A couple of methods in more detail

Hands-on Exercise

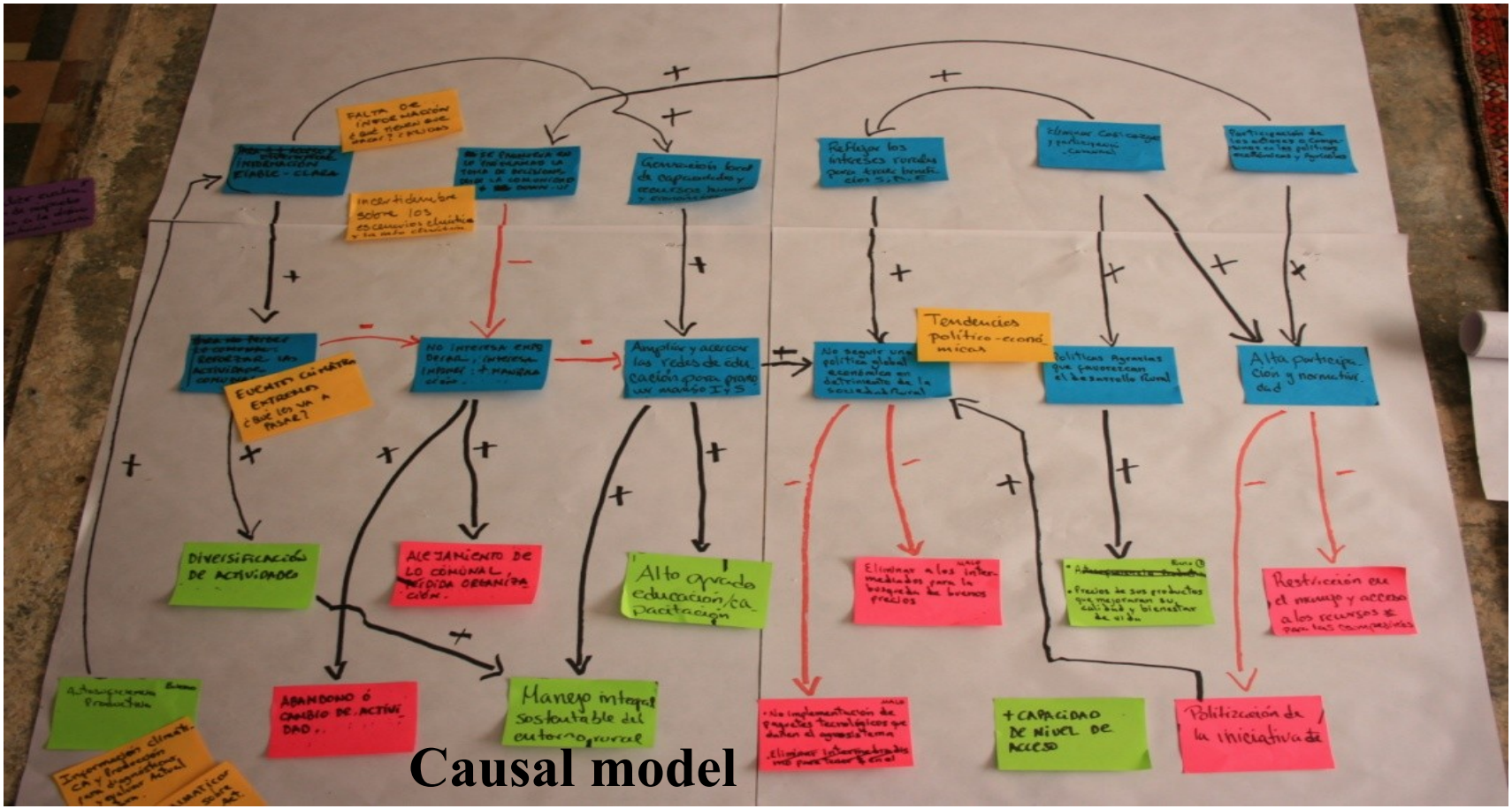
Cognitive mapping

- Class: Interview
- Number: individual
- Goals
  - Knowledge elicitation
  - System/Problem identification
  - Measures identification

Group model building

- Class: Workshop
- Number: small group
- Goals
  - Knowledge elicitation
  - System/Problem identification
  - Measures identification
  - … others?

Both create a causal model of the management system

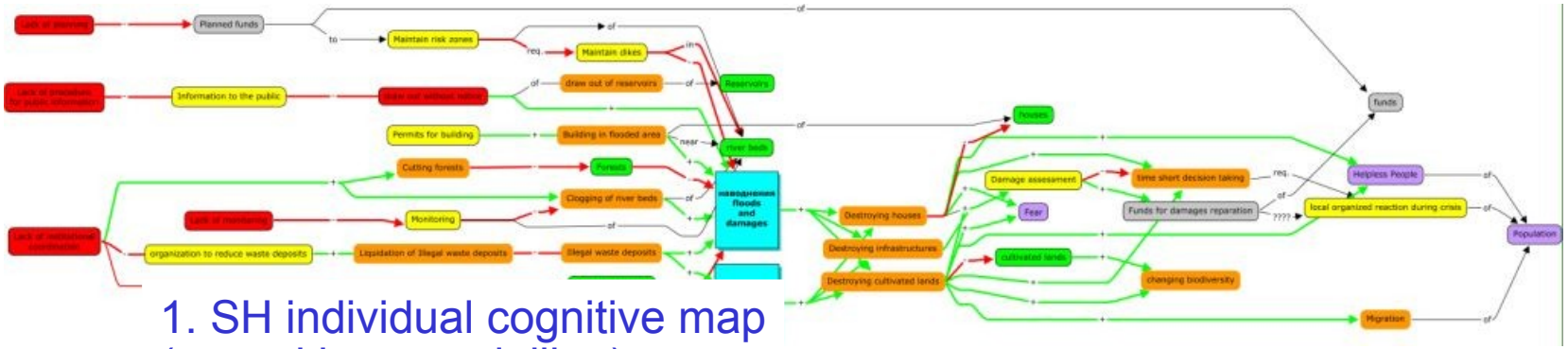


Causal model

Simpler representations

Why Causal Models are Great!

- Provides the investigator with an automatic structured model of what the person thinks, without extra processing
  - c.f. interviews
- Provides automatically a qualitative theory of the system according to the person

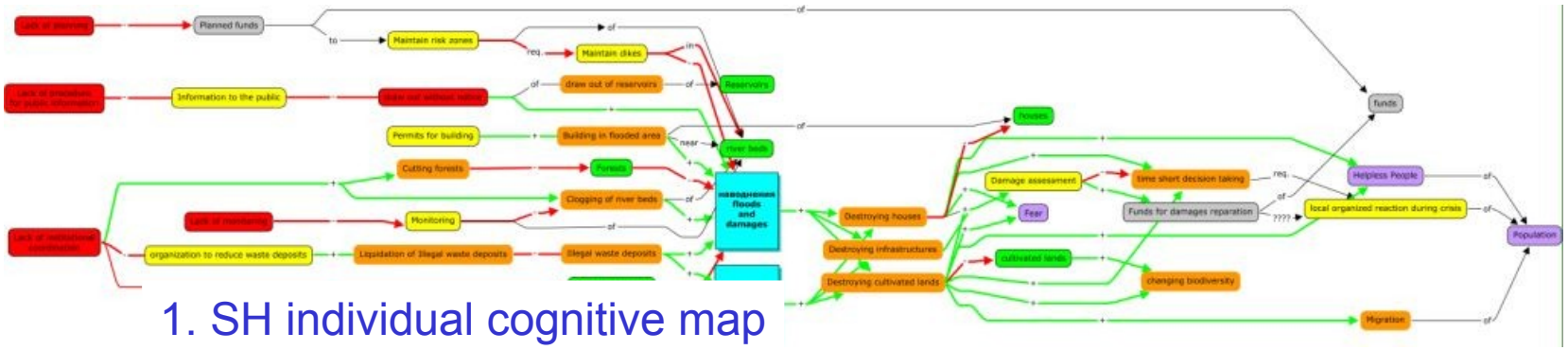


1. SH individual cognitive map (causal loop modelling)

Daniel, Ferrand, Hare etal
AquaStress Project

Cognitive mapping and Group model building

- … are contrived methods
- used when it is difficult for people to explain how systems work (even when they know)



1. SH individual cognitive map (causal loop modelling)

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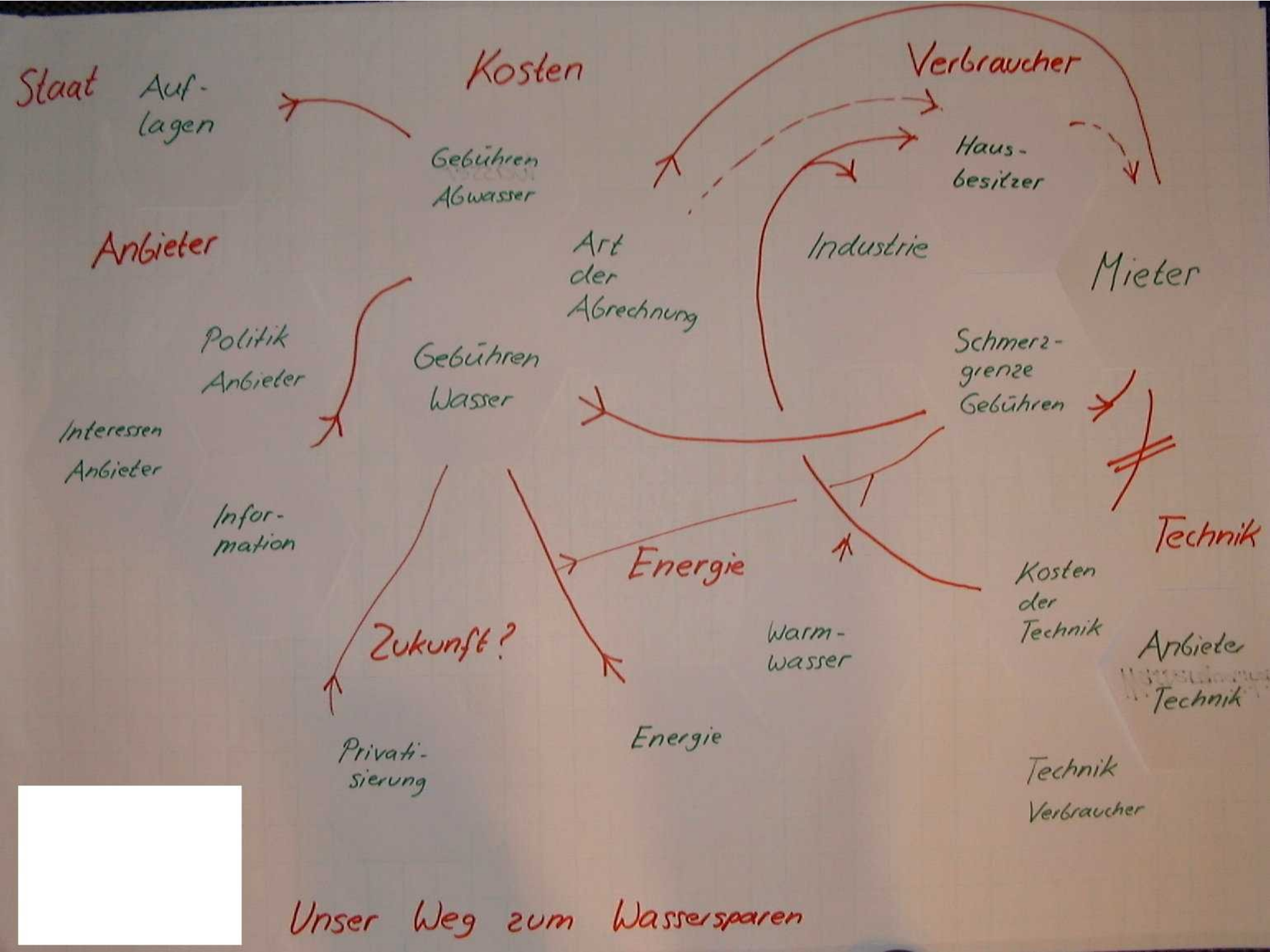
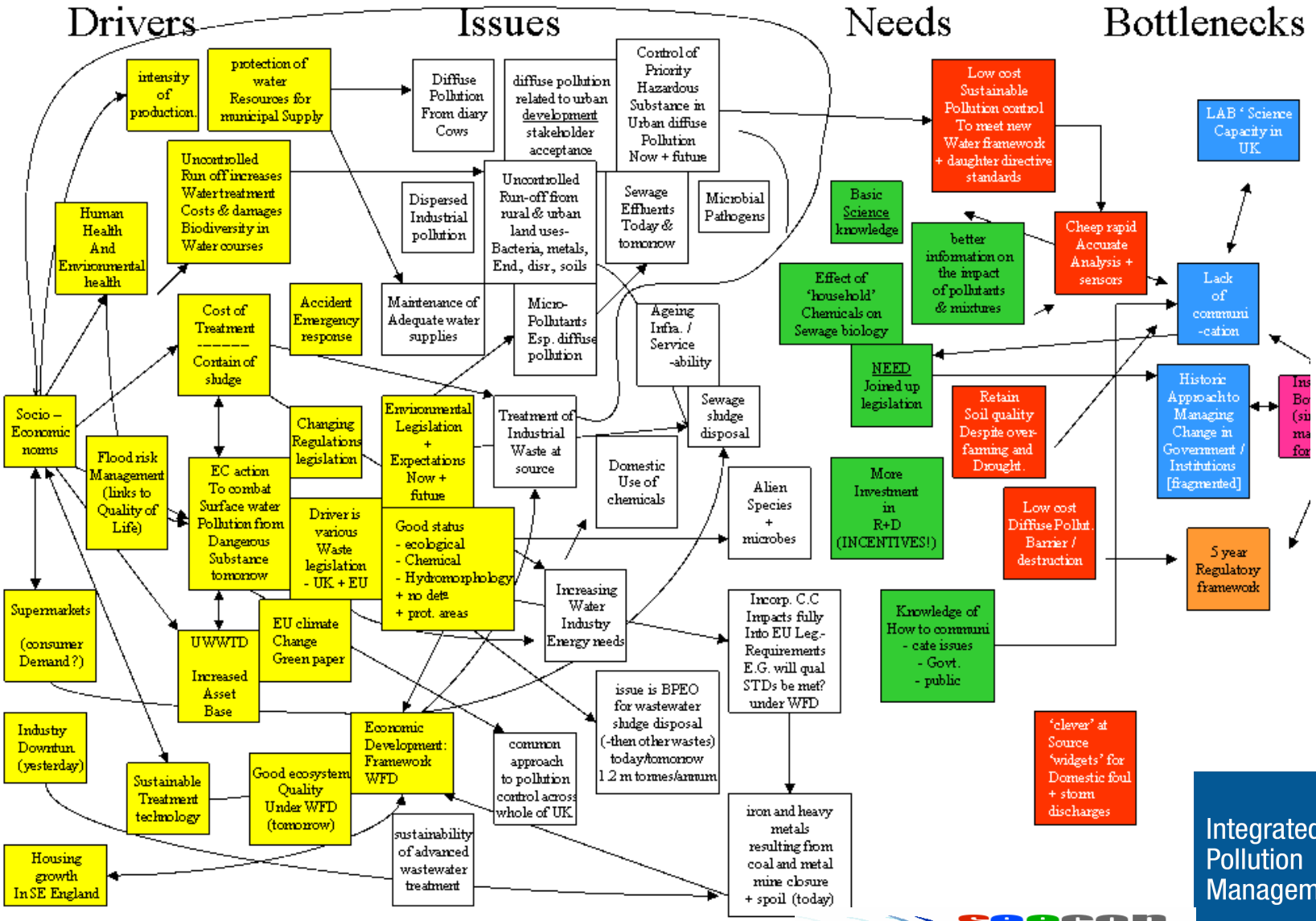

Staat
Auf-
lagen
Kosten
Verbraucher
Gebühren
Abwasser
Haus-
besitzer
Anbieter
Art
der
Abrechnung
Industrie
Mieter
Politik
Anbieter
Gebühren
Wasser
Schmerz-
grenze
Gebühren
Interessen
Anbieter
Infor-
mation
Technik
Energie
Kosten
der
Technik
Zukunft?
Warm-
wasser
Anbieter
Technik
Privati-
sierung
Energie
Technik
Verbraucher
Unser Weg zum Wassersparen


Finanzierungsproblem 3.
Flächenbedarf
Betriebseinkommen
Futtermittel
Konsument
Gesetzgeber
Umstrukturierung der LaWi
öffentl. Kontrolle
Energiepflanzen (Raps)
Energiepflanzen ausbauen
Überprod. von Fleisch/Milch
Sterben von landw. Betrieben
Gesetzgeber müsste Grenzen setzen (Bund)
Biolandbau
mehr Grünland
Kontrolle ? (Monitoring)
Güllemenge
Ausbringungszeit
Bodentyp
öffentl. Geld
neue Brunnen
Hausbrunnen (Kosten nutzen)
mehr Messstellen (evtl. Trinkwasserbrunnen)
N-Bedarf pro Fläche
Bewirtschaftung
änderung der Bewirtschaftungsweise
Zeit 2.
Maßnahmen
Gülleauswaschung
Kunstdünger
gfP
gfP müsste klarer definiert werden
Technik (ist vorhanden, & eingesetzt)
GW
OW
Keine neuen Messstellen
Fischsterben
GW-Nitrat
Grenzwert 50 mg/l
Trendumkehr >37,5 mg/l
Hochwasserschutz
Eutrophierung der Landschaft
Artenschutz Problem
PartizipA

Figure 3: Blue Group – Session 1

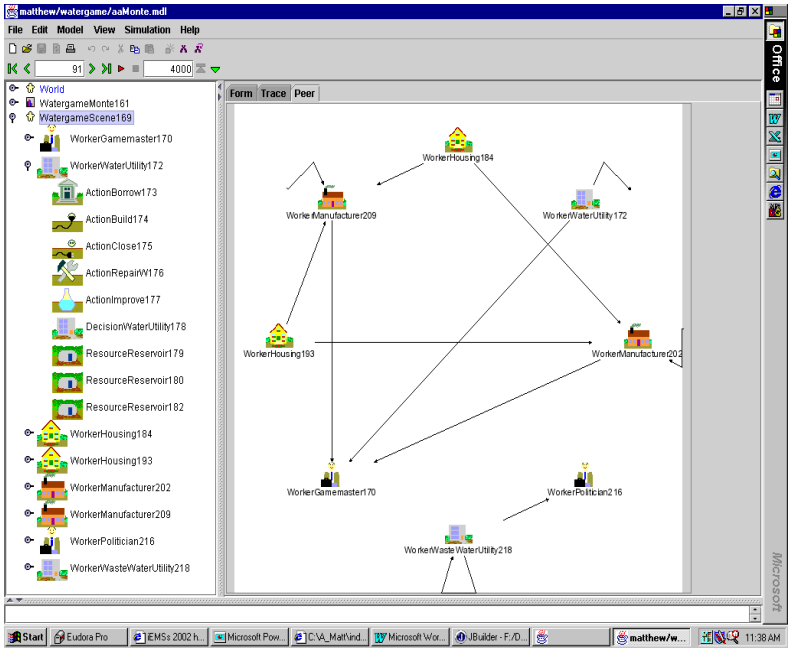


Integrated Pollution Management

Knowledge Transfer Network

Urban water management

1. Individual SH cognitive maps (Hodgson‘s hexagon modelling)



2. Scientists‘ agent-based model

Urban water management

3. Scientists‘ Role Playing Game

4. SH use - gaming and discussions

5. SH agreed workbook of recommendations

EU Water Framework Directive

2. SH integrated causal model & use
(Group Model Building (c.f. Vennix, 1996))

PartizipA

EU Water Framework Directive

Measures	Costs	Ecological Efficiency	Accep-tance	Needed control	Further Effects
Measure 1	Expert interviews	Simulation model	From group model building discussions		
Measure 2					
...	...	...	...	...	...

3. SH use - Multi-criteria assessment

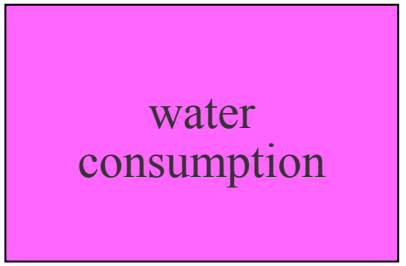
PartizipA

Causal loop modeling

A method for use in cognitive mapping and group model building

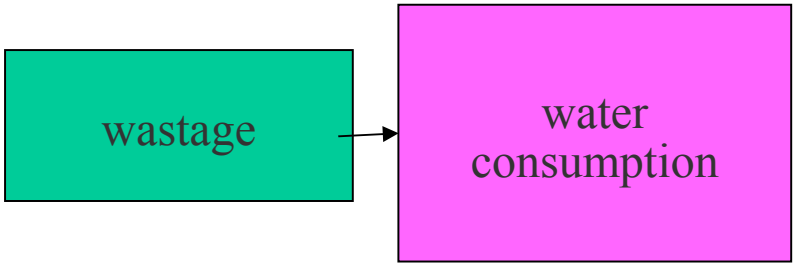
Causal Loop Modelling
(based on Vennix, 1996)

- Starting point and question wording matters...
- What are the drivers of and barriers to high water consumption?



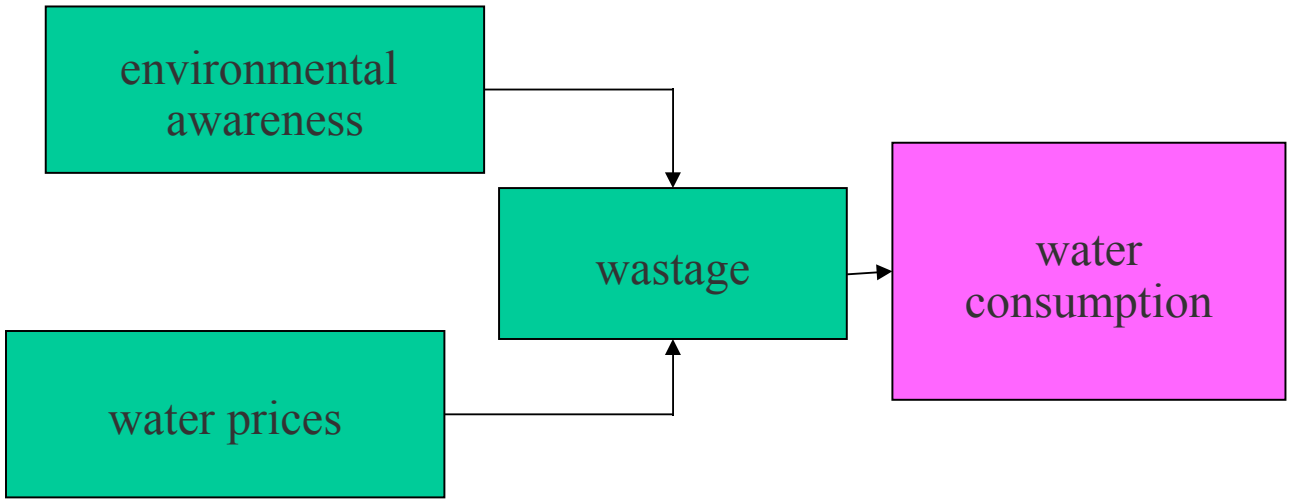
Causal Loop Modelling

- 1st order causes



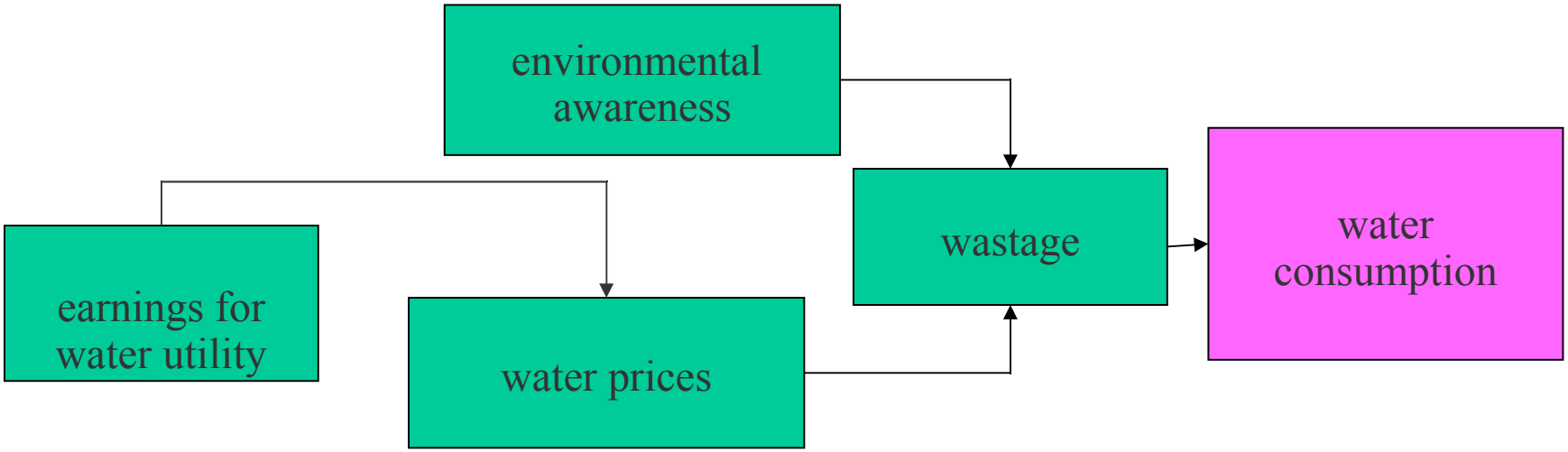
Causal Loop Modelling

- 2nd order causes



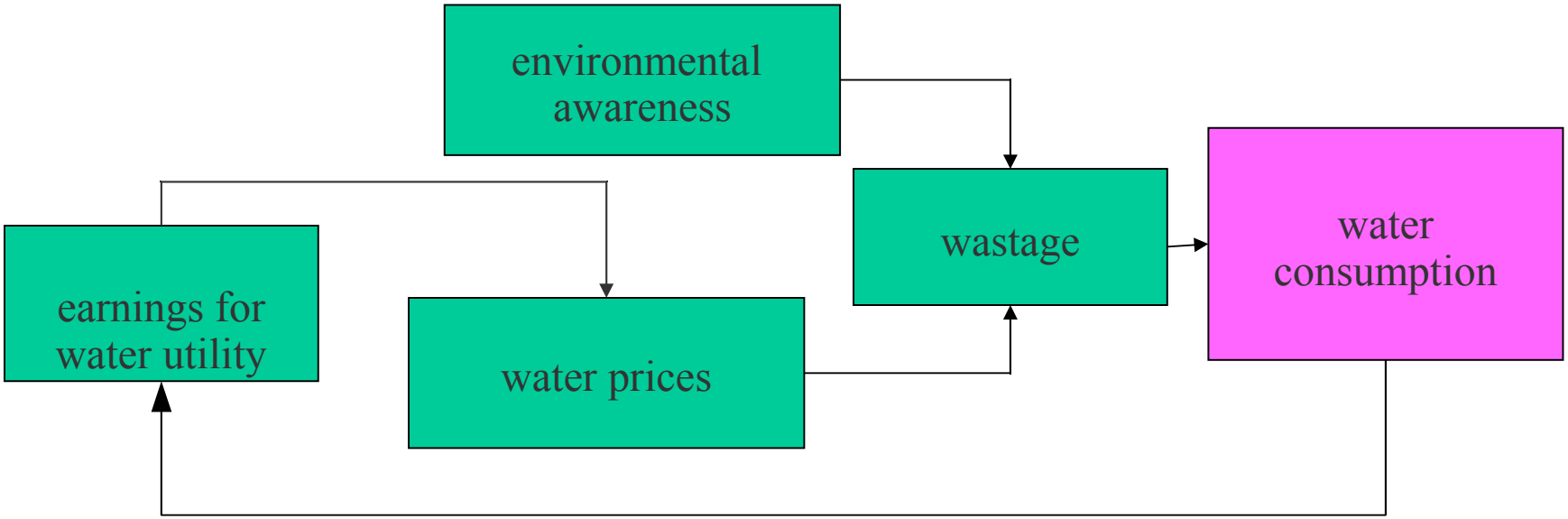
Causal Loop Modelling

- 3rd order causes



Causal Loop Modelling

- Feedbacks – the impact of water consumption

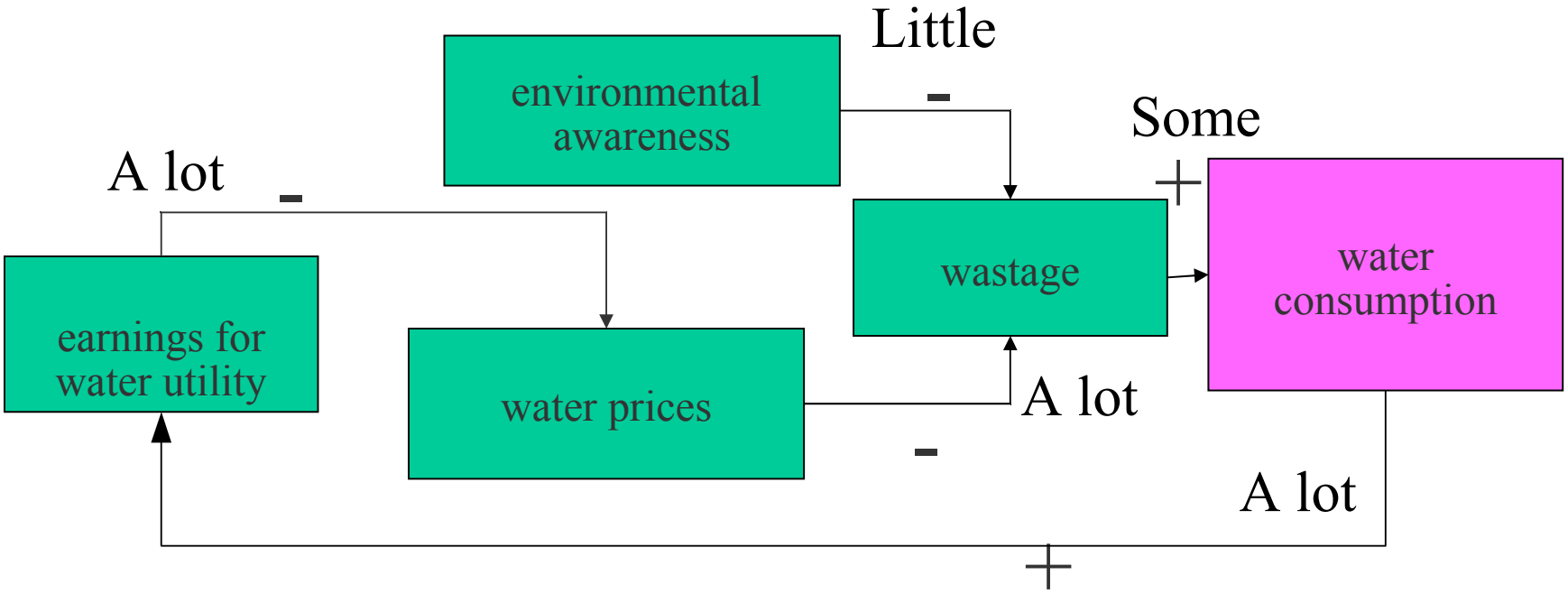


Causal Loop Modelling

- Qualifying the relations
  - \+ proportional relationship
  - \- inversely proportional relationship

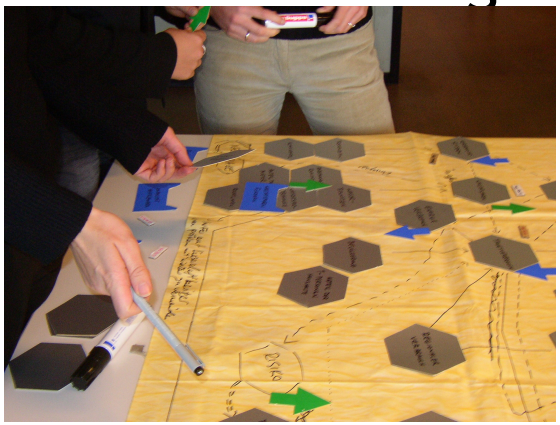
Qualifying their strength

„A lot“
„Some“
„Little“



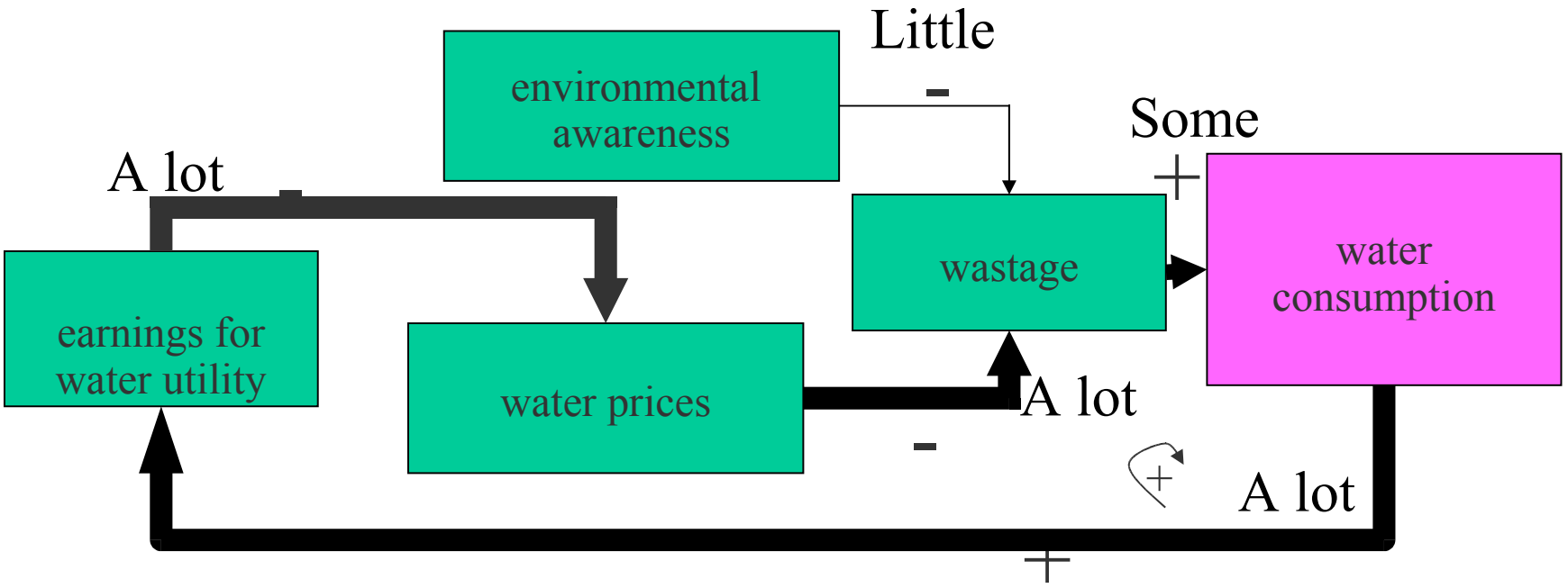
Joint use of model

A method for allowing people to identify strategies and test them using a group model



Causal Loop Modelling

- Identify positive and negative feedback loops
  - positive feedback loop
  - negative feedback loop

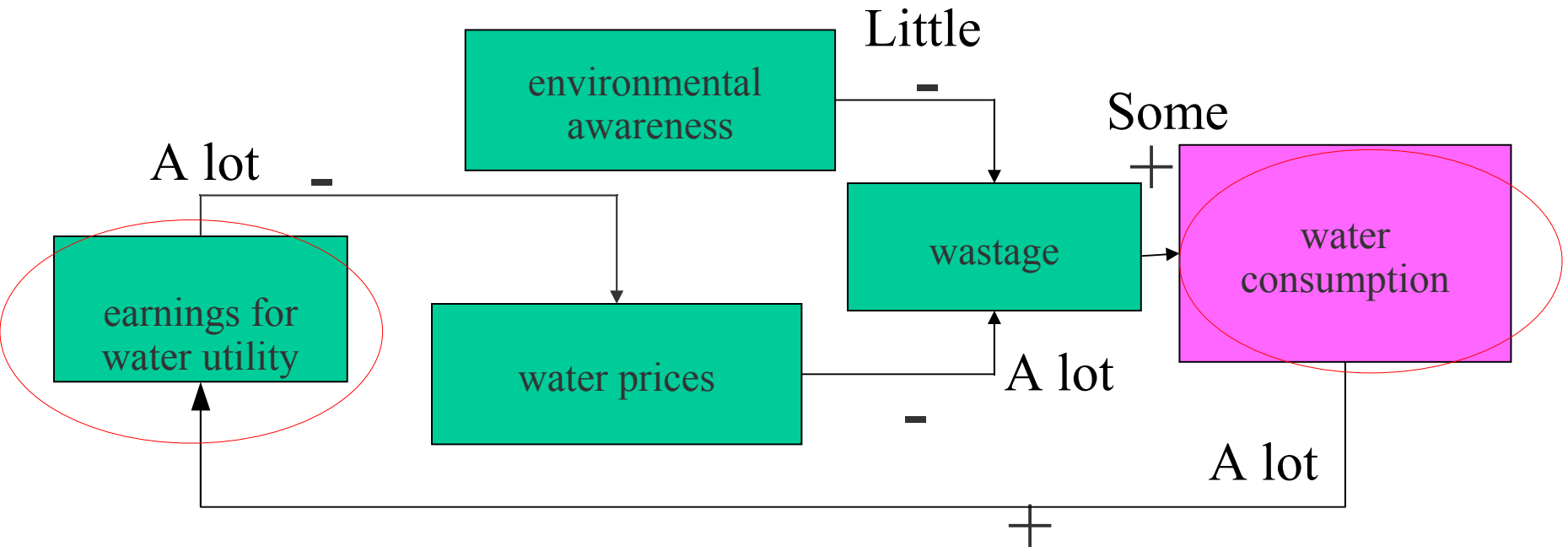


Feedback loops and their meaning

- Negative loops
  - fluctuate value of variable around an equilibrium
  - not good if you want to change that variable
- Positive loops
  - lead to exponential changes in variable away from equilibrium
  - not good if you want to stabilise that variable

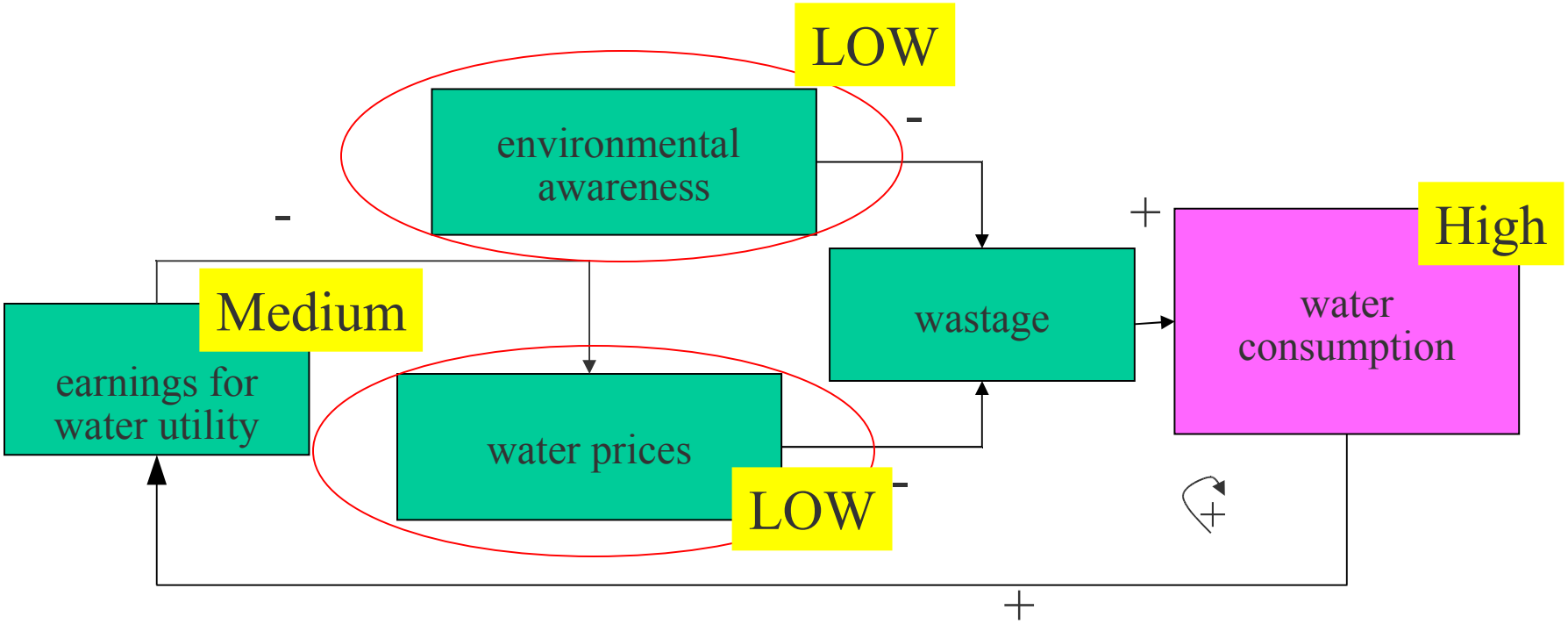
Joint use of model

- Mark the variables by which criteria of success to be measured
  - e.g. for multi-criteria evaluation of strategies



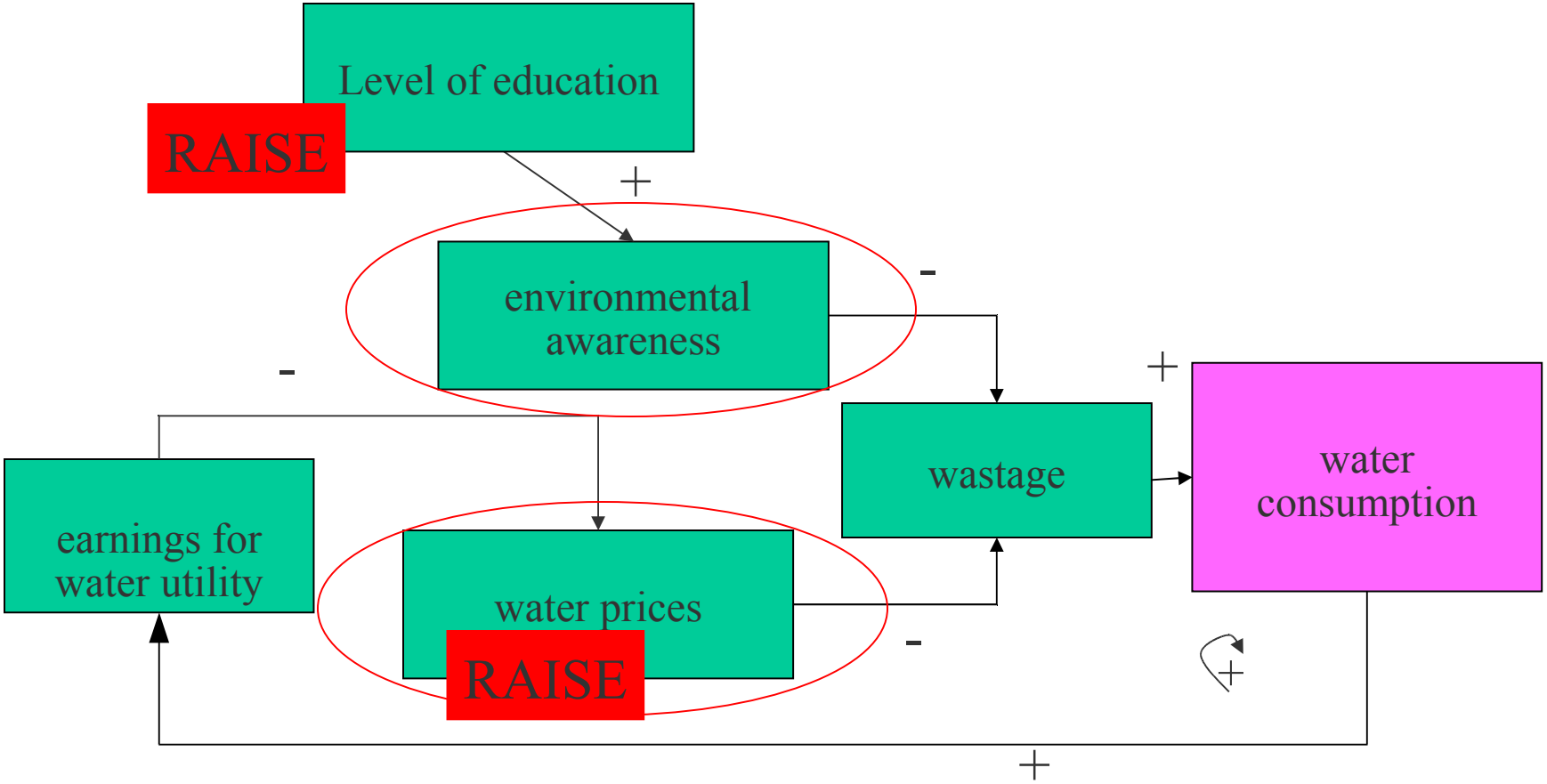
Joint use of model

- Mark the leverage points of the system
  - assess the current level of factors (high, medium, low)
  - assess where you can act upon the system to improve it
  - look out for positive and negative feedback loops
  - deal with positive feedback loops carefully



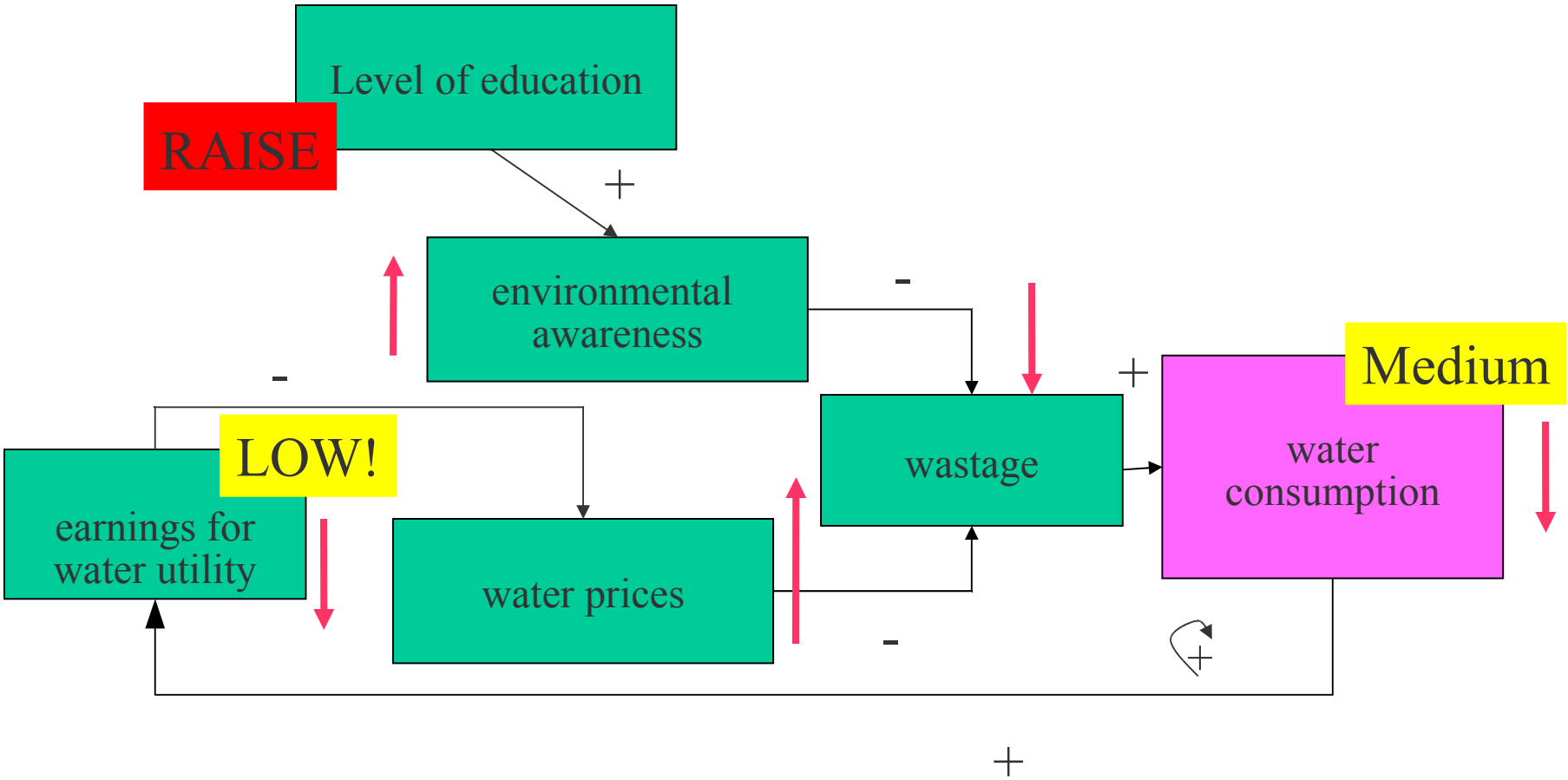
Joint use of model

- Specify strategies for acting upon the system in these areas, perhaps adding to model
- determine their effect on the model



Joint use of model

- Strategy testing
  - simulation
  - what consequences?



Joint use of model

- Identifying complementary strategies to inhibit positive feedback loops, stabilising negative feedbacks or other unwanted outcomes