Systems mapping to unpack the goals for the Sunshine Coast

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Complexity

- Multiple spatial scales
- Multiple temporal scales
- Multiple spheres (atmospheric, terrestrial, aquatic)
- Multiple dimensions (social, economic, environmental)

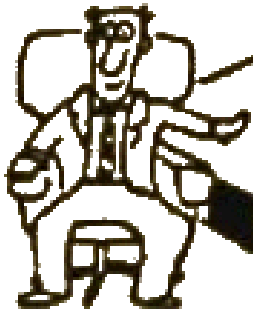
Managing for complexity

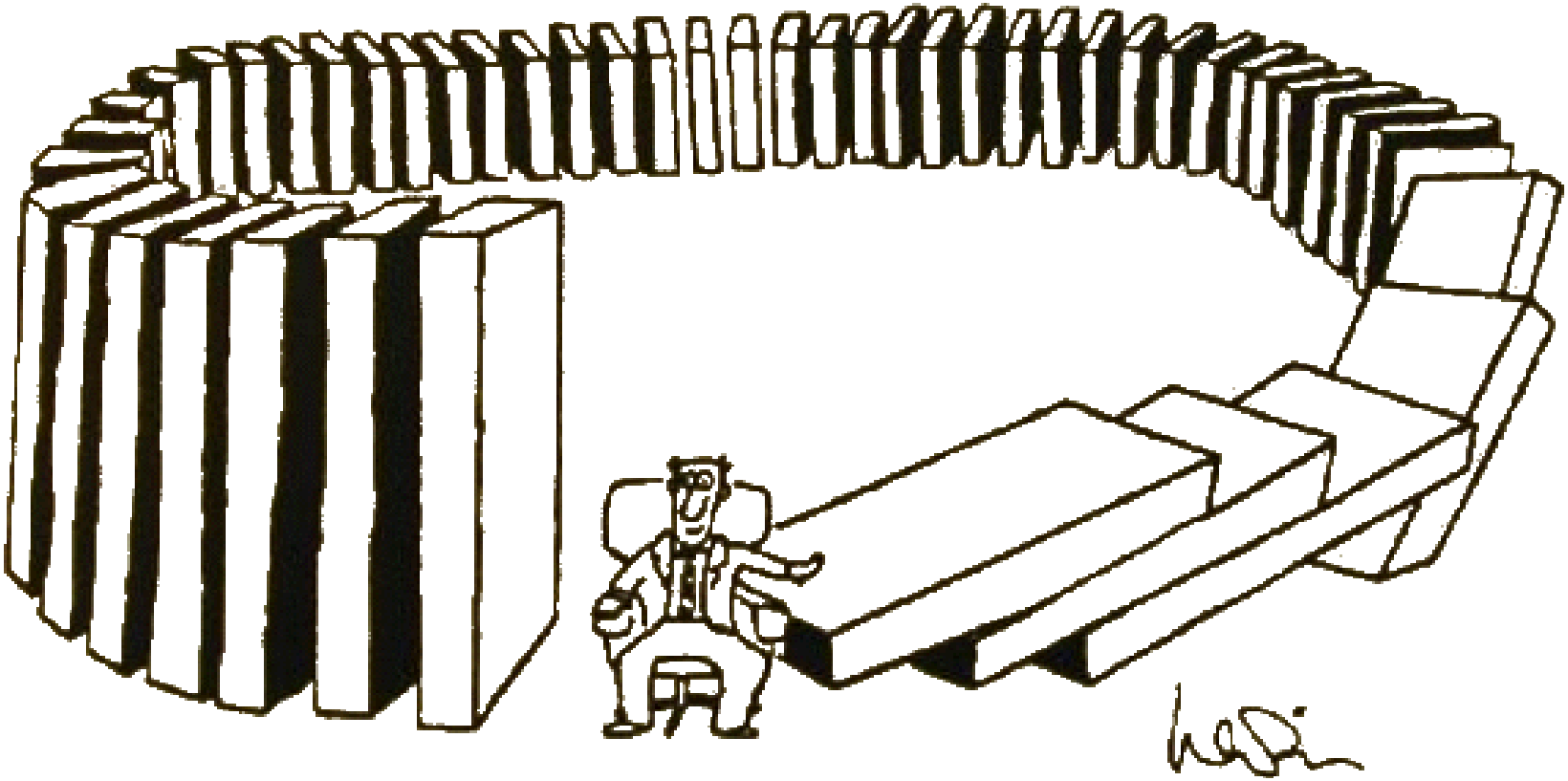
- We want to manage sustainably for multiple uses and benefits
- We need to deal with complex interactions and feedbacks
- We need to deal with uncertainty
- We need to combine all of these considerations

Systems approaches

- From disciplinary to trans-disciplinary
- From reductionist to whole of system science
- Ways of looking at the whole rather than the parts
  - A language for systemic rather than linear thinking
  - Building shared understanding of the system

Acknowledgement to Dr Russell Gorddard (CSIRO) for some of the following slides





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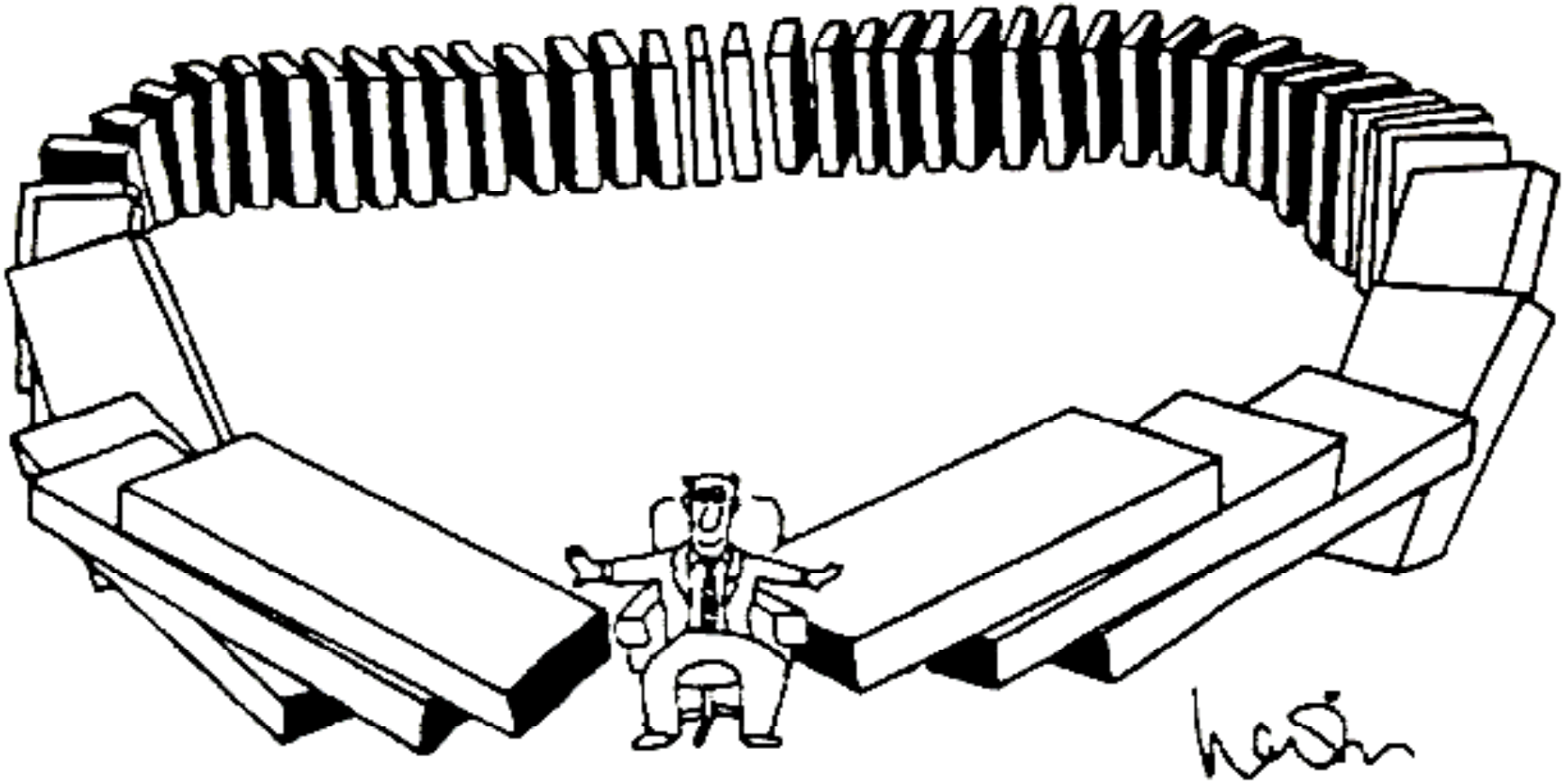


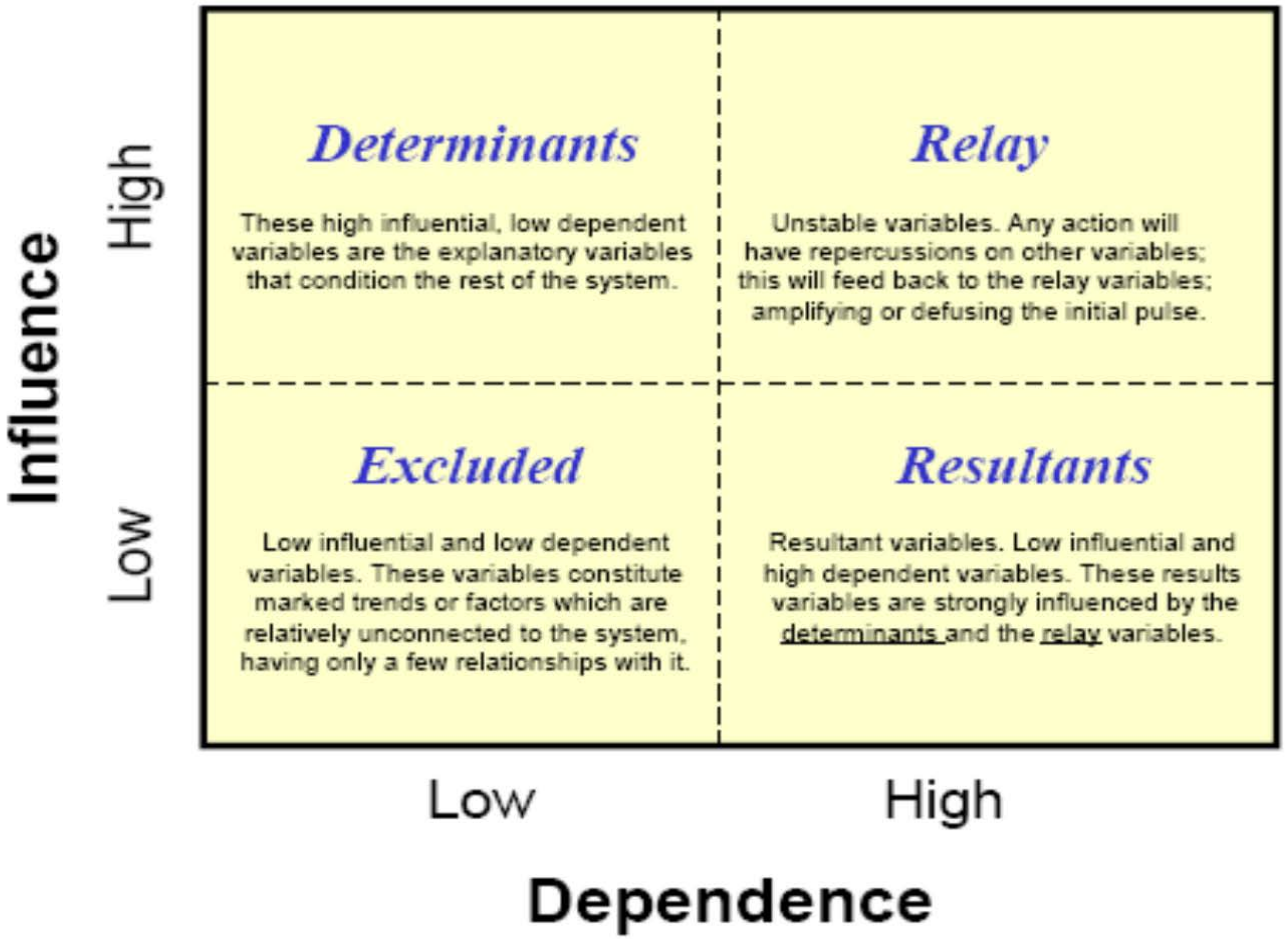
An integrated approach

- Sustainable development is complex

- To study these systems, need to look at:

  - **Drivers of change**
  - **Relays of change**
  - **Impacts on sustainable development**
  - **Management responses**

Identifying key interventions



Godet, 1994

Godet, M. (1994). From anticipation to action: A handbook of strategic prospecting. UNESCO Publishing.

Application in the Sydney Region

"Systems Approach to Regional Climate Change Adaptation Strategies in Metropolises"

Aim:

- To develop and trial a method for a systems approach to regional climate change adaptation strategies in large urban areas

Researchers:

Tim Smith, Ben Preston, Cassandra Brooke, Russell Gorddard, Tom Measham, Geoff Withycombe, Beth Beveridge, Debbie Abbs, Kathy McInnes, and Craig Morrison

Australian Government
Department of Climate Change

CSIRO

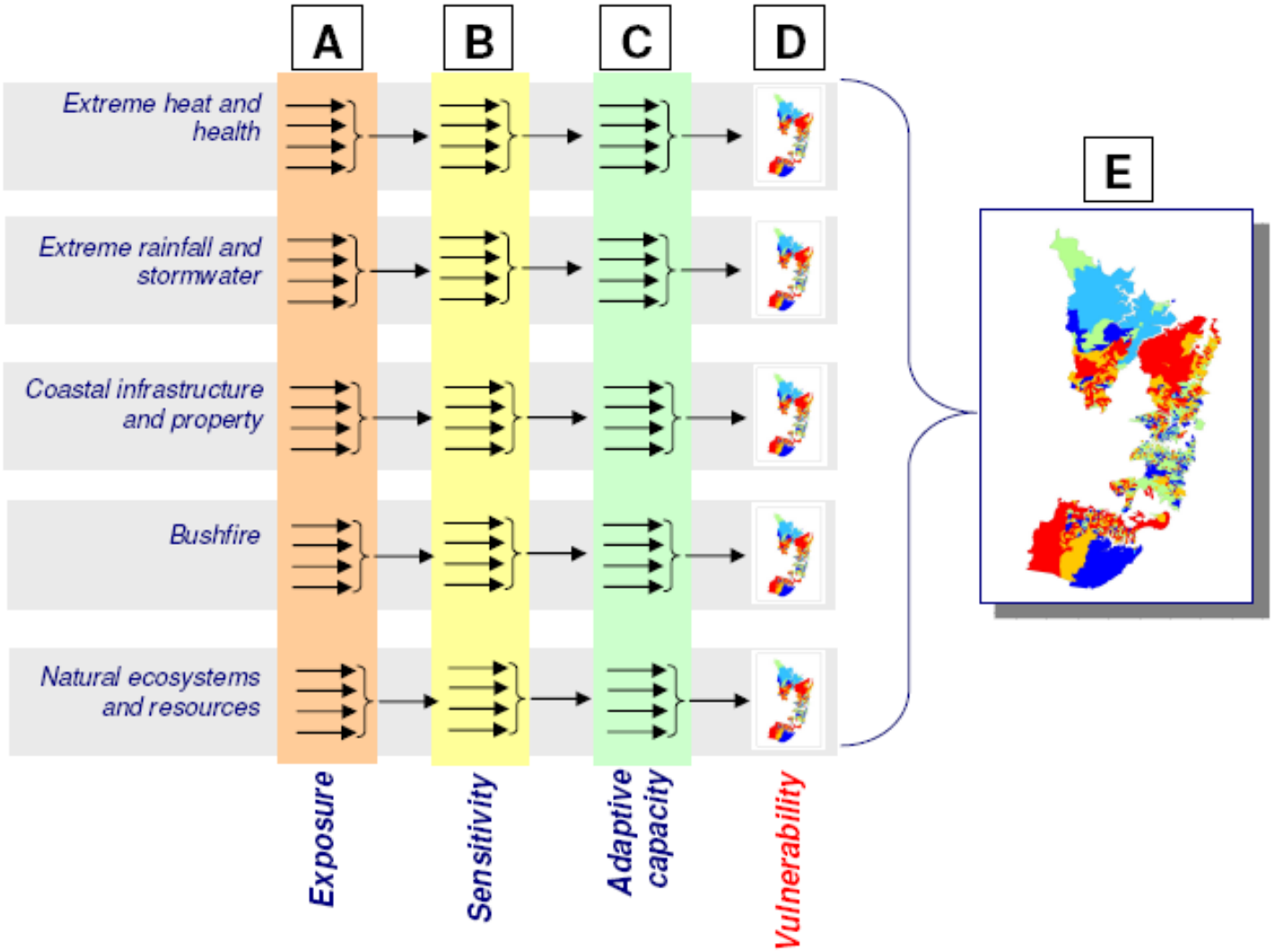
Sydney Coastal Councils

University of the Sunshine Coast

Project stages

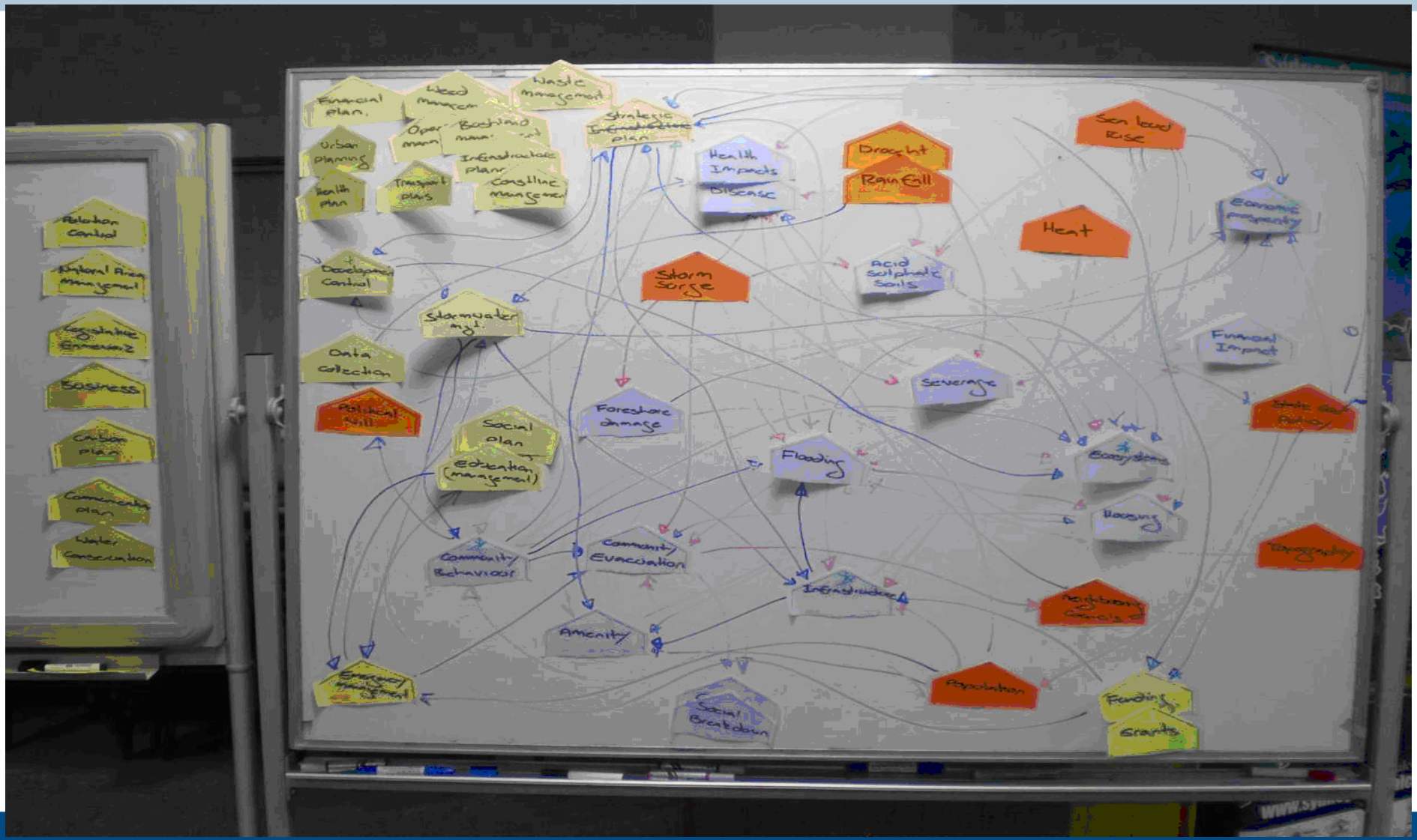
- Relative vulnerability mapping
- 15 workshops with local governments
- Adaptive capacity case studies

Relative vulnerability mapping



System conceptualisation

System conceptualisation



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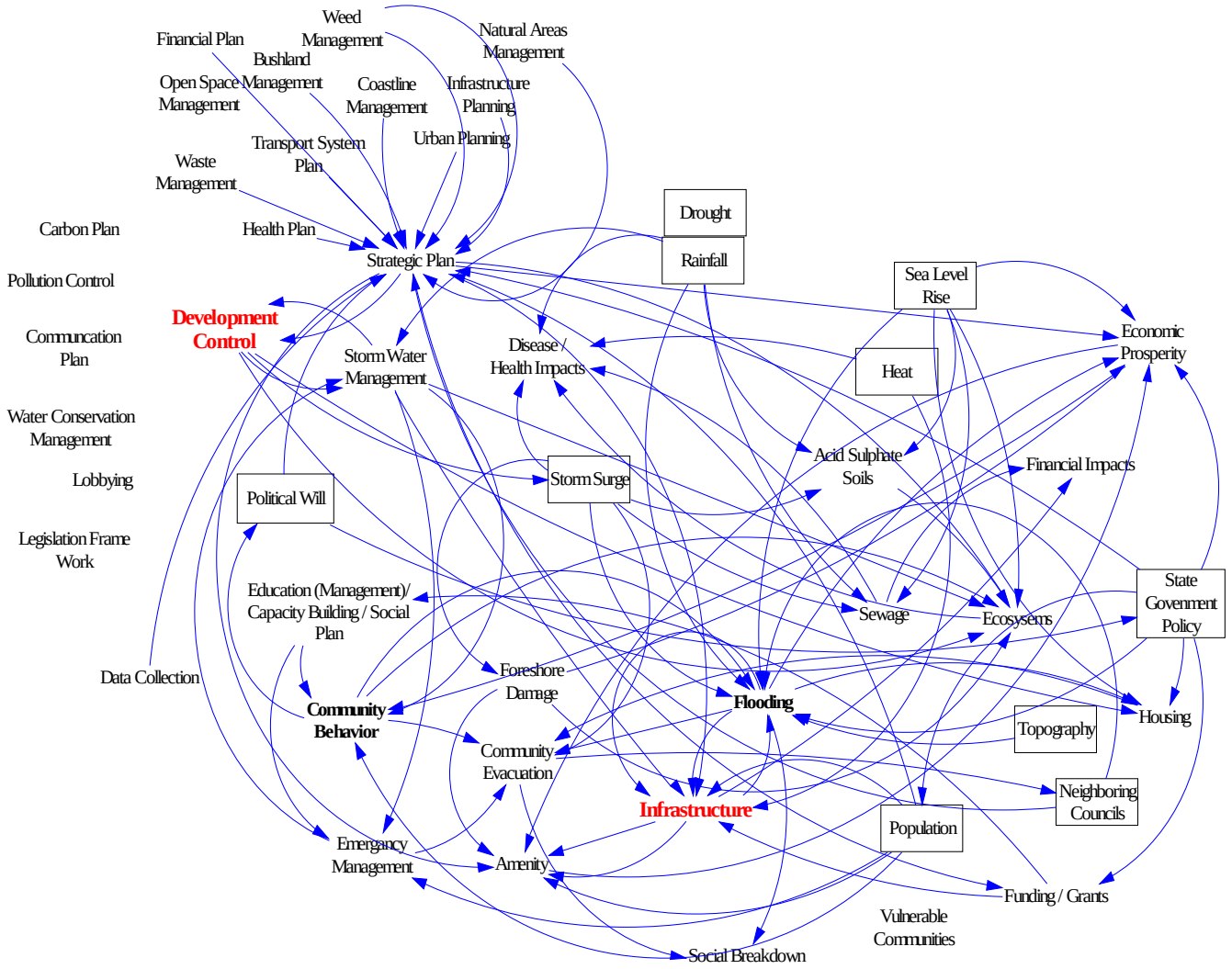
Horrendagram



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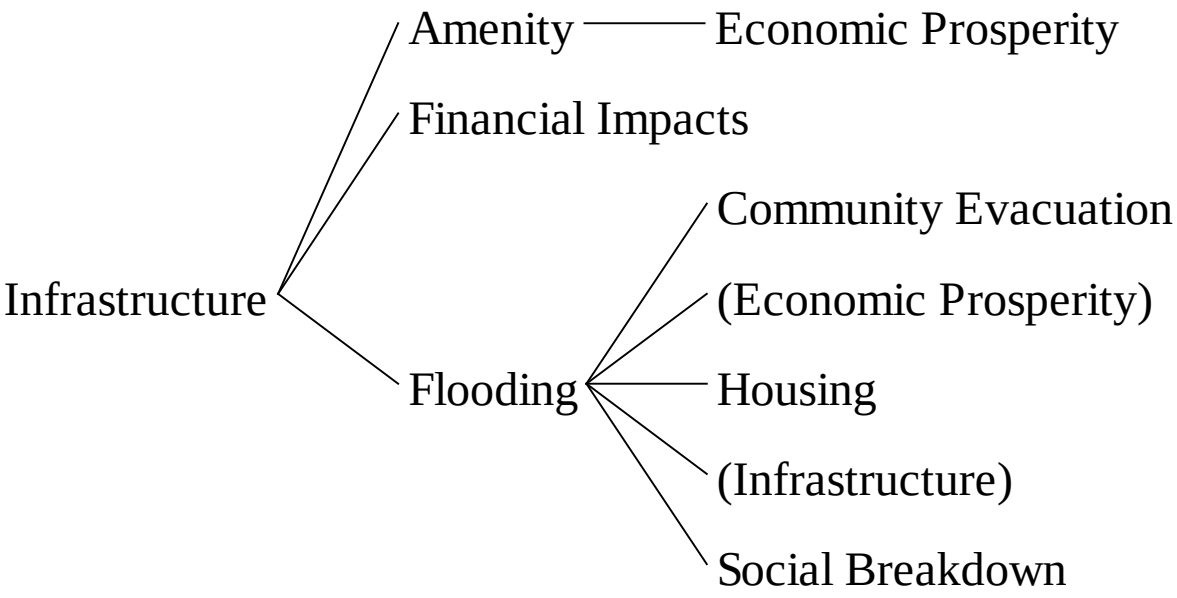
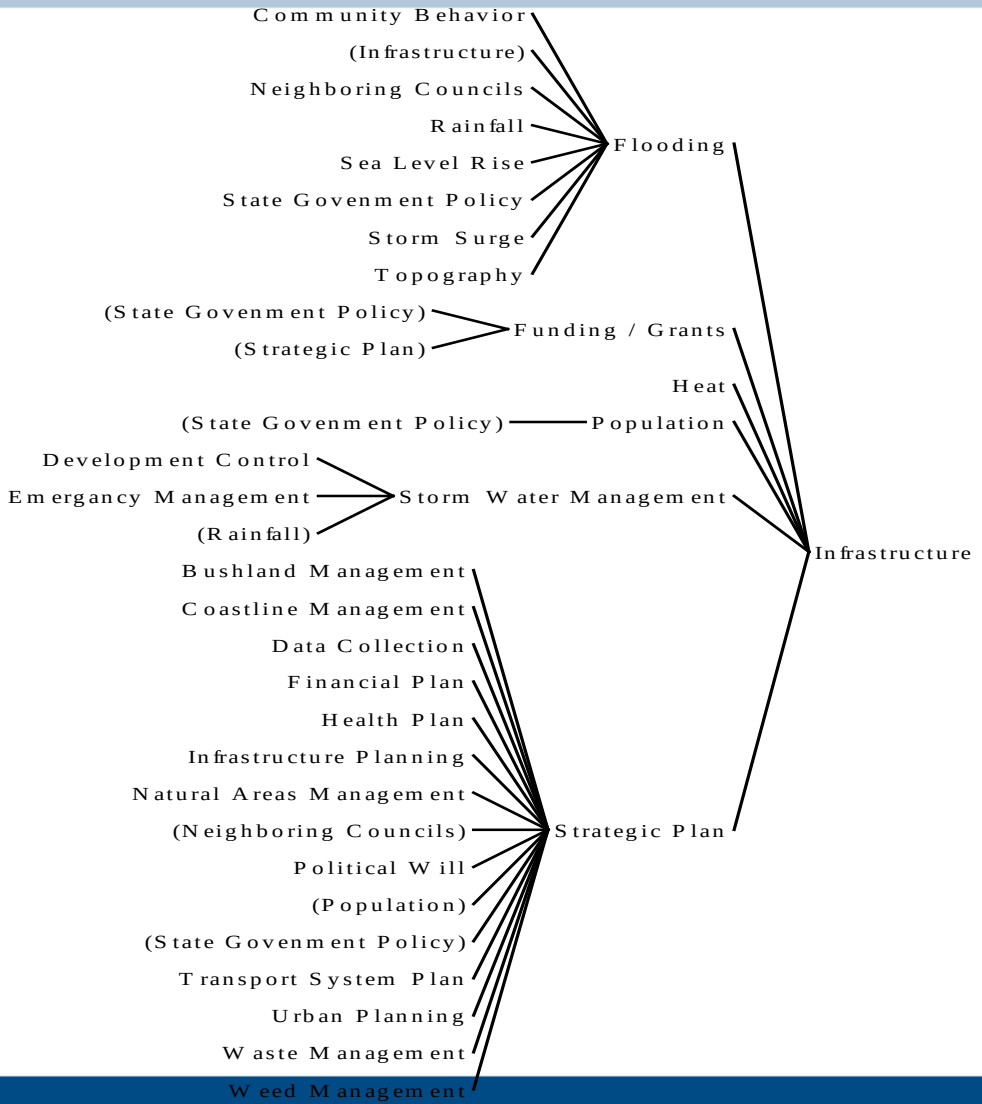
Impacts



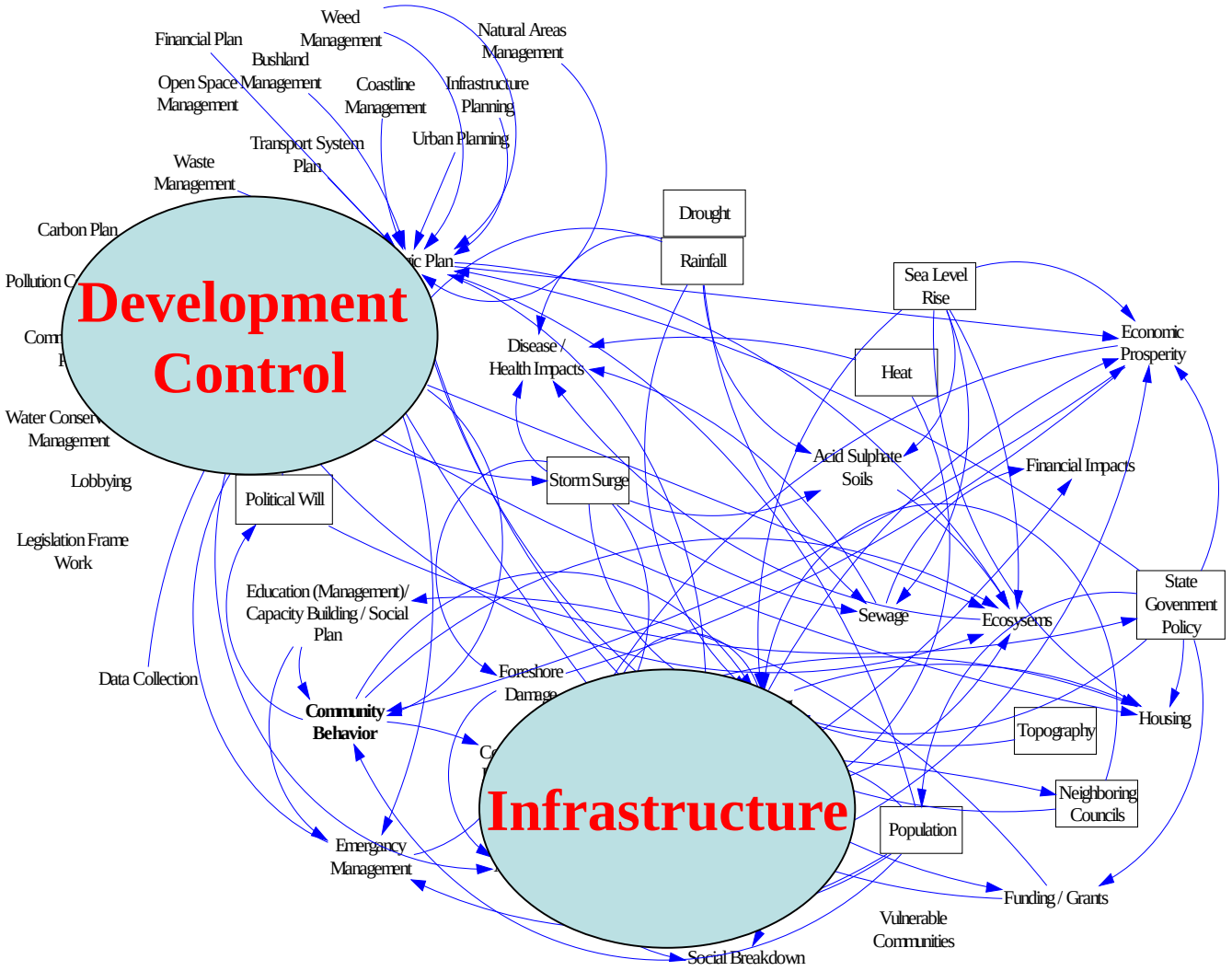
Drivers



Regional drivers, relays and impacts

Drivers		Relays		Outcomes	
Heat	15	Infrastructure	18	Land Use	4
Rainfall	15	Open Space	9	Land Degradation	4
Sea Level Rise	14	Transport	9	Pollution	4
Storm Surge	10	Water Supply	8	Stormwater	3
Wind	7	Bushfire	8	Transport Car Use	3
Storm Events	3	Flooding	8	Water Use	3
Acid Sulphate Soils	3	Development	7	Energy Use	3
Vegetation	2	Biodiversity	6	Green Space	2
Topography	2	Ecosystems	5	Environment (natural)	2
Beach Erosion	2	Transport Public	5	Building Design	2
Salinity	1	Energy	4	Heat Island	2
Beach Erosion	1	Urban Form	4	Water (Runoff)	2
Sewage (Treatment plant)		Property Damage	3	Health impacts	2
		Ground Water	3	Disease	1
Foreshore Damage	1	Water Quality	3	Natural Assets	1
UV	1	Waste	3	Emissions	1
Viruses	1	Ecological Integrity	2	Coastline	1
		Erosion	2	Energy and Water Supply	1
				Assets Private	1
				Property Risk	1
				Habitat	

Priority issues



Enhancing adaptive capacity

Issue: **Infrastructure**
Potential impact: (very low – low – medium – high – **very high**)
Capacity to manage: (very low – **low** – medium – high – very high)

Barriers	Opportunities
•Aging infrastructure •$$ high cost of maintenance and low capacity to fund new infrastructure •No standards re capacity required •Restricted space and scope to increase capacity / Brownfield •Political cutting back S94 funds •Uncertainty of science – planning for future needs •Topography •Some infrastructure would have adverse impacts on the City •Forced reliance on other infrastructure provides for institutional barriers, competing interests, legislative inconsistencies	•Good cross-unit linkages internally •New development brings funding opportunities and opportunities to ensure climate change needs are met (S94) •Improved Technology, design, higher standards •Good frame works for funding and gaining new infrastructure (legislation) •Share information with other organisation and councils •Innovative thinking •New technology to improve environmental outcomes e.g. Stormwater reuse •Proximity to public transport though fare to City • Special Levy (to ensure climate change needs are met) and storm water levy

Regional barriers

Barrier	Number of times cited
Community	33
Infrastructure	31
Planning	29
Water	23
Funds / funding	21
Development	17
State	15
Council	12
Political	11
Transport	10
Government	9
Knowledge	8
Flooding	5

Regional opportunities

Opportunity	Number of times cited
Community	36
Development	20
Water	19
Council	16
Planning	15
Management	14
Policies	13
Education	12
Capacity	11
Transport	11
Leadership	8
Social	8
Knowledge	7

Implications for the Sunshine Coast

- Need to treat research and management as integrated
- Need to treat environmental problems as social problems
- No quick fix for regional sustainability
  - –unintended consequences of short term actions may exacerbate problems in the long term
- Understanding leverage points in a system can help identify high leverage interventions
  - –getting more effect for money and time invested

Some Laws of Systems Thinking

- Small changes can produce big effects, but areas of highest leverage are often least obvious
- Today's problems come from yesterday's solutions
- The easy way out usually leads back in
- Dividing an elephant in half does not produce two small elephants

From Peter Senge's book The Fifth Discipline

Summary

- Systems approaches used to unpack complexity
- Help to build shared mental models
- Help to identify high leverage points