

Aalto ARTS – Creative Sustainability
Design Approaches to Sustainable Consumption
7.2.2023



One-Planet Lifestyles

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Michael Lettenmeier



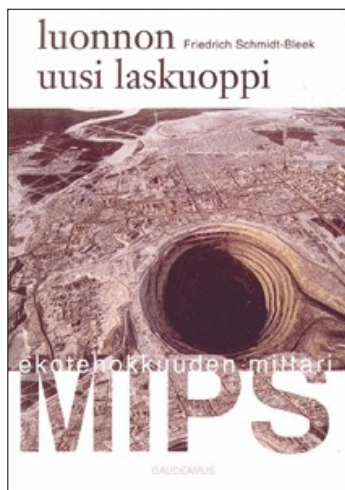
www.d-mat.fi

facebook.com/materialfootprint

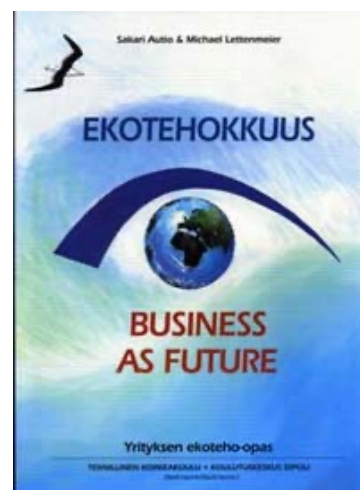
twitter.com/lettenmeier

michael@d-mat.fi

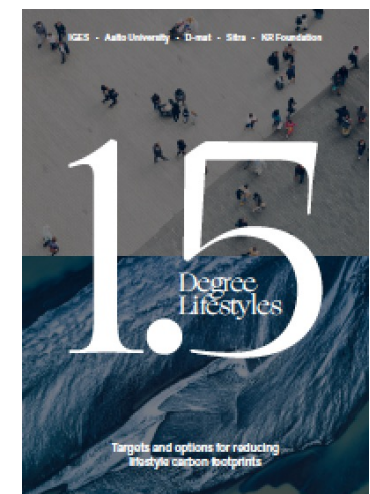
- From Germany to Finland in 1988 and 2010
- D-mat Ltd., Wuppertal Institute, Aalto University
- Consulting, training, research, projects
- Resource-efficiency, Material Footprint, Sustainability
- Companies, authorities, universities, research institutes, NGOs



Lettenmeier



One-Planet Lifestyles



D [e] mat [erialization] – Our Mission

D-mat's goal is to promote a low-carbon and resource-wise life within the limits of one planet.

We want to make people enthusiastic about our sustainable future, instead of reacting to disasters.

Our services are suitable for companies, authorities, research institutes, households, and other actors in society.

Our special expertise is in carbon and material footprint calculations and tools.

1.5

Climate Puzzle



Training & workshops



Consultancy

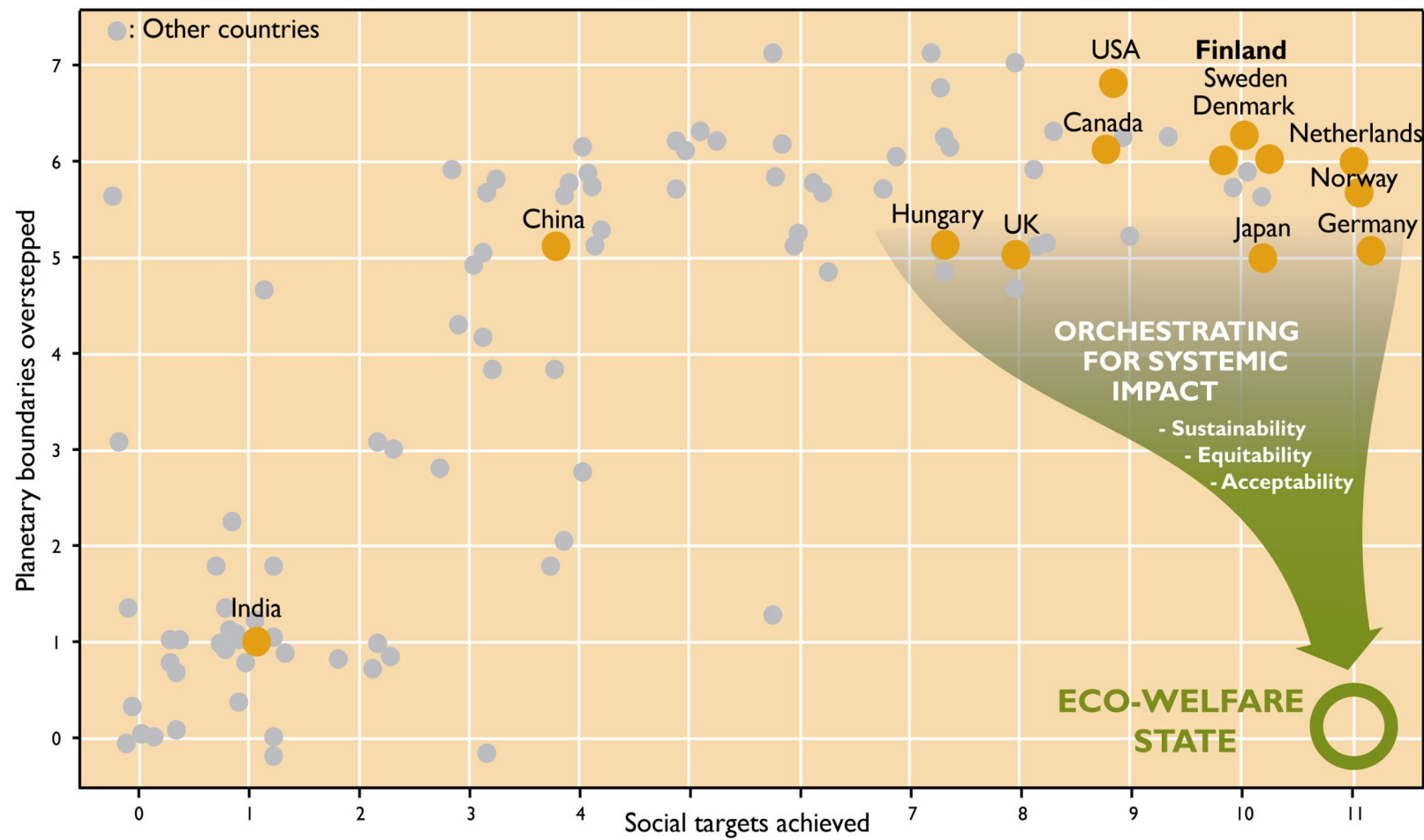


Research



Development projects

No country in the world has achieved high welfare on an ecologically sustainable basis



Modified from: O'Neil et al. 2018, © SYKE & SITRA

www.ecowelfare.fi

One-Planet Lifestyles

– The Sustainable Consumption Challenge



- Overconsumption and the material footprint
- Impacts of consumption domains and consumption patterns
- MIPS and the Material Footprint:
making (over)consumption measurable
- 1.5-Degree Lifestyles
- Assignment and The 1.5-Degree Puzzle

Does anyone remember what happened 28th July 2022?



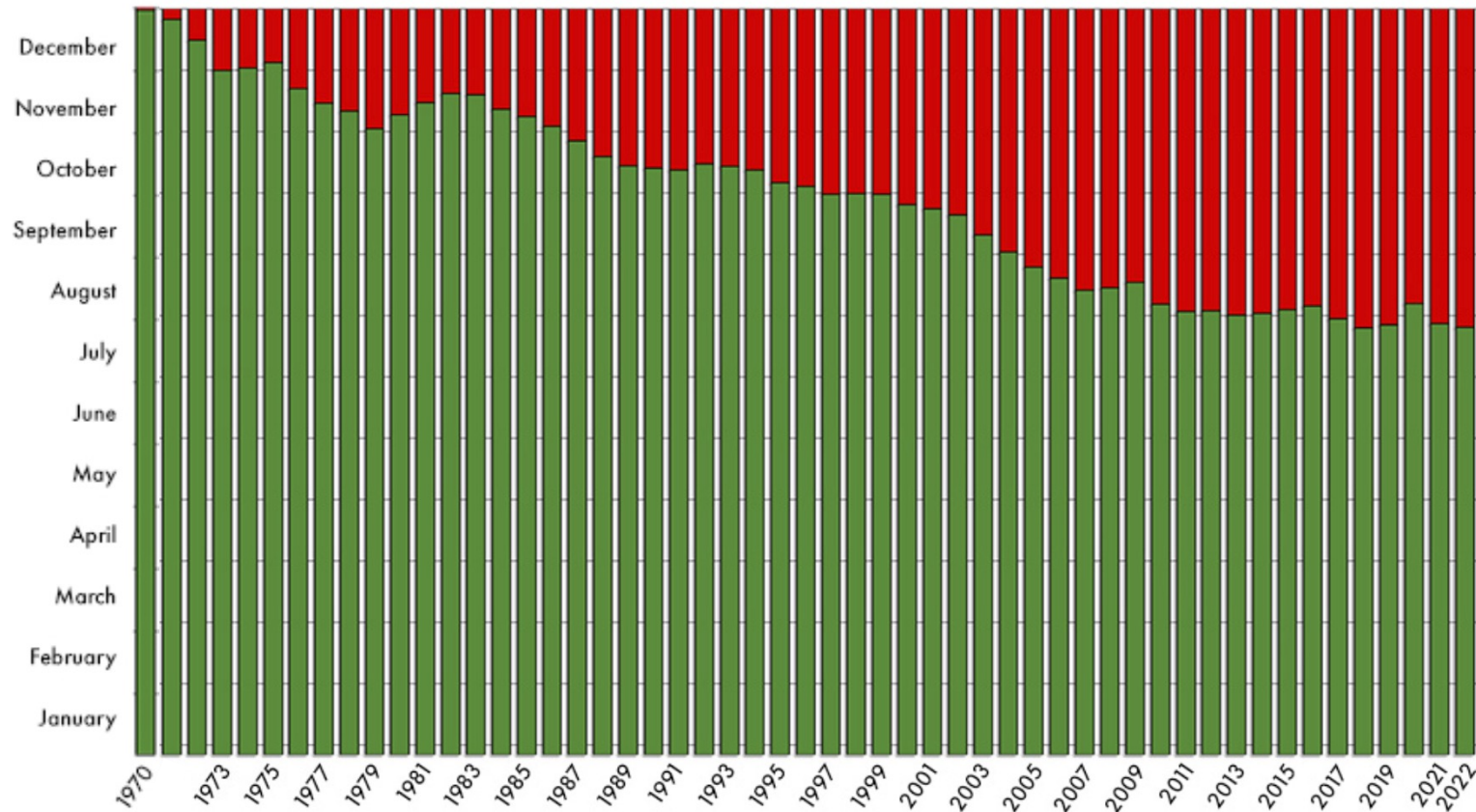


1 Earth

Earth Overshoot Day 1970 - 2022

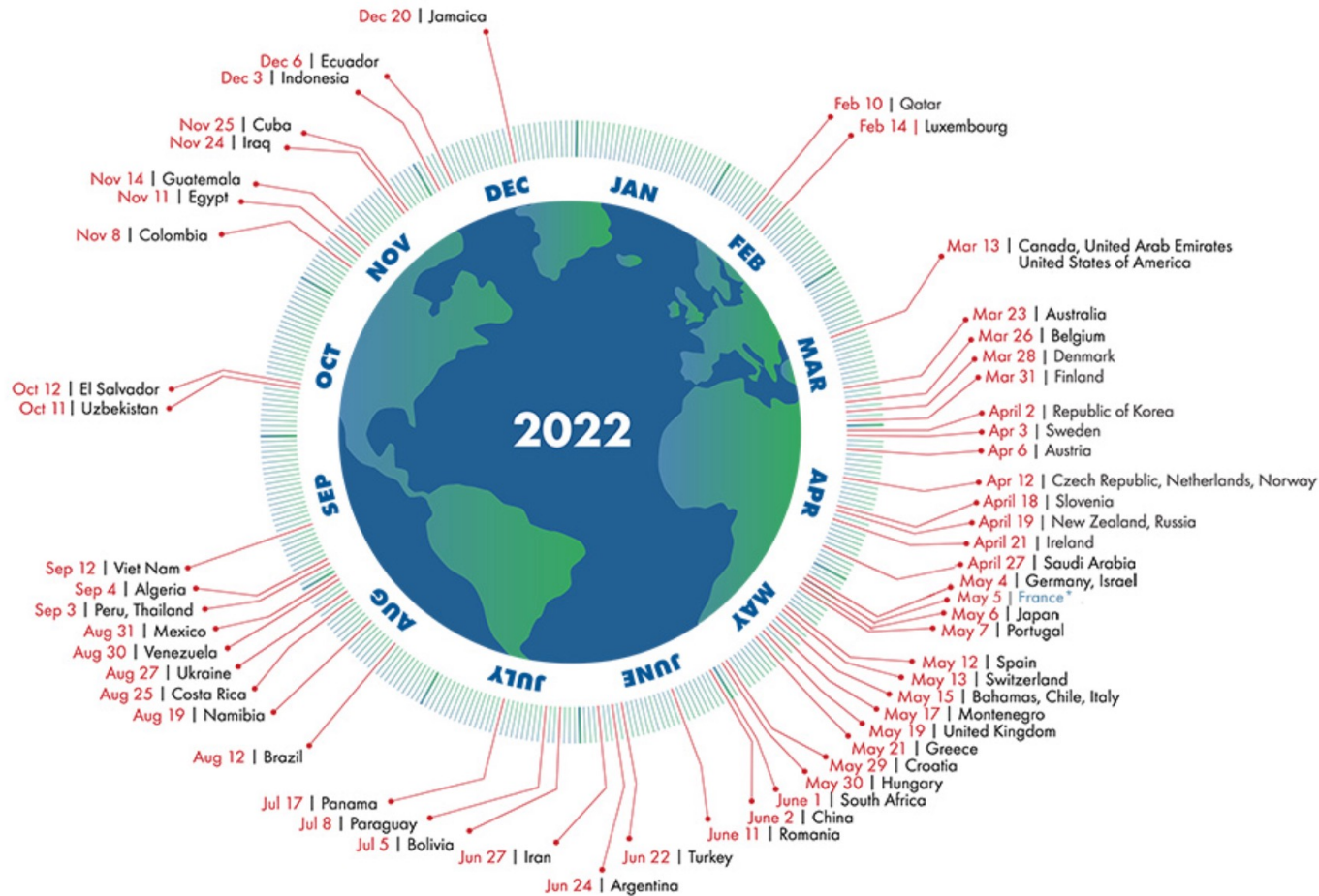


1.75 Earths



Country Overshoot Days 2022

When would Earth Overshoot Day land if the world's population lived like...



For a full list of countries, visit overshootday.org/country-overshoot-days.

*France Overshoot Day updated April 20, 2022 based on nowcasted data. See overshootday.org/france.

Source: National Footprint and Biocapacity Accounts, 2022 Edition
data.footprintnetwork.org



Source: overshootday.org

The slightly bigger sustainability gap

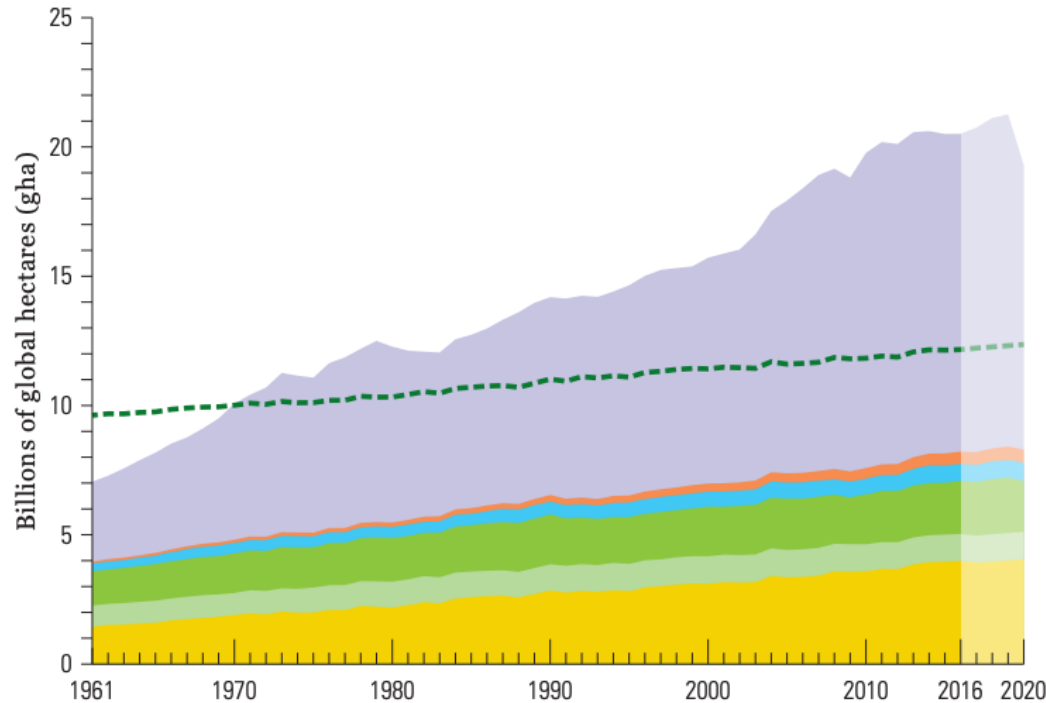


Figure 12: Humanity's Ecological Footprint against Earth's biocapacity in global hectares, 1961-2020
 Global overshoot, starting in the early 1970s, has increased since. The COVID-19 related footprint contraction - in lighter colours from 2016 onwards - is an estimate^{30, 31}.

Key

- Carbon footprint**³⁴ for absorbing emissions from fossil fuel burning and cement production
- Built-up land footprint** for accommodating roads and buildings
- Fishing grounds footprint** for wild and farmed seafood from oceans and freshwater
- Forest product footprint** for fuel wood, pulp and timber
- Grazing land footprint** for meat, dairy, leather and wool
- Cropland footprint** for food, fibre, oil and feed crops, including rubber
- World biocapacity**

Source: WWF, Living Planet Report

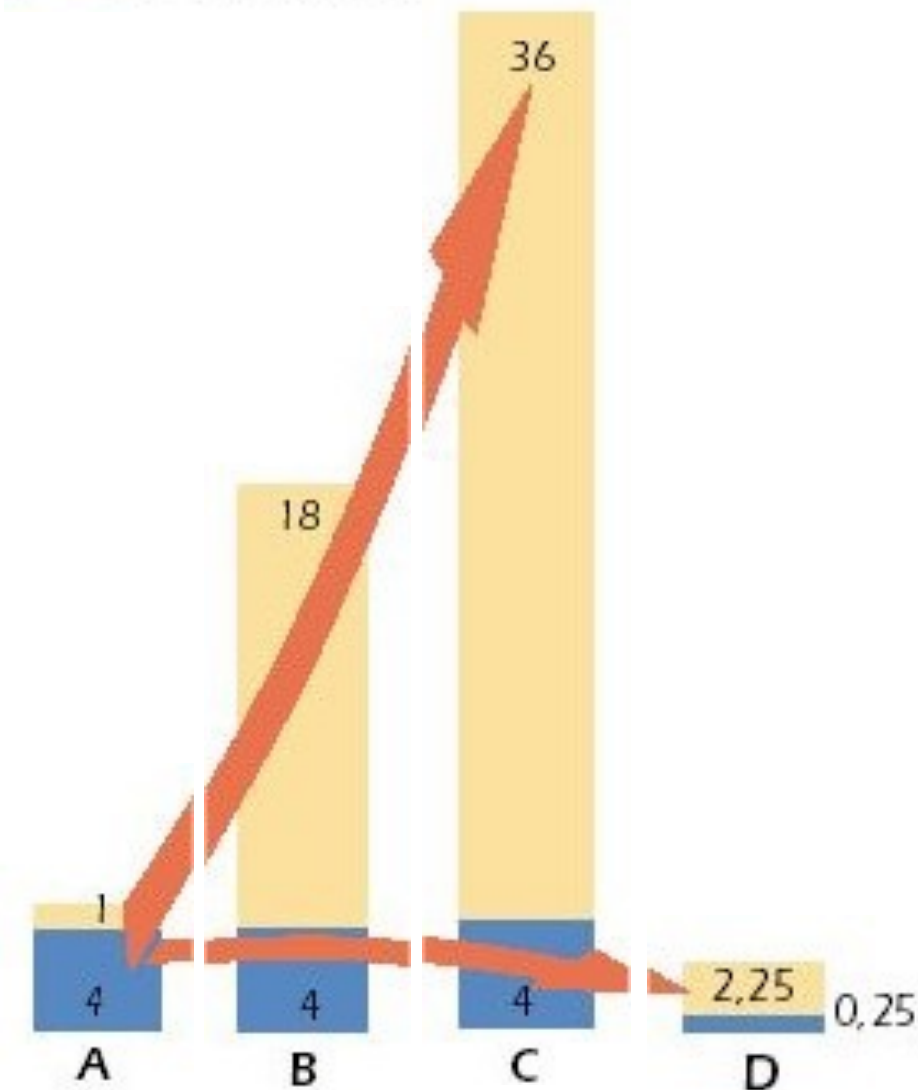
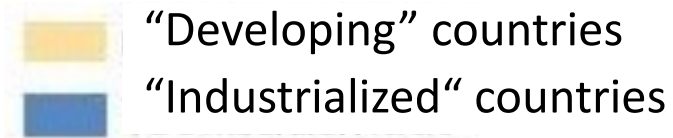
As if we had 4 planets...



"The industrial countries act as if there were several earths available. Thus, without a radical increase in resource productivity there will be no sustainable development."

Schmidt-Bleek (2009): The Earth.

How to achieve sustainability



A = 1990ies

B = Consumption p. cap. in the whole world as in industrialized countries now

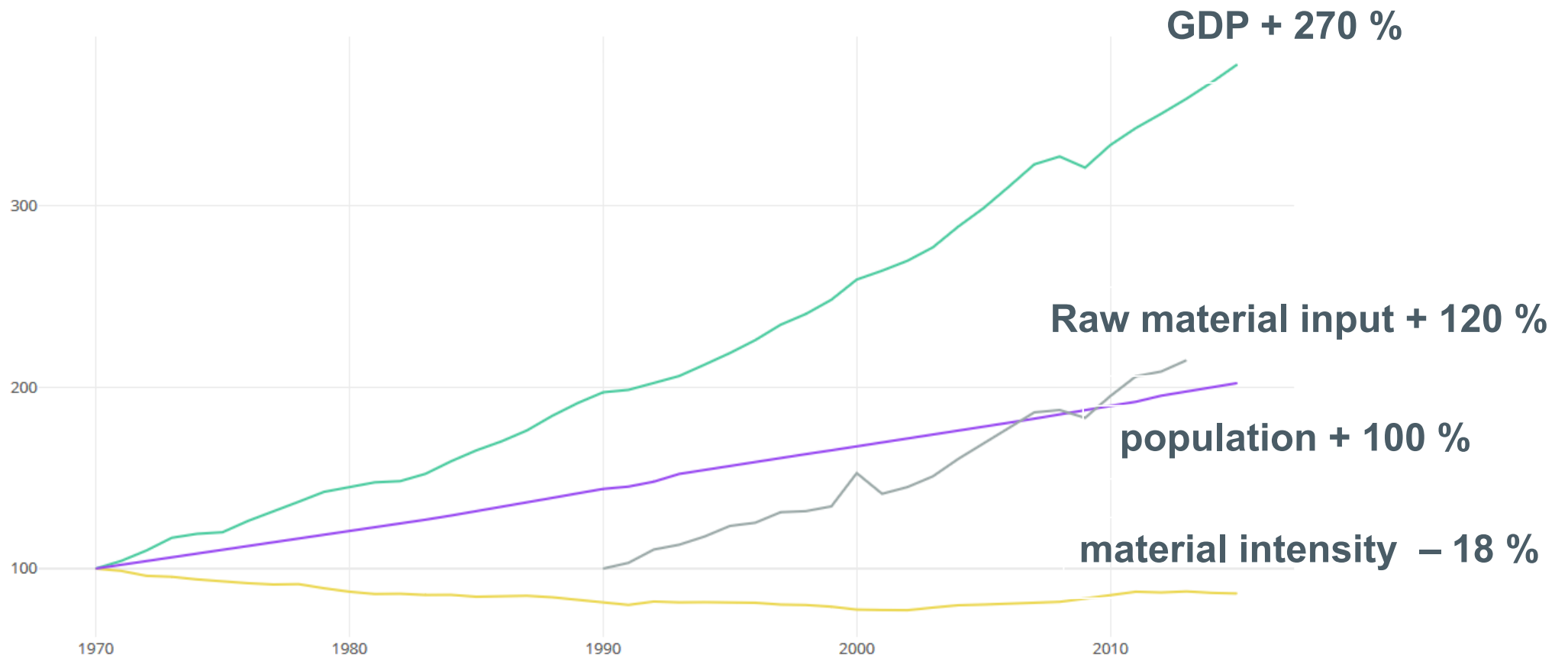
C = Same as B, incl. growing population

D = Halving global resource consumption, doubling global welfare

=> Resource productivity!

Trends since 1980

1980 – 2017



Source: www.materialflows.net, SERI

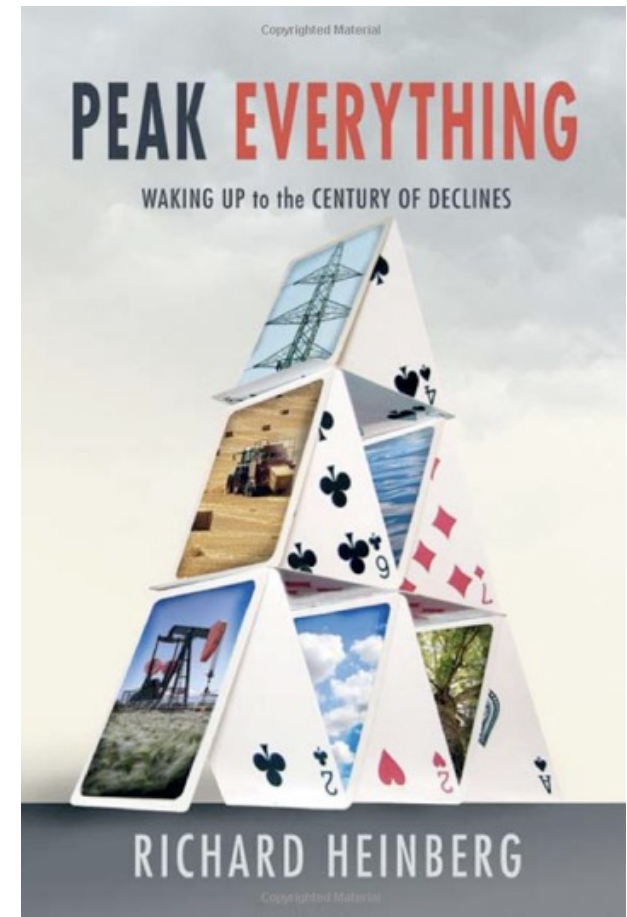
Rising and fluctuating raw-material prices: Reuters Commodity Cash Index 1973 – 2020



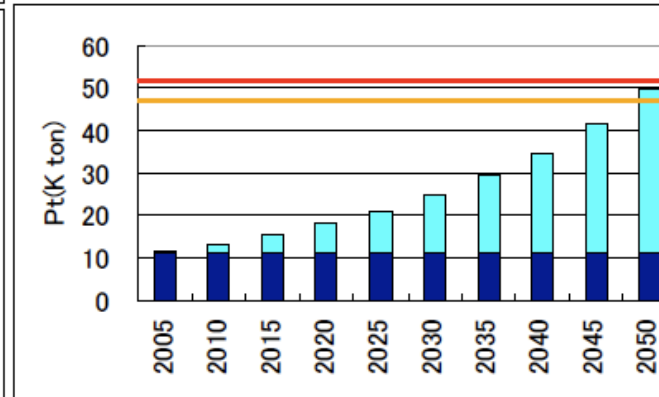
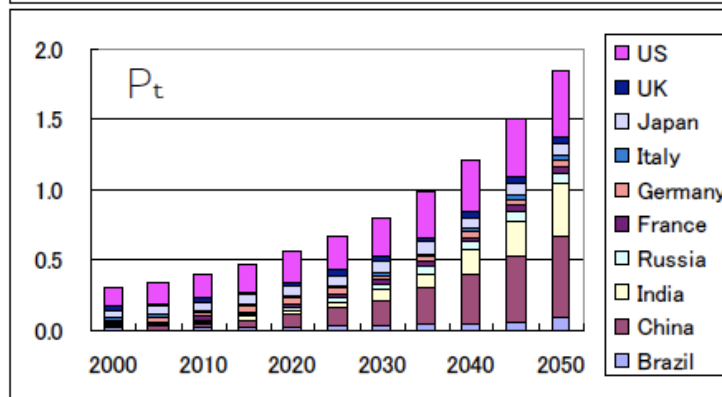
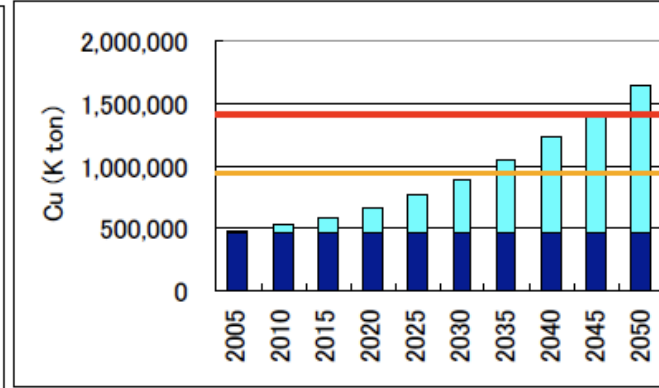
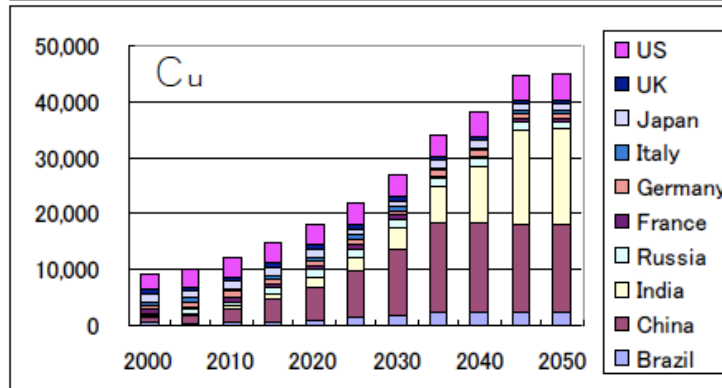
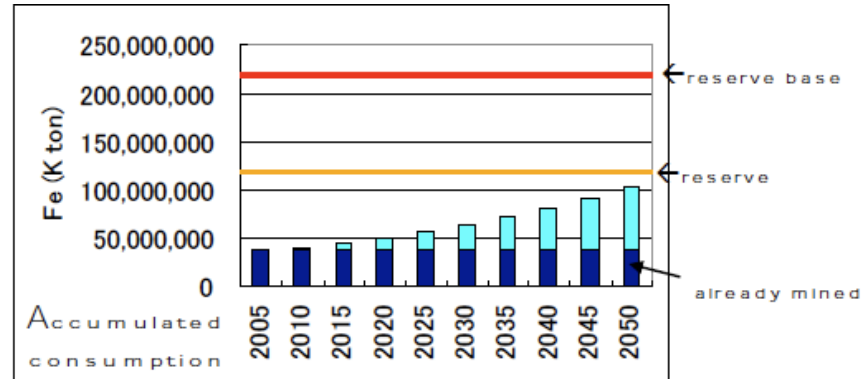
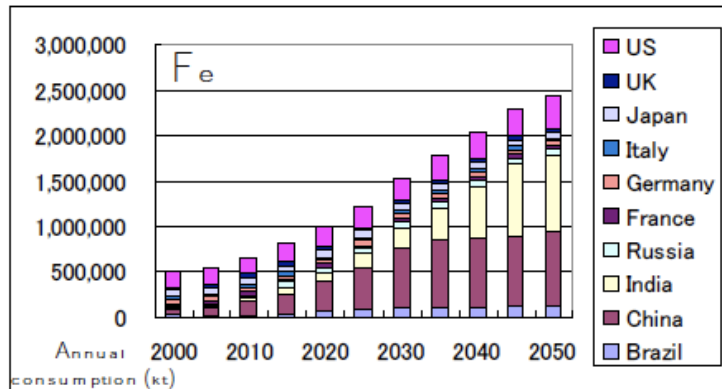
Era of abundance has gone



- Peak Oil
- Peak Corn
- Peak Gas
- Peak Soil
- Peak Water
- Peak Electricity
- Peak Rice
- Peak Metal

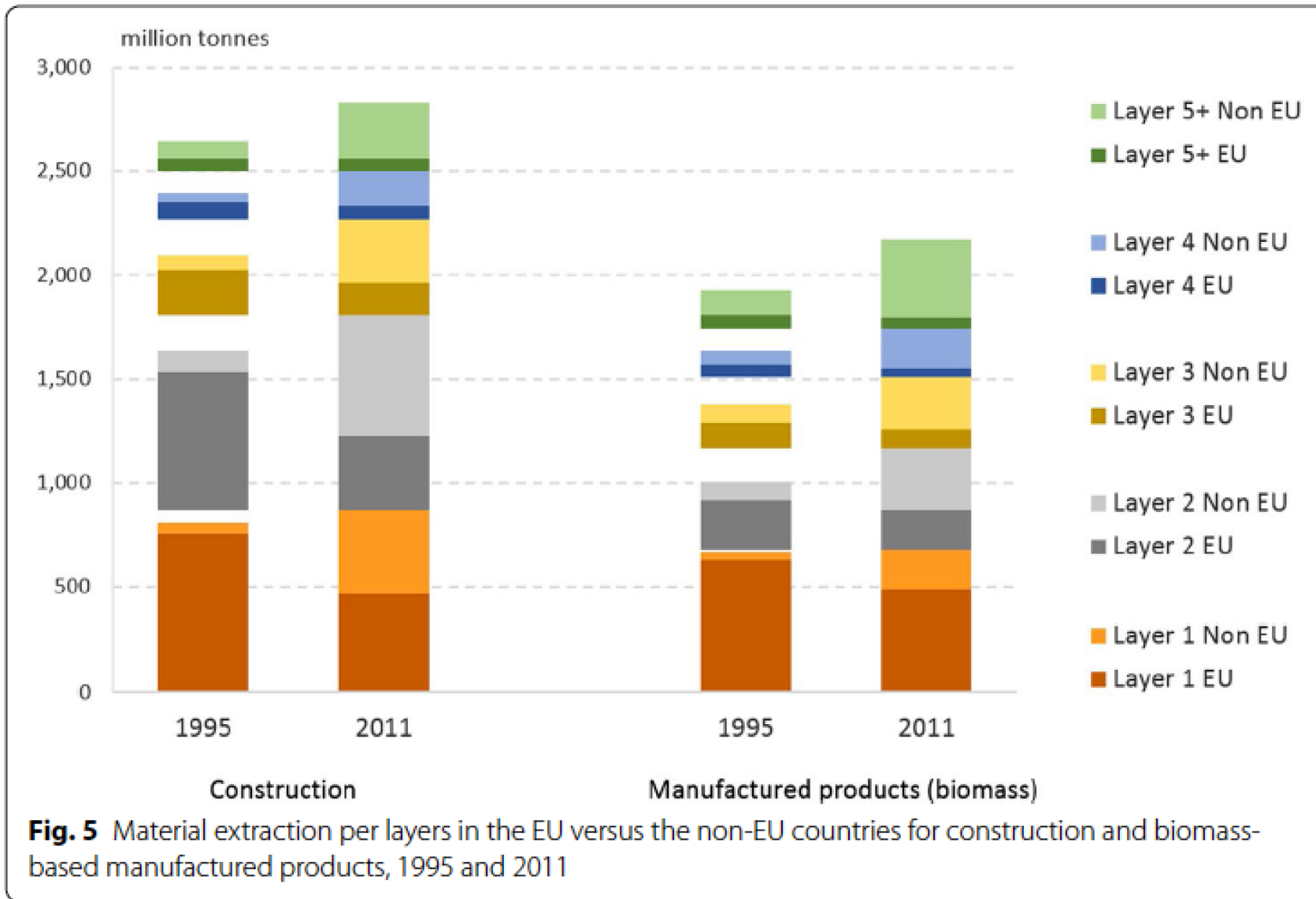


Metal consumption and reserves



Source: Dr. Halada, National Institute of Material Science, Japan

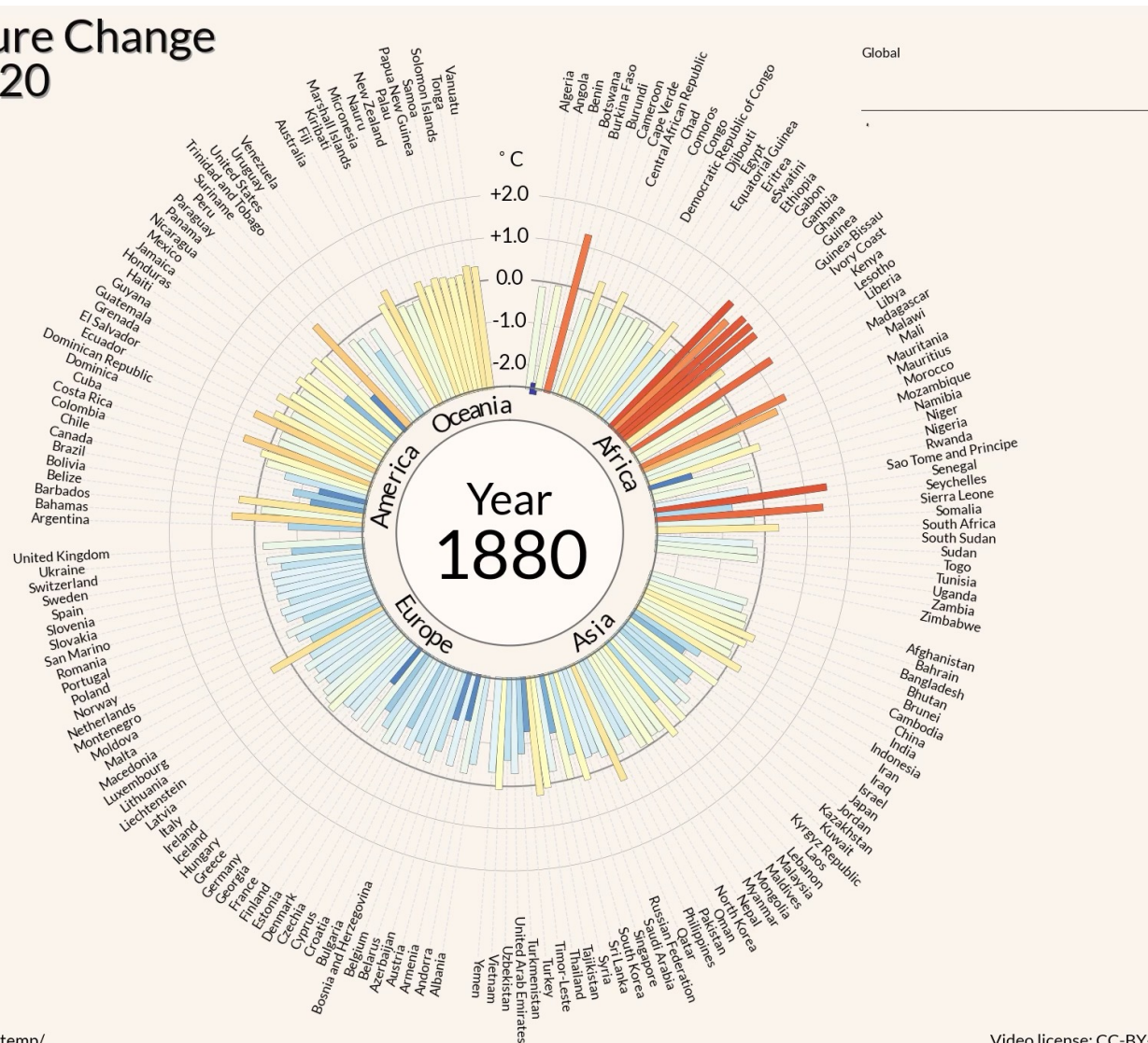
EU outsourcing material use



Lähde: Giljum ym. 2016, Journal of Economic Structures 5(1), 1-24

The world as we know it?

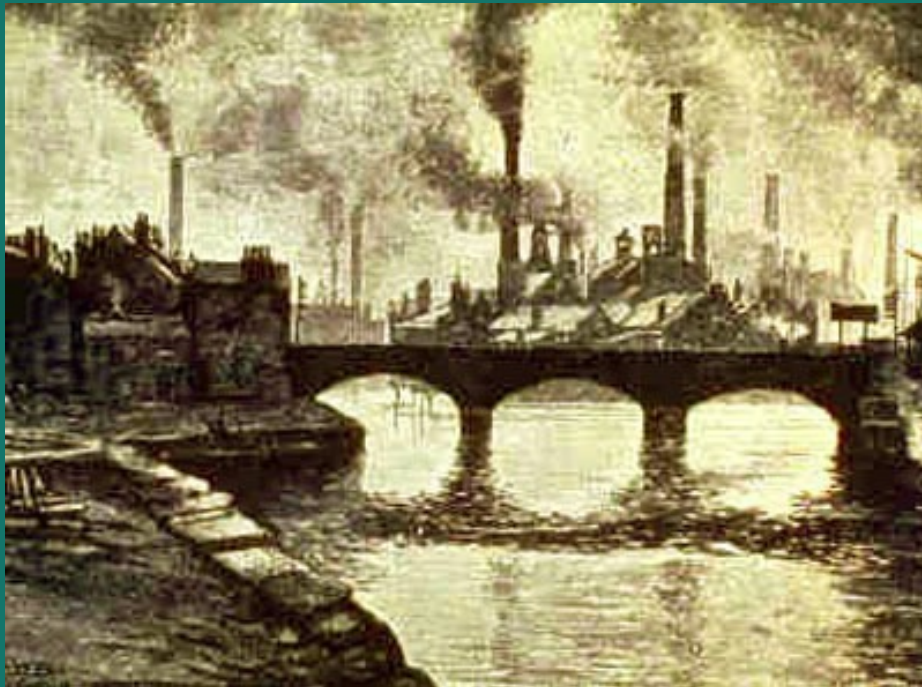
Temperature Change 1880 - 2020



Data source:
NASA GISTEMP
<https://data.giss.nasa.gov/gistemp/>
Temperature anomaly base period 1951-1980.

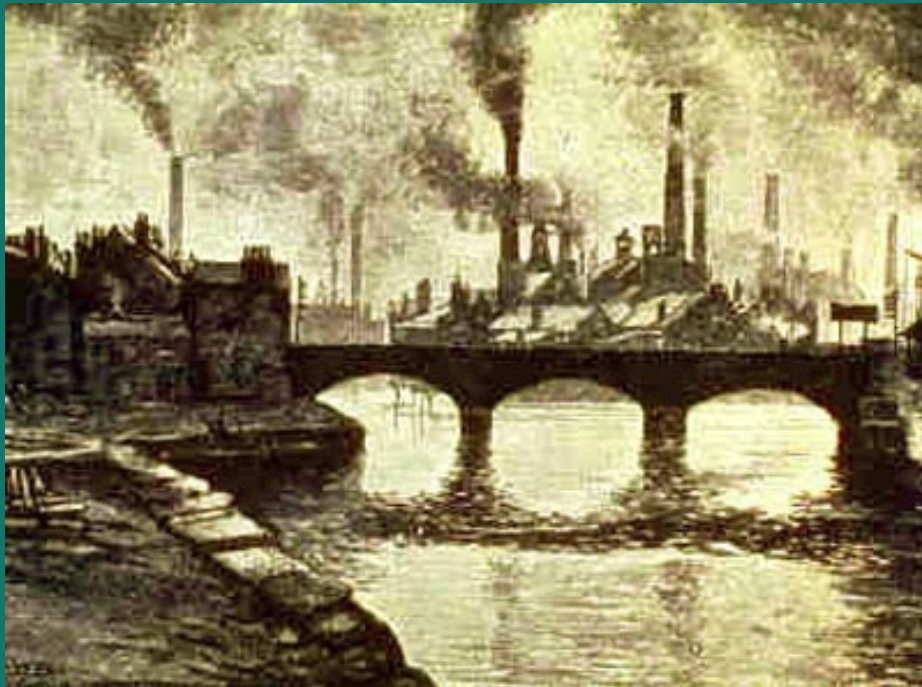
Video license: CC-BY-4.0
Antti Lipponen (@anttilip)

One of the biggest lifestyle changes we know



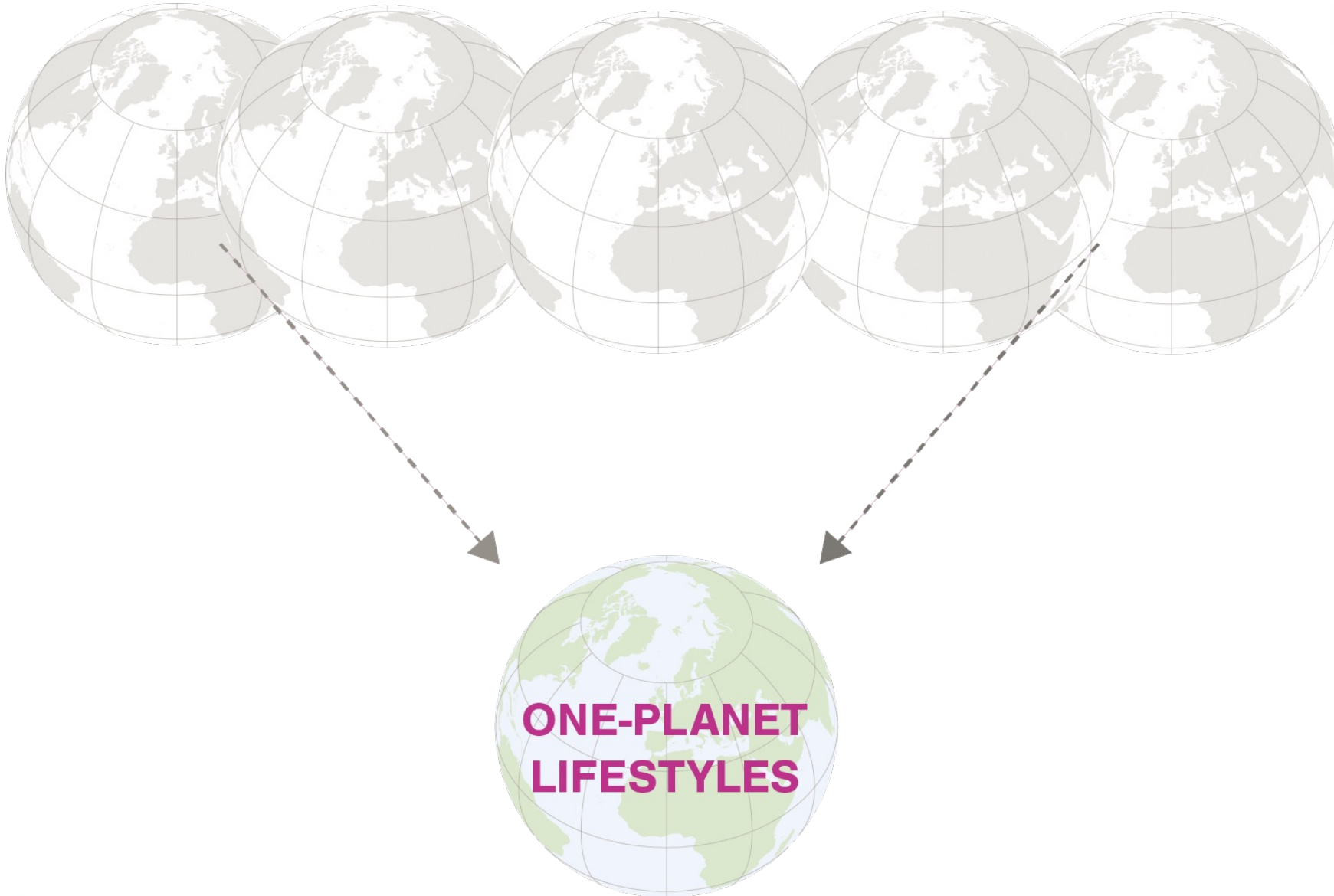
Citizendigital.org

One of the biggest lifestyle changes we know

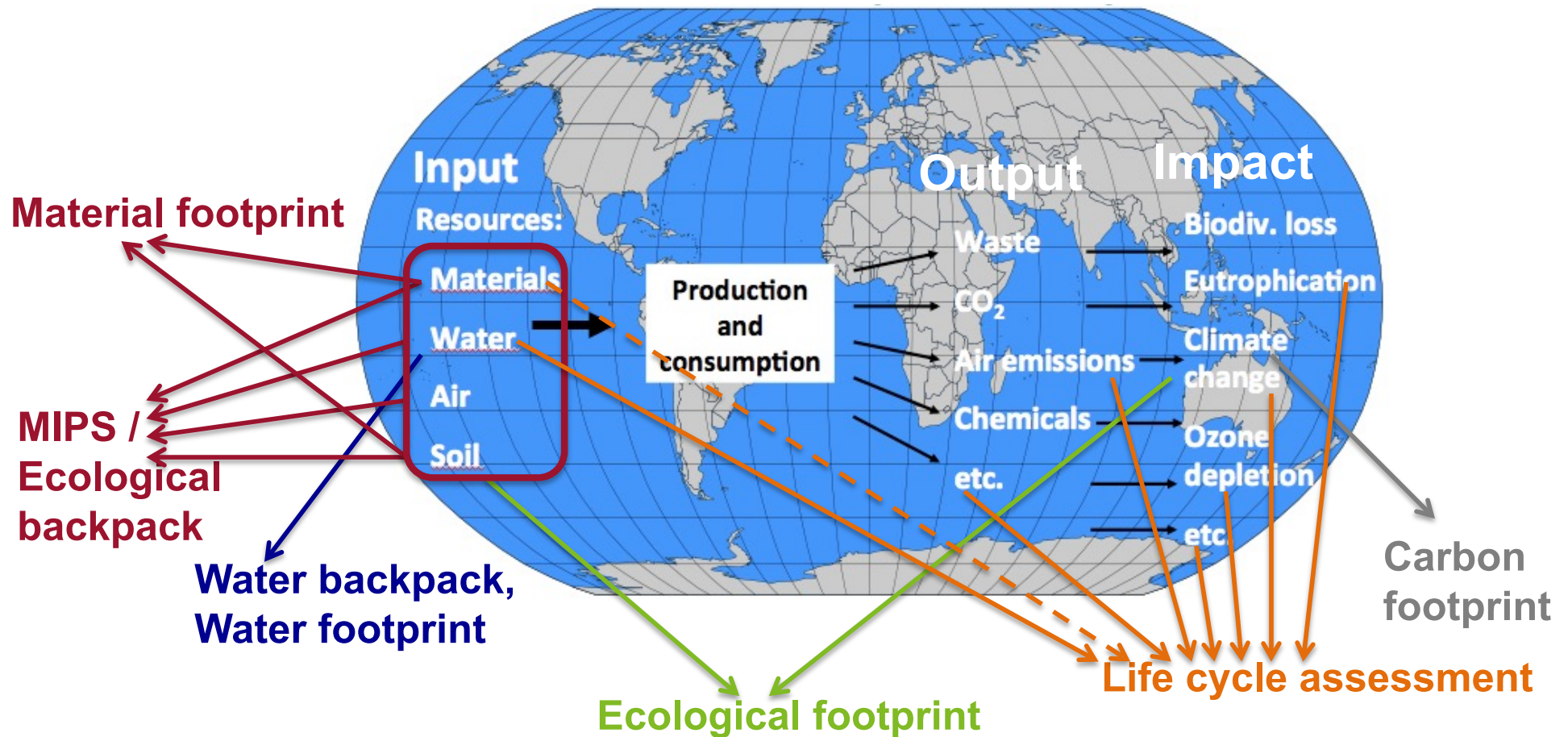


– by design or by disaster?

Lifestyle Material Footprint from 40 tonnes to 8 tonnes



Life Cycle impacts - What to quantify?



Measuring resource use

Material Footprint

Material footprint

= ecological backpack

Invisible burden any product carries

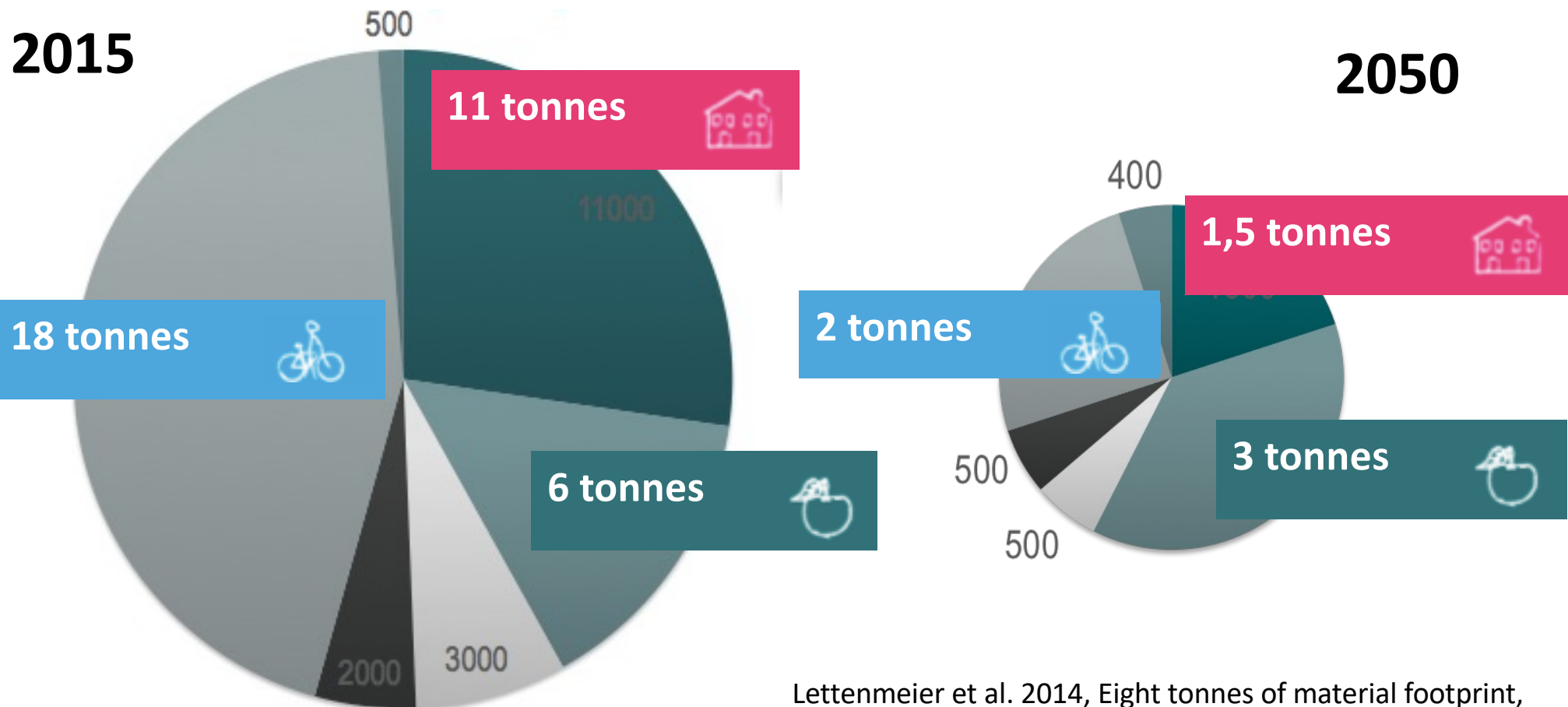
- Non-renewable material resources
+ renewable material resources
+ top soil erosion in agri-/silviculture
- Holistic, though rough indicator
- Sufficient, input-based indicator
although not addressing individual
environmental problems

Schmidt-Bleek 1993, Schmidt-Bleek 2009,
Lettenmeier et al. 2009



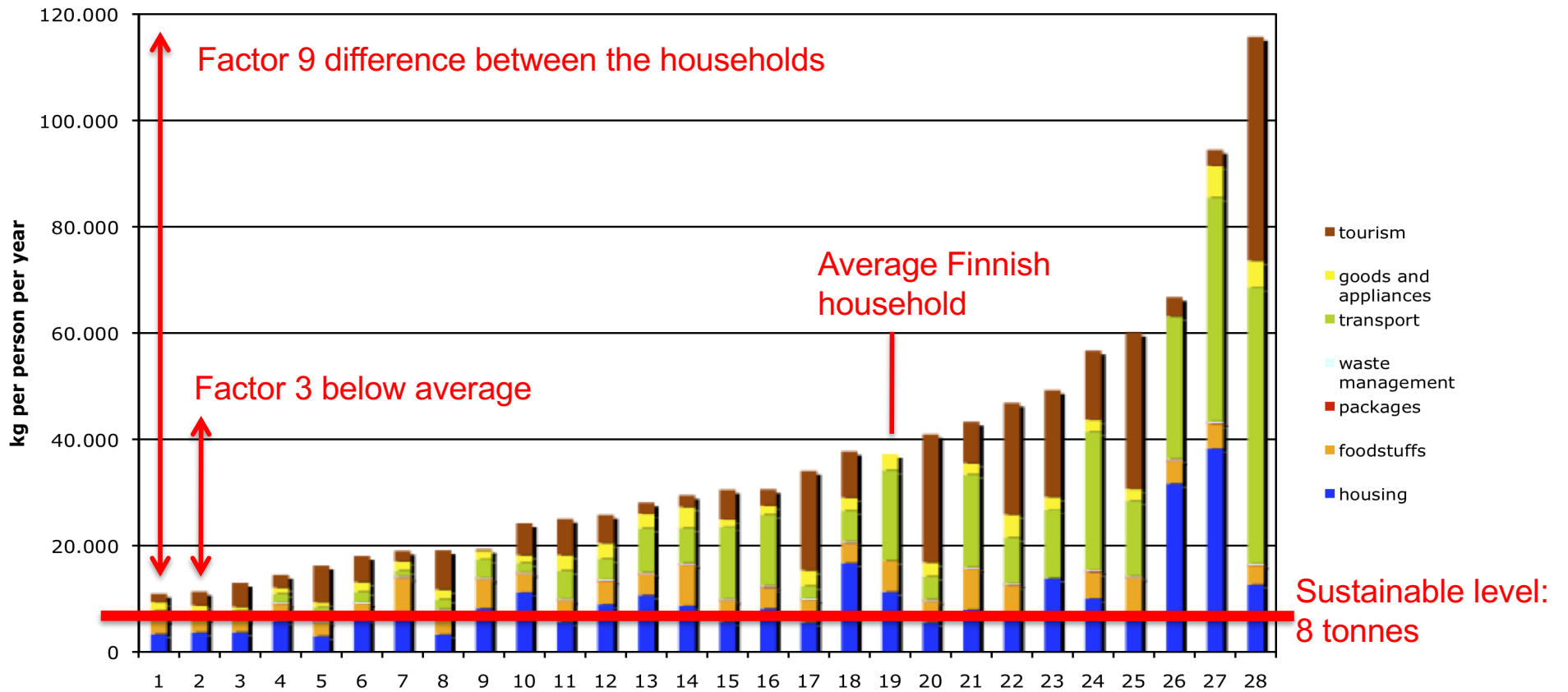
The Sustainable Consumption Challenge

Lifestyle Material Footprint from 40 to 8 Tonnes



Lettenmeier et al. 2014, Eight tonnes of material footprint,
www.mdpi.com/2079-9276/3/3/488

27 Finnish households: Factor 9 difference in Lifestyle Material Footprint

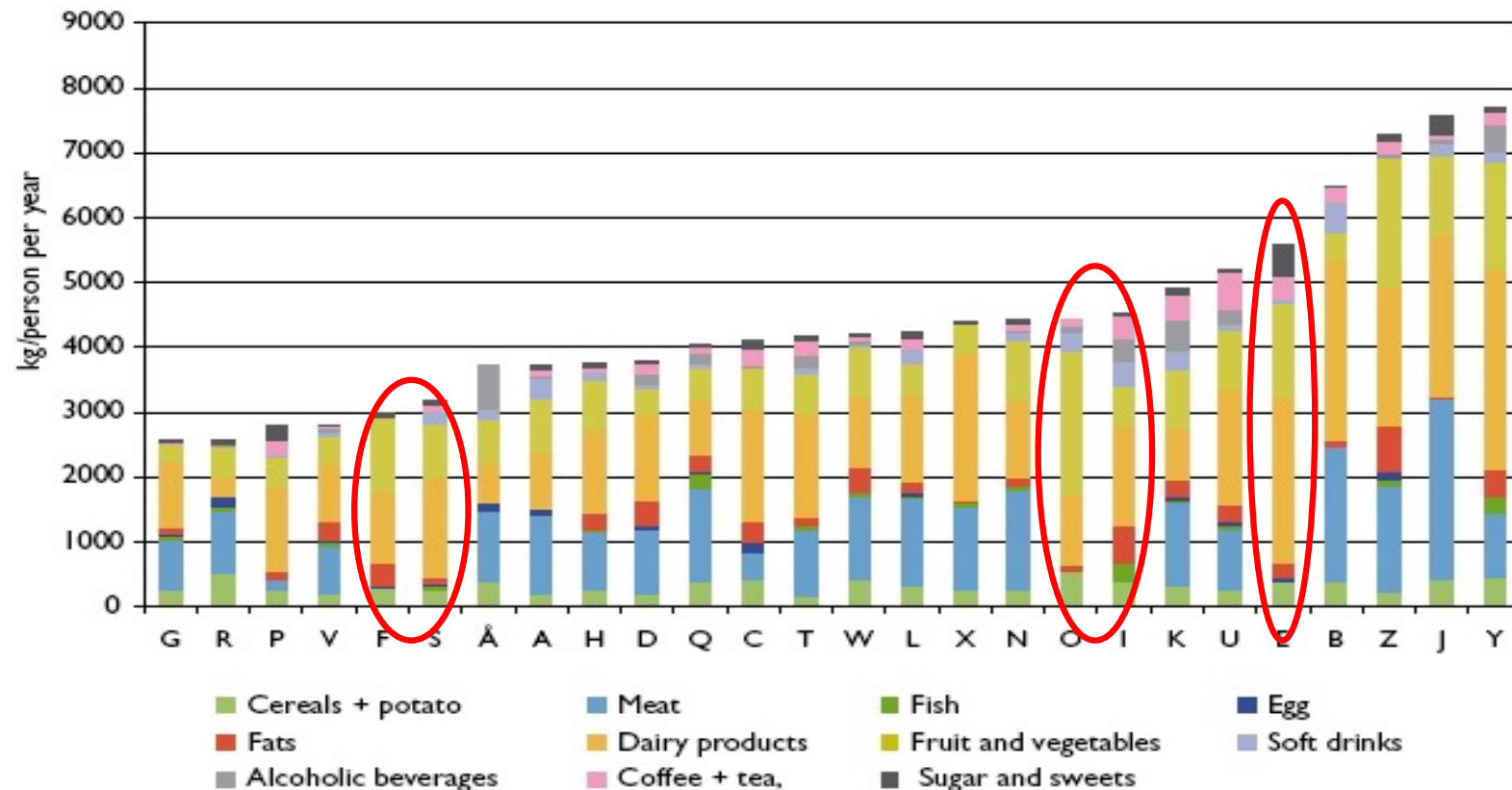


Source: Kotakorpi et al. 2008

FIN-MIPS Households

– Results on more detailed lifestyle level

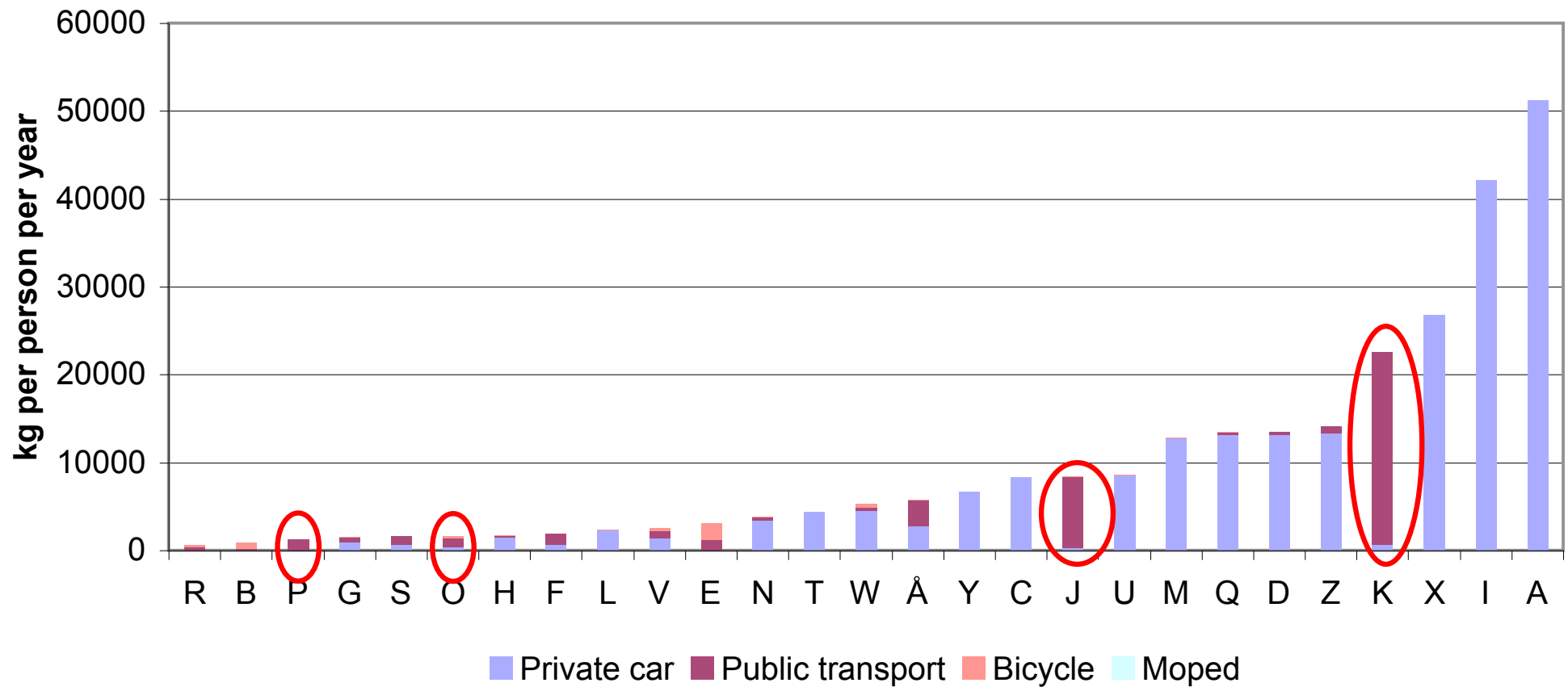
A vegetarian lifestyle does not necessarily result in a lower resource consumption



Source: Kotakorpi et al. 2008

Household MIPS – Mobility

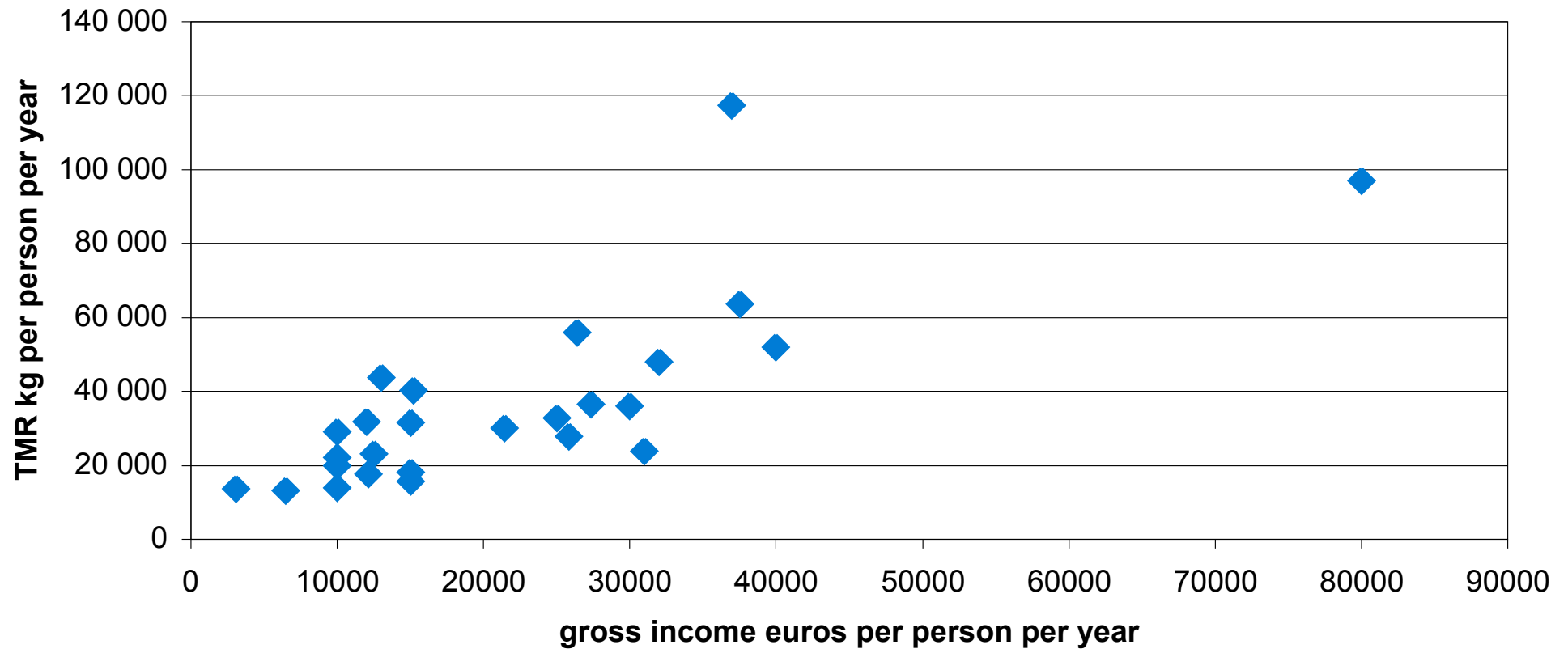
Public transport-based mobility does not necessarily result in lower resource use



Source: Kotakorpi et al. 2008

Household income and resource use

The relation between TMR and gross income

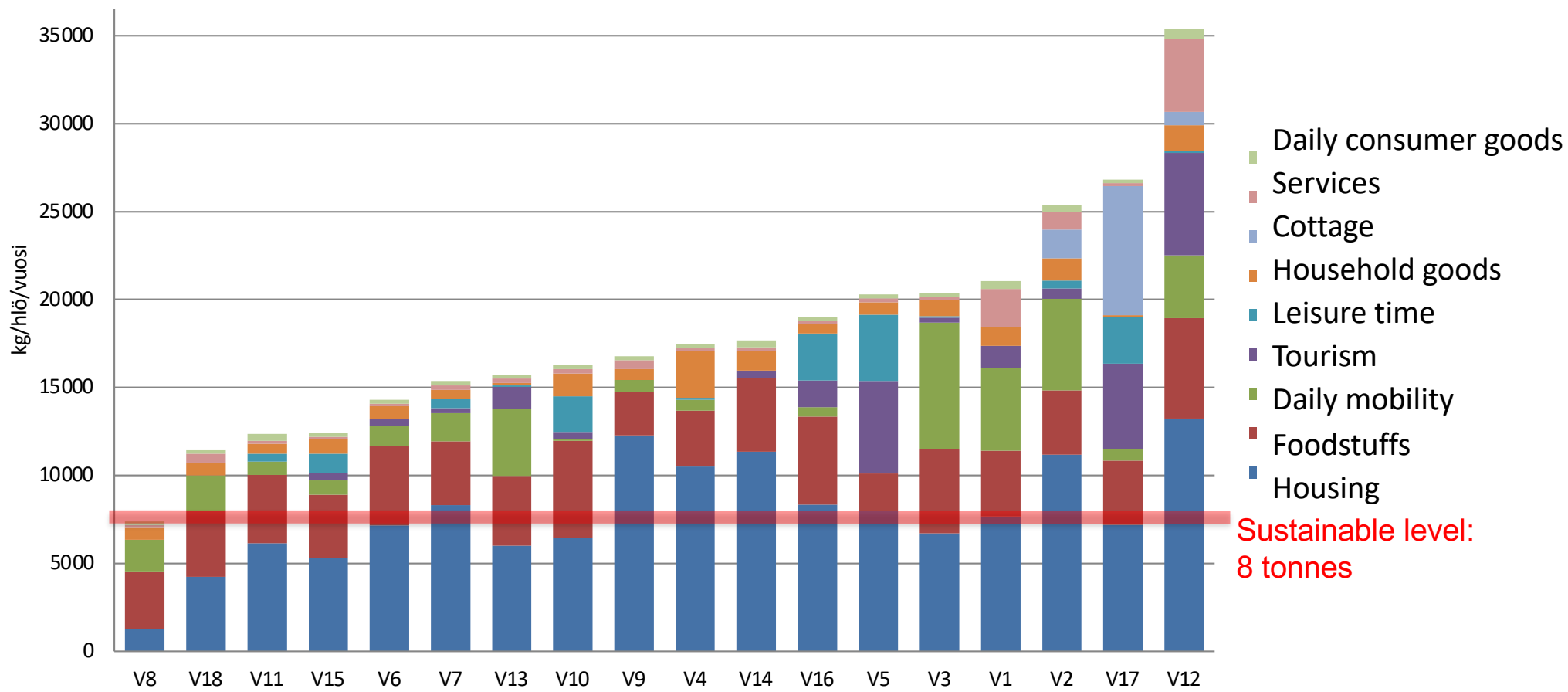


Source: Kotakorpi et al. 2008

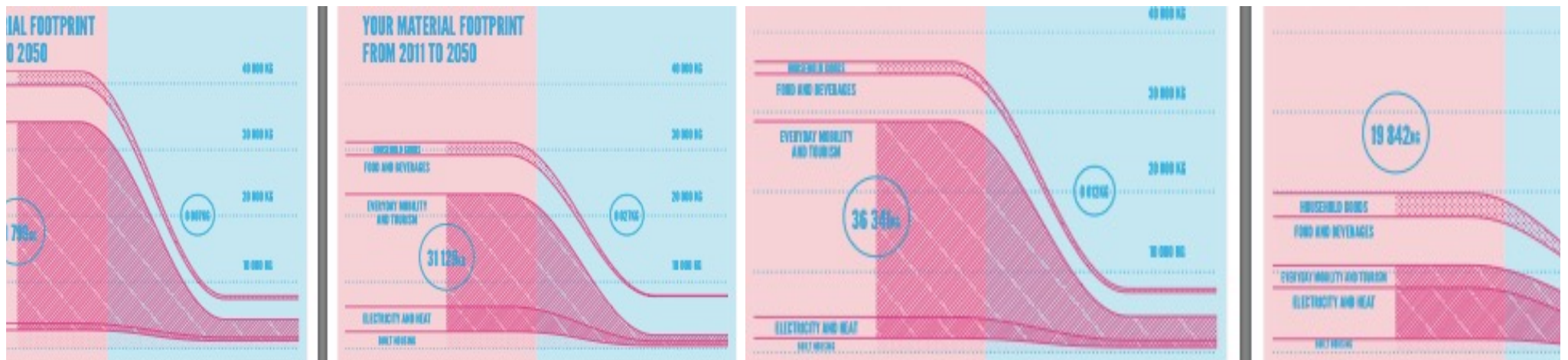
Material footprint of low-income households – the limits of sufficiency



- 18 Finnish low-income households: 6...35 tonnes/cap./a (Lettenmeier et al. 2012)



How to get household consumption to a sustainable level?



Food: from 6 to 3 tonnes



Material Footprint of lunch meals

3 kg/day = 1 tonne/year



Foot-print kg	GDA %
2.6	31

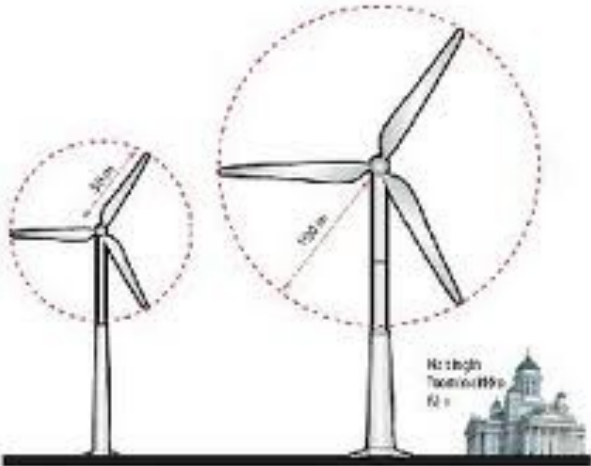


Foot-print kg	GDA %
6.8	83



Foot-print kg	GDA %
1.7	20

Housing: from 11 to 1.6 tonnes



A+++++

Mobility: from 18 to 2 tonnes



Finnish Innovation Fund (Sitra): Resource-wise region model in Jyväskylä



Targets for 2050

Zero CO2 emissions

Fossiilisten polttoaineiden käyttö lopetettava ilmastonmuutoksen hillitsemiseksi

Zero waste

Kiertotaloutta edistämällä materiaalit takaisin kiertoon

One planet life

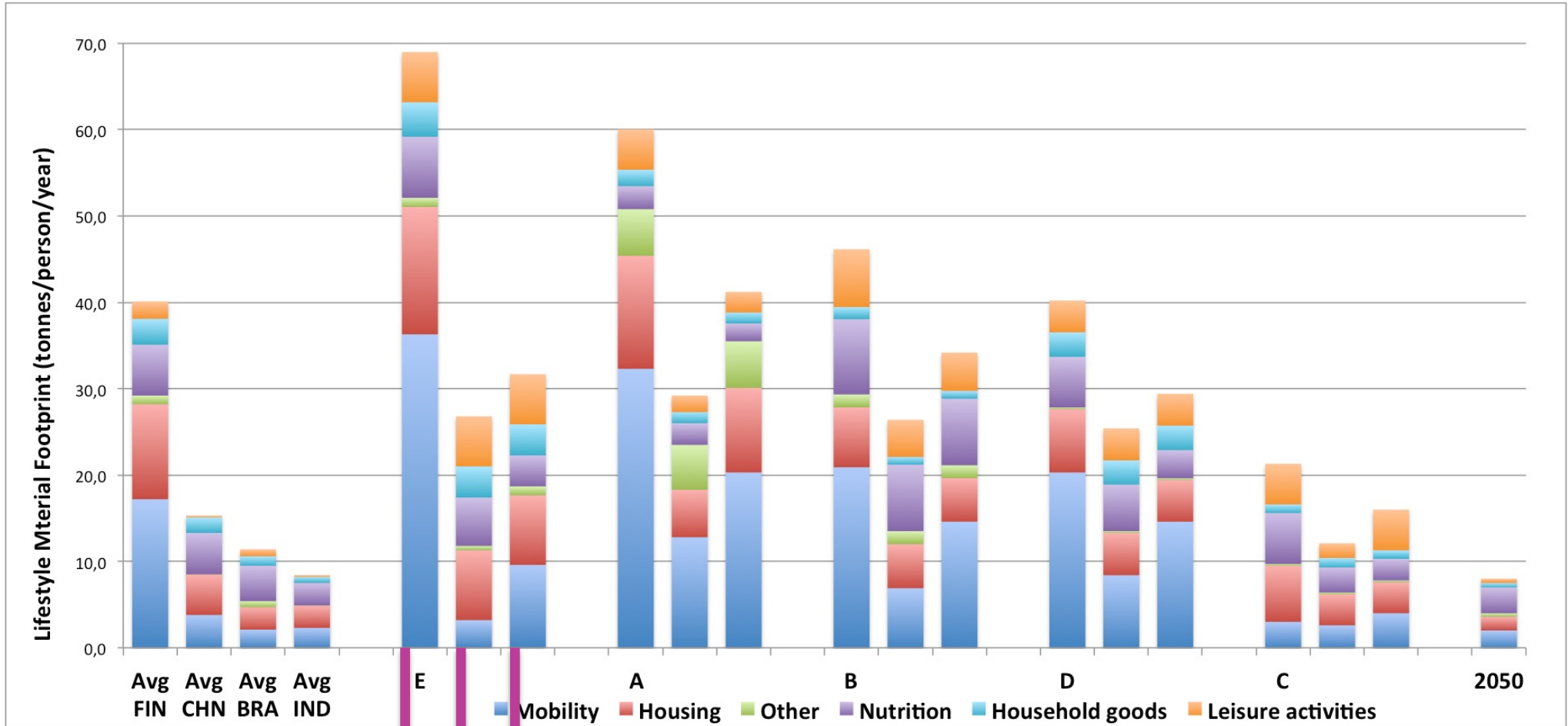
Uusiutuvien materiaalien kulutus globaalisti kestävä tasolle

Future household: 5 households out of 40 applicants



Future Households

Smaller footprint, better life



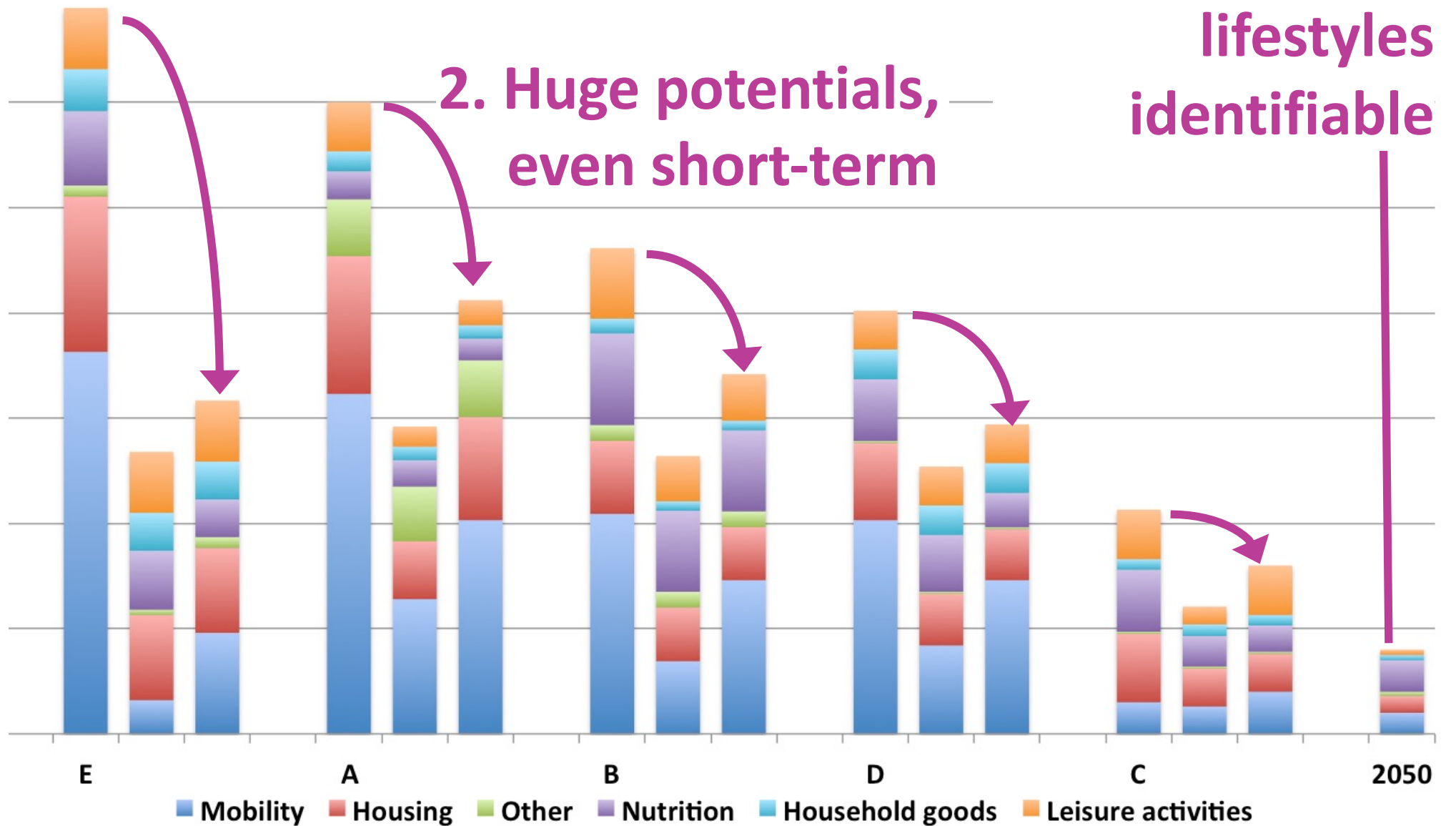
Experiments
Roadmap 2030
Baseline

Future Households – So what?



1. Sustainable lifestyles identifiable

2. Huge potentials, even short-term





3. Households will not do it alone

Policy



Entrepreneurship



Inhabitat.com



Treehugger.com



Treehugger.com



Treehugger.com

Design for One Planet

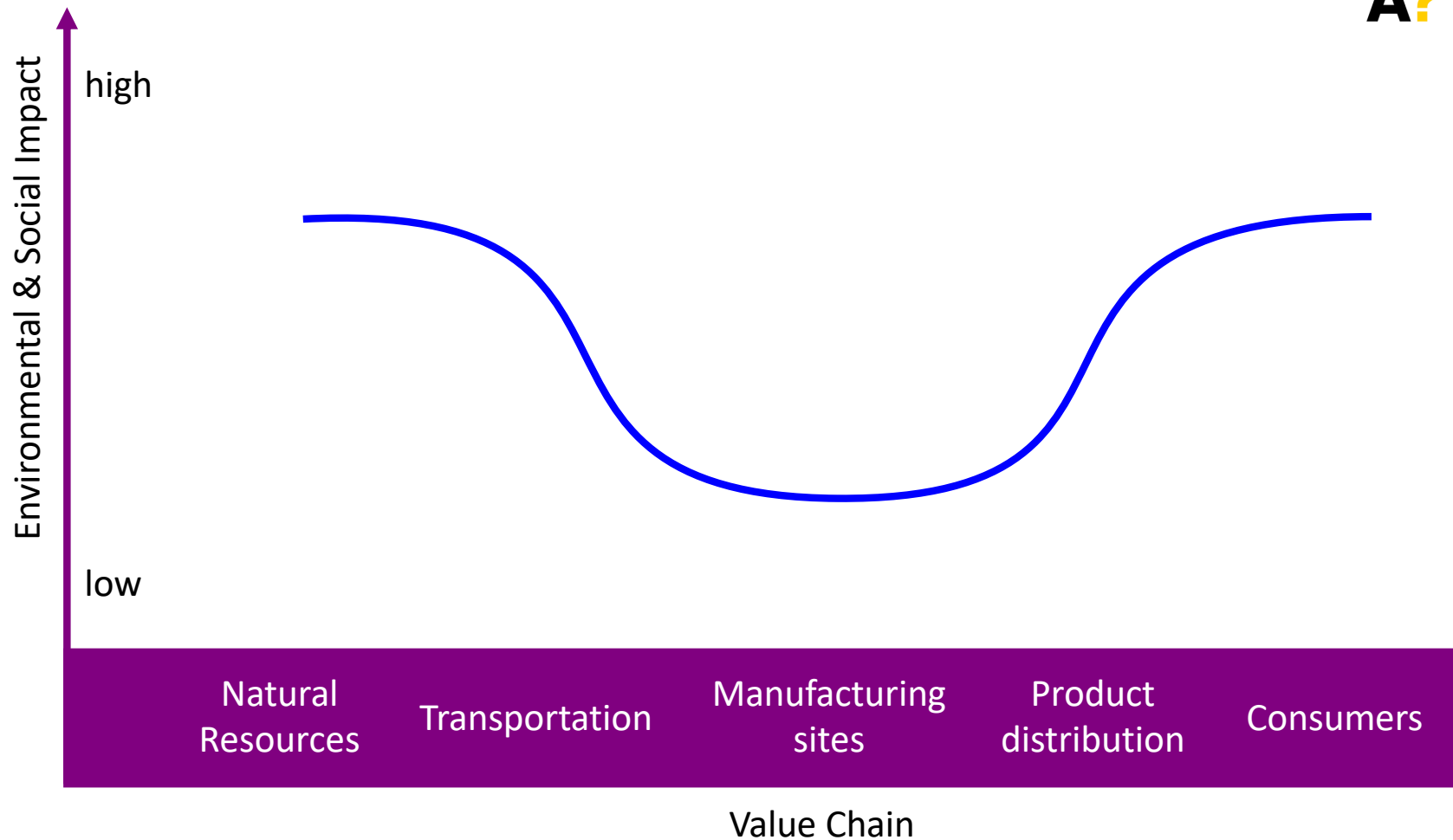


Df1P

Resource efficiency: Potential in the value chain

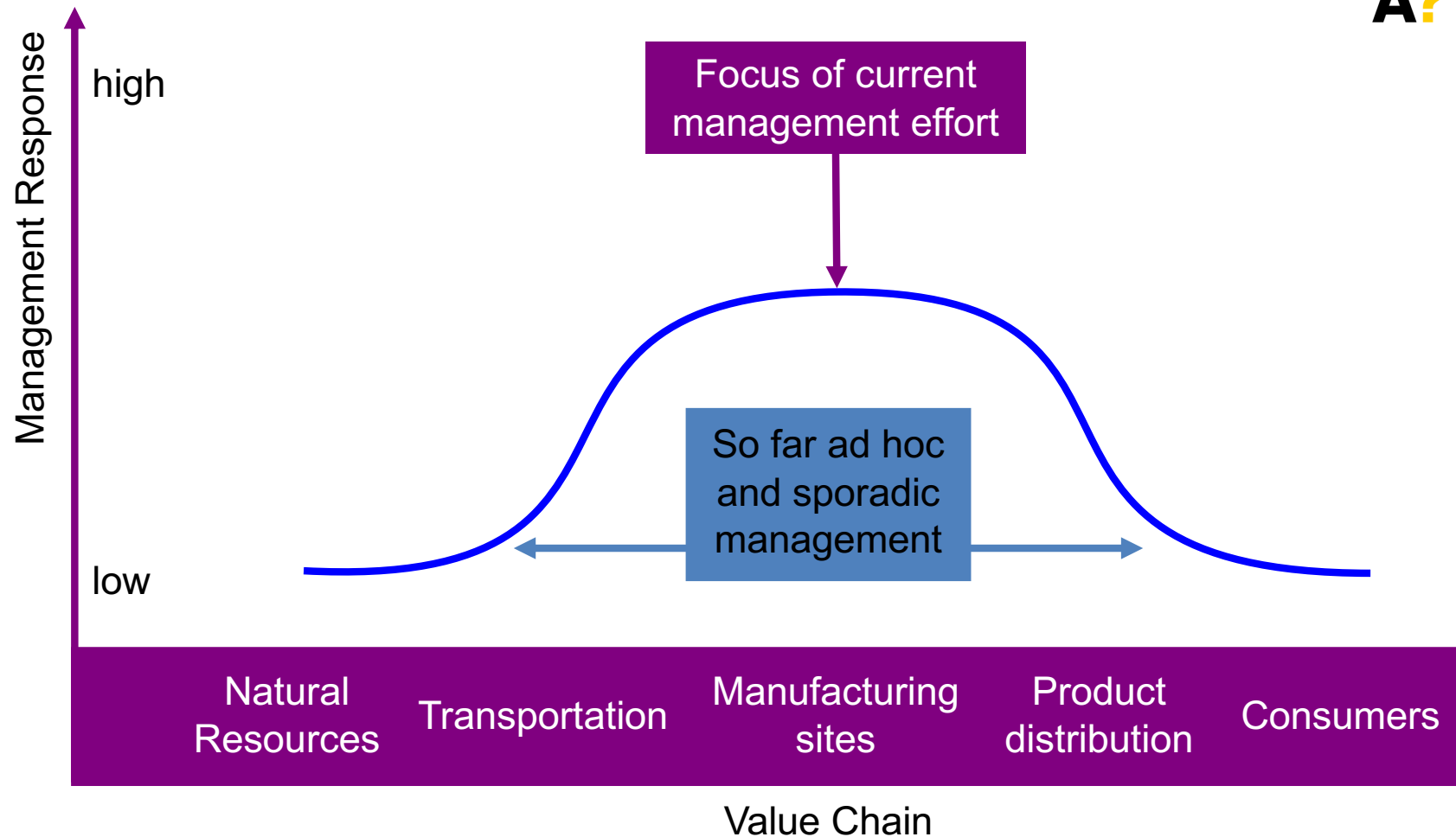


- Impacts and Opportunities of products and services



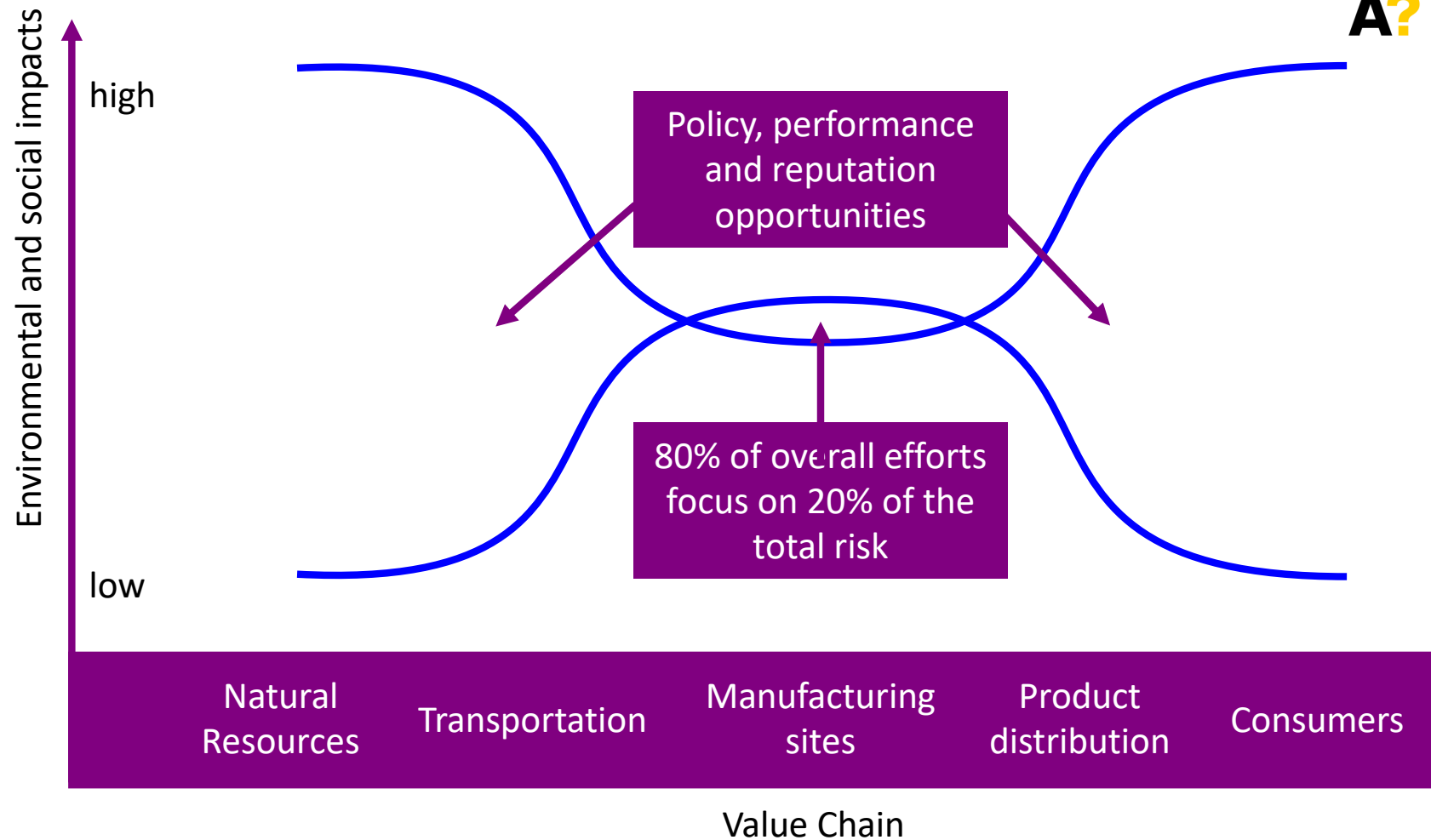
Resource efficiency: Potential in the value chain (2)

- Current Management Efforts



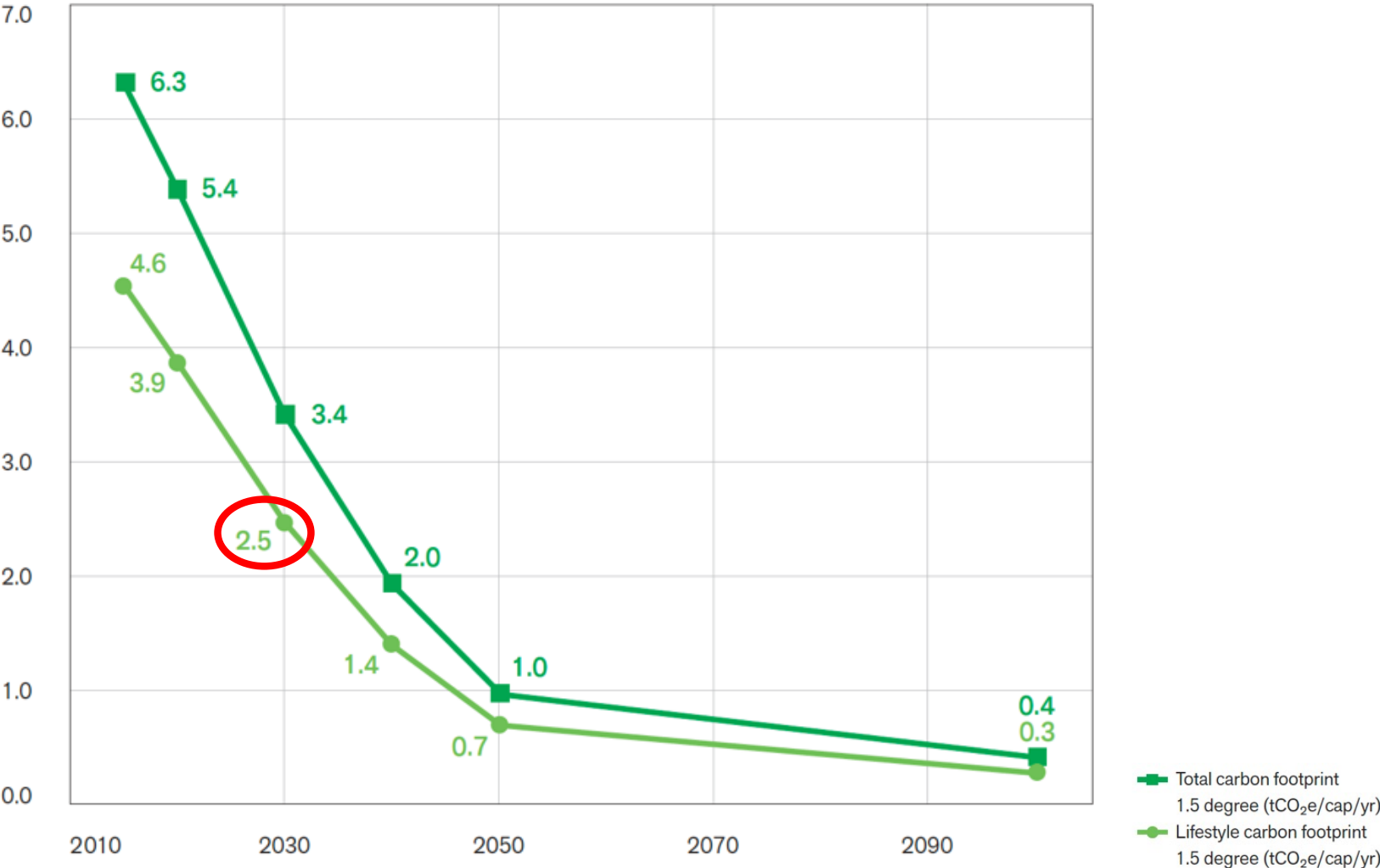
Resource efficiency: Potential in the value chain (3)

- Mismatch between the two

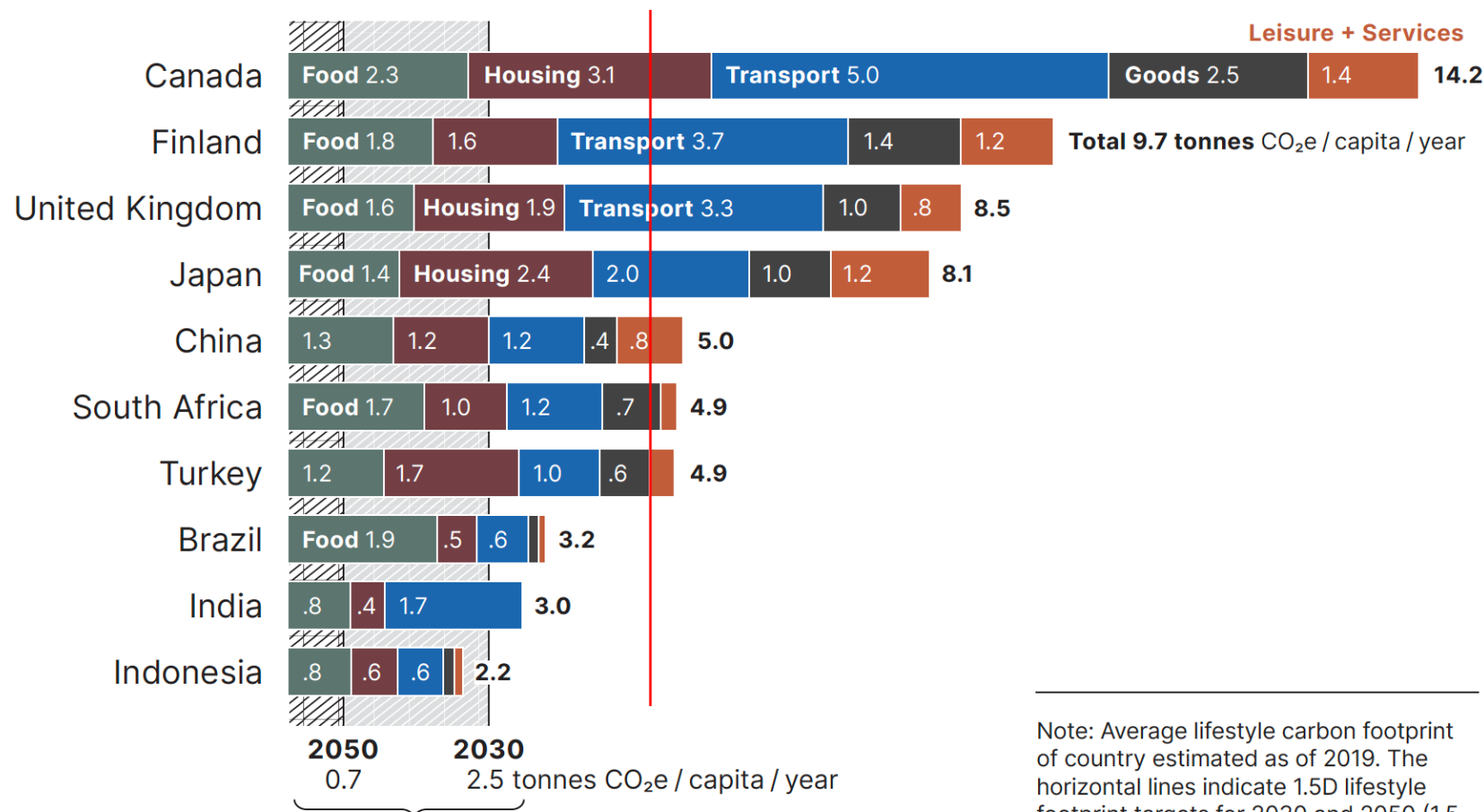




Lifestyle Carbon Footprint Targets



Current Lifestyle Carbon Footprints and targets for 2030 and 2050



Globally unified targets for the lifestyle carbon footprints

Note: Average lifestyle carbon footprint of country estimated as of 2019. The horizontal lines indicate 1.5D lifestyle footprint targets for 2030 and 2050 (1.5 °C without/less use of CCS).

Carbon Footprint



Carbon intensity



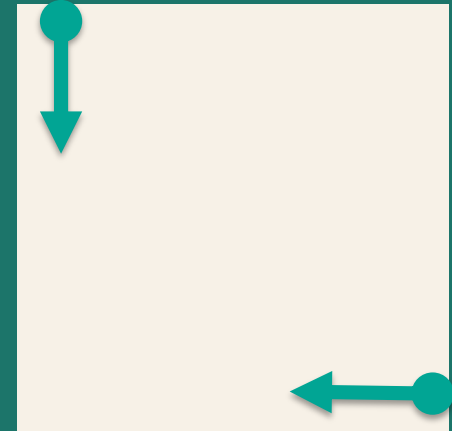
Consumption amount



Carbon Footprint



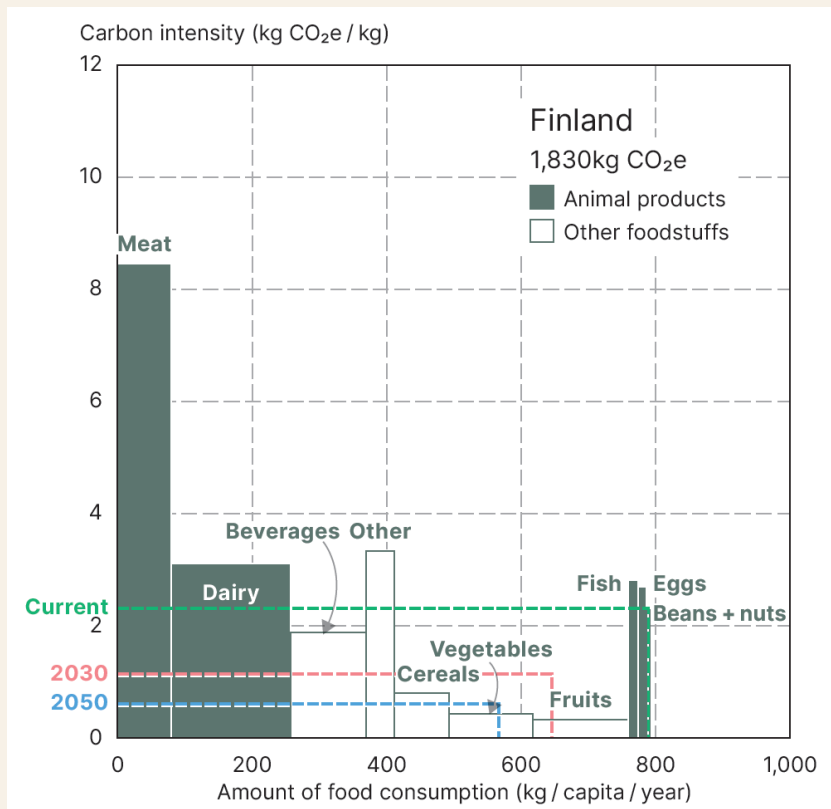
Carbon intensity



Consumption amount



Carbon Footprint of Foodstuffs in Finland



Source: Akenji et al. 2021
hotorcool.org/1-5-degree-lifestyles-report

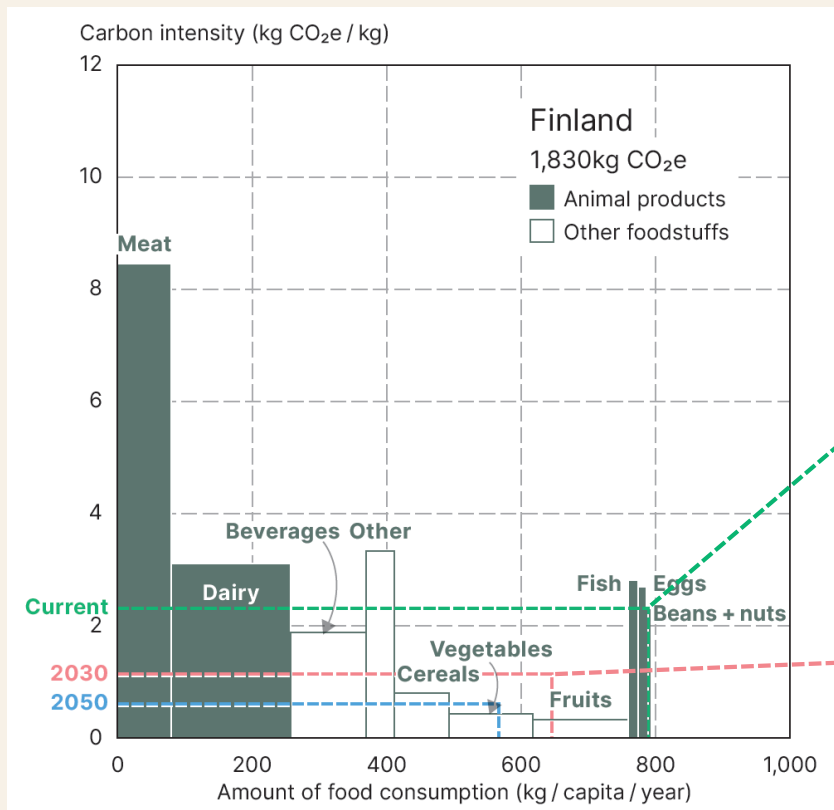
Carbon Footprint

- 1830 kg (range 3/10)
- 19% of whole footprint
- 73% of target for 2030

Out of this carbon footprint is

- 71% animal-based (36% of consumption)
- 37% meat products (10% of consumption)
- 30% dairy products (22% of consumption)

Foodstuffs: present vs. targets

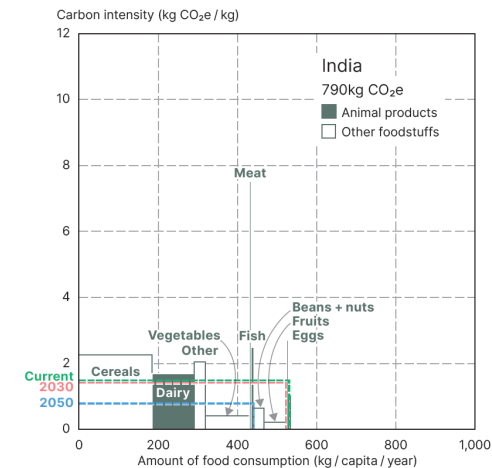
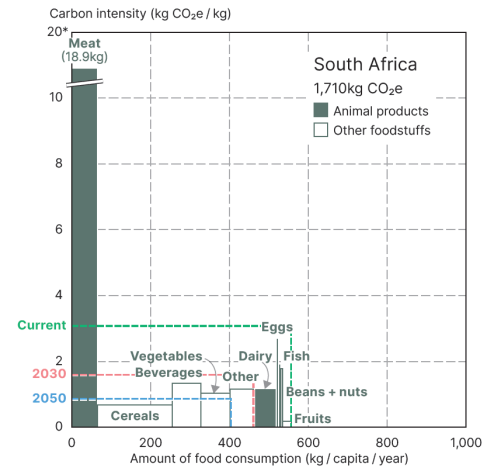
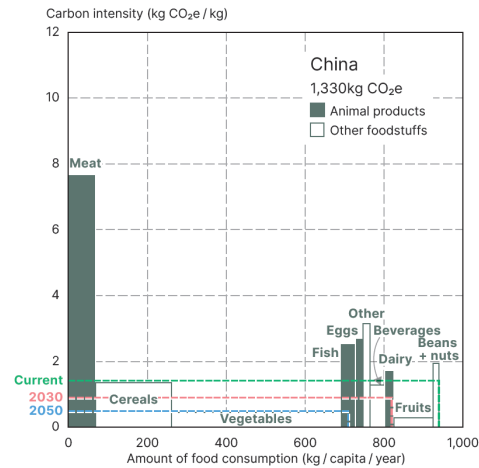
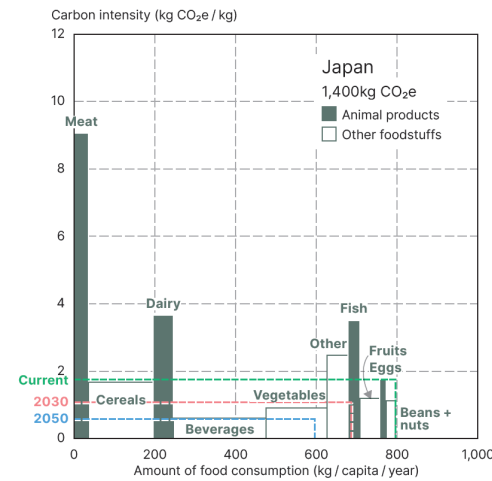
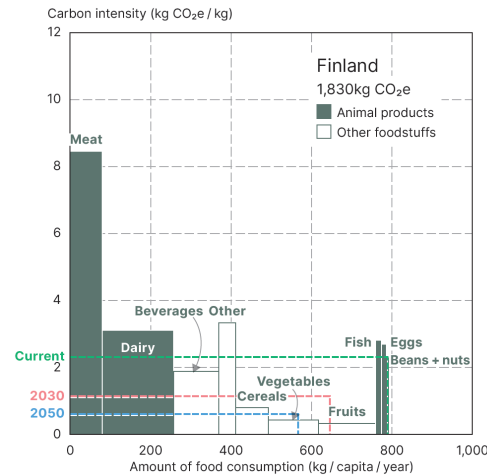
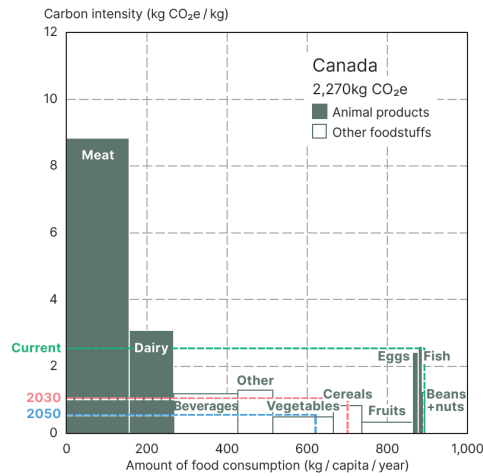


2019:
790 kg
* 2,3 kg/kg
= 1830 kg

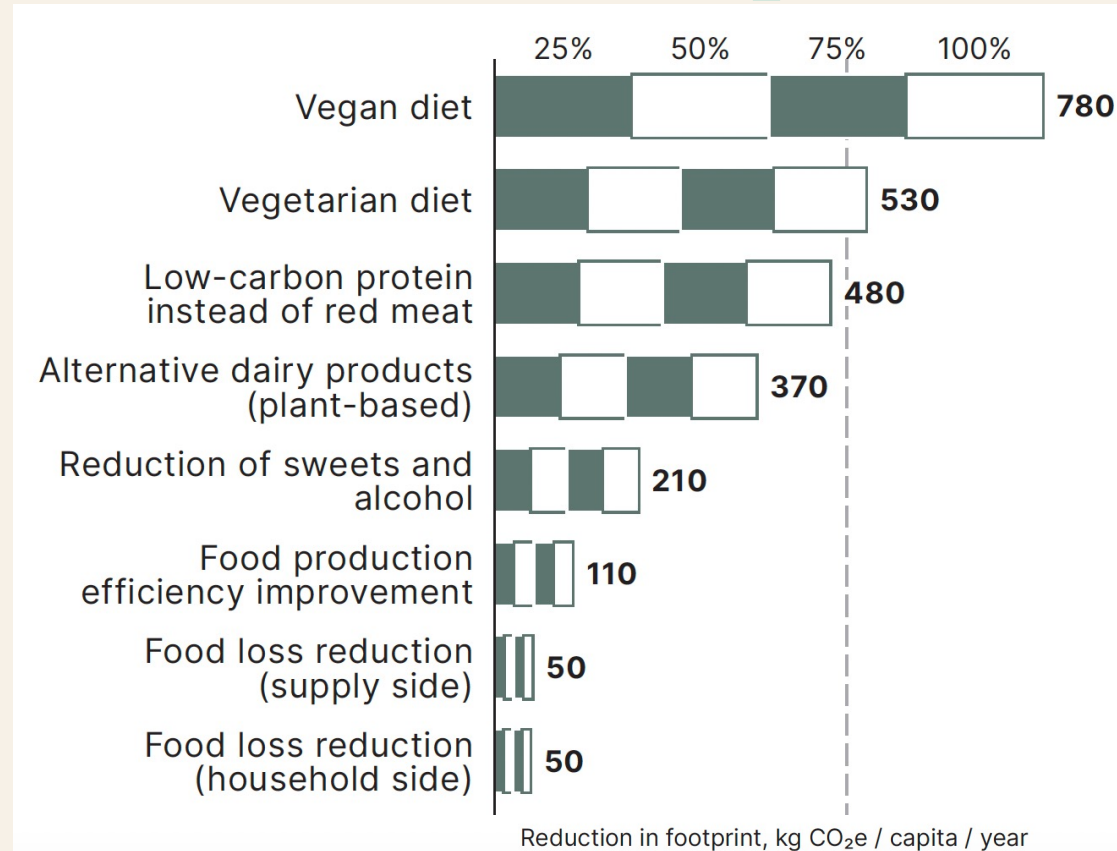
2030:
~ 650 kg
* ~ 1 kg/kg
= ~ 650 kg

Source: Akenji et al. 2021
hotorcool.org/1-5-degree-lifestyles-report

Food: Comparison

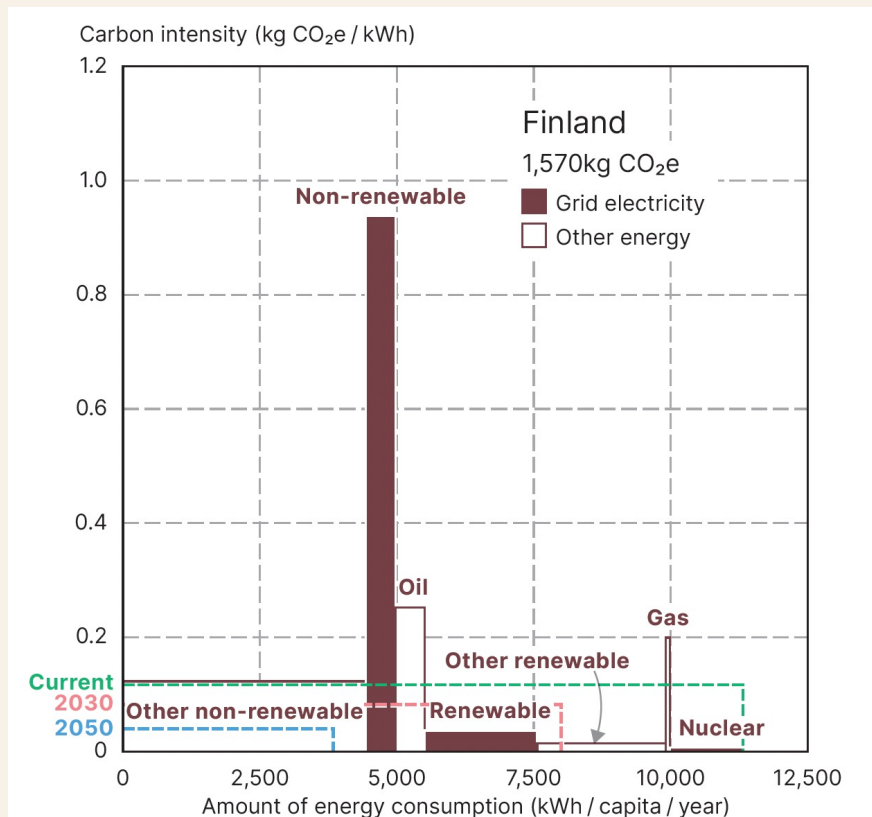


Food: most relevant reduction options



Source: Akenji et al. 2021
hotorcool.org/1-5-degree-lifestyles-report

Carbon footprint of housing in Finland



Source: Akenji et al. 2021
hotorcool.org/1-5-degree-lifestyles-report

Carbon footprint

- 1570 kg (range 5/10)
- 16% of whole footprint
- 63% of target for 2030

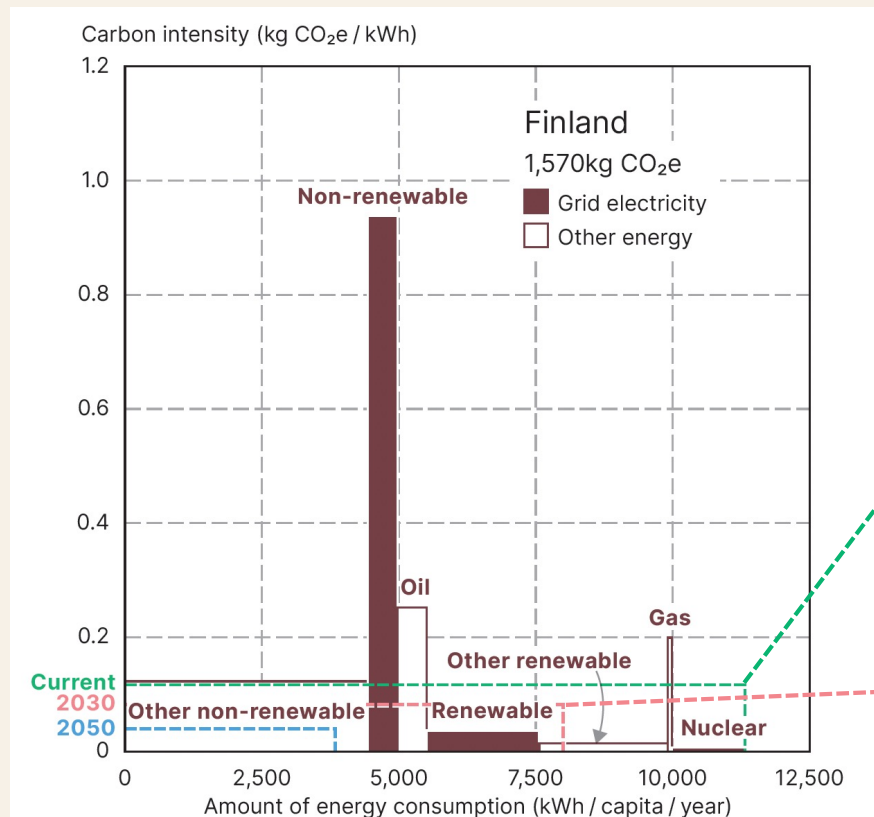
Out of this footprint is

- 15% from buildings
- 84% from energy use

Out of the energy footprint is

- 38% from fossil power (5% of consumption)
- 51% from fossil heat (45% of consumption)

Housing energy: present vs. targets

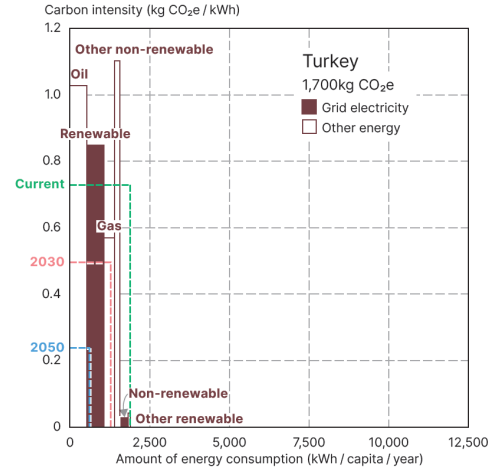
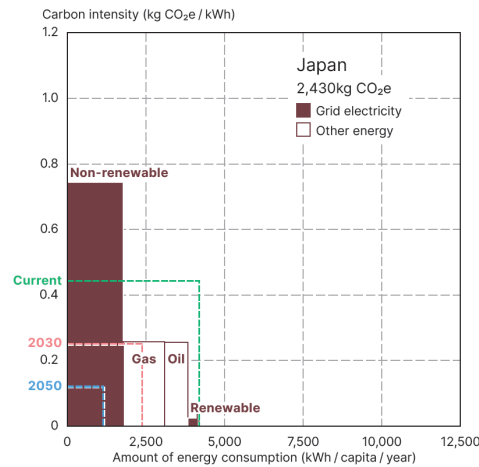
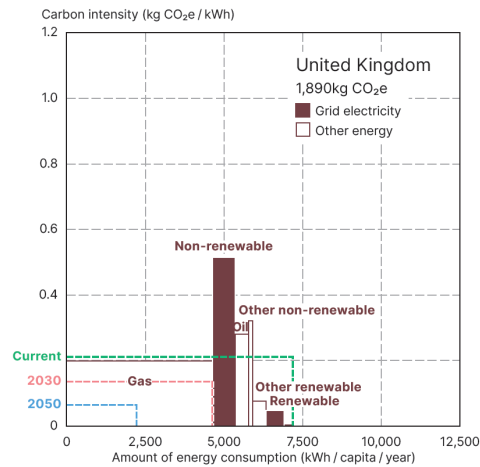
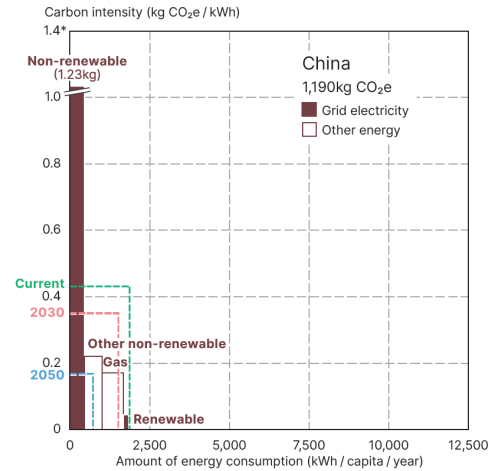
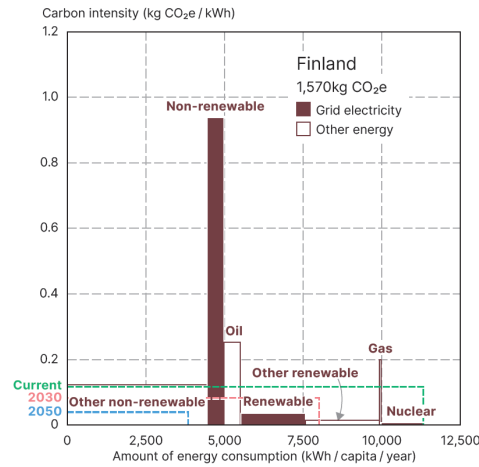
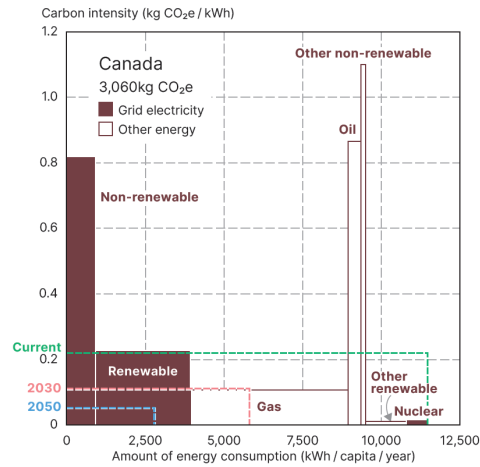


2019:
 11 300 kWh
 * 139 g/kWh
 = 1570 kg

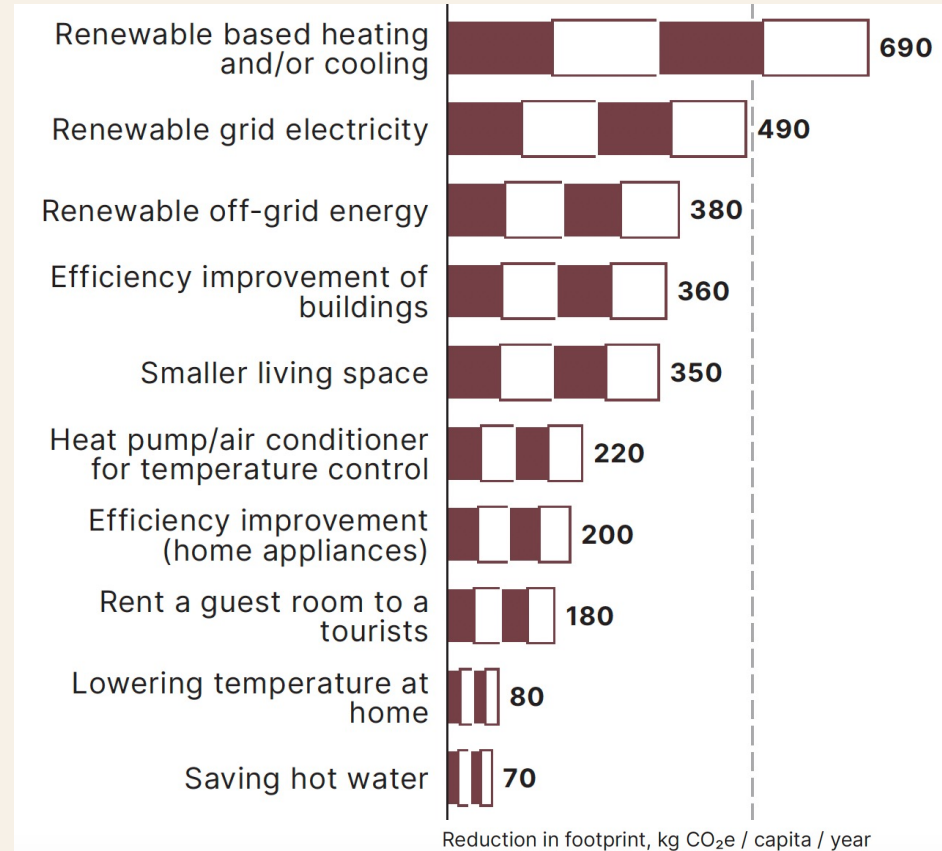
2030:
 n. 8 000 kWh
 * n. 80 g/kWh
 = n. 640 kg

Source: Akenji et al. 2021
 hotorcool.org/1-5-degree-lifestyles-report

Housing energy: Comparison



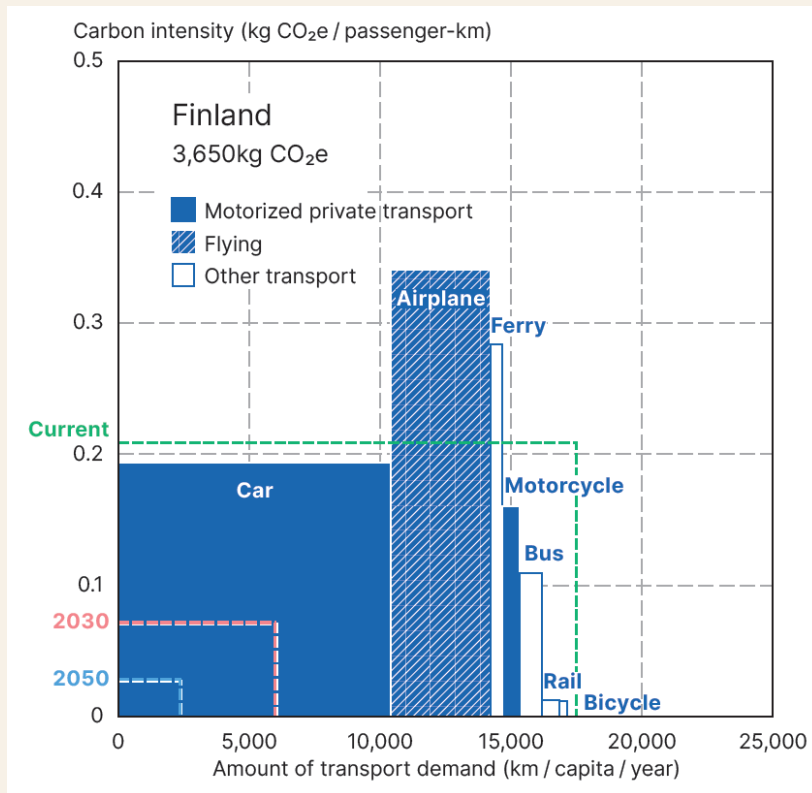
Housing: most relevant options



Source: Akenji et al. 2021
hotorcool.org/1-5-degree-lifestyles-report



Carbon footprint of mobility in Finland



Source: Akenji et al. 2021
hotorcool.org/1-5-degree-lifestyles-report

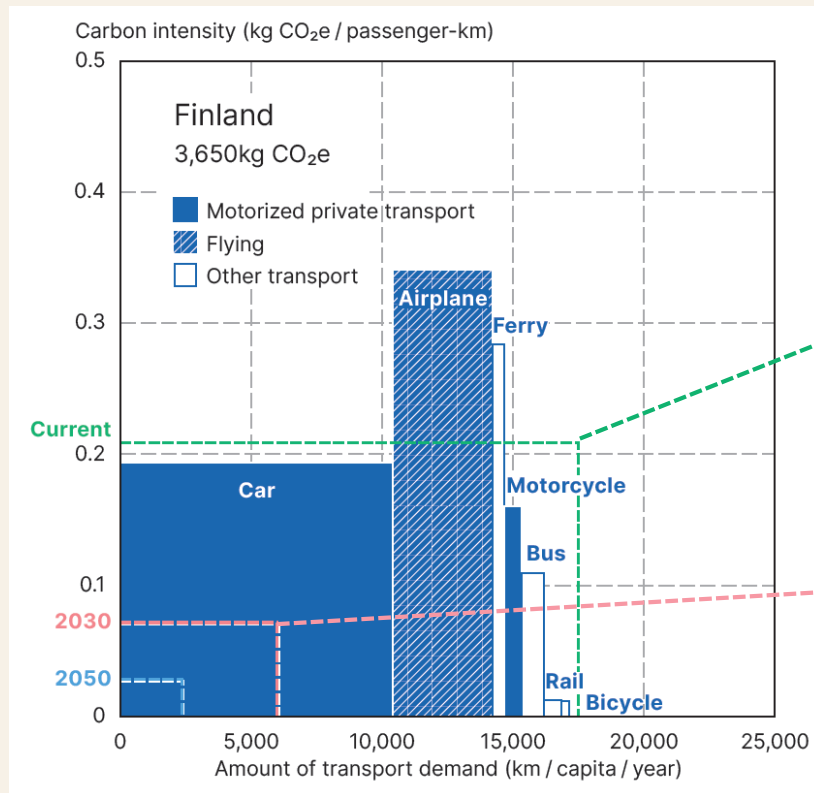
Carbon footprint

- 3650 kg (range 2/10)
- 38% of whole footprint
- 146% of target for 2030

Out of this footprint is

- 55% from car-driving (60% of consumption)
- 35% flying (22% of consumption)
- 4% ferries (3% of consumption)

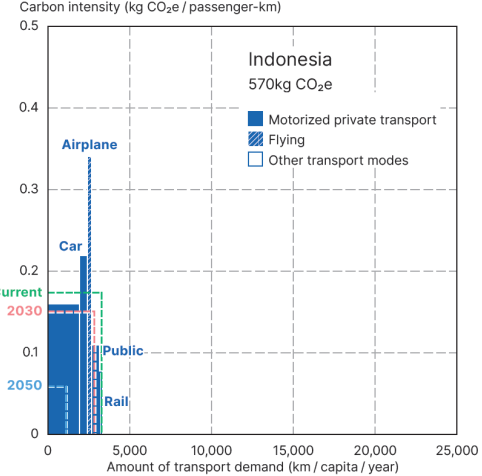
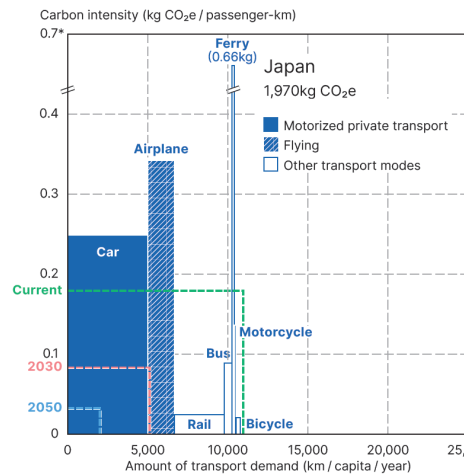
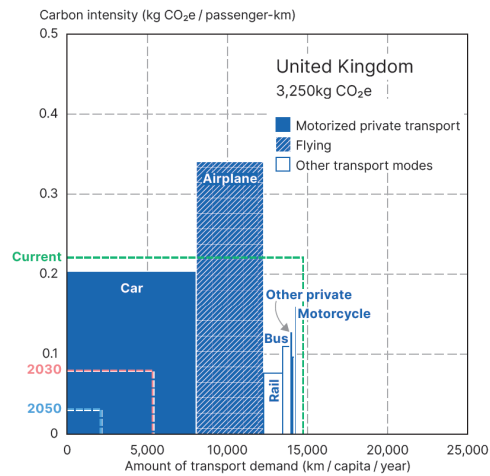
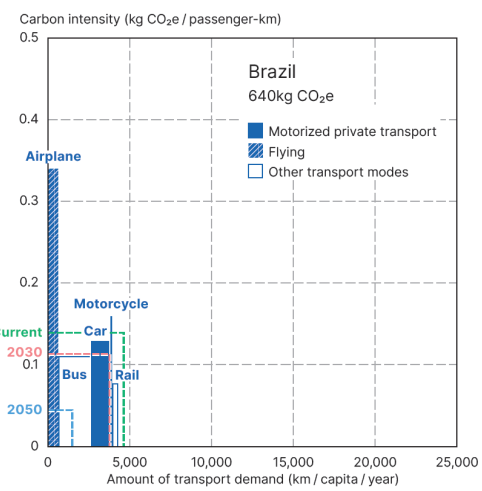
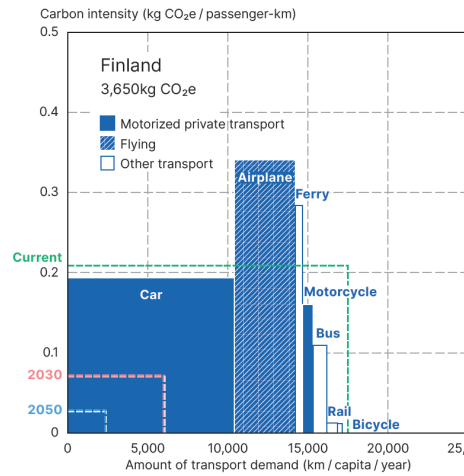
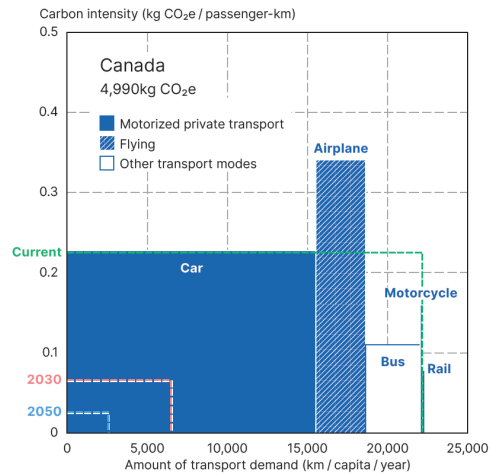
Mobility: present vs. targets



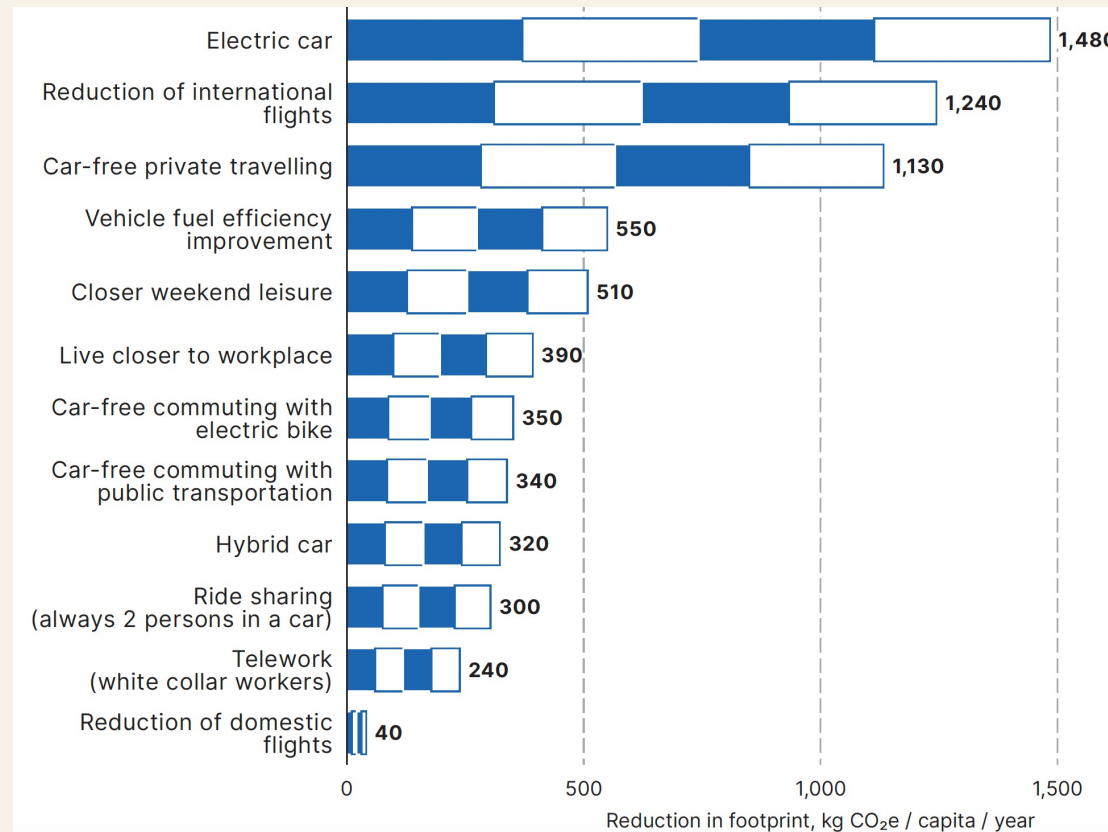
2019:
 17 500 km
 * 210 g/km
 = 3650 kg

2030:
 n. 6500 km
 * n. 70 g/km
 = n. 450 kg

Mobility: Comparison



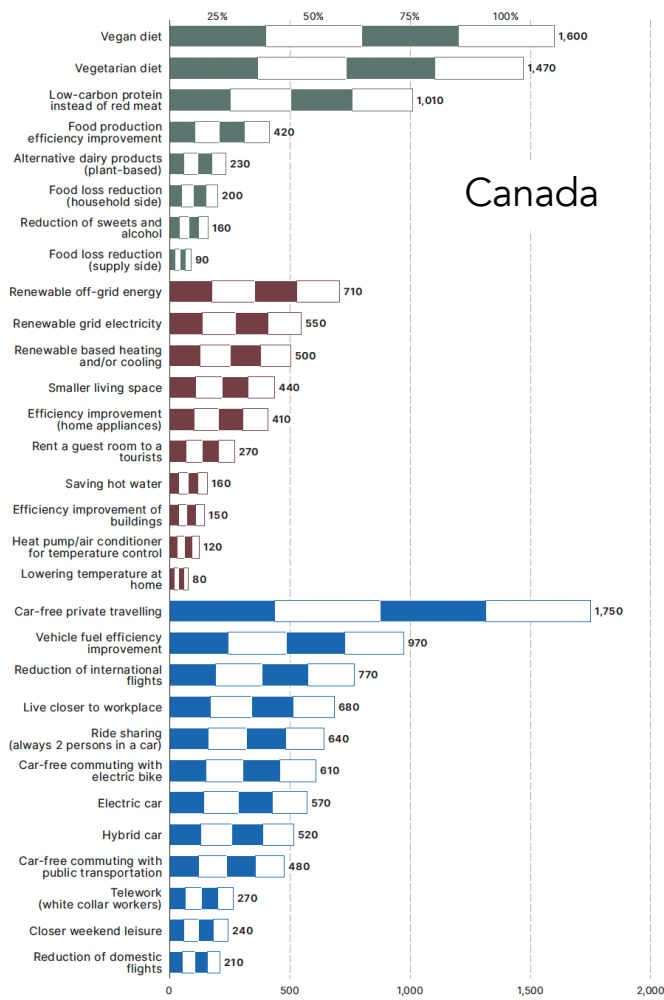
Mobility: most relevant options



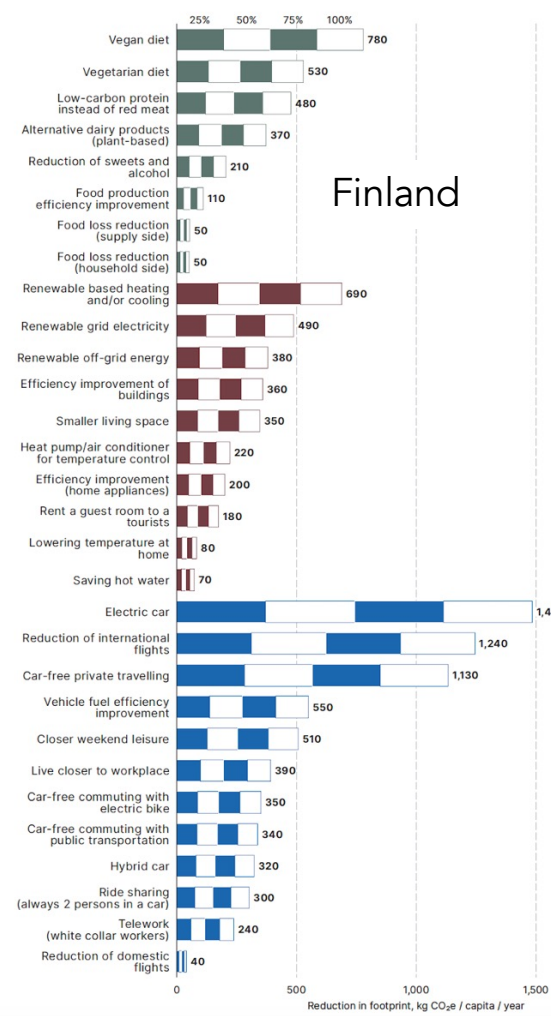
Source: Akenji et al. 2021
hotorcool.org/1-5-degree-lifestyles-report



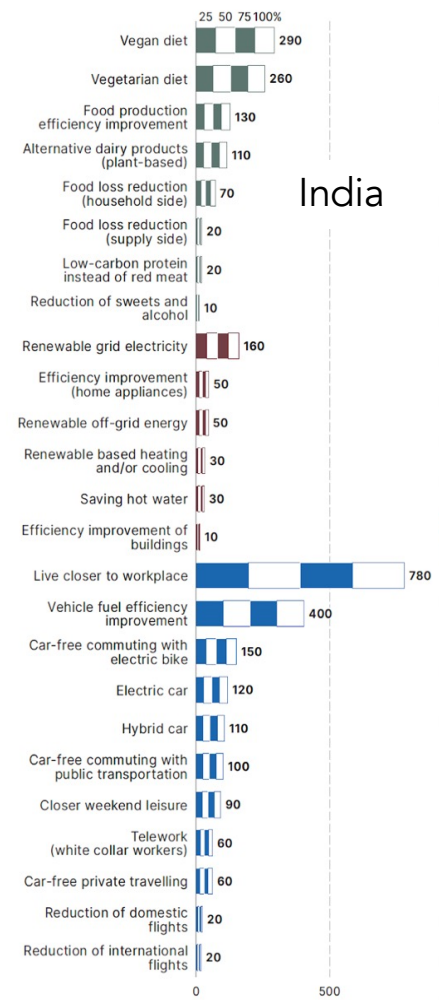
Comparison of reduction impacts



Canada

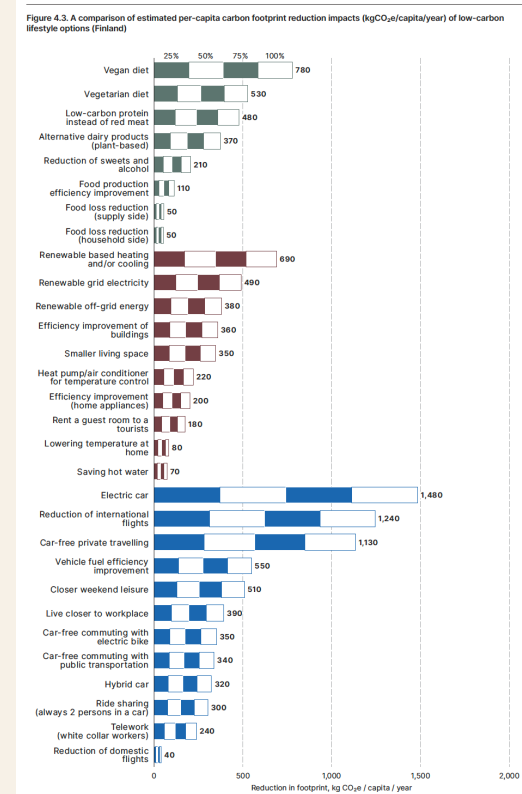
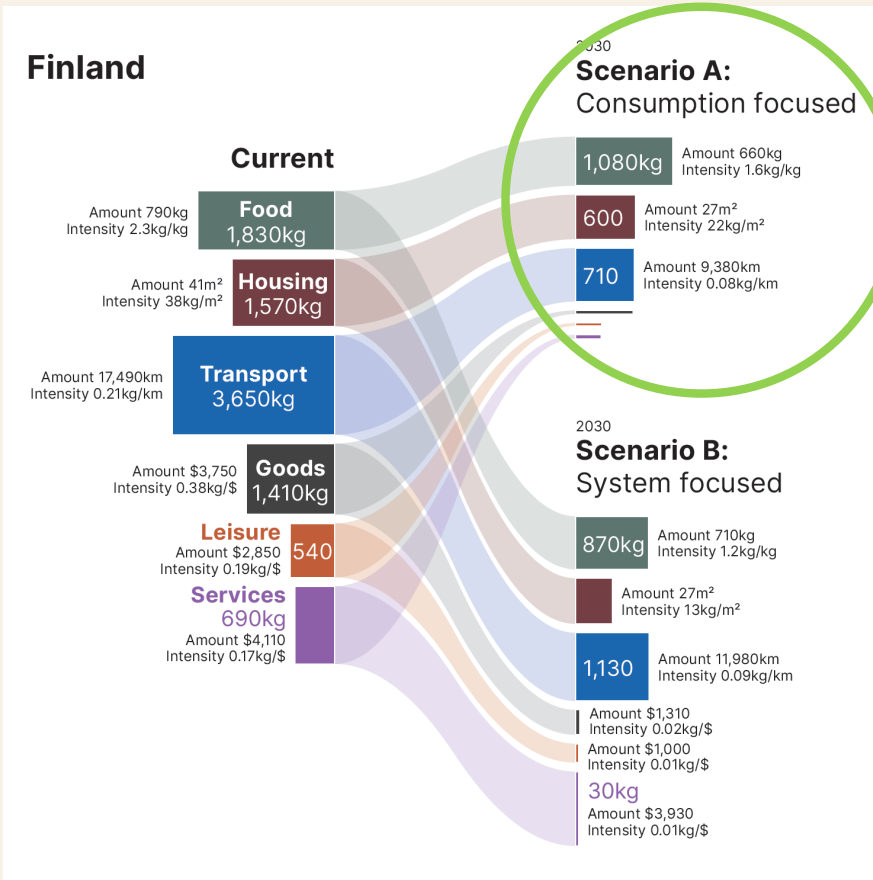


Finland



India

The job is huge but clear



	Scenario A: "Consumption Focused"	Scenario B: "System Focused"
Current Footprint (kgCO ₂ e/capita/year)	9,700	9,700
Options	Adoption rate	Adoption rate
	Consumption focused	System focused
	95%	95%
	System focused	Consumption focused
	35%	65%
Scenario based footprint (kgCO ₂ e/cap/yr)	2,480	2,450

Source: Akenji et al. 2021
hotorcool.org/1-5-degree-lifestyles-report

Climate Puzzle Workshop

EU 1.5 Degree Lifestyles



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101003880.



Climate Puzzle languages

fi

sv

de

en

Objectives



- Applying and verifying the **1.5 degree lifestyles framework in practice**
- Testing the **option-based approach**
- Bringing in the **human perspective**
- Identifying the actions where households need **help from the public and private sector**
- Ultimately, **inspiring households and other actors** to move towards and to enable low-carbon lifestyles



Background



CONCERNS:

Does this even have an impact?

How much do I have to reduce? What options do I have?

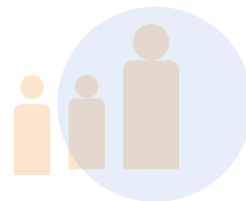
What more can I do?

MYTHS:

More ecological life
= Reducing life quality

One person cannot do much,
it doesn't matter what I do

"I'm recycling so
I'm well off"



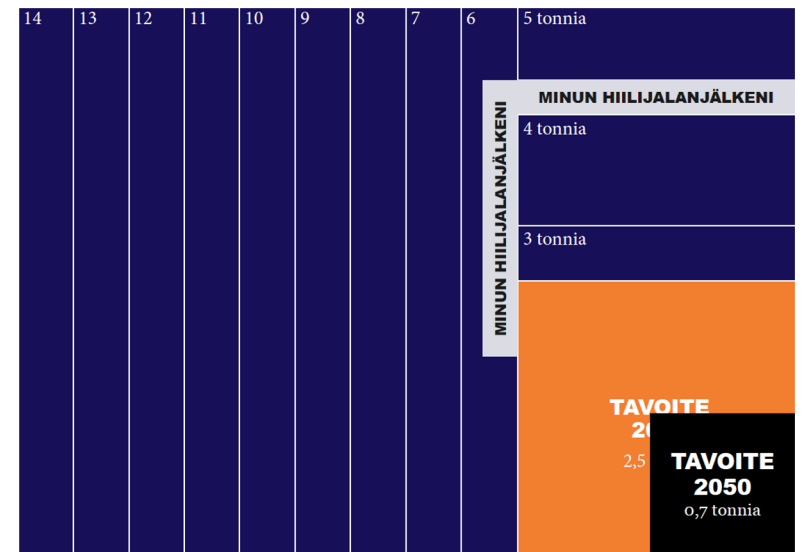
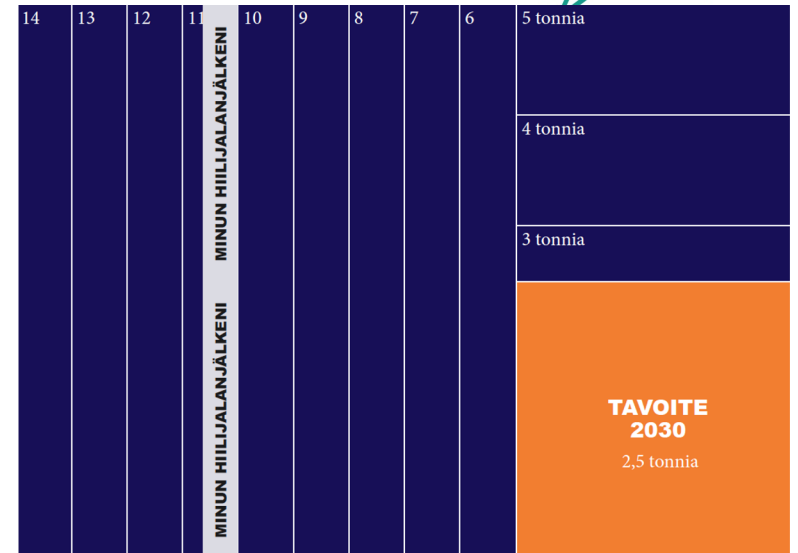
Starting point
5 minutes

Open package

Mark starting point

Choose goal

5 minutes



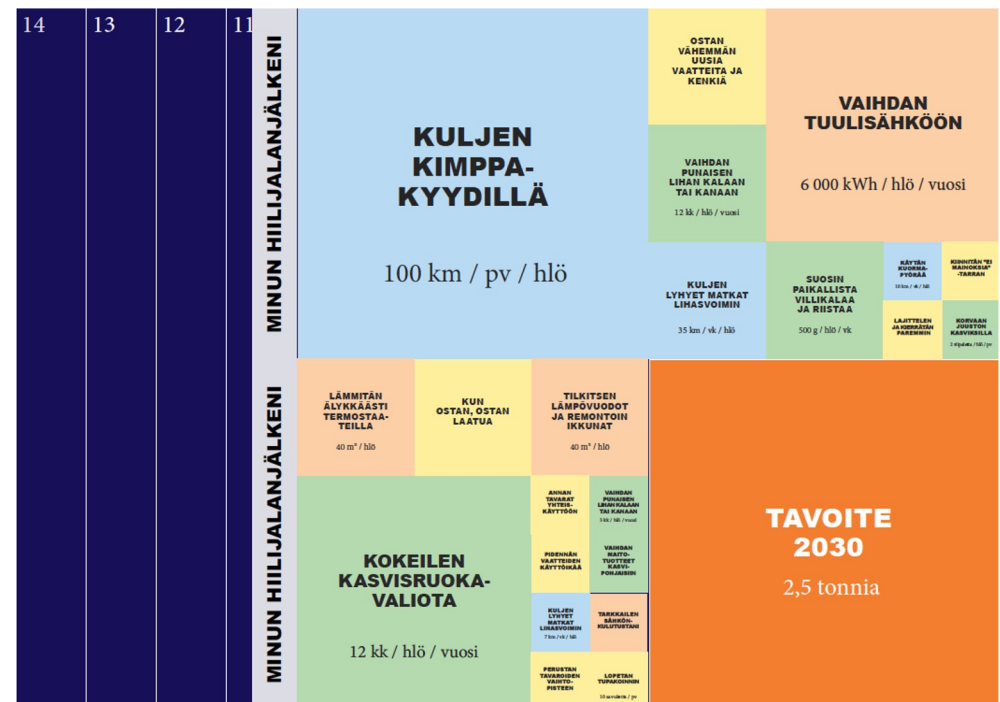
Choosing options
30 minutes

Choosing options (1/2)

30 minutes

Option cards

- Description in the back
- Several sizes of some options
- Doubling (or so) size with empty pieces
- Halving (or so) by covering with other piece(s)



Choosing options (2/2)

30 minutes

Choose

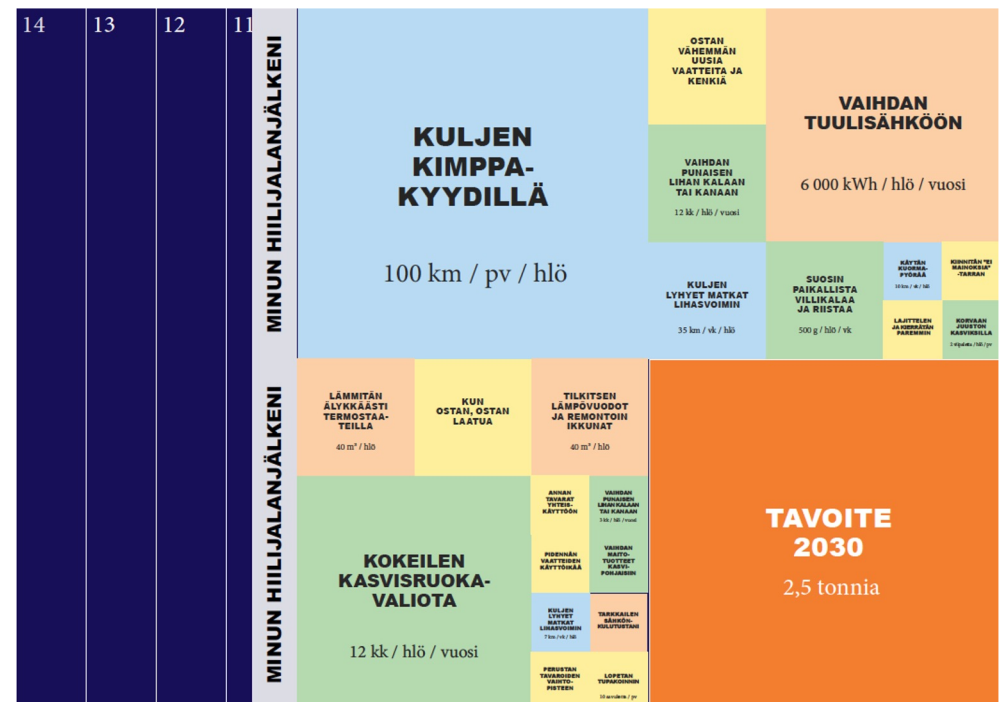
- Options you could already do
- Options you can't do yet but by 2030

Avoid

- Options you already do
- Overlapping options (or at least take it into account)

Add

- Options that fit into your lifestyle but are not in the puzzle
- Make a rough quantification of their effects and mark them by post-its into your board

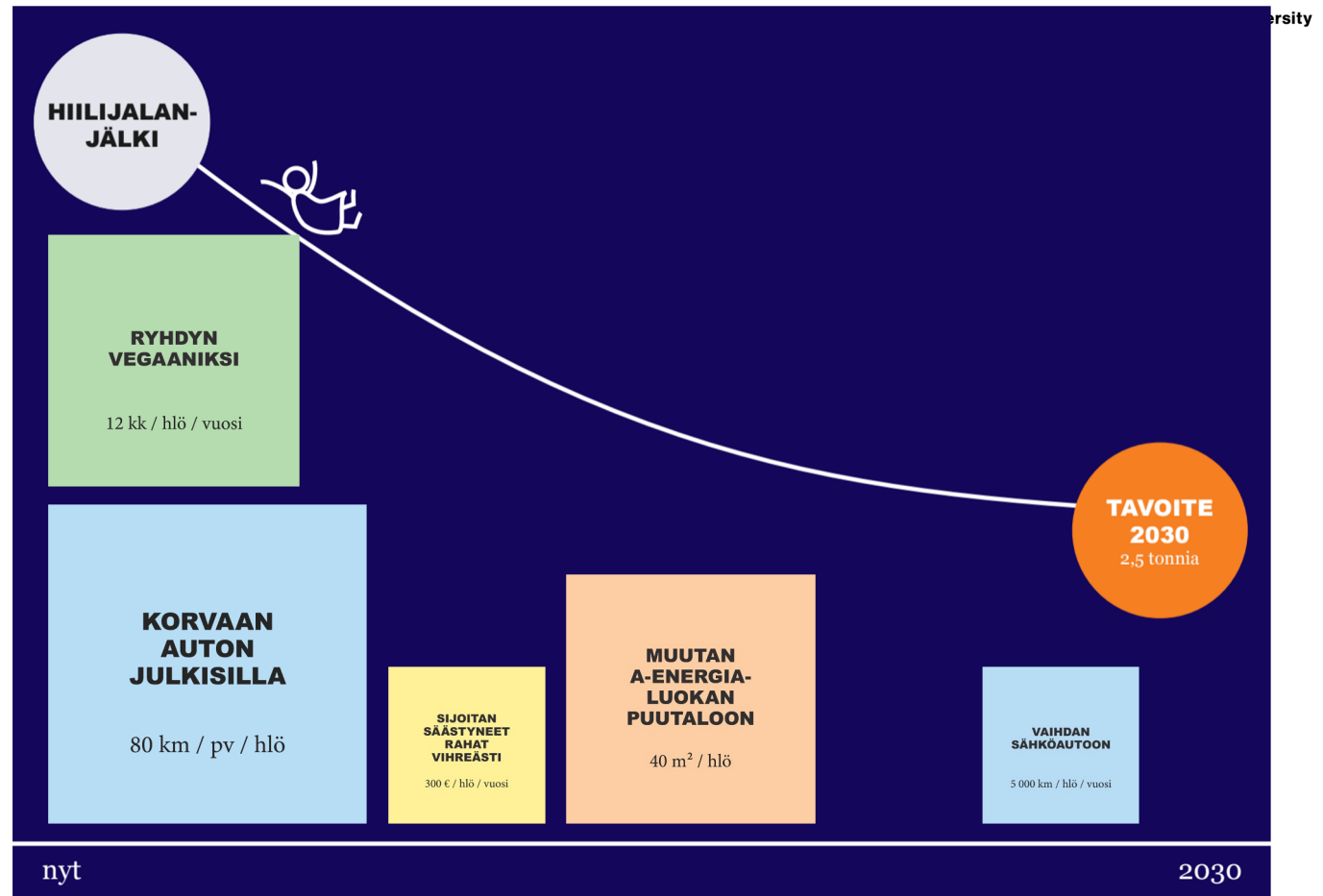


The personal climate plan

15 minutes

The personal climate plan

15 minutes



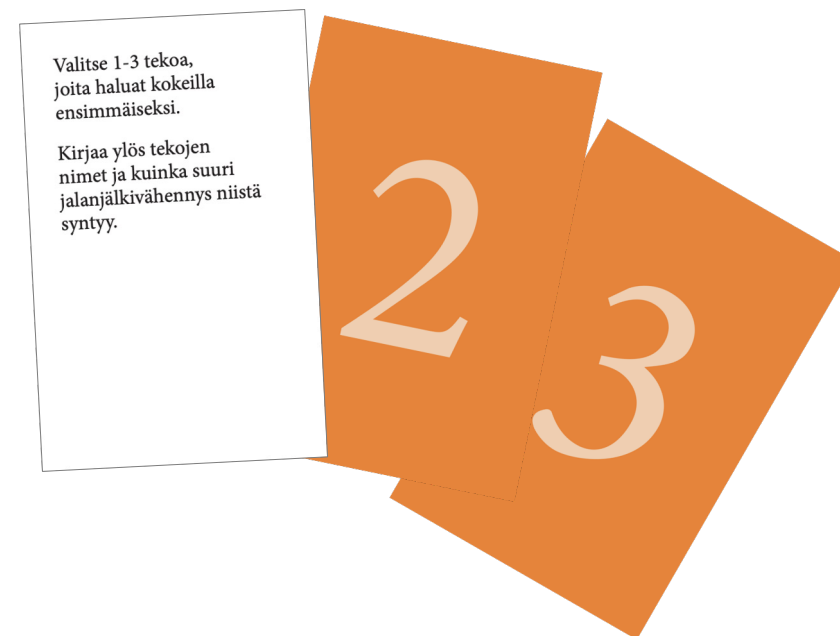
Experiments
15 minutes

Action cards

15 minutes

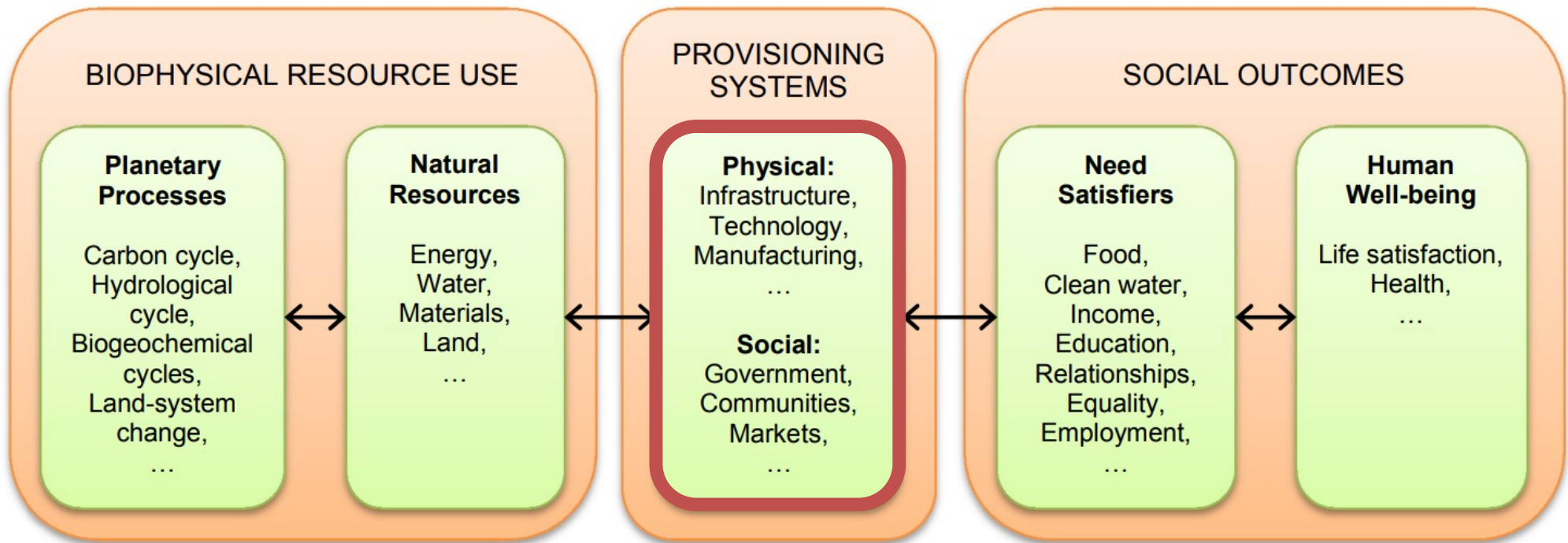
Action cards

- Choose options you would like to try out immediately
- Utilize the action cards for planning your experiments



Wishes to other actors in society
15 minutes

Framework showing the link between planetary processes and human well-being



Source: Steinberger et al.

The growing trend of plant-based food



HS OSASTOT UUTiset HSTV SÄÄ PÄIVÄN LEHTI

MAASEUDUN TULEVAISUUS

sisivu Metsä Maatalous **Ruoka** Poliitiikka Puheenaheet Kantri Suomalainen Maaseutu

Ruoka

S-ryhmä: Kasviproteiini Härkiksen myynti ohitti broilerin paistisuikaleet


Ruoka 16:45
Terhi Pape-Mustonen

Tuote on jo ohittanut porsaan sisäfileet ja lähentelee karjalanpaistilihojen myyntiä viikkotasolla.

MARKKU VUORIKARI



EDITION: UNITED KINGDOM

**REUTERS**

Business Markets World UK Tech Money Commentary Breakingviews Sport Life

HEALTH NEWS | Mon Sep 26, 2016 | 8:33am BST

Investors urge food companies to shift from meat to plants

By Simon Jessop | LONDON

A group of 40 investors managing \$1.25 trillion in assets have launched a campaign to encourage 16 global food companies to change the way they source protein for their products to help to reduce environmental and health risks.

Valtio poistaa veron kasvimaidoilta – katso HS:n laskurista, miten ruokamenosi muuttuvat

Soijamaito ja muut kasvipohjaiset juomat halutaan samalle viivalle verokohtelussa kuin lehmänmaito, josta ei peritä virvoitusjuomaveroa.

KOTIMAA 27.9.2016 15:04 Päivitetty: 28.9.2016 8:16
Teija Sutinen HELSINGIN SANOMAT



PETRI KI

TALOUSSANOMAT Joka samas

Uutiset Yrityshaku Pörssi Autot Asuminen Oma raha Digitoday

Yrittäjä-uutiset Protestit Uudet yritykset Rating-muutokset Kalenteri Viikot



★★★★☆

99,90

Naut omast
Tregren HEI

Liike-elämän huippukonferenssi yllätti – tarjoaa vain kasvisruokaa

TALOUSSANOMAT KOLUMNI Joka samas

Uutiset Yrityshaku Pörssi Autot Asuminen Oma raha Digitoday

Uutiskirjeet Kotimaa Ulkomaat Pörssi-uutiset Media Yrittäjä Kolumnit

Mallisto alkaen: 39 670€ Moottorit: 2,2 150 hv – 2,9 Yhdistetty kulutus: 4,2 – 8,5l/100km

Suursijoittajat kannustavat elintarvikejätettä vaihtamaan lihan kasviproteiiniin

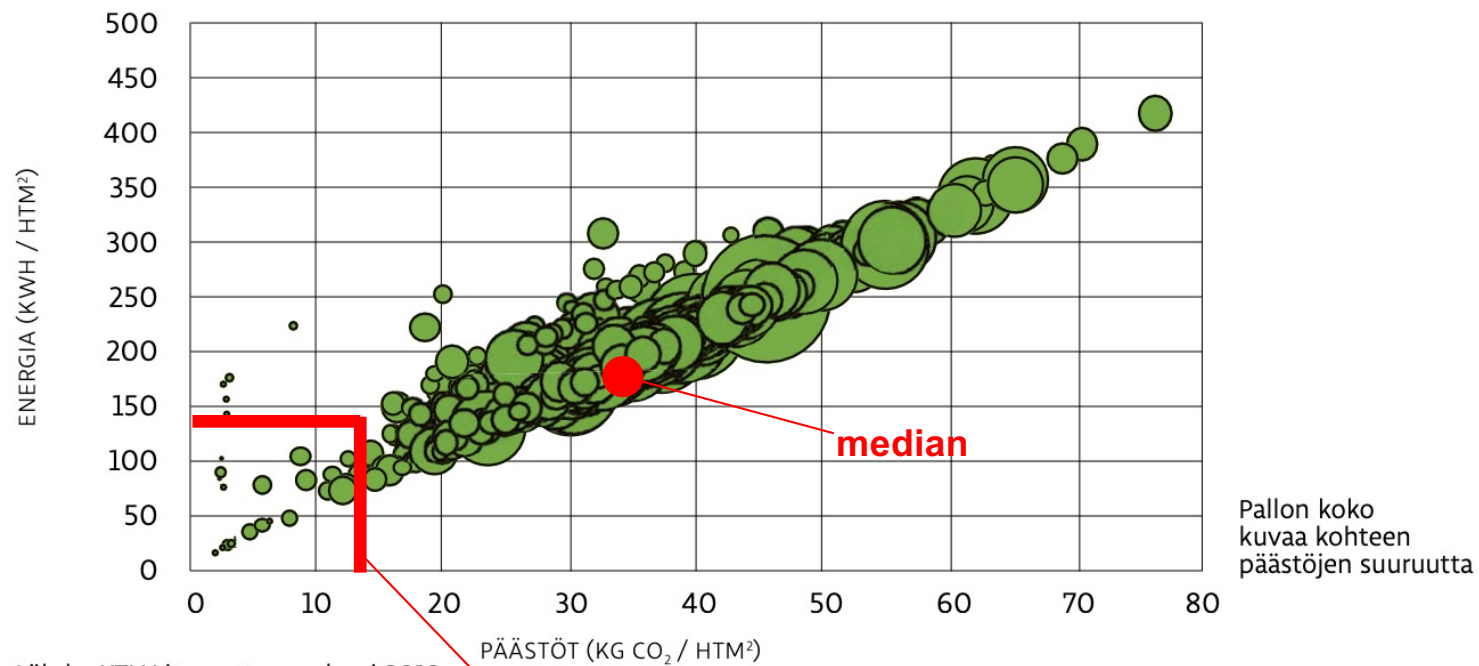
© Paulo Whitaker / Reuters



Kansainvälinen sijoittajaryhmä kehottaa elintarvikejätettä siirtymään eläintuotteista kasviproteiiniin käyttöön.

Who is going to do this job?

CO₂ emissions and energy consumption of Finnish apartment blocks



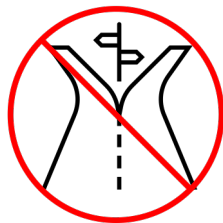
**1,5-degree lifestyles by 2030
(floor space on present level)**

Opting out – Some examples

Wales freezes all new road building projects

The Welsh government wants to shift money from new roads to maintaining existing routes and investing in public transport

Wales is aiming to reach net-zero carbon emissions by 2050.



France bans short haul flights

Government banned journeys that could be made under two-and-a-half hours to reduce climate impacts from flying

Instead, the government wants to further promote train travel





Wrap up

15 minutes

- How did it go? Thoughts, feelings



Kiitos!

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