# Choices faced by researchers in pursuit of change

MSc Thesis Plant Production Systems

Sjoerd van Liempd
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| *Name Student:* | Sjoerd van Liempd |
| *Registration Number:* | 931126516060 |
| *Study:* | MSc Plant Sciences – Specialization Crop Science |
| *Chair group:* | Plant Production Systems (PPS) |
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| *Date* | June, 2018 |
| *Supervisors:* | dr. ir. Maja Slingerland (PPS) |
| | dr. ir. Kees Jansen (RSO) |
| *Examiners:* | dr. ir. Katrien Descheemaeker (PPS) |
| *Contact:* | sjoerd.van.liempd@gmail.com |

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# Abstract

This thesis **aims** to explore choices and considerations faced by researchers who intentionally pursue change. Researchers' considerations on change were explored along four domains: (1) *Problems*, related to problem perception. (2) *People*, related to influence and power. (3) *Knowledge*, related to uncertainty, framing and influence. (4) *Interdisciplinarity*, related to interdisciplinary knowledge and group work. The **methodology** was a case study of an interdisciplinary team, and employed individual interviews and discussions, and transcript analysis. The methodology used a weak interpretive framework and concepts remained ambiguous, but the approach accurately identified considerations on research for change. The **findings** were that researchers for change face diverse problems but have a strong goal-orientation. The studied researchers actively influence others, but influence of others on the researchers is less clear. Addressing complex situations and using strategic communication pose trade-offs with safeguarding scientific principles. The freedom of researchers to shape their research makes research susceptible to influence of others. Interdisciplinarity is a preferred but complicated way of generating innovative insights, yet interdisciplinary problems are hard to define. Formal organisational and methodological domains of research could be explored further. This thesis **concludes** that conscious and explicit discussion will likely improve the ability of researchers for change to evaluate and learn from their choices and considerations.

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# Contents

# Chapter 1: Introduction

Much academic research is concerned with making a positive contribution to society. For example, emphasis is placed on sustainable development, societal impact, and participation of stakeholders. Researchers who aspire to such large goals cannot rely solely on scientific theories and methods. Instead, they face dilemmas on dealing with conflicting interests in problem situations, complicated and biased communication processes, and relations of power and dependency with colleagues, funders, and other people involved in the research. This thesis revolves around such choices and considerations faced by researchers for change. I will first define researchers and their research, and then move on to a discussion on choices and considerations in four domains of research.

This thesis is about choices and considerations faced by researchers for change. A *researcher* is anyone who is formally employed, consulted, hired or funded to perform research activities. The pursued *change* concerns an intended change in human behaviour. While any research will cause changes in behaviour of the people involved, this definition emphasises that behavioural change is part of the intended and actively pursued research outcomes. For example, the researcher for change may try to make farmers delay weeding by one week to limit soil erosion. *Research for change* comprises all activities of researchers related to application of methods and theory, the organisation and coordination of research, and changing human behaviour with research activities or findings. For example, negotiating cooperation of a seed company to reorganise a food system could be part of research for change. Lastly, *researchers for change* are researchers involved in research for change. These researchers face choices and considerations. *Choices* are defined as any decision a person may make. The term choices is used to emphasise that for all decisions, the decider likely had to consider alternative options and choose for one in particular. *Considerations* are defined as any and all underlying motivation and reasoning of a decision or choice. Choices and considerations faced by researchers for change will now be explored in more detail based on a literature discussion.

There is a vast body of literature on the choices and considerations that researchers for change may face during research for change, but much of it is either discussed in abstract concepts or oversimplified. For example, critical philosophical views on scientific practice are hard to translate to concrete decisions in research practice (to illustrate, see Kunneman (1986); van Hengel (1987)), while attempts to discuss research-related considerations on change more practically often lack depth on the relations between knowledge and values (to illustrate, see Sterk et al. (2011); van Asselt and Rotmans (2002)). A more successful but

still rather abstract attempt is the exploration by Douglas (2009) on researchers' values in policy advice processes.

Researchers for change frequently have to make decisions on complicated issues that theorists have been debating about for decades, yet little is known about how researchers make these decisions in practice. The following section explores literature from various scientific fields and tries to translate some theoretical dilemmas to practical choices faced by researchers for change. The section is followed by the aim and main research question of this thesis. The exploration of choices and considerations faced by researchers for change is divided in four domains. These domains were delineated based on personal interest and feasibility to explore in this thesis, and is intended as a preliminary exploration rather than an exhaustive explanation of choices and considerations faced by researchers for change. For example, considerations on the organisation of universities and research funding are not taken into account. The domains are discussed in relative isolation for readability, although many interactions exist among them. The four domains are:

I) **Considerations on problems.** Any desired change implies that the current situation is undesirable, and therefore problematic. Researchers for change choose what they perceive as problematic.
II) **Considerations on people.** Researchers for change work with colleagues, partners, stakeholders, and others. This introduces relations of influence and dependency. Researchers for change choose whether and how to object to, protect or comply with different people's interests.
III) **Considerations on knowledge.** Research produces knowledge, and this knowledge is an important tool for changing people's behaviour. Researchers for change have to balance uncertainty, subjective communication and conflicting interests connected to knowledge.
IV) **Considerations on interdisciplinarity.** Problems are often perceived to be bigger than the scope of any single discipline, which makes interdisciplinarity a prominent approach in research for change. Interdisciplinary researchers for change have to choose between different disciplinary views on problems, different values and views on research, and different strategies for knowledge generation.

## Domain I: Considerations on problems

Research for change requires a desirable direction for change. As problems provide the motivation for change, problems are a central part of research for change. Problems can be specified as (1) an undesirable current or expected situation, and (2) a barrier that needs to be overcome to evade the undesired situation (Schmidt, 2011). The description of a problem usually contains an implied or explicit solution (Spradlin, 2012). For example, the problem

of *misinformed* agrochemical use implies that the direction for change should concern information and education, whereas the problem of *excessive* agrochemical use implies a need for regulation and monitoring. The researcher for change thus chooses to favour and exclude some directions for change by formulating the problem in a particular way.

To consider something as a problem is a choice: situations are not inherently problematic, but have to be experienced as problematic for a particular reason (Schmidt, 2011; van den Belt, 199x). This means that researchers for change choose which situations they perceive as problematic in order to warrant research for change. Deciding whether a situation is problematic is complicated by human abilities to select and understand information: human decision making processes are often biased and self-confirming, even when our thoughts seem rational and well considered to ourselves and others (Aarts et al., 2015). This means that the whatever researchers choose to consider to be problematic is the result of subjective perception rather than an objectively problematic situation. The next domain explores how other people may influence this problem perception.

## Domain II: Considerations on people

Perception of problems by anyone is influenced by people they interact with. Researchers for change, like all people, influence and are deeply influenced by the culture and society they live in (Gramsci, 1995; Gutting, 2014) and the people they interact with (Bourdieu, 2012 (1994); Kivisto and Pittman, 2007). This means that a researcher's perception of problems is influenced by others, but also that researchers can influence whether others perceive situations as problematic. With influence also comes power and dependency (Gramsci, 1995; Gutting, 2014) in various forms, at different scales, and in different situations (Gaventa, 2006). For example, researchers are influenced by others through dependency on funding, but can also exert influence by trying to raise awareness and draw attention to issues by strategically writing funding requests (Orr et al., 2008). Researchers for change therefore choose how much they agree with other people's views on problems, and to what extent they want to put effort into raising awareness on something they find problematic themselves. For example, while non-organic agriculture is the norm in the Netherlands, some researchers reject this norm and defend organic agriculture instead.

Related to power and dependency are processes of negotiation. Negotiation processes among different groups affect resource distribution, recognition of different interests, inclusion and exclusion of people in the process, and conventions of formal and informal decision making (Fraser, 2007). If the researcher has the ability to influence these dimensions of negotiation, then he or she may use this opportunity to promote change. For

example, a researcher who can freely select household members for interviews can choose to include household members that represent all genders and age groups. If the researcher cannot influence dimensions of negotiation, he may choose to comply in order to participate at all (for examples on influencing and complying in agricultural research, see Giller et al. (2017) and Sumberg et al. (2013)). Researchers for change choose whether the current division of influence and resources is acceptable or not by deciding to comply with or resist people whom they are dependent on. Researchers for change can also choose to challenge the status quo of negotiation processes between all involved parties in their research, and knowledge is an important tool for this. This is why knowledge is discussed in the next domain.

## Domain III: Considerations on knowledge

Knowledge is an important tool for researchers of change to exert influence on others. Knowledge is hard to delineate, but can perhaps be typified by drawing on three different perspectives. First, knowledge is supposed to capture reality in a truthful and verifiable way (Bhaskar, 1975; Popper, 1972). Second, knowledge is part of communication, which is selective, biased and irrational (Aarts et al., 2015). Third, knowledge is an important resource in relations of mutual influence and power (Foucault, 2012 (1975); Gutting, 2014). For each of these three perspectives on knowledge, an important consideration regarding research for change will be discussed.

Within the first perspective of knowledge as a reliable information about the world, the issue of uncertainty requires consideration. Uncertainty exists in terms of variability of people and nature, in the accuracy and reliability of our methods, and thus also in our knowledge of the world (van Asselt and Rotmans, 2002). While any knowledge and understanding is to some extent uncertain, researchers for change do want to communicate their findings to achieve change. When communicating findings, the researcher chooses whether knowledge is certain enough to be communicated in policy processes, for example (Douglas, 2009).

Within the second perspective of knowledge as something that resides in subjective communication, the issue of framing requires consideration (Aarts et al., 2015; Entman, 1993; Fischer, 2003). The same piece of information can be framed in various ways, for example: 'Child labour was significantly reduced by 5% across all villages' versus 'Child labour was hardly reduced at all.' Both sentences are framed, but the first emphasises exact scientific results, while the second emphasises the need for more effective results. To say which sentence describes the decrease in child labour best is not always straightforward

and depends on the situation. As every statement is always framed, researchers choose what formulation of information is best in a given situation.

Within the third perspective of knowledge as an important resource in relations of power and influence, the issue of knowledge availability requires consideration. Knowledge in relation to power and influence creates the dilemma of which knowledge should or should not be produced. Knowledge plays a big role in what people find problematic and what we consider to be the best directions for change (Foucault, 2012 (1975); Gutting, 2014). For example, it is thought that agricultural research has been greatly affected by past and current political preferences like a liberal market-orientation, at the cost of research that did not adopt this orientation (Sumberg et al., 2013). This potential influence means that researchers for change can wonder to what extent they have a responsibility and capability to fulfil a societal duty in producing knowledge about particular problems or aspects of problems (Kunneman, 1986; van den Belt, 200x). As a last point on availability of knowledge, the choice for a research approach may influence and be influenced by public debate (Kunneman, 1986). For example, it is difficult for anyone to claim negative health effects of an agrochemical if no one is willing to research it. At the same time, a researcher openly announcing research on health risks may alarm people even before the research results are in. Researchers for change therefore choose a role in societal debates by designing and communicating their research in a particular way.

To conclude on the domain of knowledge: Knowledge is an important influencing tool of researchers for change. Knowledge comes with uncertainty and subjective communication, and it influences and is influenced by people that have an interest in that knowledge. The next domain will explore considerations on interdisciplinarity, as interdisciplinary knowledge is often seen as a requirement for addressing complex problems.

## Domain IV: Considerations on interdisciplinarity

This domain is slightly different from the previous three domains, as it does not concern a deep characteristic of research for change, but a research approach. Interdisciplinarity is a problem-oriented research strategy that aims to generate knowledge using perspectives of multiple disciplines (Clark and Wallace, 2015; Goddiksen and Andersen, 2014; Schmidt, 2011). Interdisciplinary researchers require professional skills that enable them to combine their own expertise with that of others (Goddiksen and Andersen, 2014). It also requires group research strategies that optimally build on the expertise of all team members while maintaining scientific quality across all involved disciplines (Andersen and Wagenknecht, 2013; Clark and Wallace, 2015; Rossini and Porter, 1979). However, different disciplines

can have greatly different core assumptions, methodological principles, customs and jargon which may spark conflicts over the preferred research approach (Brister, 2016; Jansen, 2009; Rasmussen and Arler, 2010). For the researcher for change, this means that agreeing on a perceived problem may be complicated because different disciplines identify different problem barriers and have different preferences for solutions (Brister, 2016; Goddiksen and Andersen, 2014). It also means that generating knowledge is harder, as all disciplines have their own requirements for high quality research (Goddiksen and Andersen, 2014; Jansen, 2009; Rasmussen and Arler, 2010). Therefore, while interdisciplinarity may be more effective in generating problem-oriented knowledge, it also introduces challenges and choices related to problem perception and dealing with conflicting discipline-specific interests in knowledge generation. This concludes the domain of interdisciplinarity. Together with the domains of problems, people and knowledge, it provides an elaborate but non-exhaustive exploration of choices and considerations in research for change. With these domains in mind, the aim and research question of this thesis will now be explained.

## Aim and research question

The four domains of problems, people, knowledge and interdisciplinarity contain some important choices and considerations that researchers for change face. Not only is problem perception hard to pin down and susceptible to subjective processes, but research is also complicated by people with different interests and different levels of influence. Furthermore, knowledge is a broad concept that relates to our understanding of the world, but also to framed communication, influence and interests. If the researcher for change adopts an interdisciplinary approach in hopes of addressing problems more effectively, more complications are added to the research process. These complications concern communication, knowledge and conflicting interests of researchers from different disciplines. Therefore, researchers for change have to make many choices regarding problem identification, dealing with interests of all involved and affected people, and generating and communicating knowledge. The aim of this thesis is to gain a better understanding in the choices and considerations faced by researchers for change, in relation to problems, people, knowledge and interdisciplinarity. Views and ideas of researchers for change themselves will be taken as a starting point. The main research question is:

*What choices and considerations related to problems, people, knowledge and interdisciplinarity do researchers for change face?*

The research question is addressed through a case study on research project 'the Missing Middle'. The Missing Middle is an interdisciplinary project that involves a total of eight

members from  Animal Sciences, Plant Sciences, Social Sciences, Nutrition & Health Sciences and Environmental Research. The project aims to address Sustainable Development Goal 2: No Hunger (SDG2) using a participatory and action-oriented approach to reorganize food value-chains between production and consumption (Giller and Baijukya, 2017). The case study entails interviews and discussions with all eight team members, followed by a transcript analysis. The case study aims to identify general choices and considerations on research for change rather than case-specific considerations. The approach is explained in detail in the next chapter.

# Chapter 2: Methodology

The aim of this thesis is to gain insight in the choices and considerations related to problems, people, knowledge and interdisciplinarity, faced by researchers for change. The next section describes the Missing Middle project as subject of a case study, followed by a section on the employed methods for performing interviews, discussions and the transcript analysis to arrive at choices and considerations experienced by researchers for change.

## Case study: the Missing Middle project

This thesis adopted a case study approach, but the aim of this research is to gain insights in choices and considerations faced by researchers for change in general. This is why the case study project is described briefly. Case-specific information is only used occasionally as background information throughout this report. The usefulness of this case study approach is further discussed in Chapter 4. The case study revolved around the Missing Middle project, which will be described now.

The Missing Middle project was initiated around February 2017 by the SDG2 steering committee at Wageningen university. The SDG2-committee tries to contribute to achieving Sustainable Development Goal 2: No Hunger through research and communication activities. The Missing Middle project was the first successfully launched activity. The Plant Production Systems chair group took the lead in setting up the SDG2-committee as well as the Missing Middle project. The SDG2-committee consists of 7 people, 6 of which were main members of the Missing Middle project. One additional person was part of the project, but not the committee. The eight group members kept in touch through monthly meetings and are henceforth referred to as 'the group'. Personal information and data is treated confidentially on request of some group members.

The Missing Middle project was named after its central concept, the missing middle. The missing middle concept was developed by the group, and points out that goal-setting is currently not optimised in food systems (Veldhuizen et al., 2017). The concept focusses on differences in goals between local and global levels, and between dimensions of food production and consumption. For example, there is a mismatch between food production and consumption goals when food production policies are focussed on increasing staple food production without taking into account potential losses in nutritional value for consumers (Veldhuizen et al., 2017). The concept was felt and recognised by all group members, and the project serves to validate the concept in two food value chain case studies in Tanzania and Vietnam.

The choice to use the Missing Middle project as case study for this thesis had several reasons. First, the project placed a very strong emphasis on change, by aiming to transform food systems to contribute to SDG2. Second, the project was highly interdisciplinary, which relates to one of the four domains discussed in the first chapter. Third, it was suspected, based on earlier experiences, that an early project stage was the most useful to observe planning and negotiations. Researching this early stage also meant that any useful insights resulting from this thesis could be incorporated in the project. Lastly, the group consisted of some very experienced professors and senior researchers, as well as less experienced postdocs. PhD students were hired after data collection for this thesis had finished. It was expected that the rich base of experience would make my findings more convincing, and that the less experienced members would perhaps add more refreshing perspectives. As such, the project had practical benefits of an early project stage and varied levels of experience, and high relevance to the aim of this thesis due to clear emphasis on change and the interdisciplinarity approach.

I followed the project from September 2017 to March 2018. During this time, the project proposal was approved for funding, PhD supervision was divided among the group members, PhDs were hired, and progress was made on writing a joint paper on the missing middle concept. I was present at monthly meetings, and received copies of some email interactions and joint paper drafts. These sources served as background information for individual interviews and discussions, which will be described now.

## Interviews and discussions

The aim of this thesis is to gain insights in research-related choices and considerations, particularly those concerning problems, people, knowledge and interdisciplinarity. To do this, all eight group members of the Missing Middle project were invited for interviews, followed by a one-on-one discussion some weeks later. The interviews mainly served to explore the four domains discussed in Chapter 1, and to get a good understanding of the project and group members. The discussions served to dig deeper into some dilemmas or choices that stood out from the interviews. The interview approach will first be discussed, followed by the discussion approach.

### Interviews

All eight group members were invited for interviews. Six members were able to take part (see Table 1). The interviews aimed at understanding the interviewees' views, experiences and expectations regarding the Missing Middle project. To capture the diversity in backgrounds of the group members, a semi structured interview format was used that

allowed interviewees to think and talk within their own frame of reference, and bring in their own topics. It was expected that this approach was more useful than a structured interview based on literature-based concepts to elucidate choices and considerations faced by interviewees.

*Table 1: Number of interviewees that took part in the interviews and discussions.*

| Took part in | Number of interviewees |
|---|---|
| Interview only | 1 |
| Interview and discussion | 5 |
| Discussion only | 2 |

All interviews were conducted with a list of keywords and key questions as backbone (see Appendix 1). In addition to the list, questions were improvised along the four domains: problems, people, knowledge and interdisciplinarity. Key lines of questioning per domain can be found in Table 2. With every question, I attempted to connect at least two of the domains in relation to the Missing Middle project and earlier answers. For example, the themes *interdisciplinarity* and *knowledge* can be connected through the question 'When do you consider knowledge to be interdisciplinary?' and further connected with *people* through 'How do you judge the validity of a claim made by an expert from another discipline?'. By keeping these themes in mind, interviews could drift in multiple directions while maintaining a broad focus. This broad focus meant that the interviews would not be easily comparable among interviewees. This was not considered problematic, as the aim was to explore the interviewees' choices and considerations rather than to identify common, shared ideas within the group. The interviews were transcribed word-for-word for the analysis that followed after the discussions, which will be explained now.

*Table 2: Key lines of interview questioning for each of the domains problems, people, knowledge and interdisciplinarity (see Chapter 1).*

| Interview theme | Key lines of questioning |
|---|---|
| Problems | When is something a researchable problem and why? What makes a good solution and how can research contribute to problem-solving? |
| People | What is the role of the interviewee, colleagues, stakeholders and partners in research? |
| Knowledge | What is knowledge and how can research produce it? |
| Interdisciplinarity | What is the use of interdisciplinarity? What are its main benefits and challenges? |

**Discussions**

Following the interviews, all eight group members were invited for a one-on-one discussion, of which seven were able to take part. Two of them had not taken part in the interview earlier. The discussions were mainly intended to improve and deepen understanding of the interviewees' choices and considerations on research for change. Based on a reading of the interview transcripts, I formulated a number of propositions (see Appendix 2) that highlighted ambiguities or apparent contradictions that intuitively stood out. The propositions were intended to dig deeper into more general views on research by discussing them in the context of the interviewees' own experience and the Missing Middle project. The proposition list was emailed to the interviewees one or two days prior to the discussion, and interviewees were allowed to pick freely from the propositions during the discussions. When discussing the propositions, I improvised questions based on the interviewee's arguments, literature, the interviews, the other propositions and dilemmas that I struggled to understand myself. The discussions were transcribed word-for-word, and were used together with the interview transcripts as data for the transcription analysis.

## Transcription analysis

The transcribed interviews and discussions were analysed with a self-devised method which aimed to systematically identify preferences, convictions and value-judgements that interviewees expressed. As these views were rarely expressed fully explicitly, a method was required that allowed for systematic interpretation and extraction of choices and considerations. Four steps were taken to arrive at conclusions on choices and considerations in research for change:

1) **Taking notes.** In this step, <u>choices and considerations</u> in research for change were summarised in brief statements called notes. The location of notes and their supporting data in the transcript documents was documented to make the notes retraceable.

2) **Grouping notes.** In this step, the notes were grouped in categories based on the <u>domains</u> problems, people, knowledge and interdisciplinarity. This was done to group notes with related content. Notes were grouped separately for each interviewee.

3) **Drawing conclusions.** In this step, notes were further sub-grouped on similar <u>choices or considerations</u>. Conclusions were two-sided to capture alternative or conflicting views of the same interviewee. Conclusions were drawn separately for each interviewee.

4) **Categorising conclusions.** In this step, the conclusions of all interviewees were pooled together and categorised in four general research-related choices. As the domains problems, people, knowledge and interdisciplinarity did not effectively categorise the conclusions, new categories were formulated based on the results.

After the four analysis steps, the categorised conclusions and underlying data and analysis material was sent back to the interviewees for verification. The four steps of the transcript analysis and subsequent verification will now be described. Details on the four steps can be found in Appendix 3.

**Step 1: Taking notes**

Notes were taken on the transcripts to capture choices and considerations on research for change. The notes are my interpretation of the text, and their formulation was guided by two questions: 'What preference or caution does the interview express?' and 'Why is the interviewee telling me this?'. The answer to the first question identified more explicit choices and considerations, while the second question identified more implicit choices or considerations. For example, interviewees would sometimes give an elaborate example without a clear conclusion, so I assumed that they wanted to implicitly communicate a particular choice or consideration by using that example. I tried to hypothesize notes while reading, and would only note them down after confirming it in the same segment at least once, unless interviewees sounded very convinced and explicit in a single instance. If the text did not contain a clear answer to the two guiding questions, then the text was omitted from analysis. Notes summarised about 50 to 300 words each to a length of 10 to 25 words. I tried to formulate notes clearly and unambiguously. The notes were intended to both represent the views of the interviewees as well as to give my interpretation of these views. As such, the notes did not strictly summarize the transcripts, but also selectively highlighted or emphasised what stood out to me. The notes were too high in number to allow for analysis without dividing them in smaller groups, which is why the next step groups the notes.

**Step 2: Grouping notes**

The interview and discussion notes were entered in QDA Miner Lite (ProvalisResearch, 2018) in separate files for each interviewee. The notes were coded in order to categorise them, using ten codes based on the four domains discussed in the first chapter, namely *knowledge*, *people*, *problems* and *interdisciplinarity*, and all interconnected pairs (*knowledge-people*, *knowledge-problems*, etc.). The codes are described in Table 3. The pairs allowed for coding clear connections between domains, for example when *interdisciplinarity* was described as a preferred way of addressing *problems*. Descriptions of the code differed slightly from the domains in the introductory text in order to make them more applicable to the transcripts. Notes were given no more than one code except for a small number that did not fit in any single code. Effort was put in assigning only one code to notes in order to prevent subgroups of notes reoccurring under multiple codes. These

subgroups could have created biases when drawing conclusions in the next step of the analysis.

*Table 3: Overview and description of codes used for coding notes of transcriptions.*

| Code | Description |
| --- | --- |
| *Problems* | Notes with this code contain statements about addressing problems or contributing to solutions with research. Statements with this code should only concern problems, not relations with other aspects. |
| *Knowledge* | Notes with this code deal with knowledge, knowing or truth. It also deals with how research can produce these things. Statements with this code should only concern knowledge, not relations with other aspects. |
| *People* | Notes with this code describe issues or processes that are only about people. People can be colleagues, stakeholders, policy makers, research participants, etc. Statements with this code should only concern people, not relations with other aspects. |
| *Interdisciplinarity* | Notes with this code are concerned with interdisciplinarity. Statements with this code should only concern interdisciplinarity, not relations with other aspects. |
| *Problems-People* | Notes with this code capture a relationship between people and problems. They may answer questions like: who's problem is it, why should the researcher be concerned, and who plays a role in solutions? |
| *Problems-Knowledge* | Notes with this code capture a relationship between knowledge and problems. They may answer a question like: how can knowledge contribute to problem identification and solving? |
| *Problems-Interdisciplinarity* | Notes with this code capture a relationship between problems and interdisciplinarity. They may answer questions like: when is an interdisciplinary approach useful for a problem, and how can one determine whether a problem is interdisciplinary? |
| *People-Knowledge* | Notes with this code capture a relationship between people and knowledge. They may answer questions like: how is knowledge communicated between people, and when do people accept or reject something as knowledge? |
| *People-Interdisciplinarity* | Notes with this code capture a relationship between people and interdisciplinarity. They may answer questions like: what is the |

| | |
|---|---|
| | human factor in interdisciplinarity, what group processes play a role, and can interdisciplinarity affect interaction with non-researchers? |
| *Knowledge-Interdisciplinarity* | Notes with this code capture a relationship between knowledge and interdisciplinarity. They may answer questions like: when is a piece of knowledge disciplinary or interdisciplinary, and how is interdisciplinary knowledge generated? |

**Step 3: Drawing conclusions**

The coded notes were exported from QDA Miner Lite (ProvalisResearch, 2018) to MS Excel and were kept separate per interviewee. Within each code, notes were manually grouped on similar content in order to draw a conclusions that represented sets of notes. As the notes were not always obviously related and often contained contradictory messages, I formulated two-sided conclusions containing two alternative or conflicting considerations on the same topic. Table 4 shows an example conclusion and its supporting notes. Formulating conclusions is a second interpretation step after interpreting the data using notes. The original context of the notes was often taken into account when trying to draw a conclusion, particularly to consider how serious or certain the interviewee sounded when making certain statements. In the following step, only the conclusions were used, and the notes were no longer considered.

*Table 4: Example two-sided conclusion. The first column indicates whether the corresponding note particularly favours the first side or the second side of the conclusion. This column was only added for this example..*

| **1. Shared views and ideas are needed to stimulate interdisciplinary cooperation \| 2. Interdisciplinary insights result from differences and confrontation** | |
|---|---|
| *1.* | Members of the group trust each other and generally share the same ideas |
| *1.* | The missing middle concept may not be consistent, but useful to get group together |
| *1.* | SDG2-group exists firstly because members wanted it to, secondly to actively work towards SDG2 |
| *2.* | Interdisciplinary groups arrive at better insights through confrontation and discussion |
| *2.* | Looks forward to discussions in group due to different perspectives |

**Step 4: Categorising conclusions**

The formulated conclusions of all interviewees were pooled together and categorised in a number of choices that researchers may face. The categorisation had to group the conclusions in a way that would highlight relations between views on similar topics. An additional requirement for categorisation was that each category should contain

contributions from as many interviewees as possible, to prevent that categories were skewed towards subgroups of interviewees. The four domains of the introduction, problems, people, knowledge and interdisciplinarity, did not meet these requirements. In addition, conclusions often indicate interactions and relations between domains, making them hard to place in one domain or another. Instead, four categories were formulated based on themes that stood out in the results (see Appendix 3 for distribution of conclusions across categories). The results per category resonate with some domains more than others, as depicted in table 5.

*Table 5: Description of categories used to categorise the results. The far right column indicates which domain (see Chapter 1) the results per category resonate with most.*

| Category | Description | Resonates mostly with domains on... |
|---|---|---|
| **1.** *Choosing an approach* | This category contains choices and considerations on research design and strategy. | People Knowledge Interdisciplinarity |
| *2. Choosing who to work with* | This category contains choices and considerations on selecting and working with colleagues. | People Interdisciplinarity |
| *3. Choosing a goal* | This category contains choices and considerations on setting goals and trying to achieve things through research. | Problems People Knowledge |
| *4. Choosing a role for yourself and others* | This category contains choices and considerations on how researchers can and should deal with stakeholders, policymakers and others. | Problems People |

**Verification of conclusions**

The conclusions, notes and transcripts were sent back to the interviewees for verification. Interviewees could request reinterpretation and reformulation of notes and conclusions if they felt misrepresented. The raw data was leading for reinterpretation to prevent that new data was added. Three members acknowledged the findings immediately, three accepted them after some revisions were made, and two others either had no time or did not reach an agreement on the interpretation and formulation.

# Chapter 3: Results

Interviews and discussion with Missing Middle project members were transcribed and subsequently analysed to identify considerations and choices related to research for change. The analysis resulted in notes and conclusions that captured choices and considerations of the interviewed group members. The four domains in the introduction (problems, people, knowledge and interdisciplinarity) were unsuitable to categorise the results effectively, so new categories were formulated based on the research itself. The four categories are:

1. **Choosing an approach**. This category contains choices and considerations on research design and strategy. This category relates particularly to the domains on people, knowledge and interdisciplinarity.

2. **Choosing who to work with**. This category contains choices and considerations on selecting and working with colleagues. This category relates particularly to the domains on people and interdisciplinarity.

3. **Choosing a goal**. This category contains choices and considerations on setting goals and trying to achieve things through research. This category relates particularly to the domains on problems, people and knowledge.

4. **Choosing a role for yourself and others**. This category contains choices and considerations on how researchers can and should deal with stakeholders, policymakers and others. This category relates particularly to problems and people.

The point of the results in this chapter is to gain insights in choices and considerations of researchers for change in general, rather than in trends or subgroups within the case study group. As the results cover a wide variety of choices and considerations made by researchers for change, each paragraph is introduced with a sentence in italics to indicate the unifying topic of that paragraph. Each category contains contributions from at least six out of eight group members. All non-cursive text is based directly on the conclusions from the transcript analysis (see Chapter 2). Conclusions were assigned a random number, which are used in-text to refer to the full list of conclusions in Appendix 4. Asterisks indicate conclusions that were not verified by the corresponding interviewee due to disagreement or lack of time. The four categories will now be discussed in order.

## Category 1: Choosing a research approach

*The research approach has to take complexity and research quality into account.* Research on complex problem situations often deals with higher levels of complexity than the research can account for (3, 12, 15). Research starts off with a high level of uncertainty, and deals with it throughout the project (10). Research projects may aim to change other people's thinking and practices, although a strong emphasis on achieving change does not necessarily fit standard scientific methods (9). For example, solutions to problems are

selected based on relevance, practical value and opinions of those involved (12). Research on system problems requires an elaborate approach (3), while research quality is also greatly reliant on replicability (13). Research quality is important, but there is always a small chance that incorrect evidence is verified and accepted as true (8).

*Personal motivations partially determine research design and outcomes.* The choice for a topic or methodological approach greatly influences the knowledge or insights that a researcher generates with his or her research, and this choice is partially subjective (2*). Researchers do not always need a perfectly clear concept or proof of a problem in order to start research (13, 15). In addition, personal or professional values shape the research outcomes significantly (1). Researchers may also perform research to find evidence for their personal views or convictions (8). At the same time, scientific methodology is designed to exclude inappropriate values from research (1).

*The research approach should be open to stakeholder input, but is limited by expertise.* Verifying and operationalising concepts are important goals of research, and this is improved by involving stakeholders and partners in research (4). It is important for the research team to incorporate new, relevant expertise as the research progresses (5). However, an adaptive, stakeholder-oriented approach may lead the research to topics on which the researcher or team has no expertise to offer (5). Stakeholders can also be informed about findings indirectly (2*).

*Interdisciplinary approaches can be motivated based on inherent benefits of the approach, as well as personal motivations.* Interdisciplinary approaches should solve problems more effectively than disciplinary approaches, and should also lead to more innovative scientific insights (6, 7, 14). At the same time, problems are not inherently interdisciplinary, leaving some room for the researcher's own preference to opt for an interdisciplinary approach (6, 14), for example because researchers are particularly interested in expanding their expertise and skills (11).

## Category 2: Choosing who to work with

*Group coherence builds group productivity.* Shared views and ideas are necessary for group coherence and productivity (16, 17, 20, 24), while creativity comes from differences and confrontation (16, 17). It is better to reject collaboration opportunities if differences in views are too big (26). Sometimes, enabling and stimulating collaboration is a very important goal (20), for example because enjoyable collaborations last longer (22*) and are more motivating (26). Similarly, while relevance of expertise should be an important consideration for involvement in a research team (18), personal interest and networks of

people play an important role as well (18, 24, 29). That said, the bottom line is that groups need to be productive (22*).

*Interdisciplinary collaboration requires careful evaluation of other experts' contributions.* The benefit of interdisciplinarity is that you can rely on expertise of others instead of having to master all the required expertise yourself (27). Still, researchers should make sure that they can understand and are convinced by the claims made by others (27). This can be difficult, as strong opinions can be based on experience or subjective convictions, and these are hard to distinguish when it concerns expertise from other fields (19). In general, it is best to avoid researchers with strong convictions (19).

*Interdisciplinarity comes with unique demands of researchers and groups.* Interdisciplinary groups should produce innovative insights (29). However, interdisciplinary output is often limited by practical constraints (21). Further limitations in interdisciplinary research are that it requires a particularly open attitude of colleagues (23*), and that interdisciplinary collaboration is greatly dependent on personal and professional skills (21, 29). Interdisciplinarity is an approach that supersedes disciplines (28), but also requires a strong foundation of disciplines (25, 28). Additionally, interdisciplinary insights only reach their full potential when they are successfully translated back into disciplines (25).

## Category 3: Choosing a goal

*Research should contribute good goals, although research cannot make guaranteed good contributions to goals.* Research should contribute to goals that the researcher finds good (32, 33, 34, 35). Researchers should not work in favour of goals they disagree with (34), although some non-negotiable goals have to be accepted (36). Time is then better spent on things that the researcher does have influence on (36). What makes any particular goal good comes down to personal norms and values of the researcher (30). The researcher can also choose what problems he or she wishes to address, as one may find that some problems are more problematic than others (31). The decision to contribute to any goal is complicated by the fact that research cannot guarantee good outcomes (33). Good goals should still be pursued, however, although this pursuit can have negative effects (38). Similarly, some goals may not even be attainable but are still worth pursuing through research (38). Effort should be put in preventing that solutions cause new problems (31).

*Knowledge and research can have intended and unintended influence.* Research should strive to be as far as possible independent of the researcher's own and other people's values (39*). At the same time, research is always thoroughly connected with interests and values of researchers and stakeholders (39*). Research can contribute to identifying new problems,

and raise awareness about them (37). Raising awareness about problems is a process that often involves more than just science, so it is hard for a researcher to have any intended, directed impact (37). Researchers are dependent on many others to achieve anything (35), and research outcomes may not be used because influential people have other interests (30). Similarly, research and its outcomes can be misused by others for ends that the researcher disagrees with, if the researcher's values are not adequately incorporated in the research (32).

## Category 4: Choosing a role for yourself and others

*Research can influence stakeholders, but stakeholders make final decisions.* In general, stakeholders make final decisions and create change (44, 55*, 57). Researchers are dependent on others to have any real impact (50) and stakeholders can easily reject good ideas (57), but researchers can still try to influence others to contribute to a desired change (50). Research is an important way in which researchers can influence others (44). Researchers can also actively try to raise awareness about issues (51*, 57) and create demand for research (46).

*Researchers can and should influence stakeholders and policy makers, although this influence is hard to predict.* Researchers must actively tailor their message to make it interesting and accessible to stakeholders (40, 47), and strategically formulating and spreading your message is an important part of this (43, 51*, 56). However, policy making processes are hard to predict and therefore difficult to influence (56). Researchers should not worry much about processes they cannot influence both within their research (43) and when trying to influence others (45).

*Researchers actively spread their own views through research.* To an extent, researchers should adjust their research to particular stakeholder interests (53). However, the personal values and ideas of the researcher play an important role in the research approach as well (41*, 52). With the right supportive evidence, researchers can actively bring in perspectives that go against those of stakeholders (47, 53). In addition, researchers can form alliances with stakeholders or groups with similar interests (42, 47). At times, this means that other stakeholders with different ideas or interests should be excluded from the research to achieve change, even though those stakeholders are affected by the pursued change (42, 46).

*Stakeholders should be treated respectfully.* It is important to take all stakeholder interests into account (52), to treat stakeholders respectfully and take equality and justice into account when dealing with them (49). Sometimes, the best possible improvement of the

stakeholders' situation is not necessarily the most just (54). Researchers should make sure that stakeholders are not put at a disadvantage by supporting the research project (54).

*Researchers should be credible, but not too convincing.* Researchers should take care to be objective (41*) and to protect their own credibility and integrity when working with stakeholders (48). Too high credibility of the researcher can lead to less realistic research outcomes (48), and bad quality research can still have impact if translated to stakeholders or policymakers inadequately (40).

# Chapter 4: Discussion of methodology

The results show a large variety of choices and considerations faced by researchers for change. Before moving on to a discussion to answer the research question in Chapter 5, this chapter will discuss limitations and strengths of the framework and methods used and developed in the thesis. The following sections chronologically discuss issues related to the interviews, discussion and analysis. It concludes that the weak interpretive framework is problematic and that concepts remained ambiguous. However, key strengths of the approach are worth developing further, namely its adaptability to the interviewees, ability to thoroughly discuss research choices and its accurate identification of choices and considerations in research for change.

## Interviews and discussions

This thesis was described as a case study. The case study aspect allowed interviewees and myself to explain ideas in the interviews and discussions using shared background knowledge on the project. The group was perhaps unique due to its highly change-oriented and experienced researchers. At the same time, similar results may have been obtained if the interviewees had been randomly selected from multiple interdisciplinary projects. The results are likely not specific to the case study group, and may be extrapolated to research for change in general. The case study approach therefore had the minor benefit of illustrating abstract points with shared background knowledge, but was not crucial to the effectiveness of the approach.

The interview and discussion questions were improvised on topics of shared interest between the interviewees and myself. The interview structure (see Appendix 1) and discussion propositions (see Appendix 2) served as a guide. The improvisational style of questioning allows for following the thoughts and interests of the interviewee more closely than a rigid structure, which supported the exploratory aim of this thesis. However, the approach also lead to less comparability among interviewees. While the interviews yielded many insights per individual, the results cannot identify shared views or considerations within the group.

The presently used backbone and background information was based on literature from various disciplines. Although important sources have been cited in the introductory chapter of this thesis, many questions were improvised without explicit literature on dilemmas in research for change in mind. A strength of the lack of explicit use of literature is that it made my questions less rigorously tied to existing concepts, which likely made them more accessible and relatable to the interviewees. For example, the question 'How do you make

policy makers aware of your findings?' can be answered more concretely than 'what is the function of scientific research in policy advice processes?'. However, this way of formulating questions is hard to reproduce and it does not allow for easy comparison of my results with literature.

Two minor limitations were caused by interaction with the interviewees. The first limitation is that the same interviewee took part in the first interview and discussion, and was the first to be analysed. After each step, I slightly altered my approach for the next interviewees, for example by editing the discussion propositions. The analysis of this person's data did yield a substantial amount of choices and considerations, and still served the exploratory aim of this thesis. In addition, the findings were verified by this interviewee after some deliberation, suggesting that the analysis has yielded accurate results.

The second limitation due to interaction with the interviewees is that I and some interviewees had double roles. I was an independent researcher and student under supervision. In conversations with two interviewees, I struggled to stick to my role as researcher rather than student, which hampered my ability to ask clear and relevant questions. Furthermore, two interviewees had a current or expected role in my supervision and evaluation, causing a conflict of interest in their participation. The effect of these double roles on the results is hard to identify. As the double roles likely affected group processes as well as contributions to the interviews and discussions, they should be avoided in further research.

## Transcript analysis

The interviews and discussions were transcribed, and the transcriptions were analysed in a four-step process of note-taking, note-grouping, formulating analysis conclusions and grouping conclusions. Afterwards, the conclusions required verification. These points will now be discussed chronologically, except for the step of grouping conclusions.

The first analysis step, taking notes on transcripts, was focussed on choices and considerations of researchers. However, criteria for including something in a note were not well defined, and are likely biased by my own ideas and intuition. Furthermore, much of the data was omitted, for example when it was deemed too neutral or descriptive. On top of that, data that *was* used was highly summarised upon my interpretation. The lack of a clear interpretive framework likely caused a number of choices and considerations to go uncaptured. I consider these biases acceptable for this research, as the method was new, and findings were still verified and recognised by the interviewees. Additionally, a strength of the notes is that they are retraceable to raw data, making resulting conclusions highly

verifiable. So while the analysis may not have identified a number of choices and considerations in the transcripts, it has still accurately and verifiably captured those that were identified.

In the second analysis step, the notes were grouped along the domains on problems, people, knowledge and interdisciplinarity (for the a description of the domains, see Chapter 1). Grouping was done using the software QDA Miner Lite (ProvalisResearch, 2018), but could also have been done in MS Excel or MS Word. The categorisation was needed to systematically create subgroups that were small enough to analyse more or less systematically by hand. However, categorisation is also a form of interpretation, so a different categorisation of notes will likely lead to different subgroups and therefore different conclusions. This same issue relates to the categorisation of conclusions in step four of the analysis. As the interviewees recognised the majority of my conclusions, I am confident that the categorisation of notes and conclusions did not introduce unreasonable biases.

In the third analysis step, two-sided conclusions were formulated within each group (for a full list of conclusions, see Appendix 4). The choice for two-sided conclusions is questionable. The two sides of the conclusion are often unequally supported with the data, making some halves of conclusions look more confident than they are. At the same time, two-sidedness did improve support of alternative views. For example, consider five notes that support the view that policy makers can be effectively influenced. Another, single note may claim that policy make their decisions independently. While the single note is not convincing as a conclusion on its own, it becomes significant because it offers an important alternative perspective on influencing policy makers. However, to what extent perceived significance warrants the formulation of less supported conclusions remains debateable. A second weakness is that the results (see Chapter 3) could be presented more clearly by separating the two halves of each conclusion. It therefore seems that the benefit of two-sided conclusions is limited, and it remains debatable whether two-sided conclusions lead to overemphasis of conflicting and alternative views.

The interviewees were asked to verify the conclusions. This thesis aimed to accurately capture ideas of researchers, while also critically interpreting them. This means that I may identify relations between ideas that the interviewee does not recognise, and verification allows for a discussion on whether it is a new insight or a moot point. However, verification of findings does not necessarily make them more reliable, as participants may also reject correct findings because they are too sensitive. In this research, interviewees mostly

pointed out minor inaccuracies and ambiguous formulations, and did not challenge the core meaning of the findings. I am therefore confident that the verification process strengthened my findings, and that unverified findings are still reliable.

The transcript analysis suffers from a general limitation of ambiguous concepts. For example, the concept of stakeholders can be simply defined as 'those who have a stake in a situation', but is sometimes used interchangeably with policymakers, partners and researchers themselves. Similarly, the concept of research was only defined after data collection had finished. Despite the ambiguity of concepts, the results accurately point out choices and considerations faced by researchers for change. However, the ambiguity of concepts makes the findings less concrete and explicit than they could have been.

Lastly, there is one exception to the effectiveness of this method to stimulate discussion and identify choices and considerations. The interaction with one interviewee did not go well, as questions that worked for others seemed to miss the mark. Afterwards, the transcript analysis yielded relatively few notes. Additionally, there was a high number of notes that could not be used to formulate conclusions. Upon verification, the interviewee disagreed with a number of formulations, although some core findings were recognised. It appeared that this researcher was less change-oriented than the other group members, suggesting that the method applied in this thesis is rather specialised to change-oriented research, at the cost of other goals in research.

## Final evaluation of methodology

The methodology applied in this thesis had limitations regarding the ability to compare shared views among researchers, double roles of myself and two interviewees, a weakly defined interpretive framework for choices and considerations, ambiguous concepts, and a poor effectiveness on one interviewee. Conversely, it had strengths regarding the adaptability to interviewees' ideas, discussing research choices without relying on abstract concepts, accurately capturing choices and considerations of researchers, and the verifiability of findings. The necessity and benefit of the case study setup was unclear, as was the usefulness and reliability of two-sided conclusions. Lastly, the suggested specialisation towards change-oriented research is both a strength and a weakness. As an exploratory methodology, the weakly defined interpretive framework and use of ambiguous concepts need to be addressed for further use. Some key strengths make the methodology worthwhile to develop further, particularly its adaptability to the interviewees, ability to thoroughly discuss research choices and its accurate identification of choices and considerations in research for change.

# Chapter 5: Discussion of findings

The main research question was '*what choices and considerations related to problems, knowledge, people and interdisciplinarity do researchers for change face?*'. This question is explorative, and the approach took researchers' own ideas as a starting point. Supporting literature was selected and used in a way that stimulated the deconstruction of abstract points into concrete choices and considerations. The following section discusses how the results relate back to the literature in the introduction, and highlight directions for further research. The section is structured along the same domains as those presented in the introduction: problems, people, knowledge and interdisciplinarity. It is followed by a section on potentially useful other domains. The discussion on each of the domains incorporates conclusions from multiple categories in the results (see Chapter 3). The discussion addresses each domain in relative isolation for readability, but overlap and interactions exist because many conclusions are referred to in discussions of multiple domains. Numbers behind sentences refer to analysis conclusions that can be found in Appendix 4. Asterisks indicate unverified conclusions.

## Domain I: Considerations on problems

It was argued in the introduction (see Chapter 1) that research for change requires a perceived problem in order to make change desirable in the first place, and that researchers for change choose to favour or exclude directions for change by formulating the problem in a particular way (based on Schmidt (2011); Spradlin (2012); van den Belt (199x)). The results indicate that the outcome of research for change cannot be easily fit onto a single problem: researchers experience problems with complexity and research quality (3, 8, 12, 13, 15), interaction with stakeholders and policy makers (5, 35, 37, 39*, 42, 46, 48, 50, 54, 56) and collaboration (19, 21, 26). This means that research for change cannot be considered as a process of solving a single problem. Similarly, the idea of problems as undesirable situations and barriers (Schmidt, 2011) quickly becomes complicated when situations are undesirable for different reasons and multiple barriers interact. However, researchers actively support goals they find good (32, 33, 34, 35). So while the problem may be hard to formulate, researchers *do* feel a sense of direction that guides their research choices. Further research on how researchers arrive at a sense of direction for change may help the researchers to evaluate their sense of direction and the effects it has on their research.

The second point that was argued in the introduction on this domain was that identifying something as problematic is a subjective choice (based on Aarts et al. (2015); Schmidt

(2011); Spradlin (2012)). The results indicate that problem identification can be based on experience and instinct (13, 15) but that it also requires stakeholder input (4, 53). The results also show that researchers make personal choices to decide which issues require research for change the most (1, 8, 13, 15, 30, 31, 41*, 46, 50, 51*, 52, 57). The results repeatedly point out that personal motivations are part of deciding what is problematic or a worthy goal, but do not provide insights on *how* the researchers make these decisions. These thought processes may be impossible to assess empirically due to their subjective character (Aarts et al., 2015). The identified opportunities for personal motivations for decisions in research for change nonetheless allow researchers to more explicitly consider the role of their own personal motivations in research decisions.

## Domain II: Considerations on people

The first point on this domain made in the introduction (Chapter 1) is that researchers are influenced by others, and that researchers influence others as well (based on (Bourdieu, 2012 (1994); Gramsci, 1995; Gutting, 2014; Kivisto and Pittman, 2007). Researchers for change choose how much they agree with other people's views on problems, and to what extent they want to raise awareness about new problems. The results show that researchers for change actively try to influence others with their research (8, 37, 40, 43, 47, 51*, 53, 56) and also selectively collaborate with people that they share important views or interests with (16, 17, 19, 20, 24, 26, 42, 47, 46). Conversely, the researchers mentioned few considerations on how their own views may be influenced by others. Results indirectly related to influence of others are about the necessity of enjoyable group collaboration and the role of differences and discussion (16, 17, 18, 20, 22*, 24, 27, 29). These insights suggest that researchers already quite consciously influence others, but are less aware of how their own thinking is shaped by interaction with others. Further research could elucidate to what extent group processes shape the way goals are set in research for change, for example because groups with shared ideas are more likely to share blind spots and presumptions as well (Aarts et al., 2015). These further insights could help researchers to more consciously manage their group processes to increase the quality and versatility of their work and thought processes.

The second point on the domain on people concerns dimensions of negotiation processes: by taking part in a negotiation process in a particular way, the researcher chooses whether the current division of influence and resources is acceptable or not (based on Fraser (2007)). The results highlight that researchers are often in a rather dependent position (4, 30, 32 35, 39*, 44, 50, 55*, 57, 56). This means that researchers regularly face choices on whether to accept dependence, for example because researchers still see many possibilities

for influencing others (8, 37, 40, 43, 47, 51*, 53, 56). Researchers have some bottom lines when it comes to treating stakeholders respectfully (49, 52, 54). Conversely, researchers are willing to exclude stakeholders in situations of practical limitations or conflicting interests (42, 46), and can bring in their own perspective with sufficient supporting evidence (47, 53). These results suggest that researchers have quite some power in negotiation processes in research for change. Relating this back to the literature, the results indicate that the interviewed researchers could indeed rather freely *choose* to recognise different interests, exclude people, and influence formal and informal ways of decision making (Fraser, 2007). These findings indicate that the researchers are aware of their significant influence on negotiation processes. Making the influence and choices explicit could allow for open discussion among peers, which may improve ethically and socially responsible decision making. Further research could explore how researchers for change decide in practice whether the terms of a negotiation are acceptable to all those involved.

## Domain III: Considerations on knowledge

Based on literature, three perspectives and considerations on knowledge were identified. Within the first perspective of knowledge as a reliable information about the world, the issue of *uncertainty* requires consideration (based on Bhaskar (1975); Douglas (2009); Popper (1972); van Asselt and Rotmans (2002)). Within the second perspective of knowledge as something that resides in subjective communication and understanding, the issue of *framing* requires consideration (based on Aarts et al. (2015); Entman (1993); Fischer (2003)). Within the third perspective of knowledge as an important resource in relations of power and influence, the issue of *knowledge availability* requires consideration (based on Foucault (2012 (1975)); Gutting (2014); Kunneman (1986); van den Belt (200x)).

The issue of uncertainty of knowledge was only alluded to in the results. This was mostly because this thesis took place at an early project stage, and because questions were not actively pursued on this topic. The results show that research can often not account for all complexity of the situation (3, 12, 15) and that research quality is necessary but complicated to safeguard (3, 8, 13). Similarly, researchers should put effort into finding all the necessary experts (5). These results suggest that there is a trade-off between researching complex situations and maintaining research quality. These findings further suggest that other goals *besides* maximum research quality are important in research design choices. Researchers for change may be able to justify their research approach better if these goals and their prioritisation are made explicit. Further research could explore how general decisions on research design affect decisions on choosing and executing methods in later stages of research.

The issue of knowledge framing was recognised by researchers in the results. Research is always connected to values (39*), and researchers strategically adapt their messages to their audience (40,47, 43, 51*, 56). This shows that the researchers for change are well aware that a piece of knowledge has a different meaning to different people, and that it has to be strategically formulated into a message that can raise attention or change views of other people. The results also tentatively suggest that framing has to be done responsibly to prevent misguidance of stakeholders (48, 40), and that researchers should be objective (41*). The findings suggests that strategic communication is an important part of research for change. However, the involved risks suggest that framing can harm integrity of the researcher. My recommendation is that researchers for change could consider to design ethical guidelines for strategic communication to guide complicated framing processes and protect the integrity of the researchers. Further research could explore whether and how researchers experience a trade-off between effective framing and maintaining scientific integrity in their communication.

The issue of knowledge availability relates to the idea that available knowledge steers the thinking on what is problematic to many people (Gutting, 2014; Kunneman, 1986), and that what is considered problematic by influential people may steer the direction of knowledge generation through research (Sumberg et al., 2013). Discussions on research and society were generally hard to make concrete, so results on this point are scarce. Alternatively, the results can be used to discuss how others may steer research. The results indicate that the researcher's own ideas shape research and its outcomes significantly (1, 2*, 6, 8, 11 13, 14, 15, 30, 31, 32, 41*, 52), although methodology should exclude these values (1). Research also adapts to interests of others (5, 52), sometimes with limited freedom of the researcher (36). The results strongly emphasise the many possibilities to shape their research to their own interests, with some limitations. Based on the literature, it is realistic to assume that researchers are actively influenced by others as well, even if this happens partly unconsciously (see also domain II; (Bourdieu, 2012 (1994); Gutting, 2014; Kivisto and Pittman, 2007)). Paradoxically, the freedom of researcher to shape their own research suggests that research for change can be significantly shaped by others who manage to influence the researchers. This freedom may have benefits when it comes to incorporating stakeholders concerns in research, but may also lead researchers to favour people who manage to successfully influence or deceive the researchers. This latter point on influencing researchers relates to political influences on agronomic research (Sumberg et al., 2013). The possibility that others influence research in their favour stresses the need for explicit discussions on personal choices and considerations faced by researchers for change. These discussions may both improve the recognition of stakeholder interests, while also

improving the ability of researchers to recognise when they are favouring some interests over others. Further research can explore how the ideas of researchers for change take shape in relation to those of people they are consciously and unconsciously influenced by in the practice of research for change.

In conclusion for the domain on knowledge, there appears to be a trade-off between addressing complexity while also maintaining research quality, for example replicability. Strategic communication is actively practiced by the researchers, but is it complicated and comes with risks for scientific integrity. My recommendation is that researchers could consider to set up some ethical guidelines to address this trade-off. Lastly, researchers experience considerable freedom to shape their own research, but this freedom also means that research can be shaped by others who manage to influence the researchers. This makes research more adaptable to other interests, which can be beneficial to stakeholder involvement, but also harmful when research is influenced in favour of particular interests.

## Domain IV: Considerations on interdisciplinarity

In the introduction, it was pointed out in Chapter 1 that the domain on interdisciplinarity concerns a research approach rather than a deep characteristic of research like the other three domains. Interdisciplinary introduces challenges in knowledge generation across disciplines (Jansen, 2009; Rossini and Porter, 1979), while it is also perceived as more problem-oriented (Brister, 2016; Clark and Wallace, 2015; Goddiksen and Andersen, 2014; Schmidt, 2011). The results emphasise that interdisciplinarity may address problems better and that it stimulates innovative insights (6, 7, 14, 27, 29). However, problems are not inherently interdisciplinary (6, 14). The results also highlight a number of challenges related to cooperation and building on each other's expertise (19, 21, 23*, 27, 28, 29). The literature and results are therefore in general agreement that interdisciplinarity can be a preferred way for generating new insights, but that it also poses new challenges. The results lack clear insights in how researchers come to decide that the potential benefits of interdisciplinarity outweigh the additional challenges, although there is clearly a trade-off. Further research could particularly explore how researchers decide whether a problem requires an interdisciplinary approach. This relates to points on problem perception in domain I.

## Other domains

The discussion on the domains on problems, knowledge and interdisciplinarity focussed mostly on informal processes of decision-making in research for change. However, scientific research for change likely also has a domain on formal organisational choices and

considerations regarding contracts and collaborations with stakeholders, research resources like manpower, fields, labs, or funding, shared authorship, peer-reviewed publishing, and university employment. Additionally, the four domains do not capture choices and considerations on specific methodologies and theories, even though this relates strongly to the domains on knowledge and interdisciplinarity in particular. For example, methods that require more stakeholder involvement may be preferred to stimulate change, even though more controlled methods might lead to insights of higher scientific quality. These gaps in the results likely contain important choices and considerations on research for change that affect choices in the domains on problems, people, knowledge and interdisciplinarity. Conversely, the four domains likely also influence the more formal organisational and methodological choices. To the extent that the interviewees verified the results and did not point out clear gaps on formal aspects of research or methodological choices, the results still provide a reliable exploration. However, it is likely that some considerations on formal and methodological aspects of research have not been explored, and that some interactions between these aspects and the domains on problems, people, knowledge and interdisciplinarity have gone unnoticed in the analysis. Further research could develop separate domains on formal and methodological aspects of research for change.

## Final conclusions on findings

The aim of this thesis was to explore choices and considerations faced by researchers for change, along domains on problems, people, knowledge and interdisciplinarity.

In the *domain on problems*, it appeared that the concept of problems is useful but insufficient to understand the many problems faced and addressed in the research process. At the same time, general goals are clearly pursued by researchers. My recommendation is that researchers may be able to evaluate their research decisions better if they are more consciously aware of their sense of direction and personal motivations.

In the *domain on people*, the results emphasised the influence that researchers have *on* others, but provide limited insights in how researchers are influenced *by* others. My conclusions is that more awareness on group processes may improve the quality and versatility of researchers' group work. Furthermore, it appeared that researchers for change have considerable power to shape negotiations for change. My recommendation is that open discussion on the influence of researchers' choices may improve ethically or socially responsible decision making.

In the *domain on knowledge*, there is a trade-off between the desire to address complexity while also facing limits of available expertise and resources, which makes it difficult to safeguard research quality. My recommendation is that more explicit prioritisation may improve research approaches. Researchers for change also actively and consciously frame messages, but perceive risks related to scientific integrity. My recommendation is that researchers might want to develop ethical guidelines on strategic communication to protect scientific integrity. As a last point on knowledge, researchers have considerable freedom to shape their own research. Paradoxically, this freedom opens up research to be shaped by anyone who can influence the researcher. This stresses the need for explicit discussions on personal choices faced by researchers for change.

In the *domain on interdisciplinarity*, the literature and findings were in general agreement. Interdisciplinarity may be the preferred way of generating insights or solutions, but this comes with additional challenges related to cooperation and building on different expertise. The results suggest that problems are not inherently interdisciplinary, but are unclear on how researchers come to decide whether a problem requires an interdisciplinary approach.

Other domains with additional choices and considerations could be developed, particularly regarding formal organisation and regulations, specific use of methodologies. Choices and considerations on these aspects of research have gone unexplored or unnoticed in this research, but likely interact with the domains on problems, people, knowledge and interdisciplinarity. The findings on the four domains are still considered to be reliable as no clear gaps related to formal or methodological aspects of research stood out in the verification process.

In conclusion, researchers for change face many choices and considerations, which are all partly personally motivated or affected by interaction with others. Conscious and explicit discussion of these choices will likely improve decision making on trade-offs and ethical dilemmas, which in turn may improve the ability of researchers to evaluate and learn from choices and considerations in research for change.

# Conclusion

This thesis aimed to explore choices and considerations faced by researchers for change, using case study approach focussed on choices related to problems, people, knowledge and interdisciplinarity. The methodology suffered from a weakly defined interpretive framework and use of ambiguous concepts, but its strengths are its adaptability to the interviewees, ability to thoroughly discuss research choices and its accurate identification of choices and considerations in research for change.

The findings show that researchers for change face many problems but have a clear sense of direction for solving them. Researchers actively try to influence others, but are less aware of how others influence them. Addressing complex situations, strategic communication and the freedom of researchers to shape their research pose trade-offs with scientific integrity and make research susceptible to influence by others. Interdisciplinarity is a preferred but complicated way of generating innovative insights and solving problems, but the relation between problem perception and the need for interdisciplinarity remains elusive. Domains on formal organisational and methodological aspects of research may be of use to further explore choices and considerations on research for change, and interactions between all the domains.

Researchers for change face many choices and considerations, which are all partly personally motivated or affected by interaction with others. Conscious and explicit discussion of these choices will likely improve decision making on trade-offs and ethical dilemmas, which in turn may improve the ability of researchers to evaluate and learn from choices and considerations in research for change.

# References

Aarts, N., Steuten, C., and Woerkum, C. (2015). "Strategische Communicatie - Principes en Toepassingen," Koninklijke van Gorcum, Assen.

Andersen, H., and Wagenknecht, S. (2013). Epistemic dependence in interdisciplinary groups. *Synthese* 2013, 1881-1898.

Bhaskar, R. (1975). "A realist theory of science," Verso, London etc.

Bourdieu, P. (2012 (1994)). Structures, Habitus, Practices. *In* "Contemporary Social Theory" (C. Calhoun, J. Gerteis, J. Moody, S. Pfaff and I. Virk, eds.), pp. 345-358. Wiley-Blackwell, Chisester.

Brister, E. (2016). Disciplinary capture and epistemological obstacles to interdisciplinary research: Lessons from central African conservation disputes. *Studies in History and Philosophy of Biological and Biomedical Sciences* 56, 82-91.

Clark, S. G., and Wallace, R. L. (2015). Integration and interdisciplinarity: concepts, frameworks, and education. *Policy Sciences* 48, 233-255.

Douglas, H. (2009). The Moral Responsibilities of Scientists. *In* "Science, Policy and the Value-Free Ideal", pp. 66-86. University of Pittsburgh Press, Pittsburgh.

Entman, R. M. (1993). Framing: Toward clarification of a fractured paradigm. *Journal of communication* 43, 51-58.

Fischer, F. (2003). Public Policy as Narrative: Stories, Frames and Metanarratives. *In* "Reframing Public Policy: Discursive Politics and Deliberative Practices", pp. 161-180. Oxford Scholarship Online, Oxford.

Foucault, M. (2012 (1975)). Truth and Power [1977]. *In* "Contemporary sociological theory" (C. Calhoun, J. Gerteis, J. Moody, S. Pfaff and I. Virk, eds.), pp. 305-313. Wiley-Blackwell, Chisester.

Fraser, N. (2007). Re-framing justice in a globalizing world. *In* "(Mis) recognition, social inequality and social justice: Nancy Fraser and Pierre Bourdieu" (T. Lovell, ed.), pp. 17-35. Routledge, London.

Gaventa, J. (2006). Finding the spaces for change: a power analysis. *IDS bulletin* 37, 23-33.

Giller, K. E., Andersson, J. A., Sumberg, J., and Thompson, J. (2017). A golden age for agronomy? *In* "Agronomy for development : the politics of knowledge in agricultural research" (J. E. Sumberg, ed.), pp. 150-159. Routledge, London.

Giller, K. E., and Baijukya, F. (2017). The Missing Middle: Food system transformation pathways to link action at multiple levels to SDGs 2, 12, 13 and 15 in Tanzania and Vietnam. *In* "Tackling Global Challenges through Use-Inspired Research Application form", pp. 16.

Goddiksen, M., and Andersen, H. (2014). Expertise in Interdisciplinary Science and Education. (A. University, ed.), pp. 15.

Gramsci, A. (1995). "Further selections from the prison notebooks," U of Minnesota Press.

Gutting, G. (2014). Michel Foucault. (E. N. Zalta, ed.), Vol. 2018.

Jansen, K. (2009). Implicit sociology, interdisciplinarity and systems theories in agricultural science. *Sociologia Ruralis* 49, 172-188.

Kivisto, P., and Pittman, D. (2007). Goffman's Dramaturgical Sociology. *In* "Illuminating Social Life - Classical and Contemporary Theory Revisited" (P. Kivisto, ed.), pp. 271-290. Sage, London.

Kunneman, H. P. J. M. (1986). "De waarheidstrechter : een communicatietheoretisch perspectief op wetenschap en samenleving," Boom Meppel, Amsterdam.

Orr, S., Sumberg, J., Ernstein, O., and Oswald, A. (2008). Funding international agricultural research and the need to be noticed - A case study of NERICA rice. *Outlook on Agriculture* 37, 159-168.

Popper, K. (1972). Epistemology without a knowing subject. *In* "Objective Knowledge - An Evolutionary Approach", pp. 106-152. Oxford University Press, Oxford.

ProvalisResearch (2018). QDA Miner Lite - Free Qualitative Data Analysis Software. Vol. 2017.

Rasmussen, K., and Arler, F. (2010). Interdisciplinarity at the Human-Environment interface. *Geografisk Tidsskrift-Danish Journal of Geography* 110, 37-45.

Rossini, F. A., and Porter, A. L. (1979). Frameworks for integrating interdisciplinary research. *Research Policy* 8, 70-79.

Schmidt, J. C. (2011). What is a problem?: On problem-oriented interdisciplinarity. *Poiesis Prax* 7, 249-274.

Spradlin, D. (2012). Are you solving the right problem? *Harvard Business Review* September 2012, 1-11.

Sterk, B., van Ittersum, M. K., and Leeuwis, C. (2011). How, when, and for what reasons does land use modelling contribute to societal problem solving? *Environmental Modelling & Software* 26, 310-316.

Sumberg, J., Thompson, J., and Woodhouse, P. (2013). Why agronomy in the developing world has become contentious. *Agriculture and Human Values* 30, 71-83.

van Asselt, M. B., and Rotmans, J. (2002). Uncertainty in Integrated Assessment Modelling - From Positivism to Pluralism. *Climatic Change* 54, 75-105.

van den Belt, H. (199x). Kritiek op Herman Koningsveld, 'Drie vluchtwegen uit de normatieve theorievorming', Wageningen University.

van den Belt, H. (200x). Five views on scienceand technology development: implications for democratic control and ethical assessment. pp. 22. Wageningen University and Research Centre.

van Hengel, E. (1987). Waarom technologie zich leent voor kritiek. *Spil* 61/62, 9-18.

Veldhuizen, L. J. L., de Boer, I. J. M., Brouwer, I. D., Giller, K. E., Janssen, S., Oosterveer, P., Slingerland, M. A., and van Zanten, H. H. E. (2017). The Missing Middle: Connecting global goals to local contexts and agricultural production to food consumption to achieve Sustainable Development Goal 2. pp. 10. Wageningen University.

# Appendix 1: Interview basic structure and key questions NL/EN

*Interviews were conducted in Dutch. The interview backbone was translated to English for this report..*

Discuss privacy and use of data

Interdisciplinarity

How interdisciplinary is Missing Middle project

Why using interdisciplinary approach

Why interested in interdisciplinary approach

Is Missing Middle project interdisciplinary

Expected challenges in the project

Known or expected shortcomings of the project

Do you always agree or disagree in group

What to do with conflicting views of colleagues

Knowledge

What perspective do you have on knowledge

How important is knowledge generation

What is knowledge

Collaboration

Do you trust your colleagues

How important is trust in collaborations

Missing Middle Project

Happy with the project

Project any different than planned

How do you see project develop

Has project been thought through well enough

Concept

What is missing middle concept

Is concept interdisciplinary

How was concept developed

Is concept logically coherent

Why is the missing middle missing

Why does concept need to be addressed

Why is research into the concept necessary

Who gains from addressing missing middle

Alternative strategies to addressing missing middle

Who to connect to bridge the gap of the missing middle

Who to exclude when trying to address the missing middle

What problem does concept solve

When is missing middle missing

How to discover missing middle in world

Group

Why are you taking part in the group

Why interested in missing middle project

How did you come to join the project

What do you hope to achieve with the group

Expected outcomes

How to address missing middle with the group

How to approach project with the group

What are your contributions to project

What do you hope to contribute

What do you look forward to

What are you cautious of

# Appendix 2: Discussion propositions NL/EN

*This Appendix contains the discussion propositions that were discussed with the case study group members. Most discussions were performed in Dutch (Bold). One discussion was performed in English.*

**Propositions**

- **Interdisciplinariteit leidt wel tot wat nieuwe inzichten, maar de echte voordelen zijn het grotere netwerk en meer mogelijkheden om met stakeholders samen te werken.**

- While interdisciplinarity leads to some new insights, its key benefits are its bigger network and better opportunities to work with stakeholders.

- **In interdisciplinaire projecten is het onmogelijk elkaars kennis en kunde te evalueren, waardoor overtuigingskracht belangrijker wordt dan controleerbaarheid.**

- In interdisciplinary projects, it is impossible to evaluate each other's knowledge and skill, making it more important to convince each other than to be able to check contributions.

- **Een onderzoeker draagt alleen informatie aan. Normen en waarden over de beste oplossing voor hun probleem worden bepaald door de stakeholders.**

- Researchers only provide information. Norms and values regarding the best solution for their problem are determined by the stakeholders.

- **Faciliteren van onderhandelingsprocessen is een mythe. Faciliteren vereist deelname aan de onderhandeling, waarbij de facilitator eigen doelen nastreeft.**

- Facilitating negotiation processes is a myth. To facilitate, one has to take part in negotiations, in which the facilitator pursues his or her own goals.

- **Wetenschap is niet democratisch georganiseerd, dus wetenschappers kunnen geen maatschappelijk belang dienen.**

- Science is not democratically organised, so scientists cannot serve the public good.

- **Effecten van een interventie via onderzoek doen er alleen toe als de stakeholders dat zo vinden of als basale behoeften van mensen in het geding zijn.**

- Effects of an intervention through research only matter when the stakeholders think so, or when basic human needs are at stake.

- **Kwaliteit van onderzoek doet er niet zo veel toe, waar het om gaat is dat je je boodschap overbrengt op de juiste stakeholders.**

- Research quality is not so important, what matters more is that you get your point across to the right stakeholders.


- **De drang om goed met elkaar samen te werken leidt tot het vermijden van extreem kritische perspectieven, wat afbreuk doet aan de innovativiteit van het groepsdenken.**

- The desire to work well together leads to the evasion of extremely critical perspectives, which harms the innovative capacity of the group.


- **Onderzoek kan niet neutraal zijn, en dat is maar goed ook.**

- Research cannot be neutral, and that's for the best.

# Appendix 3: Transcript analysis details

This appendix contains further details on the transcript analysis (Chapter 2). Four steps were taken to arrive at conclusions on choices and considerations in research for change:

1) **Taking notes.** In this step, choices and considerations in research for change were summarised in brief statements called notes. The location of notes and their supporting data in the transcript documents was documented to make the notes retraceable.

2) **Grouping notes.** In this step, the notes were grouped in categories based on the domains on problems, people, knowledge and interdisciplinarity (see Chapter 1). This was done to group notes with related content. Notes were grouped separately for each interviewee.

3) **Drawing conclusions.** In this step, notes were further sub-grouped based on similar choices or considerations. Conclusions were two-sided to capture alternative or conflicting views of the same interviewee. Conclusions were drawn separately for each interviewee.

4) **Categorising conclusions.** In this step, the conclusions of all interviewees were pooled together and categorised in four general research-related choices. As the domains problems, people, knowledge and interdisciplinarity did not effectively categorise the conclusions, new categories were formulated based on the results.

## Details on Step 1: Notes of values

Notes were taken with the conscious effort not to take the following analysis steps into account. This meant that the domains problems, people, knowledge and interdisciplinarity were not used as a guiding framework. When drawing conclusions in step 3, it was found that some notes were not explicit enough. In this case, I went back to the original text to refresh my memory on the context or to improve notes. There is no clearly delimited transcript data for each note. Instead, I stuck paper sheets to the sides of my printed transcripts so that every note was spatially close to the corresponding text.

## Details on Step 2: Grouping notes

Notes were grouped based the four domains by coding them in QDA Miner Lite (ProvalisResearch, 2018). In some cases, notes were given a new code during the process of formulating conclusions. Double codes did not occur more than five times per interviewee. While 10 codes were used in total (for the code descriptions, see Table 3 in Chapter 2), the codes *Interdisciplinarity*, *Problems-Interdisciplinarity*, *People*, *Knowledge* and *Problems* were used very little. To account for this, notes were sometimes pooled across several codes with few codes to support a single conclusion. Other codes, namely Problems-People, Problems-Knowledge and People-Knowledge, stood out with large numbers of relevant notes. These often had multiple conclusions per code.

## Details on Step 3: Drawing conclusions

Conclusions were drawn by manually shuffling notes within a code until subgroups stood out. This was a trial-and-error process, and notes were often shuffled around multiple times before reaching several well-founded conclusions could be drawn on as many notes as possible. If a note did not clearly relate to others, then it was not incorporated in any conclusion and left unused for the remainder of the analysis. On average, 3 notes remained unused per interviewee. The process followed three principles:

1) Conclusions should be two-sided. Except when several notes were supported a single perspective with no clear alternative views.

2) Conclusions should not be based on less than four notes. Except when notes were clearly convincing and considered to represent an important perspective.

3) Conclusions should not exceed codes. Except when codes had few codes in them, and notes across codes could be captured in a unifying conclusion.

## Details on Step 4: Categorising conclusions

*Table 6: Distribution of interviewee conclusions across categories (columns). Number behind categories indicates total number of conclusions in that category.*

| Person | Choosing an approach | Choosing who to work with | Choosing a goal | Choosing a role for yourself and others | Total |
|---|---|---|---|---|---|
| A | 1 | 1 | 1 | 1 | 4 |
| B | 2 | 0 | 0 | 0 | 2 |
| C | 0 | 2 | 0 | 3 | 5 |
| D | 5 | 2 | 1 | 3 | 11 |
| E | 3 | 3 | 4 | 4 | 14 |
| F | 0 | 2 | 2 | 2 | 6 |
| G | 2 | 3 | 1 | 2 | 8 |
| H | 2 | 1 | 1 | 3 | 7 |
| | 15 | 14 | 10 | 18 | 57 |

In this step, conclusions from all interviewees were pooled. As the domains of problems, people, knowledge and interdisciplinarity were not useful for grouping conclusions, four others were formulated to capture as many different interviewees as possible per category. For a distribution of conclusions per person and per category, see Table 66.

# Appendix 4: Conclusions per category

This appendix contains a list of conclusions as referred to in Chapter 3. Conclusions are grouped per category. The column Ref# contains the randomly assigned numbers used in Chapters 3 and 5. Asterisks behind numbers indicate conclusions that were unverified due to disagreement or lack of time.

| Category | Conclusions | Ref# |
|---|---|---|
| *Choosing an approach* | Scientific methods exclude most inappropriate values from research \| Personal and professional values are central to research outcomes | 1 |
| *Choosing an approach* | Stakeholders are often informed indirectly of findings \| Research findings are highly sensitive to uncertain and subjective research design choices | 2* |
| *Choosing an approach* | Solving system problems requires an elaborate approach \| The project can only take on a minor part of the whole situation | 3 |
| *Choosing an approach* | Operationalising concepts is an important goal of research \| Researchers cannot verify concepts without external help | 4 |
| *Choosing an approach* | Expertise has to adapt to the requirements of research as it progresses \| Trajectory of research can lead beyond available expertise | 5 |
| *Choosing an approach* | Interdisciplinarity has some inherent benefits for problem solving \| Problems can be solved with disciplinary approaches as well | 6 |
| *Choosing an approach* | Interdisciplinarity generates new insights and can prevent new problems | 7 |
| *Choosing an approach* | Scientists can argue for normative points provided they have the evidence \| Finding and verifying evidence is an imperfect process where faulty evidence can slip through | 8 |
| *Choosing an approach* | The project aims to have impact and incite change in thinking and practice \| An emphasis on change does not necessarily fit standard scientific methods | 9 |
| *Choosing an approach* | Uncertainties will be dealt with along the way \| Current approach is based on highly uncertain ideas | 10 |
| *Choosing an approach* | Looks forward to learn a lot and refine her expertise | 11 |
| *Choosing an approach* | Uncertainty and incompleteness cannot be accounted for in the project \| Solutions are chosen based on relevance, practical value and opinion | 12 |

| | | |
|---|---|---|
| *Choosing an approach* | Replicability of research is a central quality measure \| The concept is worth pursuing but hard to make concrete | 13 |
| *Choosing an approach* | Interdisciplinarity addresses questions better from multiple angles \| Interdisciplinarity is a goal in itself | 14 |
| *Choosing an approach* | Research cannot grasp a lot of complexity \| Some things can be known or understood before having proof | 15 |
| *Choosing who to work with* | Shared views and ideas are needed to stimulate interdisciplinary cooperation \| Interdisciplinary insights result from differences and confrontation | 16 |
| *Choosing who to work with* | Group effectivity depends to a large extent on shared general goals and direction \| Differences and pressure are needed to spark necessary creativity | 17 |
| *Choosing who to work with* | Expertise should be brought in based on relevance \| Project groups are formed based on interests and networks | 18 |
| *Choosing who to work with* | Researchers with strong convictions should be avoided \| Very difficult to draw line between experience and conviction regarding unfamiliar fields of expertise | 19 |
| *Choosing who to work with* | Collaborations are most effective when researchers have shared views and a unifying goal \| Sometimes enabling and stimulating collaboration is a very important goal | 20 |
| *Choosing who to work with* | Group processes and personal conflicts are an important challenge to interdisciplinarity \| Ideal interdisciplinary approach is not practically feasible | 21 |
| *Choosing who to work with* | Collaborations have to be enjoyable in order to last \| Collaborations have to deliver | 22* |
| *Choosing who to work with* | Interdisciplinarity requires an open and receptive attitude | 23* |
| *Choosing who to work with* | The SDG2-group works well because of agreement on worldviews and goals \| The group does not necessarily have anything unique to offer | 24 |
| *Choosing who to work with* | Interdisciplinarity requires a strong disciplinary basis and communication skills to reach new insights \| Insights have to be translated back into disciplines to fulfil their potential | 25 |
| *Choosing who to work with* | Spend time on what you like doing with people you can work well with \| Reject offers and exclude people that you strongly disagree with | 26 |
| *Choosing who to work with* | Interdisciplinarity generates new insights by using and relying on expertise of others \| Only accept claims of others when you understand them and are convinced | 27 |

| | | |
|---|---|---|
| *Choosing who to work with* | Interdisciplinarity requires an approach that supersedes disciplines \| Interdisciplinarity requires support from all involved disciplines | 28 |
| *Choosing who to work with* | Personal traits and interests play an important role in interdisciplinary collaborations \| Interdisciplinarity should be about generating new insights | 29 |
| *Choosing a goal* | Influential people make or break change \| What change you consider best for the world is in the end based on personal norms and values | 30 |
| *Choosing a goal* | Solutions to problems should not cause new problems \| Not all problems matter enough to be problematic | 31 |
| *Choosing a goal* | Research has to contribute to values you subscribe to \| Research can be misused for other ends if values are not adequately incorporated | 32 |
| *Choosing a goal* | Research aims to achieve good things \| Research cannot guarantee good outcomes | 33 |
| *Choosing a goal* | Work to achieve what you stand for \| Do not contribute to goals you disagree with | 34 |
| *Choosing a goal* | Research for change should contribute to specific goals \| To reach any goal, researchers face many limitations and dependencies | 35 |
| *Choosing a goal* | Do not spend time on things you cannot influence \| Accept non-negotiable goals | 36 |
| *Choosing a goal* | Science plays an universal societal role in identifying problems \| What is considered to be problematic in society cannot be reduced to science | 37 |
| *Choosing a goal* | Pursuing good goals is necessary although it can have negative effects \| Some good goals are unattainable | 38 |
| *Choosing a goal* | Research is thoroughly connected with personal and stakeholders interests and values \| Research should strive to be as far as possible independent of the researcher's own and other people's values | 39* |
| *Choosing roles for yourself and others* | Researchers have to translate their findings to make them more palatable to stakeholders \| Translation can have impact even without sufficient research quality | 40 |
| *Choosing roles for yourself and others* | Researchers should be objective and leave normative decisions to stakeholders \| Researchers inevitably bring in their own worldviews and passions | 41* |
| *Choosing roles for yourself and others* | Researchers should try to convince or find allies to pursue common goals \| Stakeholders who disagree too strongly with the goal are excluded | 42 |

| | | |
|---|---|---|
| *Choosing roles for yourself and others* | Exert influence when you can \| Do not worry about what you cannot seem to influence | 43 |
| *Choosing roles for yourself and others* | Research is an important way of exerting influence on policy and stakeholders \| Researchers cannot make final decisions for change | 44 |
| *Choosing roles for yourself and others* | Work with what you have and can do \| Do not worry about things you cannot influence | 45 |
| *Choosing roles for yourself and others* | Researchers take initiative to put problems on the agenda of stakeholders to increase demand for research \| Achieving change is more important than representing all stakeholders | 46 |
| *Choosing roles for yourself and others* | Solutions and information should be tailored well to stakeholder interests, and researchers tend to work with likeminded stakeholders \| Researchers can actively and openly bring in competing interests | 47 |
| *Choosing roles for yourself and others* | Credibility and honesty is central to communicating with stakeholders \| Too high credibility of researcher can lead to less realistic research outcomes | 48 |
| *Choosing roles for yourself and others* | Justice, equality and respect are important when dealing with stakeholders | 49 |
| *Choosing roles for yourself and others* | Researchers can contribute to a desired change by actively influencing others \| Researchers are dependent on others to have any real impact | 50 |
| *Choosing roles for yourself and others* | Researchers can proactively put issues on political agendas \| Putting issues on the agenda requires a fitting research and communication strategy | 51* |
| *Choosing roles for yourself and others* | The project's research is strongly shaped by the involved researcher's interests \| It is important to take stakeholder views and interests into account | 52 |
| *Choosing roles for yourself and others* | Research should be tailored to meet stakeholder interests \| Research outcomes can go against stakeholder interests | 53 |
| *Choosing roles for yourself and others* | Stakeholders should not be put at a disadvantage by supporting research projects \| What is considered best for stakeholders is not necessarily just | 54 |
| *Choosing roles for yourself and others* | Wetenschap creëert geen verandering, dat doen stakeholders | 55* |

| | | |
|---|---|---|
| *Choosing roles for yourself and others* | Scientists should actively and strategically disseminate their research findings to influence decision making \| Dissemination and decision making processes are muddy and unpredictable | 56 |
| *Choosing roles for yourself and others* | Research should actively raise awareness among stakeholders about issues \| Stakeholders have the final say in their situation, and can easily reject good ideas | 57 |