

Gérer des territoires via des dispositifs de partage d'information La technologie est-elle une panacée ?



Leçons de terrains et de modèles

Nicolas PAGET
nicolas.paget@irstea.fr

Qui suis-je ?

Thèse en informatique (2016)



Australian
National
University



ANU CENTRE FOR EUROPEAN STUDIES

***Faire face à des menaces en partageant
l'information pour gérer des ressources naturelles***

Empirique

Théorique

Etudes de cas

- Focus Ostréiculture
- Entretiens directs
- Observation participante
- Littérature
- Systèmes d'information particuliers
 - SIG mais pas que

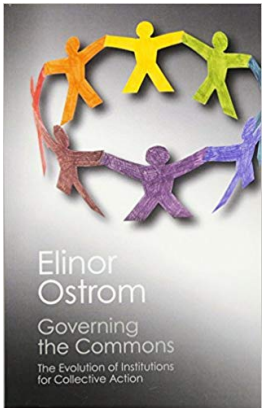
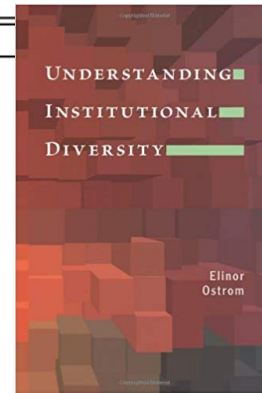
Modélisation

- Systèmes complexes
- Socio-ecological systems
- Modélisation et simulation multi-agents

Approche à la Ostrom

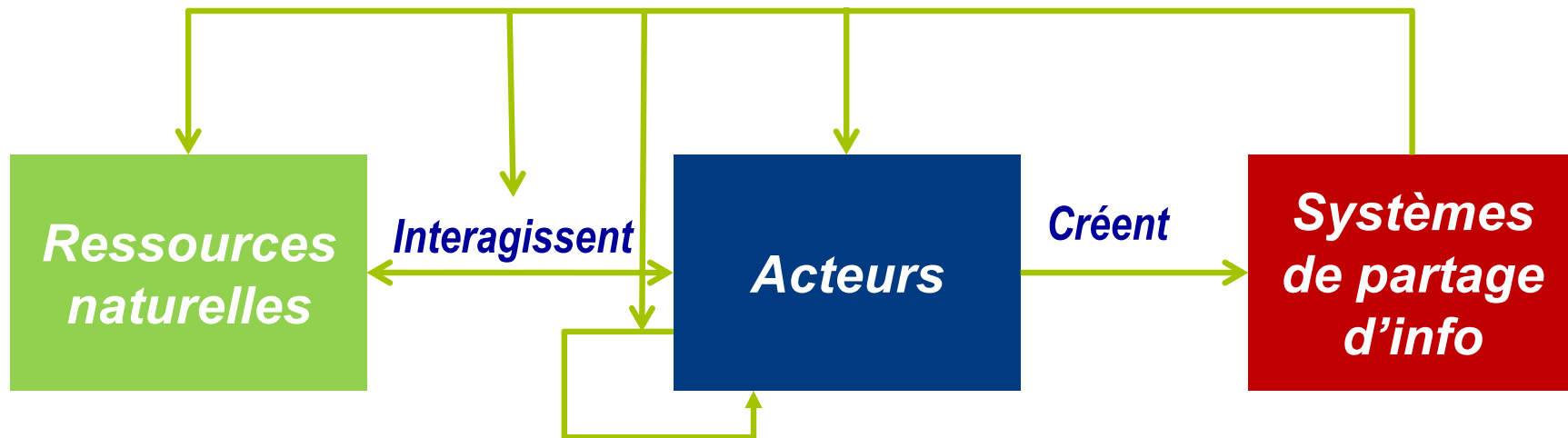


First-tier variable	Second-tier variables
Social, economic, and political settings (S)	S1 – Economic development S2 – Demographic trends S3 – Political stability S4 – Other governance systems S5 – Markets S6 – Media organizations S7 – Technology
Resource systems (RS)	RS1 – Sector (e.g., water, forests, 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
Action situations: Interactions (I) → Outcomes (O)	I1 – Harvesting I2 – Information sharing I3 – Deliberation processes I4 – Conflicts I5 – Investment activities I6 – Lobbying activities I7 – Self-organizing activities I8 – Networking activities I9 – Monitoring activities I10 – Evaluative activities O1 – Social performance measures (e.g., efficiency, equity, accountability, sustainability) O2 – Ecological performance measures (e.g., overharvested, resilience, biodiversity, sustainability) O3 – Externalities to other SESs
Related ecosystems (ECO)	ECO1 – Climate patterns ECO2 – Pollution patterns ECO3 – Flows into and out of focal SES

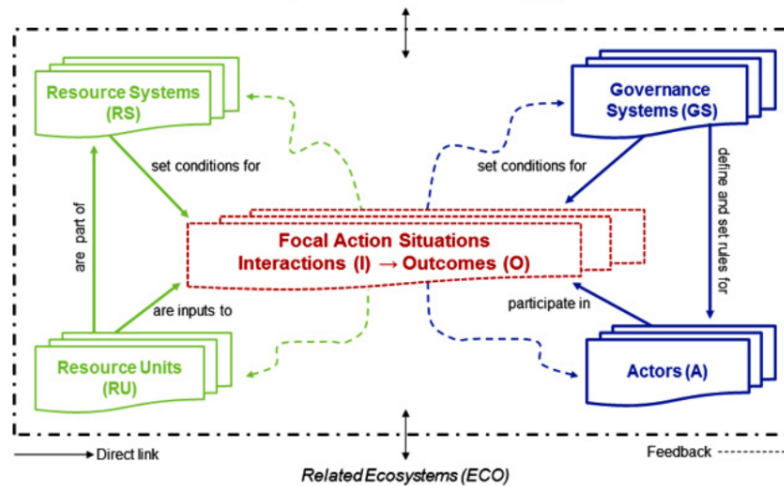


Un système d'information : une partie d'un système

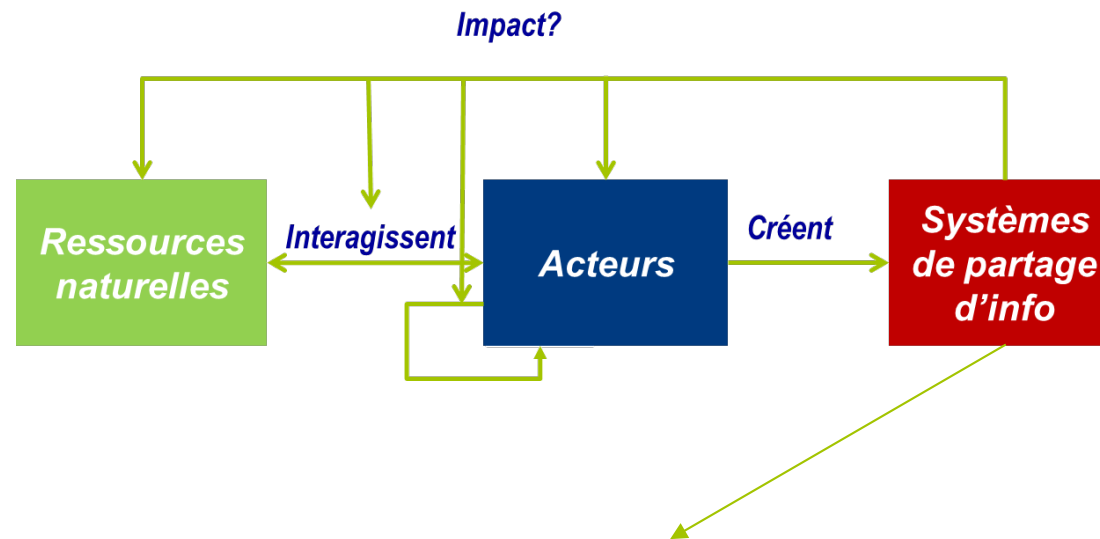
Impact?



Social, Economic, and Political Settings (S)

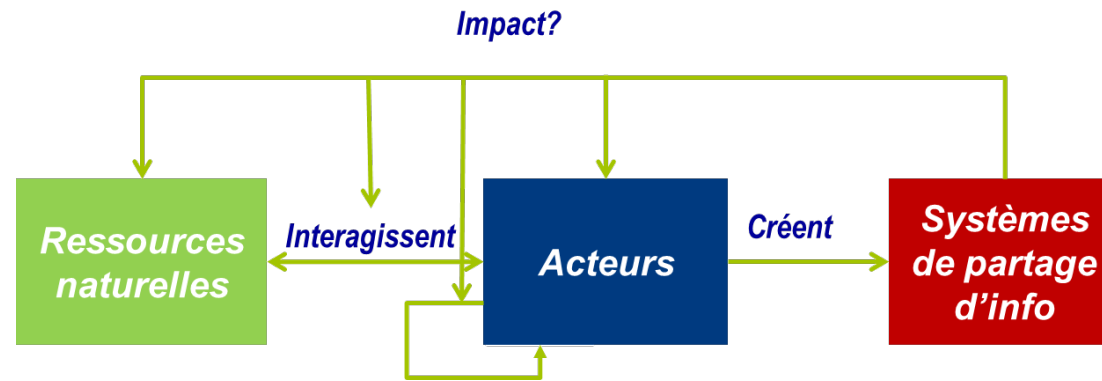


Présupposés



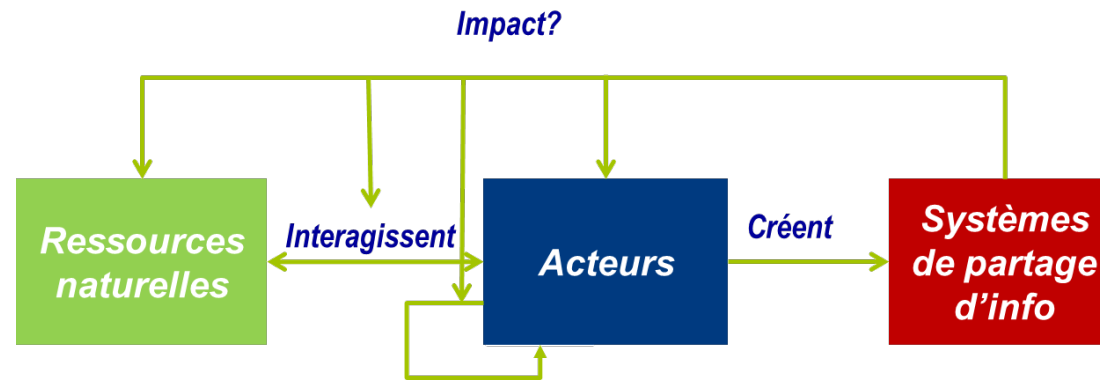
- Apporte informations manquantes
- Permet la réflexivité
- Améliore la gestion
- Favorise les relations
- Génèrera de la participation
- Sera utilisé

Questions fondamentales



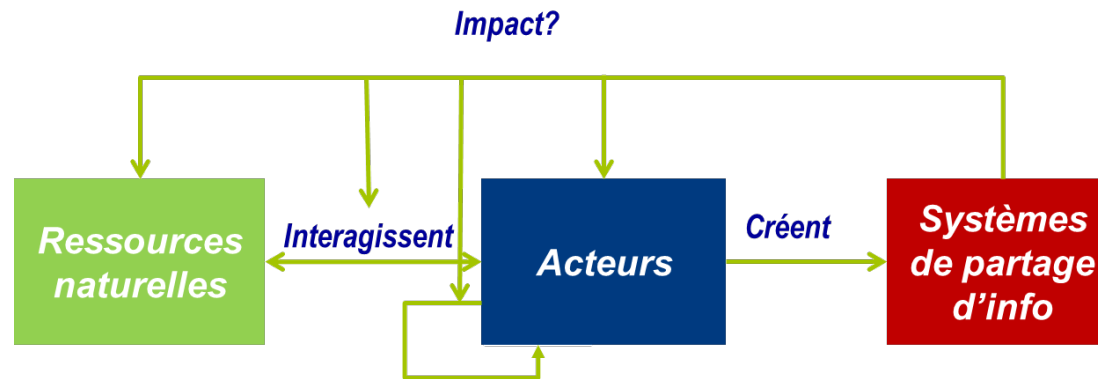
- Existence SI → Meilleure gestion / pratiques ?
- Existence SI → Apporte informations pertinentes ?
- Existence SI → Favorise le dialogue ?
- Relation entre Processus de création SI et Succès ?
- Besoin de technologies avancées, de modélisations poussées ?

Questions fondamentales ... non négligeables



- Création SI territorial coûte cher (\$\$ et temps)
- Histoire SI parsemée d'échecs (et de réussites aussi !)
 - Knowledge management
 - Systèmes experts
- Adéquation entre
 - Données collectables
 - Informations créées
 - Besoins / Connaissances des acteurs

Premières réflexions



Qu'est-ce que l'information ?

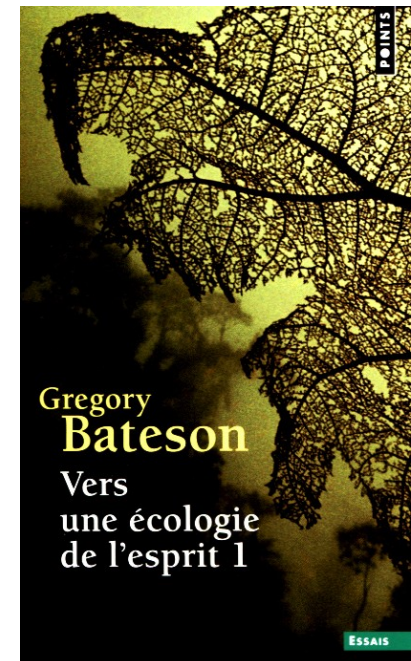
« Une différence qui crée une différence » (Bateson, 1972)

Utilité inséparable de

- Contexte
- Perception

SI = objet frontière ? (Star & Greisemer, 1989)

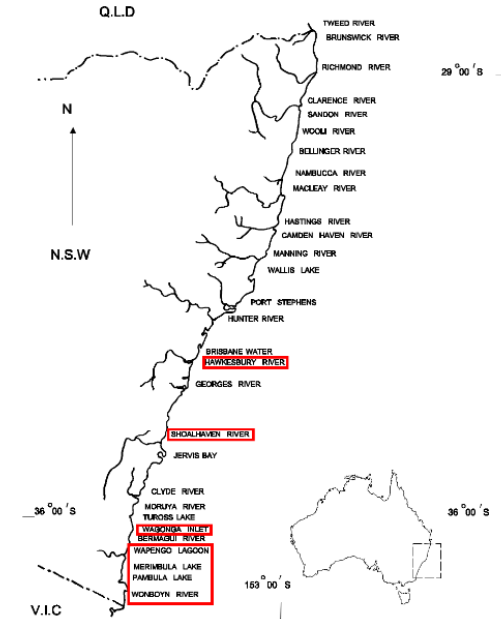
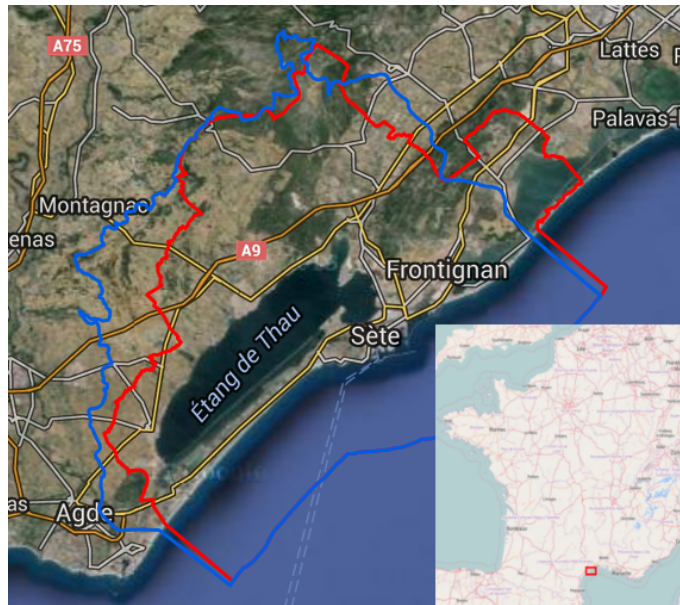
- Informations utiles à plusieurs
- Mutualisation
- Qui créent des différences variées





Enquête

Terrains

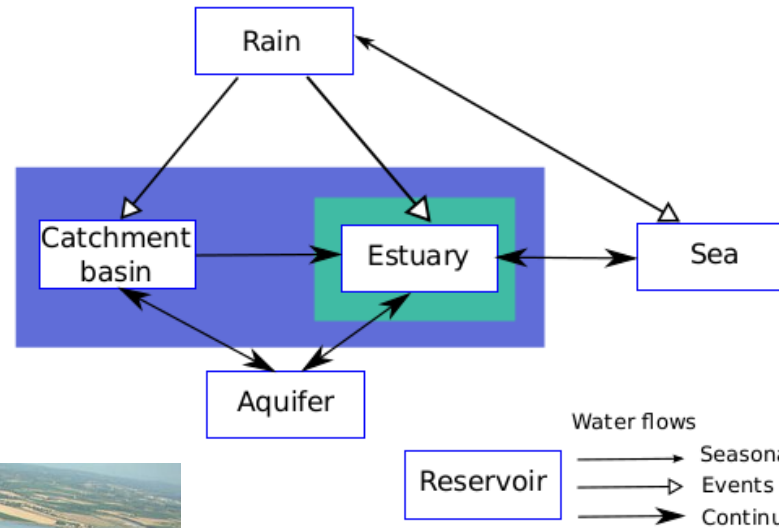


Méthodes

Etudes qualitatives / Modélisation

Ostréiculture – Très bref aperçu

**Modèle hydrologique
(Avancé !) BV**



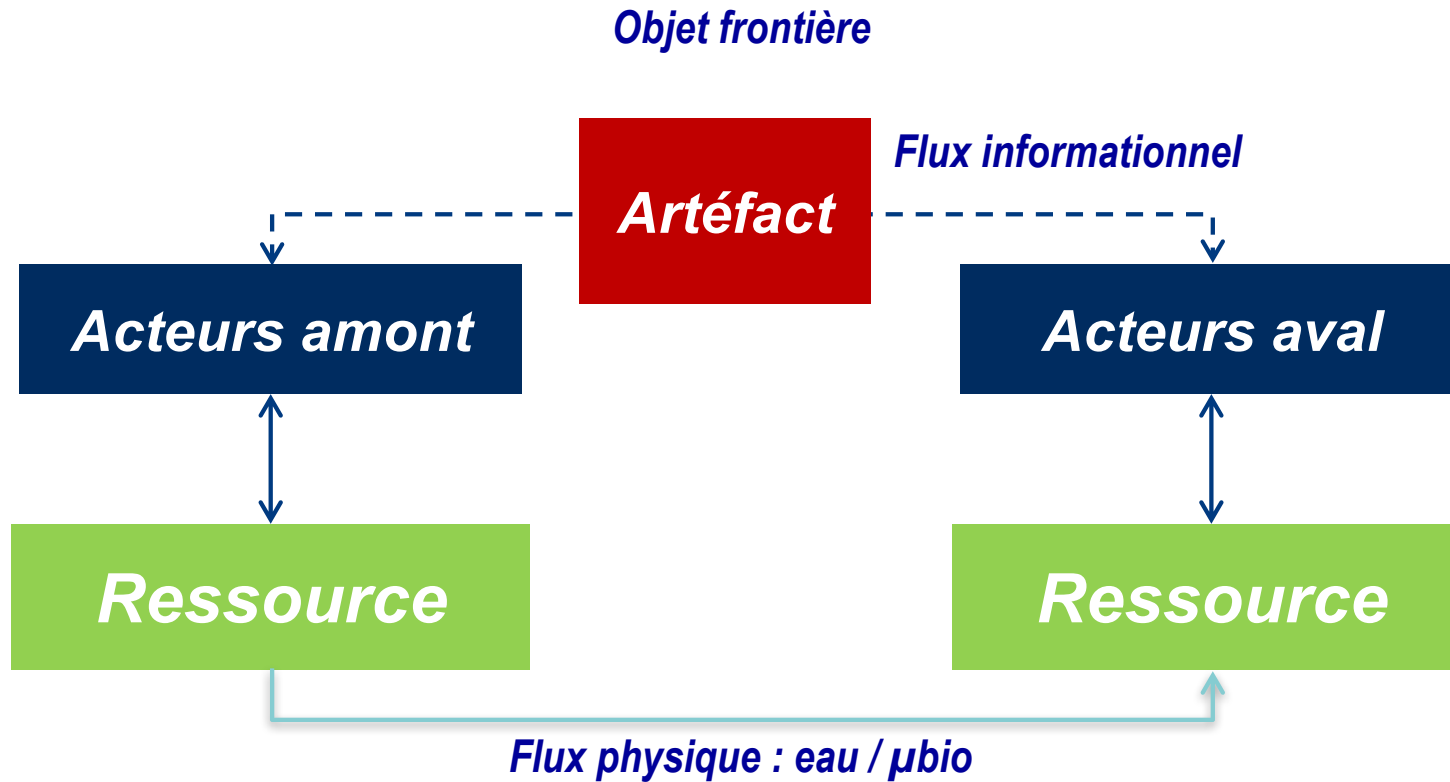
**Qualité de l'eau
Microbiologie**



Virus

→ SI pour améliorer ?

Flux microbiologiques



Deux réponses



Quelles différences ?

Comment définir le succès d'un système d'information ?



Quelles différences ?

Dimensions de changement ENCORE (Ferrand, 2004)

- Externes : dans le monde
- Normatifs : ce qui doit être selon les acteurs
- Cognitifs : ce qui est selon les acteurs
- Opérationnels : ce qui doit être fait
- Relationnels : ce qu'on pense des autres
- Equité : le ressenti



Apports information et
Processus création



Thau

NSW

Dim	Differences generated by OMEGA Thau implementation	
External	OF [†]	Almost no effect on the short run; Improvements in knowldge and impacts on WQ [‡]
	Govt and councils	Can use system to monitor water flows and predict WQ for developments (I, D)
	Farmers	None
	Project sponsors	Need to take WQ into account (I, D)
	Community	Safety during swimming and recreational fishing (C)
Normative	OF	Authorities are responsible for WQ management
	Govt and councils	Public authorities should take care of WQ
	Farmers	None
	Project sponsors	Should pay attention to consequences on WQ
	Community	None
Cognitive	OF	Public authorities do what they can to guarantee WQ
	Govt and councils	Can master future developments projects impacts and understand water flows
	Farmers	None
	Project sponsors	Individual projects have global consequences (I, D)
	Community	Water quality is an important issue
Operational	OF	Limited (warning a little earlier) (D)
	Govt and councils	Possess a decision aid tool to predict consequences of new developments (I, D)
	Farmers	None
	Project sponsors	Need to pass model test (under admissible levels)
Relational	OF	Good relations with public authorities
	Govt and councils	Are legitimate monitors of WQ
	Farmers	None
	Project sponsors	May feel more constrained
	Community	Good image of local authorities
Equity	OF	Feel that their resource is managed correctly
	Govt and councils	Better acceptance of decisions
	Farmers	None
	Project sponsors	Unknown
	Community	Unknown

Dim	Differences generated by of EMS implementation	
External	OF [†]	Cleaning up of derelict and polluting infrastructure, investment in sustainable infrastructure (I, D)
	Govt and councils	Can use oyster farmers knowledge and presence to assist when monitoring
	Farmers	Fencing off cattle to limit access to the estuarine foreshore (I), regrowth of riparian vegetation (I)
	House owners	Better on-site sewage system (I)
	Community	Safety during swimming and recreational fishing (C)
Normative	OF	OF should provide stewardship over water, others should be made aware of their impacts
	Govt and councils	OF should provide help as stewards of the waterways
	Farmers	Need to play a role in keeping good water quality
	House owners and community	Should be made aware that they can have an impact on water quality
	Community	
Cognitive	OF	Government is not an enemy
	Govt and councils	Oysters are good indicators of estuarine health
	Farmers	Farming activities can impact water quality (D)
	House owners	Micro behaviors can affect the whole system (D)
	Community	Aware that OF are not harmful (if not beneficial) to the environment, OF is associated with clean environment, suitable for tourism, generating income for the local economy
Operational	OF	Reducing high internal threats by implementing threat mitigation procedures (I, D)
	Govt and councils	OF are integrated in decision processes (I, D)
	Farmers	Maintain cattle out of the water, behind fences (I)
	House owners	Improve or maintain sewage treatment (I, D)
Relational	OF	Legitimate members of the community, can talk to others with pride
	Govt and councils	OF are knowledgeable partners
	Farmers	OF are partners in environment quality
	House owners	Accept better OF requests for costly improvements
	Community	Common interest in tourism
Equity	OF	Feel that they have input
	Govt and councils	Better acceptance of decisions
	Farmers and house owners	Agree to invest knowing OF make efforts
	Community	Legitimate use of crown resource
	Community	



Résultats enquête de terrain

Thau

- Méconnaissance globale du projet par les acteurs (ostréiculteurs)
- Différence limitée, *a priori*, car pas plus d'infos que la météo
- Beau modèle qui traque les polluants et a pas mal évolué

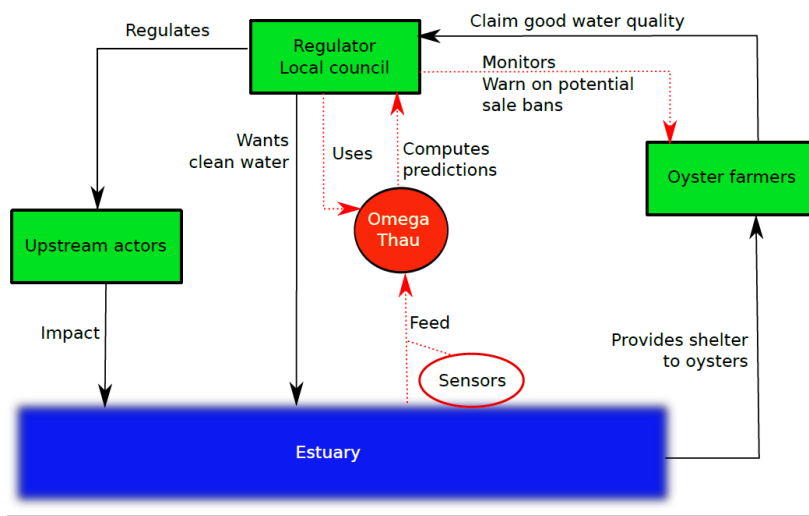
NSW

- Fierté et légitimation des ostréiculteurs
- Connexions créées avec les collectivités
- Stewards de l'environnement
- Références au document

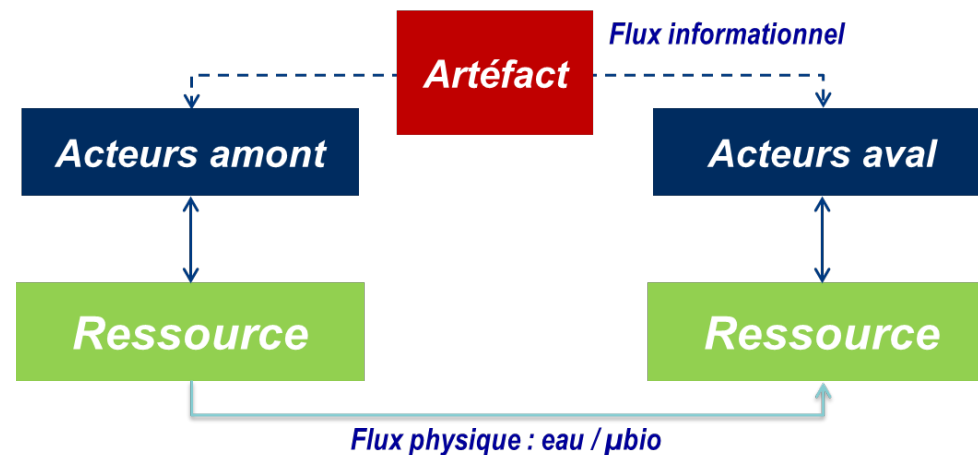
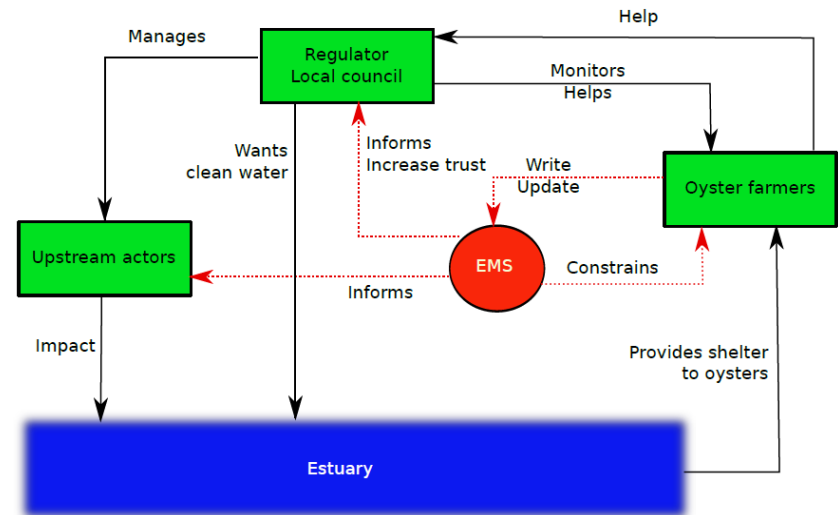
Information = « Différence qui crée une différence »

Quelles différences dans le système ?

Thau



NSW



Ostréiculture – Problématiques majeures



Qualité de l'eau
Microbiologie



Virus



Virus

Extrêmement violent

Mal compris

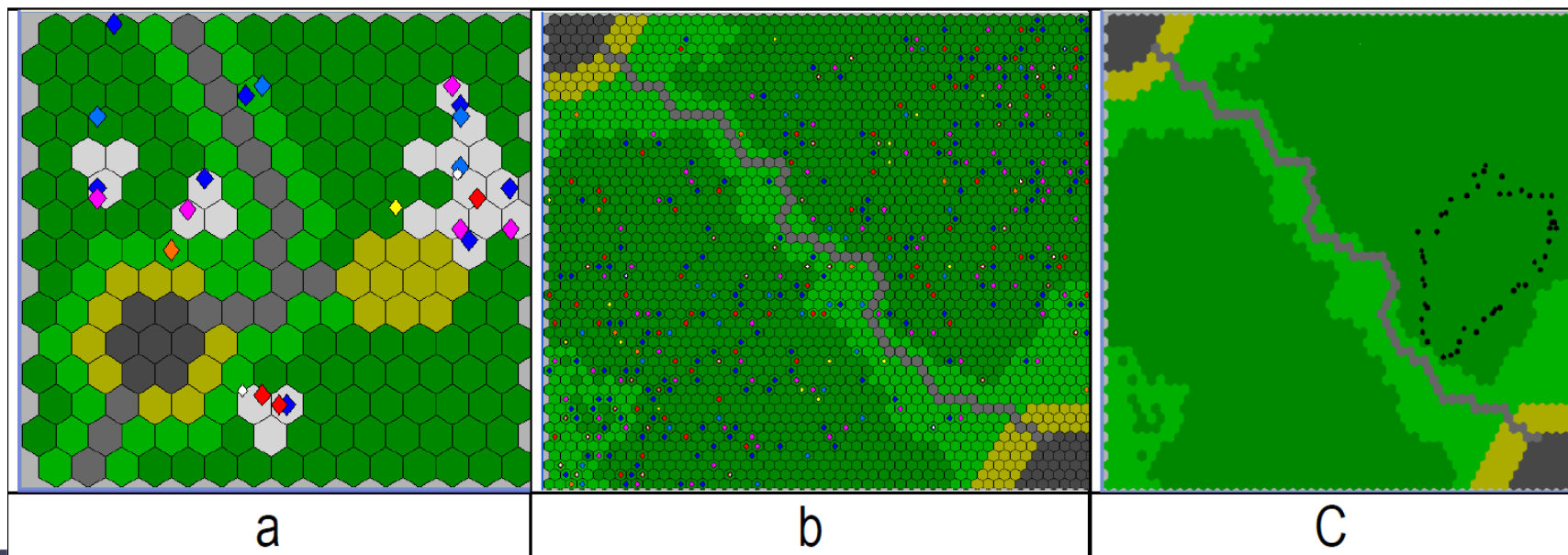
Semble dépendre des pratiques

Exploration de la notion de partage d'information

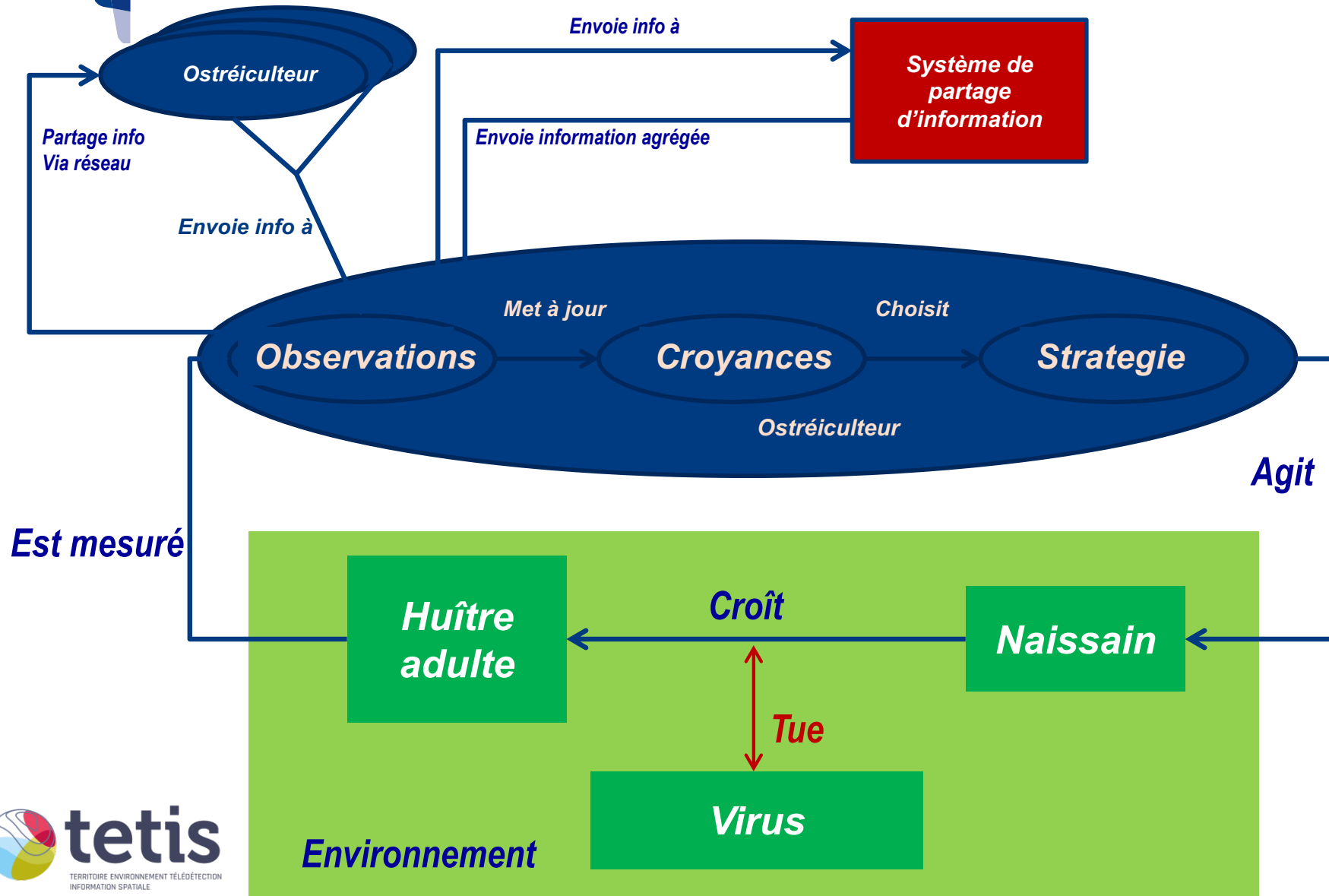
Modélisation multi-agents

Modélisation et simulation multi-agents

- Environnement (un pavage)
- Des agents
- Des dynamiques environnementales
- Des perceptions et des actions d'agents



Quel impact de l'information ?



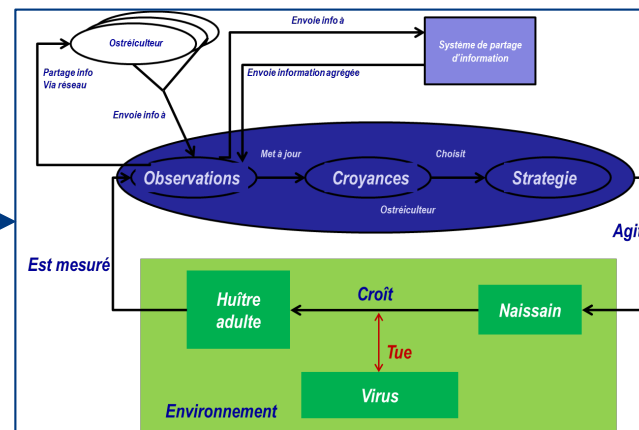
Quel impact de l'information ?

Entrée

- 3 Types agents
- 4 Nb agents
- 4 Seuils décisions
- 3 Dynamiques virus
- 9 Partage d'info

- 1300 scénarios
- 40 répliques

Modèle



Sorties

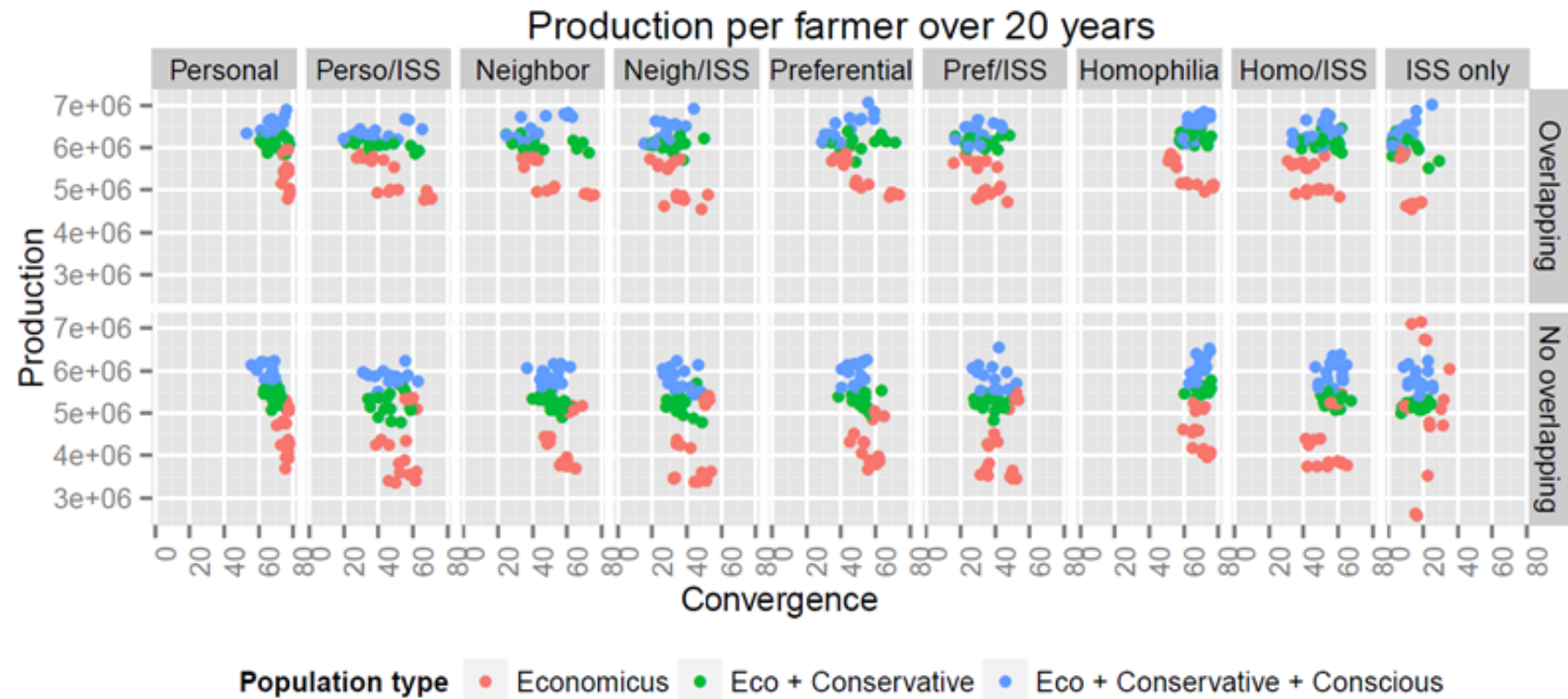
Ressource

- Production
- Mortalité

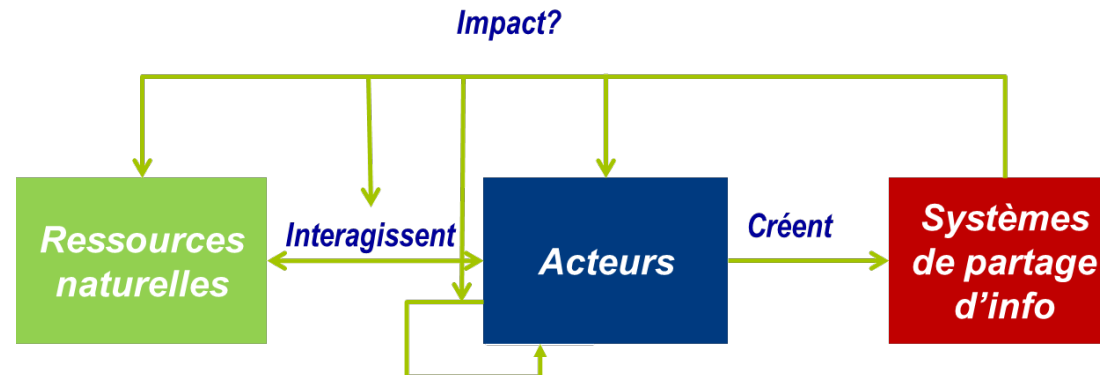
Agents

- Croyances (dispersion)
- Croyances (distance réalité)
- Pratiques (types)
- Pratiques (convergence)

Quel impact de l'information ?



Questions fondamentales → SI territorial



Existence SI → Meilleure gestion / pratiques ?

Réponses qualitatives et théoriques

Existence SI → Apporte informations pertinentes ?

Ca dépend

Existence SI → Favorise le dialogue ?

Importance pcs création

Relation entre Processus de création SI et Succès ?

Besoin de technologies avancées, de modélisations poussées ?

Les plus impactantes pas forcément les plus avancées

Se poser la question de la différence qu'elle crée ... pour qui, comment, à quel moment ?

« Ce qui compte le plus, c'est de se parler. » Annie Castaldo, ostréicultrice



Références

- * Bateson, G. (1972). Steps to an ecology of mind: Collected essays in anthropology, psychiatry, evolution, and epistemology. University of Chicago Press.
- Bommel, P., & Bécu, N. (2015). Playing with Cormas, an interactive ABM platform for managing natural resources collectively.
- * Hardin, G. (2009). The tragedy of the commons. *Journal of Natural Resources Policy Research*, 1(3), 243-253.
- Janssen, M. A., & Ostrom, E. (2006). Empirically based, agent-based models. *Ecology and society*, 11(2).
- McGinnis, M., & Ostrom, E. (2014). Social-ecological system framework: initial changes and continuing challenges. *Ecology and Society*, 19(2).
- * De Rosnay, J. (1975). Le macroscope: vers une version globale.
- * Ostrom, E. (1990). *Governing the commons*. Cambridge university press.
- * Star, S. L., & Griesemer, J. R. (1989). Institutional ecology, translations' and boundary objects: Amateurs and professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39. *Social studies of science*, 19(3), 387-420.

Vidéo sur les jeux de rôles : [Du terroir au pouvoir](#)

* = les plus importantes