

Informing and influencing urban planning processes through LCA of the total household consumption basket

Christian Solli¹, Håvard Bergsdal¹, Rolf Andre Bohne²

¹MiSA – Miljøsystemanalyse - www.misa.no

²Norwegian University of Science and Technology

Background

- Global emissions are increasing
- Also for industrialized countries emissions (footprint) per capita are increasing
- Efficiency gains are outweighed by volume effects
- How can we try to tackle this?

Background II

- Research project "Towards carbon neutral settlements – processes, concept development and implementation"
 - Centered around the Brøset-area in Trondheim, Norway
 - Total area suitable for 1200-3000 housing units
 - Main partners:
 - ✓ Faculty of Architecture and Fine Arts, NTNU
 - ✓ Faculty of Engineering Science, NTNU
 - ✓ Faculty of Arts, NTNU
 - ✓ SINTEF Building and Infrastructure
- MiSA and Spaceape (SE) as subcontractors

**Focus on technology, planning
and process**

Background III

- Research group recommended focus on total consumption basket, not just energy and transport
- The planning program from the municipality clearly states that *”the total carbon emissions per person should be shown through calculation of probable carbon footprints”*
- Reformulation of ”carbon neutral” as % reduction required to reach 2 degree target.
- 3 tonnes per capita per year (HH consumption)

Parallell planning competition

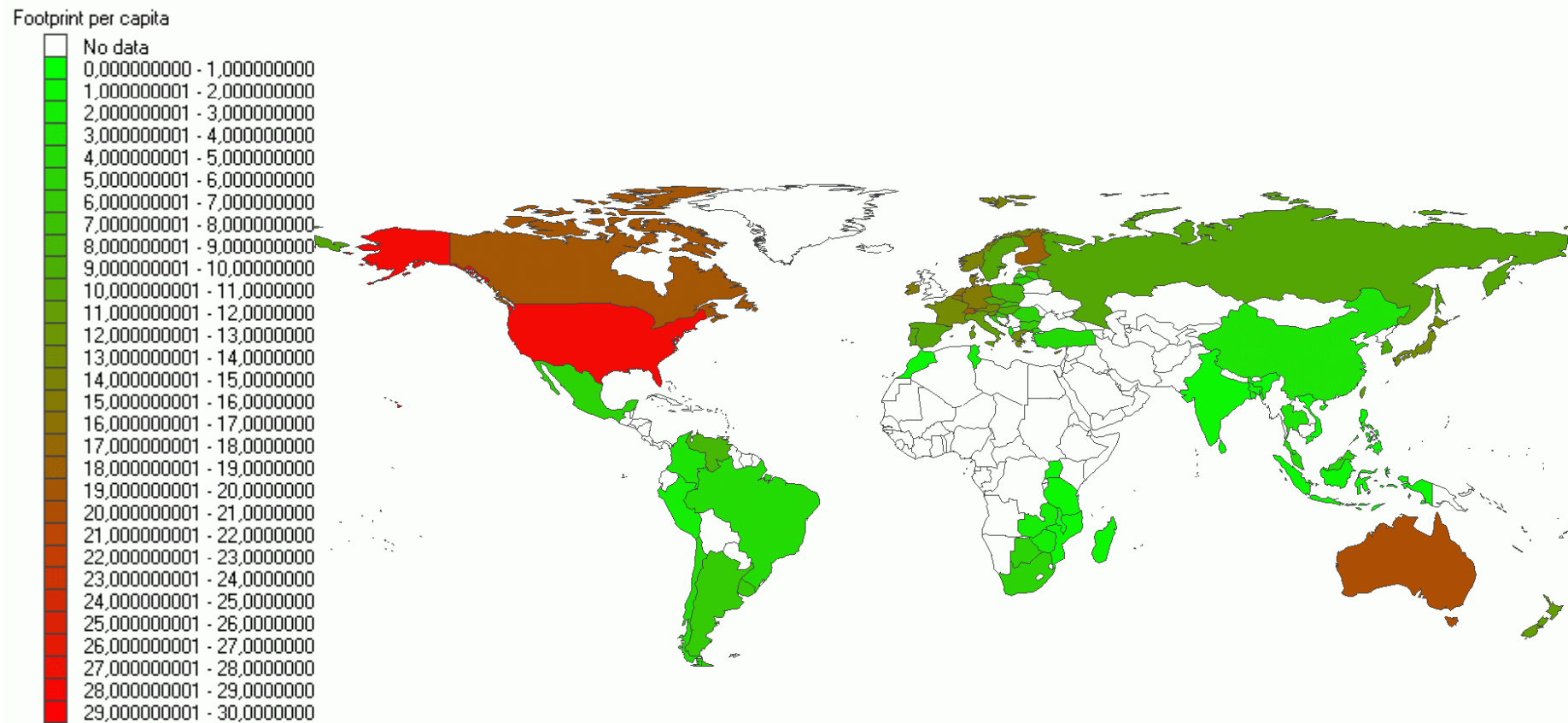
- 4 teams in parallell
- Challenge: How can city form and architecture influence consumption and life style?
- Help:
 - ✓ Information, what causes emissions?
 - ✓ Estimation tool for effects including rebound effect
- But the challenge of influencing behavior is still up to the teams alone

What causes emissions

- Input-output models connected to survey of consumer expenditure
- Cover the entire economy, ensures consistency between bottom-up and top-down
- Aggregated
- Allows imports to be treated in better detail
- Electricity modified to "consensus mix"

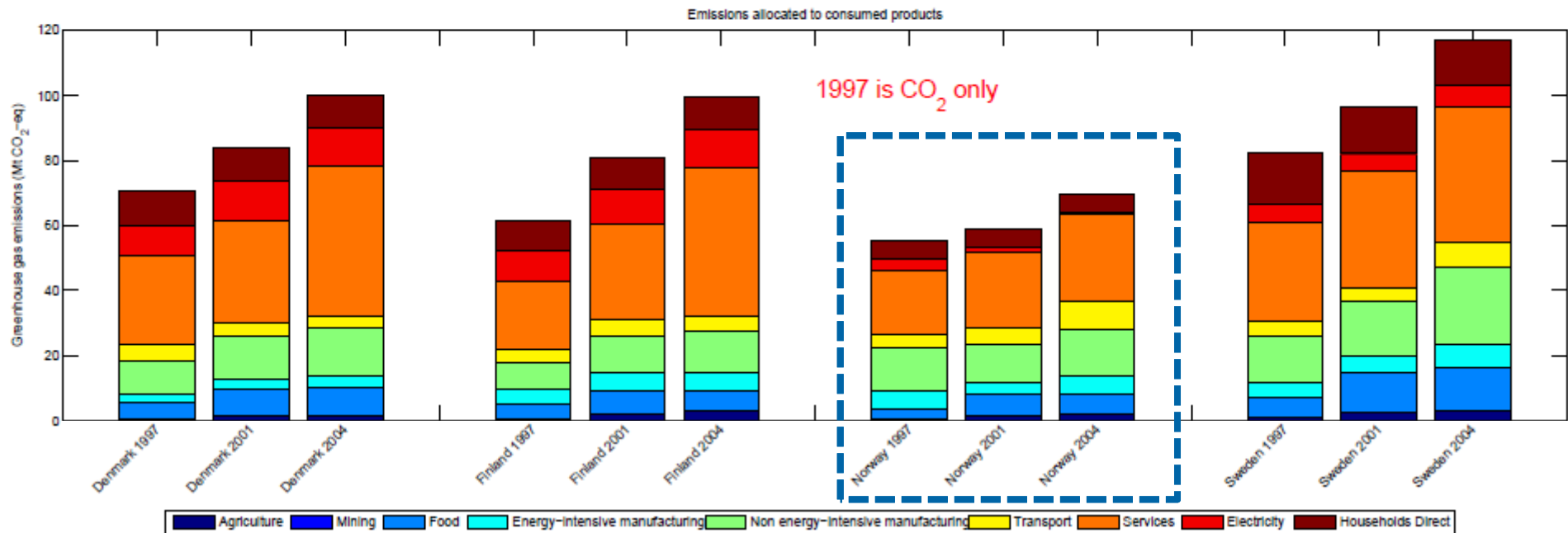
The global picture

- www.carbonfootprintofnations.com



Nordic footprints

- Territorial emissions stabilizing, footprint **increasing**

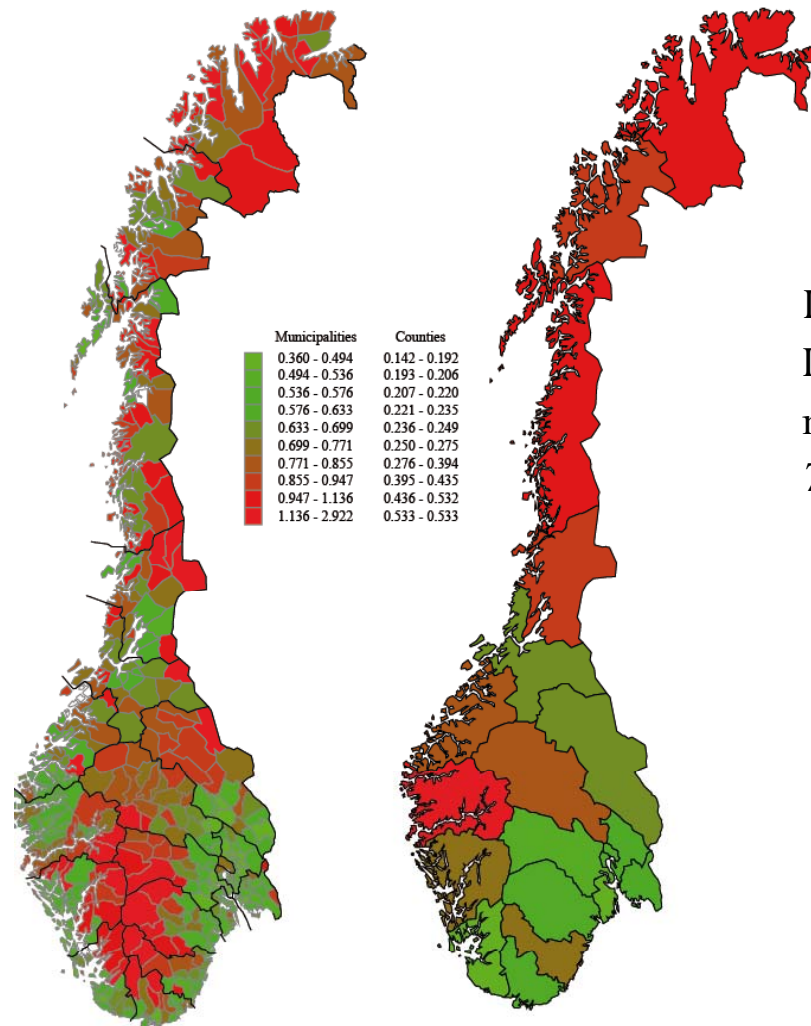


Global carbon footprints

Methods and import/export corrected results from the Nordic countries in global carbon footprint studies

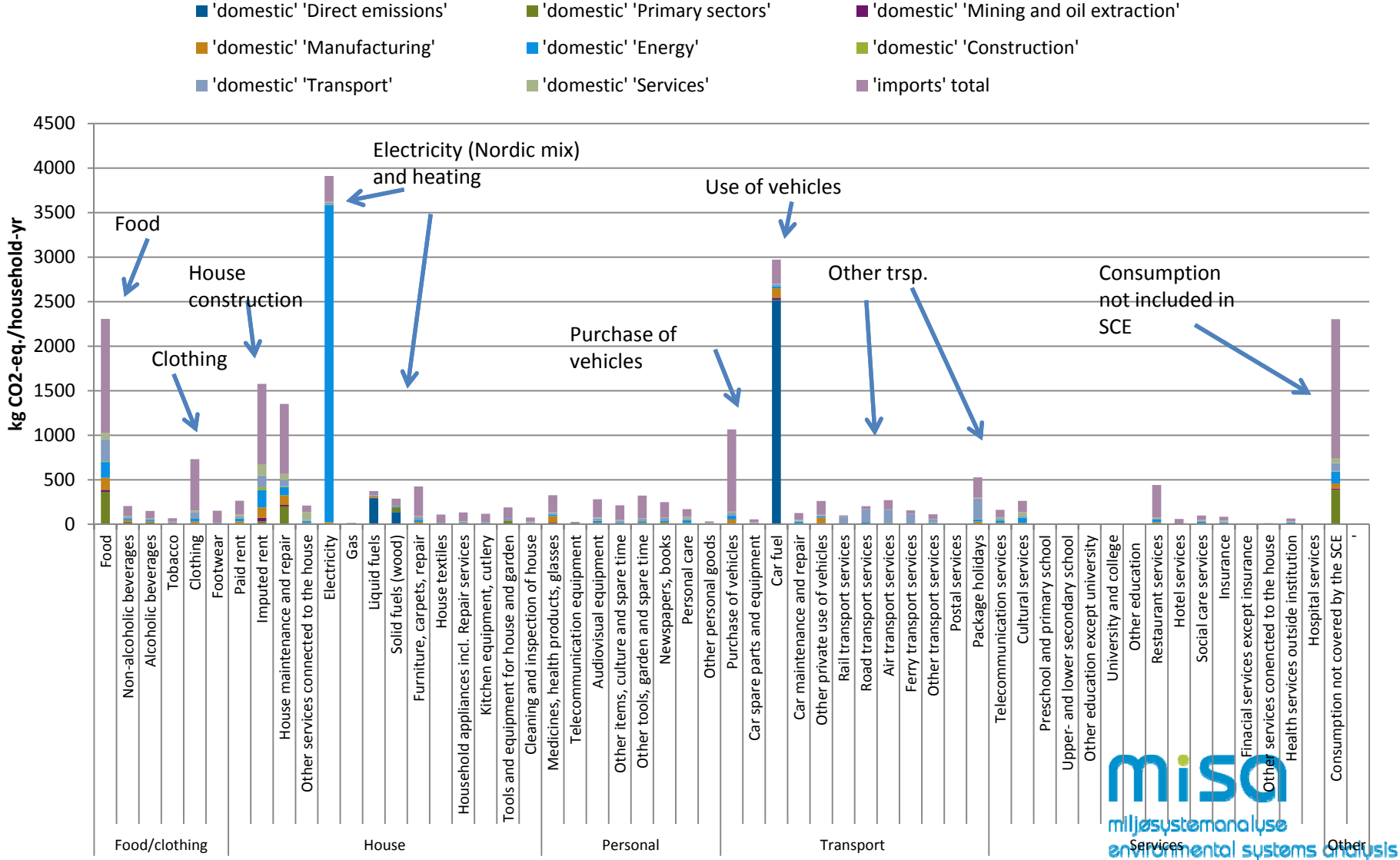
Glen Peters and Christian Solli

Regional level (only municipal services)

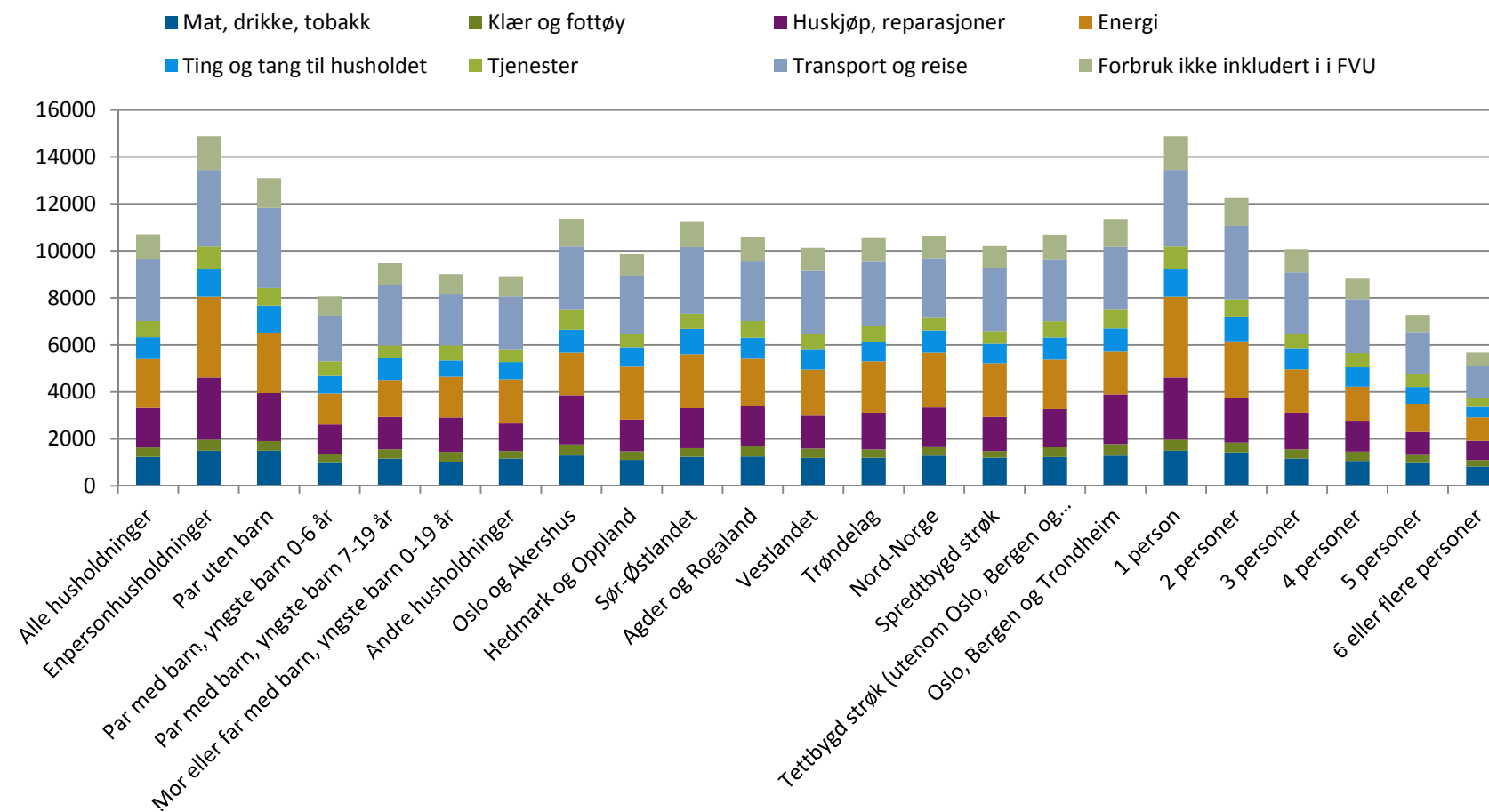


Larsen, H. N. and E. G. Hertwich. 2010.
 Identifying important characteristics in
 municipal carbon footprints. *Ecological Economics*
 70(1): 60-66.

Household level (from model developed in this project)



Household level (household types)



Estimation tool

- Problem: Completeness vs specificity
- Using the 2- and 3 digit COICOP categories
- Low resolution on construction etc.
- Justification column
- Enables rebound effect, and ensures completeness

Estimation tool, screenshot

Evalueringskalkulator	Utslipp, snitthusholdning	Endring forbruksvolum	Endring i utslippsintensitet	Beregnet utslipp	Kommentar	Kommentar fra fagpanel	Justert av eksperter		Beregnet utslipp
Forbruks-kategorier	kg CO2-ekv.	% økning eller reduksjon i kroner forbrukt	% økning eller reduksjon i utslipp per krone	kg CO2-ekv.	Begrunn valget innen hver kategori	Evaluer realismen i egenrapporteringen	% økning eller reduksjon i kroner forbrukt	% økning eller reduksjon i utslipp per krone	
Matvarer	2 307	0 %	0 %	2 307			0 %	0 %	2 307
Alkoholfrie drikkevarer	205	0 %	0 %	205			0 %	0 %	205
Alkoholholdige drikkevarer	150	0 %	0 %	150			0 %	0 %	150
Tobakk	68	0 %	0 %	68			0 %	0 %	68
Klær og fottøy	884	0 %	0 %	884			0 %	0 %	884
Avdrag og renter bolig	1 842	0 %	0 %	1 842			0 %	0 %	1 842
Vedlikehold og reparasjon av bolig	1 352	0 %	0 %	1 352			0 %	0 %	1 352
Andre tjenester knyttet til bolig	211	0 %	0 %	211			0 %	0 %	211
Elektrisitet	3 912	0 %	0 %	3 912			0 %	0 %	3 912
Gass	13	0 %	0 %	13			0 %	0 %	13
Flytende brensel	374	0 %	0 %	374			0 %	0 %	374
Fast brensel	288	0 %	0 %	288			0 %	0 %	288
Møbler, tepper og reparasjoner, boligtekstiler	535	0 %	0 %	535			0 %	0 %	535
Husholdningsapparater, inkl. reparasjon, Kjøkkenutstyr, glass, dekketøy, Verktøy og utstyr for hus og hage	441	0 %	0 %	441			0 %	0 %	441
Rengjøring og ettersyn i bolig	76	0 %	0 %	76			0 %	0 %	76
Legemidler, helseartikler, briller	326	0 %	0 %	326			0 %	0 %	326
Helsetjenester utenom institusjon, sykehustjenester	69	0 %	0 %	69			0 %	0 %	69
Kjøp av egne transportmidler	1 066	0 %	0 %	1 066			0 %	0 %	1 066
Reservedeler og tilbehør, Vedlikehold og									

How to influence footprint? (selected measures from teams)

- Density (smaller units, lower energy, better public transport)
- Energy demand
- Energy supply (heat and el.)
- Transport (parking, car sharing, electric charging)
- Other shared high quality benefits (e.g. boats, cabins, guest house, large kitchens etc.)
- Quality (access to attractive spaces + +)
- Conflict between density and quality? (low quality → more likely to spend money in more polluting way?)
- Dense + high quality possible?

- Facilitate local service production and -consumption

Results

- Most teams estimate drastic emissions reductions
- All teams overestimate the reductions!

Response from teams

- Holistic perspective:
 - Completely new to them to address the total consumption basket
 - To a larger degree forced to visualize everyday life in the area
- The function of the "tool":
 - Limited evaluation effect due to limited time/ defensible quantitative estimates. "Competition on who makes the most optimistic assumptions".
 - The pedagogical effect in the process seems to have been the most important function
 - Forced to quantify and be concrete, compared to a pre-defined benchmark (not only popular..).

Response from teams

- Rebound effect makes things harder..
- But.. opens up for new creative thoughts on how to reduce emissions
- City form cannot solve all problems, but perhaps influence more than we think?

Thank you for your attention!

Christian Solli

Senior advisor

MiSA – Miljøsystemanalyse

www.misa.no



*a systems perspective to environmental
research and consulting*

www.misa.no