



Climate Change Adaptation: A Systems-Resilience Perspective

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Part I: Resilience and Systems

- Resilience thinking
- Systems thinking
- Systems as networks
- Systems-Resilience Thinking Heuristic

Failure to Understand Resilience

“Just when risk seemed most remote on the basis of market indicators and complacency was at its highest, the system was most fragile”

Jaime Caruana, General Manager of Bank for International Settlements (quoted by Alan Mitchell in Aus. Fin. Review 13-14 February 2010)

Failure to Understand Systems

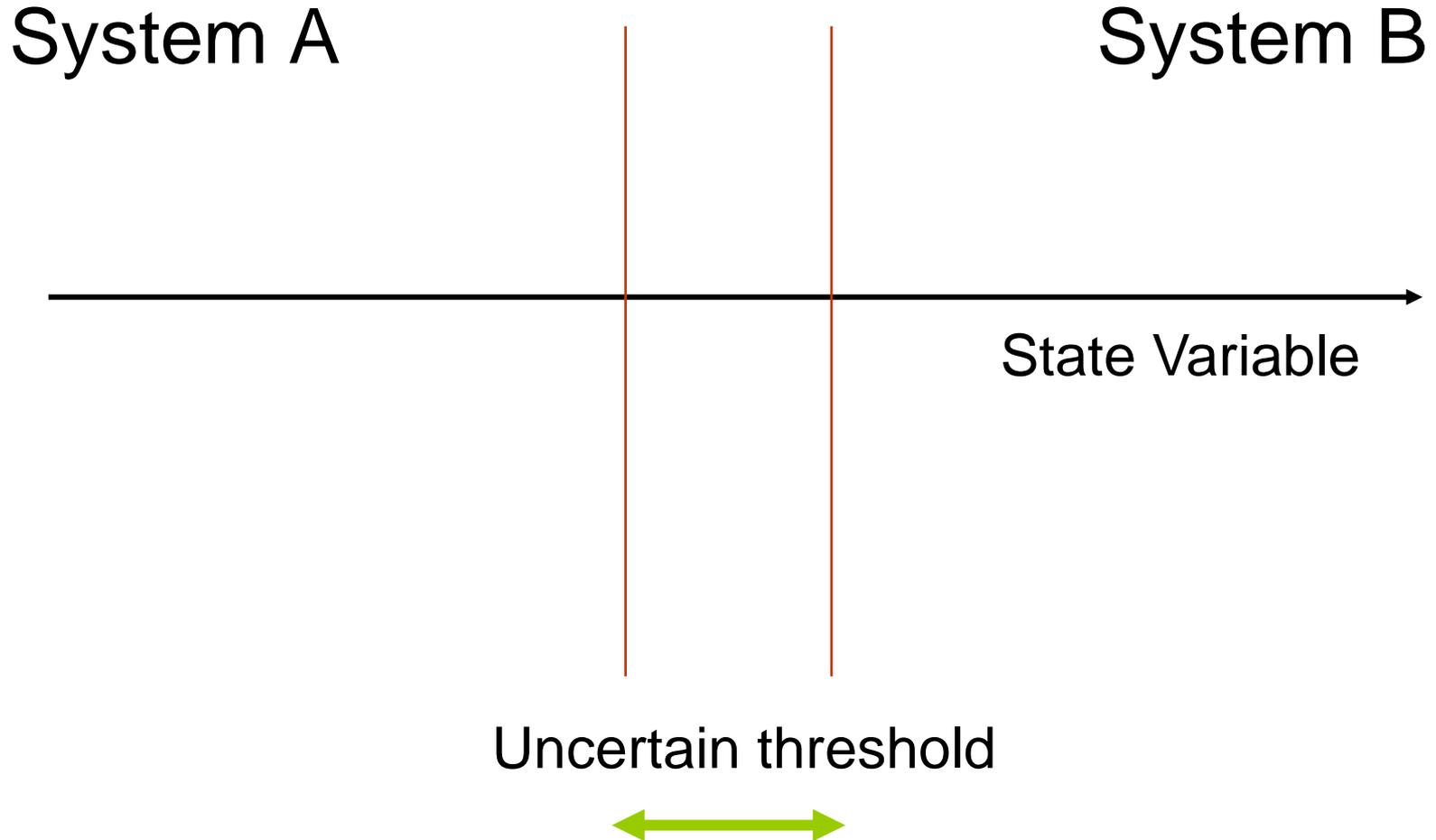
“And the human intellect, without no inkling of the immense variety and complexity of circumstances conditioning a phenomenon, any one of which may be separately conceived of as the cause of it, snatches at the first and the most easily understood approximation, and says here is the cause ”

Leo Tolstoy (1869), *War and Peace* Volume IV, Part XIII, Chapter 1 (translated by Constance Garnett)

Mistaken 'Orthodoxy'

- False dichotomies (markets *versus* regulation; economy *versus* environment etc.)
- Current economic state is what matters most, *not* trajectories to future states (Nauru in 1980, 2000 dot com crash)
- Rules/methods successful in the past or a specific situation can be applied in general (managing the GFC)
- Linear thinking (unjustified extrapolation of past trends)

Systems & Resilience



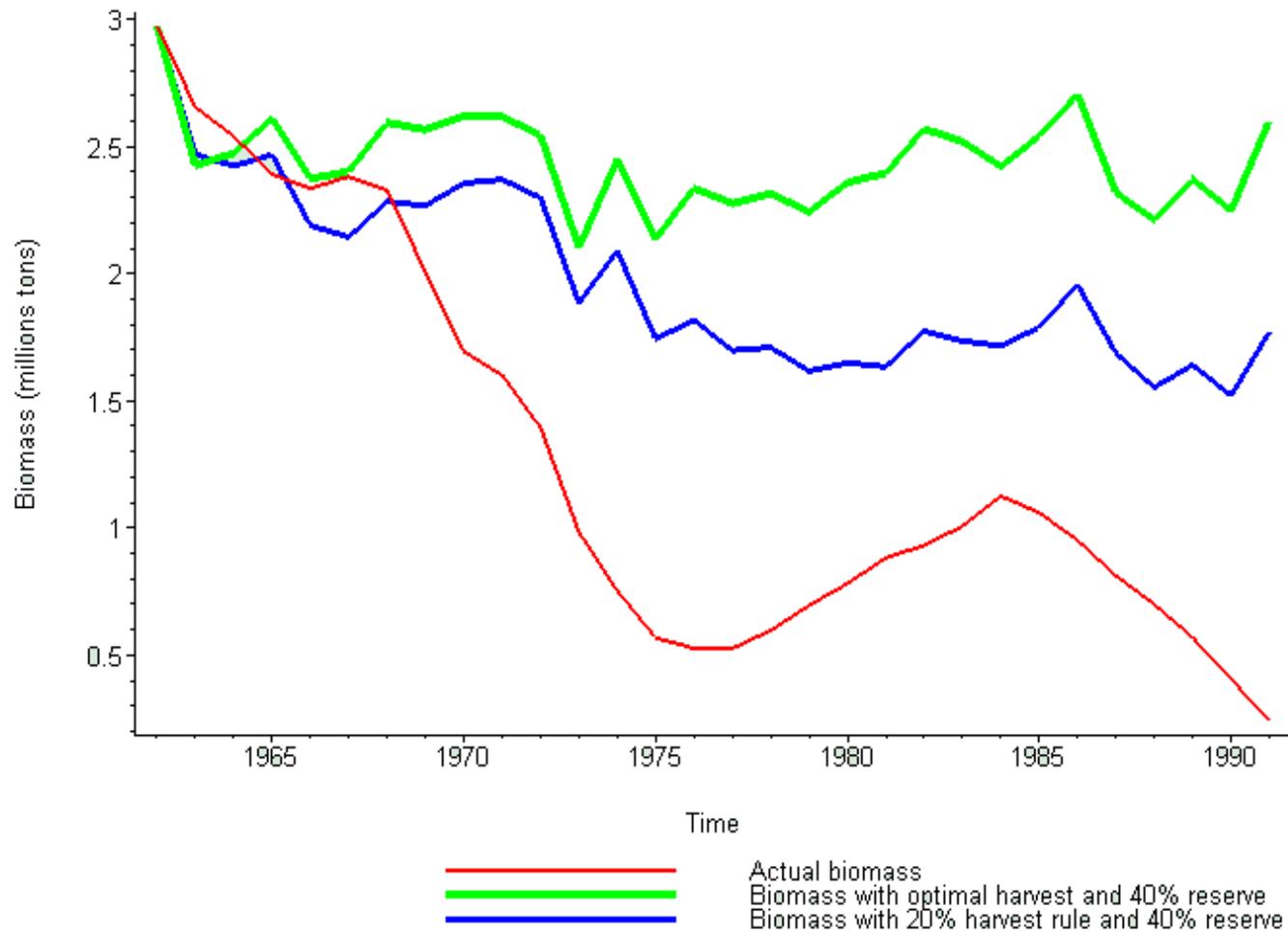
Holling Resilience

“...the capacity of a system to absorb a disturbance and reorganise while undergoing change so as to still retain the same function, structure, identity and feedbacks.”

Australia 21

[greater the shock to move from current state, more resilience]

Fish Stock

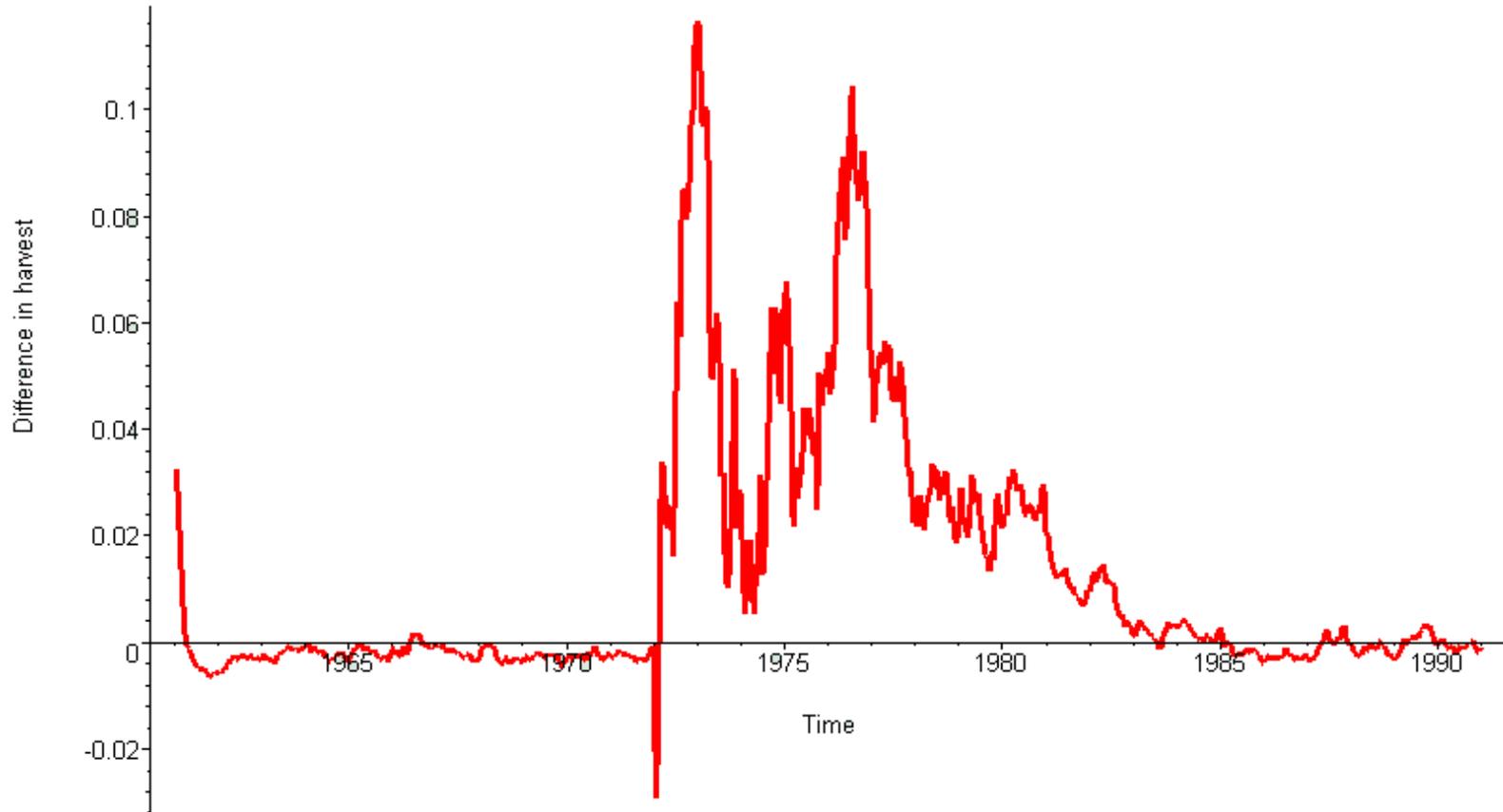


Pimm Resilience

“The speed at which a system returns to a neighbourhood of its previous state following a shock”

[faster the return, more resilience]

Fish Harvest

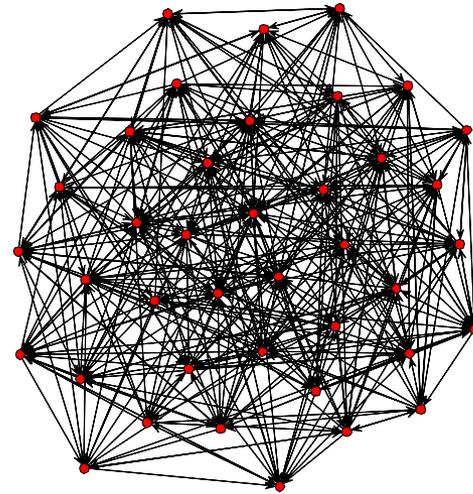
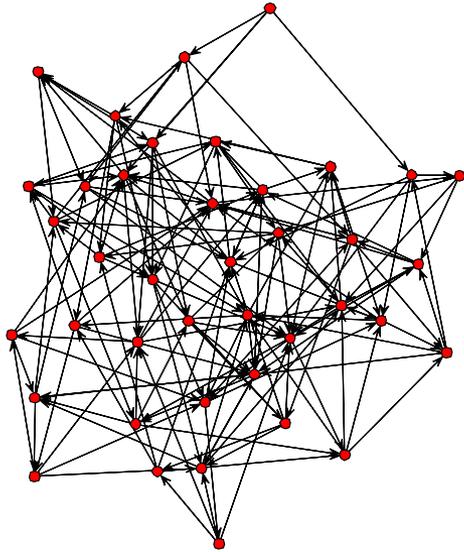


Economic Resilience

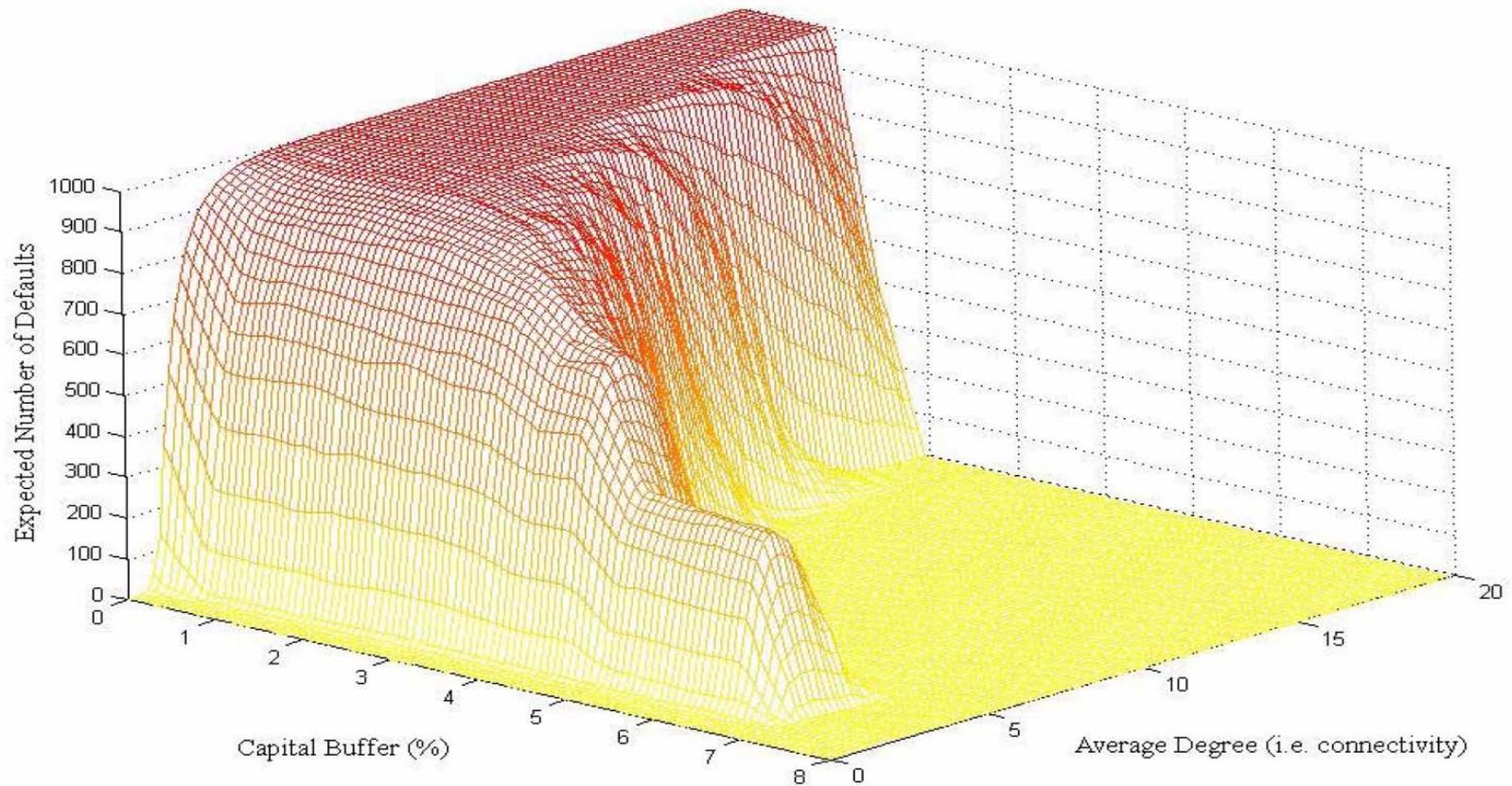
“The expected time until a system switches from one system state to another”

Hertzler and Harris (2010)

Networks as Systems



Connectivity & Contagion



Source: Gai and Kapadia (in press)

Systems-Resilience Thinking Heuristic

Phenomena

- actions will have unexpected consequences;
- multiple levers needed to ensure success in different states of the world;
- structure/connections matter, etc. linkages across and within systems affect its current & future state;

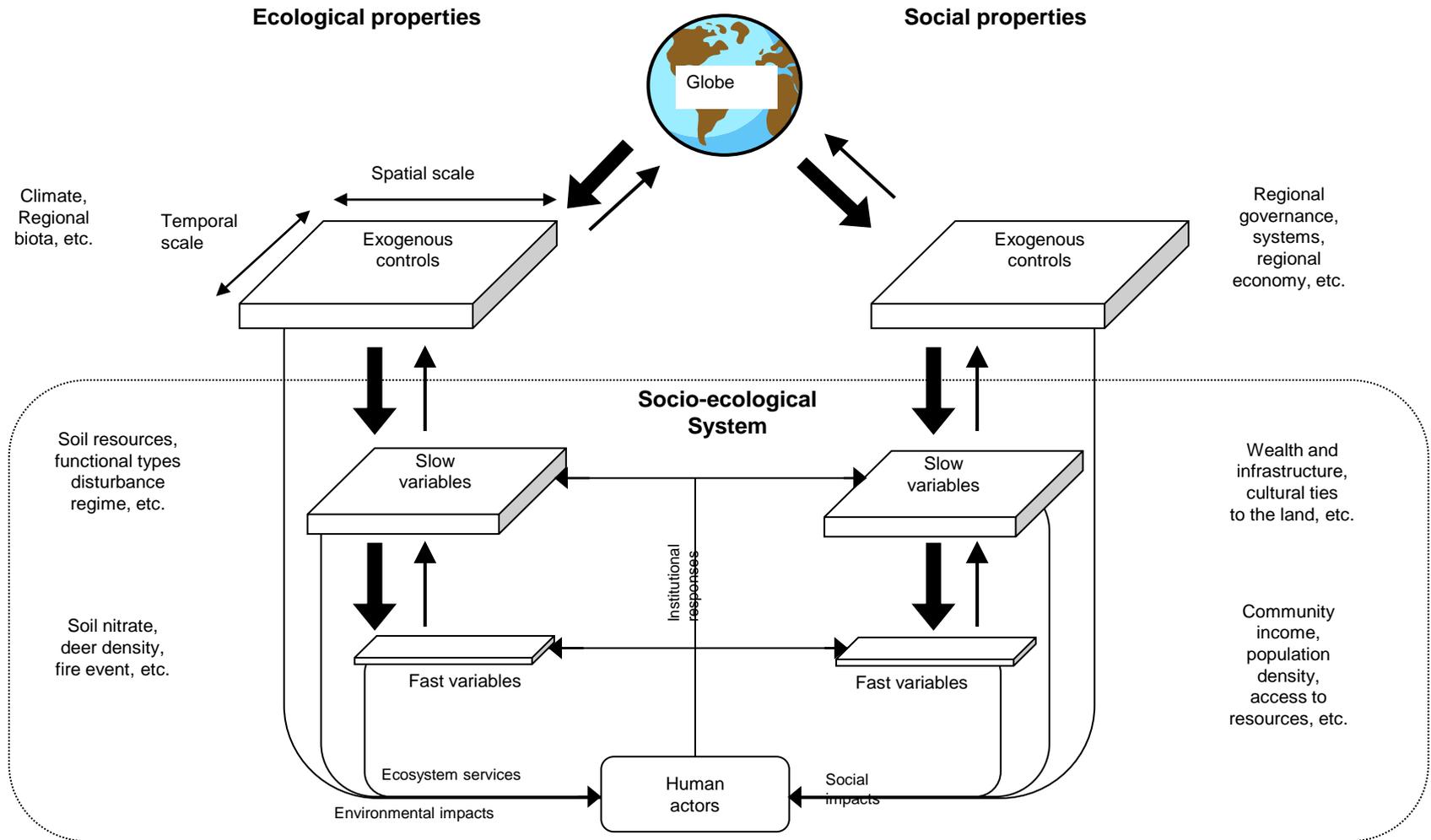
Policy

- recognise the *critical* variables that affect many components of the system;
- current actions have long-term consequences;
- cause & effects come in loops, etc.

Part II: Climate Change Adaptation

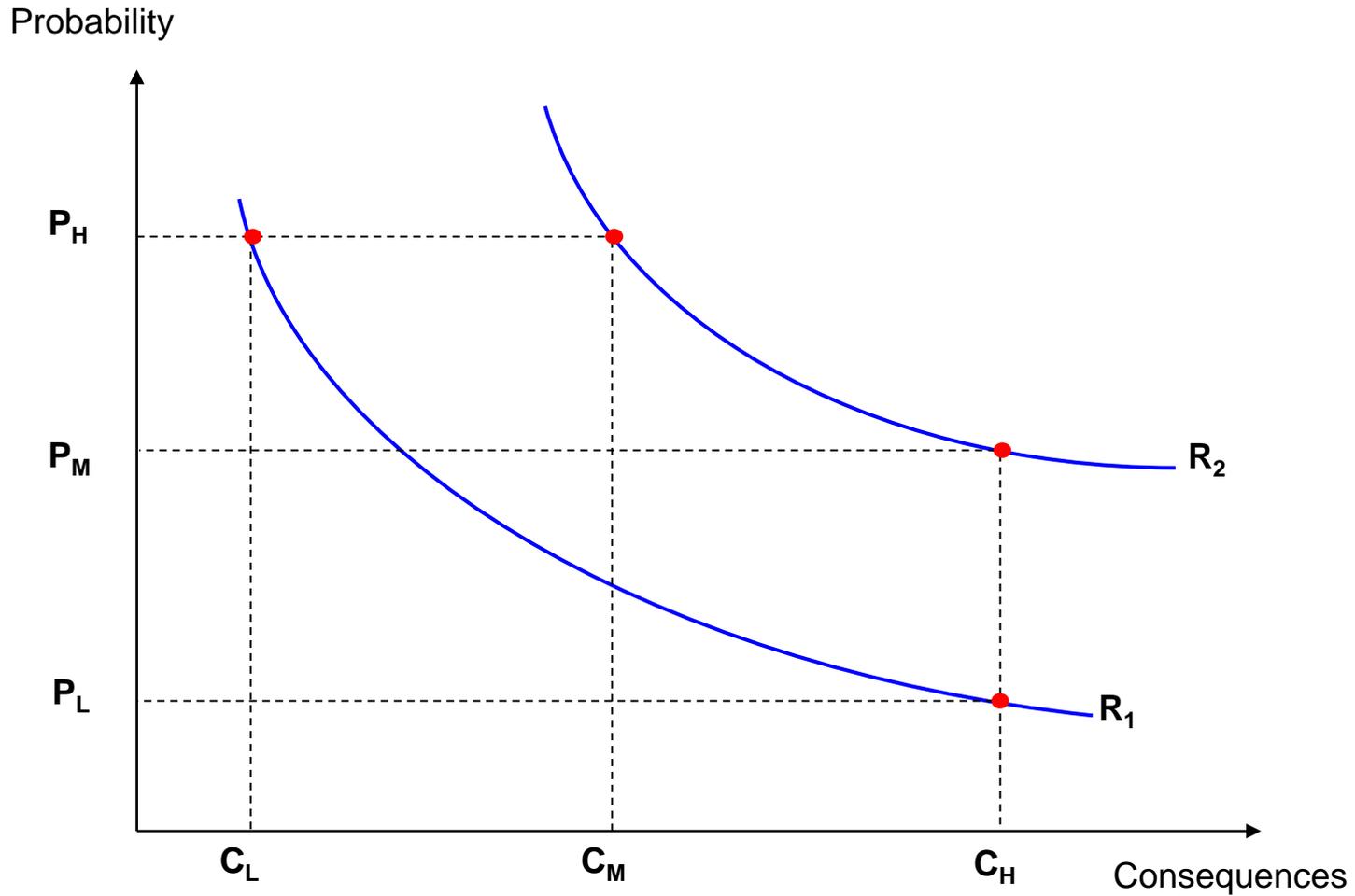
- Systems perspective
- Risk and climate change
- Adaptation capacity, planning and responses
- Reducing vulnerabilities
- Climate risk management
- Inter-temporal climate adaptation
- Systems-Resilience Adaptation Heuristic

A System Perspective

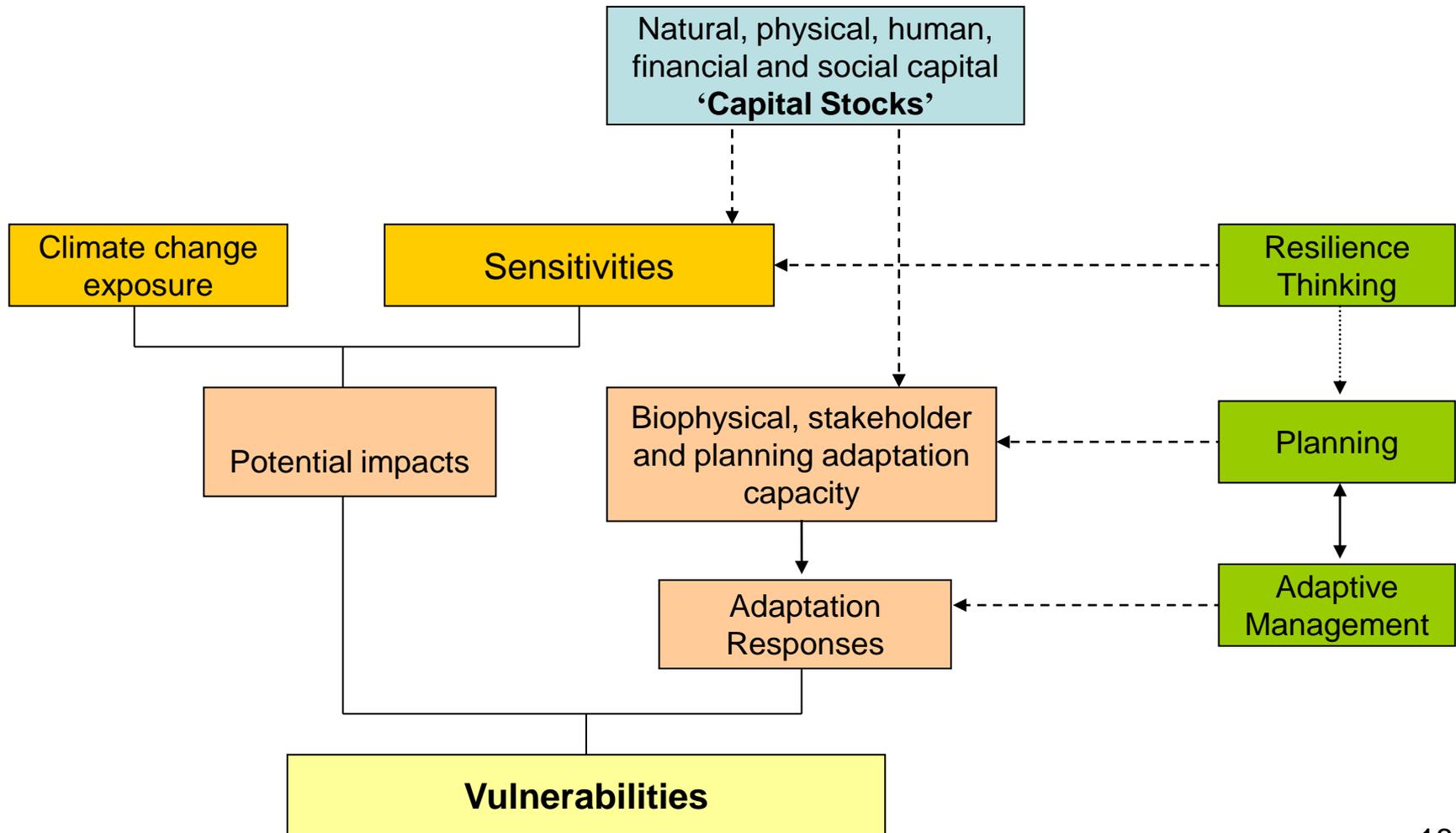


Source: Chapin et al. 2009

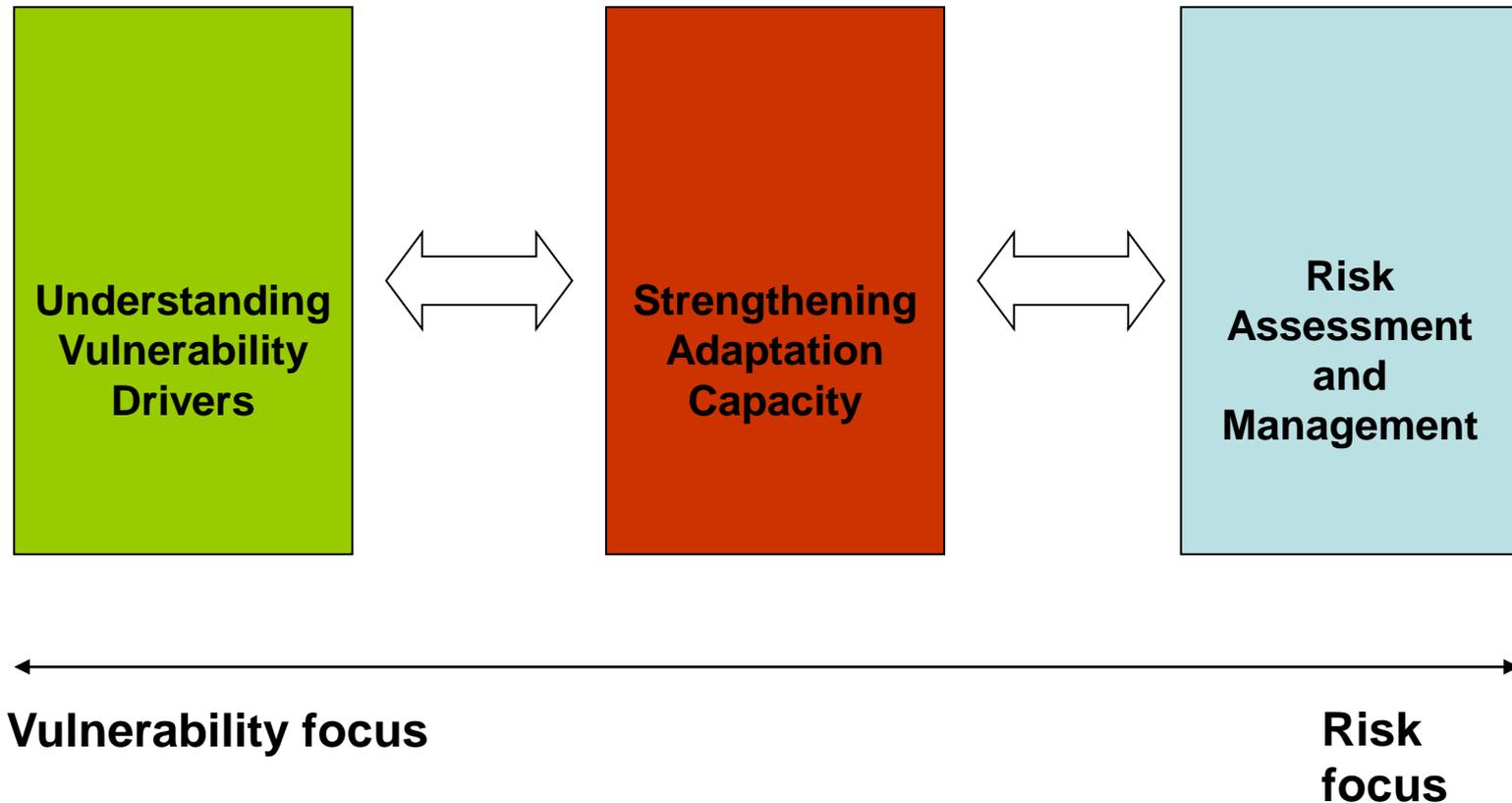
Risk and Climate Change



Adaptation Capacity, Planning and Responses



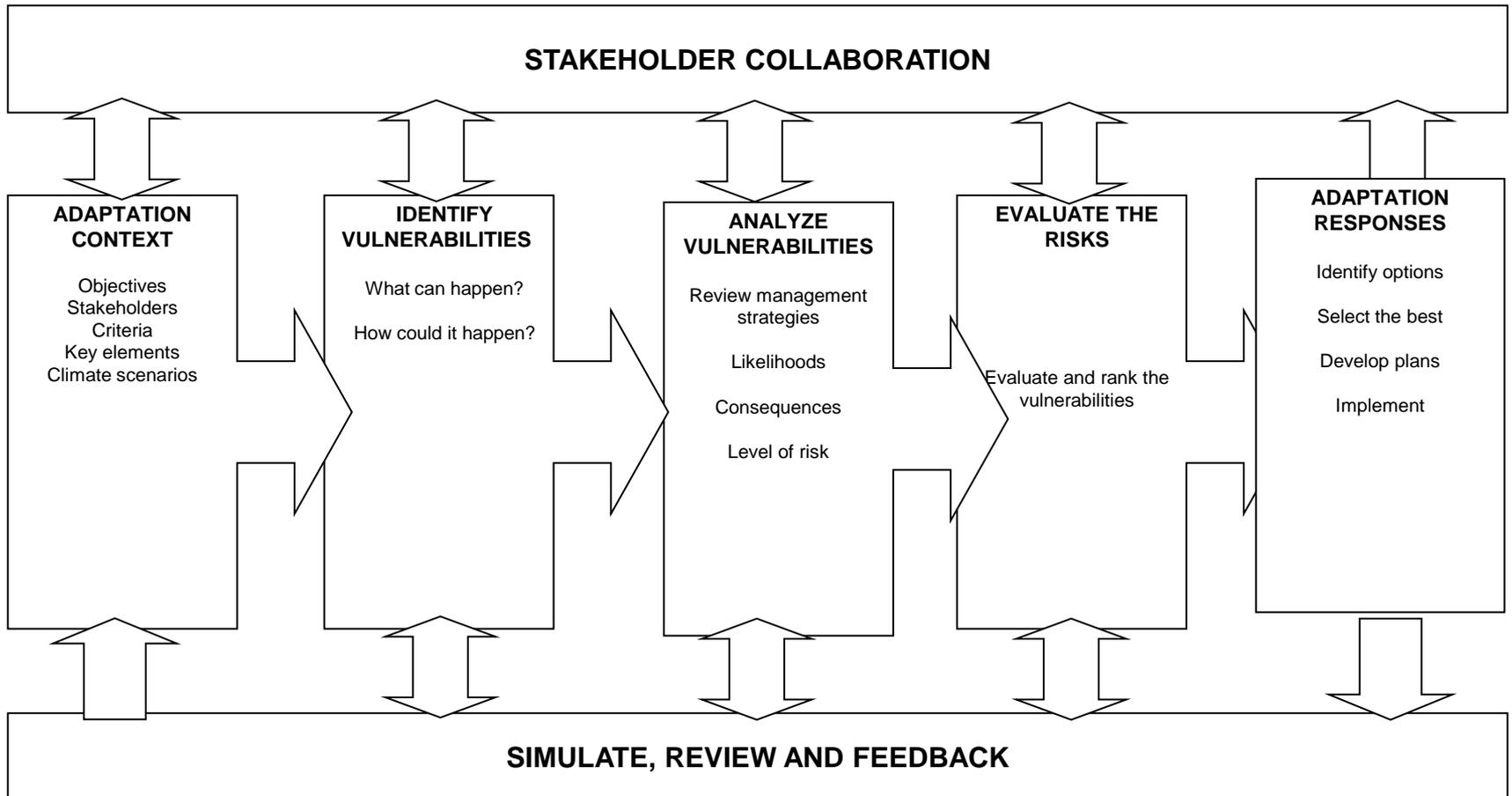
Vulnerability-Response-Risks



Reducing Vulnerabilities

- (1) Promote resilience to reduce system sensitivities;
- (2) Increase adaptation capacity;
- (3) Improve effectiveness of adaptation responses with ‘active adaptive management’; and
- (4) Improve the adaptation-planning processes.

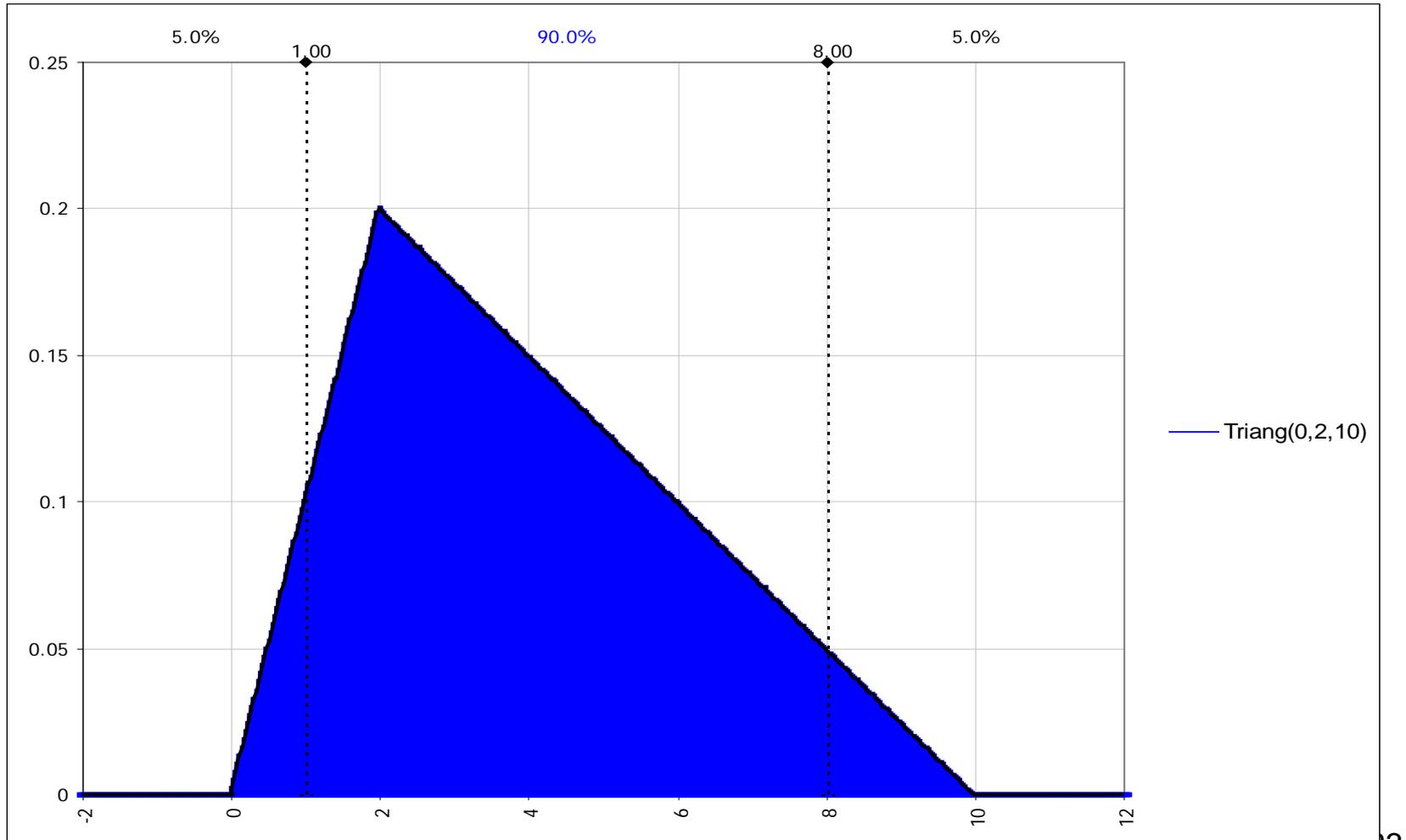
Vulnerability and Adaptation



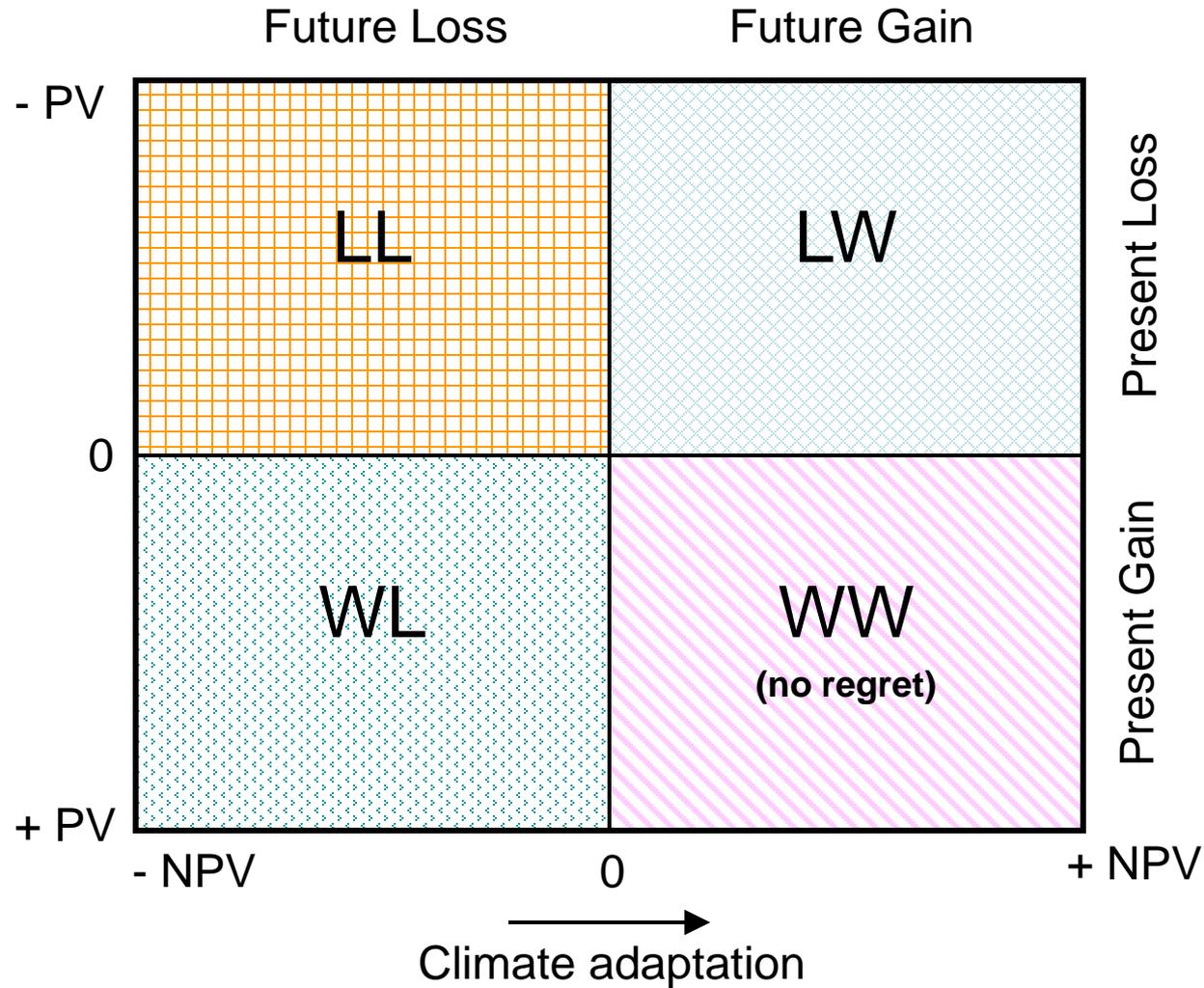
Climate Risk Management

- (1) Incorporate an assessment of current and future vulnerabilities;
- (2) Engage stakeholders in the process;
and
- (3) Model and simulate different states of the world and strategies

Risk & Simulation



Inter-temporal Climate Adaptation



Systems-Resilience Adaptation Heuristic

Processes

- (1) Promote *ex-ante* measures that support resilience in bio-physical and socio-economic systems where the current state is desirable and sustainable
- (2) Institutionalise planning processes and actively include stakeholders (Boston versus London)
- (3) Adopt risk-based decision frameworks that utilise 'buffers' and 'safety margins'

Systems-Resilience Adaptation Heuristic

Actions

- (1) Promote *ex-post* management that is actively adaptive and that ensures a speedy response to shocks.
- (2) Strategies that are ‘win-win’ such that they increase net benefits in both the short-run and long-run, after accounting for all direct cost and risks, should be implemented immediately.
- (3) Adopt reversible or flexible management actions (beware mal-adaptation!).