



Consumption based carbon accounting: needs, challenges and possible next steps to guide low GHG consumption

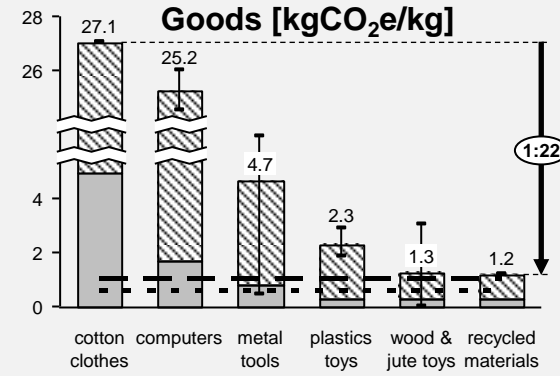
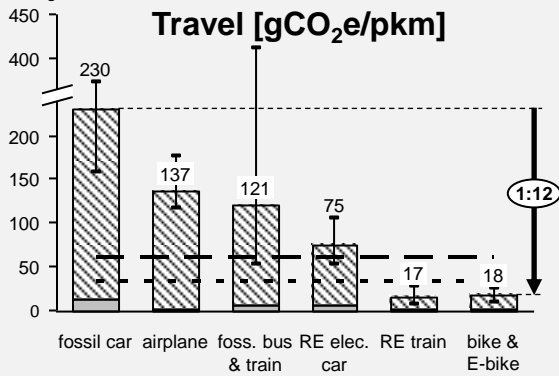
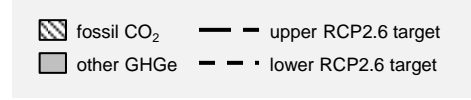
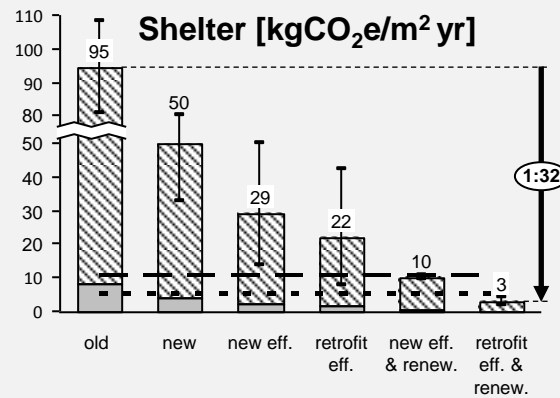
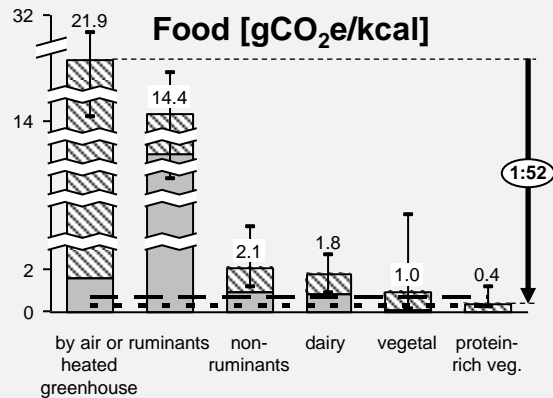
Bastien Girod (PhD, MSc)
Senior Researcher ETH Zurich
Swiss Member of Parliament

CBCA workshop
Cambridge University
7th October 2014

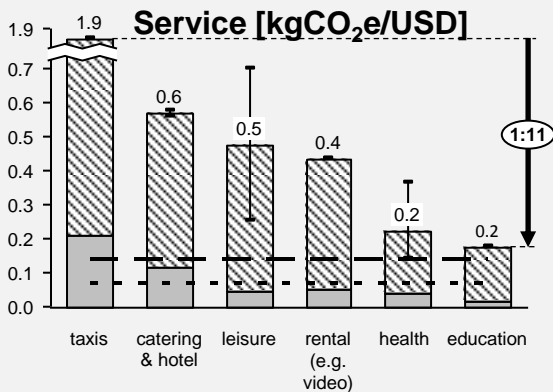
Overview

- **Why do we need CBCA to guide low GHG consumption?**
 - What do we need to guide low GHG consumption?
 - Possible next steps

Results: Low GHG consumption options



Product (nearly) in line with 2 degree climate targets available in all categories



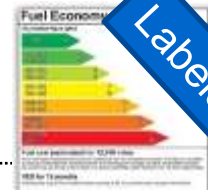
Different barriers hinder adoption of low GHG consumption options ...and are only addressed for options reducing direct emissions.

| Low GHG intensity consumption option | Higher total costs | Against consumer preferences ¹ | Product complexity | Higher CAPEX |
|--------------------------------------|--------------------|---|--------------------|--------------|
| Food | | | | |
| Vegetal food | | ● | ○ | |
| Low GHG meat | | ○ | | |
| Not by air | | ● | ○ | |
| Shelter | | | | |
| Energy efficient building | | | | |
| Low GHG & renew. Energy | | | | |
| Eff. Appliance | | | | |
| Travel | | | | |
| Mode shift | | | | |
| E-mobility | | | | |
| Goods & Services | | | | |
| Re-cycle, re-use | | | ○ | |
| Higher quality | ○ | | ● | ● |
| Energy extensive/ labor intensive | ○ | | ● | |
| Cross-cutting | | | | |
| Made by RE | ● | | ● | |

subsidies

binding targets

innovation incentives



Labels

standards

standards

incentives

● relevant for most products or consumer

○ relevant for some products or consumers

Overview

- Why do we need CBCA to guide low GHG consumption?

- **What do we need to guide low GHG consumption?**

1. Indicate carbon footprint of products

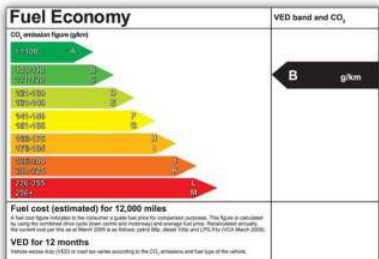
2. Physical consumption units

3. Understand consumption dynamics

- Possible next steps

1. Goal: Indicate carbon footprint of product (or retailer)

1.1. Facilitate product/retailer level carbon footprinting: Require to enable carbon transparency.



→ probably needs to be more than region and sector specific for many products.

Goal:
Rules for retailer to determine emission intensity similar to biofuel regulation.

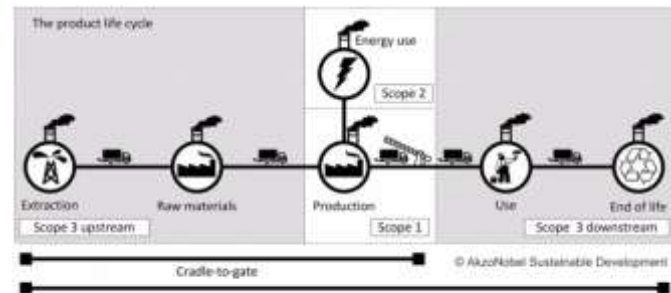


1.2. Identify mitigation potentials: Required to set feasible GHG intensity goals.



Mitigation targets for direct emissions (2021)

Goal:
Inform targets for indirect emissions.



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2. Goal: Physical (not monetary) consumption units

Required to guide consumer and producer.

Consumer perspective

Monetary allocation for assessment of household carbon footprint:

No difference between buying better (e.g. organic, home made) and buying more.

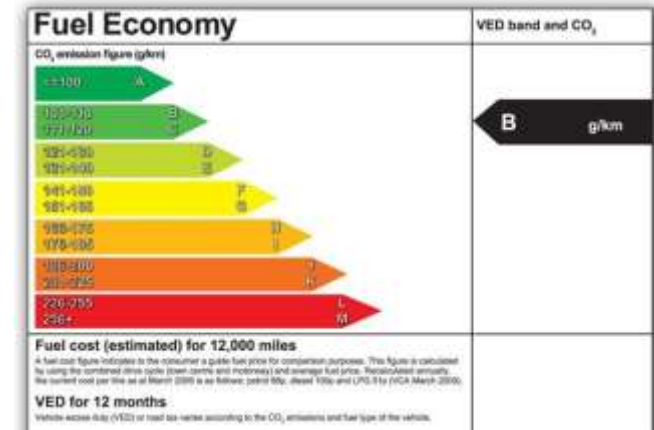
Producer perspective

Monetary unit for GHG intensity target:

Target could be achieved by increasing the price of products



regional and homemade products



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3. Understand consumption dynamics

3.1. Estimate future consumption level:

Required to determine GHG intensity for products.

Girod, van Vuuren & Hertwich 2013 *Environmental Research Letter*.

$$GHGe\ Intensity_{i,2050} = \frac{GHGe\ Target_{2050} \cdot Allocation_i}{Population_{2050} \cdot \underbrace{Consumption}_{Capita}_{i,2050}}$$

3.2. Anticipate rebound effect:

Required as low carbon innovation that reduce cost for households (monetary, time, volume, skill) can increase consumption level compared to consumption-as-usual.



Girod, de Haan & Scholz 2011 Consumption-as-usual instead of ceteris paribus assumption, *Int. J. of LCA*.

Girod, van Vuuren, Deetman 2012 Global travel within the 2 degree climate target. *Energy Policy*.

3.3. Estimate behavioral plasticity:

Required to understand the behavioral mitigation potential.

Girod et al. 2014 *Global Environmental Change*.

Dietz et al. 2009. Household actions to reduce carbon emissions. *PNAS*.

Key challenges:

1. Reduction of air travel.
2. Substitution of ruminant meat
3. Adoption of solar and smart home technologies.

Overview

- Why do we need CBCA to guide low GHG consumption?
- What do we need to guide low GHG consumption?
- **Possible next steps**

Next steps: Address open questions

1. Goal: Indicate carbon footprint of products

- Identify relevant material and processes for product categories (hybridisation)
- Combination with existing data (e.g. purchasing software): Determine additional data need

2. Goal: Physical consumption units

- Food: calories, proteins? Mix of relevant nutrients?
- Goods: kg or product basket? category?
- Service: Can't we simply allocate emission to physical consumption in food, travel, buildings?

3. Goal: Understand consumption dynamics

- Better data on household consumption
 - Physical consumption units
 - Longer time horizon for high impact consumption units

Next steps II: Evaluate exemplary projects

Example: Climate friendly menus for canteens from start-up eaternity



Indicate carbon footprint of products

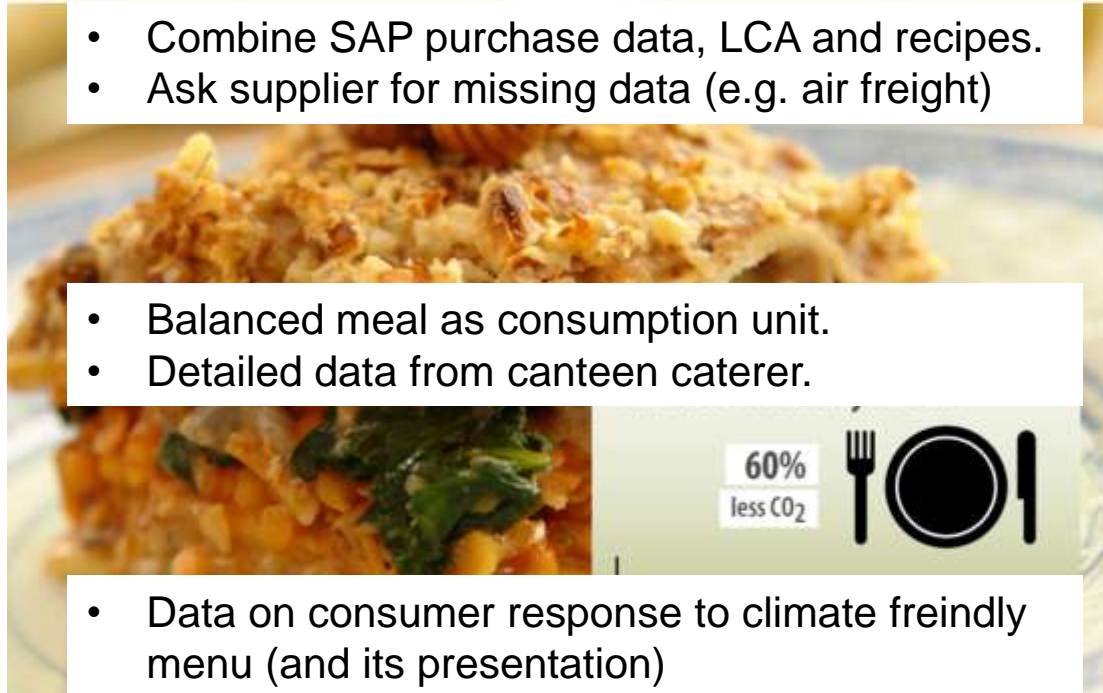
- Combine SAP purchase data, LCA and recipes.
- Ask supplier for missing data (e.g. air freight)

Physical consumption units

- Balanced meal as consumption unit.
- Detailed data from canteen caterer.

Understand consumption dynamics

- Data on consumer response to climate friendly menu (and its presentation)



Thank you for your attention

Cited publications:

- Dietz, Gardner, Gilligan, Stern, Vandenberg (2009) Household actions can provide a behavioral wedge to rapidly reduce US carbon emissions. *Proc. Natl. Acad. Sci. U. S. A.* 106, 18452–6.
- Girod, van Vuuren, Hertwich (2014). Climate policy through changing consumption choices: Options and obstacles for reducing greenhouse gas emissions. *Global Environmental Change*.
- Girod, van Vuuren, Hertwich (2013) Global climate targets and future consumption level: an evaluation of the required GHG intensity. *Environ. Res. Lett.* 8, 014016.
- Girod, van Vuuren, Deetman (2012) Global travel within the 2 degree climate target. *Energy Policy*, 45, 152–166.
- Girod, Haan, Scholz (2011). Consumption-as-usual instead of ceteris paribus assumption for demand Integration of potential rebound effects into LCA, *International Journal for LCA* 3–11.
- Girod, de Haan (2010). More or Better? A Model for Changes in Household Greenhouse Gas Emissions due to Higher Income. *Journal of Industrial Ecology*, 14(1), 31–49.

Consumption based strategies have high mitigation potential

IPAT for GHG emissions:

$$\underbrace{GHG_{emissions}_i}_{Impact} = Population \cdot \underbrace{\frac{Consumption_i}{Capita}}_{Affluence} \cdot \underbrace{\frac{GHG_{emissions}_i}{Consumption_i}}_{Technology} \quad i = \{item, category\}$$

Overview on behavioral climate mitigation strategies:

| Consumption oriented | GHG-IPAT variable | Example for car driving (BMW 3s, M3, 204 g CO ₂ /vkm) |
|--|---|---|
| Sufficiency | $\frac{Consumption}{Capita}$ | driving less |
| Better instead of more | $\frac{Consumption}{Capita}$ | more expensive (but not less efficient) car |
| New lifestyle | $\frac{Consumption_{category}}{Capita}$ | shift from travel to local wellness |
| Low GHG consumption (changing patterns) | $\frac{GHG_{emissions}_{category}}{Consumption_{category}}$ | shift to public transport |
| Low GHG consumption (product improvement) | $\frac{GHG_{emissions}_{item}}{Consumption_{item}}$ | <ul style="list-style-type: none"> more efficient variant (BMW 3s, 320d, 109 g CO₂/vkm) more efficient model (BMW i3, 0g CO₂/vkm) |
| Low GHG behaviour (product use) | $\frac{GHG_{emissions}_{item}}{Consumption_{item}}$ | Eco-Drive |

Girod, Hertwich & van Vuuren 2014 *Global Environmental Change*.

Decrease in carbon intensity of new LDV

