Scenario Planning, Backcasting, and Transition Management for Sustainable Development

Presentation for ITA
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Tellus Institute and MIT

Overview

1. The challenges of sustainable development
2. Tellus “Great Transition” scenario
3. Backcasting
4. Transition management
5. How to accelerate transitions?
6. Case: the dilemma of CCS

1. The challenges of sustainable development and climate change

- NL STD program 90s: factor 20 challenge
- Derived from IPAT equation: I=PxAxT
- Factor 20 not achievable with technology alone; cultural and structural changes

Other challenges:

- IPCC reports and scenarios on climate change
- MEA on global ecosystem carrying capacity
- UN Millennium Development goals
- Just sustainability: environmental and social justice
- Sustainable consumption and lifestyle change

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- In short: challenges are systemic and global
- Causes are multiple: technological, political, social, cultural
- Technological innovation is necessary but not enough;
- changes in consumption and lifestyle are also necessary

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CTA

- 90s: Constructive TA: steering technological innovations into ‘right’ direction while avoiding unwanted consequences
- Informed by technology dynamics and ‘social shaping’ theories
- Emphasis on social participation; underestimating politics and power relationships, and economics

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Challenges (a selection)

- Reduce CO2 emissions by 80-90 %
- Protect rainforest, oceans, biodiversity
- Poverty alleviation and water provision
- Income equality and job creation
- Preserve democracy while reforming political system
- Reform economic system
- Accelerate technological innovation

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- ...requires new thinking...
- ...new interdisciplinary approaches....
- ...new types of collaboration between scientists and practitioners....
- ...forms of higher order learning.....
- ...mental audacity....

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2. Tellus Institute: Great Transition Scenario

- Based on the work of the Global Scenario Group (GSG)
- Transition to global phase of civilization
- Global connectivity
- Branching points
- Three kinds of scenarios: conventional worlds, barbarizarion; great transitions

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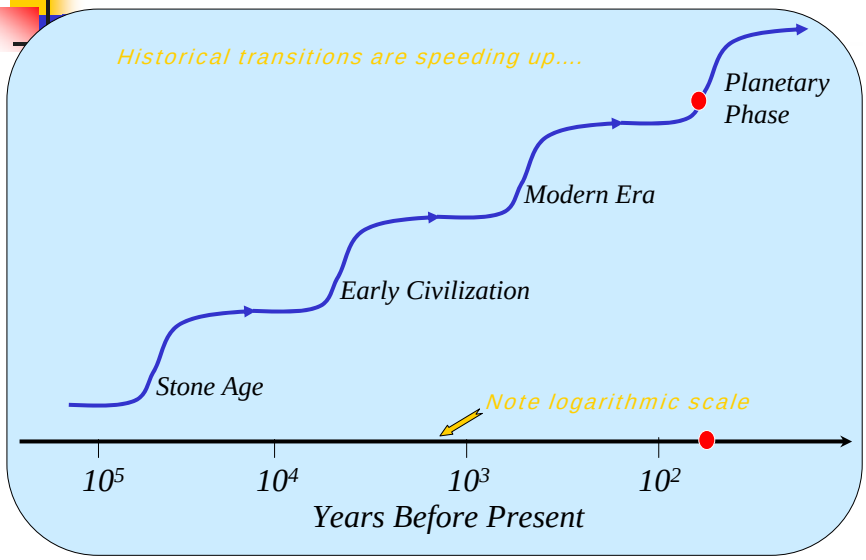
Accelerated Change



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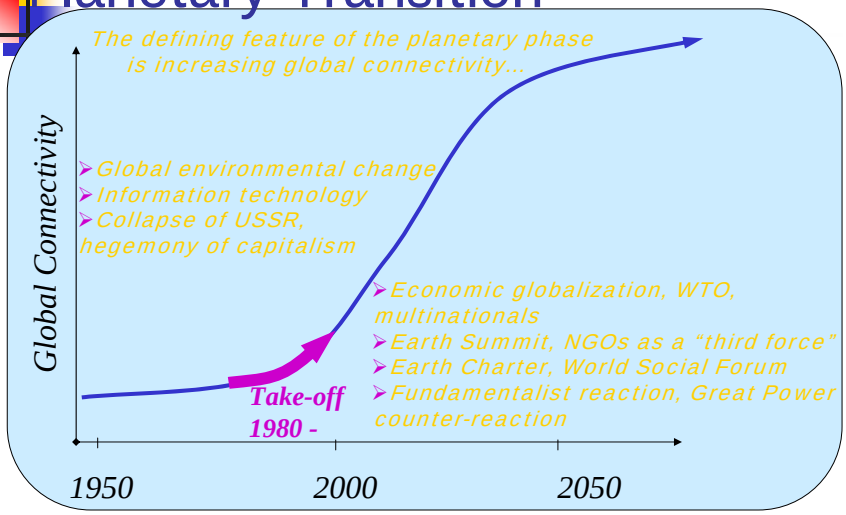
Planetary Transition



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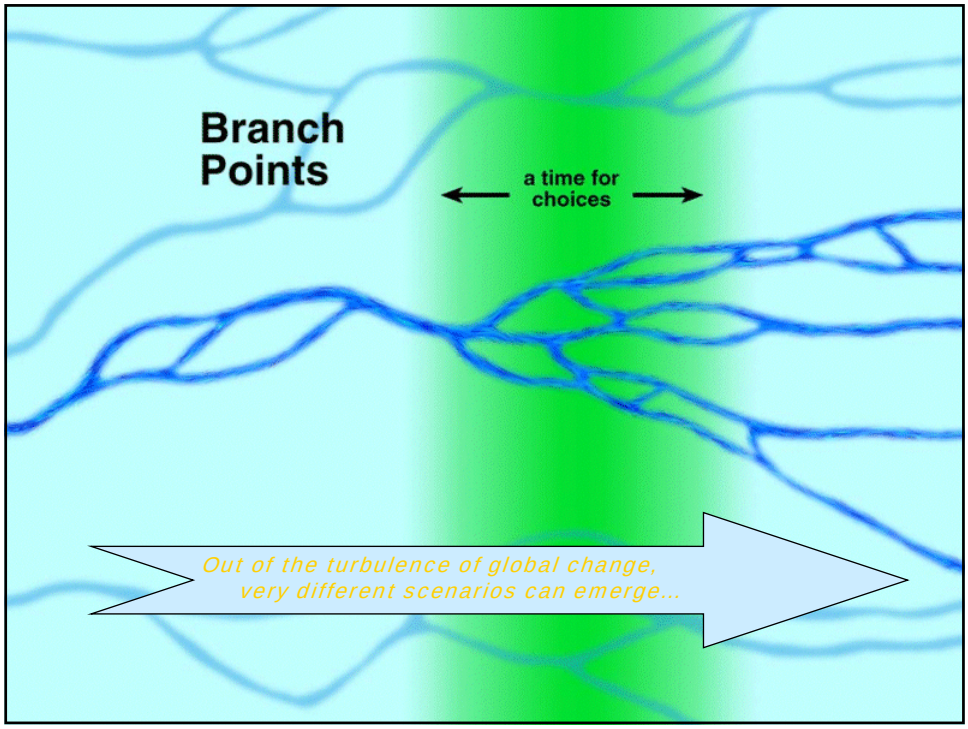

Global Scenarios

Conventional Worlds	Barbarization	Great Transitions
market forces	fortress world	eco-communalism
policy reform	breakdown	new sustainability

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3 scenarios with each 2 variants

1. Market forces- economic growth- IMF
2. Policy reform- government initiatives- UN
3. Fortress world- global apartheid
4. Break-down- spiral out of control
5. Eco-communalism- localized
6. New sustainability paradigm- great transition

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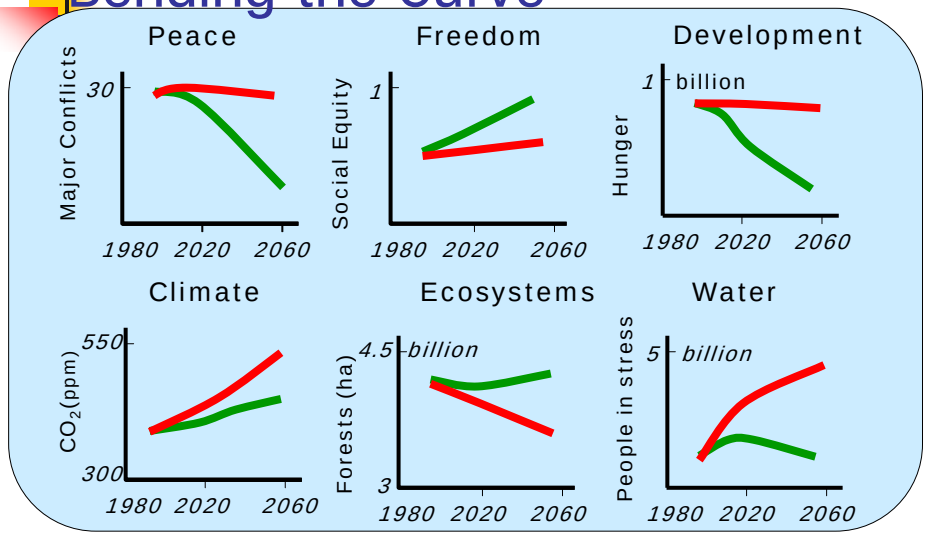
Bending the Curve



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Elaboration of future vision

- To elaborate the future vision sketched in the “Great Transition” essay, about 17 papers are being written about aspects of a GT world (“Frontiers of a Great Transition”)
- Subjects include social movements, governance, technology, business, economics, consumption and life styles, and values in a GT world
- They can be found at www.tellus.org

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GT on local level: Boston “Deep Change” scenario

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Developing Scenarios for the Boston Region

- Three archetype scenarios being developed:
  - **Business-As-Usual** (BAU): little change in production and consumption patterns; GHG emissions and ecological footprints grow; equity not addressed
  - **Policy Reform**: technological and policy measures emphasized to moderate ecological destruction and social inequality
  - **Deep Change**: changes in values lead to changes in lifestyles and institutions (along with technological innovations) to achieve sustainability with global responsibility

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Scenario 3: Deep Change

By 2050, Boston has seen political engagement towards transformation of values and lifestyles:

- Growing awareness of global connectedness and responsibility
- Deep changes in lifestyles, behavior, and institutions have led to huge reductions in CO2 emissions and footprint
- Quality-of-life (clean environment, sense of community, social equity) replaces economic growth and material consumption as key driver

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Deep Change
Transportation & Land Use

- GHG emissions from transportation reduced by 70%
- New regional governing body coordinates land-use decision-making; promotes density, transit, and healthy lifestyles and mixed use
- Private car use reduced significantly; transit and alternative modes dominate
- Major roadways redesigned to accommodate alternative modes
- Congestion and commuting time markedly reduced
- Parts of downtown Boston closed to private vehicles; served by free transit and other modes

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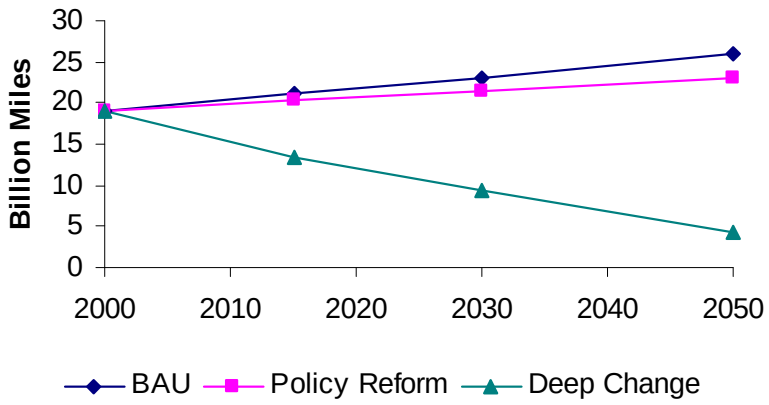
Annual Miles Traveled in Personal Vehicles



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Deep Change
Poverty & Inequality

- Poverty reduction and equality among key values adopted and acted upon
- Shorter work week leads to reduction in unemployment
- Affordable housing and universal health care reduce the financial burden on poor households
- “Living wage” adopted and poverty significantly reduced
- Considerable improvement in income equality

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3. Backcasting

- Looking back from a desirable future

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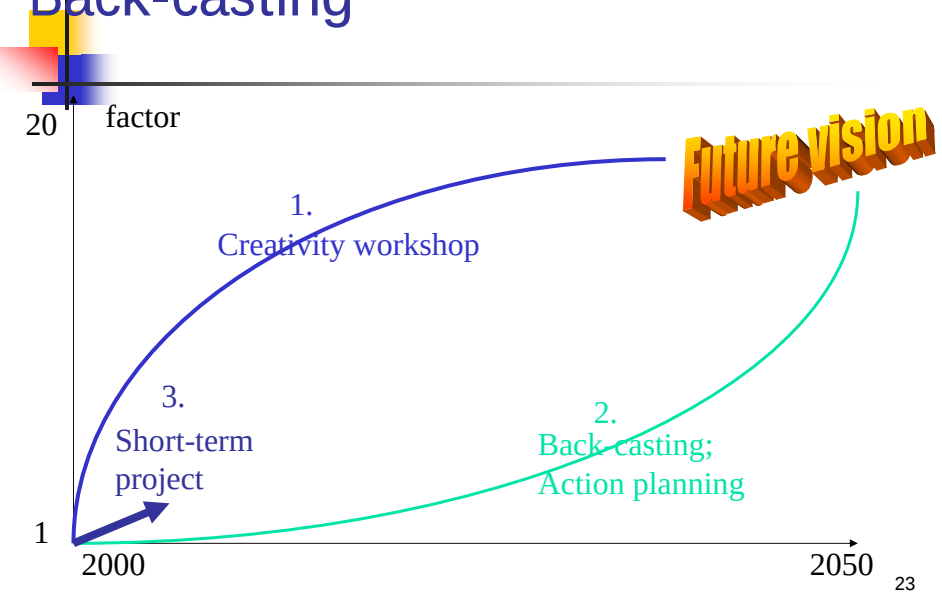
Back-casting



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Back-casting (2)

- Back-casting is reasoning backwards from a sustainable and desirable future vision towards the present (direct or in steps)
- And in the present developing activities aimed at realization of that future vision

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Backcasting (3)

- Backcasting is thus “creating a robust picture of the future, and start to think about which (technical and other) means are necessary to reach this state of affairs” (Vergragt and Jansen, 1993)
- Backcasting implies an operational plan for the present that is designed to move forward towards anticipated future states ...Such a plan should be built around processes characterized as interactive and iterative” (Vergragt and Van der Wel, 1998)

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Example 1: STD program 1992-1997

- Sustainable Technology Development (STD)
- Aim: to explore possibilities for ‘system innovations’ or ‘transitions’ to sustainable production and consumption systems by means of radical technological innovations
- Dutch 5-departmental government program
- Methodology: future visioning, back-casting, and illustrative processes (now called ‘niches’ or ‘bounded socio-technical experiments’

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The STD Methodology

- A: Develop Long Term Vision:
  - Strategic problem orientation
  - Future vision
  - Back-casting
- B: Develop Short-term Actions
  - Explore solution options
  - Set up action plan
- C: Implementation
  - Define roles
  - Implement research agenda

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Outcomes STD Program

- 15 illustration processes
  - Novel Protein foods
  - Multifunctional land use
  - Hydrogen fuel cells for ships
- A methodology and a book (Weaver et al, 2000)
- Spin-offs to other projects (SusHouse)
- Fore-runner for transition management
- Long-term thinking incorporated in policy making
- Conceptual thinking about technology, culture, and structure
- A Ph.D. thesis (Jaco Quist, 2007)

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Example 2: The EU Sustainable Households ("SusHouse") project (1998-2000)

General aim:

- To develop and test a methodology for changes towards more sustainable living (factor 20 in 50 years) in and around households
- Factor 20 is derived from the Dutch Sustainable Technological Development project (1993-97)

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Objectives

Basic assumptions:

- Factor 20 is not attainable by technology alone
- Breaches of trend in consumption patterns may be necessary
- Investigate all possible solutions, including:
  - Service products
  - Leasing
  - Sharing

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Methodology

1. Create a visioning session together with stakeholders (producers, consumers, technical experts, scientists, advisors)
2. Develop future visions (Design Orienting Scenario) derived from ideas in this workshop
3. Assess these scenarios with respect to:
   - Environmental gain (factor 20 attainable?)
   - Consumer acceptance
   - Economic and business viability

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Methodology (2)

Develop short term action plans and research agendas,

based on Design Orienting Scenarios (DOSs) and proposals,

in a workshop together with stakeholders.

(called: back-casting)

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Results: Shopping, Cooking, Eating

Function	Country	DOS
SCE	UK, Nl, Hu	Local and Green
	UK, Hu, Nl	High tech eating
	Nl	Super-rant
	Hu	High-tech rural gardens
	UK	Virtual shopping

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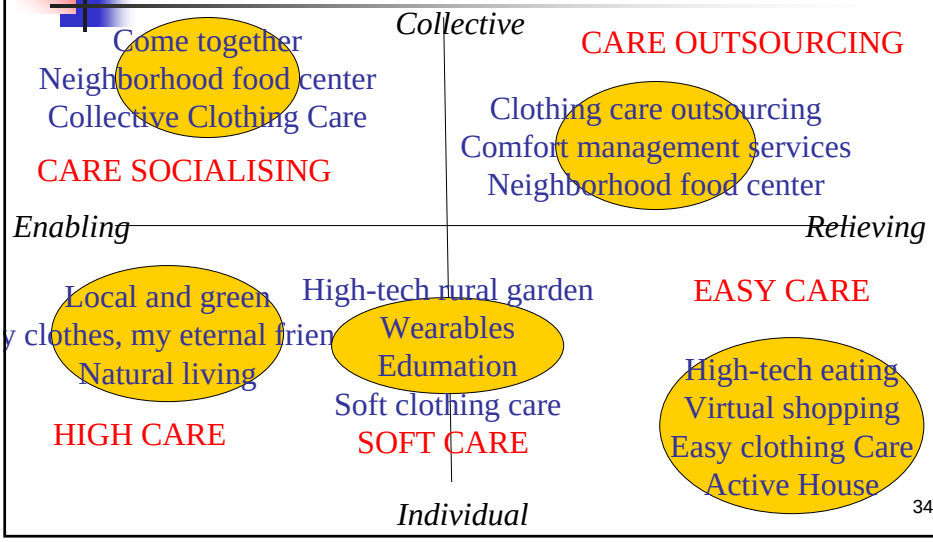
Results (2): Integrated vision



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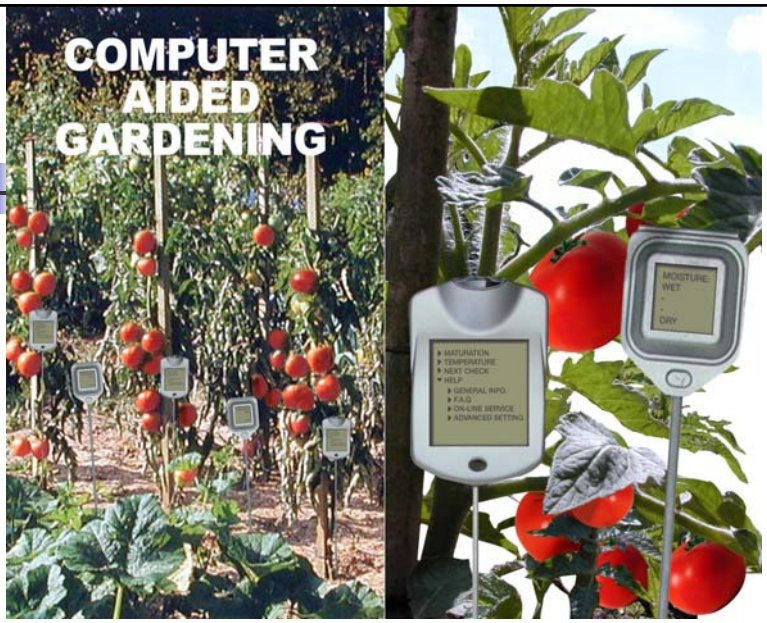
HOME RESTAURANT

There are self-organised cooking and eating groups in which everyone has his or her cooking turn for the group of 4-8 people.
Every week this group eats and cooks 1-2 times. Ingredients are sustainable, as little processed food is used as possible, being mainly from seasonal and regional sources including householder's own hobby gardens.

HOME GROWN ... HOME COOKED !

PROPOSAL 3

NEIGHBOURHOOD FOOD CENTRE



HIGH-TECH RURAL GARDENS

“My clothes, my eternal friends”

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“Clothing Care Outsourcing”

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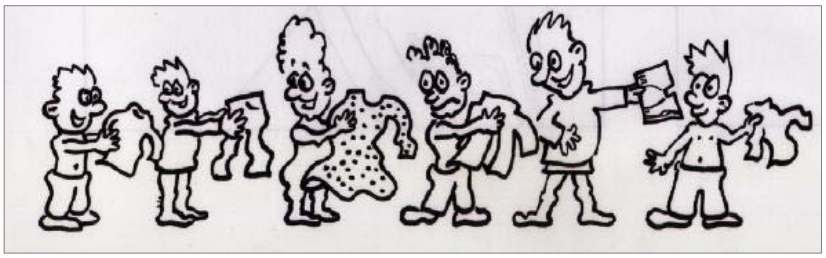
“Long chains of use”



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Results (3): overall assessments

Function	Country	DOS	envir	cons
SCE	UK, Nl, Hu	Local and Green	+++	++
	UK, Hu, Nl	High tech eating	++	+/-
	Nl	Super-rant	--	--
	Hu	High-tech rural gardens	++	+/-
	UK	Virtual shopping	++	+/-

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Results (4): Policy recommendations

- Create clear long-term future aims, visions, boundaries, and communicate them to stakeholders (setting the stage)
- Facilitate creativity workshops
- Fund assessment activities (environmental, economic, business, consumer acceptance)
- Facilitate implementation workshops
- Create and fund a follow-up perspective (long-term government commitment)

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Jaco Quist's thesis, TU Delft, April 2007

- What is the impact after 10 years of 'backcasting experiments'
- He took three cases: Novel Protein Foods; Shopping, Cooking, and Eating in 2050; and Sustainable Multiple land use
- He investigated follow-up in the research domain, in government policies, in actual implementation of changes.
- Main outcomes: one future vision is more powerful than multiple; impacts are limited and rather slow; project champions are very important

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Backcasting: conclusions

- Backcasting from long-term sustainability visions is potentially a powerful tool for research and action
- However, there is scope for improving and refining the methodology
- Results to date are somewhat disappointing (Quist)
- Systemic inertia is hard to overcome

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4. Transition Management

- In the Netherlands, “Transition management” is less a scenario approach but a new way of thinking about “socio-technical transitions” and “regime shifts”
- It is based on the notion that some ‘systemic failures’ (like unsustainability) cannot be addressed by traditional government policies
- It basic starting point is that we need a major societal transition along many dimensions (technical, social, economical, cultural) to approach sustainability
- Transition is defined as ...”a long-term structural change in a societal (sub)system

  that is the result of co-evolution of economic, cultural, technological, ecological, and institutional developments at different scale levels” (Rotmans et al., 2000)

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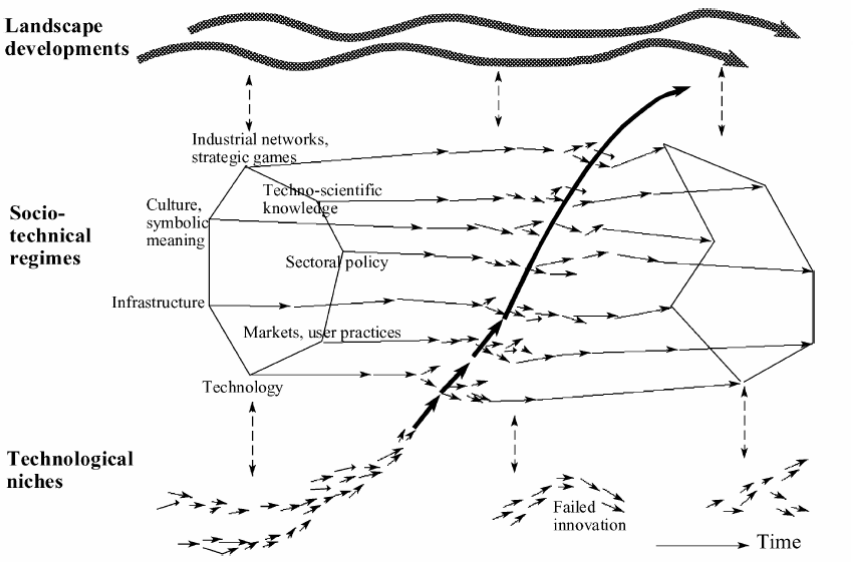
Transitions (Rotmans and Kemp, 2001



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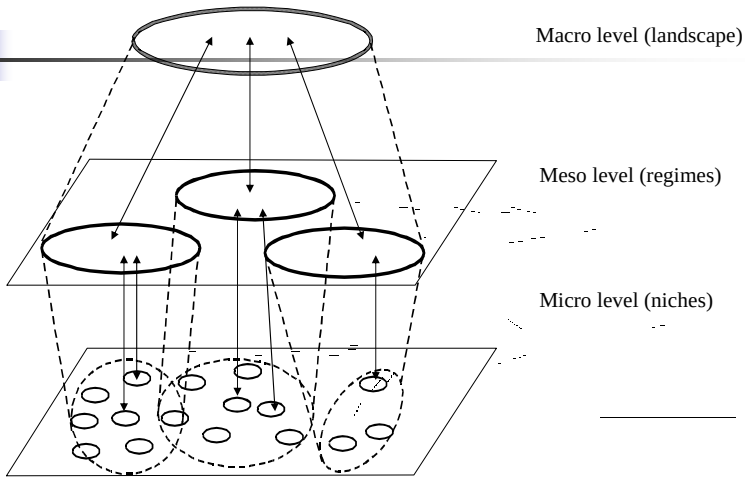
Multi-level concept



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Combined insights

from complex systems theory, social theory and new governance forms

- Only a combination of bottom-up and top-down approach works at the systems level
- regime-paradox: while regime is a major obstacle for transitional change it also aims to stimulate this change
- regime needs to broken down subsequently, while building up a new structure (regime)
- steering means creating space for innovation at the level of networks and individuals
- forced steering at wrong moments is counter-productive and will lead to the opposite of the intended result, and may even lead to an undesired systems crisis

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Transition management

Steering Principles

- stimulate niches at the micro-level (*variation)*
- interconnect niches with same direction (*emergence)*
- develop visions at macro-level that can act as guidance for niche-development (*new attractors)*
- stimulate forming of niche-regimes (*selection, clustering, upscaling)*
- further modulation between macro-micro level (*co-evolution*)

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Transition management in the Netherlands

- In the NL, a Knowledge Network of System Innovation (KSI) exists, a collaboration between major Dutch Universities, to investigate transitions
- In the Dutch Ministry of Economics Affairs, a Directorate Energy Transition develops a policy for energy transition
- Other transitions are also under development

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My understanding…..

- Shared long-term future visions are developed (energy, transportation, housing…)
- in transition-arenas consisting of major stakeholders (business, NGOs, government)….
- …..transition-experiments are developed and monitored
- Aspirational goals (ambitions) are formulated
- Transition paths (strategies) and specific options (technological and social innovations) are developed
- Research and educational tools are being developed

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Criticisms on Dutch Transition Management (based on Meadowcroft, 2005, and others)

- Historical examples are mainly technological (sailing ship to steam, coal to gas)
- Too much emphasis on niches and experiments
- Shared common vision is unrealistic and ignores economic and power structures
- Top-down policies necessary in addition to bottom-up and niche-based
- The contested notion of 'public good'
- Transition from one stable state to another is unrealistic
- Captured by incumbent interests and slow to deliver

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Points for further research

- Adrian Smith has made interesting observations about translating elements from fringe to main stream (from niche to regime) in (organic) food and (green) housing
- We (Halina Brown and I) are working on higher order learning and translation processes between fringe and main stream (Bounded Socio-Technical Experiments, BSTEs)
- We build on an earlier project in which we conceptualized a four-level scheme of social learning in an innovative housing project (a BSTE)

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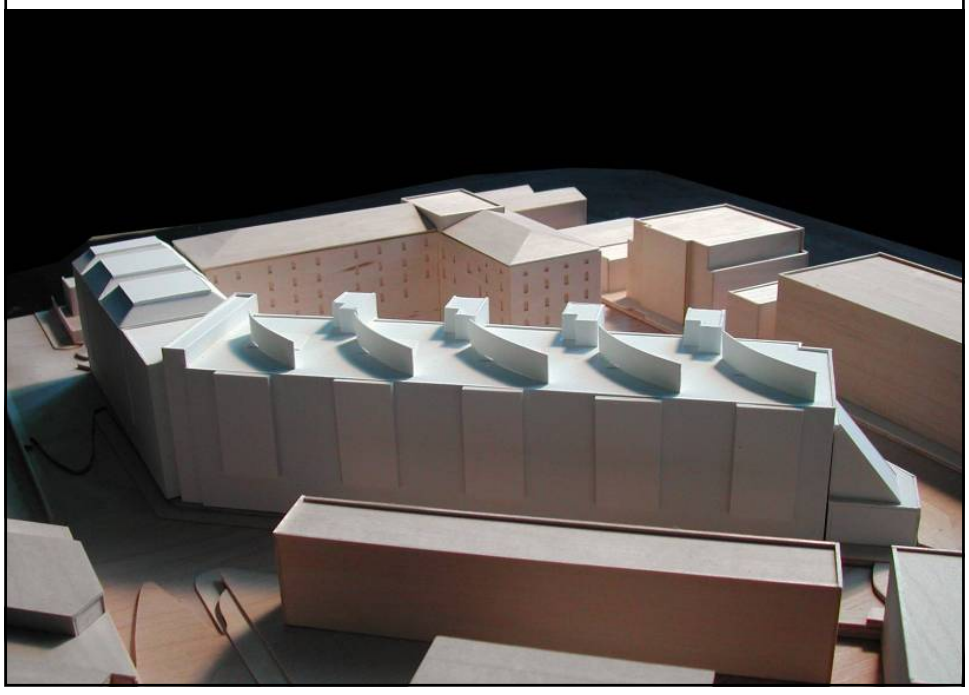

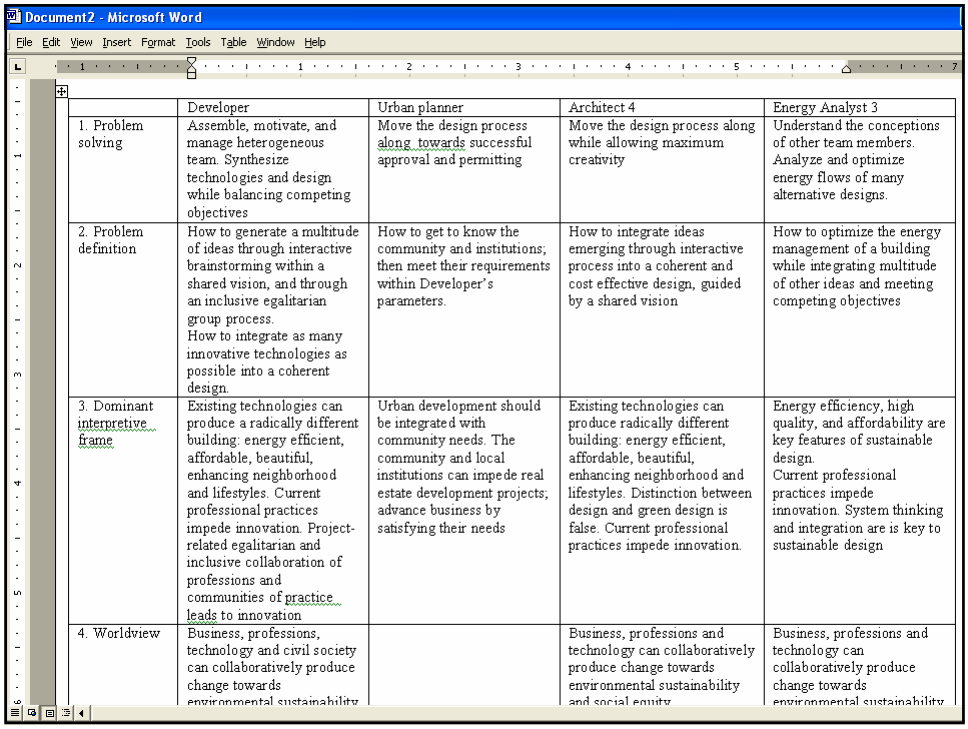

	Developer	Urban planner	Architect 4	Energy Analyst 3
1. Problem solving	Assemble, motivate, and manage heterogeneous team. Synthesize technologies and design while balancing competing objectives	Move the design process along towards successful approval and permitting	Move the design process along while allowing maximum creativity	Understand the conceptions of other team members. Analyze and optimize energy flows of many alternative designs.
2. Problem definition	How to generate a multitude of ideas through interactive brainstorming within a shared vision, and through an inclusive egalitarian group process. How to integrate as many innovative technologies as possible into a coherent design.	How to get to know the community and institutions; then meet their requirements within Developer's parameters.	How to integrate ideas emerging through interactive process into a coherent and cost effective design, guided by a shared vision	How to optimize the energy management of a building while integrating multitude of other ideas and meeting competing objectives
3. Dominant interpretive frame	Existing technologies can produce a radically different building: energy efficient, affordable, beautiful, enhancing neighborhood and lifestyles. Current professional practices impede innovation. Project-related egalitarian and inclusive collaboration of professions and communities of practice leads to innovation	Urban development should be integrated with community needs. The community and local institutions can impede real estate development projects; advance business by satisfying their needs	Existing technologies can produce radically different building: energy efficient, affordable, beautiful, enhancing neighborhood and lifestyles. Distinction between design and green design is false. Current professional practices impede innovation.	Energy efficiency, high quality, and affordability are key features of sustainable design. Current professional practices impede innovation. System thinking and integration are is key to sustainable design
4. Worldview	Business, professions, technology and civil society can collaboratively produce change towards environmental sustainability		Business, professions and technology can collaboratively produce change towards environmental sustainability and social equity	Business, professions and technology can collaboratively produce change towards environmental sustainability

5. How to accelerate transitions?

- Transitions are conceptualized as slow learning processes and processes of institutional change
- The challenge is now how to accelerate these processes without losing higher order learning, and without losing democratic control and legitimation
- Tellus and Tufts University are working on a workshop and book project on "Transformative change", focusing on bringing together systemic change with change agents and social movement theories (2008)

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6: case: the dilemma of Carbon capture and storage (CCS)

- CCS could be part of a transition to a low-carbon society
- Or it could `lock us into´a fossil fuel society
- Is transition management the answer?

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Carbon Capture and Storage (CCS)

- CCS is capturing CO2 at a point source, compressing it, and storing it underground
- It can be used at fossil fuel power plants, coal gasification plants, steam reforming of methane for producing hydrogen.
- The technology is not yet proven; experiments and pilot projects are under way.
- However, experience has been acquired by injecting CO2 underground for enhanced oil winning

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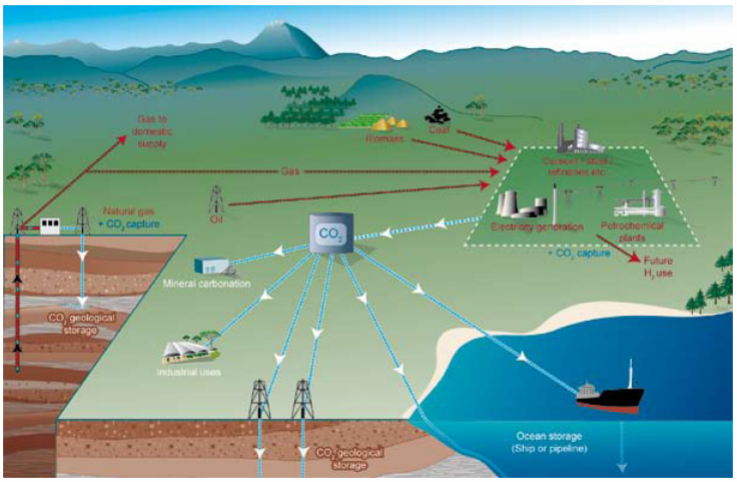

Figure SPM.1. Schematic diagram of possible CCS systems showing the sources for which CCS might be relevant, transport of CO_2 and storage options (Courtesy of CO2CRC).

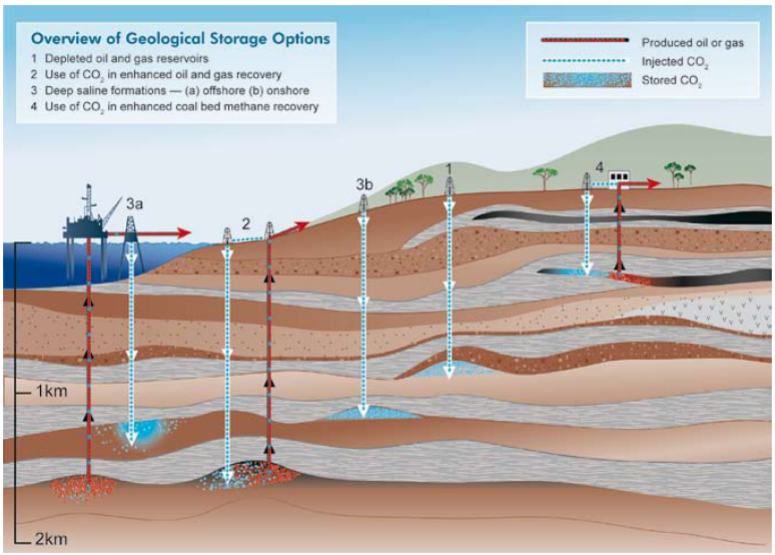

Figure SPM.4. Overview of geological storage options (based on Figure 5.3) (Courtesy CO2CRC).

CCS (continued)

- CCS cannot be considered as a sustainable technology, because it is essentially end-of pipe.
- Several aspects as safety, storage time, are not yet sufficiently understood.
- Experiments are under way to test the feasibility of large-scale CCS
- Without CCS hydrogen for transportation may not be available in sufficient quantities

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The emerging CCS system of innovation

- Oil companies (injection: Sleipner; Weyborn; In Salah)
- Utilities and oil companies: capture technology; IGCC (BP Scotland 350MW IGCC with possibly CCS)
- Pipeline builders
- Ocean tanker dispatchers
- Local communities (siting; social acceptance)
- Banks (financing)
- Governments (CO2 policies; coal policies); US-DOE regional sequestration partnership $ 100m /4 y
- FutureGen: large scale demo $ 1b
- Norway C tax $50/ton CO2

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How to conceptualize CCS?

- On the one hand, CCS is a clear example of increased entrenchment of fossil fuel industry; by CCS coal, oil, and gas can continue to be used with diminished CO2 emissions
- It can even be compared to nuclear energy, with large-scale centralized CO2 capture and compression, a heavy infrastructure for transportation; and unknown risks for the long term (gradual or sudden CO2 emissions from the ground)
- CCS under sea has even more scary risks

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- On the other hand, CCS can be conceptualized as a transition technology
- It may pave the way for hydrogen as a sustainable energy carrier on the long term
- It may buy time to develop enough conservation, efficiency, and renewables
- It may be unavoidable if we look at the fast growth in China and the key role coal power plants play there
- It is an essential “wedge” especially if we want to avoid nuclear energy (another wedge in Pacala-Socolow)

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CCS: to conclude:

- Transition management cannot help us much with the choices to be made about CCS
- Even BSTEs and small-scale social learning processes do not work with such a large-scale technology
- CCS may lead to large controversies just as nuclear energy in the past
- Decisions on CCS are being made fast without the societal debate that would be needed in a CTA approach

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Conclusions

- In this presentation, I have given some examples of long-term thinking and strategizing on sustainability transitions
- In addition I have emphasized the roles of small-scale experiments (BSTEs) and (higher order) learning
- I concentrated on civil society and academia, but of course the roles of business and government are key

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- Societal transformations need visionary leadership, small-scale experimentation, and higher order learning
- In addition, existing entrenched institutions, infrastructures and power relationships need to be addressed.
- Multistakeholder processes need to be complemented with democratic government leadership and long-term regulation
- Transformations in business are key

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Thank you

- Questions?

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