

PROTOCOL FOR PARTICIPATORY FOOD SYSTEMS MODELLING FRAMEWORK

“Empowering small-scale farmers (SPEAR): towards the SDGs through participative, innovative and sustainable livestock and poultry value chain (LPVC)”.

INTRODUCTION

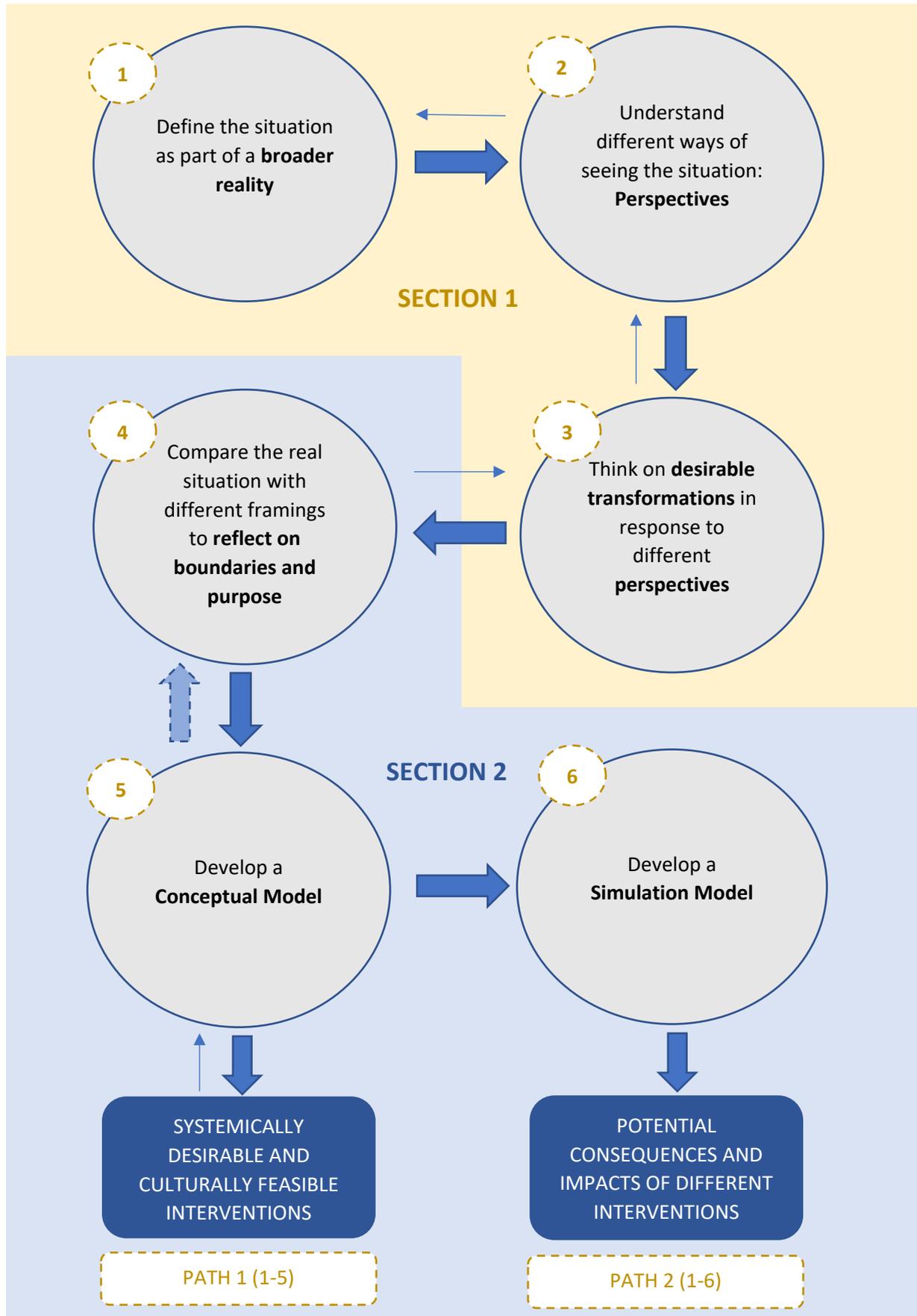
Any analysis intending to find ways to improve a complex system - like food systems - should start by acknowledging different ways in which the system may be perceived and defined, along with finding ways to establish synergies among those different views.

The 6-steps protocol is iterative and cyclic and is based mainly on the Soft Systems Methodology (SSM), developed by Peter Checkland in the late 1960s. One of the most important premises in this methodology is that **addressing a situation considered as complex required an understanding of the multiple perspectives that people brought to that situation** (Williams & Hummelbrunner, 2009). By exploring a situation in this way, we can get to understand and describe how the situation is and ought to be under different perspectives, in the different domains we have considered to collectively define the situation. Then we can collectively design interventions that lead to desirable and feasible changes – according to the wide diversity of factors and perspectives used to describe the situation —.

This methodology is relevant and useful because we have a high diversity of stakeholders that are impacted and impact the situation of interest. Every stakeholder has a way of understanding the situation, that not necessarily address the “formal purpose” of the intervention. This richness will give us more insights for identifying the purposes (in plural) of the intervention and understanding the importance that is given to some factors over others.

The Protocol proposed in this document is divided into two sections. The first section establishes a common language among stakeholders about the big picture where the situation is immersed, acknowledging different perspectives or ways of understanding the system. Then, it goes deep into the different perspectives, considering the interests and expectations that moves each stakeholder. Finally, the perspectives are translated into desired transformations in the system, which are the base to identify different framings - or ways how the situation can be understood -.

The second section starts by reflecting on how the real situation addresses different perspectives or not, which allows a more informed decision about the boundaries and purpose(s) of the system. With this clear, it is possible to identify potential lines of intervention in the system to achieve the desired state and outcomes; the last step, which is not part of SSM, also allows to estimate potential impacts and consequences of the interventions and thus, contribute to better decision-making.



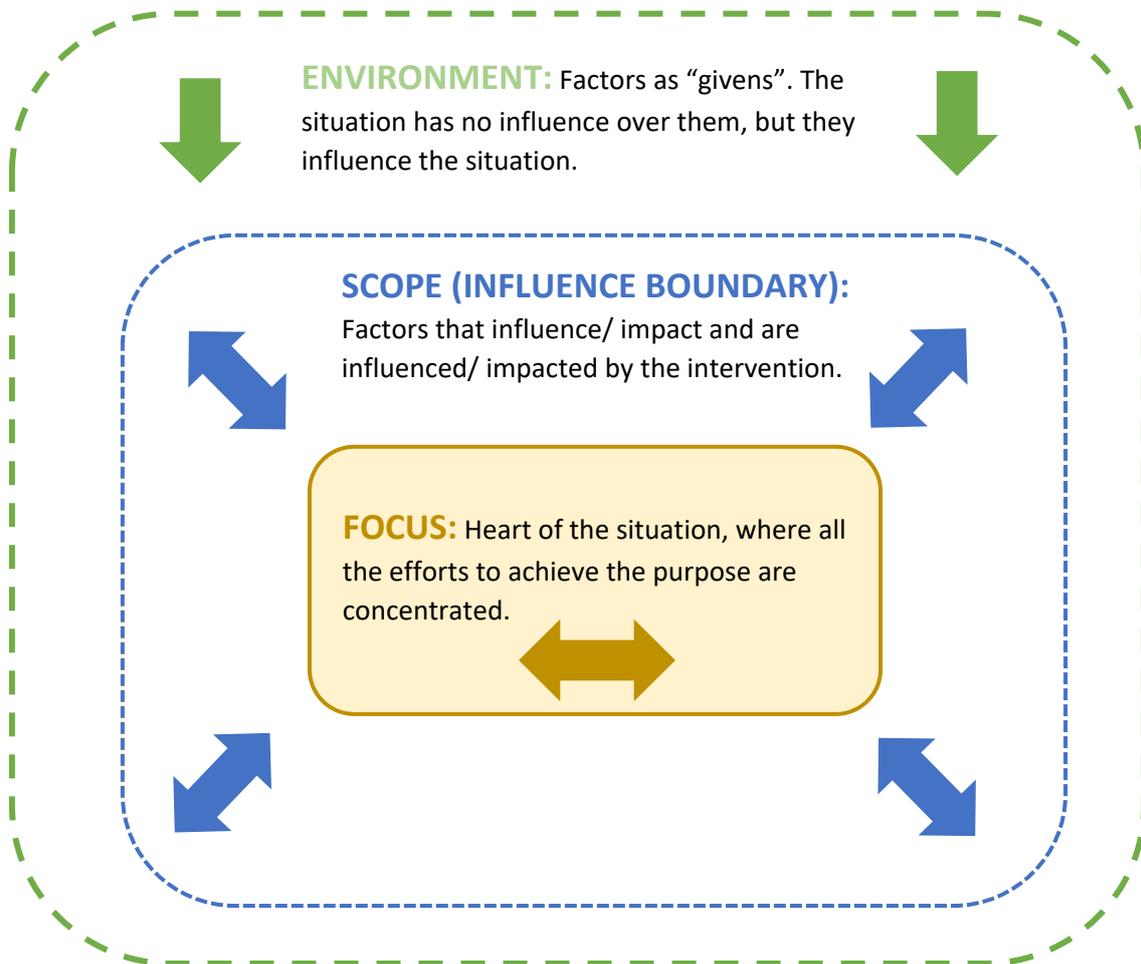
SECTION 1: Understanding the situation as whole from different perspectives

 <p>3 Sessions and 3 activities</p>	<p>The main goal of this section of the workshop is to test to what extent the understanding of the systems is shared, aligned or conflicting among the different stakeholders (including the SPEAR project group).</p>
 <p>Project team Diversity of stakeholders</p>	<p>By understanding of the system, we mean how different stakeholders define the poultry and livestock system in Ghana in terms of how and with what consequences:</p> <ul style="list-style-type: none"> - the food system is defined (elements included and excluded) - the purpose defined - the way the system works is defined - the pathways to improve and enhance the system are defined - along with other assumptions underlying the definition of the system
 <p>4,5 hours</p>	<p>Any analysis intending to find ways to improve a system should start by acknowledging different ways in which the system may be perceived and defined, along with finding ways to agree and reconcile these different views.</p>
 <p>Flipcharts Markers Sticky dots Tape Facilitation cards Voice recorder</p>	

1. Defining the “situation” as part of a broader reality

To understand the “situation”, we need to have a general idea of the reality where it is embedded; this can be made by **exploring the factors** that could explain this reality and **analyzing the nature of the inter-relations** between them. To build a common ground language over the big picture where the situation is immersed, it is important to involve multiple and diverse stakeholders.

In the diagram below we show a way of understanding this reality, organized in three levels (Williams, 2019). First, we have the "heart" or **focus** of the situation under analysis, where all the effort to achieve the purpose(s) are concentrated. In the second level are included factors that influence and are influenced by the components of the smaller box, which define **the scope or the influence boundary** of the situation. Finally, the third level refers to the **environment** where the situation is embedded and includes factors that has some influence over the situation but are not influenced by it (given factors).



To think in our situation in a broader sense, we will move beyond the activities and processes that are typically included in the value chain analysis and start thinking in factors that are related to these activities – impacting over them or being impacted by them – to understand the reality where this value chain is immersed.

To keep in mind all the possible types of factors, we use the following categorization, as defined by the TEEBAgriFood framework:



With all these factors in mind, we will represent the situation’s complexity in an unstructured way. This will allow us to have a first approximation of the situation that we want to analyze and their interrelationships with the wider environment.

Finally, thinking in this way will help us to identify all the possible factors related to the situation, which will give us some insights to identify the scope or influence boundary, the “given factor” provided by the environment, and the possible purpose(s) of the situation.

ACTIVITY 1: RICH PICTURE	
Purpose	
<p>To create a common ground language between stakeholders through the exploration of the reality that brings us together, in an unstructured way. These will provide stakeholders with a wider idea of the elements and relations that can explain that reality.</p>	
Steps	Materials
<p>1.1 Individual reflection on the situation of interest and first representation</p> <p>Each person will describe – by drawing – the situation as they understand it, considering as many aspects as possible.</p> <p>To start, we will ask the participants to reflect on the situation that brought them here, either because they want to address it, change it or improve it. The situation can be drawn as a group of elements that are related to each other.</p>	<p>One/two piece/es of paper for each participant, and one marker for each of them.</p> <p><u>Time estimation:</u> 20 minutes + 10 minutes of context setting</p>

When we talk about elements, we should think on activities, processes and resources, and also in social and personal aspects related to people and institutions that have some role in the situation. In other words, we should have in mind the four capitals described above (natural, produced, human and social).

(*) Here we include some guidelines that will help us to have in mind the four capitals in our descriptions:

Natural capital:

- Natural resources (soil, water, biodiversity...) that are somehow involved in the situation, by being used in it or impacted by it.

Produced capital:

- Infrastructure, buildings and machinery used or needed in the situation.
- Role of research in the situation analyzed. How is used and how is impacted?
- Finance at institutional and individual level: How this condition other elements in the situation? And how is also impacted by the situation?

Human capital:

- People/ institutions that influence and/or have an impact on the situation.
- People/institutions that are influenced and/or impacted by the situation.
- People's Skills and knowledge in the situation. Role in the situation?
- Interests, motivations and aspirations that people express.
- Issues and conflicts that people express.

Social capital:

- Laws and regulations that affect and could be affected by the situation.
- Conditions that enable or difficult the situation: In public or private institutions.
- Social cooperation: Role of groups, organizations and cooperatives in the situation, and how the situation affects them.

Is important to describe all the aspects that can help us to understand the situation under analysis, as the participants see it.

Alternative ways to apply this tool

The first step could be only an individual reflection on what are the interests that each person has and how they define the situation that brings them to the workshop. With that idea clear, the second step could be sharing individual interests and build a common ground language, regarding which elements - coming from the 4 capitals - can explain the situation and how are they related to each other and with the activities in the value chain. The guidelines to have in mind the four capitals in the description of the big picture will be used in this last step.

Final reflection and main insights of the activity

At the end of this activity, we will put in common the idea of that bigger reality where the situation is immersed, making easier to explore its scope or influence boundary:

- What elements in the picture are “given” by the environment, but independent of the situation of interest? → Environment.
- Where in the picture, the situation’s power to influence is reduced or weakened? → Scope

Also, we will have a first idea of the most significant or valuable inter-relationships, which will help in the exploration of the possible purpose(s) of the situation in the next steps.

2. Identification of the different ways how a situation can be understood or framed

Each stakeholder engaged in the situation understands it in a way that **reflects their interests, motivations, values and beliefs**. Knowing these different ways of understanding the system will allow us to have a wider understanding, that is more accurate and truer to the complex reality. Thus, our **analysis will acknowledge the diversity of stakeholder’s perspectives**. This intends to avoid biases derived from privileging our own understanding of the system over other’s.

Following the terms used in the first activity, the different ways of understanding the situation could mean that the focus, scope and environment in a situation not necessarily are the same for every stakeholder, and of course neither the ways how the elements are organized and interrelated.

The first step in this activity is **identifying the people or institutions that have some role in the situation**, in other words, the stakeholders. Each stakeholder, besides having a role in the situation, has some **interest or expectations that moves their behavior** and determine their understanding of the situation (step 2). Knowing this, we can have an idea of the different interests in the situation that will lead us to key framings.

ACTIVITY 2: STAKEHOLDERS AND STAKES ANALYSIS													
Purpose To identify the key stakeholders and understand what moves their behavior and their ways of understanding the situation. With that information, to formulate the key interests present in the situation under analysis, which will finally lead us to identify framings.													
Steps 2.1 Stakeholder analysis: Stakeholders are people or institutions with a significant impact or that are significantly impacted by the situation. Considering that all the participants have in mind the results from the first activity, we will make a quick list of stakeholders and answer to the following questions: - What they influence and/or have an impact on? - By what are they influenced and/or impacted?	Materials We will work on a table similar to the one below. This can be fulfilled with the information that came out of the discussion in activity 1. There is no need to do an extra activity for this. <table border="1"> <thead> <tr> <th>Stakeholder role</th> <th>Influence or have an impact on...</th> <th>Are influenced/ are impacted by...</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td></td> <td></td> </tr> <tr> <td>1.</td> <td></td> <td></td> </tr> <tr> <td>...</td> <td></td> <td></td> </tr> </tbody> </table>	Stakeholder role	Influence or have an impact on...	Are influenced/ are impacted by...	1.			1.			...		
Stakeholder role	Influence or have an impact on...	Are influenced/ are impacted by...											
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...													
2.2 Key interests’ analysis: Is what the stakeholders have in game in the situation (gain/ lose) or the reason why they are part of the situation.	Facilitation cards + tape or sticky notes (big enough so they can be read from a distance) Markers												

<p>From the previous discussion we will have an idea of the key interests that lead us to understand the different framings under which the situation can be understood. A framing is something that “<i>has to do</i>” with the situation. There might be for instance an economic framing related to the income at the household level, but there might be many other framings that condition how the situation could be understood (ie. Food and nutrition security, culture, etc.).</p> <p>Knowing the key interests, we will collectively discuss how these can be translated into framings that reflect different ways of understanding the situation.</p>	<p><u>Time estimation:</u> 30 – 50 minutes (Steps 1 and two can be conducted at the same time)</p>
<p>Alternative ways to apply this tool</p>	
<p>Discussing the role of the human capital in the first activity will provide us with the main inputs for the stakeholder’s analysis. While the discussion is taking place, one moderator per group will fulfill the table (2.1). Finally, that results will be shared and discuss with the stakeholders as the first step of this activity.</p>	
<p>Final reflection and main insights of the activity</p>	
<p>At the end of the activity we will know under which framings the situation can be understood. Also, we will know to what extent those framings can contribute to synergies, conflicts or tensions among participants.</p> <p>Finally, this will provide some inputs about which framings are being more supported by the stakeholders, why and with what consequences.</p>	

3. Deeping into framings: Think on desirable transformations that answer to stakeholders’ different interests.

“Only observing a situation and then modelling it will lead to fewer insights than **identifying the different ways a situation can be appreciated** and modelling each of those ways” (Williams and Hummelbrunner, 2009, p 242).

In this activity, we will go deeper into each framing coming from Activity 2. To that, we will collectively think about **desirable transformations** that answer to each of the framings already identified, and in how and why to do these transformations. We also reflect on the role that different agents may play in fostering or hindering that desired transformation.

ACTIVITY 3: TRANSFORMATION AND AGENTS (CATWOE) ANALYSIS	
Purpose	
To discuss the following aspects of the situation of interest – that we started to co-define in the first step of the workshop – in order to know the different ways of understanding the situation and finally reflects on its boundary.	
Steps	Materials
<p><u>Aspects to discuss:</u></p> <p>Ideally, the discussions will be maintained separately with the different groups of stakeholders created according to the framings in the last activity. Questions to be addressed are the following:</p> <ol style="list-style-type: none"> 1. Given the situation, what would be the desirable transformation in this situation? (T) 2. Why is this transformation desirable? What is the rationale behind it? (W) 3. Who are impacted positively and who negatively with the transformation? In other words, who are the beneficiaries and who the victims? (C=B+V) 4. Who enables the transformation to take place? (A) 5. Who is the responsible for the existence of the situation of interest? To who this situation answers? (O) 6. What factors can be considered as “given” by the environment? Understanding that these factors cannot be influenced by the situation. (E) <p>The final task is to form a statement of the situation according to each framing, including the components that come out from the questions above.</p>	<p>Voice recorder for the group discussion? (if appropriate)</p> <p>Flip charts (2-4)</p> <p>Facilitation cards + tape or sticky notes (big enough so they can be read from a distance)</p> <p>Markers</p> <p>Sticky dots</p> <p>TIME ESTIMATION: 1h30min with each group 2 – 4 groups are foreseeable If groups can be facilitated in parallel sessions (enough rooms, materials and facilitators), this activity may last around 1h30m, otherwise it would be as long as the number of groups needed to be facilitated sequentially.</p> <p>If facilitation in parallel is impossible, it could be done with all stakeholders at once in a longer session. We would aim to stay around 2h length, since more use to be too much.</p>
Alternative ways to apply this tool	
If the participants are clearly divided by two or more different/ conflictive framings, this activity will be made by groups according to those different framings. If there is a high level of complementarity or synergy among framings, or if there are no clear differences between them, the activity can be made in one big group or more groups if there are a big number of participants.	
Final reflection and main insights of the activity	
To each framing, we will formulate a statement of the situation, focused on a desirable transformation that answers the interests and values behind. This is the first step in the modeling process.	

SECTION 2: Boundary reflection and foundations for the modelling process

 <p>1 Session</p>	<p>With all the insights of the workshop, we can start to collectively reflect on important matters as the boundary and purpose(s) of the system, to start the modelling process. This collective debriefing is important to keep the co-creation process among ourselves in the interpretation of the information gathered in the workshop. It also may allow us to reflect on desirable and feasible transformation pathways.</p> <p>Objectives:</p> <ul style="list-style-type: none"> - Reflect on how the actual situation is considering/ addressing the different framings and perspectives of the situation, and with what consequences. - Reflect on boundaries and purpose of the system to develop a conceptual model that allows us to think in systemically desirable and culturally feasible interventions that improve the situation to achieve the defined purpose(s). - (*) Develop a simulation model to simulate scenarios and explore what-if situations, regarding to the interventions that we identified by developing the conceptual model. <p>*The inclusion of the last objective will depend on the insights found and the expected results.</p>
 <p>Project team Field experts</p>	
 <p>4,5 hours</p>	
 <p>Flipcharts Markers Sticky dots Tape Facilitation cards Voice recorder</p>	

4. Reflecting on boundaries and purpose of the system (Step 4) to develop a conceptual model (Step 5)

In practice, every situation is limited in some way, because **all observations are partial** and is not possible to see everything. Therefore, is important to acknowledge that our decisions about **what to focus and what to ignore will have consequences**.

As part of the modeling process, it is important to reflect on how the actual situation is considering or addressing the different framings and perspectives of the situation. To do that, we will **compare the desirable transformations - that came from the different framings - with the actual situation** and discuss how the different interests are being considered or addressed in the actual situation, why and with what consequences.

This comparison is what makes that the process of developing the conceptual model - besides reflecting the understanding of the situation – **changes the understanding of the situation** (Robinson, 2008). This is possible because it creates the conditions for people with different perspectives discuss and decide in a more informed way what to prioritize, being aware of the consequences.

By doing this comparison, we will gain insights and knowledge about the real situation. The discussion around this will help us to **decide what of the scope to include and exclude, and which perspectives to privilege** in the design of interventions to improve the situation; these decisions will finally reflect the **values that underpin the desired transformation**. This process will be iterative and repetitive, with continues and cyclic discussions that will finally end in a conceptual model with clear boundaries and purpose.

Even if the activity is focused in the conceptual model, the aim of this process is not the development of the model, but to **find a convenient arrangement between different interests in the situation**, an arrangement which could be an **improvement of the initial problem situation**.

The conceptual model will help us to **identify systemically desirable and culturally feasible interventions** to achieve the desired transformation/ purpose. Also, regarding the next activity, it will define what to represent and how to represent it in the simulation model.

ACTIVITY 4: DEVELOP A CONCEPTUAL MODEL	
Purpose	
<p>By comparing the different framings with the “real situation”, we will explore how these are addressed or considered in it. In an iterative process of discussion and modeling, we will define what perspectives to privilege, which will lead us to a situation with clear boundaries and purpose that can be represented in a conceptual model.</p> <p>Finally, all the process will allow us to explore possible interventions to achieve the desirable transformation in the system, comparing the models coming from the privileged perspectives with the actual situation.</p>	
Steps	Materials
<p>4.1 To ask questions of the real situation, we will reflect on each framing that came from Activity 3 (CATWOE).</p> <p>To facilitate the comparison, we will develop each framing considering the following aspects:</p> <ul style="list-style-type: none"> - Activities to achieve the transformation. - Dependencies between activities. - Factors given by the environment that are already identified. <p>Is important to <u>think about simple models for each CATWOE</u>. We can start developing a conceptual model for one CATWOE, and then run through the process of the modelling again,</p>	<p>Recorder for the group discussions. Flipchart Markers Facilitation cards/ Post-its Sticky dots</p>

<p>using others CATWOE to facilitate the comparison and gain real insights of the complexity of the real situation, <u>exploring recurring themes and identifying contradictions</u> between models coming from different perspectives.</p>																
<p>4.2 Reflects on the boundary of the actual situation, by comparing the models that came from the key interests of the stakeholders (CATWOE), with the actual situation (real world).</p> <ul style="list-style-type: none"> - Which perspectives or interests are being prioritized and which marginalized? What is left outside? - What are the implications of setting this boundary? - What values underpin the situation then? <p>This will be done by having continues and cyclic discussions during the comparison process, and then returning to the conceptual model as many times as needed. As a result, we will decide what perspectives we want to prioritize, setting in this way the boundary and purpose of the system that will be represented in the conceptual model.</p>	<p>To compare the models, we can just discuss about it in an unstructured way or we can ask some questions per component:</p> <table border="1" data-bbox="858 636 1353 1102"> <thead> <tr> <th>Questions</th> <th>Comp 1</th> <th>Comp ...</th> </tr> </thead> <tbody> <tr> <td>Does it exist in the real world?</td> <td></td> <td></td> </tr> <tr> <td>How does it behave?</td> <td></td> <td></td> </tr> <tr> <td>How is its performance identified and measure?</td> <td></td> <td></td> </tr> <tr> <td>Is this process any good?</td> <td></td> <td></td> </tr> </tbody> </table> <p>Flipchart Markers</p>	Questions	Comp 1	Comp ...	Does it exist in the real world?			How does it behave?			How is its performance identified and measure?			Is this process any good?		
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Alternative ways to apply this tool

The conceptual model(s) develop in this stage can be done using different system tools. Here we propose two options that show the relationships between key concepts in a system, including feedback relationships, facilitating a better understanding of the system. Neither can predict patters of behavior.

1. Causal Loop Diagrams (Williams & Hummelbrunner, 2009): Graphical representations that link together key variables and indicate the causal relationship between them.
 - To apply this method is important to identify the relevant elements of the situation of interest and transformed these elements into variables that can be measurable. By identifying the variables that we want to include, we will establish a boundary.
 - Then, the relationships between variables will be illustrated by arrows, indicating the direction of influence (positive or same, and negative or opposite).
 - And finally, forming the feedbacks that can be reinforcing (+) or balancing (-).
2. Fuzzy cognitive mapping (Gray et al., 2018): Graphical representations that show the relationships between key concepts in a system, including feedback relationships. It is a semi-quantitative method that use mathematical associations with qualitative weights between -1 and 1, being the first one a strong indirect relation, and the last one a strong

direct relation. The use of FCM is focused on the aggregation of stakeholders and expert’s knowledge.

Final reflection and main insights of the activity

This iterative and reflective process give us some ideas of possible interventions to reach the desirable transformation in the system. To assess the feasibility of this interventions, we will consider the information that the stakeholders facilitate us and we will explore some key secondary information.

5. Developing a simulation model

A simulation model, like System Dynamics among others, allows us to understand the events happening in the situation of interest, by analyzing the interrelations between variables (Williams & Hummelbrunner, 2009)

By including System Dynamics in the modelling part, **we make possible to probe if the suggested “culturally feasible and systemically desirable” changes could work in the real world** as we expected (Rodriguez-Ulloa and Paucar-Caceres, 2005). This is especially useful to rapidly test policy options variables (Williams & Hummelbrunner, 2009).

This method is based on the idea that **the elements in the system have a value (stock) which can change over time through inflows and outflows**. Thus, the dynamic behavior of a system is explained by the relationships between stocks and flows variables, through a **stock-flow diagram** where everything is shown in mathematical terms.

ACTIVITY 5: DEVELOP A SIMULATION MODEL	
Purpose	
To simulate different interventions and explore potential impacts in the variables that we consider relevant.	
Steps	Materials
<p>5.1 Develop a dynamic hypothesis to explain the situation of interest: The conceptual model developed in the previous activity can be used as a main input in this activity.</p> <ul style="list-style-type: none"> - <u>Stock variables</u>: Quantities accumulated from the past that exist at a specific point of time. Are represented as a rectangular box. - <u>Flow variables</u>: These describe the change in stock variables, can be inflows or outflows. Are represented by a double-lined directional arrow and a valve. - <u>Boundaries</u>: Limit of the system that defines the exogenous factors that has 	<p>Workshop insights Knowledge of all the participants (local knowledge is very important). Flipchart Markers</p> <p>Additional secondary information will be needed: Once we start the modeling process, information gaps will be identified. The simulation model needs variables, values and equations linking every variable. These gaps can only be found once the process starts, since the models would be created for this specific situation. It would require the</p>

<p>no influence on the variables consider as part of the system.</p>	<p>contribution of STEPRI staff to fill in these gaps, mostly through key informants' interviews.</p>
<p>5.2 Draw the stock-flow diagram starting with one or more fundamental relationships between variables. Everything must be quantified, and the relations defined with a mathematical function.</p>	<p>The accuracy of these information determines the utility of the model. This is the critical aspect of this second path.</p>
<p>5.3 Build a simulation model by assembling all the elements and express all relations as mathematical equations. It is important to check if the stock values can be changed only by flows, that every flow is connected to a stock, and that stocks are never directly linked to other stocks.</p> <p>Simulations can be run to test the validity of the model and explore the consequences of different types of intervention.</p>	
<p>Alternative ways to apply this tool</p>	
<p><u>Option 1:</u> The simulation can be done having as a starting point the conceptual model (Causal Loop Diagram of Fuzzy Cognitive Mapping). The variables used in these models should be translated into stock and flows variables, in order to develop a System Dynamics model.</p> <p><u>Option 2:</u> To starts right away with stock-flows diagrams, having in mind the boundaries defined in all the reflection and discussions made in the conceptual model building process.</p>	
<p>Final reflection or main insights</p>	
<p>This method allows us to simulate the impacts of different interventions in the system. Also, it allows us to compare proposed lines of interventions to improve the decision-making processes.</p>	

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