



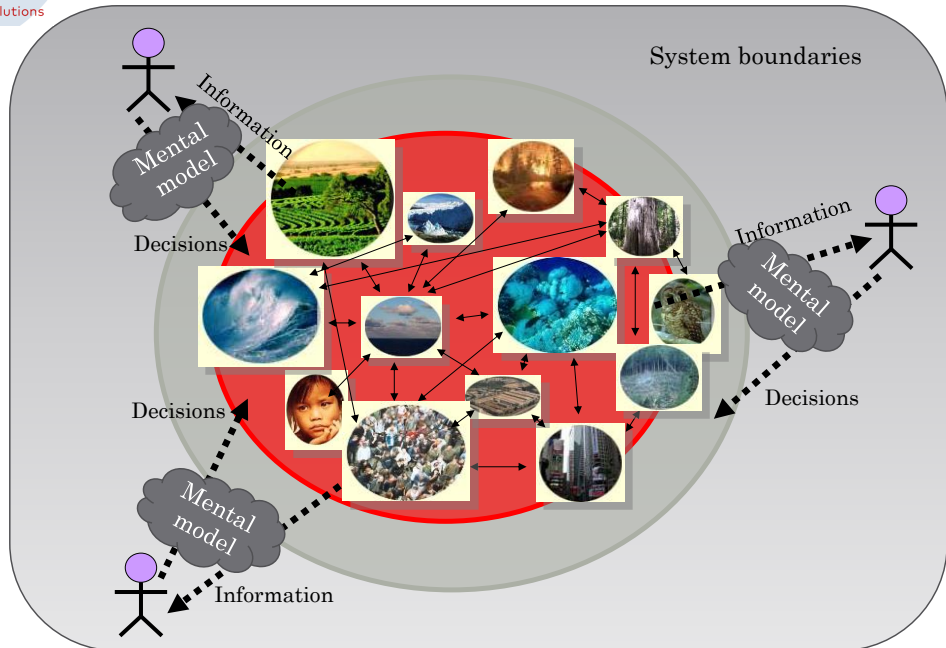
**Integrating conflict analysis in drought risk management:
Some hints from the Mediterranean area**

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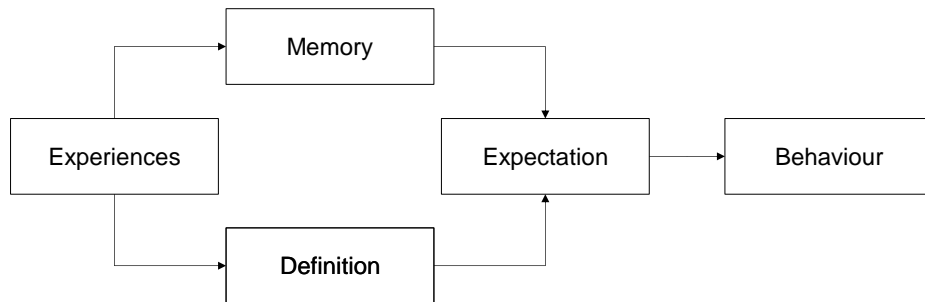
Drought and problem framing



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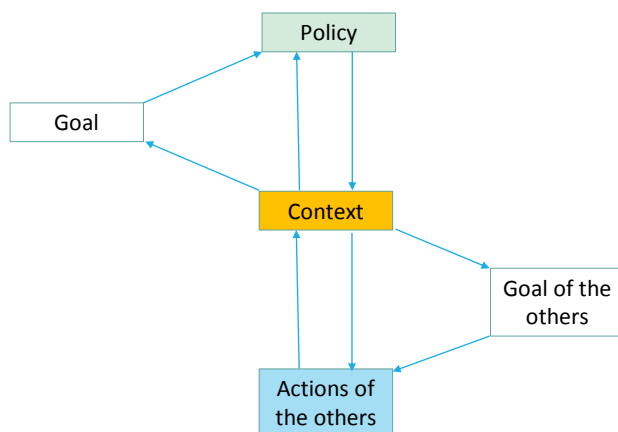
Drought and problem framing



The way drought is defined influences a stakeholder's expectation of future drought, and leads stakeholders to adopt different behaviours and to act or react in different ways during a drought phenomenon → **conflicts**.

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Drought risk management in the context



~~Ecology of action~~

~~As soon as an individual takes an action, whatever that action may be, it begins to escape from his intentions. The action enters into the universe of interactions and in the end, it is the environment that seizes it in the sense that it can become the opposite of the initial intention.~~

~~E. Morin, On Complexity~~

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Drought risk management in the context

Drought risk management policies failures occur because they do not match the peculiarities of the **contexts** in which they are implemented



Densely ramified network of interactions (**COMPLEXITY**) that happen among actors with different problem frames (**AMBIGUITY**)



What other decision-actors involved in the network are going to do is largely unknown, making difficult to predict whether the choices pay off or not (**UNCERTAINTY**)

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Drought risk management in the Apulia Region

THE CASE STUDY



The regional water authority proposed the enforcement of restrictive measures in the use of groundwater in case of drought

The new legislation caused strong conflicts between farmers, the regional authority and the irrigation consortium due to the expected economic damages to the agricultural sector.

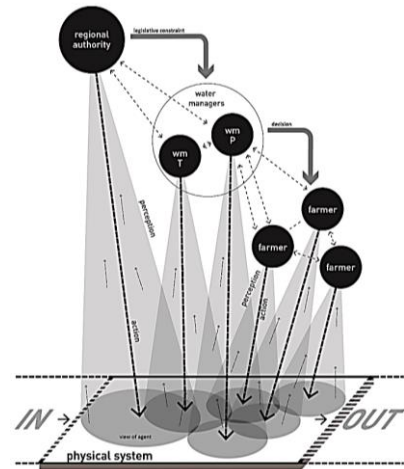
Due to this conflicting situation, the Water Protection Plan has not been implemented yet, and the regional authority is carrying on a time consuming revision process.

This work aims at **investigating how ambiguity affected the policy implementation.**

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THE DECISION AGENTS

	Agent name	Role	Type
M_{WT}	Water Manager Consortium of Capitanata (technical side)	Technician (middle level)	Organization
M_{WP}	Water manager Consortium of Capitanata (political side)	Seller (middle level)	Organization
F	Farmers	Users (Low level)	Individual
R	Regional Authority	Controller (high level)	Organization



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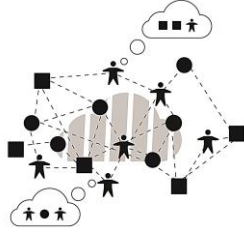
THE METHODOLOGY

- Decision-actors' understanding of the interaction space
- Decision-actors' understanding of the system dynamic (Mental Model of Dynamic System)
- Ambiguity analysis
- Learning process

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THE INTERACTION SPACE



$$IS = \langle A, O, R, S \rangle$$

Formal structure to describe the system of interactions within a finite set of actors.

	Objects	Actors	Resources
o_1	Environmental protection	a_3 Regional Authority	r_2 Legislative constraints and regulations
o_2	Agricultural productivity	a_1 Irrigation consortium	r_1 Economic resources (water price)
		a_2 Farmers	r_3 Information flow
o_3	Effectiveness of the irrigation water management	a_1 Irrigation consortium	r_5 Water accessibility
		a_3 Regional Authority	r_6 Illegal actions
o_4	Water availability	a_1 Irrigation consortium	r_8 Yield
		a_2 Farmers	r_1 Economic resources (water price)
		a_3 Regional Authority	r_3 Information flow
o_5	Decrease of groundwater overexploitation	a_1 Irrigation consortium	r_3 Information flow
		a_3 Regional Authority	r_6 Illegal actions
o_6	Water distribution and control of the irrigation network	a_1 Irrigation consortium	r_8 Yield
			r_2 Legislative constraints and regulations
		a_2 Farmers	r_3 Information flow
			r_4 Decisional power
o_7	Reduction of water consumption during drought	a_1 Irrigation consortium	r_7 Technical resources
		a_3 Regional Authority	r_4 Decisional power
o_8	Env., econ. and social sustainability of the agricultural activities	a_3 Regional Authority	r_7 Technical resources
			r_2 Legislative constraints
			r_9 Control of the territory

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The methodology



THE DECISION-ACTORS' UNDERSTANDING OF THE INTERACTION SPACE

GW PROTECTION POLICY
 $\langle A, O, R, S \rangle_{REG}$

(A) _{REG,1}	Perception of other actors	a_2	Farmers
(O) _{REG,1}	Perception of other actors' objectives	o_2	Agricultural productivity
(R) _{REG,1}	Perception of other actors' resources	r_5	Water accessibility
		r_8	Yield
(A) _{REG,2}	Perception of other actors	a_1	Irrigation consortium
(O) _{REG,2}	Perception of other actors' objectives	o_6	Water distribution and control of the irrigation network
(R) _{REG,2}	Perception of other actors' resources	r_7	Technical resources

Regional Authority
 $\langle A, O, R, S \rangle_I$

(A) _{I,1}	Perception of other actors	a_2	Farmers
(O) _{I,1}	Perception of other actors' objectives	o_2	Agricultural productivity
		o_4	Water availability
(R) _{I,1}	Perception of other actors' resources	r_3	Information flow
		r_8	Yield
(A) _{I,2}	Perception of other actors	a_3	Regional Authority
(O) _{I,2}	Perception of other actors' objectives	o_1	Environmental protection
(R) _{I,2}	Perception of other actors' resources	r_2	Legislative constraints and regulations

Regional authority

Farmers

Consortium

Irrigation consortium

Regional Authority

(A) _{F,1}	Perception of other actors	a_1	Irrigation consortium
(O) _{F,1}	Perception of other actors' objectives	o_6	Water distribution and control of the irrigation network
		o_7	Reduction of water consumption during drought
(R) _{F,1}	Perception of other actors' resources	r_1	Economic resources (water price)
		r_2	Legislative constraints and regulations
		r_4	Decisional power
		r_7	Technical resources
(A) _{F,2}	Perception of other actors	a_3	Regional Authority
(R) _{F,2}	Perception of other actors' objectives	o_5	Decrease of groundwater overexploitation
(R) _{F,2}	Perception of other actors' resources	r_2	Legislative constraints and regulations

Farmers

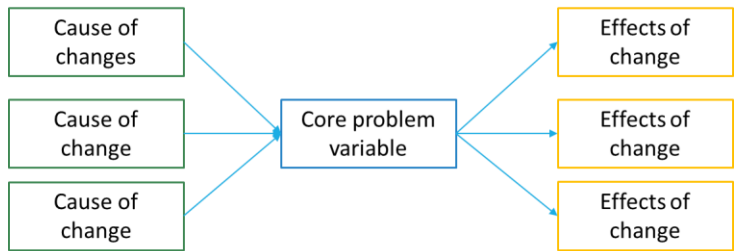
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THE DECISION-ACTORS' MENTAL MODELS OF DYNAMIC SYSTEM (MMDS)



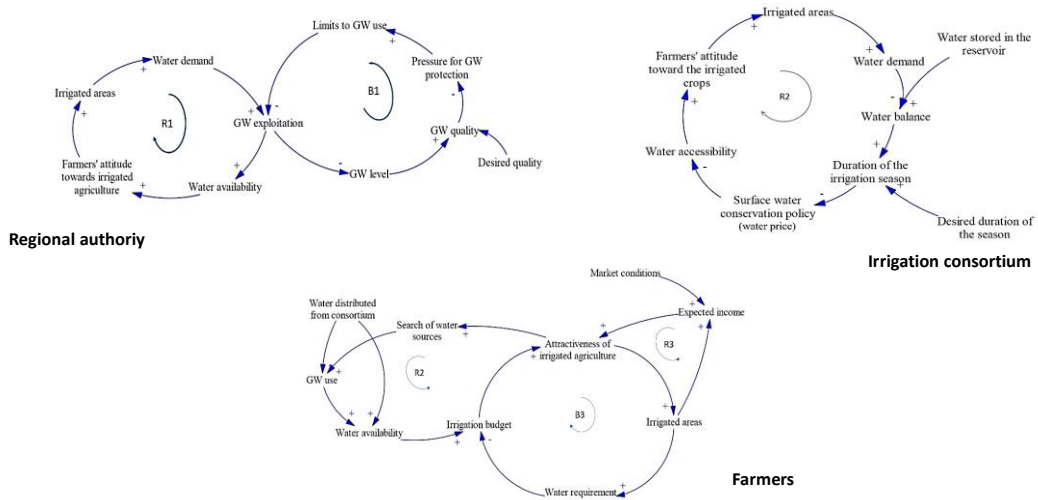
Representing the perceived cause-effect chains influencing the dynamic evolution of a system



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THE DECISION-ACTORS' MENTAL MODELS OF DYNAMIC SYSTEM (MMDS)



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THE AMBIGUITY ANALYSIS

Differences in IS perception:
the Jaccard index

	Actor	J index	Distance
Analyst	Irrigation consortium	0,42	0,58
Analyst	Farmer	0,48	0,52
Analyst	Regional Authority	0,35	0,65

The main differences:

- 1) the irrigation consortium neglects the capability of the farmers to activate illegal pumping ;
- 2) the irrigation consortium considers the information flow as a crucial resource in the interaction with farmers;
- 3) the regional authority ignores the role played by the market;
- 4) the regional authority perceives the control of the territory as a crucial resource to achieve its main goal

Differences in MMDS:
the Model Distance Ratio (MDR) index

	Regional authority	Irrigation Consortium	Farmers
Regional authority	-	0,21	0,90
Irrigation Consortium	0,21	-	0,82
Farmers	0,90	0,82	-

The main differences:

- 1) The regional authority perceives the limits to GW as an action to restore the system equilibrium;
- 2) The regional authority and the irrigation consortium perceive the water availability as the only driver influencing the system dynamic.

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THE LEARNING PROCESS

The irrigation consortium became aware of the importance of providing information to farmers in time to actually influence their decision process.

The irrigation consortium became aware of the illegal pumping activities, which requires a better understanding of the impact of the water price policy.

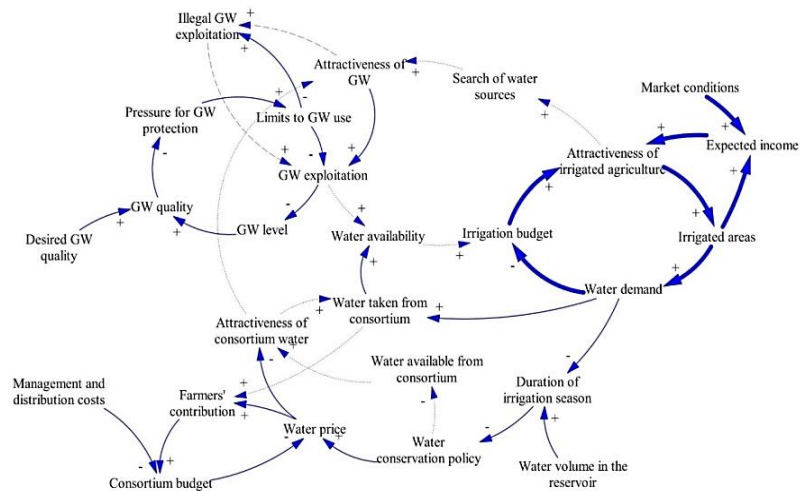
The regional authority introduced the irrigation consortium's role in influencing the farmers' behaviour.

	Actor	J coefficients
Analyst	Irrigation consortium	0,64
Analyst	Farmer	0,53
Analyst	Regional Authority	0,62

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THE LEARNING PROCESS



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Concluding remarks

THE LESSONS LEARNED

Decision actors have a limited understanding of the complexity of the interaction space.

Decision actors tend to neglect the existence of different and equally valid problem framing → they ignore the ambiguity.

In order to take actions, decision actors make assumptions about how the others are going to act and/or react to their actions → conflicting situation.

Collaborative drought risk management claims for a decision-making environment in which the parties are fully aware of their role and the roles of the others in the interaction environment (**interdependency principle**).

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