

The position of scientists in transformations of human-environment systems. An inquiry into IRI THESys research practices

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THESys retreat.

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Abstract

Transformation is a multi-faceted concept with various meanings and assumptions about desired human-environment relationships and pathways towards the ideal (sustainable) society. We need a better understanding of the different positions that scientists assume when conducting research and becoming involved in transformations of human-environment systems. In this paper we begin such an analysis by exploring how researchers at the Humboldt-Universität's Integrative Research Institute on Transformations of Human-Environment Systems (IRI THESys) position themselves within that research. Empirical work was conducted in three steps. First, a survey was carried out among the institute's academic staff to explore the influence of ideology, their involvement in processes outside academia, the ways in which their research relates to transformations of human-environment systems, and the type of science that gives them more recognition in their peer groups or institutions. Second, the findings from the survey were used as a basis for six semi-structured interviews with a sample of respondents to further investigate the heterogeneity of positions in the institute's research on transformations. Third, the co-authors of the paper – all of them IRI THESys staff – were asked to compare the overall findings with the notion that their scientific community has on the role of scientists in transformations of human-environment systems. In the results we systemize IRI THESys' scientists' positions and use them to critically reflect on the complex relationships between science and human-environment transformation. Based on our findings, we conclude that IRI THESys is a very heterogeneous epistemic environment, whose strength lies in its ability to keep people with diverse specialisations and convictions in dialogue with each other. Accountability towards different communities (scientific and beyond) and the humility of knowledge practices before the complexity of human-environment systems in transformation is key to positioning the IRI THESys in transformation research.

Keywords: transformation, human-environment system, positionality, sustainability, IRI THESys.

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1. Introduction

Research on human-environment systems understands transformations in diverse ways, and not always necessarily as a positive change or one that improves previous conditions. For instance, recent social-ecological transformations linked to changing land-uses have led to land grabs in Laos with negative consequences for local communities (Friis & Nielsen, 2016). Researchers however, often undertake research on human-environment transformations to actually inform or shape them for the better, with the implicit normative agenda of sustainability (Schneidewind, 2015).

Research on transformations takes place in a context of high pressure and uncertainty regarding the effects of humans on planetary well-being, security and justice. Human development has become a driving force of global environmental change (Brondizio & Syvitski, 2016; Lövbrand et al., 2015). Modern paths of social and economic development push humanity beyond critical planetary boundaries (Steffen et al., 2015). In return, rapid environmental change itself, in particular climate change, is a significant driving force for social and economic change.

The co-evolution of environmental change and social development today involves a renegotiation of economic exchange, moral values, knowledge and established orders of social interaction. Knowledge plays a key role in current co-evolutionary processes. A better understanding of the dynamics of transformation as well as the feasible trajectories into the future is crucial. Hence, it is a challenge for academic research to become involved in understanding and shaping these processes of material and social change. The relationships and boundaries between disciplines, the ways in which learning occurs and the understanding of the science/policy interface are all being transformed themselves in the process of conducting research on and in transformations (Schneidewind, 2015). Emerging transformation research has opened up a spectrum within academic institutions that ranges from research on transformations to transformative research – the latter marking a form of action research that becomes involved with stakeholders and civil society in order to understand and at the same time affect change towards a more sustainable future (O'Brien, 2012; Brown et al., 2013; Moser, 2016). What this future may look like often remains implicit and tends to contain a great variety of assumptions about desired human-environment relationships and pathways towards the ideal (sustainable) society.

At the centre of this emergent field of research, the notion of transformation remains multi-faceted. In its most general sense, the concept is used as a marker for the degree of change occurring as well as the need for change. The Cambridge dictionary defines *transformation* as “a complete change in the appearance or character of something or someone, especially so that that thing or person is improved”. Etymologically, it is “change of shape” or “metamorphosis”. Transformation in the context of the sustainability debate specifies a particular quality of change: rapid, affecting fundamental societal institutions and occurring in response to predicted or tangible critical changes in the stability and dynamics of the bio-geophysical environment. Transformation also suggests the need for significantly more than a shift towards a more sustainable economy, green technology or more careful consumption (Moser, 2016). Instead, transformation for many refers to a fundamental reconfiguration of the way we live and work, our systems of exchange and our relationship with the environment and nature (Nelson et al., 2007; WBGU, 2011; Brown et al., 2013).

More specifically, *inter alia* transformation can be understood as a process of building adaptive capacity and resilience of human-environment systems (Reenberg et al., 2008), as a process of societal change to adapt to global change challenges (Adger, 2003), as a fundamental rethinking of how we live on Earth (WBGU, 2011), or as a deliberate diversion from a capitalist economic system towards radically new systems, imaginaries and practices (Asara et al., 2015). What further complicates the scientific panorama of transformations are the numerous adjectives and adjectivizations that are used to give a particular nuance to the meaning of transformation i.e. deliberate transformation (O'Brien, 2012), radical transformation (Asara et al., 2015), transformational or transformative adaptation (O'Neill & Handmer, 2012), etc.

So what assumptions do scientists make and what roles do they play when conducting research and becoming involved in the transformation of human-environment systems? In this paper we begin by asking this question 'at home', i.e. at the Humboldt University's Integrative Research Institute on Transformations of Human-Environment Systems (IRI THESys), which is where all authors of this paper are based. The IRI THESys is an interdisciplinary and cross-faculty research institute at the Humboldt University financed by the German Federal Government's Excellence Initiative. It comprises research groups on site as well as members that are located in their respective institutes. The IRI's aim is to improve our understanding of human-environment systems by integrating empirical research with social inquiry and normative analysis. The transformation towards sustainability in all its facets forms a key part of research and involvement. Hence the IRI THESys is a typical example of a research institute based at a major university that conducts basic research on transformation while at the same time implicitly and explicitly being involved with and attempting to develop and shape this transformation in specific directions. This dual role of transformation research and transformative research requires new roles, new evaluative performance criteria and new expectations for members of the IRI and similar institutes; changes that have been discussed more generally in terms of mode 2 knowledge production and related debates. Here we discuss how individual researchers deal with these changes and how they position themselves within a rapidly changing research environment. It is obvious that the following insights cannot easily be generalised across other institutions in Germany, let alone internationally. Positioning processes are politically and socio-culturally situated and tailored to a particular institutional environment. Nevertheless, we hope that a certain degree of careful generalisation might be possible to strike a debate about the changing role of science in transformation research today and how that affects individual researchers.

2. What we did

A brief online survey was distributed to all IRI THESys academic staff on 8th March 2016. It was open for two weeks. The survey included questions about the influence of ideology in the researcher's work (question #1), his or her involvement in processes or with actors outside of academia (#2), the ways in which his or her research relates to transformations of human-environment systems (#3), and what kind of science gives him or her more recognition by host institutions or peers (#4). Each question was answered on a scale from 0 to 10. The questions and scales are shown in box 1. In the survey, space was provided for further comments, whether general or on any of the specific questions asked. The survey also gathered information on the respondent: the name (optional) and the status (1st year PhD student, 2nd year PhD student, 3rd year PhD student, Postdoc, Senior researcher/professor). Finally, we asked whether the respondent was available for a follow-up interview. The survey had a total of 34 respondents, distributed as

follows: 1st year PhD students (3), 2nd year PhD students (5), 3rd year PhD students (5), postdocs (6), and senior researchers/professors (15). For each question we calculated the average and the median response value and plotted the distribution of response values (see Figure 1). The correlation between the responses to the different questions was calculated by means of a Spearman's rank correlation coefficient.

<p>#1. <u>How often do you talk to, work with or meet people with opposing stances on transformations?</u></p> <p>0 (never) to 10 (always)</p> <p>#2. <u>How much of your working time do you spend outside of universities or research centers?</u></p> <p>0 (Ivory tower) to 10 (activism)</p> <p>#3. <u>What does your research do in relation to the transformation of human-environment systems?</u></p> <p>0 (analyze change) to 10 (affect change)</p> <p>#4. <u>In your peer group or institution, what is valued more?</u></p> <p>0 (basic science: "I published and I don't care") to 10 (societal impact: "I lobby with my conclusions")</p>

Box 1. Questions and response scales of the online survey.

We selected six respondents for a follow-up semi-structured interview among those who reported to be available and who left their names. Selection was made to ensure heterogeneity in researchers' positions on transformations, as well as to include different stages of career development and different institutional or working relationships with IRI THESys. Interviewees included 3rd year PhD students (2) and senior researchers/professors (4). Half of the interviewees are located at the IRI THESys central office in Berlin Mitte, while the other half is based at different partner institutions. Half were men and half were women. Among the four senior researchers that we interviewed, there were two junior research group leaders, one researcher from a partner institute and one visiting researcher. One interviewee is also co-author of this paper. The aim of the interviews was to qualitatively explore some of the insights emerging from the survey results, while grasping the heterogeneity of positions in IRI THESys research on transformations. An interview guide was designed based on the results of the survey with four questions or groups of questions. The questions included in the interview guide are given in box 2. The interviews were conducted by Iago Otero and Jörg Niewöhner in English either face-to-face or by video conference. They lasted between 15 and 35 minutes. They were summarized by Clara Sichau and Iago Otero. The summaries were qualitatively analysed by Jörg Niewöhner following an inductive coding approach under the general theme of 'transformation'. Findings from the interviews were complemented with our own knowledge of the various positions and projects at IRI THESys.

Finally, we sent a summary of the results from both the survey and the interviews to the co-authors of this paper. We asked them to critically compare the findings with the notion that either they themselves or their scientific community have on transformations of human-environment systems and on the role that scientists play or should play in those transformations.

- #1:
- Who are you working with outside of academia?
 - Is there a particular group of people or stakeholders that you interact with?
 - Are there significant gaps regarding the people that you work with?
- #2:
- There seems to be a tension between what people are doing and what they perceive they should be doing, i.e. being more transformative. Do you find this problematic?
 - What are the main barriers for you not conducting more transformative research?
- #3:
- Why do you want to engage in transformative research? Is it about biographical issues? Is it the context of the research prompting you to do it?
 - Why do you think you are competent in transformative research? Is it a matter of particular knowledge, methods or skills that you have?
 - Why do you think it is legitimate for you to do transformative research? Is it about truth, an “election”, a job?
 - Do you have a vision of where you want to get with your transformative research? Or are you only trying to solve a problem or escaping from a current undesirable state?
- #4:
- Would you like to add something?

Box 2. Questions included in the interview guide.

3. Results. Systemizing scientists' positions

3.1 Results from the survey

Figure 1 shows the distribution of the response values to the surveys' four questions (box 1). In terms of question #1, most of the responses gave intermediate values, the average being 4.8 and the median 5. As for question #2, responses were concentrated at lower values, averaging at 3.3 and with a median of 3. In response to question #3, the respondents mostly chose the equidistant answer (5), although answers were also concentrated around lower values, with an average of 3.9 and a median of 4. Question #4 received varied responses, with an average value of 5.1 and a median of 5. Spearman's rank correlation analysis showed a certain correlation between responses to different questions, but only the correlation between question #2 and #3 was found to be statistically significant (0.49; $p < 0.01$). This revealed internal

consistency in the data, as researchers reporting to spend most of their time in the “Ivory Tower” reported to analyse rather than affect change in human-environment systems, and vice versa, those that felt closer to activism reported to conduct research that affects rather than analyses change.

We interpreted these results in the following way. Having a societal impact is valued as much as doing basic science in the respondents’ peer groups or institutions (question #4). However, they reported 1) spending most of their time inside their universities or research centres, thus positioning themselves far away from the “activist” end of the gradient (question #2), and 2) conducting research that either keeps a balance between the analytical and the transformative components or that focuses on the analytical component (question #3). It remains open as to whether this means that scholarly analysis is seen as contributing to positive social impacts (i.e. it is seen as transformative *per se*); or that their research is not as transformative as their peer group demands.

The comments received by the respondents in the survey provided some hints for further interpretation of how researchers at IRI THESys think about research on transformations and their role in it. First, the limitations of the survey were stressed. Senior researcher A acknowledged that the questions were very difficult to answer. PhD student A felt confused about the meaning of “opposing” in the first question, and interpreted it as an issue of contact between different disciplines rather than between different ideologies. Postdoc A considered it difficult to answer the first question on a scale of 0 to 10 as he reported working with many stakeholders whose stances on transformations he didn’t know. He simply agrees with them on the need to solve a particular sustainability problem and this constitutes the basis for joint work, he argued. Further, senior researcher B said that the answers to questions 1 to 3 could vary depending on the research phase. As for question 4, postdoc B criticized that in the survey basic science was associated with the sentence “I publish and I don’t care!” and pointed out that the scale was irrelevant for making a distinction between applied and basic research.

Second, a tension between what researchers are doing and what they perceive they ought to be doing, i.e. being more transformative, was detected for some respondents. For instance, PhD student B said that her current research does not actually affect change even if this is her number one long-term goal, pointing out the difficulty of achieving it in practice. Similarly, PhD student C reported to be very unhappy with her answers to the survey. Having a strong social impact, she said, was her ambition when starting her PhD and getting into academia. However, she later realized that in a PhD project she can only conduct transformation research and not transformative research because the latter requires a transdisciplinary design involving long-standing networks, resources and flexibility that are impossible to build up over the PhD period. By contrast, postdoc A declared that he was engaged in both analytical and transformative research, with the latter trying to change or shape the course of the transformations analysed in the former. He did not see a contradiction between the goals of publishing and having societal impact, because he believed it was possible to write good scientific publications from an activist-research process. Finally, respondents stressed that it would be interesting to investigate i) with whom researchers focused on transformations primarily interact, and ii) whether the knowledge that scientists produce meets the needs of a positive human-environmental transformation.

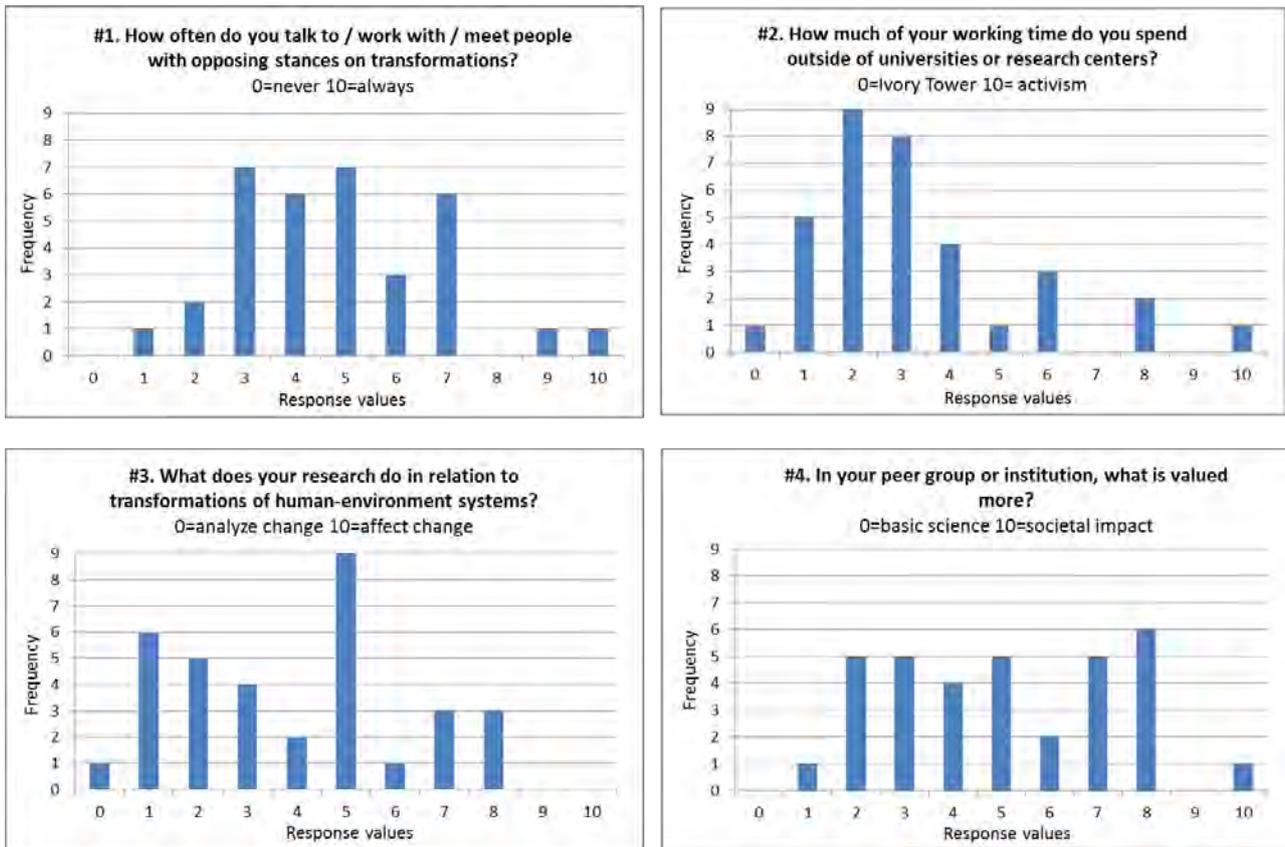


Figure 1. Survey Results for question #1, #2, #3 and #4.

3.2 Results from the interviews

Here we provide a summary of the main contents revealed by the interviews. They include both explicit positions taken by the interviewees and distinctions or emphasis that remain implicit and are revealed through analysis.

3.2.1 Research as a contribution to a better world

Most researchers understand themselves as contributing to a knowledge base to which politicians, NGOs, social movements and civil society may refer to carry out transformations towards a better world. Those who consider themselves more as activists actively seek out opportunities to translate knowledge into action. Those who consider themselves to be pursuing basic research also perceive their knowledge to be of societal relevance however and to be affected by social and political action. Hence the distinction between basic and applied or action research somewhat disappears for a group of researchers that is highly aware of the role of knowledge in processes of social-ecological change.

3.2.2 Barriers to contributing to a better world through research

a) David against Goliath

A great deal of scepticism is voiced about transformation by those engaging in specific case studies. Unless working within networks highly committed to sustainability, e.g. community agriculture in Berlin, most people have made experiences in the field that discourage their belief in positive transformation. The particulars of political, economic and social configurations, the lack of interest in research results, the long history of failures to improve the living conditions for the many and reduce massive inequalities particularly in sub-Saharan Africa and corruption, etc. have turned most of our interviewees into “realists”. Oftentimes, interviewees identify a mismatch between the aims of their research – often quite complicated – and the need for local solutions to obvious problems – often quite simple while nevertheless unattainable. So while everyone tries to affect a transformation for the better, everyone is extremely aware of the severe limitations within the reach and legitimacy of their own research.

Interestingly, most informants do not readily come forward with very clear ideas of what a ‘better world’ would look like. What ‘better’ means seems in many cases obvious, but explicating it seems also terribly difficult. Not only is it hard to theorize what is desirable or good. It is also hard to translate this into practice because the road from the status quo here to a better world over there is not clear. Researchers are very aware that their research – whatever the approach - only captures a minute part of complicated dynamics that affect change. Experiences in the field have humbling effects. In the face of blatantly obvious problems and overwhelming complexity in the search for solutions, many researchers frame knowledge production as a value in itself.

b) The practicalities of research

Even where transformation is desired as a central part of the research process – and that is not the case for everyone – it is consensus that achieving transformation needs direct and long-term contact with the relevant stakeholders and communities. Such preconditions for transformative research are difficult to establish within academic research and next to impossible to establish for PhD projects. Particularly for those in projects aiming to provide them with further formal academic qualifications in their early career development, the obvious limitations of their work in the face of urgent problems is often a source of frustration. Pressure to publish and particularly time constraints for both immediate and long-term presence in the field are perceived as the main constraints of academic engagement in transformative research.

c) Resource allocation

Even within senior research groups studying transformations and willing to commit themselves to one cause or another, resources are commonly acquired and distributed to produce the best possible science rather than the best possible outreach. Societal or political impact is seen as desirable – also on institutes’ agendas – and important for the acquisition of further funding. However, translation of research findings into advice or direct action is not problematized in terms of academic research, but mostly framed as an underfunded add-on to the key priority research. There is no clear consensus over whether this is a good or a bad thing. In few cases, research projects are designed in such a way that the distinction between science and outreach is entirely and deliberately blurred. Such transdisciplinary or participatory approaches to science are discussed further below.

3.2.3 Obligations in the academy: the ambiguous relationship of science and transformation

From our interviews, three different positions can be discerned in terms of the relationship of academic research and transformation.

In the case of the first position, the transformation of study regions or social-ecological systems towards sustainability is seen as the key personal motivation, and academia perhaps ought to do more to enable research to have such impact. While the term 'applied research' is used, more commonly researchers consider close contact with relevant stakeholders as important for asking the relevant questions and then translating the scientific findings into real-world changes. Researchers feel a (strong) moral obligation towards the field or study region, believing that their work ought to change things for the better. Interestingly, the same obligation is rarely articulated towards the academy or a disciplinary body of research. Research is often understood to be problem- and solution-oriented (natural sciences) and politically committed (some social sciences) rather than basic in the sense of primarily developing a body of existing knowledge.

The opposite position regards the field as a site of data gathering to produce high quality science. People in this camp are also politically committed to improving living conditions and see sustainability as a way of doing so, even though this is not so much, if at all, part of their research. To the contrary, they outline a strong obligation to protect science from undue influence from stakeholders, politics or business and emphasize that differences in competences, interests and legitimacy must be recognized and preserved between different kinds of knowledge practices and positions in the world. The first obligation is thus to good science; whereas the communication of these findings into the world outside of academia is a second step, also important but separated from the first one.

A third position tries to hold intermediate ground by arguing that researchers' engagement with stakeholders and the relevant communities is necessary not for moral or political reasons of relevance, but for epistemic reasons: it makes their science better. This position sees epistemic agency distributed across people in science as well as in the field. Scientific authority and position is however strengthened by this kind of approach. Transdisciplinary and participatory approaches are committed to legitimating choices in research design and analysis through the involvement of the relevant stakeholders and the public. A tension lingers between the need for transdisciplinary methods to improve research and make it legitimate on the one hand, and the need to keep scientific research as free as possible from unnecessary outside influence on the other.

3.2.4 Subject positions in transformative research

All interviewees use the well-established categories of community and people, stakeholders and scientific experts. There is little problematisation of these categories. This is somewhat surprising and perhaps an artefact of the type of interview and the questions asked. It is surprising, because the social theoretical engagement with and reflection of these basic social categories ought to play a role when conducting research on and in transformations given that research is making an effort to reach beyond the ivory tower. It is important to clarify social positions and how they relate to knowledge production, how they produce and demand legitimacy, how they have access to resources and the public and political discourses and how they are able to link with established academic knowledge production. Recent social scientific analyses recognise the broader spectrum of different practices of knowledge production and a wider distribution of these practices across different actors beyond the established academic institutions of knowledge

production. Ecologies of expertise (Beck, 2012), mode 2 knowledge production (Nowotny et al., 2003), critical participatory and transdisciplinary research (Krueger et al., 2012, 2016) and research on patient groups and biomedical research (Rabeharisoa & Callon, 2002) would be worth considering in this context and it is surprising that the institute's transformation research has not really taken up this debate.

3.3 Feedback on the results from the co-authors

The findings of the survey and the interviews were critically compared by the co-authors with the notion that they or their scientific community have on transformations of human-environment systems and on the position that scientists should take up in these transformations. The scientific community here is thought of in the broad sense: a discipline, an area of expertise, a particular interdisciplinary institute or a school of thought.

I.O. I am part of a group based at the Barcelona Institute of Environmental Science and Technology working on political ecology and degrowth. There, concern exists about the de-politicization of environmental issues. "De-politicization" is the process by which sustainability issues are emptied of their political content and turned into managerial challenges to be tackled with better knowledge, more efficient technologies and innovative market mechanisms. The political aspect is understood as the necessary clash between alternative visions of a good society. The work done in Barcelona attempts to re-politicize the public debates on sustainability and human-environment transformations by challenging the desirability of economic growth as a social objective, and by actively nourishing alternative visions and practices (e.g. Asara et al., 2015). The results of our survey and interviews seem to show symptoms of a "de-politicized" research on transformations at IRI THESys. First, researchers seem almost convinced that the world cannot be radically reshaped; at best some management adjustments can be made to improve certain variables such as water quality or child mortality, but nothing more than that. Second, their contribution to a better world seems to be based on the production of knowledge, assuming that more and better knowledge (whether it is with or without stakeholders), is transformative per se. Critical reflection on the role that scientific knowledge has in the (re)production of social-ecological configurations and emphasis on "the political" are surprisingly missing. However, it is not clear to me as to whether or not IRI THESys should aim at a re-politicization of research on transformations, and if so, how. The sometimes negative trade-off between activism on the one hand and knowledge quality on the other – pointed out by some of the interviewees – is a key challenge in this regard.

T.K. It has to be said that we are working at a university and hence knowledge production must be what we are good at and/or enjoy doing – otherwise we would not be here I suppose. We are all quite comfortably "finding out stuff", which we know (I think this comes out in the results) will not do much (if anything at all) to affect change. Lamenting this as if we did not have a choice misses the point; surely, if affecting change was our ultimate motivation, then we would be doing something different such as working in the humanitarian or environmental voluntary, public or private sector. I believe we should stop kidding ourselves and acknowledge that in many ways the science system works quite well for us (even if we are occasionally uneasy with our privileged position and the little apparent usefulness of our work). Acknowledging this, however, does not mean that the science system cannot and should not be changed. The interdisciplinary natural-social science water research community that I subscribe to tries to (a) be aware of the positionality of all research and of the ontological transformations that this brings "in any case" (b) uncover the politics and inequities hidden in traditional science-policy processes, and (c) enable

other forms of knowledge in the field to complement or challenge academic research productively and in different ways. This is ambitious, and in practice not all of these claims are realized at equal measure at all times. However, the community is motivated both epistemically and politically (as described above): Scientific knowledge is partial, implicated in inequitable water policies and technologies and hence should be opened up to negotiation among the affecting and affected actors and their knowledges (Krueger et al., 2016) while the focus lies decidedly on empowering otherwise marginalized actors (Zeitoun et al., 2016).

Ö.C.D. Knowledge production is a political process. It is this way because each knowledge gap that is filled has the potential to change power relations in societies. But doing science does not necessarily mean seeking some form of power. One seeks knowledge and might or might not aim to contribute to change purposefully. However, it is not that one “finds out things” and is not responsible for change at all. Knowledge is potentially transformative and, therefore, science is too. It is not a scientist who decides whether knowledge is transformative or not. Nevertheless, a scientist can decide how communicative his or her research will be, i.e. the level of comprehensibility and accessibility of his or her science. I think that it is not necessarily scientists’ responsibility to be actively involved in political movements for transformation, but at the same time I do not think that being involved in politics makes a scientist “less scientific”. The role of a scientist, besides producing good knowledge, should be to be understandable and approachable as much as possible. In other words, science should be communicative. When Bakunin (1970) wrote that science can only be a compass of life but not life itself, he highlighted the communicative role of science and scientists. He was against the rule of societies by experts. Instead, he advocated that science should be accessible to all people so that societies can be capable of making better decisions for and by themselves. The letter T (transformation) in the name of IRI THESys does not oblige scientists to be involved in politics or to lobby with their results. Rather, it should make IRI THESys researchers more understandable and their science more accessible to all people. For instance, my current research is based on a marginalized village in the Balkans. When I first decided to do research there, I felt I could “help” the inhabitants of the village by writing scientific papers about them and, possibly, lobbying responsible policy-makers to take action to improve social and environmental conditions. Instead, during my field research, I realized that I can only “help” them by supplying scientific knowledge and that I cannot act on behalf of them. The best I can do is to make my science as understandable as possible to them. I think that my project will contribute to a change in the village but the extent or direction of this change will not be decided or forced by me.

J.H. The results suggest that having societal impact is of equal value as doing basic research. This seems surprising. First, it sits oddly with the folk understanding of science, which would expect researchers to be interested in basic research more than in activism. Second, it is methodologically problematic. It is widely considered to be important that researchers refrain from making normative judgments whenever possible, but societal impact necessarily involves such normative judgments. Thus, the results raise an important question. Should researchers be activists? Activism is a political activity in which the activists aim at changing the world towards what they perceive to be better. In this way, activism is motivated by normative judgments. Thinking about the nature of activism and the nature of research thus raises general and more fundamental questions. The first question concerns ethics and politics; hence: What would a better world look like? Or in other words, what aims should activists pursue? This is a question that all *activists* should ask themselves. The second question concerns science; namely: Should research be free of normative judgments? Or in other words, is activism compatible with good research? This is a question that all *researchers* should ask themselves. Both of these questions need to be addressed in order to shed light

on how research and activism go together. On the one hand, there is significant literature on both of these questions. In fact, entire sub-fields of philosophy are dedicated to them. The first is investigated by moral and political philosophy, the second is investigated by the philosophy of science. On the other hand, there is also a significant interest in these questions at IRI THESys. This seems clear from the results of this study and the discussion of these results within this paper and beyond. Personally, I was surprised about the importance that seems to be assigned to activism at IRI THESys. I think it would be recommendable to engage in philosophical debates in greater depth. Philosophy can help generally to improve one's normative outlook and specifically to answer the questions that the discussion of this study has brought up. For example, Kitcher (2011) discusses such questions at the interface of science and democracy. The ideal that science should be free of normative judgments is subjected to an important critique by interpretivist and critical social science as championed by Taylor (1971) and put forward by Fay (1987). Engaging with philosophy may help to examine, revise, or buttress the self-understanding of the scientific practices of researchers at IRI THESys.

P.H. Remote sensing as my core field of expertise is entirely free of any relation to human-environment systems or social-ecological research – it is about digital image processing. However, a lot can be achieved in sustainability or transformation science based on the outcome of remote-sensing image analysis. Here I take the broader view of “the geographer”. A new problem emerges then: who is “the geographer” that I wish to relate to transformation science? Geography offers different views on transformation science and the outcome of this survey could range from 0 to 10 for any of the questions posed, depending on the geographer responding. This probably already explains why geography relates to all fields of sustainability and transformation science in general and to those playing a role in IRI THESys in particular: it can relate to all viewpoints from activist research to basic research. I agree with the above conclusion by T.K. on the limits of transformation science, not to mention transformative research. If “changing the world” was my ultimate goal, I would clearly opt to become a top-level stakeholder: a politician. Having said that, I nevertheless believe in the need for both research that is deeply rooted in basic sciences and for stakeholder involvement to improve research on transformations. I am also convinced that geography has a crucial contribution to make in this field of research, but that having an impact on transdisciplinary processes leading to transformations will always be limited on the researcher's side. As I perceive it, this is not only true for geographers, but in general. One simple reason for this conclusion is that time is limited and inter- to transdisciplinary research needs a lot of time and communication. Being acknowledged by both the science community and the transformation science community is therefore the privilege of but a handful of researchers. Closing the loop towards geography (and remote sensing) again: few geographers really strive to position their research between the social and natural sciences, but many of the topics related to transformation research fall exactly there. In my opinion though, it is always worth it for geographers to reach out to the inter-/transdisciplinary domain – even if this is not at all inherent to every geographer's research approach. Geography and how geographers are scientifically socialized provides the opportunity to grasp the social sciences viewpoint as a natural scientist – and vice versa. Even if not being inherently inter- or transdisciplinary, such an open-minded standpoint enables discussions with researchers from different disciplines, which is a prerequisite for collaborating on sustainability and transformation science. Finally – and here the remote-sensing scientist surfaces again: the ability to support sustainability or transformation science depends much on the willingness of the individual to broaden one's horizons from the well-known ground of disciplinary knowledge production to broader fields of research. Or from

the remote-sensing perspective: as long as one is interested in what fascinates other researchers in the satellite-based perspective of the Earth – there is lots of room for joint research. However, this often comes at the price of a lower success rate with research funding, as Bromham et al. (2016) discuss – which is good to be aware of.

J.N. Reflecting on the empirical findings from IRI THESys staff, I would like to share three convictions, which I harbour from my training in the anthropology of science. First, as scientists we ought to strive to produce knowledge that is interesting and good for others to invent around (Strathern, 2002). Second, theoretical concepts act as lenses to the world. Seeing the world differently through a lens makes people act differently and may well change the world. Concepts can be extremely powerful agents of change. Third, I do not believe that it is helpful to categorically separate the production of scientific facts from the production of political matters of concern, particularly not in research concerned with transformations of human-environment systems. The production of scientific facts requires choices that are to be made in methods, technology, analysis and representation. Within a certain range set by scientific standards, these choices always reflect personal and collective values, priorities and beliefs. In this sense, matters of fact are always already matters of concern (Latour, 2005). Making transparent the implicit assumptions and priorities built into disciplinary thought styles is a necessary prerequisite for productive work between disciplines. If this is what we mean by the ‘politicisation’ of science, I am all for it. If it means using science to achieve political goals set outside and independently of scientific knowledge production, I am not interested. Such approaches produce uninteresting knowledge, because they lose the ability to surprise the researcher. These three convictions – interesting knowledge, performative concepts, matters of concern – also apply to transdisciplinary research. Hence, working with stakeholders should always be aimed at producing interesting knowledge that others can invent around, where ‘others’ can really be anyone concerned by a particular research question.

4. Tentative conclusion. How transformation research should work at IRI THESys?

A broad consensus exists amongst IRI THESys staff that currently a number of global social-environmental processes with worldwide consequences change the living conditions for many people and ecosystems on this planet for the worse. Transformation seems to be an apt term to label these processes, yet it is not entirely clear as to why this term has been chosen vis-à-vis alternative ones such as regime change or social-ecological change. For most of IRI THESys staff, transformation also carries an explicit or implicit normative dimension: transformation is not only happening, it also needs to happen. Transformation is the necessary response to transformation; most other forms of response might be too slow or superficial. It is this ambivalent and often implicit conflation of empirical and normative dimensions of the notion of transformation that lies at the heart of differing views on and ways of handling transformation research.

The IRI THESys thrives on these differences in views. It is a very heterogeneous epistemic culture. Its strength lies in its ability to keep people with diverse specialisations and convictions in dialogue with each other. It is clear that the IRI THESys cannot define a politico-scientific manifesto that defines transformation in material terms. Yet it can define and insist on a process: Whatever your research, you need to be willing (1) to explain it to others and (2) to scrutinise your own work with criteria from other thought styles even beyond the academy. Good scientific practice within the IRI THESys thus arises from balancing

accountability towards your own peer group with accountability towards other members of the scientific community and beyond.

This balancing act is hard to perform in a single situation. Yet it can be done over time: within the working week, across projects or over the length of a contract. With regard to transformation research, this may mean that a period of working intensely with stakeholders in the field may be followed by highly disciplinary work on a scientific paper. Oscillating between different modes of knowledge production offers the possibility to remain accountable to diverse communities. The respect that arises from this accountability is key to positioning an academic institution such as the IRI THESys in transformation research sustainably. It is the humility of knowledge practices before the enormous complexity of human-environment systems in transformation that will ensure credibility and the production of knowledge that others can invent around.

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