Engaging Stakeholders in Water Resources Planning and Management Discussions via Causal Loop Diagrams

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OUTLINE OF TODAY'S TALK

1. Why engage stakeholders?

2. Causal loop diagrams.

3. Example of using causal loop diagrams to facilitate stakeholder discussions.

4. Participatory Model Building Framework

Benefits of stakeholder engagement

1. For decision making.

2. For plan implementation.

3. For social capital in society.

Benefits of stakeholder engagement

1. For decision making

   – Critical source of local knowledge, data, & opinions.

     Quality & quantity of knowledge & data improved.

Benefits of stakeholder engagement

2. For plan implementation

- Creates shared understanding of problems, goals & strategies.
- Increased sense of stakeholder ownership results in:
  - Increased support & involvement in implementation.
  - Increased monitoring by stakeholders.

Benefits of stakeholder engagement

3. For social capital in society:

- **Ethical consideration**: people should be able to influence basic social circumstances of their lives.

- Engaging stakeholders is a form of **participatory democracy**:

  Expands influence of those who are affected by management decisions, allowing them to voice their own needs & definitions of well-being rather than leaving those determinations solely to water managers.

  Facilitates increased empowerment of disadvantaged.

Who Should Be Included in a Participatory Process?

Two main steps:

1. Internally (e.g., within a watershed organization, or research team, etc.):

   Brainstorm, assess, & invite first set of key stakeholders.

   Can use various frameworks: Elias et al. (2002) or Inam et al. (2015)

2. At first series of stakeholder meetings:

   Ask invited stakeholders if they think any other stakeholders/groups should be invited.

   Invite these stakeholders.

Final composition should involve representatives of all roles:

Decision makers, users, implementers & experts

Plus stakeholders who are related to at least one of the attributes of

Power, legitimacy, urgency, & interest.

Plus ensure traditionally under represented stakeholders are included

Causal Loop Diagrams
and
System Dynamics Modeling

System dynamics (SD) developed in 1950s by Jay Forrester at MIT.

SD can help to understand the behavior of complex systems over time.

SD *different* from other approaches to studying complex systems due to:

use of *feedback loops* which help describe how even simple systems can be 'complex' & *nonlinear*.

Causal Loop Diagram (CLD)

Important tool in SD

Help visualize how different variables in a system are interrelated.

Each variable connected by an arrow to one or more variables upon which it has a causal influence.

Arrowhead delineates the direction of causality.

Causal Loop Diagram

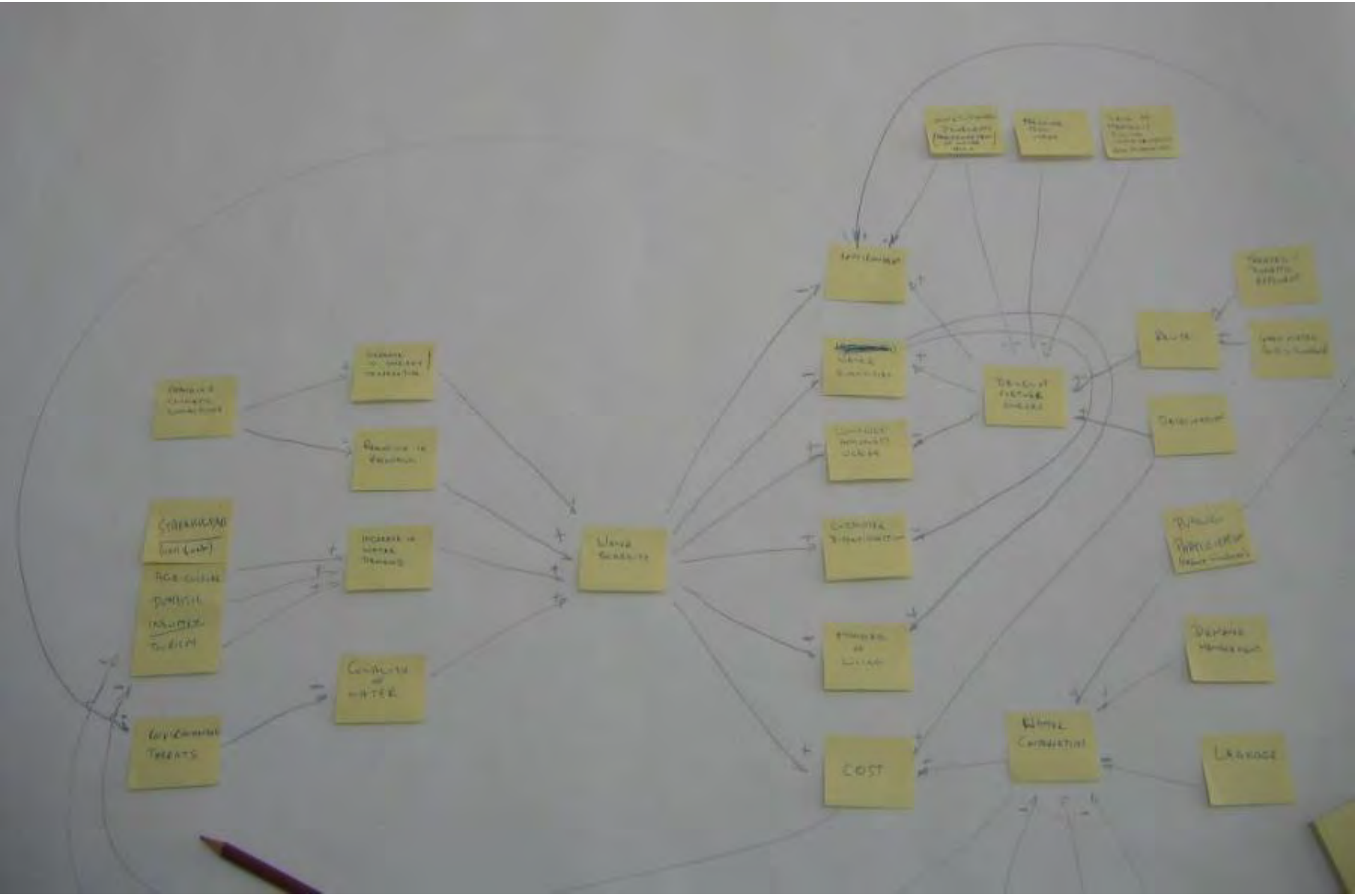
Mental map representing what is important to a stakeholder about a management issue:

- Important elements of system
- Their relationships to one another
- Problem, causes, consequences, feedbacks, strategies.

Can identify:

1. Beliefs about how system works
2. Problems & solutions

Example of CLD: Water scarcity in Cyprus



Causal Loop Diagrams (CLDs)

- Help capture qualitative understanding

- CLDs easily understood by stakeholders

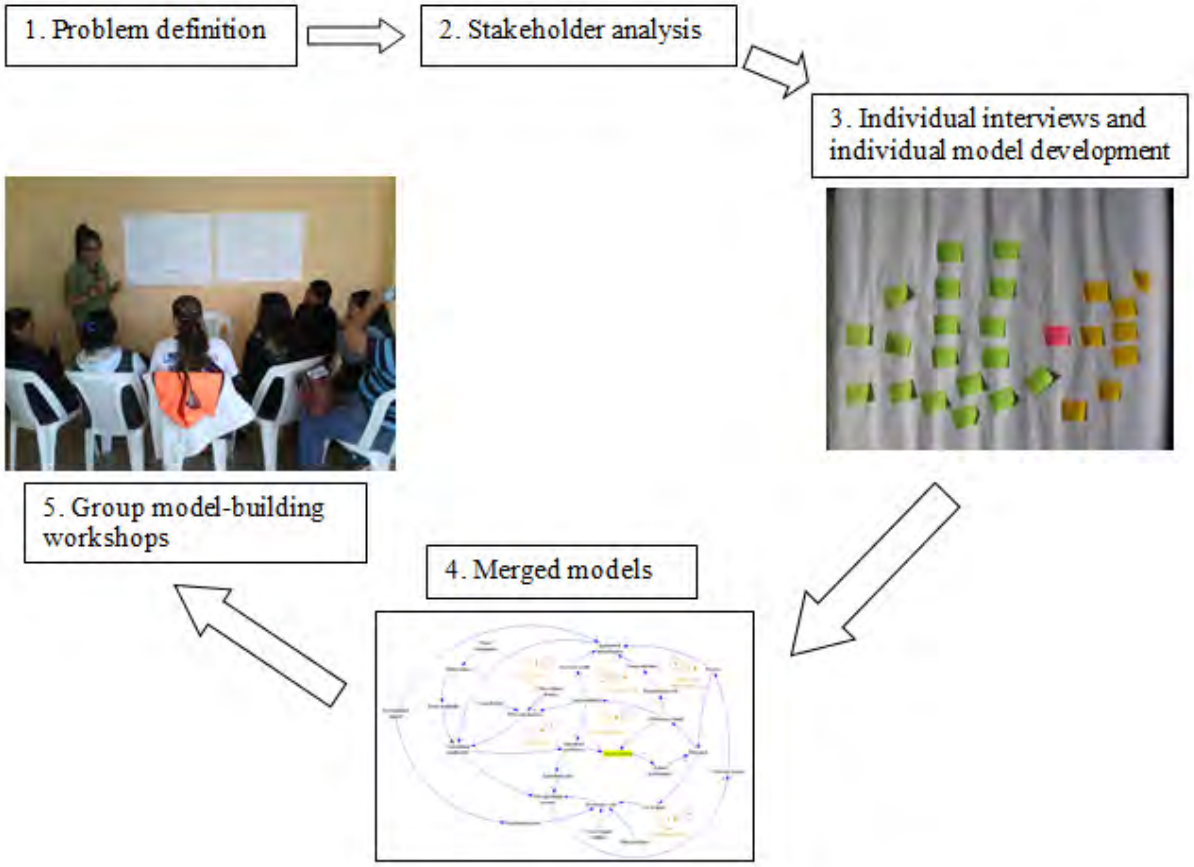
- Facilitate inclusion of stakeholders + productive discussions

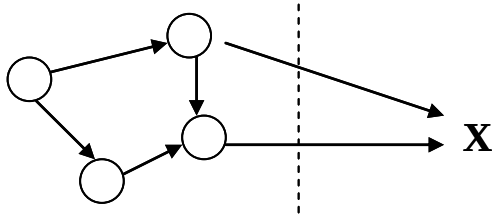
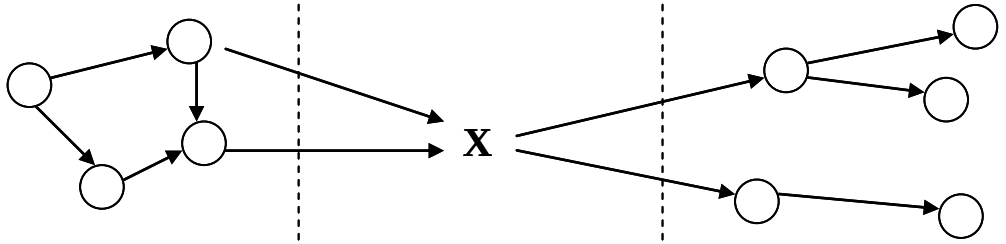
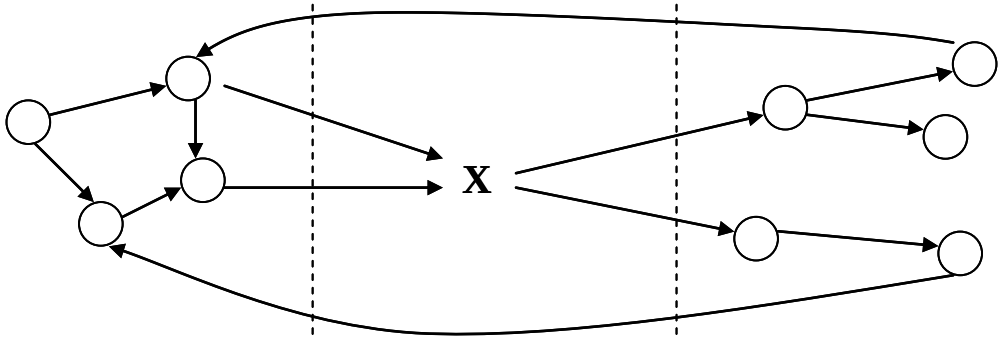
- Often modeling process itself – rather than models created – offers greatest value

- Help with reflection on:
    - Mental models of stakeholders
    - What is and is not known / data
    - Different perspectives

- Help build human capacity

Building a Participatory CLD



	Causes	Problem variable	Consequences
Step 1: Identification of problem variable		X	
Step 2: Adding causes		X	
Step 3: Adding consequences		X	
Step 4: Identification of feedback loops		X	

X = problem variable
◯ = other variables

(Vennix, 1996)

Identification of Key Stakeholders

Need to identify key stakeholders (many approaches e.g., *Elias et al. 2002; Inam et al. 2015*)

Ensure diverse representation

- local stakeholders (e.g., farmers, …)
- sectors: industry, agriculture, commerce, ….
- government (municipal, provincial, federal)
- 'experts' (water, agriculture, social issues, modelers, academics)
- NGOs
- traditionally under-represented communities (e.g. Indigenous communities in Canada)
- Etc…

Identification of Key Stakeholders

Example - Framework of Elias et al. (2002) can be used:

(i) Listing of stakeholders, including marginal ones, achieved through brainstorming.

(ii) Their categorization on the basis of their roles.

(iii) Their prioritization according to their attributes.

(iv) Their selection on the basis of their power and interest.

Inclusion
of
Traditionally Marginalized Communities

In our projects, team members (including MSc and PhD students) must learn local languages and conduct CLD building exercises in that language.

Example: our project on water and food security in rural Guatemala:

- Mayan languages are our official project languages

- Research team collectively speaks Spanish, Kaqchikel, Tz'utujil, and K'iche't

Pictures from CLD process

in our

Water & Food Security Project

in

Guatemala

Developing a CLD

Following types of questions can be asked to help stakeholder develop their CLD:

1. How has the problem developed over time?

2. What are the main direct and indirect causes of the problem's development, including link polarities?

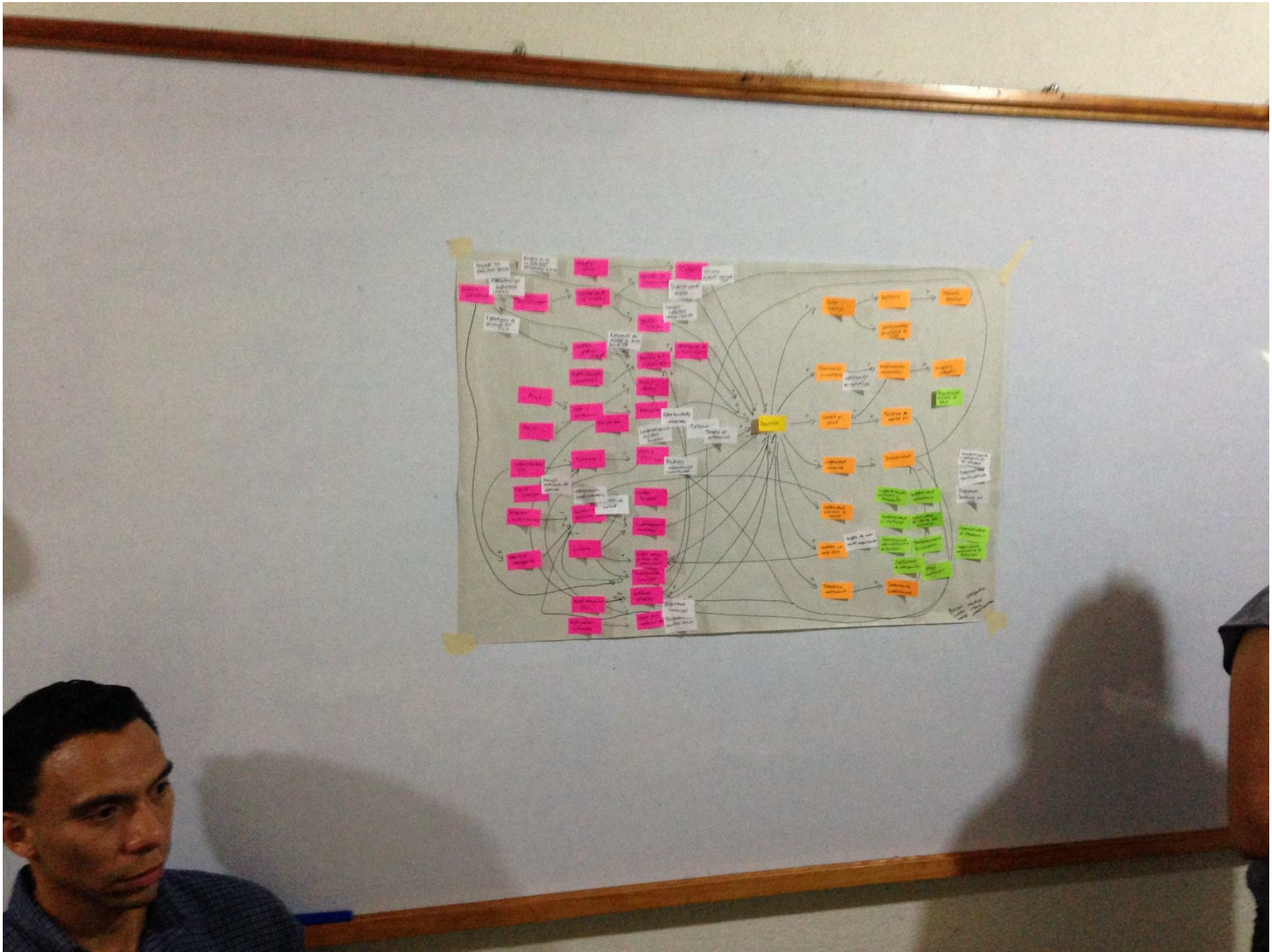
3. What are the consequences of the problem?

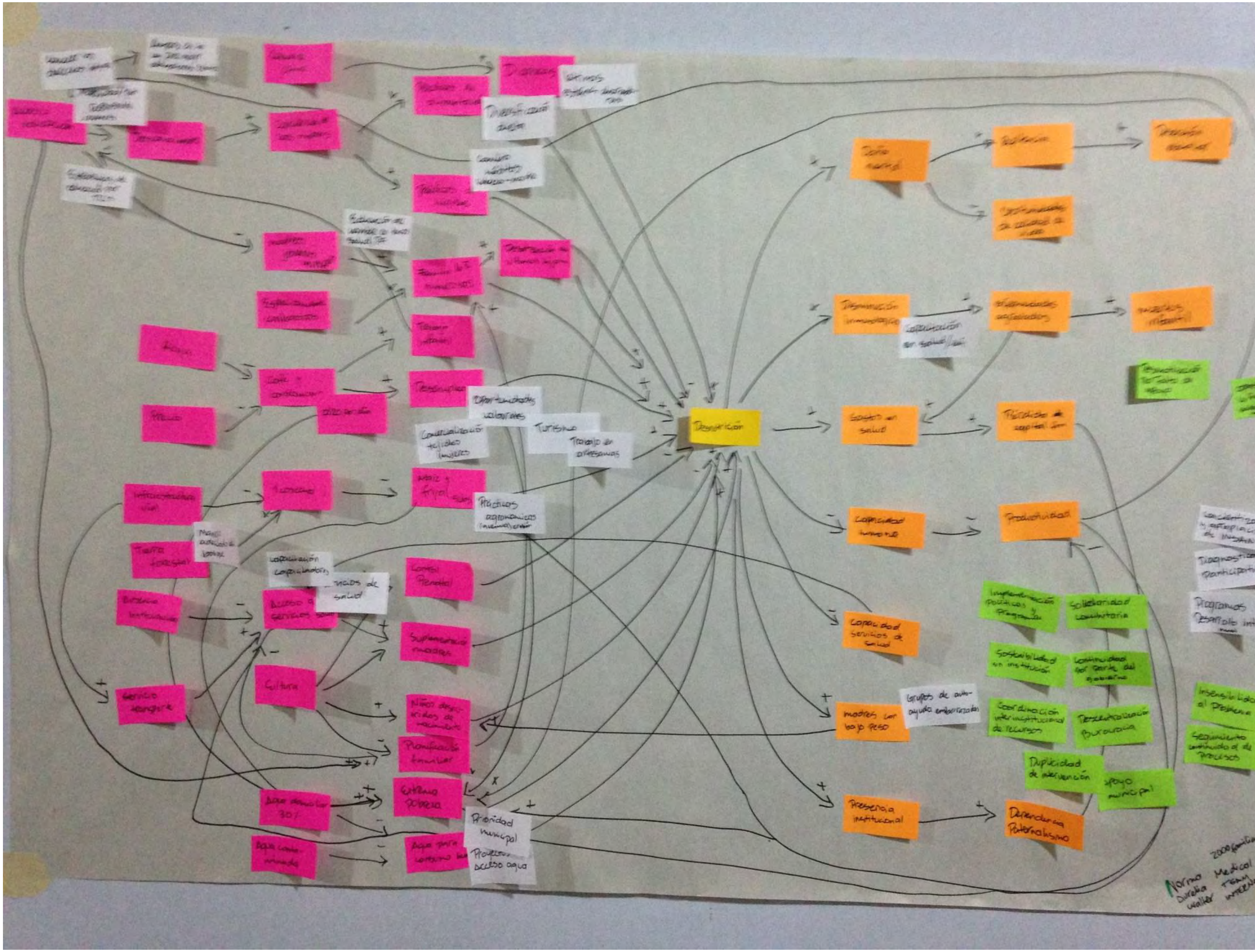
4. What are main feedback processes?

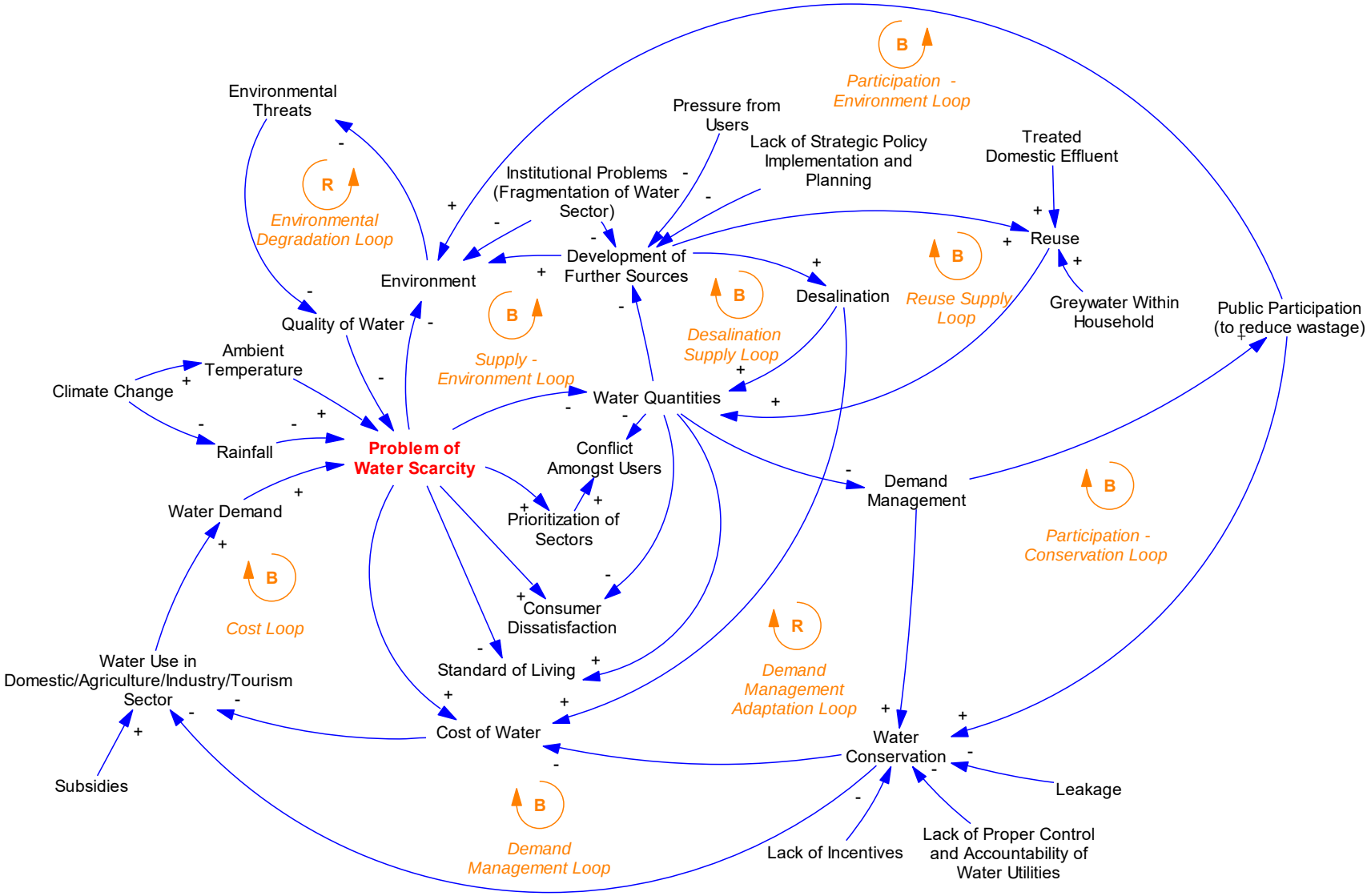
5. What kind of short-term policies do you think can be adopted to solve this problem?

6. What kind of long-term polices can be adopted to solve this problem?

7. What are the main hurdles in the success of these policies?




Diarreas
Diversificación dieta
Café y ...
Pobreza
Maíz y frijol
Oportunidades laborales
Turismo
Trabajo en artesanías
Prácticas agronómicas
Tierra forestal
Servicios de salud
Acceso a servicios salud
Cultura
Control Prenatal
Planificación familiar
Extrema pobreza
Agua domiciliar 30%
Agua contaminada
Agua para consumo
Prioridad municipal
Proyectos acceso agua
Desnutrición
Daño mental
Disminución inmunológica
Capacitación en salud
Gastos en salud
Capacidad trabajo
Productividad
Capacidad servicios de salud
Madres con bajo peso
Grupos de autoayuda embarazadas
Presencia institucional
Dependencia Paternalismo
Implementación políticas y programas
Solidaridad comunitaria
Sostenibilidad en instituciones
Continuidad por parte del gobierno
Coordinación interinstitucional de recursos
Descentralización Burocracia
Duplicidad de intervención
Apoyo municipal
Insensibilidad al problema
Seguimiento continuidad de procesos
Programas Desarrollo int
Diagnósticos participativos
2000 familias
Norma Dutra Walker
Medical Team International



Example of a CLD developed by stakeholders after a *3-hour session*

Simple Example

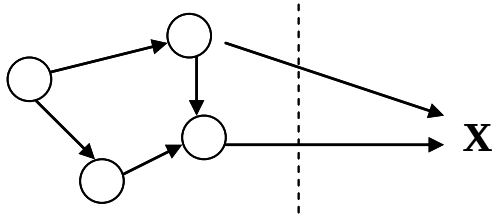
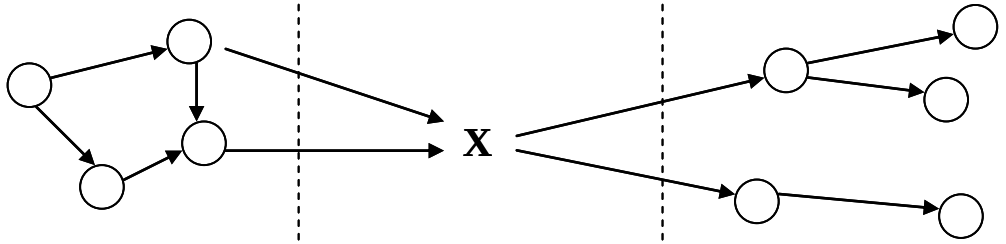
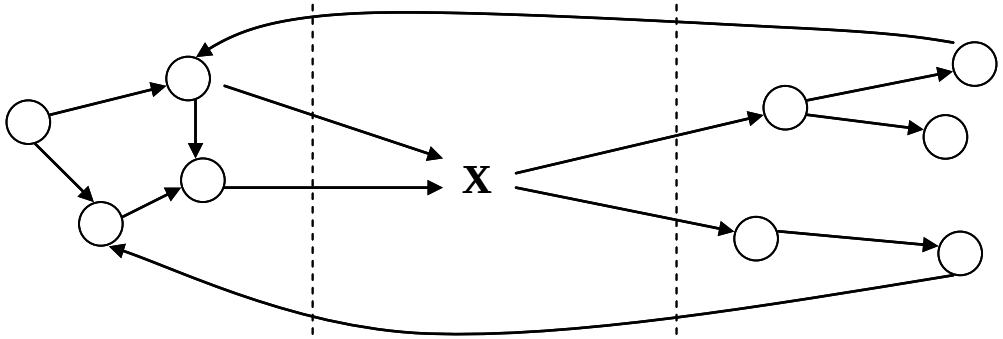
Developing a Causal Loop Diagram

to

explore the issue of

how to decrease water consumption

in a small water system

	Causes	Problem variable	Consequences
Step 1: Identification of problem variable		X	
Step 2: Adding causes		X	
Step 3: Adding consequences		X	
Step 4: Identification of feedback loops		X	

X = problem variable
◯ = other variables

(Vennix, 1996)

Feedback Loops

- Loops indicate feedback in system

- Qualitatively, this indicates that:

  a given change kicks off a set of changes that cascade through other factors to “reinforce” or “balance” the original change

- Balancing loops tend to be self regulating

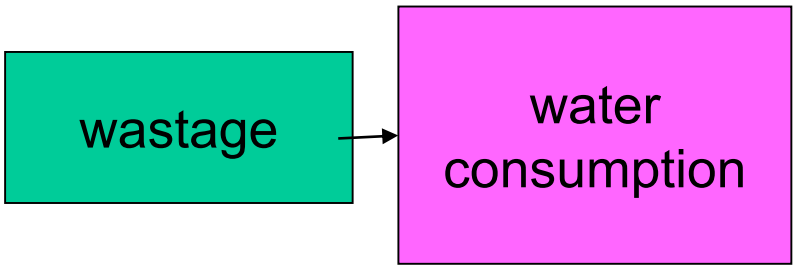
1. Causal Loop Modelling

- What is the cause of high water consumption?

water consumption

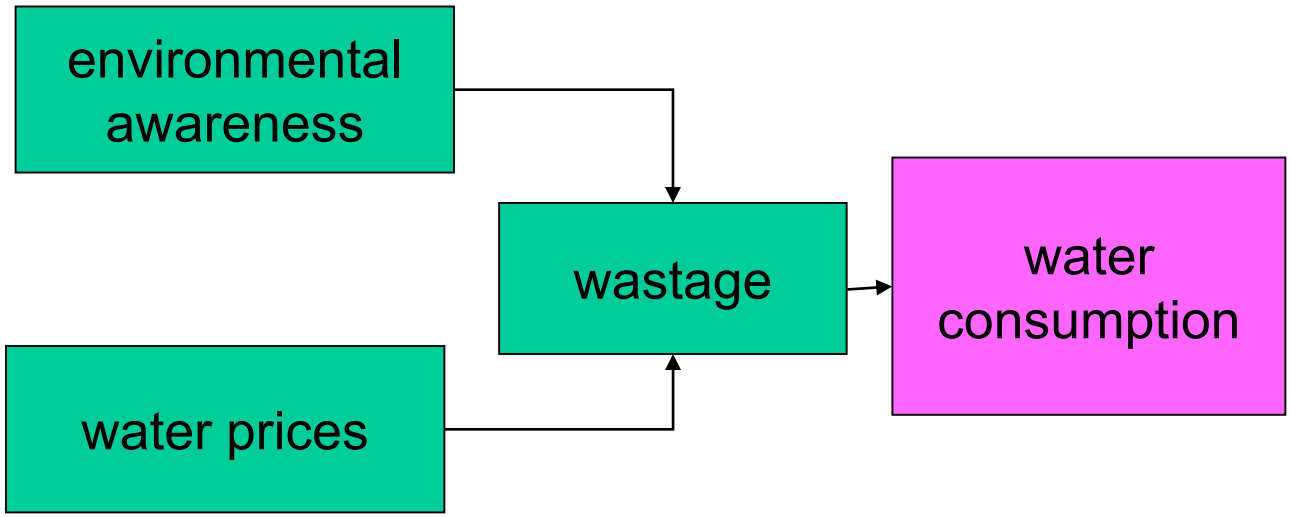
2. Causal Loop Modelling

- 1st order causes (direct causes)



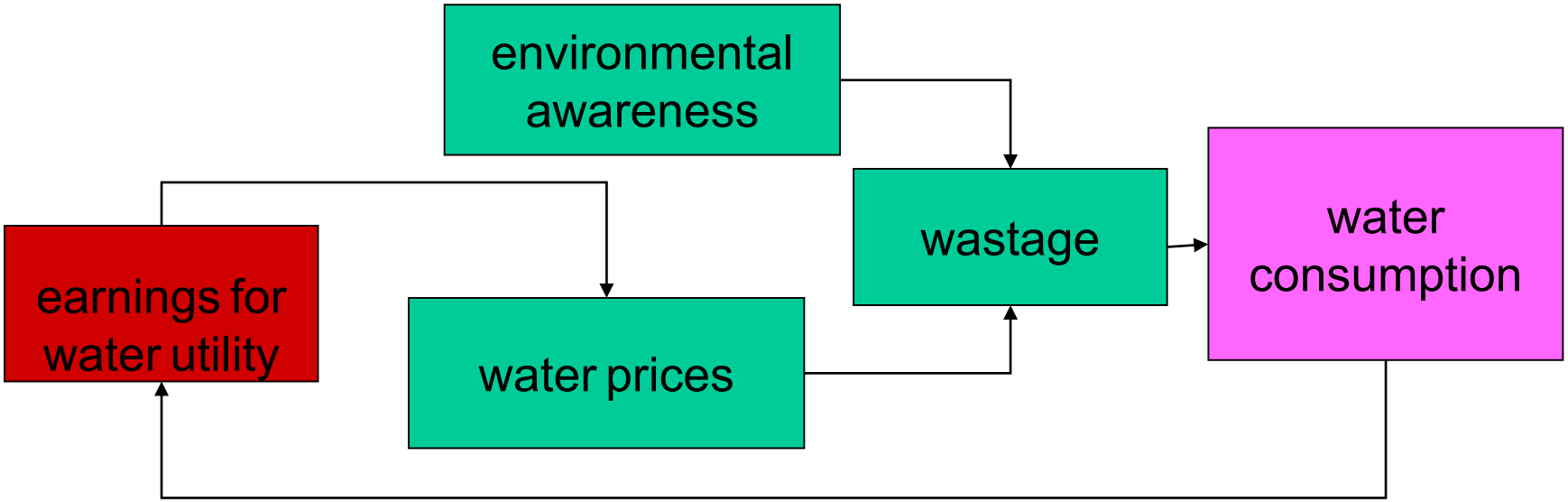
3. Causal Loop Modelling

- 2nd order causes (indirect causes)



4. Causal Loop Modelling

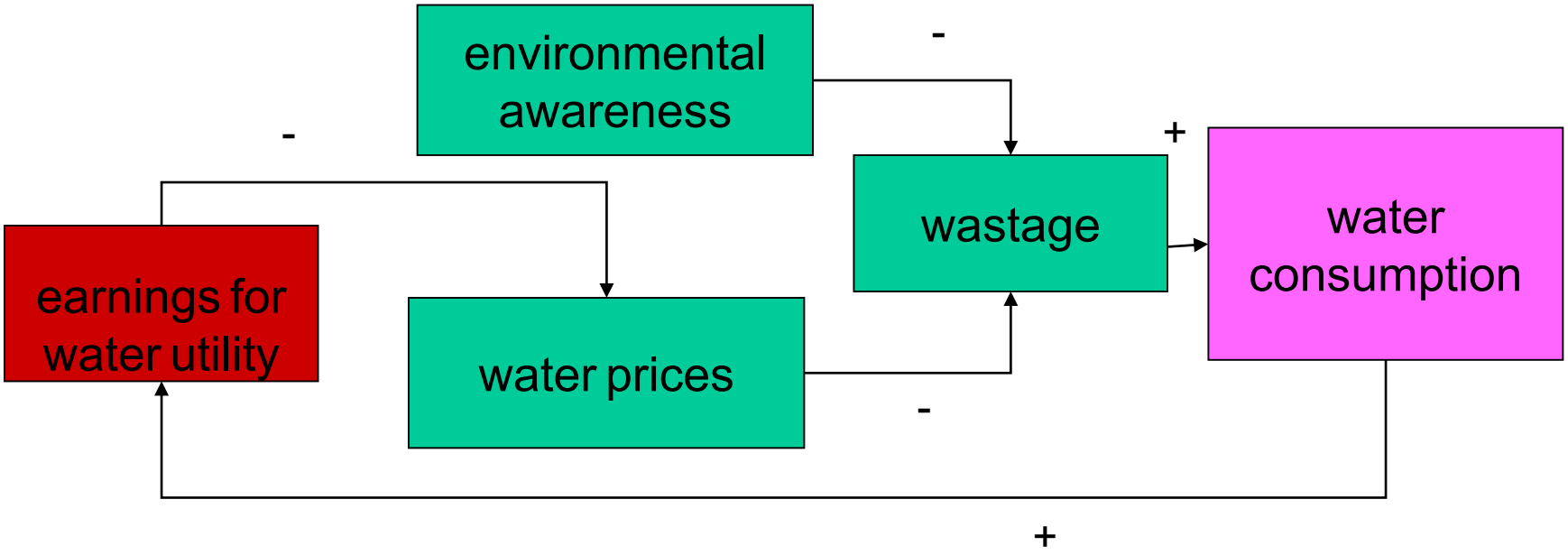
- Consequences (step 3) + Feedbacks (step 4)



5. Causal Loop Modelling

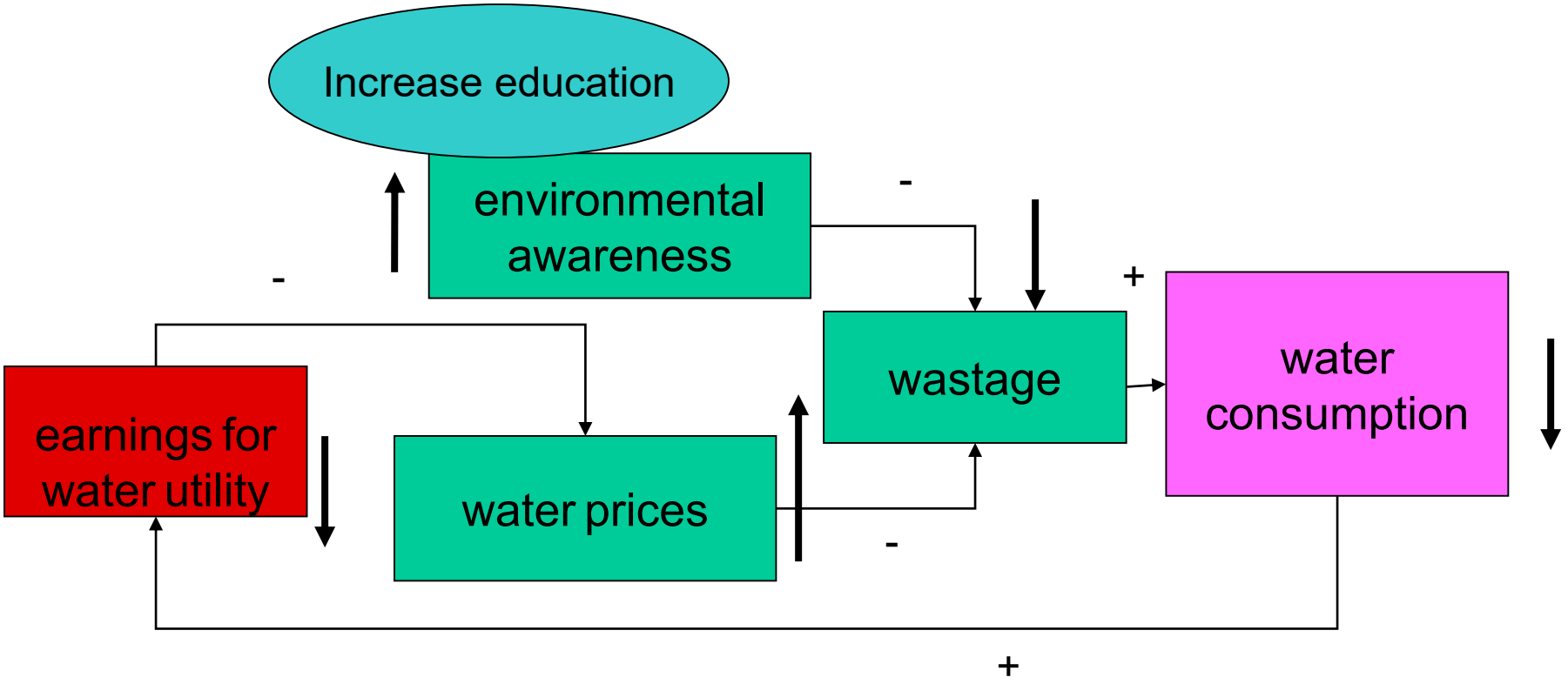
- Qualifying the relations

+ proportional relationship (positive)
- inversely proportional relationship (negative)



6. Using the model

- Strategy testing
  - Where to make change and with what measures
  - What consequences?



Some points

If there is a dispute put: !

If stakeholders unsure about something put: ?

Process creates time for stakeholders to develop a shared understanding of problems

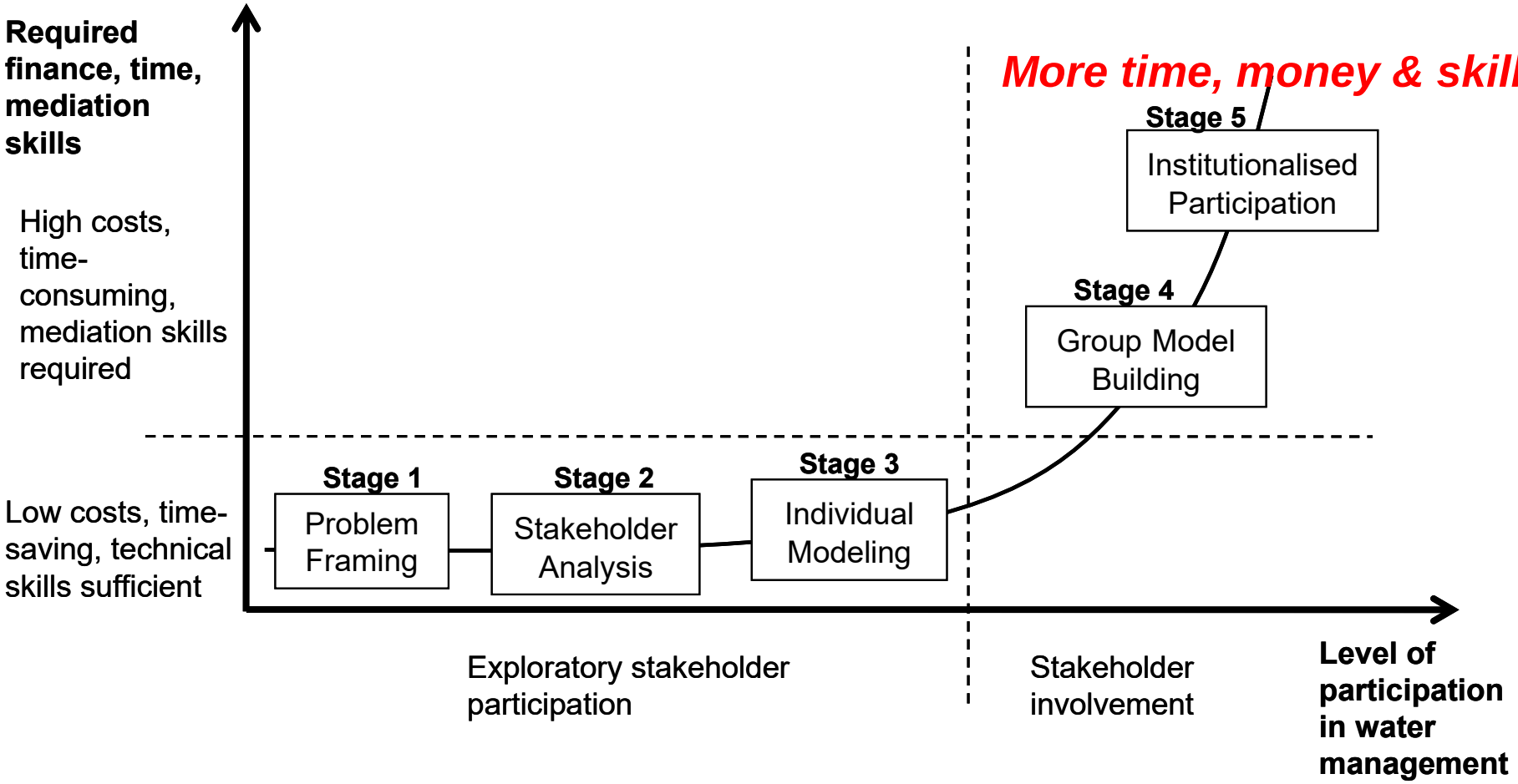
Consider: Develop individual models first, then a group model

Current Series of Research Projects:

Engaging Stakeholders
in
Discussions, Modeling, & Management
via the

Participatory Model Building Framework

PARTICIPATORY MODEL BUILDING FRAMEWORK



A stepwise approach towards participatory model building

(Inam, Adamowski, Halbe, Prasher
Journal of Environmental Management 2015)

Conclusion

CLDs one tool out of many to: engage stakeholders + facilitate discussions

This type of qualitative analysis cannot be used to infer quantitative behavior but can be useful to help:

- Explore stakeholder's 'mental maps' related to a problem (i.e., causes, consequences, feedbacks, solutions, etc.)
- Combine local & expert knowledge (i.e., diverse sources)
- Facilitate meaningful stakeholder discussions
- Detect system's critical issues
- Identify knowledge gaps for further research
- Increase stakeholders' shared understanding of a socio-ecological system
- Find areas of potential conflict
- Facilitate initial thinking regarding solutions, policies, etc.

THANK YOU!

Stakeholder Analysis

Framework of Elias et al. (2002) used:

(i) Listing of stakeholders, including marginal ones, achieved through brainstorming.

(ii) Their categorization on the basis of their roles.

(iii) Their prioritization according to their attributes.

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Stakeholder Analysis

Step 1 Brainstorming

Supported by secondary sources (e.g., academic literature, reports, knowledge of facilitators, …).

Start with a group of stakeholders (predefined through a literature survey or local knowledge) and ask them to identify other stakeholders.

Step 2 Categorization based on roles

Identify four major categories of stakeholder roles:

decision makers, users, implementers, experts.

Assign different roles to stakeholders helpful in finding gaps in the first brainstorming step and in looking for omitted relevant parties.

Stakeholder Analysis

Step 3 Prioritization of stakeholders according to their attributes

Classify stakeholders on bases of 3 relationship attributes

power, legitimacy, urgency

Step 4 Selection of stakeholders on the basis of their power and interest

Power vs. interest grid is used.

Stakeholder Analysis

Final composition of stakeholders should involve representation of all roles:

decision makers, users, implementers, experts

as well as

stakeholders related to at least one of the attributes of power, legitimacy, urgency, & interest.

as well as

traditionally underrepresented stakeholders