

Transfers of vulnerability and robustness in SES as coupled feedback loops

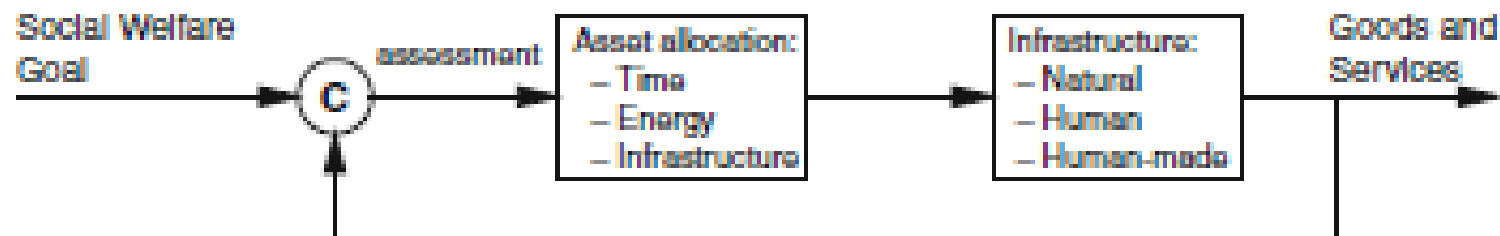


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Transfer of robustness

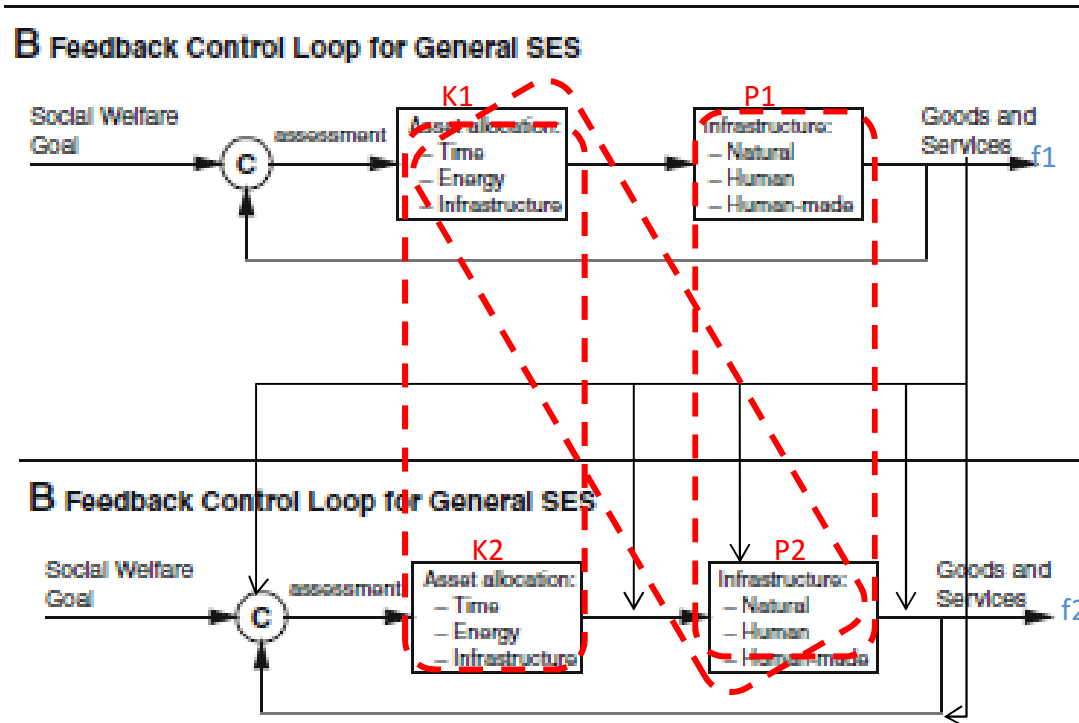
- *By transfer of vulnerability/robustness, we mean a change for other agents or stakes in their robustness while increasing one's own robustness for a given stake*
- Plurality of view points: spatial and time scales, stakes
=> Interaction between feedback loops

B Feedback Control Loop for General SES



From Anderies 2015

Transfer of robustness



From Anderies 2015

- f_i modifies the hazard encountered by J
- f_i modifies the asset allocation for P_j
- f_i modifies P_j
- f_i modifies the outcome of P_j
- f_i modifies the signal monitored by J
- With $f_i = f'_i + f''_i$
With f' fits the objective and f'' the side effects
- $K_i \cap K_j \neq \emptyset$
(competition on resources)
- $K_i \cap P_j \neq \emptyset$
(infrastructure as resource)
- $P_i \cap P_j \neq \emptyset$
(sharing infrastructure)

➤ Metaphor to analyse cases towards a typology of transfers

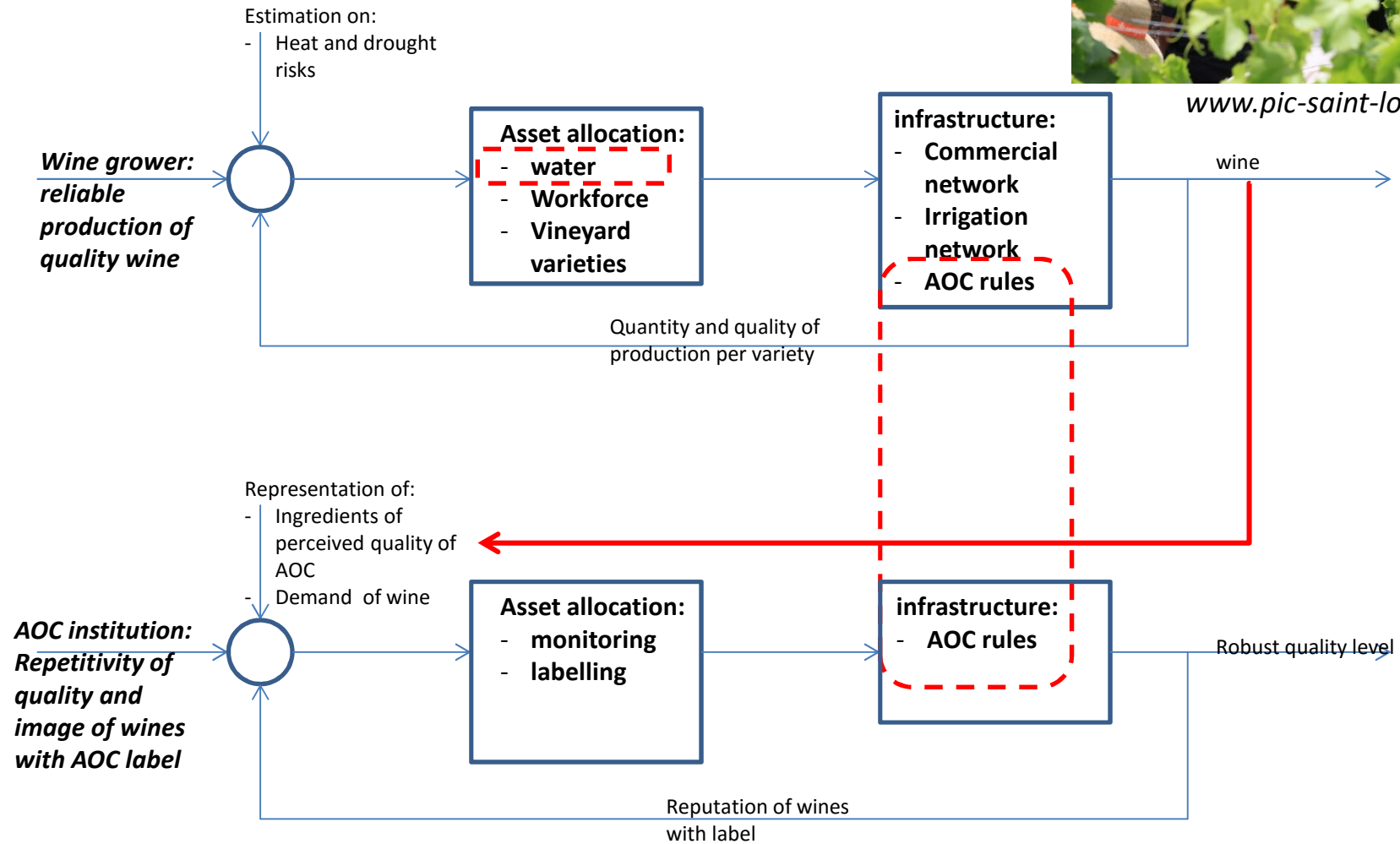
Across a diversity of levels

	$K_i \cap K_j \neq \emptyset$	$P_i \cap P_j \neq \emptyset$	$K_i \cap P_j \neq \emptyset$	Impact of intended flows	Impact of unintended flows	Impact on infrastructures	Impact on risk exposure
Cross-stake							
Cross spatial level							
Cross time scale							
Cross governance levels							
Multiple							

Drought adaptation VS Protected Designation of Origin



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Institutional locked in; possible trade off between with water sharing
(Based on Dedieu 2015)

Synthesis of cases

	$K_i \cap K_j \neq \emptyset$	$P_i \cap P_j \neq \emptyset$	$K_i \cap P_j \neq \emptyset$	Impact of intended flows	Impact of unintended flows	Impact on infrastructures	Impact on risk exposure
Cross-stake		- Mosquito/ biodiversity - Mosquito/ irrigation	Mosquito / biodiversity		Mosquito (dispersion of Bti)	Sand/dune	Urban/flood Irrigation providing new habitats to mosquitos
Cross spatial level	irrigation of wine						
Cross time scale	Wine growing (money)					Wine growing (infrastructure investment)	
Cross governance levels		- Safe urban development (social places maintenance and ownership) - AOC rules VS vineyard adaptation		Safe urban development (means for structural investments, support & money)			Flood management (risk perception)
Multiple		Land use planning					

Discussion

- Typology suitable and capture structural changes
 - Ability to identify requirements for cooperation
 - Ability to identify alternative pathways
- Robustness transfer not only an issue of flow control

Acknowledgements

- Belmont Forum (incl. NERC, NSF, NRF, ANR)
- Resilience Alliance
- Agence de l'eau Rhône Méditerranée

