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## **Knowledge brokerage context factors – What matters in knowledge exchange in impact assessment?**

### *Abstract*

The success of an impact assessment (IA) can mean both instrumental success of applying IA results directly in decision-making, and conceptual success linked to learning about policy problems more generally. Both instrumental and conceptual success can be claimed to be reliant on the knowledge exchange context of the IA, shaped by factors such as the complexity of the policy problem, type of policy area, organisational norms, actor constellations and continuance and openness of information sharing. Even though such context factors may be pre-set, they are nevertheless contested and reformulated during each IA process. This paper ties together lessons from six different IA processes that were performed between 2011 and 2013. The cases include agricultural policy at the EU and regional level in Greece, national-level climate change and energy policy in Finland and Estonia, resource efficiency policy at the German national level, and sustainable land use policy in Inner Mongolia, China. The paper introduces and applies a typology of knowledge brokerage context factors. The paper asks how knowledge brokerage is shaped by different contexts and what determines the consequent application (or non-application) of IA tools and the use of IA results. The paper concludes by highlighting the significance of identification and acknowledgement of different knowledge exchange contexts in IA.

### *Keywords*

Impact assessment; Knowledge brokerage; Knowledge exchange; Policy evaluation

### *Highlights*

Different knowledge brokerage strategies can be applied in impact assessment.

A conceptual framework for knowledge brokering is introduced.

Six test cases from different areas and jurisdictions are reviewed.

Various context factors affect the success of knowledge brokering in IA.

## 1. Introduction

Impact assessment (IA) is understood here as a policy-level appraisal focusing on the ex ante assessment of the key impacts of legislative or strategic proposals. IAs are increasingly performed as a mandatory part of national and supranational (EU) policy formulation (Adelle and Weiland, 2012). Often presented as a step-wise process including phases like identifying the problem, defining objectives, identifying policy options and analysing impacts by applying a variety of quantitative and qualitative assessment methods and tools (EC, 2009), an IA can provide a framework for the production, dissemination and use of knowledge for the policy process. However, carrying out an IA guarantees neither the appropriate use of IA results in policy-making nor better decisions (Sheate and Partidario, 2010). The inclusion of specific knowledge brokerage approaches and practices may provide routes towards a more successful IA. Knowledge brokerage is defined here as a process of communication and interaction aiming for knowledge exchange and learning between parties with different knowledge bases (van Kammen et al., 2006, Michaels, 2009, Partidario and Sheate, 2013).

Successful IA can be described as a process leading to the creation, exchange and use of relevant knowledge during different phases of the policy process. The success of IA in policy formulation and implementation is linked to knowledge dissemination and learning at multiple levels (Hildén, 2011). It concerns the “first-level” learning of policy officers and researchers about the specific policy problem but it is also about “second-level” learning of the functioning of science-policy relationships more widely. The success of an IA is a result of different and often complex processes perceived differently in different jurisdictions (Radaelli, 2004). In practice, the production of IA results is often outsourced to consultancies or research organisations and the results produced by them are – in the best case – used by policy- and decision-makers or even by other stakeholders (Weiss, 1998). The success of IA in different countries and in the EU has been questioned in a number of critical studies, which refer, for example, to poor implementation of the IA procedure, the narrow scope of the assessments, poor timing and inadequate use of the assessment results in policy-making (e.g. Radaelli, 2004, Lee and Kirkpatrick, 2006, Turnpenny et al., 2008, Hertin et al., 2009, Russel and Jordan, 2009, Russel and Turnpenny, 2009). In another case, the IA process serves merely as a façade for decisions that have already been made or it is used to hide other relevant knowledge (Lyytimäki et al., 2013).

Here we start from the rough division between instrumental and conceptual success. Instrumental success refers to the direct use of assessment results in decision-making and is thus linked to instrumental (acting on research results in specific, direct ways) and symbolic (use of results to legitimise and sustain certain predetermined positions) use of knowledge (Bayer and Trice, 1982). Conceptual success denotes the wider social learning process involving changes in the thinking and behaviour of individuals, and/or organisational changes in procedures and cultures (Preskill et al., 2003). However, this division should be understood as a conceptual partition between two overlapping layers rather than absolute separation between opposite ends of the same continuum.

Both the instrumental and conceptual success of IA is reliant on how the knowledge is created and exchanged during the IA process, as well as during the actual policy process. By knowledge exchange we mean processes of interaction involving both knowledge producers and users and including knowledge production, dissemination, transfer and use (Fazey et al., 2013, Ward et al., 2012). The effectiveness (i.e. the extent to which the desired outcome of the IA process matches the actual outcome) and efficiency (how easily an outcome is achieved given a set of resources) of

knowledge exchange in IA processes can be enhanced through the instrumental and conceptual success of knowledge brokerage (Cash et al., 2003, Fazey et al., 2013).

Knowledge exchange during an IA is not just a simple unidirectional communication process between different parties, but a constellation of different interaction processes affected by the context in which the knowledge exchange takes place (Mitton et al., 2007, Contandriopoulos et al., 2010, Fazey et al., 2013, Højlund, 2014). The knowledge exchange context is formed both by factors related to IA itself, the actors involved and the policy process. These factors are partially pre-set, depending on the level of institutionalisation of the specific science-policy interrelationships. They are also contested and reformulated during each phase of the IA process through interaction between the actors involved, notably IA knowledge producers (i.e. scientists and IA consultants) and IA knowledge users (i.e. policy officers in charge of IA and policy development).

The diverse practices of IA provide a fertile ground for introducing and testing new knowledge brokerage approaches. Knowledge for an IA can originate from various sources. It is partly based on existing knowledge and partly produced with a wide variety of IA methods and tools. Nilsson et al. (2008) categorise the IA tools into three groups. The simple tools include easy-to-use checklists, questionnaires and other generic assessment frameworks that can give a quick qualitative overview when resources for assessment are scarce, or only indicative information is needed or possible to produce. More formal tools include scenario techniques, cost-benefit analysis (CBA) and multi-criteria decision analysis (MCDA), which entail predefined analytical steps, require special know-how and provide decision-makers with suggestive quantitative knowledge. Finally, there is a group of advanced tools; sophisticated and complex computer-based modelling approaches that try to produce robust and detailed quantitative knowledge. Most of these tools focus on providing policy-relevant knowledge and the instrumental success of IA. Hence, the actual interaction and knowledge exchange may remain neglected both by knowledge providers and users (Nilsson et al., 2008, Fazey et al., 2013).

Based on a claim by Fazey et al. (2013) that knowledge exchange is very significantly influenced by a range of contextual factors including political and social considerations, power relationships, the status of individuals, and what the process aims to achieve, we start from the assumption that contexts shaped by various case-specific factors may be significant both for the instrumental and conceptual success of the IA. In our study we refer to these factors as knowledge brokering context factors. Our aim is to consider the types of knowledge exchange contexts and their impact on the success of knowledge brokering in IA. More specifically we:

- (1) Build a conceptual typology in order to identify the knowledge exchange contexts in IA.
- (2) Explore the knowledge exchange in IA based on the experiences from six case studies.
- (3) Discuss how researchers can, by using various knowledge brokering strategies, acknowledge the context and contribute to the success of an IA.

The following section presents the conceptual typology and the cases that provide insights into different knowledge exchange contexts. Key results from case studies are then presented. More detailed information on the cases can be found from other contributions of this Special Issue (e.g. Adelle, 2014) and from the deliverables of the LIAISE project (Söderman et al., 2012, Söderman et al., 2014). The results are discussed from the perspective of knowledge brokerage and recommendations for enhancing knowledge exchange in IA are presented.

## 2. Methods

### 2.1. Conceptual framework for knowledge exchange

Knowledge exchange is concretised in our study using the knowledge brokerage (KB) concept (van Kammen et al., 2006, Michaels, 2009). The general types of partly overlapping knowledge brokerage strategies range from informing and consulting (low-level KB) to more interactive matchmaking and engaging (medium-level KB), and finally to the most resource-intensive collaborating and building capacity (high-level KB) (Michaels, 2009, Table 1). The most collaborative forms of KB require that both knowledge producers and users have to take on new roles and commit themselves to building and maintaining links between knowledge production and policy-making (van Kammen et al., 2006, Turnhout et al., 2013). An improved KB can result in improved knowledge management, novel knowledge networks, and increased capacities of different actors in the policy process (Ward et al., 2009) and possibly even to co-production of knowledge in a blurred interface between science and policy (Lemos and Morehouse, 2005, Lövbrand, 2011).

Table 1. Knowledge brokering strategies and associated techniques and resource needs (adapted from Michaels, 2009).

<b>KB strategies</b>	<b>Intent</b>	<b>Examples of brokering techniques</b>	<b>Resources needed for KB</b>
Informing	Disseminate key information	Policy briefs, media stories, indicator sets, reports	Low
Consulting	Seek out key expertise	Meetings, assessments	Low
Matchmaking	Identify who to contact and how	Introducing new people to each other	Medium
Engaging	Motivate all necessary parties to take part in the process	Identification of relevant people, committees, working groups	Medium
Collaborating	Jointly framed interaction process	Facilitate collaboration in current process	Relatively high
Building capacity	Jointly framed interaction process with the aim of learning from doing	Joint fact-finding, co-production of knowledge, facilitation of long-term institutional collaboration	High

To organise the analysis and to identify the variety of factors that affect KB strategy in the different cases, we developed a conceptual typology of knowledge brokerage context factors (Table 2). These KB context factors concretise the practical science-policy interactions and knowledge exchange taking place during an IA. By concretising and identifying the contexts, policy-makers and researchers are capable of better framing the IA and making the best use of the process (Radaelli, 2004, Bina, 2007). The typology introduces four general types of policy issues for each context factor, identified from the previous conceptual and empirical studies. The general categories of context factors include different decision-making regimes based on the level of institutionalisation and broadness of policy area (summarised in Michaels, 2009), organisational norms, determining whether the assessment is based on in-house or outsourced tools and qualitative or quantitative knowledge, and whether the resources allocated to IA are adequate (Turnpenny et al., 2008), and actor roles in initiating and performing an IA (Weiss, 1979, Contandriopoulos et al., 2010). The phase of the IA process and its links to research is another key factor (Scrase and Sheate, 2002, de Ridder et al., 2007). Legal requirements for the appraisal and

assessment of policies are related to the level of flexibility and predictability of the policy process (Carroll, 2010). The openness of knowledge exchange practices and traditions among the actors involved is important for the creation of trust between the parties (Contandriopoulos et al., 2010). Finally, both trust created by shared history of knowledge exchange between users and producers of knowledge and trust created by scientific credibility, autonomy and independency are emphasised.

Table 2. Typology of different contextual factors affecting knowledge brokering. The typology is compiled based on various sources (Weiss, 1979, Scrase and Sheate, 2002, Kurtz and Snowden, 2003, Turnhout et al., 2007, Michaels, 2009, Turnpenny et al., 2008, Carroll, 2010, Contandriopoulos et al., 2010, Højlund, 2014).

Context type	Context factor	Characterisation of policy issues
Decision-making regime	Level of complexity	<ul style="list-style-type: none"> <li>• Well-structured policy issue</li> <li>• Moderately structured policy issue</li> <li>• Weakly structured policy issue</li> <li>• Unstructured policy issue</li> </ul>
	Decision regime	<ul style="list-style-type: none"> <li>• Routine decision regime</li> <li>• Incremental decision regime</li> <li>• Emergent decision regime</li> <li>• Fundamental (change) decision regime</li> </ul>
	Sense-making condition	<ul style="list-style-type: none"> <li>• Ordered (cause-effect chains identifiable)</li> <li>• Knowable systems, systems thinking</li> <li>• Unordered (complex systems)</li> <li>• Chaos (intuitive action)</li> </ul>
	Broadness of policy-making	<ul style="list-style-type: none"> <li>• Developing individual policy measures</li> <li>• Narrow sectorial policies</li> <li>• Developing sub-policy of overarching policy</li> <li>• Making overarching policies</li> </ul>
Organisational norms and resources	Organisational norms and routines	<ul style="list-style-type: none"> <li>• Desk officers use tools themselves</li> <li>• Desk officers use in-house knowledge</li> <li>• Desk officers commission external consultants</li> <li>• Desk officers commission research community</li> </ul>
	Knowledge need or tradition	<ul style="list-style-type: none"> <li>• Mostly quantitative knowledge is used</li> <li>• Mix of qualitative and quantitative knowledge</li> <li>• Mostly qualitative, some quantitative knowledge</li> <li>• Mostly qualitative knowledge is used</li> </ul>
	Availability of resources (money, time, knowledge) for IA	<ul style="list-style-type: none"> <li>• Adequate resources available</li> <li>• Some, but limited amount of resources available</li> <li>• No additional resources allocated</li> <li>• Resource allocation varies case by case</li> </ul>
Actor roles	Motivation for covering the costs of knowledge production	<ul style="list-style-type: none"> <li>• Costs are covered by knowledge users in non-politicised situations</li> <li>• Costs are covered by knowledge users in highly politicised situations</li> <li>• Costs are shared between knowledge users and producers in intermediately politicised situations</li> <li>• Costs are covered by producers in non-politicised situations</li> </ul>
	Actor initiating the knowledge exchange	<ul style="list-style-type: none"> <li>• Knowledge users/policy-makers</li> <li>• A third party (e.g. specialised knowledge broker institution)</li> <li>• Knowledge producers</li> </ul>
Phase of IA process	Key phase of policy and IA process	<ul style="list-style-type: none"> <li>• Problem identification and defining objectives</li> <li>• Development of policy options</li> <li>• Analysis of impact and comparison of objectives</li> <li>• Monitoring and evaluation</li> </ul>
	Alignment of research and decision-making	<ul style="list-style-type: none"> <li>• Research and policy-making processes are fully integrated</li> <li>• Research and policy-making processes are partly integrated</li> </ul>

Context type	Context factor	Characterisation of policy issues
		<ul style="list-style-type: none"> <li>• Research and policy-making processes cross at certain moments</li> <li>• Research and policy-making processes parallel</li> </ul>
Predictability and legal requirements	Predictability of the policy process	<ul style="list-style-type: none"> <li>• Relatively predictable policy process and structured research questions</li> <li>• Relatively predictable policy process and flexible, open-ended research questions</li> <li>• Unpredictable policy process and predetermined, structured research questions</li> <li>• Unpredictable policy process and flexible, open-ended research questions</li> </ul>
	Legal requirements for IA	<ul style="list-style-type: none"> <li>• Legal requirement and detailed procedure for appraisal</li> <li>• General legal requirement exists without a set procedure</li> <li>• Well-established practices exist but without legal requirements</li> <li>• No legal requirements or established practices</li> </ul>
Durability and openness	History of trust-building	<ul style="list-style-type: none"> <li>• A long history (5–15 years)</li> <li>• A moderate history (2–5 years, several contacts)</li> <li>• A short history (1 year/e.g. one contact)</li> <li>• The users and producers of knowledge have not collaborated before</li> </ul>
	Trust, credibility	<ul style="list-style-type: none"> <li>• High expertise of knowledge producers in targeted policy area</li> <li>• Some expertise of knowledge producers in targeted policy area</li> <li>• Independent knowledge production</li> <li>• Knowledge production is part of some sectorial administration or interest</li> </ul>
	Openness, inclusiveness	<ul style="list-style-type: none"> <li>• Closed policy-making culture, closed knowledge production</li> <li>• Closed policy-making culture, open knowledge production</li> <li>• Open policy-making culture, closed knowledge production</li> <li>• Open policy-making culture, open knowledge production</li> </ul>

## 2.2. Applying the framework

The typology was applied through six real-world cases of ex ante, ex post and explorative IA processes covering various areas, jurisdictions and policy levels (Table 3). The cases included IAs related to agricultural policy at the EU and regional level in Greece, climate change and energy policy at the national level in Finland and Estonia, and resource efficiency policy at the national level in Germany. Additionally, one case outside Europe considered issues related to sustainable land use policy in Inner Mongolia, China. These cases were chosen in order to guarantee the diversity of IA processes across scales, policy areas and science-policy traditions in our study. All case studies were conducted under the umbrella of the LIAISE project (Linking Impact Assessment Instruments to Sustainability Expertise) funded by the EU FP7 (Söderman et al., 2012, Söderman et al., 2014).

Table 3. Description of the cases.

	<b>Agri EU</b>	<b>Resource efficiency</b>	<b>Climate</b>	<b>Energy</b>	<b>Agri farmers</b>	<b>Land use</b>
Policy area	Climate change adaptation in agricultural policy	Resource efficiency policies	Energy and climate policy	Energy policy	Agricultural policy	Land use policies
Type of an IA	Exploratory	Exploratory/ex ante	Ex ante, ongoing	Ex post/ex ante	Ex post	Ex ante/exploratory
Jurisdictional level	European Union	EU/National (Germany)	National (Finland)	National (Estonia)	Regional (Central Macedonia, Greece)	Regional (China, Inner Mongolia)
Main actors/participants	University of East Anglia, University of Bonn, Alterra, WU; DGAGRI	Freie Universität Berlin Centre for European Economic Research	Finnish Environment Institute; Ministries of Economy and Employment, Environment, Traffic and Communication	Stockholm Environment Institute, Tallinn; Ministry of Economic Affairs and Communications, Estonian Development Fund, national SEA authority	Aristotle University of Thessaloniki; Region of Central Macedonia, the Ministry of Rural Development and Food, Greek Young Farmers Association	Leibniz Centre for Agricultural Landscape Research, Chinese Academy of Science, Institute of Geographic Sciences and Natural Resources Research; local policy-makers of West Ujimqin Banner
Main conceptual focus for testing	Developing KB process enhancing the use of models in an IA on agricultural policy-making by the European Commission	Exploring how policy analysis/discourse analysis can help researchers interact with policy-makers and provide relevant knowledge to IA, test how far knowledge platforms can contribute interaction	Exploring and developing interaction between modellers and policy-makers in a national climate policy IA	Exploring how policy developers choose quantitative models for IA and understanding knowledge production processes of national-level IAs	Developing “best practice” systematic interaction process utilising KB strategies for planning and carrying out IAs of regional policies	Testing how a participatory tool combined with scientific knowledge can enhance knowledge exchange and support policy formulation in absence of institutionalised IA
Key KB activities	Email exchanges, meetings, joint mapping exercise (engaging, matchmaking, collaborating)	Document analysis, workshops (engaging, matchmaking)	Email exchanges, workshop, focus group interview (engaging, matchmaking)	Direct dissemination, joint study design, workshop (informing, consulting, collaborating)	Introduction of new approaches, workshops, interaction in knowledge production (matchmaking, collaborating, building capacity)	Workshops, collaboration with local researchers (matchmaking, collaborating)

Note: KB = Knowledge Brokerage, IA = Impact Assessment.

By applying the context typology to cases, we aimed, in particular, to gain an understanding of the requirements of successful knowledge exchange in IA and to learn how different tools can be used in practice. The case studies aimed to facilitate conceptual learning and rethinking of the science-policy interface between knowledge providers and users as a part of selected real-life IA exercises. The cases introduced a wide variety of different approaches to IA. By applying various KB strategies and IA tools, the cases produced rich and policy-relevant material for the application of the typology.

The case studies included approaches based on established tools such as LEAP (Long-range Energy Alternatives Planning model, SEI, 2011) in the energy case study, and FoPIA (Framework for Participatory Impact Assessment, Helming et al., 2011a, Helming et al., 2011b) in the land use case study. The multi-criteria decision analysis (MCDA, e.g. Belton and Stewart, 2002, Gregory et al., 2012) method was applied in the agri farmers case study. The other cases did not focus on any single specific assessment tool but included a combination of tools or approaches. The resource efficiency case study in the field of non-energetic abiotic materials consisted of a European-level scoping study and a national-level study focusing on the implementation of the national resources efficiency strategy in Germany. The climate case study focused on the whole IA process of Finland's climate and energy strategy and comprised a collaborative workshop, document analysis and interviews.

Our study is based on the multiple case study approach with a qualitative emphasis (Stake, 2006). The data, which allows for the comparison of cases, was collected through expert meetings, questionnaires, self-evaluations by the researchers involved in the cases, and observations by the authors. Both systematic and ad hoc data collection procedures were applied. Systematic methods included specific context forms that were completed twice by the case study researchers in the middle of the study period (autumn 2012 and winter 2013). The context forms included questions about contextual factors influencing the case study and the IA and techniques used to overcome the challenges raised by the specific context. Based on the interviews with case study researchers and other output from the cases studies, the context tables were modified in the late phase of the case study process. Furthermore, experiences from the case studies were compared and discussed in a special working meeting (London, 12–13 September, 2013). Due to differences between the cases, it was not possible to validate the relevance of all possible contexts factors for all cases. In addition, the cases concentrated on the features and contexts that were considered relevant to knowledge brokering.

### **3. Results**

The identification of key contextual factors of cases are summarised in Table 4 and the key experiences from the cases are briefly described below. After that the results related to each context factor are presented. How the knowledge exchange is affected by different KB context factors and how utilisation of KB strategies can contribute to the success of IA is discussed in the following section.

Table 4. An overall description of the KB contexts in the cases.

Test case	Agri EU	Resource efficiency	Climate	Energy	Agri farmers	Land use
Main decision-making regime	Emergent	Fundamental and emergent	Mainly incremental	Fundamental change	Incremental	Routine and emergent
Key organisational norms and resources	Desk officers use in-house knowledge and commission external consultants and research community. Plenty of resources available	Desk officers commission external consultants and research institutes	Desk officers commission external consultants and research institutes	Desk officers commission external consultants	Desk officers commission research community	The case was based largely on external resources
Emphasised actor roles	Knowledge producers initiating the knowledge exchange	Knowledge producers initiating the knowledge exchange	Costs covered by knowledge users, both knowledge users and producers initiating the knowledge exchange	Costs shared, knowledge producers initiating the knowledge exchange	Costs covered by knowledge producers, knowledge producers initiating the knowledge exchange	A third party initiating the knowledge exchange
Phase of IA process	Mainly problem identification and developing options	Mainly problem identification and developing options	The whole IA cycle, research and policy-making process overlap at certain moments	Analysis of impact and comparison of objectives	Analysis of impact and comparison of objectives	Problem identification and defining objectives, development of policy options
Predictability of the policy process and legal requirements	Unpredictable process. Legal requirement and detailed procedure for appraisal	Unpredictable process and flexible, open-ended research questions	Relatively predictable policy process and structured research questions. General legal requirement exists without a set procedure	Relatively predictable policy process and structured research questions. Legal requirement and a detailed procedure for appraisal	Relatively predictable policy process and structured research questions. Well-established practices exist but without legal requirements	Relatively predictable policy process and flexible, open-ended research questions. No legal requirements or established practices
Durability and openness	A long history. Closed policy-making culture	A short history. Open knowledge production	A long history. Relatively closed policy-making culture	A long history. Relatively open policy-making culture	A long history. Closed policy-making culture	A short history. Closed policy-making culture

The cases represented a wide variety of the level of complexity of policy problems (Turnhout et al., 2007, Michaels, 2009). The agri EU case dealt with an unstructured policy problem: little consensus existed on how to govern agriculture in order to adapt to climate change. Furthermore, a high level of uncertainty existed about the impacts of climate change on agriculture, particularly at the European level. The Greek agri farmers case represented a well-structured problem: the goal was to help young farmers cope with changes in agricultural areas (ageing of population, imbalanced age structure) with a single policy measure (one-off grant) at the local level. In this case, consensus was reached by policy-makers to support rural employment and social communities.

The case studies on German resource efficiency, Finnish climate and Estonian energy represented different unstructured policy problems. No overarching consensus on policy goals and how to achieve them existed, uncertainty over the effects of policies and measures prevailed, and goals and values of actor groups varied considerably. However, the cases included sub-problems that were more structured. For example, the Estonian case study in the energy sector involving complex issues with many stakeholders and various disciplines with competing views. Proposed goals for energy policy were variable, ranging from the energy intensity and efficiency issues to energy security and renewable energy. However, the goal of the IA was clearly defined: to compare current development with ex post predictions. Despite this clear task, the problem definition was still in progress and no consensus was achieved.

The Inner Mongolia Land use case dealt with a moderately structured problem. There existed a general level consensus at the state level to halt land degradation. A consensus also existed about the driving forces of land degradation, including political decisions and economic development, climate change and population growth affecting grassland use. The implementation of policies was a regional-level responsibility but no consensus existed on how to regionally combine all land use functions, e.g. natural resource utilisation and maintenance of ecosystem functions.

### **3.1. Decision-making regime**

The relevant features of decision-making regime for this study include the breadth of the policy area and the potential existence of well-established policy structures (Lindquist, 2001, Kurtz and Snowden, 2003, Michaels, 2009). The agri EU case represented an emergent decision regime since climate change adaptation was not yet a mainstream agricultural or climate policy issue. The decision-making regime of the energy case was a fundamental change: the core principles and approach of national energy policy were open to scrutiny. The regime of the agri farmers case was incremental: the measure was already implemented over two periods: 2000–2006 and 2007–2013. The policy base was well established with only minor adjustment foreseeable.

Other cases were more difficult to classify. The resource efficiency case was characterised both by emergent and fundamental change regime. A rapidly increasing number of actors with diverse perspectives was involved. Fundamental questions on sustainable resource use were open to debate and the need for variable data production and knowledge exchange was acknowledged. The decision-making regimes of the climate case varied from routine, incremental, fundamental and emergent depending on the sub-policy or measure (see Lindquist, 2001, Michaels, 2009). However, the policy officers appeared to frame the climate and energy policy sub-problems in a more structured way, thus ruling out uncertainties and complexities. The regime for the land use case can be characterised as routine: all relevant political decisions are included in the five-year

plan of the Chinese national governance system. However, many actors implement policies set at a regional level, even though regional-level implementation plans have a weaker status.

### **3.2. Organisational norms and resources**

Organisational norms related to impact assessments are linked both to the tool used within the organisation performing the assessment and outsourced tool use (Turnpenny et al., 2008). They affect both quantitative modelling and approaches focusing on qualitative descriptions. The agri EU case represented a case where the European Commission acquires information through in-house consultants (Joint Research Centre of the European Commission) and also employs results from external research (e.g. FP7 research projects and IA consultants). The European Commission has traditionally allocated considerable resources to support the formulation of a common agriculture policy. In this case, desk officers had a fairly high level of technical knowledge and they relied heavily on the results from quantitative computer models. The climate, energy and agri farmers cases represented cases where desk officers commission analyses from external IA consultants or research institutions on a routine basis. The land use and resource efficiency cases represented cases where impact assessments were not (yet) a part of institutionalised decision-making routines. However, in China a common practice is that the Chinese Academy of Science is requested to present policy-relevant results as part of a permanent in-house government service, funded by the Academy's normal budget. In addition, a substantial part of funding and human resources in the Chinese case came from a German institution participating in the case and operating on project-based funding.

### **3.3. Actor roles**

Actor roles can vary widely from the initiation and performing of IA knowledge exchange and application of tools to sharing costs (Contandriopoulos et al., 2010). The agri EU case was supply driven, since knowledge exchange was initiated and costs covered by knowledge producers. Knowledge brokerage was organised mainly between modellers and policy-makers. The resource efficiency case was also supply driven, since no established policy-making community demanding certain knowledge existed. Furthermore, several research organisations were studying issues related to raw materials and resource efficiency more generally. The principal aim of knowledge brokerage was to engage policy-makers in a discussion about resource policy aims, contents and knowledge needs.

In the climate and energy cases, knowledge production was initiated by policy-makers and knowledge was produced by consultants. Knowledge brokerage in the climate case aimed at matchmaking between the key ministries. In the energy case, matchmaking focused on connecting past and future IAs. The agri farmers and land use cases represented research-based trials. The case was initiated and the costs were covered by the research project. Knowledge from earlier projects was also utilised. Knowledge brokerage was based on collaboration with policy-makers and matchmaking between policy-makers and local farmers. Knowledge production in the land use case was initiated through a collaborative effort by the European research institution and Chinese scientists. Knowledge brokerage occurred at multiple levels involving international and national research as well as local decision-makers. Thus, the knowledge brokerage extended the standard practice of the Chinese Academy of Science providing scientific knowledge for policy-makers. The land use case employed a matchmaking knowledge brokerage strategy to include matching scientific literature and workshop results of local expertise to be more credible for higher-level policy-making.

### **3.4. Phase of IA**

Research-based knowledge has different roles in different phases of the IA (de Ridder et al., 2007). The case studies included both cases focusing on certain phase of IA and cases including several or all phases of IA. The resource efficiency case focused on the problem identification phase. The agri EU case concentrated mainly on the formulation of policy options.

The energy case focused on the instrumental phase in the evaluation of the IA of the current plan and on the formulation phase of the renewal of the plan. Research and decision-making processes were partly integrated in the Strategic Environmental Assessment (SEA) and in economic analyses. The agri farmers case concentrated on the instrumental phase of the ex post assessment of the policy measures and a comparison of the two periods. In this case, research and policy-making only overlapped at certain moments because policy-makers only used the results of the IA for specific advisory purposes.

The climate case concentrated on the whole IA cycle, focusing specifically on knowledge exchange during the scoping and planning phase. The land use case concentrated on the formulation, scoping and planning phases in order to identify land use scenarios and their impacts. Research and policy-making were parallel and largely independent, but they overlapped when research input was found to be helpful by policy-makers.

### **3.5. Predictability of the policy process and legal requirements**

Most OECD countries have adopted some kind of policy assessment system (Adelle and Weiland, 2012), but the legal requirements for IAs differ from no mandatory requirements to detailed regulations. Motivations and practical procedures vary as well (Radaelli, 2004, Radaelli, 2009, Dunlop et al., 2012). There may be surprises in the assessment processes and in their relationships with actual policy processes. For example, the level of predictability of the policy process varies regarding the legal requirements for stakeholder involvement, scope of the assessment and interests of the policy-makers involved (Carroll, 2010).

In our study, the agri EU case represented the unpredictable context of climate adaptation with open-ended questions related to agricultural policies. However, the context was also characterised by path dependencies related to e.g. agricultural subsidies negotiated over a long time frame. No formal legal requirements were present and no holistic, open knowledge exchange procedure was required. However, well-established practices for IA existed, since no major proposal is adopted by the college of Commissioners unless an IA is signed off by the IA Board of the European Commission (EC, 2009). The resource efficiency case was even more unpredictable since it included a rapidly evolving research focus and an emerging policy field without designated policy actors.

The climate case was initially characterised by relatively a predictable process because the policy officers and policy-makers involved expected that the revision would follow the same path as previous strategy processes. In the end, however, the process became more complicated due to unexpected changes in the political agenda. The case was also characterised by a background of mandatory legal assessment, but in this case no strict requirements for the detailed IA procedure

were present. No holistic, open knowledge exchange procedure was required by policy-makers and the IA of the strategy revision lacked the critical evaluation of the models used.

Likewise, in the energy case the policy process was relatively predictable. It was characterised by clear legal requirements and a detailed procedure for IA, which was to be carried out under the umbrella of the SEA. The SEA set the knowledge exchange procedure open to researchers. Flexibility existed around questions regarding future energy options. Both the climate and energy cases indicated reluctance among policy-makers to risk the stability of the political process with open collaboration and unpredictable new modelling tools.

For the land use case, the five-year plans of the Chinese government provided a relatively predictable and predetermined context. However, there was flexibility in the research questions linked to the choice of scenarios and the assessment of their impacts. The agri farmers and land use cases were characterised by specific tools that were used in a context of no legal requirement for IA. The former case utilised a step-wise approach for knowledge exchange developed by the LIAISE project, while the latter tested the FoPIA tool in order to set the knowledge exchange procedure between local policy-makers and researchers.

### **3.6. Openness of the knowledge exchange**

The level of openness of knowledge exchange traditions in IAs differed across the case studies. The resource efficiency case focused on an emerging policy area that was fairly open to new actors, knowledge and interactions. The agri EU case was dominated by the EU's Common Agricultural Policy, which is a contested and crowded political space with access restricted to relatively few recognised academics, and a relatively closed policy-making culture for new actors.

The climate case was characterised by a relatively long history of collaboration between key consultants and key policy-makers, particularly regarding the co-development of certain economic and energy-related models. In general the climate policy in Finland has been closed, with minimal or no participatory processes, but some sub-tasks have been open to researchers. The energy case researchers with energy policy expertise also had a long history (up to 20 years) of collaboration with national-level policy-makers. The policy-making culture was rather open.

The agri farmers case was characterised by long-term collaboration between researchers and regional-level policy-makers. However, the policy-making culture was closed, with only certain phases open to knowledge production by researchers. The land use case was based on long-term collaboration between Chinese and European researchers as partners of the Chinese–German Centre for Impact Assessment. The common history of Chinese researchers and regional policy-makers was shorter and no previous collaboration existed between European researchers and regional policy-makers. The policy-making culture was open only to trusted or in-house researchers. FoPIA was used as a participatory tool for interactive collaboration. It incorporated elements of knowledge brokerage strategy for collaboration.

## **4. Discussion**

The cases studied here illustrated how KB strategies in IAs may fall within a wide variety of knowledge exchange contexts. In most cases, several KB strategies were in active use by

knowledge producers, but the strategies varied considerably depending on complex sets of factors such as the history of the interaction, the phase of the IA and specific tools and IA tool constellations, and the resources and mandate the researchers had. The results highlight that when an institutionalised IA procedural frame is missing, other existing legal or institutionalised frames like SEA may act as procedural platform for IA and knowledge exchange (energy case), and tools with clear procedural aspects such as FoPIA can also act as interaction platforms (land use case). If already institutionalised, knowledge exchange in IAs exists between policy-makers and in-house/external knowledge providers (agri farmers and climate cases) there may be difficulties in including emerging topics and insights, even when the need for a change of practices and the inclusion of new actors is noted both by knowledge providers and users. In general, however, a legal requirement for an IA is a fundamental – but not sufficient – prerequisite for successful knowledge exchange, IA tool application and the whole IA process itself. A legal requirement forces the policy-makers to conduct an IA, but it also gives them an incentive to consult researchers and consultancies and a legitimacy to demand resources for IA and policy preparation.

The formation of well-functioning knowledge exchange reaching all the key actors typically requires a relatively long time and a more advanced and resource-intensive KB strategy, such as collaborating or building capacity (Partidario and Sheate, 2013, Rinne et al., 2013). Intermediate KB strategies, matchmaking and engaging can have two roles: either they form the basis for later collaboration and co-production of knowledge, or they support networking and discussions in more traditional IA processes. However, it is evident that more linear KB strategies, like informing and consulting, still have an important place in knowledge exchange, in particular in IAs concerning rather restricted policy initiatives or well-defined research questions (Michaels, 2009). In two of our cases (energy and agri farmers cases) it appeared that ex post evaluations combined with ongoing policy development can serve as capacity-building platforms for the collaboration and joint framing of IA questions in a non-politicised environment. That kind of approach can create more ownership on both sides, leading to a mutual understanding and learning about IA.

Knowledge exchange is not an isolated and predefined event – it is a continuously evolving multi-directional communication process. Therefore, successful knowledge exchange should be based on frequent communication between researchers and policy-makers, and between key actors participating collaboratively in the policy process (Partidario and Sheate, 2013, Turnhout et al., 2013). Experiences from our cases suggest that the contexts characterised by high levels of trust and long-lasting collaboration increase the likelihood of policy officers and the policy process being more open to new KB practices. A variety of communication tools were employed by the cases investigated here. If compared with the enthusiasm around novel communication and interaction technologies and advanced information sharing platforms, the importance of traditional and non-technical face-to-face communication was strongly emphasised. In the agri farmers case, the close proximity of the offices of researchers and policy-makers were noted as an important background factor for successful interaction. In the land use case, a new element was that the planning (e.g. selection of indicators), scheduling and implementation of IA studies were made in collaboration with policy-makers contributing to each stage of the research. Results were also analysed with the participation of policy-makers, which differed from the commonly adopted practice where policy-makers outsource the implementation of the IA process to researchers and utilise only the final results (Contandriopoulos et al., 2010, Gregory et al., 2012).

The climate case in particular highlighted the fact that poor interaction during the scoping phase leads to poor planning of the IA and thus to a lack of mutual understanding of the key knowledge needs. In addition, a different perception of the purpose of the IA as a whole and the potential

uses of the knowledge may remain and strengthen during the IA that is based on different expertise. Overcoming this kind of “silo-based expertise” has been raised as a key concern of IA (Morrison-Sounders et al., 2014). Our cases suggested that knowledge exchange that started in the scoping phase may not eradicate the silos but it helps to create bridges between them.

One key result from the cases is that the choice of the knowledge brokerage strategy cannot be determined based solely on the impact area or policy problem. What is more important is how the actors perceive their roles in knowledge exchange and how these roles are negotiated and agreed upon beforehand. The key KB context factors in our cases included the functioning of knowledge exchange practices, especially linked to communication between the key players, and the level of trust that the knowledge user has towards the model or other IA tool as well as researchers responsible for tool development. In addition, the availability and allocation of resources can have a remarkable impact on the success of knowledge exchange and the IA itself. Our results highlight the importance of carefully considering, in light of the context and available resources, which of these KB strategies are the most suitable in individual cases.

The experiences from the knowledge exchange in the case studies suggest that instrumental success is more likely to be reached with the use of existing tools, whereas conceptual success may be built on experimentations with novel tools or novel KB approaches. No profound IA tool development was involved in the successful interaction processes of the energy, agri farmers and land use cases. Some testing and fine-tuning of existing IA tools was made in order to engage policy-makers. Such development work may help to keep the researcher interested and the policy-maker committed. This applied specifically to the agri farmers case when policy officers interested in technical issues of the models were found. However, as results of the climate case also confirm, the room for model development during policy preparation is very limited. On the other hand, acute knowledge need (by the policy officer) during the policy process appears to be required in order to get the often busy knowledge users involved in and committed to tool improvement.

Hence, the best strategy for engaging policy-makers in tool improvement in a context of institutionalised IA appears to be in fine-tuning/tailoring the IA tools. In the best case, this may lead to the co-tailoring of the tools, leading to both instrumental use and conceptual learning where researchers learn about the types of questions that policy-makers think the models can provide answers to. Likewise, policy-makers may learn which types of questions the tools are able to deal with and how to utilise this knowledge in policy-making. This kind of interaction has all the hallmarks of a high-level KB strategy: capacity building and co-production of knowledge. In the worst case, such interaction may increase the pressure to use the tools as a façade to legitimise decisions already made in the spirit of policy-based evidence gathering (Sharman and Holmes, 2010). In such cases, IA does not resolve policy problems but provides a forum where the disagreements and power relations behind them are reproduced rather than resolved (Adelle and Jordan, 2014). Thus, the conditions for co-production of knowledge should be carefully considered by the researchers involved in IA (Lövbrand, 2011).

A comprehensive and constantly evolving understanding of the context of knowledge exchange is required in order to anticipate which KB strategies are the most feasible for IA. Such understanding – acquired in an ideal case before or during early phases of the IA process – supports knowledge providers as well as knowledge users in striving for better interaction between research and policy in IAs. It also supports the evaluation and development of IA

methods, the creation of meaningful interaction between different parties and finally – hopefully – it also leads to better uptake of IA knowledge in policy-making.

## **5. Conclusions**

Both the instrumental and conceptual success of IA require a good understanding of the limitations set and opportunities offered by different knowledge exchange contexts. The actors responsible for initiating, planning and conducting IAs should identify and take into account not only the purpose of the assessment and the available tools, but also the specific context of the knowledge exchange. Perhaps the most important lesson based on this study is the need for building a mutual understanding of the different contexts of the science and policy that are brought together by the IA. Both parties – research and policy – are likely to benefit from a process that is tailored according to context, needs and resources and in which the roles for all key actors are identified and acknowledged. If the resources allow, the use of specific knowledge brokers that have the licence to support the IA is advisable, in order to enhance the knowledge exchange. It is vital that these knowledge brokers are familiar not only with the substance of the IA but also with the key contextual factors influencing both the instrumental and conceptual success of it.

By recognising the context, the actors are more likely to be capable of applying the most suitable type of knowledge brokering strategy for the IA. It is, however, important to point out that context is not everything. There are commonalities between different contexts. As Radaelli (2004) pointed out, the real issue is about degrees of contextualisation in relation to the IA procedure and the knowledge exchange in IA. Too high a level of contextualisation of IA does not allow for meaningful generalisation and may therefore hinder cross-jurisdictional learning, development of best practices and the wider application of IA assessment tools. The significance of different contexts factors in relation to each other and their importance in different situations is an interesting question, which would require a systematic analysis of several cases. The prioritisation of context factors would help to link the diverse contexts and ever-changing needs of policy-makers with the abundance of existing tools on the supply side.

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