

Joint knowledge production for global change adaptation and sustainability: lessons from six Dutch adaptation projects

Dr. Ir. Dries Hegger^{1}, Dr. Annemarie van Zeijl-Rozema², Dr. Carel Dieperink¹*

1) Environmental Governance
Copernicus Institute of Sustainable Development
Utrecht University
PO Box 80115
3508 TC Utrecht
The Netherlands
E-mail: d.l.t.hegger@uu.nl; c.dieperink@uu.nl
Phone: ++31 (0)30-2537829

2) International Centre for Integrated Assessment and Sustainable Development (ICIS)
Maastricht University
E-mail: a.vanzeijl@maastrichtuniversity.nl

* Corresponding author

1. Introduction

Connecting science, policy and practice in the domains of global change adaptation and sustainability is a daunting task due to the value pluralities and uncertainties involved (Hisschemöller and Hoppe, 2001; Kemp and Rotmans, 2009). Furthermore, connecting science and policy is inherently complex. Interactions are neither simple nor linear due to differences in time frames, reward structures, goals, process cycles and epistemologies (Edelenbos et al., 2011; Van den Hove, 2007; Weichselgartner and Kaspersen, 2010; Talwar et al., 2011).

In literature (Pohl et al., 2010; Regeer and Bunders, 2009; Van Buuren and Edelenbos, 2004; Vogel et al., 2007) and in practice (Climate Changes Spatial Planning and Knowledge for Climate, 2009), production of knowledge by scientists and practitioners together –*joint knowledge production* – is endorsed as a potential way to deal with these challenges. Joint knowledge production is said to lead to ‘better’, ‘more policy relevant’, or ‘more socially robust’ knowledge. It could enhance mutual understanding through better communication; enable parties to learn each other’s language; and do justice to different forms of knowledge including scientific-, practical-, local- and tacit knowledge (Van den Hove, 2007). On the other hand, science can become tainted with politics. Joint knowledge production might become a merely strategic or symbolic process, without intentions to arrive at deliberation of the benefit for society (Cash et al., 2003; Edelenbos et al., 2011).

Most existing analyses of joint knowledge production are conceptual in nature (e.g. Hoppe, 2005; Van den Hove, 2007; Van Kerkhoff and Lebel, 2006). Existing empirical studies (Edelenbos et al., 2011, Jones et al., 1999, Kemp and Rotmans, 2009; Roux et al., 2006; Steyaert et al., 2007, Sundqvist et al., 2002, Talwar et al., 2011) are fragmented in their aims and scopes, and use different success criteria. Comparative empirical analyses clarifying how joint knowledge production for global change adaptation could be done *successfully* and what would be suitable success conditions are lacking. Therefore, in this paper, we will explore, first, how the success of joint knowledge production can be *analyzed* and, second, how the differences in success between projects can be *explained*. Based on this analysis, we will propose an initial classification of joint knowledge production projects based on two variables: (i) *epistemological distance between participating actors*; and (ii) *normative consensus within the project*. We will argue that successful joint knowledge production requires forms of co-production *appropriate* to the context specified by the two variables.

Our analysis is based on a retrospective analysis of six Dutch research projects. These were part of two programs, titled ‘Climate Changes Spatial Planning’ (CCSP) and ‘Living with Water’ (LWW)¹. Both programs explicitly stated in project documents that they endorsed ‘joint knowledge production’. We thoroughly assessed the success of the projects, analysing how credible and salient participants perceived the developed knowledge to be and how they evaluated the legitimacy of the process. Next, we looked for factors explaining the differences.

The outline of this paper is as follows. In section 2 we introduce and operationalize our key notions: ‘joint knowledge production’ and ‘success of joint knowledge production projects’ as well as our research approach and data collection methods. In section 3 we give an overview of the researched projects. Section 4 analyzes and section 5 aims to explain the differences in success between the projects. Based on the analysis, in section 6 we will try to draw some broader lessons from the cases on how joint knowledge production for global change adaptation and sustainability can be done successfully. We finish this paper with some concluding remarks in section 7.

¹ <http://climatechangesspatialplanning.climate-research-netherlands.nl>; <http://www.levenmetwater.nl/home/>

2. Methodology

This section first introduces and operationalizes our two key notions ‘joint knowledge production’ (2.1), and ‘success of projects’ (2.2). Next, we will clarify our case selection and our data collection methods (2.3).

2.1 Joint knowledge production

Joint knowledge production implies that scientists, policymakers and other societal actors cooperate in the exchange, production and application of knowledge (Cash et al., 2003; Hegger et al., 2012; Van den Hove, 2007; Van Kerkhoff and Lebel, 2006). Such cooperation takes place at the ‘science-policy interface’ and involves ‘social process which encompass relations between scientists and other actors in the policy process and which allow for exchanges, co-evolution and joint construction of knowledge with the aim of enriching decision making’ (Van den Hove, 2007). As literature from the STS field illustrates (Jasanoff, 2004; Jasanoff and Martello, 2004), knowledge and social order is always co-produced through various – often indirect, subtle and intractable – interaction mechanisms. We focus, however, on joint knowledge production in projects, implying that we study the more direct and recognizable forms of co-production. The phenomenon under study, joint knowledge production, can be considered a manifestation of both Mode 2 research (Gibbons et al., 1994; Nowotny et al., 2001) and Post Normal Science (Funtowicz and Ravetz, 1993). It may at the same time be seen as a form of what some (e.g. Bäckstrand et al., 2010) term a deliberative turn in environmental governance (Hegger et al., 2012).

Bringing actors together in projects does not automatically lead to joint knowledge production, in the sense of co-producing knowledge which actors would not have developed in isolation. It should be empirically assessed whether this took place. This can be done by asking interviewees for examples of knowledge which they could only develop through cooperation. While doing so in the projects, one should keep in mind that there are several potential *subjects, objects and results of learning*. (Bennett and Howlett, 1992). Learning can be content-wise and process-related. The outcome can be first-order learning (means-end reasoning in case of a given policy problem and - context) and second-order learning (on problem definitions and relevant policy arenas) (Van de Kerkhof and Wiczorek, 2005). The latter is very likely to occur in climate change adaptation projects, since this empirical context involves value pluralities and large uncertainties.

2.2. Evaluating the degree of success of joint knowledge production

Following Hegger et al. (2012) we focus on *the success of the co-production* in joint knowledge production projects, as opposed to the *success of projects themselves*. Hence, we do not focus on environmental effectiveness *as such* or on what evaluation literature (Walter et al., 2007; Spaapen et al., 2007) calls ‘the broader impact of research’, although we deem it plausible that successful joint knowledge production contributes to these issues. Instead, we conceptualise successful joint knowledge production as a process leading to knowledge *acceptable to all participating actors* (extended peer community) (Ravetz, 1999). We assume that actors have different criteria and thresholds concerning the *credibility, salience* and *legitimacy* of the knowledge produced (Cash et al., 2002; Cash et al., 2003). Credibility refers to the perceived adequacy of the knowledge produced. Salience refers to the perceived relevance of this knowledge. Legitimacy refers to the extent in which knowledge production has been respectful of the divergent values and beliefs of stakeholders, unbiased in its conduct and fair in its treatment of opposing views and interests (ibid). In their original formulation, Cash et al. portrayed credibility as a scientific interest; and salience and legitimacy as ‘societal’ interests. Our starting point, however, will be that all actors may have criteria related to all three concepts (Roux et al., 2010; White et al., 2010). We expect successful joint knowledge production to require that at least actors *thresholds* regarding the credibility,

salience and legitimacy of the knowledge produced are met (Hegger et al., 2012). This will necessitate a reconciliation of the *criteria* of the participating actors. The perceived quality of the joint knowledge production is of tremendous importance for assuring long-term commitment of parties, which is a precondition for social learning (Lee, 2004).

2.3. Case studies and data collection

As we aimed to map out the diversity within a specific empirical domain, looking for differences that can be thought to be attributable to *knowledge production processes*, we used an embedded case study design (Yin, 2008; Scholz and Tietje, 2002) involving multiple levels (project and program). We selected the research programs CCSP and LWW that both focus on water and climate and both aim at science-policy-practice collaboration. From the programs we only selected recently finalized projects in which *at least* scientists and public policymakers participated *as partners*. To ensure that all partners had a real stake, we did not select projects with a budget less than hundred thousand Euros. In order to make a preliminary assessment of the projects' success we scanned available documents. It was tried to find different 'success rates' within comparable background conditions (program structure, financing schemes, empirical focus). Such a 'differentiating comparative analysis with plural causation' (Pickvance, 2001) allowed us to get insight into the diverse factors that may explain the success of projects. Table 1 provides an overview of the 6 projects we finally selected for an in-depth-analysis.

Data for this in-depth analysis were found by desk research as well as 27 semi-structured interviews. For each project, we interviewed actors from science, policy and program level (4-7 interviews per project). Topics discussed included: project outcomes (knowledge, policy measures, and network contacts); interviewees' interest in and passion for the project; the relationship between the project and interviewees' other activities; their original expectations (and the degree in which these were met); main lessons about science-policy collaboration; and finally, their opinion as to whether the collaboration in the project was fruitful. We tried to be mindful of the fact that what interviewees reported to us could be part of a (conscious or unconscious) process of 'strategic deployment of success/failure' (Van Assche et al., 2010) rather than their genuine opinion on the project.

3. Introducing the programs and projects

Both 'LWW' (2005-2010) and 'CCSP' (2004-2011) were co-financed through the 'Economic Structure Enhancing Fund' (FES) of the Dutch government. LWW aimed to contribute to a transition from 'keeping down water' to 'accommodating water' as well as to intensifying collaboration between technical and social scientists and to strengthening 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 of 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.

Table 1: Characteristics of the selected projects

Project, duration, budget	Participants	Stated outcomes
What's the future of low-lying peat land? (Waarheen met het Veen?); 2005-2009; € 3,250,000	Utrecht University; Wageningen University and Research Centre; Free University Amsterdam; three Ministries; three provinces; three Water Boards; various stakeholders, consultants and other actors.	Mapping out the ecological, economic and social consequences of water management strategies in low-lying peat areas; developing new strategies and governance arrangements
Co-valuation of water (Waardering in coproductie); 2006-2009; € 925,000	Erasmus University Rotterdam; Municipality of Middelburg; Province of Zeeland; local Water Board; Inhabitants of Arnemuiden; TAUW consultancy; research institute TNO.	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
Transitions Sustainable Urban Water management (SUW) (Transities Duurzaam Stedelijk Waterbeheer) 2005-2009; € 730,000	Erasmus University Rotterdam; regional Water Board; municipalities of Heerhugowaard and Rotterdam; research institutes for water and wastewater management (KWR/STOWA); TAUW consultancy	Assessing the feasibility of various concepts for more sustainable urban water management; analyzing the (potential for) socio-technical transitions needed to implement these concepts
Hotspot Zuidplaspolder 2007-2008	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 2008-2009	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'
Routeplanner (co-executed by LWW and Habiforum) 2006-2007	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 economic opportunities as well. *Co-valuation of Water* was initiated by the Dutch applied research organization TNO and Erasmus University Rotterdam. These institutes sought collaboration with the local stakeholders and applied for funding from LWW.

4. Comparing the success of the projects

This section discusses the relative success of the analysed projects 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 in 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’. Clearly, 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. 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 can 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. Explanations for differences in success rates

Judged by our criteria, *Co-valuation of water* and *Hotspot Groningen* score lower than the other projects in terms of the perceived credibility, salience and legitimacy. In these projects, some actors' thresholds regarding *all three criteria* were not met. From our perspective of contributing to virtuous societal dynamics, therefore, these projects can be considered 'failed' ones (although we do not want to play down the fact that also in these projects actors have learned). A crucial difference between 'failed' and 'successful' projects seems to be whether actors found *context-specific* forms of collaboration *appropriate* to the epistemological and normative situation at hand. Table 2 shows how the six researched projects 'score' on epistemological distance and underlying normative consensus.

Table 2: Knowledge production dynamics in the six adaptation projects

	Short epistemological distance	Long epistemological distance
Relative normative consensus	Hotspot ZPP Waarheen met het Veen	Transitions SUW Routeplanner
Value pluralities present	No projects	Hotspot Groningen Co-valuation of water

First, the more successful projects managed to link-up with the *epistemological distance* between participating actors. The projects differed in this respect, with on the one extreme *Hotspot ZPP*, in which *co-creation* took place in the sense of discussing, thinking and writing together, or being physically present in the same venue. The project's short epistemological distance was promoted by physical proximity combined with the involvement of knowledge-driven policymakers and practically oriented scientists. We found long epistemological distances in *Routeplanner*. In this

project, scientists had to translate much knowledge which was ‘basic’ for them to policymakers, including knowledge on concepts such as resilience, adaptation and vulnerability. Epistemological gaps were bridged through *knowledge brokering*. In *Hotspot Groningen* and *Co-valuation of Water*, epistemological distances were also long. Actors had diverging views as to what knowledge had to be derived from the project and what would constitute credible knowledge. Co-creation seems to be better feasible in cases with relatively short epistemological distance between the actors involved. Actors should have some initial knowledge and experience with a subject and do have some understanding of each other's language. Otherwise, less intensive forms of collaboration seem more appropriate.

Second, we see a distinction in *the normative consensus within the project*. Normative consensus is lacking in cases in which the project team includes many 'dissidents' or actors providing contra-expertise. The latter did not occur in the researched projects, but the former situation was manifest in *Co-valuation of Water*. Normative consensus was also low in Hotspot Groningen, in which actors disagreed as to how important the realization of ‘a climate neutral provincial plan’ actually was. According to Hoppe (2005) such advocacy projects are likely more difficult to execute. Normative consensus in the other projects was much higher. These projects can be characterised as 'learning cases' in which participants will be more 'automatically' inclined to engage in communicative action.

As the researched projects took place within a more or less comparable background situation (e.g. the participation of multiple actors, the presence of facilities and financing arrangements, type of steering through the research program) differences in success rates cannot be attributed to such factors. However personal factors did differ between the projects. Interviewees often referred to the role of persons at key positions (e.g. project leaders) – positively and negatively – when telling about a project. The scope of this paper does not allow us to discuss these factors in great detail (but see Hegger et al., 2012).

6. Lessons

Epistemological distances and the degree of underlying normative consensus are relevant factors to explain the success of joint knowledge production projects. However, other factors might mitigate the impact of these two. Also in cases characterised by long epistemological distances between the actors and value dissent, successful joint knowledge production need not be impossible. One may expect that it would be helpful ensuring – before and during the execution of projects – that knowledge interests are made explicit. The big challenge is to create a communicative context, which can be thought to be conducive to successful joint knowledge production. Based on our research, we can provide the following considerations as to how to achieve this.

First our research indicates that bridge-builders with experience in several worlds (science and policy) are necessary. They are needed at crucial positions (e.g. project leaders) in joint knowledge production projects.

Second, joint knowledge production seems to be feasible only if actors have some initial knowledge and experience with a subject and do have some understanding of each other's language.

Third, as joint knowledge production involves a large degree of task uncertainty and unpredictability (see also: Whitley, 1984); it can be ‘steered’ only to a limited extent. It is important for actors to be aware that the success of joint knowledge production is not always in their own hands. For instance, scientific findings may be unwelcome in the eyes of policymakers; or set-backs may occur (e.g. in the case of *Co-valuation of Water*, two persons from the municipality of Middelburg had to leave during the project).

Fourth, the previous sections brought to light the importance of actors being satisfied about the product and process of knowledge production in terms of the perceived credibility and salience of the knowledge produced as well as the legitimacy of the process. Moreover, we deem it important

that actors feel invited to denominate ‘successes’ as such. This can be the start of a virtuous circle of long-term productive science-policy-practice collaboration.

Fifth, the findings from the researched projects suggest there to be positive *correlations* rather than trade-offs between the criteria of credibility, salience and legitimacy. This is an addition to existing research stressing the importance of trade-offs between the notions (e.g. Vogel et al., 2007; White et al., 2010).

7. Concluding remarks

The six joint knowledge production projects have resulted in several examples of knowledge which actors would not have developed in isolation, thus illustrating the relevance of joint knowledge production efforts. However the projects did differ in success in terms of perceived credibility and salience of the knowledge produced and the legitimacy of the process. Context factors as well as personal factors account for these differences. The dominant message to be derived from our analysis is that there is no panacea in developing joint knowledge production processes. Different potentially fruitful forms of joint knowledge production (e.g. more or less intensive; aiming at concepts, arguments or ideas) can be found. These forms of collaboration, however, have to be *appropriate* to the epistemological closeness or distance of actors (the degree in which they can be expected to be able to cooperate closely) as well as the degree of agreement in values of the participants. A classification scheme including these two variables may have both analytical and practical value. Further research could use the scheme as an analytical tool to detail the relationship between types of projects and their success. Such scheme would also enable actors to make knowledge production processes more reflexive by inviting participants to purposefully choose for forms of cooperation.

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About the authors

Dr. Dries Hegger (1977) is a postdoctoral researcher in environmental governance at the Copernicus Institute of Sustainable Development at Utrecht University. His main areas of expertise include sustainability transitions, sustainable consumption and linking research to practice. He has a PhD degree in environmental sociology (Wageningen University, 2007). Dries is currently engaged in a research project – funded by the Dutch organization for scientific research (NWO) and the research program Knowledge for Climate – which systematically investigates how the gap between science and policy in the field of global change and sustainability could be bridged. In May 2011 Dries became research fellow at the Earth System Governance project.

Dr. Annemarie van Zeijl-Rozema (1971) is a research fellow in Sustainable Development at the International Centre for Integrated Assessment and Sustainable Development (ICIS) at Maastricht University. She holds a PhD in sustainability science (Maastricht University, 2011) focusing on the barriers for implementing sustainability policy in practice, at the regional level. Together with Dries Hegger she is involved in the INSPIRATOR project on joint knowledge production. INSPIRATOR stands for: Integrated Analysis of the Science-Policy Interface in Research Projects on Global Change and Sustainability – Implications for the actors involved in the co-production of knowledge.

Dr. Carel Dieperink (1960) studied Public Administration at Twente University and defended his PhD-thesis about the development of the international Rhine water quality regime at Utrecht

University (1997). He is lecturer (Bachelor Program Environmental Studies; Master Program Sustainable Development, Track Environmental Policy and Management) and researcher at the Environmental Governance group of the Copernicus Institute of Sustainable Development and Innovation at Utrecht University. His research focuses on the following questions: How do multilevel governance systems function and what factors account for this? This question is elaborated in several projects, a.o. dealing the European Union (integrated coastal zone management, implementation of the Water Framework Directive), international river basin management (development of the regime for the Rhine), joint knowledge production (assessment of Dutch and EU water and climate projects) and management of the global commons (climate change mitigation).