Appendix 1. Qualitative analysis description

Sustainability science provides the overarching research design for the LIVES project produced by these initial sessions and the project was implemented with the following characteristics (as per Filho et al. 2016, Clark et al. 2016):

- Exploratory, action research approach with the goal of generating new fundamental science for understanding the governance of interlinked water, energy and food resources.
- Multi-, inter- and trans-disciplinary approaches used at different phases of the project cycle with a focus on knowledge co-production techniques.
- Positivist context framing, normative inputs in research design.
- Integration of multiple knowledge sources and viewpoints in a systems perspective
- Recognition of system interactions, dynamics, transitions and uncertainty.
- Recognition and testing (where possible) of assumptions underpinning research design.
- Production of credible, legitimate and salient knowledge in a decision context.
- Learning oriented approach.

A reflexive approach led us to collect and store the following data throughout the project:

- Context analysis interviews commissioned at the Royal University of Agriculture at the beginning of the project in 2015.
- Stakeholder evaluation reports, meeting summaries and other documents from 5 stakeholder workshops held in the landscape between January 2015 and July 2016, and 5 workshops held between February and December 2017, including the final project workshop in Phnom Penh.
- 15 interviews with close project collaborators, following the Most Significant Change method to elicit observations about changes generated by the project (including stakeholder attitudes, interactions and risk perceptions), mindful of the social, political and historical context for the case study. The project collaborators included representatives from Luc Hoffmann Institute, the General Secretariat to the National Council WWF Cambodia, the Royal University of Phnom Penh (in Cambodia), the Royal University of Agriculture (in Cambodia).

Table A1.1 Stakeholder feedback and workshop meeting reports (Sources of 'SF' documents listed above in Table A2.1)

Document code:	SF1-provincial day	SF1-farmers' day	SF2-Phase 1 Final WS	SF4-Kratie	SF4-Stung Treng	SF5-Kratie	SF5-Stung Treng	SF6	MSC
Relevant dates:	17.03.16	18.03.16	19-21.07.16	20-21 02.17	23-24 02.17	13-14 03.17	16-17. 03.17	08.12. 17	11.17-01.18
Project partners and participants									
Cambodia-based LIVES project academic colleagues*	1	1	2	1	1	1	1		3
Cambodia-based LIVES project WWF colleagues*	5	5	9	4	7	4	4	6	7
International WWF colleagues*	1	1	2						
International LIVES academic colleagues *	3	3	2					1	
General Secretariat to the National Council on Sustainable Development Staff *	7	7	5	9	9	6	7	5	3
Ministry of Interior/ General Secretariat to the National Council on Subnational Democratic Development staff [national & provincial based]				2	2	2		2	
Ministry of Environment reps			5	1	1	1	1	1	
Ministry of Planning reps								4	
Provincial government departmental officials, Kratie	15		12	9	16	5		7	
Provincial government departmental officials, Stung Treng	14		7				4	7	
Other Cambodian provincial officials			2		2				
District representatives, Kratie	3	1	4	4					
District representatives, Stung Treng	3		3		3				
Other NGO staff members, Kratie & Stung Treng	8		12	3	1	1			
Commune representatives, Village/community representatives/Local economic sectors (tourism, fishing, farming), Kratie	1	4	4	1		3			
Commune representatives, Village/community representatives/Local economic sectors (tourism, fishing, farming), Stung Treng	1	5	5				5		
International and intergovernmental organisations staff based primarily in Phnom Penh			2	3				2	
LIVES project management team	1	1	2	1	1	1	1	2	2
Male/Female	**45/18**	**10/18**	**56/13**	**32/6**	**34/8**	**18/6**	**13/10**	**27/10**	**11/4**
Total number of people	**63**	**28**	**78**	**38**	**43**	**24**	**23**	**37**	**15**
Total number of documents	**2**		**3**	**1**		**2**		**2**	**15**

MOST SIGNIFICANT CHANGE INTERVIEW PROTOCOL

The most significant change technique is a form of participatory monitoring and evaluation. It is participatory because many project stakeholders are involved both in deciding the sorts of change to be recorded and in analyzing the data. The process typically involves three major steps: 1) the collection and verification of stories from the field level for a particular time period, and 2) the systematic selection of the most important of these by panels of designated stakeholders or staff, 3) once changes have been captured share stories and have regular and often in-depth discussions about the value of the reported changes (Dart and Davies 2003, Willets and Crawford 2007). Users of this method must choose to pre-define specific domains of change they are expecting to observe or let these domains of change emerge from the field-level stories. When the technique is implemented in programmed design and delivery over the long term, this approach complements other forms of monitoring and evaluation while enabling teams to share and focus on particular forms of impact that are sometimes difficult to capture or measure in complex or long term social change processes.

In our research context, we adjusted these steps to:

- Collecting stories from individual team members and asking for means of verification during interview (November 2017– January 2018).
- Letting domains of change emerge through preliminary analysis (5-6 December 2017)
- Feeding back the results (8 December 2017) to a group representing the majority of interviewees to discuss most significant changes and verify preliminary findings.
- Secondary analysis of stakeholder feedback contained in evaluations and meeting documents (March – June 2018).

We performed one round of interviews in December 2017 asking interviewees to reflect on whole Cambodia pilot implementation from the beginning of their involvement to the end of Phase II in December 2017. Our most significant change interview questions and protocol are as follows:

Suggested script 1: about the MSC method

> Good morning (afternoon). Thank you for agreeing to do this interview. We are interested in speaking with you as a contributing member of the LIVES project team here in Cambodia. Today

Suggested script 2: explaining the interview format and how responses are recorded

> There are no right or wrong or desirable or undesirable answers or stories. Questions asked in informal interview style to enable us to dialogue. [NOTE: We do not force or lead interviewees to talk about specific domains - these should emerge from the interviewees themselves.]. If it is okay with you, I [project team member 1] will be recording your responses for content and substance, while [project team member 2] will record verbatim notes. We will also be recording the interview. The data will be used to as part of the LIVES research activities to help us evaluate the participatory system dynamics method. When we do the analysis, we will give this document a code number and we will not use your name.

Script 3: MSC questions

- Tell me how you first became involved with the LIVES project in Cambodia and what your involvement was?
- From your point of view, tell me a story that best describes the most significant change that has resulted from the LIVES project.

  Script 3.1: This can be negative or positive changes. Examples could be changes you have seen in others, a change in the way you think, a change in the way of working etc. You're welcome to add personal / professional changes.

- Why are this change/these changes significant for you?
  Instruction: If the list of changes have been long, recap for the interviewee before posing this question.

- What were the factors that helped bring about this change/these changes?
  Script 3.2: this can be internal factors e.g. to do with how the project was designed/implemented/ managed or it can be external factors e.g. the political context / structures of government /willingness of government officials

- Were there any barriers?
  Script 3.3: were there any barriers to bringing about the most significant change (s)? These can be internal or external barriers.

- Can you give us one example of a concrete change you made in your own professional working life as a result of the LIVES project?
- Is there a change you would like to make but have not been able to make as yet? For what reason?
- Is there anything else you'd like to add?

Two interviewers took separate sets of notes that were later merged into one narrative text, with support from audio recordings. Interviews were conducted in English, which is not the native language for the majority of project partners. For some interviews, we had translation assistance from other project team members. The priority in preparing the final narrative and reporting quotes was keeping the voice of the project partners.

Our preferred means of verification is triangulation where find at least two other concrete examples of evidence that supports the story. Example: if there is a claim that new capacity has been created in the person, can we find an example where they have clearly demonstrated this new capacity and can we get feedback from their peers or manager that they have observed this new capacity.

QUALITATIVE ANALYSIS SOFTWARE AND DATA CODING

We used computer-assisted qualitative analysis [ATLAS.ti software package] (Freise 2014, 2016). For this particular analysis, an in vivo coding approach was used to the first reading of our data (King 2008, Saldaña 2016) to bring our project partner and participant viewpoints into the discussion of the modeling results discussion with statements that illustrated:

1. Prioritization of risks, and changing risk perceptions attributed to the processes
2. Reference to subnational development planning procedures, this being the ongoing decision making process where government choices are made on policy implementation and resource allocations relevant to water, energy, food and livelihood security.
3. Understanding of ownership, suggested actions for proceeding with using the new knowledge produced in the scenario and dynamic modelling.

The lead researcher recorded ideas and thoughts throughout the analysis process that were then synthesized to contribute to the initial understanding of nexus risk prioritizations by Mekong Flooded Forest stakeholders and the discussion of the modelling results in the main paper. This method is a form of grounded theory method, whereby codes and concepts emerge from the data (Saldaña 2013). While the final quotes selected reflect a certain view, they are always confirmed by other sources, i.e. other stakeholder opinions, national policy documents.

LIMITATIONS

Knowledge integration and co-production happens in power dynamics arising from visible and invisible social, political and cultural structures (Giddens 1984, Lukes 2004). We know group processes affect how participants externalize their risk perceptions (Rouwette 2017). Also, that research teams are rarely neutral agents in transdisciplinary research (Pohl et al. 2010, Wesselink et al., 2013). We are fully aware that if you work within the social and political context, as we were, no activity is a neutral player (Wesselink et al. 2013) and inevitably some biases were likely to have been introduced through the relationships developed between project team members who were interviewing and those being interviewed.

Moreover, participatory monitoring methods are normally repeated and field experiences suggest that understanding of the approach and quality of story recounting and gathering improves over time whereas we used it just once (Willets and Crawford 2007). Secondly, the MSC method was not applied extensively. For example, we focused on collecting stories of change from close project partners and not our participants given time and other resource constraints. We assumed our interviewees' observations about changes for provincial and community participants would be an adequate proxy for these 'voices', as long as we supplemented them with a secondary analysis of the stakeholder evaluations and other feedback recorded in our workshop meeting reports. Moreover, we assume that our diverse project partner group lends the MSC data some robustness.

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