

Supplementary Material

SM1: Expert interview questionnaire assessing information on stakeholder's perspectives.

General information

Name of the interviewee: [Click here to enter text.](#)

Name of the institution: [Click here to enter text.](#)

Address: [Click here to enter text.](#)

Email: [Click here to enter text.](#)

Phone number: [Click here to enter text.](#)

Sex of the interviewee: [Click here to enter text.](#)

What language(s) do you speak? [Click here to enter text.](#)

Level of education: [Click here to enter text.](#)

From the stakeholder category below, please select the one that represents you the best.

- ☐ Mayors ☐ WWTP Operators ☐ WWTP Managers
☐ State decision makers ☐ National decision makers ☐ National academia
☐ Private sector ☐ Local Community ☐ NGO
☐ Other. Please specify [Click here to enter text.](#)

Social level of problems related to the wastewater management in the region of Panajachel/Tepeji

1. Awareness of the problem

- 1.1. How interested are you in the problems related to wastewater management in the region of Panajachel/Tepeji?

(Not interested) 1 ☐ 2 ☐ 3 ☐ 4 ☐ (very interested)

- 1.2. How aware are you of the problems related to wastewater management in the region of Panajachel/Tepeji?

(Not aware) 1 ☐ 2 ☐ 3 ☐ 4 ☐ (fully aware) ☐ Don't know

- 1.3. Please briefly describe the problems related to wastewater management in the region of Panajachel/Tepeji.

2. Participation

2.1. Information sharing

- 2.1.1. How often have you tried to access certain information regarding problems related to waste water management in the region of Panajachel/Tepeji? *E.g., documents, regulations, books*

(Never) 1 ☐ 2 ☐ 3 ☐ 4 ☐ (many times) ☐ Don't know

- 2.1.2. How much information is publicly available on wastewater management problems in the region of Panajachel/Tepeji? *E.g., in the Municipality, Library, online*

(No information) 1 ☐ 2 ☐ 3 ☐ 4 ☐ (all information) ☐ Don't know

2.1.3. Please specify what kind of information you have been trying to access. If you have received the needed information, please briefly describe from whom/where you received it. And if not, from whom you did not get the needed information.

2.2. Recommendation

2.2.1. How many possibilities are there to give recommendations regarding wastewater management problems in the region of Panajachel/Tepeji? *E.g., events, activities or online*

(No possibility) 1 ☐ 2 ☐ 3 ☐ 4 ☐ (Many possibilities) ☐ Don't know

2.2.2. Have your recommendations been taking into consideration? *E.g., the recommendation was accepted, or the recommendations were unfounded rejected.*

(Not considered) 1 ☐ 2 ☐ 3 ☐ 4 ☐ (Fully considered) ☐ Don't know

2.2.3. Please specify what kind of possibilities exist. If you have given recommendations, what kind of recommendations, where and when?

2.3. Decision-making

2.3.1. How interested have you been in being part of the decision-making process? *E.g., round tables, committees*

(not interested) 1 ☐ 2 ☐ 3 ☐ 4 ☐ (very interested) ☐ Don't know

2.3.2. To what extent have decisions been taken in a co-decision-making process regarding wastewater management problems in the region of Panajachel/Tepeji? *E.g., on the local or national level*

(Not involved) 1 ☐ 2 ☐ 3 ☐ 4 ☐ (Fully involved) ☐ Don't know

2.3.3. Please briefly describe in which kind of decision-making process have you been involved. And specify the process of how decisions are taken.

3. Social Acceptance

3.1. How satisfied are you with the current wastewater management in the region of Panajachel/Tepeji? *E.g., wastewater service, costs*

(Not satisfied) 1 ☐ 2 ☐ 3 ☐ 4 ☐ (Very satisfied) ☐ Don't know

3.2. How satisfied are the citizens of Panajachel/Tepeji with the wastewater management in the region of Panajachel/Tepeji? *E.g., smell, other effects of WWTP*

(Not satisfied) 1 ☐ 2 ☐ 3 ☐ 4 ☐ (very satisfied) ☐ Don't know

3.3. Please briefly describe why are you (not) satisfied. Why you think the current situation is (not) accepted. How do you think can the acceptance of the wastewater management be improved

SM2: Wickedness Analysis questions

1 – Goal conflicts

- Are there any conflicting interests related to the problem (e.g., conflicts related to values, methods, costs)?
- If there are conflicting interests, is there a certain prioritisation of specific interests on the side of one or all actors concerned?
- Is there a need for tough negotiations to address problems or do the actors instead have to coordinate their actions?

2 – System complexity

- What types of factors influence the solution to problems (e.g., different solution options, natural factors, actors, and their interests)?
- Are these factors dynamically evolving (linearly/exponentially)? Is there a need for models to understand dynamics?
- Are the factors interconnected with each other? And is there a need for decision-support tools to understand these connections?

3 – Informational uncertainty

- Is there enough information for decision-making or is there a need to gather additional information?
- If additional information has to be gathered, what types of information are lacking?
- If additional information has to be gathered, is it possible to gather this information or are there any hindrances (e.g., lacking methods and skills, or financial restrictions)?

SM3: Detailed results of the stakeholder perspective of wastewater treatment in each case

Table i: Detailed results of the stakeholder perspective of wastewater treatment for Panajachel

1. General information

From the stakeholder category below, please select the one that represents you best:	
	Answers
Municipality	1
WWTP Operator	1
WWTP Managers	1
State decision makers	0
National decision makers	1
National academia	1
Privat sector	0
Local community	2
NGO	1
Other	2
Total	10

Please indicate your sex	
	Answers
Female	4
Male	6
Total	10

1. Awareness of the problem

(1= not interested - 4= very interested)

(1= Not aware -4= fully aware)

Score	1.1. How interested are you in the problems related to wastewater management in the region of Panajachel?	1.2. How aware are you of the problems related to wastewater management in the region of Panajachel?
1	0	0
2	0	0
3	0	0
4	10	10
Do not know		0
Average score	4.0	4.0

2. Participation

2.1. Information

sharing

(1= Never - 4= Many times)

(1= No information- 4= all information)

Score	2.1.1. How often have you tried to access certain information regarding problems related to waste water management in the region of Panajachel?	2.1.2 How much information is publicly available on wastewater management problems in the region of Panajachel?
1	0	1
2	1	6
3	1	1
4	8	2
Do not know	0	0
Average score	3.6	2.4

2.2. Recommendation

(1= No possibility - 4= Many possibilities)

(1= Not considered - 4= Fully considered)

Score	2.2.1. How many possibilities are there to give recommendations regarding wastewater management problems in the region of Panajachel?	2.2.2. Have your recommendations been taking into consideration?
1	0	3
2	2	3
3	2	3
4	6	1
Do not know	0	0
Average score	3.4	2.2

2.3. Decision-making

(1= not interested - 4= very interested)

(1= very participatory - 4= not participatory)

Score	2.3.1. How interested have you been in being part of the decision-making process?	2.3.2. To what extent have decisions been taken in a co-decision-making process regarding wastewater management problems in the region of Panajachel?
1	0	1
2	0	1
3	0	3
4	10	5
Do not know	0	0
Average score	4.0	3.2

3. 3. Social Acceptance

(1= Not satisfied - 4= Very satisfied)

(1= Not satisfied - 4= Very satisfied)

Score	3.3.1. How satisfied are you with the current wastewater management in the region of Panajachel?	3.3.2. How satisfied are the citizens of Panajachel with the wastewater management in the region of Panajachel?
1	8	7
2	2	3
3	0	0
4	0	0
Do not know	0	0
Average score	1.2	1.3

Table ii: Detailed results of the stakeholder perspective of wastewater treatment for Tepeji

1. General information

From the stakeholder category below, please select the one that represents you best:	
	Answers
Municipality	3
WWTP Operator	1
WWTP Managers	0
State decision makers	0
National decision makers	0
National academia	0
Privat sector	0
Local community	1
NGO	0
Other	3
Total	8

Please indicate your sex	
	Answers
Female	1
Male	6
Total	7

1. Awareness of the problem

Score	(1= not interested - 4= very interested)	(1= Not aware -4= fully aware)
	1.1. How interested are you in the problems related to wastewater management in the region of Tepeji?	1.2. How aware are you of the problems related to wastewater management in the region of Tepeji?
1	0	0
2	0	1
3	2	1
4	5	5
Do not know	0	0
Average score	3.7	3.6

2. Participation

2.1. Information

sharing

(1= Never - 4= Many times)

(1= No information- 4= all information)

Score	2.1.1. How often have you tried to access certain information regarding problems related to waste water management in the region of Tepeji?	2.1.2 How much information is publicly available on wastewater management problems in the region of Tepeji?
1	0	1
2	2	4
3	1	0
4	4	1
Do not know	0	1
Average score	3.3	1.9

2.2. Recommendation

(1= No possibility - 4= Many possibilities)

(1= Not considered - 4= Fully considered)

Score	2.2.1. How many possibilities are there to give recommendations regarding wastewater management problems in the region of Tepeji?	2.2.2. Have your recommendations been taking into consideration?
1	0	0
2	0	3
3	5	1
4	1	3
Do not know	1	0
Average score	2.7	3.0

2.3. Decision-making

(1= not interested - 4= very interested)

(1= very participatory - 4= not participatory)

Score	2.3.1. How interested have you been in being part of the decision-making process?	2.3.2. To what extent have decisions been taken in a co-decision-making process regarding wastewater management problems in the region of Tepeji?
1	0	0
2	0	1
3	1	4
4	6	2
Do not know	0	0
Average score	3.9	3.1

3.3. Social Acceptance

(1= Not satisfied - 4= Very satisfied)

(1= Not satisfied - 4= Very satisfied)

Score	3.3.1. How satisfied are you with the current wastewater management in the region of Tepeji?	3.3.2. How satisfied are the citizens of Tepeji with the wastewater management in the region of Tepeji?
1	0,5	4

2	2	2
3	0	0,5
4	3,5	0,5
Do not know	0	0
Average score	2.6	1.6

SM4: Detailed responses to the workshop/training evaluations

Table iii: Results of the evaluation of Workshop 1 in Panajachel (“Sustainability of wastewater systems: current and future perspectives – an assessment workshop” in Panajachel, Guatemala, from 20–23 March 2018 [40])

1.1 From the stakeholder category below, please select the one that represents you best:	
	Answers
Government official	5
Civil society	3
Private sector	3
Academic	10
Other (1 NGO)	4
Total	25

1.2 Please indicate your sex	
	Answers
Female	11
Male	14
Total	25

2. General evaluation (1 = poor – 5 = excellent)

Score	2.1 What is your overall assessment of the workshop?	2.2 How do you assess the organization of the event?	2.3 How do you rate the balance of presentations and breakout sessions?	2.4 How do you rate the quality of the presentations?	2.5 How do you rate the quality of the discussion sessions?	2.6 How do you rate the quality of the interactive sessions?
1	0	0	0	0	0	0
2	1	2	1	1	1	0
3	4	4	6	4	3	5
4	7	5	6	10	9	7
5	13	14	12	9	12	13
Average score	4.3	4.2	4.2	4.0	4.3	4.3

3. Usefulness of the workshop (1 = no – 5 = yes)

	3.1 Did the workshop help you in understanding the nexus approach?	3.2 Did the workshop help you in understanding the complexity of the problem?	3.3 Did the workshop help you in understanding the dimensions of sustainability?	3.4 Did the workshop help you in understanding the assessment framework of sustainability of wastewater systems?	3.5 Did the workshop help you in identifying sustainable management options for wastewater and sludge?	3.6 Will you be able to use what you have learnt in your work?
Score						
1	1	0	1	0	3	2
2	0	0	0	1	1	3
3	7	1	4	3	4	1
4	5	8	7	7	8	5
5	12	16	13	14	9	14
Average score	4.1	4.6	4.2	4.4	3.8	4.0

3.8 Which 2 topics or aspects of the workshop did you find most interesting?	
Interactive activities	Analytical framework, reference information, documents etc.
International experiences	Quality of the wastewater and wastewater treatment
Main actors, pollution, social conflict	Water management, sludge management (2x)
Sustainability, wastewater treatment	Sludge disposal, water disposal
Dimensions of sustainability	Creating a common basis for the social problems, Laura's presentation (on sludge management options)
The visioning exercise, analysis of actions	To talk about the problem, keeping in mind the technical part
Sustainability analysis, implementation guide	Wastewater reuse, sustainability
The focus of the different activities (economic, social, environmental, technical), the analysis of the problem	Wastewater treatment in other countries, the status of the lake
Integrated water resource management, sustainability of wastewater treatment systems	Technical, management
Problem analysis, international solutions	The focus on the transversality of the social, technical, environmental, and economic spheres

Sustainability of the systems, analysis of the current and future situations	Current base line, applied sustainable technologies
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3.9 Which 2 topics or aspects of the workshop did you find least interesting?	
Management	None
Recommendation to actors/ currently low	Interactive game (bear and hunter)
Water management	Organization, development
All aspects are important	Interactive activities
The presentations	I think everything is interesting
Not applicable	Political topics
I do not find any least interesting topic	Everything is interesting
Expectations of the workshop	

4. Further information

More time for the presentations

More time prior to the event for invitations and organization

Specify solutions and focus on the thematic

More field visits

Punctuality

Congratulations to the event

Design and planning of wastewater treatment plants, methods for sludge treatment

The order of activities: first discuss the technical issue, then visit the treatment plant and then to continue with the used methodology

Invite local actors that know the local situation

A workshop with a lot of learning, would be good to expand it further

Very long sessions, they could be done in less time

Table iv: Results of the evaluation of the Workshop 2 in Panajachel “Sustainability of Wastewater Systems – Presentation of Options” in Panajachel, Guatemala, from 2-4 July 2019 [55]; total respondents = 39.

Score	What is your overall assessment of the workshop?	How do you assess the organization of the event?	How do you rate the balance of presentations and breakout sessions?	How do you rate the quality of the presentations?	How do you rate the quality of the breakout sessions?
1	0	0	1	1	1
2	3	4	1	0	2
3	8	6	9	11	6
4	17	14	19	16	16
5	11	15	9	11	14
Average	3.9	4.0	3.9	3.9	4.0

Table v: Results of the evaluation of Workshop 1 in Tepeji (“Wastewater irrigation in the Mezquital Valley, Mexico: Solving a century-old problem with the Nexus Approach” in Tepeji, Mexico, from 15–17 March 2017 [39])

1. General information

1.1 From the stakeholder category below, please select the one that represents you best:	
	Answers
Government official	1
Civil society	5
Private sector	2
Academic	6
Other	0
Total	14

1.2 Please indicate your sex	
	Answers
Female	9
Male	5
Total	14

2. General evaluation (1 = poor – 5 = excellent)

Score	2.1 What is your overall assessment of the workshop?	2.2 How do you assess the organization of the event?	2.3 How do you rate the balance of presentations and breakout sessions?	2.4 How do you rate the quality of the presentations?	2.5 How do you rate the quality of the breakout sessions?
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	1	2	1
4	4	3	3	2	6
5	10	11	10	11	8
Average	4.7	4.8	4.6	4.9	4.8

3. Usefulness of the workshop (1 = no – 5 = yes)

Score	3.1 Did the workshop help you in understanding the nexus approach?	3.2 Did the workshop help you in understanding the complexity of the problem?	3.3 Did the workshop help you in identifying sustainable management options for wastewater and sludge?	3.4 Will you be able to use what you have learnt in your work?
1	0	0	0	0
2	0	0	0	0

3	0	0	1	0
4	4	3	3	3
5	9	11	10	10
Average	4.4	4.8	4.6	4.4

3.5 Which 2 topics or aspects of the workshop did you find most interesting?	
· Treated WW reuse. (2x)	· Wastewater use effects and resistance of microorganisms to antibiotics.
· Training for children in schools. Awareness raising.	· Eco-technologies (Wetlands) y use of antibiotics (Resistance).
· Wastewater and sludge management.	· Treated water for irrigation / benefit-cost and use of wastewater as a resource.
· Sludge management and benefits of treated water.	· Awareness raising of benefits of water reuse.
· Use of constructed wetlands for wastewater treatment and decentralized treatments.	· Sustainable use of water and resistance genes.
· Interaction between different society actors.	· Use in agriculture and sanitation for the plants.

3.6 Which 2 topics or aspects of the workshop did you find least interesting?	
· There are no least interesting topics. (2x)	· Everything was interesting. (3x)
· Wetlands, their benefits, and construction.	· Sludge incineration.
	· Sludge.

4. Further information

4.1 Please suggest improvements for future events of the organizers	
· Include Ejidatarios in the workshop.	· Congratulations! I also suggest inviting more people for this kind of workshops.
· Excellent workshop!	· I suggest giving more practical cases, less theory, and more field experiences.
· More participation of local people (farmers and consumers) in trainings. (2x)	· I would have liked to see the fieldwork already applied to the processes.
· More participation of industry and academic sector.	· It was well organized, and it had an excellent location.
	· More awareness raising.

Table vi: Results of the evaluation of Workshop 2 in Tepeji (“Sustainability of Wastewater Systems” in Tepeji, Mexico, from 12-16 November 2018 [41])

1. General information

1.1 From the stakeholder category below, please select the one that represents you best:		
	Answers	
Federal decision makers	1	
National decision makers	1	
Plant operator	2	
Private sector	2	
Local community	4	
Municipality	2	
Other	7	
Total	19	1 multiple answer

1.2 Please indicate your sex		
	Answers	
Female	5	
Male	12	
Total	17	1 forgot to specify sex

Score	2.1 What is your overall assessment of the workshop?	2.2 How do you assess the organization of the event?	2.3 How do you rate the balance of presentations and discussion sessions?	2.4 How do you rate the quality of the presentations?	2.5 How do you rate the quality of the interactive sessions?
1	0	0	0	0	0
2	0	0	0	0	0
3	1	0	1	0	0
4	5	4	7	4	5
5	12	13	10	14	13
Average	4.6	4.5	4.5	4.8	4.7

3. Usefulness of the workshop (1 = no – 5 = yes)

Score	3.1 Did the workshop help you in understanding the nexus approach about the integrated environmental resource management?	3.2 Did the workshop help you in understanding the sustainability of current solutions?	3.3 Did the workshop help you in understanding the stakeholder network?	3.4 Did the workshop help you in understanding the complexity of the problem (and how is this complexity addressed)?	3.5 Did the workshop help you in identifying sustainable management options for wastewater and sludge?	3.6 Did the workshop help you in identifying how to implement the identified solutions?	3.7 Will you be able to use what you have learnt in your work?
1	0	0	0	0	0	0	0
2	0	0	0	0	1	0	0
3	1	0	1	1	2	2	0
4	5	3	2	4	5	6	7
5	12	14	15	13	10	9	11
Average	4.6	4.6	4.8	4.7	4.3	4.2	4.6

Table vii: Results of the evaluation of the Technical Training (Training on “Basic Knowledge for the Operation and Maintenance of Wastewater Treatment Plants” 13-17 August 2018, Tepeji, Mexico [56])

1. General information

1.1 From the stakeholder category below, please select the one that represents you best:	
	Answers
Plant manager	2
Plant operator	2
Local community	2
Mayor	1
National academy	1
Other	3
Total	11

1 multiple answer

1.2 Please indicate your sex	
	Answers
Female	3
Male	7
Total	10

2. General evaluation (1 = poor – 5 = excellent)

	2.1 What is your overall assessment of the workshop?	2.2 How do you assess the organization of the event?	2.3 How do you rate the balance of presentations and discussion sessions?	2.4 How do you rate the quality of the presentations ?	2.5 How do you rate the quality of the discussion sessions?	2.6 How do you rate the quality of the interactive sessions?
Score						
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	2	1	3	1	3	1
5	8	9	7	9	7	9
Average	4.8	4.9	4.7	4.9	4.7	4.9

3. Usefulness of the workshop (1 = no – 5 = yes)

Score	3.1 Did the workshop help you in understanding the various treatment concepts?	3.2 Did the workshop help you in understanding the complexity of the operation of several treatments of wastewater in a plant?	3.3 Did the workshop help you in understanding the monitoring and documentation of the operation?	3.4 Did the workshop help you in understanding the technologies of small/decentralized plants?	3.5 Did the workshop help you in identifying sustainable management options for wastewater and sludge?	3.6 Could you apply what you have learned in your work?
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	1	1	0	1
4	0	1	0	1	1	0
5	10	9	9	8	9	9
Average	5.0	4.9	4.8	4.7	4.9	4.8