Save energy – make it a habit

Tiina Koljonen, VTT

Workshop on energy demand reduction, Padova 24.10.2023

Motivation and aim of our research is to combine different methods to study energy demand reduction

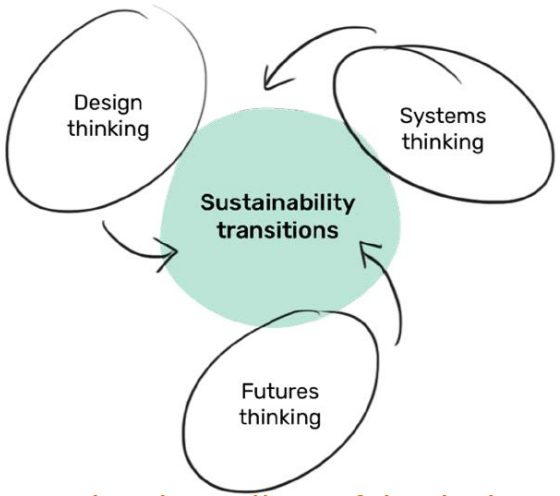


Illustration: https://www.falaydesign.com/

How to responsibly innovate in complex systems?

Original research question in Save energy: How can we stagnate or decrease the demand for energy consumption on a global level by 2040?

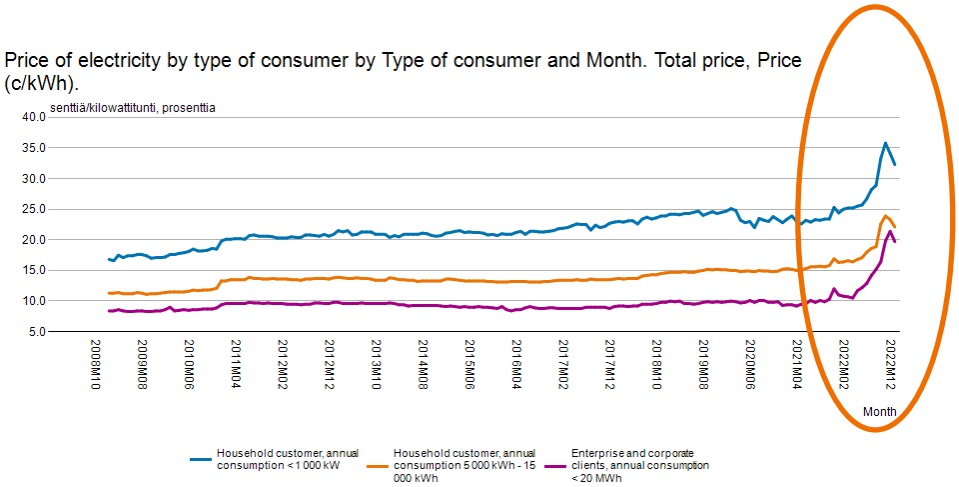
Dorninger et al. (2020) ***”If the academic research community aims to play an important role in initiating system wide transformative change, deep leverage points – the goals of the system, its intent, and rules – need to be addressed much more directly.”***

⇒ **We need deep leverage points in energy demand reduction, but how to find them?**

⇒ **All the data is from the past, so we started from the past.**

Last year’s energy crisis showed that we can change our energy behavior if we are motivated enough

Unicef: Photo from Ukraine



Data source: Statistics Finland

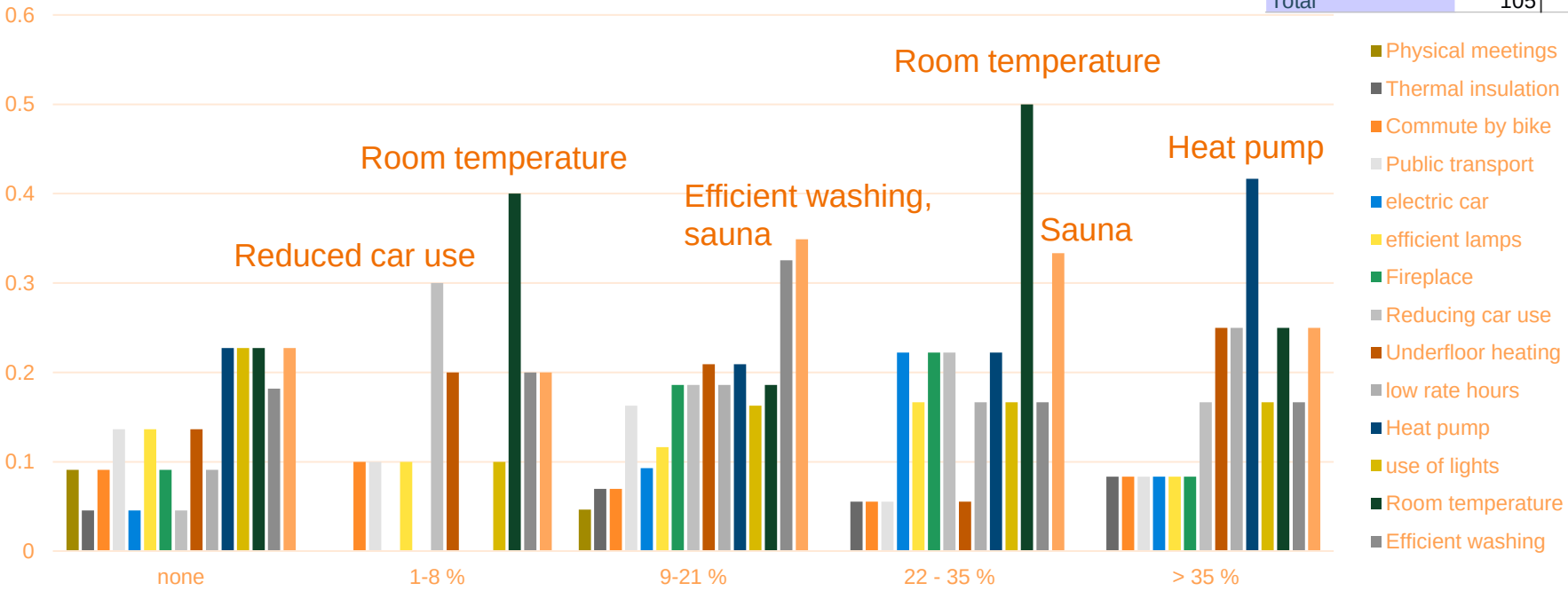
Research methods and examples of preliminary results

Survey of VTT's employees on Jan-Feb. 2023 revealed multiple strategies to reduce energy consumption

(Analysis done by Tom Tamlander, VTT)

Case Processing Summary

		N	Marginal Percentage
Reduction	none	22	21,0%
	1-8%	10	9,5%
	9-21%	43	41,0%
	22-35%	18	17,1%
	>35%	12	11,4%
Valid		105	100,0%
Missing		0	
Total		105	



Energy efficiency development in Finland 1995-2020: decomposition analysis – the parts behind the change

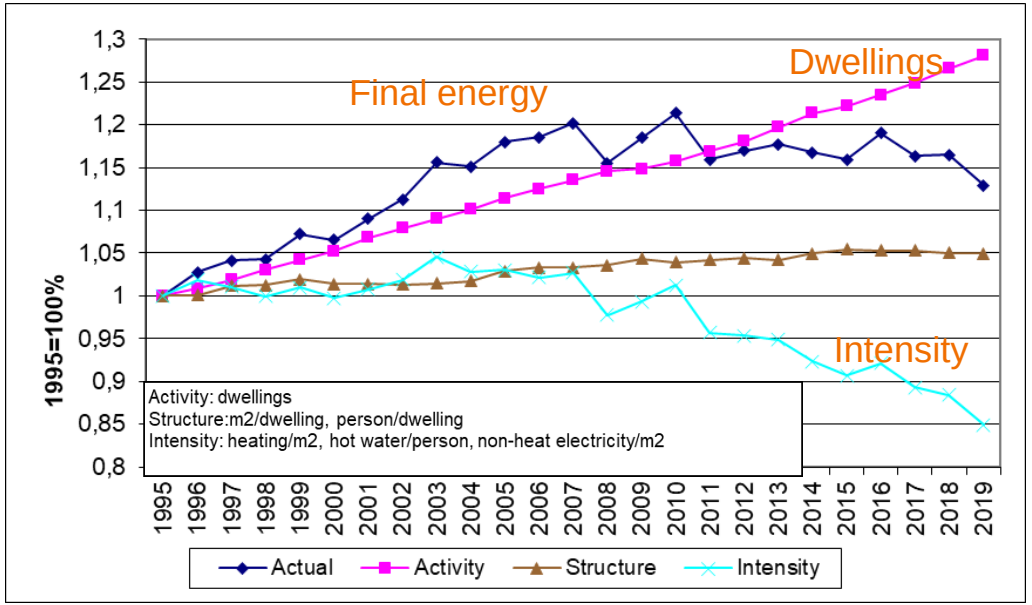
The main idea behind decomposition is to divide the change in energy use into fractions, for example:

- activity,
- structure, and
- intensity.

The partial changes of a fraction are calculated by keeping other factors at reference year level ($t=t_0$), i.e. constant (Laspeyres index method)

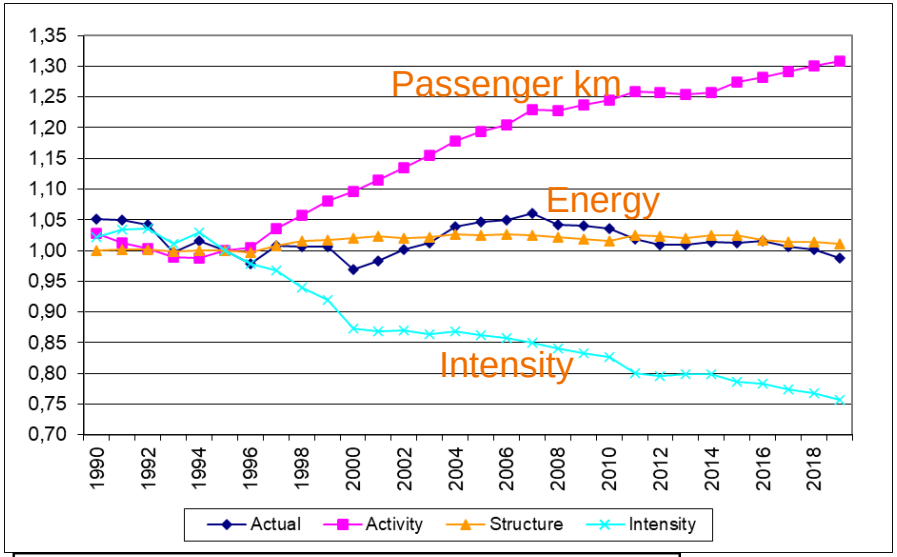
Analysis done by Göran Koreneff, VTT

Final energy consumption of households in Finland (data source: ODYSSEE database 2023)



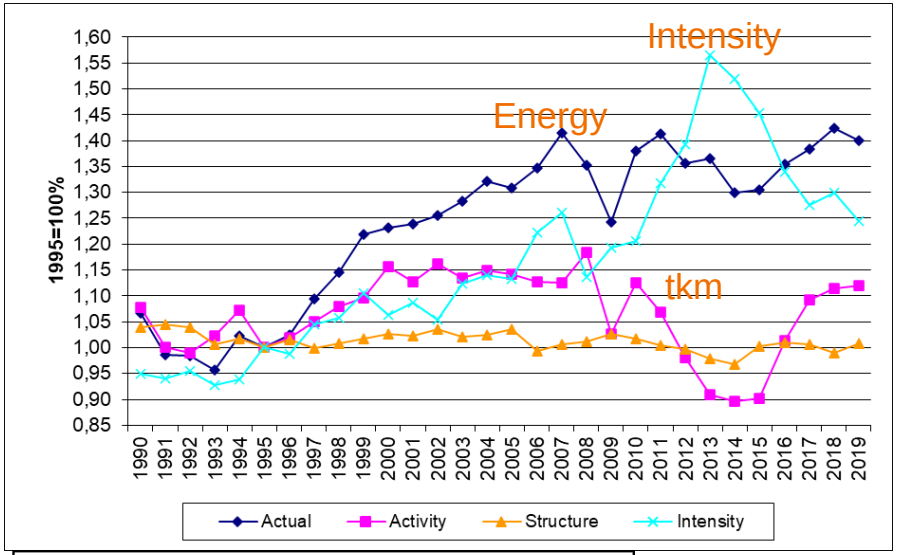
For transport we ended to a big question ”why”

Domestic passenger transport in Finland



Activity: total passenger-km
Structure:modal passenger-km/total passenger-km
Intensity: modal energy/modal passenger-km

Domestic transport of goods in Finland



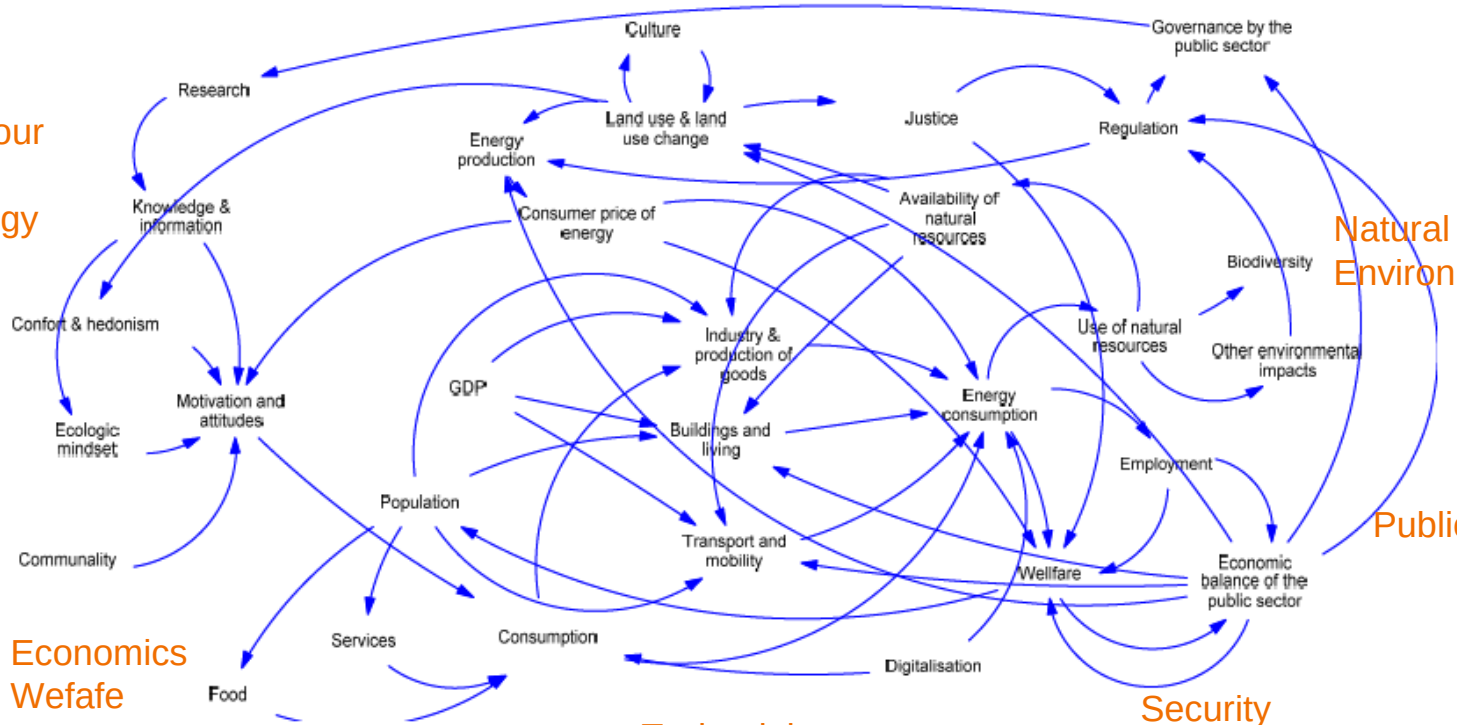
Activity: total tkm
Structure:modal tkm/total tkm
Intensity: modal energy/modal tkm

Dynamics behind energy consumption
Example from less than one hour discussion

Justice

Social change
Policy change

Energy behaviour
Energy culture
Collective energy



Natural resources
Environment

Public sector

Economics
Wefafe

Technolgies

Security
Resilience

Key takeaways for energy demand reduction

1. Existing policies and measures are not enough. However, the development of demand sectors look different.

2. Energy crises have evidenced that energy demand reduction is possible, and people tend to use multiple strategies.

3. Finding deep leverage points is difficult for demand reduction due to complex system dynamics with feedbacks.

4. We need interdisciplinary research with multiple methods, new data, etc. for both ex-post and ex-ante analysis.

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