LIAISE

Linking
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Assessment
Instruments to
Sustainability
Expertise

Discussion Paper

Synthesis of research needs for IA tools in research programmes inside and beyond the IA research community – Report 3

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SEVENTH FRAMEWORK PROGRAMME

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Preamble

LIAISE Deliverable 2.3 'Synthesis of research needs for IA tools in research programmes inside and beyond the IA research community' (D2.3) is formed as a trilogy. The present document is the third, concluding report that further elaborates the results of the reports 1 and 2 and outlines specific research questions related to policy impact assessment (IA): The first version of LIAISE Shared Research Agenda for Policy Impact Assessment (SRA) is the core element of this document. The three levels of the SRA serve as individual support to research programmers as well as to scientists to shape research activities in a more policy-relevant way. This first version of the SRA concentrates on four examples as starting point: "IA in general", "ecosystem services", "soil" and "transport/ innovation".

Reports 1 and 2 of D2.3 provided an overview of research gaps that were identified based on a structured procedure. The main activity in report 1 was a comprehensive analysis of tools funded in the European Framework Programmes (FP) 6 and 7. In report 2, information on research gaps was gathered in four different ways: (1) two workshops on soil and ecosystem services (whereas a third workshop on research gaps in transport/ innovation was prepared during the phase of report 2 and was conducted during the phase of report 3); (2) an uptake of results from the five additional LIAISE work packages (1, 3-6) and the LIAISE test cases in specific; (3) research needs identified in other LIAISE activities as conference participation, discussion rounds and presentations.

The results of these different methodological approaches for identifying research gaps were then evaluated and discussed among the members of LIAISE work package 2 to translate them into research questions outlined in the SRA presented in report 3 of Deliverable 2.3. Lastly, the research questions that were developed based on the previous results were presented and discussed in the LIAISE dissemination conference.

The present document describes the background for the need of an IA shared research agenda, examples from other research agendas, the methodological approach for the SRA development and the SRA itself. The continuous update of the LIAISE SRA and its comprehensive extension towards sustainable development as key reference for policy IA will be taken up in Deliverable 2.5.

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D 2.3 - Synthesis of research needs for IA tools in research programmes inside and beyond the IA research community

1. Introduction

The setting of research agendas has been an emerging topic especially in the past five years. On one side, this trend reflects a maturity of international, self-organised, scientific cooperation leading to a mutual comprehension of research needs. On the other side, it reflects a growing orientation of scientific communities to grand challenges expressed by society. Research agendas usually point at research needs and options within a specific discipline (e.g. Makowski et al. 2013 for agriculture and EPBRS 2010 for biodiversity). They may support (a) the strategic research setting within scientific disciplines, (b) the strategic design of research funding for scientific disciplines (e.g. from funding bodies) as well as (c) individual scientists and research groups to address specific research questions.

So far, research agendas have mainly been developed from two different communities and thus from two different angles. They have been either designed by the scientific community (e.g. EPBRS, 2010) or by the policy-making community (e.g. ESFRI, 2008). So far, no research agenda could be identified that exclusively focussed on policy impact assessment (IA). However, few authors addressed aspects related to IA (Turnpenny et al., 2009 on policy appraisals and Pope et al. 2013 on various IA instruments).

IA is applied in ex-ante manner for all European policies (SEC, 2009). The process follows six consecutive steps: (1) identification of the problem, (2) definition of the policy objective, (3) development of primary policy options, (4) analysis of the economic, social and environmental impacts of the options, (5) comparison of the options in light of these impacts, and (6) monitoring the policies. The assessment in steps 4 and 5 is based on 35 impact areas outlined in the European IA guidelines that address the three dimensions of sustainable development (economic, social and environmental aspects). The IAs are conducted by policy-makers in the Directorate General responsible for the policies and should be based on scientifically developed tools. Thus with IA there exists a strong link between policy-makers and scientists. A research agenda specifically for IA can thus contribute to support feeding scientific information directly into the policy-making process.

The LIAISE Shared Research Agenda for Policy Impact Assessment (SRA) aims at addressing the gap of an IA research agenda. For developing the SRA, we translated the research gaps (identified in the previous reports 1 and 2 of D2.3) into policy-relevant research questions. The “sharing” element of the LIAISE research agenda is meant to provide content to be relevant for both policy-making and scientific communities, thereby also addressing the wide scope of scientific disciplines.

The following document presents the development, the concept as well as the LIAISE SRA in its first version. It thereby concentrates on the exemplary themes “IA in general”, “ecosystem services”, “soil” and “transport/ innovation” as a starting point. These themes were selected due to their relation to existing IA relevant research as well as current and future policy

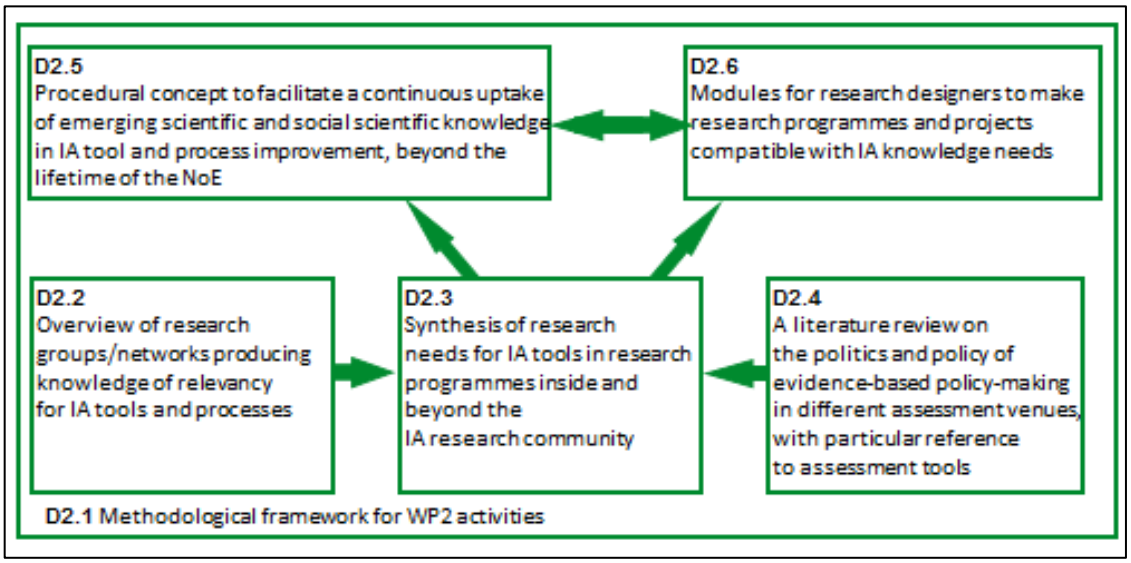
requirements. These examples helped to identify strengths, weaknesses and implementation challenges of the present SRA, particularly to provide information for a continuous update of the SRA. However, it is important to meet the comprehensiveness of IA that is required due to its relation to sustainable development. Therefore, the concept developed for a continuous update of the SRA addresses the expansion of the SRA towards sustainable development (D2.5).

2. Background information

2.1 Concept of "Science for Impact Assessment Tools and Procedures" (Work Package 2)

LIAISE work package 2 on 'Science for Impact Assessment Tools and Procedures' consists of six deliverables that interlink and build upon each other (Figure 1).

Figure 1: Deliverables LIAISE work package 2



In the beginning of the project, WP2 outlined the objectives, linkages, methodologies and implementation strategies for the different deliverables (*Deliverable 2.1 'Methodological framework for WP2 activities'*). The work started by an overview of research activities, networks and trainings that provided or supported policy-relevant scientific expertise (*Deliverable 2.2 'Overview of research groups/networks producing knowledge of relevancy for IA tools and processes'*). The first activity consisted of three elements. First, it provided an extensive analysis of impact assessment tools funded in the European Framework Programmes (FP) 6 and 7. Second, it developed and overview of relevant scientific associations and societies dealing in the narrow or broader sense with policy IA. Third, it provided a list of existing summer schools and scientific trainings that are linked in the narrow or broader sense to policy IA.
To understand the broader scope of IA as an instrument or process and to relate the WP2 results to other appraisal types and options for application it

was important to learn about other venues that also applied scientific expertise in a wider sense (*Deliverable D2.4 'A literature review on the politics and policy of evidence-based policy-making in different assessment venues, with particular reference to assessment tools'*). Specifically, these venues pointed at options where the IA tools identified in the previous step (D2.2) could be applied to, showed scientific networks in a wider sense that the scientific networks previously identified (in D2.2) could be extended towards/ linked up with and showed options for offering training course or for joining forces to learn from each other.
Parallel to identifying research communities and IA related venues, it was the core element of our work to identify and synthesize research needs from the viewpoint of policy IA. These research gaps were phrased as research questions and presented in the LIAISE Shared Research Agenda for Policy Impact Assessment (SRA). The SRA is to provide up to date information for shaping research activities as well as research programming (*Deliverable 2.3 'Synthesis of research needs for IA tools in research programmes inside and beyond the IA research community'*). Thereby it is important that the SRA is regarded as a starting point for a continuous agenda process (*D2.5 'Procedural concept to facilitate a continuous uptake of emerging scientific and social scientific knowledge in IA tool and process improvement, beyond the lifetime of the NoE'*). The perpetuation of the LIAISE SRA is mainly linked to the LIAISE kit. Here, scientists who are experts in IA offer their expertise as lead editors for the 35 European impact areas set out by the Impact Assessment Guidelines published by the European Commission as well as IA models and methods.
Further, the results of the LIAISE Shared Research Agenda will frequently be taken up by the training modules (*D2.6 'Modules for research designers to make research programmes and projects compatible with IA knowledge needs'*). These modules serve two main objectives. Firstly, they allow for a training of scientists to become more familiar with policy-relevant research and to design their research in a way that further supports a scientifically based policy process. Secondly, they further consolidate the policy IA research community.

2.2 The LIAISE Vision on a future Community of Practice

The LIAISE Vision on a future Community of Practice emphasized the relevance for a strong development of IA research programming. The LIAISE scientists saw it as key factor for the full potential of IA research that stakeholders understand scientific knowledge as salient, legitimate and credible (according to Cash et al., 2003). This understanding was key in reaching the full potential of IA related research.
The programming and evaluation of research needs to be a joint interactive process. Therefore, the LIAISE Community of Practice emphasized the need for fixed standardized procedures for designing research programmes. It is thus one of the central products and services of the Community of Practice to develop and provide a "[s]hared IA Research Agenda with a focus on knowledge generation at a strategic level to enable researchers addressing policy-makers' needs." This function of the Community of Practice is regarded as particularly relevant to researchers/students, policy-makers and policy units, research programmers and evaluators as well as funding agencies.

The vision for structuring research programming and initiatives by means of a scientific shared research agenda is embedded in the concept of IA, its development in the past decade as well as current challenges. Since its beginning in 2002, IA has been applied to an increasing number of policies. Since IA reports should be based on scientific results, the use and integration of research results as well as the application of research tools also plays an increasing role in the IA process. To provide further insight into the use of methods and models in the IA process, work package 4 (Jacob et al., no date) analysed 805 IA reports carried out between 2003 and 2013 towards their use of quantitative models to assess the effects of the proposed policy. Since it is not mandatory to list the scientific methods and models applied in the IA process in the IA reports, the analysis focused on the 222 reports (27,6%) that listed the tools they used. Thereby, the share of studies reporting their use of models almost constantly increased since the beginning of IA. They accounted to more than 60% as peak in 2013. Yet still more than 35% of the IA reports in 2013 did not report on tool application.
Assuming the willingness of policy-makers to apply tools, two main reasons may be possible for this result when arguing from a purely scientific perspective. First, as identified by Podhora et al. (2013) (D2.3, report 1; LIAISE Innovation Report #6, LIAISE Policy Brief #5), the European FPs 6 and 7 designed methods and models for 16 out of 36 European policy areas. So the absence of a description of tool use in IA reports could be based on the missing availability of methods and models. This aspect is represented in the sections “policy-relevant topics” and “scientific tools” of the LIAISE Shared Research Agenda (see chapter 4). Second, there exist challenges in the transfer of scientific knowledge from researchers as tool developers to policy-makers as tool users. So despite the scientific availability of certain tools, policy-makers may not be aware of the existence of the tools relevant for a specific IA and thus are not able to apply them. This aspect is represented in the section “knowledge transfer” of the LIAISE Shared Research Agenda.

3. Methodology: The development of the LIAISE Shared Research Agenda for Policy Impact Assessment (SRA)

The development of research agendas has increased in the past years and was developed for a variety of disciplines and policy areas. However, we could not identify a review or background paper that compared the variety of research agendas with respect to their structure, their content and their methodology. Such paper could have served as a starting point for the development of the methodology and the structure of the LIAISE SRA. Further, such paper may have discussed the aspect of continuity after the publication of the research agendas, thereby providing support for the continuous update of the LIAISE SRA (D2.5).

All agendas identified followed individual methodologies covering e.g. a summary of articles from a previous special issue (Pope et al., 2013), joint workshops (e.g. MacKenzie et al., 2002) and statements of expert groups or scientific associations (e.g. EPBRS, 2010).

The present LIAISE SRA was designed in relation to the impact assessment system of the European Community as introduced above. It therefore uses the respective background information, requirements and frameworks as a reference for the analysis. A transfer or application to non-European IA systems requires further research beyond the scope conducted for the LIAISE SRA.

The LIAISE SRA was particularly developed from a scientific perspective. It was based on scientific expertise and results, since we regarded expert and project knowledge as being the most familiar with the current availability and absence of IA relevant research. In the LIAISE project it was regarded as a major challenge in IA research and practise to bridge the scientific and the policy-making community. Thus, policy-makers may have listed aspects they would regard as research gaps though these aspects are scientifically available but not available yet for policy-makers (e.g. due to missing communication on / promotion of the tool towards policy-makers or missing training courses for policy-makers to apply these tools). However, the presentation and discussion of the preliminary SRA at the LIAISE dissemination conference is a relevant step towards discussing the results of the agenda with policy-makers and to increase the “sharing” of the agenda results (chapter 4).

The SRA presented in this document neither claims to be comprehensive nor to be complete. Rather this first version can be regarded as a starting point that aimed at two objectives. First, the SRA focused on identifying a structure that reflects the complexity of policy IA and its relevant communities. Thereby, it is meant to support research programmers and scientists with view to a long-term policy-relevant research design. This approach is presented in the three level structure of the SRA, that was developed and tested within the lifetime of the LIAISE project (chapter 4).

Second, the SRA presented in this document serves as a starting point by focusing on four exemplary themes: IA in general, ecosystem services, soil and transport/ innovation. The research questions posed were intensely discussed by IA experts from various disciplines during the process of the LIAISE project and within the methodological setting presented in the next paragraphs. In step 8 of the methodology, that takes place beyond the funding of the network of excellence, the LIAISE SRA will continuously be

updated and extended towards all dimensions of sustainable development (see D2.5).
The design of the LIAISE SRA was based on the translation of research gaps into research questions. Empirical data analyses were combined with expert discussion workshops and presentations, respectively. The SRA was developed in a joint and transparent process with the empirical results being published (Podhora et al., 2013) and the workshop reports being publically available from June 2014 on on the project website (Diehl et al., 2012, Helming, Montanarella, 2012, Virkamäki et al., 2013).
The methodology was based on eight steps. A profound analysis of IA IA related research projects funded in the European FPs 6 and 7 served as a starting point. It was followed by in-depth discussions in three expert workshops on ecosystem services, soil and transport/ innovation that were designed with respect to the three leading policy areas. LIAISE test cases and work packages provided additional knowledge as well as public presentations and additional discussion rounds. The variety of information on research gaps was then translated into research questions presented in the LIAISE SRA. Comments were provided in public discussion with scientists and policy-makers during the LIAISE dissemination conference. After the dissemination of the first version of the LIAISE SRA, the agenda will be continuously updated. These methodological steps will be presented in the following, reflected with the then current scientific state of the art and ranked according to research priorities.

Step 1: Research gaps identified for IA related research projects funded in the European FPs 6 and 7
To start we aimed at providing a first overview of research gaps. We analysed the abstracts of 7781 projects funded in the European FPs 6 and 7 provided on the European Cordis website (Podhora et al., 2013, LIAISE Innovation Report #6, LIAISE Policy Brief #5, D2.2, D2.3, report 1). We selected 203 projects that developed, extended, applied and/or tested tools for the IA process. We concentrated on quantitative or qualitative tools (models, scenarios, participatory tools etc.), their components (e.g. indicators and comprehensive analytic methods) and superior evaluation frameworks (toolboxes and platforms). We structured the analysis of the projects that designed the tools according to (i) 36 European policy areas (European Union, no date), (ii) 35 impact areas outlined in the European IA guidelines (SEC, 2009, amended by "sustainable development in general"), (iii) the jurisdictional levels (from international/global to local), and seven tool categories (de Ridder et al., 2007 assessment framework, scenario analysis tools, multi-criteria analysis tools, cost-benefit/ cost-effectiveness analysis, accounting tools, physical analysis tools and indicator sets, modeling tools, amended by category "other"). In each of these groups, we counted the number of projects to identify research peaks and gaps. The analysis of the projects funded identified the following key results:
Policy-relevance of research
- A small percentage (less than 3%, equalling 203 projects) of the projects funded in FP6 and 7 provided tools for policy IA.
- About half of these projects identified provided tools for environmental, agricultural and transport policy areas.

Tools designed for these three policy areas were subject of a further in-depth analysis presented in the next bullet points.
With respect to environmental, agricultural and transport policy areas:

Impact areas and sustainability dimensions

- The tools mainly addressed the impact areas corresponding to the policy areas (environmental impact areas for environmental policies, the impact area "land use" for agricultural policies etc.).
- Social impact areas were generally poorly addressed by the tools.
- The tools were mainly designed for one to two sustainability dimension(s). They hardly comprised all three sustainability dimensions and sustainable development in general, respectively.

Jurisdictional levels

- The tools were mainly designed for European policies and hardly for other jurisdictional levels (as international or national levels).
- They were mainly designed for a single jurisdictional level and not for multi-level governance.

Tool categories

- The majority of the projects designed several tools.
- Most tools had a quantitative character; participatory tools were poorly covered.
- More than half of these tools could not be categorized according to the current seven integrated assessment categories identified by de Ridder et al. (2007).

Terminology challenges

Many tool descriptions did not refer to the policy-relevant terms defined by the European Community (e.g. impact areas as set out in the European IA guidelines, policy areas of the European Union).

Step 2: Expert workshops on ecosystem services, soil and transport/ innovation in relation to the three leading policy areas

Following the empirical analysis in step 1, we organized three workshops between April 2012 and March 2013 to facilitate a theme-related discussion on research needs. The selection of the themes for the workshops was based on Podhora et al. (2013): More than half of the projects analysed (60%) designed tools for three policy areas, namely environment, agriculture and transport. For the workshops, we selected themes connected to them: ecosystem services (environment), soil (agriculture) and transport/ innovation (transport). Thereby, these three themes formed the examples for the first version of the LIAISE SRA.

The three themes selected were scientifically and politically backed, though certainly the three policy areas have further themes that need to be explored. Ecosystem services reflect the current scientific discussion of broadening the understanding from environmental components to environmental services. The theme of soil was backed by the current political discussions on a possible re-launch of the European Soil Framework Directive, the proposal for which is pending since 2006. Lastly, the impact area of transport unites social and economic elements. Well-functioning transport systems add to our quality of life. They are also one of the key ingredients to support the competitiveness of the European Union and thus partly contributed to a perspective that was less covered by the European research funding.

As the SRA was developed from a primarily scientific perspective, we almost exclusively invited participants with a strong scientific background to the workshops, namely well-known scientists and European or national science-policy brokers. For the transport workshop, also an NGO representatives was invited due the NGO's intense interaction with transport related IAs (in contrast to the issues of ecosystem services and soil). In this respect, NGOs

could be regarded as brokers, too. Further, two representatives of national bodies as well as two members of the European Parliament and national bodies participated who were regarded as knowledge brokers.
The workshops had a total of 53 participants including the LIAISE researchers (17 for ecosystem services; 18 for soil; 18 for transport) (Helming, Montanarella, 2012, Diehl et al., 2012 and Virkamäki et al., 2013). All scientists had first experiences with the science-policy interface within their discipline and were thus regarded as to be familiar with the corresponding research state of the art in relation to policy IA. The scientists were identified through the research projects selected for Podhora et al. (2013) from the three policy areas, scientific literature and conferences, publications, through cooperation in previous research projects and personal recommendations of scientists who could not participate in the meetings.
The scientist workshops conducted for the LIAISE SRA allowed for a short introductory presentation to facilitate the joint understanding of the elements of the research agenda as well as for a personal in-depth discussion among the participants. All workshops were structured along the three sections of "policy-relevant topics", "scientific tools" and "knowledge transfer" (chapter 4). Thereby, each section was introduced by one to two scientists to facilitate the discussion. The workshop results were summarized in individual reports (Helming, Montanarella, 2012, Diehl et al., 2012 and Virkamäki et al., 2013). The final results of the workshops were not discussed against each other among the workshop participants.
The scientific expertise as well as the political attention and implementation of the themes "soil" and "transport" have a long tradition in policy-making and IA research. This is reflected in the fact that "Soil quality or resources" and "transport and the use of energy" are both listed as individual impact areas in the European IA guidelines. Therefore, these two themes could be addressed within a day meeting. In contrast, the concept of ecosystem services can be regarded as a rather new approach that started scientifically and politically to arise approximately a decade ago (Millennium Ecosystem Assessment, 2005). Thus this theme was granted more discussion time (2.5 days).

Step 3: Gathering and discussion of research gaps within LIAISE work packages and test cases (methodology and key results D2.3, version 2)
LIAISE is a Network of Excellence, thus its researchers were regarded as scientific experts for policy IA. Therefore, they possess profound knowledge with respect to the state of the art of research on policy IA. Further, the general structure of the LIAISE project reflected the structure of the IA process (WP1: policy-making community; WP2, 3 and 4: scientific community, method scientists and modellers; WP6: test cases on knowledge brokerage uniting the policy-making and scientific communities). Therefore, we asked each work package and test case team to summarize relevant research gaps from the perspective of their researchers and particularly from their experience with the work of the LIAISE project. We asked them to categorize their questions based on the three spheres relevant for IA: policy-relevant topics, scientific tools and knowledge transfer (chapter 4).The results were further backed by the LIAISE deliverables and meetings. To inform on the SRA and to prepare our request we organized internal LIAISE discussion workshops during the annual project meeting 2012.
Key results – here summarized as messages on an aggregated level, not individually by packages and cases – were:

- The development of a tool kit should be adapted to different kinds of needs.
- Methods and models should be further developed with view to conceptualization and transparency, e.g. in terms of participatory elements, transparency and meta collections/ summaries.
- The relationship between policy-makers and scientists needs to be further developed with view to different elements of and influences on the cooperation (as cultural factors, institutionalized cooperation, standardized procedures for knowledge brokerage, language etc.).
- It is worth further exploring IA related venues (in respect of a broader understanding of the instrument).
- The context of tool use should be further explored (e.g. IA scope, problem definition, IA phases, disciplinary differences in tool use) to learn about how to improve the tool provision and to it policy needs (e.g. higher flexibility, adjustment options, speed of adaptation, appropriateness of tools/ indicators).
- There is a constant need for availability of and access to appropriate tools, e.g. those developed in previous research projects or that are specifically for IA.
- Tool application, result aggregation during the application etc. and th results themselves, should be clearly communicated to policy-makers (e.g. via "capacity building").
- Quality assurance of tools and their meta-level is needed as well as constant updates to meet the policy-makers' needs.
- There is a constant need for support of emerging policy-relevant topics.
- The role of context in the science-policy interface may influence the participants' relationship as well as the selection of tools.
- It is important to understand options for improvement of the policy cycle by means of IA and to measure the impact.
- Participation challenges need to be further explored, e.g. with respect to obstacles regarding its application, the identification of stakeholders and the individual characteristics of the process.
- The balance of the sustainability dimensions is a relevant objective and corresponding support mechanisms should be further explored.
- IA are related to scales which are applied differently with different impacts, that can be further adapted to IA requirements (e.g. according to spatial levels).
- The use of evidence is a sensitive issue (e.g. due to challenges of definition and in application).
- Many characteristics of tools for IA are yet not explored (e.g. options for increasing transparency, participation mechanisms and tool definitions).
- IA is an internationally emerging issue and calls for scientific beyond the European Community.

These aggregated results are presented in a deeper level of detail in the SRA.

Step 4: Presentations and additional discussion rounds

We initiated several discussion rounds with scientists and partly policy-makers, e.g. at international conferences. In these meetings we presented and discussed the general SRA concept, its progress, selected elements and preliminary results. Further, these workshops helped us to reflect on

research gaps and our results. Key presentations and discussion workshops were (for a detailed list of presentations and workshops, see Annex I):

- Joint Programming Initiative Agriculture, Food Security and Climate Change FACCE (2013),
- International Association for Impact Assessment IAIA (2010, 2011, 2012),
- Berlin Conference on the Human Dimensions of Global Environmental Change (2011, 2013), and
- Association for Environmental Impact Assessment in the German speaking countries (2010, 2012, 2014 in prep.).

As these activities took place from an early phase of the SRA onward, the comments often regarded previous individual results and structural elements that presented the then current state. Therefore, the results are not described in detail here, since they are mainly indirectly presented in the current structure and content of the SRA.

Step 5: Translation of research gaps and results into research questions presented in the LIAISE SRA

LIAISE scientists, who participated in the workshops due to their expertise in the themes of IA in general, ecosystem services, soil as well as transport/ innovation, had the lead in translating the research gaps into research questions. Therefore, we analysed the documents (Podhora et. al., 2013, Helming, Montanarella, 2012, Diehl et al., 2012 and Virkamäki et al., 2013, filled templates from LIAISE work packages, test cases and external European sources) with view to the three sections “policy-relevant topics”, “scientific tools” and “knowledge transfer”. We extracted research gaps and gathered them in sub-groups within these sections. The content and title of the sub-groups differed for all four themes (IA in general, ecosystem service, soil, transport/ innovation) due to the respective issues that were raised in the discussions and documents. From the content of these sub-groups, we derived the guiding research gaps (SRA level 2) and translated the content of the sub-groups from running text into specific research questions (SRA level 3). Further, all research questions were structured into the superior sections of policy-relevant topics, scientific tools and knowledge transfer (SRA level1) (chapter 5).The questions that originated from steps 1, 3 and 4 were mainly presented in the theme “IA in general” of the LIAISE SRA. The questions that we derived from step 2 (expert workshops) were included in the respective theme in the SRA (ecosystem service, soil, transport/ innovation). Questions from the soil workshop thus can only be found in the exemplary theme “soil”. Though some of these questions listed with the theme ecosystem services, soil or transport sound quite general and could be categorized in “IA in general” at first sight, they were raised within the respective workshop and thus are regarded as being relevant for this theme only. They were not generalized and listed with IA general.

Further, the individual research gaps were discussed with a different level of intensity in the workshops. Some aspects were discussed intensely, so that several detailed questions could be identified (presented as a guiding research question on level 2 of the LIAISE SRA and further detailed with the specific questions on SRA level 3). In contrast, others aspects were rather briefly tackled and were therefore only specified by one to two questions (on SRA level 3). Due to this different depth of the discussion, especially the guiding research questions have an individual level of detail. These different results were not harmonized, but taken as a result of the methodology.

We mainly phrased the questions starting with the word "How" to demonstrate the wide variety and the scope to provide research answers. Further, some research questions are based on underlying assumptions, of which the workshop participants had a mutual understanding or general agreement. To best reflect the content of the workshops as a core element of the SRA methodology, we included these assumptions. When being taken up by researchers, the rsearch questions could be further distinguished to an even deeper level of detail (e.g. with respect to research hypothesis, individual research elements related to this question) and tested with respect to these pre-assumptions.
In addition to the research questions posed, there most likely exist further research gaps that were identified by means of this methodology. Even when a sub-group of questions is only raised in one theme, it may still be applicable to another theme, though it is not listed there. These questions were then not identified or discussed in the other workshop, since the results of the workshops were not discussed against each other.
Key results will be presented in the LIAISE SRA (chapter 6). Key conceptual and methodological results of the analysis were:

- The results confirmed the tripartite structure of the LIAISE SRA along guiding sections (distinguished into "policy-relevant topics", "scientific tools" and "knowledge transfer", chapter 4).
- The results confirmed the three level pyramid structure of the LIAISE SRA (chapter 4).
- The results showed rather small overlaps of the content of the sub-groups. The three sections of "policy-relevant topics", "scientific tools" and "knowledge transfer" were the least common multiplier for the four themes IA in general, ecosystem services, soil and transport/ innovation. The comparatively big overlaps could be identified in the partly corresponding themes of ecosystem services and soil.

Step 6: Comments from and public discussion with scientists and policy-makers at the LIAISE dissemination conference
The LIAISE dissemination conference invited policy-makers and scientists to discuss LIAISE results (April 2014, Brussels). Here, we presented the preliminary results of the first version of the LIAISE SRA in two slots:

- During the presentation "LIAISE Shared Research Agenda" three commentators – Bernhard Berger from DG ENV, Jesus Maria Alquezar Sabadie from DG R&I and Frank Dreger from the German Project Management Jülich – commented on the agenda exclusively from a policy-making and research programming perspective.
- During a discussion session on "Research in support of sustainable development", the LIAISE SRA was reflected in the light of current research programming and networking options. Commentators and presenters in this session were Michael Weber from the German Project Management Jülich, Lino Paula from DG RTD, Zsolt G. Pataki from DG for Parliamentary Research Services and André Martinuzzi, Research Institute for Managing Sustainability.

Furthermore, the issues related to the SRA (particularly the implementation, suggestions for continuous updates, sharing among research communities and with the policy-making community) were raised and discussed by the LIAISE policy board.
Key results were an institutionalized interaction with the policy-makers by means of the LIAISE policy board as a contribution to a stronger science

policy interface, to pay attention to new IA elements that may then be tackled by a future adaption of the SRA as well as to understand be aware of the changes in research programming (e.g. new foci and funding mechanisms in Horizon 2020). Further, the results of the conceptual approach and background of the SRA was basically approved.
The comments from all commentators and presenters as well as the final public discussion from the conference participants allowed a final structural update and shaping of the LIAISE SRA.

Step 7: Dissemination
To reach the scientific community, we will publish the results of the present LIAISE SRA in a scientific article. The main objective of this paper is to offer with the SRA a contribution to policy-relevant science. The target journal is Environmental Science and Policy (http://www.journals.elsevier.com/environmental-science-and-policy/) with a 5 year impact factor of 3.461.
Further, it is a central element to inform the policy-making community on the results of the SRA. A first step was taken by presentations and discussions that took place during the LIAISE dissemination conference. In the future, the LIAISE policy board with representatives from the DGs will assume the role of knowledge broker. They will inform the policy-makers on the updates of the LIAISE SRA as well as request suggestions from the policy-making side towards the SRA (step 8). Further dissemination models for the results of the continuous updates of the LIAISE SRA to both communities will be presented in D2.5.

Step 8: Continuous update of the LIAISE Shared Research Agenda
The present version of the SRA is to serve as a starting point for a continuous update of the SRA. It shall not be regarded as a complete compendium for a certain discipline, topic or impact area. We tested and further developed the idea of the structure and options as key criteria by example of IA in general, soil, ecosystem services and transport/ innovation. Beyond the funding period of the LIAISE network of excellence, the SRA will continuously be updated to provide further information on research gaps to the scientific and policy-making community (see D2.5). Further, it is a relevant element of a longterm research agenda to reflect the results in relation to the scientific state of the art – an approach that shall play a relevant role in the updating concept, too. This extended scientific discussion – that goes beyond the expert discussion we chose as an approach for the first version of the LIAISE SRA – will also enable a the development of a priority list to suggest which research gaps identified could be seen as the most current and pressing ones. Thereby, also recent developments and changes within the IA system could be addressed (e.g. the extension of assessment reports towards "cost of non-Europe" and the "European added value").
We will therefore design a concept how the community and expertise platform "LIAISE kit" can serve as a mechanism for continuously updating the SRA and for becoming more comprehensive (by covering all impact areas and all IA methods and models). Lead editors and IA experts from a broad variety of scientific disciplines are invited to assume responsibility here.

All steps in the methodology were chosen in order to address the elements of science-policy interface. Though the amount of research agendas is

constantly increasing, many agendas focused on a specific topic and tackled rather marginally the science policy interface and the gaps with view to policy influence, respectively. Thus, their results could not form the basis of the LIAISE SRA, but the methodological approach presented above was needed.

4. The setting for the LIAISE SRA

For the purpose of the design and structure of the LIAISE SRA we base its development on four key IA characteristics as will be described in the following. . These characteristics also helped to better shaped the target groups for the SRA.

4.1 IA characteristics relevant for structuring the LIAISE SRA

#1: A mature, complex, legitimized instrument
IAs are currently mandatory for all major European policies. Additionally, the majority of the European member states has developed individual national procedures of national IA. Further, national and international organisations as the OECD and the German development agency Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) have designed and / or supported the development and application of IA, e.g. as recommendation to their members and cooperation partners. The instrument of IA itself is therefore already quite advanced, e.g. concerning its legal background and the political willingness for its application. Researchers have addressed its role in the policy cycle as well as its influence on policy-making in a high amount of publications (e.g. Turnpenny et al., 2009, Bäcklund, 2009, Achtnicht et al., 2009, Adelle, Weiland, 2012, Helming et al., 2011).
The SRA does not put the focus on IA as an instrument (e.g. the general IA process according to the consecutive steps or participation mechanism), but concentrates on policy-relevant themes and topics. Therefore, the SRA designed the section "policy-relevant topics": What are the important items/ issues/ topics for which new knowledge should be explored? Due to the high amount and variety of themes and topics, the first SRA focuses on four exemplary themes, namely general elements of IA ("IA in general"), ecosystem services, soil and transport/ innovation.

#2: Scientifically addressing all European policy areas and thereby connected to a multitude of research fields
In the European Commission, IA is conducted by the respective responsible DG. A total of 36 policy areas are linked to corresponding DGs. Within an IA, the impacts of a certain policy are assessed for the 35 impact areas set out in the European IA guidelines.
A research agenda needs to take into account the different themes and disciplines related to all European DGs and impact areas. Trans- and interdisciplinary integrated research is thereby key to reflect the forward-looking character and complexity of sustainable development. The SRA aims at fostering the extension and improvement of scientific knowledge and scientific assessment methods specifically suited for IA. It addresses these aspects in the section "scientific tools": What kind of characteristics do tools and data need in order to be of use in policy support and in IA? The SRA thereby outlines research questions that specifically support the scientific support of the policy process with view to sustainable development by means of interdisciplinary research.

#3: Located at the science-policy interface
A variety of research agendas (e.g. Makowski et al., 2013 and MacKenzie et al., 2002 for agriculture) mainly concentrated on the research topics

themselves. They thereby addressed the policy-relevancy of research and the transfer from science to policy in a rather limited way. Since IA reports conducted by policy-makers should be based on scientifically developed tools and results, IA is located directly at the science-policy interface.
When developing a research agenda for IA, research should address information relevant from (a) a scientific perspective (supplier of scientific results), (b) a policy-making perspective (user of scientific results) and (c) a transfer perspective (bridging science for suppliers and users). The SRA therefore aims at contributing to bridge the science-policy interface within IA. The agenda is of shared interest for both communities involved in IA, the scientific as well as the policy-making community and thereby addresses their individual as well as their joint interests. The SRA addresses this aspect in the section "knowledge transfer": What do researchers need to know about the policy-making process in order to improve their contribution to IA?

#4: Research suitable for the IA process needs to be relevant, credible and legitimate
For the IA process and its research, the LIAISE Community of Practice confirmed the three criteria set out by Cash et al. (2003) in 'Knowledge systems for sustainable development': (1) credibility concerning the adequateness of scientific results, (2) saliency with respect to the relevancy of the results for the policy-making community and (3) legitimacy regarding the way scientific information is perceived by the users.
The SRA therefore supports the development of relevant, credible and legitimate knowledge for the IA process, since these criteria play a relevant role in the provision of scientific evidence with view to sustainable development. These three criteria are reflected in the LIAISE SRA in the three sections:

- *Policy-relevant topics: Policy processes account for salient research in IA.*
- *Scientific tools: Assessment methods provide credibility to research.*
- *Knowledge transfer: Bridging the science-policy interface provides legitimacy to research.*

4.2 Target groups

In general, die LIAISE business plan summarizes the following benefits for various target groups:
"The shared research agenda implies the following benefits for the different communities:
For policy makers:

- To communicate knowledge needs and demands to the research community
- To learn about recent developments and available knowledge

For Funding Agencies

- To learn about policy makers' demands to design funding programs that target their priorities
- To learn about researchers needs to enable them to produce policy relevant knowledge

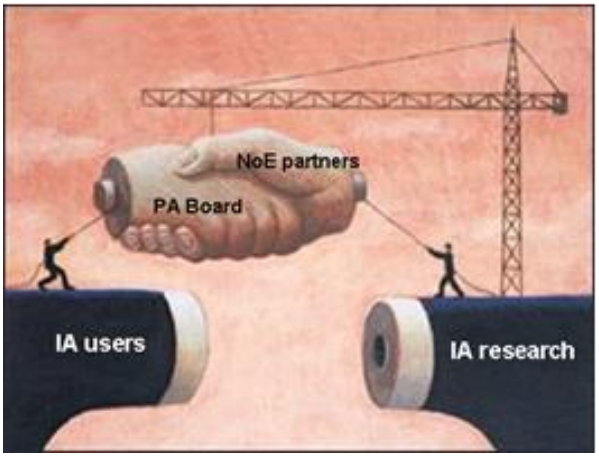
For Researchers

- To learn about policy makers' needs for knowledge to be able to include their view in the design of research projects

- To communicate to research funding agencies what is needed to be able to set up research projects that produce policy relevant knowledge"

In the beginning of the project, LIAISE research was based on the understanding of two communities: (a) the policy-making community conducting policy IA as tool users and (b) the scientific community as providers of IA tools (figure 2).

Figure 2: LIAISE understanding of policy-making and scientific communities in 2009



During the progress of LIAISE, however, we became aware that the science-policy interface is more complex and that both communities can be divided into three further sub-groups each with respect to policy-relevant research, as also illustrated in figure 3:

Scientific community:

1) no experiences with policy-oriented research
   The SRA could assist this group to align their research towards a more policy-oriented focus. This support may also help researchers to increase the policy-relevance of fundamental / basic research.
2) (first) experiences with policy-oriented research
   The SRA could support researchers who already are experienced with policy-relevant research to identify, strengthen and discuss possible topics for their upcoming research.
3) political and sustainable development sciences as policy-relevant research per se
   The SRA could provide insight for political and sustainable development scientists to better understand open questions the scientists (who are no experienced with policy-relevance) have to address when delivering evidence to policy-making.

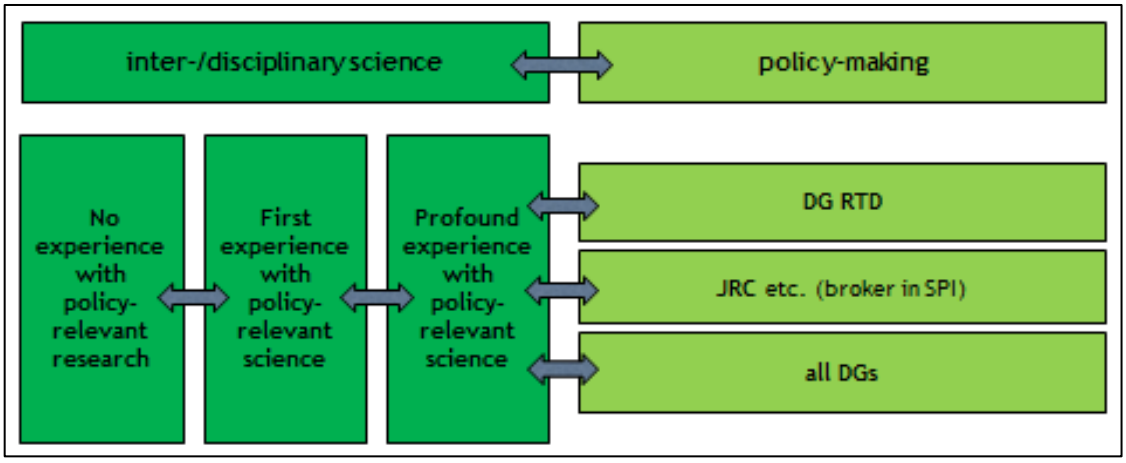
Policy-making community:

1) research policy-making
   The SRA could provide information for the design of research policies, specifically the upcoming research programmes of Horizon 2020 in the fields of IA in general as well as in specific disciplines (e.g. in the current exemplary disciplines of soil, ecosystem services and transport/ innovation in relation to IA).
2) European research institutes/ in-house research
   The SRA could assist European research institutes that work as

policy-related knowledge brokers to better understand the kind of open questions that need to be covered for better providing scientific evidence for the policy process.

3) European DGs
The SRA could provide information about research gaps in IA for the European DGs (e.g. with respect to the current SRA focus particularly to the DGs AGRI, ENV and MOVE).

Figure 3: Target groups of the LIAISE SRA



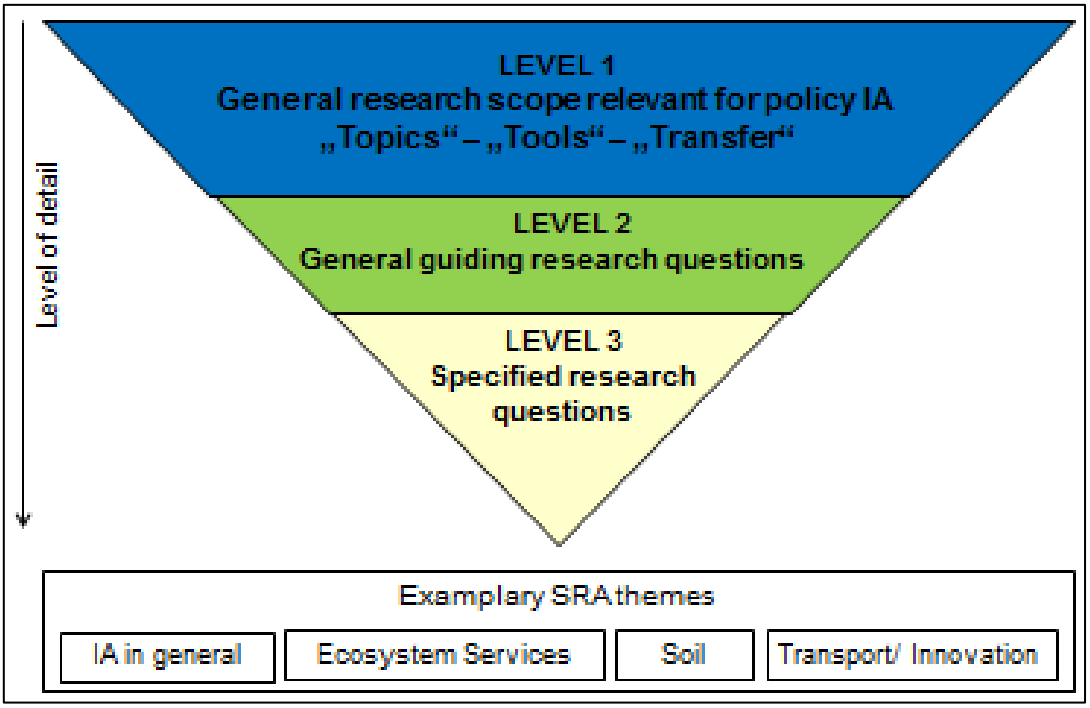
Despite this scientific focus in the methodology for developing the SRA it is a central aspect in the LIAISE SRA to serve as a "shared" agenda. The SRA defines the term "sharing" as "sharing the interests" of several communities: (a) of the policy-making community, (b) of the scientific community in general, and (c) of the wide variety of the scientific disciplinary communities. The sharing takes place differently with view to the special characteristics of each target group. Specific concepts for sharing will be presented in the concept for a continuous update of the SRA beyond the funding period of the LIAISE network of excellence (D2.5).

4.3 The pyramid structure of the LIAISE SRA

The LIAISE Shared Research Agenda consists of three levels that build upon each other as a pyramid (Figure 4). Thereby, the upper levels specify the content of the lower levels and provide different support to the target groups:

- Level 1 outlines the general research scope relevant for policy IA.
- Level 2 presents guiding research questions.
- Level 3 specifies the guiding research questions of level 2.

Figure 4: Levels of the LIAISE Shared Research Agenda pyramid and scientific target groups



Level 1: General research scope for policy IA

Level 1 suggests a general structure for research funding in relation to the science-policy interface and IA. The information provided in level 1 can be offered to research funders, who design research programmes. These are, among others, on the European level DG RTD for Horizon 2020 with its "Environment & Climate Action" area or on the national level the German Federal Ministry of Education and Research BMBF with its funding framework on sustainable development "FONA". The results may also offer information for the development of tenders in the European DGs or for European in-house research when structuring their individual policy support.

The structure of research funding presented by level 1 comprises the three spheres of the science-policy interface, namely the scientific sphere, the policy-making sphere and the interfacing sphere. Specifically, the research programmes comprises the three elements:

- ***Policy-relevant topics:*** Policy-relevant themes as policy and IA processes,
- ***Scientific tools:*** Assessment methods as provision of tools and data and methodologies, and
- ***Knowledge transfer:*** Bridging the science-policy interface.

These three sections serve as a support for the research funders, illustrated here by example of the European FPs 6 and 7 and Horizon 2020, respectively. In the FPs the "cooperation" section was designed to follow a strategic agenda to generate and compile scientific knowledge that can address substantial societal challenges and support innovation and policy-making in pursuit of sustainable development (Georghiou et al., 2009, Annerberg et al., 2010, Rietschel et al., 2009). In Horizon2020, the

programme on Societal Challenges continues in that line. Further research is commissioned directly by policy DGs through tenders and framework contracts. However, since less than 3% of all projects funded in the FPs 6 and 7 designed tools for policy IA, there seems to be the need for an increase of policy-relevant research. This target may be reached by applying the results of the LIAISE SRA, in particular of level 1 when outlining the research programmes. Two advantages shall be presented here.

General structure of the research programme
The research programmers may use level 1 to check whether the three sections "policy-relevant topics", "scientific tools" and "knowledge transfer" are integrated directly or indirectly into the structure of the research programmes. The responsibles may consider the following questions when outlining a programme or call:

- To what extend does the general structure of the research programme reflect the three sections "policy-relevant topics", "scientific tools" and "knowledge transfer", so that researchers can provide policy-relevant research directly by responding to a call?
- To what extend is the call itself shaped and described in a way that it allows researchers to address all three sections (either jointly or individually) when outlining a project proposal?

Structured continuity of the research programmes
Researchers often claim the missing continuity of a research programme, creating challenges as a missing linkage to previous calls in new ones. With the structure presented in level 1, the three sections "policy-relevant topics", "scientific tools" and "knowledge transfer" may as a continuous theme that is taken up in any kind of research programme or call. The research programmers may consider the following questions when outlining a programme or call:

- How were the three sections addressed in the previous research programmes and calls?
- To what extend does the new research programme or call serve as continuous development within these sections?
- To what extend does the new research programme or call reflect the results of the LIAISE Shared Research Agenda (levels 2 and 3), particularly the updated version of the SRA (D2.5)?

Researchers in any of the three sub-groups described above also benefit from research programmes that are designed in an IA supportive way. When the suggestions of level 1 are already reflected in the programming, research proposals already have an increased policy-relevance per se. Further, the structure of the programmes may also help to guide the researchers with shaping the outline of their proposal and implementing the project even better with view to a stronger policy support.

Level 2: Guiding research questions (detailing level 1 results)
The guiding research questions detail the three sections of level 1 (policy-relevant topics, scientific tools, knowledge transfer) for each theme presented in the LIAISE SRA. Level 2 may assist the funding bodies when specifying their research programme. The present version of the LIAISE SRA thereby focuses on the four exemplary themes: of IA in general, ecosystem services, soil and transport/ innovation.

Level 2 may serve as a support for researchers from all three target groups when outlining their superior research questions (e.g. in internal institutional programming, institutional working groups, large research projects). Level 2 provides suggestions for the actual design of new and interdisciplinary research questions. Researchers who are not or little experienced with policy-relevant research may improve their understanding of policy-relevant research design. Researchers who have a profound background in policy-relevant science may find options on how to incorporate aspects that are not yet addressed by policy-oriented research into their work. In particular, the questions posed in the SRA offer several services:

- Guiding research questions presented on level 2 may help to increase the understanding of policy-relevant research questions within the respective discipline of the scientists. Jointly with the details of level 3, they provide examples to researchers who are not yet familiar with policy-relevant research, but would like to shape their research in this way. This function of the SRA can be further supported by the LIAISE training modules (D2.6) that enable scientists to improve the policy-relevance of their research.
- Scientist may relate their individual research questions to the guiding questions outlined on level 2 to discuss their ideas in the light of the SRA.

Guiding research questions may offer an entry point for interdisciplinary cooperation. The human influence on soil services, as example, can be addressed in soil as well as in social science. These options for cooperation may not have been covered previously, but may serve as a higher influence on sustainable development.

Level 3: Specified research questions (detailing level 2 results)

The specific research questions summarized on level 3 detail the guiding research questions in the light of level 2 of the first LIAISE SRA. Thereby they provide specified questions for the exemplary themes of IA in general, ecosystem services, soil, and transport/ innovation. With view to the policy and scientific target groups, the arguments and advantages of level 3 are basically identical with the ones described for level 2 and are thus not further presented here.

5. Similarities and differences of other research agendas with the LIAISE SRA

In a variety of disciplines the development of research agendas or roadmaps (herein summarized as agenda) has been an emerging topic in the past years. The majority of the research agendas identified focused on specific scientific fields. We regarded the following agendas as most relevant for shaping the LIAISE Shared Research Agenda, because they focused on the science-policy interface, partly in relation to sustainable development, and dealt with topics of impact assessment, ecosystem services, soil or transport as topics (in relation to our exemplary themes for the LIAISE SRA).
The following paragraphs summarize research agendas relevant for the LIAISE SRA. First searches were conducted via Scopus (according to the terms "research agenda" plus "impact assessment", "ecosystem services", "transport"; publication date 2010 to winter 2013, categories life sciences and social sciences/ humanities). In addition, position papers for research agendas were identified from major research alliances and networks. Due to the very limited results, further articles from other sources and older papers were also included in the following list to allow for a wider understanding for the topic. The documents and papers identified were summarized with view to their content. The individual agendas are presented according to their methodology, the sections they use in their agendas, their individual structure and focus as well as the relevance and the suggestions they have for the LIAISE SRA.
We acknowledge thereby that there exists a variety of scientific and position papers that identified additional research gaps within the themes ecosystem services, soil and transport selected as starting points for the LIAISE SRA. Since these research questions are not directly linked to the science policy interface, we did not address them in the following literature overview.

IA and science-policy interface
Pope et al. (2013): Advancing the theory and practice of impact assessment: Setting the research agenda
Methodology: Pope et al. summarized and compared the state of the art of six well-established types of IA: environmental impact assessment, strategic environmental assessment, policy assessment, social impact assessment, health impact assessment and sustainability assessment. The state of each of these types was previously presented in a separate article in joint special issues and re-structured by Pope et al..
Research agenda sections and structure: The authors grouped their analysis around four sections:

1. Theoretical grounding,
2. Practice,
3. Effectiveness, and
4. Strengths and weaknesses.

Within these four sections they presented the research gaps and discussed them among each other and related them towards each other. The article discussed the state of the IA approaches with view to their strength and weaknesses. The focus of the paper lay on summarizing or comparing research gaps and interests of several IA types, thereby tackling challenges of IA practise and less of research or policy-making.

Relevance and suggestions for the LIAISE SRA: In this paper, the research needs for policy IA were rather reflected against other IA approaches and less within the science policy context. Though the article addressed the concept of IA, it followed a different focus.

Sutherland et al. (2012): A Collaboratively-Derived Science Policy Research Agenda
Methodology: 52 participants – from academia, government, NGO and industry – outlined their priority research gaps, supported by at least additional 83 peers. Workshop discussions and voting reduced the 239 from twelve sections of questions to 40 questions in six sections.
Research agenda sections and structure: The paper presented a research agenda relevant for the science policy process, summarizing 40 questions in six sections:

1. Understanding the role of scientific evidence in policymaking,
2. Framing questions, sourcing evidence and advice, shaping research,
3. Advisory systems and networks,
4. Policy-making under conditions of uncertainty and disagreement,
5. Democratic governance of scientific advice, and
6. How do scientists and policy-makers understand expert advisory processes?

The paper referred to the science-policy interface in general, less to IA in specific. The paper was "to identify the most important outstanding questions in this domain".
Relevance and suggestions for the LIAISE SRA: The sections outlined by the authors reflected the three sections of the LIAISE SRA for policy IA (chapter 4): "policy-relevant topics" with a focus on policy processes (Sutherland et al. section 1) and "scientific tools" with a focus on evidence for assessment (Sutherland et al. section 3), and especially the section "knowledge transfer" with a focus on the bridging the science and policy-making spheres (Sutherland et al. sections 2, 3, 4, 5 and 6).

Turnpenny et al. (2009): The policy and politics of policy appraisal: emerging trends and new directions
Methodology: The authors took stock of recent research in the field of policy appraisals.
Research agenda sections and structure: The authors define four types of research on policy appraisal:

1. design of appraisal systems,
2. performance of appraisal systems,
3. appraisal and the politics of evidence utilization, and
4. exploration of the underlying motivation to appraise.

The types 1 and 2 addressed aspects of appraisal systems rather relevant for policy-makers, types 3 and 4 focused rather on the aspects of policy appraisal systems.
The authors did not outline specific research questions, but generally described the four literature types and made suggestions for new research themes in relation to these types.
Relevance and suggestions for the LIAISE SRA: Turnpenny et al. emphasized the existence of "extensive literature on the politics of knowledge and/or evidence utilization", but noted that "little of it has been explicitly focused on policy appraisal". Further, they summarized the reason for designing a research agenda as follows: "The underlying theorization of the role of

appraisals in policy-making is that 'better tools result in better policy-making'." These arguments emphasized the need for and the relevance of the LIAISE SRA in general.

Sustainable development

Pintér et al. (2012): Bellagio STAMP: Principles for sustainability assessment and measurement

Methodology: In the late 1990ies, an expert group developed the Bellagio Principles "to provide high-level guidance for measuring and assessing progress toward sustainable development" with view to forming a common measurement approach. A group of measurement practitioners updated these principles towards Bellagio STAMP principles (Sustainability Assessment and Measurement Principles).

Research agenda sections and structure: The authors defined eight principles for a sustainable research process:

- Principle 1: Guiding vision (sustainable development),
- Principle 2: Essential considerations (societal system, interactions, risks, implications, trade-offs etc.),
- Principle 3: Adequate scope (time horizon and geographical scope),
- Principle 4: Framework and indicators (domains for core indicators, standardized measurements, comparisons etc.),
- Principle 5: Transparency (data and its use, decision-making processes, funding sources etc.),
- Principle 6: Effective communications (clear language and presentations of information, visualization, availability of data etc.),
- Principle 7: Broad participation (discussion with public and users etc.), and
- Principle 8: Continuity and capacity (repetition, adaptation to change, capacity building/ continuous learning).

Pinter et al. mainly referred to the process of projects and of research. Their results can be clustered according to the policy-relevant principles (1-3), scientifically relevant principles (4-6) and communication principles (7, 8).

Relevance and suggestions for the LIAISE SRA: Though the authors did not explicitly refer to the design of research programming, particularly their communication principles might be tested towards a knowledge transfer to research programming. Their article will thus be of relevance with view to the perpetuation of the LIAISE SRA (D2.5) and the training courses (D2.6).

International Social Science Council, International Council for Science (2010): Earth System Science for Global Sustainability: The Grand Challenges

Methodology: The summary of research gaps is part of a three-step strategy to address scientific policy needs (1: identification of research needs; 2: supporting institutional framework; 3: options for transition)

Research agenda sections and structure: The report focused on the challenges related of "the Earth system science for global sustainability". The authors defined five grand challenges, each listing two to six specific questions:

- forecasting,
    - human impact on environmental changes,
    - environmental threats to vulnerable groups/ communities and relieving responses,

- observing,
  - Observing global change in coupled social-environmental systems,
  - Characteristics of an observation system,
- confining,
  - risks of harmful consequences
  - thresholds and discontinuities
  - avoiding, adapting and transforming strategies
  - options for scientific support in decision making
- responding,
  - trade-off balancing across scales,
  - impact of economic systems on global changes,
  - lifestyle changes,
  - institutional arrangements to reduce poverty etc.,
  - challenges of the interests of various global policies, and
  - mobilization of environmental solutions
- innovating,
  - options for strengthening the nexus technology, policy and institutional innovation,
  - meeting pressing needs in selected sectors (energy security and global sustainability, scarcity of land and water in interaction with biodiversity etc., ecosystem services in support for poorest, communication patterns of citizens and scientists, geo-engineering potentials and risks).

These challenges interlinked with each other. Scientific importance was one criteria for choosing the grand challenges and their corresponding research foci. These were:

- scientific importance,
- global coordination,
- relevance to decision makers, and
- leverage.

For each foci, leading research questions were defined. The report aimed, among others, to "identify high priority research that must be carried out to address those challenges".

Relevance and suggestions for the LIAISE SRA: The challenges themselves did not refer in detail to the science-policy interface, neither did the challenge of forecasting, that can be regarded as a relative to IA, refer to IA. Yet strong similarities existed to the structure of the LIAISE SRA by choosing scientific and policy-making needs as criteria for developing a research agenda (reflecting the sections "policy-relevant topics" and "scientific tools" of the SRA). Further, the research questions defined partly related to the three SRA sections, too (e.g. communication of results and action-taking of policy-makers relates to the "knowledge transfer" section in the SRA).

Future earth research for global sustainability: Future Earth Initial Design Report (2013)

Methodology: Future Earth as a network aims at providing exchange among its scientific members also with respect to research design.

Research agenda sections and structure: In its introductory report, the network outlined three research themes with overarching questions

- Theme 1: Dynamic Planet
  - Means for scientific explanations for respective systems,

  - States and trends of key environmental components and interactions,
  - Changes under likely scenarios,
  - Thresholds, planetary boundaries, tipping points, etc.
  - Critical zones and biomes, and
  - Observing systems and infrastructures
- Theme 2: Global Development
  - Needs for insights and innovations,
  - Use of resources of land,
  - Implications of global environmental change,
  - Links between biodiversity, ecosystem services, human well-being and sustainable development,
  - Success of alternative development projects,
  - Sustainable development goals and twin-goals,
  - Energy provision,
  - Contributions of the business sector,
  - Impacts of global change on distinct societal groups, and
  - Options for restoration towards sustainable development.
- Theme 3: Transformation towards Sustainability
  - Governance alignments across levels,
  - Technological support,
  - Social influence on behaviour, lifestyle, views, etc.
  - Transformation of the Earth System,
  - Pathways to sustainable urban futures, landscapes etc.,
  - Implications of changes for conservation, restoration, etc.
  - Adaption to global warming,
  - Options of current economic frameworks to reach sustainable development,
  - Scientific implications and scientific needs for policy assessment, and
  - Data management.

The authors described the research themes in a general way without defining specific research questions. The position paper further defined four cross-cutting capabilities: observing systems, data systems, earth system modelling, and theory development. It also emphasized the need for an analysis of governance structures and decision processes without much further details or specific research needs.

Relevance and suggestions for the LIAISE SRA:

In addition to the research themes, the report offered individual chapters that are relevant for the LIAISE SRA. Chapter 4 dealt with strategies to involve stakeholder into the process and to design communication methods. Thereby, policy-makers and the science-policy interface played a relevant role. This chapter can partly be linked to the section “knowledge transfer” in the SRA. Chapter 6 and 7 addressed funding issues and implementation strategies. So both chapters could provide support for the perpetuation of the SRA (D2.5).

Agriculture, soil and landscapes

MacKenzie et al. (2002): Methods in Science Roadmapping – How to Plan Research Priorities

Methodology: The authors followed a several step methodology (identification of leaders and support team; summary of stakeholder needs; establishment of working groups for summarizing reports; establishment of

interdisciplinary diverse task force; description of roadmapping process; joint development of goals; establishment of writing teams; synthesis of results; review of draft; publication).
Research agenda sections and structure: For the development of the research agenda, seven challenges were discussed with the experts. These were the development of crop and animal products, respectively, and their uses, reduced risk of climate change on crop products, provision of knowledge for environmental stewardship, economic return to producers, strengthening of communities and families and lastly, improved food safety and health. Thereby, the challenge of stewardship refered closest to the science-policy interface. MacKenzie and colleagues included a focus on agricultural sciences, concentrating on four criteria: need; feasibility; importance; impact.
Relevance and suggestions for the LIAISE SRA: By applying the method of the expert discussion format, the authors emphasized the strong role experts play in the discussion and in the final development of an agenda. The paper thus supports the methodological step of expert workshops for the development of the LIAISE SRA.

Makowski et al. (2013): Global agronomy, a new field of research. A review
Methodology: The authors reviewed existing literature with view to a possible adaptation of agricultural techniques to global aspects.
Research agenda sections and structure: "[N]ew questions" in research were presented in two sections: "Global nutrient management" and "global food security". Further, existing literature was discussed with view to their "utility and limitations for addressing global issues" the sections "knowledge on how agroecosystems work" and "knowledge about farmers' practices and the factors driving them". Lastly, methods and their options for addressing global issues were discussed. The authors focused on the state of the art of agronomy research and methods for addressing this topic on the global level. The article mainly focused on the description, options and discussion of current agronomic research; new research questions were rather shortly presented and discussed.
Relevance and suggestions for the LIAISE SRA: By focussing particularly on global aspects, Makowski et al. selected a specific theme from the wide topic / discipline of agronomy. The LIAISE SRA follows a similar approach by selecting individual aspects from the corresponding policy areas (ecosystem services from environmental policy areas, soil from agriculture and transport/ innovation for transport policies).

Agriculture Food Security and Climate Change (2012): Report of FACCE-JPI Mapping and Foresight On Adaptation of Agriculture to Climate Change; Options for strategic collaboration
Methodology: The report was based on joint mapping meetings on the national level with researchers, policy-makers and funders with 70 participants. The results were identified in poster presentations, group and plenary discussions and desk studies.
Research agenda sections and structure: The report summarized the following research themes for action in relation to climate change:

- animal health,
- crop production ,
- forestry,
- socio-economic aspects,

- water management relevant agriculture, and
- risk assessment/ impacts of extremes.

The themes were described in a general way without detailed specifications. The agenda also summarized conceptual support to the research themes, e.g. international research programmes and research in support to the policy process. Selected research themes were particularly related to the ERA-NET Plus call. Further, it suggested themes for future mappings as well as to recommendations to the FACCE JPI governing board for all research themes.
Relevance and suggestions for the LIAISE SRA: The authors recommended a strong policy-relevant research as important element for joint research activities. Though the authors did not explicitly include the science-policy interface as a part of their research agenda, they addressed a similar structure as the LIAISE SRA, particularly in the sections of "policy-relevant topics" and "scientific tools".

Bouma, J. (2010): Implications of the Knowledge Paradox for Soil Science
Methodology: The paper served as a discussion paper to contribute to the possible implications of the knowledge paradox by example of soil sciences.
Research agenda sections and structure: The paper discussed research topics for the seven soil functions: food and biomass production, storing etc. of compounds, provision of habitat/ gene pool and of physical and cultural environment, source of raw materials, service as carbon pool and heritage archive for archaeology and geology.
These sections were embedded and derived, respectively, from five clusters that listed the research needs that were related to the soil threads and to the DPSIR model (driver – pressure – state – impact – response):

- D: Processes (soil functions, qualities),
- P: Changes of processes and parameters,
- S. Threat drivers,
- I: Influencing factors, and
- R: procedures for soil strategies

The paper described the challenges of sustainability related soil research with view to policy/ societal acceptance. The author described wider research settings and challenges (e.g. knowledge chain, communication/ public relation, scientific practice community) and less specific research questions. Further, he made suggestions on how to link up with policy-makers and stakeholders. The author thereby referred to the elements of the policy process (related to the six IA steps).
Relevance and suggestions for the LIAISE SRA: The paper provided strength to the argument that the impact area of soil requires special attention in the policy process and was thus a relevant starting point when developing the LIAISE SRA.

European Science Foundation, COST (2010): Landscape in a Changing World
Methodology: The report was developed within the initiative "A European Network of Networks" on landscape aspects, designed by international institutions as ESF Standing Committee for Life, Earth and Environmental Sciences with view to the European Landscape Convention and the Common Agricultural Policy.
Research agenda sections and structure:

- Landscape from the perspective as a common good (formation of landscape perceptions, cultural impact, collective memories, diversity

of linguistics, socio-cultural values, diversity of values, synthesis of characteristics and alterations),
- Changes in mobility and lifestyle (significance of landscape, impact of transformation, diversity of landscape types, adoption of perceptions, international landscapes and human influences, call for research),
- transformation of landscape (previous transitions, history of perceptions, narratives/ descriptions, human responses, new approaches in the socio-cultural light, virtual landscapes), and
- perspective changes (effects of changes, scale diversity, impact of human behaviour, assessment methods to influence political decision-making, knowledge transfer for application, spatial context, impact of trajectories, past-informed indicators).

The report defined six supporting requirements:
- Connection of research and policies,
- Equal cooperation among different discipline,
- Supporting formal structures,
- Agreement on research aims and methods,
- Appropriate research funding and concepts, and
- Early career support.

The authors conclude by recommending actions:
- Development of an "European Landscape Research Vision and Strategy" (e.g. with multi-level research, disciplinary balances and cooperation between scientists and policy-makers),
- "Establishment of a European Forum on Landscape" (e.g. information exchange hub, implementing the vision, and European-wide promotion), and
- "An Integrated European Landscape Research Programme" (e.g. by means of increased scientific support to the sustainability components or by tackling central policy-relevant socio-economic research questions).

Relevance and suggestions for the LIAISE SRA: The authors define similar requirements as are applied in the general LIAISE context, particularly interdisciplinary cooperation with view to sustainable development and early career support. In addition, the authors support the ideas that form the basis for the LIAISE SRA, such as an improved cooperation among scientists and policy-makers (as in the SRA section "knowledge transfer") or tool development for specific policy purposes (as in the SRA section "scientific tools").

Ecosystem services and environment in general

Anton et al. (2010): Research needs for incorporating the ecosystem service approach into EU biodiversity conservation policy

Methodology: The paper was based on reviews related to aspects relevant for the topic (e.g. terminology, the state of ecosystem services and drivers that affect them), an e-conference and five workshops with researchers, research funders and policy-makers, a reflection with other research projects and a concluding stakeholder workshop.

Research agenda sections and structure: 70 questions were grouped in seven sections in relation to ecosystem services with eight to 17 questions each (not ranked). These sections were identified in the corresponding research project:
- Ecological underpinning (e.g. state of ecosystems, biodiversity characteristics, changes in service providers properties),

- Drivers and their effects (e.g. dynamics from socio economic drivers, environmental limits, disruptions for human well-being),
- Biological traits (e.g. trait assessment, databases, trait linkages)
- Valuation (e.g. taxonomies, databases, adoption of strategic research programmes),
- Spatial and temporal scales (e.g. appropriateness, interactions of various factors on various scales, up-scaling methods),
- Indicators (e.g. for genetic diversity, various components, and values of ecosystem services), and
- Habitat management and conservation policy (e.g. factoring mechanisms with respect to planning instruments, multifunctional land management and landscape aspects, ecological corridor functions).

In a workshop, these results twelve research topics were prioritized:

1. Quantification of the role of biodiversity,
2. Creation of trait-based approaches,
3. Improvement of methods for integrated assessments,
4. Identification of thresholds among biodiversity, ecosystem functioning and services, human well-being,
5. Identification/ quantification of impacts of socio-economic and environmental drivers,
6. Understanding the cultural, economic and policy contexts,
7. Improve classification for ecosystem services,
8. Increase usefulness of value, price and cost,
9. Creation of indicators based on benchmarks,
10. Development of analysis elements and decision support systems for multi-level governance,
11. Quantification of multifunctional land management and landscape patterns,
12. Promoting of business opportunities with respect to ecosystem service management via development of tools and methods.

Relevance and suggestions for the LIAISE SRA: The authors specifically developed the agenda with view to policy-relevant research questions. Thereby, they grouped the questions according to seven categories, whereas this approach can be compared to the levels 2 and 3, though these categories did not target specifically at the science-policy interface. Further, the role of integrated assessments and particularly of policy contexts is included in two of the twelve research priorities.

EPBRS European Platform for Biodiversity Research Strategy (2010): European Biodiversity Research Strategy

Methodology: A task force developed the agenda and thereby included comments of EPBRS members.

Research agenda sections and structure: The authors summarized the objectives for biodiversity and ecosystem service research in five parts:

- ensurance of long-term survival of the species, genetic diversity etc.,
- long-term provision of ecosystem services,
- adaption to global change,
- contribution to meeting the Grand Challenges, and
- fostering of innovation.

They designed three areas of integrated research:

- A: state of the art
- B: threats

- C: encounter of challenges.

The strategy drew a bow from the research objectives to the elements of integrated research, thereby referring to the need for developing a research environment:

- Continuous updates of research priorities,
- Infrastructural support,
- Education and capacity building,
- Linking science and policy, and
- Evaluation and monitoring of research uptake.

It completes by suggesting implementation steps.

Relevance and suggestions for the LIAISE SRA: The need for developing a research environment is the most relevant element of the paper for the LIAISE SRA, as it calls for a stronger science-policy interface and for a "[c]ontinuous identification, review and horizon scanning of research priorities". It therefore supported the three sections of the LIAISE SRA (policy-relevant topics, scientific tools and knowledge transfer) as well as a concept of the perpetuation of the SRA.

Grothmann, T. et al. (2011): Anpassung an den Klimawandel – Potentiale sozialwissenschaftlicher Forschung in Deutschland (Adaption to Climate Change – Potentials of Social sciences in Germany)

Methodology: The paper was outlined as position paper. It summarized key processes and elements for social sciences related to climate change adaptation.

Research agenda sections and structure: The paper presented the most important research areas:

- Research related to less developed countries,
- Research on governance, and
- Research on communication.

For each research section, the paper outlined the problem, summarized the potential and made suggestions for concrete steps. Lastly, it summarized seven theses for the potential of social sciences: development of theories, practical relevance, methodology, multidisciplinarity, development research, governance research, and communication research.

Relevance and suggestions for the LIAISE SRA: The authors focused on the support of flexible and adapted governance structures through research, less on the science-policy interface or IA. However, the aspect of communication research supported the section "knowledge transfer" in the LIAISE SRA. The thesis "practical relevance" could also apply to policy-relevance, though it is not described as such.

Forest-based Sector Technology Platform (2012): Strategic Research and Innovation Agenda for 2020; Annex to the Strategic Research and Innovation Agenda; Research and Innovation Areas

Methodology: It was the objective of the forest-based sector platform to develop a sectoral vision that also builds the basis for a research and innovation agenda.

Research agenda sections and structure: The agenda outlined "19 specific research and innovation areas (RIAs) for the period 2013-2020". The authors designed four strategic themes with three to seven subtopics each:

- Strategic Theme 1: The forest-based sector in a biobased society (sector performance with view to global change, citizens' perceptions, policies and good governance),

- Strategic Theme 2: Responsible management of forest resources (multi-purpose management, forest ecology / ecosystem services, biomass production, wood supply/ forest operations / logistics, cascade use/ reuse / recycling),
- Strategic Theme 3: Creating industrial leadership (resource efficiency in manufacturing, renewable energy solutions, sustainable water stewardship, Biorefinery, business models / services), and
- Strategic Theme 4: Fulfilling consumer needs (building, indoor environment / furniture, biobased products, packaging solutions, hygienic, diagnostic and healthcare products, new solutions in printed products).

In the chapter "Policies and good governance" the strategic research agenda outlines eight "required research and innovation activities", whereas five of them referred to policy IA and assessment tools: Tools for assessment and communication of policy-makers; identification of policy trade-offs; devision of policy frameworks and tool development for effects on the forest-based sector; and analysis of policy impacts.
Relevance and suggestions for the LIAISE SRA: The agenda followed a similar approach as proposed for the LIAISE SRA by emphasizing the relevance of scientific support to societal progress. Further, though the agenda comprised a wider focus on forest relevant research aspects (e.g. economic development and support or implementation and management strategies), it strongly pointed at the need for policy IA in general, thereby supporting the argument of the LIAISE network of excellence towards the need of a SRA on policy IA.

Reid et al., (2010): Earth System Science for Global Sustainability: Grand Challenges.
Methodology: The International Council for Science and the International Social Science Council developed in a joint process a research framework for this topic, balancing different interests and participation options (e.g. early stage and senior scientists, less developed and developed countries).
Research agenda sections and structure: The authors outlined five so called "Grand Challenges" that were described as "overarching research framework" with view to sustainable development:

- Improvement of usefulness of forecasts and impacts,
- Development, application etc. of observation systems,
- Identification, management etc. of disruptive global changes,
- Determination of changes in institutions, behaviour etc., and their effects, as well as
- Support for innovative technological policies and social response.

The challenges were further described and concluded by a "Call to Action", that emphasized, among others, the need for interdisciplinary approaches and the time effort for building a scientific sustainable development community within this topic.
Relevance and suggestions for the LIAISE SRA: The call for action pointed at the length to build a respective scientific community. This belief is reflected in a wider support to the LIAISE SRA, namely by developing IA training modules with view to build capacity and thereby extend and further consolidate the IA research community.

In addition to the articles listed above that more or less developed research agendas, there exists a variety of articles with respect to IA elements, the

science-policy interface and sustainable development that formed a review or provided a state of the art. These papers often concentrated on selected aspects. Based on their analysis and results, the authors also called for a research agenda or aimed at contributing to the advances of these agendas. Adelle and Weiland (2012), for example, who focused their article on the state of policy IA, outlined the need for future research to address both, traditional rational linear post-positivist concepts and conceptions. Fischer and Onyango (2012) analysed 20 years of research for strategic environmental assessment as baseline for research perspectives. De Vos et al. (2013) as well as Stanley and Lucas (2012) summarized in their papers on social aspects of travel general recommendations for policy and research suggestions. Additionally, there exist research agendas with policy relevance, that are not linked to the four themes of the SRA, as Ingram et al. (2013) who defined research priorities for the food system in the UK.
Further, there exist research agendas without policy relevance as a specific target, but that relate to the themes and research questions posed by the LIAISE SRA. These include, for example, agendas on aquatic ecosystems in relation to ecosystem services (Beard et al., 2011), transport geography in relation the to transport theme (Neutens et al., 2011), research infrastructures including support for environmental aspects (ESFRI, 2008).

In addition, there exist calls for scientific policy support in relation to the themes of the SRA through governance mechanisms. Larigauderie and Mooney (2010), for example, presented and discussed the Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services. The authors emphasized the need for a strong science-policy interface with science, policy and assessment as three out of four major elements (observation the fourth).
Carpenter et al. (2012) presented the programme on ecosystem change and society (PECS) that belongs to the International Council for Science. The programme has the objective to "generate scientific and policy-relevant knowledge of social-ecological dynamics". PECS focuses on resilience. The authors outlined specific objectives and steps for the future activities of PECS. These concentrated, similar to the LIAISE SRA, on research themes (section "policy-relevant topics" in the LIAISE SRA) tool development (section "scientific tools") stakeholder involvement (section "knowledge transfer").
Lastly, the European Commission (2009) described options on how to gear European research towards sustainable development. Though it did not list research gaps or questions, the paper can still be regarded as underlying support to the LIAISE SRA in general. It emphasized the need for European funding in support of sustainability, described how research can become more relevant for sustainable development e.g. by relating it to the Grand Challenges, pointed at the support foresight may provide to research needs and encouraged knowledge brokerage processes – all aspects being relevant for the general understanding of the LIAISE SRA.

Conclusions for and key criteria of the LIAISE SRA
The summarized research agendas in the previous sections emphasized the relevance for the LIAISE SRA in three ways. First, the agendas showed that there is a need for designing an agenda with a focus on policy-relevant research. The agendas partly took up this aspect, yet it was one out of several items. The agendas showed that there is an understanding of policy-relevance within their specific discipline, yet there was hardly a link to the instrument of IA and thus to a broader understanding of policy support.

Second, in sum the agendas identified a structure similar to the tripartite proposal for the LIAISE SRA, namely policy-relevant topics, policy-relevant tools and a science-policy transfer, though very few of the agendas did apply exactly these three sections. Third, the agendas provided a different level of detail when presenting research needs, ranging from general descriptions to detailed questions and a mixture of them. Thus, the LIAISE SRA combines these two approaches with the three-level pyramid by describing the general IA research scope with three general sections (level 1) and detailing them with guiding and specific research questions (levels 2 and 3).

In contrast to research agendas developed for other research topics and in other scientific disciplines, the LIAISE SRA had the following key characteristics:

- # 1: The LIAISE SRA is the first research agenda developed specifically for policy IA.
- # 2: By focussing on policy IA, the LIAISE SRA addressed specifically a policy-relevant instrument. The other research agendas identified focused on a specific topic or a general process.
- # 3: The SRA was targeted at the science-policy interface, thereby addressing research needs from the perspectives of the policy-making community, of the scientific community and the connection among both. Thereby, they reflect the need for salient, credible and legitimate research.
  Despite their focus on a specific topic, some of the other agendas referred to the policy-relevance of their content or to the role of policy-makers as stakeholders in the research process. However, these agendas thereby addressed the policy-relevance of their research and did not outline aspects specifically relevant for policy-makers (as in "policy-relevant topics" in the LIAISE SRA).
- # 4: The SRA was outlined to take up the complex issue of sustainable development, whereas the majority of the other research agendas addressed specific topics. These topics are partly individually related to sustainable development, yet did not fully link to its comprehensive approach of sustainable development.
- # 5: The SRA was outlined in a way that allows its continuous update in connection to the LIAISE kit. The other research agendas identified were developed rather as a state of the art or as position paper, but did not call for frequent actualization.
- # 6: The SRA was structured as a pyramid along three levels that detail each other. This structure may offer information for research programmers and researchers.
- # 7: The SRA is designed as a "shared" research agenda that shares the interests of the scientific as well as the policy-making community. This term also implies that the results will be continuously shared among researchers from all scientific disciplines as well as the policy-making community. This way, the dissemination reaches out to the two communities relevant for policy IA.
- # 8 (this point was identified during the development of the updating concept; D2.5): The updates of the SRA are linked to the LIAISE kit and will specifically follow the impact areas outlined by the European Commission as well as a wide variety of sections for IA methods and models. The future versions of the SRA are thus the only research agenda identified so far, that applies policy-relevant sections that

were officially outlined by political bodies and additionally incorporates scientific state of the art sections.

6. The "First LIAISE Shared Research Agenda for Policy Impact Assessment"

The next sub-chapter presents level 1 of the LIAISE SRA that serves as overarching frame for all four themes (IA in general, ecosystem services, soil and transport/ innovation) and are not further specified for the themes. The then following levels 2 and 3 provide exemplary research questions for the four themes. Therefore, the presentation is categorized according to the themes and describes both levels together..

6.1 First LIAISE SRA (level 1)

POLICY-RELEVANT TOPICS: Research needs in relation to policies and processes

IA is a quite mature instrument. Thus research on IA should not concentrate on the instrument itself, but on providing support to all topics that circle around the IA process with its elements and structure, to specific topics that are relevant for the IA process and also around the science-policy interface in a wider sense. These include, among others, policy areas and specific policies, the consecutive steps of the IA process, consultation and participation as well as general guiding and / or mainstreaming aspects set out by the European Commission.

SCIENTIFIC TOOLS - Research needs in relation to tools and data

The IA process combines two communities: the scientific and policy-making community. The policy-making process represented in an IA should be based on scientific tools and results. Therefore, science should constantly provide tools in support for the individual steps of the policy IA process that is constantly adapted to policy requirements.

KNOWLEDGE TRANSFER: Research needs in relation to the exchange of knowledge in the Science-Policy-Interface

From both, the scientific and the policy-making community, the exchange of information is regarded as a constant challenge. Thereby, scientists e.g. would be interested in the kind of information, methods and models policy-makers need, when and how the scientific information is used during the IA process and how the information, methods and models should be prepared to suit the policy-makers' needs. In contrast, policy-makers prefer, among others, further information on the application of methods and models, their strengths, weaknesses and limits as well as the scope of the individual methods and models.

The following paragraphs present the research questions from level 2 (guiding research questions) and level 3 (specified research question) for the exemplary themes IA in general, ecosystem services, soil and transport/ innovation. The general questions from level 2 *are enumerated with Roman numbers, underlined, italic), the specific research questions of level 3 with letters, engaged.*

6.2 First LIAISE SRA (levels 2 and 3)

6.2.1 Theme "IA in general" (levels 2 and 3)

Theme "IA in general"
Policy-relevant topics: Research needs in relation to policies and processes

I. How can IA improve the overall policy (evaluation) cycle?

The instrument of IA plays a vital role in the policy-making process. Although the European Commission installed the Impact Assessment Board for quality control, this check mainly concentrates on the quality of the reports and less on the implementation of the instrument and its elements as well as on its political impact.

a. What kind of role(s) can IA have in the overall policy cycle?
b. How can be identified which phase of the IA process requires which type of scientific expertise?
c. How can the link between ex-ante and ex-post evaluations in the overall evaluation cycle be improved?
d. Can the influence of IA in policy-making be measured/established and if yes, how?
e. Which role does evidence play in IA?
f. Which role does the wider evidence use in venues beyond IA play for the evaluation of policies and political decision-making with respect to sustainable development?
g. Does policy appraisal have economic, administrative or political (i.e. 'non policy') impacts in the short, medium or long-term?
h. What are the causal mechanisms through which different policy appraisal systems bring control?
i. How can IA procedures outside Europe be scientifically supported and addressed?

II. How can stakeholder involvement and participation be continuously improved in the IA process?

The IA process provides several opportunities for the inclusion of stakeholder interests. However, it is yet unclear how the relevant stakeholders can best be included into the IA process.

a. What are the characteristics of a participative IA process?
b. What are the opportunities and obstacles for participation in IAs?
c. How are stakeholders identified in an IA process?
d. Which forms of stakeholder engagement can be supported in IA and how?
e. At what stages of IA process can stakeholders be engaged? What kind of functions can stakeholders provide in IAs?

III. How can the decision-making structures within an IA be further developed to better support sustainable development in a balanced way?

IA plays a key role in decision-making towards sustainable development. Thus research needs to identify how IA actually influences political decision-making.

a. How can a standard process of "collaborative decision-making" be defined?
b. How can IA support collaborative decision-making?

c. How do 'non-rational' variables such as power of actors influence the roles and functions accorded to policy appraisal?
d. Is political control the most important (intended or unintended) consequence of policy appraisal or do other functions prevail?

IV. How do different scales influence the IA process and results?

The impact of a policy may vary depending on the context and policy area(s) the policy belongs to. Therefore, it is relevant to understand which scale and spatial levels are adequate for a profound IA as well as to define the appropriate scope for the IA reports.

a. What is the importance of scale in IA (Impact regarding the different scales used)?
b. What is the approximate scope of IA in terms of problem definition, anticipated impact areas, data needs and time horizon?
c. What are the requirements of different spatial levels for IA tool use?

Theme "IA in general"
Scientific tools: Research needs in relation to the exchange of knowledge in the Science-Policy-Interface

First the guiding research question of level 2 is presented (enumerated with Roman numbers, underlined, italic), followed by the specific research questions of level 3 (enumerated with letters, engaged).

I. How can IAs integrate and balance the three pillars of sustainable development?

Sustainable development is the main reference when conducting an IA. In the assessment, it is reflected in the 35 impact areas outlined by the European IA guidelines, 11 economic and social ones as well as 13 environmental impact areas. Thereby, it is important to balance all pillars of sustainable development, a fact that often causes problems due to different measurement systems, a different understanding or different management objectives of the three pillars.

a. What are the criteria to balance the different dimensions of sustainability in IA?
b. How can social and environmental impacts be better qualified/quantified (including benefits) in IA?
c. How can social impact areas be included in the tool design?
d. How can tools be designed to assess a variety of impact areas?
e. How can sustainable development as an overarching objective be reflected in tool design?

II. How can jurisdictional comprehensiveness be reached?

The development of IA tools is a process that occurs simultaneously at many places of the global level. Until now there is a focus on European assessment tools in European research funding. Since most tools can be adapted to any national or regional context, there is need to expand the inventory of the LIAISE Toolbox towards non-European countries.

a. How can the existing large EU-level IA tools/models be applied at member state level?
b. How can tools be designed to allow for an application on various jurisdictional levels?

III. *How can data and tool boxes be designed for the IA process?*

Data availability (existence of data) and accessibility (ability to obtain the data) are often the key issues for tool application and need to be addressed by more emphasis on data provision (infrastructure and process). There is particular potential to integrate existing - and develop new - tools which help in qualitative assessment such as integrating different opinions.

a. How can tools be developed that support data collection and synthesis/overview?
b. How can tool boxes and data bases (e.g. the LIAISE kit) be adapted to meet upcoming research results and policy needs?

IV. *How can appropriate tools for IA be designed? When is a tool suited for IA?*

The principle of proportionality requires adequate models in relation to the impacts. This is not mainly a modelling effort, but one that needs an understanding of modelling results and the capability to transfer them into a qualitative comparison. Further, the European FPs 6 and 7 funded a variety of tools that focused on practical assessment and not or less on policy IA. Further, many characteristics of tools for the IA process are not yet fully explored (e.g. participatory elements, effects on transparency).

a. How can models adequate for small impacts be developed?
b. What is the distinction between 'simple' and 'advanced' tools?
c. How can the simplicity and complexity of tools be defined?
d. How may the appropriateness of tools and tool elements for a specific IA be assessed?
e. What are the political, cultural, institutional factors which affect the appropriateness of certain tools?
f. How is a tool as being applicable for the IA process defined?
g. When will a model be suitable for IA?
h. How can the tools best be linked to the six steps of the IA process?
i. To what extend do existing tools fulfil the purposes of specific user needs? If not, how can they be adjusted or upgraded to meet the purposes? If yes, how can the adjustment be carried out?

V. *How can a high level of transparency from IA tools be reached?*

Research needs can be derived in order to develop methodologies for a more transparent and meaningful comparison of IA results.

a. How can tools be made more transparent and participatory?

VI. *How can tools be combined for an effective IA analysis?*

There exists a wide variety of tools that are currently often applied in a singular way and less combined with each other.

a. How can single models be linked with other existing ones?
b. How can the interface and link between qualitative and quantitative studies be improved, e.g. "cost benefit analysis light" or "multi criteria analysis"?

VII. *How can the variety of tool types be extended?*

The European FPs 6 and 7 funded a high amount of quantitative tools (models, scenarios) that focused on only few policy areas. Other tools were rather poorly addressed.

a. Which kind of tools could be designed for EU policy areas that were not/ poorly addressed by the projects funded in FP6 and 7?

b. How is it possible to design especially participatory tools for IA?
c. Are the existing multi-criteria analysis and cost benefit analysis developed enough in order to meet the needs of policy IA or do they need further development/ extension?
d. How can research support the development of the framework of cost benefit analysis to the European IA to cover ecological and social impacts?
e. To what extend can a sensitivity analysis be established as a standard element of IA to overcome uncertainties and to show especially the implications of a no policy-option?
f. How can formal economic modelling tools targeted to policy IA be designed that go beyond current technical assessments, but establish concrete link to raw materials?
g. How can more robust IA models be developed that link (transfer) global hectares to actual hectares with respect to resource efficiency linked to the ecological footprint analysis (land, carbon, blue water)?
h. How can model(s) for sustainable consumption and production (for theme 2 of the Sustainable Development Strategy) be developed?

VIII. How can the application of tool use within an IA be measured?

It can be an important criteria for quality control of IA reports not only to identify whether or not scientific tools were used but also what the impact of these tools could be.

a. How can we define costs and benefits of IA tool use?
b. How can indicators be developed to assess the impact of project and of tool development?
c. How to describe and operationalize the quality of a tool with regard to its intended use?
d. How can the adequacy of the knowledge and tools that are being offered be judged? Are there good-practice cases to learn from?

Theme "IA in general"

Knowledge transfer: Research needs in relation to the exchange of knowledge in the Science-Policy-Interface

I. How can the tool selection by policy-makers and tool use be improved?

Knowledge on the selection process of IA tools by the policy-makers can currently be regarded as rather scarce. However, this type of information could provide valuable information on the design of IA tools. The area of how tools are currently used in the IA process and what improvement could increase the amount of use, or the efficiency and usability, would require integrated research between IA experts, tool developers and users, and socio-economic and behavioural scientists.

a. What are the factors that influence tool selection and use?
b. How does context affect tool selection and application (e.g. scope, problem definition, IA phases, disciplinary tool differences) as well as the relation of tool suppliers and users?
c. How to enable the potential user to make an informed selection of tools and data in relation to his/her specific use case?
d. How can tool boxes (e.g. the LIAISE kit) best meet the needs of both groups, policy-makers and tool suppliers?
e. How can scientists better understand the process in which tools might be used by the anticipated users?

f. How can the usability of individual tools, the political culture and administrative procedures within regulating and policy bodies be investigated to be improved towards the IA process?
g. Why has the institutionalization of policy appraisal not led to [more] institutionalization of appraisal tools?
h. What are the reasons for the discrepancy in IA tool use in different scientific disciplines and policy areas (e.g. underlying paradigms, reasons for the uptake, rejection of tools in certain communities)?
i. How are tools used across different policy sectors?
j. How can be identified how well the various purposes of IA/motivations for doing appraisal match with the use of different IA tools?

II. How can scientific data be made available to policy-makers?

Availability of and targeted access to data is key for a successful uptake of tools is in many cases. There is a plethora of usable data available as part of our own research and as part of many other EU funded projects. The problem is, as always, that availability of data in itself is not a guarantee of success.

a. How can scientists make data descriptions clear and complete and thereby reduce the limits of using existing data and make it easier to identify when data is useful?
b. How can ontologies of and criteria for data for use in IA be developed/extended in a way that they will act as a common or superior reference framework for data and models used in IA?

III. How can results be presented and communicated in a way that supports their inclusion into the policy process?

Not only results are important but also the way results are aggregated and communicated. Regarding this criterion, there may be a trade-off between rigorous models (which are difficult to communicate) and simple schemes such as plus/minus. Further, it can be imagined that information for the non-expert could become a third important user group of the toolbox.

a. What kind of techniques can help scientists to make results easily interpretable and unambiguous?
b. How can scientists improve the presentation and communication of their results in a way that policy-makers can grasp the outcome correctly in order to draw the right conclusions based on these and to understand when certain conclusions cannot be drawn?
c. How can new research focus on introducing EU standards (e.g. references such as impact areas, policy issues and targets as well as standard ontologies) into existing tools and how to make them more tangible with regard to tool capacities?
d. How can complex knowledge in the field of IA (in terms of drivers, indicators, scenarios, policy options, role of innovation etc.) be mainstreamed to enter a wider public debate?
e. Which elements for a common language, common procedures or common terms for policy-makers and scientists can be developed in order to understand the results and make them effective (e.g. joint language with clear names of policy areas, impact areas, institutionalized cooperation)?

f. How can the tool categories be clearly defined to meet the needs of policy-makers and researchers to facilitate the mutual communication?
g. How can a constant presentation of tools, application and

IV. How can the concept of knowledge brokerage support the use of IA tools within the policy process?

Knowledge brokerage as a concept can support the interaction of the policy-making and scientific communities within the IA process. Special attention should thus be given to a further analysis of the opportunities and strengths of this concept within IA.

a. What is the role of a knowledge broker in general and especially in IA?
b. How can the knowledge brokerage approach improve the science-policy interface, the process and quality of IA and the use of tools?
c. How do potentially hybrid roles of knowledge broker affect the process and how can that be managed?
d. What can be done to establish an institutionalized relationship or standardized procedures of knowledge brokerage between policy-makers and scientists that would allow scientists to identify new policy needs earlier and to jointly develop strategies in developing new tools and adjusting existing tools to better respond to these needs?
e. How can the concept of knowledge brokerage be further explored for strengthening evidence-based input to the policy process at the European level?
f. How can special emphasis on cost- and time efficient methods be put that can become established as standard procedures as part of the IA process?

V. How can the relation of tools and policy questions and processes be improved?

It is a constant challenge for scientists to regard the policy-making community as one of their key target group for the scientific results and not only the scientific community. This is particularly relevant for policy-related research and scientific support to IA.

a. How can scientists be more flexible with their tools as well as improve adaption options and speed in order to be able to respond to the questions policy-makers have at this moment?
b. How can scientists identify the right indicators that are the drivers behind the respective policy questions in order to model these indicators in such a way that they can have a faster response to questions of policy-makers?
c. How can further studies on pre-conditions, implementation targets, minimum standards and limitations support the development of tools that are sometimes needed for short-time user needs in the policy process?
d. How can the optimal connection between the scientific responsibility for data sets and tool development be achieved to meet policy-makers' instead of scientific interests?
e. How and to what extent can the relationship between tools and policy-making in the venue of IA be developed?
f. How can emerging policy topics be addressed?

VI. How can learning processes within IA be improved?

For the further development of the tool use within the IA process it is relevant to learn from past application and experiences of tools and its strengths, weaknesses, limits and further requirements of the tool users.

a. How, if at all, does policy appraisal lead to dialogue and learning in practice?
b. How can the design of policy appraisal be modified to nurture wider learning?
c. What kinds of learning might be expected to appear in the practices of policy appraisal and by what means should they be detected and explored?
d. What kind of factors facilitate and/or constrain learning (however defined) outcomes?

6.2.2 Theme "ecosystem services" (levels 2 and 3)

Theme "ecosystem services"
Policy-relevant topics: Research needs in relation to policies and processes

I. How can ESS be addressed in the policy process, both as policy target and as policy impact?

Policies need to set targets that relate to the existing environment, such as the limits of land take, of soil erosion and of loss of soil organic carbon. Beyond the stipulation of the target, it needs to be clarified who should implement the policies to achieve the target, how it will be measured to demonstrate its success and when the target should be achieved. Considering the ESS concept, targets also include questions of return on investment, e.g. in terms of jobs, sustainable growth and regional development.

The policy process comprises an ex-ante appraisal of potential social, economic and environmental impacts of policy options, regardless of whether the impacts will be direct or indirect. The challenge is to improve the consideration of ESS particularly for policies that are not explicitly related to ESS, e.g. energy, transport or infrastructure policies. IA may be improved when applying the ESS concept to address trade-offs between policy options.

a. How can ESS be integrated in the policy process for the purpose of environmental conservation, sustainable development or additional individual ESS targets within certain sectors?
b. How can a formalized IA serve as an adequate instrument for integrating ESS knowledge into the policy process?
c. How can ESS be included in the implementation phase of a full IA cycle?
d. Does the process of policy assessment need to be reframed to include ESS?
e. How can ESS be tackled in the policy process in all fields of governance?
f. What is the added value to IA of using the ESS concept in terms of knowledge transfer?
g. How can the ESS concept support the options for trade-offs between different policies?

II. How can a better integration of biodiversity into the ESS concept serve as a support for better integration of biodiversity into IA?

The science-policy interface is not effective in supporting a sufficient consideration of biodiversity knowledge in policy-making. This needs to be improved to contribute to a reduction of biodiversity loss. ESS are valued from the human perspective. As such the integration of biodiversity into ESS is an issue in conceptual debate.

a. To what extend is ESS an adequate concept for integrating biodiversity issues into policy-making?
b. How can administrative boundaries influence the planning, e.g. when the provision of ESS is within and the fruition of ESS is outside the boundary?

Theme "ecosystem services"
Scientific tools: Research needs in relation to the exchange of knowledge in the Science-Policy-Interface

I. How can complexity of analytic approaches be reduced to serve IA information needs?

While it is important from a scientific point of view to display processes and concepts by means of different scientific concepts, there is a need for simplicity where engagement and use of concepts are brought into practise. The ESS concept can deal with complexity through aggregation of data. Tools thereby need to be sensitive to changes in the respective service, robust in application and need to consider uncertainties in data with regard to projections.

a. How can the reduction of complex scientific information to relevant results be documented in a transparent way?
b. How can a standardization and categorization of knowledge be reached without losing the information details, e. g. for further modelling possibilities or in-depth studies?
c. Which standards exist for ESS documentation in IA tools?
d. How can the assessment of ESS in an IA stand jurisdictional challenge in order to be fully included in policy-making?

II. How can ESS-relevant information be visualized best to be of use for the IA process?

Visualisation of data, facts and figures is one useful way to transfer knowledge into an IA process. The valuation of ESS needs to be visualized in a comprehensible way in order to be communicated to the target groups. The challenge is to visualize and compare data that is based on different units or on fundamentally different perspectives (e.g. individual vs. sociological perspective, micro-economic vs. macro-economic aspects). However, all these different results need to be taken into account, since there may be contradictions.

a. How can data be integrated and visualised without reducing the information to a limited number of aspects only?
b. How can data that reflects individual perceptions be compared with data that reflects non-individual perceptions?

III. How can ESS be monetized to serve the purpose of IA?

The concept of ESS seems to support the safeguarding of biodiversity and natural capital by showing their monetary value. Yet, these approaches are

limited, since there is no real cash flow based on ESS in the economic system and, besides that, money is not a-static value.

a. How can monetary valuation of ESS relevant for IA be further advanced?
b. To what extent has the concept of monetary valuation in ESS outlived its purpose?
c. What other concepts can be used for quantifying ESS in IA?
d. How can non-use values of ESS be monetarised?
e. Which indicators can be used to show the real cash contribution of ESS to economy?

IV. Scarcity of ESS-relevant data in the IA process

Studies using different scales e.g. in terms of space and time frame generate results showing different ESS potentials for the same region. IA may be improved by using various data sources each with different foci on scales. Therefore, the scientific community needs to continue to develop better methods to measure, monitor, map, model and value ESS at multiple scales. Modelling will help to synthesize and quantify our understanding of ESS and to understand trade-offs within the larger socio-ecological systems. For many indicators used in the ESS concept there is a scarcity of data.

a. How can scales of ESS tools be matched with the scales relevant for IA?
b. How do different scales influence the IA process?
c. How can technical uncertainties regarding data access and availability, generalization, categorization, inaccuracies and suitability of scales regarding ESS be addressed in IA research?
d. What kind of ESS indicators need to be developed or mapped on a European-wide or national scale in order to improve IA?
e. How can environmental monitoring take place in order to provide process data for an improved IA?
f. How does the information flow from scientific institutions that provide data on different scales enter the policy IA?

Theme "ecosystem services"

Knowledge transfer: Research needs in relation to the exchange of knowledge in the Science-Policy-Interface

I. How can a policy-relevant terminology for the ESS concept and related perspectives be developed?

The significance of biodiversity and natural capital is subject to societal paradigms. When communicating issues of political relevance and discussing possible solutions based on current knowledge, the terminology used must fit the level of decision making. Scientists need to adapt their terminology to fit current policy concepts in order to be heard, an action that may limit the future integration of the ESS concept detached from the current concept of impact areas.

a. To what extend does / in which way does the adoption of terminology pose the risk of losing scientific integrity?
b. How can the technical language used in the scientific community be translated to the context of a policy problem?
c. How can political targets be formulated to facilitate it for researchers to address them?

II. *How can the provision of information and the information flow between knowledge holders and policy-makers be improved?*

The formalized IA steps provide support in coordinating the integration of scientific facts for ESS into the policy process. However, the research community is not yet sufficiently aware of the policy procedure to consider it in their models relevant for ESS. A mapping of knowledge holders and knowledge flows may help to identify the actors in the IA process and to overcome barriers in the knowledge flow among the IA participants.
The current focus of researchers transmitting information to an IA is by taking on the role of a consultant acting within the science-policy interface.

a. How can policy-makers as target group for scientific knowledge in the IA process be better identified and addressed when designing IA tools relevant for ESS?
b. What barriers need to be overcome in the knowledge flow concerning ESS results between different target groups?
c. What needs to be done to ensure long-term availability and free access to information sources of ESS?
d. In which step of the IA process can a consultant particularly for ESS best be involved?
e. To what extend is there a risk of losing touch with basic research when entering the science-policy interface with the intention to consult for ESS?
f. How can a variety and diversity of tools for ESS be provided by the scientific sector in a competitive way?

III. *How can ESS data specifications, standardisation and tool consistency be linked with the needs of the policy process?*

One barrier to use scientific models and methods in the context of IA lies in the different perceptions of the context of a problem. The better the context of the problem is known, the better the research data can be made to fit the question. Thereby, tools need to be based on consistent frameworks (static, logic, useful). One of the advantages of ESS is that the concept is already well considered in previous policy assessments.

a. What specifications for ESS relevant data are needed, e.g. in terms of resolution?
b. What is the role of the consultant in translating scientific information to answer a knowledge gap?
c. Can knowledge be pre-selected for the purpose of decision support?
d. What kind of measures can improve the trust of policy-makers in the reliability of models with view to ESS?
e. How can tool training for policy-makers conducting IA improve consistency of results in IA procedures?
f. Which role do ethics and communication play towards consistency of tools and how do they influence the schemes for monitoring or accounting?

IV. *Which methods for public stakeholder and civil societal consultation within IA can support to (better) address ESS?*

IAs often concentrate on land cover data, while there is less consideration of land use aspects including a focus on dynamic, intensities, management concepts and the integration of conservation issues. Participatory activities and public stakeholder and civil societal involvement in land management or resource planning can be critically reflected, e.g. by action research.

a. How can participatory methods be adapted to assess ESS for IAs?
b. How can rigor in validation be maintained for ESS in IA?

6.2.3 Theme "soil" (levels 2 and 3)

Theme "soil"
Policy-relevant topics: Research needs in relation to policies and processes

I. *How can the impact of land utilization on soil functions and services better be incorporated into policy-making?*

There is profound evidence on how agricultural practices affect soil functions and services. However, little is known about the impact of other land utilizing activities (infrastructure, tourism, flood control, urbanisation, industry) on them. This knowledge is needed to provide a robust basis to build policy-making onto it. There is also a need to develop practical instruments for policy and planning that are able to assess impacts of future policy and planning decisions, thereby addressing the "what-if" question with adequate spatio-temporal scope.

a. How can the relevancy of soil for climate change mitigation (e.g. carbon sequestration, green-house-gas emission, spatio-temporal dynamics) be better understood to better incorporate this role in climate change related policies?
b. How can the relevancy of soil for biodiversity be better understood to better incorporate this role in biodiversity related policies?
c. How can indirect impacts and spatial spill-over effects of soil use and management be identified and accounted for in policy-making?
d. What kind of future trends of land utilization affecting soils might require future policy steering to maintain soil functions?

II. *How can property rights, planning processes and management of soil be addressed adequately in the decision-making process?*

The legal dimension of the property, management etc. of soil is particularly relevant, because soil is a public good, yet often managed privately and is linked to a variety of policies affecting land use and thereby soil functions.

a. What are the legal relationships of those who own and those who manage soil as well as of those who benefit from soil functions and services and who are affected by soil degradation?
b. How do economic policies other than agriculture affect soil properties and processes (e.g. urbanization, infrastructure, traffic, energy production, mining, tourism)?
c. How can targets of various soil functions be integrated into the planning process of land related activities?
d. How can trade-offs between the principle of subsidiarity and achieving superior strategic goals be managed in planning processes?

III. *Which options exist to better acknowledging the sustainability dimension of soil functions in the IA process?*

The variety of soil functions relates to the three sustainability dimensions, however not all of them are equally addressed by research.

a. How can the social functions of soil be researched as intensively as the economic and environmental functions?

b. How can the social, economic and environmental functions of soil be acknowledged in an integrated way in concepts and policies of soil management?
c. How can the different spatial-temporal scales that are relevant for soil sustainability considerations and management be reflected in and incorporated into the policy processes?

Theme "soil"
Scientific tools: Research needs in relation to the exchange of knowledge in the Science-Policy-Interface

I. How can harmonization and standardization of classification, management and storage systems for data, tools and indicators serve for the purpose of IA?

Currently there is little integration and/or joint analysis of different data types. However, e.g. monitoring data could be used to validate modelling and other forward looking data exercises. Often, data is measured that is not immediately relevant for policy, while policy relevant data is not measured or monitored. Indicators can help to harmonize data acquisition with policy information needs. Further, there is a need for a spatially distinct classification system for each of the soil functions, while currently only a classification system for soil fertility (production function) exists, that – in addition – is not harmonised across Europe.

a. How can data and meta-data on laboratories, experimental stations and long-term field experiments as well as on soil experts be integrated across national boundaries and made publically available for the IA process?
b. How can the different sets of data, tools and indicators that are used for the different steps in the policy cycle be integrated and harmonized, respectively, to improve policy coherence?
c. How can different data types such as static data (e.g. maps), trend data (e.g. monitoring), dynamic data (as model and scenarios) and hybrids (experimental data) be harmonized in a way that one can be used to validate and/or substantiate the other in the policy process?
d. How can the ability of soils to fulfil various soil functions be classified to meet the needs of IA?

Theme "soil"
Knowledge transfer: Research needs in relation to the exchange of knowledge in the Science-Policy-Interface

I. How can the mutual understanding of scientific and policy processes be improved?

Generally, research is explorative and focuses on asking precise questions. So the objective to establish a mutual understanding poses specific requirements to the knowledge management, including a meta-data system including search functions and links to information systems used by policy-makers. Further, once the science-policy interface is strengthened, there is a risk that policy relevant research is decoupled from the very dynamic and complex basic research. This would run the risk that policy support is not grounded on latest scientific information.

a. How can data be made available to policy-makers in a format that is useful for them?

b. How can the integration and flow of information between basic research and applied research on one side, and between applied research and policy decision support on the other side be improved?
c. How can intellectual property rights of data sources be clarified to allow for both, options for a monetary and career development as well as an uptake of data in the IA process?
d. How can criteria for indicator systems be harmonized for both, a policy-making viewpoint and a scientific viewpoint?
e. How can the policy process and the policy-related need for scientific information be made transparent to researchers in a way that they can provide the information that exactly is required at the appropriate point of time in an appropriate format?
f. How can the research process and frame conditions be made understandable and transparent to policy-makers?
g. Which role can intermediates / brokers play in the science-policy interface?
h. How can data acquisition (mapping, monitoring, modelling) acknowledge information needs of policy-makers with regards to topic, spatial and temporal scale and resolution?
i. How could hybrid approaches between policy-making, business activities and civil society engagement be designed?

6.2.4 Theme "transport/ innovation" (levels 2 and 3)

Theme "transport/ innovation"
Policy-relevant topics: Research needs in relation to policies and processes

I. How can the IA and policy processes be scientifically supported?

The issue of transport is closely related to a variety of policy areas. Today's transportation problems cannot be solved with a single transport policy-measure; policy-mixes interacting into the same direction are therefore needed. In general, there is an increasing pressure on current transport systems. Innovations thereby serve as incentives for sustainable solutions and act as front runners for a sustainable change. Research thus needs to take into account this complexity of policy-mixes.

a. How are the questions in IA processes defined (including the inclusion and exclusion of certain aspects, respectively)?
b. How can tools be designed to connect environmental impact assessment of transport projects and policy level IA related to transport?
c. How can policy measures be enhanced towards innovations?
d. How does IA respond to the complexity of transport on the system level?

Theme "transport/ innovation"
Scientific tools: Research needs in relation to the exchange of knowledge in the Science-Policy-Interface

I. *How can the analytic complexity of policy packages and mixes related to transport be scientifically addressed?*

There is a vivid interaction between different transportation measures that together can lead to either incremental changes in the transportation system or towards the system's explosion.

a. How can scientific IA methods and processes contribute to the changes a system affected by so many policies?
b. How can research tools be used for "meta IAs" in the transport sector to address complex policy systems from different policy areas and scientific disciplines?
c. How can tools better analyse the impact of multiple policies affecting transport needs?
d. What kind of indicators should be used to measure social and cohesion impacts of transport policies and infrastructure?

II. *How can specific impact areas and additional spheres and conditions tackled by transport policies be assessed?*

One difficult aspect is to study the impacts of transport and innovation policies at the same time. Tools for such analyses are often missing and in general models do not necessarily help us to foresee trend breaks. Methods for impact assessments of policy packages are needed, thereby taking into account that different levels of policy-making need different kinds of tools.

a. How can be assured that all 35 impact areas listed in the European IA guidelines and additional impact areas are covered in an IA by the tools applied?
b. What kinds of tools are suited for a detailed analysis of impacts on different social groups and companies and innovation effects of transport policies?
c. How can the different external costs of transport related projects be estimated?
d. Where are the gaps in IA in foreseeing specifically sustainable transport?
e. How can policy coherence relevant to systemic change be analysed?
f. How can the logic of transport economics be tested in virtue with the logic of transport civil engineering?
g. How could diversity in local conditions be better acknowledged in transport related IA models?
h. How could different models better take into account technological questions and expectations?

III. *How can interdisciplinary research support transport-related policy processes?*

Quantum leaps in the system require multiple policies and actions to coincide, yet policies are easier to implement one at a time. This is especially a challenge for the European level where have huge challenges in coordination exist. Science should better stretch interdisciplinary and apply longer term policy processes With IA addressing also the system level and system-interaction.

a. What kind of scientific disciplines should be taken into consideration in research for policy processes related to transport?
b. How will interdisciplinary methods affect the design and application of tools in transport related IA?

Theme "transport/ innovation"
Knowledge transfer: Research needs in relation to the exchange of knowledge in the Science-Policy-Interface

I. What are appropriate information styles and formats for providing policy-relevant research to policy-makers?

When policy-makers and scientists meet, they do not always understand each other's knowledge base and time limits. There is a need to translate science for policymakers, easy digestibility. Researchers should also develop summaries and comparisons of research – means and mechanisms to find and compare different results and their relevance.

a. How can the knowledge of external costs be delivered to policy-makers in order to support/detain certain policy options?
b. To what extend is the identification of "winners and losers" of policy measures an appropriate way to communicate anticipated impacts?
c. How could information on mixed-transport technologies and their impacts better be provided for policy-makers?
d. How can researchers adequately react to the changes in the decision-making process and in the environment?
e. How can a constant learning from tools be facilitated throughout the IA process?

II. How can challenges of the cooperation be overcome?

It is difficult to know how research is taken up in policy-making as there is often a gap between the two worlds. Policy and science improve one another when in interaction, so it is suggested to keep the dialogue going and to improve its elements.

a. How can research scientifically address the questions needed from policy-makers for the decision making process?
b. How can IA be used as a means to understand the challenges that may arise during the policy process itself related to a certain issue prior to conducting the IA (e.g. preferences of and power play between road and city planners)?
c. How can scientists demonstrate to policy-makers their objectivity when being involved in the policy process?
d. Which stakeholders groups are invited to comment during an IA process?

7. Synthesis and discussion of the LIAISE SRA

The following chapter discusses the strengths, weaknesses and challenges of the LIAISE SRA. It partly builds on the discussion presented by Podhora et al. (2013) who analysed the IA related projects funded in FP6 and 7. Their discussion arguments were reflected towards the first LIAISE SRA presented in this document as well as towards the perpetuation of the SRA (D2.5).

LIAISE SRA as first research agenda for policy IA and future development

As no research agenda specifically for policy IA could be identified so far, the LIAISE SRA is pioneer work. The LIAISE SRA is unique in eight different ways (see chapter 5). These unique selling points highly influenced the structure and the content of the LIAISE SRA. No other research agenda could be identified that designed three pyramid levels of which level 1 was further defined by a tripartite structure (policy-relevant topics, scientific tools, and knowledge transfer) and by applying it to the exemplary themes of IA in general, ecosystem services, soil and transport/ innovation.

The results of the first LIAISE SRA for the four exemplary themes IA in general, ecosystem services, soil and transport/ innovation serve as a starting point for the continuous updates of the SRA to comprise the complexity of sustainable development within IA (D2.5). They results for the further extension of the SRA within the continuous updates. The questions raised within these themes do not claim to be complete, but summarize the aspects identified by means of the applied methodology. Thereby, the individual research gaps behind the research questions were differently discussed in the workshops. Thus, we expect the content and contributions of the SRA to grow in the years to come as the IA community will continue to grow and to become more intensely linked. The methodology for the update is linked to the LIAISE kit, that serves as a communication and expert platform for IA (see D2.5). Thereby, lead editors – mainly scientists and knowledge brokers – assume responsibility for the 35 impact areas set out by the European Impact Assessment Guidelines as well as for IA methods and models. Further, IA experts registered in the kit stating their expertise in certain impact areas or with certain methods and models. The updating concept suggests that lead editors and experts jointly discuss the research gaps relevant for within their areas of expertise. Additionally, the results for the themes IA in general, ecosystem services, soil and transport/ innovation are then checked by the lead editors and experts of the LIAISE kit for the corresponding impact areas. Thereby, the results will also be further reflected with the current scientific state of the art and with upcoming policy requirements and developments.

Scientific focus for the development of the "Shared" Research Agenda and the "sharing" of the results

Podhora et al. (2013) identified that communication challenges between scientists and policy-makers. Thus, to identify "research" gaps we invited scientists and knowledge brokers with a high level of scientific expertise to the discussion workshops. In a joint workshop with policy-makers and scientists or a workshop with policy-makers only, aspects may have been discussed for that research exists, but whose results have not yet been successfully communicated from science to the policy-making community.

Further, the policy-makers may have highlighted procedural challenges in relation to governance structures etc. and less any challenges with view to scientific contributions. This approach may have identified "communication" or "governance" gaps rather than research gaps.
Despite this methodological approach, the constant sharing of the current and upcoming agenda with scientists and also with the policy-making community is a relevant element of the LIAISE SRA. It is thereby relevant to cooperate with scientific associations and networks to meet a variety of scientific disciplines and to inform researchers with all levels of experience in policy-oriented research. Further concepts for sharing the LIAISE research agenda will be presented in D2.5. These are also closely linked to a constant update of the SRA.

Specific sharing with the policy-making community
A reflection by the policy-makers is needed for two main reasons. First, though IA is a politically and scientifically well-established instrument since 2002, constant changes occur on the policy-making side. These include, among other, the recent development of the assessment reports of the "cost of non-Europe" and the "European added value". As fairly new instrument they are neither part of the LIAISE kit nor the SRA yet. Second, the policy areas of the European Commission experience frequent changes, e.g. by the restructuring of responsibility areas of the DGs, by an establishment of new DGs or simply by the development of new policies that may create new policy areas in the long run. It is therefore relevant to mirror the European jurisdictional development with the LIAISE kit and the SRA.
The policy board will continue to meet beyond the lifetime of the project to accompany the further implementation of the LIAISE kit, of which the SRA is part of. The SRA results will be presented to the board and they are invited to comment from their perspective. Further, as representatives from the DGs, the members of the policy board serve as a nexus between the SRA and the DGs.
During the LIAISE dissemination conference first options for a sharing with the policy-making community were discussed, whereas the LIAISE policy board will play an influential role. Further concepts for sharing the LIAISE research agenda will be presented in D2.5.

Growing amount of policy-relevant research in the European FPs 6 and 7
Following our selection criteria for the analysis, less than 3% of the projects funded in FP6 and FP7 were classified as concerning tools for policy IA. At first glance, this seems to be a small number because both FPs were, among other purposes, explicitly dedicated to provide evidence to support policy (Annerberg et al., 2010; Rietschel et al., 2009). However, their research was to a considerable extent driven by a scientific rationale, providing researchers with a high degree of freedom in designing the methods, purposes and products of research (Annerberg et al., 2010). Additionally, the notion of research dedicated to supporting policy IA has only recently emerged with policy IA as a new instrument that has only become known over the last five years (Hertin et al., 2009). This trend is also illustrated by the large share of FP7 projects in the selected sample: approximately half of the projects were funded under FP7, although we could only analyse the first five years of FP7. Against this background, the 203 projects addressing tools

for IA can be regarded as an impressive number. The considerable potential of these projects to support policymaking was highlighted in the evaluations of the FPs that were carried out regularly on behalf of the European Commission. For example, some of the projects selected in this paper were considered "landmarks in linking science to policy", as "highly ambitious and groundbreaking" in the ex-post evaluation of the FP6 sub-priority "Global Change & Ecosystems" (EC, 2009b).
These results confirmed the hypothesis of the LIAISE project that there is a small but growing amount of policy-relevant research, yet it is still scattered across various disciplines. The need for an agenda thereby becomes obvious as with its tripartite structure (policy-relevant topics, scientific tools, knowledge transfer) it will imbed policy-oriented research support in the IA context. Further, there will be three levels of the SRA target at research programmers as well as researchers and will contribute to raising awareness on policy-related research among scientists and research funders. Lastly, with the sharing element of the SRA the option for providing scientific support for IA may become more familiar within further disciplines thereby possibly tackling policy areas that are not yet covered by scientific expertise.

Policy areas covered in the IA related projects funded in FP6 and 7 and their reflection in the SRA

The policy areas addressed by the IA relevant projects funded in FP6 and 7 covered 44% of the policy areas the European Union outlined. Most of the areas covered have the common theme of being somehow related to the conservation and/or use of natural resources. The superior position of environmental, agricultural and transport policy is even more impressive considering the other areas that were addressed by the tools: environment is related to climate change; agriculture to urban strategies, maritime affairs as well as fisheries, and transport to energy. The reasons for the more comprehensive coverage of policy areas related to natural resources and particularly the dominance of the agriculture, environment and transport might be threefold: (1) relevance to the European budget, (2) relationships with developments in the policy agendas in these fields, (3) close relationship with sustainable development.
First, the "[p]reservation and management of natural resources" (including agricultural elements such as rural development and fisheries) accounts for 60% of the European budget in 2012 (EC, 2012). This high amount of budget availability is clearly reflected in the high amount of projects the Commission funds for designing IA tools related to the corresponding policy areas (thereby mainly addressing single policy areas and not designing policy-crossing tools).
Second, the design of new policies and reforms are often a medium-term political objective. Reforms of the Common Agricultural Policy (CAP), the most relevant policy in the agricultural sector, take several years from design to implementation. Further, especially after the 2001 report of the Intergovernmental Panel on Climate Change (IPCC), the mitigation of and adaptation to climate change entered the environmental and agricultural policy agendas. These medium-term policy processes allow researchers more time to design specialized and scientifically robust tools. A considerable amount of projects referred to specific CAP instruments, not to agricultural policies in general. In contrast, policies that are developed and implemented in a rather ad-hoc manner to respond to sudden political or societal needs

limit the opportunities for researchers to develop and test their tools over a period of several years.
Third, environmental, agriculture and transport policies are closely related to the discourse of sustainable development, which is one of the driving factors for implementing the IA instrument (Bäcklund, 2009, De Smedt, 2010). The high number of environmental tools could be a result to encounter the tradeoff between environmental and economic aspects to equally address the three dimensions of sustainable development.
In contrast, among the 20 European policy areas not addressed by tools, many concern social and institutional issues. Despite the limited research funding for these thematic fields compared to other areas such as environment and transport (Rietschel et al., 2009, Annerberg et al., 2010), this limitation may also indicate that in the corresponding research fields analytical tools such as those for IA are not the most important knowledge instruments to support policy development. Other methods such as direct communication and consultation might be more common in these fields.
Another reason for little attention of IA tool suppliers to certain policy areas could be an apparently missing relevancy of sustainable development for these policies. Certainly, agricultural, energy or trade policies, among others, seem to have a stronger influence on sustainable development at first sight than multilinguistic and sport policies. However, as stated in the introduction, IAs are mandatory requirements for all major European strategies.
For the LIAISE SRA these results led to the design of the scientist workshops to create a link between top policy areas supported by IA research tools and scientific workshop themes (environmental policy area – ecosystem services; agricultural policy areas – soil; transport – transport/ innovation). Certainly one may question why it was necessary to pay further attention to policy areas that are already rather intensely covered by tools funded in FP6 and 7. There are two main reasons for having chosen this approach.
First, when discussing research gaps it is relevant to have a certain amount of research available that serves as a starting point for the discussion ("critical mass"). Thus having conducted workshops with a focus on social impact areas or the policy area of human rights (that are both poorly or not covered by the tools funded in FP6 and 7) may have rather led to a discussion on why these impact and policy areas were not well covered, neither by research funding nor by research projects. Such a discussion focus may rather have led to a position or lobbying paper for DG RTD and further funding bodies on the need to provide funding in general for these aspects. It may have distracted the focus from a three-level research agenda that aimed at providing general and specific research questions as support to funding bodies and scientists. However, first steps have been taken towards social considerations in a research agenda by the article "Sexual orientation and gender identity in human rights impact assessment" (Sauer, Podhora, 2013) co-written by a LIAISE researcher and by the recent expert workshop on "Health in Environmental Impact Assessment" organized by WP2 researchers to trigger further research discussion
Besides an analysis of the current legal framework and examples for application, the authors provided an overview of existing research and tools with respect to the topic. However, as these results are not yet part of the first LIAISE SRA , they will be handed over to the lead editor of the LIAISE kit for the impact areas "Social inclusion and protection of particular groups", "Gender equality, equality treatment and opportunities, non –

discrimination", and "Individuals, private and family life, personal data" (no lead editor available yet in any of these impact areas). These results may serve as a starting point for the future elaboration of the SRA within these areas beyond the lifetime of the LIAISE network of excellence (D2.5).Second, though IA needs to be applied on a mandatory basis for all policy areas, there seems to be a greater need to provide scientific tools for policy areas that stem from the themes that are covered by the majority of the EU budget. The EU budget may be interpreted as reflecting a certain political importance, thereby possibly calling more urgently to a wide scope of scientific policy support. It is thus likely, that further research will be requested on these issues in the years to come.
Challenges in our approach can certainly be found with respect to the partial overlap of environmental and agricultural policies in general and soil and ecosystem services in specific. As shown in the results of the SRA, the results of these two themes are closer to each other than the results provided by the transport workshop (see below). However, during the analysis of the IA related projects funded in the FPs 6 and 7 we also asked for a verification of our results from the respective project coordinators. Several of them pointed at the aspect of "ecosystem services" instead or in addition to the existing impact area of "Biodiversity, flora, fauna and landscapes". Thus there was a clear scientific demand for addressing this aspect. Further, the reform of the European Common Agricultural Policy (CAP) and the current proposal for a re) launch of the European Soil Framework Directive were regarded as clear demand from the policy-making side to provide scientific tools for soil that is expected to be highly effected by the CAP. Thus these two themes reflected again the interests of both IA communities, the scientific and the policy-making one.

Impact areas covered in the IA related projects funded in FP6 and 7 and their role in the LIAISE SRA

A policy area is closely linked to the impact areas in which the policy directly aims to achieve improvements. As demonstrated in the analysis of the projects funded in FP6 and 7, the majority of tools developed for environmental, agricultural and transport policy areas were indeed designed to assess effects in this correlation. However, in keeping with the goal of sustainable development, IA tools should also cover other unwanted or unexpected side effects on adjacent impact areas. From this point of view, our analysis revealed that the available IA tools do not make a well balanced coverage of all three dimensions of sustainable development possible, addressing mainly one to ten impact areas. In particular, the limited coverage of social impact areas further emphasizes this finding. The results also confirmed earlier studies regarding the general underrepresentation of societal issues in policy assessments (Achtnicht et al., 2009).
With respect to the SRA these results emphasized the need for a complex, integrative agenda that addresses all impact areas. Therefore, the first LIAISE Shared Research Agenda is a starting point for a constant update of IA research needs. This can best be reflected by the 35 lead editors in the LIAISE kit who assume responsibility for the impact areas, supported by IA experts registered in the kit. However, as just described the impact areas may underlie scientific or policy-relevant changes (as the development from biodiversity towards ecosystem services). Hence this results suggested a regular check of the LIAISE kit based on the results of the updated SRA to identify whether its categories are still suited for the updates of the SRA.

Integrated assessment towards sustainable development by example of the tools funded in FP6 and 7 for environmental, agricultural and transport policies

Despite the criticism just expressed with respect to the missing coverage of social impact areas, relevant steps towards integrated assessment covering the wide variety of sustainable development have been made; 8% of the projects could be identified that designed tools covering a multitude of impact areas (16–24) and 15% of the projects attempted to address sustainable development using a single, integrated analytical frame. Some of those projects emerged from the series of large FP6 integrated projects that involved the collaboration of more than 30 research partners each to develop tools for agricultural policies, namely SEAMLESS, SENSOR and PLUREL. Those large-scale projects were able to assemble a critical mass of expertise in different disciplines to address a multitude of impact areas with the level of scientific quality necessary to be integrated into the respective tools (König et al., 2013). Sophisticated tools that combine a wide spectrum of analytical threads may be able to achieve the IA goal of comparatively assessing a multitude of impact areas. On the other side, these sophisticated tools are difficult to use and contain significant inertial elements that reduce their adaptability and applicability to new policy issues (Helming et al., 2011). The questions of exactly how the different impact areas can be successfully integrated and what degree of analytical depth is required for each area will be the subject of scientific exploration and debates in science policy in the coming years (McNie, 2007).

For the LIAISE SRA these results again emphasized the need for a constant update of the SRA based on the 35 impact areas. Here, again the LIAISE kit by means of the lead editors for the impact area serves as a valuable starting point.

Jurisdictional levels covered in the IA related projects funded in FP6 and 7 in support of environmental, agricultural and transport policy areas and role in the SRA

The majority of tools were designed for the European jurisdictional level, which is not surprising for European funding schemes, particularly because creating added value for Europe is one of the key criteria for evaluating the success of European FP research (EC, 2009a, 2008). One fourth of the tools also addressed other jurisdictional levels. However, only 19% were designed for use at multiple jurisdictional levels. This finding is especially important because the EU member states are also gradually implementing individual national IA procedures (Adelle, Weiland, 2012). The design to support policy-making at specific jurisdictional levels limits the tool applicability at other levels. Research is required to conceptually link different jurisdictional levels and the relevant processes in IA tools, thereby allowing for the analysis of interactions in multilevel policies.

With view to the LIAISE SRA it is important not only to refer to the European IA system but to take into account the emerging field of national and international IA concepts. First steps have been taken towards international considerations in LIAISE by the sub-project on IA in emerging and developing countries (led by UEA) and specifically in Mexico (González Olivo, 2011). However, these results have not yet been part of the first LIAISE SRA. They will be handed over to the lead editor of the LIAISE kit for the impact areas “Specific regions or sectors“ and “Third countries and international

relations" (in both cases LIAISE researcher T. Bournaris from AUTH) as an additional starting point for the future elaboration of the SRA beyond the lifetime of the LIAISE network of excellence (see D2.5 for a comprehensive presentation of how to update the LIAISE SRA by means of the LIAISE kit).

The role of tool categories in the SRA

The categorization of the IA tools in the SRA followed the seven tool categories outlined by de Ridder et al. (2007; extended by the category "other" by Podhora et al., 2013):

1. Assessment framework
2. Participatory tools
3. Scenario analysis tools
4. Multi-criteria analysis tools
5. Cost-benefit/cost-effectiveness analysis
6. Accounting tools, physical analysis tools and indicator sets
7. Modelling tools
8. Other/tools not specified

The distribution of the tools funded in the FPs 6 and 7 across these seven tool categories illustrated the clear focus on quantitative tools. Some categories, primarily modelling tools, require scientific development and are therefore more likely to be developed in research projects. In contrast, multi-criteria analysis and cost-benefit/ cost-effectiveness analysis are well-established methods that have long been used in IA and thus may not need much further research and are ready to be applied. This history might explain why they have been poorly addressed by the projects. An additional item is the participatory component of the tools that can bring additional components and values into the assessments. Although some projects organized stakeholder workshops, the methods used in these workshops were not always well described in a formalised way. Standardisation, validation and reproducibility of the applied method were therefore not possible. Further, several projects designed analytical or qualitative IA methods that we listed with "category (viii): other", although they may describe participatory approaches to IA. In these cases, the participatory element was not highlighted adequately. Future research must determine whether the increased provision of formalised constructivist-normative tools (Morris et al., 2011, König et al., 2013) can help to better target the comprehensive requirements of policy IA.

With respect to the SRA, these results emphasized the need not only to cover tools in general in the SRA, but to focus on the individual tool categories, since the tool categories currently have a different level of policy-orientation. Therefore, the lead editors for the tool categories outlined in the LIAISE kit are individually asked to comment on their tool category. Further, Podhora et al. (2013) suggest an update of tool categories suited for policy IA. This result again emphasized the changing character of the IA process and IA research. Hence the LIAISE kit – as a basis for a continuous update of the SRA – should be regularly check based on the results of the updated SRA to identify whether its categories are still suited for the updates of the SRA.

Updates for IA tool categorization

The categorisation of the IA tools into the seven de Ridder et al. categories proved to be a difficult and somewhat ambiguous task that called this categorisation scheme into question. About 40% of the projects designed tools that did not fit into any of the categories. Other tools seemed to fit into

more than one category, as these categories were not necessarily discrete and independent but rather interrelated in that one category could be understood as subcategory of another. For example, category (vi) (accounting tools, etc.) is a subcategory of (vii) (modelling tools). The modelling tools category can be subdivided into many types of modelling, while methods such as multi-criteria analysis and cost-benefit analysis can be regarded as methods established with the modelling tools. Another challenge could have been that de Ridder et al. referred to the European impact assessment system in general (category (i)). A clear categorization specifically of policy IA tools is thus needed based on adequate IA categorization schemes. Several other studies have identified and used tool categories, e.g., Boulanger et al. (2005) and Ness et al. (2007) for economic tools, Payraudeau and Van Der Werf (2005) for farming regions and Uthes et al. (2010) for agricultural policies. However, a comprehensive categorization applicable for all policy fields and the variety of tools is still missing. Future IA tools require a clear focus or specification towards impact assessment through an improved typology that is designed from the user's point of view. The tool categories should be re-shaped in a way that is applicable across policy areas and that would help both the suppliers and users of IA tools make their own selections from the overwhelming number of analytical approaches and fields of application for IA tools. Those categories should consider the methods behind the tools and the application field, policy and impact areas, IA steps in the process, jurisdictional level and possibly geographic scope.
With respect to the SRA, there is a clear need not only to look at specific tool development but also to address superior issues. Therefore, all lead editors from the LIAISE kit will not only be asked to provide a summary of research gaps within their lead impact and policy area, respectively, but also to provide comments on research gaps on the meta level, such as tool categories, data collections etc..

The SRA results for "IA in general", "soil", "ecosystem services" and "transport" by comparison

The SRA does not focus on the instrument of IA, but relates it to specific disciplines and topics. Exemplary themes were "IA in general" and the three exemplary themes "soil", "ecosystem services" and "transport". These themes could be categorized according to the three sections of the SRA "policy-relevant topics, scientific tools, knowledge transfer" (level 1 of the pyramid). Further, all four themes provided guiding research questions (levels 2) and specific research questions (levels 3). However, few similarities could be identified with respect to the content or structure of the questions. Even when the guiding questions (level 2) sounded partly similar, the specific research questions (level 3) then had different foci. Bigger overlaps than with transport exist for the results for ecosystem services and soil.
With respect to the SRA, these results emphasize the different needs and foci the various scientific disciplines have within the implementation of IA. To meet their requirement within the updating concept of the SRA as part of the LIAISE kit, it is important to link impact areas and scientific disciplines. Currently, there exist lead editors for impact areas and tool categories, yet there is no lead for scientific disciplines (and is currently not planned to be established). To integrate the complexity and the understanding of the scientific disciplines into the SRA and the IA process, the lead editors from the impact areas will therefore be asked to invite scientists from various disciplines to comment on the frequent updates of the SRA. We assume that

great variety of disciplines could already be covered by the scientists who registered as experts in the kit (D2.5).

Summarizing, the SRA can be regarded as a relevant starting point for analysing the IA related research gaps in a structural way. It is important to further extend the SRA in the years to come to fully reflect the complexity of sustainable development while meeting policy-makers' and scientists' interests as well as their cooperation (see D2.5). A central aspect of further developing the SRA as well as for addressing the identified research needs is a further extension and stabilization of the IA research community. The LIAISE training modules aim at contributing to this support mechanism (D2.6).

8. Conclusions

The development of the LIAISE Shared Research Agenda for Policy Impact Assessment closes a relevant research gap at a superior guiding level. The SRA identified existing IA research and outlined future research needs in relation to previous research results. The SRA thereby addressed all IA spheres, namely the policy sphere (tool uptake/ use), the scientific sphere (tool provision) and a combination of both spheres to improve the mutual understanding of the individual needs and interests within the spheres. The SRA covered aspects of IA in general as well as pressing policy-relevant (agriculture/ soil) and scientific issues (ecosystem services) as example.
The results of the SRA pointed at two clear future needs. First, it is important to extend the SRA to the other impact areas not yet addressed (and in the long run even challenge them scientifically in order to identify whether they are still suited for the IA process). The current SRA presented in this deliverable can only serve as a starting point and should be extended to include all impact areas and types of IA methods and models (as outlined in the LIAISE kit). A concept for an extensive perpetuation of the SRA in cooperation with the LIAISE kit beyond the funding period of the LIAISE network of excellence will be provided in D2.5. Second, the structure of the SRA (mainly based on scientist workshops and comments from policy-makers) clearly identified the need for mutual understanding of the policy-making and the scientific spheres in IA. Thus, training courses for both communities may support this mutual understanding towards improving the science-policy interface. A concept for training modules will be presented in D2.6.

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Annex I

Presentations

- Helming, K., Podhora, A. (2014): Shared research agenda. Impact Assessment for Sustainable Development: Knowledge Systems for the Future. Brüssel, Belgien, 01.04.2014.
- Podhora, A. (2012): Einleitung: Die Nachhaltigkeitsprüfung – wo stehen wir? In: Themenforum: Nachhaltigkeitsprüfung als neues Instrument aus Umweltsicht, 11. UVP-Kongress 2012 „Emotional? Rational? UVP!“, Dresden, 07.-10.11.2012.
- Podhora, A., Helming, K., Heckelei, Th., Kautto, P., Reidsma, P., Rennings, K., Turnpenny, J., Jacques, J., Adenäuer, L. (2012): Tools assessing trade impacts – a state of the art in European research for impact assessment. 2012 Berlin Conference on Evidence for Sustainable Development, Berlin, 05.-06.2012.
- Jansen, J., Wien, J.E., Jordan, A., Turnpenny, J., Helming, K., Podhora, A., Roosenschoon, O., Reis, S., Jacob, K., Dick, J., Söderman, T., Saarela, S.-R., Crimi, J., Weiland, S. (2012): The LIAISE approach to unite researchers and practitioners in a community of experts on impact assessment. 2012 Berlin Conference on Evidence for Sustainable Development, Berlin, 05.-06.2012.
- Podhora, A., González Olivo, D. (2011): Current research on ex-ante policy IA in Mexico. 31st Annual Meeting of the International Association for Impact Assessment, Puebla, Mexiko, 29.05-04.06. 2011.
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Workshops (organization, moderation)

- Podhora, A., Statz, A. (2014, in prep.): Experten-Workshop NHP
- Podhora, A., König, H. (2014): Ansätze zur partizipativen Nachhaltigkeitsbewertung. Trainingsworkshop 12. UVP-Kongress 2014.
- Ferretti, J., Podhora, A. (2011): Nachhaltigkeitsprüfung/ Impact Assessment. Workshop UVP Summer School 2011, Dresden, 07.10.2011.
- Helming, K., König, H. J., Podhora, A. (2011): Methods and tools for sustainability impact assessment in land use and agriculture. Sino-german international research training group: Modeling material flows and production systems for sustainable resource use in intensified crop production in the North China Plain, Hohenheim, 16.11.2011.
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Conference sessions (organization, moderation)

- Helming, K., Podhora, A., Jacob, K. (2014): Research in support of sustainable development Impact Assessment for Sustainable Development: Knowledge Systems for the Future. Brüssel, Belgien, 02.04.2014.
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- Sieber, S., Podhora, A. (2012): Research for policy impact assessment for energy policies. 32nd International Association for Impact Assessment, Porto, Portugal, 27.05.-01.06.2012.
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- Venn, O., Podhora, A. (in cooperation with International Union for Conservation of Nature) (2010): Landscapes and Ecosystem Services, Climate Change and Impact Assessment, Aalborg (Denmark), 25.-26.10.2010.
- Podhora, A. (2010): Modeling Resource Use. 2010 Berlin Conference on the Human Dimensions of Global Environmental Change, Berlin, 08.-09.10.2010.

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