Building Market Briefs

Context-specific comparison of building stock data across countries in Europe

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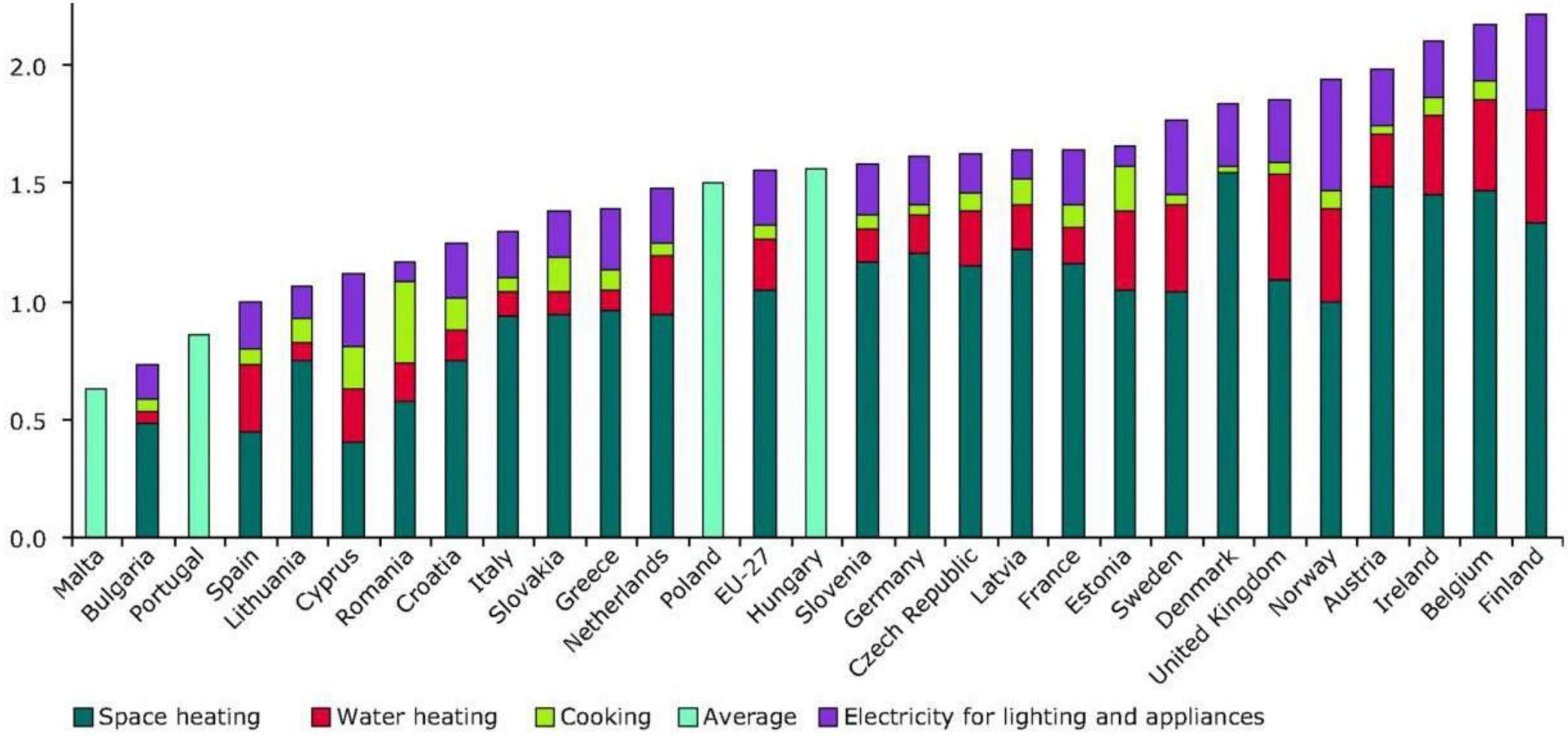
Justus von Geibler, Henk Visscher, Andrea Palacios, Arjen Mejer, Paula van der Brom, David Goatman, Saurabh Saraf, Ulrich Reiter, Lene Hennes, Katrin Binge

COP21 – A global legally binding climate agreement

The state of play on data of the EU building stock



Source: U*mberto Berardi / Procedia Engineering 118 (2015) 128 – 136;*
EAA, Primary energy consumption by fuel (CSI 029/ENER 026), European Energy Agency, 2015.

Lack of data leads to perplexity - perplexity leads to inaction

https://geschaeftsbericht2017.volkswagenag.com/an-unsere-aktionaere/der-vorstand.html

BMB 2016 - 2020

- ✓ Condensed, multifaceted view on the market
- ✓ Reliable and comparable evidence basis for the building market
- ✓ Holistic view that includes literature review of the market, stakeholders views based on the BMB survey results, and a model based analysis of the market trends.
- ✓ European community building of experts

BMB content

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)

BMB content

Chapter A

- A1 Introduction
- A2 Building stock
- A3 Energy, emissions, and climate goals
- A4 Policy framework
- A5 Investment and employment
- A6 Demand, supply, and affordability

Additional content

Executive summary
Survey methodology
Building Inventory Factsheet
Building value chain

Chapter B

- B1 The building value chain
- B2 Building typologies and project types
- B3 Technology competences
- B4 Current status of the building stock
- B5 The technology selection
- B6 Motivations behind projects and obstacles to implementing energy efficient and low-carbon technologies
- B7 Promising approaches to achieving climate goals
- B8 Barriers & drivers to specific technologies

Chapter C

- C1 Status quo of the building stock
- C2 Climate policy scenarios
- C3 Development scenarios
- C4 Development of the building stock
- C5 The building markets
- C6 The building envelope market
- C7 The building technologies market
- C8 A deep dive into the heating system market

Subchapter
Title/ Subtitle

Legend

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

Graph

Main text (objective, quantitative)

A3

Energy, Emissions, Climate Goals
Introduction to the energy mix, emission profiles and implications of climate goals

USEFUL READINGS

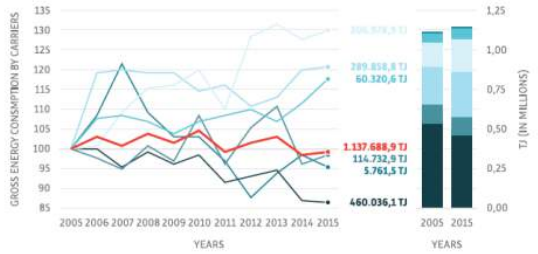
G. BFE 2017. Swiss Energy Strategy 2050. Bundesamt für Energie (BFE), Bern. www.bfe.admin.ch

H. Swiss nuclear phase-out: Energy supply challenges, 2012, ETH: e-collection.library.ethz.ch

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[1]. 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[2]. In terms of renewable energies, proportion of renewable energy in gross consumption stood at roughly 18% in 2014, up from 14% in 2005.

A3.1 – 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, including energy efficiency.

Sources:
Bundesamt für Umwelt (BAFU);
EUROSTAT



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%). The resulting average emission factor of the electricity produced is 0.24 kg CO_2eq/kWh. Electricity prices range between 0.05 EUR/kWh$_{electr}$ and 0.26 EUR/kWh$_{electr}$ with an average price of 0.17 EUR/kWh$_{electr}$[3].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 kWh$_{electr}$ has increased by +1% per annum.

USEFUL READING

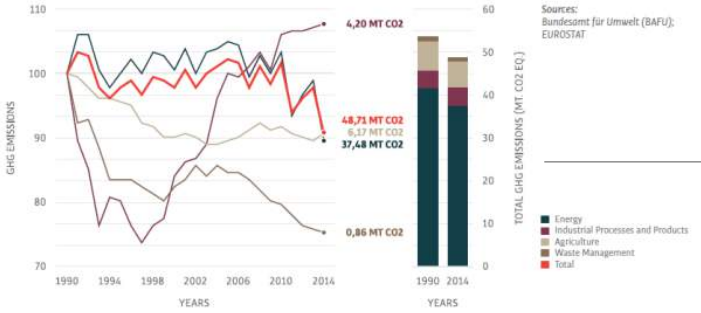
BFE 2016. Analysis of energy consumption by specific use. Bundesamt für Energie (BFE), Bern. www.bfe.admin.ch

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/kWh$_{heat}$. Heat energy prices range between 0.05 EUR/kWh$_{heat}$ and 0.18 EUR/kWh$_{heat}$[4]. 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.

EXPERT COMMENT: Tbd!

The energy consumption by households thus directly translates to emissions attributable to buildings. In 2014 the building sector contributed 11.88 Mt CO2 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%. Since 1990, the building emissions reduction has been almost the same or -30.5%[5].

A3.2 – Since 1990, Swiss total direct CO_2 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 53-53 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:
Bundesamt für Umwelt (BAFU);
EUROSTAT

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 the first phase up to 2012. 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 a 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[6].

In the run up to the Paris conference in 2015, Switzerland was the first country to submit its INDC 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 CO2 equivalents in 2030, and between 1 and 2 tonnes of CO2 by 2050[7 8].

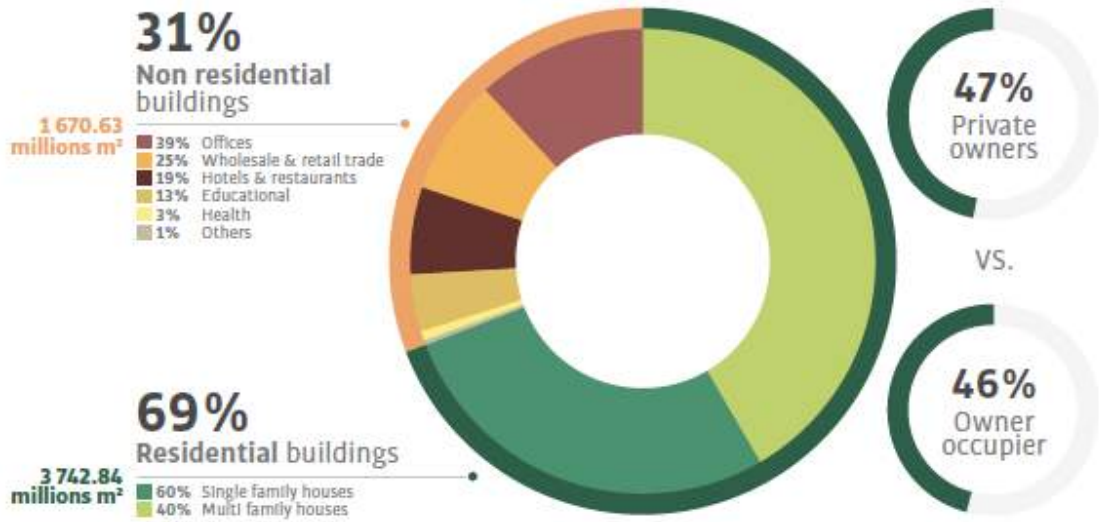
USEFUL READING

J. UNFCCC 2015. Intended Nationally Determined Contributions. United Nations Framework Convention on Climate Change (UNFCCC). www.unfccc.int

Intended Nationally Determined Contributions

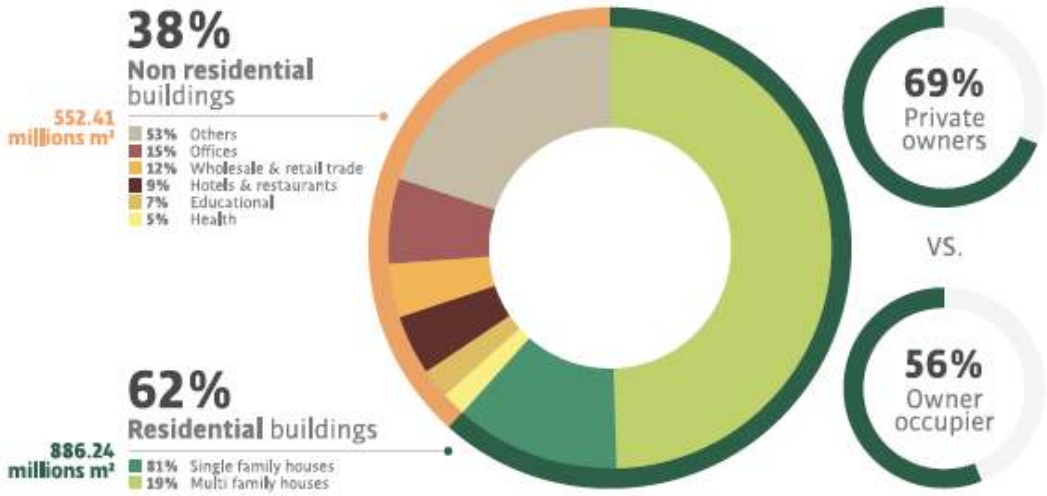
Chapter A

Germany's residential building stock is characterised by private tenancy.



Germany

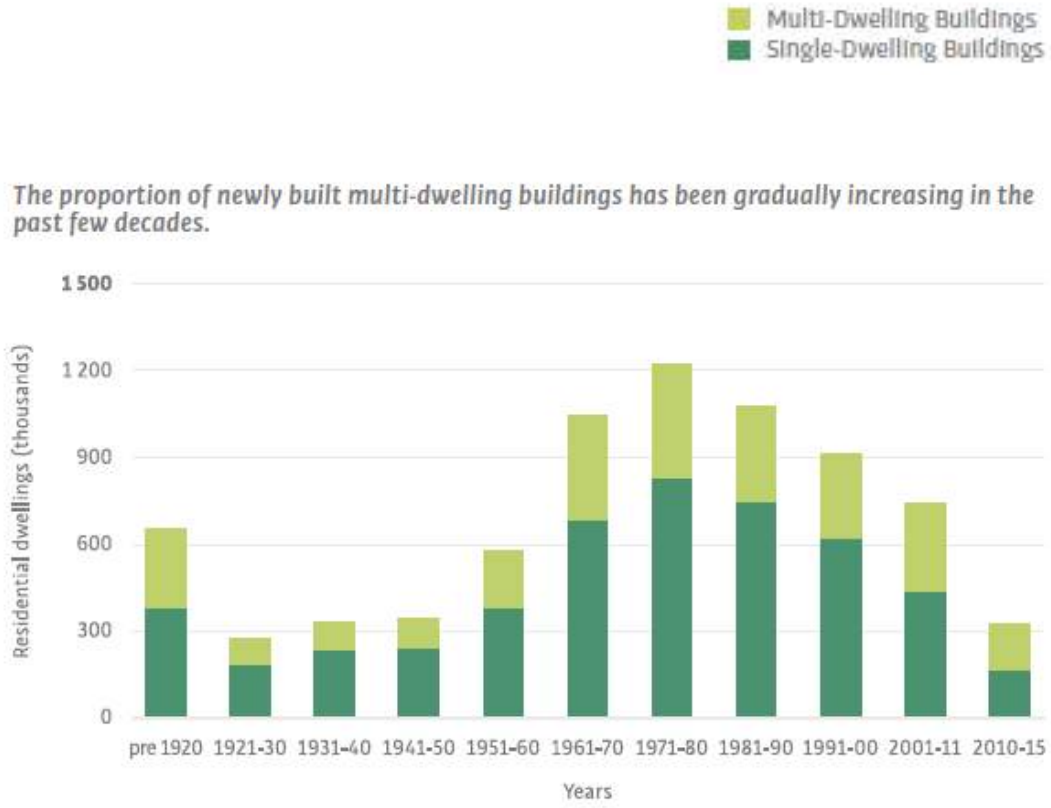
Dutch residential building stock is characterised by a substantial presence of publicly owned social dwellings.



The Netherlands

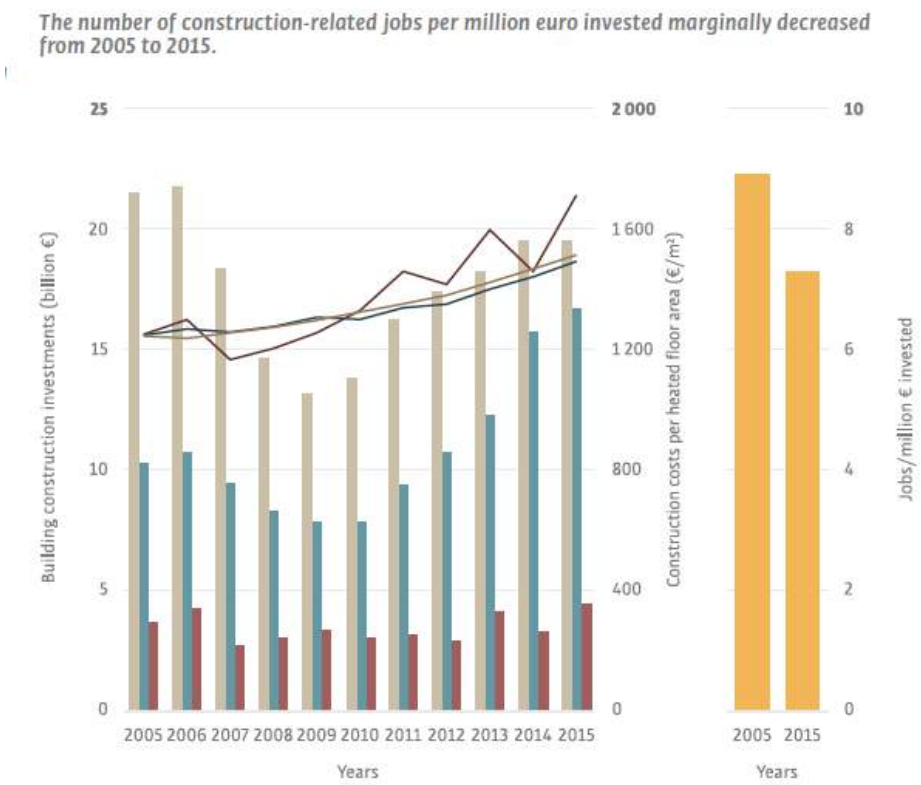
Chapter A

Germany

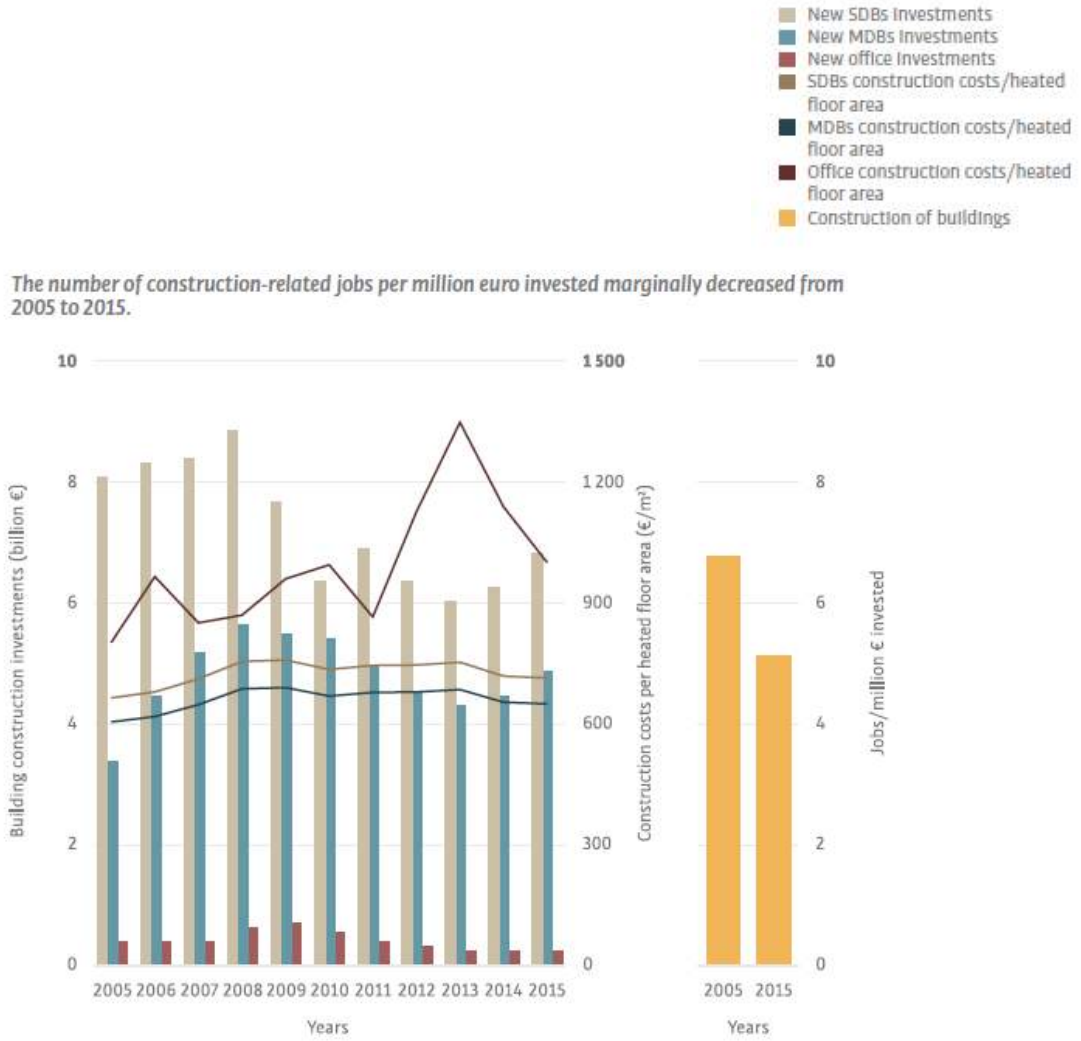


The Netherlands

Chapter A



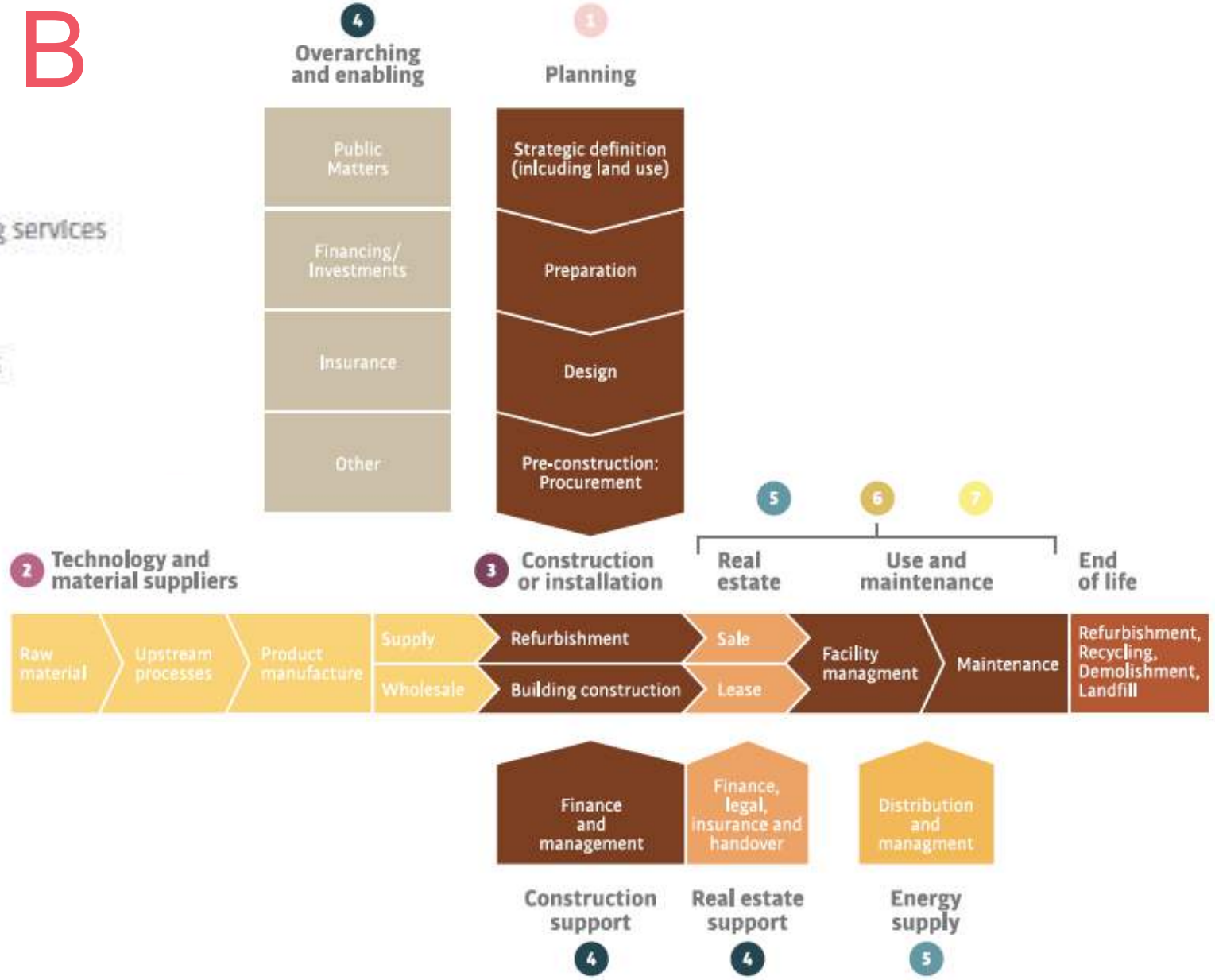
Germany



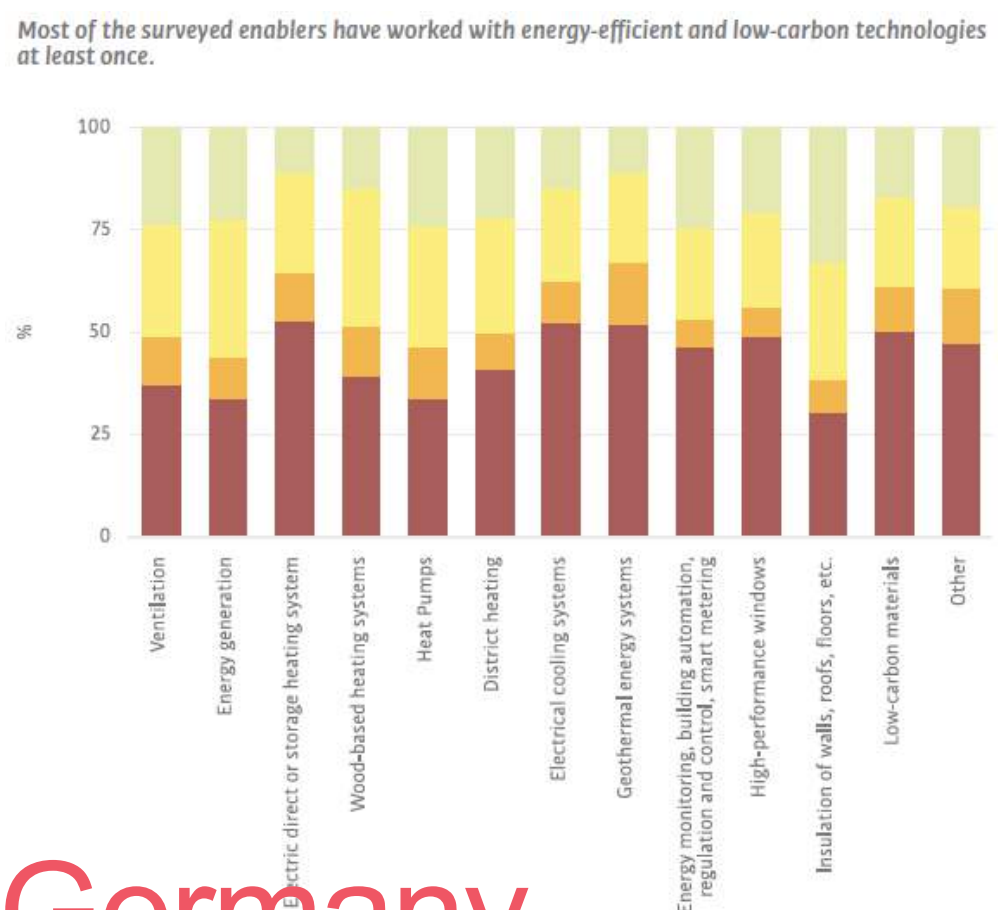
The Netherlands

Chapter B

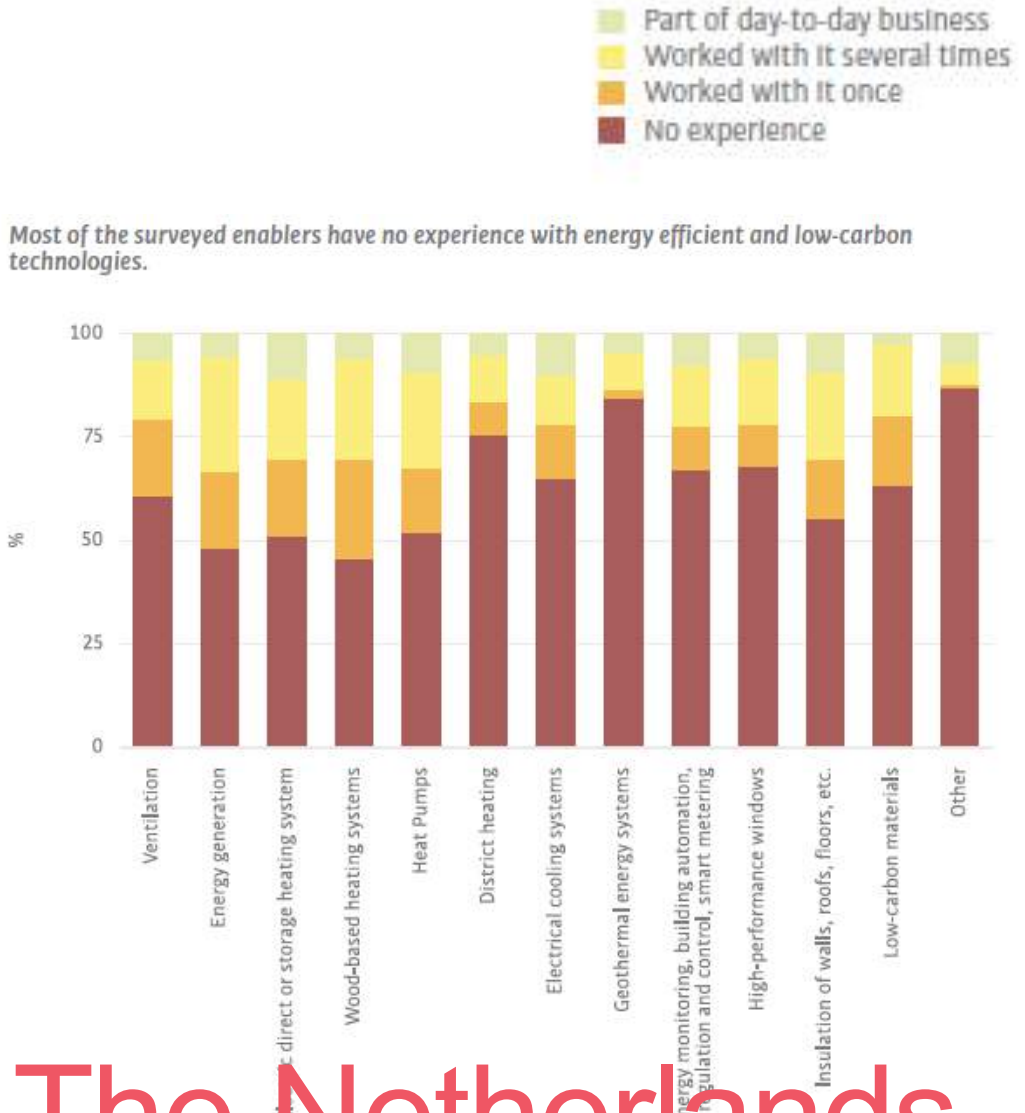
1. Conceiving, planning, and consulting services
2. Material and technology supplies
3. Construction and installation
4. Enabling services
5. Operation and maintenance services
6. Institutional demand side
7. Private demand side



Chapter B



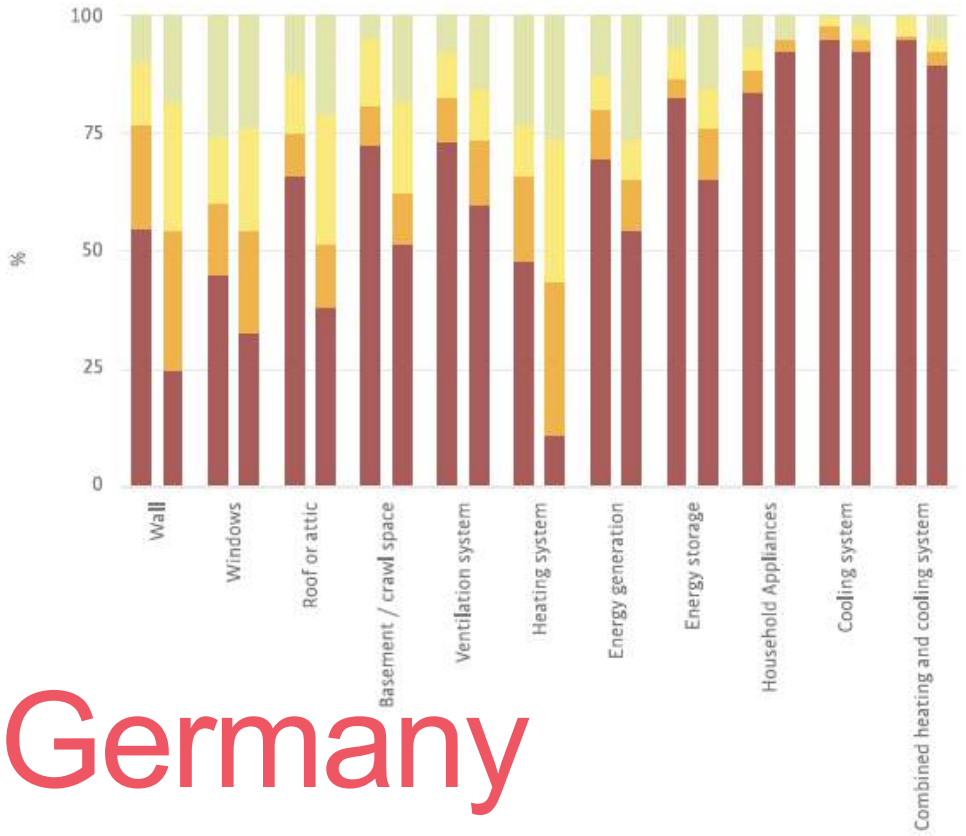
Germany



The Netherlands

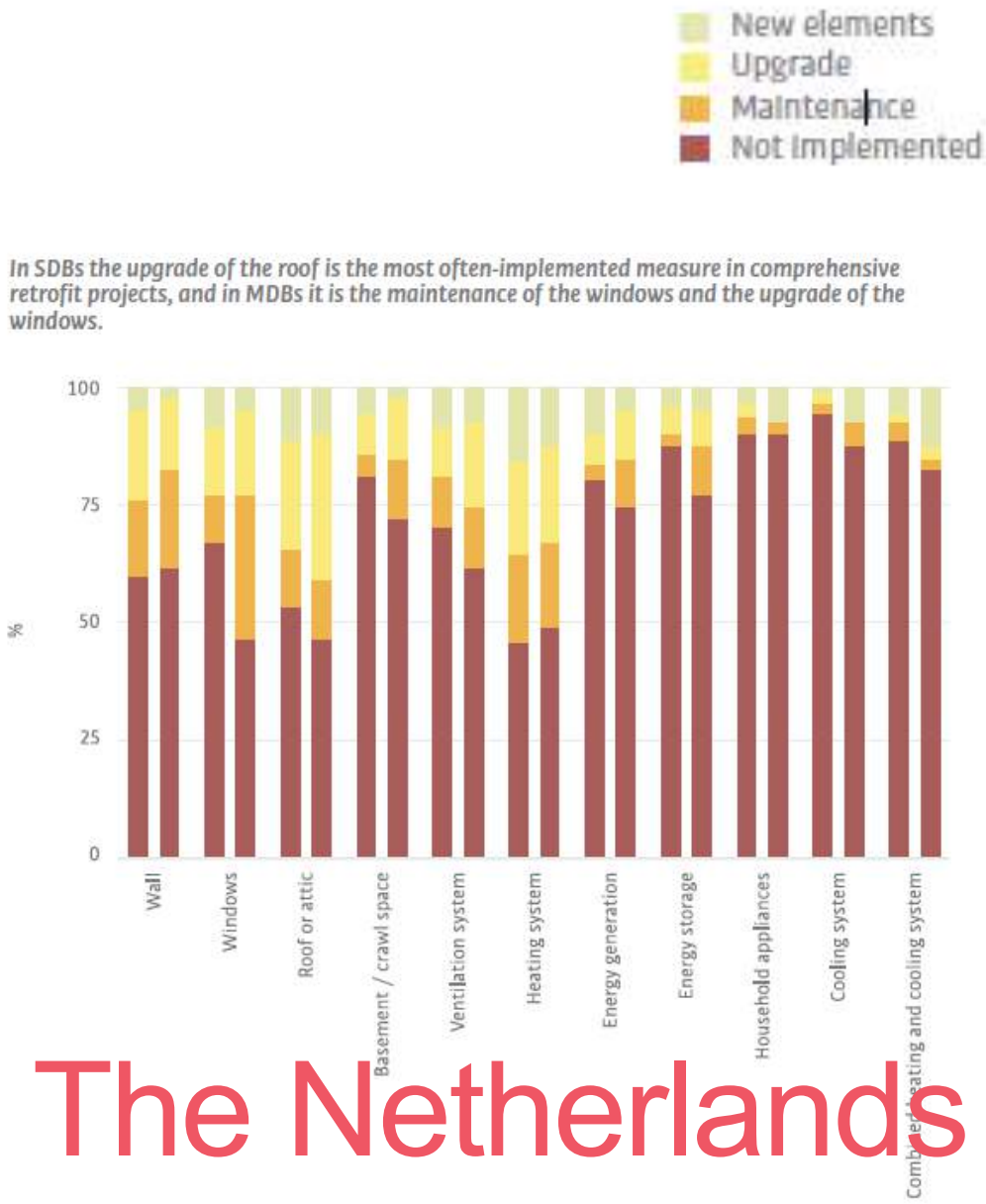
Chapter B

Adding new windows is the most often implemented measure in SDBs, and in MDBs it is the maintenance of the heating system.



Germany

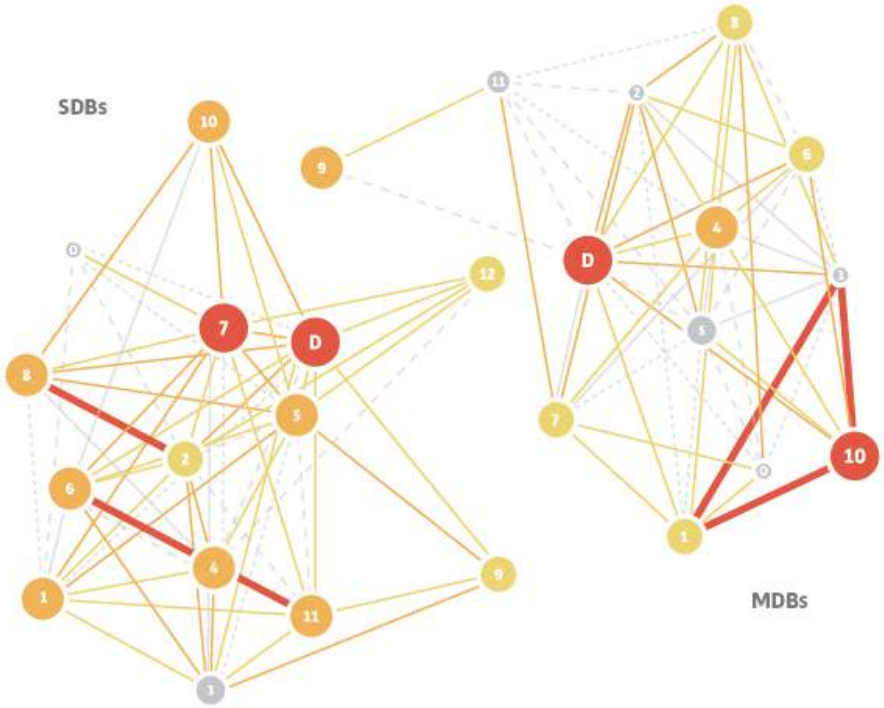
In SDBs the upgrade of the roof is the most often-implemented measure in comprehensive retrofit projects, and in MDBs it is the maintenance of the windows and the upgrade of the windows.



The Netherlands

Chapter B

Technical facility managers have the highest level of power in the technology selection in overhaul projects in MDBs, besides the demand-side actors.



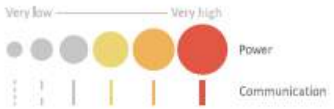
NOTE

Stakeholder groups 1-7, see table B1.2

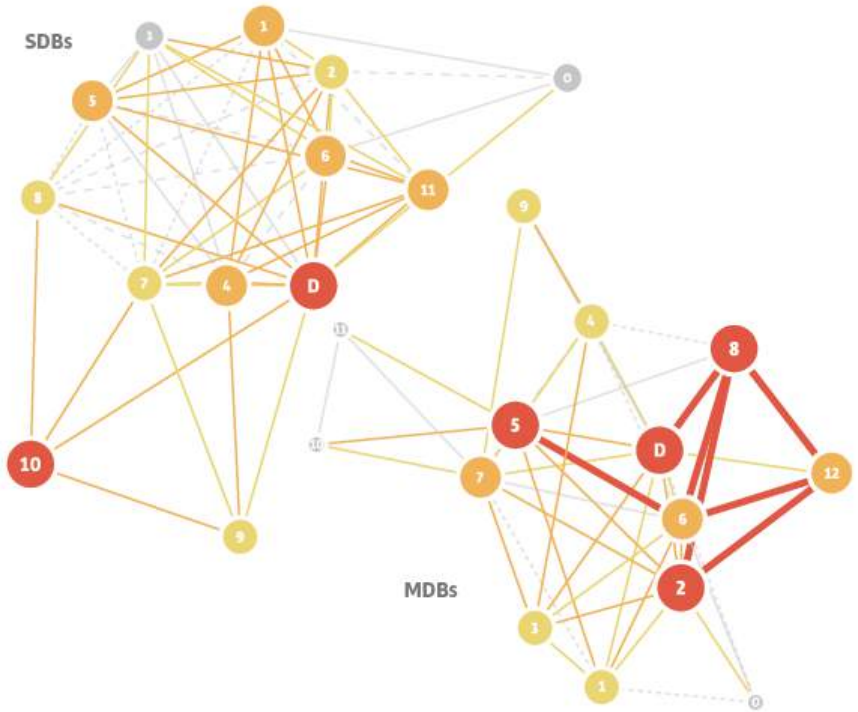
1. Material or technology trader
2. Architect
3. Engineer
4. Consultant
5. Installer
6. Construction company
7. Public authority
8. Bank/other financial service company
9. Facility manager-administrative
10. Facility manager-technical
11. Energy supplier/utility or energy service company
12. Business association, agency agent

D. Demand-side actors, including:
- Investment or developing agent
- Housing company agent (for profit)
- Housing company or association agent (public / non-profit)
- Private house owner

0. Other



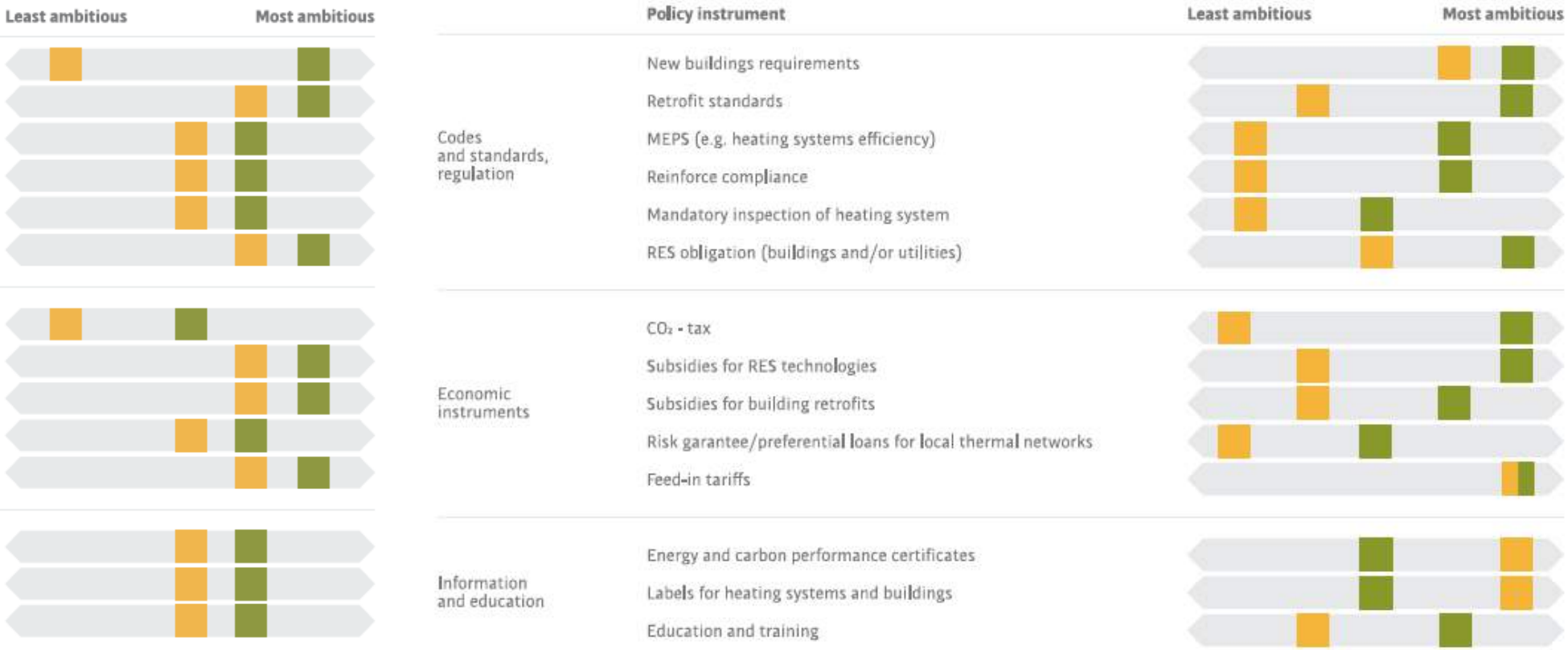
In retrofit projects in both SDBs and MDBs in the Netherlands, there are many strong interactions among the actors, in MDBs especially among the demand-side actors, the architects, and banks or other financial service companies.



Germany

The Netherlands

Chapter C



Germany

The Netherlands

Chapter C

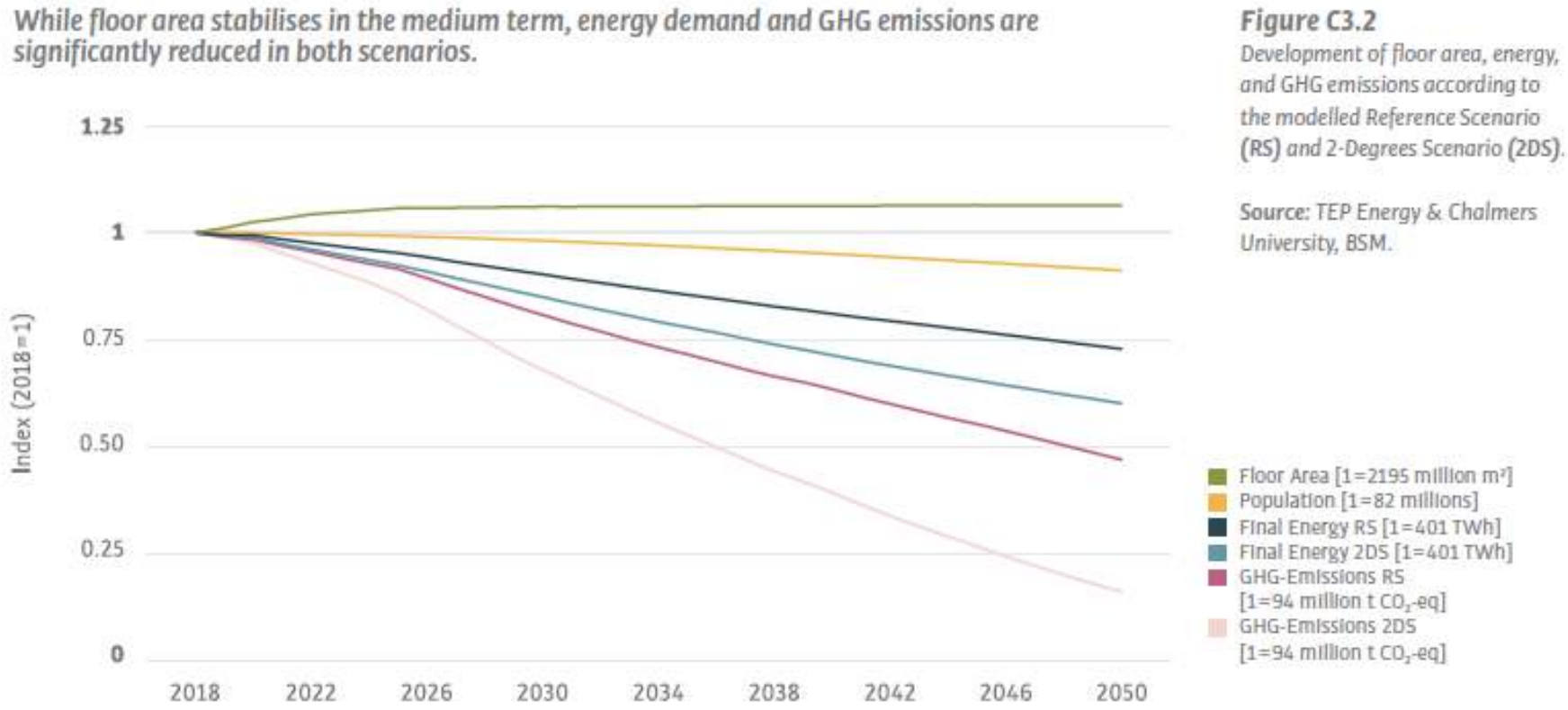
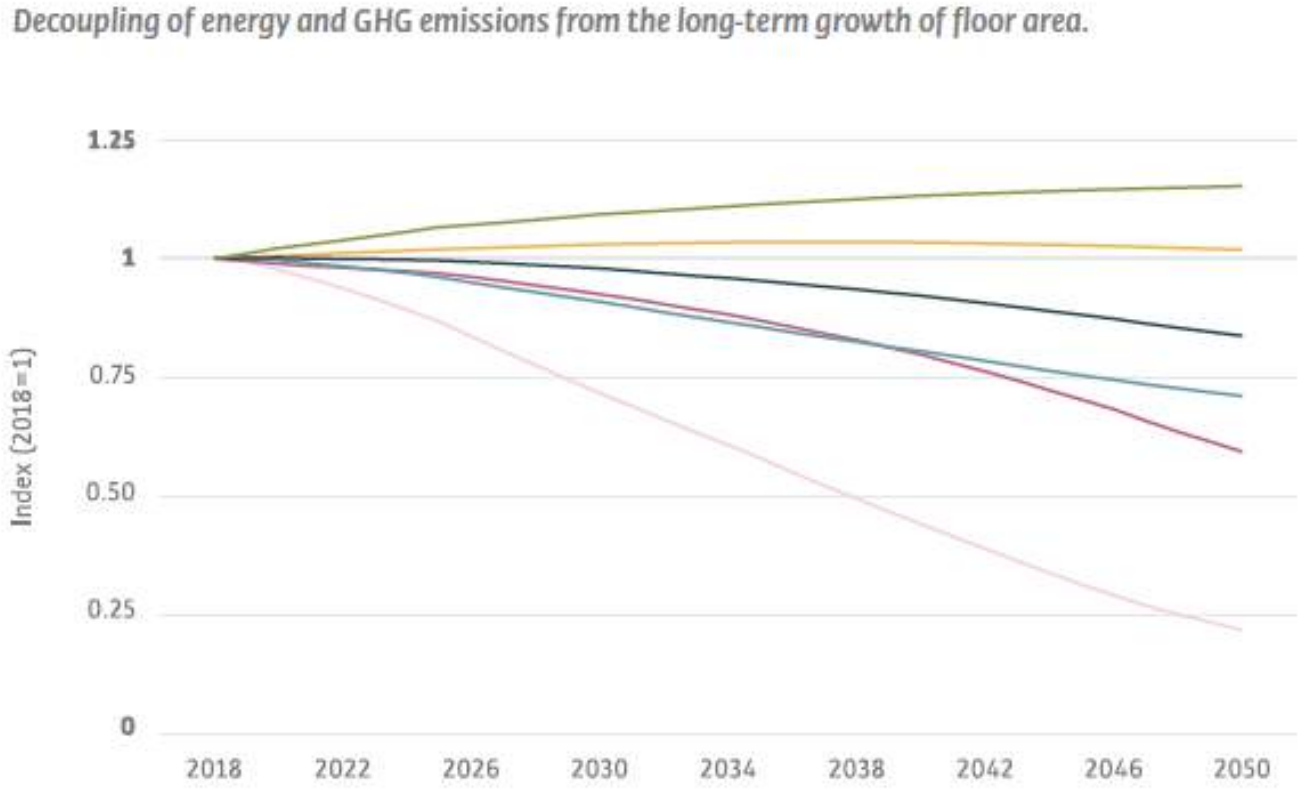


Figure C3.2
Development of floor area, energy, and GHG emissions according to the modelled Reference Scenario (RS) and 2-Degrees Scenario (2DS).

Source: *TEP Energy & Chalmers University, BSM.*

Germany

Chapter C



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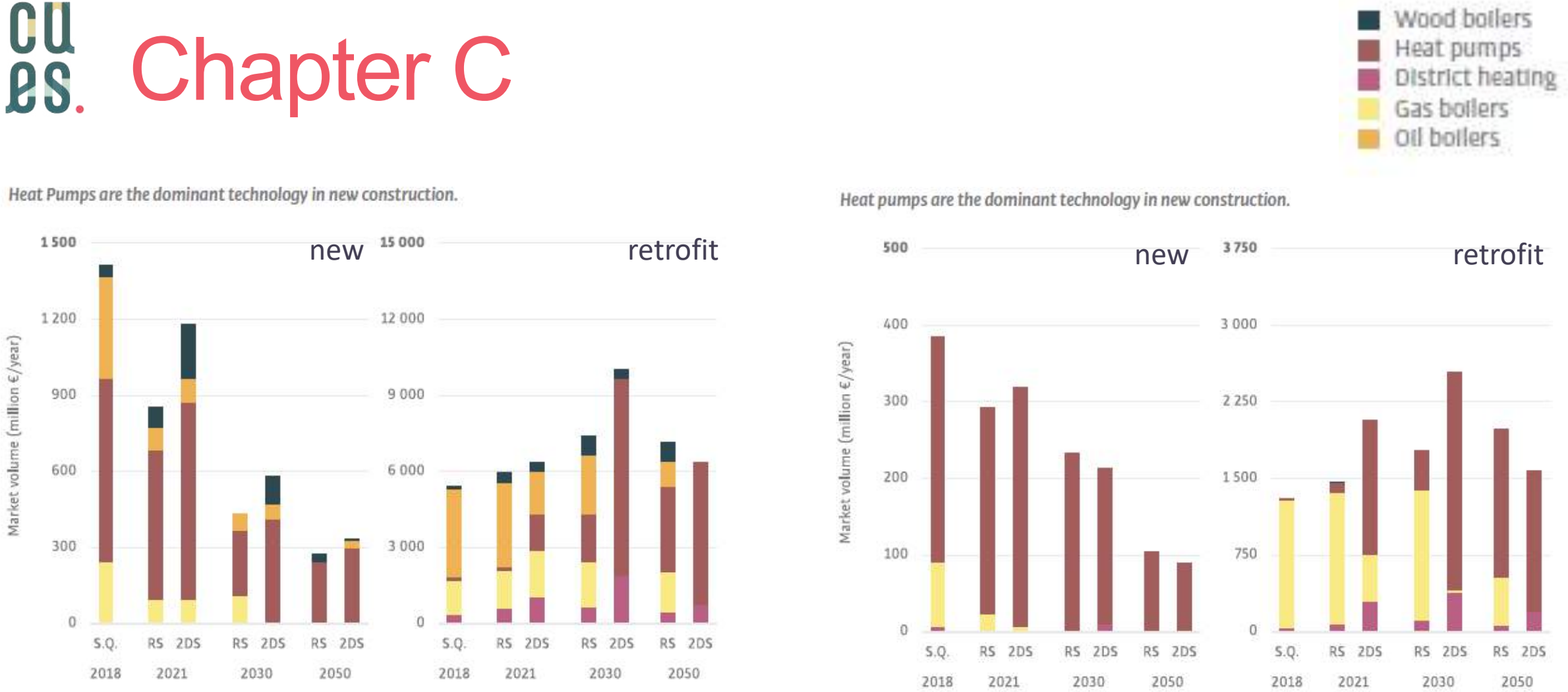
Source: *TEP Energy & Chalmers University, BSM.*

The Netherlands

Chapter C

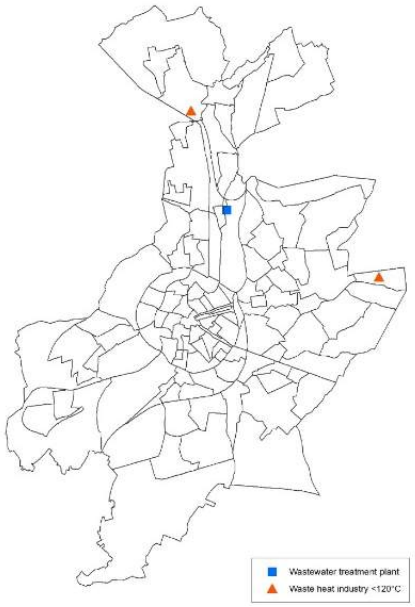


Germany

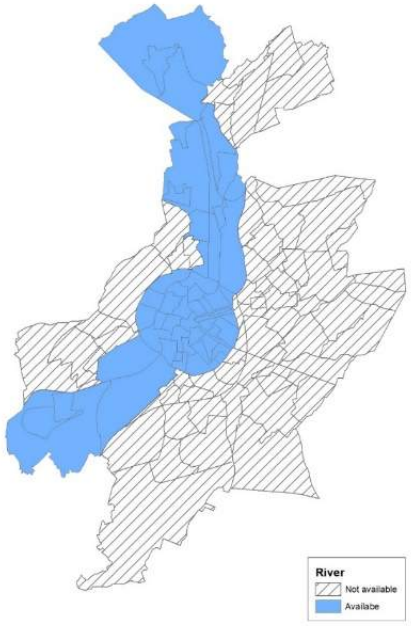
The Netherlands

Follow ups:City BMB_Leuven

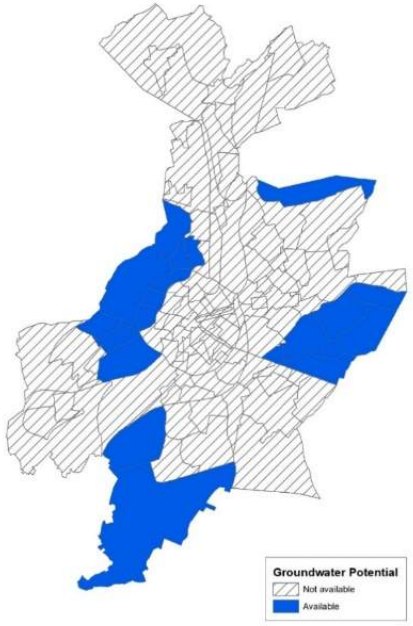
Point sources



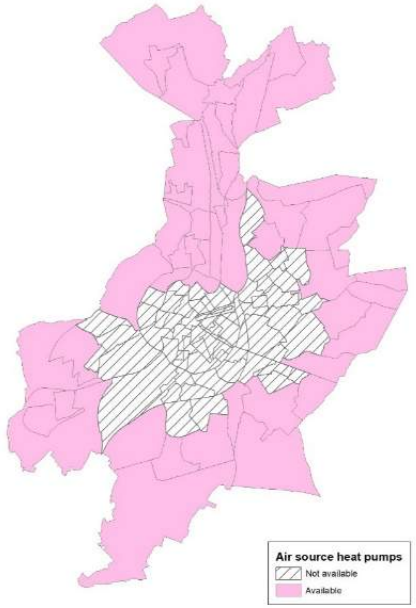
River



Groundwater



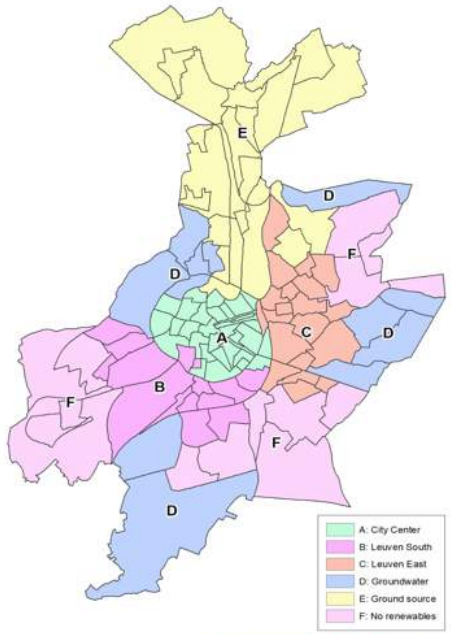
Air-source HP

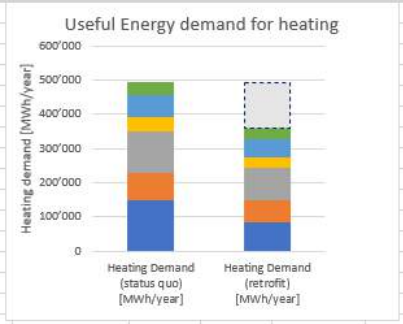


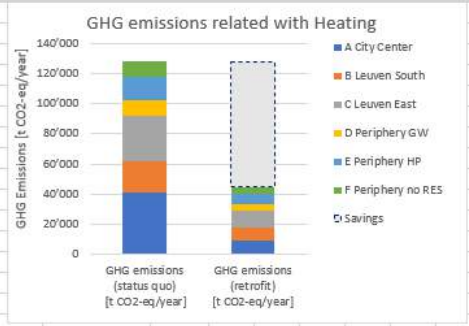
Geothermal HP

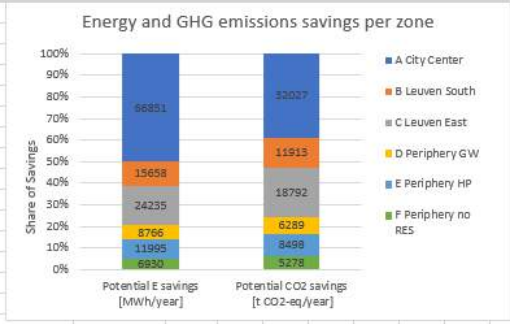
Follow ups: City BMB_Leuven

CODE country	CODE_b	ID_Country	Country	ID_City	City	ID_Area	Area	ID_Building Age Class	Building Age Class	ID_Building Type	Building Type	Average Floor Size [m² EBF]	# Dwellings	Total Floor Area 2018 [m2]	rp0	% standard							Energy demand [kWh/year]	GHG emissions [kg CO2-eq/year	rp1	% standard							
																							14										
2_1_1	2_1_1_T	2	BE	1	Leuven	A	City Center	1	(Before 1960)	1	SFH	77.1		393235.8	0.5	0.3	0.0	0.0	0.3	0.3	0.0	0.0	29193482	2474143	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
2_2_1	2_2_1_T	2	BE	1	Leuven	A	City Center	2	1961-1990	1	SFH	77.1		82229.5	0.8	0.3	0.0	0.0	0.3	0.3	0.0	0.0	8544170	724117	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
2_3_1	2_3_1_T	2	BE	1	Leuven	A	City Center	3	1991-2010	1	SFH	77.1		32488.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	2666933	664771	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
2_4_1	2_4_1_T	2	BE	1	Leuven	A	City Center	4	2011-2018	1	SFH	111.8		7393.8	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	415807	103646	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
2_5_1	2_5_1_T	2	BE	1	Leuven	A	City Center	5	nach 2018	1	SFH	111.8		0.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
2_1_2	2_1_2_T	2	BE	1	Leuven	A	City Center	1	(Before 1960)	2	MFH	73.5		571403.4	0.5	0.3	0.0	0.0	0.3	0.3	0.0	0.0	31476535	2667632	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
2_2_2	2_2_2_T	2	BE	1	Leuven	A	City Center	2	1961-1990	2	MFH	73.5		120079.1	1.0	0.3	0.0	0.0	0.3	0.3	0.0	0.0	11626492	985344	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
2_3_2	2_3_2_T	2	BE	1	Leuven	A	City Center	3	1991-2010	2	MFH	73.5		49508.5	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	3058725	762431	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0







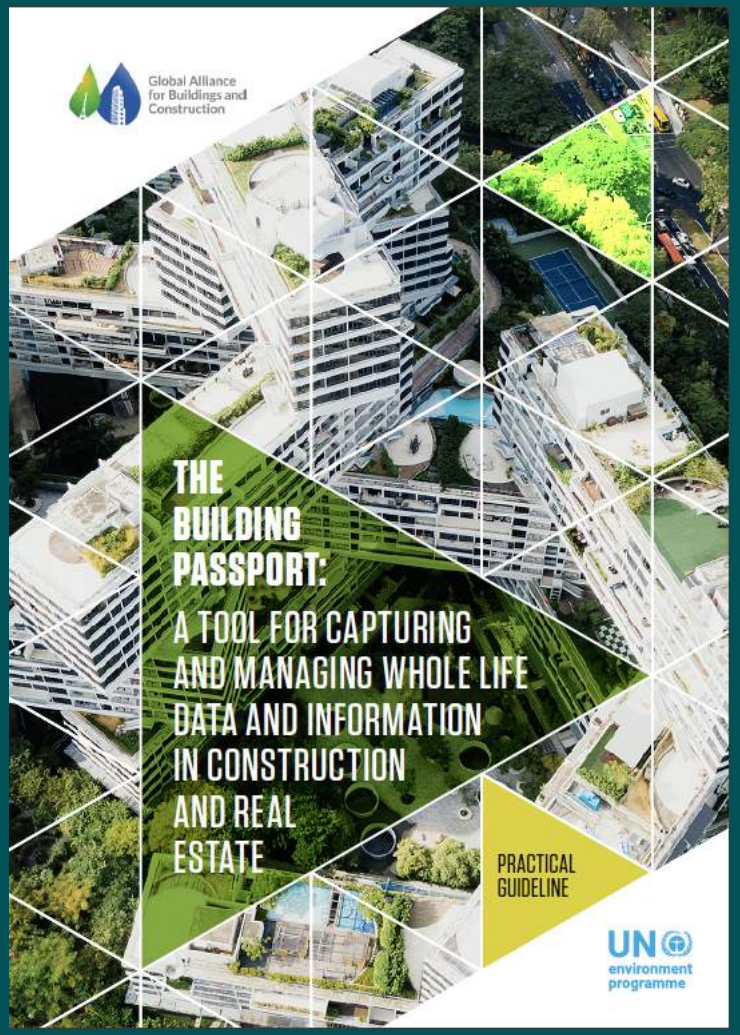


Restrictions of packages per Area

ID	Name	rp0	rp1	rp2	rp3	rp4	rp5	sp0	sp1	sp2	sp3	sp4	sp5	sp6
A	City center	✓	?	✓	x	x	x	✓	x	x	✓	✓	x	x
B	Leuven South	✓	?	✓	✓	x	✓	✓	x	?	✓	✓	✓	?
C	Leuven East	✓	?	✓	✓	x	✓	✓	x	?	✓	✓	✓	x
D	Periphery GW	✓	?	✓	✓	✓	✓	✓	✓	x	x	x	✓	✓
E	Periphery GS HP	✓	?	✓	✓	✓	✓	✓	✓	✓	x	x	✓	x
F	Periphery no GS H	✓	?	✓	✓	✓	✓	✓	✓	x	x	x	✓	x

ID's | Instructions | Packages | Tool Retrofit per Zone

Follow ups: Building Passports



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