

# The resilience lens and sedimentary systems

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**TNO | Knowledge for business**



# Resilience of the system

- Origin in: systems ecology, economics, thermodynamics, complexity theory
- Applied to: ecosystems, cities, natural resource management
- Socio-ecological system is non-decomposable



# Resilience (Folke, 2006):

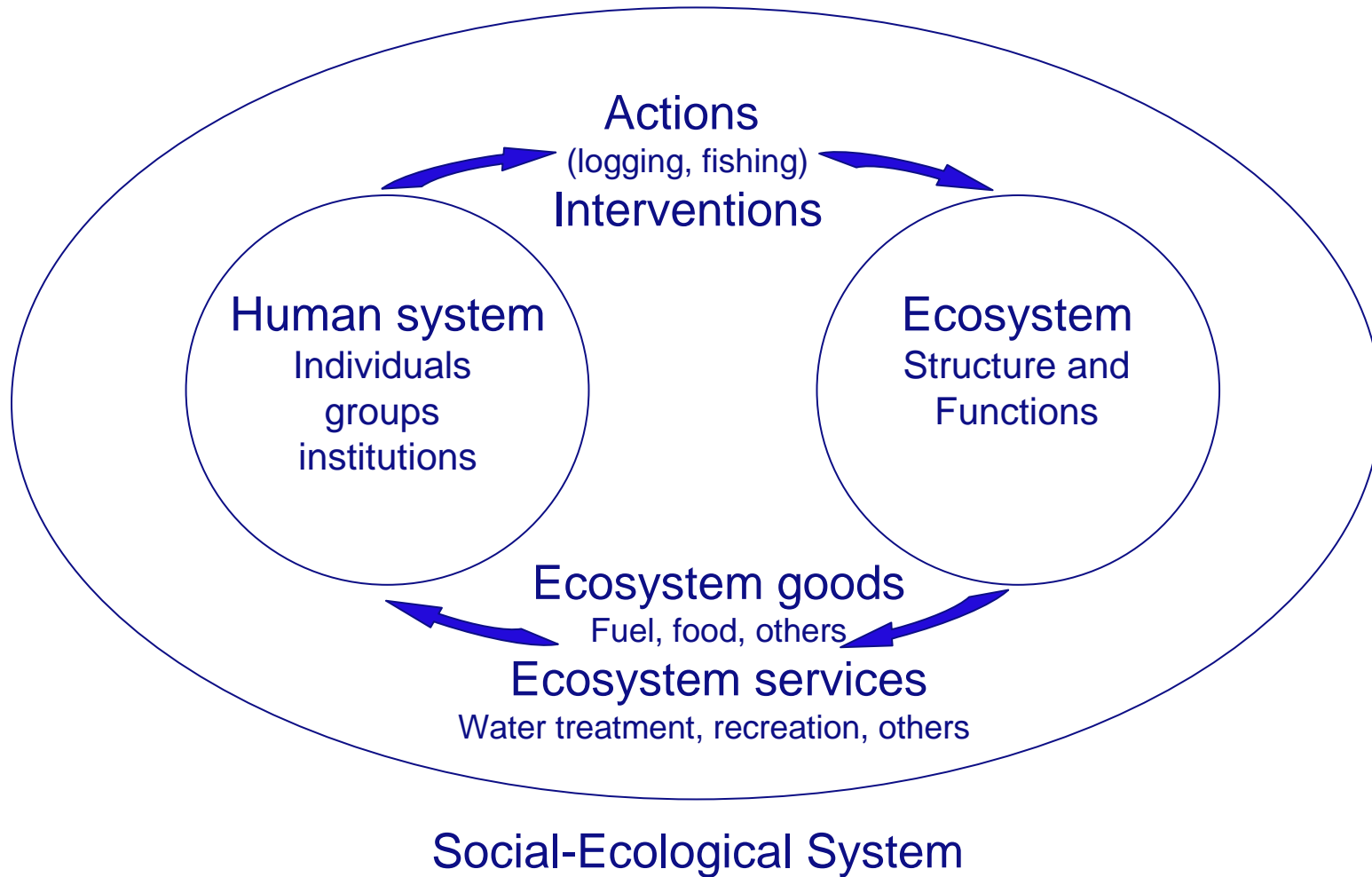
Is about:

- Capacity to absorb shocks and still function
- Non-linear dynamics, multiple equilibriums
- Vulnerability versus adaptive capacity
- Renewal, re-organization, (re)development
- Gradual and rapid change
- Uncertainty and surprise
- Patterns across different temporal and spatial scales

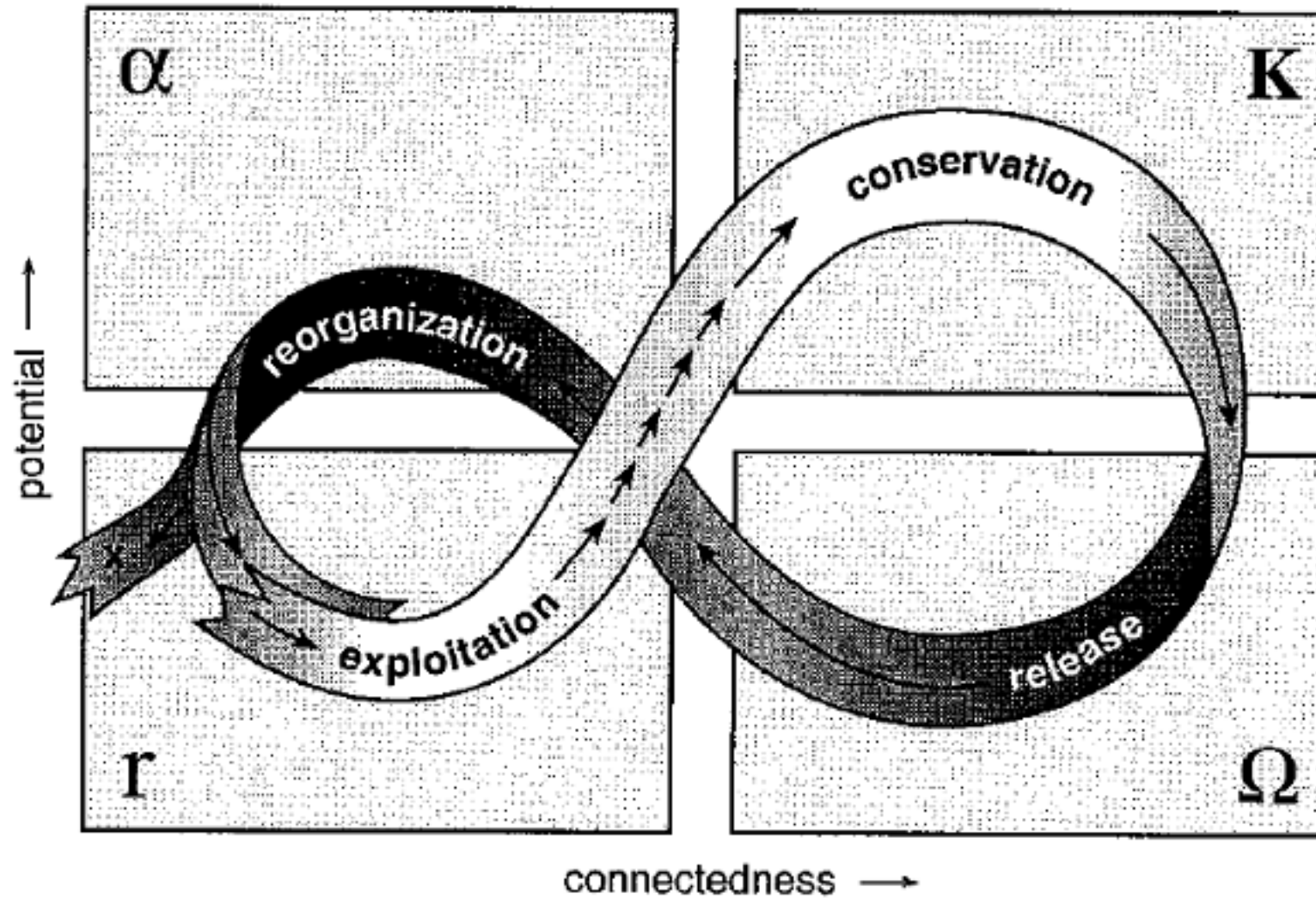
## Resilience concepts (Folke,2006)

<b>Resilience concept</b>	<b>Characteristics</b>	<b>Focus</b>	<b>Context</b>
Engineering resilience	Return time, efficiency	Recovery, constancy	Vicinity of a stable equilibrium
Ecosystem resilience/ social resilience	Buffer capacity, withstand shock, maintain function	Persistence, robustness	Multiple equilibriums
Social-ecological resilience	disturbance and reorganization, sustaining and developing	Transformability, learning, innovation	System feedback Cross-scale interactions

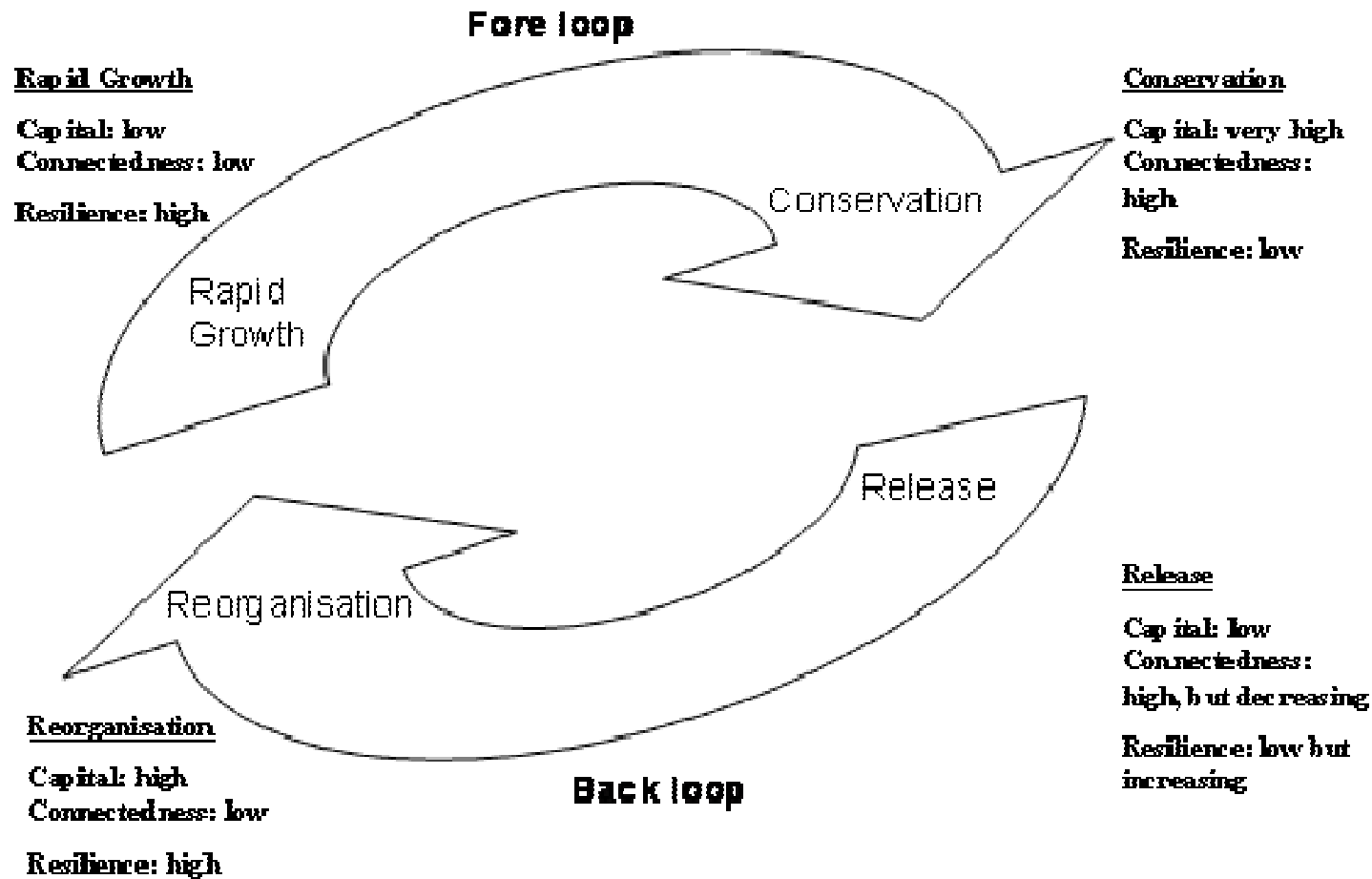
# Social-ecological systems



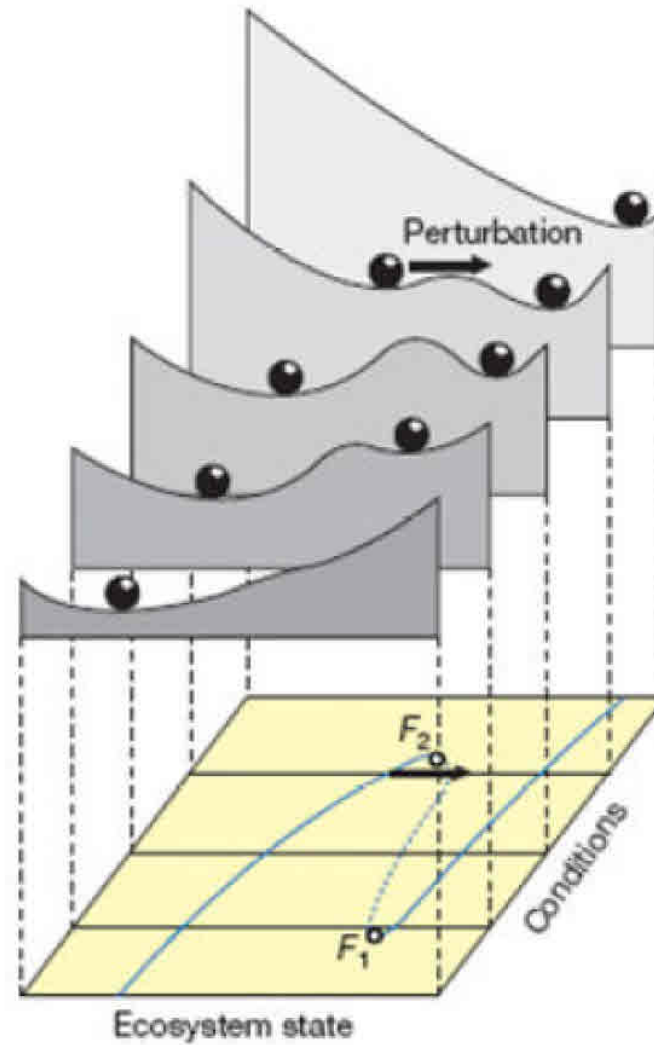
# Key elements: Adaptive cycle



# Adaptive cycle

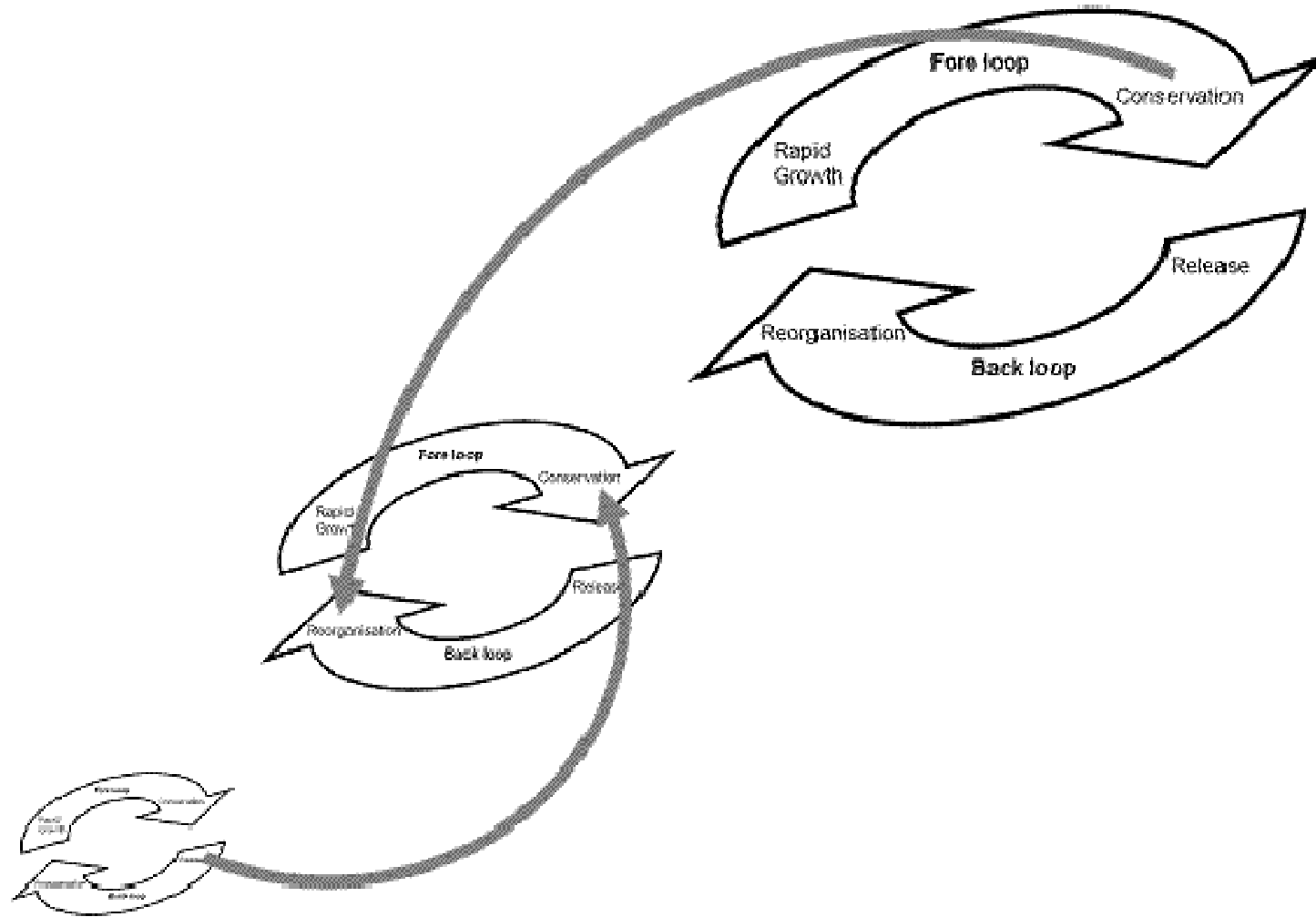


# Key elements: Regime shift



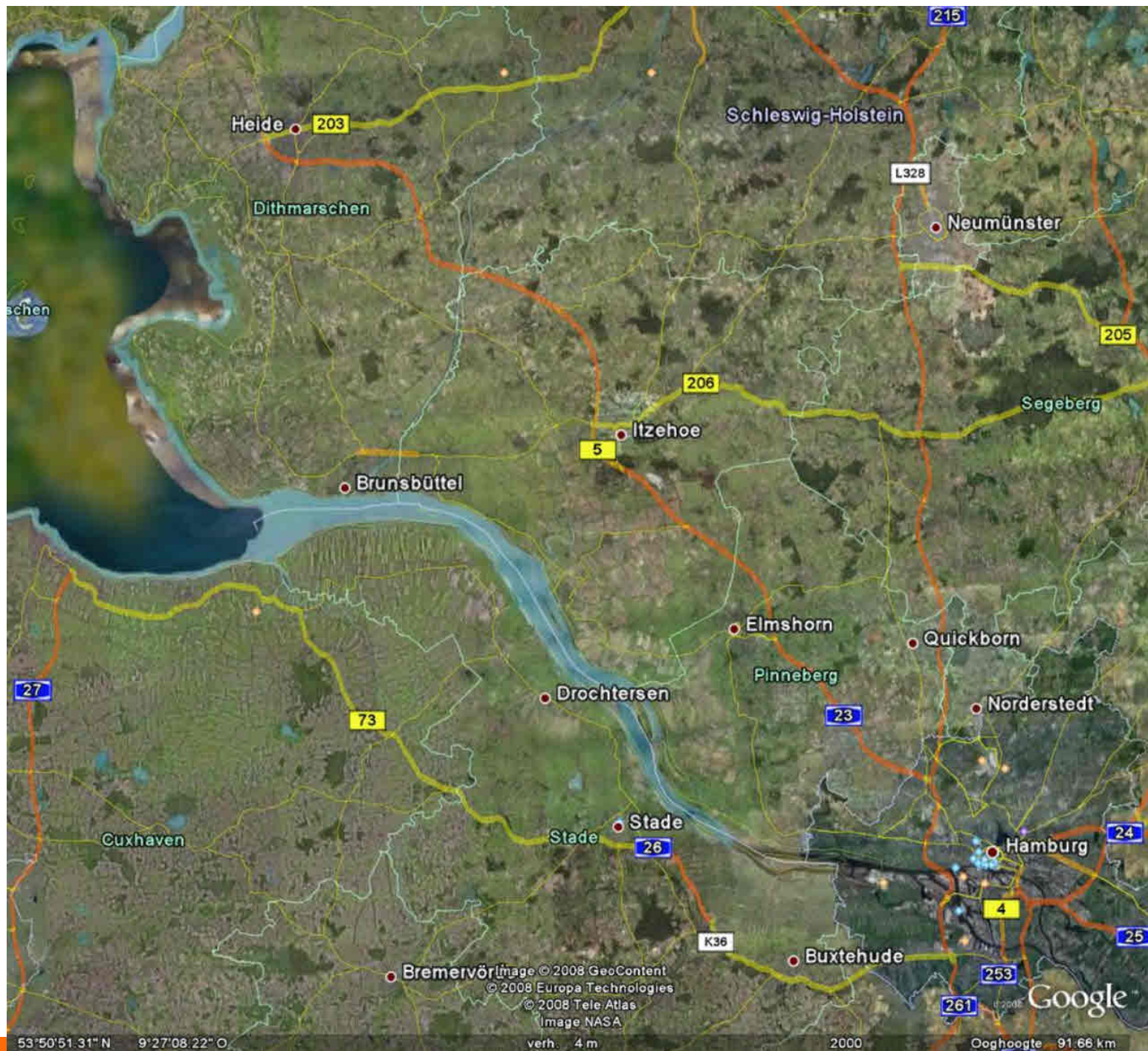


# Key elements: Panarchy

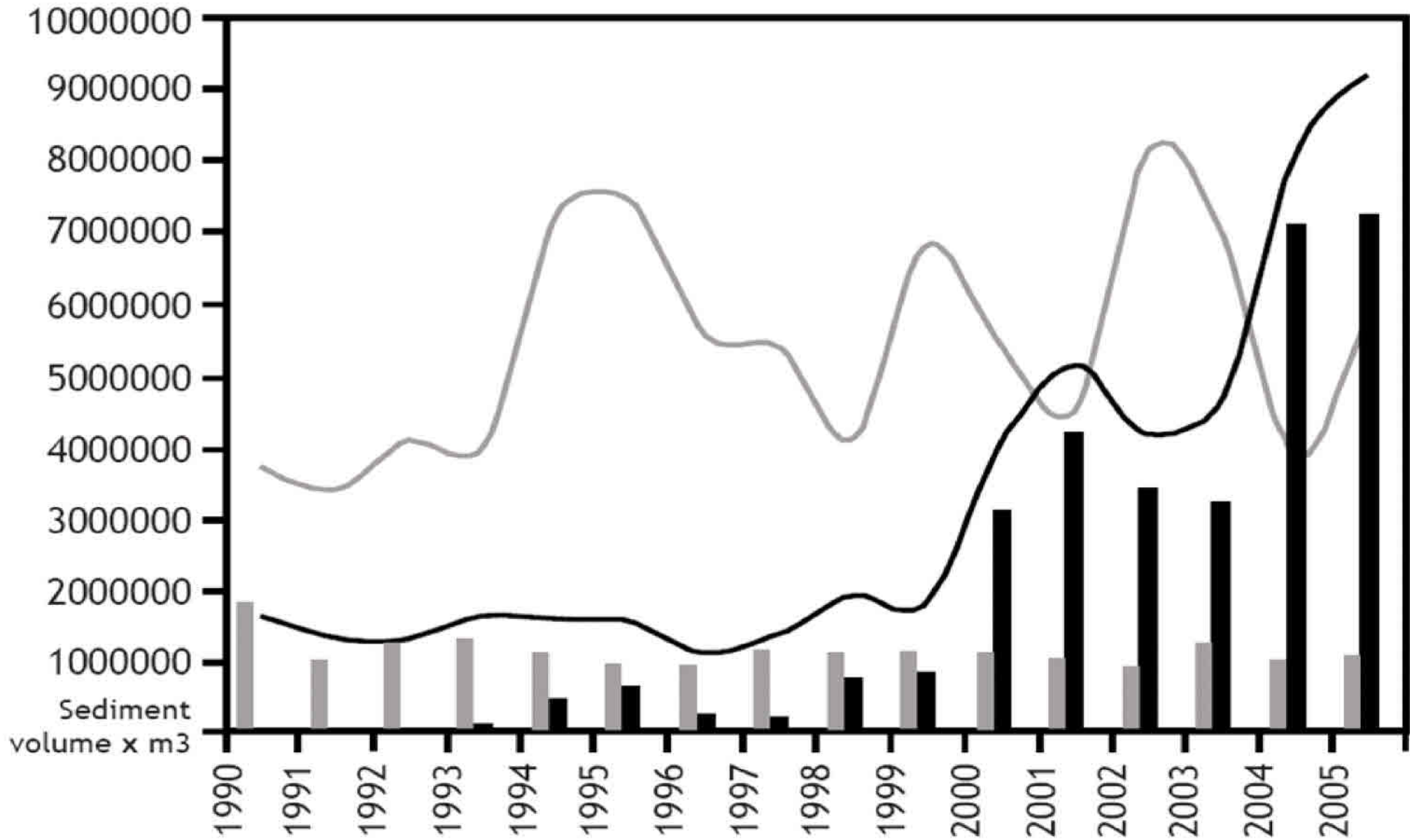


# Example: Hamburg harbour





# Sediment in Hamburg Harbour



# Tidal effects in the innercity



## Adaptive governance (Folke, 2006)

- Understanding ecosystem dynamics
- Continuous learning to respond to ecosystem feedback
- Building adaptive capacity to deal with uncertainty and surprise
- Support flexible institutions and social networks in multi-level governance



# Learning cycle for biophysical/social systems

