ENPER-EXIST

WP3 Building stock knowledge

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Main objectives in WP3

- To conduct a survey of the level of information available in the member states regarding the existing building stock to obtain a better knowledge of the potential of energy savings

- To make proposal on how to gain improved knowledge of the existing building stock using certification schemes

Content of the report

Existing building stock knowledge from ENPER-EXIST

Existing building stock knowledge from international sources and other projects

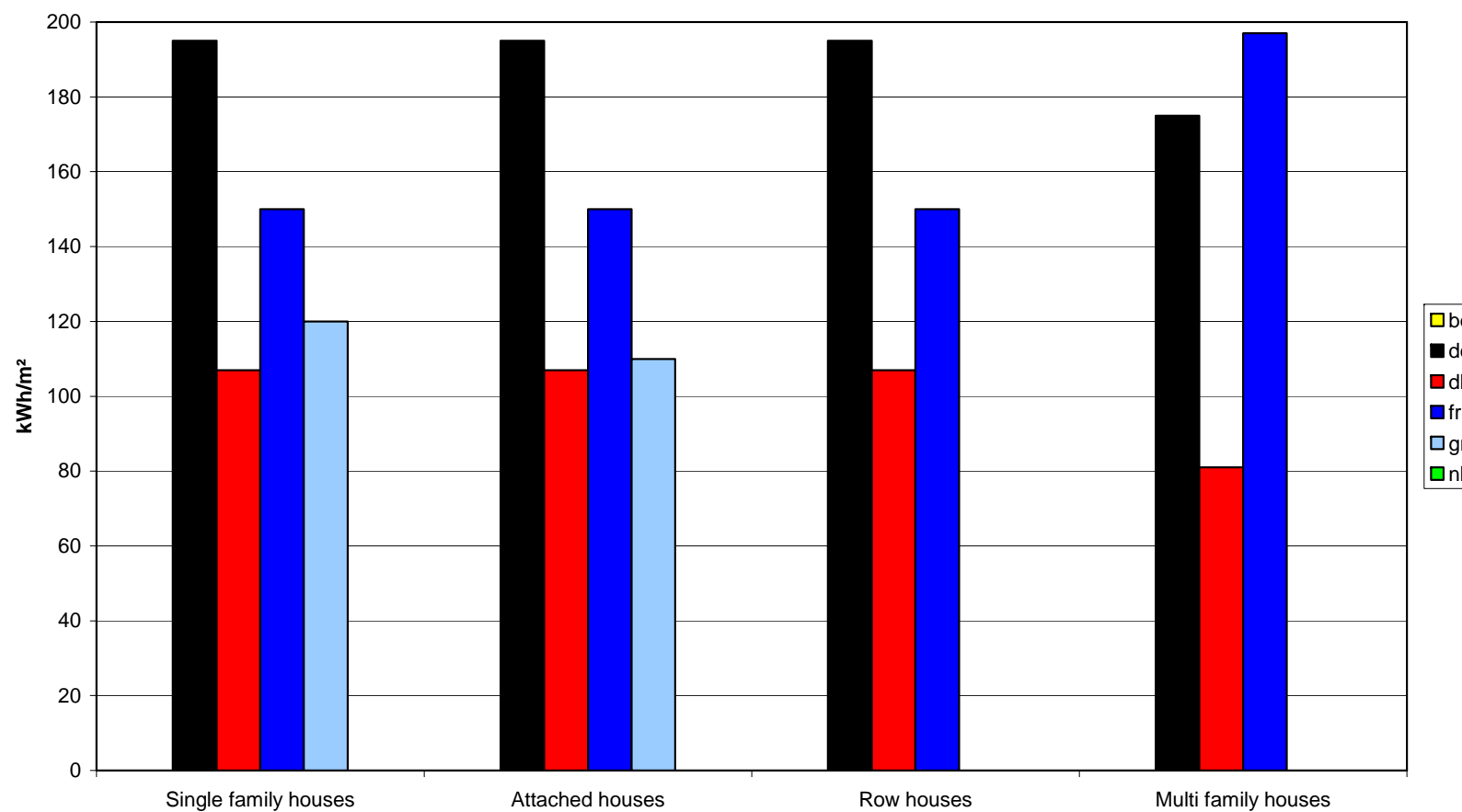Available buildings stock information sources - wwwSources and reports

Knowledge based on actual labelling schemes

Improved knowledge based on new labelling schemes

Excel tool

Content

	at	be	cs	cy	de	dk	es	et	fi	fr	gr	hu	ie	it	lt	lu	lv	mt	nl	pl	pt	se	sk	sl	uk	eu
	Austria	Belgium	Cech rep.	Cyprus	Germany	Denmark	Spain	Estonia	Finland	France	Greece	Hungary	Ireland	Italy	Liutuenia	Luxemburg	Latvia	Malta	Netherlands	Poland	Portugal	Sweden	Slovakia	Slovenia	United Kingdoms	European Union

Characterisation of existing building stock

		at	be	cs	cy	de	dk	es	et	fi	fr	gr	hu	ie	it	lt	lu	lv	mt	nl	pl	pt	se	sk	sl	uk	eu
# buildings	Total, Res	☺	☺			☺	☺				☺	☺				☺				☺						☺	9
	Total, non Res	☺	☺			☺	☺					☺								☺						☺	7
area / type	Total, Res		☺			☺	☺				☺	☺					☺			☺							7
	Total, non Res	☺				☺	☺				☺	☺								☺						☺	7
typical const period	Total, Res	☺	☺				☺				☺	☺					☺			☺						☺	8
	Total, non Res	☺					☺					☺								☺							4
statistical	Total, Res	☺	☺			☺	☺				☺	☺				☺				☺						☺	9
	Total, non Res	☺	☺			☺	☺				☺	☺								☺						☺	8
estimate	Total, Res											☺															1
	Total, non Res											☺															1

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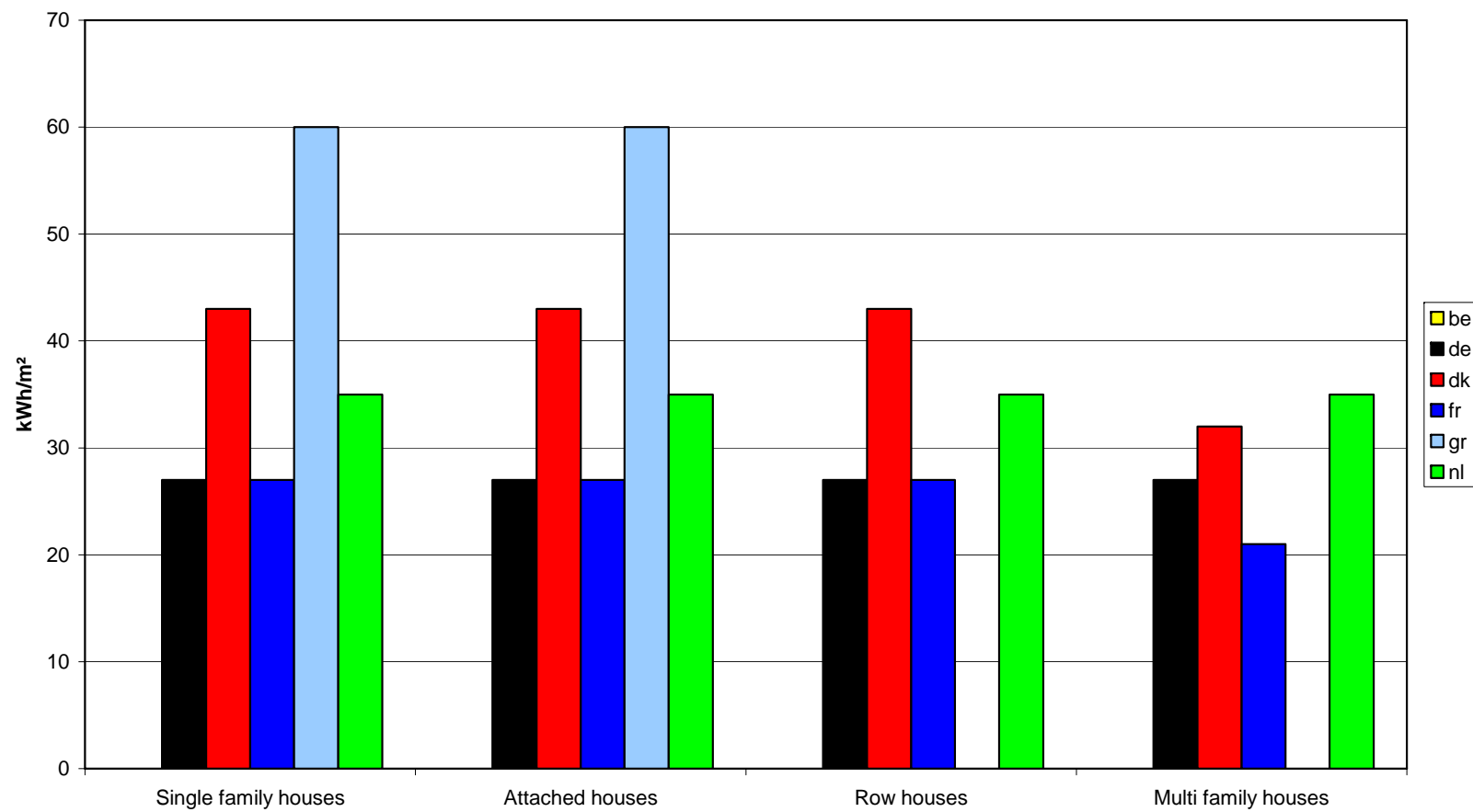Heating consumption, residential

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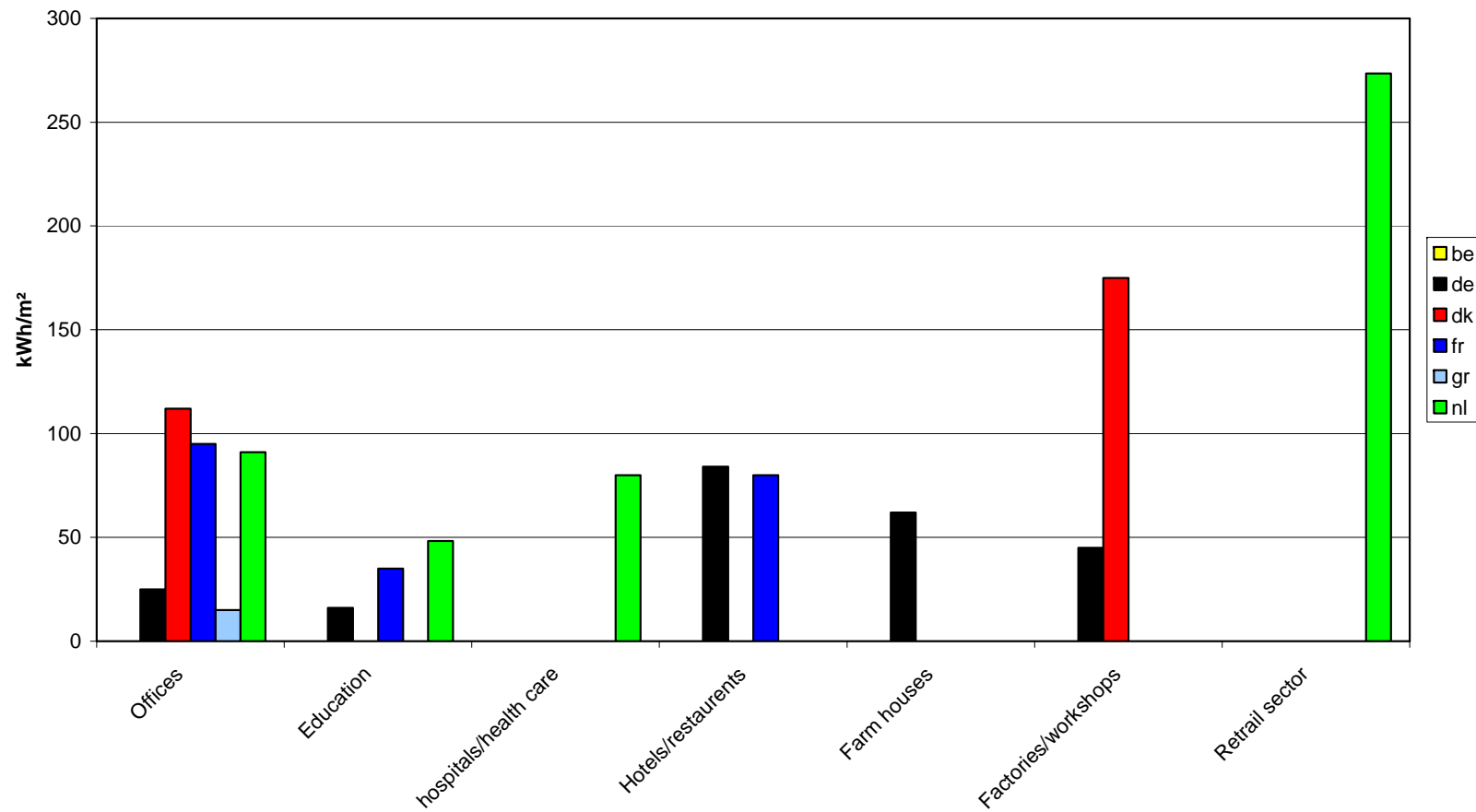Heating consumption, non-residential
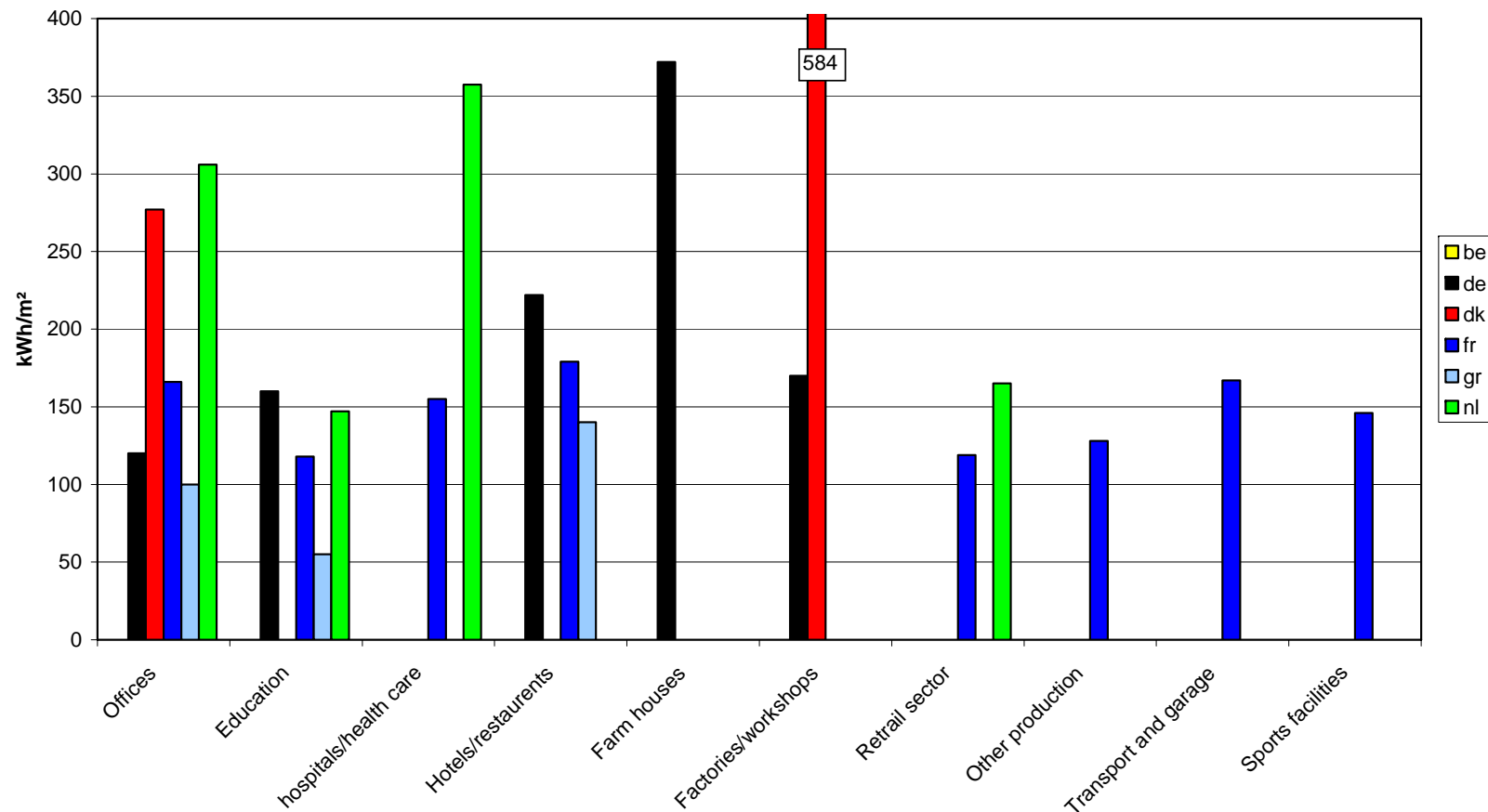
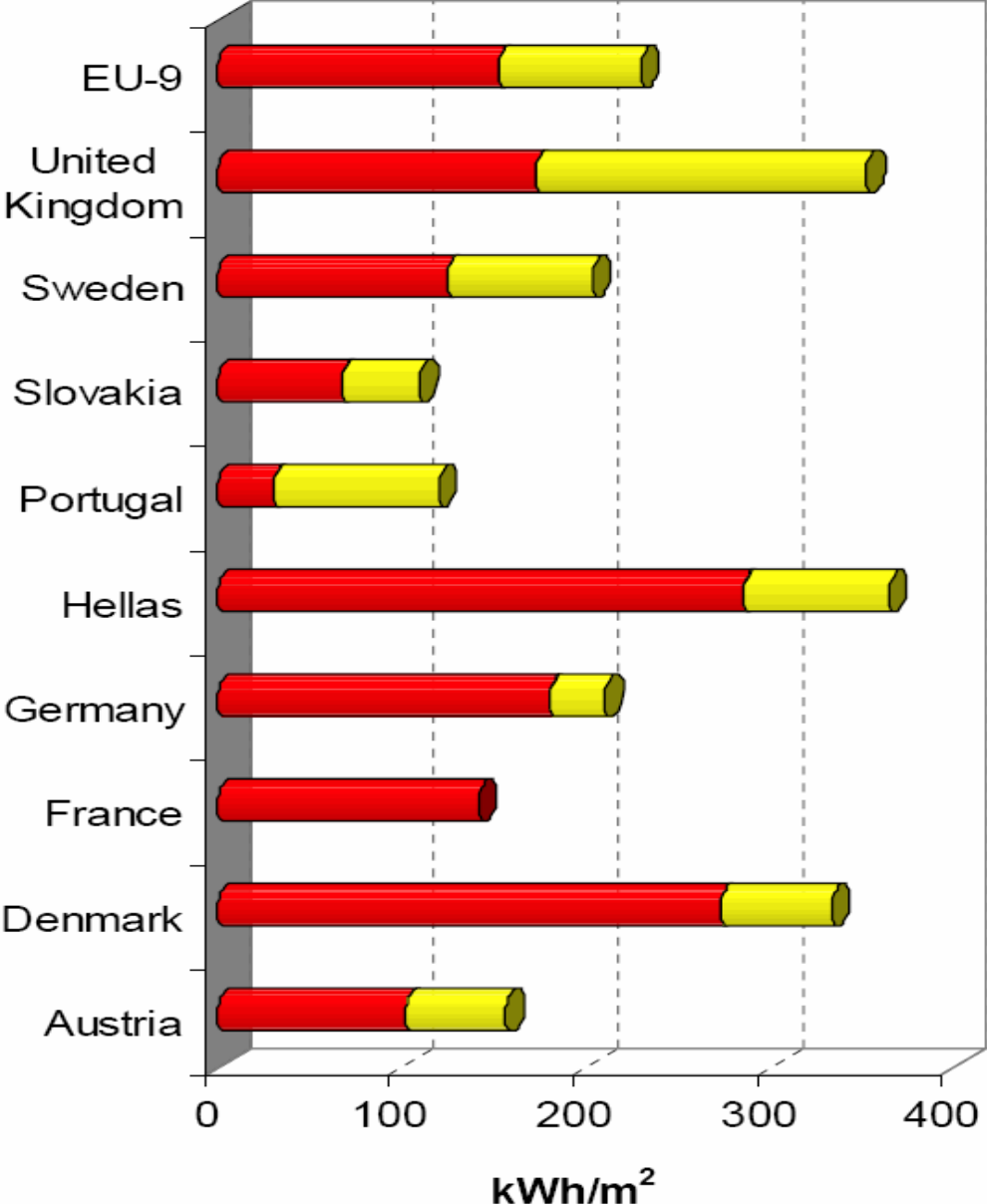# ENPER-EXIST

Electricity, residential
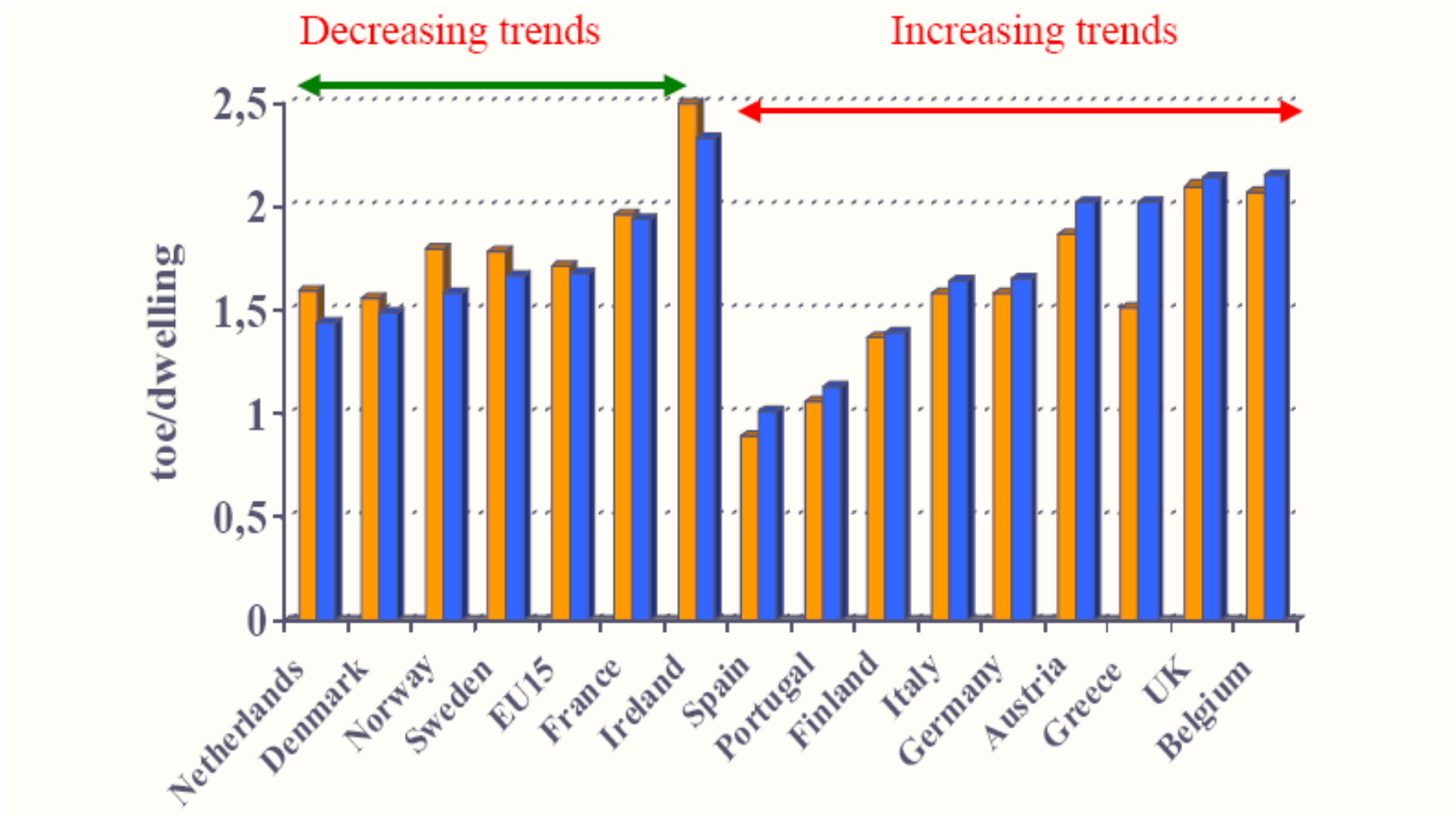
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Electricity, non-residential

EPA-NR

Total annual thermal and electrical energy consumption per unit floor area (kWh/m2) for office buildings, when data is available.

Average consumption per dwelling and trends across countries (ODYSSEE, 2004).

Building knowledge based on the Danish energy certification scheme

The objectives were to find the potential for heating savings for Danish dwellings

- Background

- Method and calculations

  - Data from BBR register (building stock register)

  - Data from EM-scheme (energy labelling scheme)

- Findings: The potential of energy savings

Grading into seven typical construction periods

Period	Characteristics
• Until 1930	• Dominated by massive brick constructions
• 1931 – 1950	• Hollow core masonry walls
• 1951 – 1960	• Hollow walls insulated
• 1961 – 1972	• BR61
• 1973 – 1978	• BR72 and energy crises 1
• 1979 – 1998	• BR78 and energy crises 2
• 1999 – 2003	• BR95/98

Data sources

BBR register

- Information about the building stock, the area, the constructions, the sizes and the systems divided in different types of buildings

Labelling scheme (EM-scheme)

- Extract from database of approx 200,000 buildings in the period from 1999 to 2003

- Analyses of registred U-values diveded into different constructions and periods

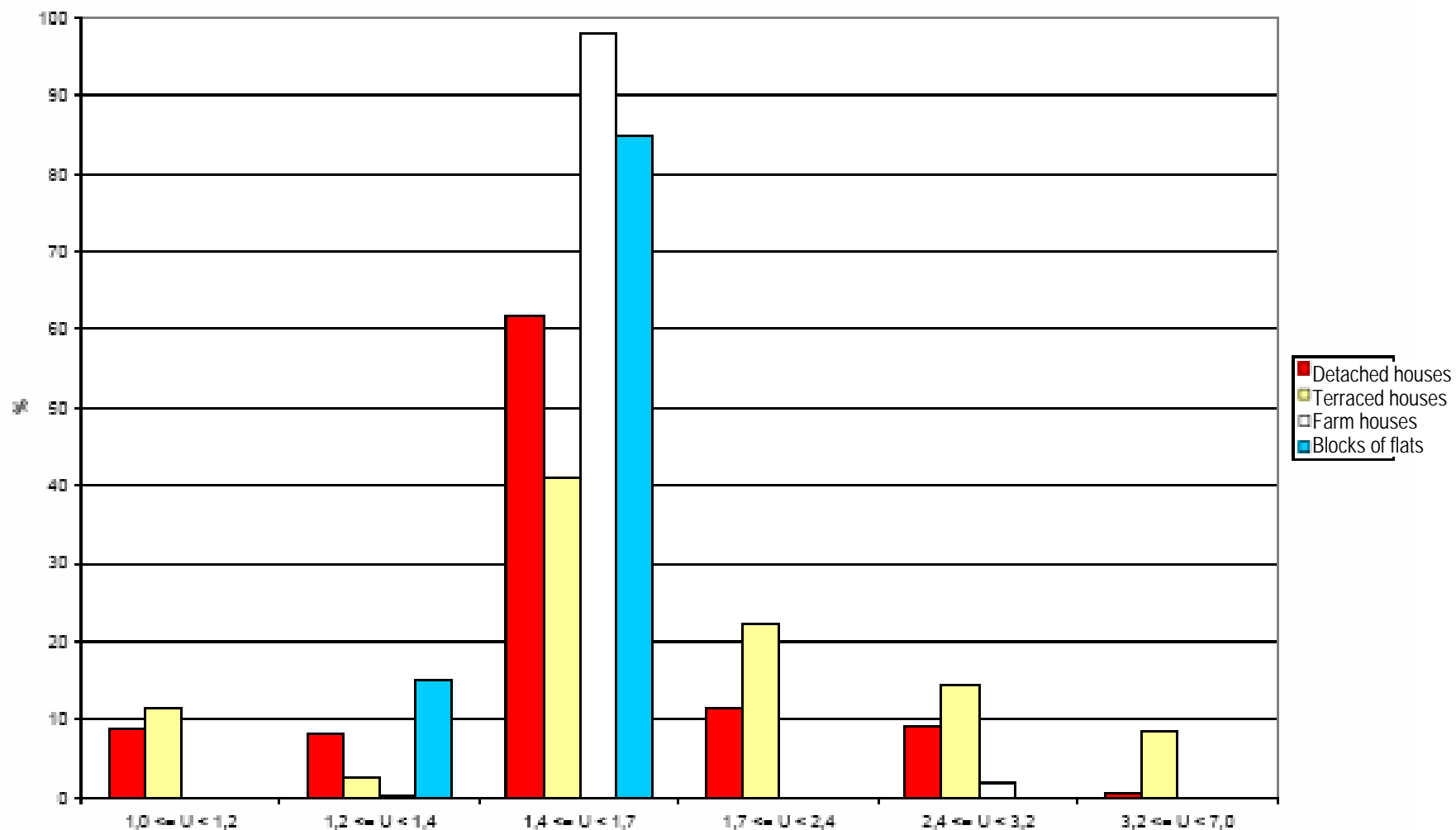# BBR: Area distribution
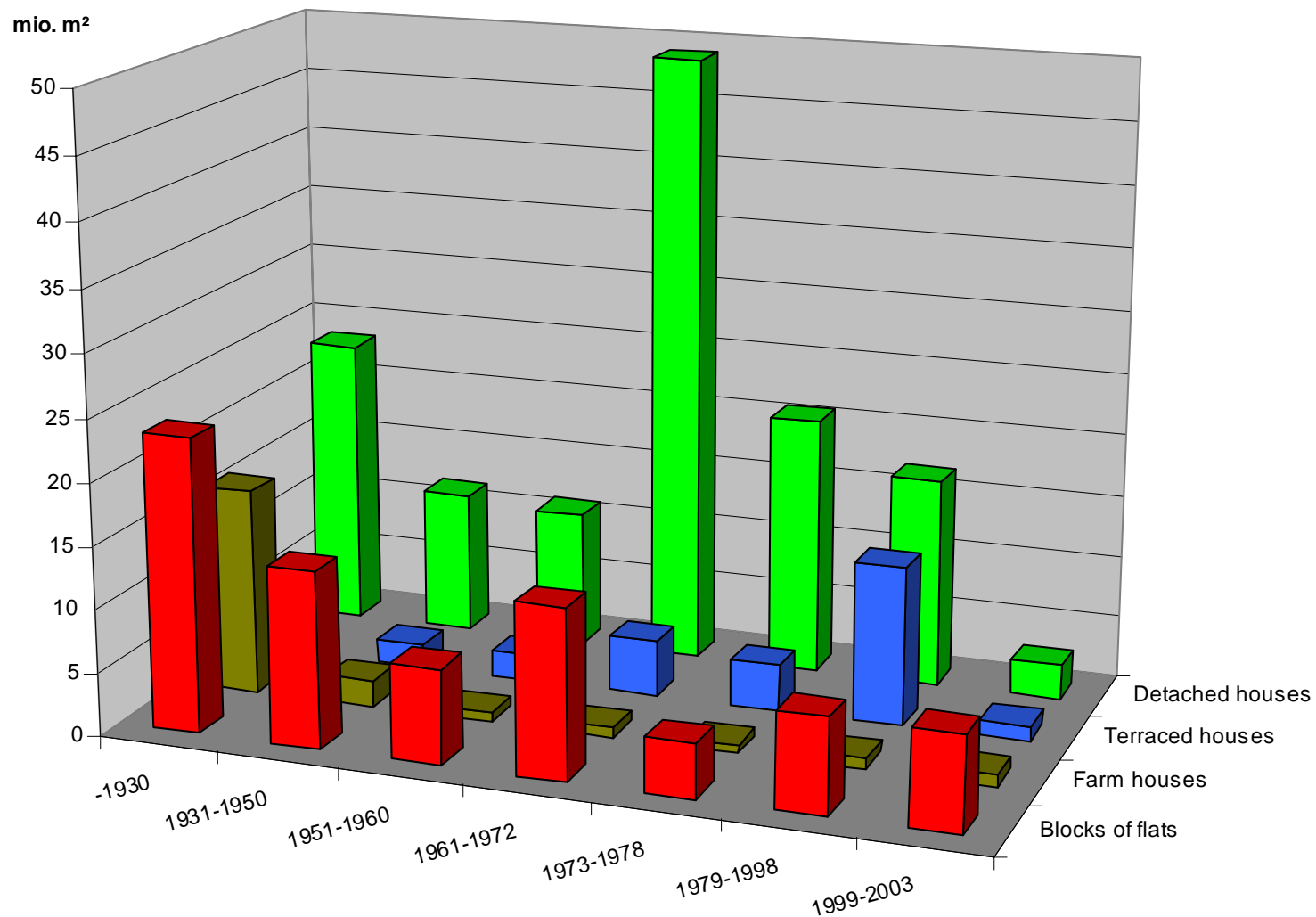
EM: Outer walls, before 1930
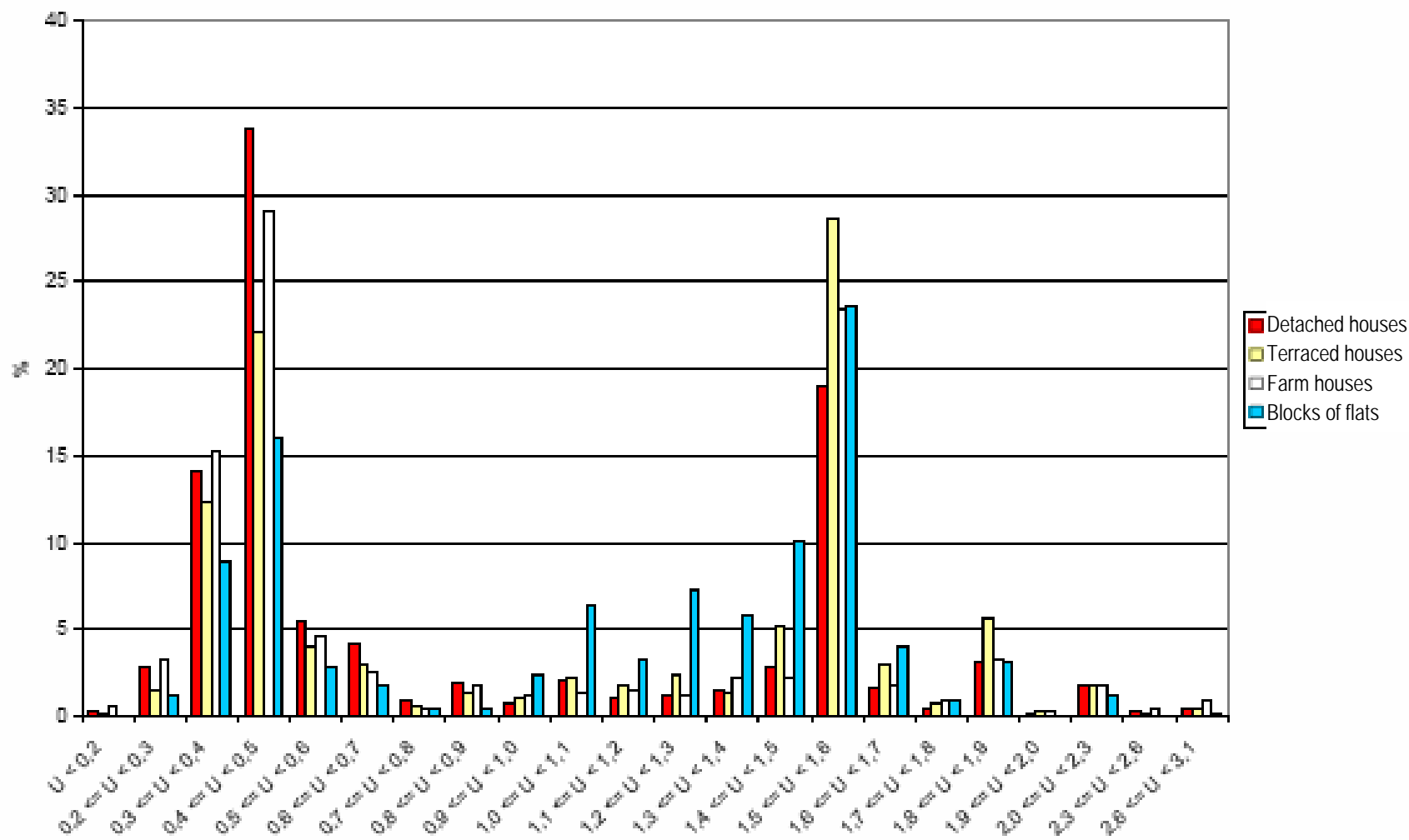
EM: Windows 1961-1972
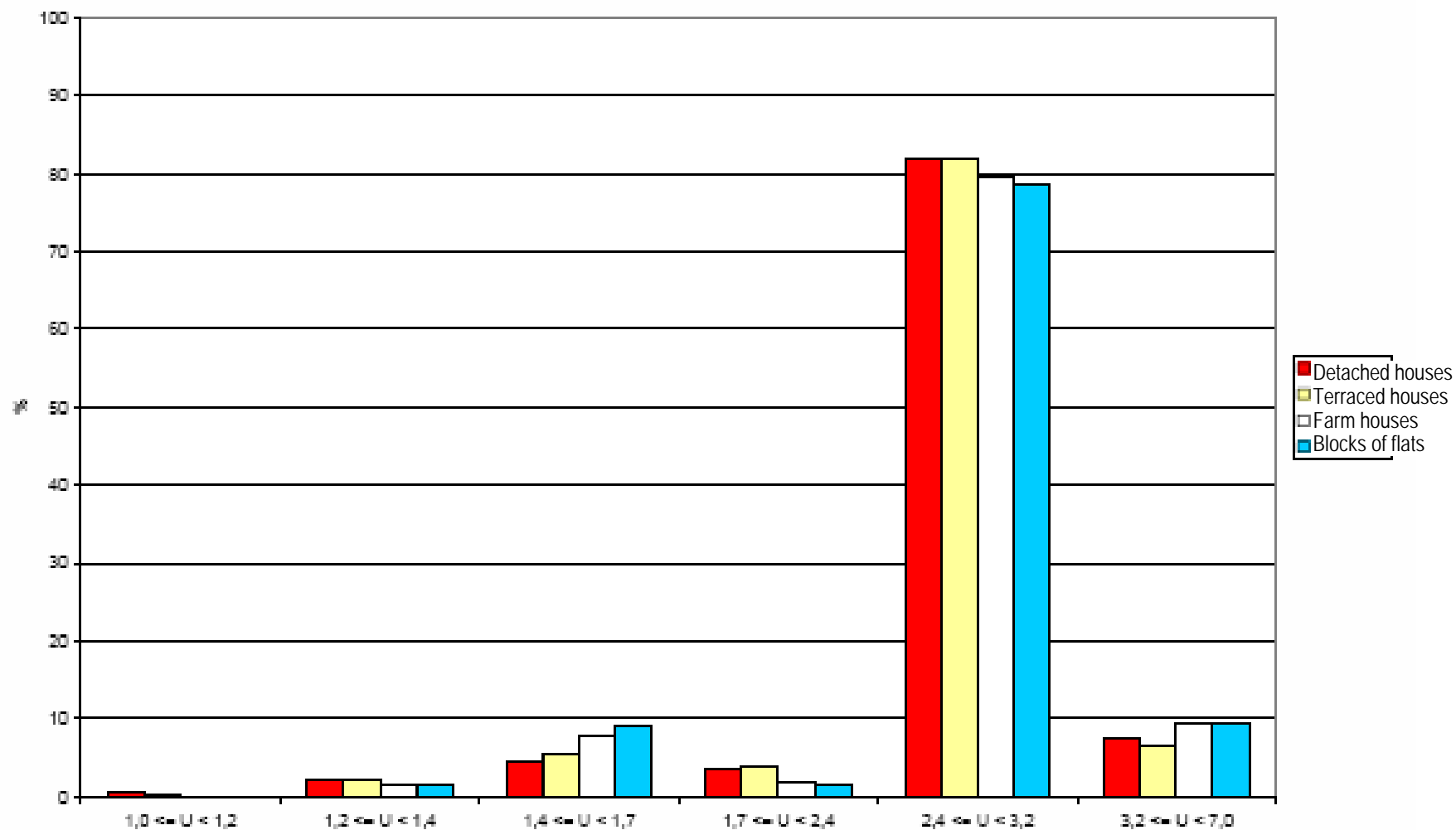
EM: Windows 1998-2003

Building models

- Model for average buildings

- Estimation of heat losses through the thermal envelope by use of the P-faktor method

  - The p-factor expresses the heat loss through the building construction in W/m^2K.

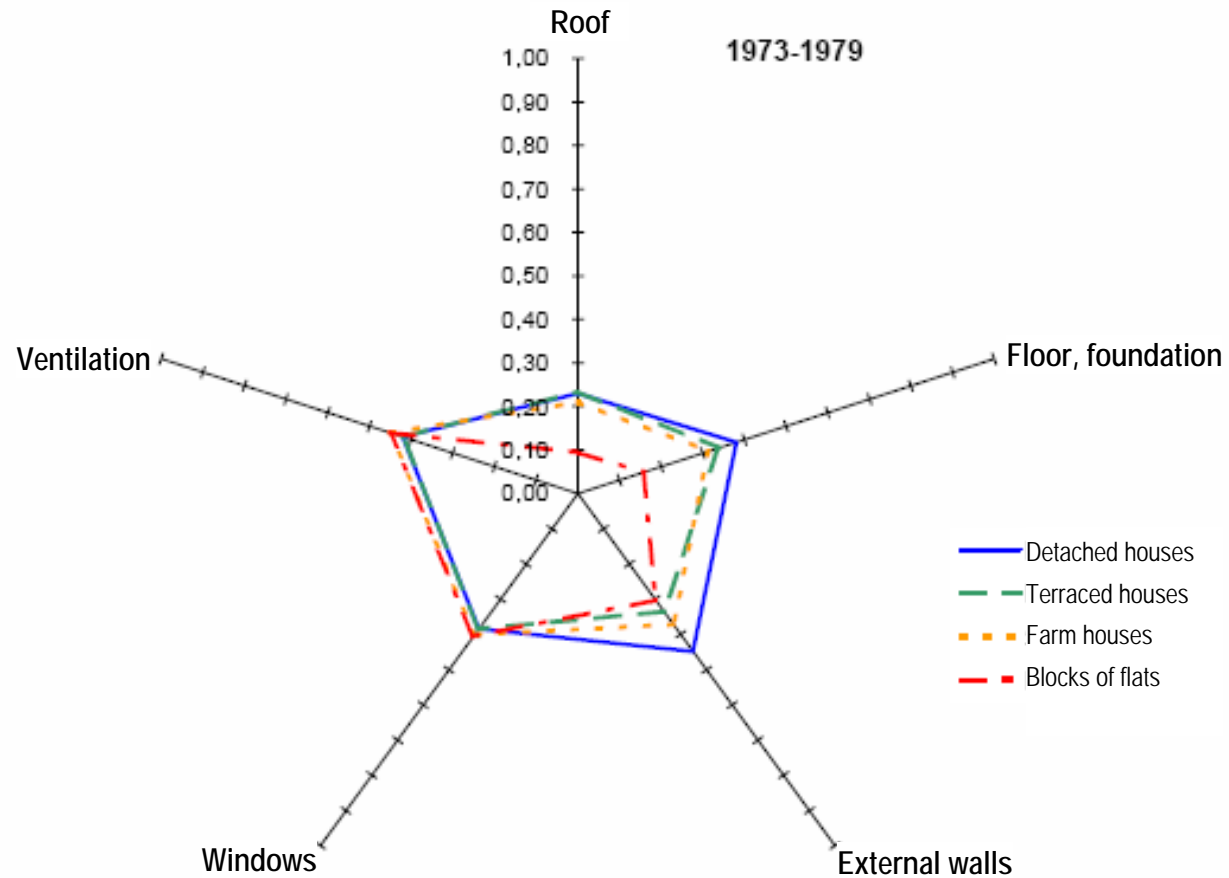- The data from the labelling is used to create an overview over the P-factors

1931 - 1950
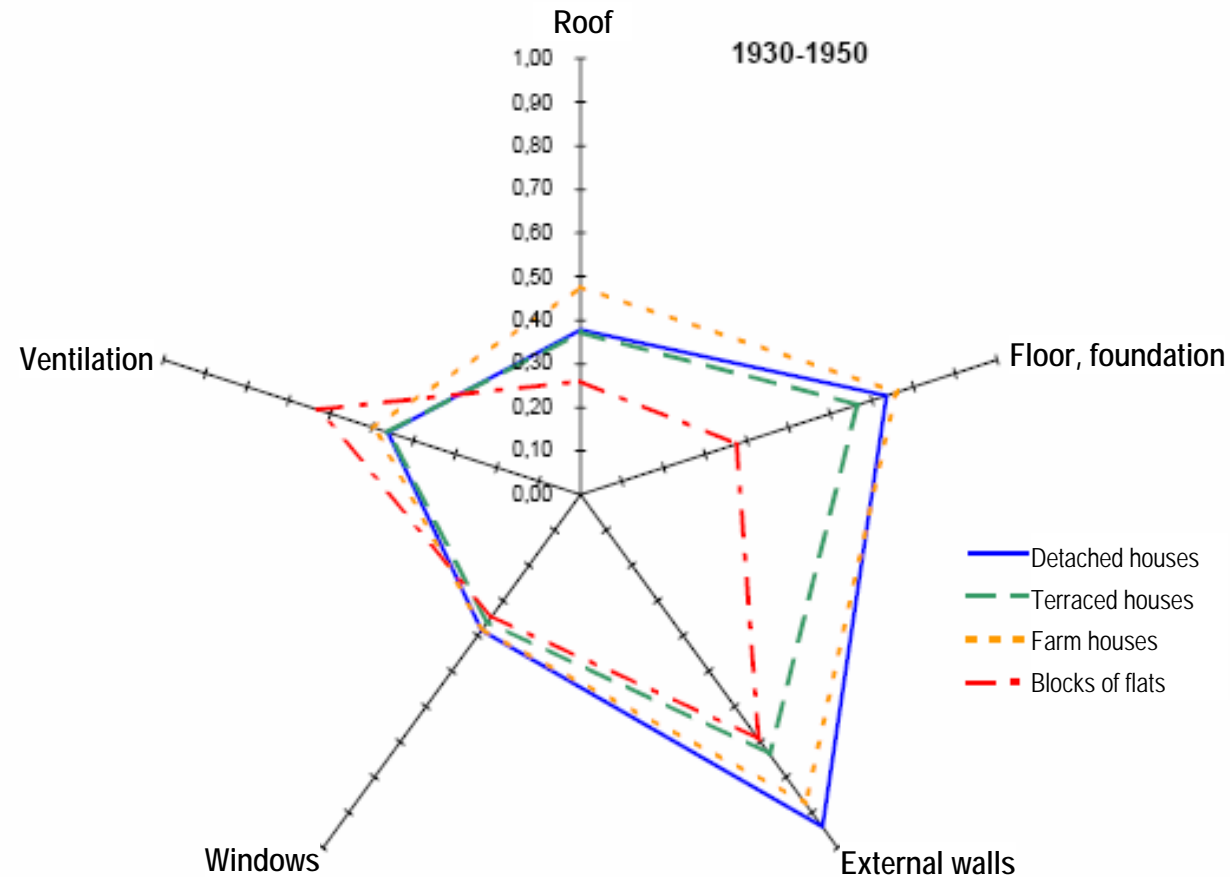
P-factor for dwellings 1931-50. External walls cause the largest heat loss pr m^2 heated floor.
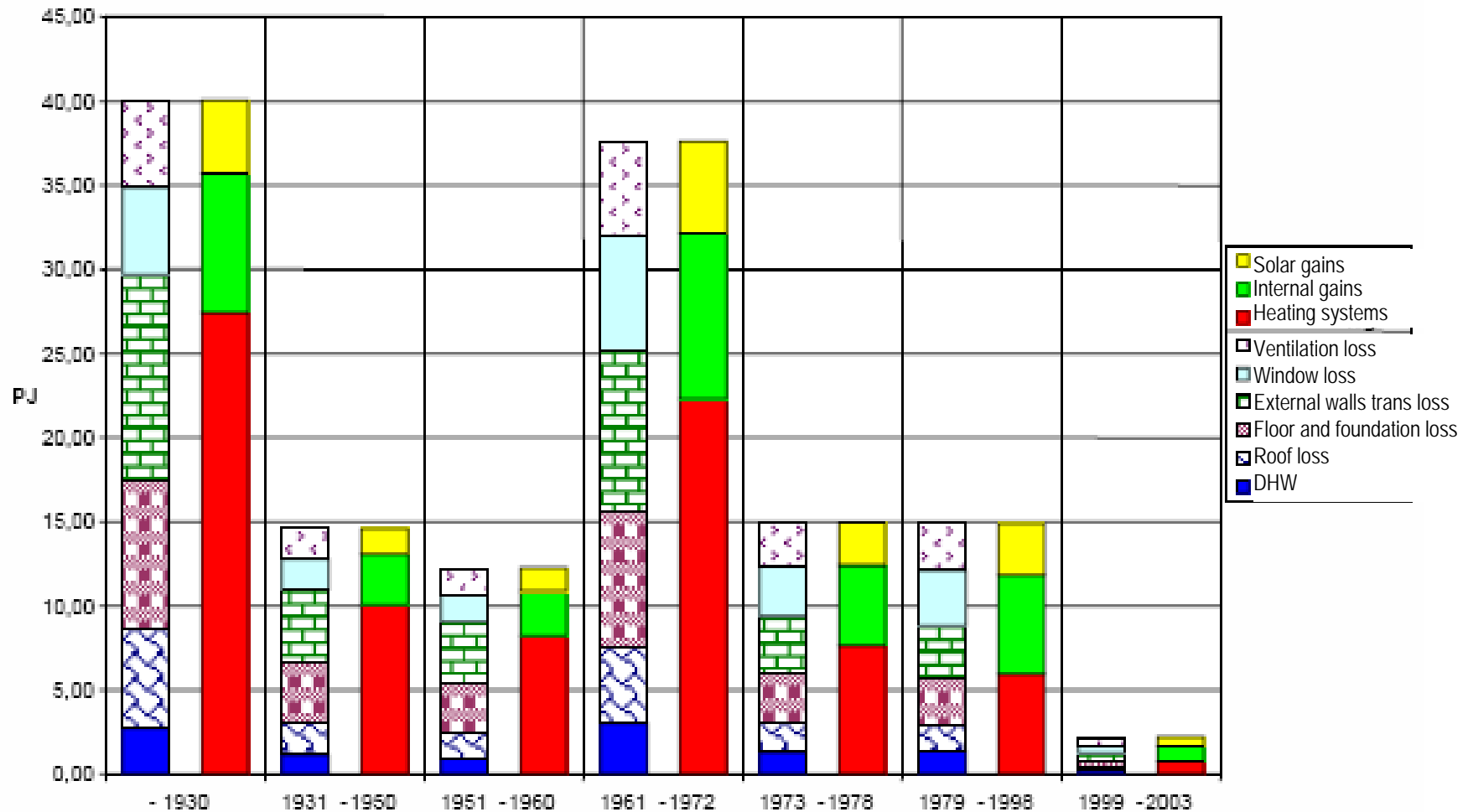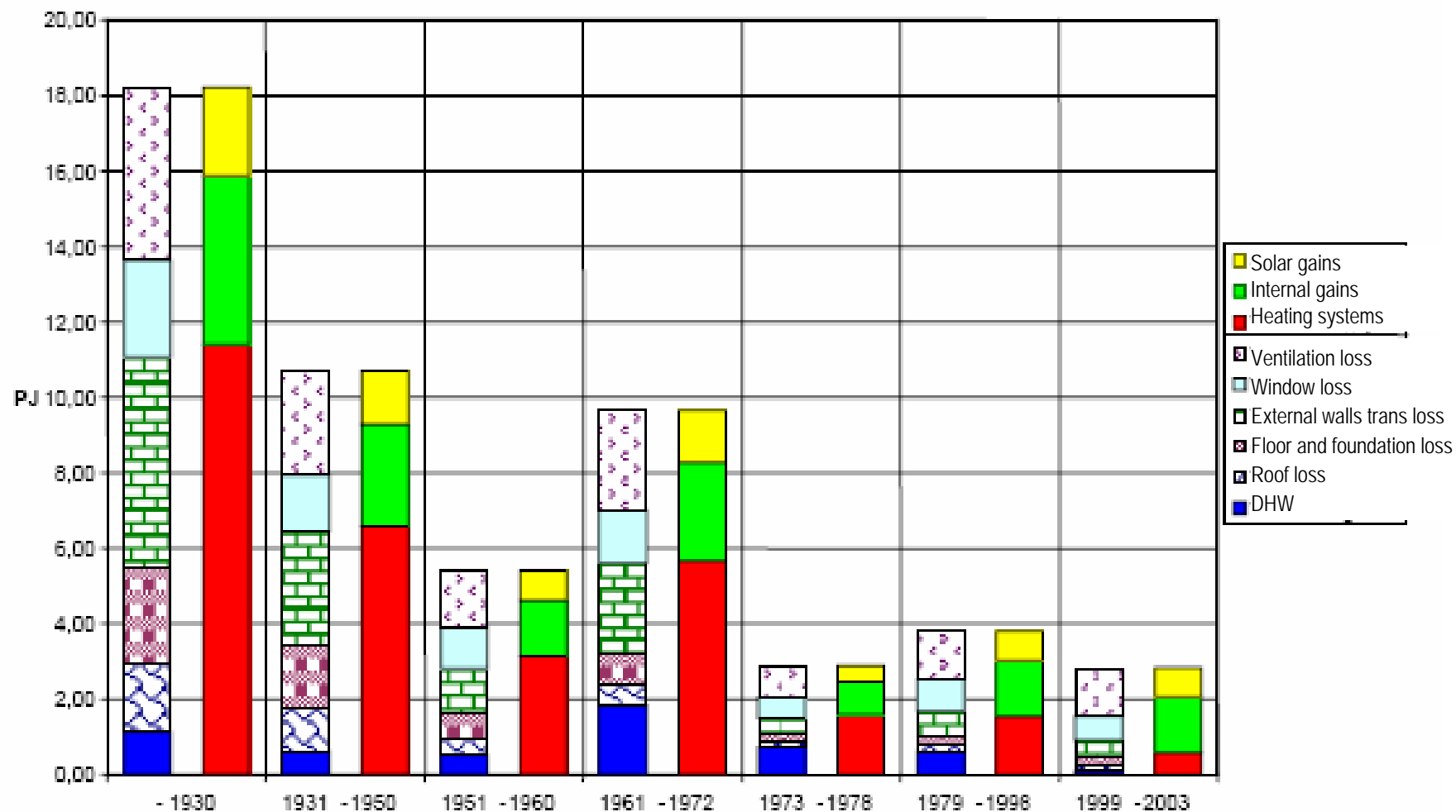
1961 – 1972
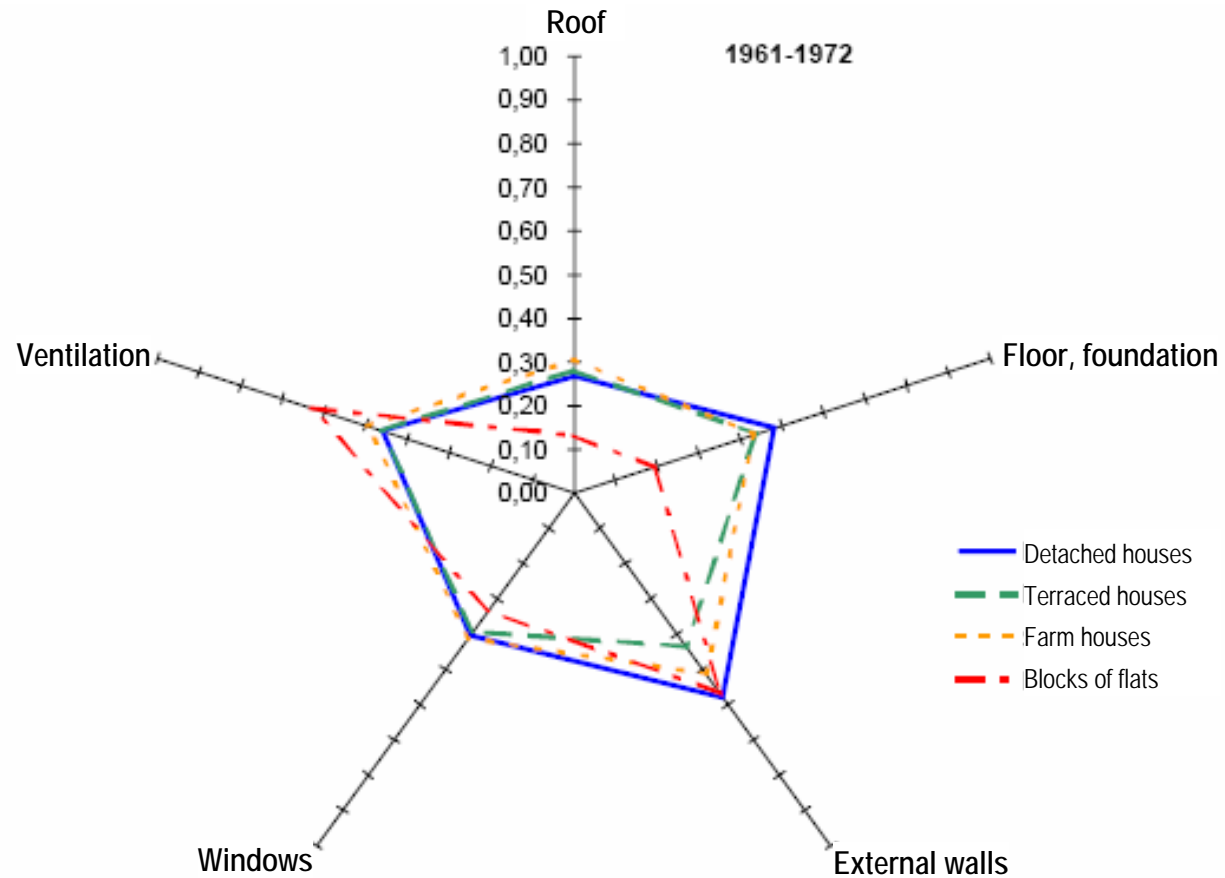
1973-1979

Energy balance for single family houses

Energy balance for blocks of flats

Assumptions

- 50 % of all external walls and floors with U-values at 1.0 W/m²K and above can be improved to a U-value of 0.45 W/m²K

- 50 % of all roofs with a U-values of 1.0 W/m²K can be improved to a U-value of 0.35 W/m²K

- All windows can be replaced with windows of todays standard corresponding to an average U-value of 1.6 W/m²K

- All U-values of the improved U-values is the average U-value taking into account thermal bridges

Energy saving potential in TJ
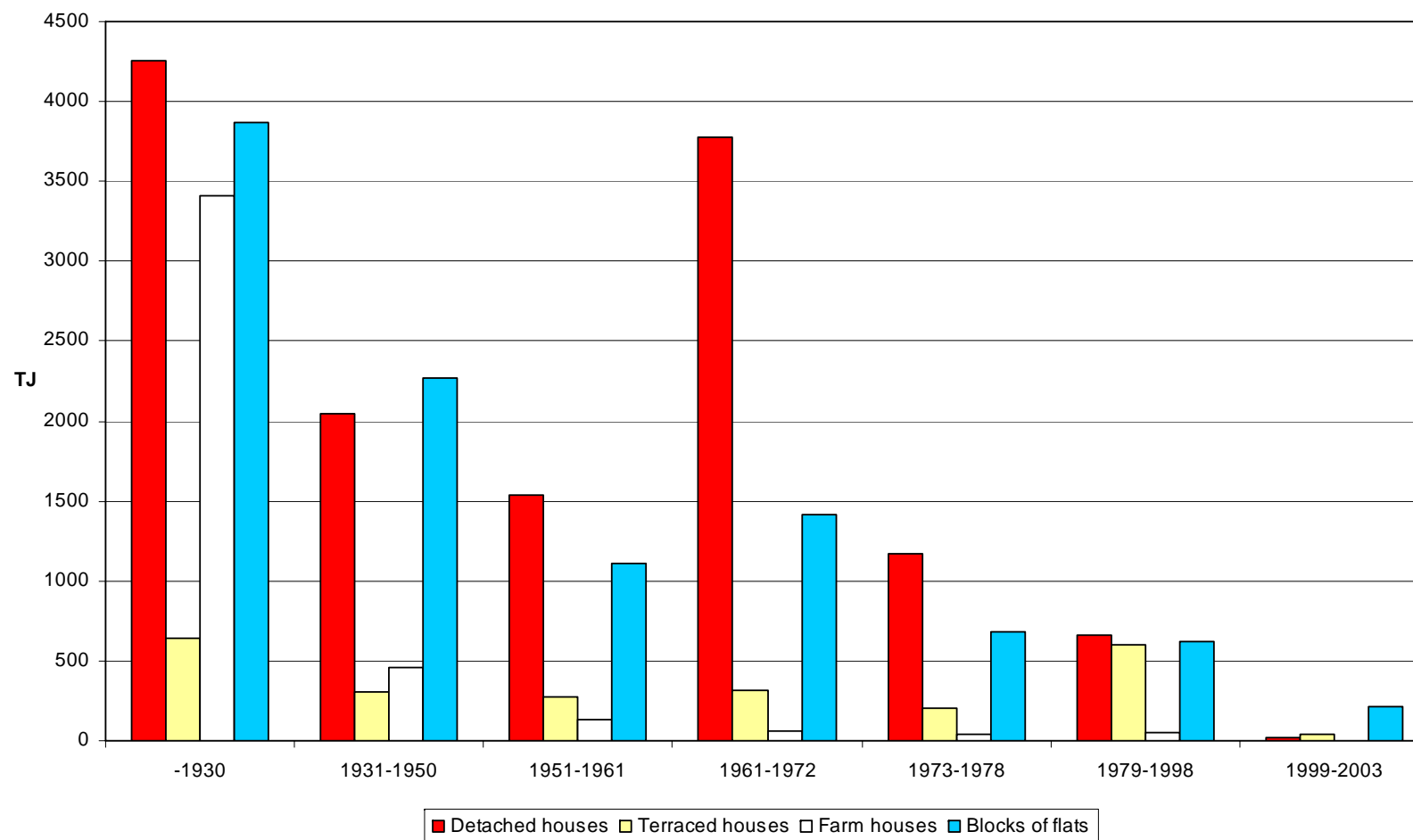
Energy saving potentials

- One-third of heating consumption in dwellings can be saved

- More than 30 PJ ($30 \cdot 10^{15}$ Joule) per year can be saved in DK corresponding to 830 millions litre oil

- It is a conservative estimate, but on the safe side!

Barriers

- Energy savings are not visible as e.g. new kitchen and bath

- Energy savings are not "sexy"

- Energy savings do not cause increased prestige

- Energy savings are expensive and troublesome – even sometimes demand craftsmen!

Measures to improve building stock knowledge

Pro and cons for possible measures to improve the building stock knowledge from information gathered in the new European labelling schemes.

Summarizing important elements to improve building knowledge gained by building certifications systems.

Measures to improve building stock knowledge

Central Authority

Standard forms

Computer forms

Authorised energy consultants

Use of handbook

Quality control

Public access

Use of calculation/metered values

Establish of database

Minimum set of information to be recorded

Building
- Build-up area and heated floor area, number of floors
- Construction year and year for major renovations
- Location of the building (climate zone)
- Recorded energy and water consumption (for comparison with calculations)

Thermal envelope
- Type, area and U-value for each opaque construction type
- Area, U-value and solar energy transmission factors for each transparent element incl. any shading objects
- Thermal bridges (length/size, transmission coefficient)
- Thermal storage capacity of the building

Systems
- Primary and secondary heating system (incl. efficiencies and location)
- Ventilation system including an estimate of the natural or mechanical ventilation rate
- Cooling system (incl. efficiencies and location)
- Heating and cooling distribution systems (pipe length, insulation level, location)
- Domestic hot water production (incl. location and distribution)

Default values
- Internal loads (persons, equipment, lighting, etc)
- Domestic hot water consumption (based on persons and/or floor area)