Acting on SDG synergies and trade-offs requires policy-focused systems tools
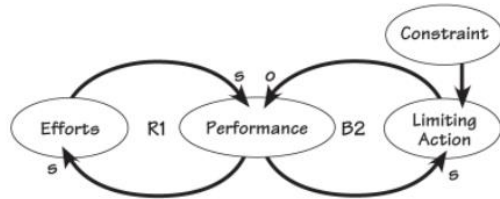
Sibel EKER

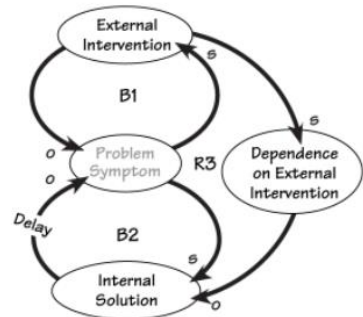19 May 2022
5th International Workshop on Archetypes in Sustainability Research
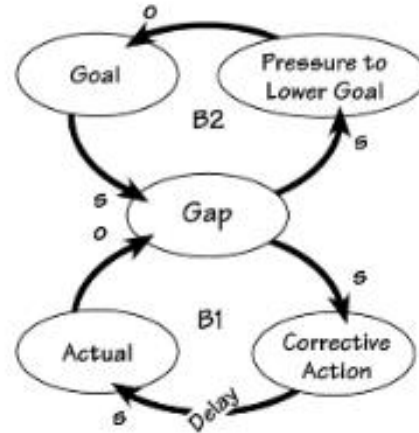
International Institute for
Applied Systems Analysis
I I A S A www.iiasa.ac.at

sibel.eker@ru.nl

@sibel_eker_

Radboud University

System archetypes

Drifting Goals

Fixes That Fail

Limits to Success

Shifting the Burden/Addiction

Escalation
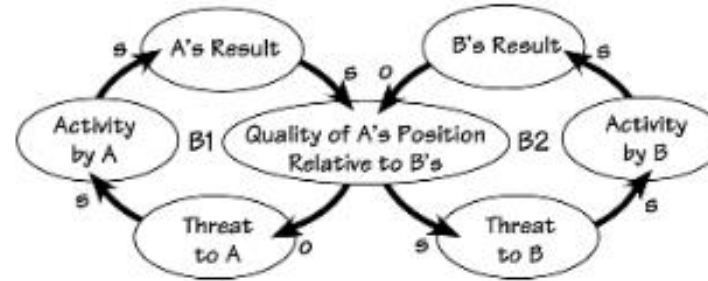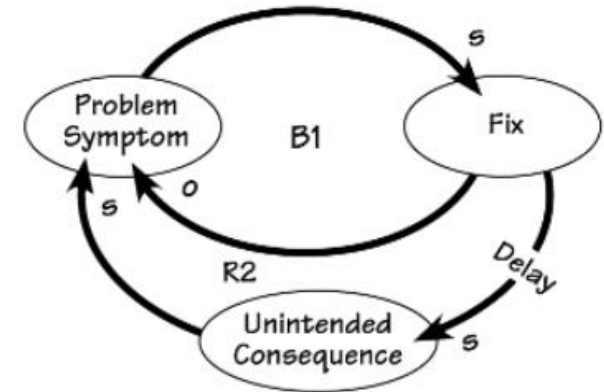
Growth and Underinvestment
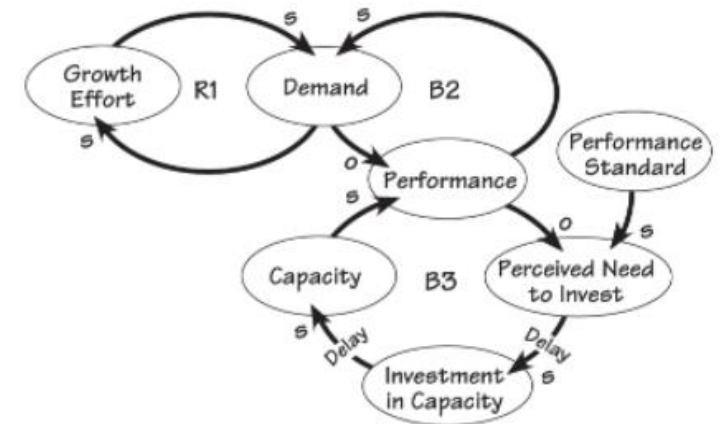
Source: Kim (1992) *Pegasus Communications*

Loss of crop diversity

Average change in the calories consumed from key crops worldwide (1961-2009)

% change

Soybean		+284
Sunflower		+246
Palm oil		+173
Cassava	-38	
Sweet potatoes	-45	
Millets	-45	
Sorghum	-52	

Source : BBC (Adapted from Khoury et al. (2014) *PNAS*)

Success to the Successful
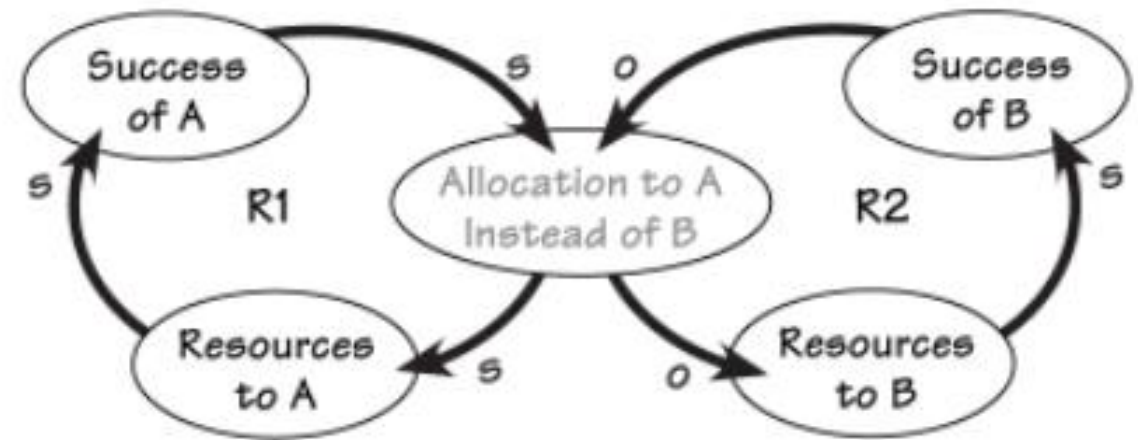
s : + causality
o : - causality

System archetypes

Thinking in Systems

A Primer

Donella H. Meadows

Edited by Diana Wright
Sustainability Institute

THE FIFTH DISCIPLINE

NATIONAL BESTSELLER — OVER 400,000 COPIES IN PRINT

The Art & Practice of The Learning Organization

PETER M. SENGE
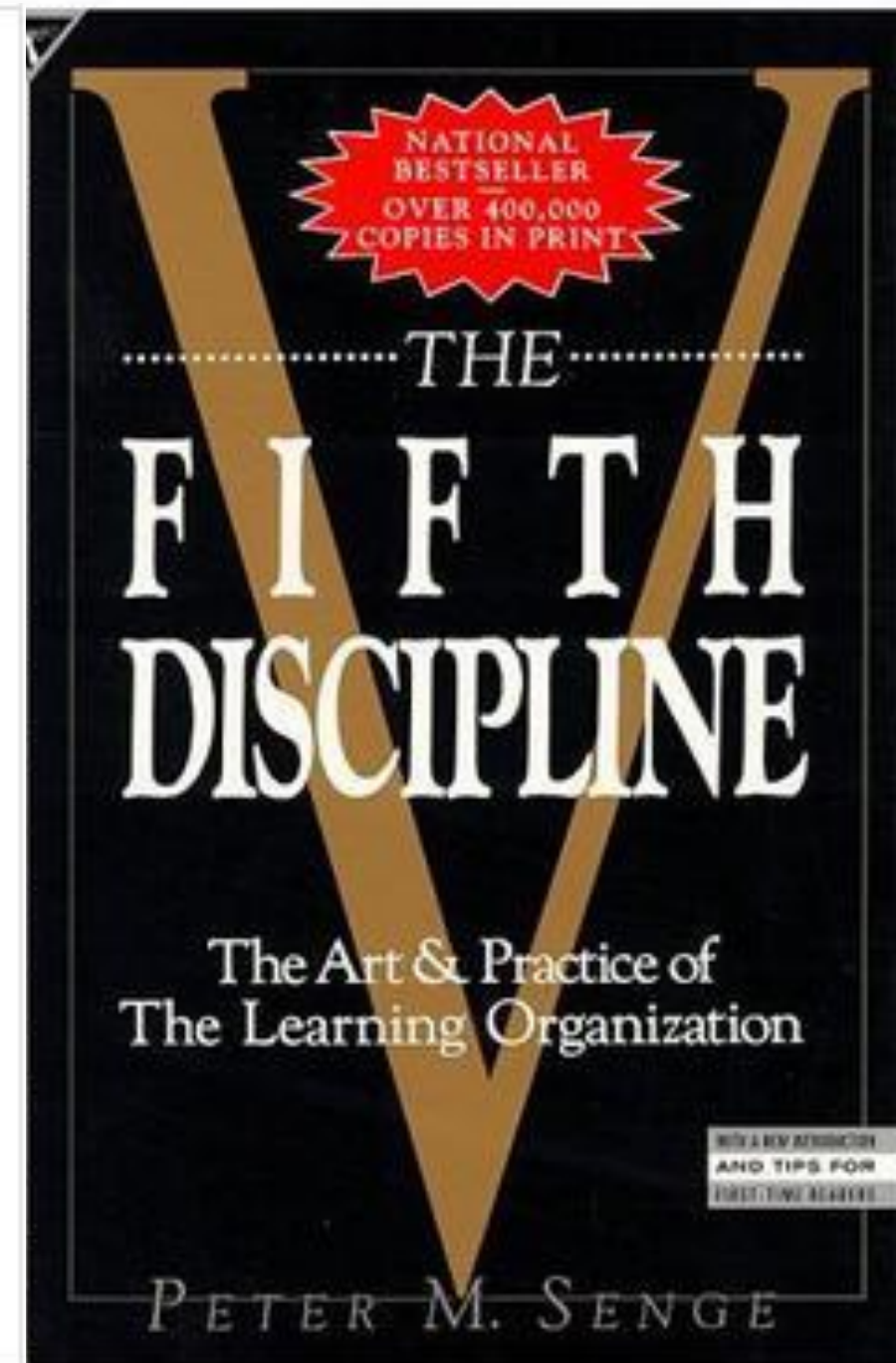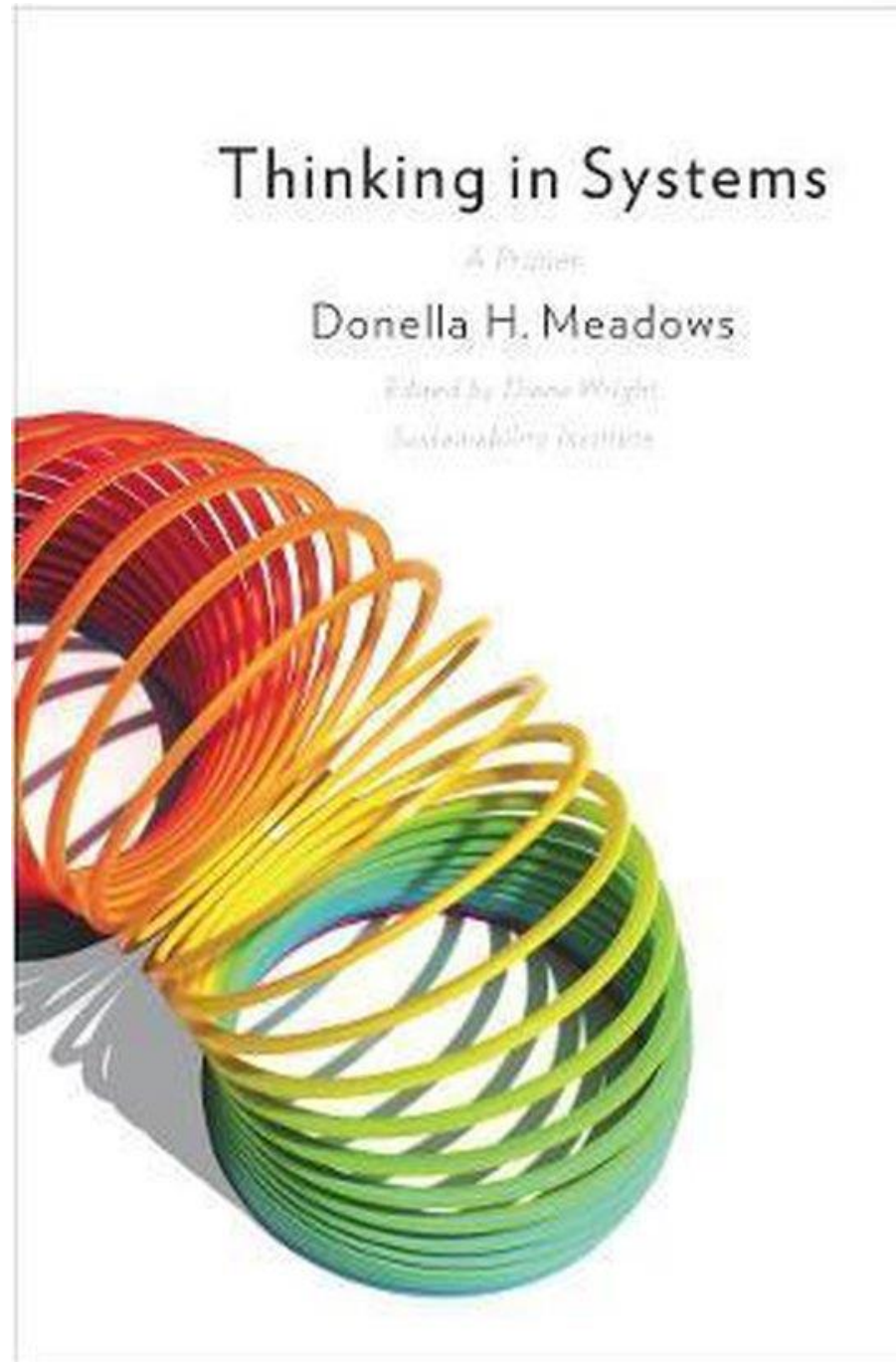
Anna Karenina

LEO TOLSTOY

CHAPTER I

All happy families resemble one another, but each unhappy family is unhappy in its own way.

each functioning system is successful in its own way, but all misfunctioning systems resemble one another.
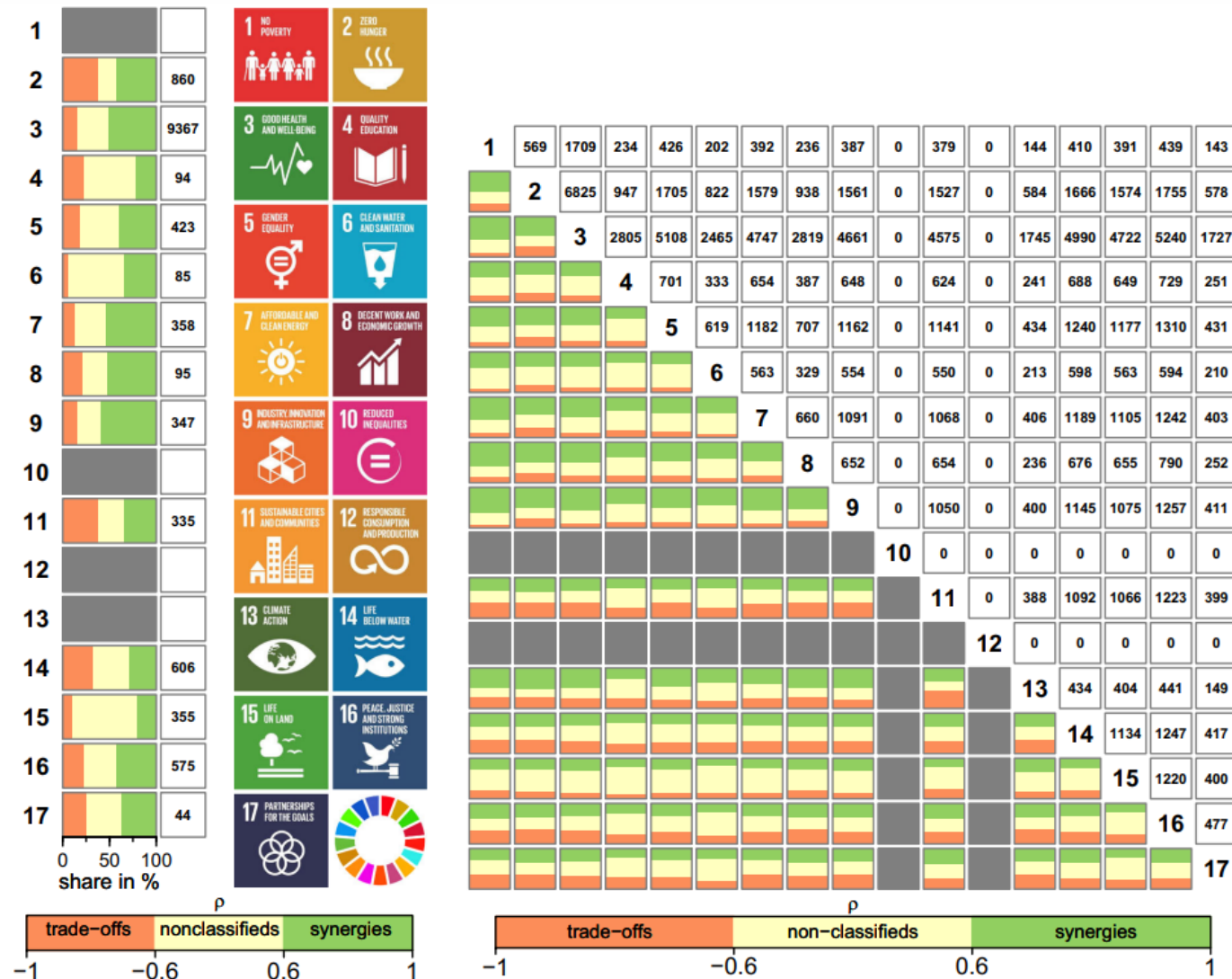
Acting on Sustainable Development Goal (SDG) synergies and trade-offs requires policy-focused systems tools

Enayat A. Moallemi[1,*], Seyed Hossein Hosseini[2], Sibel Eker[3,4], Lei Gao[5], Edoardo Bertone[6,7,8], Katrina Szetey[1], Brett A. Bryan[1]

https://eartharxiv.org/repository/view/3136/

Radboud University

SDG interactions

Source: Kroll et al. (2019) *Palgrave Communications*

A DYNAMIC VIEW ON TRADE-OFFS AND SYNERGIES

SDG interactions

Source: Moallemi et al. (forthcoming)
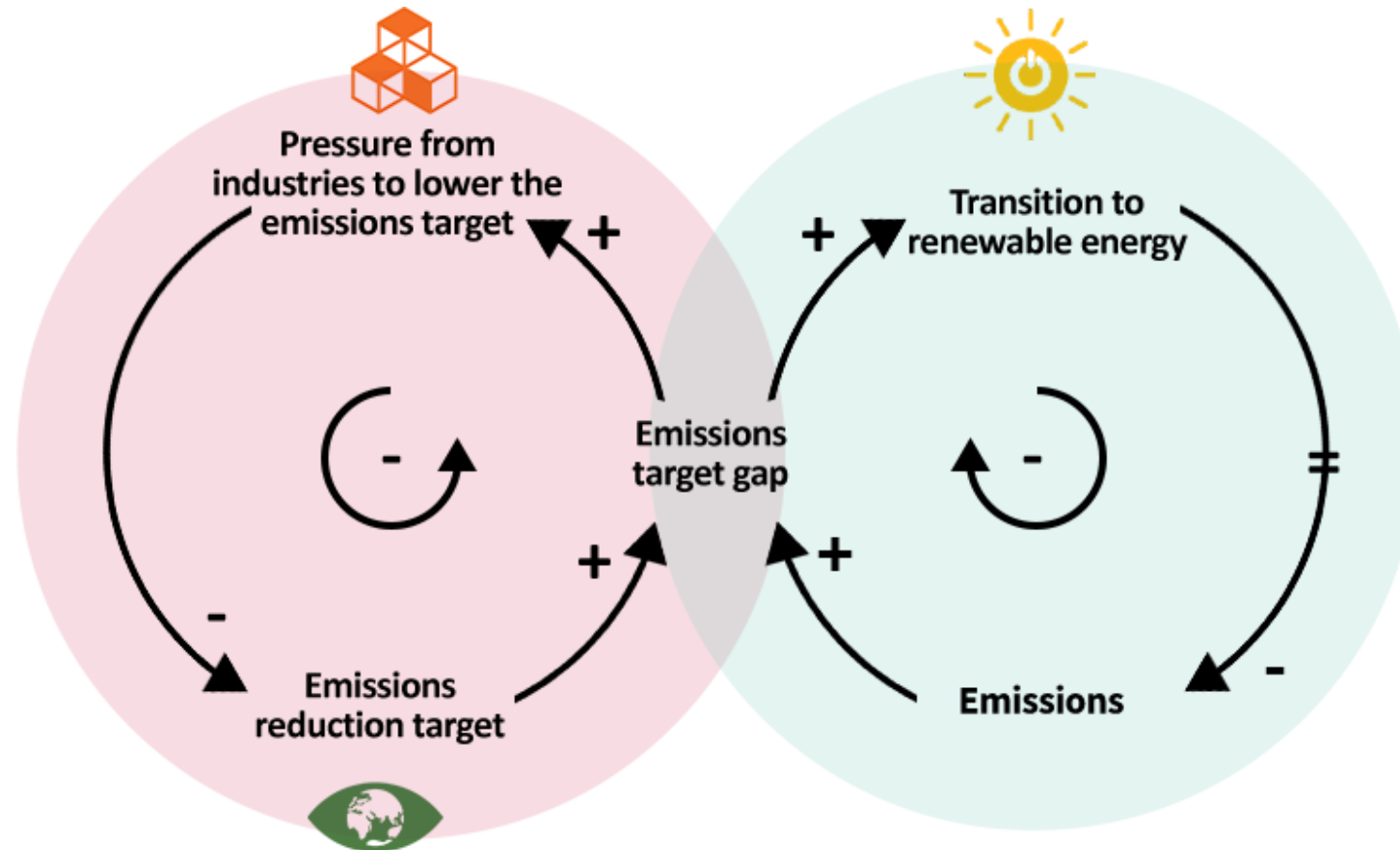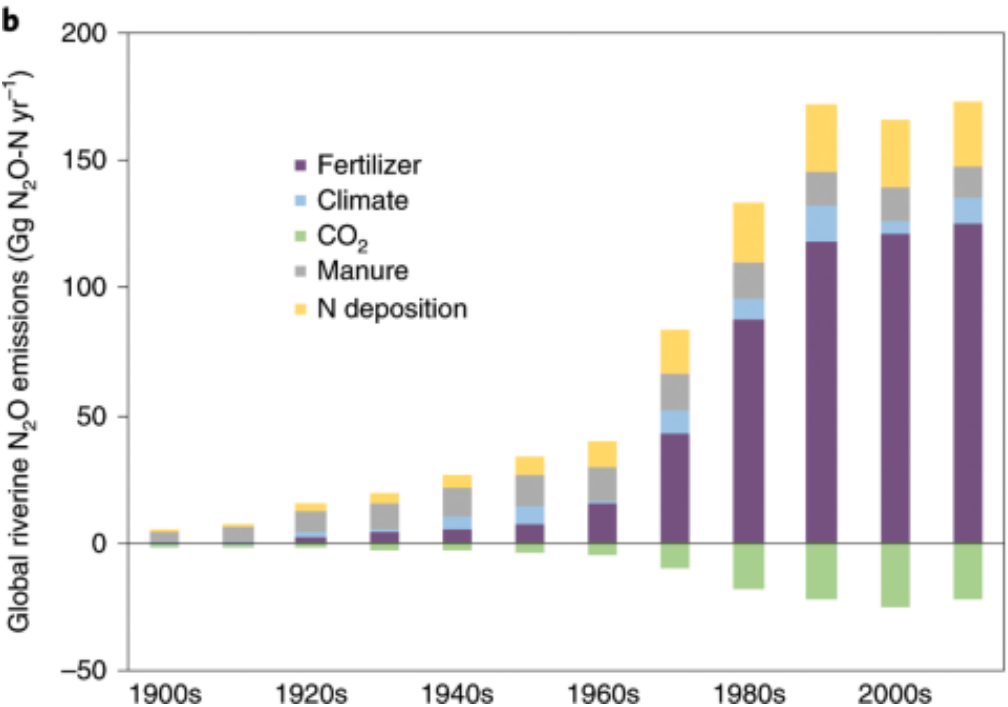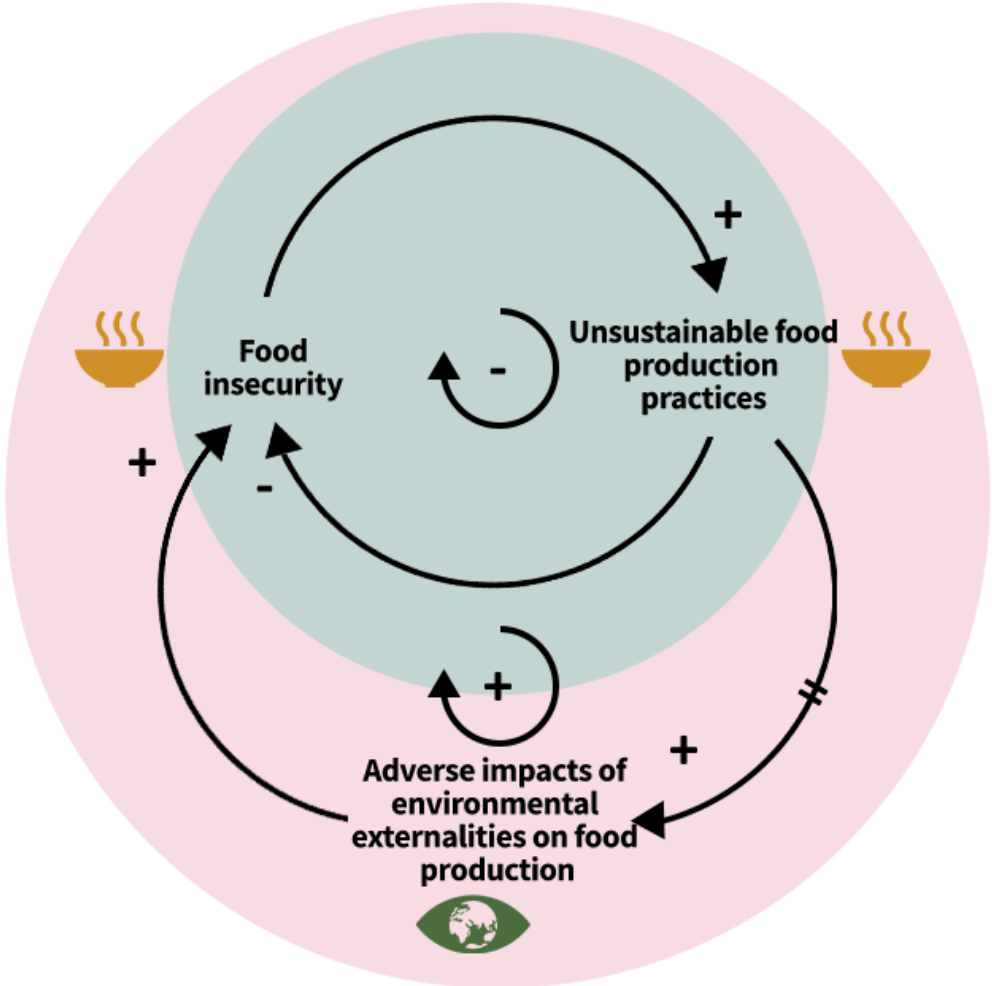
System archetypes in the SDG context

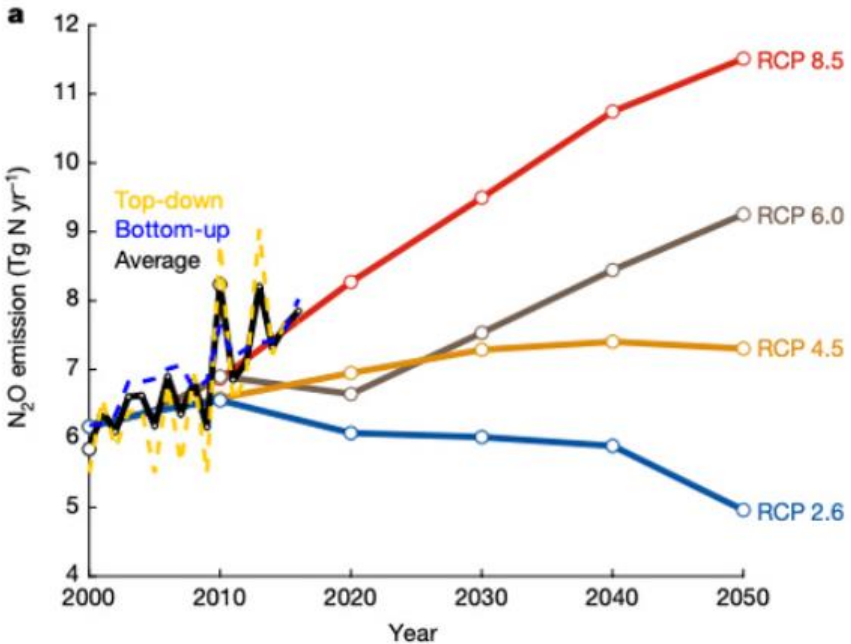| Driver	Interaction archetype	Description	Potential behaviour	Example
Perverse side-effect	Fixes That Fail	SDG interventions end up with opposite effects due to delayed trade-offs with other goals	Slowing progress despite increasing efforts	(32)
	Band-Aid Solutions	Band-aid solutions with short-term moderate impacts diminish the need for transformative SDG interventions	Slowing progress due to declining presence of long-term interventions	(33)
Time-delayed response	Eroding Ambitions	Long-term interventions with time-delayed response create uncertainty about SDG achievement and justify lower ambition	Increasing progress, but towards low-ambition goals that can be easily achieved	(34)
	Downplayed Problems	The ignorance of trade-offs which are seemingly insignificant due to their time-delayed response but will eventually overshadow all synergistic interactions and can halt or reverse progress	Initial progress due to synergistic interactions, followed by rapid decline from the prevailing effects of downplayed trade-offs	(35)
...dency	Escalating Tensions	Increasing temporary interventions with path dependency result in unsatisfactory progress in conflicting goals	An overall decline in progress in all goals, despite increasing efforts	(36)

Fixes that fail

Fixes that fail
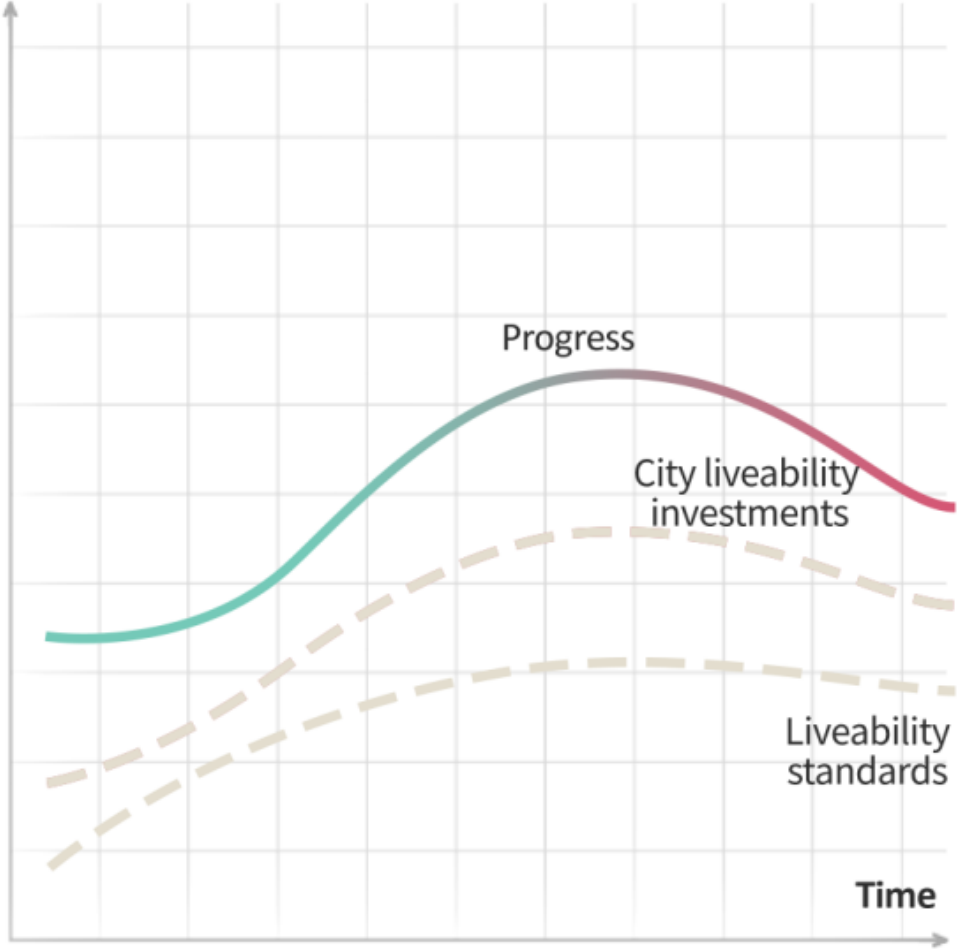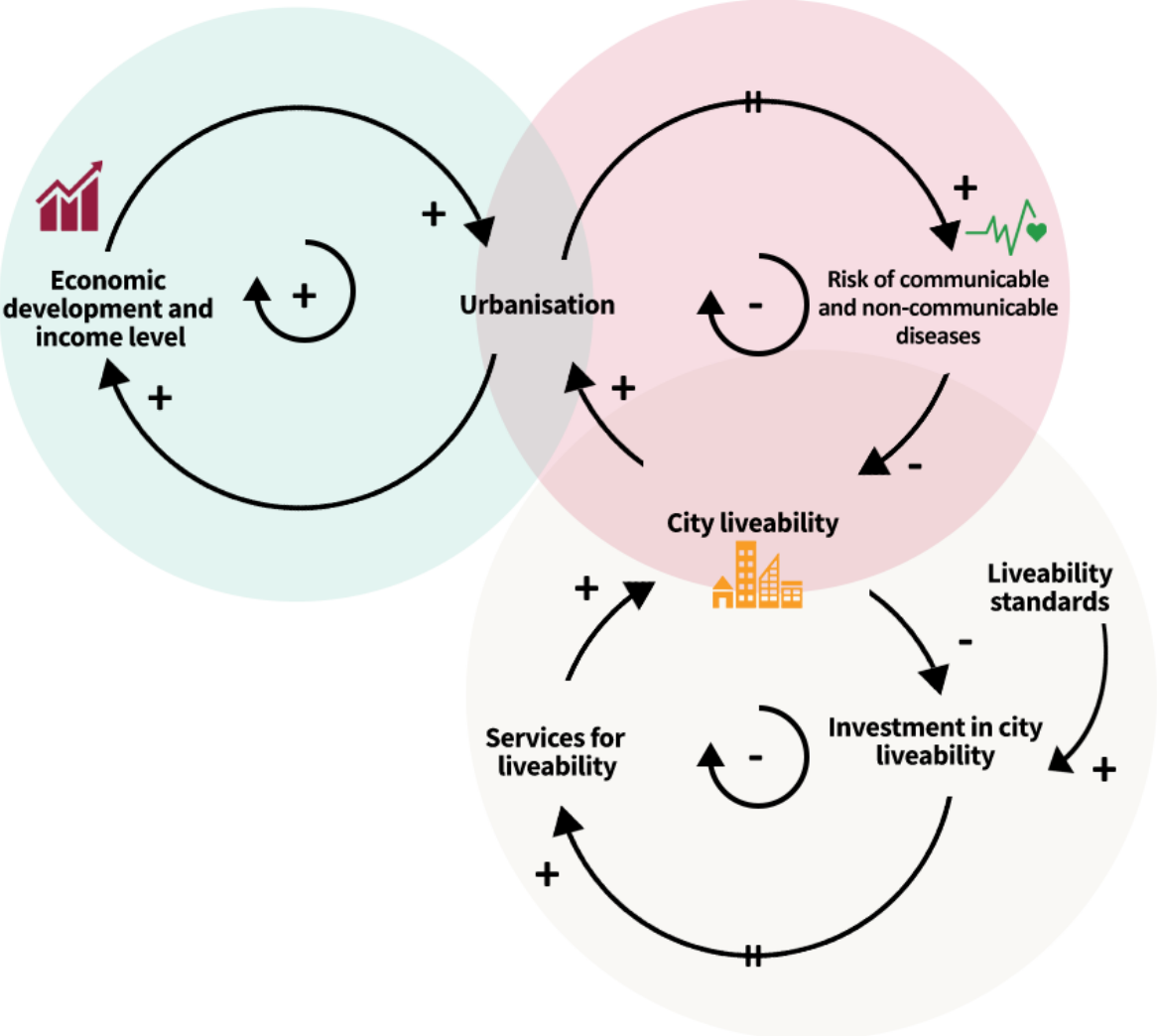

Food insecurity (+) Unsustainable food production practices (−)

Adverse impacts of environmental externalities on food production (+) (+)
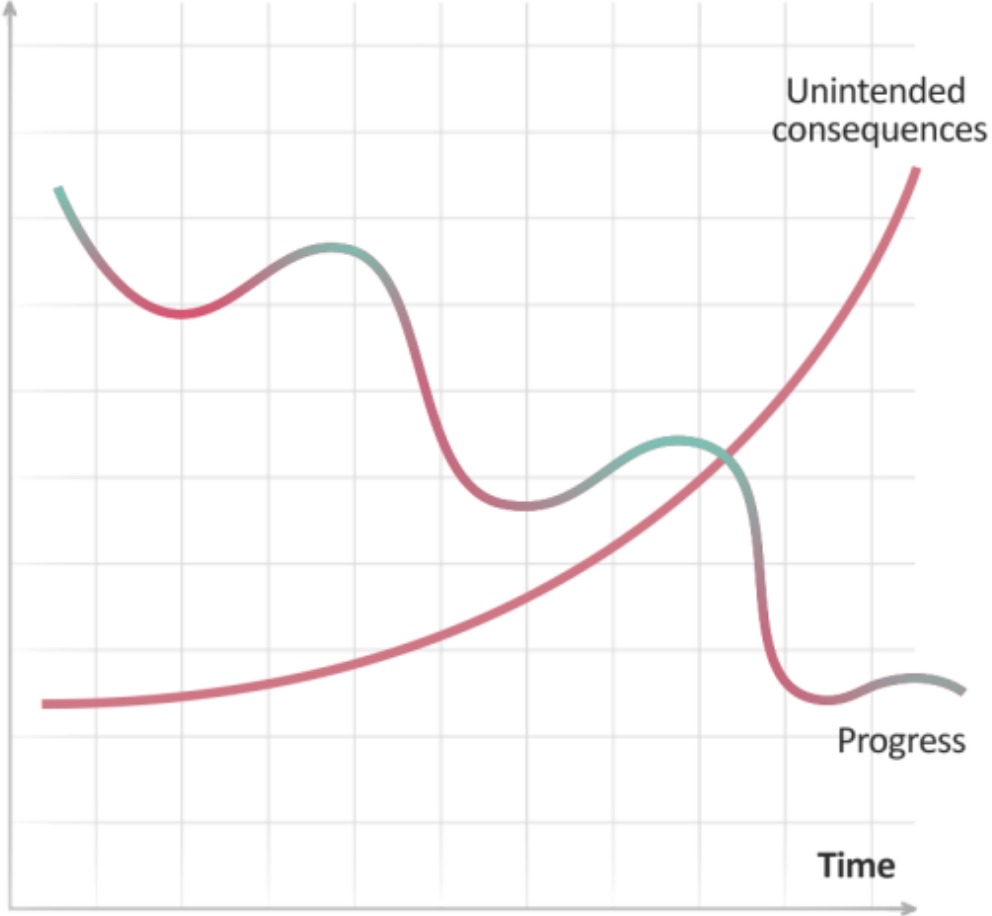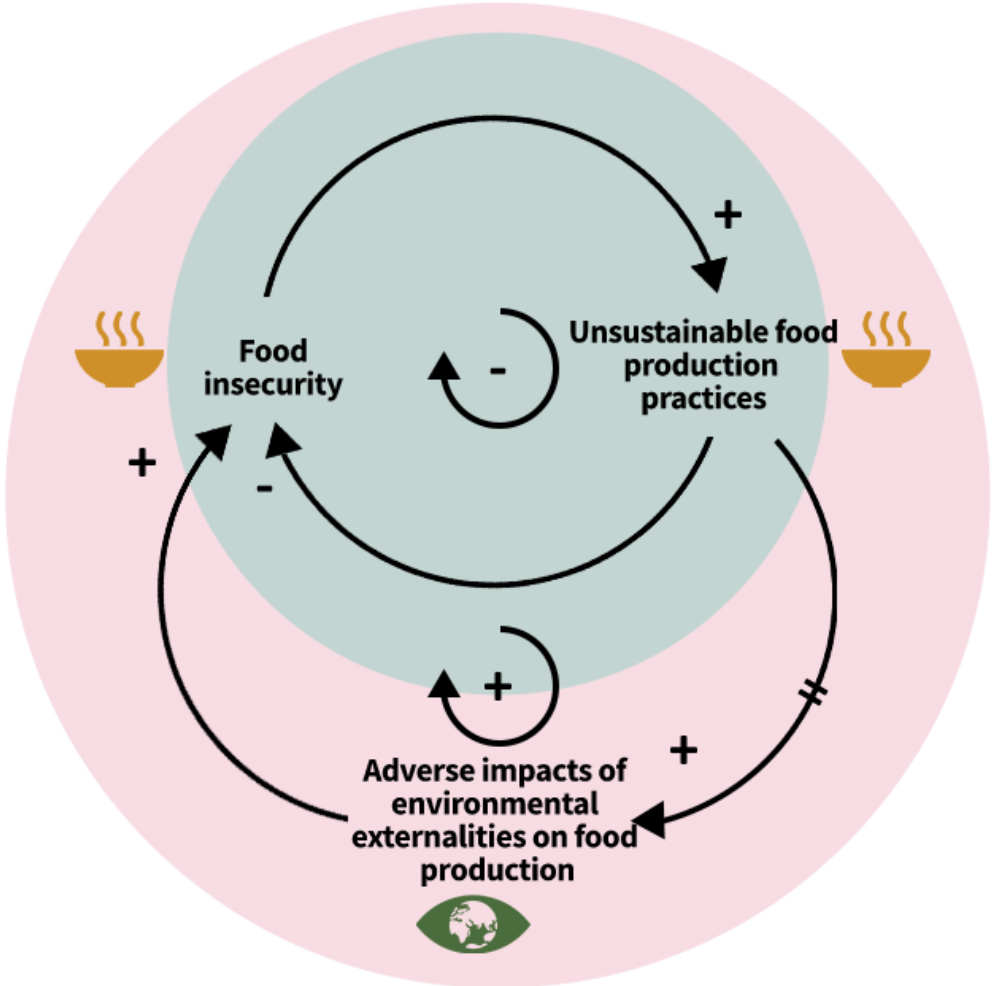
Yao et al. (2019) *NCC*

Tian et al. (2020) *Nature*

Radboud University

Downplayed problems

Archetypes as a practical tool

Step 1

Data collection
- Collect instances of events related to the SDGs

Step 2

Database construction
- Detail and document events in chronological order with their causal relationships

Step 3

Archetype recognition
- Distil archetypes from event trajectories and their interactions documented in the constructed database

Step 4

Evaluation and triangulation
- Triangulate the identified archetypes by other sources/experts and modify them if needed
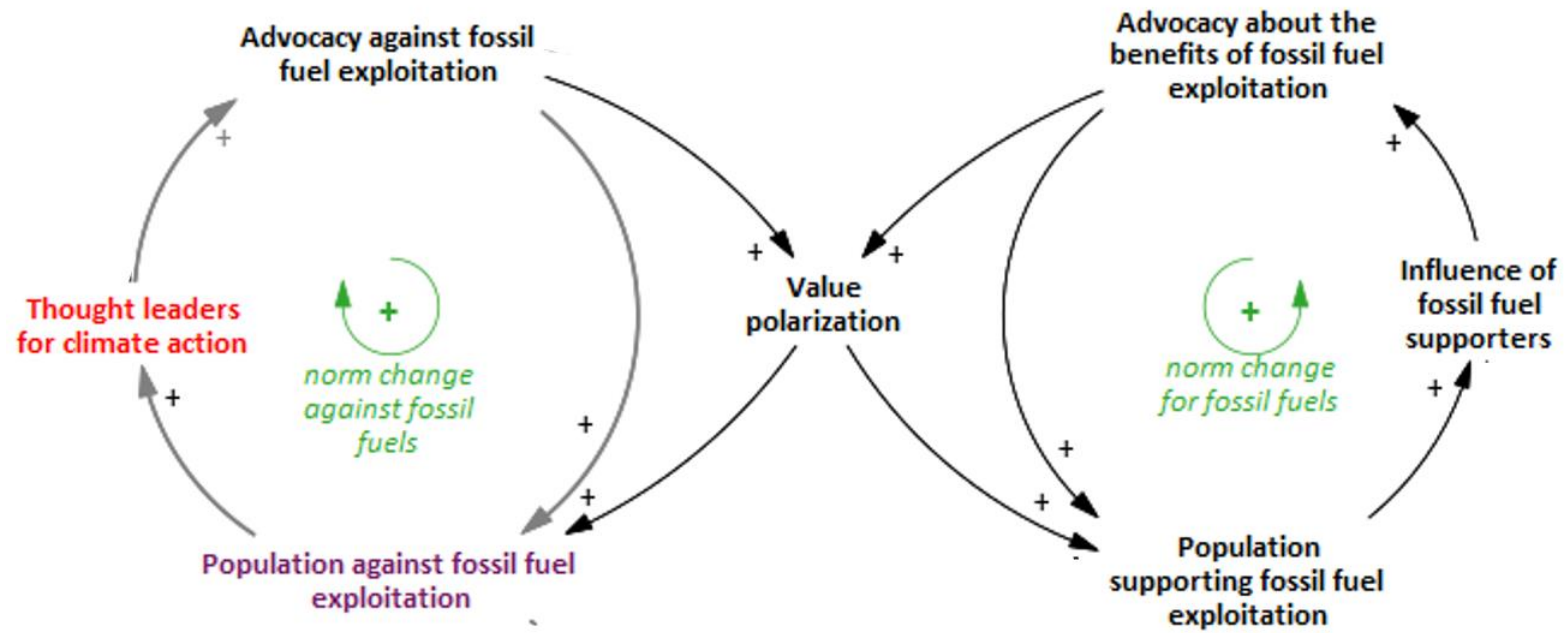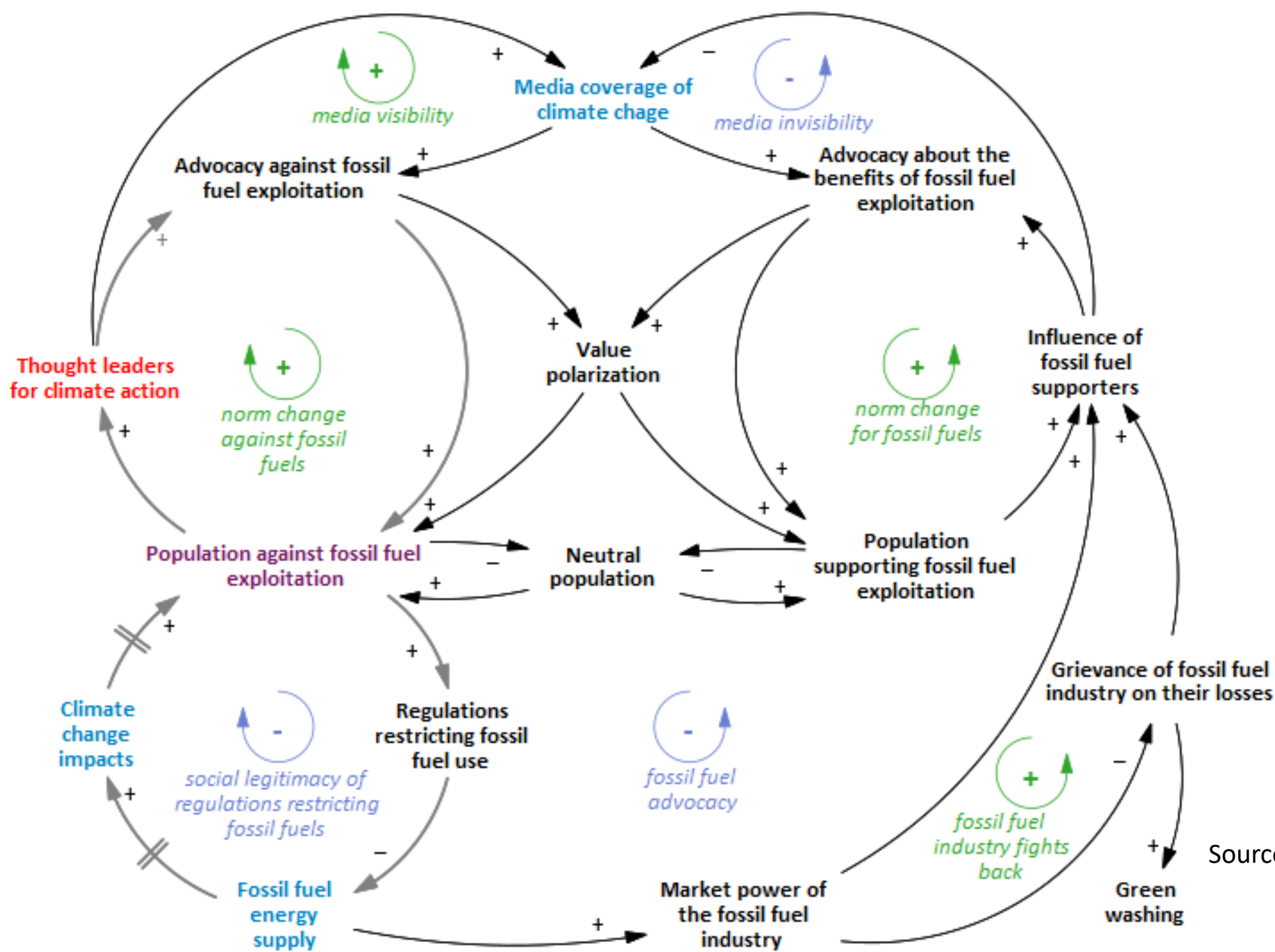
Radboud University

Are archetypes enough?

"If we are taught how to recognize a set of system archetypes, will we be able to improve our intuition about complex dynamics enough to render simulation unnecessary?" (Sterman, 2000)
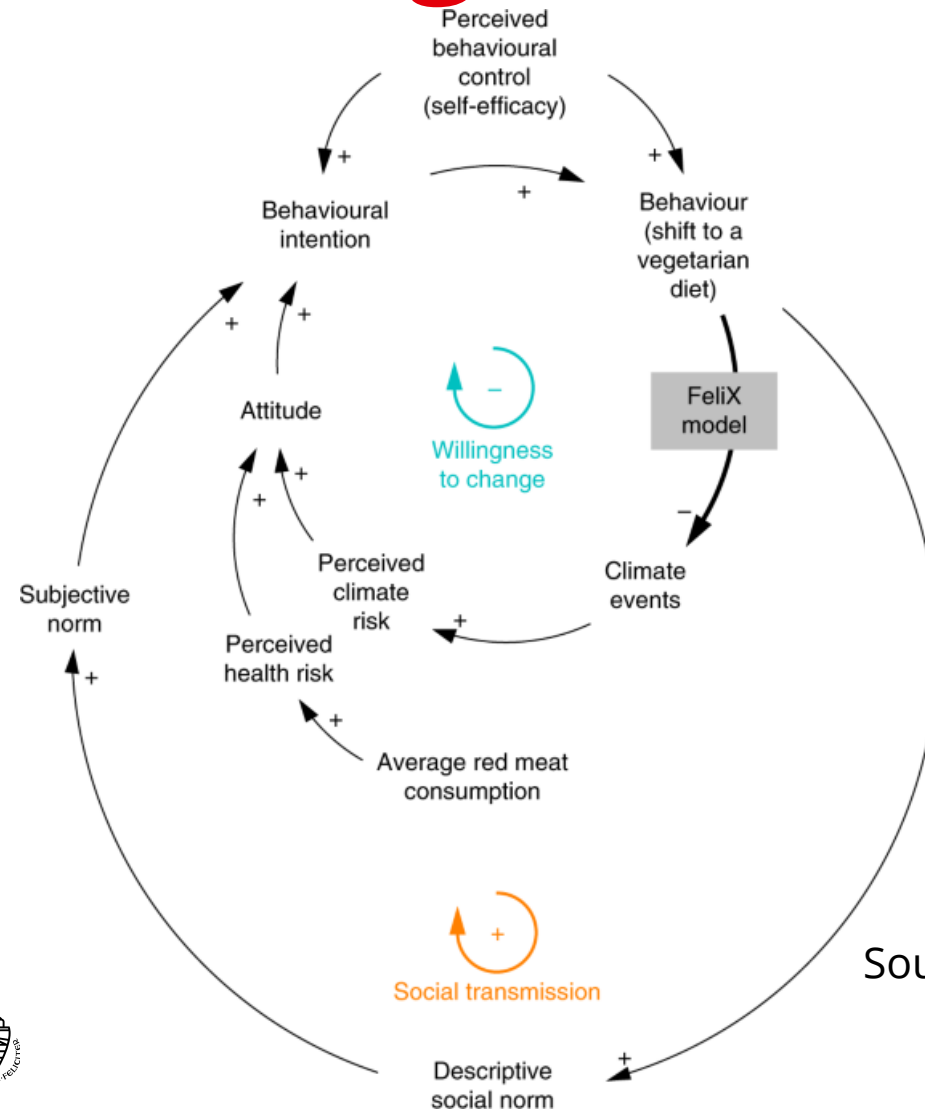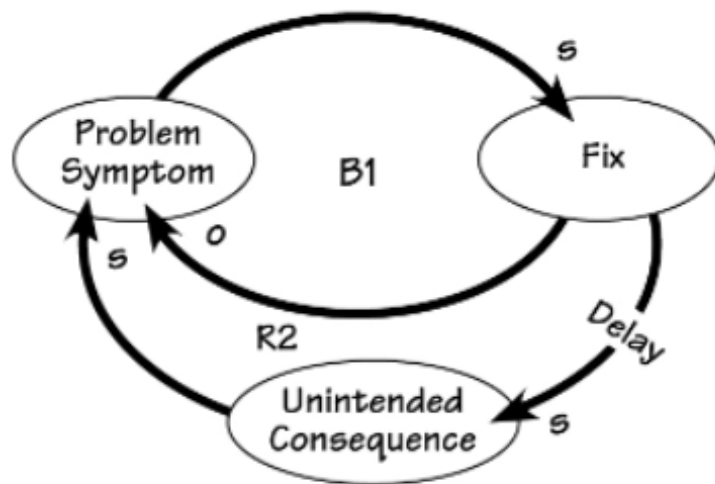
Escalation

Source: Eker & Wilson (2022) *IIASA.*

Source: Eker & Wilson (2022) *IIASA.*

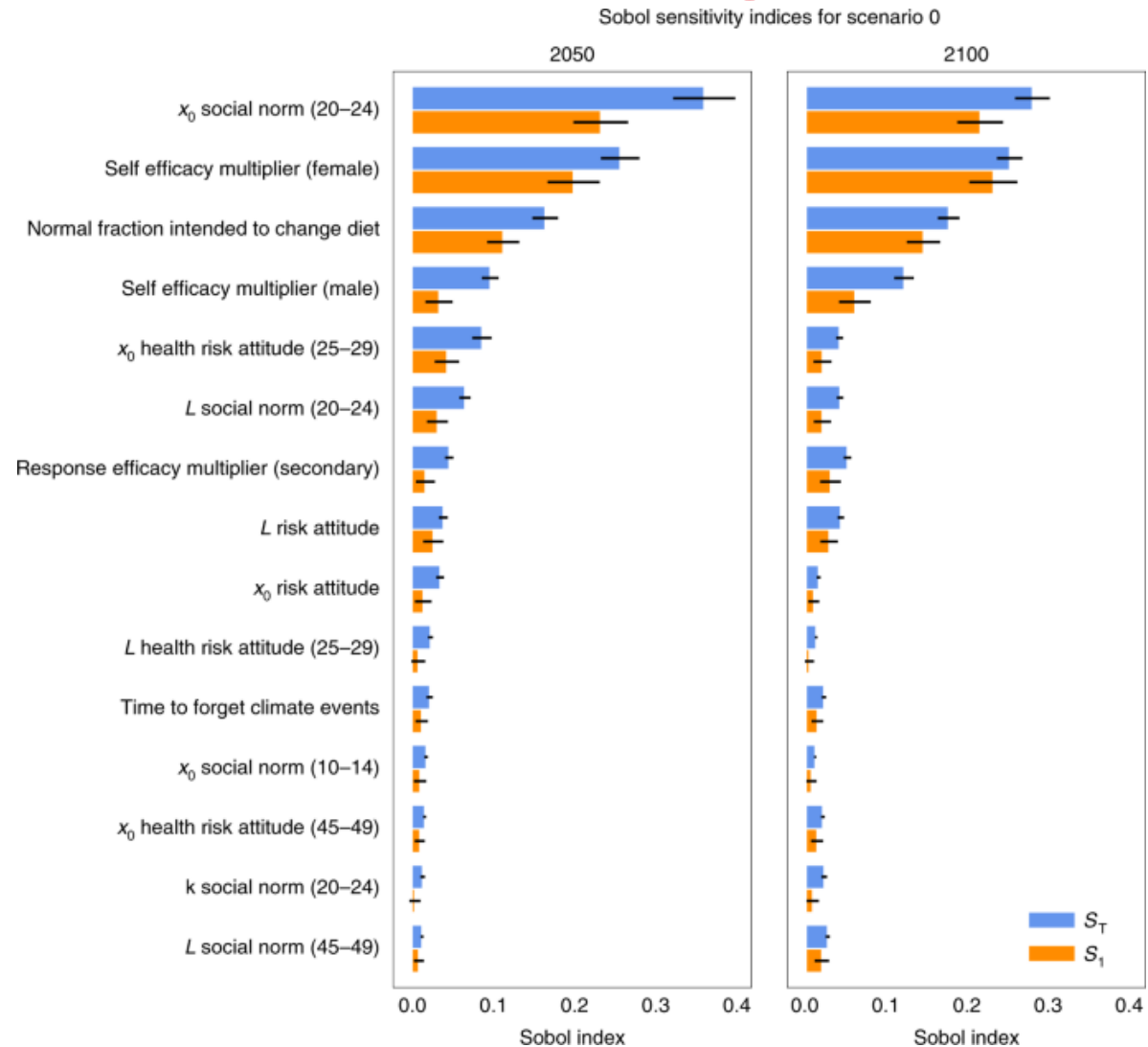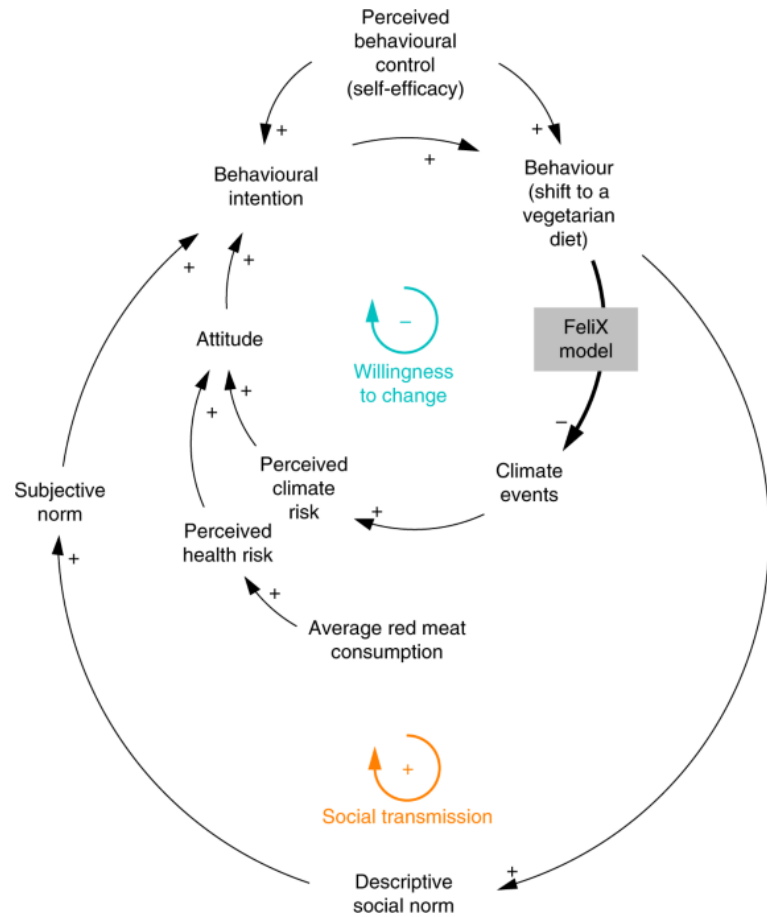# Role of simulation modelling

Source: Eker et al. (2019) *Nature Sustainability.*

Role of simulation modelling

Source: Eker et al. (2019 *Nature Sustainability*.

Conclusions

- Archetypes are useful tools to conceptualize misfunctioning systems that resemble each other, such as the trade-offs between SDGs.

- Archetype recognition requires empirical evidence.

- Archetype use requires support from empirical methods such as simulation modelling to analyze complex systems.

Acting on SDG synergies and trade-offs requires policy-focused systems tools

Sibel EKER

19 May 2022
5th International Workshop on Archetypes in Sustainability Research

sibel.eker@ru.nl

@sibel_eker_

International Institute for
Applied Systems Analysis
I I A S A www.iiasa.ac.at

Radboud University