

Science-policy interface in EU biodiversity and ecosystem services projects

Understanding the use and influence of science-policy interfaces

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Summary

For this research ten research projects from the Seventh Framework Programme for Research and Technological Development in the thematic area of Environment, funded by the European Commission were studied to analyse how a science-policy interface contributes to the policy relevance of a project and how this changes over time. Therefore it was analysed how these projects framed their problem and solution in relation to the SPI, which activities were undertaken and what the expected outcomes were of the SPI. The research starts with explaining two ways in which a science-policy interface can be understood – as a linear model and as a two-way process – and continuing with describing the importance of this interface for both science and policy.

For the analysis this research used the theory of framing since this would make it easier to compare projects with each other. By selecting phrases from project documents a reconstruction was made of the science-policy interface description, the way in which actions are framed in relation to the science-policy interface and the expected outcomes of the projects. After coding and classifying the phrases an overview is given of the most important elements of the science-policy interface frames and action frames which consist of stakeholder involvement, communication and dissemination, the relation with the policy domain, networks and raising awareness.

After the presentation of the basic results these elements were compared among projects in order to find out what the main differences were and which frames could be distinguished. Consecutively the science-policy interface frames were compared with the action frames to see if there were differences between description and execution followed by a comparison between action frames and expected outcomes to see if there was a relation between them.

Finally it is discussed what the relation is between a science-policy interface frame, an action frame and what kind of outcomes can be expected. This is taken further by looking at how these relations can be linked to the research objectives and research drive. Following from the relations remarks are given on the use of a science-policy interface with a discussion on how this relates to the commodification and valorisation of science. The chapter on the discussion ends with recommendations on how to improve the connection between scientific projects and policy makers on the EU level. This thesis ends with an overall conclusion on the use of science-policy interfaces and a warning for possible commodification of science through science-policy interfaces and a continuous adaptation to policy demands.

1. Introduction

In 2007 the EC (European Commission) had launched the FP7 (Seventh Framework Programme for Research and Technological Development), the seventh programme that aims to increase scientific knowledge in Europe in order to “*strengthen the scientific and technological base of European industry*” (EC, 2012). This knowledge is not meant to be only accessible for or solely produced by countries within Europe, it also encourages countries from beyond to generate and expand knowledge. The 7th framework programme is by far the most expensive one that the EC has set up, granted a total sum of fifty-five billion euro over a period of seven years which amounts for almost half of the total funding that has been assigned to the previous six framework programmes over a period of 23 years. From this €55 billion budget €1,7 billion was assigned to environmental research (EC, 2012). The environment is a sector that concerns and affects everyone and since there is such a large investment in the environment the developed knowledge should be put to good use and is required to have some societal influence in most of the projects (Pielke, 2010). In this sense, to achieve the objective in the field of the environment, it is important that science and policy work together to increase the amount of knowledge to advance the current knowledge for societal issues.

The dominant discourse on science-policy interaction assumes a linear model where science is seen as a link between a problem and the formulation of policy; good science gives a solution to a problem and the knowledge on the solution should simply be implemented in policy (Lawton, 2007). But even this linear model can be perceived in different ways, as is depicted in figure 1, adapted from Lawton (2007). From a policy science perspective, decision makers assume that their goals can be translated into scientific questions by scientists and that scientists can come up with clear outcomes (Wesselink et al., 2013). Instead, according to Hulme et al. (2011) a link between science and policy should be perceived to be more than simply the production of knowledge on one side and the implementation of that knowledge to its full extent on the other. Given these perceptions on the science-policy interaction it should be said that the way in which the Directorate-General Environment frames the science-policy interaction seems ambiguous. On the one hand they state that scientists are responsible for making their results more accessible for policy makers and on the other hand a need for dialogue between scientists and policy makers is mentioned in order to make results more understandable and accessible for policy makers (EC, 2015). Although communication between scientists and policy makers is mentioned, the main emphasis is put on getting understandable outputs from the scientific field rather than a creating a mutual understanding of each other’s capabilities and needs. In other words, they want to bridge the gap between science and policy, moving away from a linear approach between the production of science and the policy use of it. According to Choi et al. (2005) this is an important part of the SPI to prevent frustration from both sides, on the one hand because policy makers do not get answers to the questions they asked – or meant to ask – and on the other hand because scientists do not understand the questions or cannot give answers to the questions that have been asked.

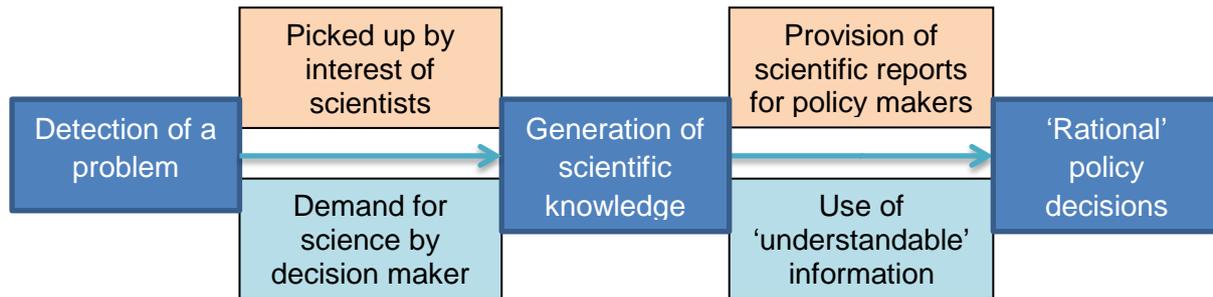


Figure 1: Assumption of the linear model of the interaction between science and policy

The promotion of interaction between the fields of science and policy provides a basis to the assumption that sound science is needed for the justification of good policy (Van den Hove, 2007; Huitema and Turnhout, 2009). This relationship is also beneficial for the scientific community since funding is needed for the practice of science, which underlines the reciprocal relationship between science and policy (Choi et al., 2005). Such interaction between scientists and actors involved in the policy making process is called a science-policy interface (SPI). In a SPI a close interaction between science and policy is encouraged, but because of the dominant paradigm – which assumes that scientists can only develop objective science if they are fully independent and are not influenced by policy processes while producing science for society’s sake (Owens et al., 2006; Turnhout et al., 2014; Wesselink et al., 2013) – such interaction is not yet broadly applied to projects. The fear that science is being steered too much in favour of decision makers is one of the main reasons why scientists are often reluctant to operate in a SPI and try to maintain a linear relationship with decision makers. In other words, science should provide policy with knowledge to improve policy instead of policy demanding knowledge to support already made decisions (Choi et al., 2005). But doing scientific research only for the sake of solving policy issues and not supporting curiosity driven science also forms a danger for policy (Van den Hove, 2007). It is the curiosity driven science that can lead to new insights and fields where policy should be demanded and lead to issue driven science. Therefore it is important to bear in mind that not all research that is funded should be oriented on solving issues but should also support curiosity driven research in areas where discoveries are expected which can lead to further research that can support policy.

Concepts such as boundary work and the SPI argue for a non-linear understanding of the relation between science and policy (Hoppe, 2005). The importance of the interaction between the fields of science and policy is exemplified by two occurrences where there was no extensive science-policy interface. The first case describes how science could have played a role in policy actions in the United Kingdom. In 1996 there was a great outbreak of BSE in the United Kingdom which formed a threat to public health (Jasanoff, 2001). During the BSE crisis the government took wrong measures for public safety because there would have been a lack and dispersion of available knowledge on BSE. Before the outbreak of BSE knowledge on the disease was already obtained, but during the crisis the government officials did not know how to reach the information quickly. It was only during this crisis that public and stakeholders, such as supermarkets, got themselves informed by scientists on how to reduce risks of BSE since the necessity for this information was evident for the stakeholders. In this case scientists took action to improve the interface together with other actors since they did not find enough contact with the policy actors. In the second case, described by Crouch and Smith (2011), there was a language barrier between South African

policy makers and their botanical experts. The botanical experts tried to send a message for a suggested change in environmental policy through their reports but the policy makers did not understand what the implications of the report were. Unfortunately the policy makers understood what the numbers and jargon had implied when they saw the practical relation between economic losses and biodiversity loss. The lesson that scientists learned from this occasion was that they needed to take the opportunity to explain their findings to policy makers if their results should contribute to policy.

Science indeed is an important part of policy making but the assumption that enough research will always lead to good policy is incorrect. Better policy is not necessarily the outcome of generating more knowledge (Choi et al., 2005; Jasanoff, 2007; Sarewitz and Pielke, 2007), there are limits to how far uncertainty can be reduced and thus to how effective policy can be. Perrings et al. (2011) and Sluijs (2005) describe a few ways to deal with uncertainty of which two are most relevant for this research. The first way is that when scientists and non-scientists are working together, there should be a clear demarcation of what science is and what not so that the non-scientists accept the developed knowledge and use the available knowledge. The second way to deal with uncertainties is to accept, as scientists and non-scientists, that uncertainties are omnipresent and to try and deal with them. This is especially relevant for a science-policy interface since decision makers should be able to accept a 'lack of knowledge' when scientists are able to explain why there is uncertainty in all models. With the interaction from a SPI decision makers should thus be able to know better what they can and cannot state in their policy. In this sense "[s]cience does not provide the solutions, but it can help understand the consequences of different choices" (Lubchenco, 1998: 495). Thus, decision makers need a scientific understanding to be able to interpret the results of scientists and scientists need to be able to talk in a different way to communicate with decision makers. A SPI can play a key role in this by bringing decision makers and scientists directly into contact with each other instead of communicating with each other through reports (Wesselink et al., 2013).

On a global level SPIs are being promoted by the IPBES (Intergovernmental Platform on Biodiversity and Ecosystem Services) which was convinced that the link between science and policy is more complex than the linear model. The IPBES is an example of an organization that tries to integrate science and policy by providing a platform to enhance the network of scientists and decision makers to spread their knowledge rapidly. This can be found in the goal of IPBES "*to strengthen the dialogue between the scientific community, governments, and other stakeholders on biodiversity and ecosystem services*" (IPBES, 2014). By mentioning a 'dialogue' in the goal, the IPBES promotes interaction between science and policy rather than a one-sided transaction of information. Mind that in this goal 'other stakeholders' are included in the interaction, implying that there is more to a SPI than dialogue only between experts and decision makers.

The inclusion of SPIs in IPBES shows that there is an increasing interest in science-policy interfaces, therefore it is important to get a better understanding of how SPIs work and how they influence policy making. To this end this study analysed ten FP7 funded projects in the thematic area of Environment on their science-policy interfaces. Through this analysis a better insight will be gained of how the projects conceptualized and organized their SPI. As part of this the relation between knowledge development and use, the problems and solutions in this relation, the kinds of activities undertaken to improve the science-policy

interface and the dynamics in this conceptualization and its effects were analysed. The way in which the problems and actions are framed contribute to the expected outcomes of the SPI, hence it should be studied how these relate to each other and how divergences occur. To do an analysis on these aspects the following research questions have been formulated.

1. What are the frames for problems and the solutions in relation to the SPI?
2. How were the actions related to the SPI framed?
3. What were the expected outcomes of the SPI?
4. What are the relations between these three elements and how does this relation contribute to the understanding of SPIs?

This analysis will provide the basis of further exploration of the elements that are necessary to create a successful SPI and with that enhance the possibility for collaborative research projects to attain their goal. Mind that the aim of this research is not to create a universal model for a successful SPI application, firstly because each SPI is context dependent and a standardization can misinform the user – both decision maker and scientist – and make him blind for what more could have been researched or in what different ways the interaction could or should have taken place (Turnhout et al., 2008; Turnhout et al., 2014). Rather it should be seen as a reflection on the use of SPIs. The innovativeness of this research lies in the way a relation is sought between research objectives, actions, outcomes and the contribution a SPI can make to reach these objectives as well as analysing how useful a SPI can be for different types of projects.

This thesis has the following set up. First, a theoretical section is devoted to framing analysis which forms the basis for the research. It will elaborate on framing theory and show how framing is used to analyse how the conceptualization of a SPI took place in the projects. Secondly in the methodological chapter the concepts and ideas of framing will be translated into tools for analysis and it will be explained how the research was conducted on case study basis as well as for the comparative analysis. Following up on this the results will be presented in an analytical and comparative way to guide the outcomes to a discussion and conclusion on the general findings from the analysis and recommendations for the use of a SPI mechanism will be provided.

2. Theoretical framework

There is a great variety of understandings of what a frame and framing is in different fields of interactional studies. In the field of bargaining and conflict resolution Putnam and Holmer (1992: 129) define frames as “*a key to deciphering how bargainers conceive of on-going sets of events in light of past experiences.*” Drake and Donohue (1996: 298) have an understanding of frames as “*communicative structures that can be monitored and shaped to influence integrative processes*” and “*framing refers to talking about a topic or issue in ways that identify a particular domain within that topic, temporarily ignoring other relevant domains*” (ibid.: 303). A more modern and abstract explanation of frames and framing is found in the work of Kpéra et al. (2014: 3) “[f]rames are structured, shared ways of speaking, thinking, interpreting, and (re)presenting social realities in the world”. These understandings of frames have some implications for the analysis of frames. Firstly, it is assumed that thoughts form an actor’s actions within the frame, making actions a part of the frame and subject of analysis.

This aspect is important for this research since it puts an emphasis on the relation between different actors regarding their frames and changes in frames through interaction, which is the second implication: that frames are interpretative and are a language that describes an actor's reality (Berger, 1966; Keller, 2005). When there is a variety of ways to frame the reality and this framing is open to changes through interaction, the process of framing and frames are seen as reflexive and dynamic (Putnam and Holmer, 1992; Schon and Rein, 1994). This does not necessarily mean that an actor creates a completely new understanding of the previous frame, rather should it be seen as reframing to fit better to the understanding of the subject (Dewulf et al., 2005). The change of frames is interesting for an analysis of frames since it implies that interaction took place and actors perceive their reality differently. A change in perceived reality has major influence on the formulation of the solution and the course of a project or process. In the assessment of SPIs in the different research projects it is therefore important to look at how various SPI aspects are included in the description of the SPI.

When approaching the frame of a SPI as the totality of ways of speaking and actions of a project regarding this subject, information on the frame can be obtained by collecting these pieces of information. A change of the SPI frame can be found by comparing the proposed solutions with the actions and possible rephrasing of the solutions. This is best done by dividing the projects in different phases in accordance with a beginning-middle-end structure:

1. Set-up/ start: Problem definition and direction of project
2. Main research/ action: Activities undertaken to improve the SPI
3. Concluding: (expected) outcomes of the project with regards to the SPI

Similar structures are found in the set-up of the reporting of projects to the EC where three to four moments are used to document progress: proposal for the research and set-up; mid-term reporting(s); and final reporting. These phases are consecutive and reflect on the previous phase(s) which allows to compare the frames between these phases.

In figure 2 the upper row shows the elements that were expected to be found in documents and interviews in order to reconstruct how the SPI was described, which actions contributed to the development of the SPI and what the effects of the SPI were. It is expected that during the first phase of the project the SPI was conceptualized. During the second and third phase changes in this conceptualisation occurred and a more practical implementation of these frames was observed through the actions related to the description. By comparing the description of the SPI and the actions that have been undertaken in the SPI it was analysed if there was a relation between the problem conceptualization and the action frames. Consecutively these project actions were compared with each other to see if there was a relation with the effect the SPIs have and if the expectations for influencing policy differ. Eventually it will be discussed what the practical implications of these comparisons and outcomes are for a SPI. In order to compare structured ways of thinking and interpreting (Kpéra et al, 2014), the texts and actions were coded according to certain criteria and subsequently these codes were grouped under a class. In this analysis indicators for a SPI, as found in literature, were used to define the codes. The codes then were used to make different classes in the classification system. A further elaboration on the practicalities of the coding and classification process is given in the methodological chapter.

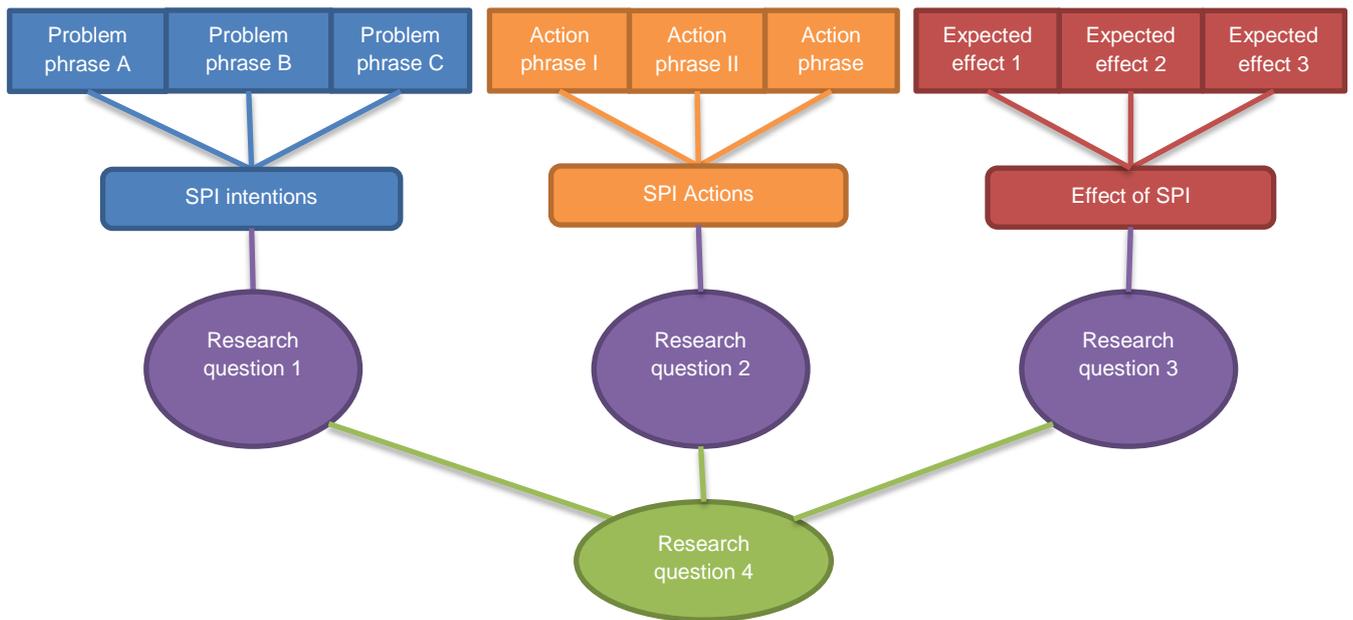


Figure 2: Overview of the relationship between problem-solution phrases, action phrases, outcomes, SPI frames and research questions

To provide phrases with codes, three indicators have been used: the orientation of the phrase, the involved/mentioned stakeholders in the phrase and the critical element of the phrase. By looking at the orientation of the SPI aspects the overall focus of a phrase can be classified which can help analysing the interaction between science and policy. Secondly, the amount and type of actors that is perceived as important or relevant gives insight in the inclusiveness of a SPI. Lastly, the critical element relates to the SPI element and is decisive for the code that is assigned to the frame. One element is the need for a mutual understanding of what scientists' and decision makers' goals are and how they can legitimate their process of interaction. Such understandings are established through debates on assumptions from both sides and the explanation of the roles of uncertainties. In other words, uniformity of goals and language with scientific credibility is a prerequisite for a good SPI (Van den Hove, 2007; Pielke, 2010; Watson, 2005; Weichselgartner and Kasperson, 2010). Where science tries to narrow down the research in order to deliver precise policy advise, decision makers tend to look for a 'bigger picture' (Hoppe, 2010; Weichselgartner and Kasperson, 2010). Since policy in this sense requires broadly defined answers – there can also be demand for very specific science – science should try to meet this demand to remain policy relevant and then where necessary confront policy makers with the uncertainties of the produced scenarios (Runhaar and Nieuwaal, 2010; Watson, 2005). The second element is measurability of indicators which is desirable for both policy makers and scientists in order to substantiate policy and outcomes (Watson, 2005; Hinkel, 2011; Runhaar and Nieuwaal, 2010; Weichselgartner and Kasperson, 2010). Measurability of indicators is important since that means that policy can be monitored and improved after evaluation. The third element is the importance of a scientific reward in the SPI in order to encourage scientists to cooperate. A scientists career depends on publications and not on unpublished policy support so it is assumed that there is a need for some kind of reward (Weichselgartner and Kasperson, 2010). This demand should be met by decision makers to increase the readiness of scientists to cooperate in a SPI. Awareness helps in a SPI as well and is therefore set as the fourth element. According to Van den Hove (2007) scientific knowledge contributes to the

discovery of issues and to placing these on the political agenda. Additionally scientific networks can help to keep issues on the political agenda by acting as one group and arguing in favour of the subject. Next to this Choi et al. (2005) argue that raising awareness on certain topics in the policy domain is not enough, the public should be made aware of these issues as well since they form the public opinion and thus policy. The final element, as has been mentioned more frequently in the introduction, is interaction and communication between stakeholders which are key to a well-functioning SPI. Van den Hove (2007) mentions that science-policy interfaces are participatory and according to Choi et al. (2005) this can take place for example by engaging a knowledge broker to make communication easier. A complementary argument is being made by Pregernig (2014) who says that it usually is not the case that policymakers do not understand what is being said, instead there is an information overflow from the supply side. So rather than communicating with the policy field what is going to be supplied and then try to deliver the message in an understandable way it should be discussed what kind of knowledge is thought to be necessary and deliver that. The extent to which these aspects are implemented in a SPI can help identify the strength of a SPI. An overview of the indicators and their related criteria is given in table 1.

Figures 3 and 4 show the expected processes that the projects can undergo when forming a SPI. Because the SPI focuses on the inclusion of scientific and political needs, thoughts and actors, the figures represent only the political and scientific orientation. The orientation of the project is the most basic way to determine whether a science-policy interface includes aspects from different disciplines or not. By making this distinction it can be analysed how much attention has been actively spent on the development and maintenance of a SPI since a SPI is expected to include perspectives from the science and policy disciplines. Figure 3 shows a scenario in which a SPI is present at the beginning of the project; if that would be the case the framing analysis should show existing links and contacts with the policy domain. In this case little to no changes are expected in the SPI during the project and stakeholders are expected to be actively involved in the SPI. Figure 4 shows the expected scenario where there is no SPI present yet. From this position there are three expected scenarios to occur. In the first scenario it is expected that scientists and decision makers do not get in dialogue and only present their problems or solutions. Due to a lack of communication there is a mismatch between the desired and required solution, as well as in the understood problem and the actual problem which result in research outcomes that are not useful for policy. Another scenario sketches the introduction of an arbiter who helps scientists and decision makers to match their needs with their capabilities and demands, resulting in a SPI where both parties indirectly communicate with each other. Finally, actors can have discussion together and come to agreements by creating a SPI on their own. These four scenarios sketch the hypothesised paths for the development of the selected projects. Depending on the outcomes from the frame analysis these scenarios are supportive in determining how the SPI was established and maintained.

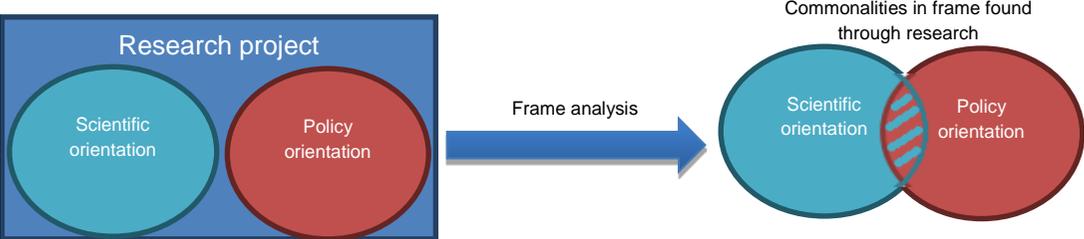


Figure 3: Expected scenario for the establishment of a SPI with presence of common frames

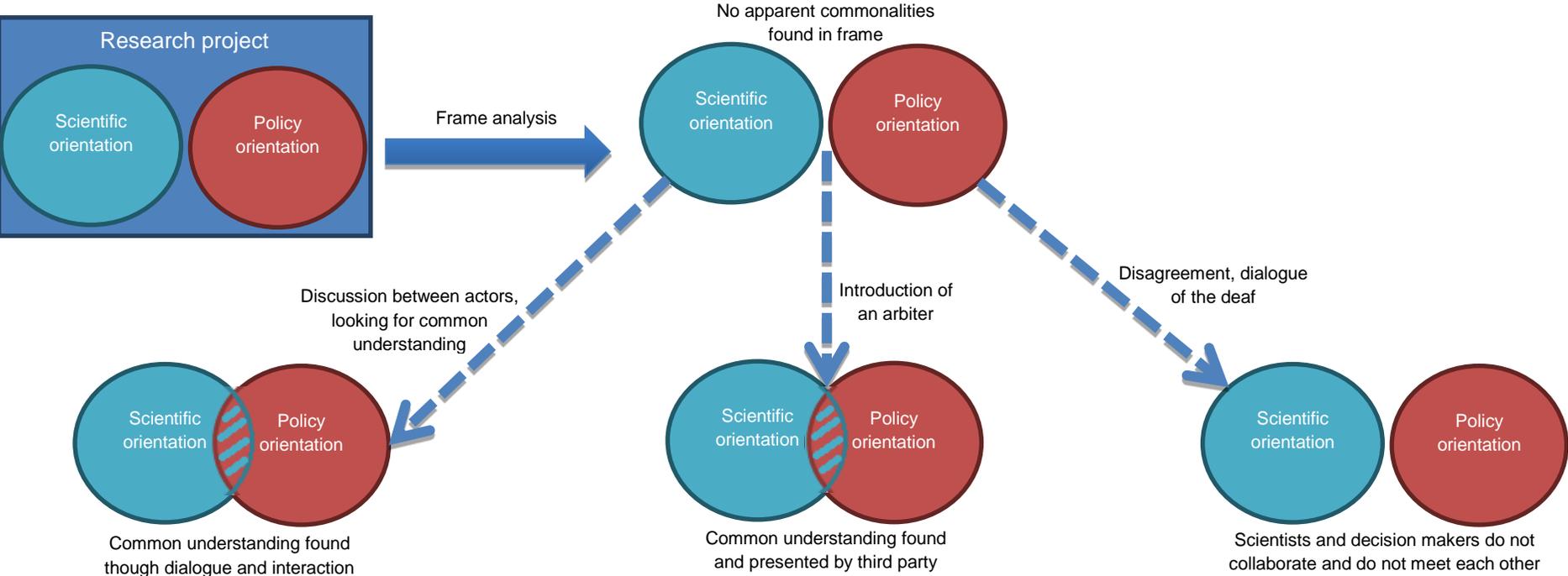


Figure 4: Expected scenarios for the establishment of a SPI when there is no apparent common understanding

3. Methodology

This research intended to conceptualize the relationship between knowledge development and use. To this end a frame analysis was done on the different phases of ten collaborative research projects, funded by the FP7. The phases that have been determined are the following:

1. Set-up/ start: Problem definition and direction of project
2. Main body/ action: Activities undertaken to improve the SPI
3. End: (expected) outcomes of the project with regards to the SPI

Documents, reports and meeting notes have been read for all the projects and phrases including characteristics of a SPI were selected for the analysis. These phrases have been analysed by using the indicators from table 1 in order to make codification possible. To prevent limitation in the coding an inductive content analysis (Elo and Kyngäs, 2008; Hsieh and Shanon, 2005) with a saturation approach has been applied. This data is qualitative and by using the indicators for the coding a structural approach to the understanding of the project was enabled. This section will elaborate on the method in which data was collected and how the data was analysed.

Table 1: Overview of the coding indicators with corresponding elements

Orientation	Stakeholders	SPI elements
<ul style="list-style-type: none"> • Science • Policy • Science-policy • Linear relationship • Public • Project objective 	<ul style="list-style-type: none"> • Policy makers, managers and decision makers • Scientists • Public • External stakeholders • Great variety of stakeholders 	<ul style="list-style-type: none"> • Common goal and language • Policy scale • Measurability of indicators • Scientific reward • Communication • Other characteristics

3.1 Data collection

Ten collaborative research projects, funded by the FP7, were selected in accordance with the following selection criteria:

- Projects are related to biodiversity and ecosystem services
- Projects have an expected impact on policy
- Projects promise to organize impact in the proposal
- Projects offer a diverse and comprehensive overview of different realized impacts, different types, strategies and extent of engagement processes organized

With regards to the last criterion, concerning the different types of projects and strategies, there has been made a distinction between marine/ aquatic, terrestrial and policy oriented cases. The projects have been selected by a brief analysis of the project objectives and with the help of experts who were familiar with different FP7 projects. These were EC Scientific Officer Adrian Peres, member of the UFZ Science-Policy Expert group Dr. Carsten Nesshöver, Dr. Peter Bridgewater and Dr. Esther Turnhout. The selected projects are mentioned in table 2.

Table 2: Ten selected collaborative research projects funded under FP7 with interviewees for the analysed projects.

Name project	Interviewee
BESAFE	Rob Bugter
BioFresh	Klement Tockner
BIOMOT	Riyan van den Born & Luuk Knippenberg
HERMIONE	Sybille van den Hove
REFRESH	Julia Martin-Ortega
ROBIN	Terry Parr
SOILSERVICE	Katarina Hedlund
SPIRAL	Juliette Young
STEP	David Kleijn
TESS	Robert Kenward

From these projects six have expired and four were still running. For none of them it was possible to attend a meeting which focused on the SPI, on the one hand because it is impossible to do so with expired projects and on the other hand because there was no time to arrange or attend a meeting from the running projects. Therefore all projects were analysed in a similar way. The interviews may have been affected by this same time factor: projects that were running could be better memorized than expired projects. To equalize this expected difference the interviewees were told briefly what the interviews would be about and the interview started with asking the interviewees what a science-policy interface is and how this looked like in their project. Through these questions it was attempted to obtain elaborate answers on the SPI, the interview questions can be found in the Appendix C. Below a brief description of the projects is given per project orientation.

Policy oriented

BESAFE was a project that was still running during the research. Its goal was to improve the understanding of the use of alternative arguments to improve biodiversity policy making. By collecting arguments that have been used for biodiversity conservation in a publically accessible database, BESAFE tries to make an overview of which arguments can be used in which occasions.

BIOMOT is a sister project of BESAFE and looks at the underlying reasons of the arguments. This project has a more sociological and psychological basis, analysing why some arguments work and how they work. The goal was to design a theory which explains what kind of reasoning moves people to act for biodiversity. BIOMOT too is a policy oriented project which is still running.

TESS's goal was to design a transactional environmental support system through which local actors could provide knowledge to the national policy level in exchange for information on how to best manage the local nature. This system was meant to be used to enhance management and information on both national and local level. This project has expired.

SPIRAL is the final policy oriented project, which also has expired. SPIRAL is a special project in this category since its focus lies on improving the science-policy interface which is

beneficial for both science and policy. To this end they had studied various SPIs and supported these while being involved.

Aquatic/ marine oriented

BioFresh has developed a platform through which scientific information on freshwater biodiversity can be easily looked for per topic and region. Their goal was to make data more accessible and easier to find. Additionally they wanted to raise awareness on freshwater issues and include it into water policy on different policy scales.

HERMIONE is an expired, marine oriented project which did research on the deep sea biodiversity and production of goods and services. Their goal was to develop knowledge of the deep sea in order to make it possible to design governance based management strategies for the use of the deep sea.

REFRESH is the last aquatic based project which has recently expired. Their objective was to help water managers design cost-effective measures for freshwater biodiversity restoration. REFRESH tried to do this by doing research and developing scenarios with stakeholders on case study level.

Terrestrially oriented

ROBIN is included in the group of terrestrially oriented projects because it aimed to provide guidance on land-use planning. They worked together with local and national levels to discuss the use of different tools to mitigate climate change with a targeted focus on REDD mechanisms. Together with stakeholders they wanted to look how these tools would be useful and how to implement these in policy. This project was still running at the start of the research.

SoilService is the most terrestrially oriented project of the selected projects. SoilService aimed to design a new way through which soil biodiversity could be valued. By analysing economic drivers in relation to soil health they developed a valuation tool to evaluate current soil policy in economic terms. This project has expired.

STEP is the final project. This project was still running and focused on pollinator loss and is thus part of the projects with a terrestrial orientation. STEP's objective was to document pollinator decline and look for causes of this decline. Next to this they were to make a Red List of pollinator species, develop monitoring tools for pollinators and eventually provide tools and strategies to reduce pollinator decline and reverse this where possible.

The sources in which frames were sought consisted of available documents from the projects, being mainly: Description of Work, Communication Plan, Work Package description, Newsletters, Periodic Reports, meeting notes and other relevant documents. These sources have been obtained through the projects' websites and in some cases from involved actors who provided the research with additional sources. Complementary to the literature research semi-structured interviews were carried out with project partners who had a good overview of the project and its challenges and who were able to answer the questions sufficiently. A list of the interviewees can be found in table 2. When possible the interviews were held face-to-face, otherwise they took place via phone calls. All interviews have been recorded and transcribed.

3.2 Data analysis

During the collection of the data preparatory measures were taken for the data analysis. First of all the articles were sorted so that different project phases could be distinguished and phrases could be sorted per phase. The phrases were collected in an Excel sheet which contained boxes for the indicators which are mentioned in table 3. In this way it was possible to assign characteristics to the frames which would ease the codification and classification in a later stadium of the research.

After the phrases were sought in the first eight projects an open coding approach was applied to develop codes for the various phrases. To ensure that the phrases with the same codes would have a similar nature, based on the findings and content of the phrases a description for the codes has been made. Open coding with a saturation approach was used and saturation was reached at 31 codes. An important remark for the coding is that depending on the orientation and the phase in which the concerning phrase was found the interpretation of the code could change. It was chosen not to include more codes for the various definitions as this would have led to an amount of codes almost equal the amount of phrases. A clarification of the interpretation for the various codes is described in the table 4.

Table 3: Indicators for coding used during frame collection

Project name
Project phase
Phrase
Orientation
Stakeholders
Universal language and goal
Geographical scale
Measurability
Scientific reward
Communication
Critical element
Code
Class

Table 4: Definition of the used codes

Code	Definition
1. Work on measurability (for PM)	The main goal is to develop tools to quantify and measure units on a scale. Measurability is meant to make monitoring possible for policy making and scientific ends. When this code is used in "outcome" issue frame (IF) it means that the tool or indicator for measurability has been developed.
2. Guide policy making	When a phrase is coded "Guide policy making" it refers to science which aims to steer policy in a certain direction, be it to raise awareness for a certain approach or because it is seen as the best approach. In fact scientists provide products which can help policy without these product being asked for by policy makers.
3. Scalability of project	The phrase refers to the possibilities to implement knowledge or policy at different political scales. A distinction was made at implementation on regional, national or global scale but also at implementation in developed or developing countries.

4. Interdisciplinary cooperation for jointly approved targets	A variety of actors with different disciplinary backgrounds are working together in order to produce outcomes – i.e. practical tools and models, agreements on the research approach – on which the relevant actors agree. Meetings, workshops, symposia and extensive feedback loops are included in the frame.
5. Involve the public/ SH through different media	Description of how the general public and stakeholders will be involved in the project. The focus lies on the different channels through which actors were informed and involved with the project as well as the reflection on the approaches used in the project.
6. Using networks	Develop a link between stakeholders – short term but mainly long term – and involve (relevant) stakeholders to increase the impact of the project or to information data from stakeholders.
7. Effort to include (more) scientific actors	Explanation on scientific rewards for scientists when they would participate in the project.
8. Publication of papers for scientist's interest	The promise for or mentioning of the publication of scientific articles as part of the research project.
9. Reach out to wide audience	Focus on the act of reaching out to a wide audience and increasing the range of the project.
10. Knowledge adjusted to user group	Phrase looks at the information that is delivered to the target groups. The frames with this code are defined by their adjustment of information flow. The selection of which knowledge is presented is the most important part of this code.
11. Stakeholder consultation	Phrase looks at the involvement of stakeholders as resource for information rather than the channels through which stakeholders are involved. The consultation usually takes place through interviews and does not emphasize multiple disciplines working on the project.
12. Invest in continued SH participation	Description on how the project tries to keep stakeholders involved in the process. This code has overlap with some other codes, but the phrases with this code emphasise an on-going inclusion of present and new stakeholders.
13. Open access to research for everyone	Make the results (and when deemed necessary other products and publications) publically accessible rather than for a select stakeholder group.
14. Demand for knowledge	A lack of knowledge has been identified, either by an actor (group) or by the project, which needs to be overcome to provide advice.
15. Dissemination of results	Action of disseminating and spreading of the results of the project. This focuses on informing stakeholders and a wider public on what the outcomes of the project (phase) are.
16. Scientific focus on research	The more theoretical approach to increase background knowledge for the project. An understanding of processes and increase of the knowledge base are the fundament of this code.
17. Participatory approach	There is clear interaction between scientists and policy makers but it is unclear to what extent the disciplines work together. There are dialogues and workshops organized in which stakeholders are welcome to participate.

18. Get involved in others' activities	The project tries to get attention from other projects, groups and collaborations order to get attention and/or influence them.
19. Active attention for policy	Outspoken concern for influence and added value of the project on policy. This code encompasses the phrases which pay attention to policy but are not identifiable as the other policy oriented codes.
20. Improvement for communication needed	An increase or improvement in the communication between actors – science to policy and science to science – appears to be necessary. Recommendations to this are included in this code.
21. Translation of languages	It is chosen to adjust the language of the output to the audience without differentiating it from the way it was written for experts. The difference with the code "Diversification of languages" is that there is no mentioning of different versions of the same report, rather the report is presented to all involved actors in the same 'language'.
22. Increase awareness	Increase awareness of policy makers and public on the need for change in policy and on the importance of the environmental content of the project.
23. Focused stakeholder inclusion	Include and seek stakeholders which have an added value to the research and who can profit from the research.
24. Involvement of third party	Involvement of an actor to establish communication between scientists and non-experts either fully or partially.
25. (Increased) Attention for the SPI	Emphasise that there is a need to improve the understanding of a SPI for the project and enhance the connectivity between science and policy without clear description for the activities to do this.
26. Development and work with interface or database	Explaining the use and necessity for an interface and/or database through which policy recommendations can be made or extracted.
27. Active role for policy makers in contributing to the research	Clearly mentioning the role of policy makers in the project: how can they contribute to the project and how can they contribute to the use of the outcomes of the project? Policy makers are seen as crucial part to the success of the project in process as well as in use.
28. Activities to improve the SPI	Approaches and activities aimed at improving and establishing a science-policy interface in the project.
29. Aiming at change of general behaviour	Encouragement by scientists to change behaviour of policy makers or public.
30. Working towards a common goal	Looking for an agreement between the different actors on what should be the goal of (a part of) the project. The unique aspect of this code is that it clearly focuses on the work for a common understanding on what has to be done.
31. Support policy making	Provides knowledge on what the problem is and why it is tackled in this way. Usually goes paired with interaction between scientists and policy makers. This code specifically focuses on the intentions of the project towards policy.

For the classification a similar approach was used since it is, in fact, a higher order of coding which helps to structure the data (Elliot and Timurak, 2005). Based on the code descriptions

and the content of the phrases, six classes were developed for the codes as can be found in table 5. Finally, duplicate phrases have been removed and codes have been double checked during the classification in order to make the coding less dependent of the mind-set of the researcher.

Table 5: Identified classes with corresponding codes.

Class	Code
Communication	5. Involve the public/ SH through different media 9. Reach out to wide audience 13. Open access to research for everyone 15. Dissemination of results 20. Improvement for communication needed 22. Increase awareness 29. Aiming at change of general behaviour
Involving stakeholders	6. Using networks 11. Stakeholder consultation 12. Invest in continued SH participation 17. Participatory approach 18. Get involved in others' activities 23. Focused stakeholder inclusion
Supportive for policy	2. Guide policy making 14. Demand for knowledge 19. Active attention for policy 27. Active role for policy makers in contributing to the research 31. Support policy making
Scientific interest	7. Effort to include (more) scientific actors 8. Publication of papers for scientist's interest 16. Scientific focus on research
Orientation for science-policy cooperation	4. Interdisciplinary cooperation for jointly approved targets 10. Knowledge adjusted to user group 21. Translation of languages 24. Involvement of third party 25. (Increased) attention/action for the SPI 28. Activities to improve the SPI 30. Working towards a common goal
Tools and approaches	1. Work on measurability (for PM) 3. Scalability of project 26. Development and work with mechanism or database

With the classes set and assigned it was possible to reconstruct how the SPI was described. The construction of the SPIs made it possible to identify the problem and solution definitions and the undertaken activities. Next to this it was possible to compare the different SPIs from the projects and look for differences and similarities in the SPIs. Additionally it helped identifying which stakeholders were involved throughout the project. This helped determine if there was a mixture of natural science oriented actors and policy oriented actors and others.

Next to the literature research interviews have been held to obtain further information on some of the elements from the SPI as well as the expected effects of the SPI. The interviews were most valuable for the projects which had not yet expired to give insight in the final phases of the project's actions but they also provided more context for the phrases.

Before continuing to the "Results" chapter it should be explained what information was used for which sections. For the first section, "Description of the projects SPIs" the main source of information was literature with some additions of the interviews. In the second section "Practical implementation of the SPI" there was a combination of literature and interview information. In some projects the contribution of the interviews was great due to a lack of

documented information. For the “Expected outcomes of the SPI” the interviews were the main source of information as most of the projects did not evaluate the influence of their SPI. In short the interviews are used as source of information where literature was lacking.

4. Results

In this chapter the results from this research will be presented through illustrative citations – from publically accessible documents – and quotes that resemble the aspects of the SPI frames from the various FP7 projects. This chapter is built up in three sections with various sub-sections to provide a clear overview of the main aspects of a SPI in a chronological order. At the end of each section a short summary will be provided with the projects’ view on the SPI. The first section presents the problems with associated solutions in the science-policy interface which helps determine how the projects frame the SPI. In the second section the actions that have been undertaken to develop and maintain a SPI will be presented. The final section will present projects’ (expected) outcomes and compare these with the actions to see if these contributed to a higher impact on the policy domain.

4.1 Description of the projects’ SPIs

First of all it is important to remark that of all projects eight used the exact term science-policy interface to describe the SPI within their projects. SoilService and TESS did not mention a ‘science-policy interface’ in the analysed documents, but there were findings of phrasings that resemble SPI characteristics. The interaction between scientists and policy makers was formulated in a form similar to the following example:

“A variety of information flows, analysis approaches and decision processes used for environmental assessment and sustainability assessment for biodiversity were identified by discussions with government departments (WP2) and local case-study sites (WP3) across a limited range of countries, in which partners are based and in which governance approaches are likely to differ.” (TESS, 2009a p.3)

The other projects did mention a science-policy interface with some specification like this:

“HERMIONE will also continue to develop and implement appropriate science-policy interfaces to ensure policy relevance of the research and to facilitate rapid translation of research into policy advice at national, European, and international levels...” (Weaver et al., 2009 p.181)

Although SoilService and TESS did not use the exact term ‘science-policy interface’ since this concept was not widespread at that time, various aspects that are included in a SPI have been mentioned in the project’s documentation. To determine how the SPI was framed the following sub-sections will analyse and compare the role of stakeholder involvement, communication and dissemination, relation with the policy domain, raising awareness and networking in the framing. Eventually the description of the SPI will be compared with the project objectives to see if these match.

Stakeholders

To begin with, all projects stated in some way that needs and interest of policy makers and other end-users should be taken into account during the research. Usually this is mentioned as direct engagement with stakeholders or as stakeholder consultation:

“To ensure that the models and products produced are relevant to the needs of decision makers, stakeholders will be consulted in the development of indicators to be used in Modules 2 and 3.” (ROBIN, 2011a p.5)

Most projects had not yet defined the approach to stakeholder engagement in the first phase of the project. HERMIONE and SPIRAL were exceptions as they had concrete examples of an organized panel with stakeholders to actively communicate with, respectively the Science Implementation Panel and the Dynamic Network of Advisors. These panels were asked to guide the project in keeping outputs policy relevant and to inform the project on policy developments. Next to HERMIONE and SPIRAL there were some other projects that had an Advisory board with less outspoken tasks. Thus stakeholder inclusion was important in the first place to understand their needs and interests but also to obtain additional information on the issue and for this interaction is necessary. Interaction took place in various forms ranging from surveys which were sent and reflected upon with scientists and stakeholders as well as meetings during which feedback was given on the project. Such interaction is seen as a two-way process.

“To guarantee its usability, this web tool will be developed in close cooperation with the ‘users’ from the target groups ...” (BESAFE, 2013a p.4)

“Stakeholder engagement in REFRESH will be a two-way process. WP1 Task 3 will provide a forum for discussion and agreement of appropriate scenarios and storylines to be used in REFRESH and identification of potential barriers to the implementation of adaptation and mitigation strategies.” (REFRESH, 2014 p.3)

Not all projects included these elements in their description and neither did they all do it extensively. BioFresh and BIOMOT focused more on the communication and dissemination than on interaction with policy actors, despite BIOMOT having stated that two-way interaction through interviews is very important. It should be mentioned though that BIOMOT had this kind of interaction with other stakeholders. STEP and SPIRAL did not really elaborate on the two-way interaction either but they did include the necessity of feedback from stakeholders on the project.

Most projects stated to involve stakeholders mainly through personal and professional networks, but it was not always clear how these stakeholders were selected. HERMIONE and REFRESH however mention the use of a stakeholder analysis to identify relevant stakeholders. With the exception of SoilService all projects mention the need for a close collaboration and investment in continuous involvement – either through participation or informing – of the stakeholders in the project. REFRESH focused the continuous involvement of political stakeholders in one work package rather than for the whole project.

Overall most projects ascribed a role to (policy) stakeholders with two-way interaction in the SPI. From the selected projects BIOMOT and BioFresh paid least attention to the involvement of policy actors in the SPI from the beginning of the project. A critical note should be made for BioFresh since the used Description of Work (DoW) mentioned stakeholder inclusion from the beginning for one work package. But since the latest version of the DoW was used it cannot be established if this aspect was included in the first version as well. On the other side of the spectrum stand HERMIONE, ROBIN and TESS who clearly outlined the importance and relevance of (political) stakeholders for the research.

Somewhere between these two groups stand BESAFE, REFRESH, SoilService, SPIRAL and STEP as they did not extensively describe stakeholder inclusion nor lacked it. In the case of REFRESH it must be said that the stakeholder inclusion was found almost exclusively in one work package but for this work package there was lot of attention for stakeholders which led to this grouping. These results lead to the following categorization of stakeholder inclusion in the SPI framing:

1. Minor involvement of stakeholders in the SPI
2. Stakeholder involvement seen as a part of the SPI
3. Major stakeholder involvement needed in the SPI

The results above show that the projects BIOMOT and BioFresh should be matched with the first category, BESAFE, REFRESH, SoilService, SPIRAL and STEP match the second category and HERMIONE, ROBIN and TESS fit best with the third category. The next subsection will elaborate on the results for communication and dissemination.

Communication and dissemination

There were a lot of findings on communication and dissemination showing different approaches but with comparable characteristics. For starters, with the exception of SoilService and TESS all projects emphasized the use of diverse dissemination channels. In general, projects saw communication as the use of traditional channels to spread information:

“to engage directly with stakeholders throughout the project through workshops, brochures, web based applications, public meetings, publications in popular and policy relevant media and scientific papers.” (BESAFE, 2011 p.7)

Some projects chose to focus on certain types of dissemination and communication channels. HERMIONE put a focus on the use of e-media such as YouTube and Wikipedia while STEP put a major focus on the use of journalistic media. In a later stadium of the project BIOMOT and BioFresh emphasized the use of journalistic media and increased the use of different communication channels. Although conferences were included as communication methods in the projects, BIOMOT, SoilService and STEP had included during the description of the SPI the importance of mid-term (BIOMOT) and end-conferences (SoilService and STEP) to get the message across and elicit discussions with stakeholders. Usually the mentioned activities were accompanied by a description of actor groups that had to be reached with these activities.

“Communicate and disseminate project results to: The Public, Policy makers, Managers, Practitioners, Conservation bodies and the Research community” (Kernan, 2010 p.27)

In general the dissemination products were meant for a wider audience, but usually in other parts of the documents there was more specific information on the target audience. HERMIONE, REFRESH, ROBIN and SPIRAL specified that their disseminated information should focus on stakeholders and, together with STEP, that dissemination activities should be adjusted to the target group. BioFresh, HERMIONE, ROBIN, REFRESH and SoilService specifically outlined that outputs had to be aimed at policy maker. SoilService was the only project that initially required the results to be disseminated internally and to a limited extent to external actors. Only during a late phase did it include this type of dissemination in the SPI

description. Consequential, SoilService was the only project that posted little information on the website for external actors, all other projects mentioned an extensive use of the website. For the publications REFRESH and ROBIN formulated a clear distinction for which products could be disseminated internally and externally, with ROBIN emphasizing that external publication should occur during a later phase.

Another important aspect that was found in the projects is the translation of the products. On the one hand this meant that products were translated from English to other national languages, on the other hand this meant that information was made intelligible and relevant for policy makers.

“HERMIONE will also continue to develop and implement appropriate science-policy interfaces to ensure policy relevance of the research and to facilitate rapid translation of research into policy advice at national, European, and international levels...” (Weaver et al. 2009 p.181)

In most cases the projects mentioned a ‘translation’ of scientific knowledge to understandable outputs but there were also examples of projects who referred to a ‘tailored approach’ or a ‘right format’ to show awareness of the difference between scientific and policy formulations and a need to adjust this to understand each other. In its core these different terms say the following, which was well formulated by Sybille van den Hove during the interview “... of course when you are going to meet policy makers and you use scientific jargon and you do not target your key messages in what you want to say and if you just flash vague scientific grasps without explaining. You need communication skills but the policy makers are able to understand complex messages.” Essentially all efforts that include aspects that imply a reduction of scientific jargon – such as simplification and translation – show that projects are taking into account that providing stakeholders with scientific reports is not sufficient to effectively influence policy. It was very common that this translation was perceived as something that should be done by a group of scientists directly involved with the project, usually accompanied by a partner specialized in communication, or as something that could be done by a partner. For BioFresh the communication was so important that they included specialists. In other projects it was not clearly specified which approach would be used but the formulations were similar to the following:

“Translating the scientific results of STEP into easy understandable forms, such as best practices, recommendations, guidelines, published through popular science newsletters, brochures...” (STEP, 2010a p.10)

Simplification of outputs was shown through the use of popular media as Twitter by BESAFE, ROBIN and STEP to reach out to the public and stakeholders. Next to this BioFresh and STEP mentioned the training of stakeholders to get used to SPI activities as a part of their description. These activities give an impression of various forms through which translation could take place. Further elaboration on such activities is given in the next section: ‘Practical implementation of the SPI’. An important addition to the use of activities was made by ROBIN and STEP who included a research on the most appropriate dissemination activities in their SPI description.

Additionally there were four projects that assigned an important role to the openness and accessibility of the outputs for a SPI on top of the use of websites: BESAFE, BioFresh, ROBIN and STEP.

“The Strategy is also in accordance with the latest directives of the Council of Europe recognising ‘the strategic importance for Europe’s scientific development of open access to scientific information’ (STEP, 2010a p.2)

Although the quote implies that according to regulations it was obligatory to openly publish the results, it was not common in the projects to include it in the SPI description. Therefore it is additionally mentioned in this section to emphasize that there were projects who deliberately included this.

The results show that the projects had different priorities to communication and emphasized different elements in communication. According to most projects it was useful to use a variety of communication channels, some focussing more on journalistic media and some on e-media. What all projects had in common is the use of a digital platform to reach stakeholders. All projects stated that it was important to make results policy and stakeholder relevant and all projects noticed that translations were an integral part of communication, either by including it in the tasks of scientists or by (partially) outsourcing it to partners. These views on the importance of communication in a SPI allow for three categories:

1. Limited external communication with a focus on stakeholders
2. Attention for external communication with a focus on stakeholders and emphasis on intelligibility
3. Extensive external communication with a focus on stakeholders and emphasis on intelligibility

SoilService and BIOMOT are part of the first category as they paid least attention to communication in the SPI description. BESAFE, TESS and SPIRAL are assigned to the second category since they do underline the importance of communication and elaborate on methodology, but compared to the next set of projects they seem to have put less emphasis on communication to external actors. Finally BioFresh, HERMIONE, REFRESH, ROBIN and STEP had added value to communication in various aspects and are therefore placed in the third category.

Relation with policy domain

As should have become clear from the previous sub-sections all projects included stakeholders and policy and decision makers in the SPI to some extent. Policy makers were perceived as actors that could provide input to the projects, should be able to give feedback and tell scientists how they perceived problems and how outputs could best be communicated to them in an understandable format. But there were also projects that showed an additional interest in supporting policy making through a science-policy interface.

“It will identify and liaise with specific key decision makers in the policy community to understand policy requirements and the most appropriate routes for delivering high quality policy-relevant information so that decision makers can implement well supported and reliable actions.” (STEP, 2009 p.54)

This was how BESAFE, BioFresh, and STEP described the support of policy actors in the SPI. In a similar way SPIRAL described support of policy actors by helping them, together with scientists, to understand how a SPI works and by looking at how to improve these interfaces. Additionally SPIRAL had established a Dynamic Network of Advisors and, a network which would actively engage stakeholders to be involved in the project and establish a closer link between stakeholders and the project. HERMIONE and SoilService had a slightly different approach to policy support, they described the help by feeding outcomes into different policy levels. Hereby it should be remarked that SoilService included this in their description during a later phase of the project.

BioFresh, HERMIONE and STEP showed some additional policy commitment in their description. BioFresh for instance stated that the EU would be the main level for their science policy dialogue due to the relevance of the project which was centred around the EU. HERMIONE announced the establishment of a Science Policy Panel which would have had the task to closely interact with the policy domain so that policy evolution could take place during the project. Finally, for STEP close and informal interaction seemed an important aspect in the description of the SPI since an Annual bee breakfast at the European Parliament was included. These annual breakfasts were meant to briefly inform policy makers at EU level on the status of the project and more importantly on new findings.

By comparing how much the projects involved the policy domain two groups could be identified:

1. Include policy actors as a part of the SPI
2. Provide active and important role for policy actors in SPI

BIOMOT, REFRESH, ROBIN and TESS did not describe an intensive role for policy actors particular so they are part of the first group. In contrast BESAFE, BioFresh, HERMIONE, SoilService, SPIRAL and STEP did ascribe an active role for policy actors to contribute in the SPI and are therefore included in the second group. A remark here is that SoilService included this during the end of its first phase.

Raising awareness

For a project to be able to connect to the policy domain and work with stakeholders it was important to get noticed and be known. The difference with communication and dissemination is that for those a public is needed and a public is gained by getting known. It was important that stakeholders in the broad sense were knowledgeable of the field in which the project took place. The following citation adds up to the explanation and exemplifies how awareness raising was included in SPI description.

“Make farmers and farmers organisations aware of the ecosystem services that are present in soil of their pastures and fields etc. and the economic and long term benefits they may gain from taking use of these services.” (SoilService, 2010a p.2)

Just more than half of the projects included awareness raising in their SPI description, BESAFE, BIOMOT, REFRESH and TESS did not include this aspect. Whereas the majority of the other projects had to start raising awareness on the project and on the topic they were studying, STEP and HERMIONE had an advantage over these: during the FP6 there were projects that already had raised awareness on pollinators and the deep-sea, respectively

ALARM and HERMES. This factor might have contributed to their clear outlining of awareness raising activities.

From the findings two groups were distinguished:

1. Projects that initially paid little to no attention to awareness raising in their description
2. Projects that did include the aspect of awareness raising in the SPI description

BESAFE, BIOMOT, REFRESH and TESS are classified as the first group, BioFresh, HERMIONE, ROBIN, SoilService, SPIRAL and STEP are classified as the second group.

Networks

A final aspect that was found to be of importance in the description of the SPI is the use of networks. All projects but REFRESH included connections to networks and the development of new networks. BESAFE, BIOMOT, ROBIN and STEP planned to make use of existing networks such as ALTERNET, TEEB and COLOS. SoilService, ROBIN and BIOMOT strongly encouraged their partners to use their personal and professional networks to expand the range of the project. Next to this HERMIONE, ROBIN, SPIRAL and STEP highlighted that networks were assumed to grow in a 'natural' way throughout the project and making use of a social aspect. Such an interpretation implies that networking in a SPI is seen as a process and should go further than making use of established links. In the 'Stakeholder' subsection it has already been mentioned that networks were also used to involve more stakeholders and actors in the project.

"Establish contacts with relevant scientists in ecology and economy, national farmers organisations; stakeholders and policymakers to disseminate our results on national level and within the European community for future development on EU policies" (SoilService, 2010a p.2)

This citation illustrates the instrumental use of networks, namely that networks would help to disseminate results further into policy domains and get attention for the project. With an exception of ROBIN the projects explicitly mentioned in their documents that the links were assumed to contribute to a further dissemination of the results.

Networks were important in the SPI description because they helped reaching the right stakeholders and to magnify the effect of the research. The extent to which the networks were included in the description and the use that was ascribed to the networks makes it possible to distinguish three categories:

1. Networking not included in SPI description
2. Network included in SPI description
3. Network included and extensively described in SPI description

REFRESH was the only project that is part of the first category. BioFresh, BIOMOT, ROBIN and TESS did include the aspect of networks and networking into its SPI description but their description of the importance of networks was not extensive. Therefore they are assigned to the second category. Finally BESAFE, HERMIONE, SoilService, SPIRAL and STEP described extensively what the role of networks was and what it meant for a SPI which makes them part of the third category.

Intentions of the SPI: problems and solutions

This sub-section will look at the sum of the aspects found in the SPI description and formulate frames which have been adopted by the projects. Next to this the SPI frames will be held next to the project objective to see how these related to one another. The analysed projects all had different formulations for their SPI but when compared with one another it becomes clear that there were similarities in the core messages. By taking these together and subsequently comparing the five SPI aspects between the projects three SPI frames emerged:

1. SPI as one-way process that informs policy actors rather than including them in the project

BIOMOT, REFRESH and SoilService framed a science-policy interface as a rather one-way process in which the policy domain should be initially involved and after this involvement is informed rather than included in the project. BIOMOT aimed to provide the policy domain with a certain understanding to affect policy making, implying that better policy can be made with more knowledge. In contrast, SoilService was to develop a tool which would help policy actors to evaluate soil quality in economic-ecological terms. REFRESH aimed to feed its results into policy making which implies that it is taken up more actively than when policy actors are only informed. The underlying thought was that by improving the knowledge on freshwater this knowledge could be implemented well in policy to improve freshwater biodiversity. Even though REFRESH mentioned a continuous stakeholder inclusion, it was not used for the full project, but only for one work package. Since REFRESH and SoilService wanted to produce tools for policy making a two-way interaction with discussion on outputs would have been a more logical approach.

2. SPI as two-way process that includes and facilitates the involvement of policy stakeholders

BESAFE, SPIRAL and TESS framed the SPI as a process that should be facilitated and should welcome stakeholders in the project. The facilitation of the SPI was described different per project: BESAFE was unclear on the whereabouts of the SPI but did frame it as an integral part of the project with the involvement of stakeholders; SPIRAL described the SPI as an integral part of the project but mainly because it was the study object, the SPI was seen as an observable part of other projects where SPIRAL would help when possible; and TESS described the SPI as a process on a small scale and focused on communication with known stakeholders. The main difference between TESS and REFRESH was that the whole project of TESS was focused on a small scale instead of one work package with other work packages that seemed to forget the SPI. BESAFE had a two-way interaction frame and its objective was to provide policy actors information and tools for this information to argue more effectively for biodiversity. TESS and SPIRAL aimed to feed their results into the policy domain. TESS and SPIRAL wanted to develop tools and handbooks for policy use to improve their way of making policy which made two-way interaction a logical part of the project.

3. SPI as two-way process that assigns a major role to policy stakeholders and actively involves them

Finally there were four projects that framed the SPI as a two-way interaction with a major role for stakeholders: BioFresh, HERMIONE, ROBIN and STEP. These projects described

elaborately the interaction between science and policy and provided policy actors with an active role in the project. There still was a variation in the elaboration between projects, but in general they had in common that they reached out to the policy domain more than the projects with other descriptions. Remarkable was that ROBIN described such an intensive two-way communications while its objectives show that they aimed to provide policy makers with more knowledge on how to implement REDD mechanisms and monitor outputs. Another unexpected result was that STEP described much activity in the two-way interaction but their main goal was to improve the knowledge base on pollinators, not necessarily for the policy domain. Contrasting to these BioFresh and HERMIONE stated in their objectives that they wanted to feed their results into policy which corresponded with the SPI descriptions. In the case of BioFresh this was because there was lots of knowledge on freshwater systems spread across the globe and it was not used well. By collecting this knowledge and storing it in one place the project wanted to help policy actors and researchers to reach this information more easily. HERMIONE on the other hand aimed to provide actors with knowledge on the deep-sea and tools to use this knowledge to ensure establishment of policy for sustainable use of the deep-sea.

Framing the SPI provided an insight in the promises and problem-solution definitions of the interfaces and guide the projects in how they should implement their own SPI. Since this is only a promise it is important to see how the interfaces worked out in practice and how these differ from the SPI descriptions. The next section will show the differences and similarities in approaches and activities in the SPI.

4.2 Practical implementation and activities of the SPI

This section will deal with the implementation of the SPI and will show which approaches and actions have been used in the projects while comparing these. At the end of each sub-section a summary of the approaches and a categorization will be provided in order to assign frames to the projects' actions at the end of this section. Included in these outcomes are new problem definitions to the SPI and newly proposed solutions to these problems. At the end of each sub-section a comparison between the SPI description and the implementation will be made to see whether there was a contrast between promises and actions. A critical remark to this is that deviations with the SPI descriptions might occur due to a small amount of available data for projects that have not yet documented the last phase of the project. These projects were BESAFE, BIOMOT, ROBIN and STEP.

Stakeholders

Stakeholders were described as an important part of the SPI, according to the projects they were needed to get feedback on the stakeholders needs, make outputs understandable and increase the overall relevance of the project for stakeholders. In accordance with the SPI description projects made efforts to do this, usually during workshops and interviews. Regardless, REFRESH remained in its approach to include stakeholders mainly in the socio-economic work package. Contrastingly, SoilService, who did not mention such stakeholder inclusion in its SPI description, also had workshops for policy makers and other stakeholders. The following phrase exemplifies how stakeholder inclusion generally was found in the documentation.

“During its first year, pilot surveys were carried out in nine countries by the main project partners in order to list and analyse the existing government information

requirements at national and intermediate levels and to identify the local level information needs of both local municipalities and stakeholders in making assessments and decisions for land-use management.” (Sharp et al., 2011 p.5)

While all projects involved stakeholders for these matters BioFresh and SPIRAL made some additional effort by stimulating stakeholders to provide feedback outside the planned activities. This took place through open invitations in newsletters and on the website, asking stakeholders if they could help improve the communication. HERMIONE as well requested additional feedback from stakeholders, although they did not do this through newsletters and such. Instead they had different panels and groups who could be asked for additional feedback during the full duration of the project. For ROBIN and TESS one of the main components was the continuous stakeholder involvement. For ROBIN this was important as the project worked with different countries who had diverging visions and demands which had to be brought together. As for TESS, stakeholder inclusion was crucial due to the local aspect of it and the design of a tool that had to be used by both local and policy stakeholders. BESAFE, although they approached stakeholders during workshops to become their ambassadors, are not included in the group of projects who made extensive effort to stakeholder inclusion. The reason is that, as Rob Bugter (BESAFE) said, they hoped that people would become their ambassadors, implying that there was no further contact with the stakeholders to assure their further interest.

1. Stakeholders included in the project when information is needed

“To determine how farmers can be influenced in order to manage their soils and adopt measures to conserve soil organic matter we performed a postal survey to farmers in two countries.” (SoilService, 2012 p.25)

2. Stakeholders requested to provide continuous feedback on the project

“We are already responding to a number of comments and suggestions we received [on the data portal], but we are still very much looking forward to receive any additional remarks!” (BioFresh, 2011a p.7)

These quotes are illustrative for the two categories of stakeholder inclusion that have been found in the projects: one in which stakeholders were asked for information at certain instances and one in which stakeholders were encouraged to stay continuously involved with the project to provide continuous feedback. The first quote shows that stakeholders had certain moments at which they were included officially in the project while the second quote shows that the project could be approached by stakeholders at any time. These quotes support the following categories:

Projects that fall under the first category are BESAFE, BIOMOT, REFRESH, SoilService and STEP. These projects have shown to include stakeholders to some extent to improve the project and to obtain feedback from them. STEP had described an intensive program for stakeholders which was followed in the beginning of the project but there came a shift towards a one-way approach of educating and informing. In the final phase there seemed to be again some more interaction with the stakeholders but this is overshadowed by the high amount of informing activities. Despite BESAFE making some additional effort to get feedback from stakeholders there have been only two stakeholder workshops in three years, despite it being mentioned that committed stakeholder involvement was needed for the

project to be a success. BIOMOT was increasing its activities to further involve stakeholders in the project and use their feedback of which a large part was gained through the SPIRAL workshop on SPIs. The other projects – BioFresh, HERMIONE, ROBIN, SPIRAL and TESS – are part of the second category as they have shown that they continuously involved stakeholders and requested feedback.

Communication and dissemination

There was a great range of dissemination activities which differed per project. Due to the great amount of data and the great range of methods the main aspects will be explained. As was demanded from the projects all had more than one communication channel with some of them emphasizing a particular channel. To start with, digital media were favoured by multiple projects mainly because of the broad audience that could be reached through these and the openness that it provides.

“I am not sure if I used the word internet before, but it is absolutely essential for delivering information to local policy makers. There is no other alternative really that is truly effective.” (Interview Robert Kenward, TESS)

BESAFE used a website to some extent but they were planning to put a greater focus on the web tool that is being produced, how this would exactly be done was unknown. SoilService used a website minimally for some updates on the project and granted public access to selected outputs. On the opposite the TESS website was the main dissemination platform and therefore translated into 23 languages and made user-friendly to be accessible for the local stakeholders, after the final conference they also established a portal for external use. HERMIONE, REFRESH, SPIRAL, STEP and BioFresh paid a lot of attention to the interface and the website as well, also by using feedback from stakeholders for improvement. HERMIONE and REFRESH had continuously updated the website and made a separate section with information for policy actors; SPIRAL has produced an interactive search engine through which an actor can indicate which information he is looking for; for STEP the website was the most important way to communicate with stakeholders and the public by placing announcements and archiving data; and BioFresh put major effort into the website, using a lively blog, making clear sections and providing online trainings to work with the website. These projects showed the potential of web based tools, how it could be effectively used to reach the public and the importance of a good interface. The time spent on the BioFresh website was exceptional, but the reason behind this was a lack of time and resources to have more face-to-face meetings with stakeholders. Instead they had decided to give the same information in an interactive way to an even broader public, recognizing the importance of personal meetings and underlining the lack of resources for these. BioFresh is not the only project that emphasises the importance of personal communication: BIOMOT, REFRESH, SoilService, SPIRAL and TESS too put a major emphasis on this aspect.

“However much time you spend on an email and on crafting it, making it wonderful, it will just get deleted because they don’t feel that it is personal for them. Whereas after a while it became clear that we needed to prioritize that.” (Interview Juliette Young)

“I think that it would be better if there is more dialogue between policy makers of the EU and the projects. This workshop I told you about was my only face to face

contact with them. The conclusion of all of us at that time was that we really should be in dialogue for it to be effective.” (Interview Riyan van den Born)

As mentioned earlier, openness and accessibility were improved through the internet and gradually increased during the projects. It is assumed that there was a lack of accessibility to project outputs in BESAFE, BIOMOT and REFRESH since they stated a need for an improvement of the accessibility of the results. That BESAFE lacked this accessibility is remarkable as it had included this aspect as an important part of the SPI. BioFresh and STEP on the other hand, who had included an extensive view on these aspects in their SPI description, acted in accordance with their description and mentioned the compliance with the directives of the Council of Europe to open access. Although all projects are obliged to comply with these directives it did not become clear from the documents that all projects would give openness to their documents during the project.

A different approach to disseminate to a wide audience was the extensive use of journalistic media (i.e. television, radio and newspapers), adopted by STEP. According to David Kleijn it was important that the project and results were communicated through these media because *“...it is not just the policy makers that are having a choice but it is also the public that can form an opinion based on the outcome of the research and then it is up to them.”* By investing in informing and educating the public – which was done by providing trainings to certain stakeholders ranging from local beekeepers to policy actors – STEP tried to stimulate people to steer policy. But STEP was not the only project that made use of journalistic media, BIOMOT too approached newspapers to spread their findings across a wide public. Next to this STEP tried to enhance the range of research outputs by getting involved in social networks and social media. SPIRAL, ROBIN, BESAFE and BioFresh also made use of Twitter in a later phase of the project.

Summarized the projects made use of some to almost all of the following dissemination methods: newsletters, policy briefs, workshops, conferences and meetings, websites, (hand)books, blogs, YouTube channels and personal communication. Projects used the amount of different outputs in accordance with their descriptions. Here it should be remarked that BIOMOT and REFRESH had very few outputs. Further efforts to the use of dissemination methods have been made by BioFresh, REFRESH and TESS who analysed the most favoured methods and used these for further dissemination. ROBIN and STEP had described this as an integral part to their SPI but with the available information it was not found that this had occurred. Reflecting on the dissemination focus and the approaching end of the project it was not expected that this would effectively happen for STEP.

“The communication methods most favoured [by stakeholders, including policy makers] were short policy briefs, presentations at other events (conferences and national workshops), and face to face meetings. Least popular were blogs, unsolicited mailshots, phone calls and tweets.” (REFRESH, 2013a p.6)

For the implementation of the communication it was found that BESAFE and BioFresh designated a greater part of their communication to a partner in the consortium. In the case of BESAFE the Communication and Dissemination strategy shows that Pensoft (one of their partners) was responsible for almost all written dissemination materials. BioFresh assigned parts of the communication to partners, in the words of Klement Tockner *“because the SPI*

somehow, like PR has to be done in a professional way." This is substantiated by one of the phrases in the Description of Work of BioFresh:

"Due to the importance of communication skills and professional PR work in this type of project, public relations will be implemented by Ecologic Institute, Oxford University and IUCN. Their task will be to take up project results from all partners, and develop strategies and products for wide dissemination to a multitude of stakeholder groups, as well as the general public." (BioFresh, 2013a p.89)

BioFresh decided that for written materials it was useful to have a professional partner that could deal with this in a good way. Other dissemination activities were meant to be done with a broader range of partners. The difference between BioFresh and BESAFE is that BioFresh made a clear distinction between what lied beyond the scientific partners' possibilities and what they could do, keeping an eye out on what the professionals were doing. In the case of BESAFE the 'Communication and Dissemination Implementation Plan' showed that most of the written communication materials would fall under the responsibility of one actor without further elaboration on this task division. That it could be useful to have partners who support a project in the communication appeared from the interview with Riyan van den Born (BIOMOT) who mentions that it is not always possible for scientists to communicate their results to non-scientists: *"but you also notice that when at the same meetings we have to talk about communication it was often a step too far for the researchers"*. Deriving from this she mentioned that it would be useful to educate scientists in the importance of communication of science, a view that was supported by Julia Martin-Ortega (REFRESH).

Another aspect of communication was an increase in dissemination activities and attention for the right language and format. All projects made efforts to translate scientific knowledge and put the information in the right format. To this end ROBIN and SPIRAL had decided that their final output would consist of multiple briefs from which the reader could select those that fit his interests best rather than producing general outcomes. In some cases projects stumbled upon troubles because of their approaches and adapted their strategy. The occurrence of problems showed that it was not always possible to follow desired routes and plans sometimes had to be adjusted. On an official level this was done in the DoW. In order to take such deviations into account, a DoW was said to always include a possibility to make adaptations and changes in the approach. Sybille van den Hove gave a good reason why this is so important in a research:

"So you write a great DoW, this is what we are going to do for four years, but things change. If you knew exactly on day one what you would do for the coming four years, then it is a fake, it means it is not a unique research. There are surprises, things that don't work, other ideas that pop up." (Interview Sybille van den Hove)

A general change that was found with BESAFE, BIOMOT, REFRESH, ROBIN and TESS was the shift in focus groups and the way of giving information. ROBIN and TESS adopted changes on the scale at which they put the focus, the other projects included new stakeholders in the dissemination: policy makers in the case of REFRESH and BIOMOT and a broader stakeholder group in the case of BESAFE. Additionally these projects expressed a need for an increase of dissemination activities and the translation and formatting of outputs.

“Another outcome is the weak involvement of non-leading partners, which is an after-effect of the non-inclusion of substantial communication in the design of the project.” (Van den Born et al., 2014 p.4)

This referred to a lack of external communication from the beginning towards political and other actors. Next to this BIOMOT came across another dissemination aspect that could be improved, namely the time spent on communication with those non-leading actors which was underestimated. These problems were meant to be fixed by the communication team during the second and final phase of the project. BIOMOT, together with ROBIN, BESAFE and BioFresh, improved their communication and dissemination activities with the recommendations that they gained from the SPIRAL workshop on SPIs. REFRESH encountered similar hurdles during the project but followed a different path to improve the SPI. The SPI Water Cluster Group wrote out a report with advice on how to improve a SPI which was taken up by REFRESH. From the documentation it appeared that from that moment the attention for intelligibility and translation increased and more was done in the field of communication.

“Dissemination of the Project results is a key component of REFRESH and considerable resources have been set aside so that output from the Project reaches the widest (and most appropriate) audience and is communicated in a way that ensures these results have a practical applicability.” (REFRESH, 2014 p.3)

During the interviews with representatives of BioFresh and BIOMOT the interviewees mentioned that there was not enough time for the dissemination and that effects of communication could not be measured. According to Luuk Knippenberg this was due to the way a research project is framed *“When it is finished and then for us, because we frame it as a scientific project, then it is finished and then perhaps there will be articles published but scientists have to go on to other projects.”* Both Luuk Knippenberg and Klement Tockner mention the desire for an additional period in which dissemination of the full set of results can take place. Additionally Klement Tockner stated that during such a period delay effects could be observed which would allow a project to better reflect on its outcomes. Next to this he mentioned a lack of time and resources for large stakeholder meetings in which information could be disseminated well. This however could have been caused by other factors than the amount of resources for the project.

Yet another approach to communication was projects pulling together and presenting the outcomes of both projects at the same conference. This was done by BioFresh and REFRESH who organized a symposium together and it was done by HERMIONE and CoralFresh as well. The main benefit of this approach was said to have been a reduction of efforts that policy makers needed to make to be present at various conferences or symposia at various times. This was expected to increase the number of attendees since policy makers had to reserve only one timeslot for multiple projects.

The communication and dissemination of the projects – in relation to the SPI – consisted of various aspects which in total provide an insight in the activities of the SPI. The projects can be categorized to the extent to which they implemented SPI activities but there are lots of nuances. Before the categorization is done a remark should be made on BIOMOT and REFRESH who know two SPI activity phases: before and after the advice on SPIs. Before

the SPIRAL workshop and the SPI Water Cluster Group advice these projects were passive in the implementation of SPI strategies. In the case of BIOMOT this was mainly because the focus was put on a science-society interface which led to little research and insight in a SPI: *“The whole project is more framed on the science society interface because we were looking at new ways how to motivate society as a whole and policy makers to act for biodiversity. That was the purpose of the project, we were looking for that. And then at a certain moment, just after 2 years, the EU came and the EC, they said ‘No no no, you should focus more on the SPI’, which is something completely different. We made the switch but it explains why we didn’t focus on the beginning that much.”* (Interview Luuk Knippenberg). For the categorization of these projects an emphasis is put on the ‘second’ implementation phase. The following quotes are supportive for the three determined communication categories:

1. Little communication and dissemination activities

“Just presenting the evidence that biodiversity is important does not seem to work, so we need to learn how to communicate the message better. Therefore we should not just address policy makers, but also NGO’s and biodiversity people in general because they need to be convinced that they need to change their approach when it comes to “selling biodiversity”.” (Bugter, 2014 p.6)

2. Making use of conventional communication and dissemination activities

“Three synthetic reports on lessons learnt from existing science-policy interfaces; A collaborative Internet pilot platform for the AfriSeb Network; A website and regular newsletters, providing updated information about the evolution and results of the project...” (SPIRAL, 2011 p.6)

3. Extensive use of communication and dissemination activities

“The survey found that preferred methods for receiving scientific information on freshwater biodiversity include face-to-face briefings, policy briefs and conferences/workshops, with less interest in newspapers/magazine articles. Blogs and YouTube-style videos are recommended, with blogs allowing for real time targeted interaction between the scientific and policy/stakeholder communities.” (BioFresh, 2013b p.8)

The results show that from all projects BESAFE and BIOMOT have paid least attention to communication and dissemination during the project. In contrast, BESAFE had described lots of communication activities but these were not found. Next to this it was not clear from the description itself that the greater part of the dissemination would be done by solely one partner. In the end, BESAFE turned out to be less active in the action phase than the SPI description had promised. Despite BIOMOT’s efforts during the second part of the project there was not enough information to tell to what extent their communication activities have improved.

Compared to the other projects TESS, SPIRAL, SoilService and ROBIN did not intensively communicate with external actors but they did use the conventional dissemination channels. TESS was very active in local communication/ participation but they did mention improvements for the communication. SPIRAL did not intend to extensively communicate with her stakeholders as they were mainly studying the interaction between actors (which included stakeholders). Still, dissemination of the results was continuously prioritized: briefs

were published, newsletters were sent and SPIRAL was open for questions. Yet when compared to the other projects they did not use a broad range of dissemination channels and put a focus on the main stakeholders. SoilService is a case which exemplifies the difference between communication and dissemination. Contrasting to their SPI description SoilService had lots of communication with actors and stakeholders during the project and informed them in few ways. But the dissemination was hardly present: actors who were not directly involved through a network could hardly get to the project information. The lack of dissemination activities complies with the SPI description as this was not well included in the activities. ROBIN is part of this category as with the available information ROBIN cannot be placed in the third category, yet it is not excluded that with the efforts in the final phase it could eventually be included in the third category. Additionally REFRESH is placed in this category as well. Since the changes in their communication strategy REFRESH became more active in communicating and disseminating results with the policy domain on other scales next to the case studies. Despite the great improvements it is not expected that REFRESH had reached the third category.

Finally BioFresh, STEP and HERMIONE are part of the last category. These projects have made extensive use of dissemination channels and used plenty of dissemination channels, in accordance with their SPI description. STEP was found to invest a lot of energy in journalistic media, reaching a broad audience. Because of this a lot of the communication appeared to be on an impersonal level. Although BioFresh's start was not very strong it was active in different communication channels before they participated in the SPIRAL workshop and after the workshop it further improved its activities. Included was a shift from the desired stakeholder meetings to interactive digital media. Due to time and resource constraints the project tried to simulate the planned interaction in a digital environment with a wider reach. For HERMIONE there is little more to say than that its implementation complied with the description and a great diversity of dissemination and communication channels and activities have been held throughout the entire project.

Relation with policy domain

Policy actors have been part of the stakeholders and were also targets of the communication and dissemination but from the results there appear specific outcomes that need more attention. When the projects approached policy makers they usually encountered a barrier. BESAFE, BIOMOT, BioFresh, HERMIONE, REFRESH, ROBIN and SoilService all mentioned that it was hard to get in touch with policy makers. HERMIONE had most trouble to reach policy actors at the European level and SoilService and ROBIN especially had trouble to reach policy actors at the national level.

“Problems we had, it is really hard to reach the top level policy makers because these guys are busy and they don't necessarily have the time to come to your meetings.” (interview Sybille van den Hove)

To gain the interest of policy makers Klement Tockner stated that it was important to present a strong, scientifically funded story in a short time. SoilService, HERMIONE and BIOMOT mentioned that meetings for policy makers in the EU were held in Brussels so that it would reduce the time needed for travelling, just as the joint meetings that were mentioned in the previous sub-section. SPIRAL, STEP and TESS on the other hand did not mention these troubles. SPIRAL was studying science-policy interfaces and therefore did not necessarily need to approach policy makers outside the observed SPIs. Next to this they had close

contact with the Scientific Officer who was very involved with the project. In the case of STEP it was assumed that policy makers were well informed on their outcomes since they were able to publish in Science for Environmental policy, the DG (Directorate-General) Environment News Alert Service. Through this, their presence at a high number of meetings, conferences and symposia to present their findings and the issue being hotly debated, STEP thought to have a lot of communication with the policy domain next to a wider audience. Finally Robert Kenward from TESS said that policy makers were not directly involved in the process but their input was gained through the coordination team. The importance of the project for the policy domain was highlighted by inviting members of DG Research to the final symposium to stress the importance of the outputs for policy in general, a strategy adopted by SoilService as well. Next to this TESS assumed that stakeholders who had links with the policy domain would indirectly affect policy makers.

Related to the time to spent on visiting projects and generating interest are the time scales at which they work. HERMIONE, REFRESH, SoilService and SPIRAL noticed that the policy domain had certain time limits which influence the impact of a message. Juliette Young gave an illustrative example of the difference in time scales during her interview:

“the difficulty in terms of adjusting different time pressures, you would have Adrian or others, like “Could you give that to me because I need it since yesterday” and then we were struggling to try to find some middle ground” (Interview Juliette Young)

HERMIONE and SoilService were made aware of these limits at forehand and were requested to publish at important moments. Being aware of time limits HERMIONE, SoilService, SPIRAL and TESS tried to publish reports and results in a timely manner. Next to this HERMIONE and REFRESH tried to link their project to the political agenda in order to deal with the time limits. For HERMIONE this worked out well because they had made themselves well known to policy makers. Finally HERMIONE and STEP had organized annual meetings to inform policy makers of the EU on the project and discuss what should further be done. To gain such information it was important to include policy makers in a project's network, an aspect which will be discussed in the next sub-section.

Lastly there are three important findings that have been reported by single projects. One of these is that during a meeting with policy makers it appeared they were more science oriented than ROBIN had expected. This showed that policy makers understood scientific messages and simplified products were not needed per se for communication. The second finding was that policy makers were expected to invest in the SPI and should not wait for scientists to come to them and take the lead in the SPI, it should take equal efforts to make it work. Two examples that were given are that if a SPI is important to policy makers they should also try to make time to get involved in it rather than wait for it to come to them. The second example showed a willingness of scientists to adjust outputs so that policy makers would understand it but with a lack of knowledge how to do this, policy makers were expected to provide feedback and help the project make it work. Although this was found to occur in most projects, BIOMOT appeared to fear that they were expected to take up the interface with policy makers on their own. The last finding concerned a need for capacity building and good working relationships with policy makers. SPIRAL got supported by their Scientific Officer by developing a good working relationship and being open for communication which gave them opportunities to further work out their project.

Taking these policy domain related aspects into account, three different categories were made:

1. Late development of a relation with the policy domain
“Research projects should write, in a standardised-format, a policy statement for each reporting period to demonstrate how results are relevant for EU and national politicians.” (SPI-Water Cluster, 2012 p.2)
2. Good relation with the policy domain
“I would say we started within six months with setting up regional advisory groups. I was beginning with these reservations, certainly in South America, after the first regional advisory group we had and our attempt to try and set up a second regional group so perhaps two years, half way through. And then we kind of changed our strategy a bit to not try and stick with a fixed regional advisory group but thinking in terms of dissemination events to broader policy audience.” (Interview Terry Parr)
3. Close relation with the policy domain
“Yes, [it is important that policy people are also actively involved in the discussion] from the start and it is also what they say when we work with them, that it is really important that they are involved from the start. So they ask a questions to us. It can go two ways, we have to translate what we do but we also have to ask what questions they want us to answer” (Interview Katarina Hedlund)

To a certain extent all projects had a relation with the policy domain but the weakest and late developing relationships were found with BESAFE, BioFresh, BIOMOT and REFRESH. BioFresh, BIOMOT and REFRESH developed closer relations with the policy domain after they got advised how to improve their SPI. From these three projects BioFresh picked this up the best by showing openness to contact with policy actors. BESAFE on the other hand did not express lots of interaction and relations with the policy domain. In the middle category ROBIN, SPIRAL, STEP and TESS are found. These projects have shown to approach the policy domain in different ways but not as intensively as HERMIONE and SoilService, who were categorized as having a close relation with the policy domain. HERMIONE and SoilService documented additional efforts to involve policy actors in their project. Both projects showed awareness towards the little time that policy makers spent on research projects and held meetings in Brussels to reduce travelling time and they took time limits in the policy domain into account for publications. Next to this HERMIONE held annual meetings with policy actors and SoilService invited representatives of different DGs to back up the policy relevance of their findings. These aspects were not unique to HERMIONE and SoilService but the combination and amount of these aspects led to this categorization. Additionally it should be remarked that if BioFresh and REFRESH sooner had started with their final approach they would have been expected to be included in the third category.

Networks and raising awareness

The aspects of networks and raising awareness have been included in the SPI descriptions and have implicitly been dealt with in all projects. This sub-section highlights some of the aspects that have been made more explicit by the projects, recognizing that the projects that are not mentioned had implemented activities in accordance with their descriptions.

An important actor in networking was DG Research and to a certain extent DG Environment who helped BESAFE, SoilService and STEP with getting in touch with important actors and who played an instrumental role by organizing meetings and helping projects to get more known. Additionally DG Research provided some support for the development of the SPI mechanism for ROBIN. By keeping in close contact with DG Research projects could benefit from a broader network with EU policy actors and could improve their SPI. HERMIONE and SPIRAL perhaps benefited most from the contact with DG Research and the Scientific Officer. HERMIONE was presented as an exemplary project for science-policy interfaces and Juliette Young understood that SPIRAL's handbook on effective interfaces between science, policy and society would be distributed among all Horizon 2020 projects.

In fact all projects made use of networks and networking but BESAFE and REFRESH mentioned a need to further implement their strategies into existing networks and increase their networks. Since these notes came up half way the projects it is assumed that till that time both projects were not active in networking. ROBIN included an entry to ECOWEB, a portal with information about various European Eco-Innovation projects, to get attention from existing networks and to raise awareness for the project. This leads to the second topic of this sub-section: raising awareness.

With BioFresh, REFRESH and TESS a lack of awareness on the projects was noticed which led to an increase of certain activities. In the case of REFRESH dissemination and communication activities were increased, making use of the advice of the SPI Water Cluster Group. TESS started to further promote its project and was supported in this by some people from different DGs. BioFresh got advised by its stakeholders to increase its awareness raising activities. To this end the project made more extensive use of the blog and implemented new methods for awareness raising. At the other side of the spectrum stood HERMIONE and STEP on whose topic's awareness was raised through previous projects, respectively HERMES and ALARM. Nonetheless both projects had to present themselves and HERMIONE assured to show interest in policy makers demands in order to get them closer to the project.

Since the projects usually adopted activities that were in accordance with their SPI description there was a minor change in the categorization of the aspects 'Raising awareness' and 'Networks'. Since REFRESH included the use of networks the category 'Networking not included in SPI description' was eliminated, leaving two categories.

1. Make use of awareness raising and networking activities

"The key points to come out of the open discussion session were the need for: credible data, the need for effective promotion of the portal among land users and the need to ensure that users are motivated to be involved in the project and that they will use the system." (TESS, 2011 p.14)

2. Make extensive use of awareness raising and networking activities

"SPIRAL 'mentors' could present the SPIRAL handbook, and engage with teams on how to apply the handbook to improve their science-policy activities. This could result in the development of SPI roadmaps, i.e. the practical steps needed to achieve their SPI goal(s)." (SPIRAL, 2013a p.8)

The projects can be split in two equal groups that are assigned to these categories: BESAFE, BIOMOT, REFRESH, ROBIN and TESS as the projects that did not make extensive use of awareness raising and networking activities; and BioFresh, HERMIONE, SoilService, SPIRAL and STEP who did make extensive use of these activities. When the activities were compared to the descriptions it was found that BESAFE and ROBIN have been less active in raising awareness for the project than was expected and BESAFE did also appear to be less active in networking. BioFresh on the other hand had increased its activities to raise awareness for the project for which it was included in the last category.

SPI in practice

The way in which the projects described their SPI already showed that there was a great variety in how a project can deal with a SPI. The practices verified the difference in approaches but they also showed that actions were not always in accordance with the description. Through a comparison the projects' actions were categorized on a scale as being of low to high intensity with a maximum of three categories. Actions related to the following aspects have been analysed: involvement of stakeholders, the amount and use of communication and dissemination channels, the relation with the policy domain and the use of networks and awareness raising activities.

In the first section the following frames have been found for a SPI:

1. SPI as one-way interaction, focusing on communicating results to the policy domain
2. SPI as an interaction that should be facilitated and come from both sides
3. SPI as a two-way interaction, actively involving stakeholders and giving them a role in the project

To analyse if the SPI frames and the undertaken activities matched, the outcomes of the first section are briefly summarized: BIOMOT, REFRESH and SoilService were assigned with the first frame, BESAFE, SPIRAL and TESS were assigned with the second frame and BioFresh, HERMIONE, ROBIN and STEP maintained the third frame. By looking at the activities that were held in the SPI context and based on the SPI description frames a slight adaptation to these categories has been made:

1. Minor involvement of policy domain in order to improve one-way communication
2. A two-way process that facilitates the involvement of and includes policy stakeholders
3. A two-way process that assigns a major role to policy stakeholders

The first category fits with BESAFE, BIOMOT and REFRESH. These projects communicated to the policy domain rather than having it actively involved on various scales. BESAFE and REFRESH promised to invest in the SPI on a more local level which has found to be the case. But since all projects were expected to have an effect on EU level they were supposed to have a SPI at supra-national level as well. BESAFE had described the SPI as a more two-directional process but due to a lack of actions in the interface it shifted towards one-way communication. Actions on the level of the SPI were still perceived as important in BESAFE and they kept on taking place but little output from this SPI has been observed.

BIOMOT and REFRESH showed the opposite: whereas these projects started by describing the SPI as a one-directional process they have made changes. BIOMOT initially hardly focused a SPI and during the second half of the project efforts were made to include the policy domain in the project. Since there was no data on the activities and outputs during the

last phase of the project – as it is on-going – it was not possible to say if the further activities steered towards a more engaging two-directional process. REFRESH on the other hand started with a SPI in one work package and improved the involvement of policy actors in the overall project by the end of it. Additionally Julia Martin-Ortega felt that there was a lack of commitment towards the SPI from some of the natural scientists, who seemed to rather focus on the outcomes of their research. Because of this and because they had identified a lack of communication with policy actors beyond the work package they were seen as adopting the one-way communication strategy.

ROBIN, SoilService, STEP and TESS fit in the second category. Despite its description of an intensive two-way process ROBIN did not show a major role for policy actors on higher policy levels. According to Terry Parr this is mainly because the project was busy on ground to collect information and data to be able to return to policy actors and discuss these with them and because these policy actors were hard to reach. For the data collection there was lots of communication with the local stakeholders and policy actors but more data of the final phase is needed to conclude whether the efforts were as intensive as described or not.

The SPI activities of TESS were in some ways similar to those of ROBIN. In TESS there was a major emphasis on the communication between local and national policy levels, but the project also mentioned points for improvement and as policy actors were not directly involved in the project it could not be said that TESS had an intensive two-way communication with the policy domain. TESS definitely put lots of effort in stakeholder involvement but it was not clear to what extent this included policy actors.

SoilService appeared to be more active in the SPI than it had described. In the description it seemed to be a one-way effort where the project would provide information – with some input from policy makers – which would be communicated to the policy domain. Contrary to this it appears from notes and minutes that the scientific partners were considering the importance of policy actors and involved them in the project with an active role. The lack of inclusion of policy actors was seen in the low involvement of national policy actors. These were not interested and could not be reached which led to a lower impact than could have been gained.

Finally the activities that STEP had pointed towards a two-directional process that included actors but not as intensively as it had framed. From the SPI description it was expected that STEP would have included more activities in which policy makers could provide input. Stakeholders' main contribution was in formulating the General Questions during the first phase but after this policy actors were less included and STEP was providing information rather than interacting. Most effort was put in informing a wide public and increase the knowledge base on pollinators which means that even though STEP is placed in this category it was leaning towards a one-directional SPI approach.

The projects that were actively involving policy stakeholders in the project were BioFresh, HERMIONE and SPIRAL. BioFresh started off with little activity in the SPI but it increased its efforts to improve the SPI during the second phase. Dissemination took place on different levels and through different channels and actors were encouraged to help BioFresh make the project more relevant. It took BioFresh some time and feedback to improve the SPI but in the end they were as active as was described at the beginning of the project.

HERMIONE on the other hand had and created some advantages through which it was able to develop a well-established SPI. One of the advantages was that there was a project that

preceded HERMIONE: HERMES. In this project different SPI mechanisms had been developed which could be adopted in HERMIONE as well. A second advantage of HERMES was that the project raised awareness on the topic of deep-sea which helped HERMIONE to further raise awareness on the project. The last advantage was that by presenting itself as being available at any time and by using the SPI mechanisms HERMIONE was able to get policy makers closely involved with the project.

By analysing the science-policy interfaces SPIRAL had to get involved to a certain extent in the projects. They wanted to make the outputs relevant and understandable for both scientists and policy makers in a way that both groups recognized themselves and their roles in this. A close cooperation with the policy domain was also found through the workshop that was promoted by DG Research and the Scientific Officer Adrian Peres, who was actively supporting the project. The described role of observer became more inclusive and participatory during the project which is why SPIRAL is perceived as part of the third category.

4.3 Expected outcomes of the SPI

This is the final section of the results. Here the outcomes and the expected outcomes of the SPI will be analysed as an effect of the SPI activities. A greater part of these results was obtained through the interviews with representatives of the projects. At the end of this section the (potential) impact will be analysed by reflecting on the SPI activities to see how they influenced the expectations and outcomes of the projects.

Most projects had some kind of expectations on the effect they would have in the policy domain and a small number of these had specific examples of outcomes that were being taken up. In some cases it was responded that it was not possible to clearly tell which changes were caused by the project and for TESS it was said that it was too soon to tell what the effects were.

"I mean, we are not the only cause really, but I think you can never tell who has done the job but I think also that a bit of work was done" (Interview Katarina Hedlund, SoilService)

"Like the Chinese when asked about the utility of the French revolution, I would say it is too early to tell." (Interview Robert Kenward)

Although for TESS it was not clear what the expected effects on the policy domain were it was known that there was strong support from policy actors for the work and for the design of the transactional environmental support system. For ROBIN too it was not clear what the outcomes would be but this project was still running and aiming to contribute to disentangle the various contradicting policies in order to improve biodiversity and associated matters in these policies. The prospects for the impact of STEP on policy level were less positive. Although policy actors were interested in what the project had to say it did not lead to major shifts in high level policy. David Kleijn said that there were lots of other voices, influences and considerations due to which the results were slightly disappointing. Still, STEP produced outputs such as a red list for bees and monitoring tools for pollinators which were useful for policy makers. Next to this it did have various achievements in the scientific community by increasing the knowledge base and on a practical level with other stakeholders.

BESAFE and BIOMOT had the least positive prospect for their outputs. Starting with BESAFE, this project wanted to promote its final output, which was a web tool. This was expected to some extent to be done by actors who were present at the workshops and who would spread this information throughout their network. The highest impact was expected to be gained through the end conference where the web tool will be presented, yet it was not clear how the promotion would take place and how actors not included in the mailing list would be reached. Meanwhile BIOMOT was struggling with both time and the final conference: more time was needed to analyse all data and the outputs did not fit in the current discourse which made it difficult to get policy actors enthusiastic. These outcomes were not surprising, the project adopted a more intensive SPI strategy only once it was half way which, through an inclusion of more actors, led to an increase in data. Dealing with the current discourse was a problem that would remain throughout the whole project as the outcomes did not fit well in an economic approach.

Specific outcomes and expected outcomes were found for REFRESH, SoilService and SPIRAL. On a case study level REFRESH did a survey with relevant policy makers to find out how useful they expect the outputs to be. According to Julia Martin-Ortega *“What we did, we asked relevant policy makers for each case study to provide a response on how useful you find what we did. ... So we had some very valuable cases and in others it probably ended up in a drawer somewhere.”* It was not known what the expected impact would be on a higher policy level. SoilService was able to deliver its message to provide information on the decisions to reform the Common Agriculture Policy. Through their innovative approach to quantify and value ecosystem services they also functioned as an eye-opener in the policy domain, showing how important soil quality is in economic terms for farmers. Although this was a major achievement on European policy level, SoilService was not able to sufficiently reach national policy levels. Lastly SPIRAL expected to have a major influence on new projects from DG Research. To the understanding of Juliette Young the handbooks on SPIs will be handed over to the projects from Horizon 2020. Additionally SPIRAL has shown to be effective in improving the SPIs from different projects: BESAFE, BIOMOT, BioFresh and ROBIN have said that the workshop with SPIRAL improved their understanding of a SPI and from the documentation it also appeared that their activities towards the SPI improved after adopting this advice. If the handbook would be accompanied with workshops on interfaces SPIRAL could have a high impact on the use of SPIs in European research projects.

Finally BioFresh and HERMIONE had the most concrete examples of their project's influence. Although BioFresh has expired, the digital platform and the blog were still maintained and the web tool Atlas was further developed to communicate with policy makers and the public. Next to this a survey showed that some of the results were highlighted as highly policy relevant. Klement Tockner gave some examples of results that were ready for use for policy makers:

“The second key result is the identification of key biodiversity areas which is used for key conservation areas, in Europe for example. To give you a third example, this was to combine a global database and future hydro power plants and this raised immense public attention. Just recently, there you see it may influence the further people's standards for hydro power plants.” (Interview Klement Tockner)

In the case of HERMIONE there were multiple examples why the project would have an impact through its SPI but it was also mentioned that it is never possible to ascribe certain changes to one single project. Nonetheless Sybille van den Hove was able to give some concrete examples of outcomes which were directly related to the project:

“We have found a copy paste from our text into the UN general assembly documents so there we say ‘Yes, we got it!’ But also in planning, because this is also part of the SPI, planning future research project, we found some of our wording into calls for new topics in relation to what we were doing.” (Interview Sybille van den Hove)

This part of the section gave an overview of the produced and expected outcomes of the SPI, the following section will provide more information on the link between activities and outcomes.

Contribution of SPI activities to expected impact on policy

For the projects TESS and ROBIN it was not clear yet what the outcomes would be, although ROBIN mentioned that they expected to help in improving policies to improve the biodiversity status in participating countries. BESAFE and BIOMOT had low expectations because it was not clear how the final conference would be given form or how it should be promoted to the public. STEP had a lower impact in the policy field due to great competition for attention and issues on the priority list of the EU. On the bright side their SPI had positive effects on scientific and practitioner level. REFRESH and SoilService were projects that could point out effects of their SPI but there were no concrete examples of successes and the successes were usually on one scale. SPIRAL on the other hand had some examples of successes and its effects could reach further if the outputs would be picked up by the EC. Finally BioFresh and HERMIONE had a few concrete impact examples related to their SPI and were expecting future impact as well.

To find out how these outcomes related to the undertaken activities the interaction categories were compared with the (expected) impacts per project and between projects. By comparing between projects it was possible to say which projects had relatively low and high expected impacts. The projects which had one-way communication, leaning towards two-way communication with policy makers, were BESAFE, BIOMOT and REFRESH. From these projects BESAFE and BIOMOT did not have high expectations for the outcomes, for BESAFE because it was not clear how policy actors would be attracted to the final meetings and for BIOMOT there was little time and the project should look for a way to make the message clear within the current discourse. REFRESH, who had a predominantly one-way communication, has shown to have positive impact on policy making on case study level. The SPI on local level appeared to be effective but interaction with and impact on policy on EU level was not visible.

Projects with good two-way communication were SoilService, TESS, ROBIN and STEP. SoilService was quite active in two-directional interfaces with policy makers but to generate a major impact in European policy national actors should have been reached as well. Despite the excellent timing at which the project's message was delivered in the EU the impact was not as big as it could have been if national policy makers were further included.

TESS was not able to tell what the outcomes were expected to be which leads to the assumption that for TESS the effect of the SPI was not clear or should have been greater to make assumptions on the effect of the project.

Terry Parr mentioned that for ROBIN it was expected that on local level they would be able to encourage a reduction of deforestation through the implementation of REDD+ and UNFCCC mechanisms. Next to this they expected that they can provide a contribution to the decoupling of contradictory policies in order to further reduce deforestation. It can thus be said that the expectations of ROBIN are very ambitious and they had clear goals to which they were working to.

Despite its efforts in the science-policy interfaces STEP did not expect that it would cause major shifts in policy making. The main reason for this, according to David Kleijn, was that there are many considerations that should be taken into account and that STEP was “*only one voice in a room full of voices*”.

Finally BioFresh, HERMIONE and SPIRAL had the most intensive two-way communication with policy actors. This is quite remarkable for a project as BioFresh which focused on developing a platform to collect scientific information and make it publically accessible. BioFresh included policy actors since they should be able to understand and use the platform and give feedback on how to increase the accessibility of the information (which in this case was more than only being able to find the information). HERMIONE was very active in making contacts with policy actors and involving them in the project through various ways, personally as well as through panels. These efforts were also reflected in the present and expected impacts: both projects could come up with concrete examples of influences on policy and expected this to continue. Lastly there was SPIRAL who helped some FP7 projects to improve their understanding of SPIs and is expected to have a major influence if their handbook on SPIs will be distributed to other projects as is understood to be the case. They did not expect to have much two-way interaction with policy actors but as the project progressed the interaction increased.

In almost all cases there seemed to be a relation between the implementation of the SPI and impacts on policy: projects with one-way communication had no concrete or high expected impacts; projects with two-way communication had average to high expectations for policy impacts and projects with intensive two-way communication had the highest expectations for impacts on the policy field and could give concrete examples. The only projects that did not match this relation were REFRESH and STEP. In the case of REFRESH there were successes in supporting policy making on case study level which lead to the understanding that, where present, the SPI functioned well. For STEP there were other considerations which appeared to higher priority for the EU than those presented by them, leading to a low impact on policy.

This chapter provided an overview of how a SPI was framed in the different projects, what kinds of activities and approaches were used in the SPI and what the expected outcomes were as a result of the projects' actions. In the next chapter the research questions will be answered and the links between the framing and expectations will be thoroughly discussed as complement to the results.

5. Discussion

This research looked at how ten FP7 projects in the thematic area of Environment described their science policy-interface (SPI), which actions they undertook for their SPI and what the expected and actual outcomes of this SPI were. This chapter briefly summarizes the findings in order to answer the research questions and discuss the relation between project orientation, action frames, outcomes and issue or curiosity driven research. After this a discussion with the findings in the literature on SPIs will follow to show where this research contributes to the understanding of a SPI. The chapter will end with a reflection on the research method and recommendations on the use of SPIs will be given.

5.1 What are the problem-solution frames, action frames and expected outcomes?

It has been shown that the projects have been working on different issues and had different formulations on what they were working on. The descriptions of the problems were less explicit than the proposed solutions, but through the analysis a description of the problems and solutions has been found. From the analysis it became clear that there were three general ways in which problems and solutions were framed.

Problem-solution frames

1. Development of knowledge is required and desired

This first frame entails approaches which define the problem as a lack of knowledge. This lack of knowledge can have two interpretations: a lack of knowledge which hampers good policy making and a lack of knowledge which leads to the lack of understanding a certain issue. The latter interpretation implies that a topic is not known well enough to raise an understanding of the necessity for policy and regulation, contrary to the former interpretation which implies that it is known that more information is needed on a certain topic. The solution proposed to such problems is the development of knowledge on the unknown.

2. Improving policy making through development of tools and mechanisms

In this frame the problem is related to a lack of instruments to use the available knowledge. On lots of topics there is quite some information present or readily available but for policy making this information should be processed in some way. The solution to such a problem is to design or develop a tool/ mechanism which helps actors to process information.

3. Generation of knowledge and development of tools for policy improvement

The last frame is a combination of the previous frames: the problem is complex because it is known that a lot is unknown on an issue but in some way policy should be made. An example is the deep sea: it was expected that policy would be needed on various aspects of the deep sea but it was unknown on which topics and what kinds of regulations should be set. Through research it was identified which topics needed policy measures and tools and mechanisms were developed to help policy makers develop good policy for the deep sea.

Action frames

The frames for the activities were more complex than the frames of the problems and solutions because they consist of more elements. In relation to the SPI we found three frames that differ in the extent to which the policy domain was involved in the activities. This led to the following three frames.

1. Minor involvement of policy domain in order to improve one-way communication

The first frame has the least intensive and involving role for policy actors since it focuses on the output of a product that does not demand deep inclusion of those actors. An example of such an output is the development of knowledge. The main role for the policy field then is to provide input in what is interesting for them and leave the rest up to the epistemic community.

2. A two-way process that facilitates the involvement of and includes policy stakeholders

In this frame activities have been undertaken in which support and feedback from the policy field could be used to improve the usability of the outputs. In fact the activities required interaction with policy actors in order to make outputs fit for use and understanding. In one-way communication it would be much harder to adapt the outputs to the requirements of the policy field and the process would be much slower.

3. A two-way process that assigns a major role to policy stakeholders

The third and last frame describes an intensive interaction between science and policy actors in the activities. Policy actors have an important role because they are involved in the process where it is discussed what is actually needed and consecutively both parties discuss how to make those outputs useful.

Expected outcomes

Lastly the analysis showed that there is also a gradation for the expected outcomes of scientific projects which relates to the SPI.

1. Expectations for policy impact are low

Even though aiming at changing or influencing policy, it depends on the objectives and actions of a project if its outputs can lead to change. When a project is aiming to produce knowledge without practical tools, it is very hard to tell if the outputs had an effect on policy making. Mind that this does not mean that the project had no effect at all, this effect can be picked up in an epistemic community or by smaller stakeholders or it can have an effect on the long term.

2. Some expectations for policy impact

Of course it is not always possible to tell what changes were caused by a single project, but it is possible to expect changes. This is the case when a product is delivered for policy actors and stakeholders which helps them in making policy in some way. The height and amount of expectations then depends on how involved the policy domain was in a project.

3. Expect high policy impact and booked results present

In the last frame it is possible that projects have high expectations and possibly a visible impact. Whether this can be reached depends mainly on the project goals, the interest of the

policy field in the topic and the interaction between science and policy. The policy domain should be aware of the importance of the issue and the contribution to policy making to show willingness to participate and the inclusion of policy actors should be included in the project objective.

These sets of frames and expectations are a general summary of the findings within the projects and give insight in the general approaches to problems, actions and expectations. In the next section the relationship between these frames with one-way and two-way interactions, thematic orientation and the research drive will be shown to gain a better understanding of the role of a SPI and its contribution to the usability of a project for policy.

5.2 Relationship between orientation, frames and expected outcomes

When the problem-solution frames and the action frames are taken together in relation to the SPI, a SPI generally is framed in three ways:

1. A one-way process that informs policy actors rather than including them in the project
2. A two-way process that includes and facilitates the involvement of policy stakeholders
3. A two-way process that assigns a major role to policy stakeholders and actively involves them

The reason that there is a differentiation between problem-solution frames and action frames is that these show more clearly what the problems are and how these are tackled. Next to this this differentiation shows that framing a project as a two-way process does not mean that the actions correspond with this due to a change in framing. Thus the SPI frame can change over time which is best shown by using the problem-solution frame and the action frame. The three clearest examples where such shifts occurred were BESAFE, SoilService and STEP. BESAFE framed a two-way process, but acted according to a one-way process while interaction was framed as important as they developed a tool for the policy field which had to be understood by policy actors. SoilService was developing a valuation tool for policy makers and shifted from a one-way process to a two-way process in order to make the tool more usable. STEP did the opposite: whereas they had framed the SPI as a two-way process they started by involving policy actors at the beginning for some input and then shifted to a one-way process as their main objective was to produce more knowledge. These examples will help understanding the relationship between project orientation, frames, SPI frames and research drive.

Table 6 shows the relation between the SPI frame, the problem-solution frame, the action frame and the expected outcomes. The project orientation – aquatic, terrestrial or policy – is not included in the table since there was no link with the other elements. What table 6 shows is that there was a clear relation between the action frame and expected outcome and that they are part of a certain SPI frame. The problem-solution frame which is in the same row fits best with the action frame, expected outcomes and the SPI frame from that row, but as mentioned earlier, the way in which a problem is framed can differ from the eventual approach. This is shown by leaving the problem-solution frame fields blank. The projects STEP and BESAFE showed best that there can be a difference between problem framing and related activities. STEP had adopted the SPI frame “*A two-way process that assigns a major role to policy stakeholders*” while its problem-solution frame was mainly “*Development*

of knowledge is required and desired'. In the end the problem-solution frame shifted more towards "Improving policy making through development of tools and mechanisms" and the SPI frame more to "A two-way process that facilitates the involvement of and includes policy stakeholders" since their action frame was "A two-way process that facilitates the involvement of and includes policy stakeholders". In BESAFE there was a mismatch between the SPI frame and problem-solution frame with the action frame. The problem-solution frame was "Improving policy making through development of tools and mechanisms", the SPI frame was "A two-way process that facilitates the involvement of and includes policy stakeholders" which related to the problem-solution frame, but the action frame was "Minor involvement of policy domain in order to improve one-way communication". Eventually the action frame is decisive for the implementation of the SPI.

Another example: BIOMOT's objective was to produce knowledge and a one-way process frame for the SPI was adopted. Due to the nature of the project it is not surprising that the SPI was not strongly implemented, for the development of knowledge research needs to be done and policy actors cannot always help in this. A SPI is less helpful for curiosity driven projects since interaction was most useful for obtaining information on what kind of knowledge is needed and to feed this knowledge back. Of course projects that actively involved policy actors in the development of tools (REFRESH, ROBIN, SoilService, TESS) had some expectations for the impact since they discussed how present knowledge can be used. In a cooperation with the policy domain policy actors' needs and demands should be taken into account. The projects with a more intensive two-way SPI (BioFresh, HERMIONE, SPIRAL) had higher expected policy impacts and examples of results due to a closer interaction with the policy domain. The two-way process frames had higher expectations than the one-way process frames because these were issue driven projects. By committing themselves to the production of usable tools for policy actors, involvement was necessary.

Table 6: Overview of frames, SPI frames and expected outcomes in relation to each other

Problem-Solution frame	Action frame	Expected outcomes	SPI frame
Development of knowledge is required and desired	Minor involvement of policy domain in order to improve one-way communication	Expectations for policy impact are low	A one-way process that informs policy actors rather than including them in the project
Improving policy making through development of tools and mechanisms	A two-way process that facilitates the involvement of and includes policy stakeholders	Some expectations for policy impact	A two-way process that facilitates the involvement of and includes policy stakeholders
Generation of knowledge and development of tools for policy improvement	A two-way process that assigns a major role to policy stakeholders	Expect high policy impact and booked results present	A two-way process that assigns a major role to policy stakeholders

A Science-Policy Interface is a good mechanism to get scientists and policy makers together but it depends on the project objectives how useful it is. In curiosity driven research the SPI is helpful to raise awareness on the research and to bring found knowledge to the attention of policy actors. Further involvement does not seem to be necessary since the policy contribution is minimal. BIOMOT did research to gain a deeper understanding of the motivation to act for biodiversity and this knowledge could be used by policy actors to fund and set up issue driven research to use the obtained knowledge. In issue driven research projects work to tackle an issue and therefore need the help and cooperation of policy makers to make clear what needs to be tackled. A SPI is then very useful and would help projects to better deal with the presented issue and the demands from policy. These two types of research – curiosity and issue driven – show that the use of a SPI can differ but the inclusion of policy actors does not determine how useful a project can be for policy. By obtaining more knowledge through curiosity new issues for policy making can be detected. This introduces the next section of the discussion.

5.3 The use of a SPI

In the introduction and the theoretical section it has been explained how a SPI works and how it can be perceived. The EC strives to work towards a SPI with two-way interaction by requesting her projects to involve policy actors. The case studies showed that there are different ways to implement a SPI with different activities leading to different expected policy outcomes. These studies have also shown that the research objective is leading for how the SPI eventually takes place in a project and to what extent it is a two-way process. Therefore it should be discussed how, why and to what ends a SPI can be used.

To start with, a SPI was said to consist of generally five elements: Mutual understanding, measurability and monitoring capacities, a scientific reward, awareness raising and communication. Dealing with all of these elements is a costly process which does not by definition work in favour of every project (Turnhout et al., 2013). Sarkki et al. (2014) mention that various trade-offs can occur when taking these elements into account while also emphasizing that these trade-offs are not the same or even present in every case. This has been seen in the case studies of this research by showing that projects had to struggle with different issues. Depending on the project and its goal the question should be asked “Which SPI elements with policy interaction will help us to improve the way through which the goal can be reached?” In the SPI there is a balancing between what kind of science will be produced and how this will be used in the field of policy (Wesselink et al., 2013). The goal of the project can influence the way in which policy can use outcomes when scientists and policy actors work together on the project goals. In this sense policy actors can steer to a certain type of research and scientists in their turn can demand to include other aspects to justify the research in the epistemic community. Such an approach in the SPI can help both actors to understand each other and their needs and motives in the research.

A SPI is a good tool to get science closer to policy and to get policy in touch with science, but for projects which produce knowledge from a curiosity drive thorough interaction with the policy domain reduces the amount of time that can be spent on the research and policy makers have little use for knowledge which is not practically applicable. Nevertheless, this does not mean that curiosity driven projects do not need a SPI at all, contrary, by involving

policy actors at the beginning of the process societal interests can be included in a project and at the end of the project policy actors can, together with scientists, look for ways through which such knowledge in the long term can be used for practical uses. This is in line with the observations of Turnhout et al. (2013) who found that the roles of science as described by Pielke (2007, in Turnhout et al., 2013) can be classified as knowledge brokers with different roles: supplying, bridging and facilitating. In short, the extent to which the knowledge brokers include policy actors and stakeholders in the scientific process differs where the role of supplying gets actors and scientists together to collectively formulate questions. This resembles the action frame "*Minor involvement of policy domain in order to improve one-way communication*". Consecutively the role of bridging corresponds with the action frame "*A two-way process that facilitates the involvement of and includes policy stakeholders*" and the role of facilitating matches the action frame "*A two-way process that assigns a major role to policy stakeholders*". Hence it is advocated that also in curiosity driven research a SPI with knowledge brokers should be established while reflecting to what extent the SPI needs to be implemented. The most important aspect from the research of Turnhout et al. (2013) too shows that networking is one of the most important elements of the SPI and deserves lots of time and attention.

In the case of issue driven researches this research has shown that a SPI contributes to affecting policy making. This was not easy for the projects, on the one hand because a SPI depends on the interest of both scientists and policy actors and on the other hand because there is a strongly embedded discourse which places scientists and policy actors in two non-linked domains. Therefore it takes a lot of effort to get both parties together and help them understand each other through a translator (Young et al., 2014). Yet the cases showed that it is possible to get scientists and policy makers around the same table, enhancing policy relevance of projects. But here too projects should be aware of the trade-offs that can occur. Next to the trade-offs of a SPI that Sarkki et al. (2014) mention there is one more possible negative effect of a SPI. In the case where science is only funded when it can serve policy and produce outcomes which can be economically valorised, commodification of sciences occurs. According to Pappenheim (2014) it is not possible to quantify the quality of all research in the same way which implies that the value of research cannot always be expressed in economic values. If only issue driven research gets funded, De Oliveira (2012) argues that policy is commodifying science. Building on this argument De Oliveira (2012) continues that when a project keeps trying to adjust to the demands of the research's funder it exists only because an output which can be translated to an economic improvement can be produced. Although curiosity driven research usually does not show immediate economic benefit (De Oliveira, 2012; Sarkki et al., 2014; Young et al., 2014 and Van den Hove et al., 2011) it can have implications for future issue driven research. Therefore it is important that there is awareness that when engaging into a SPI both scientists and policy makers should not only look at the direct practical use of produced knowledge but it should also be thought of how research can be socially relevant. BIOMOT is a great example of this: by developing a theory for the understanding of what motivates people to act for biodiversity there are no practical outputs that can be directly used for policy, yet the implications of the obtained knowledge can change the way of thinking and lead to new researches which can be issue driven. In BIOMOT therefore the SPI had to have a focus on asking policy actors what their interests were and in the end deliver a message for policy actors and society to reflect on how they think about biodiversity and what they can do with this information.

Until now only the disadvantages of valorisation and commodification of science have been discussed, but there are also advantages. When science is valorised it is easier to show the economic benefits of doing research through an input output matrix in an economic model since science is seen as a source of growth (Stephan, 2007). Additionally this makes it more visible for the public to show the economic benefit of research which does not seem beneficial at instance. Especially for environmental research such valorisation can help to justify research as economic values are usually desired but not always clear. Next to this valorisation of some projects could justify the execution of projects where such valorisation and direct commodification is not possible. When it can be advocated that insights from research which cannot be valorised paved a path for research which can be valorised, commodification of issue driven research can contribute to the justification of curiosity driven research. Valorisation and commodification of science thus can have a positive effect on science, but it should not overshadow the goal of science and scientific projects: in the case of research funded by the EC science is a public good which is funded with public resources and should lead to public benefits. To prevent that projects are only funded when they are issue driven and can lead to direct economic benefit (Stephan, 2007), research should get the chance to research areas which can contribute to the social welfare (which includes social progress) in a non-monetary or valorised way.

A SPI can thus be both an enhancing as well as a restraining tool, both for the usefulness of outputs for policy as well as for the policy understanding and use of science. It is also a good tool to get policy makers, stakeholders and scientists together and discuss what questions should be answered and how they can be answered. The use of a SPI has no one-size fits all recommendation, but SPIRAL managed did produce a handbook which can help both scientists and policy makers to understand how to deal with certain issues in a SPI, which describes what elements should be taken into account, which pitfalls can be expected and how problems within the SPI can be solved. Yet the extent to which the SPI is used and exploited for the improvement of policy use of scientific results should be determined by the focus of a project; a SPI should not be mistaken for a mechanism which is used only to improve the usability of scientific research for policy. For issue driven research it is highly recommended to actively involve the policy domain to make results policy relevant, whereas curiosity driven research is not expected to benefit as much from such extensive SPI use. In the end policy should reflect and represent societies needs and demands, meaning that in curiosity driven researches policy actors can contribute by involving societally beneficial questions.

5.4 Research reflection

For this research ten FP7 projects have been selected with the help of experts. Of these projects the SPIs have been studied with the help of a frame analysis. To find out how the SPI was framed in the different projects documents have been read which described the SPI and the process of the project. By coding and classifying the phrases an overview of the approaches and problems statements of the SPI was reconstructed. Through this overview a comparative analysis could be made between problems, actions and objectives within a project but also between projects to explain if and how differences between the SPI of the projects differed. To reduce the effect of interpretation a second opinion on the coding and classification would have been useful but due to time limits it was not possible to do this.

Additionally coding examples from similar researches could have been used for inspiration on the coding.

This research mainly used literature for the data collection and used framing theory for the analysis. A different approach would have been to use storytelling theory but due to the large amount of data and the benefits of structuring with codes and classifications, as adopted from framing theory, storytelling was not preferred. Discourse theory could have been a more thorough approach in which actions of running projects could have been studied and deeper interviews with more stakeholders could have been held. By adopting a discourse approach more time would have been spent on less cases but a more accurate and deeper understanding could have been obtained of the projects. However, the goal of this research was to identify the description and activities of the projects with regard to the SPI and look for differences and similarities rather than fully mapping how the SPI took place in those projects. Therefore it was more useful to study a higher quantity of projects to be able to make better comparisons. With more time more actors could have been interviewed and an understanding of different stakeholders involved in the SPI could have been analysed.

5.5 Recommendations for the use of a science-policy interface

One of the problems mentioned by Pregerning (2014) and found in the projects is an overflow of information which made it hard to get policy makers' attention. There are two approaches to reduce the overflow of information: as project to interact closely with policy actors to gain their attention and keep this attention or to cooperate as projects to put an issue on the political agenda by showing interconnectedness and jointly presenting the relevance of the topic. To this end it would be very useful to make various platforms similar to ECOWEB, a portal with information about various European Eco-Innovation projects, on European level so that projects from the same thematic area will be able to find projects with similar research. Additionally from DG Research those projects need to be made aware of the existence of these platforms and encourage projects to seek each other. This is not only beneficial for the projects to raise general attention for their topic, joint presentations will also relieve policy actors from time that would otherwise be scattered over different moments for different projects. For this to work all projects should have experts working on networks and keeping track of changes in the scientific community on European level.

Additionally it is recommended to establish a database with contacts from different projects. Through such a database it would be easier for policy actors to find out which project produces knowledge that is useful for them and who to contact to obtain information on that project. This should have an interface similar to that of SPIRAL, an interface which brings you at the requested projects through answering a small number of questions. Projects should be added to that database during the proposals phase so that policy actors can contribute to the base of the project and its use for policy making. Additionally the database should provide policy actors with alerts whenever a new project is added to the database to keep policy actors updated on new projects. Contrary to regular emails such alerts can remain until the project's page is visited. This makes it easier for policy makers to reach information and to at least get informed on projects which are meant to contribute to their policy domain. By enabling policy actors to reach out to scientists the SPI can become a full two-way interaction model where policy makers can also take the first steps to get involved in scientific projects. Here too people should be working on continuous updates of the platforms and make both policy actors and scientists aware of the importance of those updates: policy

makers so that they get used to the use of this tool and scientists to remind them of the impact of their updates and inclusion of policy actors.

The proposed platforms should work complementary and will need lots of attention to be maintained and to get used. As was shown with the research, networks and awareness raising are crucial parts of the SPI and the first steps through which a SPI can be established. Then through discussions and communication policy and science can sort out how intensive the SPI for them should be. Additionally these platforms are not only useful for the issue driven researches since policy knowledge can be used in curiosity driven research to include societal interest in a project.

6. Conclusion

The European Commission tries to move away from the linear approach to the relation between science and policy through their aspiration to bridge the gap between these two domains. Although this is a noble aspiration, for some reasons the SPI did not include policy actors in all projects as much as would be expected of a full-fledged SPI. Not all projects were suitable for a useful SPI implementation with close interaction with policy makers. Projects whose objective it was to produce new knowledge could not involve policy actors to the described extent due to a lack of interest from the policy field. Mind that the lack of interest did not only depend on the policy actors, the messages had to be delivered in an interesting way as well to reach the public. For these projects it was more important to raise awareness and develop networks in order to show the importance of the studied area which is a linear approach to the SPI. These projects were the curiosity driven research projects: BIOMOT and STEP. The curiosity came from both the EC as well as from scientists. Projects which designed tools and mechanisms for the improvement of policy with known and/ or gathered knowledge had more effect on policy through the SPI and were issue driven projects. For these projects – BESAFE, BioFresh, REFRESH, ROBIN, SPIRAL and TESS – it was important to focus on the outputs and make these useful for policy making. In order to do that it they had to adapt parts of the research to the requests of policy makers and the possibilities of the researchers. Finally HERMIONE is the only project which did research on new areas and who was able to combine curiosity and issue driven research and had close interaction with policy actors.

Because of the high expectations projects had to describe the highest possible promises which did not always contribute to the objective of the project. Pushing projects to their limits by making high demands is not wrong per se but it should not lead to measures which do not contribute to the quality of the projects goal. In the curiosity driven researches a mismatch between SPI description and objective occurred because there is no need for an intensive SPI when knowledge is gathered. Mind that it states no need for an 'intensive' SPI, meaning that in any case aspects of a SPI could be included to inform the policy domain of scientific developments for future policy or new project demands. Because networks are key to spreading knowledge and raising awareness on projects the support of DG Research to provide contacts in the policy domain was very useful and should be done in the future as well. The issue driven projects had more intensive contact with policy actors and from the projects which had most personal contact the higher expectations for outcomes of the SPI have been noticed. This too is not surprising: when a project works on a policy issue it is expected to solve this issue to some extent. Additionally projects which got informed on the time limits in the policy domain had a higher (expected) policy impact than other projects because their information could be immediately picked up. It is therefore important to see how a SPI contributes to the research goal and use the contributing aspects to their fullest extent. In this way resources are used more efficiently than when a project tries to invest in every aspect of a SPI only because it has to, resulting in inefficient use of resources which could have better been invested in those important SPI elements. That being said, all projects should at least include policy actors at the start of the project to include their visions. They too can have interesting angels through which a project can be observed.

Resulting from the observed importance of networks and awareness raising, it is recommended to develop scientific networks and platforms through which projects within a

thematic area are able to find each other to jointly promote their case for policy actors to make the issue stronger. These networks should be accompanied by an additional platform for policy makers where they can find projects within the thematic area in which they work to be able to contact people from the project for information and updates. By enabling policy makers and scientists to find each other more easily information exchange will be made easier and the SPI can be initiated from both scientists and policy actors.

A SPI is a very good way to involve policy makers in the domain of science and this inclusion can be a valuable contribution to important work. However, the SPI mechanism should not be perceived and used as a way to commodify science and argue only for projects which include SPIs because they have a clear and directly useful output for policy. A SPI is not only meant to fix policy issues with scientific knowledge, when looking at the knowledge level a SPI is useful to include societal interests through policy actors who represent societies needs and demands. When SPIs would become obligatory for funding there is a slippery slope to the commodification and valorisation of science if the SPI would be seen as synonym for "science as producer for practical outputs". Therefore it is important that both science and policy understand the multiple uses of a SPI. A research project should analyse to what extent a SPI can support the objective and adopt the SPI in the best possible way instead of including a SPI to its full extent. The main role of the EC in this would be to strongly encourage projects to include a SPI in some way in the projects, be it to include societal interests in the development of knowledge or to help finding out how knowledge can best be used for policy making, and to support projects in the implementation of the SPI.

7. Reference list

Berger, P. L. (1966). "The reality of everyday life" In: The social construction of reality, A treatise in the sociology of knowledge. Berger, P. L. and Luckmann, T. (Eds.) Penguin Books, England, pp. 33-43.

BESAFE (2011). "Leaflet"

BESAFE (2013a). "What kind of information on ecosystem services is relevant for decision making, and how can we incorporate it in the decision making process?" Policy brief October 2013

BioFresh (2011a). "BioFresh Newsletter Issue No. 2"

BioFresh (2013a). "Annex I - "Description of Work""

BioFresh (2013b). "BioFresh science-policy dialogue strategy and detailed action plan (M49)"

BIOMOT (2011a). "MOTivational strength of ecosystem services and alternative ways to express the value of Biodiversity"

Bugter, R. (2014). "D 2.2: WS1 evaluation of methodology, protocols and case studies, with stakeholder recommendations"

B. C. K. Choi, T. Pang, V. Lin, P. Puska, G. Sherman, M. Goddard, M. J. Ackland, P. Sainsbury, S. Stachenko, H. Morrison, C. Clotey (2005). "Can scientists and policy makers work together?" Epidemiological community health (59): 632-637.

Crouch, N. R. and G. F. Smith (2011). "Informing and influencing the interface between biodiversity science and biodiversity policy in South Africa." Botanical Journal of the Linnean Society 166(3): 301-309.

De Oliveira, M. B. (2013). "On the Commodification of Science: The Programmatic Dimension" Science & Education 22(10): 2463-2483

Dewulf, A. and R. Bouwen (2012). "Issue Framing in Conversations for Change: Discursive Interaction Strategies for 'Doing Differences'." The journal of applied behavioural science 48(2): 168-193.

Dewulf, A.; Craps, M.; Dercon, G. (2004). "How Issues Get Framed and Reframed When Different Communities Meet: A Multi-level Analysis of a Collaborative Soil Conservation Initiative in the Ecuadorian Andes." Journal of community & applied social psychology 141: 177-192.

Dewulf, A.; Craps, M.; Bouwen, R.; Taillieu, T.; Pahl-Wostl, C. (2005). "Integrated management of natural resources: dealing with ambiguous issues, multiple actors and diverging frames." Walter Science & Technology 52(5): 115-124.

Dewulf, A.; Gray, B.; Putnam, L.; Lewicki, R.; Aarts, M.N.C.; Bouwen, R.; Woerkum, C.M.J. (2009). "Disentangling approaches to framing in conflict and negotiation research: A meta-paradigmatic perspective." Human relations 62(2): 155-193.

Drake, L. and Donohue, W. (1996). "Communicative Framing theory in conflict resolution." Communication Research 23: 297-322.

EC (2012). "FP7 in Brief" Available in: http://ec.europa.eu/research/fp7/understanding/fp7inbrief/what-is_en.htm [Accessed on 05-08-2014]

EC (2015). "Environment and Research" Available in: http://ec.europa.eu/environment/integration/research/interface_en.htm [Accessed on 19-02-2015]

Elo, S. and Kyngäs, H. (2008). "The qualitative content analysis process." Journal of Advanced Nursing **62**(1): 107–115.

Elliot R. and Timulak, L. (2005) "Descriptive and interpretive approaches to qualitative research." In: A Handbook of Research Methods for Clinical and Health Psychology Miles, J. and Gilbert P. (Eds.) Oxford University Press, pp. 147-160.

Hinkel, J. (2011). " 'Indicators of vulnerability and adaptive capacity': Towards a clarification of the science–policy interface." Global environmental change **21**: 198-208.

Hsieh, H.-F. and S. E. Shannon (2005). "Three Approaches to Qualitative Content Analysis." Qualitative Health Research **15**(9): 1277-1288.

Hoppe, R. (2005) "Rethinking the science policy nexus from knowledge utilization and science technology studies to types of boundary arrangements." Poiesis & Praxis: International Journal of Technology Assessment and Ethics of Science. **3**(3): 199-215.

Hoppe, R. (2010) "Lost in Translation?" In: From climate change to social change, Driessen, P. and Leroy, P. (eds.), International Books, Utrecht, pp. 109-129.

Huitema, D. and E. Turnhout (2009). "Working at the science–policy interface: a discursive analysis of boundary work at the Netherlands Environmental Assessment Agency." Environmental Politics **18**(4): 576-594.

Hulme, M.; Mahony, M.; Beck, S.; Görg, C.; Hansjürgens, B.; Hacak, J.; Neßhöver, C.; Paulsch, A.; Vandewalle, M.; Wittmer, H.; Bösch, S.; Bridgewater, P.; Diaw, M. C.; Fabre, P.; Figueroa, A.; Heong, K. L.; Kom, H.; Leemans, R.; Löwbrand, E.; Hamid, M. N.; Monfreda, C.; Pielke, R.; Settele, J.; Winter, M.; Vadrot, A. B. M.; Hove, S. van den; Sluijs, J. P. van der (2011) "Science-Policy interface: Beyond assessments." Science **333**: 697-698.

IPBES (2014). "About IPBES" Available in: <http://ipbes.net/about-ipbes.html> [Accessed on 06-08-2014]

Jasanoff, S. (2001). "Civilization and Madness: The Great BSE Scare of 1996", In: Hisschemöller, M., Hoppe, R., Dunn, W.N., Ravetz, J.R. (Eds.), Knowledge, Power, and Participation in Environmental Policy Analysis. Transaction Publishers, New Brunswick, London.

Jasanoff, S. (2007). "Technologies of humility." Nature **450**: 33.

Keller, R. (2005). "Analysing Discourse. An Approach From the Sociology of Knowledge." Forum: qualitative social research **6**(3) art. 32

Kernan, M. (2010) "BioFresh Biodiversity of Freshwater Ecosystems: Status, Trends, Pressures, and Conservation Priorities" Presentation Monash University 07-07-2010

Kpéra, G. N.; Aarts, N.; Tossou, R.C.; Mensah, G.A.; Saïdou, A.; Kossou, D.K.; Sinsin, A.B.; Zijpp, A.J. van der (2014). "'A pond with crocodiles never dries up': a frame analysis of human–crocodile relationships in agro-pastoral dams in Northern Benin." International Journal of Agricultural Sustainability **12**(3): 316-333.

Lawton, J. H. (2007). "Ecology, politics and policy." Journal of Applied Ecology **44**(3): 465-474.

Lubchenco, J. (1998). "Entering the century of the environment: a new social contract for science" Science **279**: 491-497.

Owens, S., Petts, J., Bulkeley, H. (2006). "Boundary work: knowledge, policy, and the urban environment." Environment and planning **24**: 633-643.

Pappenheim, P. (2014). "The purpose of science" Available in: <http://www.project-democracy.com/?p=1350> [Accessed on 26-03-2015]

Perrings, C.; Duraiappah, A.; Larigauderie, A.; Mooney, H. (2011). "The Biodiversity and Ecosystem Services Science-Policy Interface." Science **331**: 1139-1140.

Pielke, R. A. (2010). "Creating useful knowledge." In: From climate change to social change, Driessen, P. and Leroy, P. (eds.), International Books, Utrecht, pp. 51-68.

Pregernig, M. (2014). "Framings of science-policy interactions and their discursive and institutional effects: examples from conservation and environmental policy" Biodiversity conservation (**23**) 3615-3639.

Putnam, L. and Holmer, M. (1992). "Framing, reframing and issue development." In: Communication and Negotiation, Putnam, L. and Rolof, M. (eds), Sage, London, pp. 128–155.

REFRESH (2013a). "Refresh Newsletter Summer 2013"

REFRESH (2014a). "Deliverable 7.27: Final plan for the use and dissemination of foreground"

ROBIN (2011a). "Annex I - "Description of Work""

Runhaar, H. and Nieuwaal, K. van (2010). "Understanding the use of science in decision-making on cockle fisheries and gas mining in the Dutch Wadden Sea: Putting the science–policy interface in a wider perspective." Environmental science and policy **13**: 239-248.

Sarkki, S.; Niemelä, J.; Tinch, R.; Van den Hove, S.; Watt, A.; Young, J. (2014). "Balancing credibility, relevance and legitimacy: A critical assessment of trade-offs in science–policy interfaces" Science and Public Policy **41**: 194-206

Sarewitz, D. and Pielke R.J. (2007). "The Neglected Heart of Science Policy: Reconciling Supply of and Demand for Science." Environmental Science & Policy **10**: 5-16.

Schon, D.A. and Rein, M., (1994). *Frame Reflection: Toward the Resolution of Intractable Policy Controversies*.

Sharp, R.J.A.; Ewald, J.A.; Kenward, RE. (2011) "Policy Recommendations and Guidelines" TESS

Sluijs, J. van der (2005). "Uncertainty as a monster in the science–policy interface: four coping strategies." Science and technology **52**(6): 87-92.

SoilService (2010a). "D2: Communication strategy"

SoilService (2012). "SOILSERVICE: Conflicting demands of land use, soil biodiversity and the sustainable delivery of ecosystem goods and services in Europe"

SPIRAL (2011a). "1st Project Periodic Report"

SPIRAL (2013a). "Final newsletter"

SPI-Water Cluster (2012). "Roadmap for uptake of EU water research in policy and industry"

STEP (2009). "Annex I - "Description of Work""

STEP (2010a). "Deliverable: 7.2 - General communication and dissemination strategy"

Stephan, P. E. (2010). "The Economics of science" Handbook of the economics of Innovation **1**: 217-273

TESS (2009a). "D3.2 – Model of the local decision making process"

TESS (2011). "Report: Transactional Environmental Support System (TESS) Conference" EP intergroup on climate change, biodiversity and sustainable development

Turnhout, E.; Hisschemöller, M.; Eijsackers, H. (2008). "Science in Wadden Sea policy: from accommodation to advocacy." Environmental science and policy **11**(3): 227-239.

Turnhout, E.; Stuiver, M.; Klostermann, J.; Harms, B.; Leeuwis, C. (2013). "New roles of science in society: Different repertoires of knowledge brokering" Science and public policy **40**: 354-365

Turnhout, E.; Neves, K.; Lijster, E. de (2014). "Measurementality' in biodiversity governance: knowledge, transparency, and the Intergovernmental Science - Policy Platform on Biodiversity and Ecosystem Services (IPBES)." Environment and Planning A **46**(3): 581-597.

Van den Born, R.; Coenen, M.A.; Knippenberg, L.; Groot, W.T. de. (2014). "Communication plan" BIOMOT

Van den Hove, S. (2007). "A rationale for science-policy interfaces" Futures (**39**): 807-826

Van den Hove, S.; McGlade, J.; Depledge, M. H. (2011). "EU innovation must benefit society" Nature **474**: 161

Watson, R. (2005). "Turning science into policy: challenges and experiences from the science-policy interface." Philosophical transactions of the royal society **360**: 471-477.

Weichselgartner, J. and Kasperson, R. (2010). "Barriers in the science-policy-practice interface: Toward a knowledge-action-system in global environmental change research." Global environmental change **20**: 266-277.

Wesselink, A.; Buchanan, K. D.; Georgiadou, Y.; Turnhout, E. (2013). "Technical knowledge, discursive spaces and politics at the science-policy interface." Environmental Science & Policy **30**(0): 1-9.

Weaver, P. E.; Boetius, A.; Dnovaro, R.; Freiwald, A.; Gunn, V.; Heussner, S.; Morato, T.; Schewe, I.; Hove, S. van den. (2009). "The Future of Integrated Deep-Sea Research in Europe: The HERMIONE Project," Oceanography **20** (1): 170-183.

Young, J. C.; Waylen, K. A.; Sarkki, S.; Albon, S.; Bainbridge, I.; Balian, E.; Davidson, J.; Edwards, D.; Fairley, R.; Margerison, C.; McCracken, D.; Owen, R.; Quine, C. P.; Stewart-Roper, C.; Thompson, D.; Tinch, R.; Van den Hove, S.; Watt, A. (2014). "Improving the science-policy dialogue to meet the challenges of biodiversity conservation: having conversations rather than talking at one-another" Biodiversity Conservation **23**(2): 387-404

Appendix A: Project summaries

BESAFE

BESAFE wanted to develop a framework for a web-based tool – on arguments used for the conservation and restoration of biodiversity – that is easily and publically accessible as well as user-friendly. Success of the project depended on the communication with policy makers since they needed to be made aware of the relevance of the research outcomes for biodiversity protection. To make the project relevant for a broad range of stakeholders different situations with different arguments were used for the research. To raise awareness on the project among the user group – consisting of policy makers and NGOs and other stakeholders – BESAFE made use of networks and connections such as those in ALTERNET, PEER and KNEU. *“Further science-policy dialogue will be promoted in close collaboration with the KNEU and SPIRAL projects, the PEER network and the BESAFE Associates.”* (BESAFE, 2011) It was attempted to involve members of these networks in participating and testing the provisional framework, especially the network in RUBICODE was important for the selection of relevant stakeholders. BESAFE tried to expand its own network by trying to integrate in existing networks. In this way it was attempted to create a feedback loop from non-scientists to the scientists who aim to provide information to policy makers and demonstrate the value of this knowledge. For this feedback BESAFE deemed it necessary to include a wider range of users than only policy makers to be able to affect policy in different ways. Therefore it was made possible for individual actors to register online and get updates on the project, which is an interactive approach to the project. Involved stakeholders were invited to give input to the project and BESAFE attempted to keep them involved.

The feedback loop should have been enhanced through communication with and integration of stakeholders from the beginning of the project. Next to communication dissemination played a key role in BESAFE's SPI strategy. Dissemination was planned to take place at different scales and through the use of different media: i.e. personal, newsletters, social media. Under the heading of personal communication one should think of conventions, workshops and meetings Rob Bugter, coordinator of BESAFE, expected their activity on social media to rise when the web tool will be presented during the end conference but also that their communication partner will announce of the end conference and the web tool. The advertisement of the tool would start later in the project and was assumed to get more popular by that time. Another aspect of communication was the use of language.

In the second phase a heavier emphasis is put on the accessibility of the web tool. There is a continuous effort to making the results relevant for policy makers and involved actors. During this phase BESAFE also put more attention into the way in which the message was communicated: *“The major recommendations were to concentrate our effort on people arguing for biodiversity to make sure to use the right ‘tailored’ approach and language for different user groups, and to advise the right combination of arguments for different situations.”* (Bugter, 2014 p.3). Next to the difference in ‘languages’ BESAFE also tries to deal with the differences in native languages.

Interaction with stakeholders had the intended effect: to obtain feedback and information on needs and interests of the stakeholders. Through this input the results were to be made more relevant and more in line with the expectations and demands of the users. Rob Bugter, told that stakeholders indeed had a major role to play in the SPI and they helped in designing the process. Despite this input coming in late, BESAFE tried to make the information more easily accessible and tried to provide the knowledge stakeholders are looking for, by investigating what they are interested in.

On the expected effect Rob Bugter said that *“What we hope for is that they [policy makers] take notice and will use the knowledge we offer in how they argue for biodiversity or more effectively argue for biodiversity protection.”* This could be linked to the effort of making the results relevant for policy groups. BESAFE tried to get noticed by policy makers through newsletters and by letting policy makers participate in workshops. Through such an approach the web tool was assumed to get spread throughout personal networks of the approached actors. On the other hand, during the interview Rob Bugter mentioned that it was *“very hard to get enough people to our two workshops and also to get people in the DGs interested and responding.”*

BioFresh

BioFresh was working on publically accessible visualisation tools and predictive models by collecting information on freshwater biodiversity into one information platform. The project website is the core product of BioFresh since it is a gateway to information, a communication and dissemination platform and it helps in raising awareness for freshwater biodiversity. In the first place the target group for the platform are policy makers at the EU level and secondly for scientists and policy makers on a global level. According to Klement Tockner the produced Atlas is the most useful tool for policy makers and the public. The data was collected to raise awareness and to develop a better understanding on freshwater biodiversity but also to help policy and management with finding information for their policy and to help make EU policies consistent with international policies. According to BioFresh there should be an information flow between science and relevant stakeholders in order to reach a dialogue on the proposed issue. Accordingly such dialogue was facilitated through the inclusion of national and international stakeholders who were requested to provide the project of feedback and by translating information into an understandable format for non-scientists. *"To answer these questions, clear, understandable but not over-simplified information about the causes and impacts of freshwater biodiversity loss and related ecosystem services must be made available in a variety of formats"* (BioFresh project, 2015). The format was also important for the media as the project wanted them to play a role in the dissemination to a wider audience. Therefore the stakeholders were invited to give suggestions and additional input for the project. With this input BioFresh tried to make their results more understandable and accessible. Dissemination also took place through the use of 'champions' who had to get key messages to related stakeholder groups. Next to the use of champions there was also a plan to 'exchange' partners with projects to extend their network.

In the second phase of the project the communication channels and efficiency were prioritized over the selection of relevant stakeholders. BioFresh implemented new ways to communicate science to different actors who were affected by freshwater biodiversity in order to raise its own profile and to test the effectiveness of the methods in cooperation with WaterDiss, communication professionals who dealt with the blog and social media. In relation to the effectiveness of communication methods, BioFresh has done a survey which showed that freshwater biodiversity is not well-established in the policy field and awareness should be raised. Not surprisingly, raising awareness was a prioritized key issue. *"BioFresh aims to improve the capacity to protect and manage freshwater biodiversity by building an information platform, do scientific analyses, increase the awareness for freshwater biodiversity and support the European Union and other bodies' environmental policies with our knowledge and results."* (BioFresh, 2013c p.1) BioFresh implemented recommendations from the SPIRAL workshop in its SPI strategy. According to Klement Tockner was too little time and too little resources to get large groups to the stakeholder meetings which were desired for the SPI. Instead more effort was put in the design of the interactive web-based tool with accompanying explanation on how the tool works.

BioFresh had to deal with two major hurdles during the process. First of all it was hard to gain attention from relevant stakeholders and actors, a 'good story' with *"excellent information to confirm that story"* (Klement Tockner) was necessary to convince the target audience. The IUCN and DG Research played a major role in getting access to the right people. The second and greatest hurdle was a time constraint. The effect of the project reaches beyond the planned time span and Klement Tockner tells that *"now some of the results we came with, let's say the delay effect, we see important information and messages that are coming out."*

In order to guarantee policy relevance of BioFresh results and to gain continuous input for improvement, stakeholders were involved with the project from the start. According to Klement Tockner the WWF and the IUCN were included from the start of the project and only later the public and media got involved and in the final phase, during the final conference, policy people and decision makers were involved.

BIOMOT

The main goal of BIOMOT was to make a general “theory of motivation to act for biodiversity” to enhance the activities for biodiversity of a range of actors from local to global scale. A Detailed Communication Plan (DCP) has been set up by the BIOMOT communication team in which the target groups and the ways of communication were specified. External communication was aimed at target policy makers, NGOs and public and business leaders. The produced knowledge was to be communicated to an open and public sphere, accessible for everyone. With their results BIOMOT wanted to convince policy makers, ranging from a local to a global scale, to invest in biodiversity on the basis of non-economic arguments. To get the results worked out through the various scales, expand its network and increase its impact, BIOMOT worked towards a good relationship with TEEB. *“A good working relationship with TEEB will be built through the many contacts that BIOMOT researchers already have with TEEB economists and ecologists.... This way, BIOMOT will become embedded in the broad network and professional communication efforts of TEEB, through which it can multiply its impact”* (BIOMOT, 2011a p.50).

In the second phase there was a critical remark by the project itself: during the project the time needed for and the importance of external communication was underestimated. This was mainly due to a late and weak communication which was caused by a lack of a substantial communication strategy towards non-leading actors. The importance of these actors was underestimated and the amount of effort for communication with these actors was underestimated. A communication team has taken the lead to fix this since it was important for BIOMOT to make the results visible to stakeholders and by focussing on the commitment to communication, smart data collection and use of appropriate communication tools. One approach to this was the development of visual elements to transfer the key messages a short time. Additionally newsletters were written to inform stakeholders and interested readers on the results of BIOMOT. BIOMOT worked towards a two way engagement in its interaction with stakeholders and considered feedback and an established long-term interest to be crucial to this interaction. Journalists would be invited to the final conference to create mass media attention for the findings. This was one of the approaches to increase the use of media.

At the beginning BIOMOT got the task to focus on a science-society interface. Halfway the project BIOMOT got the task from the EC to focus more on the SPI. BIOMOT was not oblivious to the way a SPI works, according to Riyan van den Born *“we also would have chosen another approach, because then you can start a dialogue in the beginning and ask them what they needed from us.”* During the SPIRAL workshop BIOMOT got introduced to policy makers and people from different DGs and they learned that there is a need for proper communication between policy makers and scientists. From this point on BIOMOT increased its efforts to develop and improve their SPI. Various communication methods have been used to these interfaces in for the SPI: *“For the Science-Policy Interface, the networks of all work package leaders will be used to inform policy makers about BIOMOT face-to-face. In addition BIOMOT was represented at conferences... Written media will also be used to inform policy makers about BIOMOT.”* (Van den Born et al., 2014 p.7). Next to that a small group of policy makers was part of an advisory panel that was formed to give advice to BIOMOT and steer the research towards the interest of stakeholders.

One of the hurdles that was found by Luuk Knippenburg was the limited amount of time for the project and the focus on science rather than communication. Another hurdle was the communication from scientists to non-scientists, communication seemed beyond the reach of the scientists. Another problem that BIOMOT came across during the project was that it is hard to get in touch with the relevant policy makers on EU level as well as to get policy briefs at their desk. Policy makers were perceived as important actors in the translation and should have been more open to make time for this in the project.

At the beginning of the final year, face-to-face interaction with policy makers was starting up. Some policy makers already have been approached during interviews and once the results would take shape they would be fed back to policy makers and other stakeholders. Together with policy makers BIOMOT was looking at what should be done to make the results usable for their target group. To get some more face-to-face contact the final conference was planned as close to the policy makers as possible, especially to reduce the time that needed to be invested in getting to the conference.

HERMIONE

HERMIONE aimed to have available and useful information on deep seas for decision makers from national to global level. They believed that motivating the public to keep the oceans on the public agenda is crucial to the effectiveness of policy. A Science Implementation Panel has been established to provide HERMIONE with feedback on the policy needs, relevance and political and societal issues that are at hand. To let EU and global policy co-evolve with the results a SPP (Science Policy Panel) has been established with the goal to provide relevant actors – mostly policy makers – with relevant information. This SPP consisted of high level policy makers who were involved with the process right from the start. Together with and for the SPP workshops have been organized to discuss and share the findings of HERMIONE and to raise awareness for the work and give feedback on the process. Next to the SPP there was a panel which consisted of policy makers from DG Mare, DG Environment, DG Research the EC and NGO's and industry actors who were invited to partake in the panel and provide input for the project approach. The main task of this panel was to help shape the research and results as well as to help identifying time limits in the policy field.

"HERMIONE will also take full advantage (where appropriate) of various e-media such as Wikipedia, YouTube and networking sites such as Facebook. Partners involved: NOCS, with input from project partners" (HERMIONE, 2009a p.66). HERMIONE also made use of an online interface with guides, an animation movie and FAQ sheets among other outputs for visitors of the website. Furthermore meetings had been planned to get organized with stakeholders to ensure that the produced results would be useful for stakeholders. Next to these meetings there were ad hoc meetings with policy makers that would help to quickly anticipate on questions from the policy domain.

There was a lot of attention for the development of SPI mechanisms and mechanisms that have proven useful in HERMES were implemented here as well. Another help in the SPI was that the Scientific Officers were keen on helping and especially for one Sybille van den Hove said *"Adrian Peres is really keen on pushing the SPI stuff."* Through their science-policy links HERMIONE tried to further develop their own network and they tried to close the knowledge gap on deep sea ecosystems in order to show the importance of deep seas and to design policy on EU and on international level. According to Sybille the 'language' that scientists and policy makers used was not an issue *"I think they can understand complexity, they can understand uncertainty, they do it all the time, decide under conditions of uncertainty."* A problem was that it was hard to reach the people at the top levels due to a lack of time on their side. By pulling together with CoralFresh to organize meetings the amount of meetings for policy makers to attend was reduced.

The research was policy relevant to begin with since there was a present demand for knowledge on the deep sea when the project started. The project was linked to the political agenda which led to direct questions for specific knowledge on the deep sea and *"because we had all these things we had made ourselves known by, people for instance in the EC, people knew they could come to us and ask us."* (Sybille van den Hove). Next to the policy makers from the EU there also was a demand for this kind of knowledge from the industry with regard to Environmental Impact Assessments (EIA) which makes this research relevant for multiple actors.

HERMIONE had been involved in over a thousand interviews, presentations and invited talks as part of their dissemination and communication activities. Next to this there was lots of interaction on political level: *"We have held a number of meetings in Brussels at both DG Mare and DG Environment where we have presented our results and engaged in a dialogue. We have also held dedicated science policy panel meetings in both 2010 and 2012 where a small group of scientists from HERMIONE have engaged with representatives from Directorate General (DG) 'Mare', DG 'Environment' and DG 'Research' for a whole day of discussions."* (CORDIS, 2013a) It was not possible to measure what the impact from HERMIONE was in the policy field since there are many different factors that can influence policy. On the other hand, some results have been taken up into policy as Sybille van den Hove mentions: *"We have found a copy paste from our text into the UN general assembly documents."*

REFRESH

The goal of REFRESH was stated as *"to develop a framework that will enable water managers to design cost-effective restoration programmes for freshwater ecosystems"* (REFRESH, 2011a p.6). This goal was meant to contribute to policy relevance of the project since it sought validation of the formulation for the scenarios with stakeholders. In order to find out which key groups needed to be involved in the research a stakeholder analysis had taken place before the stakeholders were included. Stakeholders and local policy makers were involved from the start of the project in order to help develop relevant scenarios and storylines. *"This requires a negotiated relationship between relevant agencies, water managers and water users and a consideration for the multiple perspectives and potential conflicts of interest between the stakeholders."* (REFRESH, 2014b)

During the second phase REFRESH got advice from the SPI Water Cluster Group on how to improve its SPI. Included in this advice were earlier inclusion of stakeholders, more face to face contact and providing stakeholders with more draft of outputs for further inclusion. Additionally they were advised to build forth on previous meetings and to use communication campaigns. *"Show the benefits/results to society and stakeholders through communication campaigns.; Disseminate the benefits of your research, not only the results. Translate the benefits to financial and societal results interesting for the stakeholders."* (SPI Water-Cluster, 2012 p.11). REFRESH made efforts to write targeted outputs in such a way that the stakeholders would be able to understand the content. In this especially the understandability and readability of the products for non-scientists was highlighted next to the usability of results for policy makers and industries. On the awareness issue it is mentioned that the project should assure that policy makers should use the produced knowledge to its fullest extent. Related to these issues there is more emphasis on the accessibility of research results and a faster transfer of these results. More emphasis is also put on the use of networks. REFRESH has been advised to use existing networks and to implement their strategy into existing networks.

Input from stakeholders had been used to formulate key questions and once these had been formulated they had been sent back to the stakeholders for a check to assure that all relevant questions had been included. Because a scientific understanding of the freshwater ecosystems was regarded to be crucial to a successful implementation of the research, dissemination and communication activities had to get lots of attention in the project. The relevance of the project has been highlighted during various conferences and the present audience had been involved in discussions on the results. As part of the communication and dissemination activities REFRESH had held a joint meeting with BioFresh on freshwater management with recommendations for policy making.

During the final phase of REFRESH research had been done on what the most appreciated methods of dissemination were and updated their website. With the results and feedback from the SPI Water Cluster group of Projects the dissemination strategy had been revised. *"revision of the REFRESH dissemination strategy in the light of discussions within the Science Policy Interface community including those involved in the Common Implementation Strategy (CIS) of the Water Framework Directive (WFD) Science Policy Interface (CIS:SPI) activities and the SPI Water Cluster group of Projects."* (REFRESH, 2014a p.5) For the communication and dissemination the project website is the central platform through which results can be found. The main focus of the final reporting period was to ensure REFRESH research output was disseminated in a targeted way to the appropriate stakeholders.

The actual SPI took place almost exclusively at the socio-economic aspect of the research. According to Julia Martin-Ortega this was mainly because *"social sciences in general are the bridge between all the disciplines and policy science, so it is natural."* Related to this was the late inclusion of policy makers in the project. According to Julia Martin-Ortega the inclusion of policy makers is crucial for a project and there is no need to wait with the inclusion of these actors. To review REFRESH's effect on policy, policy makers have personally been asked how useful they thought the project was and the general responses were positive with some less positive to negative responses.

ROBIN

ROBIN aimed to inform stakeholders and partners of the project on the CBD and REDD++ through various dissemination activities, depending on what the best dissemination approach was to the deliverable and to present an approach to policy makers. There was a continuous emphasis on the policy relevance of outputs, the goal was to provide workable tools and close the knowledge gaps with regard to carbon storage and biodiversity conservation. The communication strategy described various communication approaches that would be used to deliver the information to different stakeholders. *"To ensure best use is made of project deliverables, we will identify dissemination and exploitation activities appropriate to each output."* (ROBIN, 2011a p.57). Included in these activities were planned events and meetings to establish direct dialogue and an opportunity for stakeholders to provide input for ROBIN. This was a crucial part to the approach of ROBIN to reach its aim. By spreading information to non-consortium member countries and by using an educational communication channel ROBIN tried to ensure the uptake and use of the results. Alongside this, results were made publically accessible on a common place. To raise public awareness on biodiversity conservation and climate change ROBIN uses verbal communication and printed materials. During the first phase there has been set up a list of conferences, meetings and publications that have to be reached in order to communicate to their target group as is desired.

During the second phase the project was still identifying stakeholders and seeking their consultation for policy relevance. Communication had a low priority during the first phase of the project since there was mainly knowledge being produced with the already involved stakeholders. Stakeholder engagement became more important in the second phase and ROBIN tried to produce clearer outputs with relevant information for climate mitigation policies. The SPIRAL workshop provided ROBIN with insights that were going to be used in the communication. Terry Parr mentioned some of the gained insights: *"So they [policy actors] were asking quite more scientific questions, much more in terms of wanting to have some basic knowledge on which to develop policy. ... And then the useful part of that was to get an idea on what a good policy brief would look like."* With the advice of SPIRAL and feedback from stakeholders the communication strategy was continuously adapted in order to use the best approaches for the project.

ROBIN focusses on informing countries and governments on the CBD and REDD++ mechanisms in South America and Mesoamerica. To this end they established links with governmental organizations, but also with EU key staff to show the relevance of the project for the EU. *"To ensure that the outputs from ROBIN best serve end-user needs, we will engage with relevant stakeholders in South America, Mesoamerica and Europe throughout the project, beginning at an early stage."* (ROBIN, 2011a p.57). Furthermore there were plans to develop a contact database to make it easier to get in touch with stakeholders and to keep this updated. For the projects scientists were attracted to the project through the Alternet network with an aim for a 'natural growth' of the community. In other words, every contact could let the community grow by inviting new members.

ROBIN worked on multiple scales with SPIs, on the global level with CBD and UNFCCC (since the start of the project) and on national and local level with government agencies and authorities. From the moment that there were presentable products higher level people and organizations were being more involved again. It was hard to establish science-policy links at the higher government levels with some of the involved countries as to which a regional advisory group was established, according to the proposal of the national stakeholders. This did not go without trouble: the different countries dealt with different types of policy and had different rules to deal with which slowed down the process. On the other hand it became clear that it was best to produce a set of policy briefs with a target audience instead of one product with general outcomes. This SPI attempt showed that it was not possible to have a regional SPI there and the SPIs had to take place at the national level, leading to a shift in a national focus half way the project. This exemplifies the impossibility to follow a DoW step by step and it underlines that a SPI is a process open to changes with hurdles, which have been dealt with and will be dealt with in ROBIN by using the feedback from stakeholders. On the European scale DG Research was helping with the SPI by outlining the structure and mechanisms and for the future Terry Parr expects that *"they will be much more helpful in the final stage where we are going to explore the relevance of what we have done to EC policies and maybe national policies for countries within Europe."*

SoilService

SoilService wanted to raise awareness on soil ecosystem services and economic benefits among stakeholders, including farmers and farmers organizations due to a demand for soil policy different from the current approaches. The aims of SoilService are to develop ideas and tools to help decision makers link ecosystems with policy and land use as well as a link between economic models and soil ecosystem services. These links should provide new insights of the gains of soil protection for policy makers as well as scientists and contribute to a knowledge based competitive economy. According to Katarina Hedlund the main goal was not really affecting policy, rather it was to show the importance of soil in ESS by quantifying and valuating ESS for policy and thus indirectly affect policy. To keep the research policy relevant SoilService found it necessary to interact with decision makers and stakeholders to find out what was relevant and obtain their feedback. This was partially necessary to assure that the involved international community would understand and see the information as relevant. Next to keeping outputs relevant stakeholders were asked to validate outcomes and policy actors were invited to workshops to interact with scientists *"The [next] Workshop will be about: "Outreach to policymakers". Invited speakers would be, apart from scientists, policymakers and stakeholders as well as people from media."* (SoilService, 2010b p.2) Additionally there was an opportunity during some meetings to provide SoilService with feedback and suggestions to link knowledge better to policy makers and stakeholders.

During the second phase there was an emphasis on the dissemination of the results to users. As part of this aim there was a meeting in Brussels for DG Environment and DG Agriculture as well as a policy maker oriented meeting – including stakeholders and media – and the publication of summaries in various national languages on the SoilService website. To increase the intelligibility of the outputs scientists were obliged to translate their findings to a language that was understandable for policy makers and policy makers in their turn had to present their thoughts on how to tackle the issue. This had to lead to discussions on the main questions and on the way in which the message should be formulated to be useful for policy makers. For the dissemination policy briefs were written and Katarina Hedlund mentioned both a positive and negative aspect of the briefs: *"... the policy briefs they were quite good, I could see that. I actually saw one farmers advisory group translating one of our policy briefs and sending them to the farmers. But I mean that is impossible because it is in the wrong language so it ended up in the waste bin of the farmers."*

In the second phase another goal of SoilService becomes clearer, namely that it *"will enhance the development of cost-effective conservation policies, such as habitat banking, enhancing sustainability of soil-based goods and services."* (SoilService, 2010c p.7). It further emphasises that it will reconcile two stakeholders with opposing views by identifying best practices. In the final phase AgriPoliS had been developed, an economic valuation tool linked to ecosystem services and identified the best practices which should reconcile two opposite stakeholder groups. Next to this a link between ecosystem services and farmers economic decisions has been worked out in socio-economic models.

SoilService obliged its partners to establish contacts with relevant scientists and farmers in involved countries. Scientists involved in this project were already part of the SoilService network which helped in creating a good working environment. Further expansion was established by an exploration of the organized field and informing who would be interested. The barrier to get in touch with the project was very low, moreover, Katarina Hedlund was very active in involving interested actors personally to the project. Unfortunately it was not possible to get in touch with non-EU which led to the assumption that the message did not arrive well at those national levels.

SPIRAL

SPIRAL's goal was to develop recommendations for SPIs and enhance interaction in projects through the study of the interaction between research projects and policy actors and stakeholders. This means that SPIRAL did not aim to actively affect policy, rather it tried to affect the way in which policy and science work together, generating an indirect effect. SPIRAL's intention was to reach out to as many relevant stakeholders as possible and to keep these informed on the progress in the project. To this end the DNA (Dynamic Network of Advisors) has been established, consisting of policy makers, decision makers, NGOs and many other types of actors, continuously growing through open and personal invitations. *"This DNA encourages active involvement and ensures effective coordination of the engagement of stakeholders in SPIRAL, as well as ensuring the policy relevance and practical value of the work carried out in SPIRAL."* (SPIRAL, 2011a p.5). Next to the DNA there was a group of six people who were able to quickly provide feedback on the work done by SPIRAL to improve the way in which outputs were communicated.

A dissemination and communication strategy has been written to assure that different dissemination formats would be used so that outputs would fit best with their target group. Before dissemination outputs were first validated by stakeholders to check once again if they would be well understood. Next to this SPIRAL kept producing dissemination products during the whole project to keep the attention of stakeholders with the project. According to Juliette Young it was very important to keep all stakeholders informed at more or less the same level which was time intensive. *"Communicating SPIRAL processes and results has been an ongoing effort during the second reporting period of the project. Our main communication tools were the SPIRAL website, the SPIRAL Newsletter, and numerous direct contacts with actors engaged in SPIs, in particular (but not only) through the test cases."* (SPIRAL, 2012a p.23). The type of contact evolved from less to almost fully personal. Various workshops have been organized to find out how to make results policy relevant and external communication of the work was started up during the second phase. In accordance with the philosophy that actors should be involved during the whole process, SPIRAL kept stakeholders involved in the interfaces. One of the ways through which such involvement was attempted was by providing stakeholders and actors the opportunity to request specific information for a brief. Additionally SPIRAL chose to produce a set of briefs as final product because from the feedback and the process it appeared that this would be the best way to find information. The briefs were written in different topics and through an interactive platform policy makers can look for relevant information.

A workshop has been held with SPI coordinators and DG RTD and DG ENV representatives on the preliminary results of SPIRAL to enhance a discussion on the project. This meeting was held in Brussels during the second phase of the project and focused on evaluation criteria for a SPI, participants experiences of a SPI and failures and successes of a SPI according to the evaluation criteria provided with feedback. Meetings were planned with relevant stakeholders and actors to think about the direction and evaluation of the test cases and interviews with stakeholders have been planned, which have been executed in the second phase. In this way SPIRAL tried to identify stakeholders demands and institutional gaps in existing SPIs.

Through the Network of Excellence and the produced handbook SPIRAL assumed it would have an impact in improving the capacity on the science-side to enhance the connectivity with policy-making. Juliette Young thinks that especially the handbook, which was much supported by Scientific Officer Adrian Peres, will get across policy fields. Juliette Young's understanding is that *"he [Adrian Peres] is now going to hand these handbooks out to all the projects on Horizon 2020 so that they can have a very easy and quick and in-depth understanding of how to improve the SPI in their projects."* The relationship with DG RTD was also very important because the request for a better understanding of the link between science and policy originated with them and they supported the SPIRAL workshop with other projects.

To further increase the effect of SPIRAL in the third phase the project itself identified different areas to act upon. According to Juliette Young SPIRAL encountered some hurdles, like any other project. One of these was the difference in time schedules: policy makers and scientists work in different time schemes. Next to this there were some frustrations between the parties, which were solved during the project. Thirdly there was a difference in languages which sometimes resulted in back and forth communication between scientists and policy makers. Not surprisingly one of SPIRAL's recommendations is to include translators who are able to communicate the needs of both scientists and policy makers.

STEP

The objectives of STEP were to quantify drivers and impact of change, identify relevant strategies and instruments for the conservation of pollinators and finally disseminate the results to stakeholders. Putting the focus on the SPI and interaction with the policy domain it is important to mention that STEP developed a strategy to find relevant stakeholders. The links with most of the stakeholders were, as assumed by David Kleijn, made with and by the work package leaders, partially based on present links. Consecutively these policy actors were supplemented by contacts suggested by DGs and were then again asked to identify relevant people to engage with. DG Research thus was helpful in providing contacts, feedback and advise on the mid-term review. Stakeholder meetings were held with the intention to make the governing questions for the project with policy makers and other stakeholders, making these cooperative and policy relevant. There were also an ad-hoc advisory group which helped STEP meet policy demands and an Advisory board was planned to update STEP on the events in the policy domain and provide inputs.

For the dissemination of results the website was used as most important tool for actors to find relevant information. Additionally social media were actively used to disseminate information and the use increased during the third phase. On top of that STEP made most of its products publically available which was in accordance with the European Directives for open access. But next to the website and the social media there were lots of different dissemination activities described in the dissemination portfolio. *"STEP will produce a portfolio of dissemination materials ranging from top international scientific publications to carefully targeted booklets for end-users such as farmers and beekeepers, as well as delivering findings directly to a wide range of stakeholders through talks, workshops, TV and newspaper articles."* (STEP, 2011 p.6). STEP too did research on which dissemination activities were most appropriate for which stakeholder groups. Not mentioned here is the amount of face-to-face contacts which increased during the final phase according to coordinator Simon Potts and the awareness raising activities which were accompanied with (public) education and trainings of stakeholders. Another type of awareness raising activities took place through presentations, their presence at conferences and the use of mass media for which the translation of scientific language took place. Awareness raising played an important role according to Kleijn since the public plays a role in what policy makers will do *"it is not just the policy makers that are having a choice but it is also the public that can form an opinion based on the outcome of the research and then it is up to them."*

Next to the dissemination portfolio there was a communication strategy ensuring a continuous information flow to interested and involved stakeholders to keep them interested and involved. For policy makers this was done by inviting them to presentations and workshops and by publishing in the EC policy letter Science for Environment Policy Newsletter. *"A research supported by STEP, alongside other European Commission projects (ALARM and MACIS) has been placed among the Top 10 most popular Policy Briefs for 2012 in the classification of Science for Environmental Policy (SEP)."* (STEP, 2013a). It was assumed that the present interest of the 'hot issue' on pollinators, which got more attention from the predecessor project on pollinators ALARM, would increase through these newsletters. Further influence was exerted through the extensive use of social media and social networks. Kleijn assumed that policy makers are more inclined to do something about an issue when it gets more attention in the media. But pollinator policy was influenced by more factors than STEP which made it hard to express the impact that it had on policy making. Next to this Kleijn mentioned that STEP was *"one voice in a room full of voices"* which would have limited the possible impact of the project on policy.

STEP planned to integrate the project into other networks since these had to play an important role in the translation and dissemination within their own network. An international network was planned to be established in order to exchange ideas and information. STEP thus was active on a global scale, but they also worked on a rather local scale with actors such as beekeepers and farmers. Finally, STEP aimed to enable continual dialogue and to improve the SPI on various scales. This was pursued by participating in science-policy meetings and workshops.

TESS

Before TESS had started the focus already shifted from a national to a more local level as the survey showed a lack of interest and knowledge on the local level. TESS aimed to encourage land-users to monitor their practices in order to enhance income and biodiversity and on governmental level it aimed to enhance the information needed for assessments. Their strategic objective was to *"design a decision support system related to environment and land use that will enable policy makers to integrate knowledge from the regional and local level into the decision making process, while also encouraging local people to maintain and restore biodiversity ecosystem services."* (TESS, 2008a). The project intended to be a win-win design enabling central policy to obtain local data and local managers to get complex guidance in return for their knowledge.

TESS adopted a participatory approach in which both non-experts and experts had to contribute to the project on an equal level. During the first phase a proposal was made to contact local stakeholders so that their visions and ideas could be included to the project and to make the project policy relevant. This proposal was further worked out during the second phase by including private individuals, NGO's and conservation agencies to the participatory process. Interviews had been held to determine the requirements and demands of the stakeholders and an assessment for the relevance of local monitoring was demanded. *"The key points to come out of the open discussion session were the need for: credible data, the need for effective promotion of the portal among land users and the need to ensure that users are motivated to be involved in the project and that they will use the system."* (McKinley, 2011 p.14). But next to the inclusion of local stakeholders TESS also put a focus on policy makers' needs on information for a strategic environmental assessment and a sustainability impact assessment to increase the policy relevance of the project. During the third phase TESS promoted itself by pointing out that it was a central coordination system that reduced expenses and time spent on looking for information.

TESS wanted its dissemination activities to have a double function, namely to inform actors and to function as a channel for feedback which shows the desire for a SPI. The website of TESS was the most important dissemination channel because, according to Robert Kenward, this was the only way to really reach the most local actors. Therefore a lot of effort was put into it and the website was translated into the 23 languages of their partner countries to make it more accessible. Additionally, due to the focus on (lay) individuals support for the project, the language was kept not too complex which would assure that the project was understandable for everyone. This communication and dissemination was run by a coordination team – which consisted of three different institutions – in order to have the research partners focus on doing research. As part of this team an ex-civil servant was responsible to a large extent for the interfacing with policy actors. All together they had the responsibility to make the translations.

European associations with strong networks were included in TESS in the hope they could generate support and influence institutions on European level and with grassroots organizations. TESS was quite active in SPIs since they had talks and meetings with DG Environment and national governments. DG Research tried to provide support for the SPIs through a Case Officer but due to circumstances she was not able to do so. According to Robert Kenward there was no further substantial support from DG Research. TESS influenced policy makers mainly through their final conference and through charters that have been produced for the Bern convention, which has influence on all signatory states of the EU.

Support for the results of the project became clear during the final conference where policy makers, experts from different disciplines and civil society showed their strong support for the work that had been done. According to Robert Kenward this meeting, arranged at the European Parliament, was the most influential approach to directly influence policy makers and indirectly by inviting stakeholders connected to policy makers. In the report on the final conference present stakeholders were outspokenly positive: *"She [Professor Jacqueline McGlade (Executive Director of the EEA)] felt that the TESS project offers a 'phenomenal way to reach civil society' and make something of local knowledge and expertise, concluding her presentation by offering the EEA as a 'home for TESS'."* (McKinley, 2011 p.7). There are lots of issues for which the TESS tool can be used but due to a lack of knowledge on climate change it was not possible to make it applicable for all climate related research.

Appendix B: Reference list of consulted research documents

BESAFE (2013b). "Annex I: Description of Work"

BESAFE (2013c). "D1.1 Report – Second version, Report on the classification of arguments and the provisional framework"

Stoev, P.; Bogers, M.; Van Dijk, J. (2013). "D6.2 Communication and Dissemination strategy" BESAFE

BESAFE (2013d). "First stakeholder workshop" Presentation, INBO, Brussels 23-24 May

BESAFE (2013e). "BESAFE Newsletter 1/2013"

BESAFE (2013f). "BESAFE Newsletter 1/2013"

BESAFE (2013g). "How have we advanced our understanding of the links between biodiversity, ecosystem functions and ecosystem services?"

BESAFE (2014). "A comparison of arguments surrounding the Biodiversity Strategy 2020" Presentation, INBO, Brussels 13 May

BESAFE (2015). "Biodiversity and Ecosystem Services: Arguments for our Future Environment" Available in: <http://www.besafe-project.net/index.php?P=36> [Accessed on 22-08-2014]

BioFresh (2009). "BioFresh: Overview, Work Packages and Key Contacts"

BioFresh (2010a). "General Presentation BioFresh" Presentation of the project

BioFresh (2010b). "BioFresh Newsletter Issue No.1"

BioFresh (2011b). "BioFresh Newsletter Issue No. 3"

BioFresh (2012a). "BioFresh Newsletter Issue No. 4"

BioFresh (2012b). "BioFresh Newsletter Issue No. 5"

BioFresh (2012c). "Less 'charismatic' species should not be forgotten in conservation" Science for Environment Policy 281

BioFresh (2013c). "BioFresh Newsletter Issue No. 6"

BioFresh (2013d). "BioFresh Newsletter Issue No. 7"

BioFresh. (2014a). "BioFresh Newsletter Issue No. 8"

BioFresh (2014c). "Report on face-to-face meetings and training needs on the BioFresh platform for key stakeholders and integration of a set of on-line training media into the BioFresh platform (M51)"

BioFresh (2014d). "International Science Policy Symposium convened to support BioFresh products, and to encourage stakeholders to support integration of habitat and freshwater biodiversity issues into relevant sectoral environmental policies (M51)"

BioFresh Project (2015). "Welcome to the BioFresh Project" Available in: <http://project.freshwaterbiodiversity.eu> [Accessed on 28-08-2014]

BIOMOT, (n.d.). "Work package 1"

BIOMOT, (n.d.). "Work package 2"

BIOMOT, (n.d.). "Work package 3"

BIOMOT, (n.d.). "Work package 4"

BIOMOT, (n.d.). "WP1 Current status and future planning"

BIOMOT, (n.d.). "BIOMOT WP2 Current state"

BIOMOT, (n.d.). "Current state WP3"

BIOMOT, (n.d.). "BIOMOT – WP4 Current affairs"

BIOMOT (2011b). "Leaflet"

BIOMOT (2012). "Koli meeting December 2012" Report on the meeting in Koli, Third week of December

BIOMOT (2013a). "Manchester meeting February 2013" Report on the meeting in Manchester, 19-27 February

BIOMOT (2013b). "Newsletter No. 1 ("After value. Putting a price tag on Biodiversity doesn't work.")"

BIOMOT (2013c). "Policy brief #1. The Limitations to Economic Environmental Valuation"

BIOMOT (2013d). "Policy brief #2. Towards a more Comprehensive Classification of Ecosystem Services"

BIOMOT (2013e). "Motivation for Biodiversity Action: Vocabulary, theories and framework"

BIOMOT (2014a). "Newsletter No. 2 (Presentation of BIOMOT's 'people workpackage' WP3)"

BIOMOT (2014b). "Newsletter No. 3 (Presentation of BIOMOT's 'policy workpackage' WP2)"

BIOMOT (2014c). "Policy brief #3. Effective research for biodiversity action"

BIOMOT (2014d). "BIOMOT mid-term conference report" Conference report, Brussels, 24-25 March 2014

BIOMOT (2015). "BIOMOT – FP7-ENV-2011 Collaborative Project" Available in: <http://www.biomot.eu/> [Accessed on 28-08-2014]

Blyth, E.; Bolt, A.; Thonicke, K.; Cisowska, I. (2013). "A unique approach to modelling biodiversity and land management in land surface models" ROBIN

Bonaiuto, M. (2013). "BIOMOT in Makari – Interview meeting September 2013, Italy" Report on the Makari Meeting, Third week of September

Brincat, J. (2010). "Protection of vulnerable marine ecosystems, deep-sea fisheries and marine biodiversity: Developments at international and EU level" Presentation, 27 April 2010

Cid, N. & Cardoso, A. C. (2014a). "Policy brief Issue No. 6" BioFresh

Cid, N. & Cardoso, A. C. (2014b). "Science Policy Brief 1, Zooplankton: an integrative Biological Quality Element for assessing the Ecological Status of lakes" REFRESH

Cid, N. & Cardoso, A. C. (2014c). "Science Policy Brief 2, Riparian Forest can help mitigate climate warming effects in lowland temperate streams" REFRESH

Cid, N. & Cardoso, A. C. (2014d). "Science Policy Brief 5, Riparian areas to sustain freshwater life" REFRESH

Clavijo, F.; Toledo, M.; Ascarrunz, N. (2013a). "ROBIN holds first meeting of Regional Advisory Group for South America in Bolivia, March 2013" ROBIN

Clavijo, F.; Toledo, M.; Gerritsen, P.; Blanco, I.; Lazos, E. (2013b) "Stakeholder engagement in climate change mitigation: institutional responses must have the support of local people" ROBIN

CORDIS (Community Research and Development Information Service) (2013a). "Final Report Summary - HERMIONE (Hotspot Ecosystem Research and Man's Impact on European seas)"

CORDIS (2013b). "Periodic Report Summary BIOFRESH (Biodiversity of freshwater ecosystems: status, trends, pressures, and conservation priorities)"

European Union (2013). "Recognising the value of soil biodiversity" Research and Innovation

Ewald, J. (2009) "WP 5 - Pan-European Survey, Construction of Draft Pan-European Questionnaire Survey" Presentation TESS Workshop on Information Flows, 15 September 2009, London, UK

Freyhof, J. & McKenna, D. (2013). "Policy brief Issue No. 3" BioFresh

Hedlund, K. (2012). "Conflicting demands of land use, soil biodiversity and the sustainable delivery of ecosystem goods and services in Europe" Presentation at Brussels

HERMIONE, (n.d.). "Hotspot Ecosystem Research and Man's Impact On European Seas brochure"

HERMIONE (2009a). "Annex I: Description of Work"

HERMIONE (2009b). "Marine & Coastal Research, HERMIONE" European Commission/ European Research Area/ Environment

HERMIONE (2010). "HERMIONE first SPP meeting, 27 April 2010, Brussels" Available in: <http://www.eu-hermione.net/news/science/71-hermione-spp> [Accessed on 26-08-2014]

HERMIONE (2012). "HERMIONE second Science-Policy Panel meeting" Available in: <http://www.eu-hermione.net/policy/science-policy-panel/209-hermione-second-science-policy-panel-meeting> [Accessed on 26-08-2014]

HERMIONE (2015). "Hotspot Ecosystem Research and Man's Impact On European Seas" Available in: <http://www.eu-hermione.net/> [Accessed on 26-08-2014]

Hodder, K. & Butters, J. (2009) "Work-package 3 Environmental information use at the local level – demand and supply" Presentation TESS Workshop on Information Flows, 15 September 2009, London, UK

Jepson, P. (2013). "Policy brief Issue No. 5" BioFresh

Jones, L. & Kok, K. (2014). "Scenarios and policy options in ROBIN" ROBIN

Julio, M. (2014). "ROBIN and the Convention on Biological Diversity" ROBIN

Kaphengst, T. & Freyhof, J. (2013). "Policy brief Issue No. 4" BioFresh

Kenward, R. E.; Ewald, J.; Sharp, R. J. A. (2010). "D5.1 Pan-European survey of assessment processes" TESS

Kenward, R.E.; Dick, J.M.; Smith, R.I.; Papathanasiou, J.; Andreopoulou, Z.; Chatzikostas, G.; von Bethlenfalvy, G.; Carvalho, C.R.; Sharp, R.J.A.; Tederko, Z.; Szemethy, L.; Ivask, M.; Navarodu, I.; Avcioglu, B.; Casey, N.; Sotherton, N.; Ewald, J.; Walls, S.; Turner, S.; Watt, A.; Ntavarinos, K.; Chatzikamaris, P.; Morgado, R.; Gallo, J.; Székely, D.; Piirimäe, K.; Arupee, E.; Gem, E. (2011) "D6.3 Design of a Transactional Environmental Support System" TESS

Kernan, M. (2013). "REFRESH Adaptive strategies to Mitigate the Impacts of Climate Change on European Freshwater Ecosystems" Presentation Freshwater Management in a Changing World, 7th November 2013

Lazos, E. & Gerritsen, P. (2013). "Stakeholder meeting Mexico" ROBIN

Manners, R.; Varela-Ortega, C.; Blanco, I.; Esteve, P.; Guerreiro, L.; Simões, M. (2014). "Brazilian Stakeholder Workshops" ROBIN

McGlade, J. & Koranteng, K. (n.d.). "Major findings and recommendations of the Group of Experts" Presentation

- McKinley, E. (2011). "D6.4 Workshop to propose TESS for SEA, SIA, EIA and land use decisions" [TESS](#)
- Neßhöver, C. (2010). "D1.1: Concept Note on Common Framework for Case Study Analysis" [SPIRAL](#)
- Neßhöver, C. (2011). "D1.2: Study on landscape of science-policy interfaces" [SPIRAL](#)
- Neßhöver, C. (2012). "Stocktaking and assessment of existing science-policy interfaces for biodiversity governance (WP1 Synthesis Report)" [SPIRAL](#)
- Neßhöver, C.; Timaeus, J.; Wittmer, H.; Krieg, A.; Geamana, N.; Van den Hove, S.; Young, J.; Watt, A. (2013). "Improving the Science-Policy Interface of Biodiversity Research Projects" [Gaia](#) **22**(2): 99-103
- Neumann, P. & Potts, S. G. (2011). "D1.1: Recent changes in honeybee colonies, populations and beekeeping in Europe"
- Niemelä, J. (2012a). "D3.1: Attributes of Science-Policy Interfaces and their Linkages to Instruments and Mechanisms for Encouraging Behaviour that Reduces Negative Human Impacts on Biodiversity" [SPIRAL](#)
- Niemelä, J. (2012b). "D3.2: Recommendations for the improvement of the science-policy process for developing the integration of indicators and other mechanisms for influencing behaviour to reduce negative human impacts on biodiversity" [SPIRAL](#)
- Nöges, P. & Nöges, T. (2014a). "Science Policy Brief 3, Stricter nutrient loading limits help lake ecosystems to withstand climate change pressures" [REFRESH](#)
- Nöges, P. & Nöges, T. (2014b). "Science Policy Brief 4, Stronger need for maintaining environmental flow in streams in a changing climate" [REFRESH](#)
- Pittock, J. (2011). "Data on biodiversity for freshwater managers" [Water environment](#) **21**: 56-58
- Ratamáki, O. & Jokinen, P. (2011). "D6.1: List of Governing Questions and the hierarchical sub-division into more detailed questions" [STEP](#)
- REFRESH (2010a). "REFRESH Work package 7, Dissemination" [Presentation during meeting 22nd – 26th March, Antalya, Turkey](#)
- REFRESH (2010b). "REFRESH WP7 WORKSHOP IN ANTALYA (WED 24TH 9.00AM) – Minutes" [Meeting minutes Antalya](#)
- REFRESH (2010c). "Work Programme" Available in: <http://www.refresh.ucl.ac.uk/about/overview> [Accessed on 27-08-2014]
- REFRESH, (2011a). "D1.13: Report on scenarios and storylines workshop to present the outputs of Task 2 to the key national stakeholders responsible for implementing the WFD and HD policies for the eight demonstration catchments"
- REFRESH (2011b). "REFRESH Work package 7, Dissemination" [Presentation during meeting 3rd – 8th March, Aberdeen, Scotland](#)
- REFRESH (2011c). "REFRESH SECOND PROJECT MEETING – ABERDEEN 3RD-8TH APRIL 2011" [Minutes meeting Aberdeen](#)
- REFRESH (2012a). "Tasks 6.4 & 6.5 Interim Report, Proceedings of the workshop for informing the disproportionality analysis and flagging the wider benefits of improving water quality in the Thames sub-catchment, UK"
- REFRESH (2012b). "Social and economic effects of improving water quality in the River Thames"
- REFRESH (2013b). "REFRESH Newsletter | Winter 2013"
- REFRESH (2013c). "Joint interregional dissemination event - REFRESH and Lake Admin, Estonia"

REFRESH (2014b). "Stakeholder Engagement" Available in: http://www.refresh.ucl.ac.uk/Work_Programme_4 [Accessed on 30-08-2015]

REFRESH (2014c). "REFRESH Newsletter | Spring 2014"

REFRESH (2014d). "REFRESH stakeholder meetings: October 2013-January 2014"

REFRESH (2014e). "Science Policy Symposium for Freshwater Life "Water Lives: new scientific horizons for biodiversity and water policy"

ROBIN (n.d.). "Flyer"

ROBIN (2011b). "Biodiversity, ROBIN" [European Commission](#)

ROBIN (2012a). "ROBIN meets in Mexico to get the project off"

ROBIN (2012b). "ROBIN | Role of Biodiversity in Climate Change Mitigation" Available in: <http://robinproject.info/home/> [Accessed on: 12-11-2014]

ROBIN (2013). "First Periodic Report 01 November 2011 to 30 April 2013"

Rundlöf, M. & Bommarco, R. (2011) "D4.1: Review of the uptake of mitigation strategies counteracting pollinator loss across Europe"

Rundlöf, M. & Smith, H. (2011), "D4.2: Review of the uptake of mitigation strategies counteracting pollination loss across Europe" [STEP](#)

Schepper, J. & Kleijn, D. (2011). "D4.3: Analysis of the effectiveness of measures mitigating pollinator loss" [STEP](#)

Sharp, R. (2009). "TESS Work-package 2 – Reporting, Central Policy Environment" [Presentation TESS Workshop on Information Flows, 15 September 2009, London, UK](#)

Sier, A. (2012a). "Project team meeting in Bolivia" [ROBIN](#)

Sier, A. (2012b). "ROBIN to be presented at European Forum on Eco-Innovation" [ROBIN](#)

Sier, A.; Equihua, M; Equihua, C. (2012a). "D4.2.2 - ROBIN Communication Strategy" [ROBIN](#)

Sier, A.; Hernández, A.; Equihua, M. (2012b). "D4.2.3 - Publicity material on interactions between climate change, biodiversity and environmental services" [ROBIN](#)

Sier, A. (2014). "ROBIN is on Twitter" [ROBIN](#)

Simpson, I. (2012). "D4.2.1 – Website & Branding" [ROBIN](#)

SoilService (n.d.). "SoilService Brochure"

SoilService (2008a). "D 3: Workshop 1 Call"

SoilService (2008b). "Minutes from the SoilService meeting 2-4 June 2008, Reading, UK" [Meeting minutes, 2-4 June 2008, Reading, UK](#)

SoilService (2009a). "Conflicting demands of land use, soil biodiversity and the sustainable delivery of ecosystem goods and services in Europe"

SoilService (2009b). "Soil diversity and ecosystem services how can we value services and identify threats to soil sustainability? A multidisciplinary workshop bringing together policymakers, economists and ecologists"

SoilService (2010b). "Meeting 2010-09 Thessaloniki" [Notes on project meeting Thessaloniki, Greece.](#)

SoilService (2010c). "Second project periodic report"

SoilService (2010d). "D8: Workshop 2 call"

SoilService (2010e). "Threats of Land Use Change and Urbanization on Soil Ecosystem Services, 2nd Soil Service Workshop" [Summary presentations at Lammi workshop](#)

SoilService (2010f). "D12: Scenarios of socio-economic and environmental changes that could drive future land use change within Europe"

SoilService (2010g). "Soil biodiversity: functions, threats and tools for policy makers | Technical Report – 2010 – 049" [European Communities](#)

SoilService (2011a). "D 13: Workshop 3 Call"

SoilService (2011b). "Project summary 2011"

SoilService (2013). "Appendix 1 – Plan for using and disseminating the knowledge"

SPIRAL (2010) "D5.3: SPIRAL Newsletter 1"

SPIRAL (2011b). "D5.3 SPIRAL Newsletter 2"

SPIRAL (2011c). "D5.2: SPIRAL Communication and Dissemination Strategy"

SPIRAL (2012a). "2nd Project Periodic Report"

SPIRAL (2012b). "D2.1: Recommendations to improve the communication between scientists and policy-makers on biodiversity"

SPIRAL (2012c). "D5.5 SPIRAL Newsletter 3"

SPIRAL (2012d). "SPIRAL Newsletter 4"

SPIRAL (2013b). "Annex I - "Description of Work""

SPIRAL (2015). "SPIRAL, Interfacing Biodiversity and Policy" Available in: <http://www.spiral-project.eu/> [Accessed on 28-08-2014]

STEP (n.d.). "Biodiversity, STEP" [European Commission, European Research Area, Biodiversity](#)

STEP (2010b). "D7.2: General communication and dissemination strategy"

STEP (2010c). "D8.1: Intranet portal for internal communication"

STEP (2010d). "Newsletter Issue 1, July 2010"

STEP (2011). "1st Project Periodic Report"

STEP (2012). "Newsletter issue 2, January 2012"

STEP, (2013a). "Research supported by EU projects STEP, ALARM and MACIS makes it into top ten for 2012 on Science for Environmental Policy (SEP)" Available in: <http://www.step-project.net/news.php?n=370> [Accessed on 14-12-2014]

STEP (2013b). "2nd Project Periodic Report"

STEP (2014). "3rd Project Periodic Report"

STEP (2015a). "Status and Trends of European Pollinators, FP7 Collaborative project" Available in: <http://www.step-project.net/> [Accessed on 28-08-2014]

STEP (2015b). "Calendar Events" Available in: <http://www.step-project.net/allevents.php?P=10> [Accessed on 19-11-2014]

St.John, R. (2011) "Press release: BioFresh use animation as a novel tool for communicating freshwater ecosystem science in new ways" Oxford, UK

TESS (2008a). "Project objectives" Available in: http://www.tess-project.eu/project_objectives.shtml [Accessed on 22-08-2015]

TESS (2008b). "TESS Leaflet" [European Commission/ European Research Area/ Environment](#)

TESS (2009b). "TESS Project Minutes of the London PMC Meeting" [Minutes meeting London, 14th September 2009](#)

TESS (2009c). "D2.2 Model of information flows from local & regional to central"

TESS (2009d). "D3.3 Synthesis report: Central and local information flows and decisions making requirements"

TESS (2009e). "D2.1 / D3.1, Combined Report Local and Government information workshop requirements"

TESS (2009f). "TESS Project Minutes of the Tallinn PMC Meeting" [Minutes meeting Tallin, 6 and 8 October 2010](#)

TESS (2010). "TESS Workshop on Decision Support from Predictive Modelling" [Minutes meeting 7 October 2010 Tallin Estonia](#)

Tinch, R.; Van den Hove, S.; Armstrong, C. W. (2011). "Policy demands for value evidence on deep-sea environments" [HERMIONE](#)

Toledo, M. & Lavijo, F. (2013). "Stakeholder meeting" [ROBIN](#)

Vaissière, B. E. (2011). "D4.4: Analysis of the effectiveness of measures mitigating pollination loss for crops and wild plants"

Van der Putten, W. (2009). "Introduction to the meeting" [Presentation Wageningen meeting](#)

Weaver, P. (2012). "Science Policy Panel September, 2012" [Presentation](#)

Appendix C: Interview Questions

What is a Science-Policy interface according to you?

- Of which elements does a good SPI comprise?

How did the SPI in your project look like?

- Which elements in your SPI got most attention? Why?
- How did these elements take form in your project? In what actions and approaches did the project attend to these elements?
- What was the role of the actor (groups) in your SPI?
- When were end users involved in the project?
- Did DG Research facilitate the establishment of a SPI in some way?

Have you noticed any demand from the policy field for scientific knowledge to support policy before this project started delivering its deliverables?

- How/where did you find this demand for knowledge/ policy advise?
- Why were the research goals established as they were? How were they established?
- In what way does your research contribute to the aimed policy domain?

Was/ is the provided knowledge being used in current policy?

- What were stakeholders' opinion(s) on the contribution of science on policy making or implementation of the knowledge?
- How useful are or do you expect your results to be when it comes down to influencing future policy on local, national and European (maybe also global) level?

How well do you think the project results have been communicated to managers and policy makers?

- How did the communication between scientists and policy makers take place?
- Which activities were crucial to this?
- What was the effect of these activities?
- Why was this good/bad? Could you give me examples?
- Could you describe some hurdles you came across during the project?
- What could have been done/ will be done to make sure that the policy makers and managers you aim at will take your knowledge up?
- (How) did the project adapt its strategy over time?
- How do the communication and dissemination efforts translate in effect on policy?