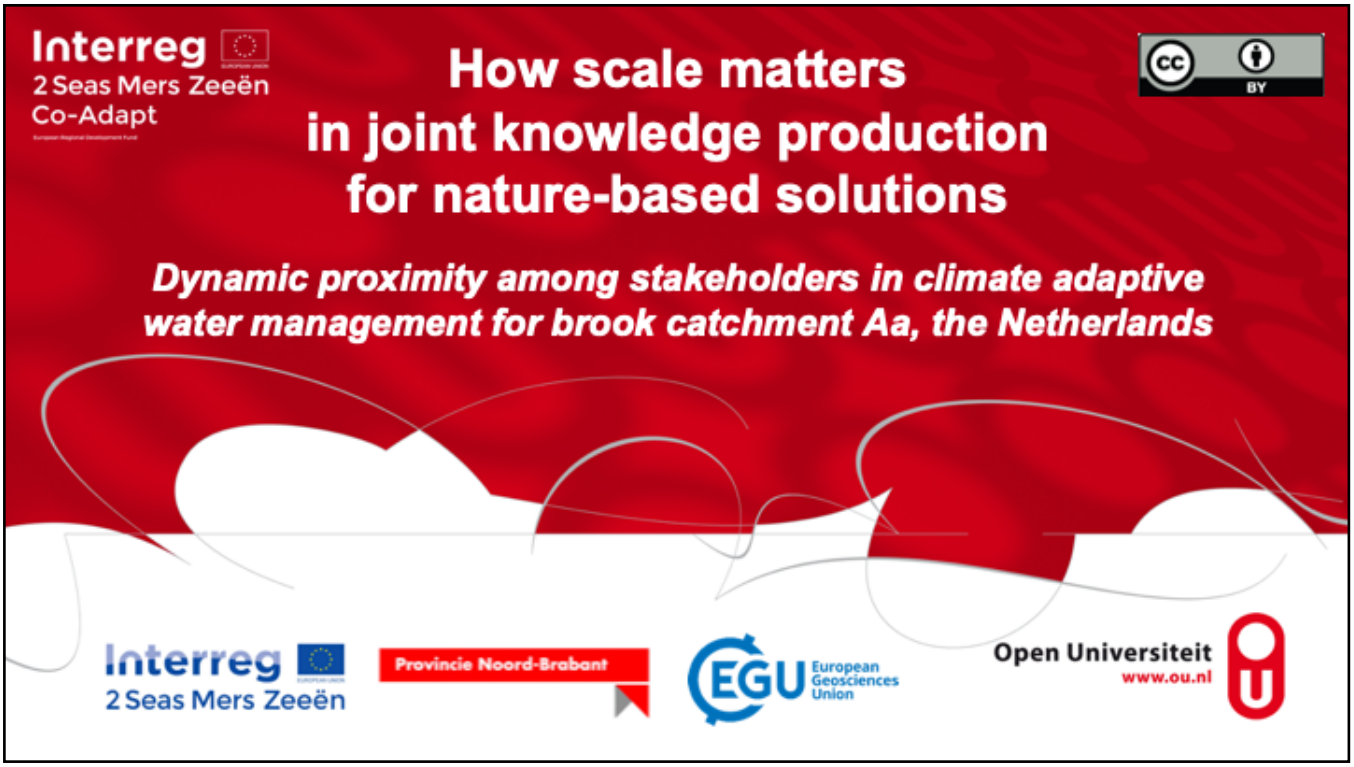
Interreg
2 Seas Mers Zeeën
Co-Adapt
How scale matters
in joint knowledge production
for nature-based solutions
Dynamic proximity among stakeholders in climate adaptive
water management for brook catchment Aa, the Netherlands
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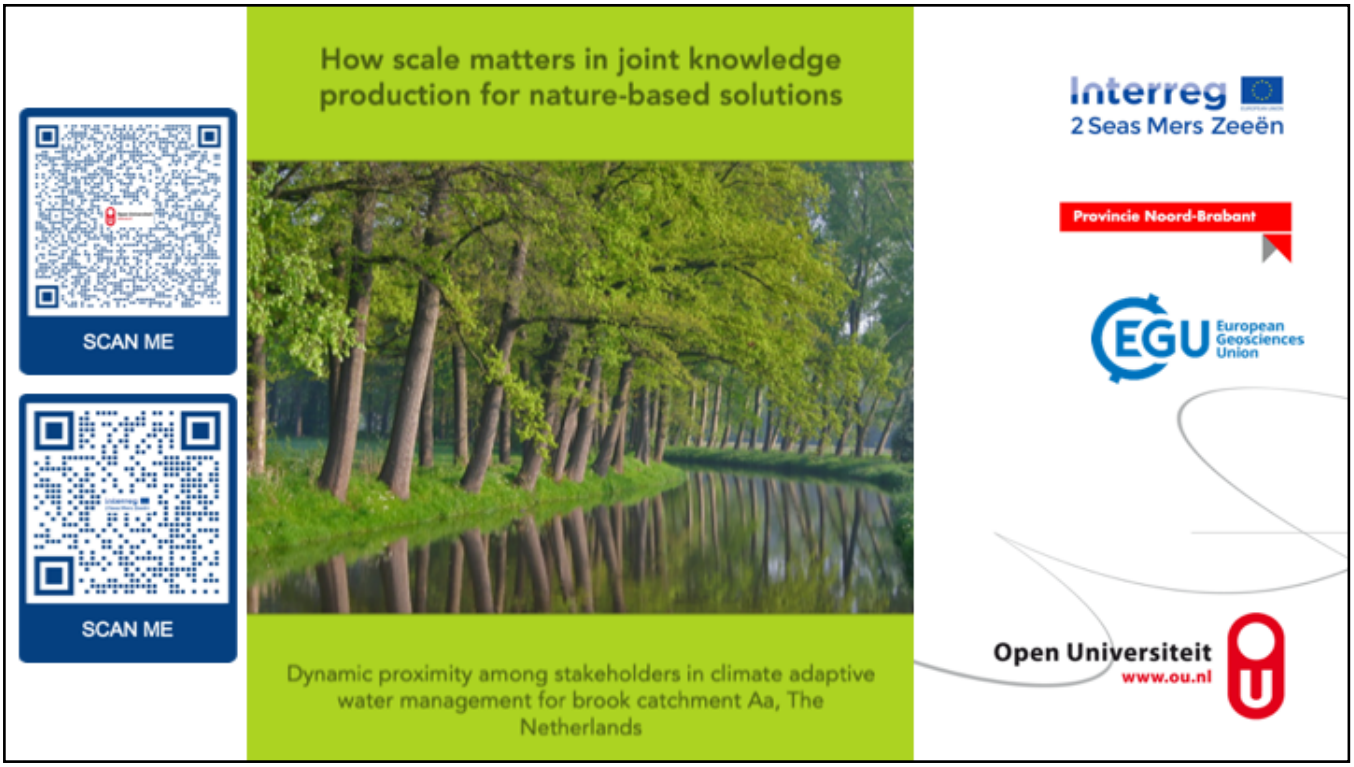
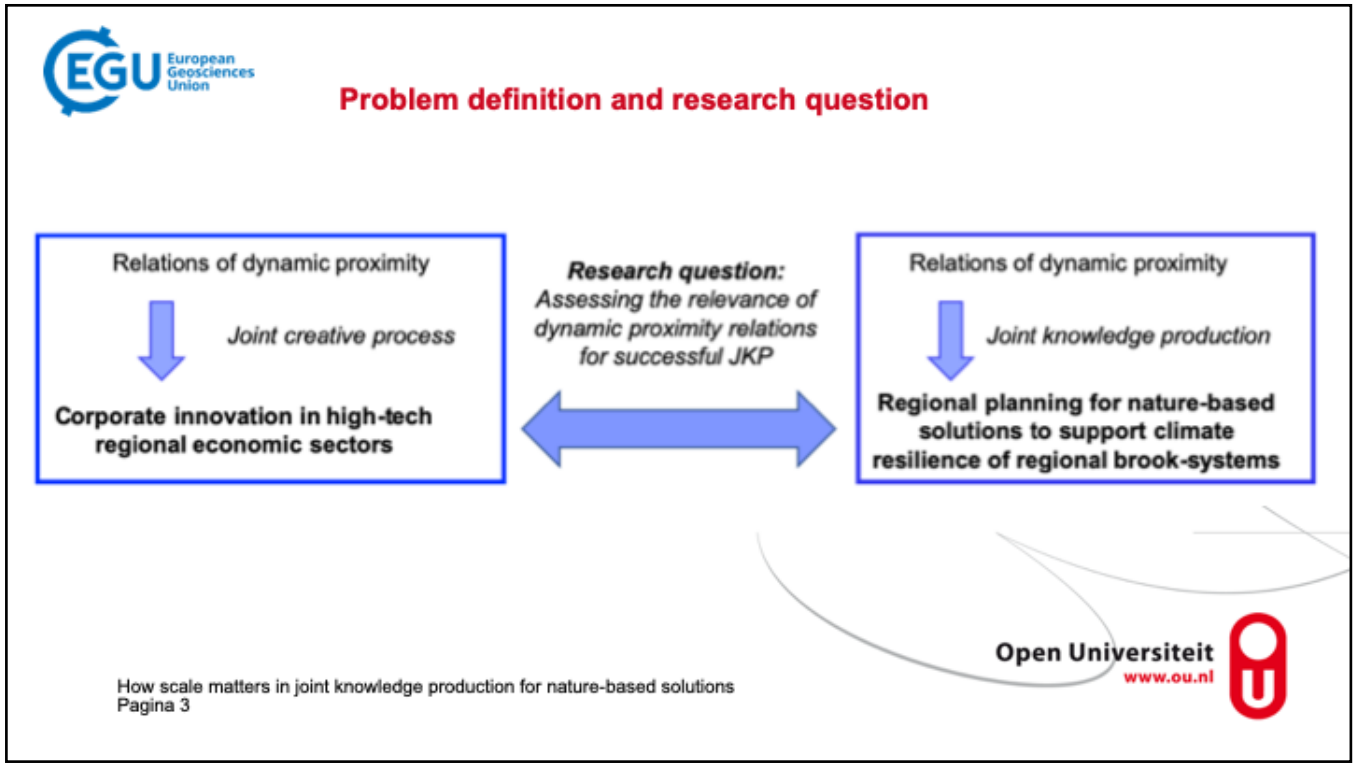
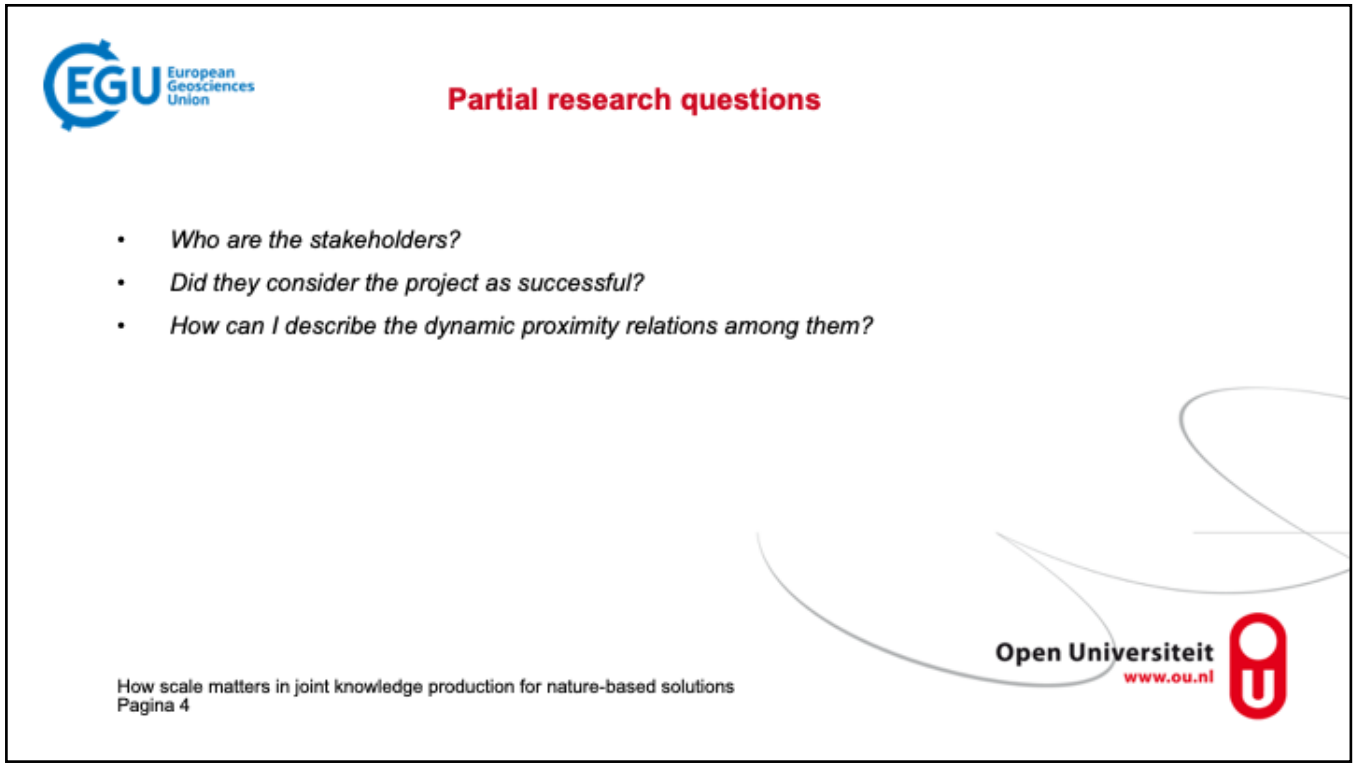


In the spring of 2020, upon starting this research, we had an introductory meeting with the supervisor at the Province of North-Brabant, Frank van Lamoen. We were going to define the exact topic of the research in the context of the EU 2-Seas Program 'Co-Adapt'. One remark mr. Van Lamoen made during this meeting stayed with us during the entire research trajectory: "Could you explore what differences in scale in fact do within such regional climate adaptation projects?" He had noticed that it was not always easy to communicate knowledge on a worldwide scale, on climate change and land-use change, in local or regional projects on, for example, climate adaptation and brook-restoration. Interests and urgency were often felt quite differently on the regional scale. This for us was the reason to start looking into the *proximity* between stakeholders in the process of a regional project aimed at climate adaptation as the central theme of this research.

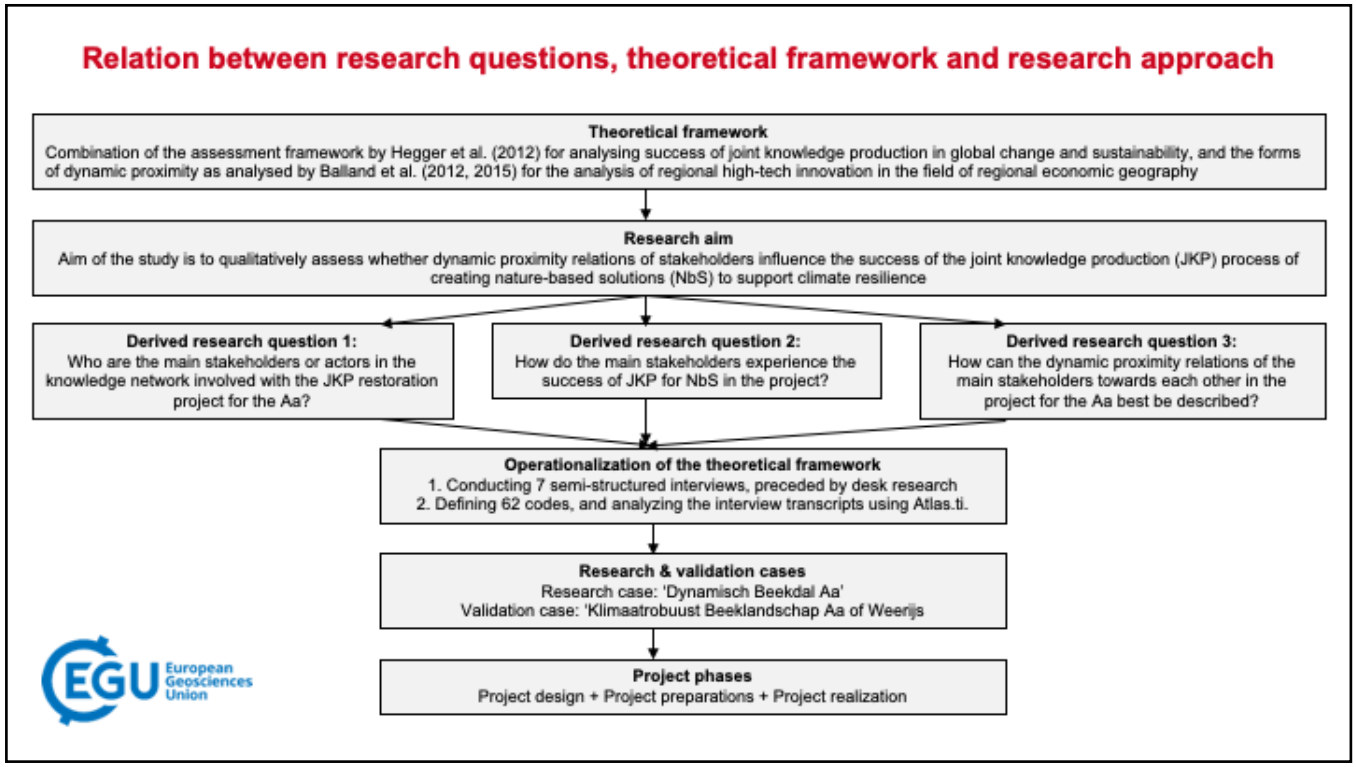


In the search for climate resilience of brook catchments stakeholders collaborate. Those collaborations involve dynamic proximity, and if all goes well, this gives rise to innovative, creative solutions using natural hydrological and landscape processes. Dynamic proximity is known from innovation research in the field of high-tech regional economic development. The question we have asked ourselves, is whether dynamic proximity of the stakeholders in a knowledge network influences the success of joint knowledge production as well. And if this is the case, to determine which forms of proximity are most of relevance. In trying to answer that question, we have focused on a more *low-tech*, or *nature-tech* context of regional economic development: creating nature-based solutions to support climate resilience in a regional brook-catchment.

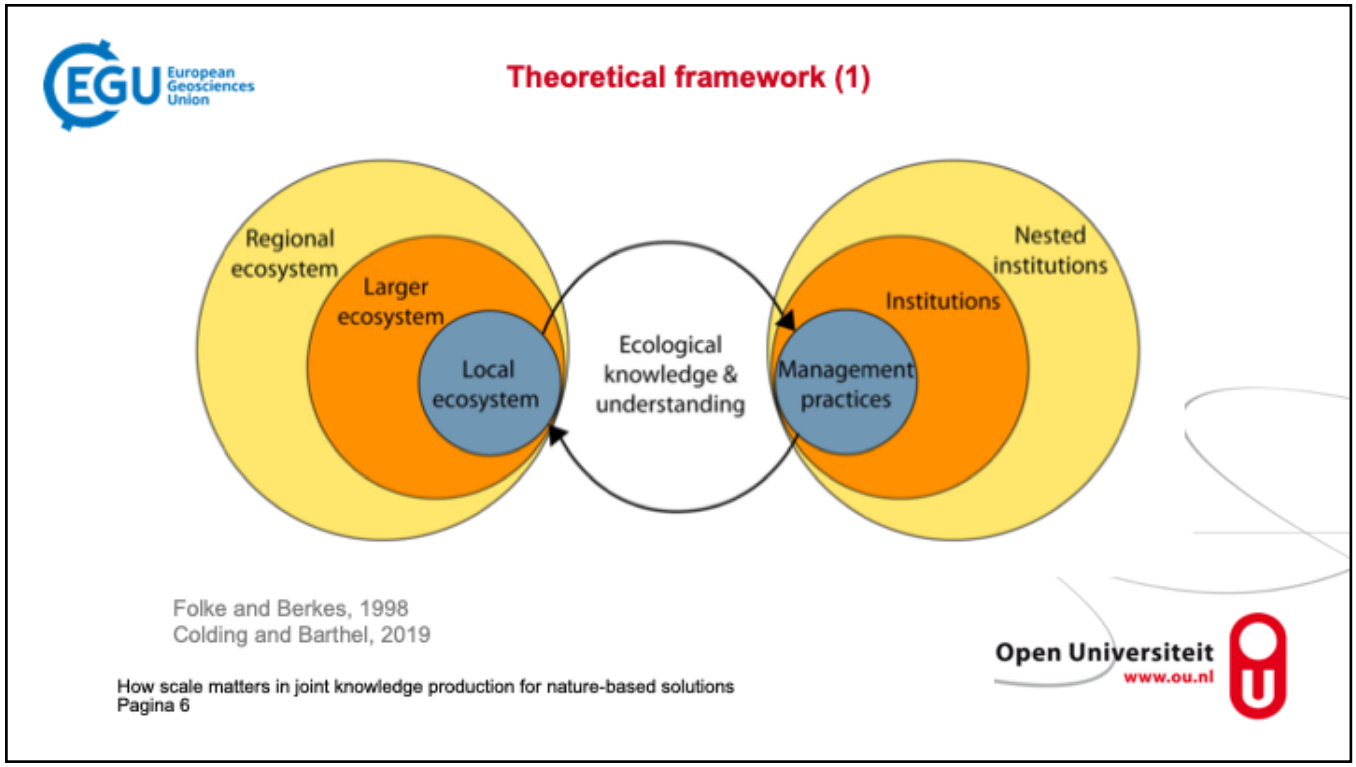


We have broken up the main research question into 3 sub-question with the aim of structuring the research process:

1. Who are the main stakeholders in the knowledge network, what are their roles, and can their network relations be graphically shown?
2. How do the main stakeholders experience the success of joint knowledge production for nature-based solutions in the knowledge network?
3. How can the dynamic proximity relations of the main stakeholders among each other in the knowledge network best be described?

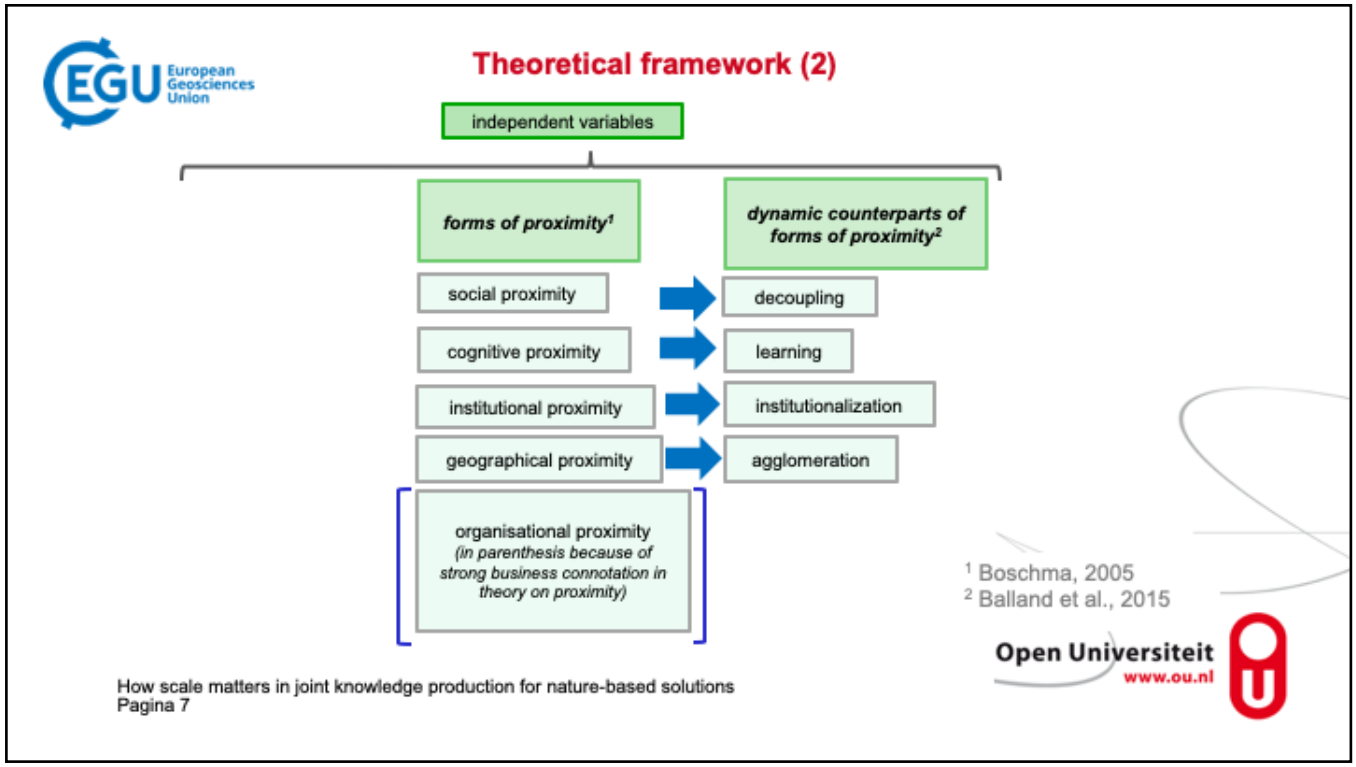


The diagram shows the relation between research questions, theoretical framework, and research approach we followed. We will explain this further.



Starting-point and presupposition for this research is that a regional brook system can be considered a social-ecological system on different, *nested* scales, in the sense Folke and Berkes gave to it. The social-ecological system consists of the natural system (left hand side of figure), which may consist of a number of nested sub-systems. For example think of a brook's drainage basin, containing a number of nested watershed ecosystems. The social-ecological system also consists of the social system (right hand side of figure), which is again a nested system. It may consist of the local management practices of farmers by the brook on the small scale, to larger-scale institutions such as the European scale of administration, issuing regulations like the Water Framework Directive. The linkage between both system-types lies in the ecological knowledge and understanding of the user's resource base. This knowledge and understanding is critical. Without it, a sustainable use of the resource base is not likely, according to Folke and Berkes.

Following this line of thinking, it matters to study human behavior in brook-catchment restoration, because in the social-ecological system the social system is as important as the natural system. Without productive human behavior there is no healthy brook-system.



Now how is the production of ecological knowledge & understanding influenced by the scale on which the knowledge production takes place? That issue is being studied in economic geography and regional economics on *proximity*. How does the proximity among stakeholders, in various meanings of the word, influence knowledge networking, innovation, and regional development? Balland, Boschma en Frenken (2015) have distinguished 5 forms of dynamic proximity. This framing is the starting point of our research. These authors, like we will, speak of *dynamic* proximity, because they consider the *process* of knowledge networking as the central issue for study. Proximity is not just something that arises through external influences; but by collaborating, proximity between stakeholders originates and changes.

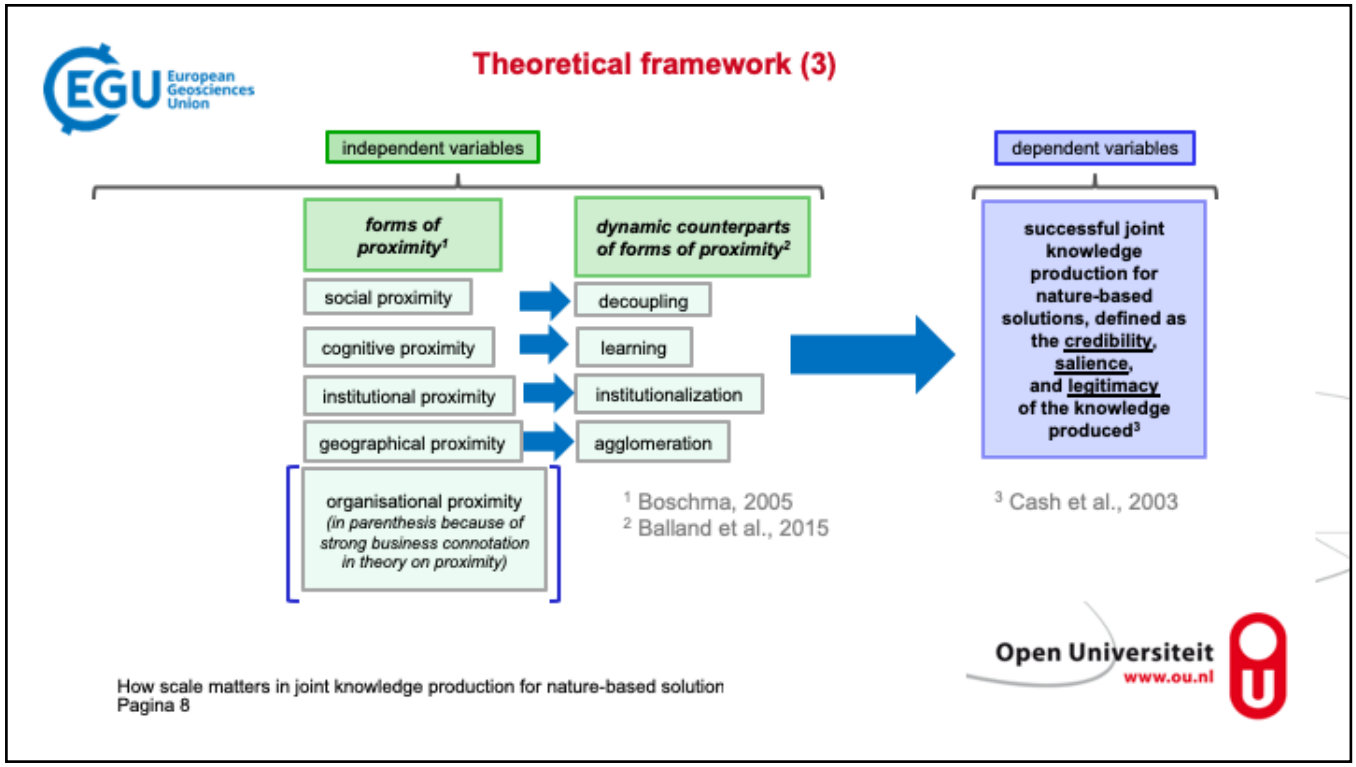
Decoupling points to the 'becoming autonomous' of personal relations through time; that is when a relation among stakeholders can be decoupled from its original context and ends up existing for itself.

Learning is the creation of new overlap in knowledge bases.

Institutionalization is the progressive integration of rules and values in stakeholders' behavior, which arises from the socialization process of individuals and organizations.

Agglomeration is the choice of location of organizations.

I have not used the form of **Organisational proximity** in my framework, because it is strongly associated with a business context in the theory on proximity.



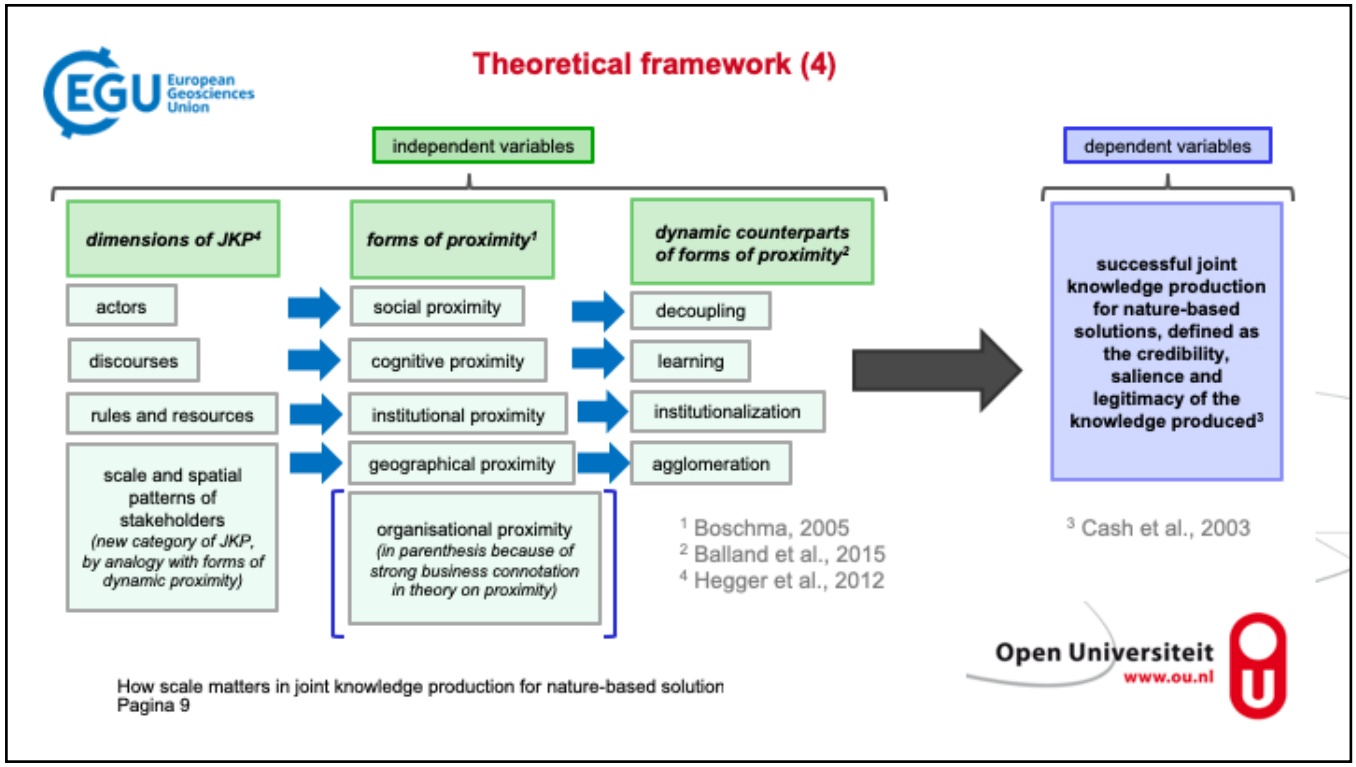
As we have chosen to focus on the *process* of knowledge production, the question is: What is an appropriate process to produce viable knowledge within the social-ecological system, and how can that be assessed? This question has been subject of research in the field of environmental governance and policy studies. Cash and co-authors have suggested that science and technology can best be mobilized for sustainability when they manage the boundaries between knowledge and action, which can be assessed by evaluating the salience, credibility, and legitimacy of the knowledge produced.

Credibility should be understood as the perceived adequacy of the knowledge produced.

Salience should be understood as the perceived relevance of the knowledge produced.

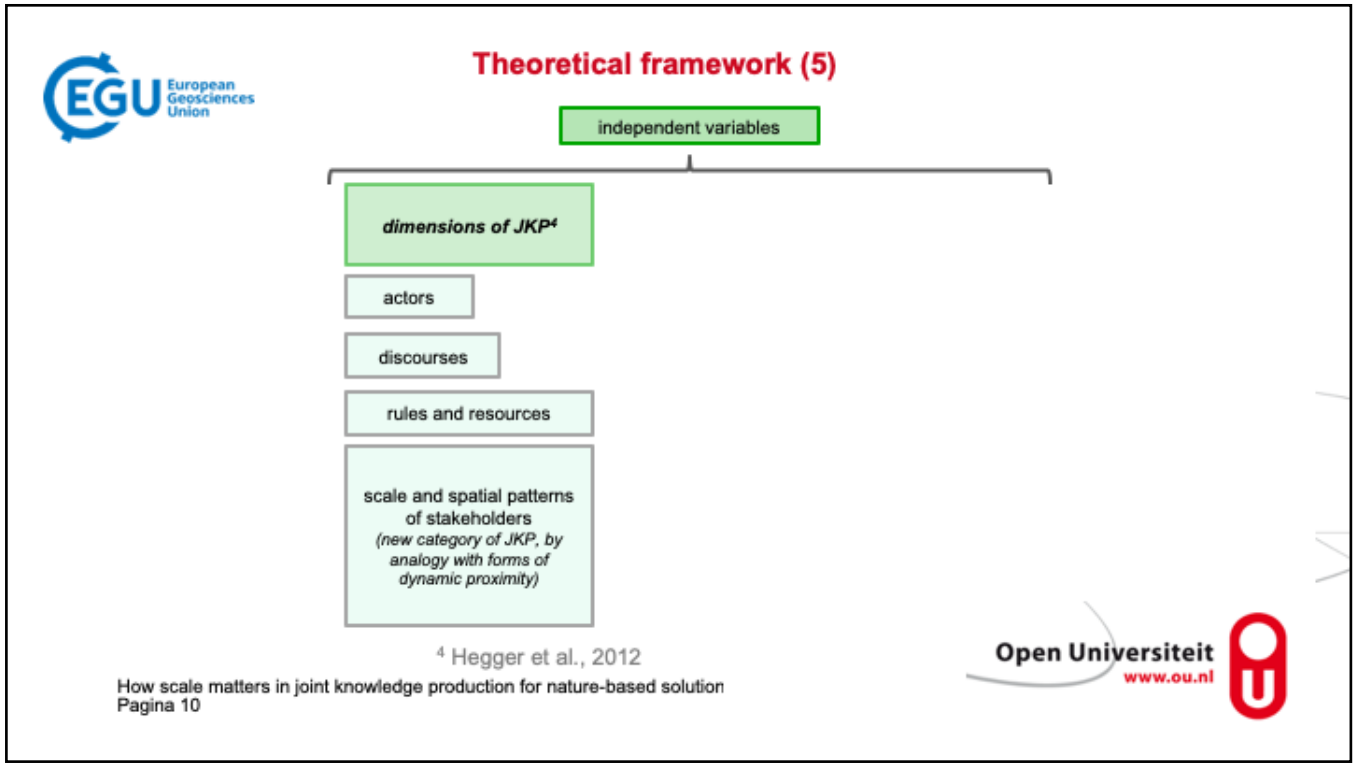
Legitimacy should be understood as the extent to which knowledge production has been respectful of the divergent values and beliefs of stakeholders, unbiased and fair.

In our research these concepts function as the *dependent variables*.



Hegger and co-authors have operationalized Cash' insights by presenting a research model for use in empirical research. They study projects in which science and public policy collaborate to produce knowledge in the field of global change and sustainability. They term such projects *joint knowledge production (JKP)* projects. They pinpoint success conditions, the fulfilment of which leads to credibility, salience and legitimacy of knowledge produced.

We have chosen to combine the forms of dynamic proximity, with the dimensions of joint knowledge production as defined by Hegger and co-authors into the theoretical framework of my research. We do this, because we feel this is a way to assess the main issue: whether dynamic proximity among stakeholders can be said to influence the success of joint knowledge production processes. These combined forms of dynamic proximity, and success conditions for joint knowledge production form our independent variables.



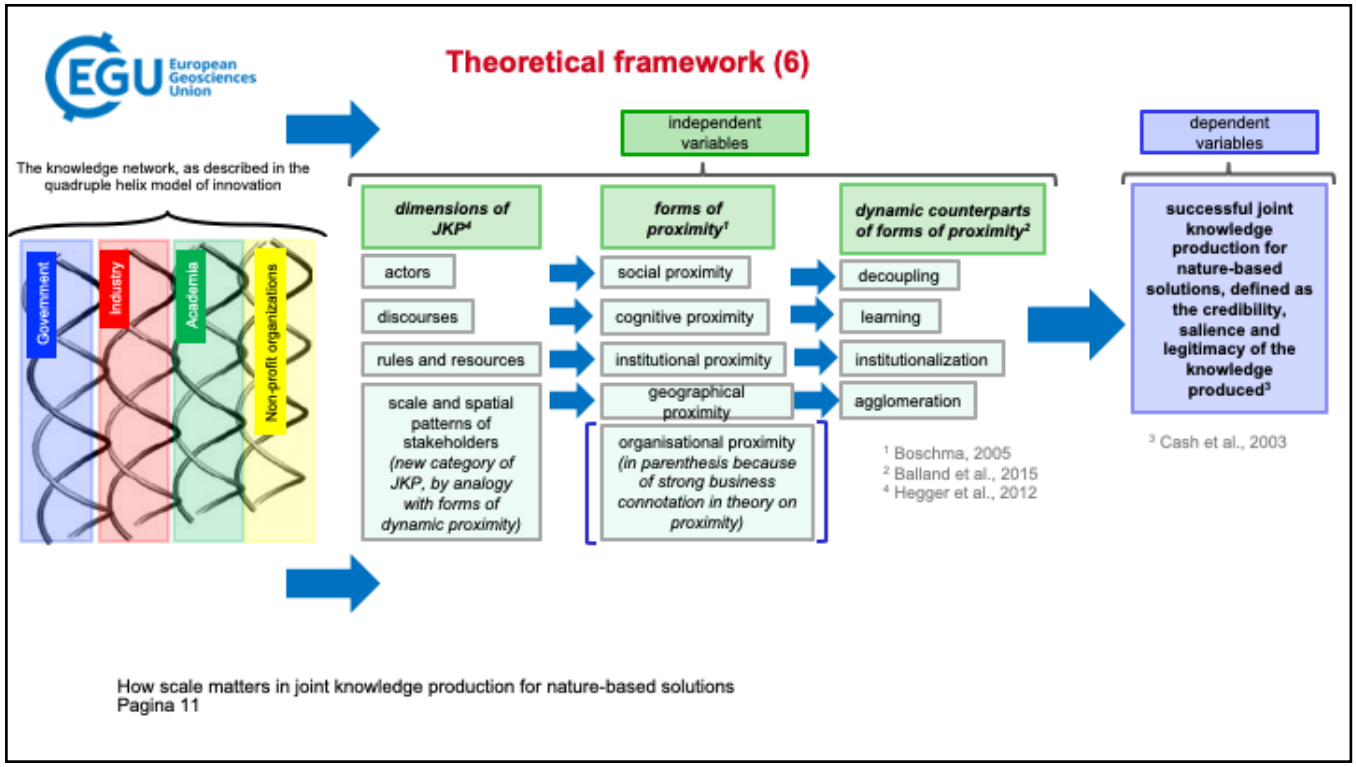
We need to focus in a little more on the meanings of the new success conditions for joint knowledge production, as brought in by Hegger and co-authors:

Under the **dimension 'Actors'**; the main success condition is the presence of the broadest possible stakeholder coalition in a knowledge network.

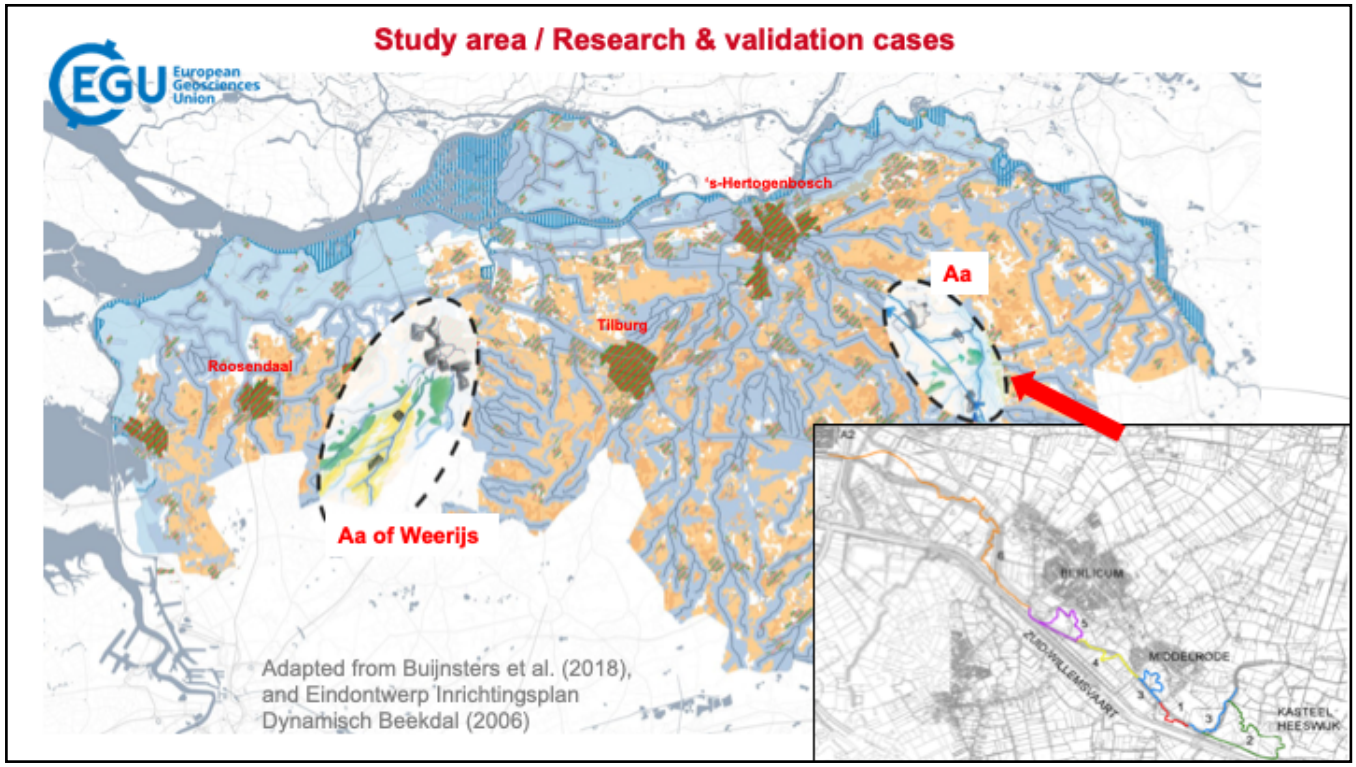
Under the **dimension 'Discourses'**; success conditions include a shared understanding of goals and problem definitions of the knowledge network.

Under the **dimension 'Rules and resources'**; success conditions include having organized reflection on division of tasks by stakeholders, and the availability of resources.

Under the heading **'Scale and spatial patters'** a dimension is created, not mentioned by Hegger and co-authors. I introduce this dimension as a new dimension of joint knowledge production, analogous to 'agglomeration' in the context of the forms of dynamic proximity.



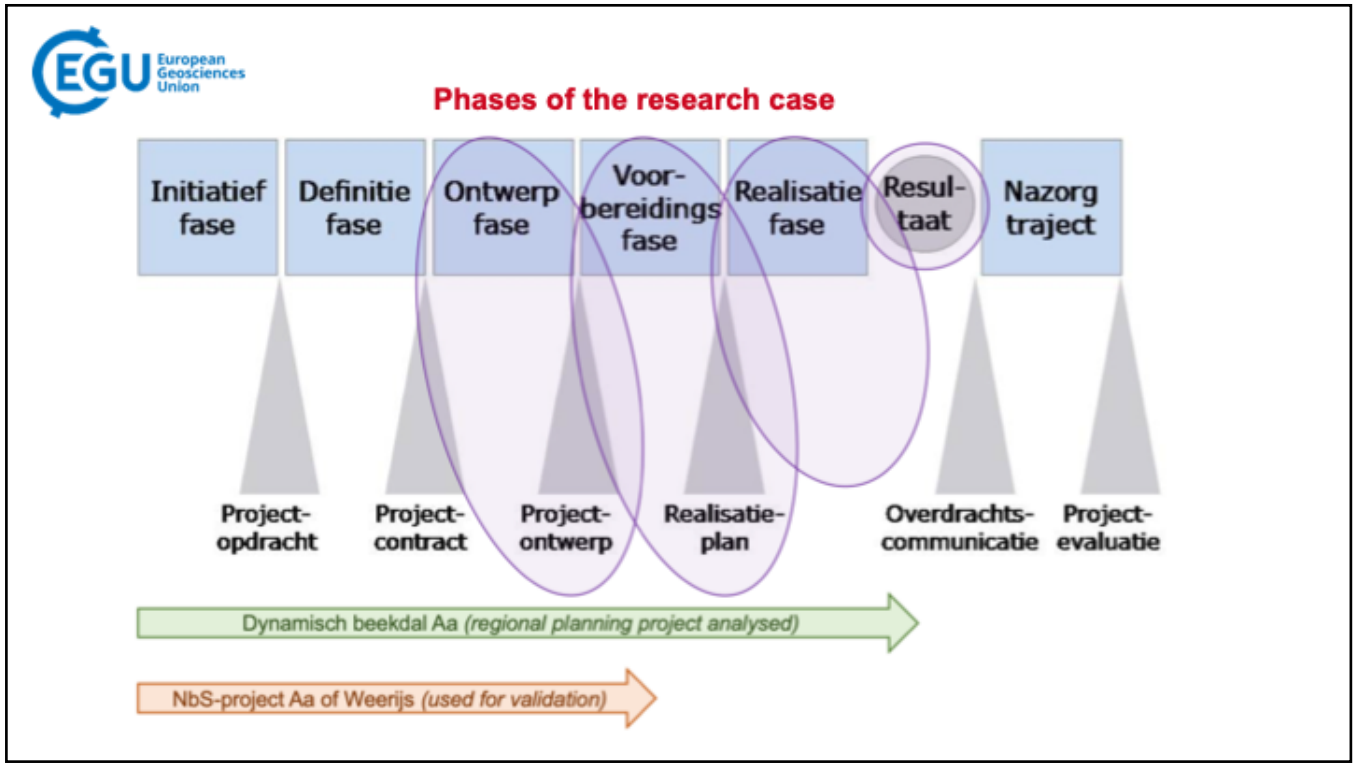
This leads us now to the complete theoretical framework as used in the study. Stakeholders positioned within the quadruple helix, as described in the quadruple helix model of innovation, act within a knowledge network. The quadruple helix model of innovation stresses the relevance of the participation of a variety of stakeholders in society in research and innovation. Because this principle fits well with the framework of this research, we also frame the stakeholders in the knowledge network in terms of the quadruple helix model. The relations of dynamic proximity among them in their right balance support high-tech innovation, and possibly *nature-tech* innovation as well, in creating nature-based solutions to support climate adaptation.



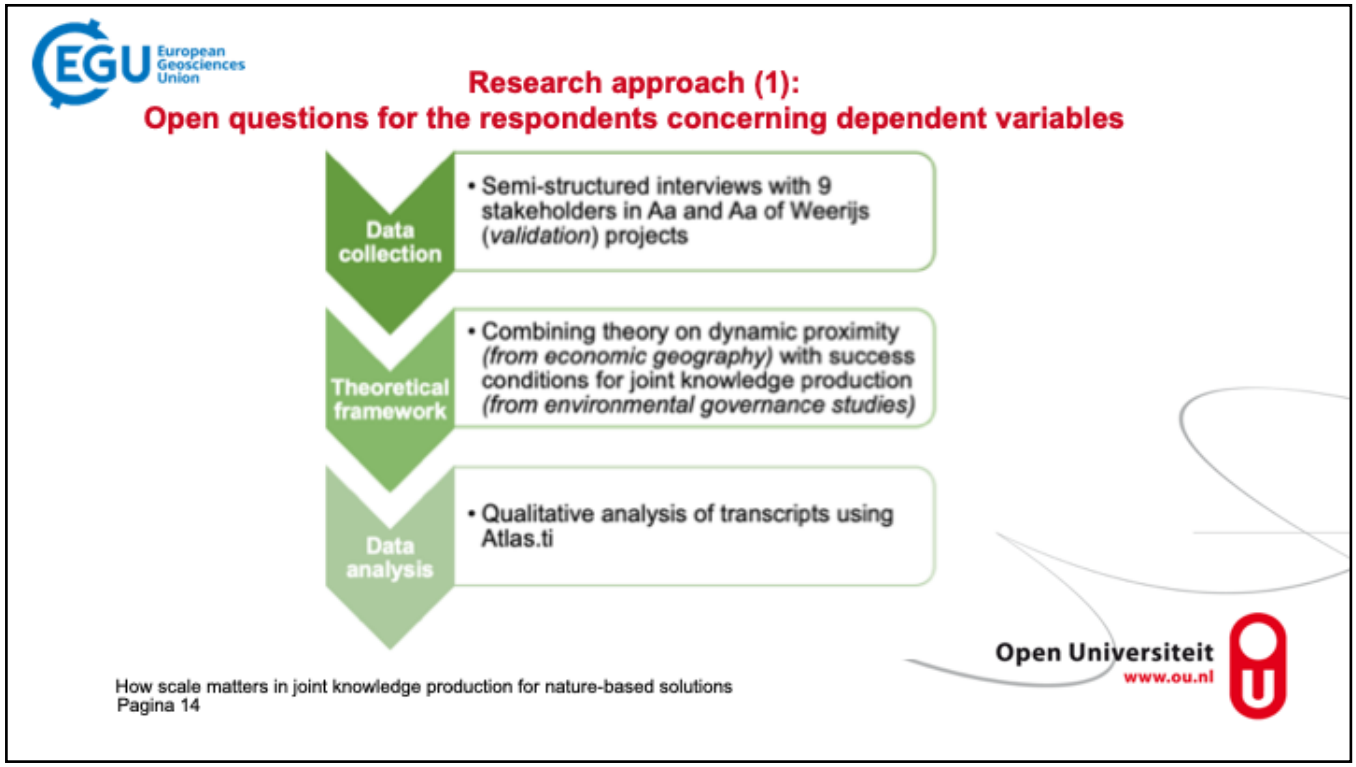
As research case, we have chosen the project 'Dynamisch Beekdal Aa', an initiative of the Water Authority (*Waterschap*) Aa en Maas, in which it cooperated with the two municipalities within the project area Sint-Michielsgestel and Bernheze, and the Province of North-Brabant. Following the big river inundations in the south of the Netherlands of 1995, the design phase of the Aa-project took place over the period of 1998 to 2005. In the design of the project dating from 2006 the project was divided into six phases intended to be carried out successively; *as shown on the sheet*. In the period from 2011 to 2013 the entire project proceedings until that moment were repeated, because project results over the 2005-2011 period were considered disappointing. This time around, project preparations lead to an adapted plan for the project. And during this 2011-2013 period, an agreement was reached with most of the stakeholders in the area. In 2016 the Aa-project between the Castle of Heeswijk and 's-Hertogenbosch was completed.

We have validated the findings from the 'Dynamisch Beekdal Aa'-case against the project 'Klimaatrobuust beeklandschap Aa of Weerijs, which concerns the catchment of the Aa of Weerijs-brook from Zundert to Breda, and focusses on the area around Zundert. This project has only recently been started up and has not reached the implementation phase yet.

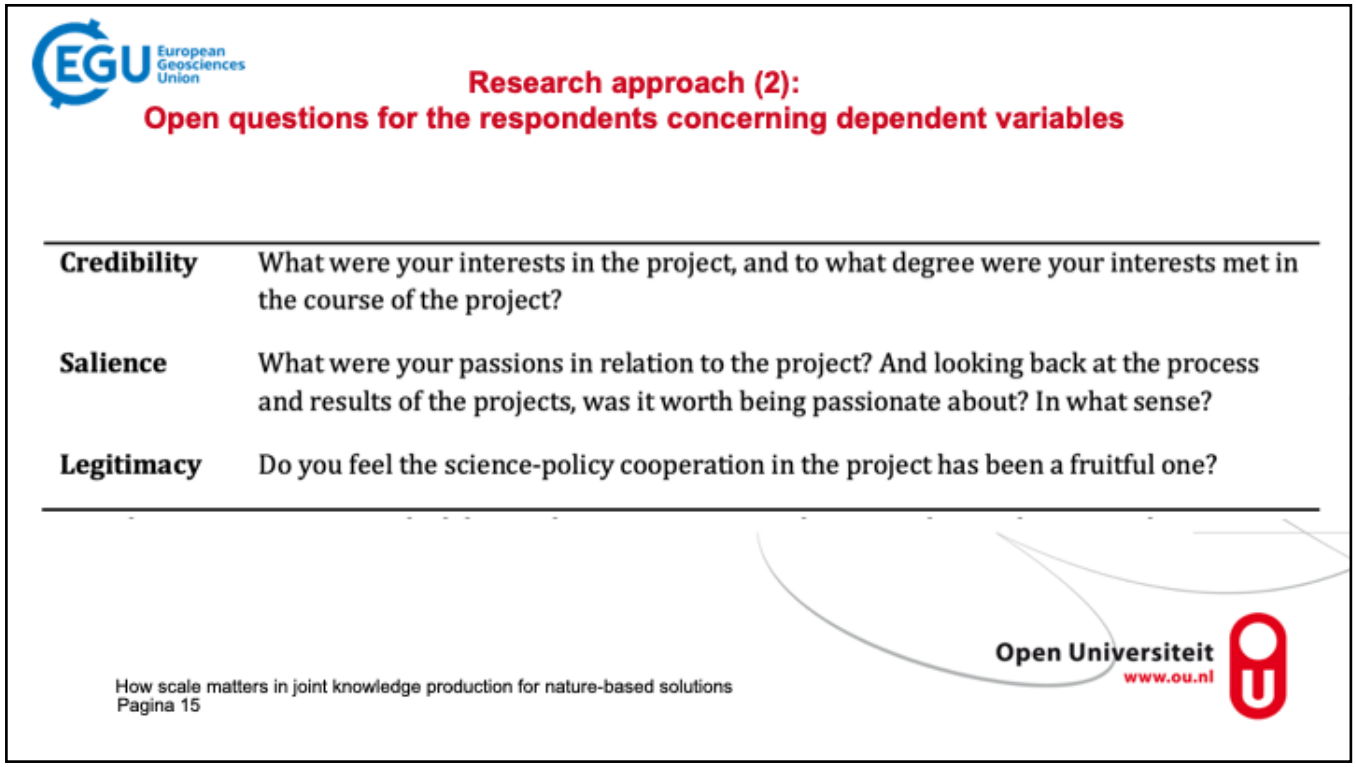
In the picture, stream valleys are indicated in blue, dry sandy soils indicated in orange, and urban areas in red and green.



In terms of the project management for these regional planning processes, our research focusses on the selected project from the phase of its' design, up to and including the actual realization phase. The monitoring of results is not part of the analysis. The initiation and definition phases of the project (more strongly associated with the process of policy making) are also outside the scope of the study.

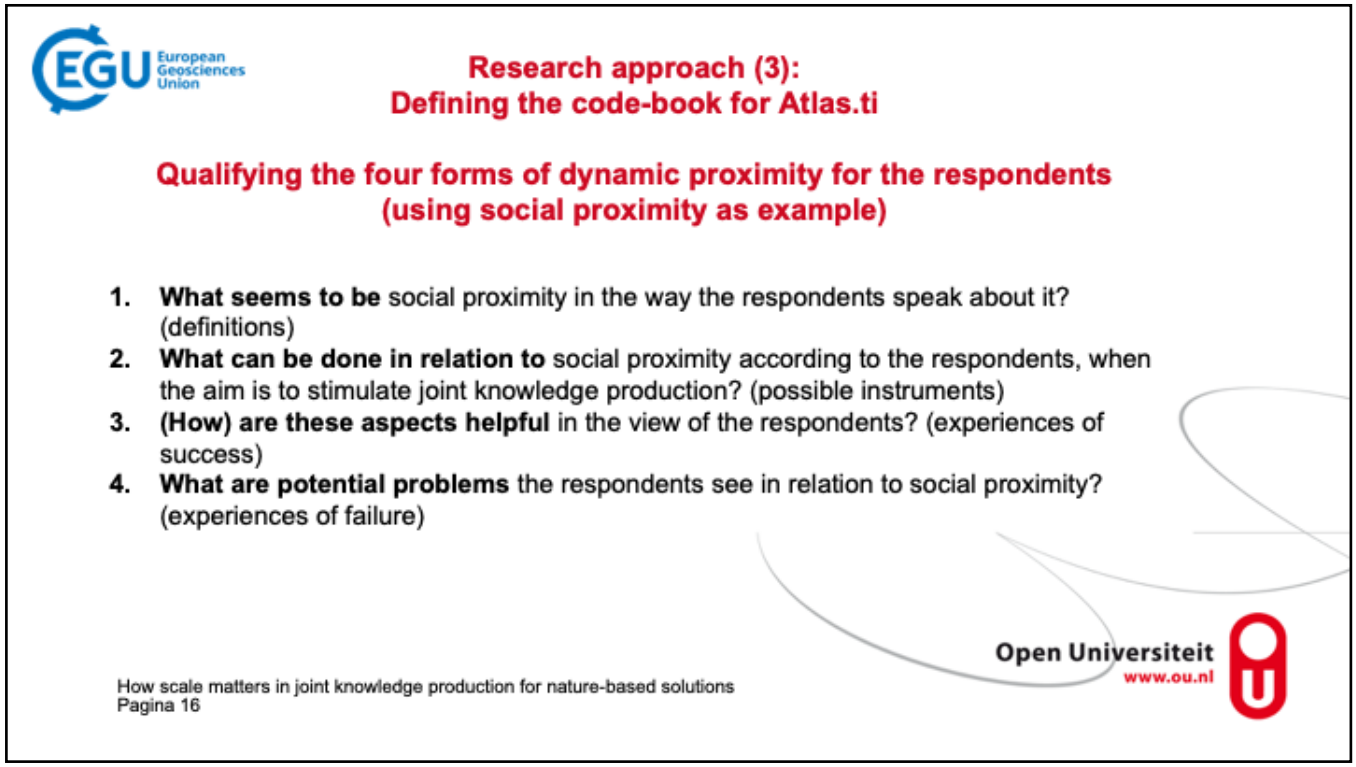


We collected the information we needed by conducting 7 semi-structured interviews (with a total of 9 respondents), preceded by desk research to form a first picture of the situation. We have selected relevant stakeholders for the interviews in an iterative manner, starting from desk research and progressively obtaining information about central stakeholders during the first interviews. We selected at least one stakeholder from industry, academia, government and non-profit organizations, following the 'quadruple helix model of innovation'. We have chosen to conduct semi-structured interviews, because this type of interview allows for open-ended responses and in-depth qualitative information from respondents.

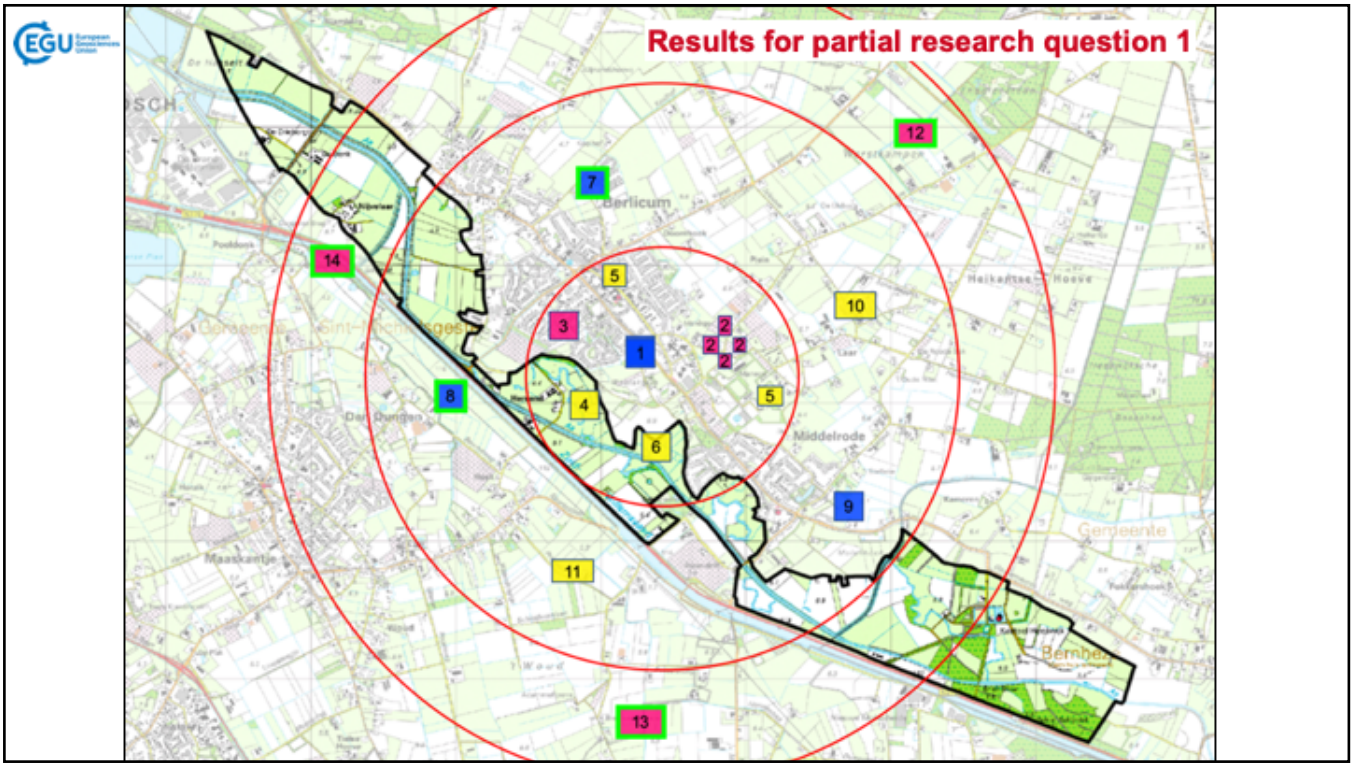


We have asked questions relating to the *dependent variables* of this research, *as projected on this sheet*. We have treated these three notions in an actor-specific way, assessing the ideas of the stakeholders interviewed on the credibility, salience and legitimacy of the process' results.

Relating to the independent variables, we have asked more questions, all focusing on the four forms of dynamic proximity and the way they were felt to exist among the stakeholders in the process studied *(for reasons of conciseness, questions not included on the sheet).*



We have analyzed the transcripts of the seven semi-structured interviews using Atlas.ti, to produce a qualitative analysis of the transcripts. For this purpose, we have made a code-book for use in Atlas.ti, further specifying the 4 forms of dynamic proximity. Subsequently we have coded the data according to the code-book. We have started the work on the code-book by paying attention to four questions, the answers to which qualify the meaning of each of the four forms of dynamic proximity, in the way the respondents speak about them. *In the sheet we have mentioned the four questions for the social form of dynamic proximity as an example.* In an iterative manner, we have subsequently phrased 62 codes to be used for coding in Atlas.ti.



Findings for partial research question 1:

Who are the main stakeholders in the knowledge network in 'Dynamisch Beekdal Aa', what are their roles, and can their network relations be graphically shown?

To graphically show the main stakeholders in the knowledge network, we have first looked at their geographical proximity, interpreted as the geographical distance between the location of the stakeholder and the location of the catchment system studied. Our schematic representation of geographical proximity among stakeholders consists of drawing three imaginary circles around the catchment system studied: one for local stakeholders, a wider one for regional stakeholders, and a still wider one for nationally or even internationally active stakeholders.

Schematically visualizing geographical proximity in this way is inspired by visualizations used in geographical social network analyses, working with nodes and links. The nodes *(cubes in the picture)* represent the stakeholders involved in the project. Nodes are placed within a coloured frame, representing their belonging to a "helix" of the quadruple helix model. A blue coloured frame represents a government stakeholder. A red coloured frame represents a stakeholder who is associated with a company. A green coloured frame

represents a stakeholder who will likely contribute scientific or engineering insights to the project. A yellow coloured frame represents a stakeholder of a non-profit organization, or private interests.

Conspicuous in the visual representation is the fact that there are no purely green nodes present, indicating that no representatives of academic organisations, such as universities or other research institutes, were involved in the project implementation. This may be a characteristic of the way regional planning is organised in the Netherlands, where consultancy and engineering firms are important for including science and engineering into regional planning.

Results for partial research question 2 *(first result)*

	R1	R2	R3	R4	R5	R6	R7	Endtotal
Failure	55	43	14	28	37	48	21	246
Neutral	72	75	128	204	92	256	175	1002
Success	2	5	31	46	17	50	36	187
Endtotal	**129**	**123**	**173**	**278**	**146**	**354**	**232**	**1435**
Value for S/F ratio	0,04	0,12	2,21	1,64	0,46	1,04	1,71	0,76

How scale matters in joint knowledge production for nature-based solutions
Pagina 18

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Findings for partial research question 2:

2. How do the main stakeholders experience the success of joint knowledge production for nature-based solutions in the project?

First finding

Focussing on the respondents' experiences of success or failure, in a broad sense the scores show that respondents experience the results of the Aa-project more strongly as a success than as a failure.

The table shows the number of times each code has been scored for every respondent, and the codes have been sorted into three categories: codes indicating success-experience *('success');* failure-experience *('failure'),* and normatively neutral experience *('neutral').*

The bottom row shows the success (S) / failure (F)-ratio: a score of 1 means: the respondent reported just as many experiences of success as experiences of failure. A score higher than 1: indicates relatively more success-experiences. A score lower than 1: indicates relatively more failure-experiences.

Results for partial research question 2 *(first result)*

	R1	R2	R3	R4	R5	R6	R7	Endtotal
Failure	55	43	14	28	37	48	21	246
Neutral	72	75	128	204	92	256	175	1002
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How scale matters in joint knowledge production for nature-based solutions
Pagina 19

So, respondents scoring over 1 we consider as experiencing the Aa-project as successful on the whole.

Results for partial research question 2 *(second result)*

	Failure	Neutral	Success	End total	Ratio S/F	Ratio div.
R1	10	13	2	**25**	*0,20*	*0,40*
R2	10	19	3	**32**	*0,30*	*0,52*
R3	8	33	12	**53**	*1,50*	*0,85*
R4	9	35	11	**55**	*1,22*	*0,89*
R5	10	24	6	**40**	*0,60*	*0,65*
R6	9	37	11	**57**	*1,22*	*0,92*
R7	10	38	10	**58**	*1,00*	*0,94*
End total	**66**	**199**	**55**	**320**	***0,83***	***0,74***

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How scale matters in joint knowledge production for nature-based solutions
Pagina 20

Findings for partial research question 2:

Second finding

The respondents who experience relatively little success in relation to the project-results, generally also show relatively little variety in their scores on the various codes. Reversely, those experiencing relatively more success in relation to the projects-results, generally score on a relatively wider range of different codes.

Results for partial research question 2 *(second result)*

	Failure	Neutral	Success	End total	Ratio S/F	Ratio div.
R1	10	13	2	**25**	*0,20*	*0,40*
R2	10	19	3	**32**	*0,30*	*0,52*
R3	8	33	12	**53**	*1,50*	*0,85*
R4	9	35	11	**55**	*1,22*	*0,89*
R5	10	24	6	**40**	*0,60*	*0,65*
R6	9	37	11	**57**	*1,22*	*0,92*
R7	10	38	10	**58**	*1,00*	*0,94*
End total	**66**	**199**	**55**	**320**	***0,83***	***0,74***

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How scale matters in joint knowledge production for nature-based solutions
Pagina 21

In this table, it is not the number of scores on a specific code which has been counted, but only whether the respondent has scored on a specific code or not. In this way, the table scores *diversity* in the use of codes by respondents.

In the code-book 12 codes indicating an experience of success are used, 12 codes indicating an experience of failure, and 38 codes indicating a normatively neutral experience. Therefore the S/F-ratio in a 0/1-count is meaningful, as it starts out from 12 possible scores on both success- and failure-experiences.

Results for partial research question 2 *(second result)*

	Failure	Neutral	Success	End total	Ratio S/F	Ratio div.
R1	10	13	2	**25**	*0,20*	*0,40*
R2	10	19	3	**32**	*0,30*	*0,52*
R3	8	33	12	**53**	*1,50*	*0,85*
R4	9	35	11	**55**	*1,22*	*0,89*
R5	10	24	6	**40**	*0,60*	*0,65*
R6	9	37	11	**57**	*1,22*	*0,92*
R7	10	38	10	**58**	*1,00*	*0,94*
End total	**66**	**199**	**55**	**320**	***0,83***	***0,74***

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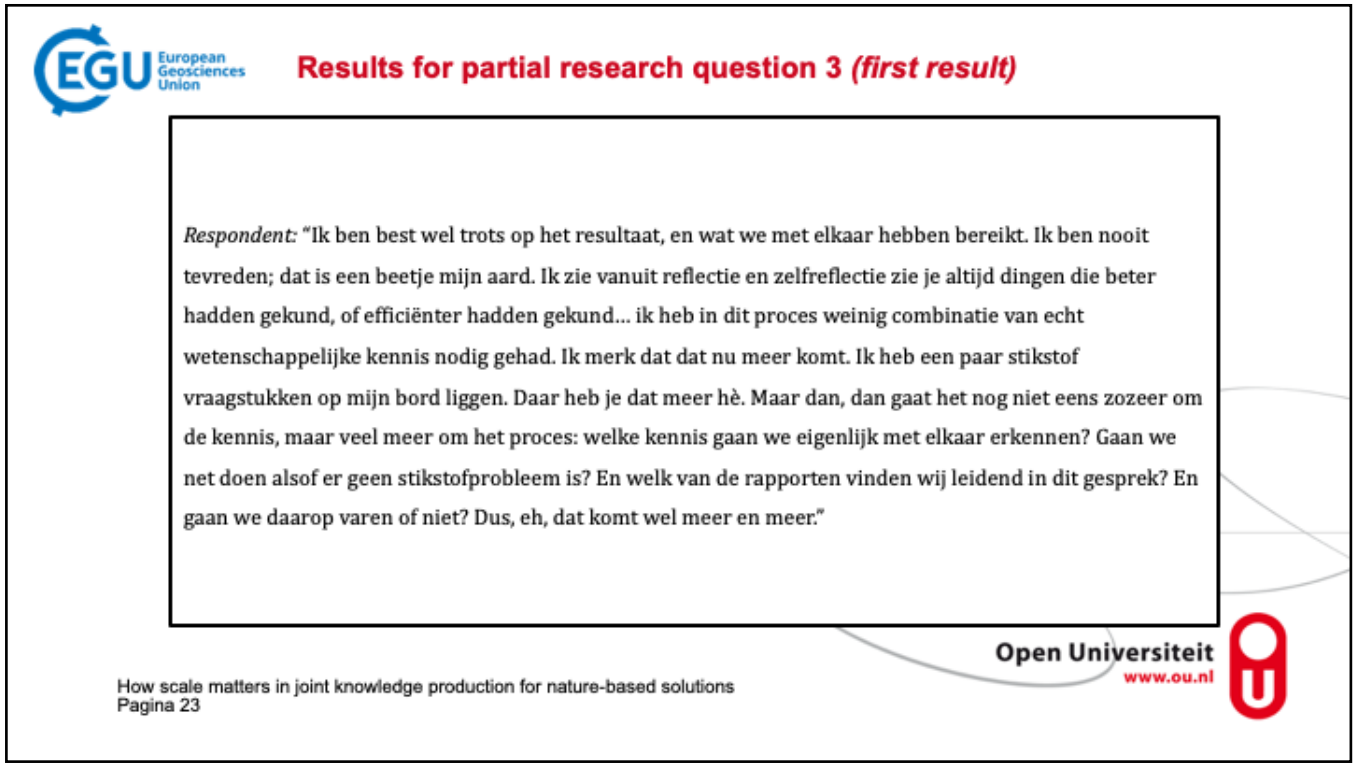
How scale matters in joint knowledge production for nature-based solutions
Pagina 22

The ‘Ratio div.’ is a number for the degree of diversity in codes scored on, for each respondent. A score of 1 is the maximum, meaning that the respondent has scored on every code in the code-book during the interview.

The Ratio S/F in this table indicates the use of *different* ‘success’-codes, devided by the use of *different* ‘failure’-codes. A score of 1 or less means the respondent tends to think in terms of ‘failure’; a score higher than 1 means the respondent tends to think in terms of ‘success’.

Both columns together show that each respondent who scores higher than 1 on Ratio S/F, also scores 0,85 or more on Ratio div. Reversely, each respondent who scores less than 1 on Ratio S/F, also scores less than 0,65 on Ratio div.

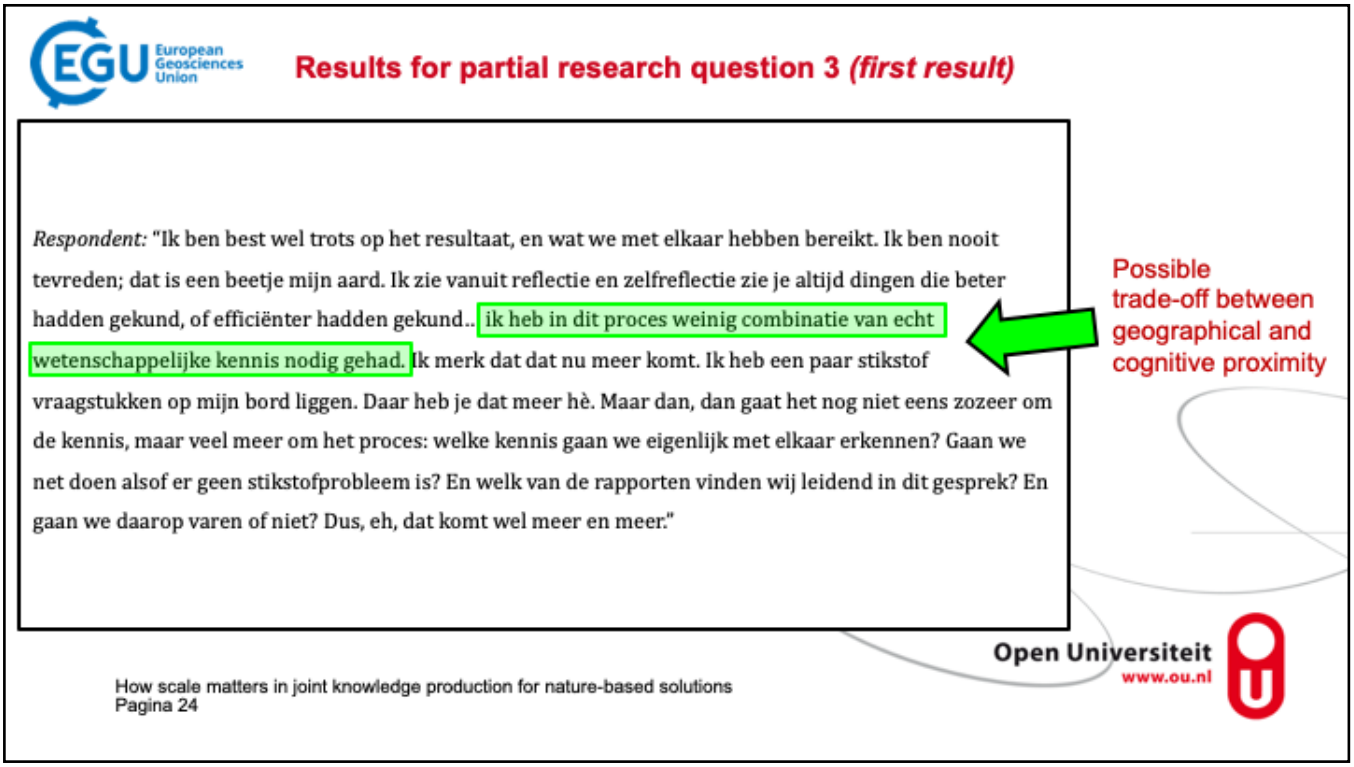


Findings for partial research question 3:

3. How can the dynamic proximity relations of the main stakeholders towards each other in the project for the Aa best be described?

First finding

We have taken specific quotes from the interview-transcripts to study this partial research question. Qualitatively analyzing the interview transcripts, some quotes seem to indicate that it is possible to overdo an aspect of proximity, in such a way that it gives rise to adverse effects.

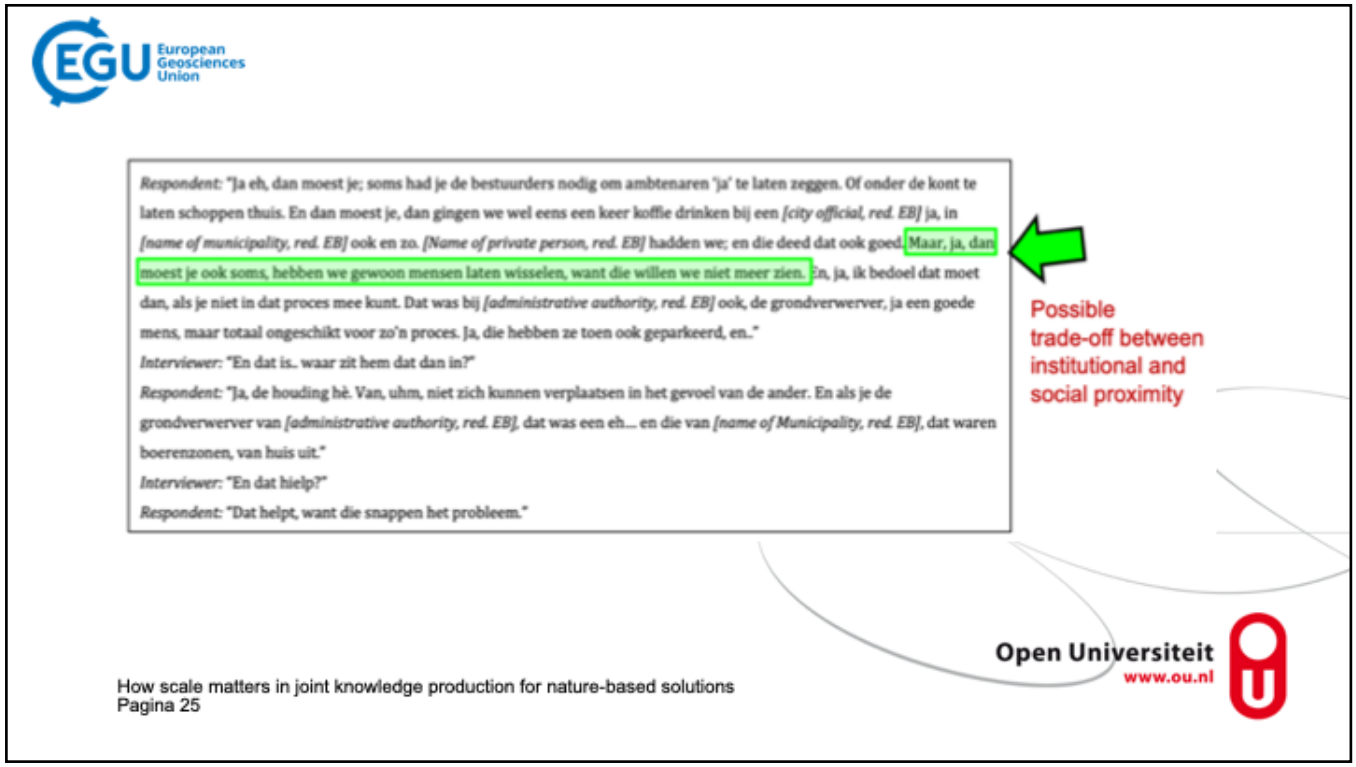


In this example, the respondent seems to point to a focus within the Aa-project on reaching "consensus with the area" (geographical proximity), and less on the use and creation of knowledge (cognitive proximity), which may be considered as a trade-off between geographical and cognitive proximity.

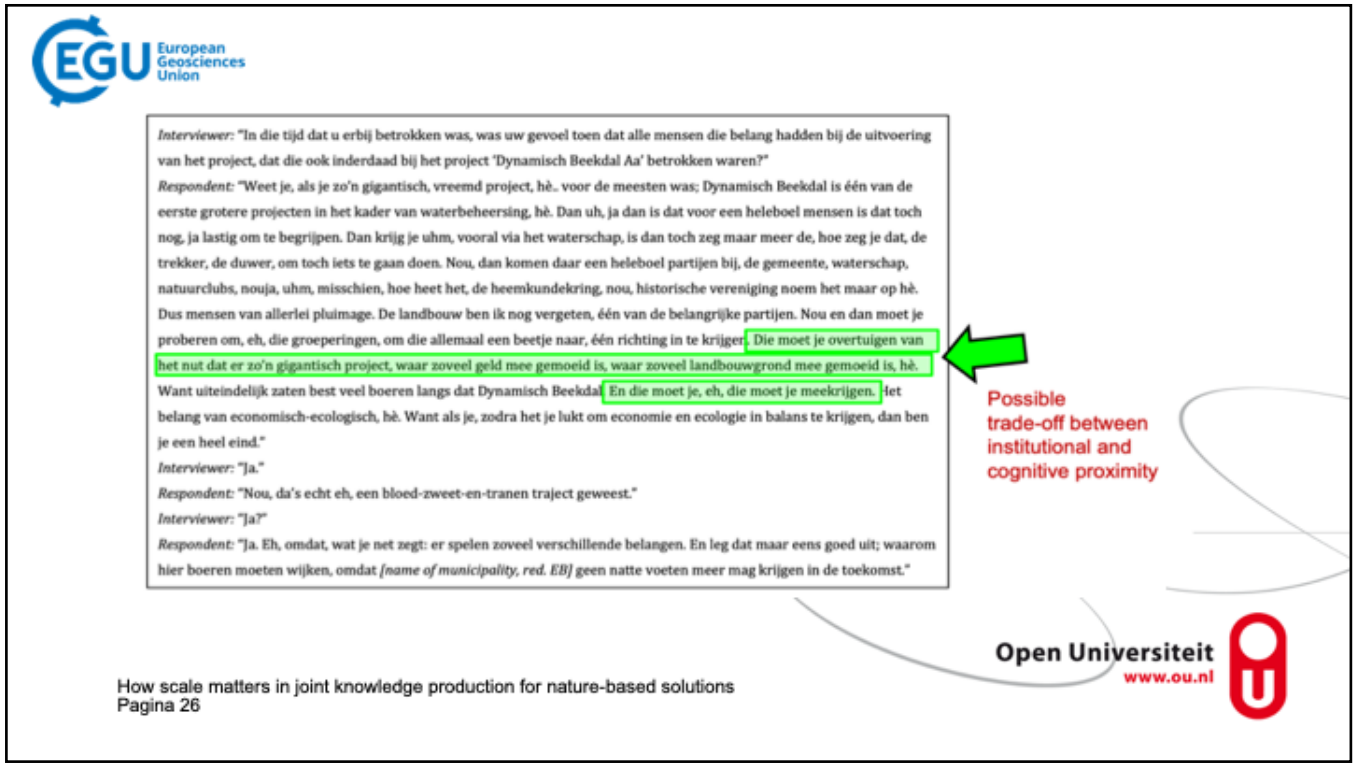
A possible explanation for this may be that in the Aa-project there has been relatively much attention for stakeholders' interests and for available project-resources, given the difficult start of the project. This may have favoured the attention for 'geographical proximity' during the process.

We found this "overdoing" while stakeholders spoke about the institutional or geographical forms of dynamic proximity. We did not find "overdoing" while stakeholders spoke about the social or cognitive forms of dynamic proximity. Possibly this has to do with the setting of the type of project studied. In regional planning projects, there is automatically a great variety of stakeholders. The existence of this multiplicity of stakeholders possibly prevents a social comfort-zone (or: too much social proximity) from emerging easily. The same variety of stakeholders involved is likely to entail a variety of interests different stakeholders wish to defend, and a diversity in knowledge they wish to spread, preventing an "overdoing" of the cognitive form of

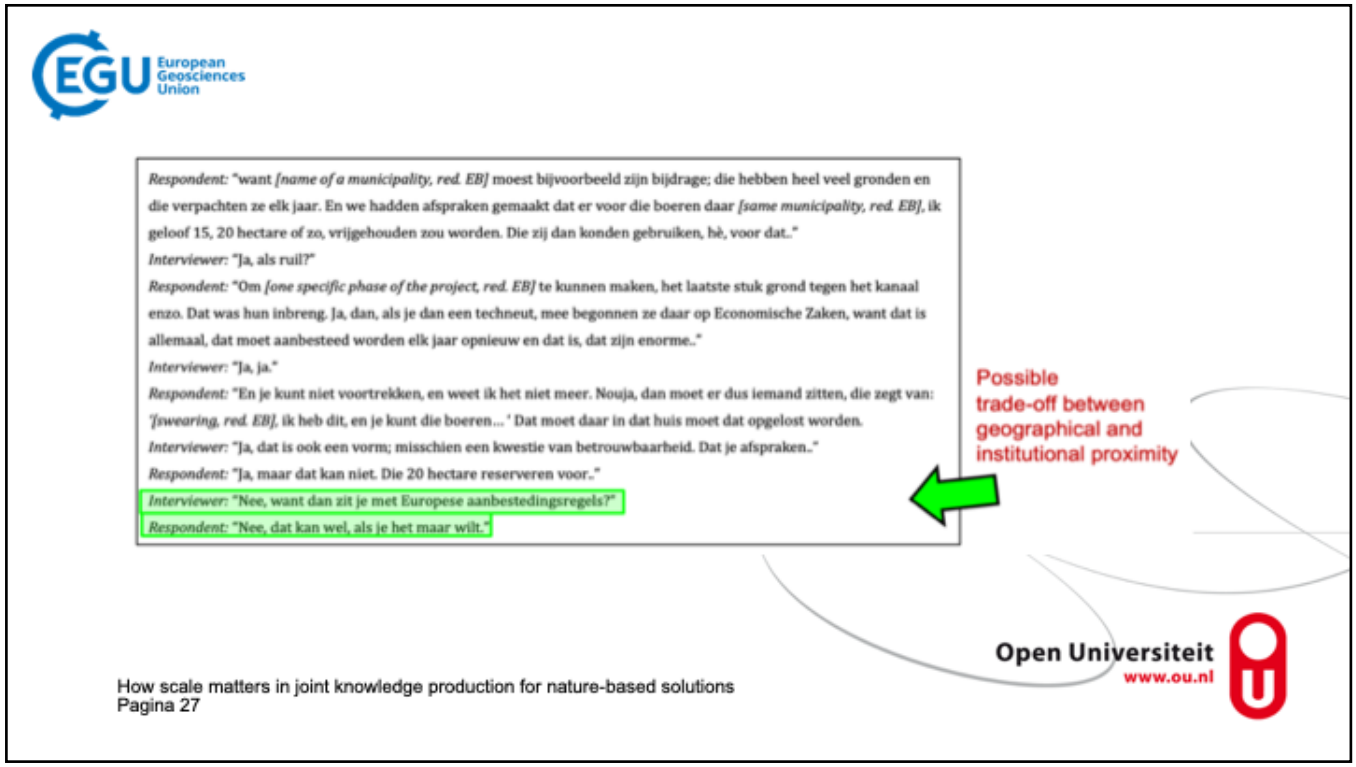
dynamic proximity.



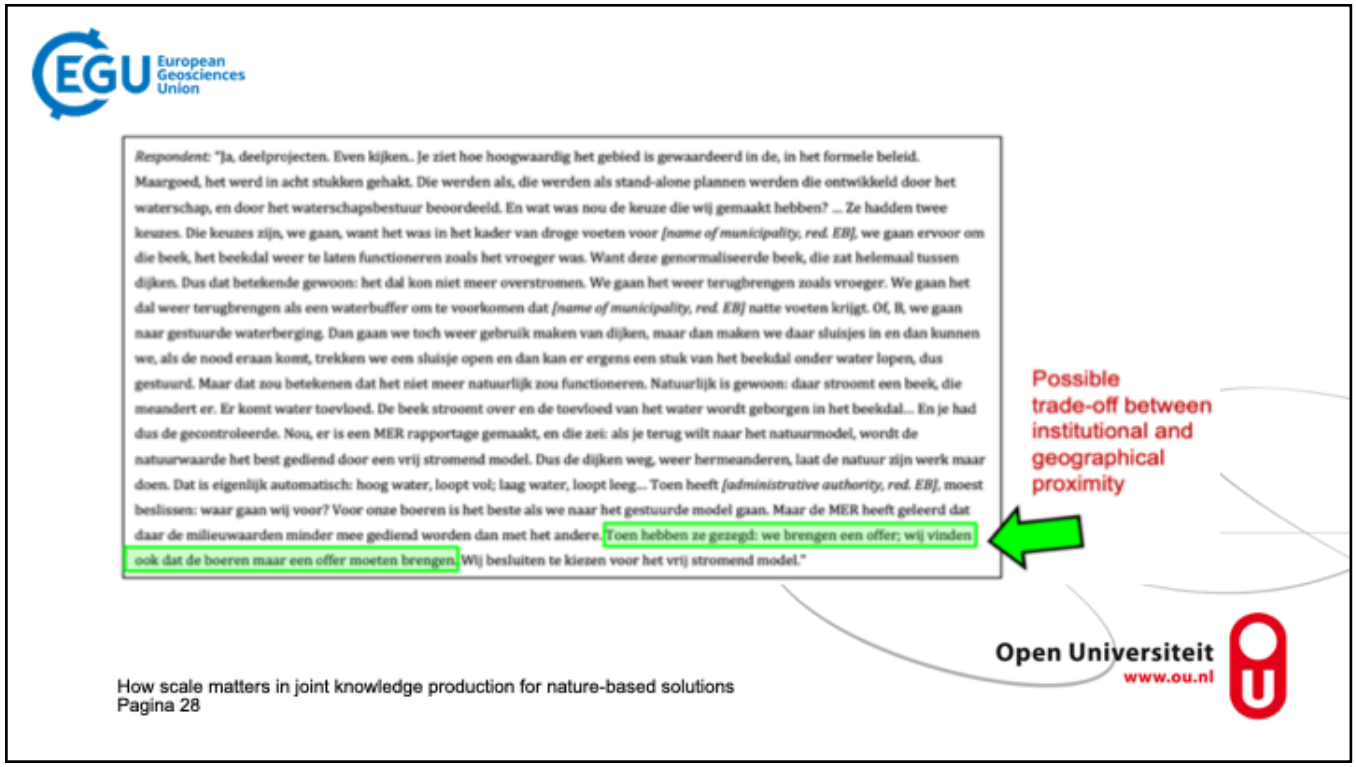
In some quotes, institutional proximity seems to be used to exclude certain stakeholders (social exclusion), which can be considered as a trade-off between institutional and social proximity.



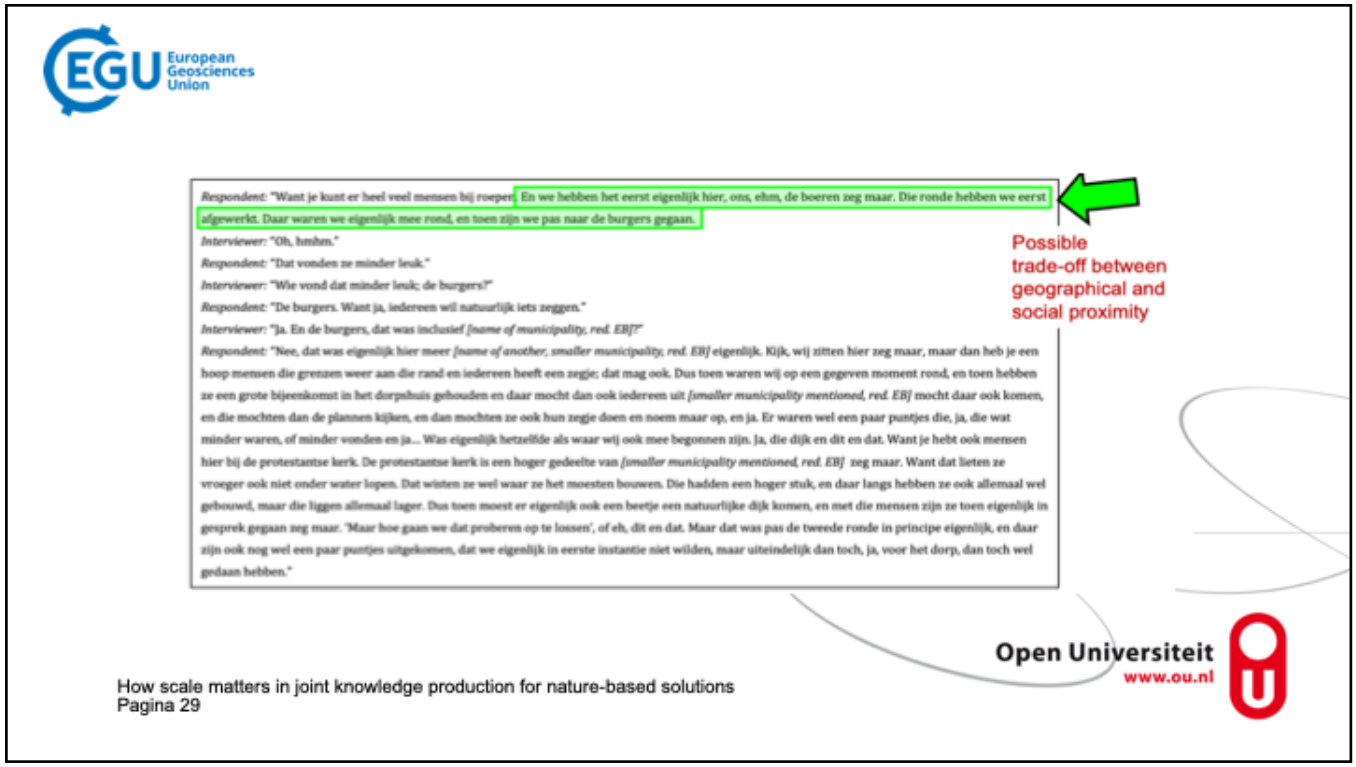
In other quotes, institutional communication-channels seem to be used to "push" stakeholders towards a discourse, preferred by one, possibly dominant institutional stakeholder, which can be considered as a trade-off between institutional and cognitive proximity.



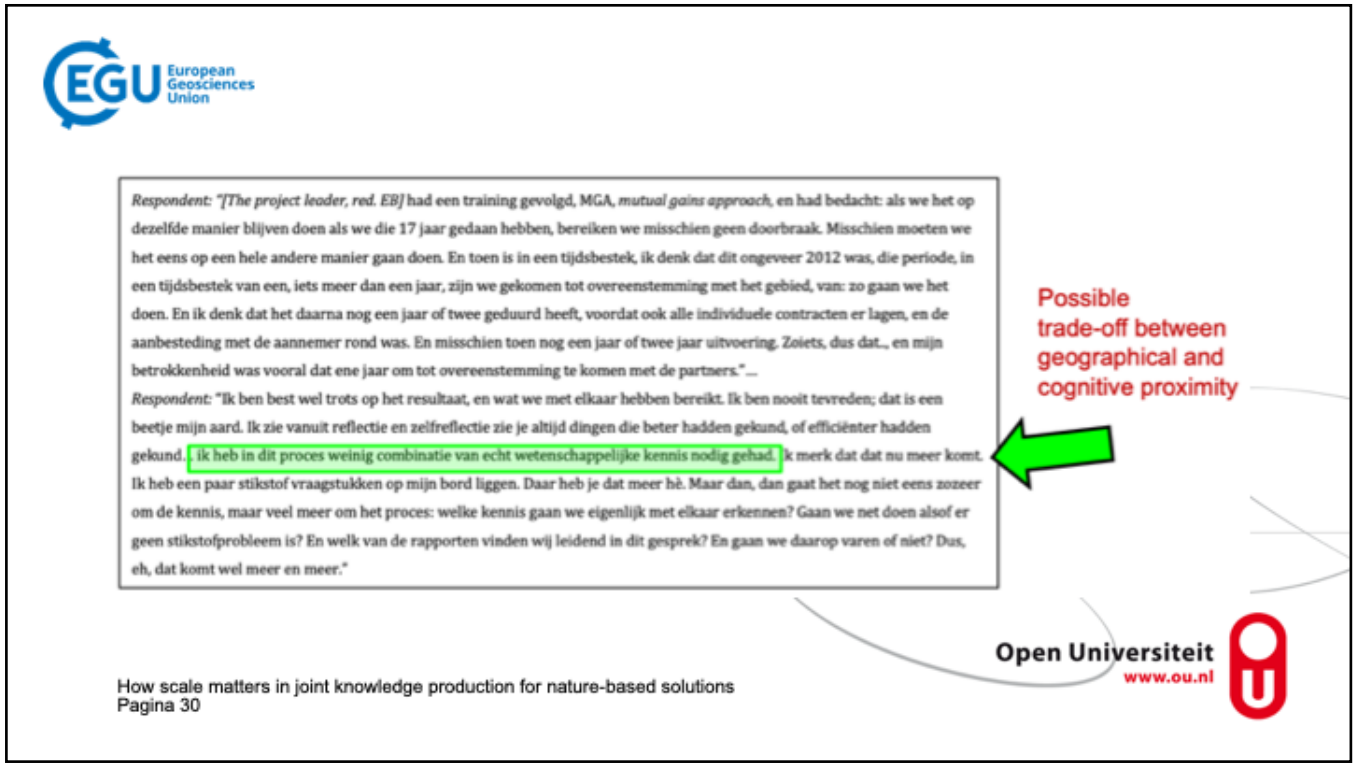
In again other quotes, local interests and conflict-solving on the one hand and larger-scale institutional rules (such as European tendering procedures) on the other hand seem to conflict, which can be considered as a trade-off between geographical and institutional proximity.



Or sometimes, just the reverse seemed to happen: local interests seem to be “pushed away” by institutional means, which may be considered as a trade-off between institutional and geographical proximity.



Or in other quotes, the most geographically near stakeholders (living closest to the Aa) seem to participate in the earliest roundtable discussion, already taking some important decisions before other stakeholders (geographically a bit further away) are involved, which can also be considered as a trade-off between geographical and social proximity.



And finally in some quotes, the respondent seemed to point to a focus within the Aa-project on reaching “consensus with the area” (geographical proximity), and less on the use and creation of knowledge (cognitive proximity), which may be considered as a trade-off between geographical and cognitive proximity.

Results for partial research question 3 *(second result)*

Cognitive instruments	R1	R2	R3	R4	R5	R6	R7	End total
11 cognitive/MGA	1	0	7	13	3	6	9	39
12 cognitive/joint fact finding	0	0	2	1	0	7	2	12
13 cognitive/situation assessment	0	0	1	2	1	4	1	9
14 cognitive/science-practitioner	0	0	0	0	0	8	1	9
15 cognitive/vizualise science on local scale	0	0	1	2	3	11	4	21
32 social+cognitive/roundtable for reluctant stakeholder	0	0	1	0	0	2	1	4
33 social+cognitive/introduce discourse reluctant stakeholder in project	0	0	0	0	0	3	1	4
37 cognitive+institutional/take time for clear rules in planning & realisation	0	4	4	6	1	6	4	25
38 cognitive+institutional/use process management in planning & realisation	0	4	5	5	1	3	4	22
59 cognitive+geographical/balancing the combination of local & large-scale knowledge	0	1	4	9	6	16	9	45
60 cognitive+geographical/incorporating local knowledge into general models/scenarios	0	2	4	9	5	10	9	39
Total quotes cognitive instruments	**1**	**11**	**29**	**47**	**20**	**76**	**45**	**229**
Total quotes	**129**	**123**	**173**	**278**	**146**	**354**	**232**	**1435**
Ratio cognitive instruments quotes / total quotes	**0,01**	**0,09**	**0,17**	**0,17**	**0,14**	**0,21**	**0,19**	**0,16**
Ratio cognitive success vs. success total	0,00	0,20	0,48	0,41	0,47	0,56	0,53	0,48

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How scale matters in joint knowledge production for nature-based solutions
Pagina 31

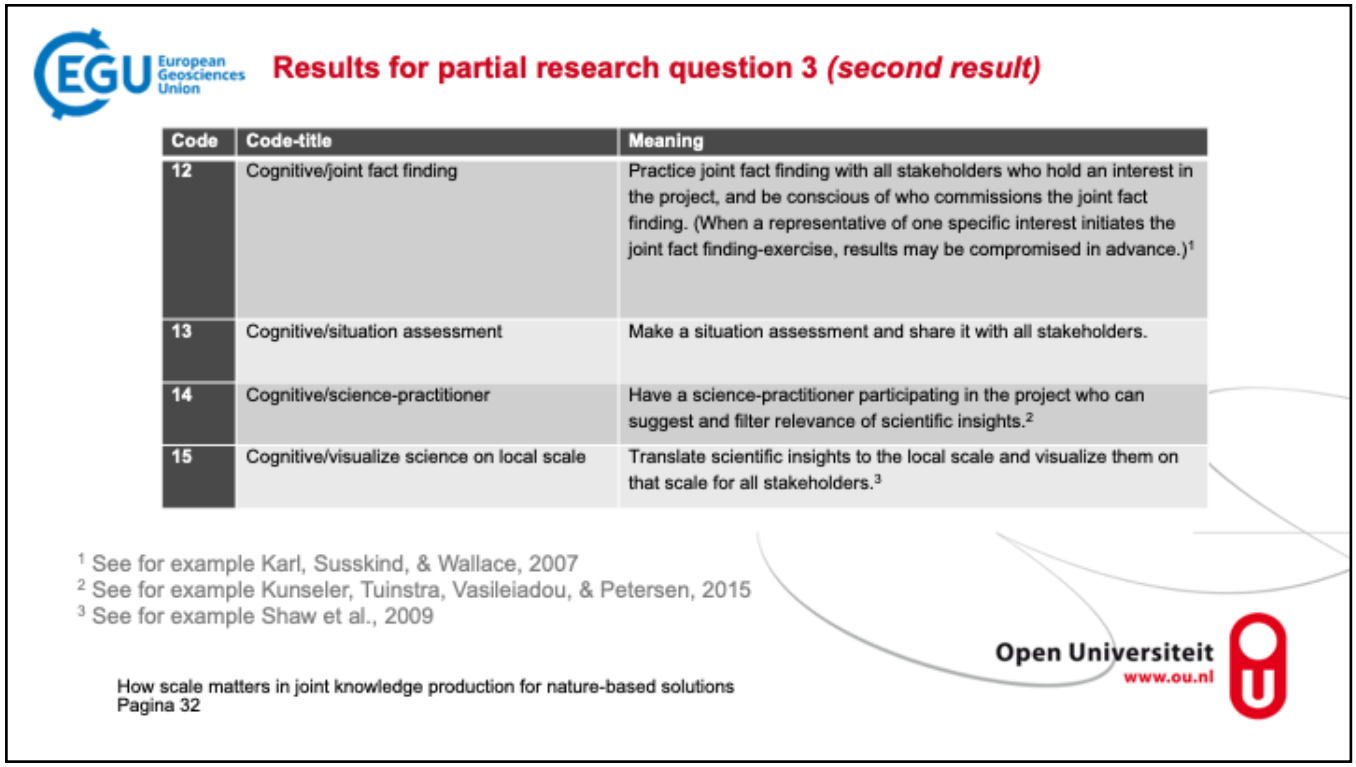
Findings for partial research question 3:

Second main finding

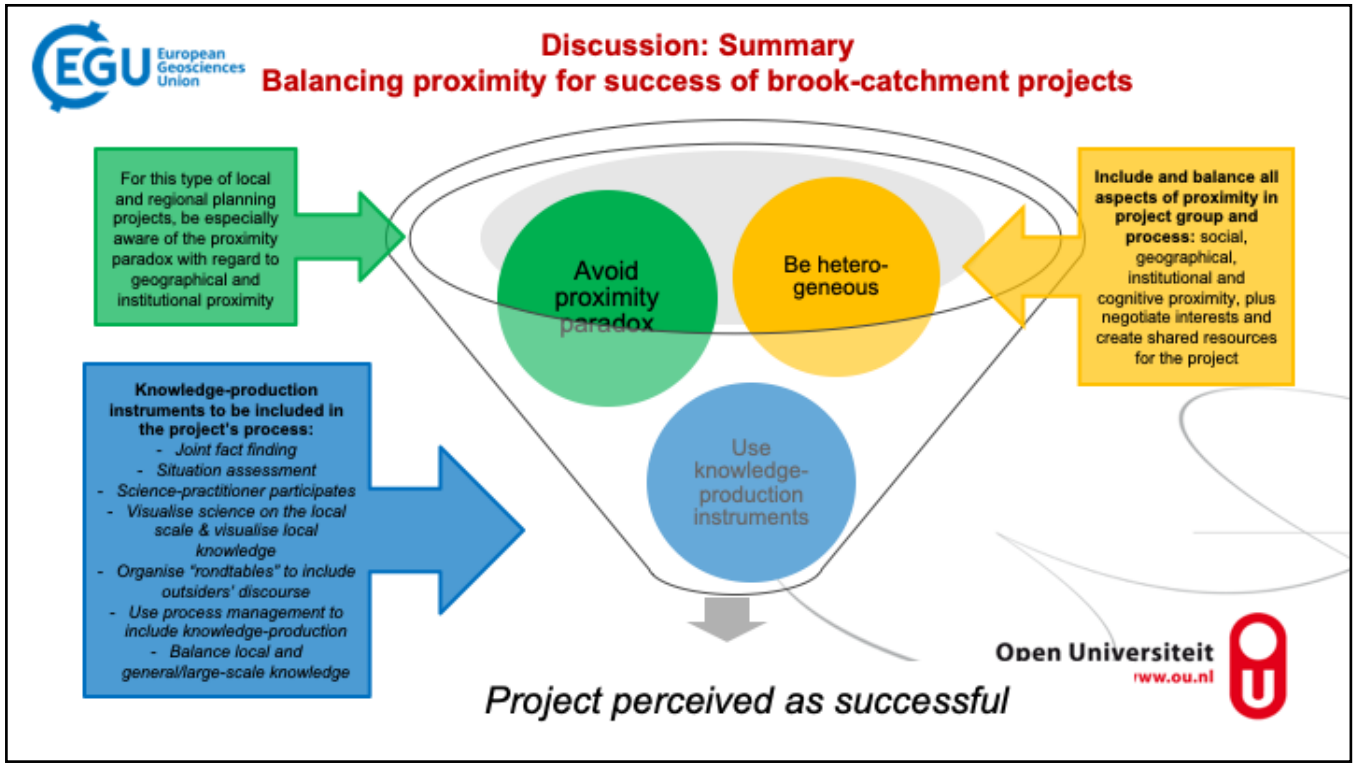
The interview-transcripts give important clues as to how knowledge production can be enhanced in this type of regional planning projects. In the interviews, various instruments are discussed which specifically aim at promoting knowledge production in the project.

The table shows a list of all codes without a normative component, within the broad family of cognitive proximity-codes *(rows).*

From the instruments mentioned, only the mutual gains approach (MGA; code 11) should be excluded, as this instrument exclusively aims at negotiating interests. The table shows how respondents were **not uniform** in the way they spoke about their use of knowledge production instruments *(columns).* Red colour shows a respondent did not use a specific code at all; yellow-to-green colour shows increasing use of a specific code.

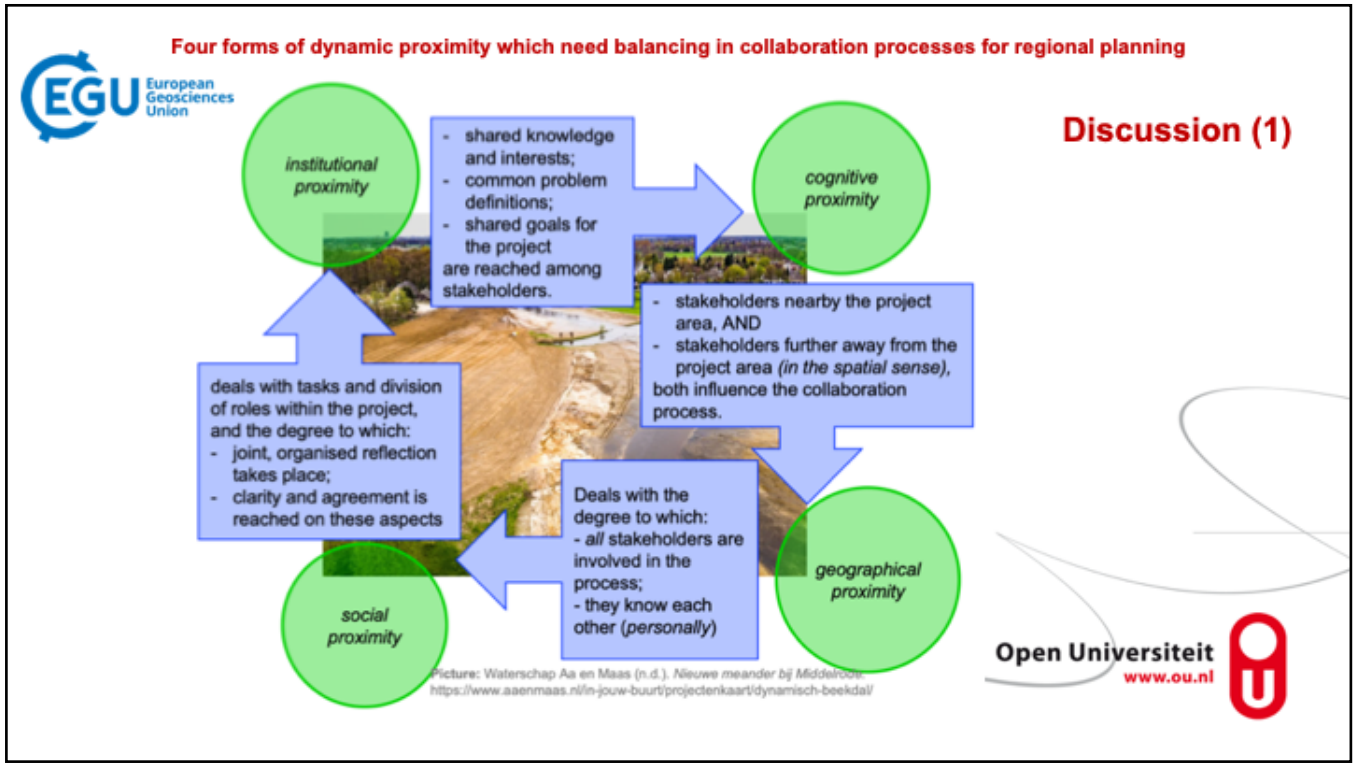


Instruments that can be explicitly mentioned in this respect, are: the practice of joint fact finding, consciously make a situation assessment within the knowledge network, have a science-practitioner participating in the process, and the visualisation of scientific insights on a local scale during project meetings.



Discussion (general)

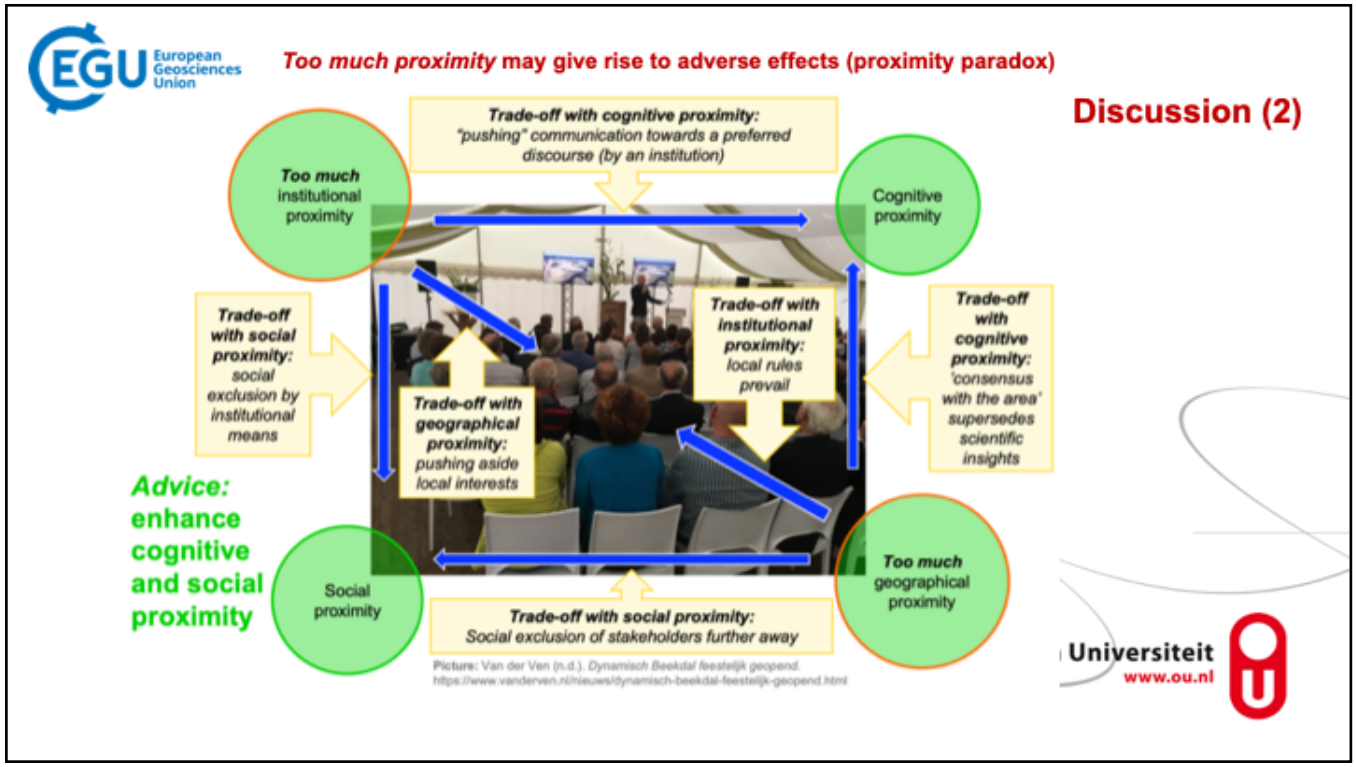
The sheet shows a summary of three central findings that we will discuss.



Discussion 1

We first found that the respondents who experienced relatively more success in relation to the process-results, also generally scored on a relatively wider range of different codes than the respondents who experienced less success.

We interpret this finding as meaning that those stakeholders who are able to vary the using of different forms of dynamic proximity in a process are better equipped to experience a process gone through as successful, or to see various successful aspects of it. This finding is reflected in the literature on proximity and heterogeneity in the field of regional innovation and development. For example Mattes (2012) notes that learning and innovation rely on proximity, but are also closely connected to heterogeneity.

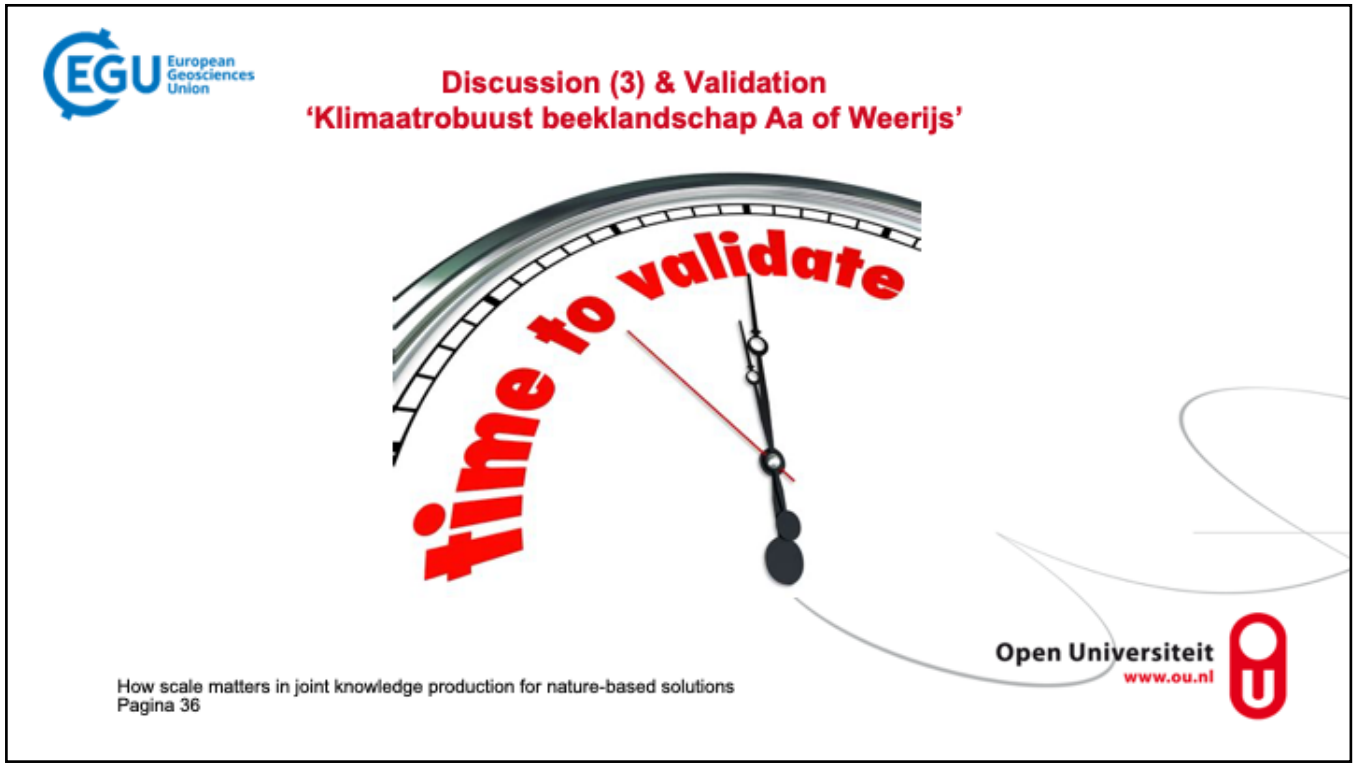


Discussion 2 & 3

Secondly, we found that it seemed possible to "overdo" certain aspects of proximity, or in other words: to get *too proximate* in some respect(s). In the project studied, this 'getting too proximate' primarily showed on the aspects of institutional and geographical proximity, and less on the aspects of social and cognitive proximity.

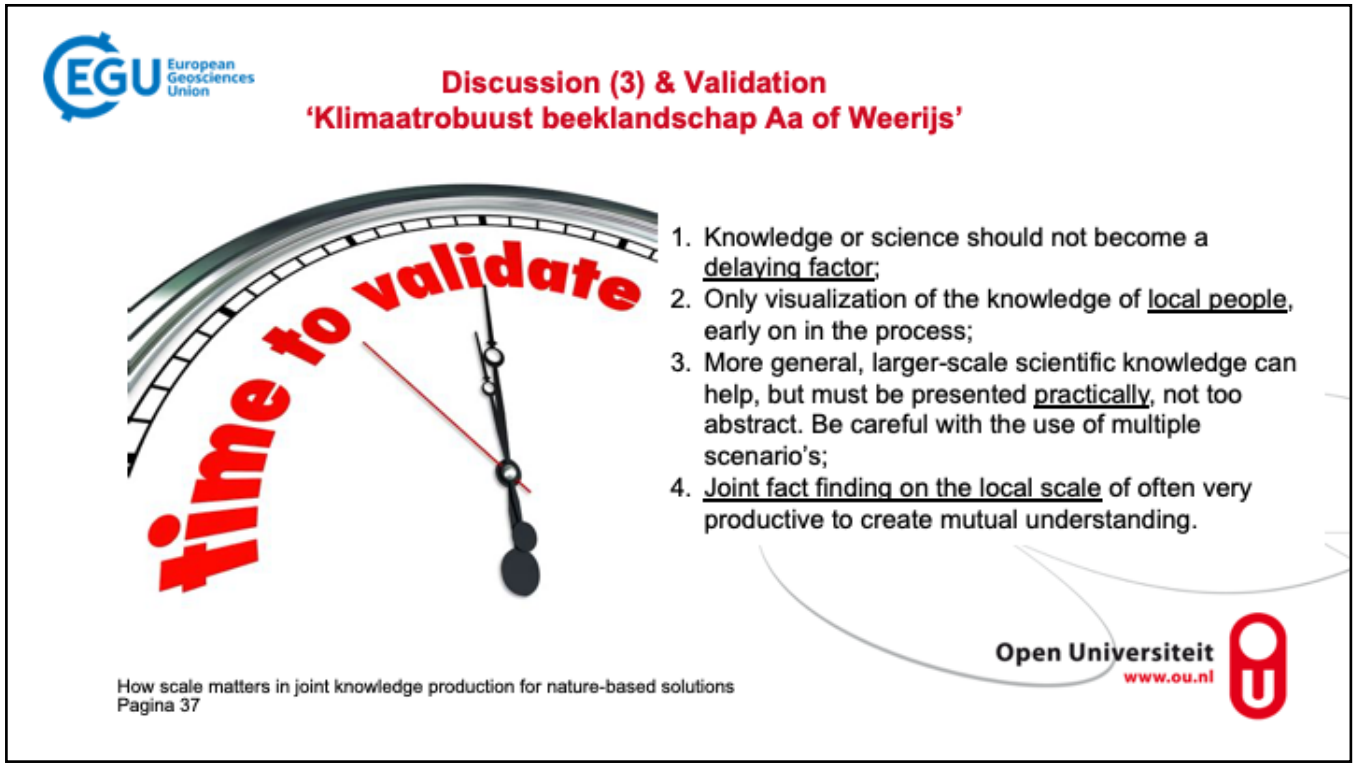
Within the field of economic geography this mechanism has been described as the *proximity paradox*. In the literature on the credibility, salience and legitimacy of knowledge production a comparable point is being made in terms of *trade-offs* between the credibility, salience and legitimacy of knowledge produced. And a comparable concept appears in the literature on the historical-institutionalist approach to political science, namely the concept of path dependence. A specific form of path dependence, relevant in the context of this study, is that of *lock-in*. The relevance of the concepts of proximity paradox, trade-offs and of lock-in for this study, is that they all describe a "too much of one thing". Knowledge production, and innovation, apparently require being proximate to each other to enable knowledge transfer, and at the same time they require heterogeneity, a distance, or an openness to new and diverse influences to enable innovation and knowledge production.

Thirdly, we found that if knowledge production is an aim of the project, as distinct from for example negotiating different interests of stakeholders, than knowledge-production instruments should be used.



Addition to Discussion 3: Validation

Respondents in the validation phase of the research *qualified* a productive use of knowledge production instruments in regional planning projects. This was an important addition to the findings of the research, coming from the Validation.



Addition to Discussion 3: Validation (2)

Respondents mentioned 4 preconditions for applying the knowledge production instruments mentioned:

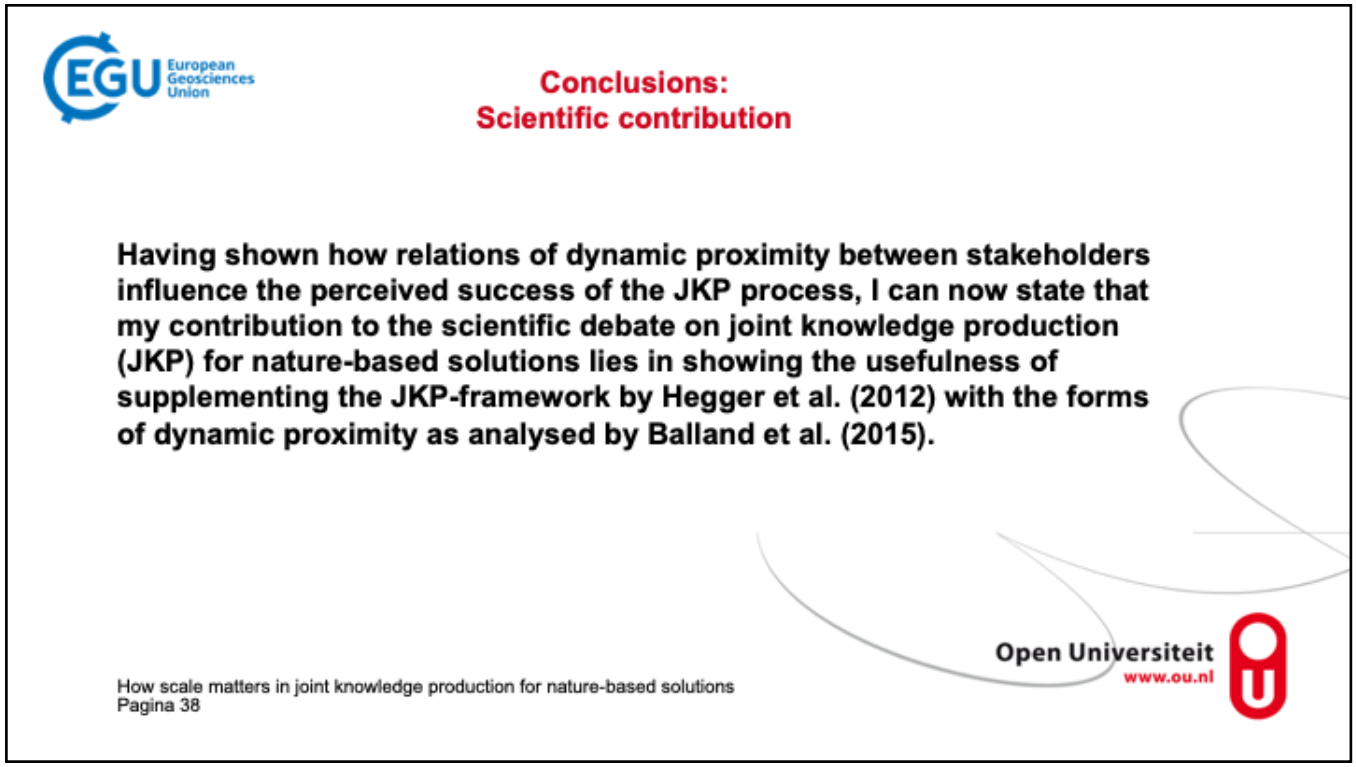
Make sure knowledge or science does not become a delaying factor in the process;

Visualization should primarily be the visualization of knowledge local people brought into the project group, preferably early on in the process;

More general, larger-scale scientific knowledge (such as for example climate scenario's) may help, but only when presented in a practical framework, not getting too abstract. Presenting multiple scenario's should be used with restraint, as it may lead to resistance in stakeholders;

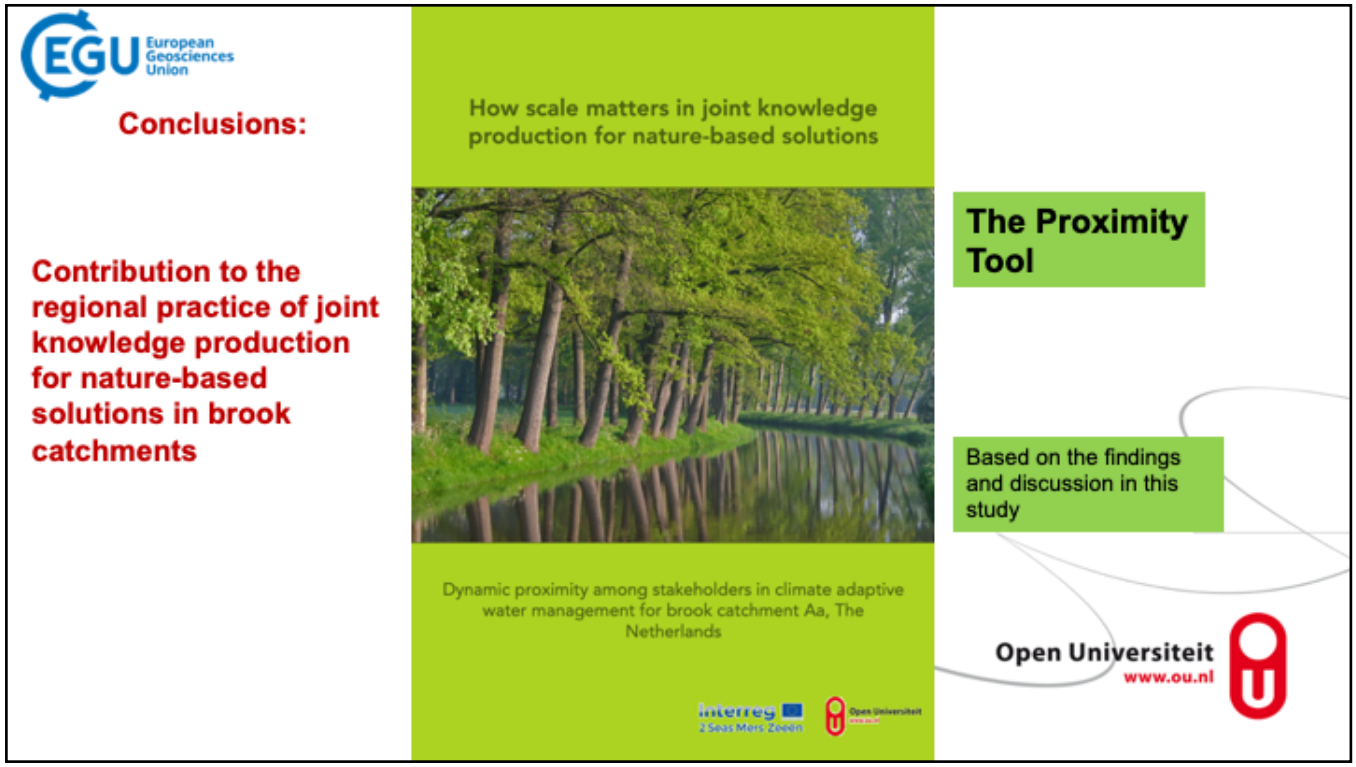
Joint fact finding on the local scale may be very productive as an instrument to enhance mutual understanding between stakeholders.

The validation was a final step in the methodology: we have tested results of the analysis of the 'Dynamic Brook-Valley Aa'-process against the project plans for the process 'Klimaatrobuust beeklandschap Aa of Weerijs'. We have done this, by conducting a semi-structured interview with two key stakeholders in the project for the Aa of Weerijs.



Conclusion (scientific)

Our findings have shown that relations of dynamic proximity between stakeholders influence the perceived success of the joint knowledge production process. Therefore, our contribution to the scientific debate lies in showing the usefulness of supplementing the joint knowledge production framework with the theory about the forms of dynamic proximity.



Conclusion (contribution to regional practice)

We conclude that the findings of this study may be fit for use in preparing regional planning projects. This conclusion is supported by the validation interview, in which stakeholders in the Aa of Weerijs-project recognised the central findings of the study.

On the basis of the findings and discussion in this study we have produced a proximity tool *(which is a separate set of sheets and a summary of this presentation)*.

The proximity tool is the contribution of this research to the practice of joint knowledge production for nature-based solutions to scaffold the climate resilience of regional brook-systems.

From the research follow a number of recommendations for practice. They deal with the question of how joint knowledge production can best be achieved among the various stakeholders “across various scales”. They pertain to the preparation phase of regional water management projects. In Dutch, and phrased for use in the Dutch practice, the proximity tool, or ‘checklist van nabijheid’ is presented.

The author wishes to thank dr. ir. A. Lansu, F. van Lamoen MSc, and dr. J. Floor for supervising this research. She also thanks the Province of North-Brabant for offering an internship, and the Omgevingsdienst Midden- en West-Brabant (OMWB) for providing fundings to perform this research.