

COMPLEX SYSTEMS ANALYSIS (CSA)
POLITICAL AND POLICY ASPECTS

JULIAN HUNT
EARTH SCIENCES & MATHEMATICS
UNIVERSITY COLLEGE LONDON, UK

Also
House of Lords, UK and Lighthill Risk Network

1. PERSPECTIVES ON CSA FOR POLICIES TO DEAL WITH SERIOUS, INTERNATIONAL, COMPLEX, INTERCONNECTED PROBLEMS

CSA PROVIDES FRAMEWORKS AND MODELLING TECHNIQUES FOR ANALYSIS, PREDICTIONS (USING DATA/EXPERIENCE)

- SCENARIOS, POLICY OPTIONS
- DECISIONS, UNDERSTANDING/EXPLANATIONS

TALK: OVERVIEW OF MAJOR PROBLEMS, CSA APPROACHES/INSIGHTS, CSA AND DECISION MAKERS; RECOMMENDATIONS FOR COORDINATED ACTION

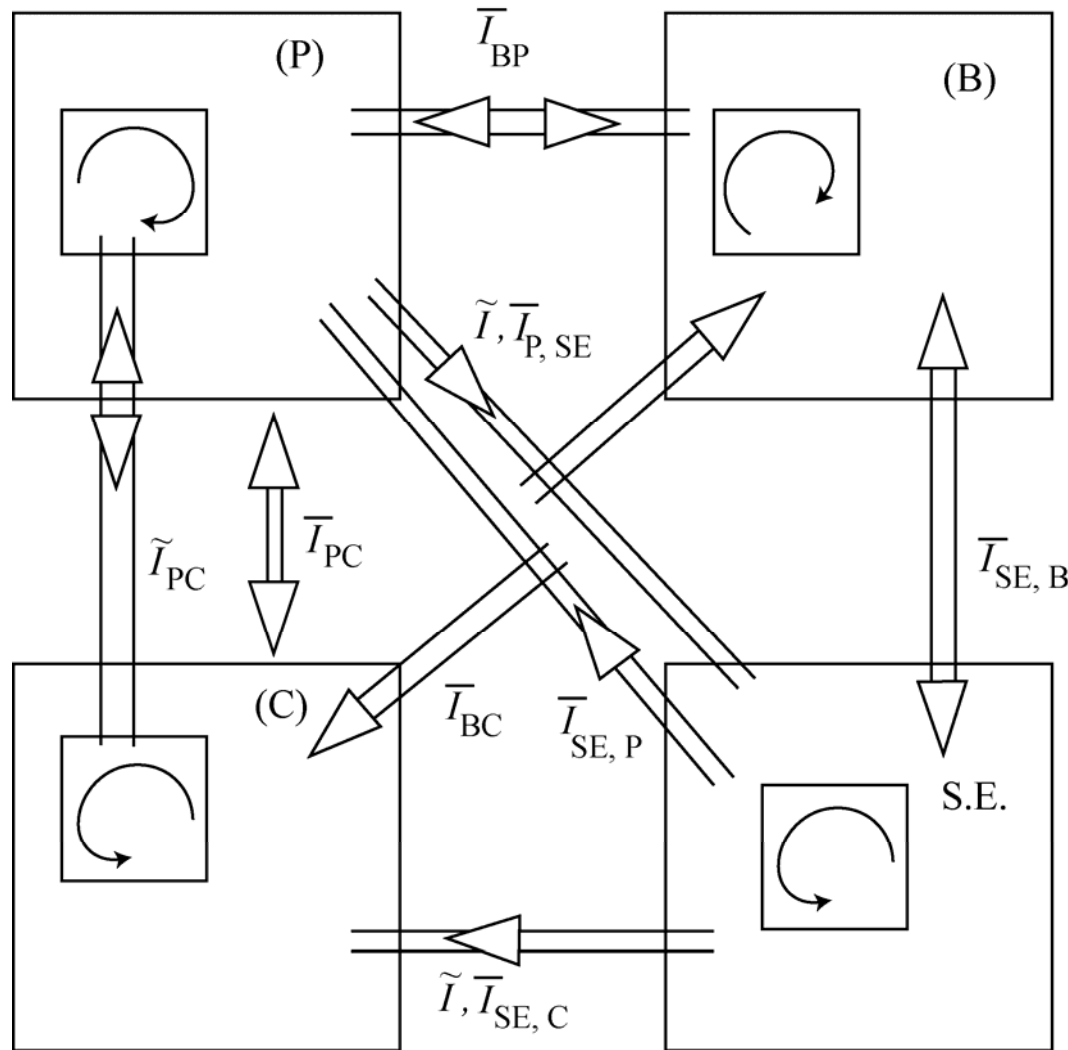
Environmental Modeling and Decisions

- Interconnections and time scales
- Four Aspects: Physical (P), Chemistry (C) (including emissions), Biology (B) (including agriculture and forests), Socio-Economic (SE) (including industry, technology, planning/infrastructure)
- Each has ‘internal’, short time-scale processes , and longer time scale processes with many external inter-connections. They are also on short and longer time scales (denoting the processes involved)
- Time scales for socio-economic impact are approximately time scales for response and decision making.

Short: - individuals/ small communities – local environmental factors – W – 1 year.

Long: - Communities Government
 Regional Global
 day > 1 year

- Hazards
- ‘Internal’ oscillations of these systems occur – which affect the short and long term environmental effects (*e.g.* El Niño seasonal oscillations or business cycles)
- Systematic approach more efficient computation/ data gathering/ decisions and considering new connections.



Note:

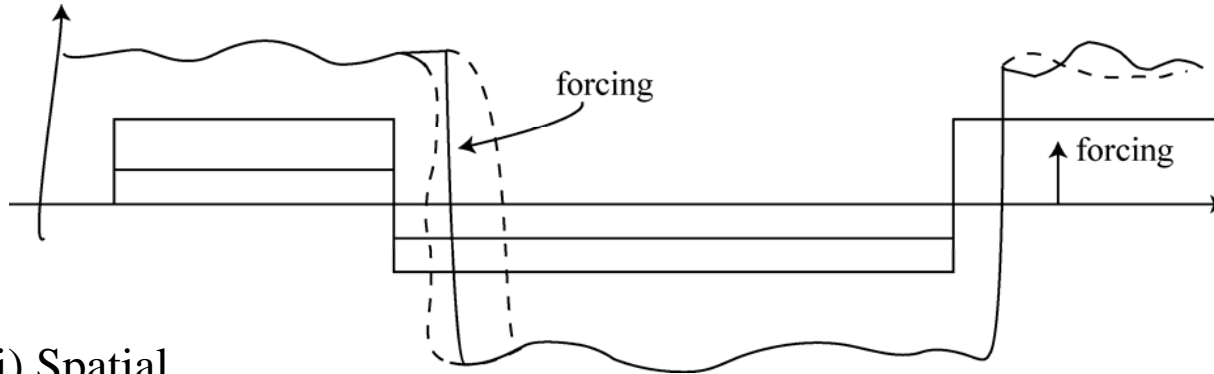
- Short time scale interactions only occur between some sub-systems (e.g. transport chemistry air pollution weather, Hazardssocietal/ economic consequences)

- Long time scale interactions exist between all subsystems and often in changes of consequence

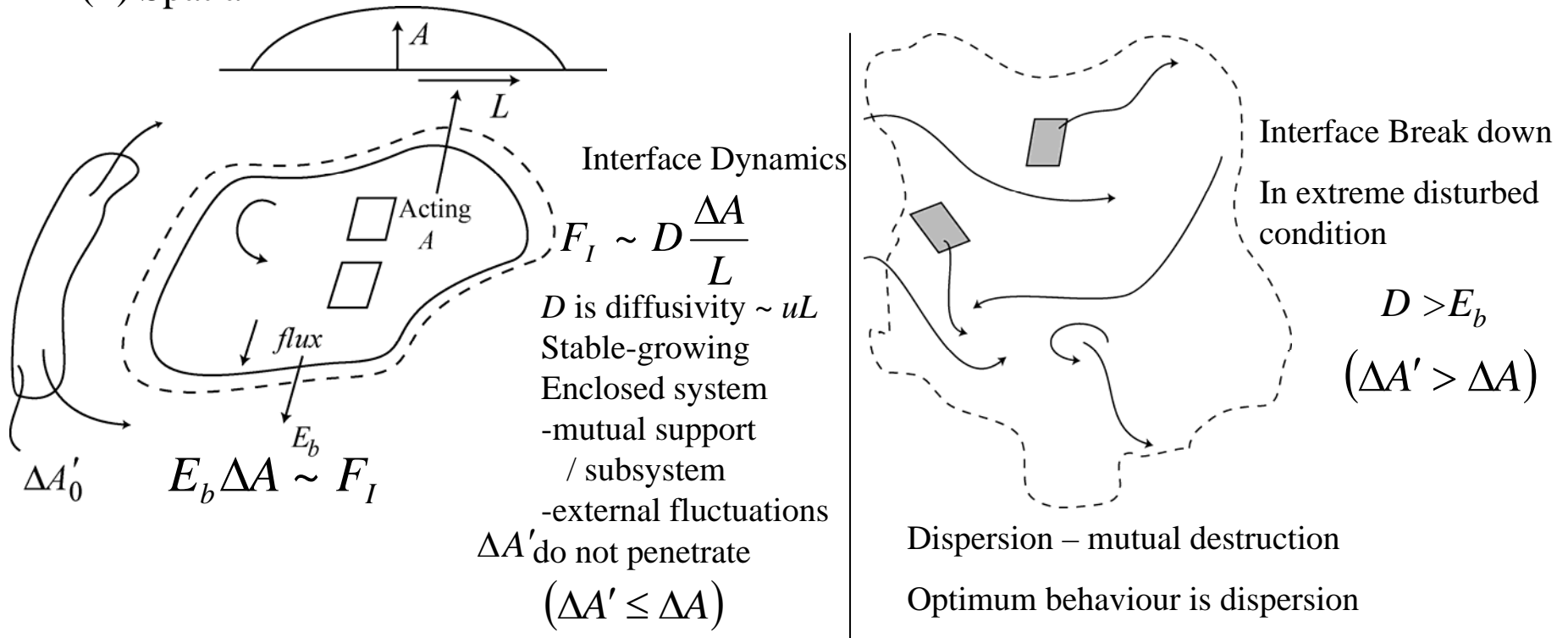
- SE decisions relevance/ adaptation, mitigation, restoration are different for short/ long time scale interactions.

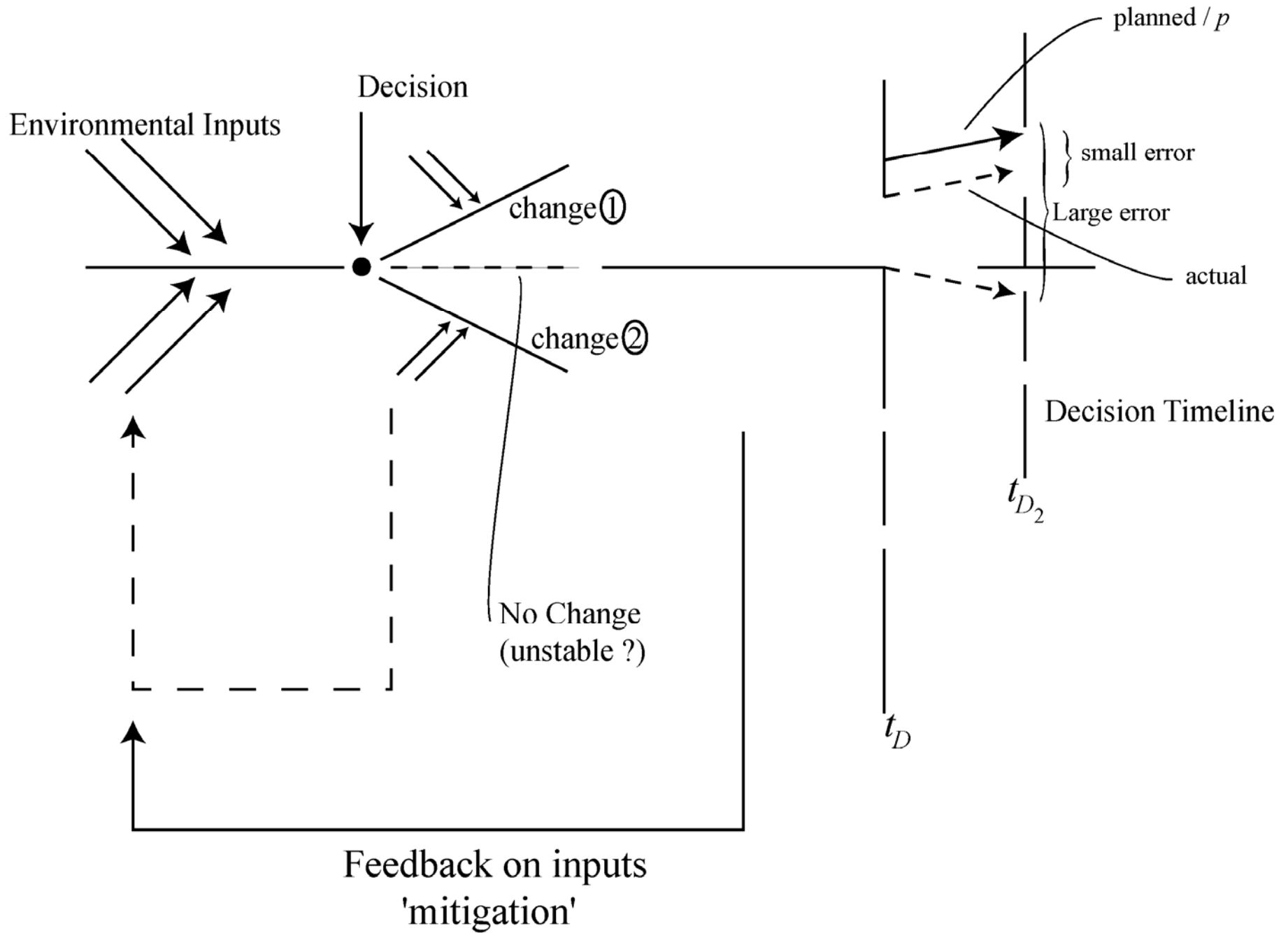
Meta – stable states of complex systems

(i) 1-D unsteady – hysteresis



(ii) Spatial





2. ANALYSIS OF MAJOR PROBLEMS

	Time Scale	CAUSE Human/ Natural	Problem Policies		
			Mitigation	Adaptation	Recovery
(a) Climate change	S	H (N?)	✓	✓	X
(b) Environmental dangers	F/S	H	✓	✓	X
(c) Disasters (Natural/Human)	F,S	N + H	✓	✓	✓
(d) Depletion of resources/person	S	H	✓	X	X
(e) Diseases	F,S	H + N	✓	✓	X
(f) Security	F,S	H	✓	✓	(X)
(g) Danger of economic slowdown	F,S	H (N?)	✓	X	X

Note:

- (i) Significant interactions between elements of each problem and between problems – but weak connections between solutions
 - SYSTEM ANALYSIS + CONSIDERATION OF ‘WHOLES’ (OR HOLISTIC – cf. SMUTS 1926)
- (ii) M & A Policies controversial / varied
- (iii) By definition problem involves significant perturbations from norm/equilibrium. All ‘problem policies’ aim to minimise global perturbations (except (d)) – but with different priorities, (i), (ii)

3. CSA FOR DEALING WITH PROBLEMS

(i) Type of approach

Hard: logical and/or quantitative, statistical or reductionist modelling related to data (sequential or integrated; discrete or pattern)

*Importance of anal. of models
- weaknesses (via dyn. system / phase plane)
- how to improve
- limits of acc. which depend on sit./applic.
Problem of inferring
results from models |
beyond their field of |
accuracy (eg downscaling) |*

- Progress in models' accuracy (including prediction of sudden change), complexity, variability, via size, computers, data, comms, and collaboration (e.g. disease and climate prediction, US ASCI projects on supernovas, rockets, etc.)
- Linkeage of models in different disciplines (e.g. climate-economic scenarios; heart dynamics...)

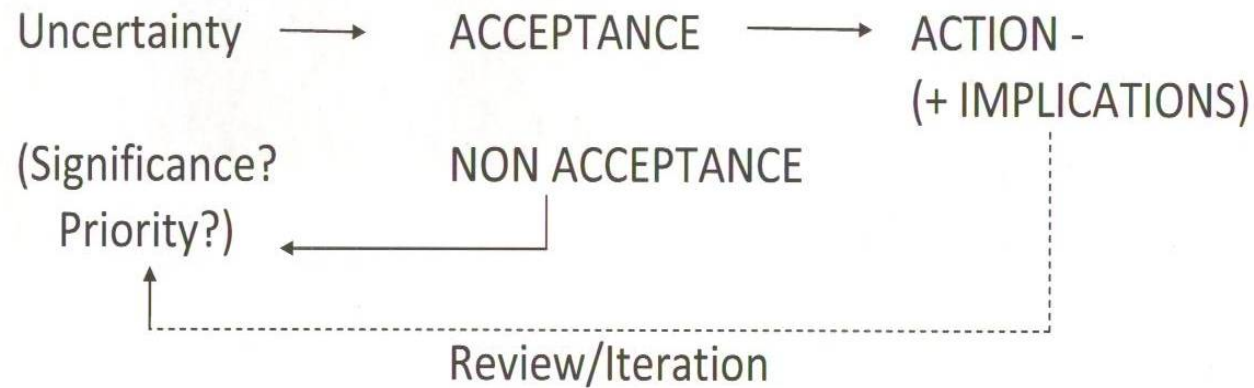
But significant variation in decision making on major problems.

Soft: aim is to make beneficial decisions based on human perception, behaviour, individual / group interpretations/objectives not agreed

- Critical to major problems ((a), (c), (e), (f))
- Recognition by government and industry (e.g. insurance following Hurricane Katrina)
- How to combine with Hard approaches?

(ii) Stages / routes of CSA for problems

Stages:

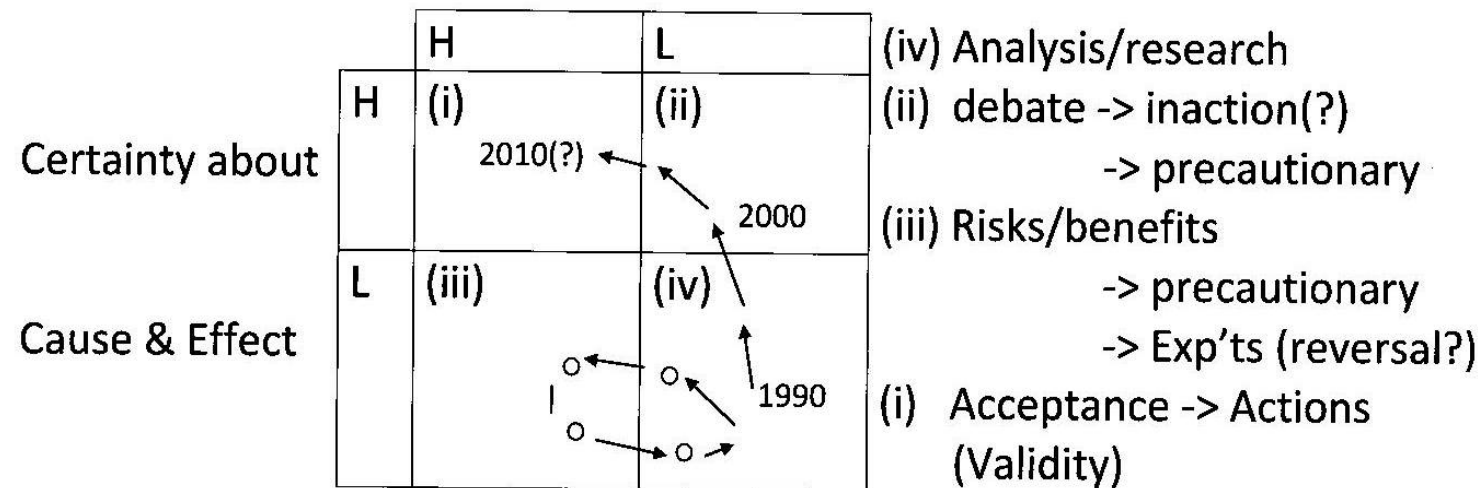


e.g. Examples of Acceptance
Stratospheric Ozone
Acid Rain
AIDS

Examples of Incomplete or Non-Acceptance
Sustainable development
Climate change, disease control
(too complex/uncertain?)

Uncertainty table and policy routes

Level of Acceptance of policy objectives



Trajectories of

policy development:

Climate change → → (iv) -> (ii) -> (i) (?)

Disease/Transportation (iv) -> (iii) -> (i)

— ○ → ○ —

cf. Earl & Hopwood

(iv) ←

Note experimental policies and reversals in some cases

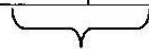
4. CSA INSIGHTS ON POLICY PROBLEMS

(i) Policy Options via Risk Analysis

⇒ Different decisions/actions

Risk of Environmental Effects

		Possible	Unlikely
Risk of Increased GHG	P	Fossil	
	Unlikely	Nuclear	Renewable



soft evaluation

Risk of supply failure

Possible	Unlikely
	Fossil
Gas	Coal
Wind/ Solar	Nuclear Tidal

How to develop policies / make decisions?

Modelling/Simulation to estimate risks/consequences e.g. conflict and energy supplies; climate effects on energy; new technologies for nuclear waste

=> more comparisons between evaluations?

(ii) System dynamics and description

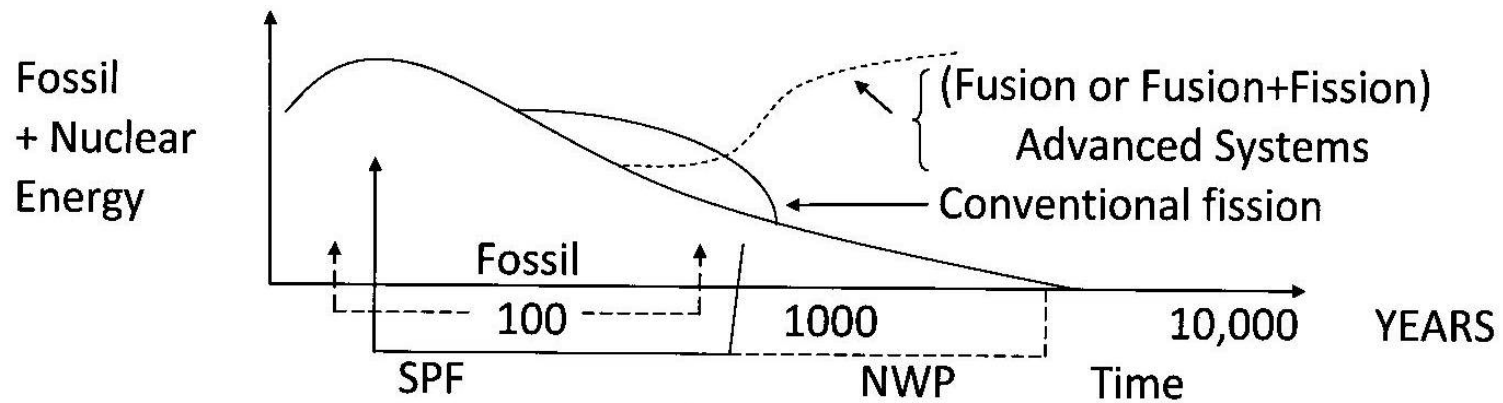
Note: charac spatial/temporal patterns from linkages or dynamics of subsystems (climate, disease,...)

⇒ Sensitivity to human/natural influence
(prediction; understanding; possible solution
e.g. urban; disease – both examples of self reinforcing
'virtuous circles of decision and policy or 'vicious' circles)

(iii) Response process in relation to threats

- Approach to a critical limit (e.g. resources)
- Threat of conflict / competition between (A) and (B) (examples of effective modelling; use by industry)
- Sudden changes in behaviour

5. TIME SCALES FOR ENERGY POLICIES AND FEEDBACKS

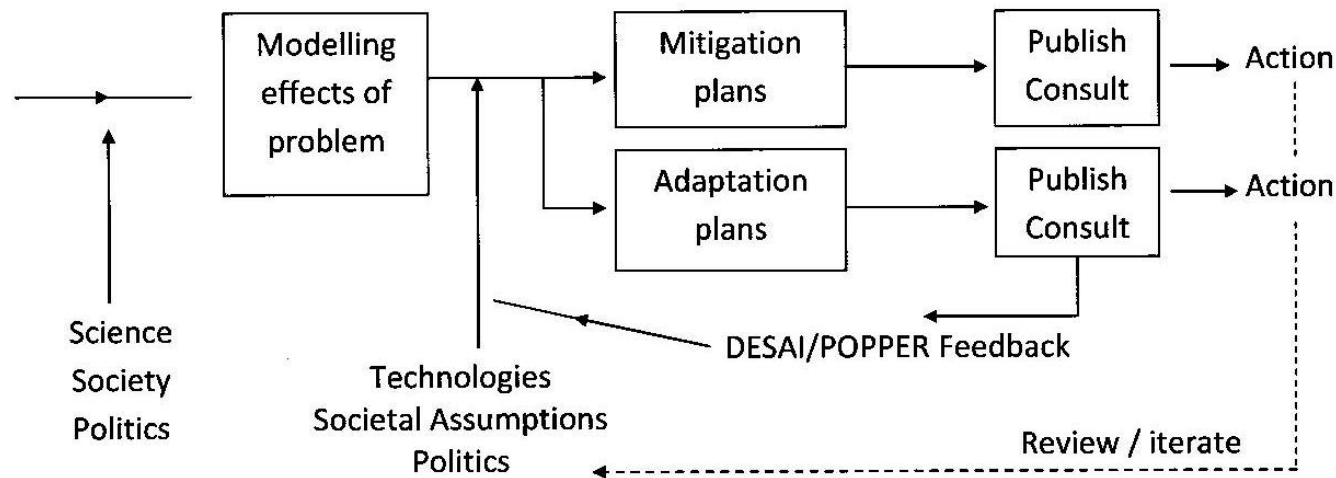


Note: SPF = Social / Political Feedback } Affecting present policies
 NWP = Nuclear Waste Policies } from future scenarios

- (1) Some countries have long range plans
(resources technology)
(1000+ years)
- (2) Large differences between countries in risk estimates and plans
(nuclear vs non-nuclear; proliferation issues; possible technologies)
- (3) Current debate and decision making is affected by future policies on
nuclear waste, advanced nuclear fusion / fission technologies

(‘SOFT’ ANALYSIS)

Transparency / consultation in decision processes influenced by CSA – once problem action is agreed



Note D/P Feedback: Publication affects peoples actions and thence predictions/actions for future.

Heat Island / Air Pollution -> Integrated Mitigation / Adaptation in urban areas

Climate Change Flooding -> District M?A policies

Integration of 'M&A Solutions' – complex issues – role

Proposal full title: **Global System Dynamics and Policies: simulation and visualisation technologies**

Proposal short name: **GSD**

Funding scheme: **Coordination action (CA)**

Work Programme topics addressed:

Cooperation Work Programme: ICT Theme 2007-2008

ICT-2007.8.0: FET-Open coordination actions (CAs) Continuous

Name of coordinator: **Professor Steven Bishop, University College London**

List of participants:

Participant No.	Participant organisation name and short name	Country
1 (Coordinator)	University College London (UCL)	UK
2 (Contractor)	Copernicus Institute for Sustainable Development and Innovation of Utrecht University (CIU)	Netherlands
3 (Contractor)	Max Planck Institute of Meteorology, Hamburg (MPIM)	Germany
4 (Contractor)	European Climate Forum (ECF)	EU
5 (Contractor)	Chalmers University (CHU)	Sweden
6 (Contractor)	Unit for Research into Changing Institutions, Apollo-Gaia (APG)	UK
7 (Contractor)	Intercollege Limassol Campus (ILC)	Cyprus
8 (Contractor)	Tallinn University of Technology (TUT)	Estonia
9 (Contractor)	Universidad de Alcalá (UAH)	Spain
10 (Contractor)	École des Hautes Études en Sciences Sociales (EHESS)	France
11 (Contractor)	Potsdam Institute for Climate Impact Research (PIK)	Germany

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Holism and Evolution

The original source of the holistic
approach to life

Complete and unabridged

by Jan Christiaan Smuts

edited by Sanford Holst



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LONDON'S ENVIRONMENT

Prospects for a Sustainable World City

Includes
Mayor Ken Livingstone's
vision for London's
environment

edited by
Julian Hunt (University College London, UK)

London's Environment: Prospects for a Sustainable World City analyses the dramatic recent developments in London and relates them to the city's unique environmental, social and cultural history.

The book opens with a general discussion by the editor of London's environment and its prospects for a sustainable future. The subsequent chapters are written by leading experts on architecture, planning, air pollution, biodiversity, transport, rivers, parks, aesthetic aspects of London's landscape, politics, health, and economics. In an era of global warming, urbanisation and public health scares, this collection of essays represents a topical and accessible broadening of the debate. Authoritatively and in some detail, the authors outline the major developments influencing London's environment and the directions it is taking towards a more sustainable future: there have been changes in the law (with the GLA act), politics (adopting sustainability as a political goal), policies on waste disposal (no more landfill), housing areas, building development (e.g. Canary Wharf and Thames Gateway), traffic management (congestion charge), policies for enhancing biodiversity, transport infrastructure (roads, rail, trams), managing risk of floods and other disasters (responding to climate change). The book shows how these policies for the future global environmental pressures and practical developments are strongly interconnected. The essays will prove highly instructive to those comparing London with other world cities facing similar problems and finding their own solutions.

The book is written for the general reader as well as students with broad interests in environmental issues and how the main scientific, policy and community dimensions can be more effectively integrated. The up to date examples of how London is dealing with these issues will also be relevant to those studying and lecturing on the environmental aspects of their specialist subjects including geography, planning, civil engineering, chemical engineering, architecture, urban economics, political science, public health, and environmental conservation. The discussions of current policy questions should be of interest to those in local and national government and in non-governmental organisations who are making and influencing decisions about sustainable development and urban environments around the world.

The book's impressive scope includes the following:

- **World Contexts:** London's Urban Renaissance (*R. Rogers*); Sustainability of London's Environment and the World Context (*M. Meacher*); London's Sustainability – An Overview (*J. Hunt*); Foundations of a World City – London's Historic Environment and Future (*T. Nixon*)
- **Environmental Developments and Perceptions:** Environmental Strategies for London (*D. Goode*); The Changing Air Over London (*H. ApSimon*); London's Water Supplies (*R. Wotton & H. Evans*); Parks and their Roles in a Sustainable City (*W. Weston*); Places, People and Socio-Economic Differences in Health (*M. Marmot & M. Stafford*); Art and Science in London's Atmosphere Around 1900 (*J. Thorne & G. Metherell*); Biodiversity and the Urban Environment: Benefits, Trends and Opportunities (*P. Henderson*)
- **Planning and Politics:** Dealing with Disasters (*D. Parker & E. Penning-Rowsell*); Civilising Transport (*D. Banister & E. Duxbury*); A London Fit for Pirates? (*J. Glancey*); London's Governance and Sustainability (*T. Travers*); Thames Navigation and its Role in the Development of London (*J. McGlade*); Community Participation in Urban Regeneration Through use of the Internet (*M. Batty et al.*); Towards a Sustainable Environment in London (*L. Walker & M. Simmons*); The Mayor of London's Vision of the Future of London's Environment (*K. Livingstone*)

Readership: Students, instructors, researchers, engineers, architects, planners, environmental consultants, urban ecologists, health professionals, businessmen, politicians, environmental campaigners, urban specialists, geographers, general interest.

350pp (approx.) May 2005
1-86094-486-8 US\$80

Published by Imperial College Press and distributed by World Scientific Publishing Co.