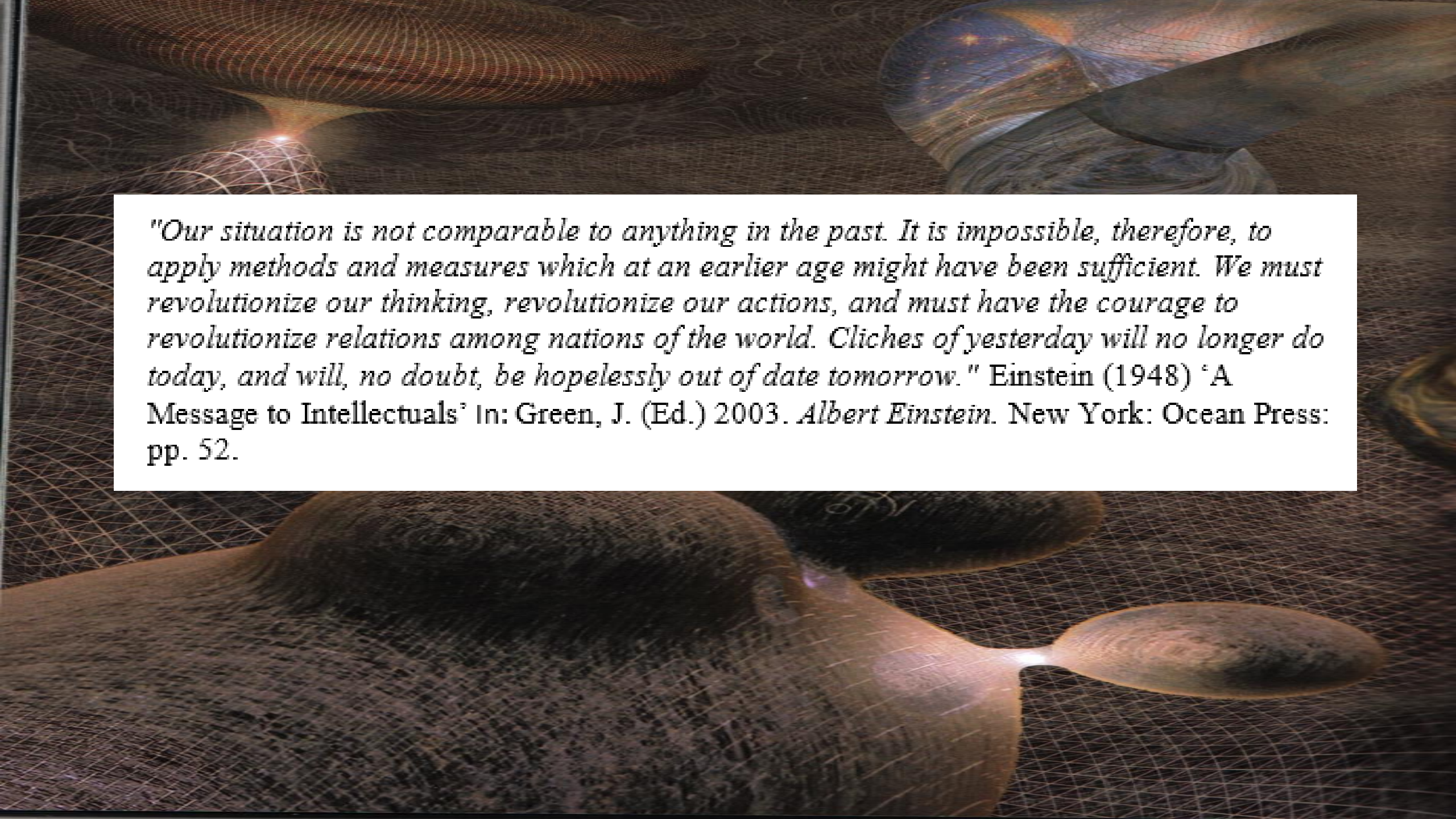
LEARNING FOR SUSTAINABLE TRANSITIONS THROUGH THE LENS OF COMPLEXITY THINKING

Anneke Muller
SPL, Stellenbosch University



"Our situation is not comparable to anything in the past. It is impossible, therefore, to apply methods and measures which at an earlier age might have been sufficient. We must revolutionize our thinking, revolutionize our actions, and must have the courage to revolutionize relations among nations of the world. Cliches of yesterday will no longer do today, and will, no doubt, be hopelessly out of date tomorrow." Einstein (1948) 'A Message to Intellectuals' In: Green, J. (Ed.) 2003. *Albert Einstein.* New York: Ocean Press: pp. 52.

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- Sustainable Development (SD)
- ‘Wicked’ problems and Complexity Thinking
- Types of Learning for Sustainability
- Understanding transitions and planning for Sustainability through the lenses of complexity thinking & triple-loop learning
- Conclusion

INTRODUCTION

- SD has to deal with very **complex, interacting dilemmas** - Probably requires quite drastic transformation & changes
- Focus in planning & management theory - how to adapt to **complexity** ,'wicked' problems & for postmodern Age and on **exploring role of learning-**
- Use of **Triple Loop Learning** explored to help revolutionise our thinking or help to think 'outside the box'
- Explore **different types of learning** (behaviour-based, cognitive, social constructivist and gestalt approaches)
- Examine **learning needed for SD-** Fields of Education for SD (**ESD**) (bolt-on); Education for Sustainability (**EfS**) (built-in) & Sustainable Education (**SE**) (transformation & integrated) (UNESCO, 2006; Thomas, 2009)
- Exploring what this means for helping to understand learning for sustainable transitions and planning

SUSTAINABILITY & SD

- Many **sustainability challenges**: Poverty, inequality, population growth; urbanisation; biodiversity loss; levels of resource use**; social and justice issues** such as poor people without access to land and resources; laws & policies criminalising practices of the poor
- SD defined in 1987 Brundtland Report; 1992 Rio Agenda 21; 2002 WSSD JHB Plan of Implementation; 2012 Rio +20 'The Future we want'
- But seen as **fuzzy, fluid** or **illusive**; **many possible meanings** with continuum between polar opposites (Ex. Top-down, autocratic & expert-driven; bottom-up; co-created; broad vs narrow, etc)
- Some **inherent** fundamental issues (long-term thinking; integration; some form of equity; **Human Rights**; Right to Development)
- **Planning important to achieve SD –** although not necessarily in its present form

Ecological modernisation	Risk society
• optimistic approach	• sceptical approach
• sees no conflict between economy and environment	• sees irreconcilable conflict between current mode of production and environment
• relies on science and technology to 'refine production' for improving environmental performance	• sees modern technology as the cause of risk to ecological system and survival
• sustainability concept is marketised and utilitarian, can be priced and traded off with other goods	• sustainability concept is radical and moral with protection of ecosystems having the highest priority
• relies on elitist, techno-corporatist approach to policy-making	• calls for greater participation in policy-making at the local level
• state as enabler, facilitating market forces within a regulatory framework	• interventionist state based on power of collective action asserting its will on private interest
• accepts the status quo	• calls for social transformation

Figure 6.2 The twin discourses of sustainability

Conflicting ideas on what is needed to achieve SD

We can't solve problems by using the same kind of thinking we used when we created them

(Einstein)

Source: Davoudi, 2001: 89

PARADOXES OF SUSTAINABLITY

- Complex, **never-before experienced problems**
- Interlinked challenges, with **unexpected interactions** between Technology and Nature (example of Fukushima nuclear disaster)
- **Paradoxes of economic system** built on Model of Infinite Growth in a world with Finite Resources
- **Jevon's Paradox** (rebound effect) where resource & energy efficiencies actually in the medium/long term leads to increased use of the resource and not less
- **Tragedy of the Commons**
- **Trade-offs** between **efficiency** (for example in agriculture) at cost of **diversity** (mono-cultures), **independence** (heavily dependant on external fertilisers & GMO), **sustainability** (pollution) , **resilience** (less adaptibale to change) & **equity** (livelihoods)
- **Competing/conflicting rationalities** & **governmentalities** (practices & techniques, ways of thinking)

CONFLICTING RATIONALITIES & GOVERNMENTALITIES

- People's view so fundamentally different, they can never understand each other (Watson, 2003)
- Massey (2013) explored the example of the **technocratic, standards-driven, neo-liberal & economic-accounting governmentalities** of the Cape Town municipality when upgrading informal areas vs the **organic, flexible, tradition-based, informal, survivalist & socially-driven governmentalities** of women's groups – **outcome did not meet needs of the poor**
- These conflicting rationalities/ governmentalities lead to the **paradox where more information** can actually make debates and political conflict more intractable and difficult to solve – example of climate change debates (Sarewitz, 2010)
- These paradoxes all examples of '**wicked' problems** or complexity

‘WICKED’ PROBLEMS & COMPLEXITY THINKING

- **‘Wicked’ problems** (Rittel & Weber, 1973) -problems of organised complexity
- That cannot be solved through rational planning or 1st generation systems thinking, but through **2nd generation “planning as argumentative process…”**
- Ambiguity, uncertainty, complexity, interconnectivity, conflict & societal constraints (Mason & Mitroff , 1981)
- **Paul Cilliers** characteristics of complex systems- many elements; multiple non-linear interactions; open; distributed memory; history; self-organisation & emergent behaviour
- **Knowledge of complex systems always limited & depends on framework used to study system (**what we leave out, may change system)

RITTEL & WEBBER'S 9 CHARACTERISTICS OF 'WICKED' PROBLEMS (1973)

- No one definite formulation for wicked problems
- Formulating or understanding is synonymous to solving it
- No right or wrong solutions- only good or bad according to value system within which applied
- No way of knowing when it is solved- need constant monitoring and improvement of solution
- Possible range of methods that can be used to solve problems are unlimited
- Many explanations and depending on one chosen, so solution differs
- Never clear if addressed at right level, as they have no identifiable root cause- often symptoms of other problems
- Once a solution has been attempted, it cannot be reversed
- Every wicked problem is unique

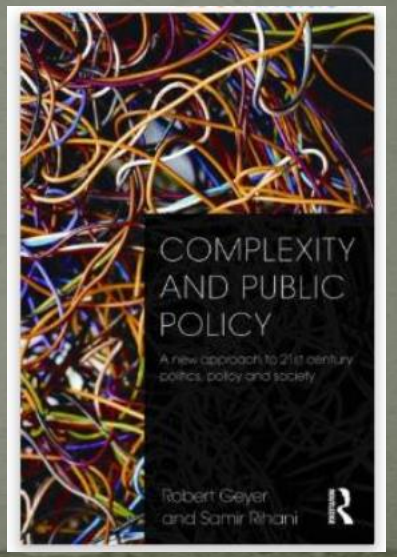
PAUL CILLIERS' CHARACTERISTICS OF COMPLEX SYSTEMS

- Large number of components – may be simple
- Components interact dynamically
- Interactions quite rich
- Interactions non-linear (no relation between cause & effect)
- No direct link necessary to interact
- Abundance of feedback routes
- Open system
- Operate under far from equilibrium conditions
- History of system important
- Subcomponents can only act on local info- do not have access to all info of system

COMPLEXITY THINKING

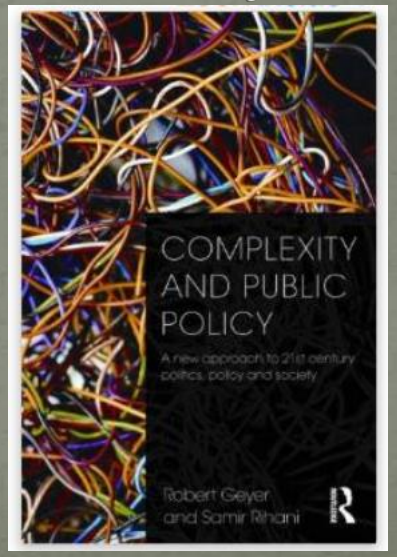
- Complexity **Thinking** versus Complexity **Theory** or Complexity **Science Science**
- Complexity concepts: order/disorder, chaos, on the edge of chaos, inertia, entropy, equilibrium/disequilibrium, lock-in, path-dependence, triggers, thresholds, critical levels, attractors, fractals, feedback loops, becoming, virtuality, emergence, self-organisation, co-evolution,
- **Two different streams** of viewing complex systems in planning
  - Complex quantitative modelling (belief in control, order , rationality) versus
  - Complexity thinking as an **alternative** to / **critique** of modernist, rational views of science & belief in control, based on Complex, Adaptive Systems – focus on the qualitative
- Modernism versus Postmodernism with

  complexity as bridge between these views (Geyer, 2010)



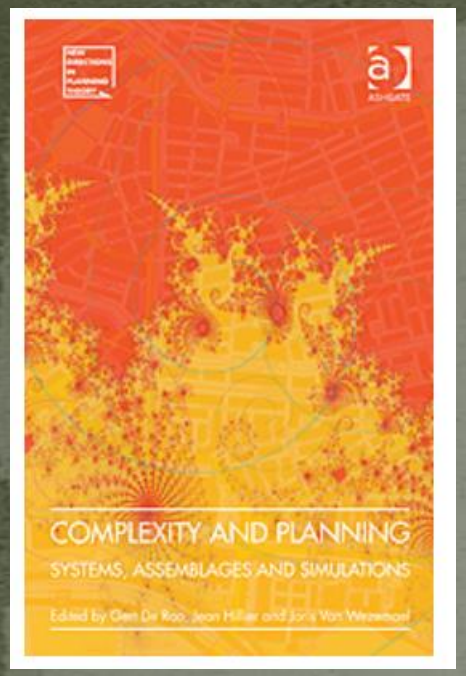
POSITIONS OF MODERN, COMPLEXITY AND POST-MODERN SCIENCE (GEYER, 2003: 10)

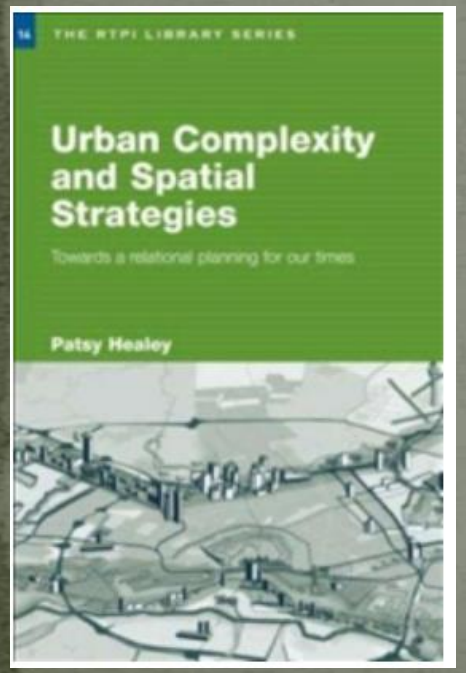
Modern	Complexity	Postmodern
Epistemological position		
Order	Partial order	Relational
Rationality	Bounded rationality	Relational rationality
Predictability	Predictability and uncertainty	Unpredictable
Reductionism	Reductionism and holism	Irreducible
Determinism	Probablistic and emergent	indeterminate
Non-interpretive	Interpretive	Relational interpretation
Relation of physical and social sciences		
Subservient/inferiority relationship. Social science must strive to duplicate methods and results of physical science.	Integrative relationship. No necessary separation between physical and social sciences.	No clear relationship exists. Relational and interpretative nature of humanity makes clear relationship difficult.
Relation of humanity to nature		
Expanding human dominance over nature	Holistic interpretation of human and natural symbiotic co-evolution	Unclear relational distinction between humans and nature
Methodological implications		
Experimentation, quantification and search for fundamental laws	Integration of experimen-tation and interpretation. Fundamental laws and distinctive outcomes	Relational interpretations and undermining truth claims
Vision of Progress		
There are no inherent limits to human knowledge and progress.	Significant limits to knowledge and progress due to complexity and uncertainty.	No fundamental order. Pure knowledge creation and progress is impossible to know.
History is progressive, cumulative, and leads to an ultimate end.	History may progress and display fundamental patterns, but it is also uncertain and tortuous	History is relational hence it does not universally progress.
Range of outcomes for Complexity Theory		
Order	Stifling Order	Creative Complexity	Destructive Disorder	Chaos

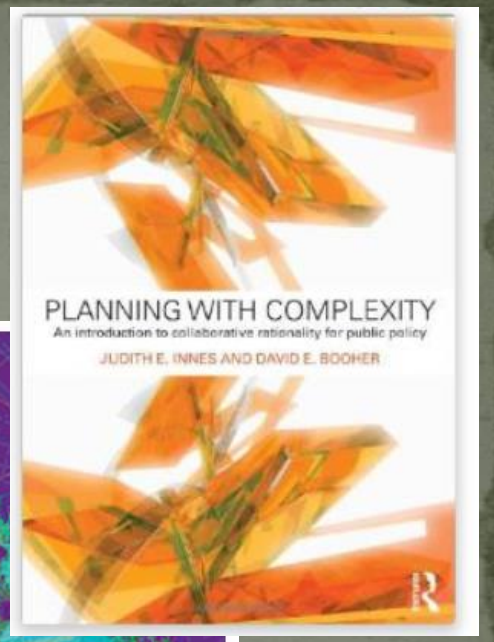


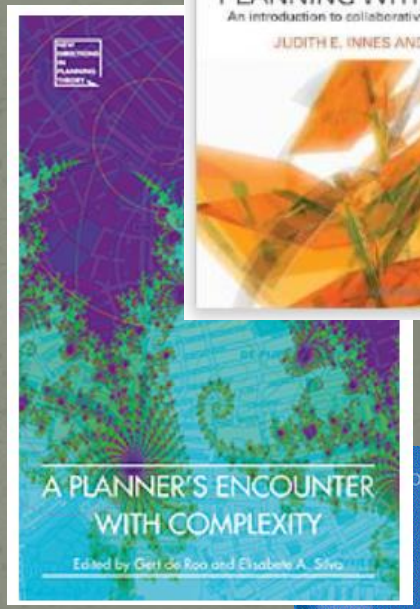
Meaning for Planning?

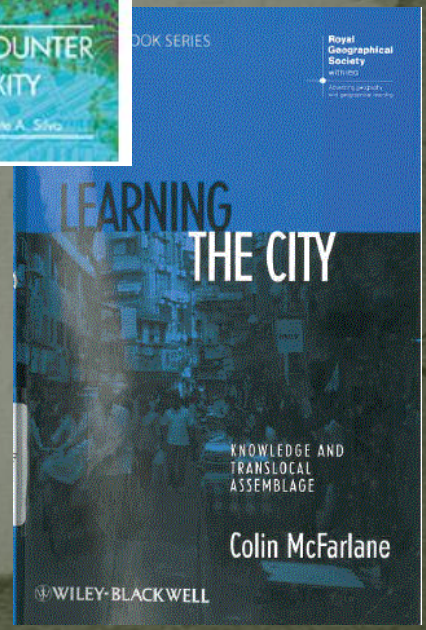
- Chettiparamb (2006) - Complexity as Metaphor – used in Theory Transfer
- Metaphors can illuminate or blind (Norgaard, 2010)
- Innes and Booher (2010) – Participative processes
- Healey (2007) Questions role of spatial planners
- De Roo & Porter (2007) – Fuzzy Planning
- Evolutionary planning (Bertolini, 2010) – Between Bargaining & Experimenting (adaptive management & governance; Strategic Choice Approach; etc)
- Hillier (2011) – Deleuze & Guattari 's view of Assemblage theory - creative transformation and new ways of seeing
- McFarlane in 'Learning the City'– urban learning assemblages & more socially just forms of learning
- Exploring multiplicity of ways of seeing the world - good for understanding complexity











MEANING FOR MANAGEMENT?

- Complexity and organisational learning (Mitleton-Kelly & Ramalingam, 2011)
- Complexity and innovation (Andriani, 2011)
- Complexity and policy exploration (Bankes, 2011)
- Complexity more than a metaphor: New Rules of Management (Hazey, 2011)
  - **Managing for resilience** and not design for stability - design assumes stability, control, predictability, absolute knowledge, an endpoint
  - **Evolutionary mindset** promotes resilience – requires **transparency**, open **communication channels**, **distributed control** systems, **experimentation**, forward-looking
  - **Frozen accidents** – present institutions and system based on arbitrarily and chance decisions of the past

MEANING FOR MANAGEMENT

- Adaptive Management , Adaptive Co-management & Adaptive Governance (Stankey et al, 2005)– action learning approaches
- Transition Management (Rotmans & Kemp, 2008)
  - Transition towards Sustainability
  - Complex-adaptive system
  - Evolutionary, experimenting process
  - Promoting a diversity of approaches and projects
  - No top-down control
  - Create synergies between these with visioning
  - Changing mental frameworks

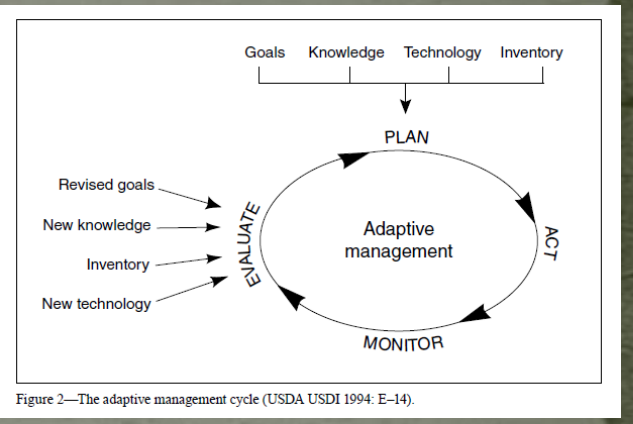


Figure 2—The adaptive management cycle (USDA USDI 1994: E–14).

The essentials of transition management

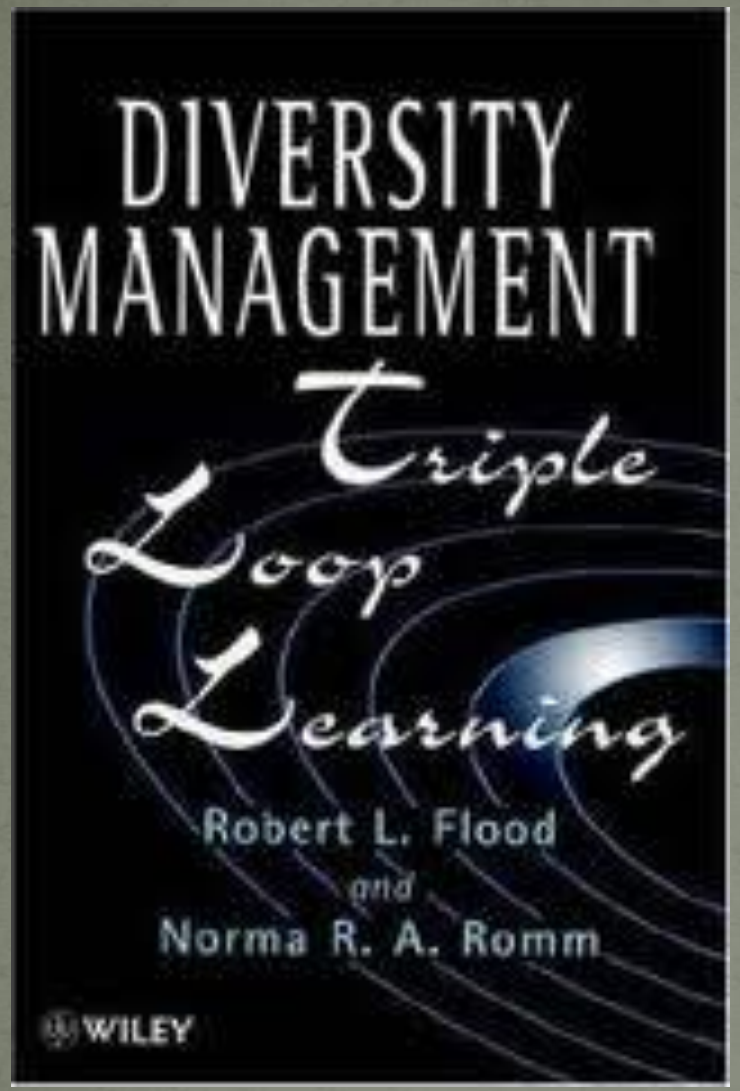
Transition management is a model of coevolutionary management of transformative change in societal systems through a process of searching, learning, and experimenting. Managing here means adjusting, adapting, and influencing rather than the command-and-control mode (Loorbach, 2007; Rotmans et al, 2001a; 2001b). The rationale behind transition management is that there are persistent problems for which there are no immediate solutions. By transforming the persistent problem into a visionary challenge, transition management explores a range of possible options and pathways, by carrying out a diversity of small-scale experiments. Based on what is learned form the transition experiments, the vision, agenda, and pathways are adjusted, if needed. Successful experiments are continued and can be scaled up; failed experiments are abandoned. Another round starts until some kind of convergence is reached. Transition management is thus a cyclical process of envisioning, agenda building, instrumenting, experimenting, and learning. Rather than focusing on a single, available solution, transition management explores various options and is aimed at guiding variation-selection processes into more sustainable directions, with the long-term aim of selecting the most sustainable option(s) and paths based on learning experiences.

4 TYPES OF ORGANISATIONAL LEARNING THEORIES (MITLETON-KELLY & RAMALINGAM, 2011)

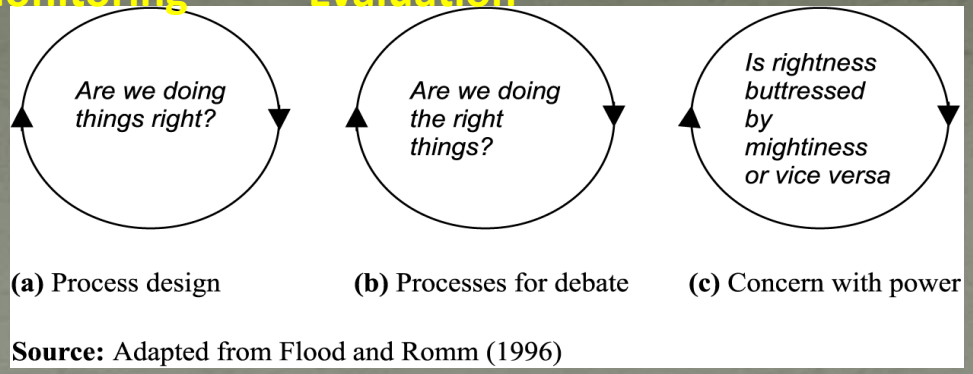
TYPE	DESCRIPTION	EXAMPLES
Behaviour-based	Stimulus-response conditioning through sanctions and incentives – only in stable mature environments	Single-loop learning
Cognitive	Mental processes- thoughts, beliefs, perception & interpretations	Argyris & Schön (1972) Double-loop learning; Kolb; Triple-loop learning
Social constructivist	Learning emerges from social interactions – build collective understandings & shared problem-solving	Transdisciplinary literature **TRANSDISCIPLINARY TRIPLE-LOOP LEARNING**
Gestalt approaches	Integrated, holistic, whole-body learning (cognitive, physical, emotional, spiritual)	Peter Senge (1990) Fifth Discipline Nonaka & Takeuchi **HOLISTIC TRANSDISCIPLINARY TRIPLE-LOOP LEARNING**

SINGLE, DOUBLE & TRIPLE LOOP LEARNING

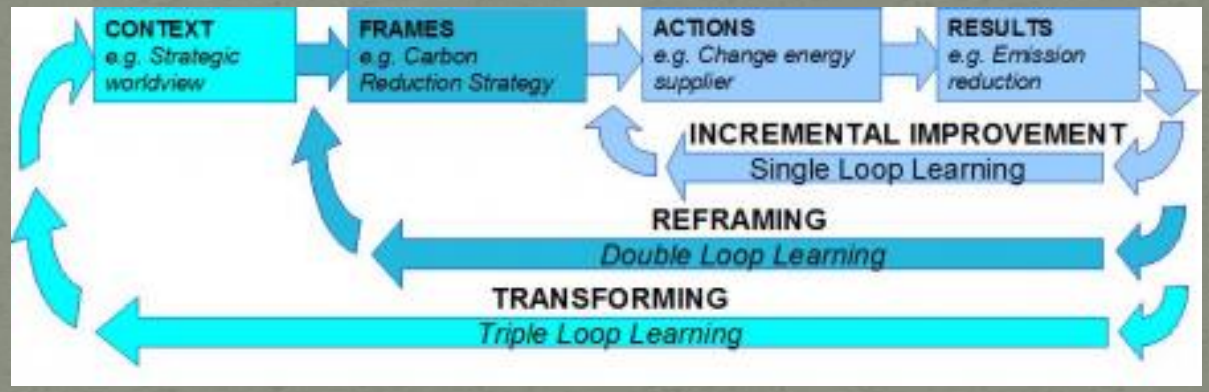
- **Argyris & Schön** (1972) Single Loop (Error-Correction) & Double Loop Learning (Reflective) and Model I (Inhibits Double Loop Learning) & Model II learning
- Gregory **Bateson** (1974) Deutero learning and 5 levels of learning
- **Hawkins** (1991) Treble-loop learning
- Swierings & Wierdsma (1992) Becoming a Learning Organization – Triple-loop learning
- **Flood & Romm** (1996) Diversity Management: Triple loop learning
- **Triple loop learning described as as 'collective mindfulness', 'generative dialogue', enacting the blind spot, enabling system to see itself…**

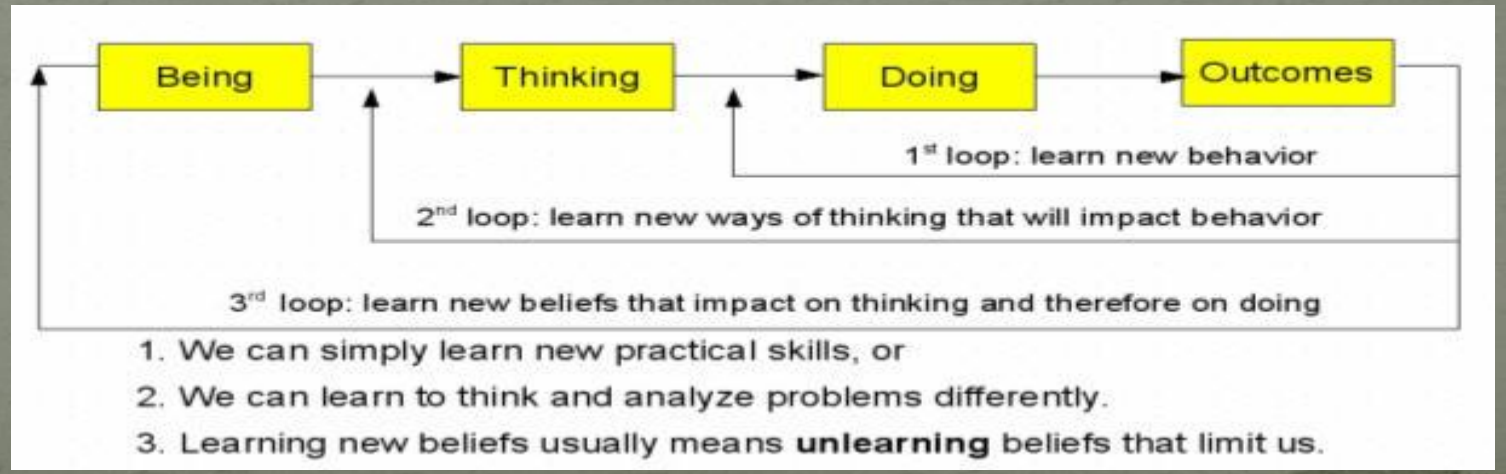


Monitoring Evaluation



Source: Adapted from Flood and Romm (1996)





Triple loop learning about revolutionising our way thinking & learning, our mental models, with focus on role of power

APPLICATION OF LENSES TO LEARNING TO PLAN FOR SUSTAINABILITY

- SD is hard to define and hard to teach **- Even more challenging to re-orientate entire system to achieve sustainability** (UNESCO, 2006)
- Need **for critical reflection on learning** to help **change mental frameworks**
- Thomas (2009) – 4 stages – Denial – ESD (Bolt-on) – EfS (Built-in)- SE (Wholly integrated, transformative, critical and self-reflection leads to revision, **redefining and reframing of assumptions**, problems, values, habitual ways of doing)
- Planning systems, cities, communities are **complex adaptive systems** – rational planning not always very useful, but communicative planning with social and transformative learning – inbuilt critique and reflexive & critical capacity

APPLICATION OF LENSES TO LEARNING TO PLAN FOR SUSTAINABILITY

- Sustainability problems cross disciplinary boundaries and **transdisciplinary** (TD) approaches needed, where all parties learn, not just experts
- Need to bring excluded knowledge of the poor to policy debates (McFarlane)
- Sustainability discourse should not be seen as top-down or totalitarian, but as open to be **co-created** to suit the context
- TD approaches need to be **part of way planners are trained**
- SA systems promote **compliance** rather than **creativity** – we need to explore the characteristics of **systems that stimulate creativity & innovation**
- Every problem and city **unique** – **no universal pathways** to sustainability
- **Need to explore skills needed to promote Triple Loop Learning** - group work; understanding power and politics; power in discourses, working with diversity; engage critically beyond narrow ideological views

CONCLUSION

- World getting more unequal, unsustainable & unjust
- Many elements of present systems probably '**frozen accidents' that contribute to unsustainability**
- Requires drastic changes and for us to revolutionise our way of thinking, learning and relating to each other
- 'Wicked' and complex problems require revolutionised '**outside the box**' thinking and thinking **outside present discourses**
- **New ways of seeing the world** such as Complexity Thinking, assemblages & Triple Loop Learning can help us do this
- Knowledge of many different disciplines, and perspectives needed
- Especially important is knowledge of the marginalised


THANK YOU