Governance of complexity in systems thinking

A multidisciplinary heuristic approach

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Agenda

- Complexity Science
- Systems thinking
- Governance
- Synthesis
- Case studies
- Discussion
- Provocation

Complexity Science

- The definition of complexity science is still very much open to debate (Bristol Centre for Complexity Science)
- To some, complexity science is merely the study of branches of different sciences, each with its own examples of complex systems
- Others argue that there is a single natural phenomenon called ‘complexity’, which is found in a variety of systems, and which can be the subject of a single scientific theory or approach.

Characteristics of a Range of CoIs

The abaci Partnership

Components and Structures

Shaped by history. Structured behaviour embedded in **pre-defined system**	Structure shaped by agreed interactions – formalised as **systems of systems** (SoSs)	Structure sand behaviours shaped by events - adapts franchises - **federated SoSs**	Transient behaviours arise from shared 'purpose' – ad-hoc, on-demand interoperability	Unstructured. Swarm	Unstructured. Hermits / Mavericks
'Institutionalised" Groupings	'Recognised" Groupings	Organised Response	Ad-hoc Activity	Riot Mob	Individual Activists
'Establishment' **TYPE 1**	'Enterprise' **TYPE 2**	'Community' **Type 3**	'Crowd' **Type 4**	Danger!	'Sages'
• Context known and largely predictable • User needs can be specified clearly • System design and behaviour accredited, repeatable, verifiable • Minimal need for external interoperability	• Common context can be agreed upon • User needs / process can be standardised • Inter-system interfaces can be agreed and verified • Interoperability using pre-agreed standards	• Events define the 'context', fluid • Users' needs context-driven and fluid • 'Come-as-you-are' federations – largely agreed 'on-the-fly' • Interoperability based on open-standards	• Context ever-changing, unpredictable • No user needs as such, emergent • Peer-to-peer, ad-hoc collaboration enabled 'just-in-time' • Ad-hoc working via wikis, social networking		

Innovation in Systems Thinking

- Integration of infrastructure and construction design
  - Innovation at the interface
  - Balancing costs and benefits, risks and uncertainties
- Human and environmental impact
  - Safety, behaviour, congestion, community
  - Noise, air quality, pollution, carbon
- Information integration
  - Data from all sources over a range of timescales
  - Systemic models to enable predictions to support decision making through whole life cycle and throughout the supply network
- Professional bodies can act as *convenors* for the debate on how to define systems and then manage and engineer change
- Information and collaboration are the new assets available to facilitate change

Governance

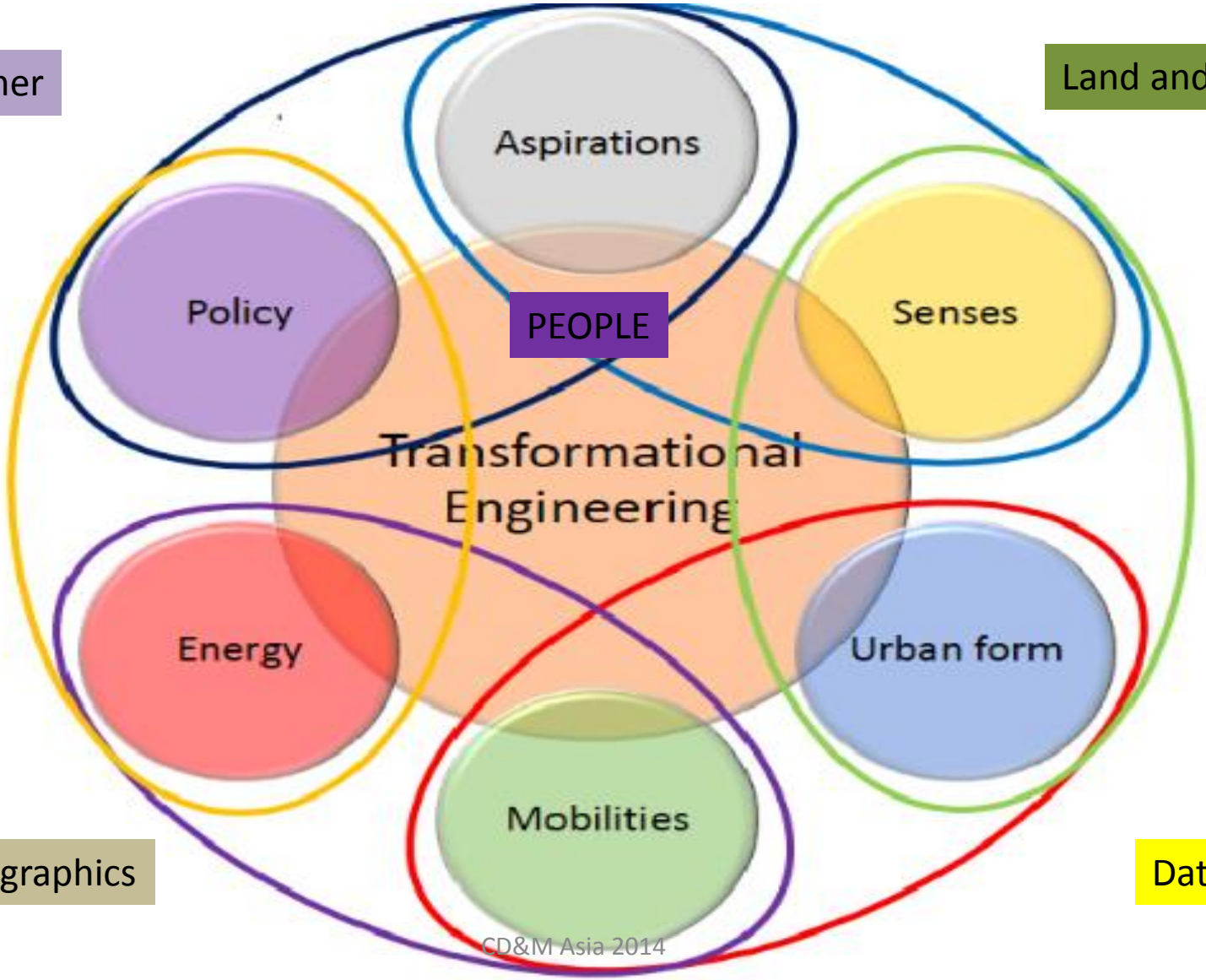
- **Governance** is the act of governing. It relates to decisions that define *expectations*, grant power, or verify performance. It consists of either a separate process or part of management or leadership processes.
- These processes and systems are typically administered by a government.
- A reasonable or rational purpose of governance might aim to assure, (sometimes on behalf of others) that an organization produces a *worthwhile* pattern of good results while avoiding an *undesirable* pattern of bad circumstances.

Source - wikepedia

Synthesis

- The act of combining or adding parts to make a unified whole
- The ambition of strengthening networks of policies by building strong alliances among key stakeholders
- The activity of contributing policy recommendations that incorporate stakeholder perspectives on
  - the integration of policies
  - more effective collaboration and cooperation

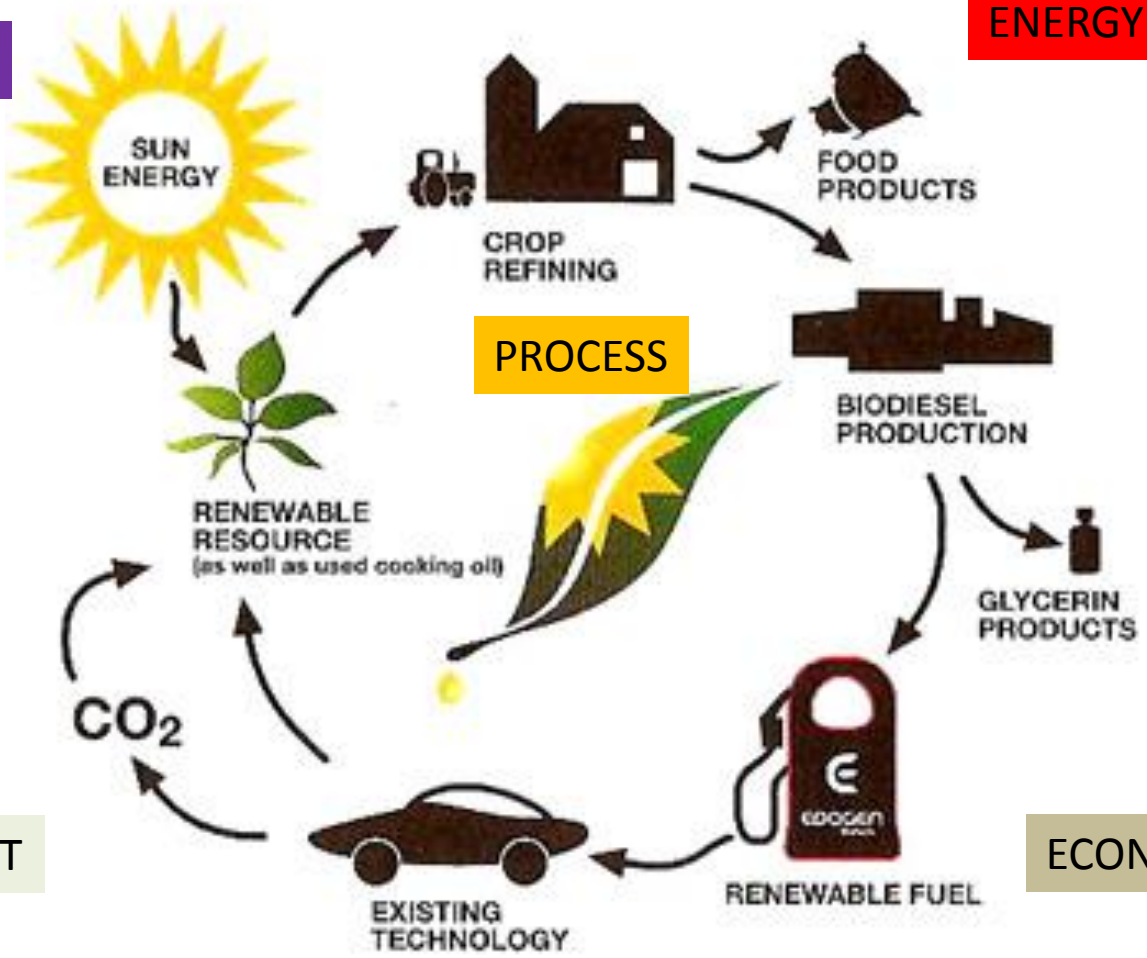
The holistic, integrated, vision of cities



Bio Fuel cycle

PEOPLE

ENERGY



PROCESS

LAND

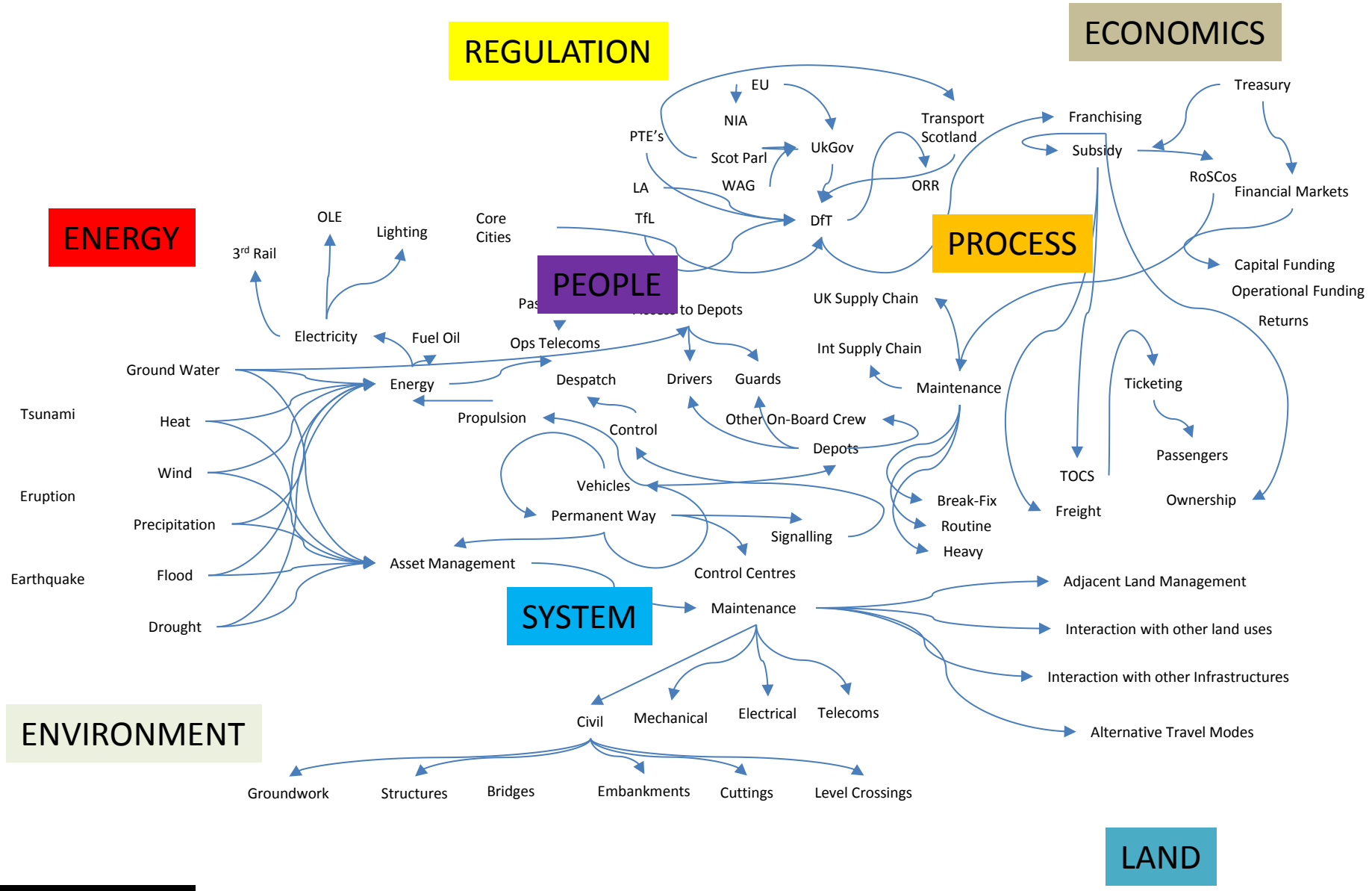
REGULATION

ENVIRONMENT

ECONOMICS

SYSTEM

Initial System of Systems Representation for GB Railways



A challenge to the status quo

- Complex packages of policies are avoided because impact is more difficult to assess as is attribution of successful governance.
- Multi factoral evaluation of benefits are difficult so too many stakeholders are to be avoided
- Financial models for different infrastructure sectors are different, so the risk of integration is hard to evaluate.
- The overhead of collaboration is not seen to add value because single stakeholder benefit assessments are used

The opportunities

- Use new systems thinking approaches combined with complexity science to support the evaluation of integrated investment and governance.
- Examine different governance models for their degree of integration and what aspects of their degree of integration and complexity produce a significant contribution to the delivery of benefits and mitigation of risks
- Identify key factors needed in a managed change programme to improve outcomes by better governance where appropriate
- Understand where the convening power is for sets of communities and facilitate their activities


Thank you