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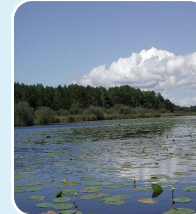
A social-ecological approach to collective action
for water quality management in agriculture.
The case of drinking water source protection in
France.

Laurence Amblard (INRAE, UMR Territoires)

TED4LAT workshop and doctoral school
October 23rd, 2024

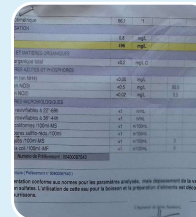
Introduction

- Diffuse pollution from agriculture (nitrates, pesticides)
 - A significant pressure on surface and ground waters in the European Union and French contexts
 - Multiple environmental, economic and social impacts



Impact on ecosystems and biodiversity

- Eutrophication



Human health risk

- Regulatory standards for nitrate and pesticide rates (EU Drinking Water Directive)



Extra-costs of drinking water production

- Water treatments, resource blending/substitution



Introduction

- EU Water Framework Directive (WFD) (2000)
 - Objective of good status for all water bodies in Europe
 - Protection of water bodies used for drinking water production “*in order to reduce the level of purification treatment required*”
- “Grenelle” policy in France (2009)
 - Identification of 1000 priority water catchments
 - Definition and implementation of action programs targeting diffuse pollution
 - Cooperation between water suppliers and agricultural stakeholders (farm organizations, farmers)



Introduction

- “Grenelle” policy in France (2009)
 - Mixed outcomes
 - Only half priority catchments covered by an action program in 2019 (MTE, 2020)
 - No significant improvement in water quality

- Research objective :

- Identifying the factors affecting the success/failure of collective action



Outline

1. Conceptual framework

- A combination of the Social-Ecological Systems (SES) framework and transaction cost economics

2. Methodology

- A comparative multi-case study approach

3. Results

- The factors favoring/constraining collective action

4. Conclusion



Conceptual framework

- Transaction cost economics
 - The development of cooperation depends on the benefits and costs linked to participation to collective action
 - Transaction costs = resources used to define, establish, maintain and transfer property rights (Allen, 2000)
- In the field of natural resource management and environmental policy (McCann et al., 2005)
 - *Ex-ante* transaction costs : information collection and processing costs, decision-making costs and/or negotiation costs for reaching agreements
 - *Ex-post* transaction costs : monitoring and enforcement costs of agreements

Conceptual framework

Benefits and costs of collective action

Benefits

Costs

Transaction costs

Costs for defining actions (ex ante)

Costs for implementing actions (ex post)

Drinking water suppliers

Water quality improvement/maintenance

Opportunity costs of alternative options

Economic resources

Information costs

Consultation/negotiation costs

Control/enforcement costs

Farmers

Savings from input reduction

Subsidies/compensation

Profit losses

Labor/investment costs

Information costs

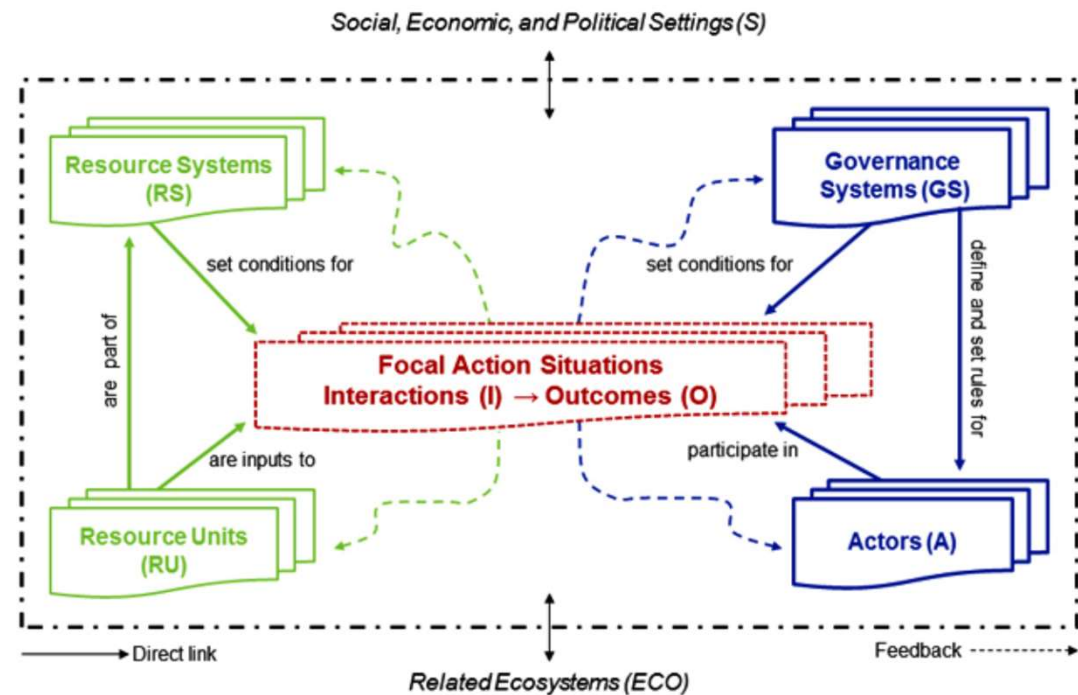
Consultation/negotiation costs

Control costs

Sanctions (non-compliance)

Conceptual framework

- Social-Ecological Systems (SES) framework
 - Identification of the factors affecting the benefits and costs of collective action



Ostrom, 2007; McGinnis and Ostrom, 2014



Conceptual framework

- SES framework : focal action situations
 - Actors make choices among available options in light of information about the likely actions of other participants and the benefits and costs of options
- Interactions : harvesting, information sharing, self-organizing activities, conflicts...
- Outcomes :
 - Social performance measures (efficiency, equity...)
 - Ecological performance measures (biodiversity, resilience,...)

Conceptual framework

- SES framework :
governance
systems
 - Multi-level sets
of rules

Constitutional rules

Individuals' actions taken that affect collective-choice situations
Constitutional situations

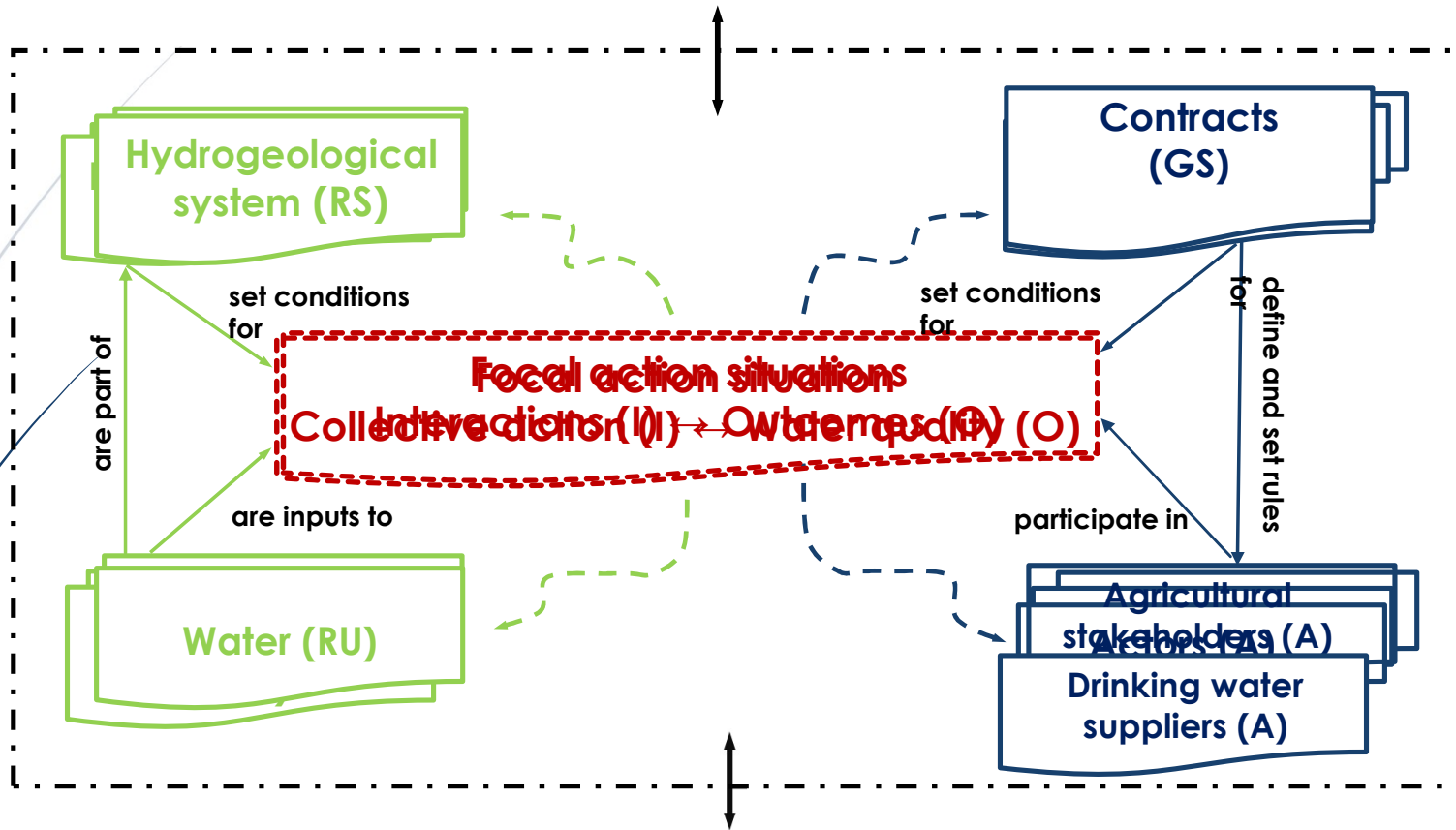
Collective-choice rules

Individuals' actions taken that affect operational situations
Collective-choice situations


Operational rules

Individuals' actions taken that affect the resource
Operational situations

Related Social, Economic, and Political Settings (S)



Related Ecosystems (ECO)



First-tier variable	Second-tier variables
Social, economic, and political settings (S)	S1 – Economic development S2 – Demographic trends S3 – Political stability S4 – Other governance systems S5 – Markets S6 – Media organizations S7 – Technology
Resource systems (RS)	RS1 – Sector (e.g., water, forests, pasture, fish) RS2 – Clarity of system boundaries RS3 – Size of resource system RS4 – Human-constructed facilities RS5 – Productivity of system RS6 – Equilibrium properties RS7 – Predictability of system dynamics RS8 – Storage characteristics RS9 – Location
Governance systems (GS)	GS1 – Government organizations GS2 – Nongovernment organizations GS3 – Network structure GS4 – Property-rights systems GS5 – Operational-choice rules GS6 – Collective-choice rules GS7 – Constitutional-choice rules GS8 – Monitoring and sanctioning rules
Resource units (RU)	RU1 – Resource unit mobility RU2 – Growth or replacement rate RU3 – Interaction among resource units RU4 – Economic value RU5 – Number of units RU6 – Distinctive characteristics RU7 – Spatial and temporal distribution
Actors (A)	A1 – Number of relevant actors A2 – Socioeconomic attributes A3 – History or past experiences A4 – Location A5 – Leadership/entrepreneurship A6 – Norms (trust-reciprocity)/social capital A7 – Knowledge of SES/mental models A8 – Importance of resource (dependence) A9 – Technologies available
Related ecosystems (ECO)	ECO1 – Climate patterns ECO2 – Pollution patterns ECO3 – Flows into and out of focal SES

Conceptual framework

- A sub-set of factors likely to be critical for the success of self-organized collective action involving users of a common-pool resource (Ostrom, 2009)

First-tier variable	Second-tier variables
Resource system (RS)	RS3 – Size of resource system RS5 – Productivity of system RS7 – Predictability of system dynamics
Resource unit (RU)	RU1 – Resource mobility
Governance system (GS)	GS6 – Collective-choice rules
Actors (A)	A1 – Number of relevant actors A5 – Leadership A6 – Norms (trust-reciprocity)/social capital A7 – Knowledge of SES A8 – Importance of resource (dependence)

- Set of assumptions regarding factors affecting collective action for diffuse pollution control

Conceptual framework

First-tier variable	Second-tier variable	Impact on benefits/costs and Transaction Costs (TCs)	Impact on collective action
Resource system (RS)	RS3 – Size of resource system	↗ TCs Small size ↘ benefits	-/+
	RS5 – Productivity of system	Moderate scarcity ↗ benefits	+
	RS7 – Predictability of system dynamics	↘ TCs	+
Governance system (GS)	GS6 – Collective-choice rules	Autonomy of users ↘ TCs	+
Resource units (RU)	RU1 – Resource unit mobility	Mobile units ↗ TCs	-
Actors (A)	A1 – Number of relevant actors	↗ TCs Small number ↘ resources	-/+
	A5 – Leadership-entrepreneurship	Presence of leaders ↘ TCs	+
	A6 – Norms/social capital	Shared norms/trust ↘ TCs	+
	A7 – Knowledge of SES	↘ TCs	+
	A8 – Importance of the resource	↗ benefits	+

Adapted from
Ostrom, 2009



Methodology

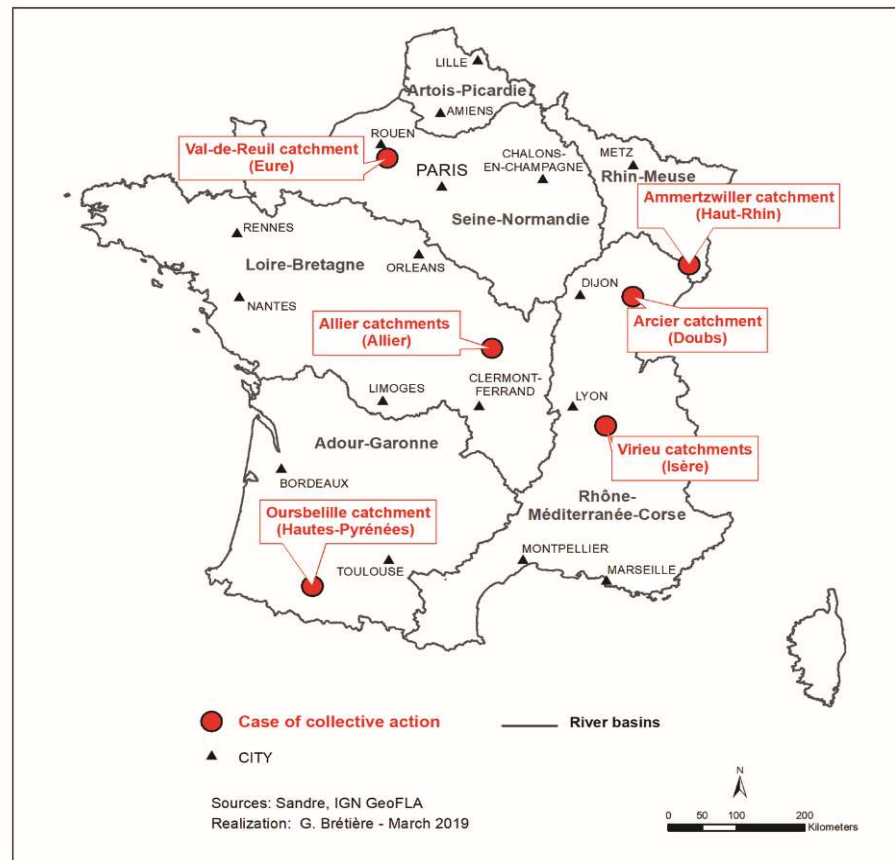
1. A review of cases of cooperation in the French context

- Literature review
- Interviews with stakeholders at the water basin and national levels (12)
 - Ministries, water agencies, farm organizations, private water operators

2. Case studies of collective action in six drinking water catchments

- Review of documents
- Interviews with local stakeholders involved in cooperation (36)
 - Water suppliers, farm organizations, state administrations, farmers

Methodology



Methodology

	Allier	Virieu	Oursbellile	Arcier	Ammertzviller	Val de Reuil
Regulatory frame	Grenelle	Grenelle	Grenelle	Grenelle	SDAGE Rhin-Meuse	-
Start date	2009	2009	2009	2004	2008	2008
Type of pollution	Nitrates	Pesticides	Nitrates	Pesticides	Nitrates/ pesticides	-
Level of contamination	Moderate	High	High	Moderate	High	Good water quality
Catchment area	8300 ha	115 ha	396 ha	10 200 ha	363 ha	127 ha
Number of farms	118	10	19	72	30	7
Farming systems	Mixed farming	Livestock	Field crops	Mixed farming	Field crops	Field crops
Outcomes						
Farm participation	3/118	5/10	7/19	20/72	16/30	4/7
Area covered	0,9 %	40 %	18 %	19,5 %	22 %	87 %
Water quality trend	No improvement	Improving trend	No improvement	Improving trend	Improvement	Maintenance of good quality

The factors affecting collective action

- The factors affecting the benefits of water suppliers

Factors

Level of water contamination

Cost of alternative approaches to water catchment protection

Financial and human resources

External support from public agencies

Impact on collective action

+

+

+

+

The factors affecting collective action

- The factors affecting the benefits of farmers

Factors

Type of farming systems

Markets/food supply chains

Economic incentives provided by contracts

Environmental preferences

Impact on collective action

Intensive: -
Extensive: +

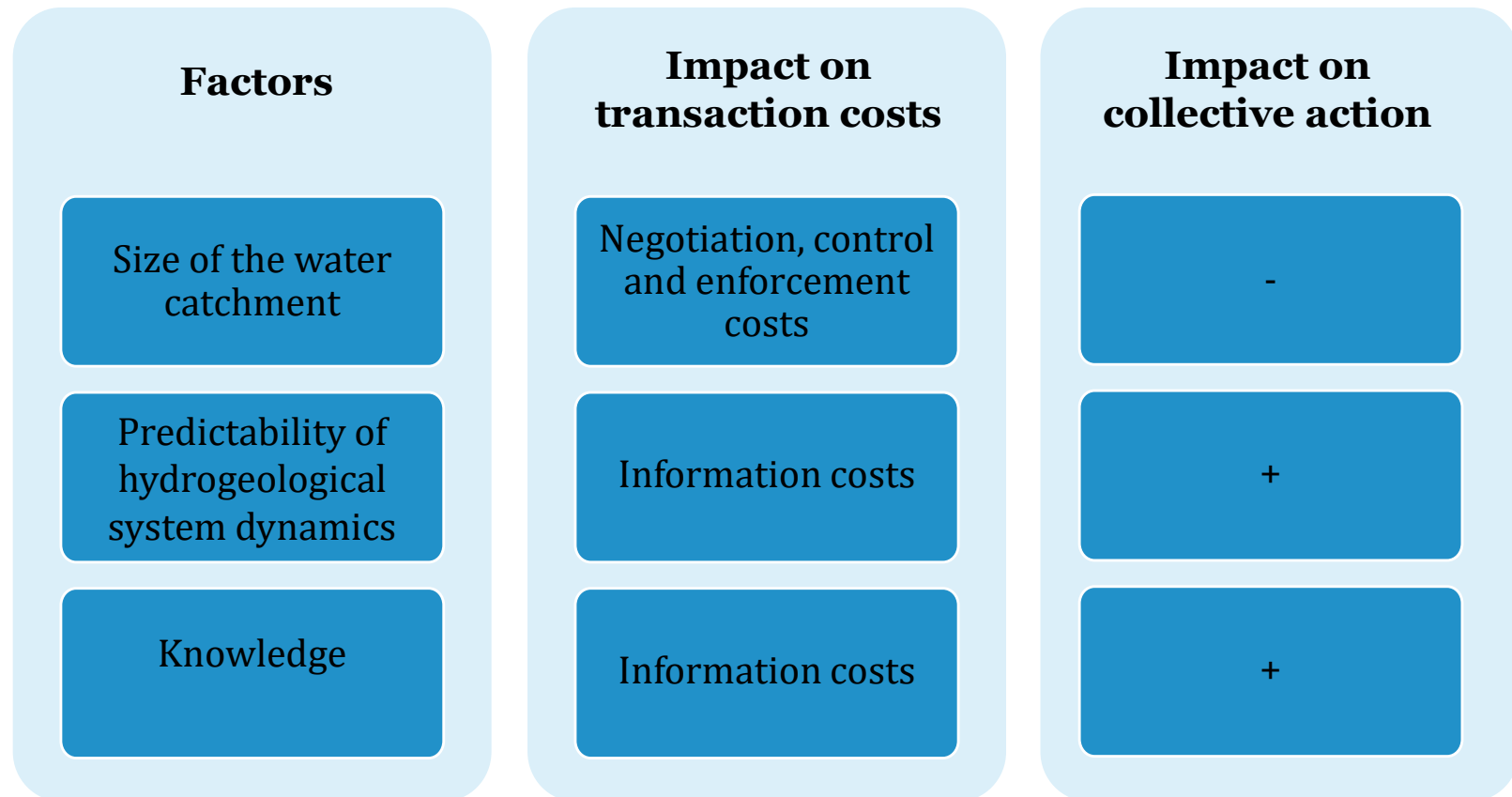
-/+

-/+

+

The factors affecting collective action

- The factors influencing transaction costs



The factors affecting collective action

- The factors influencing transaction costs

Factors

Involvement of farming leaders

Norms of reciprocity/social capital

Autonomy in contract design

Impact on transaction costs

Negotiation, control and enforcement costs

Negotiation, control and enforcement costs

Trade-off benefits/transaction costs

Impact on collective action

+

+

-/+



Conclusion

- The factors favoring/constraining cooperation between water suppliers and farmers
 - Interactions between the characteristics of the resource system, the actors involved, the governance system and the broader context
 - The sub-set of 2nd tier variables identified as crucial for the success of collective action by users of a common-pool resource ≥
 - Resource mobility (groundwater versus surface waters)



Conclusion

- The factors favoring/constraining cooperation between water suppliers and farmers
 - Other SES variables as conditions for the success of collective action
 - Socio-economic attributes of water suppliers and farmers ≥
 - The economic and policy context ≥

First-tier variable	Second, third and fourth-tier variables
Social, economic and political settings (S)	<p>S4 – Other governance systems <i>S4.1 – Larger scale governance systems</i> S4.1.1 – External support from public agencies</p> <p>S5 – Markets <i>S5.1 – Market conditions for agricultural products</i></p>
Resource systems (S)	<p>RS3 – Size of resource system * <i>RS3.1 – Size of the water catchment</i></p> <p>RS5 – Productivity of system * <i>RS5.1 – Level of water contamination</i></p>
Governance systems (GS)	<p>RS7 – Predictability of system dynamics * GS5 – Operational rules <i>GS5.1 – Contract incentives</i></p> <p>GS6 – Collective-choice rules* <i>GS6.1 – Autonomy at the collective-choice level</i></p> <p>GS8 – Monitoring and sanctioning rules <i>GS8.1 – Contract enforcement</i></p>
Actors (A)	<p>A1 – Number of relevant actors * <i>A1.1 – Number of farmers</i></p> <p>A2 – Socio-economic attributes <i>A2.1 – Resources available to water suppliers</i> <i>A2.2 – Type of farming systems</i> <i>A2.3 – Heterogeneity of farming systems</i></p> <p>A5 – Leadership-entrepreneurship * <i>A5.1. – Leadership in the farming community</i></p> <p>A6 – Norms (trust-reciprocity)/social capital *</p> <p>A7 – Knowledge of SES *</p> <p>A8 – Importance of the resource * <i>A8.1 – Economic importance for water suppliers</i> <i>A8.2 – Environmental preferences of water suppliers/farmers</i></p>



Conclusion

- Results = adaptation of the SES framework to the case of collective action for drinking water source protection
 - Use of identified factors as assumptions to be tested on a larger sample of cases in France
 - Application of the adapted framework to cases of cooperation in other countries
 - The role of factors linked to the different institutional context at the national/EU levels



Thanks for your attention

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