

NAVARUN VARMA  
EARTH SCIENCE AND CLIMATE CHANGE  
DIVISION,  
THE ENERGY AND RESOURCES INSTITUTE

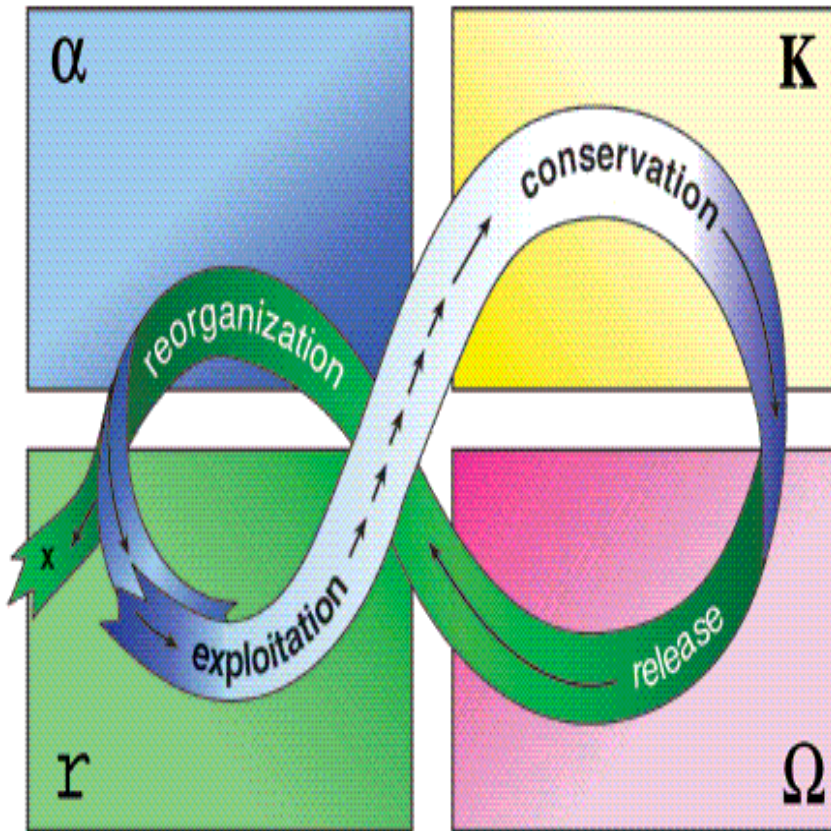
# Major trends in Bangalore

- Population growth
  - Growth in Urban sprawl
  - Decrease in water bodies and vegetation
  - Increase in Water demand
  - Occurrence of Urban flood
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1. Are there linkages among the trends?
  2. Can we distinguish between drivers, impacts and responses?
  3. Are we seeing them? Can such linkages even change?
  4. How do we understand tradeoffs and respond?

# Concepts of systems thinking and dynamics

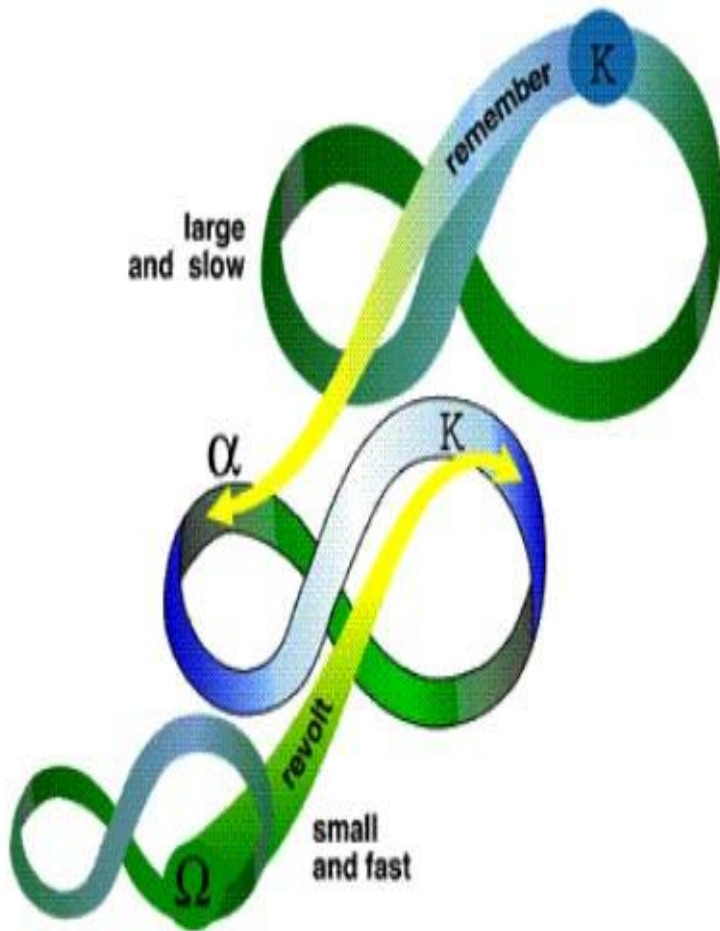
- Stability and chaos
- No simple cause-effect for any outcome due to non-linearity
- Self organization through feedbacks
- Emergence of behavior

# Vulnerability and adaptation in System- An ecological perspective



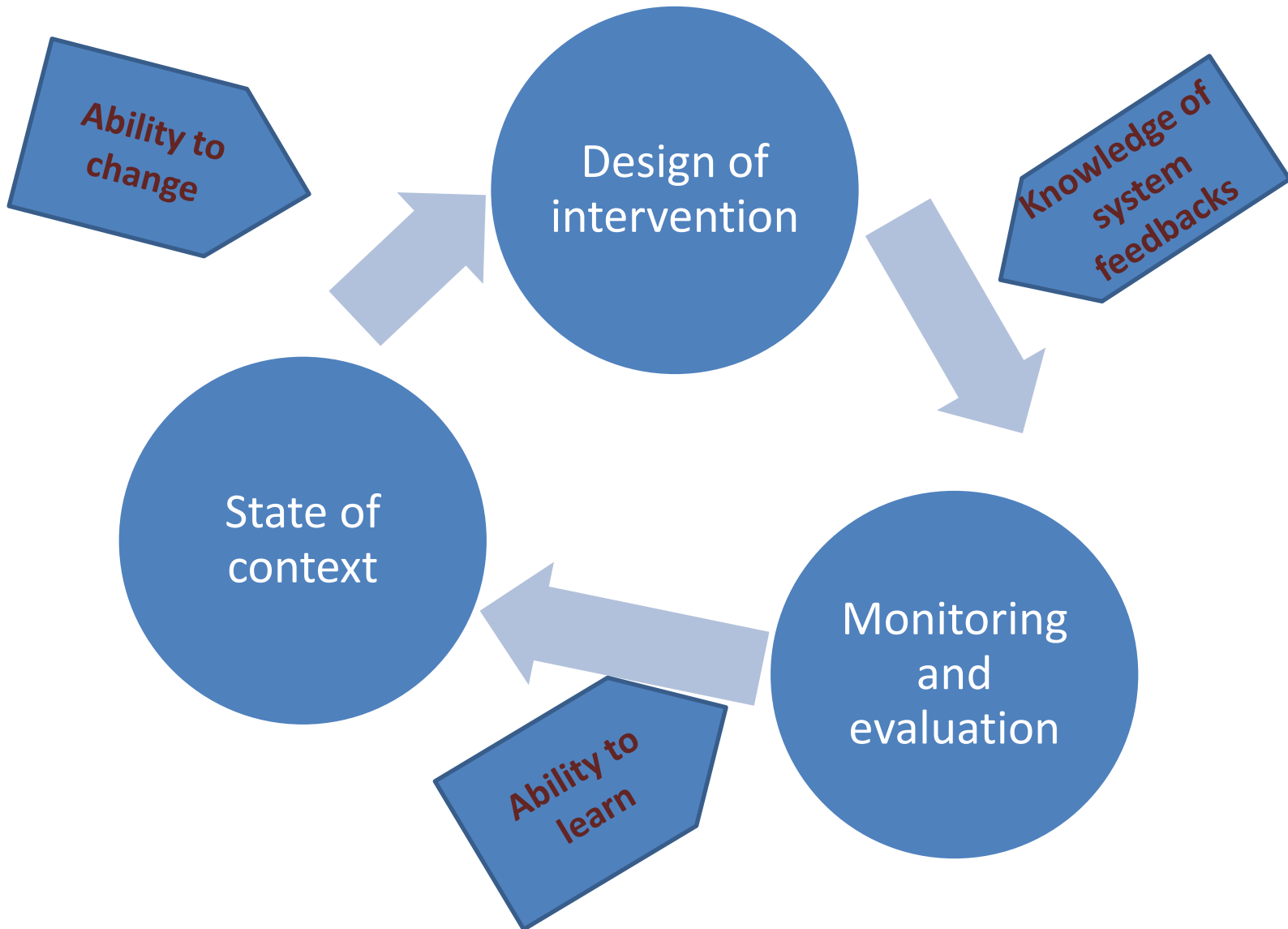
- Adaptive cycle
- Resilience
- Ecological resilience vs. engineering resilience

# Panarchy



- Cross-scale interactions
- Hierarchy vs. Panarchy
- Systems may become rigid, vulnerable to surprise, chaotic
- Need for Balance

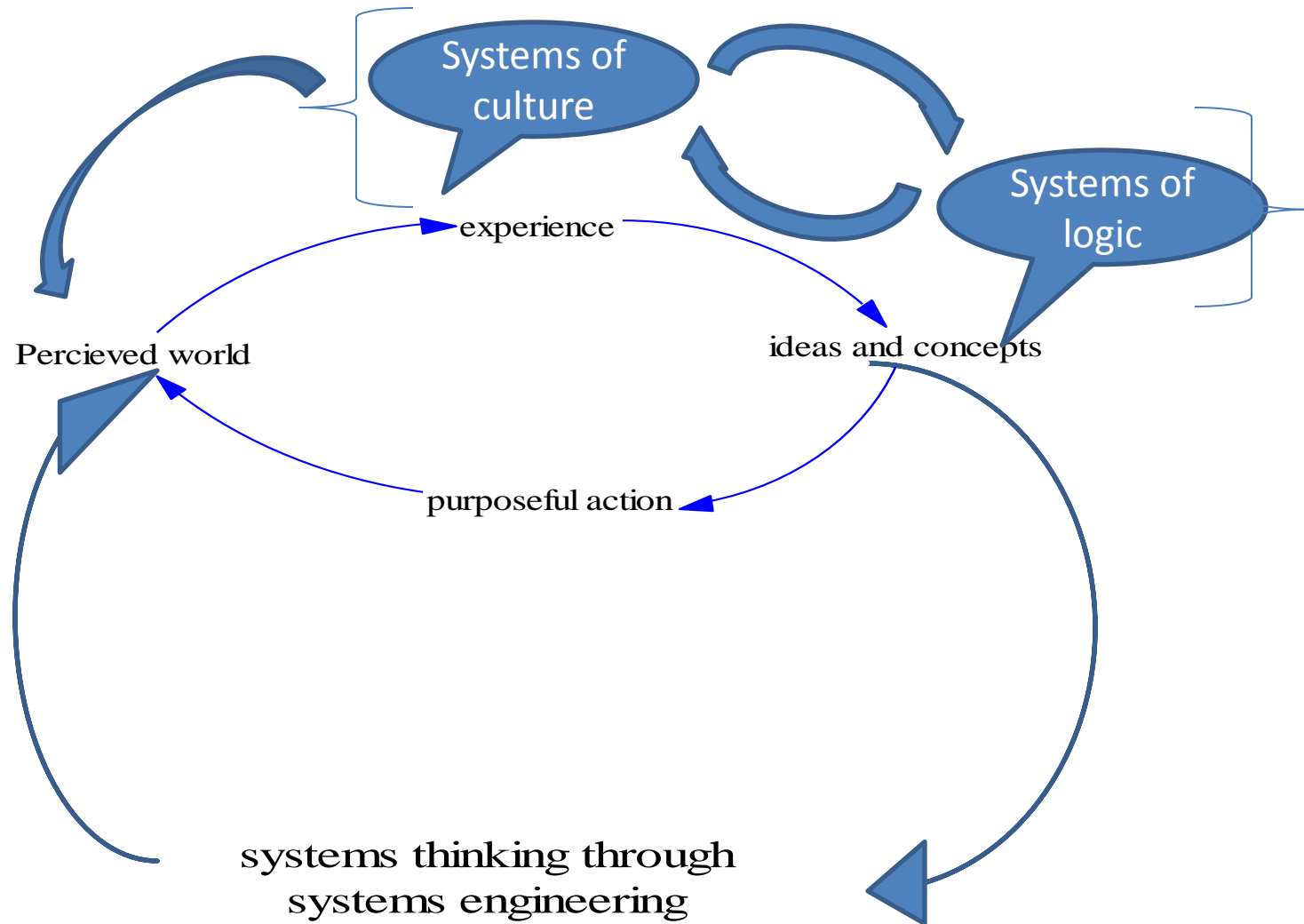
# Adaptive Management



# Systems approach

- Understanding of the unit of analysis as a coupled human-environment system or Social-Ecological system (SES)
- Appraisal of the linkages between society and ecology of a context in order to understand its vulnerable condition to risk(s) outside of it
- Recommendation for management of resilience

# Soft systems approach-We look into a system systememically!





# Group modeling

- Urbanization and land use
- Storm water and sewerage
- Demand for public services and infrastructure development

# Example of conceptual model

