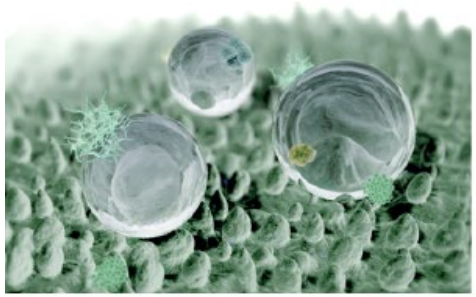
Sustainable development as **redirected evolution**

René Kemp



Presentation at Seminar "***Cultures and Local Practices of Sustainability***: *Intersecting Multiple Footprints and the Environmental Humanities*"

Dec 10, 2018, Santiago de Chili

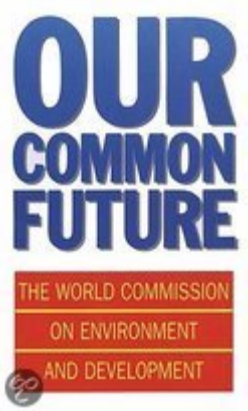
International Centre for Integrative Studies (ICIS)

Maastricht University
UNU-MERIT

Sustainable development is

- a process of change in which
- the exploitation of resources,
- the directions of investments,
- the orientation of technological development,
- and institutional change
- are all in harmony
- and enhance both current and future potential
- to meet human needs and aspirations'

(WCED, 1987)



- Sustainable development ties together concern for the **carrying capacity** of natural systems with the **social challenges** facing humanity (poverty, happiness, ..).
- It is about **protection** (of environmental amenities) *and* **creation** (of material and immaterial well-being)

SD as a **balance** between economy environment and social issues

- **Economic:** An economically sustainable system must be able to produce goods and services on a continuing basis, to maintain manageable levels of government and external debt, and to avoid extreme sectoral imbalances which damage agricultural or industrial production.
- **Environmental:** An environmentally sustainable system must maintain a stable resource base, avoiding over-exploitation of renewable resource systems or environmental sink functions, and depleting non-renewable resources only to the extent that investment is made in adequate substitutes. This includes maintenance of biodiversity, atmospheric stability, and other ecosystem functions not ordinarily classed as economic resources.
- **Social:** A socially sustainable system must achieve distributional equity, adequate provision of social services including health and education, gender equity, and political accountability and participation.

(Jonathan M. Harris, June 2000)

SD as a **moral obligation**

- A just, more equitable world, in which **hunger is eleminated**, people have **access to basic services** (including education), are not excluded from decision-making, in which income is distributed more equally, in which there is an **ethos of responsibility and respect** for others, including nature and animals.

Sustainability values

- Recognition of interdependence
- Self-determination
- Diversity and tolerance
- Compassion for others
- Upholding the principle of equity
- Recognition of the rights and interests of non-humans
- Respect for the integrity of natural systems
- Respect for the interests of future generations

(Porritt, 2007, p. 314)

Sustainable development

- Is a **universalist** notion (a set of nice words!)
- Whose **translation in practical action** is **contested** (because of practical implications and different values)

Do we need the term SD?

- What does SD as a *universalist* and *practically contested* concept add?

SD makes us reflect about

- Our needs and priorities
- The link between natural environment, economy and society
- Long-term system effects
- Risks
- Whether gains in one area are achieved at the cost of something else
- Reforms, principles for decision-making

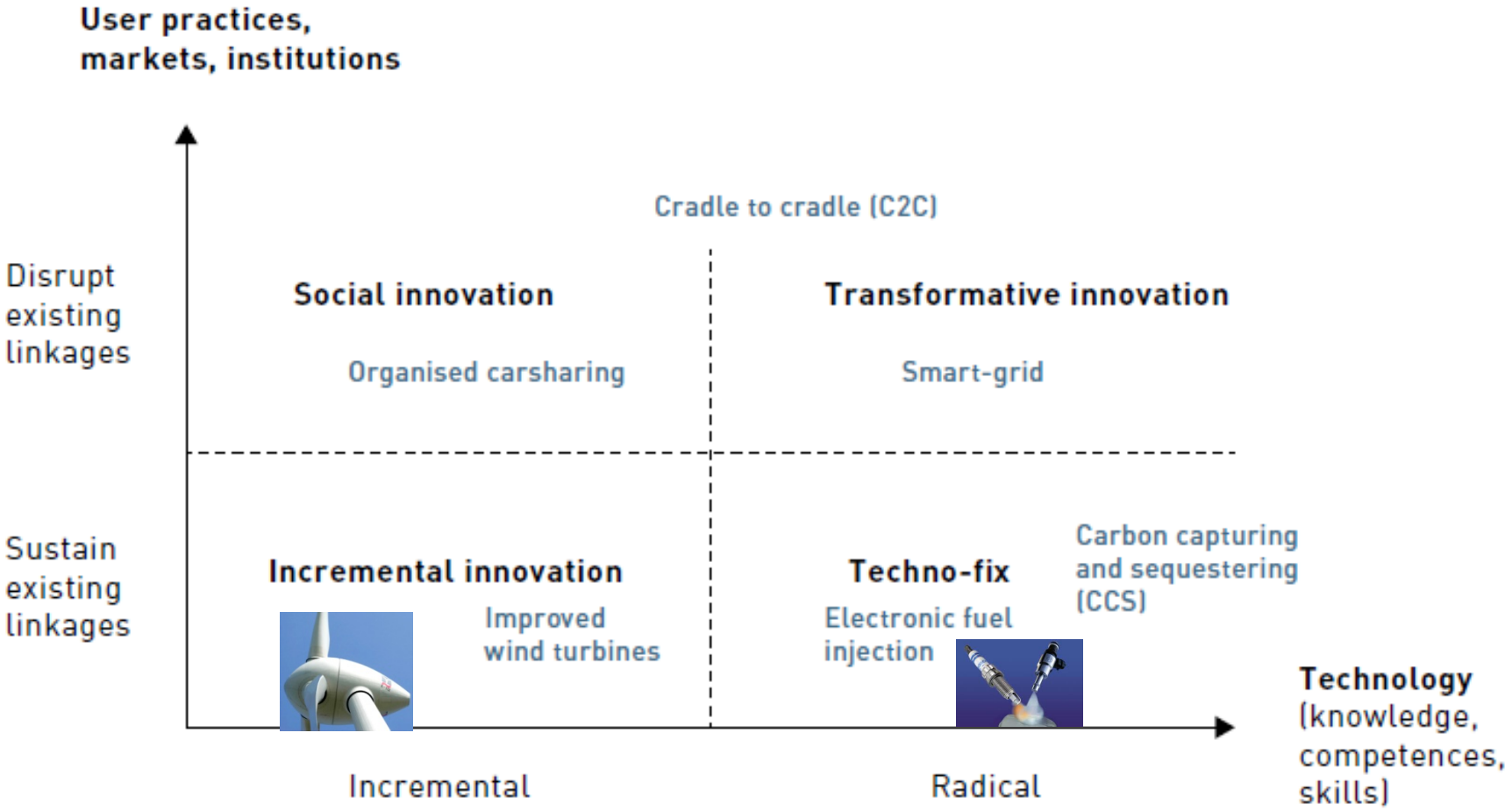
My view on SD

- SD as the "wholly grail" can never be reached; it constitutes an ever-continuing quest (struggle) for societies and for individuals
- SD as a progressive goal is **a difficult concept for policy** because it is normative, elusive, and involves contradictory requirements of support and control
- Innovation may help us get closer to sustainable development goals but **for sustainable development there are no engineering solutions**, nor are their management principles (such as C2C) through which sustainability development can be achieved

Sustainability gains may be found *within* existing regimes and **through alternative regimes**

- **Fossil fuels use can be made more sustainable**:
  - Carbon capturing and sequestering
  - Fuel efficient ICE cars
  - Weatherproofing of homes
  - ...
- But we should **also explore alternative trajectories** through processes of variation, selection and retention

A typology of innovation



Adapted from Abernathy and Clark (1985)

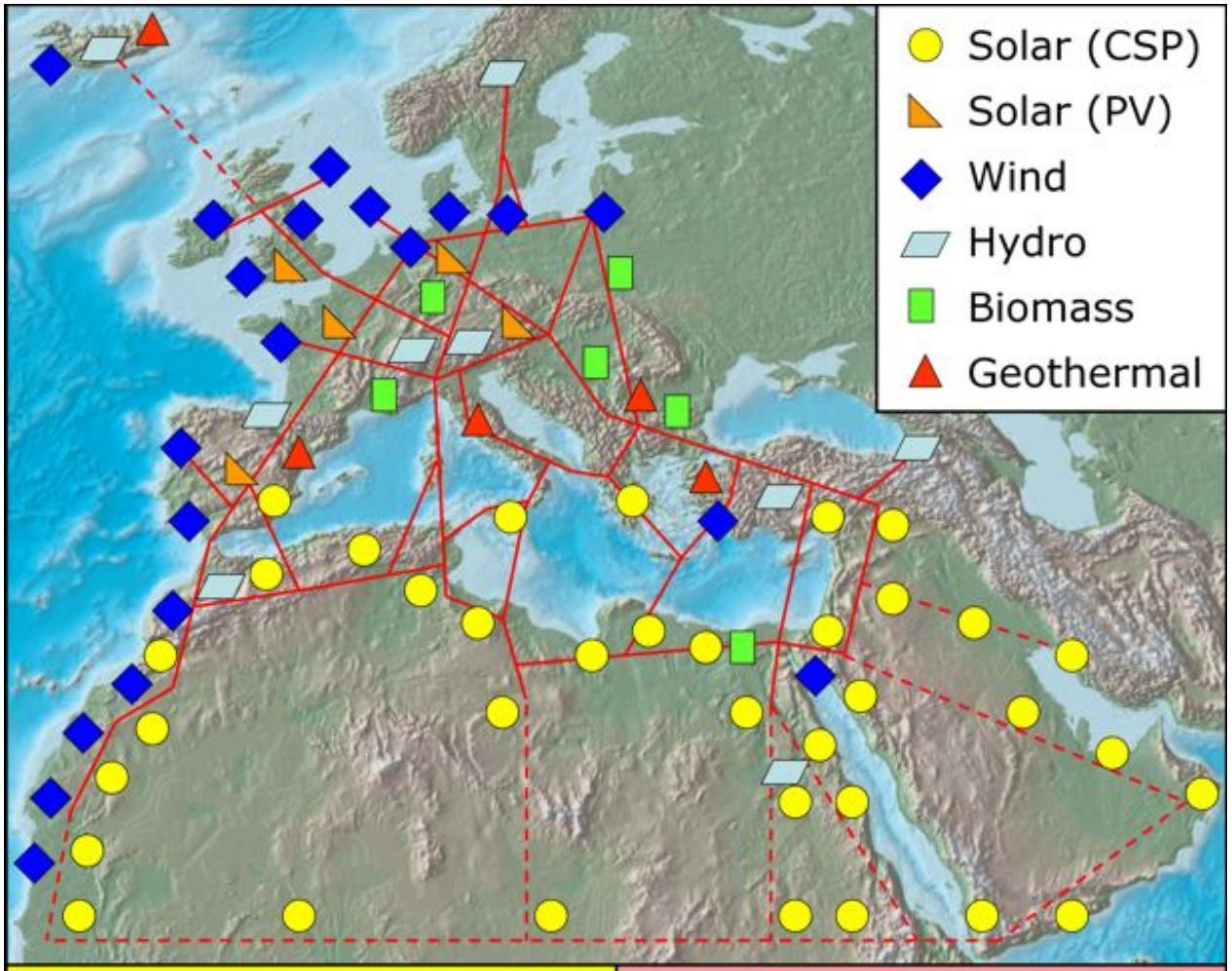
Transformative innovation

- Is **broad in scope** and **radical** in character
- It is about the implementation of a **system-wide** novelty (system innovation)
- It involves a wide diversity of actors and often **takes decades** to move from margins to mainstream
- It is **dynamic** and **non-standardised**
- It is **disruptive** from the viewpoint of incumbent actors (including users)

Source: Fred Steward, Breaking the Boundaries.Transformative change for the Common Good, 2008

Pose marré (DE)

- Passive homes with heat exchange system (100 m deep)
- New destination of old factory
- Located near public transport hubs to Dusseldorf and Wuppertal
- Urban element in green environment (Neadertal)
- Different age groups
- Working and living
- KFW loans for eco-houses

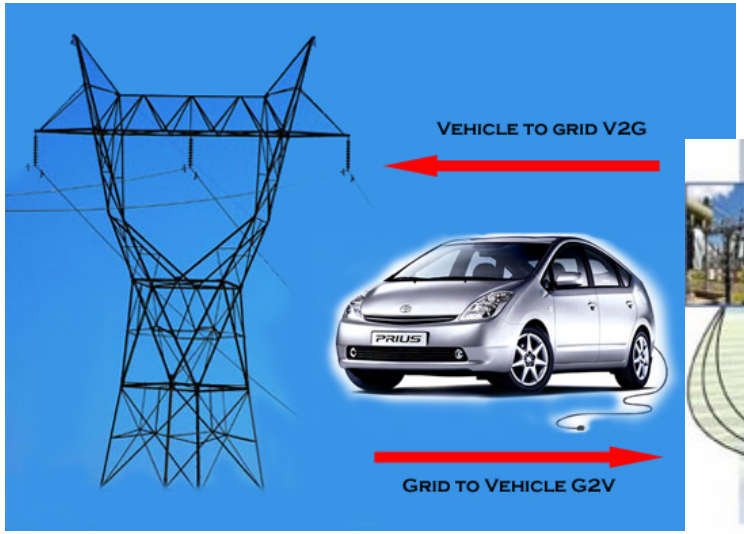


Concentrating **S**olar Thermal **P**ower (**CSP**):
- Solar heat storage for day/night operation
- Hybrid operation for secured power
- Power & desalination in cogeneration

Sketch of **H**igh-**V**oltage **D**irect **C**urrent (**HVDC**) grid: Power transmission losses from the **M**iddle **E**ast and **N**orth **A**frica (**MENA**) to Europe less than 15%.

Power generation with CSP and transmission via future **EU-MENA** grid: 5 - 7 EuroCent/kWh
Various studies and further information at **www.DESERTEC.org**

Vehicle to Grid (V2G)



The need for multiple transitions that are innovation based

- SD is an ongoing process that requires **multiple transitions** in:
  - Energy, mobility and food systems
  - Resource use
  - Corporate behavior and capitalism
  - Governance
  - Knowledge production
  - Hearts and minds of people
  - People's lifestyles

Transitions to more sustainable systems of energy, mobility, housing

Examples of "sustainability transitions"

- **In energy**: moving to renewables (solar PV, CSP, biofuels, geothermal, hydro, …
- **In mobility**: bicycles, modal shift, intermodality, green cars, reducing the need for transport
- **In waste management**: waste prevention, recycling and re-use
- **Resource efficiency** as a cross-cutting challenge (together with responsible behaviour)

Innovation & evolution

Link #1

- **Innovation requires resources** for its production, distribution, use and post-consumption activities Example resources are energy, materials, knowledge, finance
- And involves lots of dependencies and shaping factors (→ eco-system)

Innovation Ecosystem

MEDIA

BUSINESS INFRASTRUCTURE

ECONOMY

DEMAND

SCIENCE & RESEARCH

REGULATIONS

EDUCATION

INDUSTRY

IDEAS

CAPITAL

CORPORATIONS

TALENT

LAWS

TAXES & INCENTIVES

ACCESS TO GLOBAL VALUE CHAINS

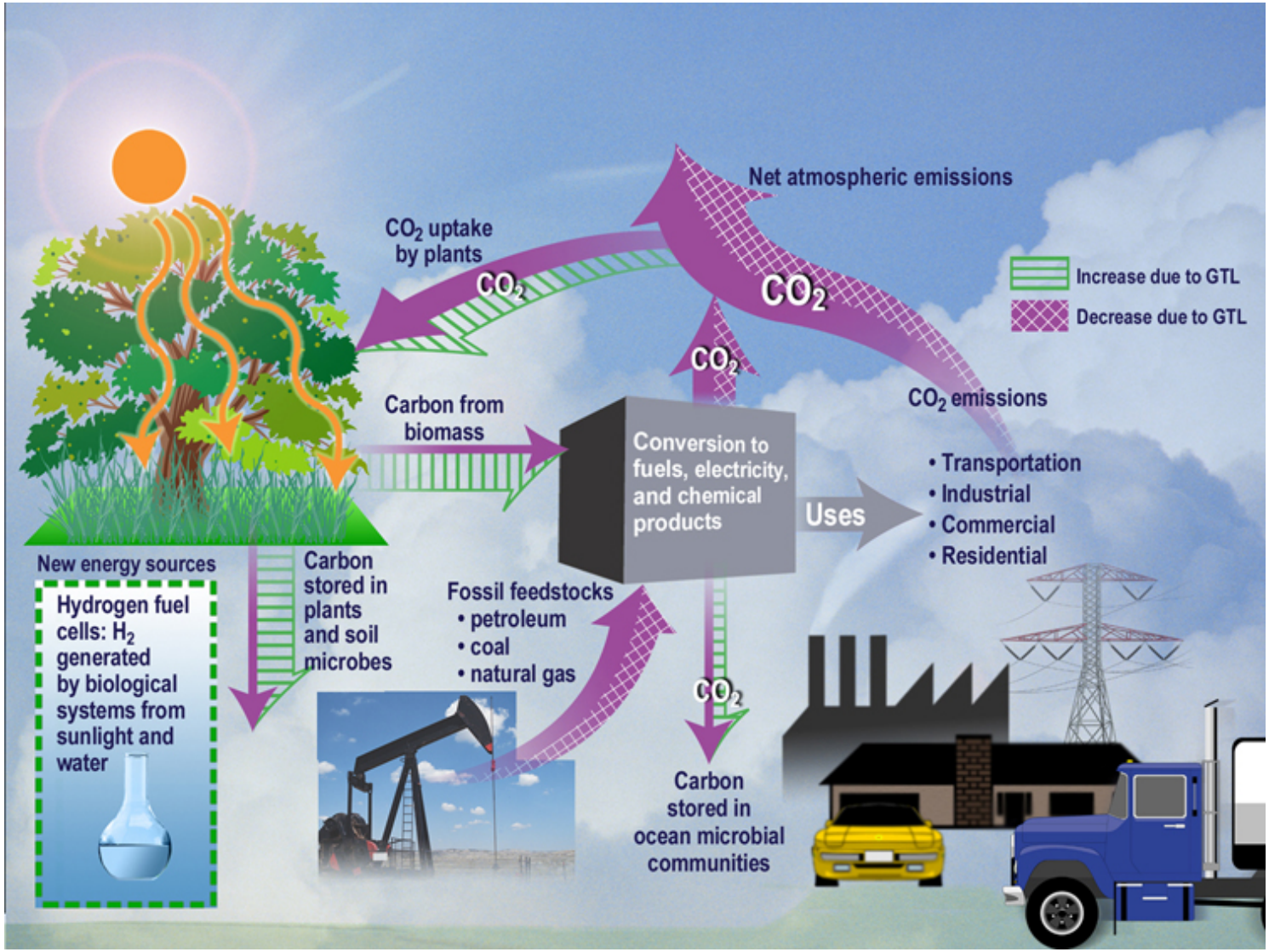
ENTREPRENEURS

MENTORS

GOVERNMENT

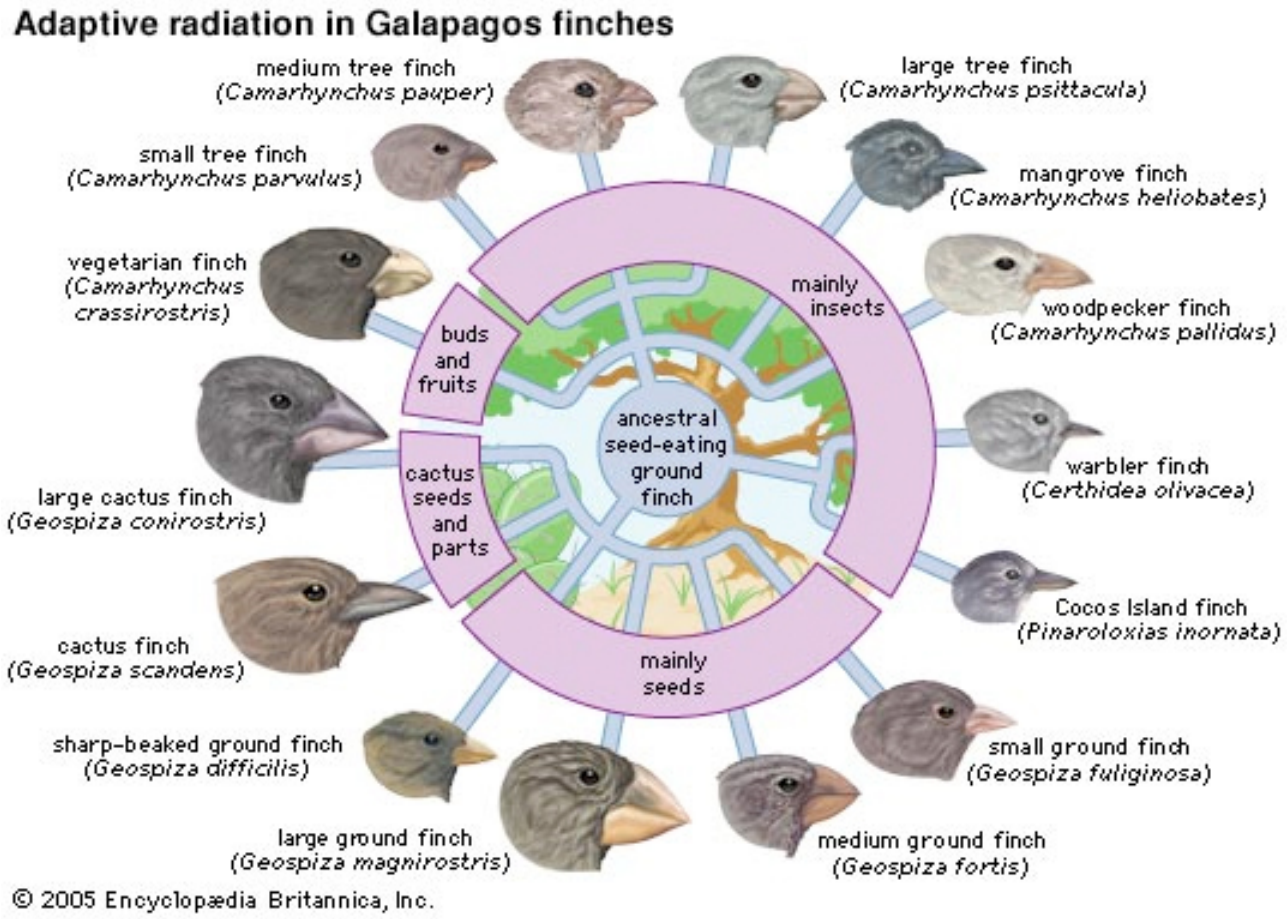
SERVICE PROVIDERS &CONSULTING

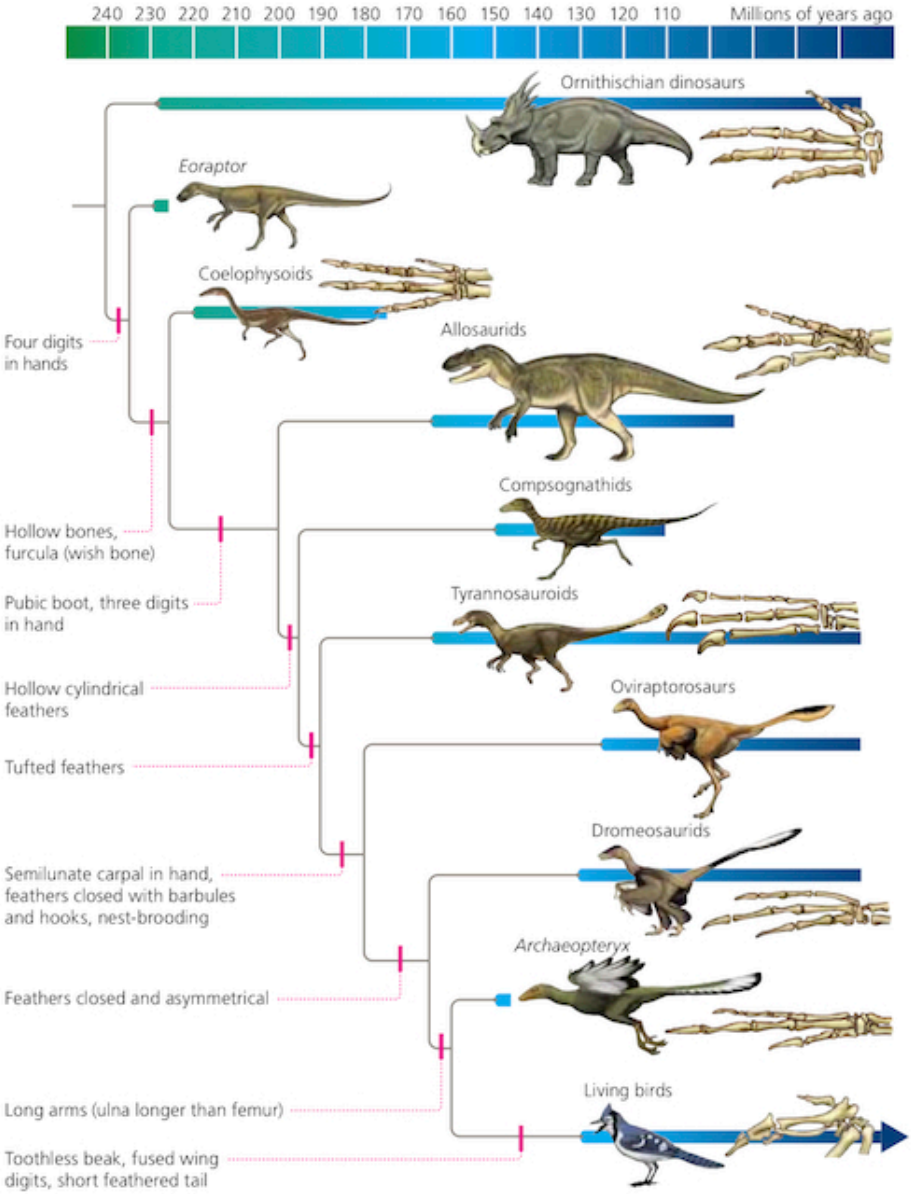
CULTURE, BEST PRACTICIES


Net atmospheric emissions
CO_2 uptake by plants
CO_2
CO_2
CO_2
Increase due to GTL
Decrease due to GTL
CO_2 emissions
Carbon from biomass
Conversion to fuels, electricity, and chemical products
Uses
• Transportation
• Industrial
• Commercial
• Residential
New energy sources
Hydrogen fuel cells: H_2 generated by biological systems from sunlight and water
Carbon stored in plants and soil microbes
Fossil feedstocks
• petroleum
• coal
• natural gas
CO_2
Carbon stored in ocean microbial communities

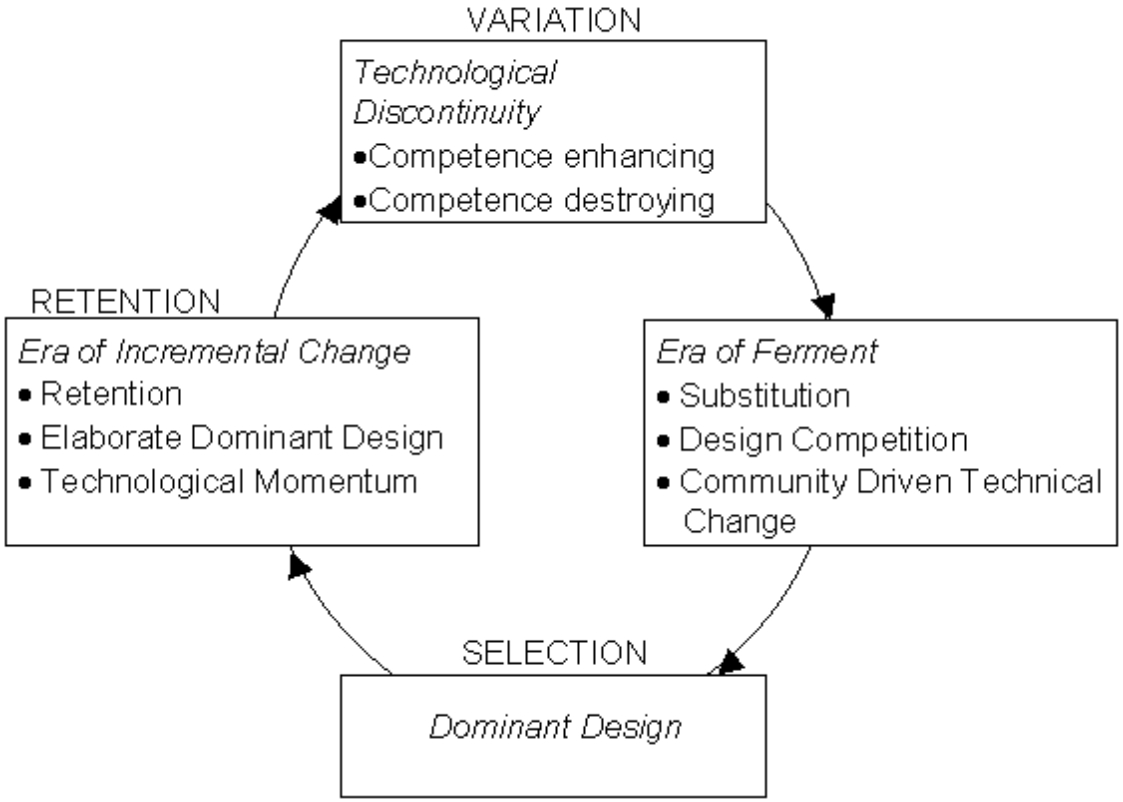
Variation and selection

(link #2)


Adaptive radiation in Galapagos finches
medium tree finch
(Camarhynchus pauper)
large tree finch
(Camarhynchus psittacula)
small tree finch
(Camarhynchus parvulus)
mangrove finch
(Camarhynchus heliobates)
vegetarian finch
(Camarhynchus
crassirostris)
mainly
insects
woodpecker finch
(Camarhynchus pallidus)
buds
and
fruits
ancestral
seed-eating
ground
finch
warbler finch
(Certhidea olivacea)
large cactus finch
(Geospiza conirostris)
cactus
seeds
and
parts
Cocos Island finch
(Pinaroloxias inornata)
cactus finch
(Geospiza scandens)
mainly
seeds
sharp-beaked ground finch
(Geospiza difficilis)
small ground finch
(Geospiza fuliginosa)
large ground finch
(Geospiza magnirostris)
medium ground finch
(Geospiza fortis)
© 2005 Encyclopædia Britannica, Inc.


240 230 220 210 200 190 180 170 160 150 140 130 120 110 Millions of years ago
Ornithischian dinosaurs
Eoraptor
Coelophysoids
Four digits in hands
Allosaurids
Compsognathids
Hollow bones, furcula (wish bone)
Pubic boot, three digits in hand
Tyrannosauroids
Hollow cylindrical feathers
Oviraptorosaurs
Tufted feathers
Dromeosaurids
Semilunate carpal in hand, feathers closed with barbules and hooks, nest-brooding
Archaeopteryx
Feathers closed and asymmetrical
Long arms (ulna longer than femur)
Living birds
Toothless beak, fused wing digits, short feathered tail

The emergence of a dominant (technological) design



Examples of dominant designs / regimes

Examples &
how dominant design concept relates to technological discontinuity

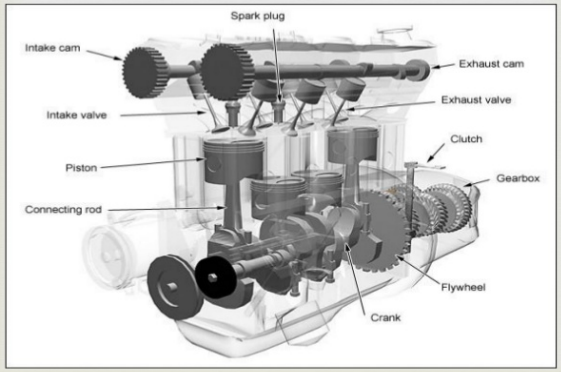
Discontinuities in video format industry:

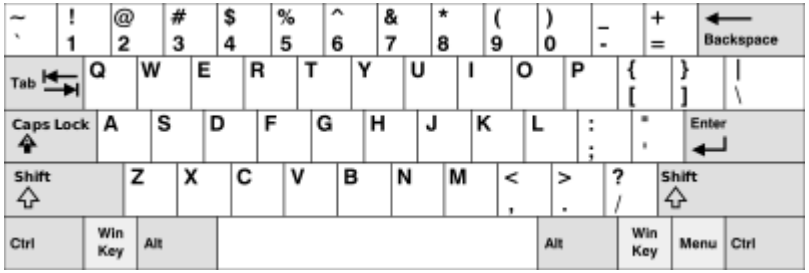
- Betamax → VHS (dominant) →
  - CDV (5 min) → VCD (no copy protection) → CD-R (dominant) →
    - DVD (dominant) →
      - HD DVD → Blu-ray (dominant)

competence-destroying discontinuity

competence-enhancing discontinuity

Internal Combustion Engines



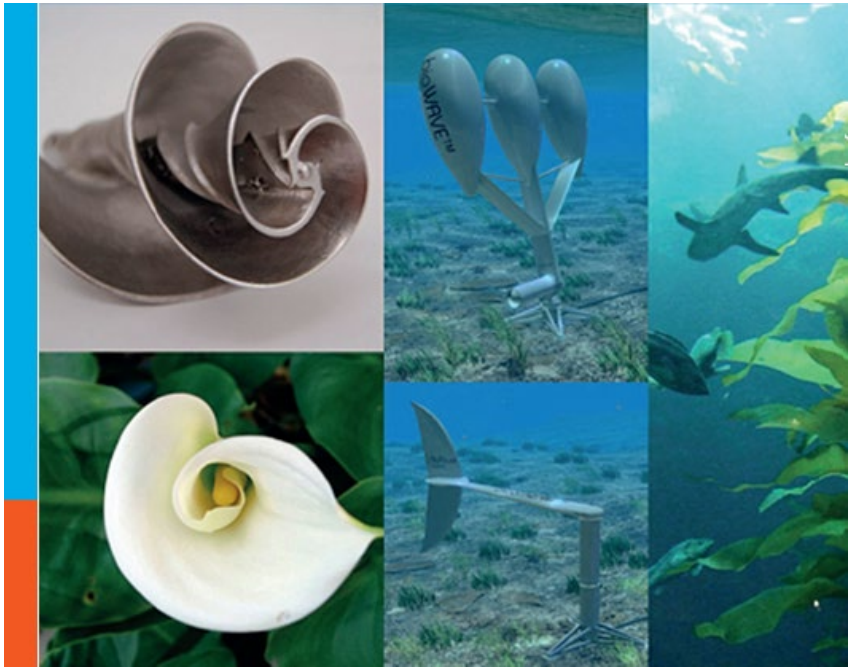


Inspired by nature

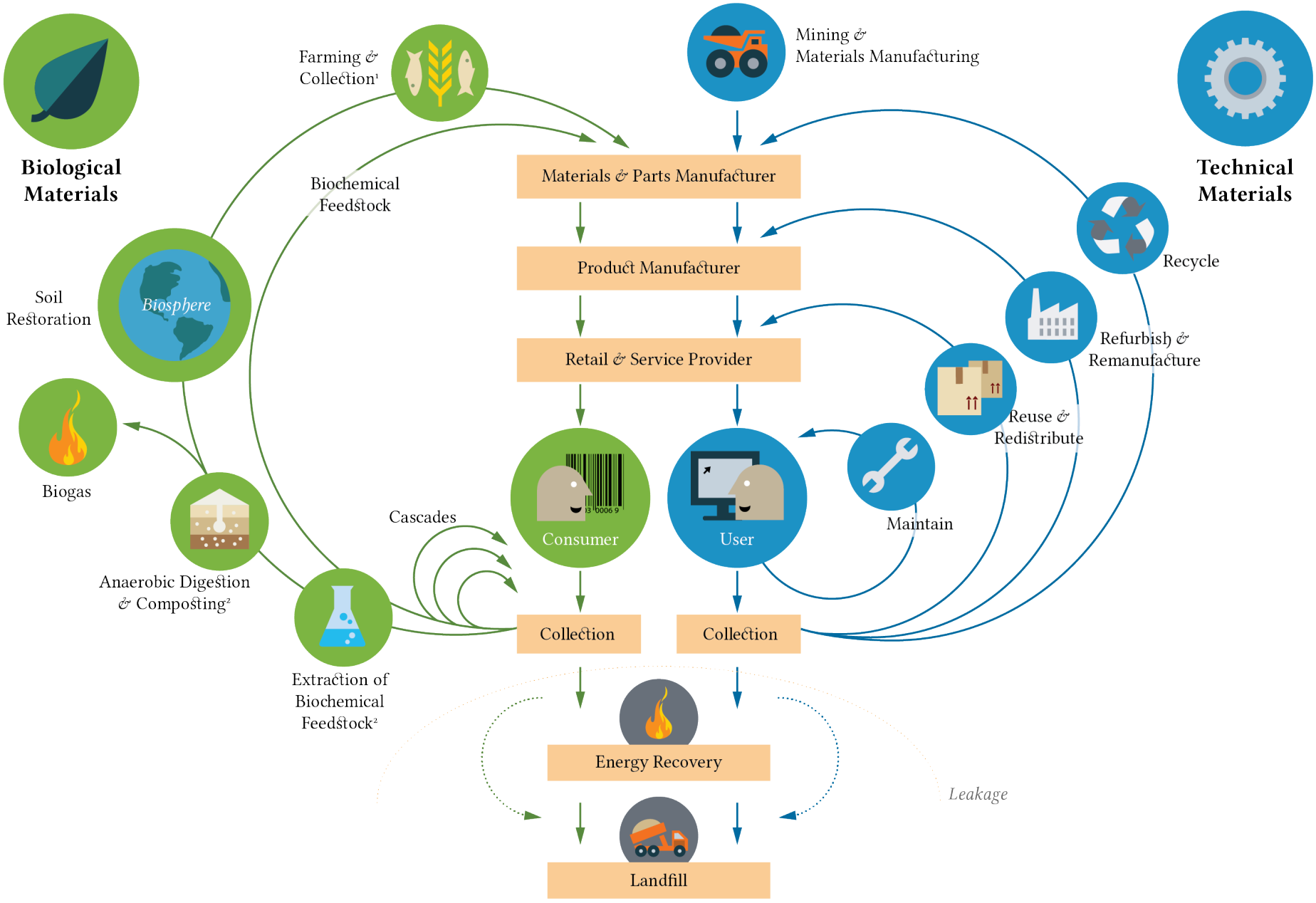
(link #3)

Cradle to cradle

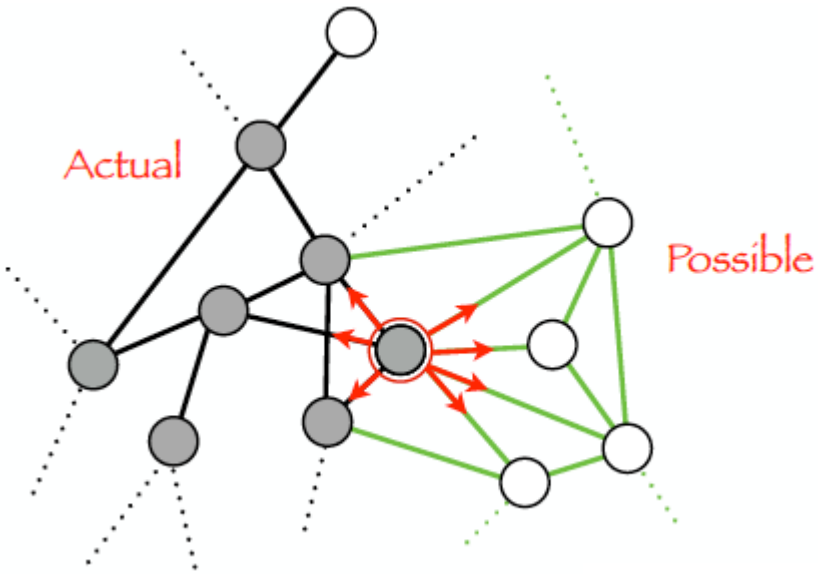
bio-mimicking

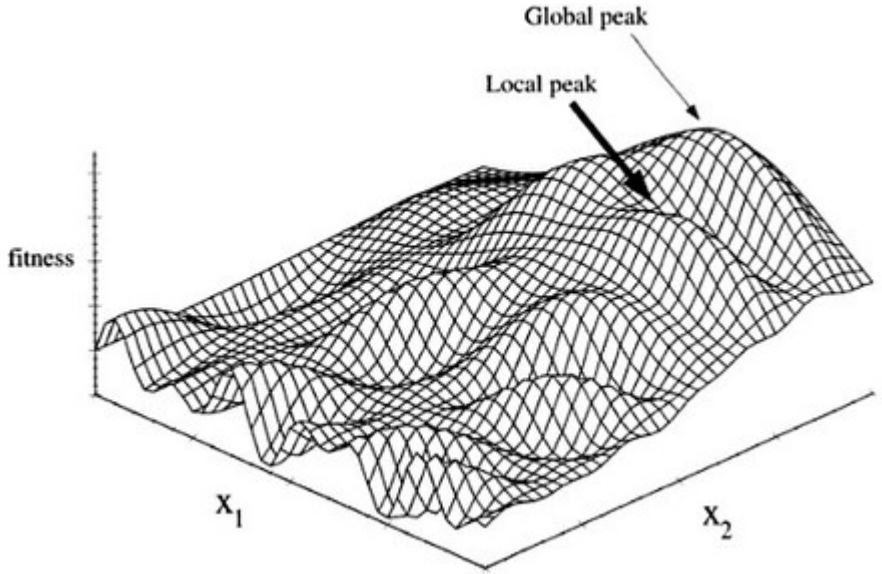



RESOURCES
WASTE
MANUFACTURING
CONSUMPTION & USE
RECYCLING

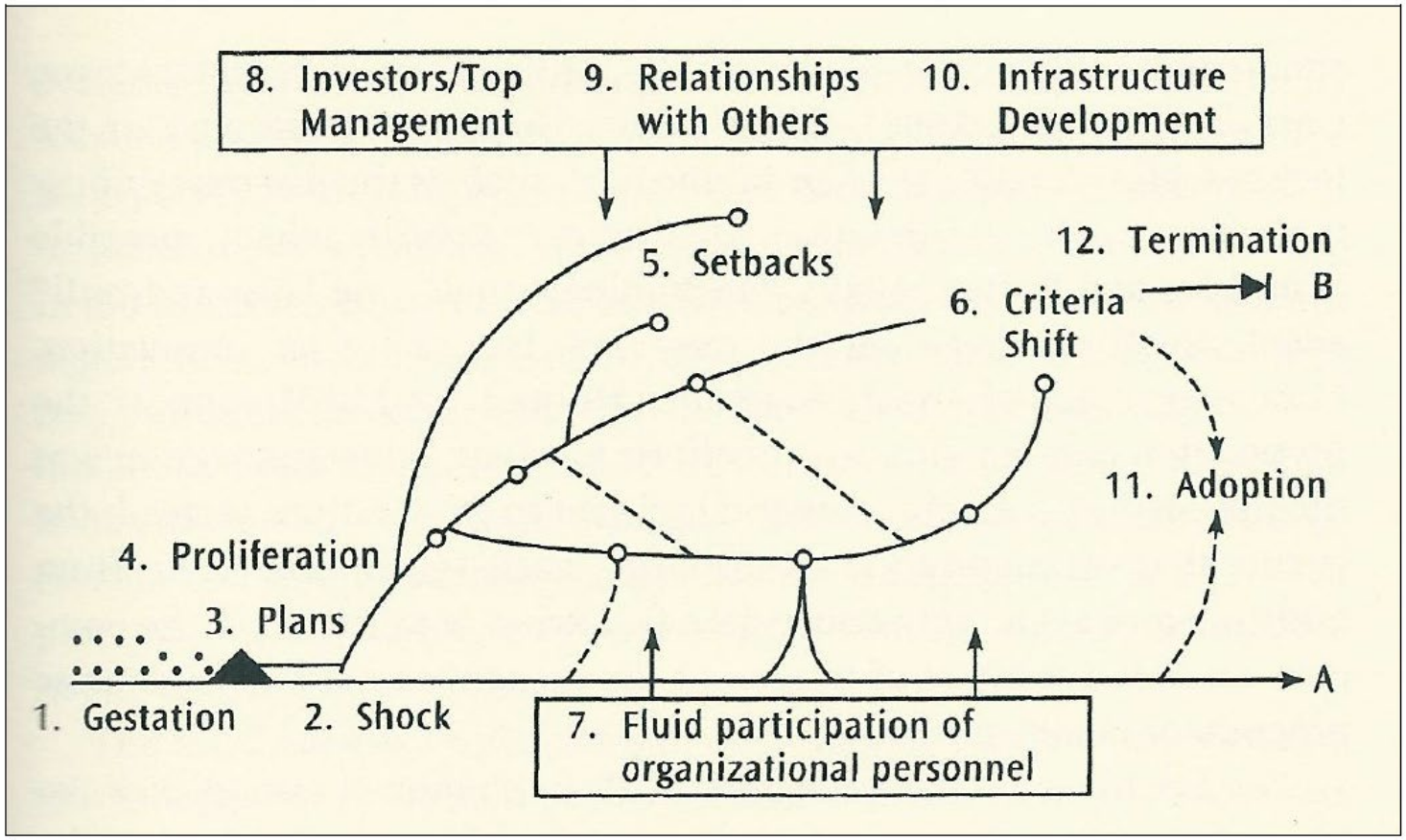

Biological Materials
Farming & Collection[1]
Mining & Materials Manufacturing
Technical Materials
Biochemical Feedstock
Materials & Parts Manufacturer
Product Manufacturer
Retail & Service Provider
Recycle
Refurbish & Remanufacture
Reuse & Redistribute
Soil Restoration
Biosphere
Biogas
Anaerobic Digestion & Composting[2]
Cascades
Consumer
User
Maintain
Extraction of Biochemical Feedstock[2]
Collection
Collection
Energy Recovery
Leakage
Landfill

The adjacent possible
(link #4)


Actual
Possible


Global peak
Local peak
fitness
x_1
x_2

The innovation journey



Source: Van de Ven et al., 1999, p. 25

Connecting the dots (as clues for working towards SD)

Transition management

as *guided evolution*

by exploiting the **adjacent possible** in a forward-looking, adaptive way

(links 1-4)

Readings about TM

- Rotmans, J., R. Kemp, and M. van Asselt, 2001: More evolution than revolution: Transition management in public policy. *Foresight*, 3(1), 15-31
- Meadowcroft, J. (2005). Environmental political economy, technological transitions and the state. New Political Economy, 10(4), 479-498
- Kemp, R., D. Loorbach and J. Rotmans (2007) Assessing the Dutch energy transition policy: how does it deal with dilemmas of managing transitions? *Journal of Environmental Policy and Planning* 9(3-4): 315–331.
- Loorbach, D., 2007: *Transition Management. New Mode of Governance for Sustainable Development*. International Books.
- Kemp, R., 2010: The Dutch energy transition approach. *International Economics and Economic Policy*, **7**(2-3), 291-316

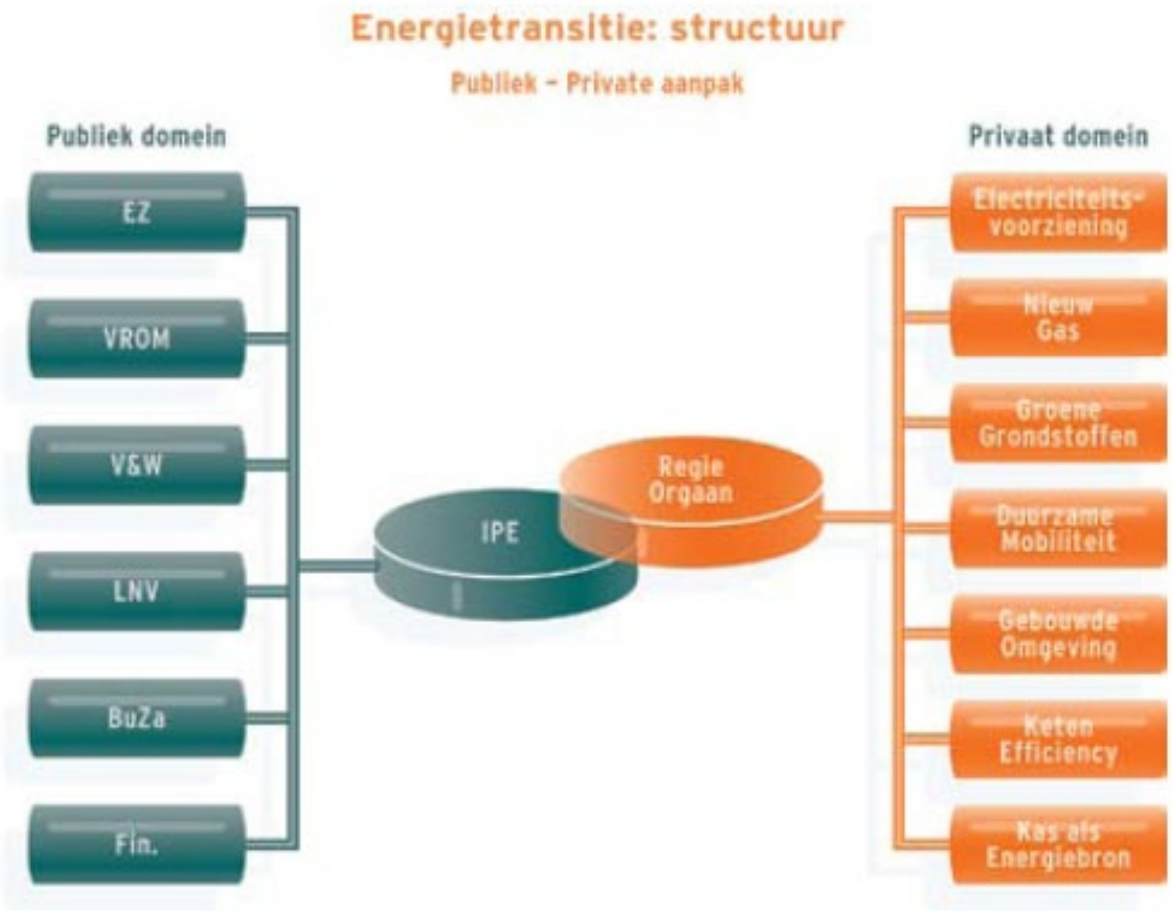
Key elements of TM

- **Forward-looking thinking** (visions of alternative systems)
- **Learning and experimentation** by actors interested in alternative systems
- Putting pressures on non-sustainable regimes (easier to do in case of well-developed alternatives)
- Adapting policies and portfolios that receive support
- Government as facilitator
- Institutional support for transition

TM as used in the Netherlands

- At the heart of the energy transition project are the activities of 7 **transition platforms**.
- In these platforms individuals from the **private** and the **public** sector, **academia** and **civil society** come together to develop a common ambition for particular areas, develop pathways and suggest transition experiments.
- The 7 platforms are:
  - New gas
  - Green resources
  - Chain efficiency
  - Sustainable electricity supply
  - Sustainable mobility
  - Built environment
  - Energy-producing greenhouse

Creatieve Energie
EnergieTransitie


Energietransitie: structuur
Publiek – Private aanpak
Publiek domein
EZ
VROM
V&W
LNV
BuZa
Fin.
IPE
Regie Orgaan
Privaat domein
Electriciteits-voorziening
Nieuw Gas
Groene Grondstoffen
Duurzame Mobiliteit
Gebouwde Omgeving
Keten Efficiency
Kas als Energiebron

Platforms	Pathways
Chain Efficiency Goal: savings in the annual use of energy in production chains of: - 40 à 50 PJ by 2010 - 150 à 180 PJ by 2030 - 240 à 300 PJ by 2050	KE 1: Renewal of production systems KE 2: sustainable paper chains KE 3: sustainable agricultural chains
Green Resources Goal: to replace 30% of fossil fuels by green resources by 2030	GG 1: sustainable biomass production GG 2: biomass import chain GG3: Co-production of chemicals, transport fuels, electricity and heat GG4: production of SNG GG 5: Innovative use of biobased raw materials for non-food/non-energy applications and making existing chemical products and processes more sustainable
New Gas Goal: to become the most clean and innovative gas country in the world	NG 1: Energy saving in the built environment NG 2: Micro and mini CHP NG 3: clean natural gas NG 4: Green gas
Sustainable Mobility Goals: Factor 2 reduction in GHG emissions from new vehicles in 2015 Factor 3 reduction in GHG emissions for the entire automobile fleet 2035	DM 1: Hybrid and electric vehicles DM 2: Biofuels DM 3: Hydrogen vehicles DM 4: Intelligent transport systems

Platforms	Pathways
Sustainable Electricity Goal: A share of renewable energy of 40% by 2020 and a CO2-free energy supply by 2050	DE 1: Wind onshore DE 2: Wind offshore DE 3: solar PV DE 4: centralised infrastructure DE 5: decentralised infrastr.
Built Environment Goal: by 2030 a 30% reduction in the use of energy in the built environment, compared to 2005	GO 1: Existing buildings GO 2: Innovation GO 3: Regulations
Energy-producing Greenhouse Goals for 2020: • Climate-neutral (new) greenhouses • 48% reduction in CO_2 emissions • Producer of sustainable heat and energy • A significant reduction in fossil fuel use	KE 1: Solar heating KE 2: Use of earth heat KE 3: Biofuels KE 4: Efficient use of light KE 5: Cultivation strategies and energy-low crops KE 6: Renewable electricity production KE 7: Use of CO2

Green Resources

Goal: to replace 30% of fossil fuels by green resources by 2030

- Sustainable biomass production
- Biomass import chain
- Co-production of chemicals, transport fuels, electricity and heat
- Production of SNG
- Innovative use of biobased raw materials for non-food/non-energy applications and making existing chemical products and processes more sustainable

More than technology support

- The transition approach goes beyond technology support. It is **oriented at creation capabilities, networks and institutions for transitional change** through the creation of agendas, partnerships, new instruments, and vertical and policy coordination are part of it.
- The IPE (*Interdepartmental Project directorate Energy transition*) plays an important role in "taking initiatives", "connecting and strengthening initiatives", "evaluate existing policy and to act upon the policy advice from the Regieorgaan and transition platforms", to "stimulate interdepartmental coordination" and to "make the overall transition approach more coherent"

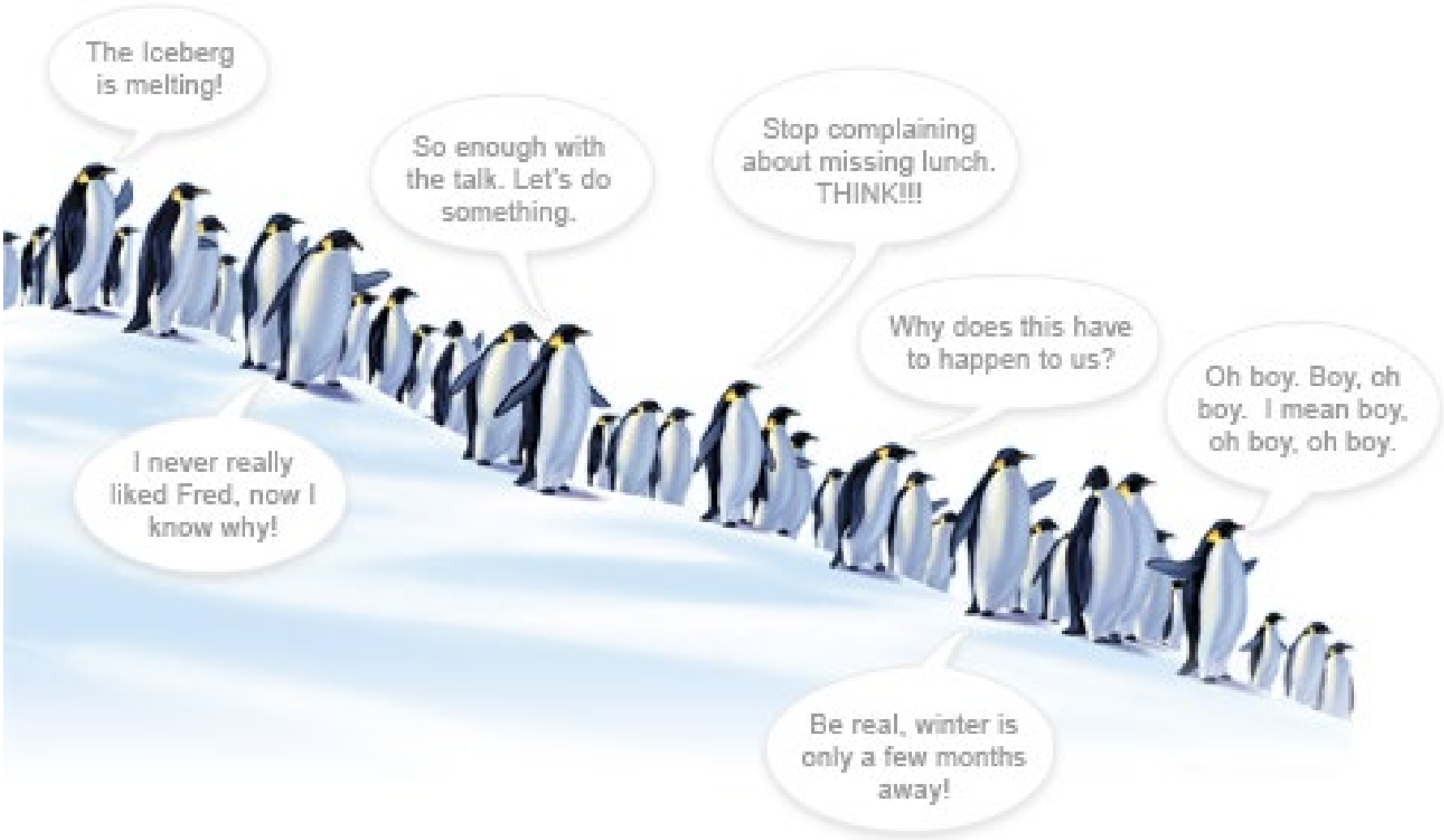
The philosophy behind TM:

Perspektivischer Inkrementalismus

A plea for guided evolution

Based on visions of progress but relying on evolutionary change in the form of 'darwinistic' processes of variation and selection rather than blueprints

Sustainable development requires wishful thinking but not too much of it



From Kotter Our Iceberg is melting