

Data for Sustainability Development

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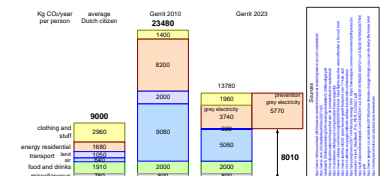
Abstract

The transition to a sustainable society requires solutions for all Sustainability Development Goals. One of the challenges is to understand this global problem elaborated in 17 Sustainability Development Goals. This presentation provides examples of available data and discusses challenges in using them.

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draft
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Connecting the Global Picture to an Individual

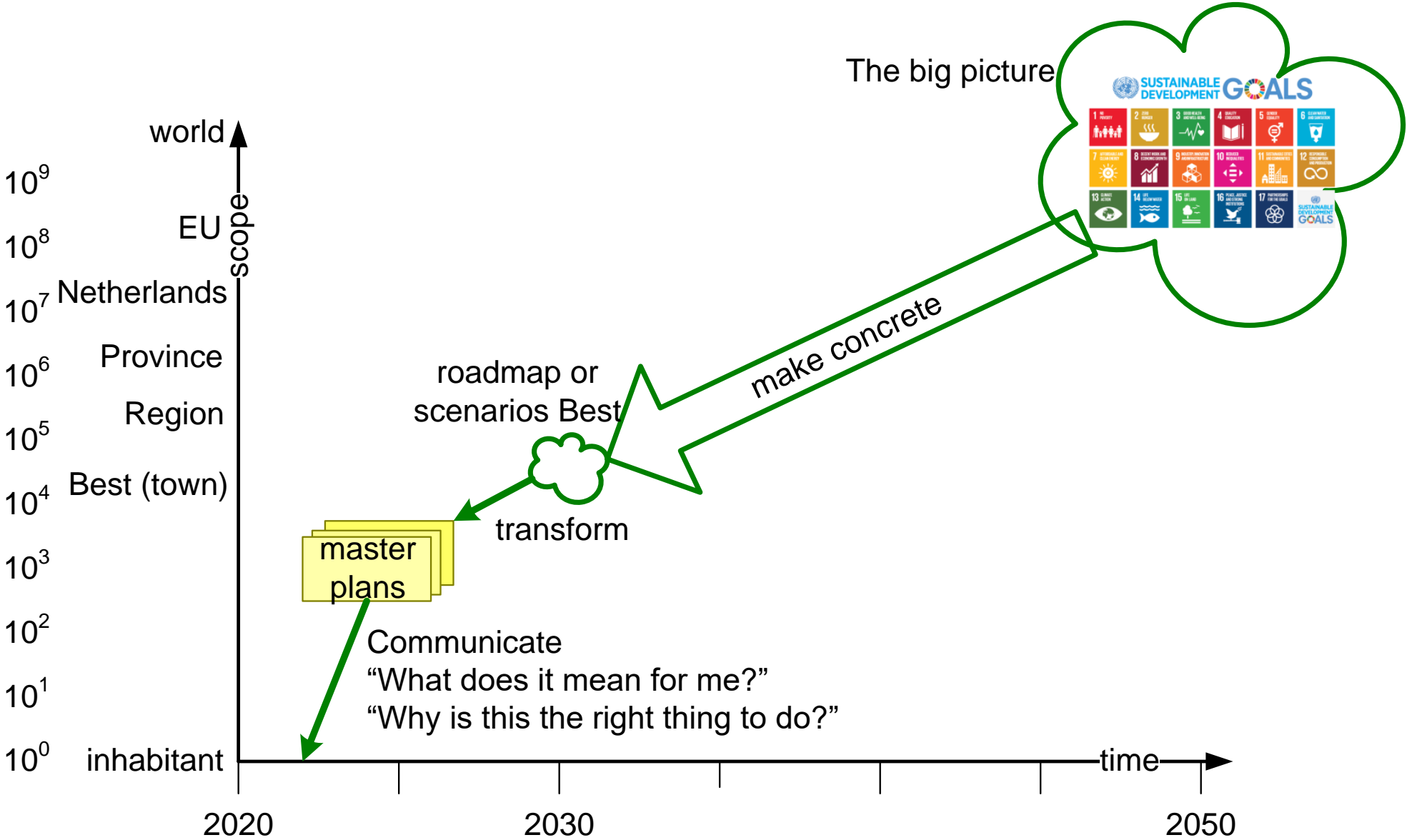
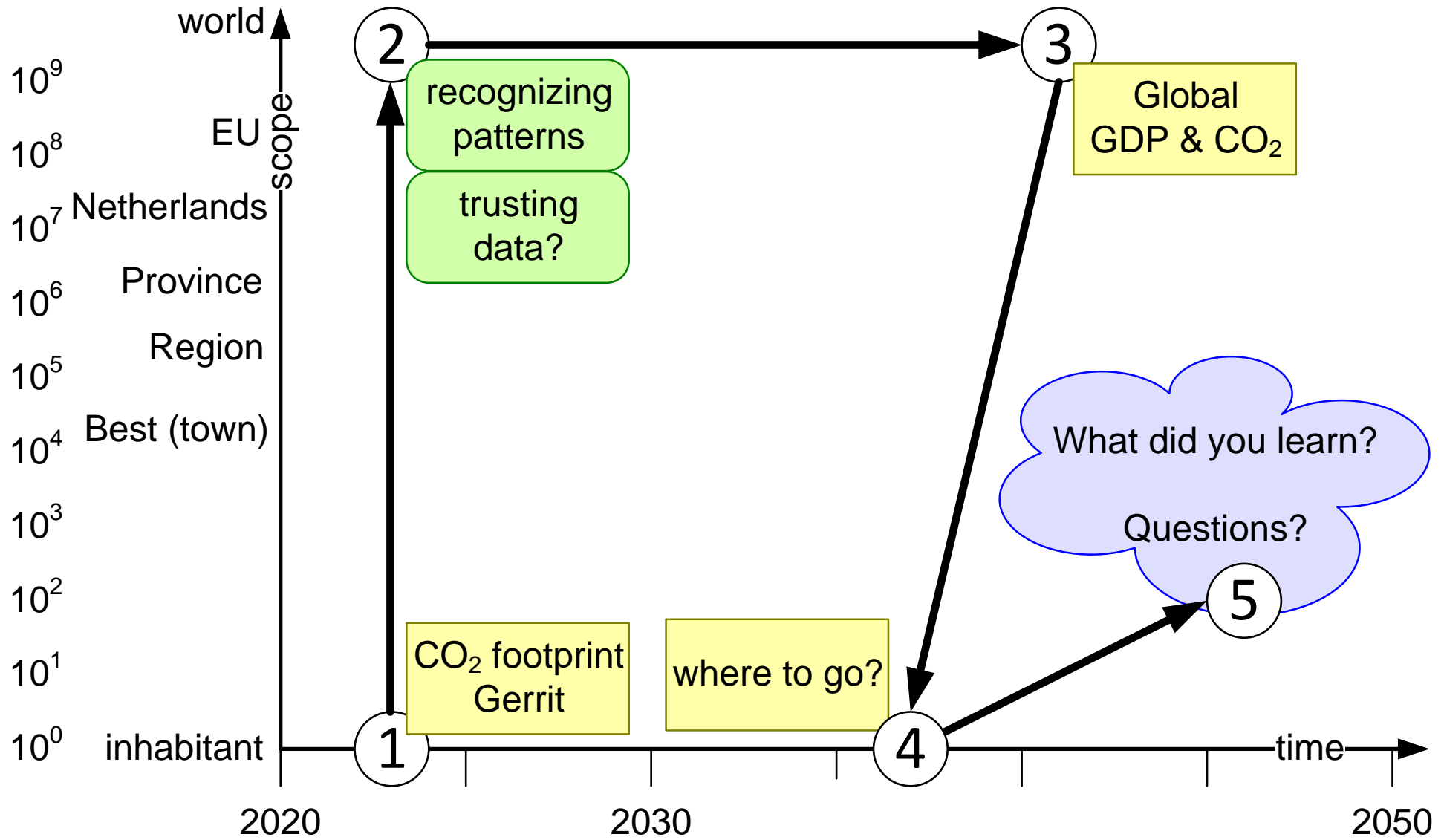
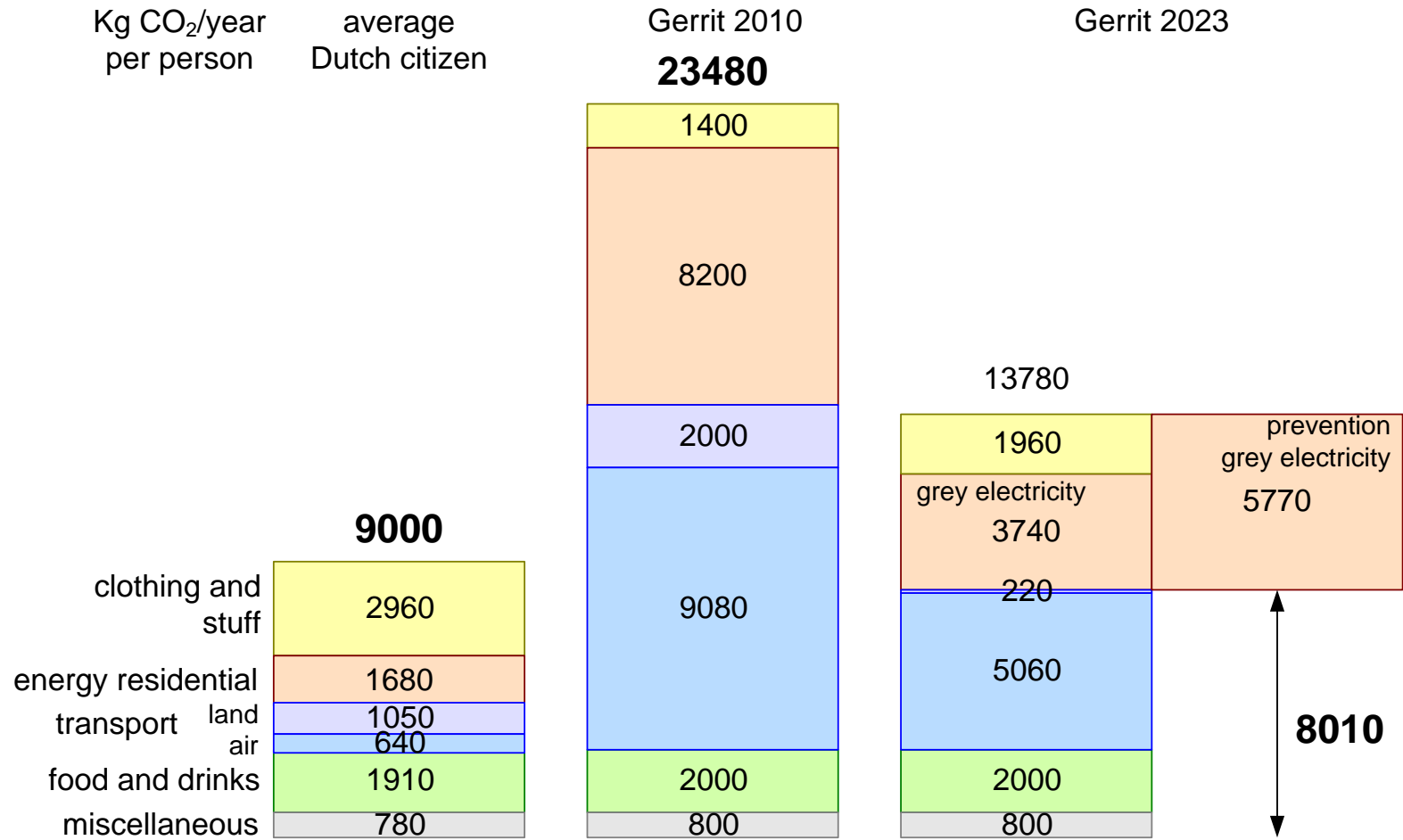


Figure of Content



Total CO2 Footprint Gerrit



Sources

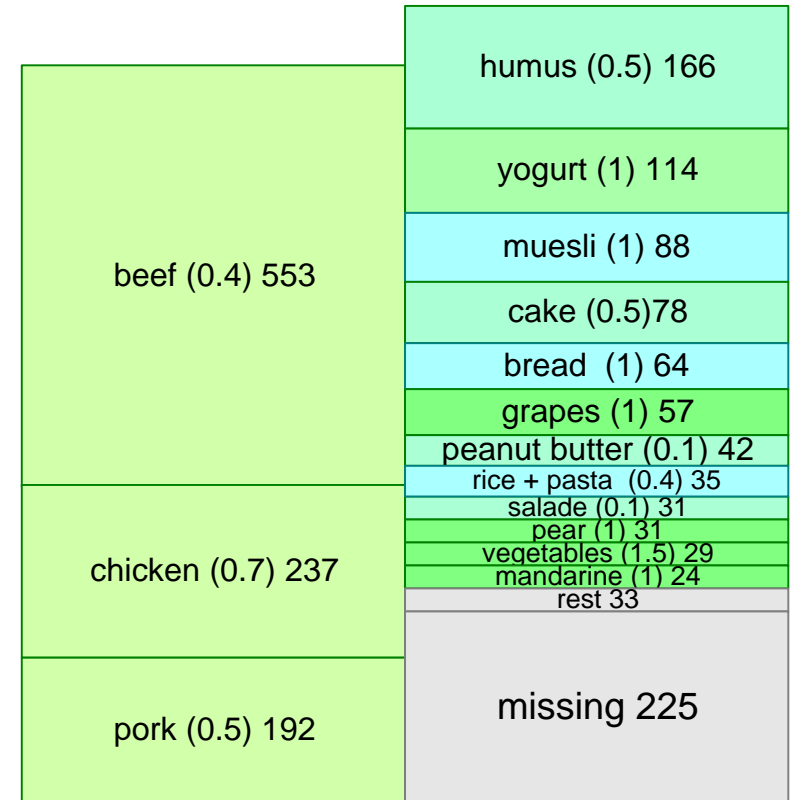
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- <https://www.rivm.nl/sites/default/files/2021-02/Database%20milieubelasting%20voedingsmiddelen%20Beveiligd.pdf>
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- <https://www.robeco.com/en/insights/2020/02/short-haul-flights-are-the-worst-offenders-for-co2.html>
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- <https://www.penguin.co.uk/articles/2019/jul/ios-climate-change-things-you-can-do-daily-life-home.html>
- <https://mobly.be/nl/wiki/co2-uitstoot-auto-berekenen>

Food and Drinks CO2 Footprint

| food and drinks | | Kg CO ₂ /Kg | | | |
|--------------------|-------------------|------------------------|--------------|---------------|------|
| butter | sandwich filling | 9.25 | potatoes | carbohydrates | 0.18 |
| cheese | sandwich filling | 12 | bread | carbohydrates | 1.2 |
| Humus | sandwich filling | 6.4 | rice | carbohydrates | 1.8 |
| peanut butter | sandwich filling | 8 | wheat flour | carbohydrates | 0.9 |
| salad | sandwich filling | 6 | pasta | carbohydrates | 1.5 |
| wine | drinks | 2 | musli | carbohydrates | 1.7 |
| tea | drinks | 0.16 | cake | luxury | 3 |
| coffee | drinks | 0.3 | kidney beans | legumes | 1.5 |
| Vegetarian sausage | protein | 4.3 | chickpeas | legumes | 6.2 |
| tofu | protein | 3.2 | mayonnaise | sauce | 5 |
| vegetarian slice | protein | 3.3 | beef | meat | 26.6 |
| vegetables | fruit, vegetables | 0.37 | pork | meat | 7.4 |
| grapes | fruit, vegetables | 1.1 | chicken | meat | 6.5 |
| mandarine | fruit, vegetables | 0.47 | fish | meat | 6 |
| pear | fruit, vegetables | 0.6 | yogurt | dairy | 2.2 |

preparation counted twice

Gerrit (food/week in Kg) 2000



Clothing and Stuff CO2 Footprint

Gerrit 2023
1000 + 960 Kg CO₂

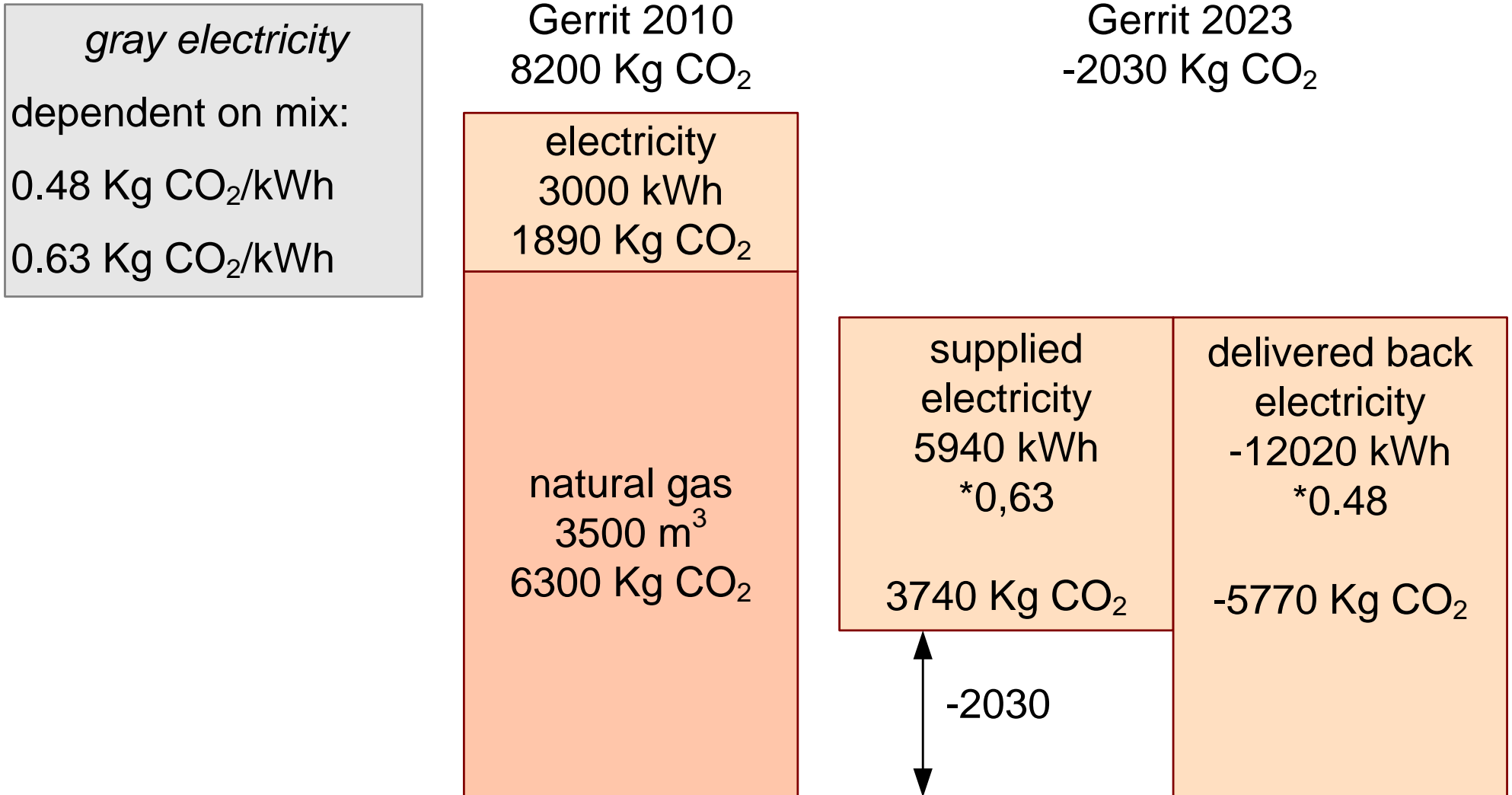
| CO ₂ emission data | |
|---------------------------------|-------------------------|
| | Kg CO ₂ /Kg |
| production textile | 13.6 |
| transport textile | 1.4 |
| paperback | 2 |
| | Kg CO ₂ |
| shoes/pair | 4 |
| laptop/piece | 250 |
| AA battery | 0.1 |
| household equipment | 300 |
| small car (Citroën C1) | 6000 |
| medium car (Mondeo) | 17000 |
| large car (Landrover) | 35000 |
| PV panel (1.7*1m ²) | 31 |
| | Kg CO ₂ /kWh |
| Li-ion battery | 73 |

| Clothing (maat XL) | | |
|--------------------|--------|---------------------------|
| garment | weight | Kg CO ₂ /piece |
| shirts | 280 | 4.2 |
| vest | 850 | 12.8 |
| jeans | 780 | 11.7 |
| T-shirt | 200 | 3.0 |
| underpants | 80 | 1.2 |
| towels | 230 | 3.5 |
| tea towels | 70 | 1.1 |
| pair of socks | 80 | 1.2 |
| jacket | 1000 | 15.0 |
| pajamas | 760 | 11.4 |

| |
|-------------------------|
| electronic devices 281 |
| household equipment 300 |
| books 132 |
| clothing 128 |
| shoes 4 |
| rest 155 |

| |
|---|
| PV 94 |
| electric car "depreciation" over 10 years 863 (battery 263) |

Energy CO2 Footprint

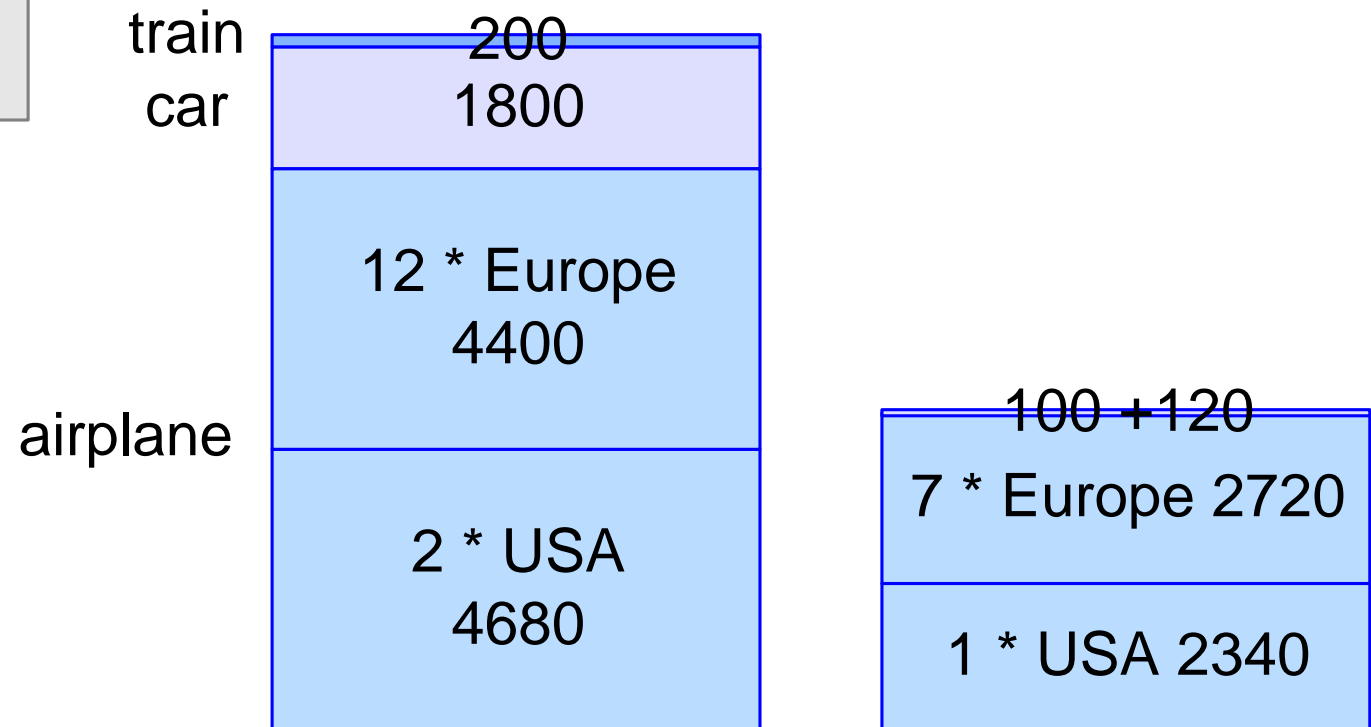


Transport CO2 Footprint

| transport | |
|----------------|------|
| flying | g/km |
| short distance | 251 |
| long distance | 195 |
| train | 41 |
| car, 5l/100km | 120 |

Gerrit 2010
land 2000 Kg CO₂
air 9080 Kg CO₂

Gerrit 2023
land 220 Kg CO₂
air 5060 Kg CO₂



CO₂ footprint for typical Dutch family (2021)

| family of 2.2 persons | Kg CO ₂ /yr | % |
|-----------------------|------------------------|----|
| clothing and "stuff" | 6500 | 33 |
| residential energy | 3700 | 19 |
| transportation land | 2300 | 12 |
| transportation air | 1400 | 7 |
| food and drinks | 4200 | 21 |
| miscellaneous | 1700 | 8 |
| total | 19800 | |

<https://www.milieucentraal.nl/klimaat-en-aarde/klimaatverandering/wat-is-je-co2-voetafdruk/>

gray electricity
dependent on mix:
0.48 Kg CO₂/kWh
0.63 Kg CO₂/kWh

Transort cost containers Shanghai-Rotterdam

| modus | Cost[\$] | time[days] | distance[km] | Kg CO ₂ |
|-------|----------|------------|--------------|--------------------|
| ship | 4000 | 35..55 | 20.000 | 757 |
| train | 8000 | 15..28 | 11.000 | 125 |
| plane | 32000 | 5.. 8 | 9.000 | 49.500 |

NRC Handelsblad ZATERDAG 16 APRIL 2022, CarbonCare.org

person transport

| | distance[km] | Kg CO ₂ |
|----------------|--------------|--------------------|
| flying | | g/km |
| short distance | 251 | |
| long distance | 195 | |
| train | 41 | |
| car, 5l/100km | 120 | |

food and drinks

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CO₂ emission data

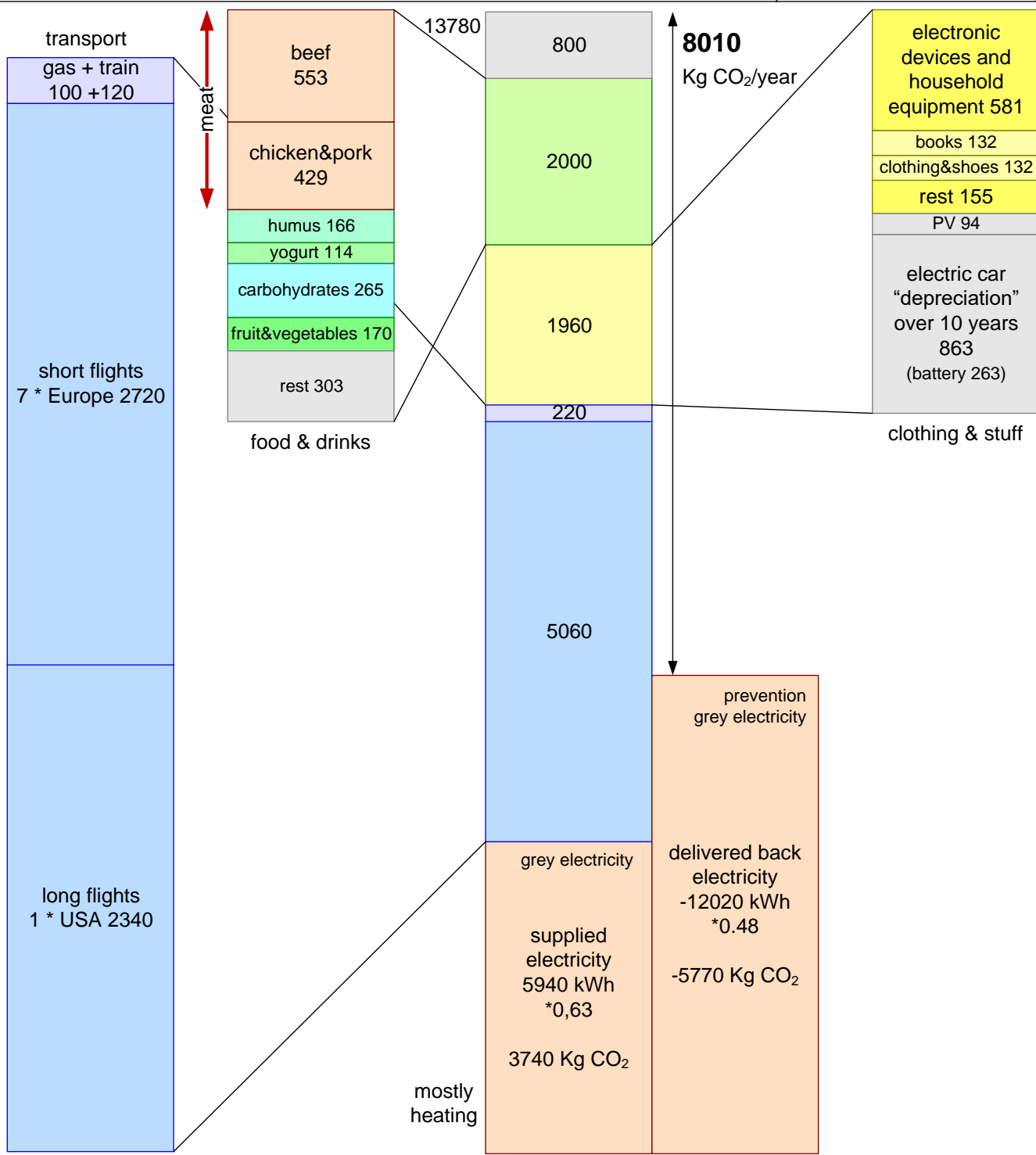
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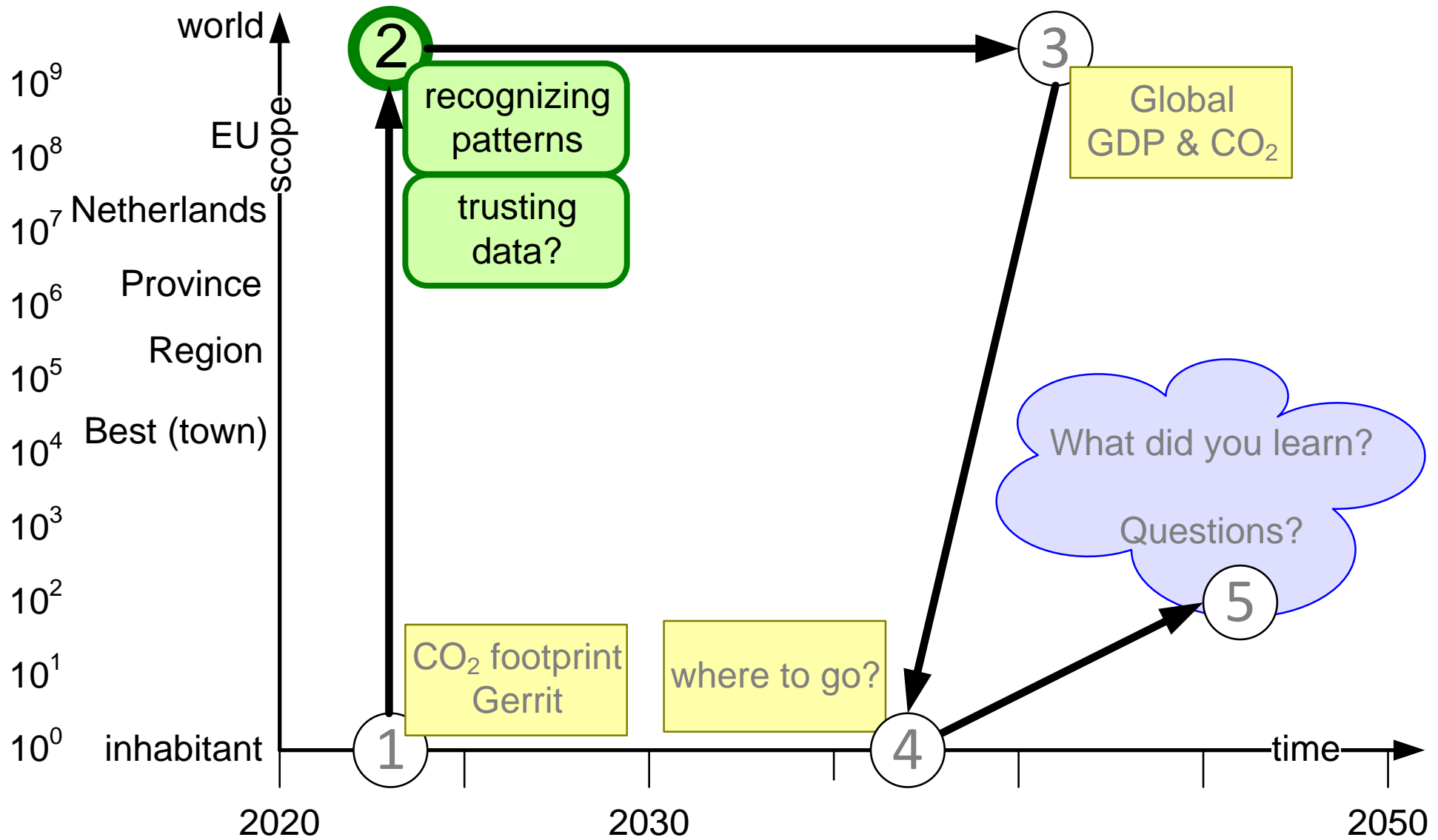
Sources

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<https://mobly.be/nl/wiki/co2-uitstoot-auto-berekenen>



mostly heating

Patterns an Data Limitations



CO2 is Proportional with

CO2 production ~

weight

distance

income

efficiency

waste

production footprint / lifetime

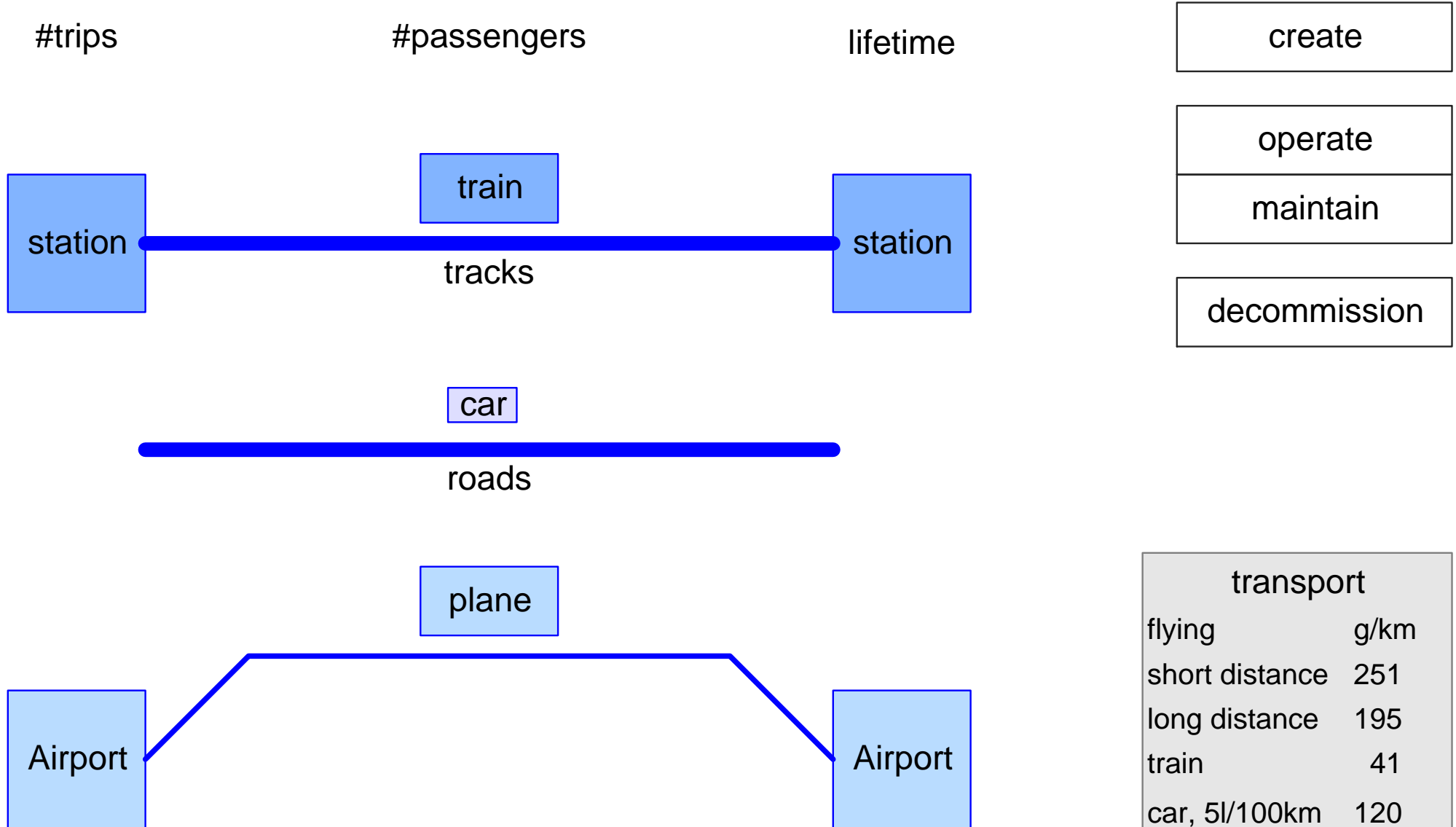
use / #users

utilization⁻¹

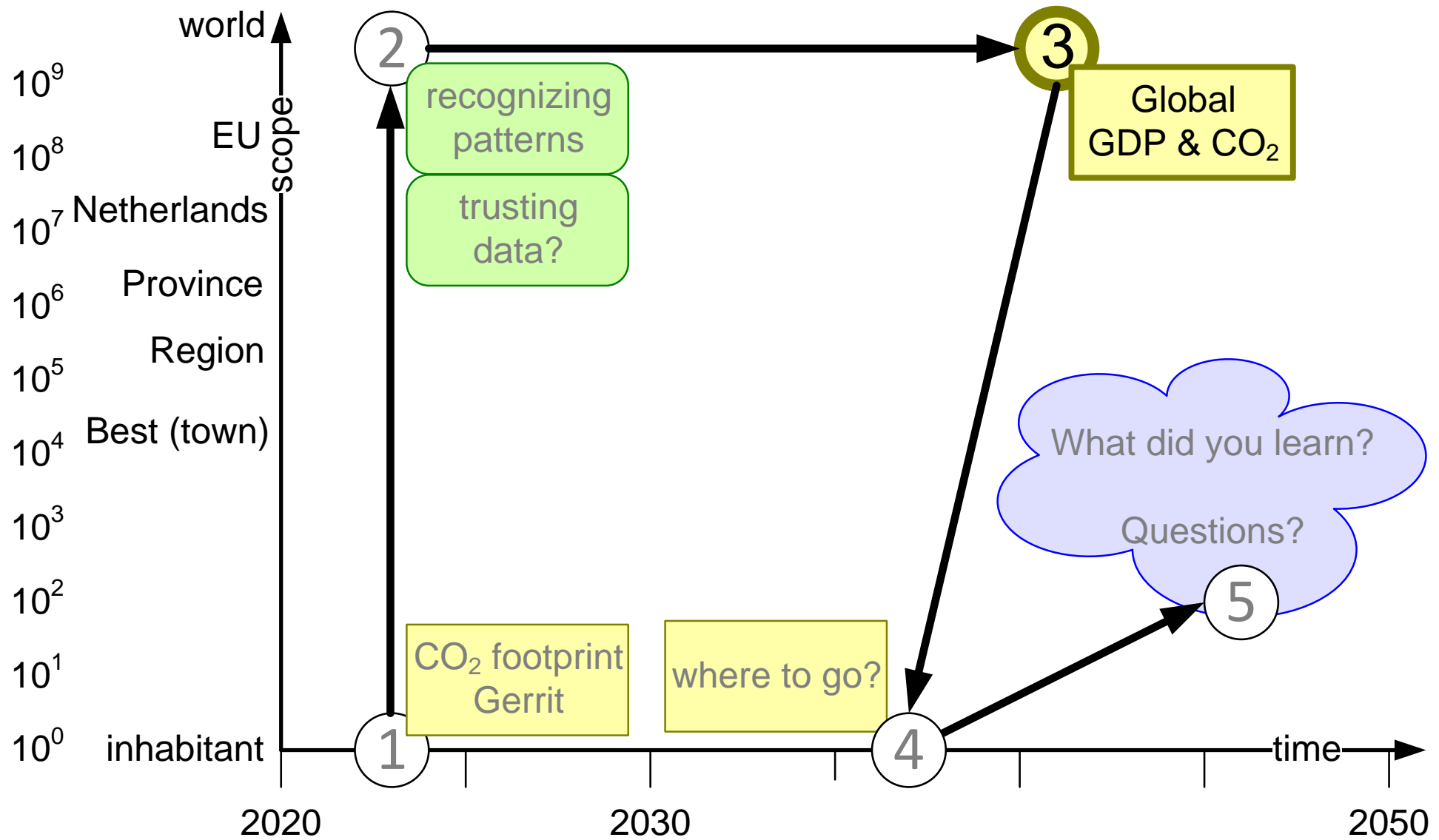
population

insulation⁻¹

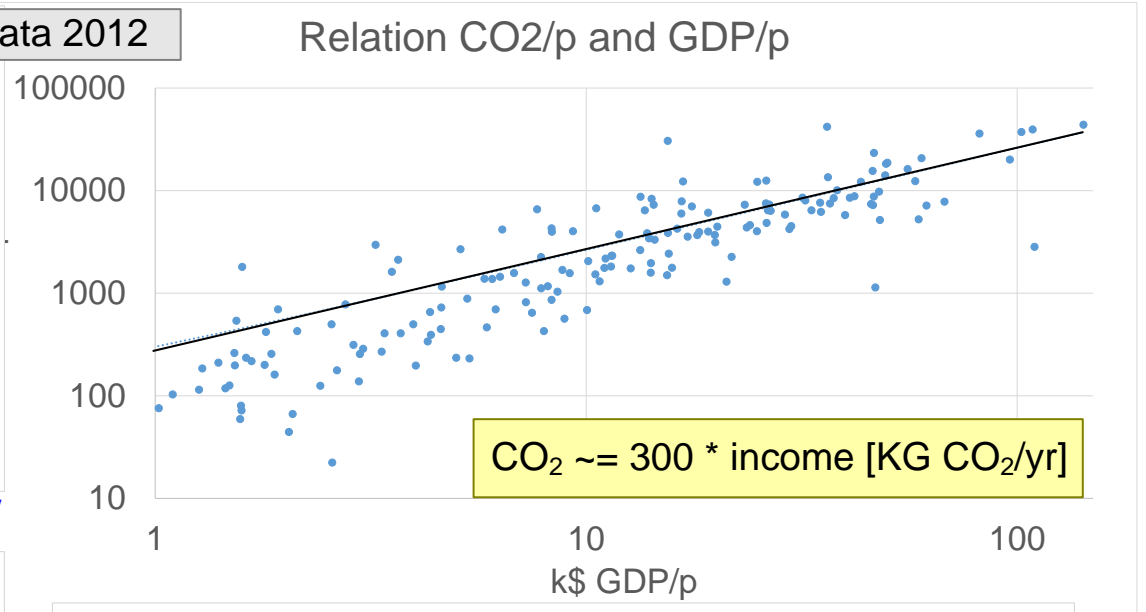
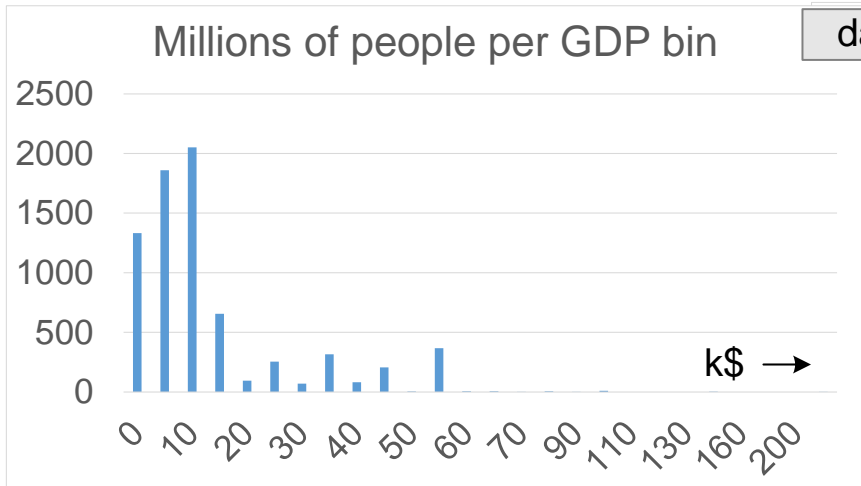
Transportation; Parameter Sensitivity



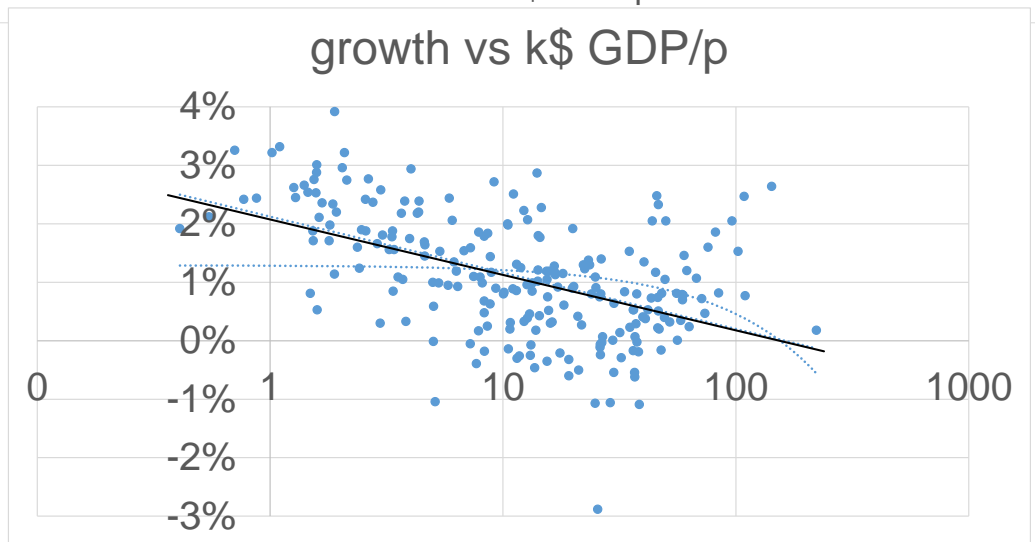
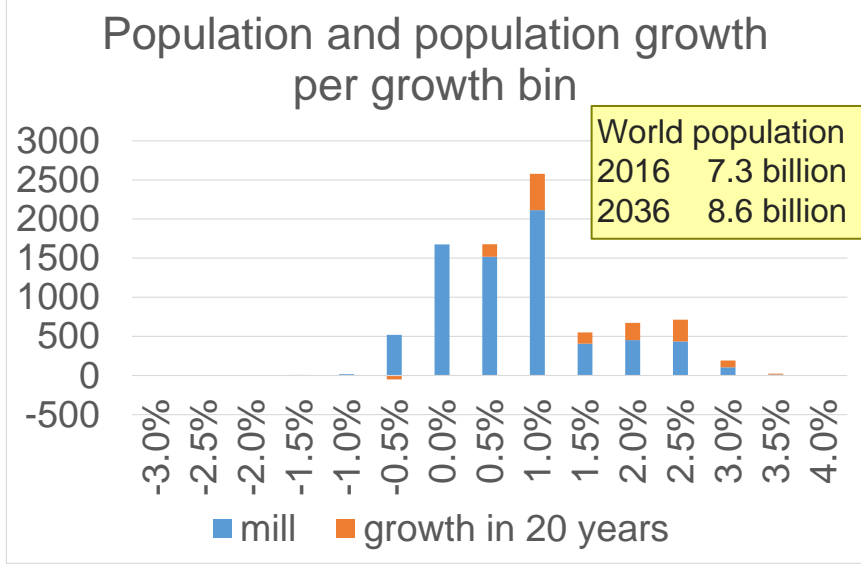
Taking the Global Perspective



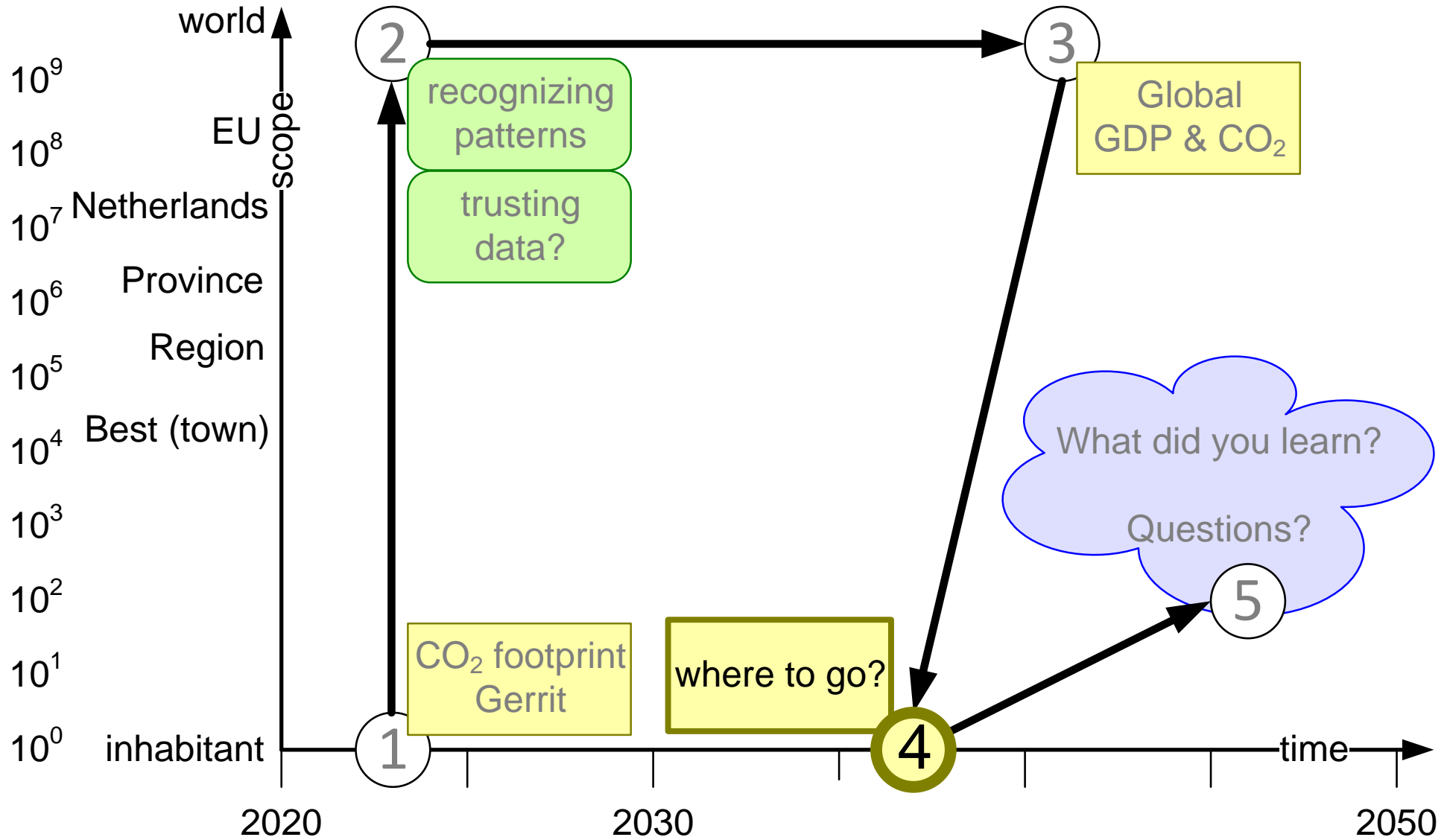
Population, Growth, GDP, and, CO2



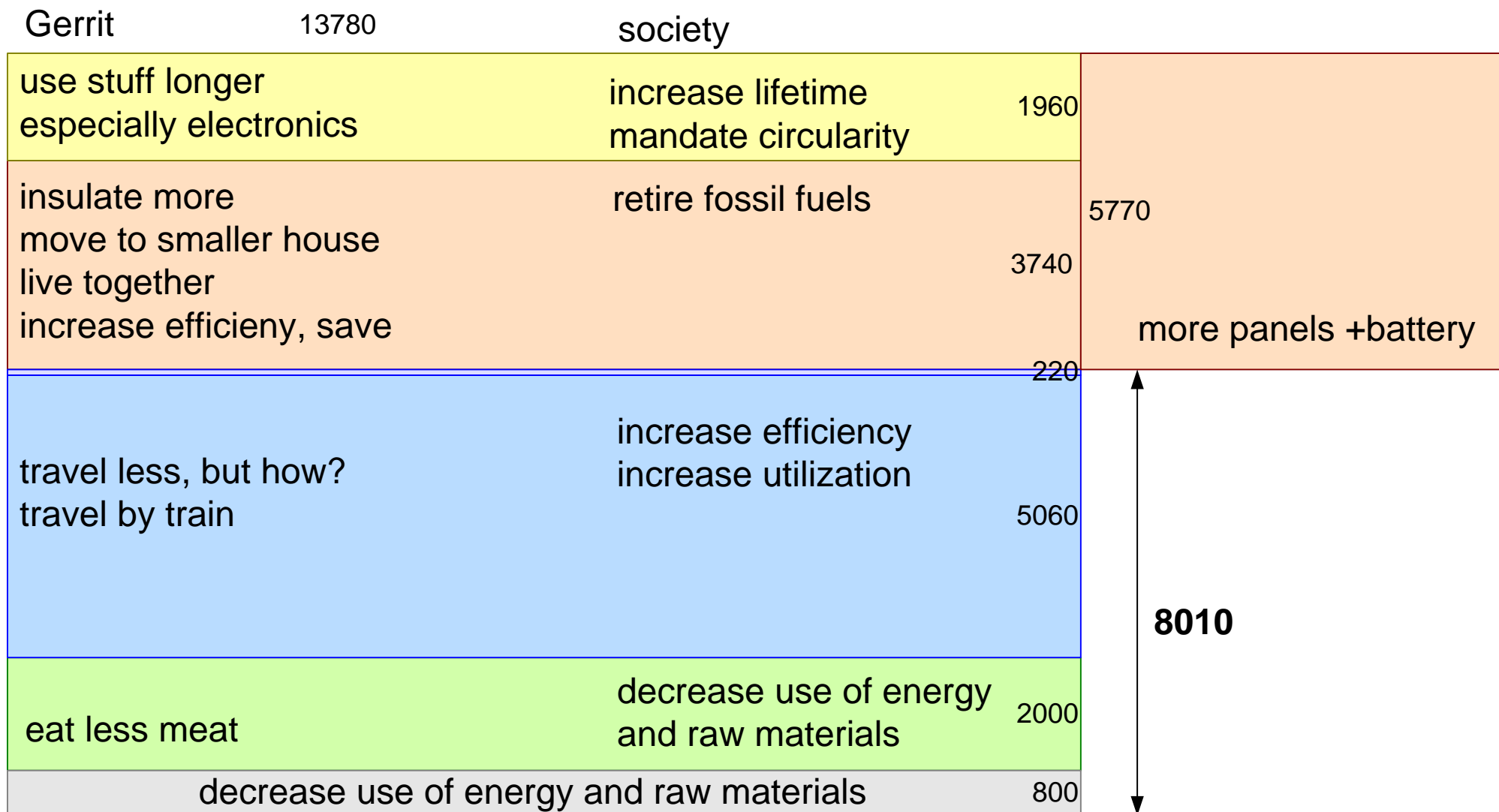
<https://www.cia.gov/library/publications/resources/the-world-factbook/>
retrieved November 2016



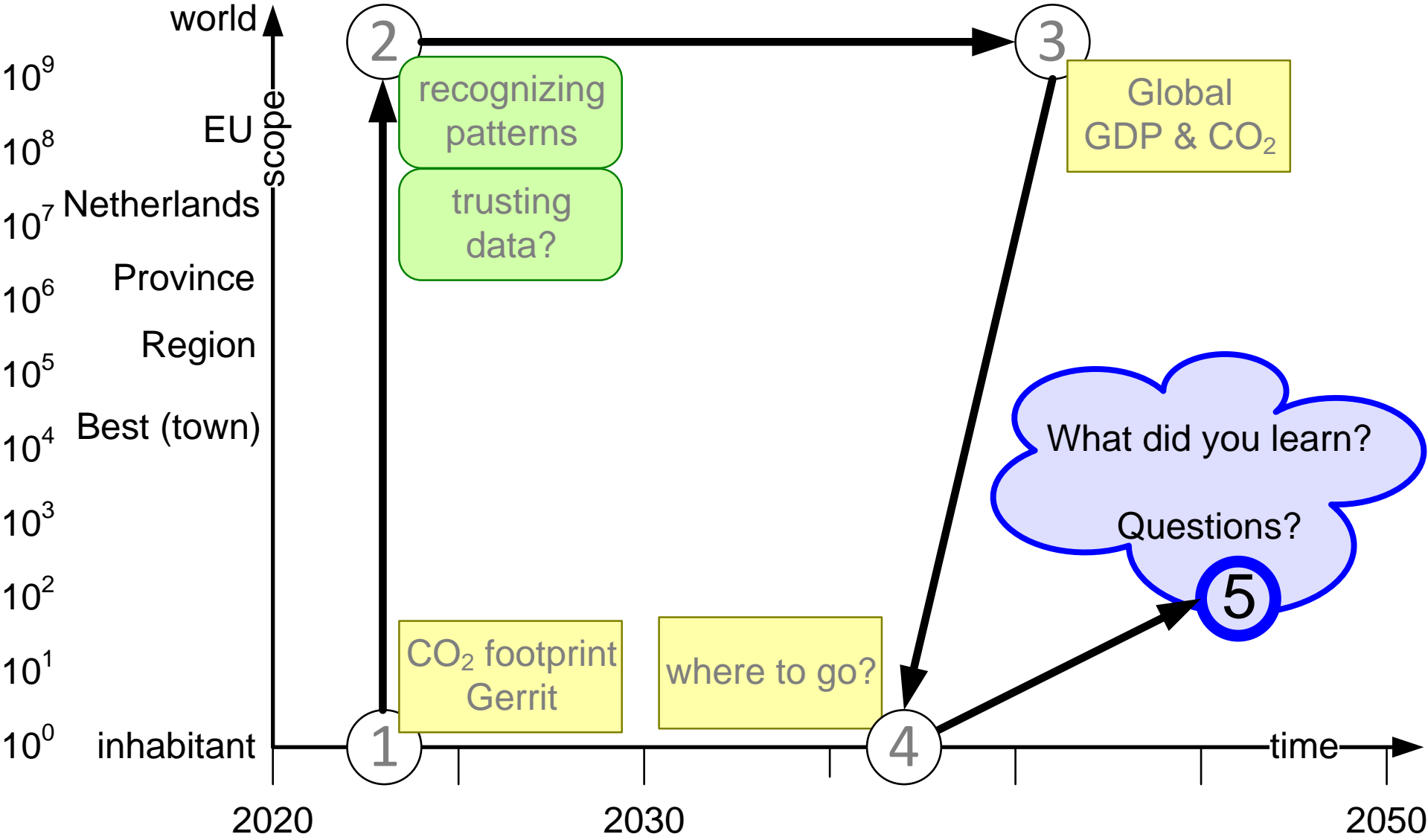
Where to Go?



Where Should Gerrit Go?



Conclusions and Questions



Conclusions and Questions

What is your personal CO₂ footprint?

How much **“stuff”** (clothes, electronics, cars, boats, campers) do you have?

How much **electricity** do you use?

How much do you **drive**?

How much do you **fly**?

What is the footprint of your **food**?

How can you increase **efficiency, utilization, lifetime, insulation**?

How can you reduce waste?

Data helps to become concrete and to get perspective

However, don't believe all numbers

Context and underlying models determine the meaning of the data

Population and GDP growth force even more footprint reduction