

The Role of Psychological Ownership in Safe Water Management: A Mixed-Methods Study in Nepal

Benjamin Ambuehl, Vica Maria Jelena Tomberge, Bal Mukunda Kunwar, Ariane Schertenleib, Sara J. Marks and Jennifer Inauen

Supplementary materials

Table S1. Settings, water quality and functioning of community-based water system.

In this part, the three investigated villages will be briefly described based on water quality assessment and field notes of the impressions about the village's condition by the interviewers.

<i>Scheme</i>	<i>Tap</i>	<i>E.coli</i> [CFU ^a /100ml]	<i>Risk E.coli</i>	<i>Total coliform</i> [CFU ^a /100ml]	<i>Risk Total coliform</i>	
2	1	2	low risk	TNTC ^b	high risk	
2	12	31	intermediate risk	TNTC ^b	high risk	
2	8	18	intermediate risk	TNTC ^b	high risk	
2	9	32	intermediate risk	TNTC ^b	high risk	
2	4	12	intermediate risk	TNTC ^b	high risk	
2	10	24	intermediate risk	TNTC ^b	high risk	
3	8	36	intermediate risk	TNTC ^b	high risk	
3	7	29	intermediate risk	TNTC ^b	high risk	
3	1	48	intermediate risk	TNTC ^b	high risk	
3	6	27	intermediate risk	TNTC ^b	high risk	
3	5	26	intermediate risk	TNTC ^b	high risk	
<i>Scheme</i>	<i>Reservoir tank</i>	<i>E.coli</i> [CFU ^a /100ml]	<i>Risk E.coli</i>	<i>Total coliform</i> [CFU ^a /100ml]	<i>Risk Total coliform</i>	
2	1	2	low risk	TNTC ^b	high risk	
2	2	23	intermediate risk	TNTC ^b	high risk	
2	2d	27	intermediate risk	TNTC ^b	high risk	
3	1	11	intermediate risk	160	high risk	
3	1d	7	low risk	280	high risk	
3	2	12	intermediate risk	240	high risk	
<i>Scheme</i>	<i>Household</i>	<i>E.coli</i> [CFU ^a /100ml]	<i>Risk E.coli</i>	<i>Total coliform</i> [CFU ^a /100ml]	<i>Risk Total coliform</i>	<i>Water filtered</i>
2	11	3	low risk	126	high risk	yes
2	12	TNTC ^b	high risk	TNTC ^b	high risk	no, no filter present
2	13	55	intermediate risk	41	high risk	no, filter broken
2	14	TNTC ^b	high risk	TNTC ^b	high risk	yes
2	15	0	low risk	TNTC ^b	high risk	yes
2	20	0	low risk	19	intermediate risk	yes
2	21	90	intermediate risk	200	high risk	yes
2	22	30	intermediate risk	TNTC ^b	high risk	yes
2	23	55	intermediate risk	41	intermediate risk	no, no filter present
3	16	3	low risk	9	low risk	no, no filter present
3	17	17	intermediate risk	TNTC ^b	high risk	no, no filter present
3	18	0	low risk	0	low risk	yes
3	19	TNTC ^b	high risk	TNTC ^b	high risk	no, no filter present

Note. ^a CFU = colony forming unit ^b TNTC = too numerous to count

WS_good (Scheme 1)

The water system “WS_good” is located in the middle of the Surkhet district. In comparison to other villages in the REACH project this was the most developed one, i.e. with a comparatively high socioeconomic status. Most of the houses were made out of stone or wood. A lot of the people are cooking with gas and not with fire. In the village center is an N-cell tower located which enables the villagers to use internet. Most of the interviewed people in the village were Buddhists or Hindu.

According to the chairperson, 216 families were living in this village. 207 out of the 216 households were facilitated by private taps supplied by one water scheme. This water scheme with private taps had been built three months before we started the interviews (29.05.2018). As this system was very new, the villagers had not faced any problems so far. Only two days before our arrival a heavy rain caused trees to fall and leaves to clog the source. The chairman conducted a community meeting to solve the problem and the villagers cleaned the source four days later. It seemed as if the whole villagers had a very good relation with the local NGO, which had helped them to get the private taps. Before the new water supply the household had been supplied by 15 public taps whereas the new water system supplied nearly every household with private taps.

The water system was looking very new and modern. No sign of breaking or no damage in the reservoir tank (RVT). The RVT was properly fenced and locked. Inspection area and cover from the RVT was closed and there is less possibility to enter runoff water during rainy season. The intake, the outlet pipe, the washout and the overflow pipe looked in good condition. There was an air vent in the structure. It had a little leakage in the outlet. The RVT was near to human settlement, so they are facing hazards like toilet nearby, open grazing, cultivation, waste and animal dung.

During the community meeting were just women attending. The woman told us, that 80% of the men are working abroad or in the military and living far away. It was a very welcoming atmosphere. I recognized a very strong community feeling in the meeting.

WS_intermd (Scheme 2)

The water system “WS_intermd” was located in the Jajarkot district. The 54 Households had 14 public taps. People had quite big houses in this village and most of the houses were made out of mud, some houses were made out of stone. The village looked rather dirty, there was a lot of waste on the ground and a lot of animal dung everywhere. There was some internet connection in the village but not everywhere and it was very slow.

The chairperson seemed drunk. During the interviews a lot of people were complaining about the chairperson’s corruption and perceived about his behavior regarding the water scheme to be incompetent. Additionally, he was accused for sexist behavior. The source of the village was in the chairperson’s land. Normally, the community buys the land of the source before the construction of the water system. In some cases, the community pays annually a fee to the landowner. This can cause problems, because the property owner can rise the payment.

Four out of the 14 taps were not functioning and seven were leaking. The pipe was exposed on three places as well as leaking in one part. In total approximately 210 meters of the pipe were exposed. Four of the ten sanitary structures were broken.

WS_poor (Scheme 3)

The water system “WS_poor” was located in the Jajarkot district. Households supplied by this water system seemed to be of an average socioeconomic status. Some Villagers had internet connection. The system was eight to nine years old. Many things were not working. 51 households were supplied by eight taps. Three of these were not working and two were leaking. There was a water shortage in the village at the time of the interview. Villagers had to go to another source to fulfill their water demands. The general atmosphere in the village was quite displeased due to the dysfunctions. The chairman seemed quite informed, he had ordered a very good filter from India (0 *E. coli* and 0 Coliforms).

The village maintenance worker had no filter at home. During the community meeting, mostly men were attending.

Six out of nine of the sanitary structures were broken and two were leaking. The general impression of the structures was somewhat clean. The pipe was exposed in two places due to landslide and road construction. In total, approximately 210m of the pipeline was exposed. The intake had no protection dam and no cover. It had a crack in the structure and was damaged.

Questionnaire Guidelines. Sample guideline for qualitative interview.

Introduction and inclusion criterion

Hello. My name is ... and this is I am working with HELVETAS-Nepal and Eawag (the Swiss Federal Institute of Aquatic Science and Technology) on a study of water services and quality of life here in Mid-Western Region.

1. Are you responsible for water supply for this family? *[If individual is not responsible, ask to speak to a head of household and begin introduction again.]*

2. For the interview we need families with water filters at home therefore we would like to know if you have a water filter at home? *[If no, come to an end and find a new household]*
[If yes, proceed to consent]

Date:

ID of respondent:

Thank you for taking the time for this interview. As mentioned, my name is _____ and this is _____. We work for HELVETAS-Nepal and Eawag (the Swiss Federal Institute of Aquatic Science and Technology).

Observation

Is the filter broken? Does it look in use? How is the behavior of the respondent?

Part 0: Stakeholder

[These questions just have to be asked if the respondent has a special position in the community]

- 1) What is your position? And since when are you in that position?
- 2) What are your responsibilities, your tasks? Do you have special tasks and rights regarding the water system than the other people of the community?
- 3) Why did you want the position and how did you get the position (election etc.)?
- 4) What changes did you make and what changes do you want to make?
- 5) In the PAST YEAR, about how many meeting did the water committee hold amongst itself to discuss matters related to the water system?

Part 1: Free exploration water system

First, we would like you to explain **where your drinking water is from.**

Knowledge and Involvement

Can you explain me how your water system works? When was it built and finished? What was there before the actual system?

WHO was it that INITIATED the water project?

During the planning phase of the water system, in what decisions could you participate? (level of service delivered, Water tariff design, Contribution level)

Who was responsible for building it? Which parties have been involved in the building process? What decisions were made during the construction and who could finally decide?

Who is responsible for ensuring that the systems properly works? Who maintain the system? When it is broken would YOU fix it or are there other people responsible? (Who)

Where do you get the money from, when there is any problem in the system?

Self-investment and contribution

What are your tasks and responsibilities for the system? How much money and how much labour did you contribute? What did families and/or village leaders contribute toward the construction of the water system? If you have any problems with the system, who would you ask for help? How high is the chance that your problems will be solved?

Attitude, conflicts and restrictions

Do you use different system or just one? What were your fears and hopes before they started the project? What are your feelings now? How important is it to have that water system for you and why?

Do you think the system meets ALL the water demands of the village members? Are there any RESTRICTIONS on how water from the piped system can be used? Are there any water-related conflicts in the village?

Free exploration water filter

Can you explain me, **what was the reason to buy a filter?**

Investment

When and where did you buy it? How much did you pay? Who decide to get a filter? Who gave it to you? Who is in charge for maintenance of the filter?

Knowledge

Can you explain me, how the filter works? Where did you get the information from?

Attitude

What are your feelings about the filter? Do you feel safe to drink from the filter? How often do you use it? How often do you clean it? Which aspects of the water service are you dissatisfied with?

Part 2: Exploration of ownership

1) In your own words, can you tell me what ownership means to you?

Further questions you might ask:

- What items belong to you personally/ family/ village/ greater public?
- What is the difference between items that belong to you personally and to your family or to the community?
- Some items may not belong to you, but you may feel as if though they also belonged to you (e.g. because you use them often) any items where you have this feeling? E.g. husband's mobile phone, field is on the name of your husband but you maintain it?

2) Let's think of the drinking water system in your village: Can you explain, who owns it?

Further questions you might ask:

- Who owns the land where the water system is? Are different owners for the land where the pipelines go through, Source, RVT?
- Do people have different rights, if the water filter is on their land?
- Who pays for the water system? Who paid initially? Who pays for use?
- Who may use the water system? Who may not use it?

- Do you feel responsible that the water system works properly?
- 3) How IMPORTANT would you say the water system is to the LIVELIHOODS of people in this village?**

Further questions you might ask:

- Why is it important / not important?
- What else is important for the LIVELIHOODS of people in this village?
- What is the most important thing for you and your family?

- 4) Now, let's think of the drinking water filter in your home: Can you explain, who owns it?**

Further questions you might ask:

- Is your water filter working? Do you have problems to use it?
- Who is responsible for ensuring the water filter works properly? Do you feel responsible?
- Who may use the water filter? Who may not use it?
- Are there different tasks between different people of the family? (Husband/ Wife/ Children)

- 5) How IMPORTANT would you say the water filter is to the LIVELIHOODS of you and your family?**

Further questions you might ask:

- Why is it important / not important?
- Which problems can be caused without having the filter? Which benefits?
- Are other treatments important for the livelihood? Do you use other treatments? Which is more effective?
- How many people are using the filter in your community?

Part 3: Picture task items

How true is it that: This is my...

How much do you own the following things? Please assign the pictures to the dots. The dots indicate how much you feel that you own an item. The bigger the dot, the greater the feeling of ownership. Multiple pictures can be assigned to the same dot. Please note that these pictures are just examples of items. Think of your personal items (e.g. your own water filter), the questions should be answered for your personal items.

[Attention! People tend to rank the items according to the importance]

Picture Task: Forced choice

Please rank the following items from the one you own the most to the least.

- This is my water filter (Filter)

- This is my mobile phone (Phone)
- This is my tap (Tap)
- This is my water System (Water System)
- This is my toothbrush (Toothbrush)
- This is my school (School)
- This is my house (House)

Picture Task: Owners

Which party owns the system the most? Please rank the following pictures.

- Helvetas
- Local NGO
- Government
- I
- Family
- Community

Part 4: Think aloud

Now, we would like to talk to you about your and your family's "feeling of ownership" towards your water system and your water filter. We would like to understand **how you choose your answer**. To do this, I am going to ask you to "think-aloud" as you complete the questionnaires. I want you to tell me everything that you are thinking as you hear each question and **decide how to answer it**. Please try to explain how and why you choose your answer I will ask you some further questions, if you are silent for any longer period of time.

We will move on to the questions, please keep in mind, that you should tell me everything that you are thinking.

Instruction

Think about the home, animals or furniture that you own or co-own with someone, and the experiences and feelings associated with the statement 'THIS IS MY (OUR) HOUSE!' The next questions deal with the 'sense of ownership' that you feel for the water system in your village.

1) This is MY water system. [Use scale]

- What do you understand with under the term water system? (tap, whole system, RVT)
- Is everything that belongs to you also belonging to your family?
- What makes it to YOUR system? (Labor, money, importance, decisions about it.)
- Why do you think the water system is (not at all...very) YOURS?
- Did you always find the water system as yours? Or has it changed over time?

2) This is OUR COMMUNITY's water system. [Use scale]

- Is there something (else) that belongs to everybody (school/temple etc.)?
- Is there a difference of the feeling of Ownership between your system and your community's system?
- Why is it (not at all...very) your community's water system? What makes it the system belonging to all the community?

3) It is hard for me to think about this water system as MINE. [Use scale]

- Would it be different if you could decide more / less about the system?
- What do you think about the water system? Do you like it / dislike it, is it safe, enjoyable?
- Are you agree with all decisions about the water system?
- Do you want to change something? (Private / public tap? Nearer tap stand? Treatment in system level? Better maintenance?)

4) My family is one of the owners of the water system. [Use scale]

- Why is it (not at all-very) true that your family is one of the owners?
- Are other families more responsible for the system?
- Are there other owners? NGO, elite, WUSC, etc.?
- Does your family's opinion about the system has any influence?
- Are there any health issues related to your drinking water system?

Now let's talk about your water filter you have in your home.

5) This is my water filter.[Use scale]

- What are the benefits / problems of having a filter?
- Is the water from your filter safe to drink?
- Is the water without filter safe to drink?

6) This is OUR FAMILY's water filter. [Use scale]

- Are all members of your family using the filter?
- How often are you using the filter?
- To which occasions are you using the filter?
- How important is it for your children to drink treated water?
- Is your filter in good conditions?

7) It is hard for me to think about this water filter as MINE. [Use scale]

- Would you repair / buy a new filter when it breaks?
- Why is it (not at all...very) hard for you to think about this water filter as YOURS?
- Did you treat the water before having a filter? How?

Part 5: Probing

- 1) Which questions were difficult for you to answer?
- 2) Did you have challenges in rating the level of agreement?
- 3) Is any questions irrelevant in your opinion?
- 4) Is any questions missing in your opinion?

Part 6: Sociodemographic questions

Finally, I have some personal questions. Again, we will keep this information strictly anonymous:

What is your ethnicity?

How old are you?

What are your household's monthly expenses?

What is your highest education?

Gender:

Name:

District:

Municipality:

Phone Number:

We are nearing the end of this interview. Thank you very much for your time. You have helped us a lot in better understanding the process of answer choosing. Is there anything we did not mention yet you would like to add? Do you have any questions for us?

Table S2. Items included for data analysis.

<i>Concept</i>	<i>Items</i>
Psychological ownership	How much do you agree with the following statement? 1 = agree not at all to 5 = agree very much <ul style="list-style-type: none"> - This is MY water system - This is out COMMUNITYS water system. - My family is one of the owners of the water system - The water system is owned by all the people who live in this village.
<i>Routes</i>	
Involvement household in water supply system	Is anyone in this household involved in the water supply system in this community? <p>Female community health volunteer</p> <p>Village maintenance worker</p> <p>Member of WSP team^a</p> <p>Member of WUSC^b</p> <p>No</p> <p>other</p>
Decision making on level of service	During PLANNING of the water system, did anyone in your family participate in deciding about the level of service to be delivered by the system? <p>yes</p> <p>no</p> <p>I don't know</p>
Perceived influence during planning and construction	Overall, who do you think had the MOST influence over decisions about the water system during planning and construction? <p>Donor or Ngo^c</p> <p>Local government</p> <p>Village leaders</p> <p>All users of the scheme</p> <p>Water committee</p> <p>Other</p>

<i>Concept</i>	<i>Items</i>
Water committee meeting discussions on water scheme	How often does WUSC meet with water users to discuss issues about the water system? Monthly Bi-monthly Once every 3 months Once every 6 months Once per year As needed Don't know Never
Knowledge existence of village maintenance worker	Is there a village maintenance worker to look after your main drinking water scheme? Yes/ No
Contribution cash Contribution labour Contribution materials	Did your family contribute any of the following toward the construction of the village's water system? cash labor materials meals / lodging nothing I don't know
<i>Consequences</i>	
Self reported functionality	Is your main drinking water source functioning now? No, not functioning Yes, functioning but not well Yes, functioning well
Expected functionality	Do you think the main drinking water source will be functional one year from now? Yes/ No
Interruption:	In the last 6 months, were there any times when water from main drinking water source was not available for more than one week? Yes/ No
Confidence in reparation:	If main drinking water scheme needed repairs, how confident are you that the problem could be fixed within 1 week?

<i>Concept</i>	<i>Items</i>
	1 = not at all confident to 5 = very confident
Perceived safeness of main water source	How safe do you think your main drinking water source is for drinking? -2 = Very safe to 2 = Very risky
Perceived water taste	How do you perceive the taste of drinking water from your main drinking water source right now? Good Rusty Salty soil Varies from rainy to dry month
Exclusive use of water scheme	Which water source do you use as MAIN drinking water source? Do you also use other water sources for drinking? Piped water in the house or yard (Private tap) Piped water in the village Rainwater harvesting Open source (dug well, pond, spring) Protected source (well, spring) Unmanaged piped system River, Stream or Canal Lake Bottled Water
Treatment after collection from water scheme	<i>Filtered for water system users:</i> Do you use any method to treat your drinking water? Yes / No

Note. ^a WSP team = water safety planning team ^b WUSC = water users committee ^c NGO = non-governmental organization