System archetypes to diagnose challenges of sustainable consumption and production in the food sector

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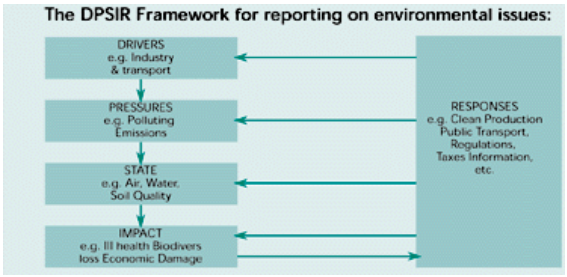
Overview

- 1. Why to use system thinking/dynamics approach?
- 2. Tools to describe a dynamic systems - in relation to SCP.
- 3. Case study on application:
  - increasing processed food consumption

SYSCONS Study: Nemeskéri, R. L., Bodó, P., Herczeg, M., Mont, O., 2007:
System dynamics to diagtnose and devise patterns for sustainable consumption and production (SYSCONS).
Report to the Swedish EPA, FLIPP Programme. Lund University, 2007.

The DPSIR framework



System thinking approach

- The C&P system is a complex adaptive system comprising needs, culture, market, regulation, ecosystems, and physical environment, which continuously co-evolve.
- Policy making is part of it.
- Components are in a non-linear, complex interrelationship.
- There are balancing and reinforcing feedback loops among different system components.
- Policy intervention should understand the long range of changes it evokes through the various causal chains.

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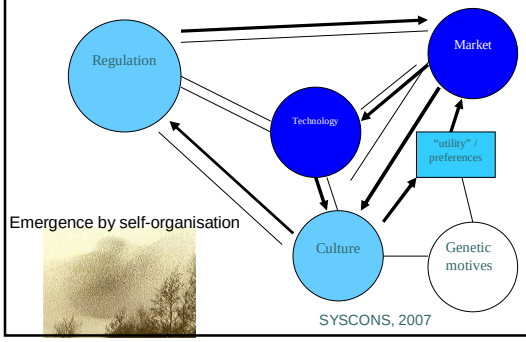
The C&P system is a Complex adaptive system (CAS)



Emergence by self-organisation

SYSCONS, 2007

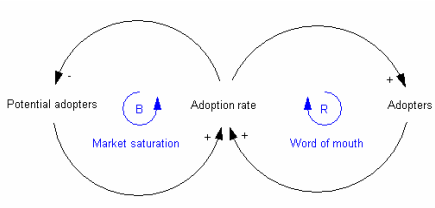
Why system dynamics?

- Problems are dynamically interrelated
  - Not the results of simple cause & effect relations, but of linked feedback loops
  - Change in one variable affects other variables over time, which in turn affect the original variable, and so on
- Relations are non-linear and not even monotonous
  - E.g. with growing consumption utility does not necessarily improve
- Problems are tendentious
  - System interactions are different if we change the time factor
- Problem solution needs a coordinated intervention at a number of leverage points
  - Sysdyn leads to leverage points

From: Jay Forrester in the1950s

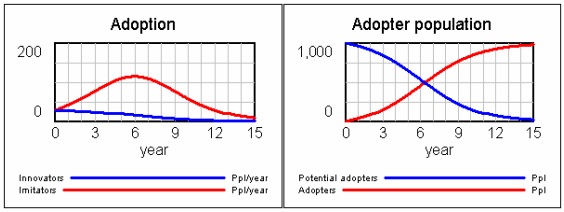
Casual loop diagrams

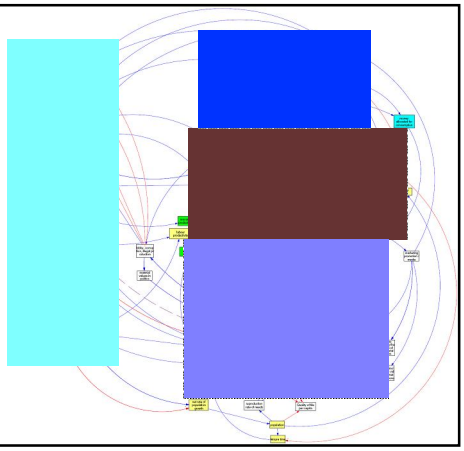
- Negative (balancing - B) feedback loop
- Positive (reinforcing - R) feedback loop



Simulation: behaviour over time (BOT) diagram

The well-known S-curve:



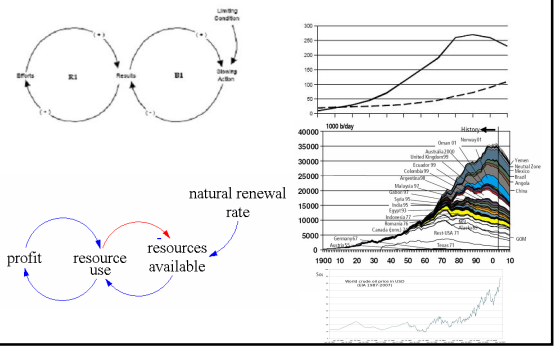


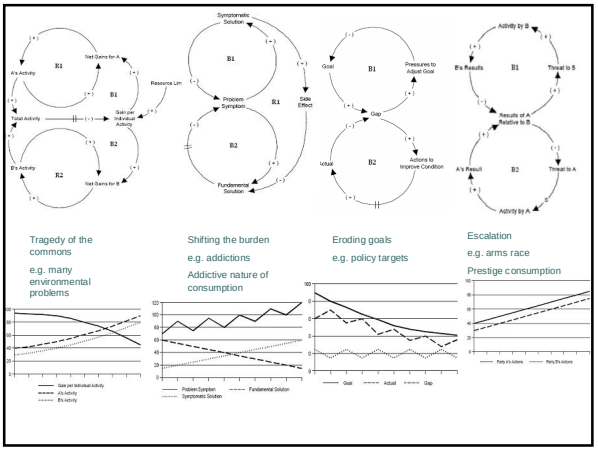
Typical behavioural patterns: System archetypes

- Limits to Growth (aka Limits to Success)
- Shifting the Burden
- Eroding Goals
- Escalation
- Success to the Successful
- Tragedy of the Commons
- Fixes that Fail
- Growth and Underinvestment
- Accidental Adversaries
- Attractiveness Principle

Braun, 2002

Example: Limits to Growth





Case studies - Methodology

- Disaggregating problematic trends
  - *factors behind the problematic trends*
- Understanding underlying structures
- System archetypes and behaviour over time
- Recommendations
  - *specific and general*

Processed food consumption – disaggregation of problematic trend

- Food demand (consumption) is increasing.
- The same time under-nourishment remains high.
- Food wasting is increasing in the western countries.
- Time allocated for food preparation is decreasing.
- Number of persons per household is decreasing.
- While relative food prices (as percentage of household consumption) are slightly decreasing in rich countries, it is increasing in less affluent countries.
- Adverse health effects of processed food and food additives are increasing.
- Environmental impacts from food production are increasing.
- Environmental impacts from processed food production are increasing.
- Food miles and environmental impacts of food transportation are increasing.

Underlying structures
Processed food – functions for consumers

- Convenience
  - Decreasing time budget
  - Increasing money budget
- Social identification
- Health
  - all season availability of at least some of the nutritional value of seasonal products
  - hygiene
- Taste
  - With immediate feedback (as opposed to long-term health impacts)

Underlying structures
Processed food – functions for producers

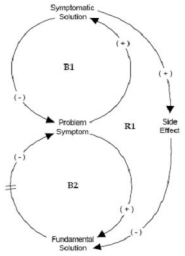
- Durability
  - Transportability
  - Shelf-life
- Cheaper production
  - Geographically (low-income labour)
  - Intensive agriculture
- Preference for intra-industry trade
  - As standardised commodities
- Access to new markets
  - Geographically (high-income consumers)
  - Better product differentiation

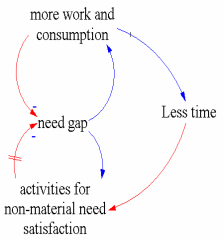
Increasing consumption of processed food

Share of processed products has been rising by 6 percents between 1990-2001 (EEA, 2007)

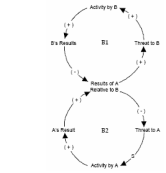
- A Survey in the UK (MINTEL, 2005) demonstrates that:
- 27% of consumers feel that additives in food are an area for concern
- 24% of consumers claim to try to avoid tinned fruit or vegetables in favour of fresh produce.
- 71% of people sampled bought ready meals despite 70% also saying that they try to buy as much fresh quality produce as possible.
- **Thus most people buy processed food despite their attempts to avoid it.**

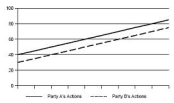
Shifting the burden

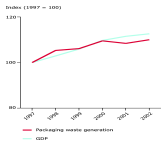




Escalation



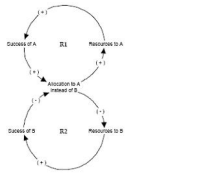


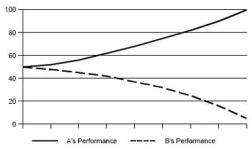


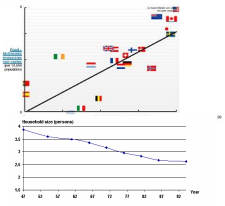
Escalation

- the trends between GDP and the amount of packaging waste generated;
- the level of GDP per capita and processed and fast-food consumption;
- and the number of single households and processed and fast-food consumption.

Success to the successful







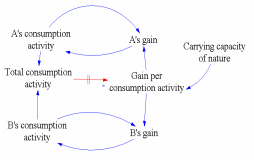
Food - Recommendations

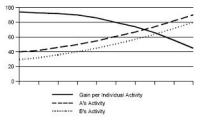
- Green tax reform
- Supporting eco-innovation, eco-design
- Harmonisation of labelling
- Substance ban
- Community or local food initiatives
- Local market protection
- Promote local and domestic food consumption
- Promoting greener consumer lifestyles
- Change market rules
- …
- …
- …
- Paradigm shift

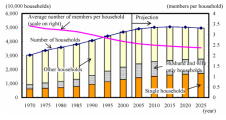
In a nutshell

- Assessment of causal loop diagrams, system archetypes and behaviour over time may help better understanding the *complex reasons* of actual problems.
- The approach is more suitable for well defined systems, however may lead to uncover less obvious causalities.
- These aspects are extremely relevant when it comes to designing effective policy measures.

Further examples







Further examples