Climate-KIC is supported by the EIT, a body of the European Union

Meeting Europe's building renovation challenge "Building Market Briefs Project"

York Ostermeyer

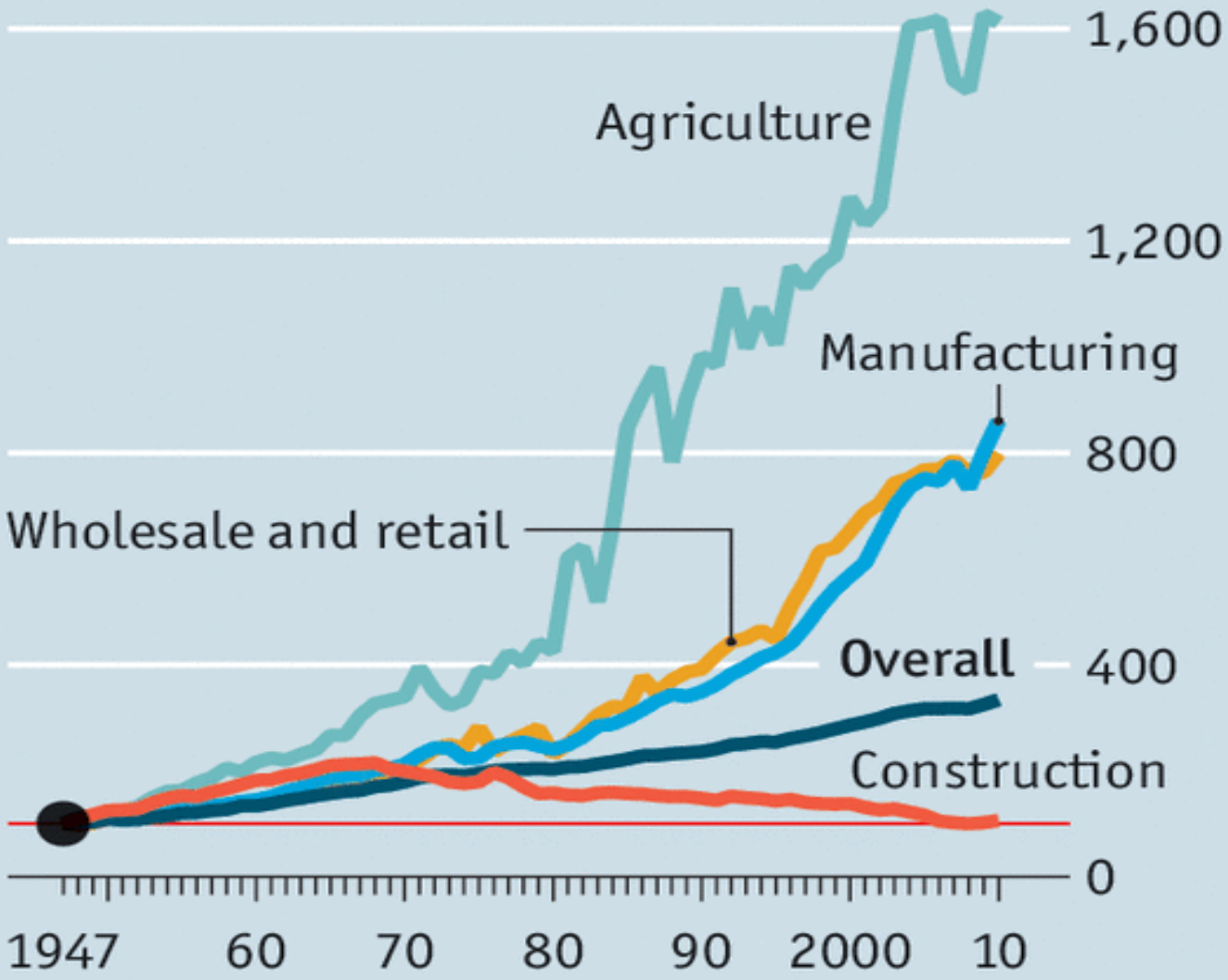
20.03.2019

EIT Climate-KIC, Brussels

Unlearning by doing

United States, gross value-added*

Per hour worked, 1947=100



Source: McKinsey Global Institute

*At constant prices


They don´t know…


…and they don´t know either…





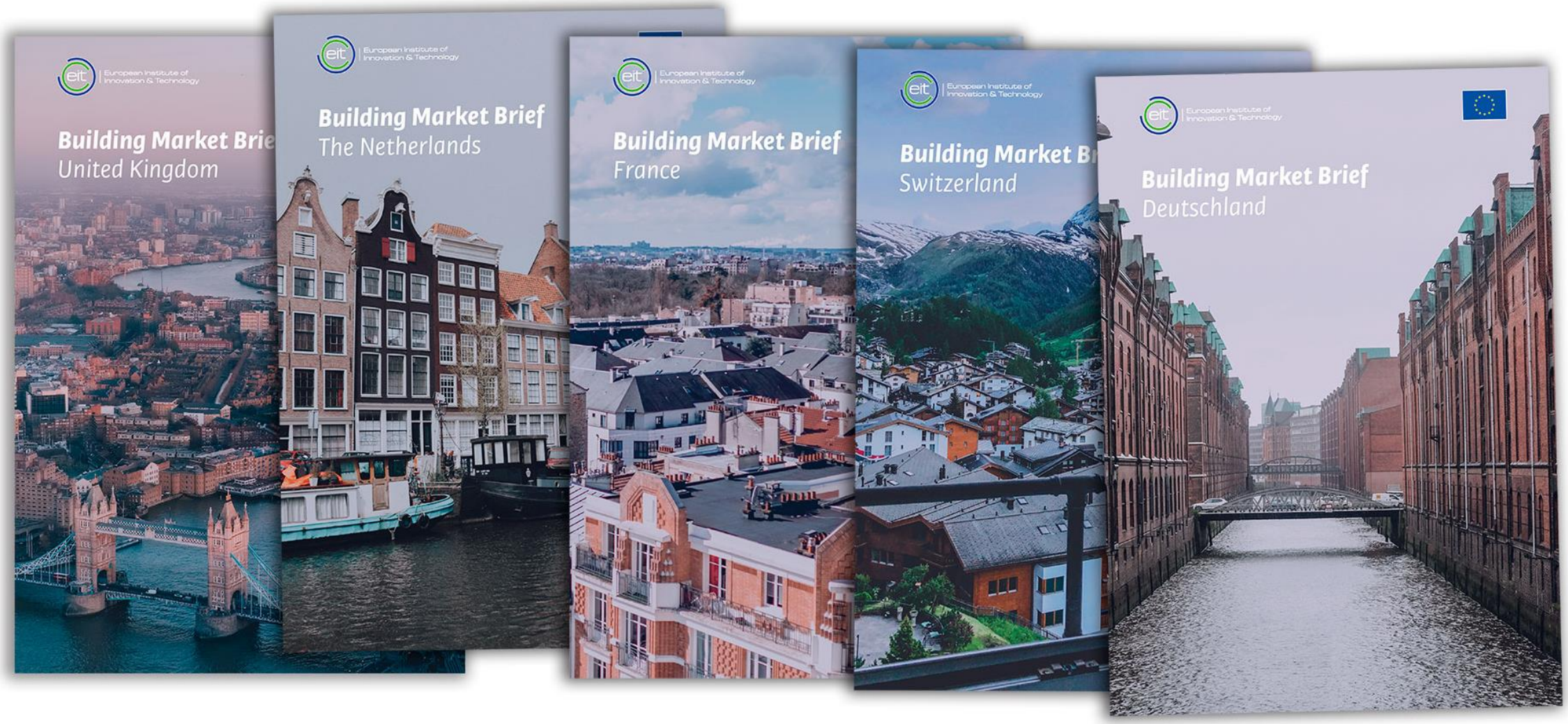





Source: https://europeisnotdead.com/video/images-of-europe/european-stereotypes/

Key demands:

- **Comparable across countries**
- **Not too high level** (IPCC)
- **Not too granular** (the insulation market of south Italy on 800 pages)
- **The character of the market needs to be visible**
- **Science based facts**
- **Transparent methodology**
- **Updated regularly**
- **Data related to single technologies as well as systemic solutions**


European Institute of Innovation & Technology
Building Market Brief
United Kingdom
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The Netherlands
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Switzerland
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Deutschland

The reports and the complementary data consists of three parts:

Chapter A (literature based)

- Statistical data from public international (Eurostat) and national sources
- Methodological aligned data to allow comparability of national sources
- Information on building codes, subsidy schemes and policy

Chapter B (survey based)

- A survey covering the complete value chain and all stakeholders
- An assessment on technology solutions and preferences by building typology and project type
- Barriers and drivers to technologies by stakeholder group
- Decision drivers and influence of different stakeholders on specific decisions

Chapter C (building stock model based)

- Synthetic building inventories of buildings that allow for exact modelling
- Two market development scenarios, on based on current policy and one target scenario
- Market volumes per technology in different RoI segments (from high to low profitability)

A)

20 | A Energy and climate goals Grid mix, emission factors and implications of climate goals Switzerland

A3

Energy and climate goals
Grid mix, emission factors and implications of climate goals

Switzerland's gross energy consumption has reduced at an average annual rate of -0.07% in the period 2005-15. Oil and nuclear energy constitute more than 60% of the current energy mix. In September 2011, the Federal council and Parliament decided in favour of systematic scaling down of nuclear energy which will result in a complete decommissioning of nuclear plants by 2035. In terms of renewable energies, proportion of renewable energy in gross consumption stood at roughly 18% in 2014, up from 14% in 2005.

A.3.1 *A decade since 2005, the swiss total gross energy consumption decreased by 1.15%*
The likely phasing out of nuclear by 2035 will lead to gradual dependence on other energy sources, as well as including energy efficiency.

Sources: www.pxweb.bfs.admin.ch

Total Petroleum Products, Solid Fuels, Gas, Waste (non-renewable), Nuclear Heat, Renewable Energies, All Products

In 2015 Switzerland consumed roughly 58,000 GWh of electrical energy. 32.2% of this was consumed by households. The Swiss electricity mix is dominated by hydro (56%) and nuclear power (38%[2]). The resulting average emission factor of the electricity produced is 0.24 kg CO_2eq/kWh. Electricity prices range between 0.05 EUR/kWhelectr and 0.26 EUR/kWhelectr with an average price of 0.17 EUR/kWhelectr .The significant price variation between different areas (454% between highest and lowest) mainly stems from differences in the production cost, procurement costs and the different mixes of the utilities. In the last 10 years the average electricity price per kWhelectr has increased by +1% per annum.

Heat production in the residential building sector of Switzerland is dominated by heating oil (44%) and natural gas (25%) and electricity (18%). The average resulting emission factor is 0.23 kg CO_2eq/kWhheat Heat energy prices range between 0.05 EUR/kWhheat and 0.18 EUR/kWhheat. The price variation between is notable (236% between highest and lowest) and mainly comes from the choice of energy carrier and the efficiency of the heating system. While urban buildings generally have access to gas or district heating, in rural areas oils based systems dominate. Oil based systems in rural areas are more likely to be exchanged by electrical and wood based systems, as grid building expenses can be prohibitive. The ratio of electrical energy consumption to heat energy consumption in Swiss buildings on average is 1 to 2.77.

The energy consumption by households thus directly translates to emissions attributable to buildings. In 2014 the building sector contributed 11.88 Mt CO^2 equivalent emissions or over 24% of the total Swiss emissions. Since 2005, building sector emissions fell by -31.7% at an average annual rate of -3.45%. From a long term perspective the building sector emission reduction since 1990 has been almost the same or -30.5%.

[1] www.bfs.admin.ch
[2] 2014 values

Switzerland Grid mix, emission factors and implications of climate goals Energy and climate goals A | 21

A.3.2 *Since 1990, Swiss total emissions decreased by 9.3% while building sector emissions reduced by 30.5%*
Switzerland is responsible for 0.1% of global emissions. While its total emissions remained stable in the range of 51-53 Mt, from 1990 to 2014, its emissions per capita have decreased by 27.53% (6.25 t CO_2eq/capita in 1990). While on m² scale the emission reduction is extrapolated to be 34%.

Sources: www.bafu.admin.ch

Energy, Industrial Processes and Products, Agriculture, Waste Management, Total

It must be noted that while in the same period (since 1990), residential building space to be heated increased by 36% (from 3.15 mio. m² to 4.29 mio. m²) and the Swiss population increased by 23.3% (from 6.7 mio. to 8.2 mio.), the overall emissions reduced. A slew of energy efficiency measures, to meet Switzerland's climate commitments, helped in achieving this.

Switzerland, a signatory of the Kyoto protocol met the 8% emission reduction target (from 1990 levels) for phase I. The domestic target was divided among several sectors and since fossil fuels usage in heating and transport were major contributors to Swiss emissions, policies in general focused on buildings and transport. In its national CO_2 law (2000), Switzerland adopted a joint CO_2 emission reduction target for heating, process fuels and transport fuels of 10% below 1990 levels in the period 2008-2012. In 2008 a revenue-neutral tax was also introduced on stationary fossil fuels. Its revenues were partially earmarked for the building refurbishment programme.

For meeting the obligations of second phase (2013-20) of Kyoto, the country passed the CO_2 Act (2013-20). This act prescribes emission reductions by 20% from 1990 levels to be achieved in 2020 through domestic measures. Instruments such as CO_2 tax on heating fuel, are aimed at letting fuel importers share part of the emission burden due to transport, stringent emission reductions for new cars and the Buildings Program[3].

In the run up to the Paris conference in 2015, Switzerland was the first country to submit its INDC[4] that aimed to reduce greenhouse gas emissions by 50% relative to 1990 levels by 2030. In this at least 30% of the reduction is to be achieved domestically while the remaining abroad. Switzerland also put forward a long-term target of 70% - 85% emissions reduction by 2050 comparing 1990. The targets, if achieved, will result per capita emissions to reach 3 tonnes of CO_2 equivalents in 2030, and between 1 and 2 tonnes of CO_2 by 2050[5,6].

[3] www.swissinfo.ch
[4] Intended Nationally Determined Contributions
[5] www.climateactiontracker.org
[6] www.unfccc.int

Subchapter

Title/
Subtitle

Legend

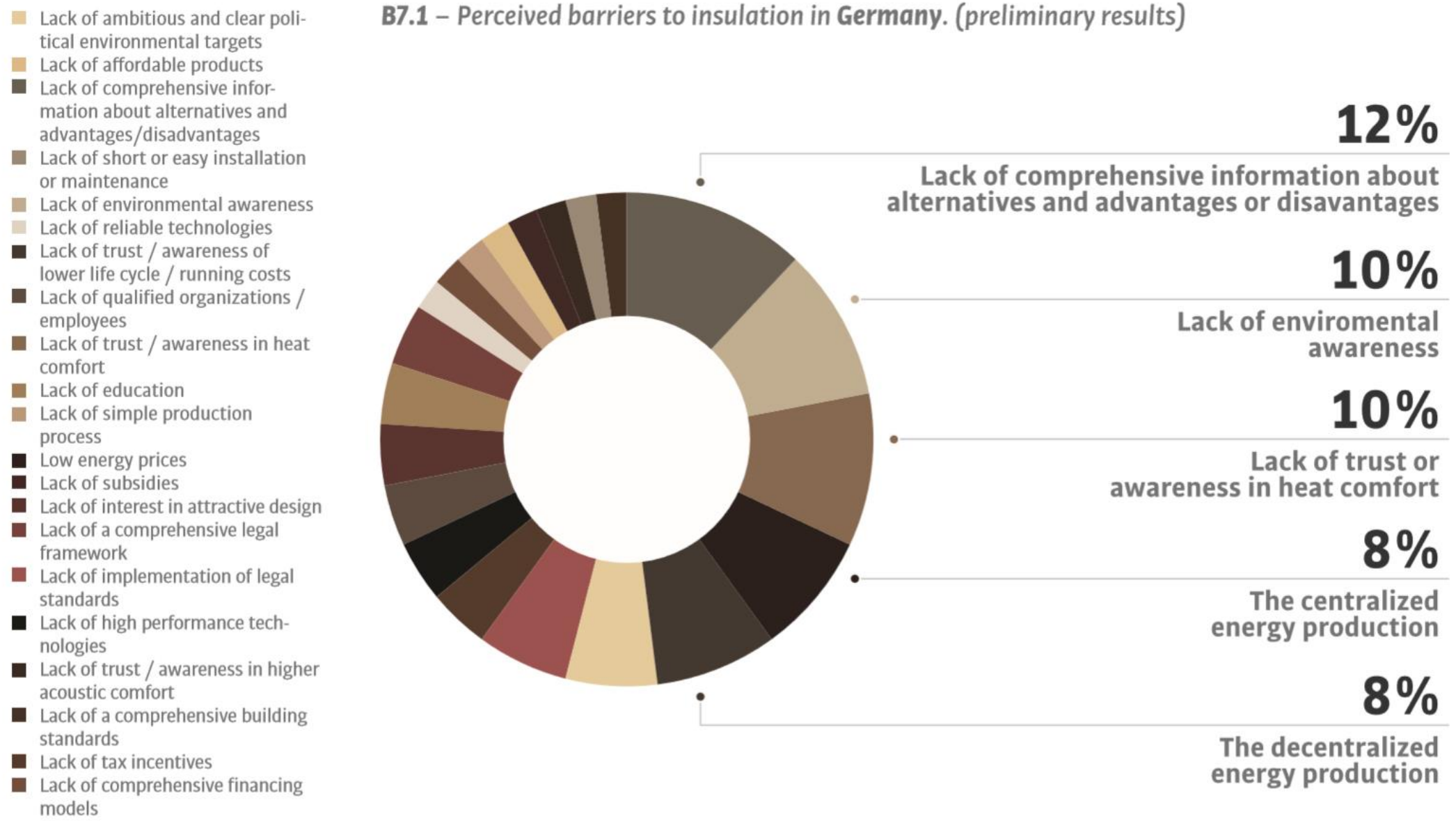
Links to additional reports or market experts comments (subjective, qualitative)

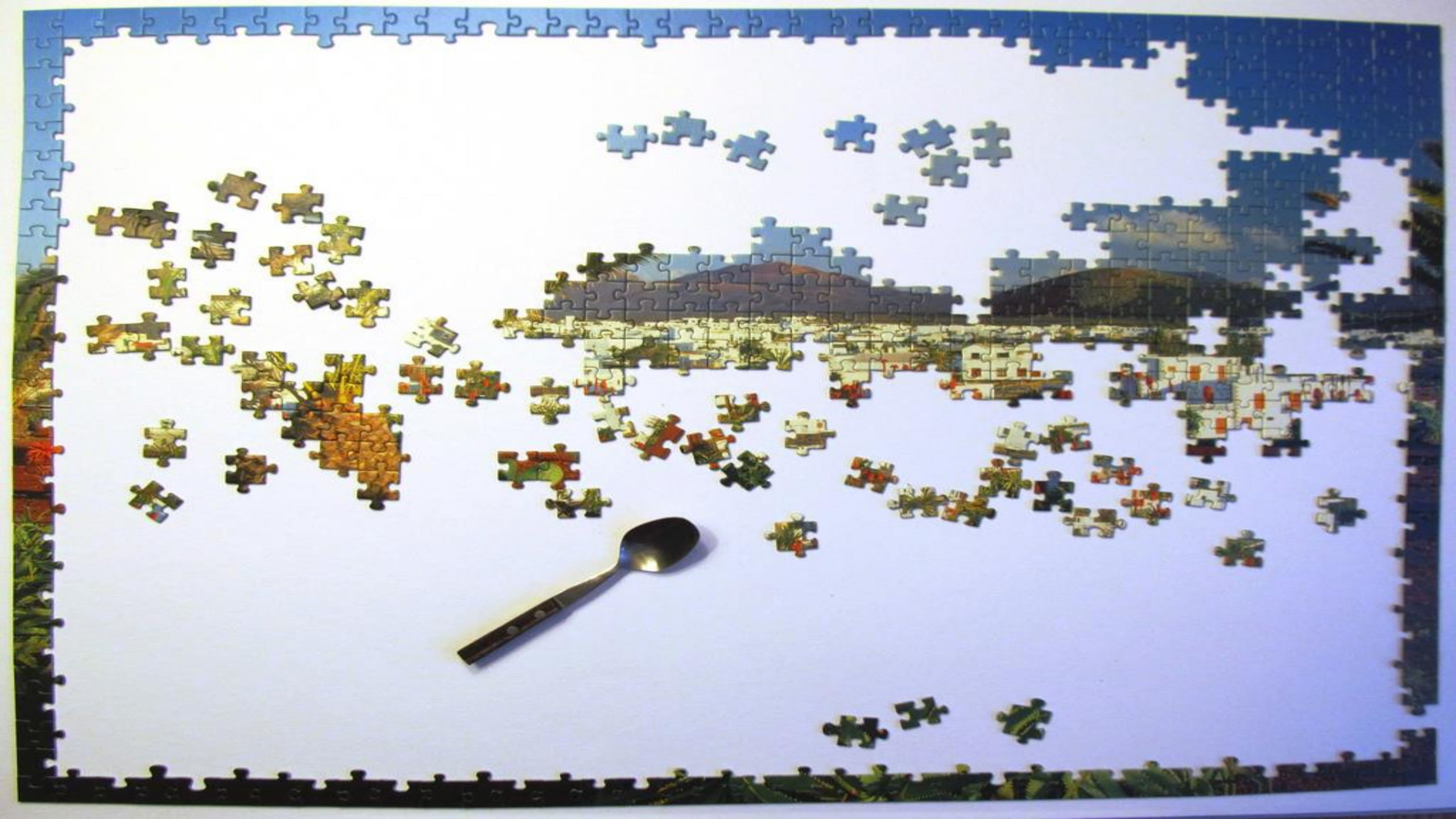
Subchapter

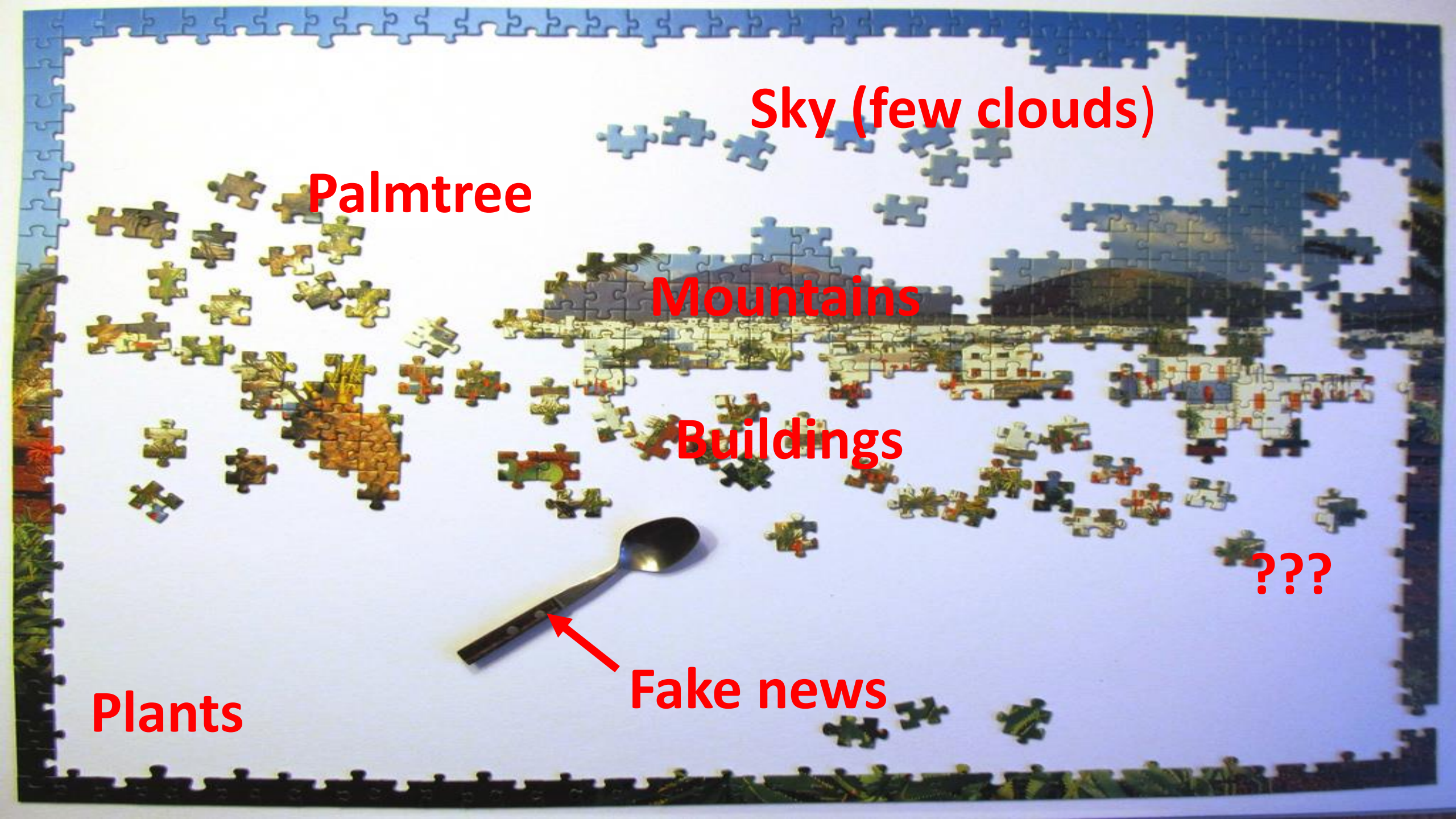
Graph

Main text (objective, quantitative)

B)


Lack of ambitious and clear political environmental targets
Lack of affordable products
Lack of comprehensive information about alternatives and advantages/disadvantages
Lack of short or easy installation or maintenance
Lack of environmental awareness
Lack of reliable technologies
Lack of trust / awareness of lower life cycle / running costs
Lack of qualified organizations / employees
Lack of trust / awareness in heat comfort
Lack of education
Lack of simple production process
Low energy prices
Lack of subsidies
Lack of interest in attractive design
Lack of a comprehensive legal framework
Lack of implementation of legal standards
Lack of high performance technologies
Lack of trust / awareness in higher acoustic comfort
Lack of a comprehensive building standards
Lack of tax incentives
Lack of comprehensive financing models
B7.1 – Perceived barriers to insulation in Germany. (preliminary results)
12%
Lack of comprehensive information about alternatives and advantages or disavantages
10%
Lack of enviromental awareness
10%
Lack of trust or awareness in heat comfort
8%
The centralized energy production
8%
The decentralized energy production



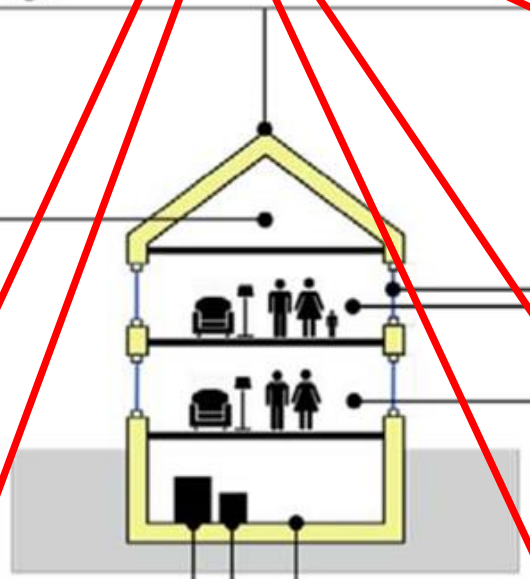

Sky (few clouds)
Palmtree
Mountains
Buildings
???
Fake news
Plants

C)

Building	
Building Type	MFH
Construction Period	1920-44
Construction Year	1931
Scaling Factor	159
Number of Dwellings	2
Residential Floor Area	166 m^2
Heated Floor Area	201 m^2
Footprint Area	100 m^2
Volume	584 m^3
Roof Type	Flat
Number of Floors	2
Number of Basement Floors	1
Height Floor	2.9 m
Length	17.2 m
Width	5.8 m
Ventilation Rate Infiltration	37 m^3/h
Electricity Auxiliary	175 kWh/a
Heat Capacity	115 kJ/K m^2

Opaque Components	
Component Type	Roof
Year	1992
Surface Area	152 m^2
U-Value	0.4 W/m^2 K
Orientation	139°/319°
Angle	45°

Transparent Components	
Component Type	Window
Year	2001
Surface Area	25 m^2
U-Value	1.4 W/m^2 K
g-Value	0.65
Shading Factor	0.81
Frame Ratio	0.18
Orientation	139°
Angle	90°



Usage: Dwelling	
Dwelling Area	83 m^2
Number of Rooms	3
Number of Occupants	3
Occupancy Time	13 h/pers. day
Set Temperature	20.4 °C
Consumption Hot Water	31 m^3/pers. day
Electricity Lighting	172 kWh/a
Electricity Appliances	1429 kWh/a

Heating System	
Heating System Type	Gas Boiler
Year	2006
Efficiency	96%
Energy Carrier	Gas
Solar Collector Installed	No

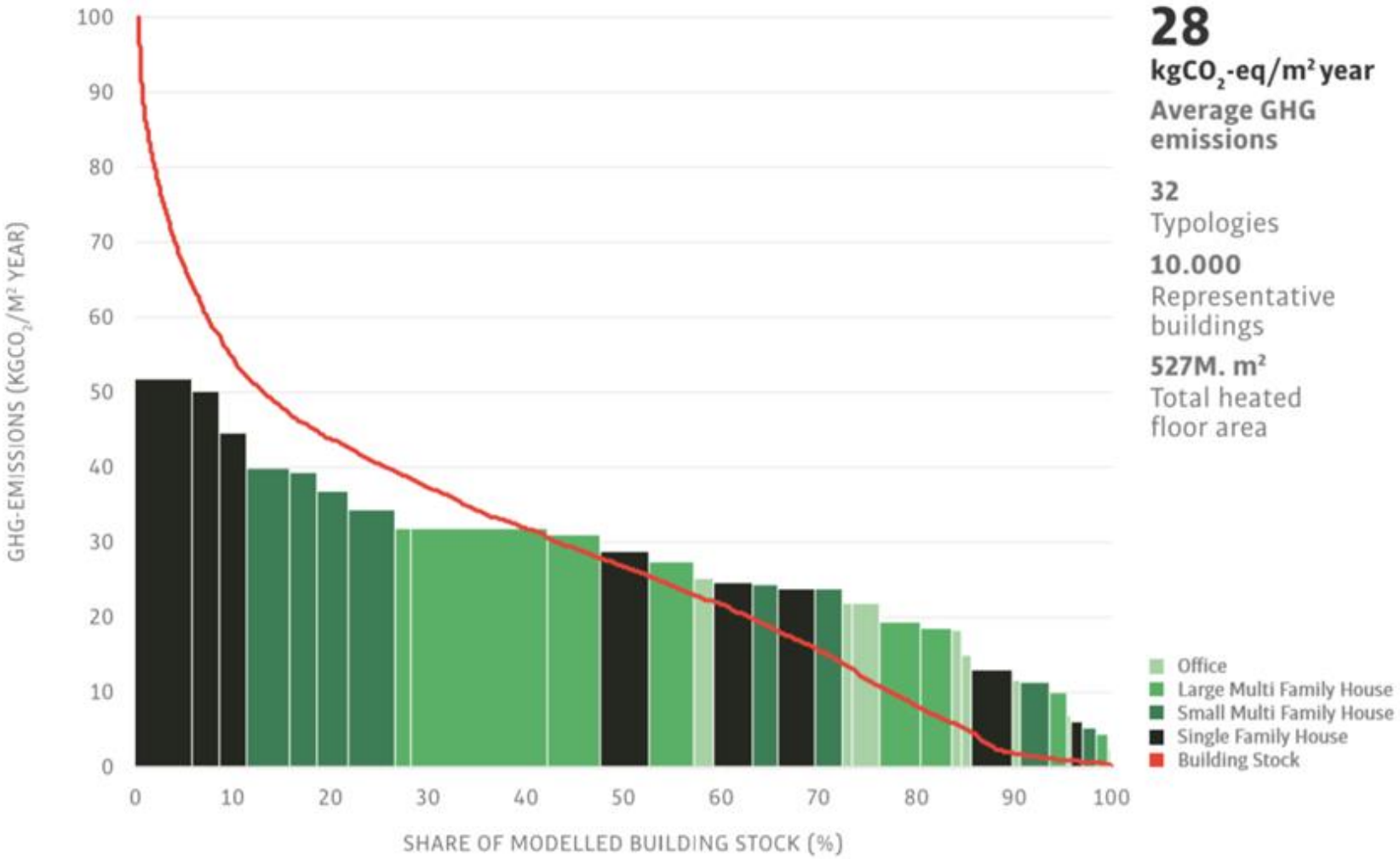
Hot Water System	
Hot Water System Type	Combined with HS
Year	2006
Efficiency	80%
Energy Carrier	Gas

Ventilation	
Ventilation Type	Natural
Year	-
Ventilation Rate	230 m^3/h
Efficiency Heat Recovery	0%
Specific Fan Power	0 W/m^2 h

C)

C1.2 – Greenhouse gas emissions per square meter of the status quo of the building stock.

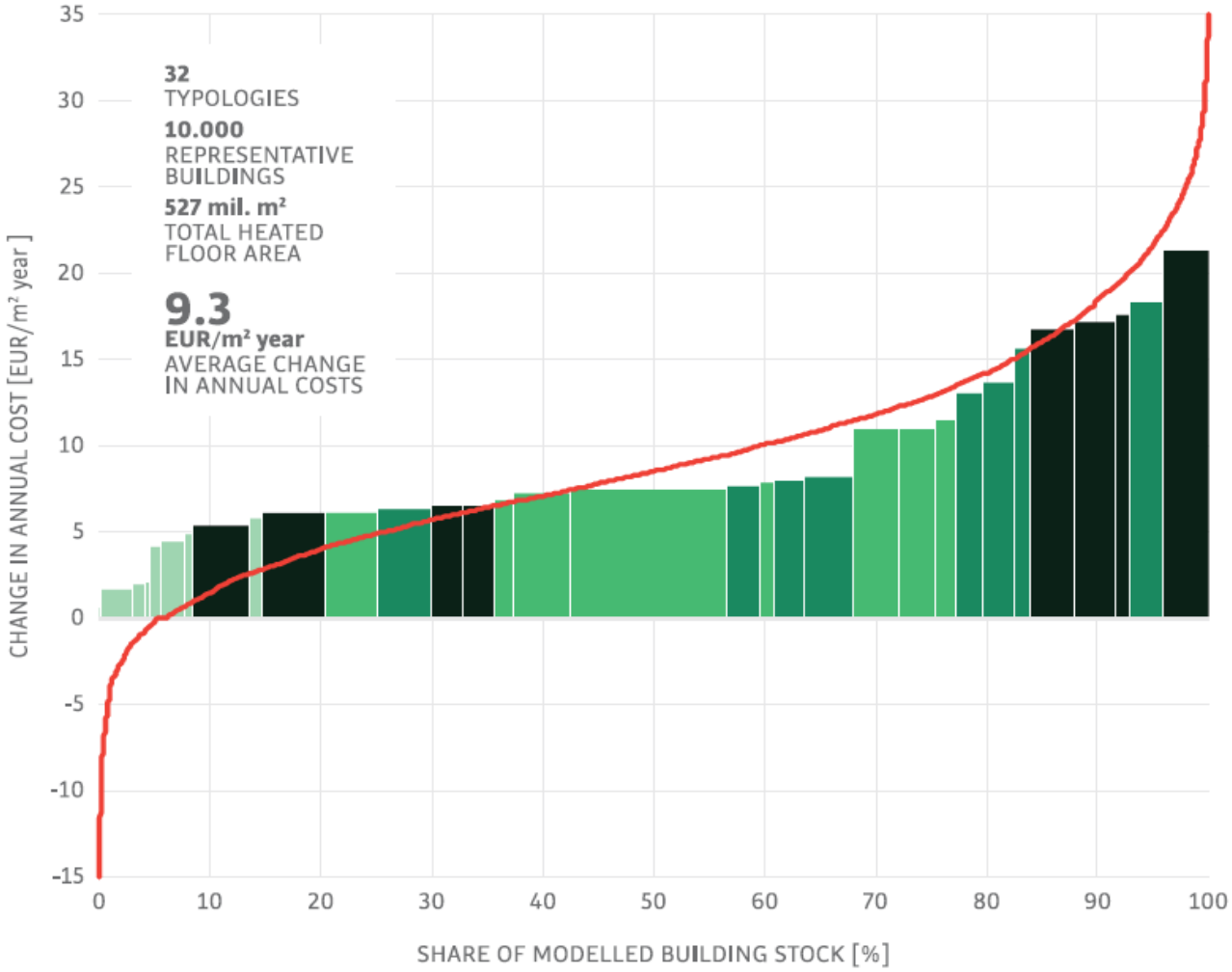
The figure depicts the greenhouse gas emissions in kg-CO_2-equivalents per m² and year of the status quo of the building stock ordered according to decreasing emissions from left to right. The bars represent the average value for a given typology, the red line represents the ordered costs across the 10'000 modeled representative buildings of the building stock.



C)

C.5.1 *Change in Equivalent Annual Costs for the renewable energy focused approach*

The figure depicts the change in the equivalent annual costs through the refurbishment of the building stock ordered according to increasing costs from left to right. The bars represent the average value for a given typology, the red line represents the ordered costs across the 10'000 modeled representative buildings of the building stock



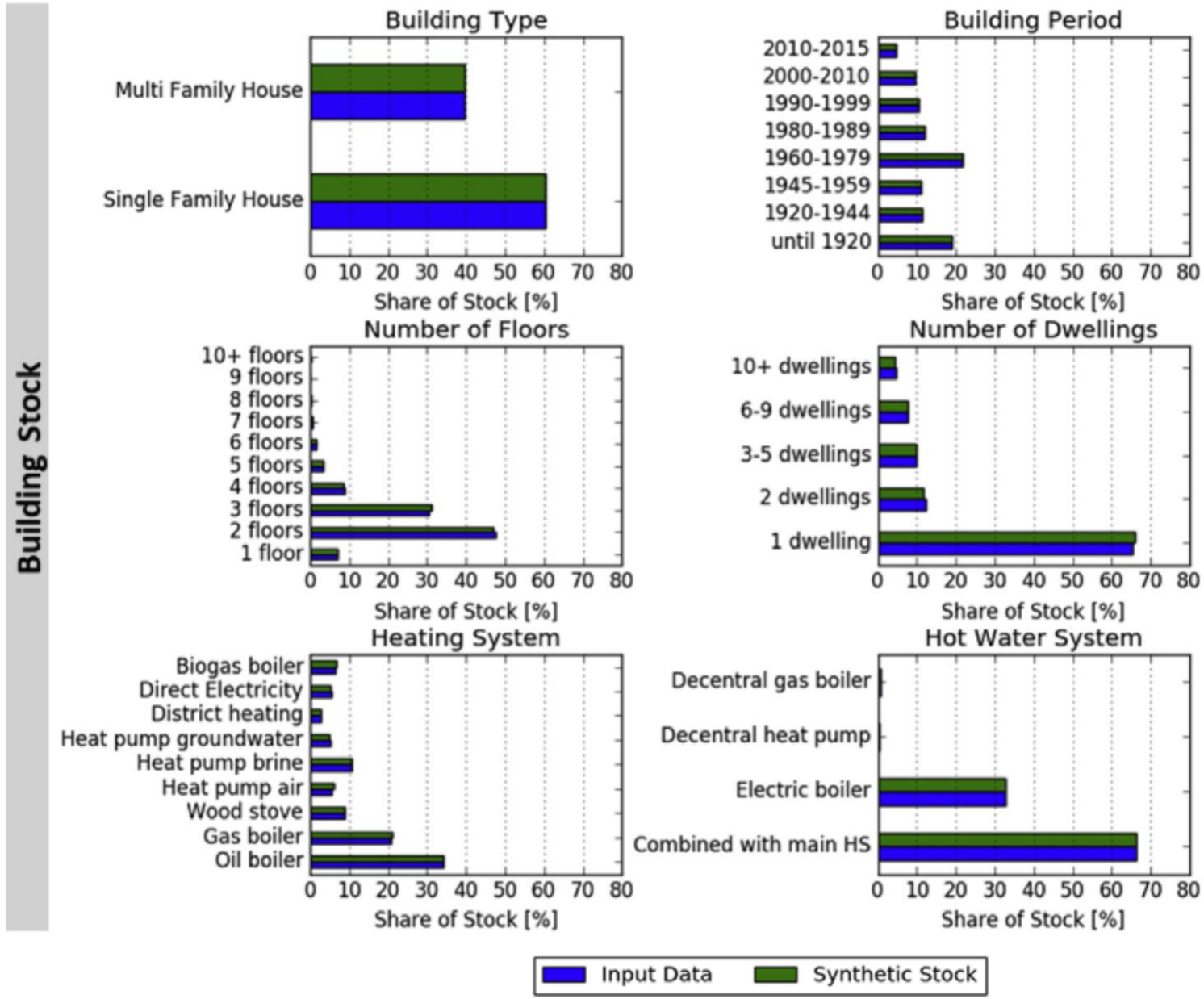


Fig. 4. Distribution of various attributes across the created synthetic building (top) and dwelling (bottom) stock based on the initialization step. The synthetic stock data are shown in green and the input data in blue bars. The shares are weighted based on the number of buildings/dwellings in the stock.

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download / contact: www.cuesanalytics.eu

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