International energy (footprint) inequality – problems and solutions

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Seminar at the Institute for Socio-Economics, University Duisburg-Essen

About myself

- Final year PhD, University of Leeds, from Aachen

PhD work → 3 first author studies, 2 published

1. Large energy inequality 2. Global redistribution 3. Global luxury carbon taxation

- Research interests: distributional modelling, understanding inequality and energy development, quantitative modelling in general

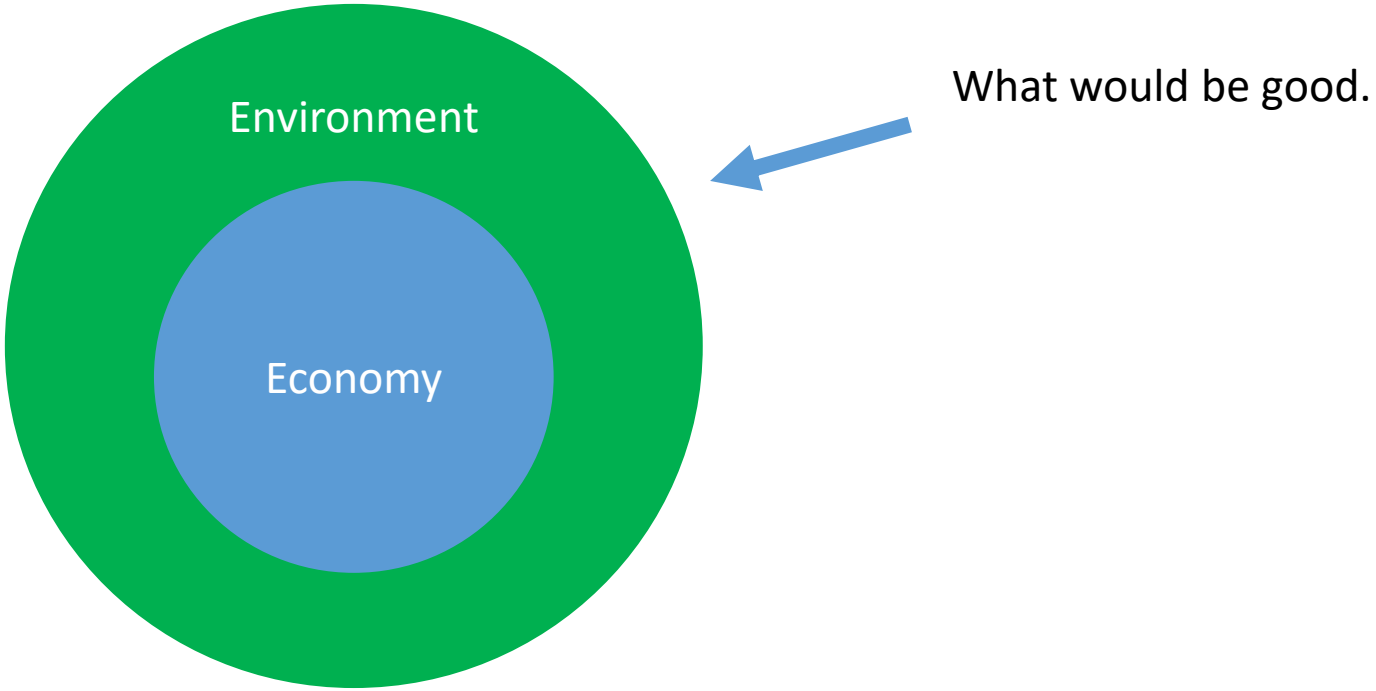
Content

- Living well within limits project (LiLi)
- Motivation to study energy inequality
- Methods
- Energy footprint inequality as it is
- What can we do about it?
- Discussion with you

The “Living well within Limits (LiLi)” project

Prof. Julia Steinberger
Project leader
University of Lausanne
University of Leeds

What is the amount of biophysical resources required to achieve human well-being?



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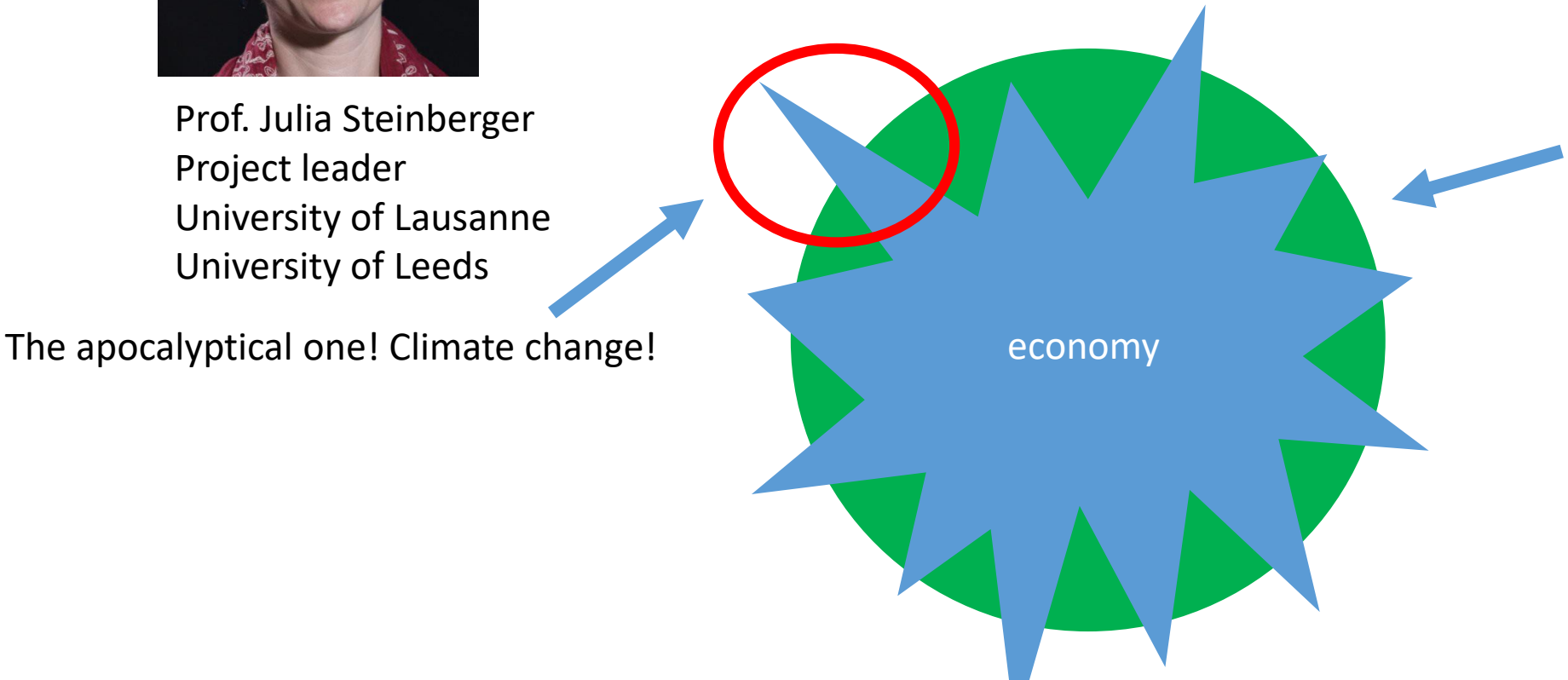
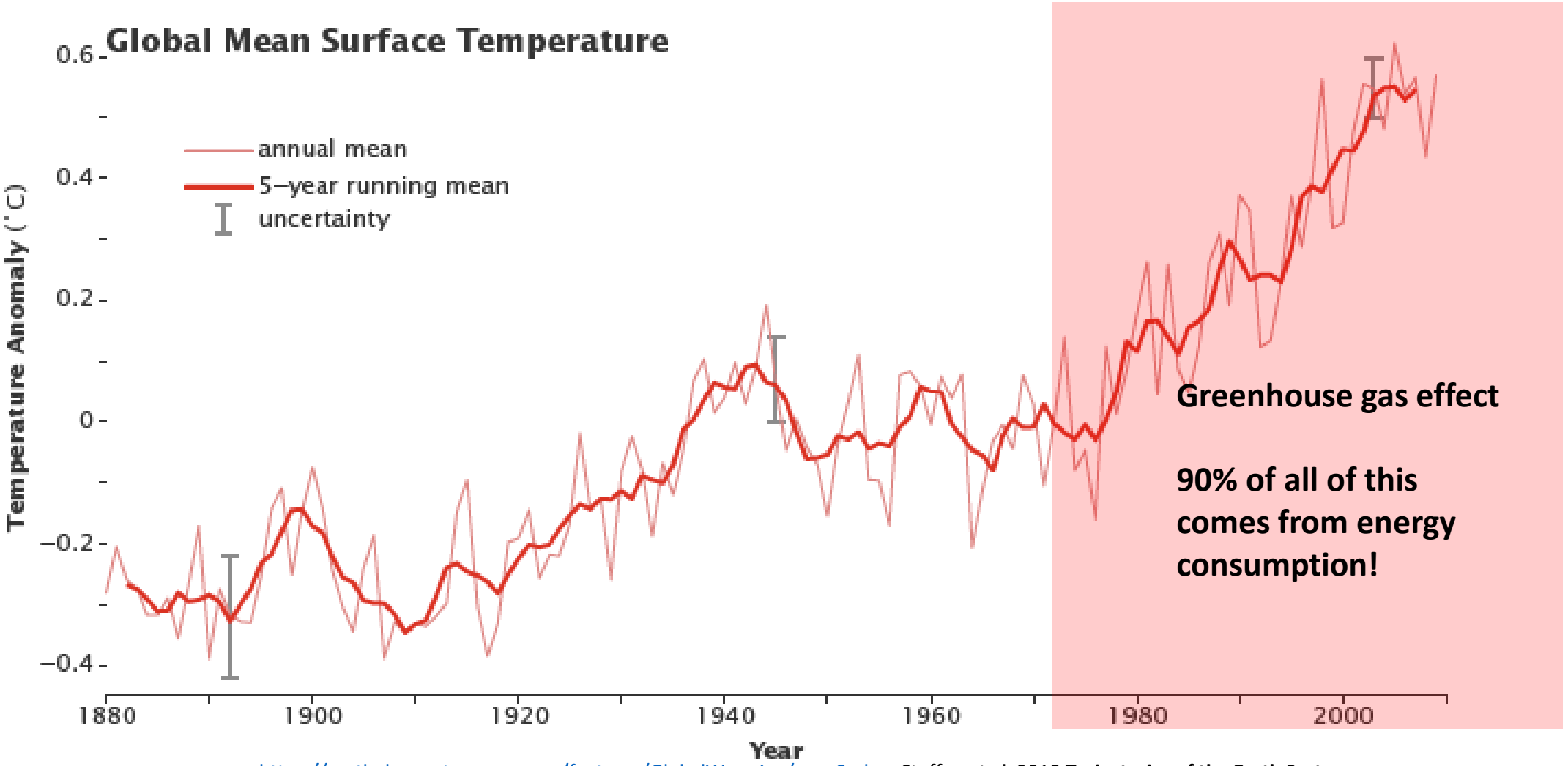


The apocalyptical one! Climate change!

What is actually happening.

The economy is transgressing *planetary boundaries*

The “Living well within Limits (LiLi)” project



https://earthobservatory.nasa.gov/features/GlobalWarming/page2.php, Steffen et al. 2018 **Trajectories of the Earth System in the Anthropocene, PNAS** https://doi.org/10.1073/pnas.1810141115

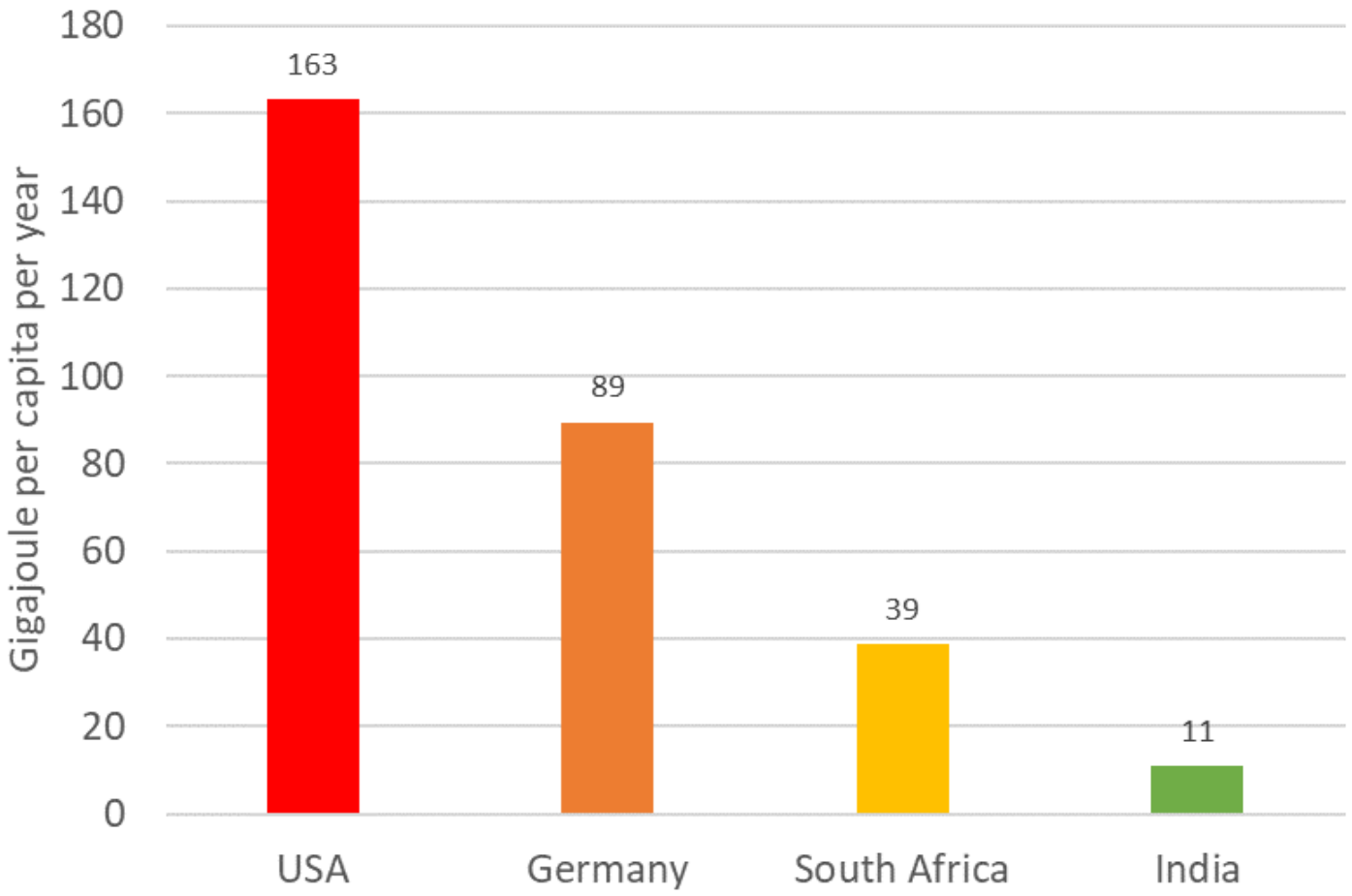
Motivation

Motivation (1) - Energy inequality ***between*** countries

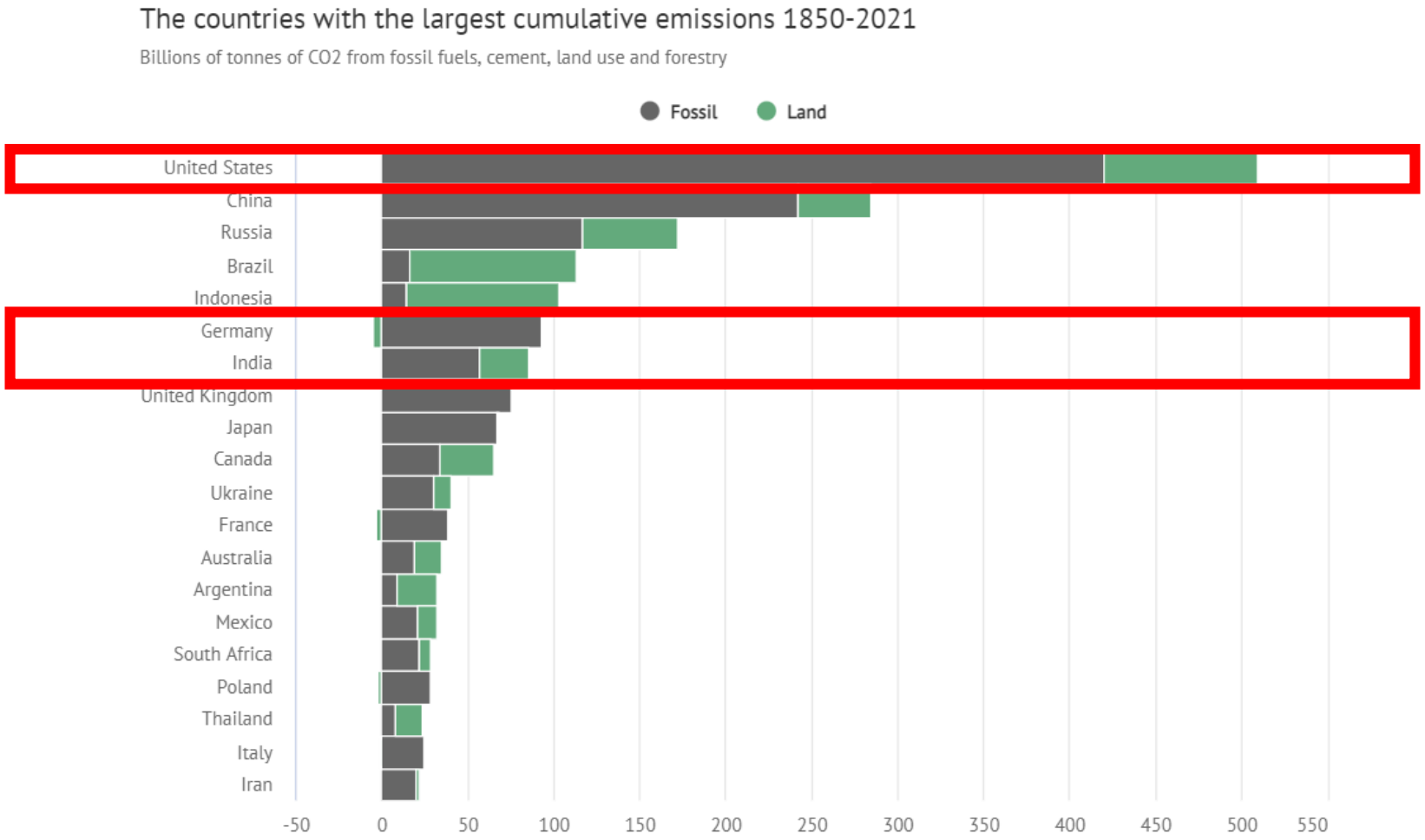
1 GJ = 277 kWh

~ powering 300 laptops all day

~ 450 km in VW Golf

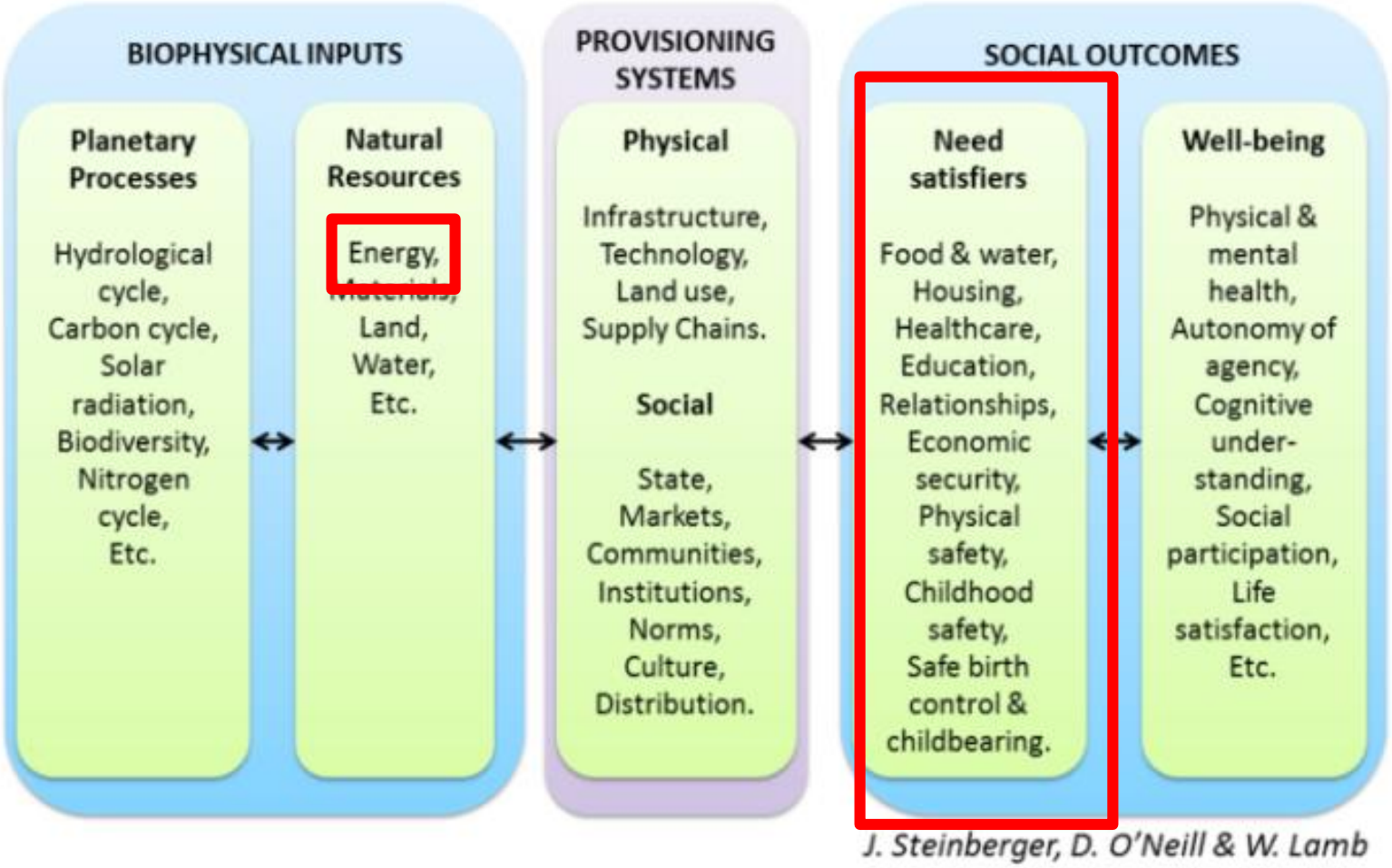


Motivation (2) – Historic emissions responsibility



from https://www.carbonbrief.org/analysis-which-countries-are-historically-responsible-for-climate-change

Motivation (3) – Still energy is absolutely fundamental to human needs satisfaction



Motivation (4).. But! Not all material consumption is equal!

Basic purposes/ **Necessities**

Leisure/Secondary purposes/ **Luxury**

Motivation (4).. But! Not all material consumption is equal!

How is energy inequality shaped by different consumption purposes? What do these two things have to do with each other?

Methods

Quantitative Modelling

Data-driven and putting a lot of data together

Household surveys (1)

What do you consume?

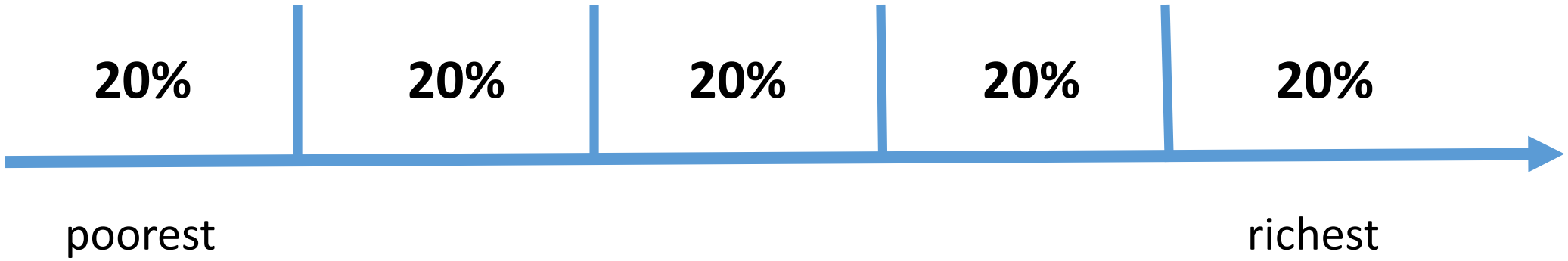
How much do you spend on food? On gasoline? Etc.

Consumption category	Quantity
Food	..
Transport	..
Furniture ..	..

My project used surveys for 88 countries including Global North and South for the year 2011. All of Europe, India, China etc.

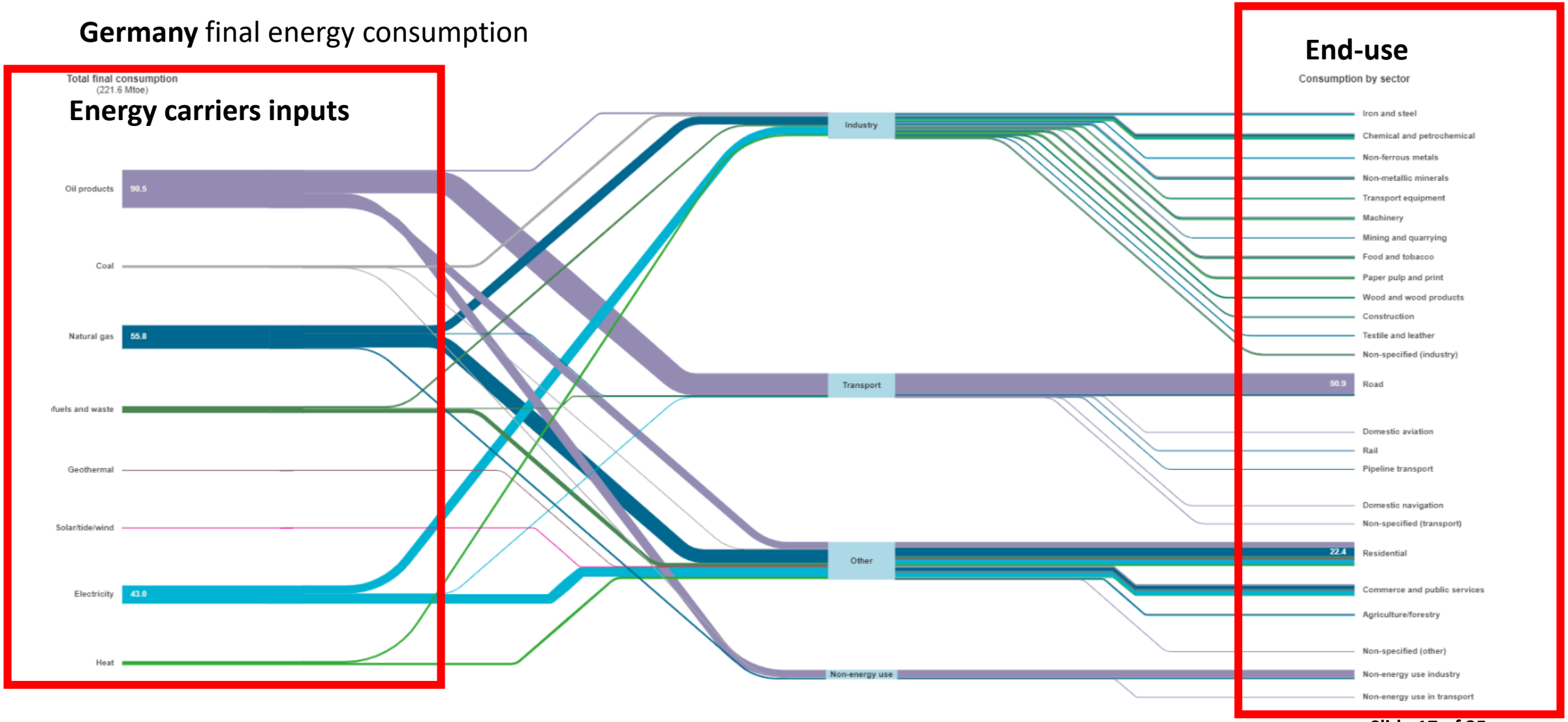
By the World Bank and Eurostat

Household surveys (2) – Income classes =>within country inequality



Energy data by the International Energy Agency

Germany final energy consumption



Economy model (input output table)

	Agriculture	**Construction**	**Automobile**	**Steel**	**Household demand**	**Government demand**
Agriculture	50	10	10	10	100	20
Construction	50	100	10	50	100	200
Automobile	10	50	70	20	100	20
Steel	5	100	50	50	20	100
	115	260	140	130	320	340

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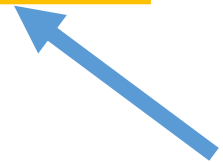
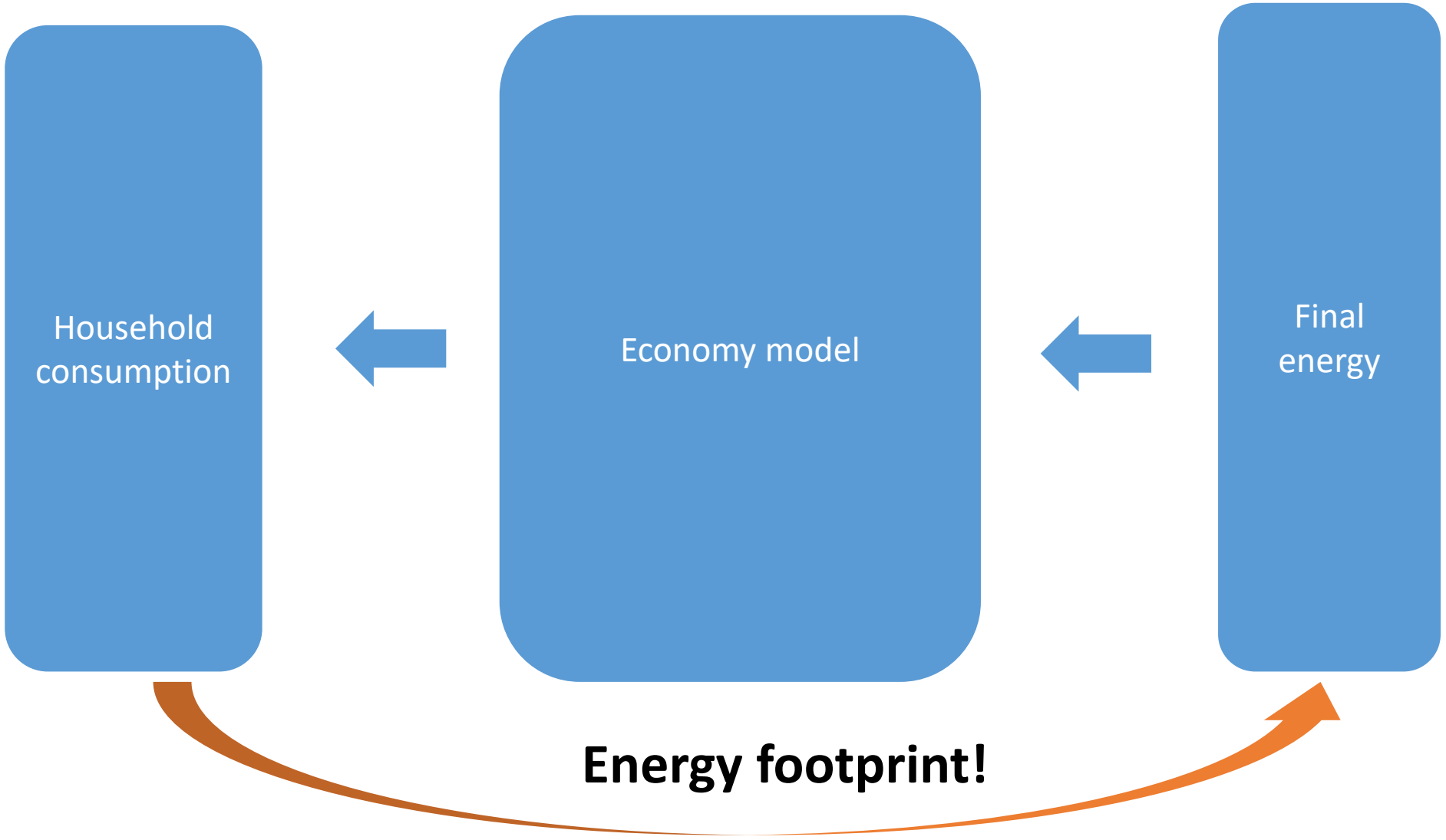


Same as in household surveys

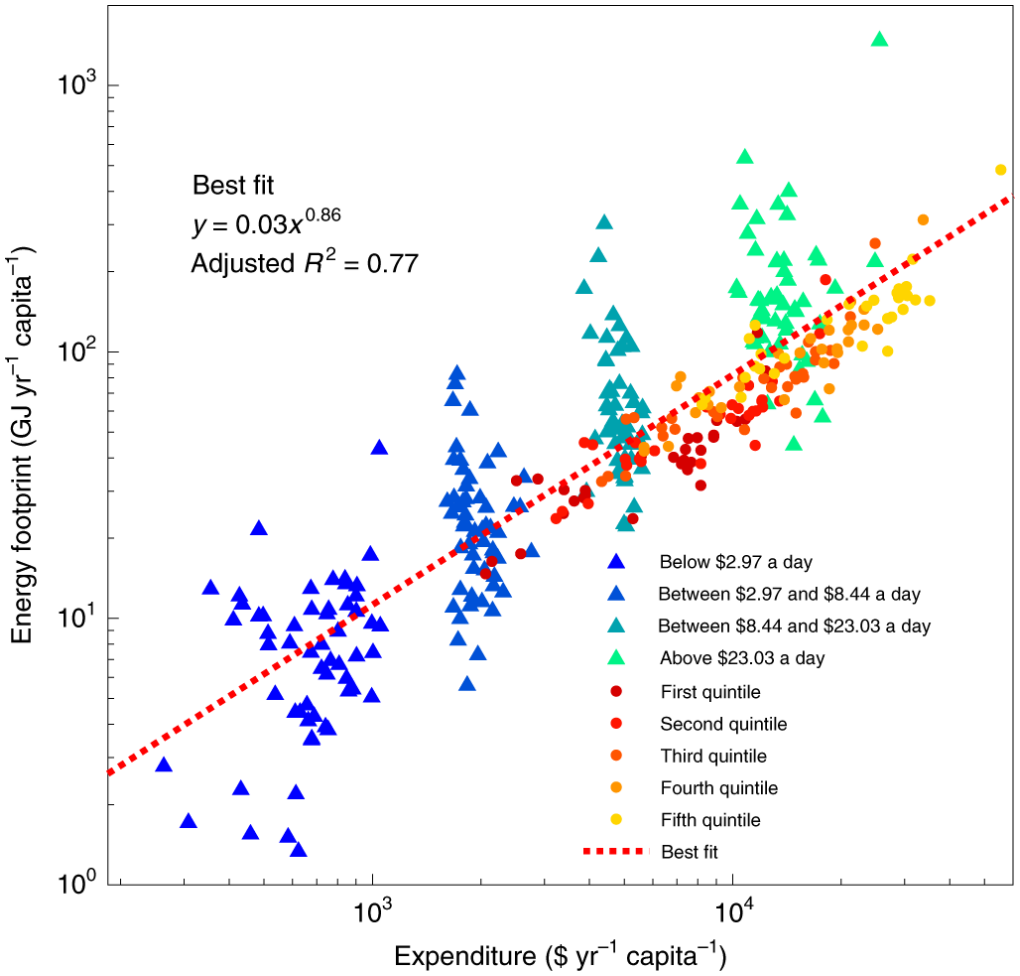
Putting it all together



Results

Richer people use more energy (1)

Energy footprint



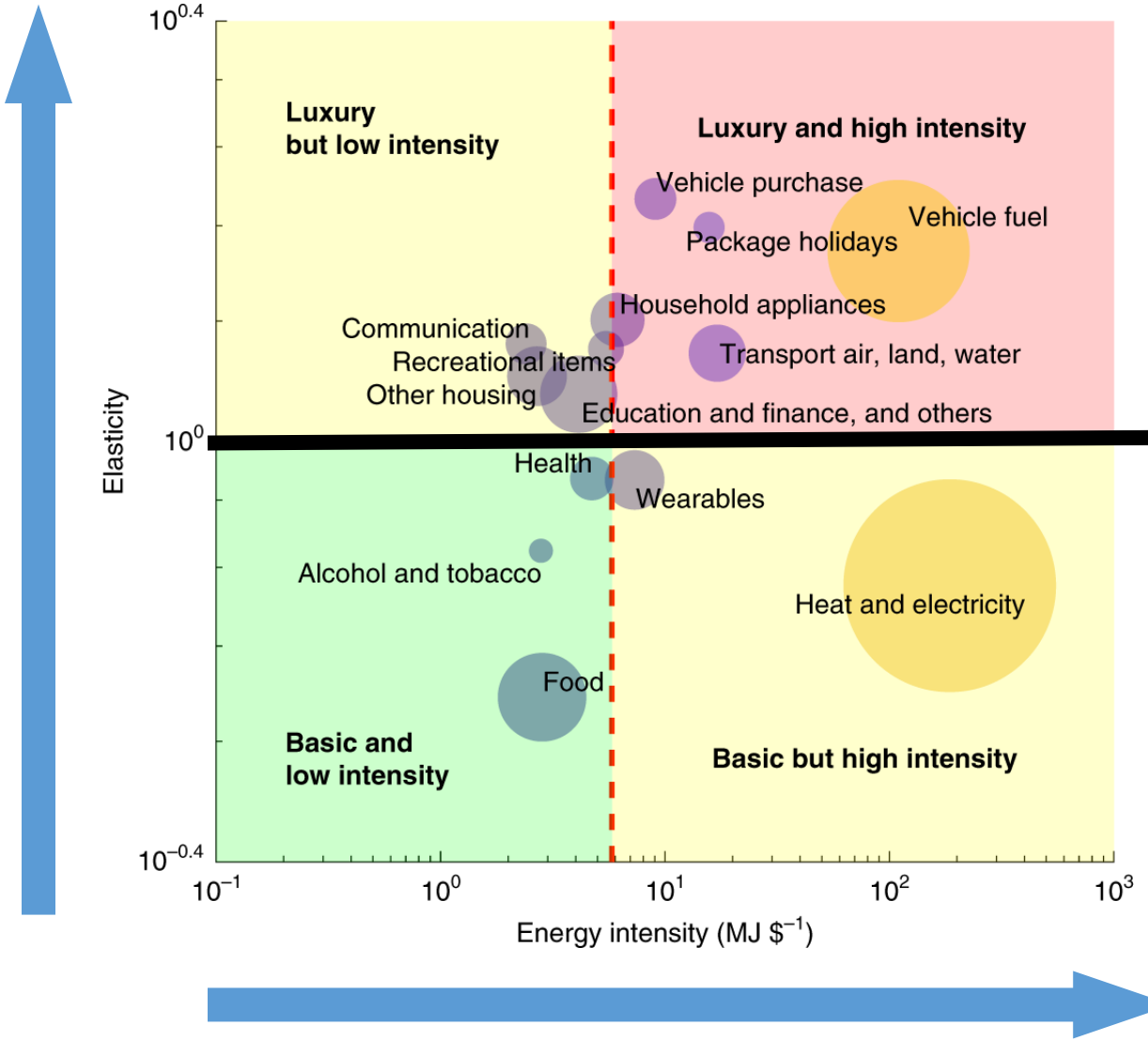
$$\text{Elasticity} = \frac{\%\ change\ energy\ footprint}{\%\ change\ income}$$

$$0.8 = \frac{0.8\ \%\ change}{1\ \%\ change}$$

Disposable income

Biggest energy consumption is residential energy which is a basic good but Luxury goods are energy intensive too

Richer people consume more



Critical threshold
Elasticity = 1

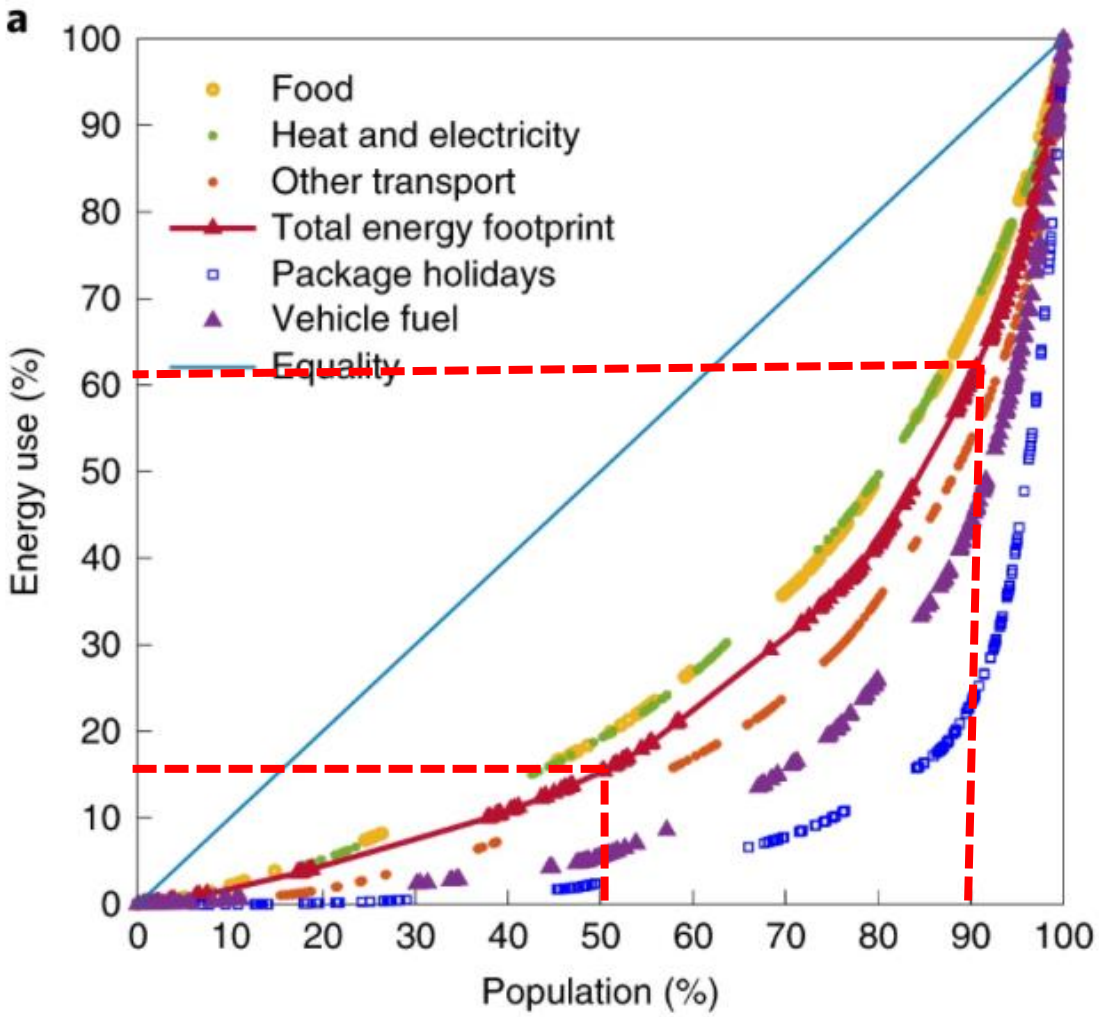
$$\text{Elasticity} = \frac{\%\ change\ consumption\ of\ a\ good}{\%\ change\ income}$$

$$\frac{\%\ change\ number\ apples\ demanded}{\%\ change\ income}$$

$$\text{Energy intensity} = \frac{energy\ use}{\$\ money\ spent}$$

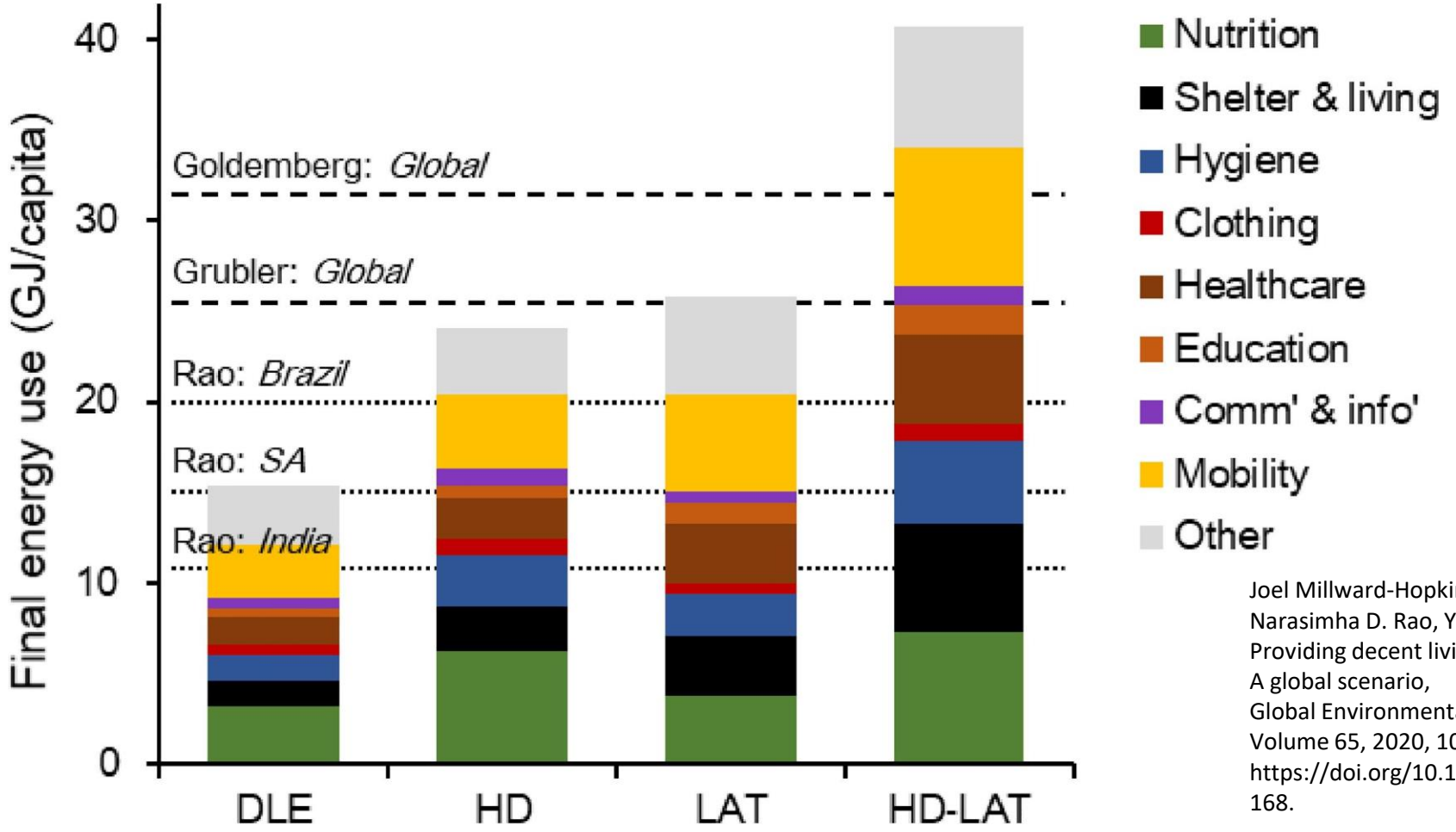
Consumption uses more energy

Richer people use more energy (2)



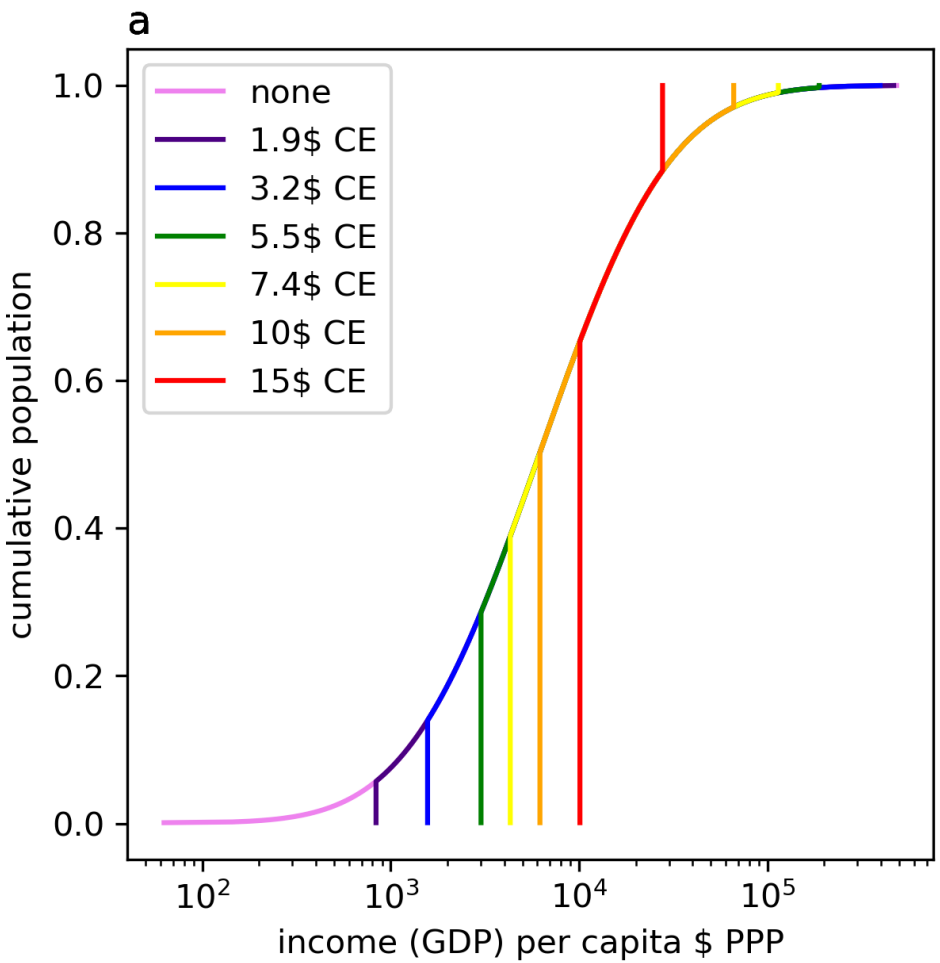
What can we do about this?

Good news is: Much less energy is necessary to live well than currently used by rich people



Joel Millward-Hopkins, Julia K. Steinberger, Narasimha D. Rao, Yannick Oswald,
Providing decent living with minimum energy: A global scenario,
Global Environmental Change,
Volume 65, 2020, 102168,ISSN 0959-3780,
https://doi.org/10.1016/j.gloenvcha.2020.102168.

Redistributing income redistributes energy



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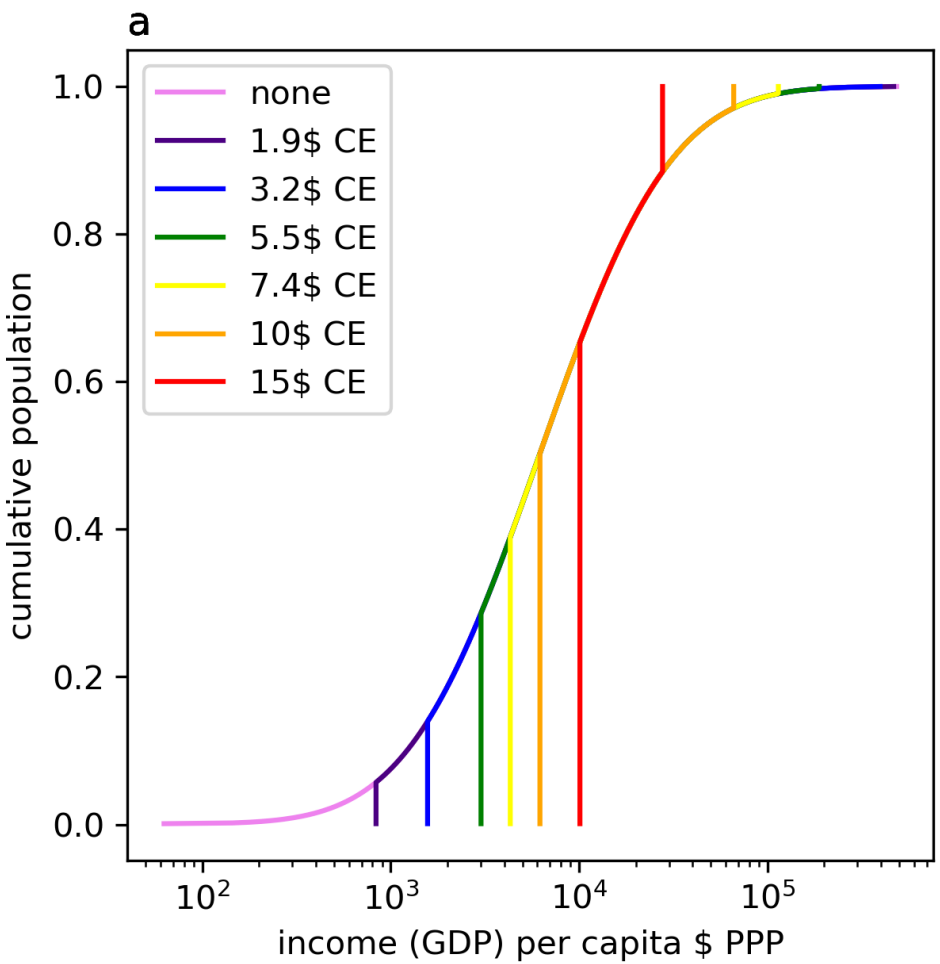
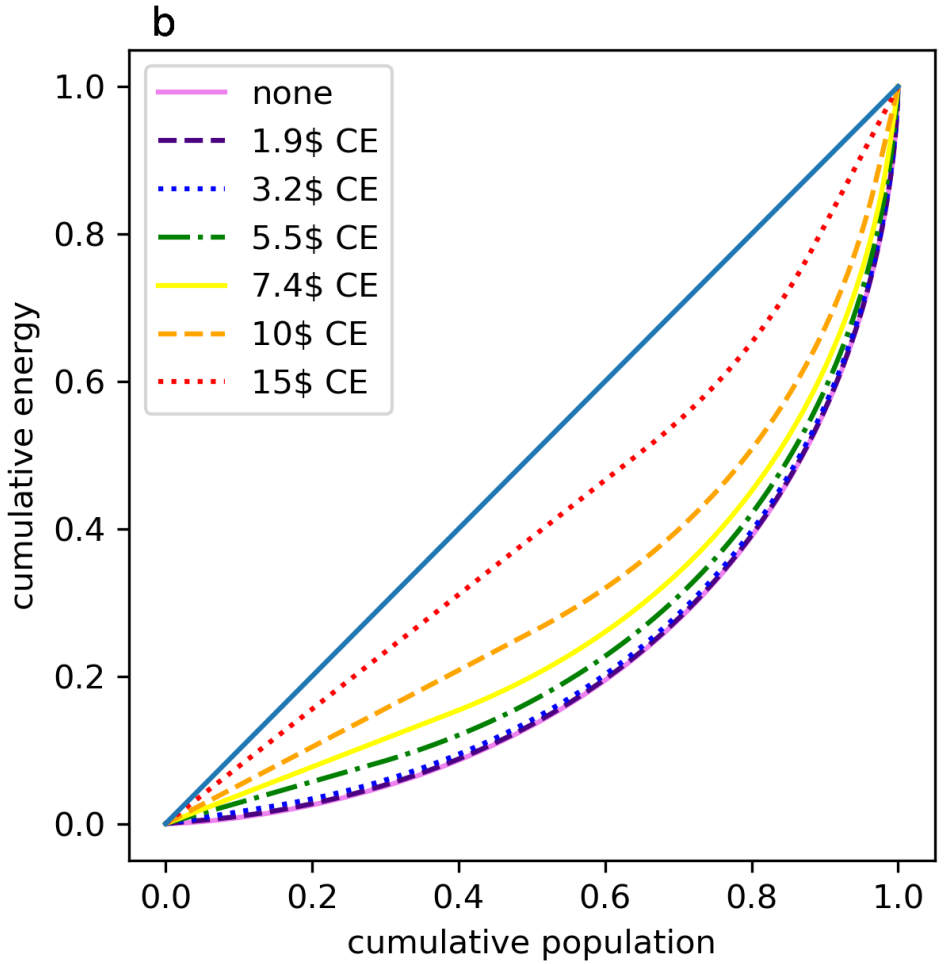
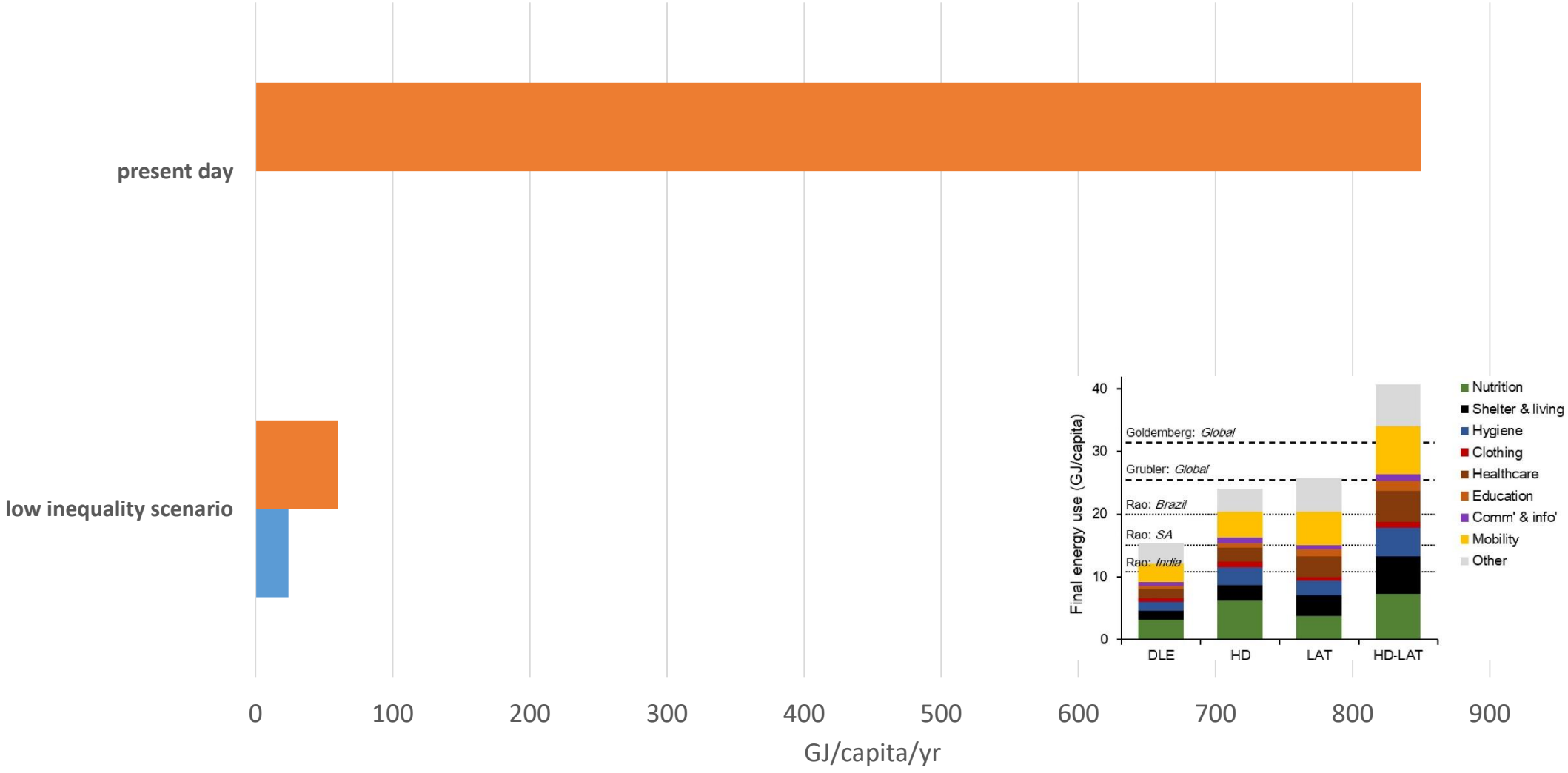


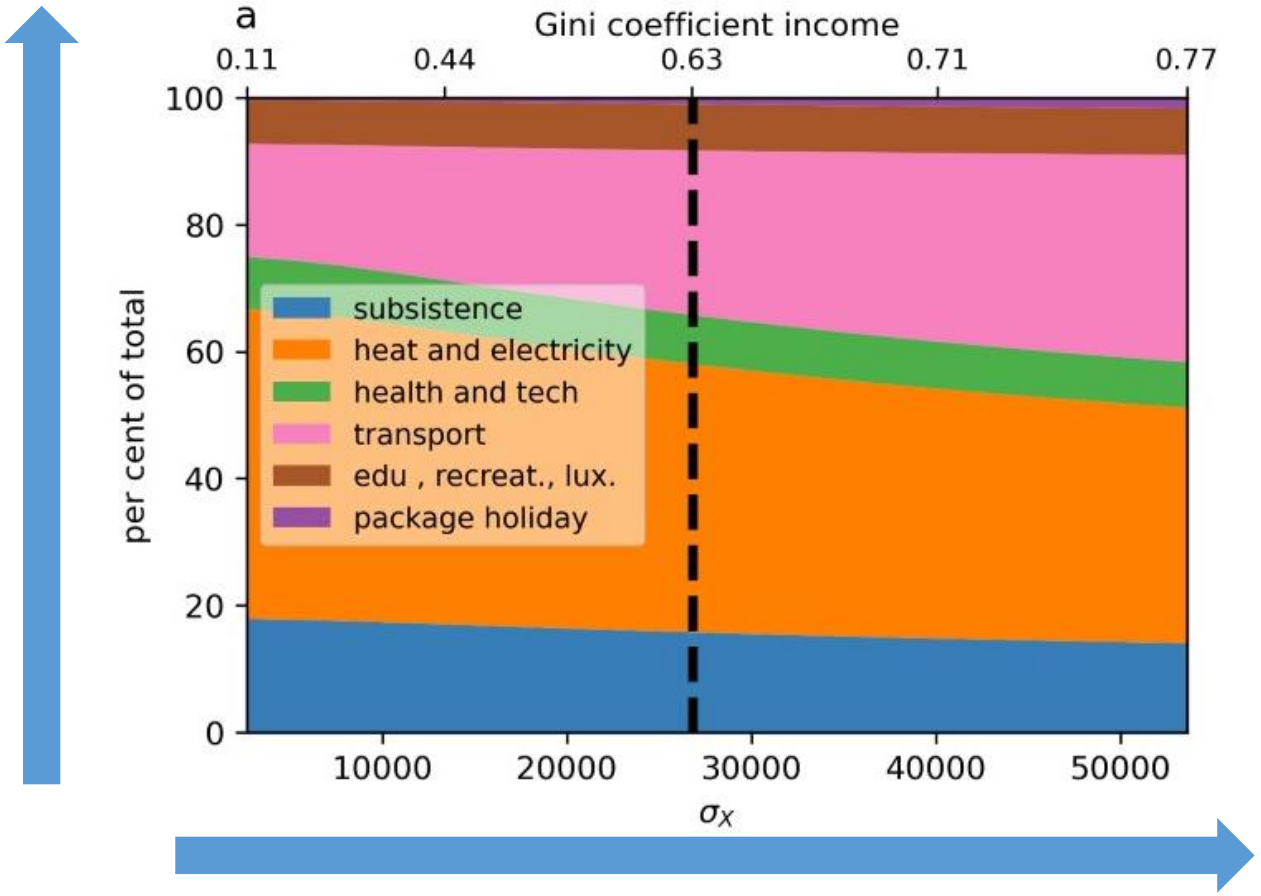


Post-redistribution energy range



Redistributing income changes the entire energy system

Composition of energy system



Higher inequality

Economic policy = energy policy + climate policy

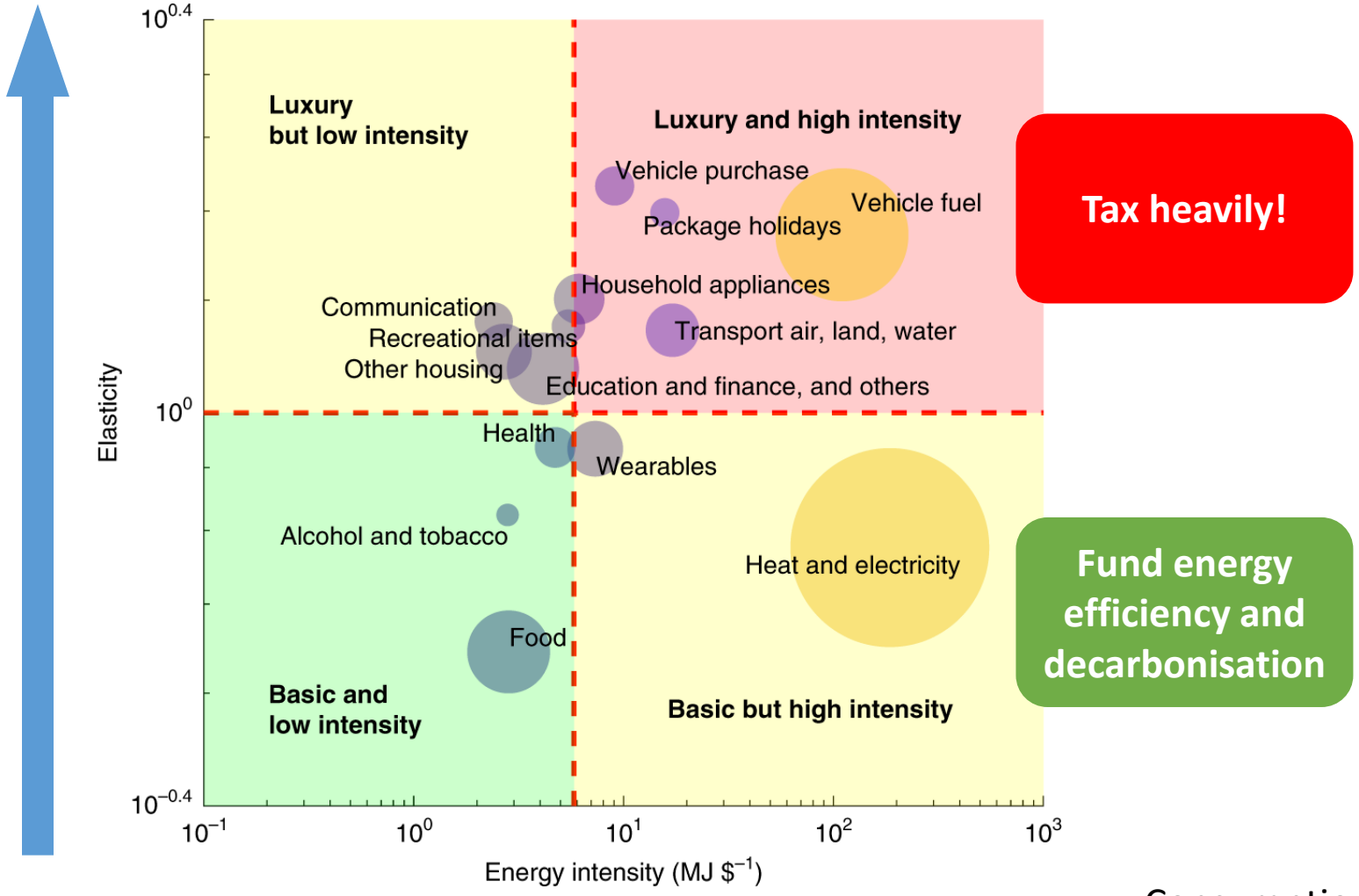
Examples

- Wealth taxes
- Income taxes or caps and floors
- Consumption taxes or caps and floors
- Etc.

Utopia or realistic?

The realist's minimum – luxury carbon/energy taxes

Richer people consume more



Tax heavily!

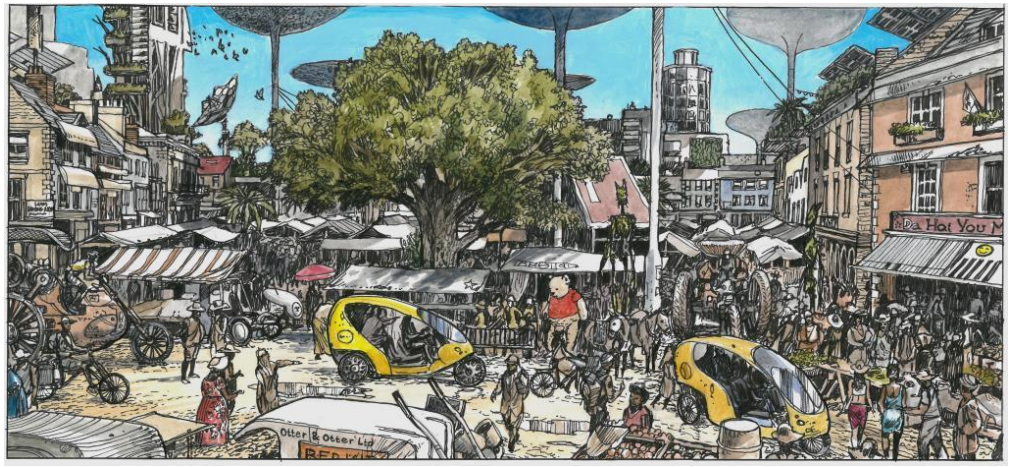
Fund energy efficiency and decarbonisation

Consumption uses more energy

Conclusions in a German context

Economic wealth under current system => high energy transport

Best would be **inclusive small scale** transport



But will it work?

FDP is already about to lower taxes on cars

SPD

BÜNDNIS 90
DIE GRÜNEN

Freie
Demokraten
FDP

Thank you!

References for presentation

- Images if not references from Pixabay free for all use types.
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