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Reconciling collaborative action research with existing institutions: insights from Dutch and German climate knowledge programmes

Catrien Termeer, Arwin van Buuren, Joerg Knieling and Manuel Gottschick

ABSTRACT

Researchers and policymakers increasingly aim to set up collaborative research programmes to address the challenges of adaptation to climate change. This does not only apply for technical knowledge, but for governance knowledge also. Both the Netherlands and Germany have set up large-scale collaborative action research (CAR) programmes for the governance of adaptation to climate change. Despite the collaborative designs, the initial enthusiasm, the available resources and the many positive outcomes, both programmes encountered several stubborn difficulties. By comparing both programmes, this paper explores the difficulties researchers encounter, analyses the underlying mechanisms and presents some lessons. It found that many difficulties are related to the tensions that exist between the assumptions underlying the new collaborative trajectories and the logics of the existing policy and research institutions. These institutional misfits are decisive to explain ultimate difficulties and successes. Furthermore, the paper concludes that risk aversion, stereotyping and scale fixation strengthen institutional misfits; and that these misfits persist due to lacking bridging capabilities. We suggest some lessons that can help to resolve the difficulties and reconcile CAR into existing institutions: organize the knowledge arrangement as a collaborative process; construct boundary objects as focal point for collaboration; and invest in bridging capabilities.

Key words | action research, climate change, governance, institutions, science–policy interface

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INTRODUCTION

Climate adaptation involves technical measures, like raising dikes or creating water storage, to cope with the consequences of climate change, but it also calls for broader processes of societal change and transitions in terms of raising awareness, behavioural change, and increasing the adaptive capacity of society to deal with unexpected future changes. Hence, adaptation to climate change is not only a technical issue, but also a demanding matter of governance. The governance of adaptation will face all the usual difficulties, hindrances, and opportunities of dealing with complex problems. On top of that, however, adaptation to climate change poses some specific, particularly demanding governance challenges and dilemmas such as a fragmented context because the ramifications of climate adaptation stretch across different policy domains and institutional levels; the lack of a well-structured policy domain; important uncertainties about the nature and scale of risks and about the effectiveness of solutions; and persistent controversies (see e.g. Hulme 2009; Haug *et al.* 2010; Jordan *et al.* 2010; Termeer *et al.* 2011; van Buuren *et al.* 2014a). In spite of these inherent complexities and ambiguities, decisions about adaptation strategies need to be taken or prepared now.

Many scholars present collaboration between science and policy as a way to address the specific challenges of adaptation to climate change (e.g. Pahl-Wostl 2009; Hoppe 2010; Pielke 2010; Hegger *et al.* 2012, 2013). Pielke (2010) even

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claims that society's ultimate success in responding to, and preparing for, climate change in the face of on-going uncertainty depends on the renewed relation between climate scientists and policymakers. Many others have pleaded for innovative knowledge arrangements that enhance, among other things, second-loop learning (Pahl-Wostl 2009), reflexivity ('t Veld 2010; Gottschick 2013), joint fact-finding (Ehrmann & Stinson 1999), stakeholder involvement (Sutherland 2003), room for experiments (Greenberg *et al.* 2003) or transdisciplinarity (Bergmann *et al.* 2012). These arrangements carry labels like collaborative research, boundary arrangements (Hoppe 2010), co-production of knowledge (Pohl *et al.* 2010), Mode 2 research (Gibbons *et al.* 1994), or transdisciplinary research (Pohl 2008; Lang *et al.* 2012).

The need for collaborative arrangements does not only apply for technical knowledge but for governance knowledge also. The latter arrangements face the challenge to connect the world of policy science with the world of policy-making (van Buuren & Edelenbos 2004; Hoppe 2009). In this paper, we argue that knowledge arrangements for governance issues call for other methods than those for technological knowledge. Governance practices – and to a certain extent policymakers – are both the object and subject of change. Little impact is expected of traditional models in which governance knowledge and governance practice are constructed in isolated worlds and mediated through policy questions and experts advise (Hoppe 2009). Against this background, collaborative action research (CAR), in which researchers and policymakers construct governance insights together, are very promising (Checkland & Howell 1998; Flood 1998; van Buuren *et al.* 2014b). In an ideal situation, CAR means that researchers enter real-world governance practices and intend to improve them, and that policymakers join the research and intend to take action and experiment with new forms of governance (Eden & Huxham 1996; Termeer & Kessener 2007).

This paper reflects on two ambitious CAR programmes: the Dutch Knowledge for Climate programme and the German KLIMZUG programme. Both programmes have many similarities large-scale programmes funded by the government (50 million euros in the Netherlands and 80 million euros in Germany); time span from 2008 to 2014; focus on developing climate adaptation strategies; collaborative design involving governmental organizations, non-governmental organizations (NGOs), businesses, research institutions and universities; and special subprogrammes for the governance of adaptation. The focus is on both governance subprogrammes. Despite the collaborative programme designs, the initial enthusiasm, the available resources and the many positive outcomes, both subprogrammes encountered several stubborn and similar difficulties in conducting CAR.

This paper seeks to understand these difficulties by focussing on the underlying institutional tensions. In doing so, it differs from other studies on collaborative knowledge that seek to explain success and difficulties by analysing the effectiveness of specific methods; the involvement of the right actors; the intensity of social learning; the level of mutual trust; or the influence of power asymmetries (Cornwall & Jewkes 1995; Hegger *et al.* 2012, 2013; Huntjens *et al.* 2014; Pahl-Wostl 2009; Regeer & Bunders 2009; Sutherland 2003; Zuber-Skerritt 2005). We assume that many of the experienced problems are related to the tensions that exist between the assumptions underlying the new collaborative trajectories and the rules and routines of the involved organizations and their institutional environment (Jacobs 2010). Like other innovative governance arrangements, these knowledge arrangements will inevitably face contradictions or even mismatches with the rules, values and power relations of existing institutions (Diamond & Liddle 2005; Keast & Brown 2006; Feldman & Khademian 2007; Termeer 2009). We expect these institutional misfits to be more decisive to explain ultimate difficulties and successes of CAR.

Against this background, the aims of this paper are to: (1) provide insights into two large-scale CAR programmes for the governance of climate adaptation, and the difficulties that researchers and policymakers encounter; (2) analyse the extent to which these difficulties can be traced back to differences in institutional logics of science and policy and reveal the underlying mechanisms; and (3) draw some lessons to better reconcile CAR with existing institutions.

BRIDGING BOTH WORLDS THROUGH COLLABORATIVE ACTION RESEARCH

In this section, we first reflect upon the distinguishing logics of the worlds of science and policy. Then, we present an overview of the assumptions underlying CAR.

The worlds of science and policy

The nature of scientific knowledge production has changed significantly during the last decades. We can witness an intensive debate about perceived shifts from mode-1 towards mode-2 knowledge production (Gibbons *et al.* 1994; Hessels & van Lente 2008). This is accompanied by increasing contextualization of scientific knowledge, characterized by a co-evolution of societal developments and scientific progress (Nowotny *et al.* 2001). On the one hand, this can be seen as a macro-level development in which the worlds of science and society become blurred. On the other hand however, there is still a deep cleavage between these two worlds (Hessels & van Lente 2008). Snow (1964) was among the first scholars to conceptualize the domains of science and policy in terms of two worlds with their own cultures, which are different in all relevant aspects.

Starting from an institutional perspective, we argue that both academic governance research and policy-making have their own logics, embedded in vested institutions. Table 1 presents the logic of research and the logic of policy-making by comparing them on five aspects.

Although we acknowledge that these logics are presented in a rather ideal typical way, this comparison clarifies the difficulties of working on the boundary between the worlds of science and policy. Of course, processes of powering also influence the world of research, and analytical processes also play a role in policy-making. However, the way in which processes are structured by the rules of the game, the incentives that guide the behaviour of involved people and the criteria used to assess outcomes differ significantly between both worlds.

CAR

CAR is an umbrella term for methodologies that aim to reconcile both worlds through intensive collaboration between researchers and policymakers. Since, governance processes show similarities with organization processes, we capitalized on the long tradition with action research in the field of organizational change. This tradition goes back to Lewin's (1951) 'Field Theory in Social Science' and his famous quotation 'If you want truly to understand something, try to change it' (Lewin 1951). We will briefly summarize the three guiding principles of CAR action, research and collaboration (Eden & Huxham 1996; Termeer & Kessener 2007).

Action

All action research engages with real life issues, with those who deal with or experience those issues directly (Coghlan & Jacobs 2005). The questions, dilemmas and experiences of policymakers form the starting point for action research. Researchers and policymakers try to improve practices through testing insights and strategies, and evaluating their usefulness (Argyris & Schön 1982). In our case the focus is on testing new governance arrangements and adaptation

Table 1 | Logic of research and logic of policymaking

	Logic of research	Logic of policymaking
Progress	Empirical cycle: from research questions and hypotheses to data collection, analysis, intervention, to evaluation	Disjointed incrementalism: non-linearity, hiccups, setbacks characterize complex decision processes
Structure	Research is organized around a single researcher and by establishing a structured set of involved participants	Decision-making processes are multi-actor, multi-level and multi-arena: elements of the process are located in different arenas
Change	New data and insights are used to refine hypotheses and to adjust interventions	Changing circumstances (legal, budgetary, etc.) or power balances can necessitate changing course
Intervention	Interventions have to contribute to gaining more insight into the way in which processes unfold and are aimed at testing theoretical hypotheses	Interventions have to contribute to realizing effective and legitimate collective action and have to fit in existing plans and agendas
Outcomes	Results have to be scientifically valid and worth publishing	Results have to be politically feasible and have to attract enough resources to be implemented

strategies. It demands the close involvement of the researchers intending to improve the governance of climate adaptation (Eden & Huxham 1996). It also implicates that policymakers are willing to take action and to experiment with new policies and reflect on this. The focus on action differs from most other collaborative knowledge arrangements, which are limited to joint knowledge production or joint fact finding (Ehrmann & Stinson 1999; Pohl *et al*. 2010).

Research

However, action research is more than researchers deliberately trying to improve policy processes and influence societal developments. It is also scientific research. Action research is only successful when it results in scientifically valid and reliable knowledge which can be generalized and used as a starting point for further research (Eden & Huxham 1996). By analysing the effects of the new governance arrangements in terms of the dynamics they generate, researchers are better able to understand the working of the complex systems analysed (Dick *et al*. 2009). To make the experiences and the learning in a particular context meaningful to other contexts, they have to be scaled up. Recoverability will help to justify the generalization and transferability of results (Checkland & Howell 1998). The focus on research differs from action learning trajectories that do not aim to translate contextual learning experiences into scientific knowledge (Argyris & Schön 1982). For researchers, close interactions with policymakers improve not only the utilization of scientific knowledge, but also its quality in terms of its sensitivity to contextual factors and the incorporation of local knowledge (Byrne 1998).

Collaboration

CAR implies an intensive collaboration between researchers and practitioners. In an ideal process of CAR, representatives of all stakeholder groups are involved (Fitzgerald *et al*. 2001). In this process of collaboration, new knowledge and new thinking is created through an interactive process in which both policymakers and researchers learn. Preferably, they not only reflect on their actions but also pay attention to the way they are learning, including a reflection on the collaborative research arrangement and its outcomes (Checkland & Howell 1998; Boonstra 2004). This critical reflection is very important to prevent the interests of policy analysts and policymakers becoming intermingled. CAR is closely related to participatory action research, in which the people who take action also actively participate in the research (Whyte 1991; Huntjens *et al*. 2014). Besides, solving the problems at hand and contributing to theory-development, participatory action research also aims at making change, and learning a self-generating and self-maintaining process in the organization.

So far we have summarized the action, research and collaboration principles of CAR. These principles are interwoven in cyclic processes. A final important characteristic of CAR is the continuous feedback loop between analytical activities (theory building, formulating hypotheses) and empirical activities (interventions, actions, experiences) (Eden & Huxham 1996). This cyclic method differs from traditional forms of consultancy and research.

METHODS

This paper analyses two cases: the governance of adaptation subprogramme of the Dutch Knowledge for Climate programme and the German KLIMZUG-NORD project, covering the Metropolitan Region of Hamburg. By following this comparative strategy, we were able to focus on different salient aspects of the knowledge partnerships and existing institutions in two different cases (Scholz & Tietje 2002). We selected these case studies because they are both unique climate knowledge partnerships, with at first sight many similarities in terms of resources, time span, ambitions, topics and difficulties. A similar case study design helps us to find out whether the differences in institutional logic actually explain the difficulties to realize CAR.

The analysis is built on participatory observing. The authors all have a long-term involvement (6 years) in either the Dutch Knowledge for Climate programme or the German KLIMZUG programme. They engaged in setting up the knowledge partnerships and collaborative arrangements between scientists and practitioners, and between knowledge institutions, governmental organizations, NGOs, and other participants. This provided them with the opportunity to be present at the heart of the

action, as was necessary to identify the relevant issues in relation to reconciling innovative knowledge partnerships and existing institutions (Erlandson *et al.* 1993). The case studies thus are based mainly upon the researchers' auto analysis and can be seen as a form of analytical autoethnography. 'Analytic autoethnography refers to ethnographic work in which the researcher is (1) a full member in the research group or setting, (2) visible as such a member in the researcher's published texts and (3) committed to an analytic research agenda focused on improving theoretical understandings of broader social phenomena' (Anderson 2006, p. 375).

Important sources of data included reflective papers written by researchers, meetings with the advisory panels, workshops and numerous meetings in which we – researchers and policymakers – discussed our attempts to organize CAR, the difficulties we faced and ways to solve them (e.g. Albert *et al.* 2012; Gottschick 2013, 2014; van Buuren *et al.* 2014c). The close inclusion of a researcher in the field is necessary but also brings the danger of collusion, the phenomenon whereby close connection makes participants blind to a certain extent and creates a climate of non-confrontation (Gray & Schruijer 2010). So some other contexts for more distant reflection were organized, like, for example, an international workshop (in Hamburg in 2013) in which both Dutch and German policymakers and scientists shared and reflected on experiences with collaborative knowledge arrangements.

The Dutch Knowledge for Climate programme and the German KLIMZUG programme provide a set of differences and similarities (see Table 2). Below we briefly describe both programmes. The focus will be on the encountered difficulties.

THE DUTCH COLLABORATIVE ACTION PROGRAMME FOR GOVERNANCE OF ADAPTATION TO CLIMATE CHANGE

The knowledge partnership

The Knowledge for Climate programme focused on specific locations in the Netherlands particularly vulnerable to the consequences of climate change, such as the Schiphol, Rotterdam, Haaglanden regions, the Southwest Delta, the major rivers, the peat areas, the dry rural areas and the Wadden Sea. These locations were called hotspots and functioned as real-life laboratories where knowledge was put into practice. In the hotspots, mixed teams of policymakers, businesses, and scientists worked together. The research programme focused on eight themes, of which governance of climate adaptation was one. It ran from 2009 to 2014. The aim of the governance of climate adaptation subprogramme was to develop and test governance arrangements that would contribute to (1) developing and implementing adaptation options and (2) increasing the adaptive capacity of society so that future climate change could be confronted. To fulfil the dual ambition to develop practically relevant and scientifically sound knowledge, a CAR method was adopted. The programme was organized around 10 projects, each one conducting research in at least three different hotspot areas. It brought together key stakeholders and researchers, including eight PhD candidates.

The process

In 2008, the Knowledge for Climate programme organized an open call for pre-proposals. Consortia of research organizations were invited to apply for funding, which has to be matched by in-cash contributions from the hotspots. After both a scientific and a societal review procedure, the consortia were selected. Collaboration between researchers and policymakers from the different hotspots could get started to develop a full proposal. Projects and possible projects (case studies) were defined, and co-financing was sought from hotspot partners. In this phase, it was crucial to identify practical challenges of climate adaptation in the hotspots for which broad problem ownership existed and that could serve as anchors for the different projects.

After formal approval of the full proposals (May 2009), the idea was to consolidate the co-funding contracts, to select the PhD candidates, to organize the research consortia, to intensify the interactions with the hotspot partners, and finally to further define and organize the research projects. However, the circumstances changed. The Netherlands was caught up in a serious financial crisis leading to drastic budget cuts at all governmental levels. Moreover, environmental issues were not a priority of the

Table 2 | Overview main characteristics

	Knowledge for climate subprogramme: governance of climate adaptation	KLIMZUG subprogramme: climate adaptation governance in KLIMZUG-NORD
Time span	2009–2014	2008–2014
Main aims subprogramme	Developing and testing governance arrangements	Regional capacity building
	Scientific knowledge production, applicable in regional hotspots	State-of-the-art approach to managing climate change
	Regional, evidence-based adaptation strategies	Innovative strategies for adaptation to climate change
Funding programme	Financed by the Ministry of Infrastructure and the Environment: 50 million euros. Co-financing by regional governments (organized in hotspots) and research institutions	Financed by the Federal Ministry of Education and Research: 80 million euros. Co-financing by regional governments and research institutions
Structure subprogramme	Research consortium based on various governance disciplines. PhD research for preference	Research consortium based on multiple disciplines. PhD research because of lack of post doc capacity
	Ten projects, consisting of various case studies in different hotspots and different delta subprogrammes	Steering board as a feedback platform between practice and research
	Steering board – at a distance – as a feedback platform between practice and research	
Methods	Started with explicit CAR, evolved into a more pragmatic approach	In the beginning, no explicit method for collaborative research, evolved into a transdisciplinary method
Science–policy collaboration	Ups and downs: quite constructive during definition phase of programme, problematic in relation to defining research questions, projects and co-funding	Ups and downs: ambitious start phase, problems during the long research duration
	Varying from very intensive in a couple of cases, to more traditional in other cases	Very intense in some fields and regions, rather low in others
	Final co-creation trajectory mobilized additional energies and intensive collaboration	Final *Kursbuch* mobilized additional energies and motivation, including an intensive dialogue and feedback loops between research and practice
Main results	Important contributions to regional adaptation strategies of hotspots and Delta Programme	Important contributions to regional adaptation strategies
	Governance of climate adaptation handbook	*Kursbuch*
	Many scientific deliverables. Increased awareness of, and demand for, governance knowledge	Many scientific deliverables. Increased awareness of the complexity of the climate issue
	Budget cuts due to financial crisis	
'Main external constraints'	Climate change disappeared from the political agenda	Changing political priorities during the research process consequent to a change of government in Hamburg
	The start of the Delta Programme in 2010 (new opportunity)	
'Main difficulties encountered'	Organising co-funding	Mutual misunderstanding
	'Paper' commitments	Unbalanced problem ownership
	Misunderstanding	Lack of interdisciplinary methods
	Hesitation about experimenting	Lack of experienced researchers
	Translation of research results into practical courses of action	Pressure to publish
	Job rotations/staff turnover	Discontinuity of partners
		Lack of attention at the finish

new right-wing coalition government that started in 2010, and the problem of climate change nearly disappeared from the political agenda. In this volatile political and financial context hotspots hesitated, and it proved difficult to intensify the interactions with stakeholders and consolidate the promised co-funding. During the research process, the interaction with many hotspots remained difficult, due to a lack of commitment, resources and continuity of people. At a certain point in time and because of the PhD researchers' strict 4 year schedule, further delay was no longer possible. The PhDs started with their research projects (focused upon some general research questions) and selected case studies in those hotspots where enthusiastic policymakers were willing to collaborate.

Furthermore and parallel with the Knowledge for Climate programme, the Dutch government had installed in 2010 the so-called Delta Programme. The Delta Programme is aimed at guaranteeing that the Netherlands remains safe and attractive, now and in the future, and that the freshwater supply is adequate. The Delta Act that constitutes the basis for the Delta Programme, the Delta Fund and the Delta Commissioner (Vink *et al*. 2013) came into force on 1 January 2012. At that point, the Knowledge for Climate programme was already preparing its midterm review. Despite this time gap, the newly started Delta Programme provided some alternative CAR opportunities. New collaborative research projects were identified in which researchers from the governance research programme started to collaborate with policymakers from the Delta Programme on governance issues. They improvised and developed a variety of collaborative research methods, varying from workshops and advisory reports to learning tables and in-house analysis. Whereas the pre-planned collaborative projects faced many difficulties, the more spontaneous projects proceeded more smoothly.

Finally, in 2013 the governance consortium organized a so-called co-creation trajectory in response to a critical message from the midterm review, with regard to the societal relevance of the research. Eight key policymakers in the domain of climate adaption were invited to present their most challenging governance issue. These persons were partnered with a senior researcher from the consortium. These newly formed couples of policymakers and researchers were asked to jointly develop courses of action for the specific governance issues. The results were presented and elaborated at a conference in 2014 and compiled into a handbook.

All in all, the research programme was quite successful in generating scientific output. However, in only half of the projects CAR was successfully applied, resulting in in-depth learning, changed governance arrangements, and new scientific insights (van Buuren *et al*. 2014b). In the other projects, interaction between researchers and policymakers was limited to developing research questions and disseminating the results of completed studies through workshops and lectures.

Main difficulties

Organizing co-funding contracts

Finding the required co-funding became a time-consuming process. Budget cuts, changing political priorities and the installation of the Delta Programme with a separate research agenda further complicated the co-funding process. The hotspot partners hesitated, because their former political backing had eroded. Whereas in the first phase the policymakers responsible for climate issues interacted with the researchers, the financial experts from both the hotspot partners and the universities now entered the scene. Apart from the high transaction costs, these experts also introduced output requirements that were highly contrary to the assumptions underlying CAR. Instead of climate adaptation, budgetary and administrative issues became the central concern in the relation between researchers and policymakers. When the general Knowledge for Climate board decided to reduce the co-funding requirements, the PhD candidates were allowed to start with CAR projects outside the hotspots also. 'Following the energy' became the guiding motto.

Different interpretations of basic terms and concepts

Important terms in CAR are research, research questions, policy, policy guidelines, experiments, and learning. The cases show how different interpretations of these terms caused misunderstanding. For example, the term 'research question' caused some misunderstanding. When policymakers in the Knowledge for Climate were invited to develop research questions, the scientists qualified these

questions as consultancy questions not relevant for scientific contributions. This superficial disqualification continued during the collaborative process.

'Paper' commitments

The CAR method had been deliberately discussed. Initially, policymakers were enthusiastic because they were no longer interested in waiting for the researchers to leave their ivory tower to present their intangible analyses and recommendations. However, getting started proved to be difficult because of different expectations (in-depth research versus advice usable tomorrow) and misfits between the national scale on which the programme was initiated and the regional questions of hotspots formulated. On top of this, not all hotspots evolved into strong regional networks. Whereas, some hotspots were rather successful and displayed strong leadership, other hotspots almost faded away.

Hesitation about engaging in experiments

Testing new or improved governance arrangements is a key element of CAR. However, policymakers were very cautious about experimenting with new adaptation policies and to engage in real experiments to test scientific hypotheses. Researchers were hesitant to engage in policy practices also, because scientific journals, for example, are critical of researchers who engage in the practices that they are studying, instead of keeping at a distance, using 'proven' methodologies and remaining 'objective'. Both policymakers and researchers struggled with balancing scientific and practical demands.

Translation of research results into practical courses of action

Notwithstanding all these collaborative projects, some policymakers expressed their disappointment with the outcomes during the midterm review. From their point of view, the knowledge was too abstract, or too specific because of the level of analysis chosen by the researcher (who was for example interested in studying the dynamics of framing instead of the collaborative process as a whole), relevant insights came too late (due to different time horizons used by policymakers and researchers) and did not fit in their day-to-day practice. This was partly caused by a lack of experience among some involved PhD researchers to make this translation. To bridge this perceived gap, the consortium decided to make an additional effort to reconcile knowledge and practice, resulting in the co-creation trajectory (with senior researchers), including a conference for practitioners and a handbook, as already mentioned.

Job rotations

Reorganizations in the public domain and regular job rotations caused some continuity problems. For example, all members of the steering group except one had to leave this group prematurely because of job rotations. This steering group represented the hotspots and the ministries, and advised about the usability of the research. It was difficult to replace them with involved and committed people. This discontinuity resulted in a loss of trust and fewer interactions. As a consequence, the idea of reflection on the process of mutual learning and collaboration faded away.

THE GERMAN COLLABORATIVE KNOWLEDGE PARTNERSHIP FOR REGIONAL ADAPTATION TO CLIMATE CHANGE

The knowledge partnership

The KLIMZUG-NORD project was one of the seven large projects funded by the Federal Ministry of Education and Research in Germany (BMBF) in the research priority 'KLIMZUG – Managing climate change in the regions for the future'. It ran from 2008 to 2014. KLIMZUG's objective was to develop innovative strategies for adaptation to climate change and related weather extremes in regions. All projects focused on regional aspects, as adaptation to climate change must be tackled by measures at regional and local level. Regional cooperation networks were developed to pool the scientific, planning, technical, and entrepreneurial strengths of the stakeholders involved in a region and to actively establish structures for a new, state-of-the-art approach to managing climate change. The networks were meant to exist and to evolve on a long-term basis and thus to strengthen the competitive advantages for future climate conditions. The

successful implementation of measures for climate change adaptation on a regional level is highly dependent on the commitment of local citizens. For that reason, KLIMZUG also emphasized educational and capacity building aspects.

The process

In 2008, the KLIMZUG-NORD consortium won the national research competition together with six other projects distributed all over Germany. KLIMZUG-NORD addressed the Metropolitan Region of Hamburg. Severe flooding events of the river Elbe had weighted climate adaptation highly on the region's political agenda. KLIMZUG-NORD was organized under three overarching topics (urban development, cultivated environment and estuary management) and five cross-cutting themes (climate change, nature conservation, economy, governance, and communication and education). Altogether, KLIMZUG-NORD consisted of 25 subprojects with over 180 members, who came from higher education and research institutions and non-scientific partners like the civic administration, companies, fire insurance companies or farmers' associations.

During the research process, it became apparent that the level of analysis was too general to enhance stakeholder involvement and interdisciplinary work. Therefore, it was decided in 2009 to add smaller subregions to the project design. In these so-called model areas, a range of disciplines worked together to develop a strategy for a specific local challenge; sometimes even smaller focus areas were identified for solution finding. The areas were selected to serve as examples of specific problem constellations allowing the transfer of problem solutions to comparable areas in the region, in other parts of Germany or internationally. The model areas represented, for example, climate adaptation in a dense urban quarter of the City of Hamburg, middle-sized cities in the hinterland of Hamburg, the basin of the river Elbe protected as a biosphere reserve and rural agricultural areas in the Metropolitan Area of Hamburg.

Furthermore, the collaboration was practised intensively to prepare a core final output of the research consortium, the so-called *Kursbuch*, a concentrated selection of main recommendations of the research for politicians and civic administrators. The first draft was written by the researchers in the first half of 2013 (as a result of a complex interdisciplinary process), then a workshop with the administration and a review process by practitioners contributed substantially to rewriting and editing the *Kursbuch* at the end of 2013.

Besides those boundary objects where research and practice were forced to directly work together (and did successfully), the consortium included some organizational structures to help bridge the gap between the two worlds. On the one hand KLIMZUG-NORD had a board that contained members from the involved scientific and practice partners as well as practitioners from outside the region adding a critical and more independent view. The board opened the opportunity for regularly having a dialogue about expectations of the policymakers towards the project and on ideas and restrictions the researchers were dealing with. More often than the board, a steering committee met for discussing actual questions of the project development. Here, practice and research sat together and were forced to find a way of understanding each other and to jointly agree upon the next steps. A project conference each year provided transparency about the project results and offered a platform for open dialogue between the senior and young researchers on the one hand and the policymakers on the other hand.

The KLIMZUG-NORD science–policy interaction process covered a range of aspects. It generated knowledge and aimed to communicate it in a way that this knowledge was in principle usable to support decision-making. To facilitate collaboration and improve reflexive capacity, interdisciplinary work was undertaken with several kinds of stakeholder involvement, varying from workshops, local dialogues (e.g. in the form of a Learning and Action Alliance) and conference series aiming at good science communication. This process did not start at the end of the project. Rather it was embedded along the research process from 2009 to 2014.

Main difficulties

Mutual misunderstandings

In the first instance, the collaborative process went very smoothly. During the development of the proposal, a number of meetings had allowed researchers and practitioners to get to know each other and learn about the

aims and motivation, but also restrictions and barriers, on both sides. Consequent to substantial co-financing by the Metropolitan Region of Hamburg (MRH) and the participating universities, all partners started with high expectations. The first working phase, therefore, was characterized by integration into each other's running working processes, for example in 2010 researchers were initially invited to the MRH's regular climate mitigation and adaptation working group. However, this process resulted in some mutual misunderstanding. The MRH members were not used to researchers asking them what they should research. It seems to be risky for them to invest time and energy in such open collaboration process. In addition, disqualifying the practicality of scientific output lowered the expected benefits for the members. On the other side, offering unsolicited advice was easily interpreted as a critique. This was especially the case when researchers aimed to support the professional work of policymakers.

Unbalanced problem ownership

Another aspect was the unbalanced problem ownership concerning climate adaptation. The consortium partners had different identifications with the core problem to be solved. Some researchers and practitioners had been working on topics relating to flooding for several years; others had been involved in writing IPCC reports. Both groups were strongly concerned to promote climate adaptation. Other members of the consortium brought in important competencies in specific areas of expertise or related fields of administration, but had not previously been that involved in the climate change discussion. This produced a sort of incoherence, resulting in misunderstandings and mutual disharmonies between different standpoints.

Lack of inter- and transdisciplinary methods

Nevertheless, in contrast to the Dutch case, there was much focus on inter- and transdisciplinarity. However, due to the lack of an explicit methodological concept for this, the process was in parallel faced with problems of interdisciplinarity and science–policy collaboration. Sometimes, it even led to conflicts between researchers from different disciplines caused by differing goals (e.g. peer-reviewed journal papers in the English language versus applied outputs useful for regional practitioners) or self-conceptions of research (e.g. critical analytical versus positivistic, technically oriented innovation approach).

Lack of experienced researchers

As is often in such projects and because of the structural decrease in post doc positions in German universities, the main burden of research was carried out by PhD students. The strong demand of the funding organization for network building, applied science and stakeholder involvement forced them to initiate and facilitate processes without sound knowledge and experience. This led in some cases to practically and scientifically weak processes and outcomes. It must be realized that CAR needs a backbone of experienced researchers.

Pressure to publish

Academics increasingly face pressures to publish in high-impact, English language journals, because universities are more and more working with performance indicators in which the number of publications in high impact journals is a crucial element. This implies that scholars need to devote much of their time to writing and rewriting scientific articles. This is difficult to reconcile with collaborating with practice actors in the field. Also, high impact journals tend to put strict demands on the rigour of the research, including a rigorous research design. Several journals are also hesitant to accept articles based on CAR because they are critical of researchers who engage in the practices that they are studying. Furthermore, this pressure leads to English language publications, which are hardly usable for the dialogue with practitioners.

Continuity of partners

The discontinuous availability of partners caused problems in project organization. The duration of the numerous subprojects varied, with the result that some partners (both researchers and policymakers) had to leave the project prematurely and were hardly available in the final phase. Also, this discontinuity had the negative effect that trust that had been

built-up between the partners was lost. In the civic administrations, continuity was affected by personnel changes consequent to reorganization or staff turnover. This also resulted in a loss of trust but offered the chance to include new, engaged and innovative persons in the consortium.

Lack of attention at the finish

In the final phase of the research, attention decreased because researchers were already looking for new funding and projects. This caused some frictions in the consortium because the remaining researchers had to carry the burden of finishing the project and were confronted with high expectations by the practice partners who were eager to use the results in the administrative and political decision-making processes at local and regional level.

DISCUSSION

Both case studies show that collaborative research is a complex hybrid activity that proceeds with ups and downs. Although, collaborative research aims to reconcile the worlds of science and policy, many of the difficulties experienced can be explained by tensions between the logics of research and of policy-making. Examples include, amongst others, the pressure to publish in high impact journals versus developing relevant knowledge; balancing between time for scientific research and stakeholder activities; high transaction costs due to mutual misunderstanding and so forth. These findings are rather obvious and have been reported previously (Hegger *et al.* 2012, 2013; Jacobs 2010; van Buuren & Edelenbosch 2004). Subsequently, we tried to analyse the underlying mechanisms.

We revealed three mechanisms, embedded in the institutional logics of science and policy-making, which are especially relevant to explain the persistent difficulties for CAR. The first mechanism is 'risk aversion'. It refers to the dominant logic of scientists to keep on the safe side with regard to methods for data collection and engagement with practitioners versus the dominant logic of policymakers to prevent policy processes from external, unexpected dynamics. At both sides risk aversion can be witnessed. CAR requires both researchers and policymakers to engage in experiments and reflect on existing routines. However, they were both hesitant to leave their comfort zone. We found examples of policymakers who liked the ideas behind an experiment but decided to postpone implementation until a more appropriate juncture, who discarded a new idea – which challenged the existing policy paradigm – as too risky, who feared direct interventions by scientists into praxis; but the same applied to scientists. Some scientists were also hesitant to engage in action, because they feared that it was too time consuming and would not bring them interesting scientific results. Conflict avoidance is another type of risk aversion. Both researchers and policymakers preferred to have cosy discussions and avoided explicitly discussing the tensions in the collaborative processes. Tennekes *et al.* (2014) found that getting out of the comfort zone is a more general difficulty of climate adaptation policy. This reason potentially strengthens the mechanism for risk aversion.

Differences in institutional logics were strengthened by the second mechanism: 'stereotyping'. Negative pre-assumptions about scientific knowledge as abstract and not applicable versus policymakers as focusing on short-term results, not really interested in research outcomes and not reflective proved to be very stubborn. Such stereotypes resulted in mutual misunderstanding and less interactions. Simultaneously, and as a result of limited interaction, these stereotypes also remained very hard to remove.

The third and final mechanism is scale fixation. It refers to the inability to (re)create fit between relevant scales. This mechanism is to some extent specific to the governance of climate adaptation, which requires a good fit within and between jurisdictional scales, geographical scales and time scales (Cash *et al.* 2006). Right from the start, misfits regarding the jurisdictional scale became evident. Both programmes were funded mainly by national or federal governments, whereas most climate adaptation measures need to be implemented at regional level (Garrelts & Flitner 2014). Actors involved lacked the ability to recreate fit. The Dutch solution of requiring co-funding from regional authorities further complicated this issue. Regarding the time scale, researchers had a longer-term focus than policymakers, who are pressed to achieve things within the term of their elected authorities. In both programmes, however, researchers also displayed a short-term orientation because they could not

sustain delay in policy processes and experiments and because involvement in long-lasting policy trajectories conflicted with their temporary contracts. The different CAR activities, such as stakeholder involvement or strategy development, have their own optimal geographical scale. The pre-given installation of hotpots hindered the Dutch programme to address transboundary adaptation issues. The German case shows that, when the geographical scale does not fit these activities, it can be fruitful to change the programme design and continue with smaller subregions.

These three mechanisms strengthened the misfits between both institutional logics. Furthermore, both the research and the policy institutions lacked some essential capabilities to bridge both institutional logics and to facilitate processes of mutual learning. These include lack of resources; lack of methods and competences; and lack of boundary spanners. Governmental agencies and scientific institutes do not have earmarked resources to invest in the relation between both worlds. They use the available money as much as possible for their own core tasks. Within both programmes, the majority of the means was used for research (salaries of PhDs), not for organizing the interface between science and policy. Policymakers had to set priorities under budget constraints and used their budget rather for hands-on advice than for CAR. There are not many useful and proven methods which facilitate interaction between both worlds. The same holds true for competences of people involved in this interaction: they are often not (enough) experienced in organizing collaborative research. CAR requires both good research and process/intervention skills. Finally, there was a lack of boundary spanners; actors speaking the language of both worlds. Especially, for the less experienced researchers it proved difficult to engage with practitioners. Those people who are in a position to organize interaction (for example, the hotspot coordinators) were often overcommitted to different boundary spanning roles and thus paradoxically not powerful enough to realize expectations.

However, not all difficulties in the collaboration of research and practice could be traced back directly to tensions between both logics. A couple of problems are also related to the management of the programmes and the conditions within which they have to operate. Especially the issues of funding, the staff continuity and output indicators are relevant. The whole action research cycle is hard to complete when the same policymakers and researchers cannot be twined for a longer period of time. When the output is mainly defined in terms of written and visible deliverables, there is a strong disincentive for both researchers and policymakers to invest much in workshops, discussions and other types of interaction. These findings confirm existing insights that successful CAR requires the availability of enough time, enough resources, and mutual commitment (Van Vliet *et al.* 2014). Without these preconditions met, CAR remains fragile and vulnerable, particularly in times of austerity and changing political agendas.

CONCLUSIONS

Across the world, researchers and policymakers are increasingly involved in collaborative research programmes to address the challenges of adaptation to climate change. In general, this does not fit with traditional, but still dominant, interpretations of good policy, and good research. We reflected on this misfit by distinguishing between the logic of research and the logic of policy-making. The CAR method aims to reconcile both worlds through intensive collaboration between researchers and policymakers, and a focus on actions. However, both cases have shown how collaborative actions research proceeds with ups and downs. These problems can be partly solved by improving the management of this type of research programmes and by fine-tuning the conditions for these activities. Our research shows that a couple of problems cannot be solved by better management, due to the irreversible institutional differences between both worlds. The paper analysed the main difficulties with regard to colliding institutional logics and revealed three mechanisms that strengthened these institutional misfits: risk aversion, stereotyping and scale fixation. These misfits persist due to lacking bridging capabilities.

In spite of all these insights, we still believe that CAR has high potentials to bridge the logics of governance science and governance practices in the field of climate change. Although our focus was on difficulties, we must not forget the many successful CAR projects and activities in both programmes. An important conclusion from this research is that change comes with ups and downs. As many authors remind us, we

cannot expect CAR to occur successfully overnight (van Buuren & Edelenbos 2004; Hegger *et al.* 2012, 2013). Rather than a picture of abrupt change, what is more in order is a picture of continuous ups and downs resulting in small wins (Weick & Westley 1996). In that respect, we are currently witnessing a promising transformation process within the world of science, in which valorization becomes more important, as well as collaboration in the 'triple helix' of research, private business and the public sector, and the 'quadro helix' including also civil society (Ghazali & Martini 2012). This process of institutional change also results in more and stronger auxiliary or intermediating arrangements at the boundaries of the various domains (Pohl 2008; Metcalfe 2010). These arrangements can facilitate interaction and coproduction between these domains and are crucial for successful CAR.

Finally, we suggest some principles that can help to resolve the difficulties and reconcile CAR into existing institutions.

Organize the knowledge arrangement as a collaborative process

The described difficulties are at least partly familiar in all collaborative processes. Therefore, it is important to organize the knowledge arrangement as a collaborative process that makes use of the rich insights from the literature on collaboration (Gray 1989; Huxham & Vangen 2005). Gray (1989, p. 5), for example, provides interesting insights about the continuous process of increasing participants' and organizing collaboration as a process 'through which parties who see different aspects of a problem can constructively explore their differences and search for solutions that go beyond their own limited vision of what is possible'.

Construct boundary objects as focal point for collaboration

Both climate research programmes show that the best examples of collaboration were found at so-called places of collaboration (Ciolfi *et al.* 2008) where policymakers and researchers were challenged by concrete joint tasks and worked together on 'boundary objects' – issues that link different communities together, because they are important for both of them (Wenger 1998). In the Netherlands, such boundary objects were the Delta subprogrammes that had to prepare for a strategic Delta decision or the partnerships that had to develop a course of action for a specific governance issue. In Germany, they were focus areas, where research and practice jointly developed concrete solutions for climate adaptation, and a regional strategy document. These boundary objects also helped to overcome the scale mismatches. This means that large-scale CAR programmes can only be successful when they facilitate places of collaboration, that animate people for CAR.

Invest in bridging capabilities

Improving the quality of the collaboration process and facilitating places of collaboration helps to remove obstacles and barriers to CAR. At the same time, this is not enough to deal with the tensions between the two institutional logics, especially when it comes to realising outcomes that fit in both logics. Dealing with wicked issues like climate change adaptation presupposes effective knowledge arrangements between scientists and policymakers. Establishing effective CAR arrangements is only possible when the logics of both worlds become more synchronized. Therefore, it is important to invest in bridging capabilities resources, competences and boundary spanners.

This paper is based on the insights of two large-scale CAR programmes. Further, empirical research is necessary to better understand the extent to which these principles are helpful to overcome the institutional cleavages between the worlds of science and policy. Besides, empirical research on the above-mentioned lessons could help deepen the knowledge to advance future research concepts. For example, which collaborative process methods are promising or critical, how can hotspots or model areas contribute to a more effective CAR and how to organize investments in bridging capabilities in times of austerity?

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