Using dialogue arenas to manage boundaries between sectors and disciplines in environmental research projects

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Abstract
An interactive research strategy, a form of action research, was used in two environmental research projects. This strategy emphasises a balance between research and practice. Further, the method of dialogue arenas was used, meaning the creation of different types of meeting places where research and practice interact with each other. This paper shows the strength of these dialogue arenas to identify and cross boundaries. During these dialogue arenas the interactive researcher encountered two such boundaries. The first boundary was found in the research system between social science and natural science. The second boundary was found in the practice system between the collaborating sectors. Dialogue arenas helped in managing these boundaries by clarifying the role of the social scientist, facilitating collaboration, and democratising the research process.

Keywords: Interactive research, boundaries, cross-sector collaboration, transdisciplinary science, environmental science

Utilizando espacios de dialogo para gestionar los límites entre sectores y disciplinas en proyectos de investigación ambiental

En dos proyectos de investigación ambiental fue utilizada una estrategia de investigación interactiva, una forma de investigación acción. Esta estrategia hace hincapié en el balance entre la investigación y la práctica. Además, se utilizó el método de los espacios de dialogo, lo que significa la creación de diferentes tipos de lugares de encuentro donde la investigación y la práctica interactúan entre sí. Este artículo muestra la fuerza de estos espacios de diálogo para identificar y cruzar límites. Durante estos espacios de dialogo, el investigador interactivo encontró dos de estos límites. El primer límite fue encontrado en el sistema de investigación entre las ciencias sociales y las ciencias naturales. El segundo límite fue encontrado en el sistema de práctica entre los sectores colaboradores. Los espacios de diálogo ayudaron a manejar estos límites, aclarando el papel del científico social, facilitando la colaboración y democratizando el proceso de investigación.

Palabras Clave: Investigación interactiva, límites, colaboración intersectorial, ciencia transdisciplinar, ciencia medioambiental

1 Introduction

Environmental problems need to be addressed by both natural and social sciences in order to include both technical and social processes. As stated by Hilary Bradbury (Bradbury 2001) action research can provide "a common language to many of the cross-sector initiatives that include people from the cultural and economic realms". Even large scale problems like climate change can benefit from an action research approach, as it empowers people to influence policy from a grassroots level (Hall, Taplin, & Goldstein 2010). It has also been noted that action research can aid in sustainability transitions by creating an interactive space between academics and the community (Wittmayer, Schäpke, van Steenbergen, & Omann 2014). In this paper, we define and present dialogue arenas as examples of such interactive spaces. Dialogue arenas can be seminars, workshops, search conferences and other common meeting forums where researchers and participants interact with each other.

Previously search- and dialogue conferences have used this same principle. These use a longer timespan which is more demanding for the researcher and the participants (Ahmad, Gjøtterud, & Krogh 2016; Ekman Philips & Huzzard 2007; Shotter & Gustavsen 1999). Other terms that have been used are study circles, peer-group mentoring and research conferences (Rönnerman et al. 2015). During such dialogue arenas communicative spaces are created (Wicks & Reason,2009). The goal is to create informal situations based on a specific topic of interest both to researchers and practitioners. Well-functioning communicative spaces are inclusive by design (Forester 1999). While the organisers present the topic, the discussion part is important and here the participants should mix with each other to get new input. Dialogue has been an integral part of action research and its importance for the research process has been emphasised in dialogic action research (Maurer & Githens 2010). Such spaces are open to the expression of needs, frustrations, and visions from individual participants.

The empirical context is based on previous research conducted by the main author who has been a member of an environmental science research group for more than five years. While members of the group had their background in natural sciences, the main author had a background in social sciences and was recruited to the group to do research on environmental research collaborations. More specifically, triple helix collaborations (Etzkowitz & Leydesdorff 2000) where university, industry and public sector collaborate. Being a social scientist in a natural scientist environment meant taking part of two different ontological and epistemological worlds. Involving participants in cross-sector collaboration added another level of complexity for the action researcher.

Balancing between the research and practice systems is a recognised challenge in action and interactive research (Ellström 2008; Sandberg & Wallo 2013). In this paper an interactive research model, for studying and facilitating cross-sector collaborations, is developed. Dialogue arenas are at the centre of this model. The first aim of this paper is to identify and discuss two boundaries that were encountered by the interactive researcher in two environmental research projects. The second aim is to describe and evaluate the interactive research model that was developed in order to investigate, and at the same time manage, the challenges that arose from the two boundaries within the cross-sector collaborations. The following subsection describes these two boundaries.

2 Boundaries between disciplines and sectors

The literature on boundaries gives an indication into how an interdisciplinary and cross-sector environment functions. Boundaries are different ways to demarcate between one social arena and community to another. Such boundaries can consist of differences in rules, identity, culture, knowledge that are more or less social and cognitive and have different spatial and physical characteristics related to different occupations (Barley & Kunda 2001; Hsiao, Tsai, & Lee 2012). These characteristics become evident when working in cross-sector collaboration and between disciplines.

It has been noted that solving environmental problems also requires crossing disciplinary, organisational and national boundaries which complicate such collaborative work (Perz et al. 2010). First, we consider the *disciplinary boundary*. Interdisciplinary collaboration has previously been a common way to approach environmental problems (Holm et al. 2013; Lang et al. 2012). Further, there has been a call for increased interdisciplinary collaboration between social science and natural science to tackle complex environmental challenges (Bryant 1998; Pohl 2005). However, there has also been previous criticism that environmental science leaves out large parts of society due to its positivist nature (Cortner 2000). Collaboration between the macro sciences, such as social sciences and natural sciences, leads to additional challenges due to different paradigms and methods (Lowe & Phillipson 2009). Disciplines have their language and terms creating a linguistic divide. Each discipline has unique methods to acquire and validate information. Further, each discipline has different views of the role of stakeholders and the societal context for the research process (Eigenbrode et al. 2007).

The idea of a radical inter-disciplinarity can be used to describe the collaboration between social science and more technical disciplines. As environmental challenges often are framed as physical or technical, it has been noted that social science can help manage social, political and cultural issues during such collaborations (Petts, Owens, & Bulkeley 2008). However, such collaborations bear with them risks as the end-results can fall between traditional paradigms (Evans & Marvin 2006). Natural sciences recognise the law-like nature of, for example, environmental systems. In this, there is also a sort of reluctance from natural scientists to go all the way over to social science which also recognises the subjectivity of the researcher (MacMynowski 2007). At the same time, research collaboration between natural and social sciences can bring a rewarding reflection upon the different epistemological and ontological views.

Second, we consider the *sector boundary*. Cross-sector collaboration has been acknowledged as an integral part of modern day knowledge production (Gibbons 1994). There are however ideas and theories that discuss the constituents of contemporary knowledge production. One such idea is the triple helix model (Etzkowitz & Leydesdorff, 1997; Leydesdorff & Etzkowitz 1998) which recognise the importance of increased interactions between university, industry and public sector in contemporary knowledge production. While the original triple helix model was intended to be used as an analytical tool, it has also been used as a way to rationalise projects that include participants from the different sectors.

These cross-sector boundaries are in a way also boundaries between research and society. Indeed, scientists themselves have an interest in upholding boundaries between science

and non-science (Gieryn 1983; Merton 1973) and between science and policy (Waterton 2005). This can create a distance between academia and other sectors of society which can lead to difficulties in collaboration and in dissemination of knowledge.

One proposed solution has been transdisciplinary research which is characterised by the focus on one problem, targeted by several disciplines on one hand, and by several societal practices on the other hand (Hadorn, Bradley, Pohl, Rist, & Wiesmann 2006). As noted in previous research: "Transgressing boundaries between disciplines and boundaries between research and practice demands attention to the nature, the backgrounds and the implications of such boundaries" (Hollaender, Celine Loibl, & Wilts 2008, p. 395). A transdisciplinary approach can benefit from an action research methodology because of the emphasis on interaction between researchers and the community (Stokols 2006). While this has been recognised before (Hadorn et al. 2008), we identify a need for a further discussion about this methodology.

Overcoming such boundaries means that the researcher cannot be an isolated onlooker (Gustavsen 2003). For researchers as well as practitioners, managing the cross-sector and the natural/social science boundary in cross sector collaboration requires a flexible and inclusive methodology. The inclusive methodology was a part of the research design, and played an important part in validating early research results, and made it possible to provide value for both practice and research systems.

Interestingly the action researcher has previously been noted as an example of a role that can help span such boundaries. The action researcher can act as a form of boundary subject (Huzzard, Ahlberg, & Ekman 2010). Such a person could potentially sit between and intersect different domains bringing a shared understanding between these and facilitates connections and common understandings. These domains can, for example, be the triple helix sectors (Lundberg 2013; Metcalfe 2010). In doing so, the researcher ideally creates room for a reflection among the participants about their role and how they act when encountering other disciplines, sectors or society in general. In other terms, the action or interactive researcher can be a boundary spanner (Kellogg, Orlikowski, & Yates 2006; Levina & Vaaste 2005). Such boundary spanners (Williams 2011) can focus on networks, relationships, diplomacy, brokering, interpretation and organising. Further, different types of boundary-spanning activities can be used (Aldrich & Herker 1977; Ancona & Caldwell 1992). These activities concern different ways of communicating progress and knowledge between the various social worlds or, in our case, disciplines and sectors.

3 Interactive research

Action research is in broad terms a strategy where the participation and interaction between researcher and other participants is encouraged. Thus, it is well suited for any project where facilitation for collaboration and more knowledge about such processes is needed (Huxham 2003). Action research also aims to bridge social sciences and practice (Reason & Bradbury 2006). Knowledge is gained from intervention and inclusion of a diversity of participants, recognising that each of these has valuable knowledge to share.

For this paper, we use the term interactive research to emphasise the importance of finding a balance between research and practice. In a Scandinavian context, the term inter-

active research is a tradition associated with workplace learning (Nielsen & Svensson 2006). This tradition emphasises the need to create common ground between participants through dialogue. Here the researcher role should ideally be equal to the other participants (Svensson, Eklund, Randle, & Aronsson 2007). The involvement of participants in the knowledge production and analysis is another important aspect. Further, keeping a distance between research and problem solving in practice requires a continuous reflection upon the role of the researcher. Previous work on interactive research presents some of its characteristics (Svensson, Ellström, & Brulin 2007): Focus on joint learning process and an equal researcher role with less responsibility for change. Further, the goal is theoretical development that has practical relevance and research with the participants throughout the process. This is achieved by balancing distance and closeness, and the use of several methods.

Ellström illustrates interactive research and joint learning processes, between researchers and practitioners, as the interaction between a research system and a practice system (Ellström 2008). The research system is driven by problems, theories, data collection, and analysis. The practice system is rather motivated by problems in practice, local theories, and action. Both systems are interlocked while still being separated. This means that the systems are integrated which makes it possible to identify common denominators and collaborative understanding of the studied process. Thus, it is also possible to identify problems that originate both in research and practice. Ellström also recognises that feedback to the practice system is performed through the use of seminars that help the researcher to balance practice and research cycles.

Interactive research can also be seen as a balancing act, where the researcher needs to take part of action and change processes, but without becoming a captive of the practice system (Sandberg & Wallo 2013). The main question is to what extent an interactive researcher can and should engage in change processes and organisational action. In our proposed model we have put the dialogue arenas in the centre. This model also takes inspiration from traditional action research cycles and spirals (see for example Coghlan & Brannick 2014). The dialogue arena here is considered to be a key to reaching the practice system and at the same time cross the boundaries between disciplines and sectors. This helps the interactive researcher to reach a collaborative understanding with the participants (Figure 1). This gives input on the research questions, methods and results through involving participants during the whole research process.

Dialogue arenas have been considered as a core aspect of pragmatic action research (Greenwood & Levin 2007). These have the potential to create room for learning processes where the main goal is to create communicative action. In this way these serve an important purpose by "creating new experiences for both the insiders and the professional researchers to reflect on" (Greenwood & Levin 2007, p. 95). Ideally participants' local knowledge and the researcher's theoretical knowledge contribute to a process of sense making that can benefit both practical and research related results. As the research results are shared and the goals of the research can adjust according to this, the responsibility for change and action are shared between the researcher and the participants. As we see it, this ambition is also what constitutes a dialogue arena, compared to regular workshops and seminars.

Figure 1. The interactive research model

This paper shows how interactive research can be used to span the boundaries between research and practice. We propose that dialogue arenas are practical tools used to create interaction between these two systems in collaborative projects. When used in this way it is also possible to discover and deal with additional challenges that occur due to internal boundaries within these systems, namely: between disciplines and between sectors.

4 Two types of dialogue arenas

In this section, we discuss the experiences from two interactive research processes. This research was conducted during two projects where collaboration between sectors was central in targeting environmental problems. From these two projects we have identified two distinct types of dialogue arenas during which the role of the interactive researcher varied, and had different impacts on the research process. The two types of dialogue arenas are summarised in Table 1 as a seminar type and a workshop type.

During these dialogue arenas the interactive researcher encountered challenges related to a natural/social sciences boundary in the research system, and a cross-sector boundary in the practice system. The dialogue arenas were used to bridge research and practice, and to manage the two internal boundaries in the research and practice systems. This section will focus on the common challenges and advantages for the interactive researcher handling these dialogue arenas. It has been stated that common ground is needed to learn about the different interests and ways of working, as this enables ways to communicate across organisational boundaries (Carlile 2004). In the projects dialogue arenas served as such a common ground where participants could learn about each other's interests. The two dialogue arenas and the interactive research process is described in two subsections below.

Table 1. Two types of dialogue arenas

	SEMINAR TYPE DIALOGUE ARENA	WORKSHOP TYPE DIALOGUE ARENA
Interactions in the research system	Research group members from environmental science	Project team members from university, company and an administrative agency
Interactions in the practice system	Invited representatives from university, industries, companies and public sectors in the region	Open invitation to participants mainly from companies, industries, and municipalities
Project description	Six-year research collaboration with the aim to find wastewater treatment solutions	Two-year research project with the goal of advancing the circular economy in waste management
Intended input to the research system	To identify challenges with triple helix collaboration and find out how participants managed these challenges	To discuss how the circular economy idea is used by the participants and how it can improve waste management
Intended input to the practice system	Reach out with research results to a wider audience and find applications for these by creating a network of triple helix actors	Reach out with research results mainly to industry, companies, and municipalities to improve waste management

4.1 Seminar type dialogue arena

The first research process was a study of the collaboration between environmental scientists and a wood industry on a regional level. The goal of the project was to find solutions for wastewater treatment. A three-year extension of the project aimed to reach out to society with the research results and include additional sectors in the process. Contacts were made with other industries and companies in the region as well as public sector partners, consultants, and business networks. This formed a loose network of collaborators centred on the research group and the interactive researcher. During this process, the interactive researcher was part of the environmental science research group, and could study the challenges of collaboration by following the project process and taking part in activities in the research group. The aim of the research was to explore these cross-sector challenges.

The main type of dialogue arena that was arranged within the project was based on a seminar method and lasted for 1,5 hour each. The interactive researcher began with a short introduction about the triple helix idea and then asked questions to the participants to encourage a dialogue where the challenge of cross-sector collaborations was explored. The first dialogue arena was conducted within the research group. Here the interactive researcher presented a series of challenges within the collaboration, identified throughout the interactive research process. The members of the research group then discussed these challenges with the interactive researcher. This meant that the environmental scientists encountered a different method for inquiry and a forum where the social aspects of cross sector collaboration could be discussed.

As the research system was shared with natural scientists this sometimes led to suspicion and friction. The role duality between organisational and researcher roles can also lead to issues of loyalty and identity (Brannick & Coghlan 2007). Inquiries from social science can be seen as intrusive if participants are not used to this. During the research process, the more natural scientific aligned colleagues in the research group did not always grasp what the research was actually about. There was a joke that the researcher was using the environmental scientists as study objects. This problem was highlighted in the logbook of the main author:

One conflict is between the roles within the research group, between social science and natural science. What prospects does social science actually bring to the research group?

By generating a dialogue arena, the interactive researcher opened a discussion about how collaboration between the environmental scientists and other sectors in society works. While similar discussions had occurred before, for example during coffee breaks and other informal occasions, this dialogue arena was appreciated by the environmental scientists. This led to a sense of curiosity about issues of collaboration. The environmental (natural) scientists experienced the seminar type dialogue arena as an opportunity to discuss collaboration in itself, compared to the usual technical discussions. As such this dialogue seminar created a space that the natural scientists would not have created themselves. Interactive research disrupted the traditional mode of science where representatives of their own disciplines surrounded the scientists. The role of the social scientists and the interactive researcher in particular, became clarified in the dialogue arena.

During a second dialogue arena, a broad range of representatives were invited to discuss the role of triple helix collaboration for the region and the challenge of collaborating outside one's sector. The participants included representatives from the public sector in the region, industries and companies, liaison office representatives from the university, researchers, and consultants working with environmental issues. In this dialogue arena, the interactive researcher led a discussion about the challenges of cross-sector collaboration. This turned out to a discussion about how collaboration between the triple helix sectors works. The different discussions ranged from similarities and differences between the triple helix sectors, the role of students as links between university and society, and the role of open dialogue in collaboration, to how to reach an informal forum for collaboration.

The interactive researcher, as the initiator of this dialogue arena, facilitated the discussion. During this second seminar type dialogue arena, early and preliminary results from the ongoing research process were presented to the participants. These results were based on previous interviews about the triple helix process in the region. This formed a base for the discussion. This was a way to validate the research results and get new perspectives on these. As the interactive researcher presented results from the research system, the participants interpreted this in the light of their experience and role in the practice system. A consultant that took part in the seminar type dialogue arena saw the importance of including a social scientist to focus on the collaborative process in itself:

You are researching how this collaboration works. It does not matter whether you are a sociologist, behavioural scientist, communicator or natural scientist. These collaborative processes need to be strengthened, and more people like you are needed. We need to take advantage of your knowledge. If I have this project for example, what do I have to consider? You need to contribute with knowledge about these processes.

This quote also served as an example where the social scientist stir up discussion about cross-sector collaboration and even socio-ethical questions when engaging with the more technically aligned counterparts (Schuurbiers, 2011). A public sector representative, argued that:

We need social scientists, environmental scientists as well, but also social scientists. It is a problem of co-ordination. How do we co-ordinate environmental projects? If we improved upon this, it would create a win-win situation for the companies as well.

Many of the participants thought that the dialogue seminar was an opportunity to connect with the university. It was appreciated that someone from the university initiated a discus-

sion that acknowledged the people side of collaboration, and doing this onsite at university. In doing so this helped to facilitate the cross-sector boundary between the triple helix sectors. The discussion contributed to knowledge, especially about how the other sectors perceived the university, and what researchers could do to bridge research and practice.

4.2 Workshop type dialogue arena

During the second research process, the interactive researcher collaborated with a project team. This project team included mainly three representatives: from university, a business network, and an administrative agency. The idea of a circular economy was a core driver for the project. The basic ideas behind the circular economy is to reach a sustainable consumption, use waste in a more efficient manner by creating circular flows and repair, design, reuse and recycle products in a more responsible manner. One aim of this project was to disseminate research results within waste management and create a dialogue about the circular economy, thus bridging research and practice.

Figure 2. Discussion during a workshop type dialogue arena

The dialogue arenas in this project took a form similar to workshops. During these, the project team invited participants, mainly from companies, industries, municipalities, and shared knowledge about the circular economy and waste management with them. The workshops were planned in collaboration with the project team and evaluated afterwards in follow-up meetings and during interviews with the participants. The workshop type dialogue arenas were led by the interactive researcher, and were performed as breakfast meetings, lasting for 1,5 hours each. There was a diversity of participants due to the open invitation, and these came from a variety of sectors.

Before conducting the workshop type dialogue arenas, the interactive researcher had to negotiate were to fit into the project. The interactive researcher introduced a social scientific method to the research system. This was new to the project team who were used to natural sciences. The attempts to explain the role of the researcher was not enough to show the potential benefits of including interactive methods in the project design. When the project team was told that they were contributing to the research as co-researchers, one of them

thought, albeit jokingly, that it was "something to put on the CV!". As such it took some effort to show how interactive research could provide added value to the project process. When the interactive researcher led the two workshops the role of the researcher became clearer. As the interactive researcher contributed to the project by a straightforward facilitation during the workshops, this was noted by the project team in follow up discussions afterwards. Further this showed how such research could provide a way to scientifically evaluate the networking and workshop part of the project.

The agenda for the workshop type dialogue arenas was generated as a collaborative effort by the project team and the interactive researcher. Findings from the project, mainly an overview of waste flows and processing in the region, were presented during the dialogue arenas. At the end of the session, the workshop part was conducted with the participants who discussed waste management in their organisations. This created an informal dialogue where participants could discuss issues about waste management first with a partner that they did not know before and then openly to the group. In this way the dialogue arenas made a direct input to the practice system as it brought participants from a variety of sectors together. A participant from the business sector got the chance to reflect upon this afterwards:

I did not know who would come or who had been invited, but the group had the right size. You notice if the right companies are present as it creates a dynamic meeting place. It was the right persons for this type of meeting and they had different knowledge and different angles. It was not just about the presentation of research results as it included a workshop as well.

This quote summarise the importance of gathering different competencies and bringing together a diverse group of actors to get a fruitful discussion. As such it helped to cross the sector boundaries in the practice system. The dialogue arenas were also appreciated as a way to cross the boundary between university and the other sectors as portayed by a participant from public sector:

It is exciting that the university presents this in the way you did. Such information mostly comes from the private sector otherwise. And it is not just the practical examples, but the competence from university can make us work better.

It was important for the project team as well to get recognition that their research contributed to society. At the end of the workshop part of both dialogue arenas the participants were also asked to write down their thoughts on paper which they gave the interactive researcher at the end of the session. This input gave input to the research system, and helped the project team to evaluate the dialogue arena and the impact of the project.

5 Summary and concluding remarks

We have presented empirical examples of how interactive research methods can be applied. Dialogue arenas meant that the researcher could stay within the context of the specific process and at the same time being able to discuss this with the participants. We argue that one important feature of the interactive research approach is that boundaries between researchers and practitioners are bridged. We have illustrated how an interactive method, based on the creation of dialogue arenas, integrated and helped to manage the interaction between the research system and practice system.

Further, we have shown that these systems have internal complexities in the form of boundaries related to differences between disciplines and sectors. The dialogue arenas were important to manage these two internal boundaries. The boundaries were manifested as natural/social sciences in the research system, and cross-sector collaboration in the practice system. Dialogue arenas served as a method for collaborators to manage these boundaries. Further, the dialogue arenas were useful to analyse preliminary research findings and validate these with an extended peer group. We can see that the dialogue arenas contribute to input to both systems as illustrated in the presented research model (Figure 1). By situating dialogue arenas at the centre of this model the benefits of these for the research process is highlighted. These benefits are shown in Table 2.

In the research system there was a need to clarify the role of the researcher and the interactive research, in particular regarding its benefits to the collaborative processes. When the interactive researcher facilitated the dialogue arenas, this meant that the researcher did something practical for the projects, not just collecting data using various methods. When the role of the interactive researcher was clarified, the natural science participants also showed interest in the actual collaborative process. In environmental projects, there is often focus on the technical processes with lab work and field studies. The collaborative processes might have been something that the natural scientists had thought about before, but it was the dialogue arenas that provided a dialogue about collaboration in itself. In this way, the collaboration was problematised from a social scientific perspective rather than a natural science perspective. The different ontological and epistemological views emerged here and the dialogue arenas helped the participants to understand, in particular, the role of social science.

Table 2. Benefits from dialogue arenas

BOUNDARY	**BENEFITS OF DIALOGUE ARENA**
Natural / Social sciences in the research system	Clarifies the role of the social scientist and bridge ontological and epistemological differences
	Sparks curiosity about and facilitates the collaborative process
	Inspires a self-reflection among the scientists and their relation to practice
Cross-sector collaboration in the practice system	Facilitates a democratic dialogue about collaboration
	Making each sector representative reflect upon their role and relation to other sectors
	Making sense of theoretical ideas (triple helix, circular economy) in practice
	Tests the validity of research with non-researchers

In the practice system, the participants developed a bottom-up understanding of triple helix collaboration and the idea of a circular economy during the dialogue arena. This meant that these theoretical ideas were discussed from the participants' viewpoint, which we consider as a democratisation of research. The dialogue arenas helped to relate abstract and theoretical ideas to the concrete experiences of participants. When the interactive researcher presented results during the dialogue arenas, these were validated by a community beyond ac-

ademia. Following the core idea of action research, the dialogue arenas can be used, as a way to democratise research and close the gap between research and society. In other words, this became a place where participants could meet and talk to academics (who contrary to popular belief do not bite) and leave their prestige back home.

There were still differences in status, as the researchers took the leading role in the facilitation of the dialogue arenas. Further, a more critical study could be made, focusing on the effect of the status differences between participants in dialogue arenas and how the process impacted the decision making in the participating organisations. While not the focus of this paper, these differences in status did not emerge as an unsurpassable obstacle during the performed dialogue arenas. Rather, there were participants that valued a space were they could meet representatives from other sectors, which in turn could help to reduce the effect of status differences.

The two internal boundaries were highly visible during the interactive research process and during the dialogue arenas. The main way to manage these boundaries was the two types of dialogue arenas, employed during the two different processes of environmental collaboration. Environmental issues often involve many disciplines and societal sectors. We hope this model will be useful for research in similar contexts even outside environmental science. While we have used the term interactive research, the focus on dialogue arenas can be integrated into other action research processes, especially when similar boundaries are encountered. Such arenas can be rewarding if situated in the centre of any action research process.

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