Intelligent Energy Europe

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

Introduction

Summary

Existing building stock knowledge from ENPER-EXIST

Existing building stock knowledge from international sources and other EU projects and from industry

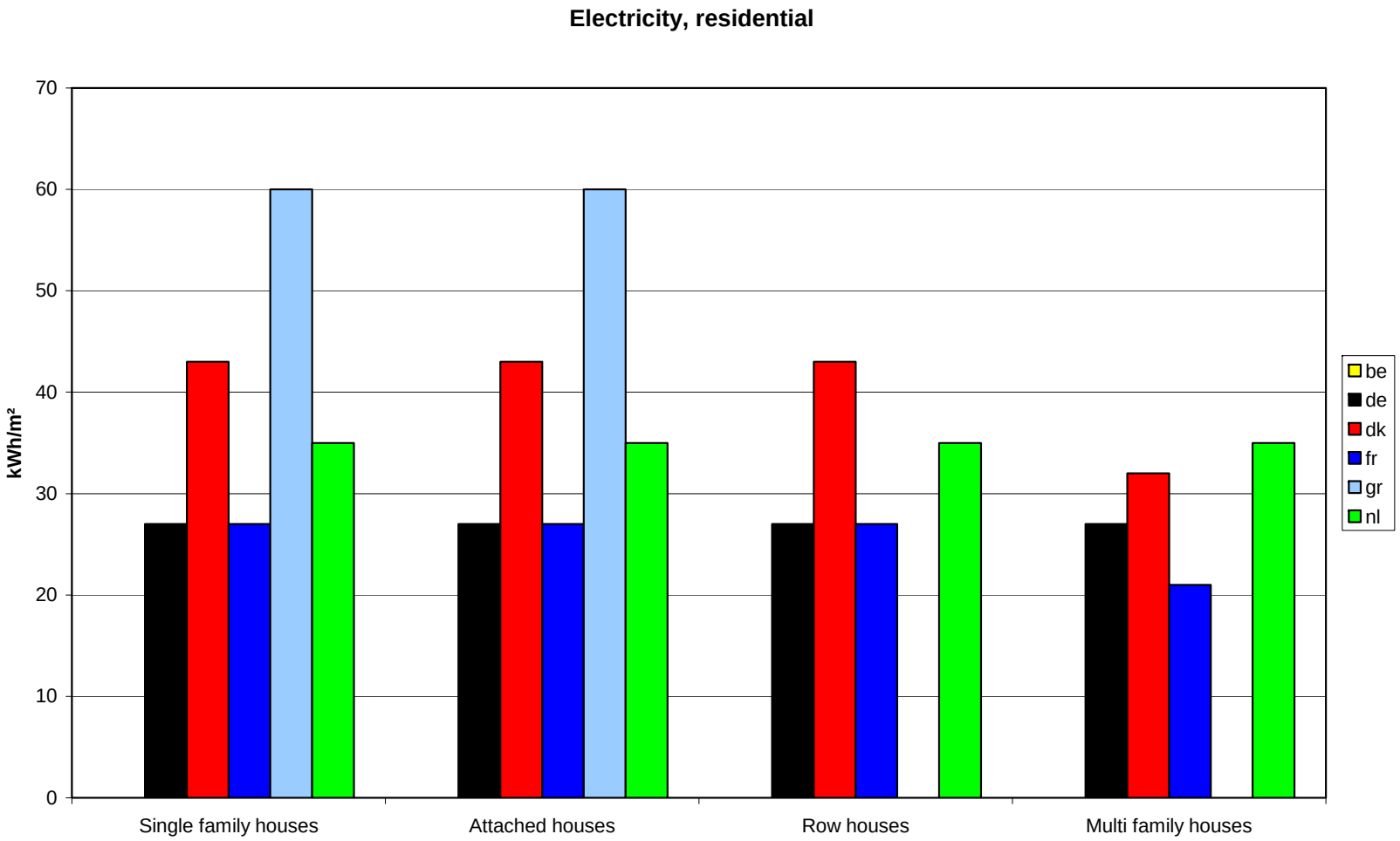
Available building stock information sources - wwwSources and reports

Knowledge based on actual labelling schemes

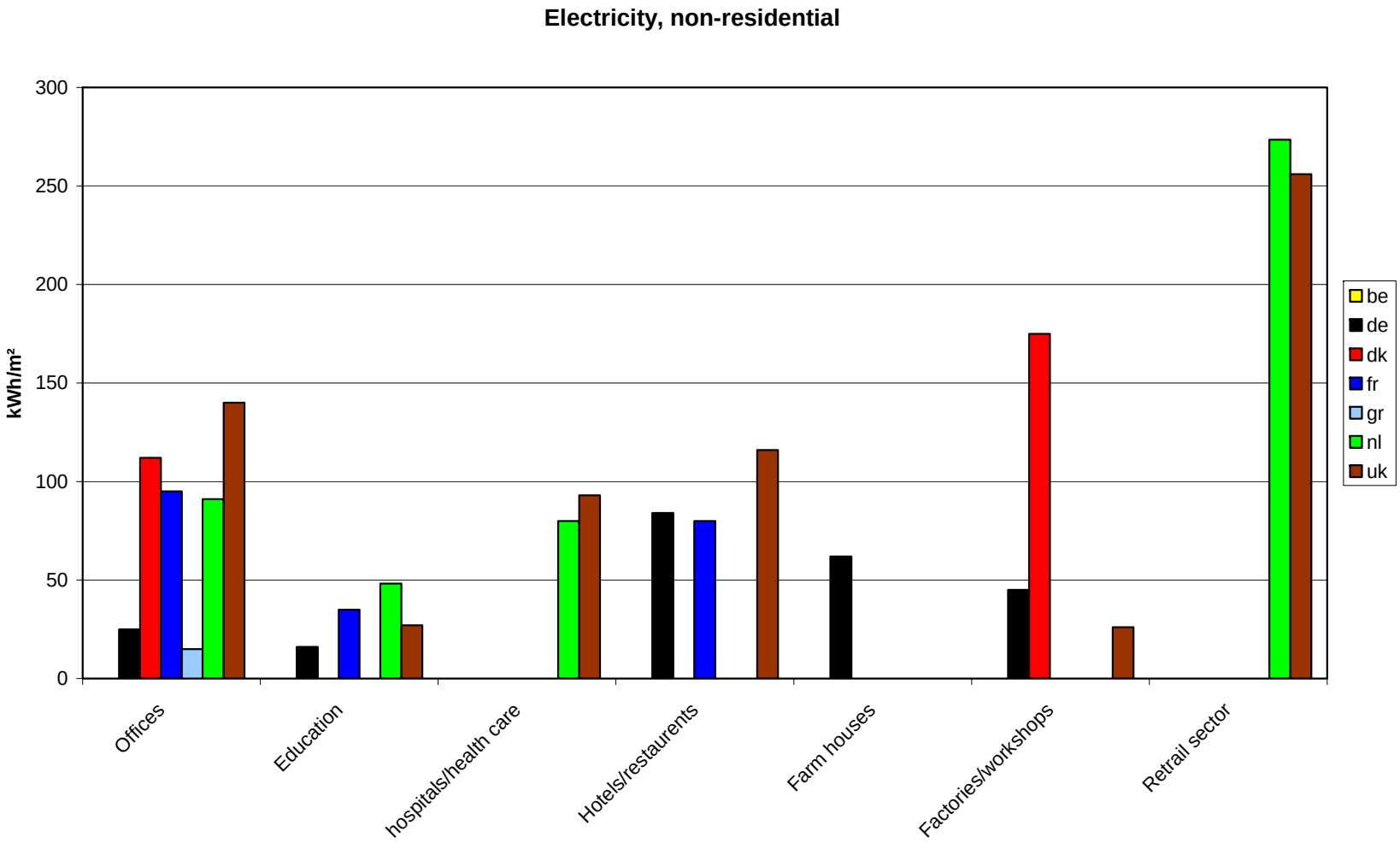
Improved knowledge based on new labelling schemes

Annexes

ENPER-EXIST


Electricity, residential
kWh/m²
70
60
50
40
30
20
10
0
Single family houses
Attached houses
Row houses
Multi family houses
be
de
dk
fr
gr
nl

ENPER-EXIST


Electricity, non-residential
kWh/m²
300
250
200
150
100
50
0
Offices
Education
hospitals/health care
Hotels/restaurents
Farm houses
Factories/workshops
Retrail sector
be
de
dk
fr
gr
nl
uk

Building knowledge based on the Danish energy certification scheme

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

- 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

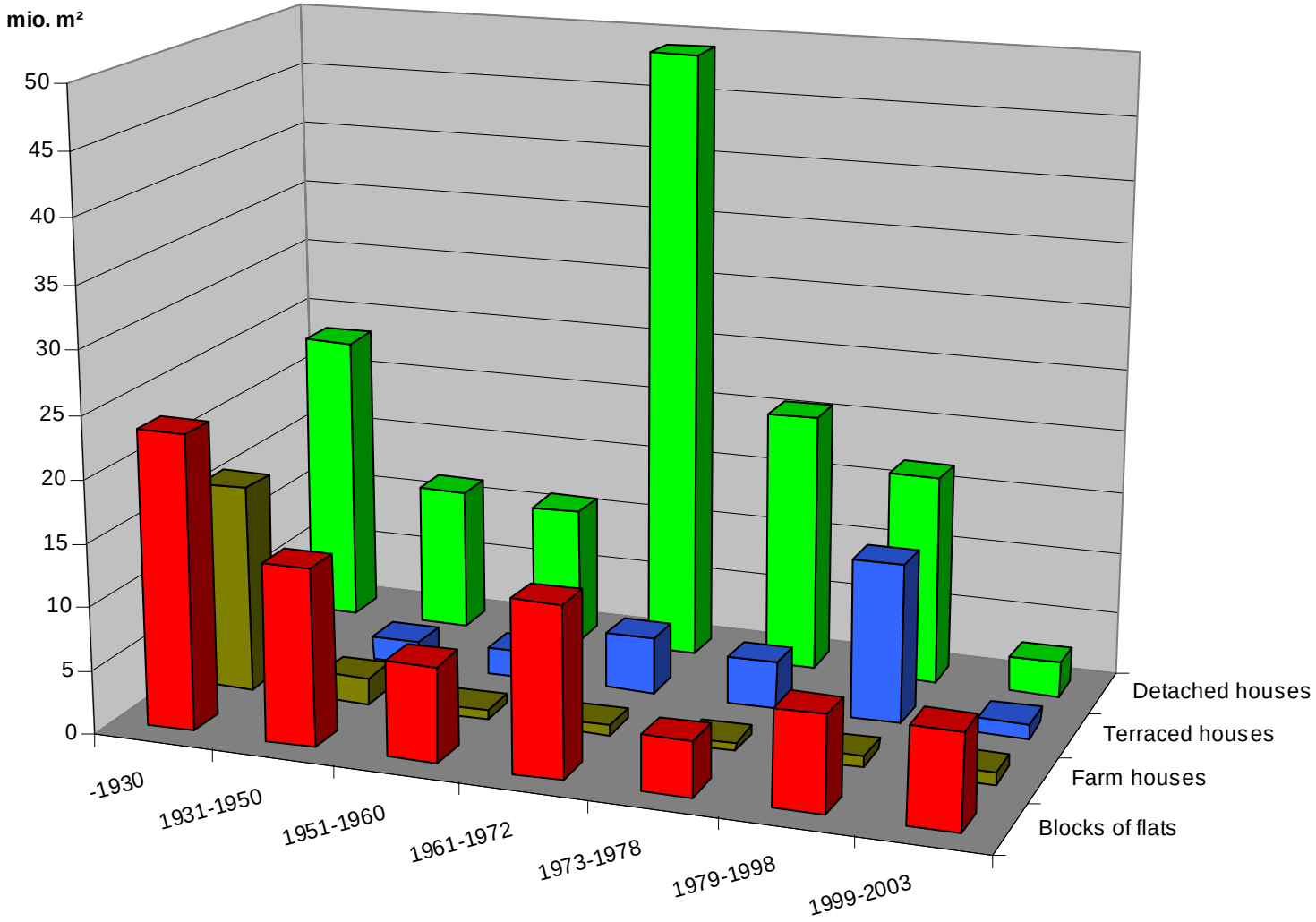
BBR register

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

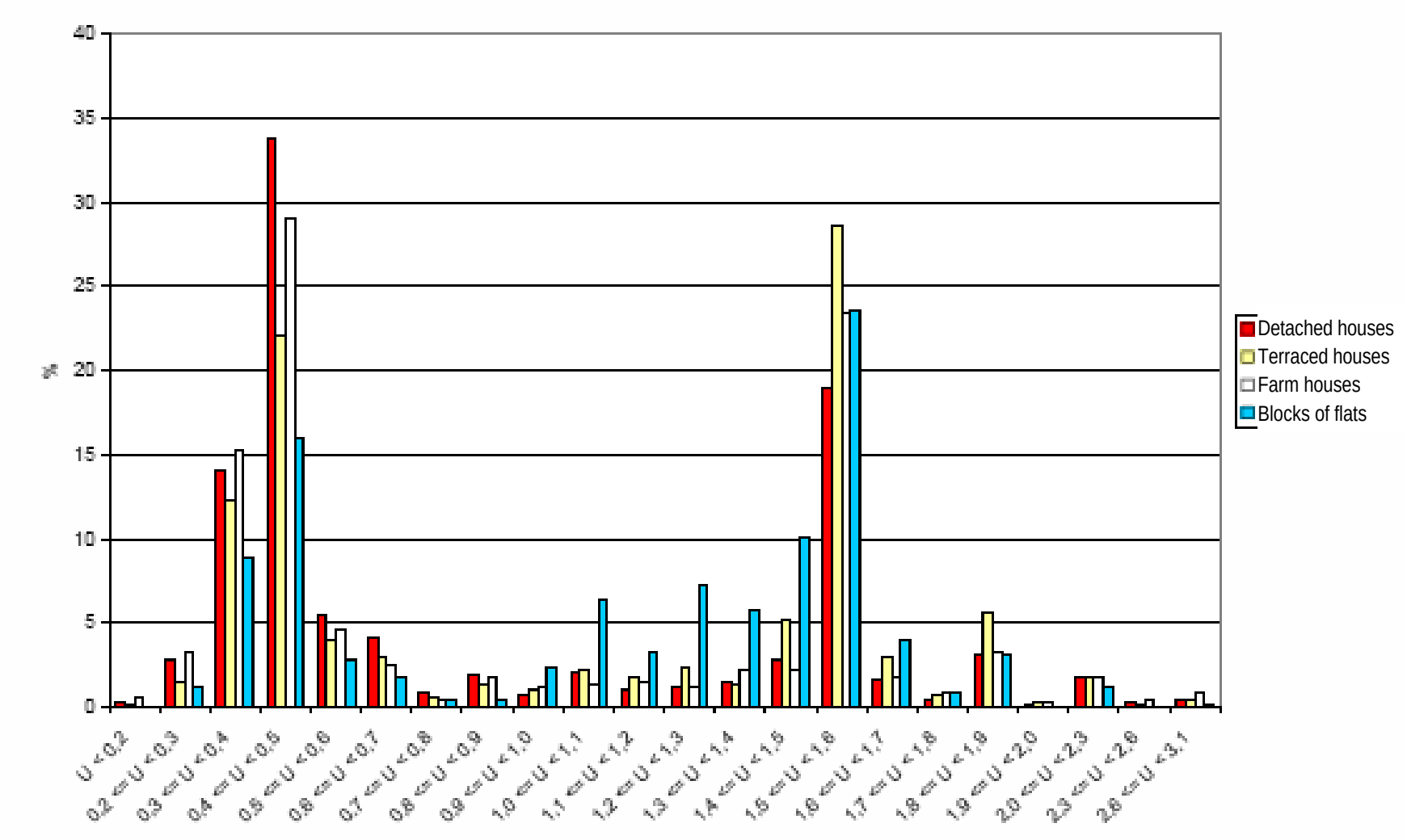
Labelling scheme (EM-scheme)

- 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

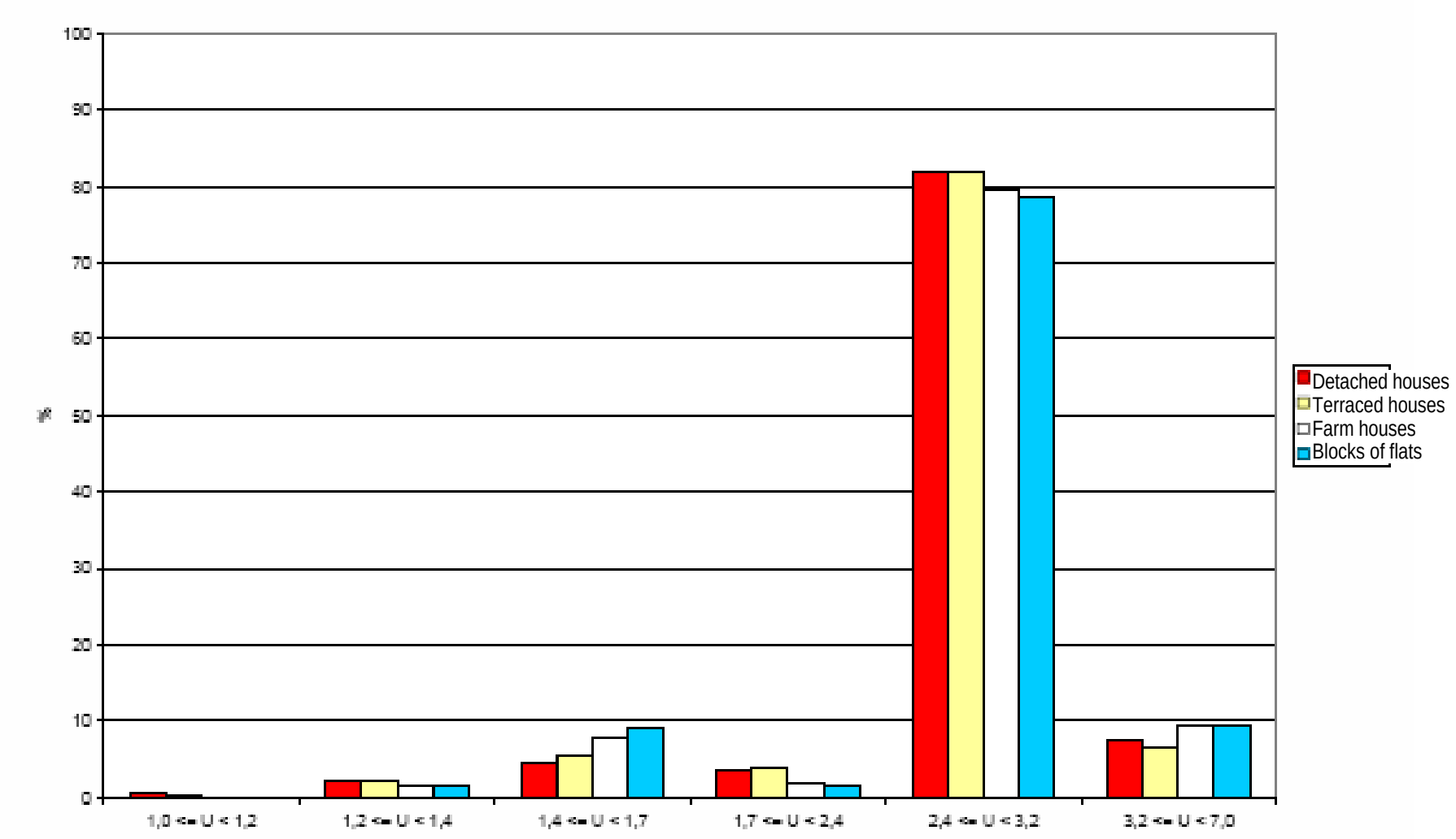
BBR: Area distribution



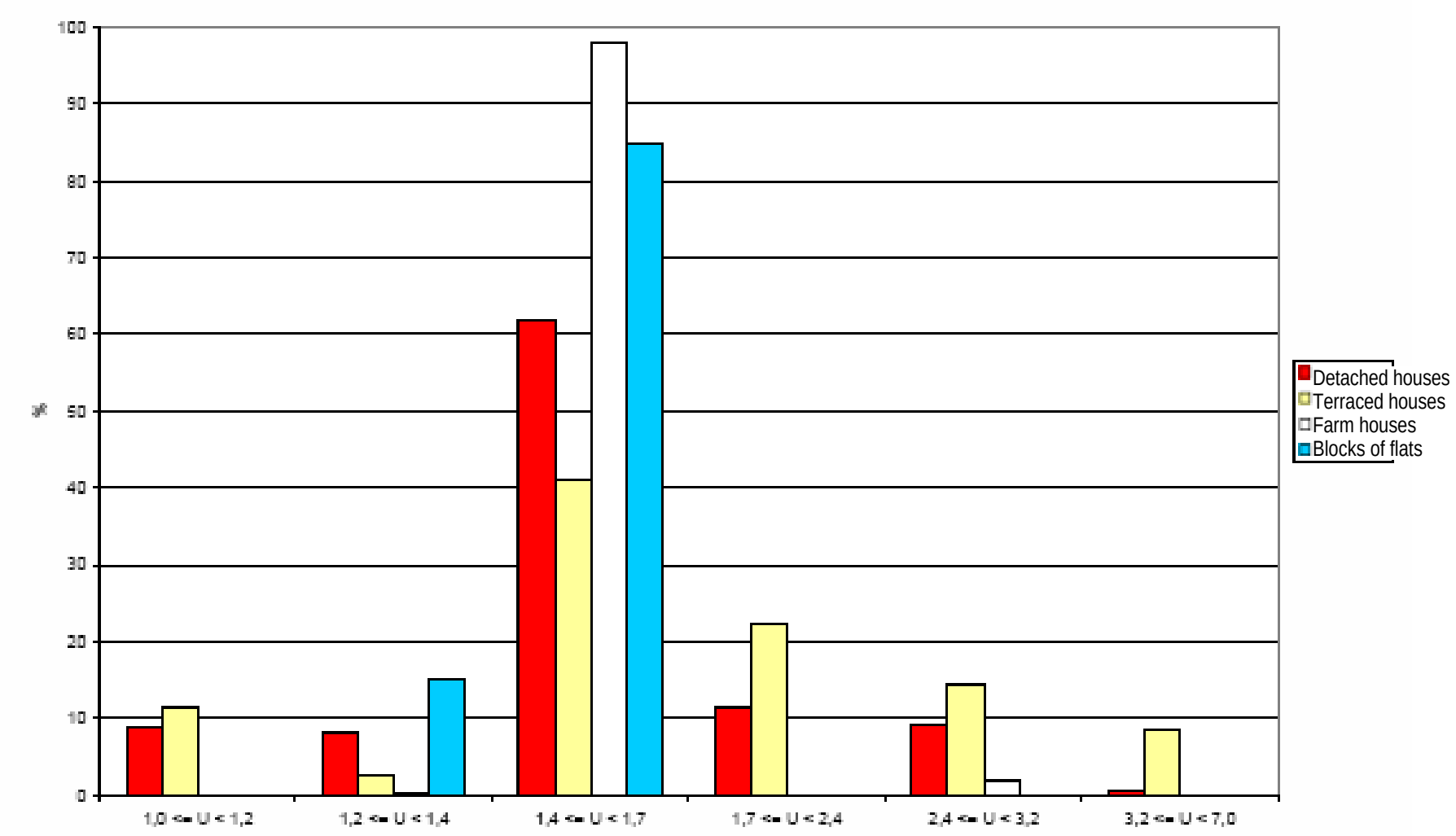
EM: Outer walls, before 1930



EM: Windows 1961-1972



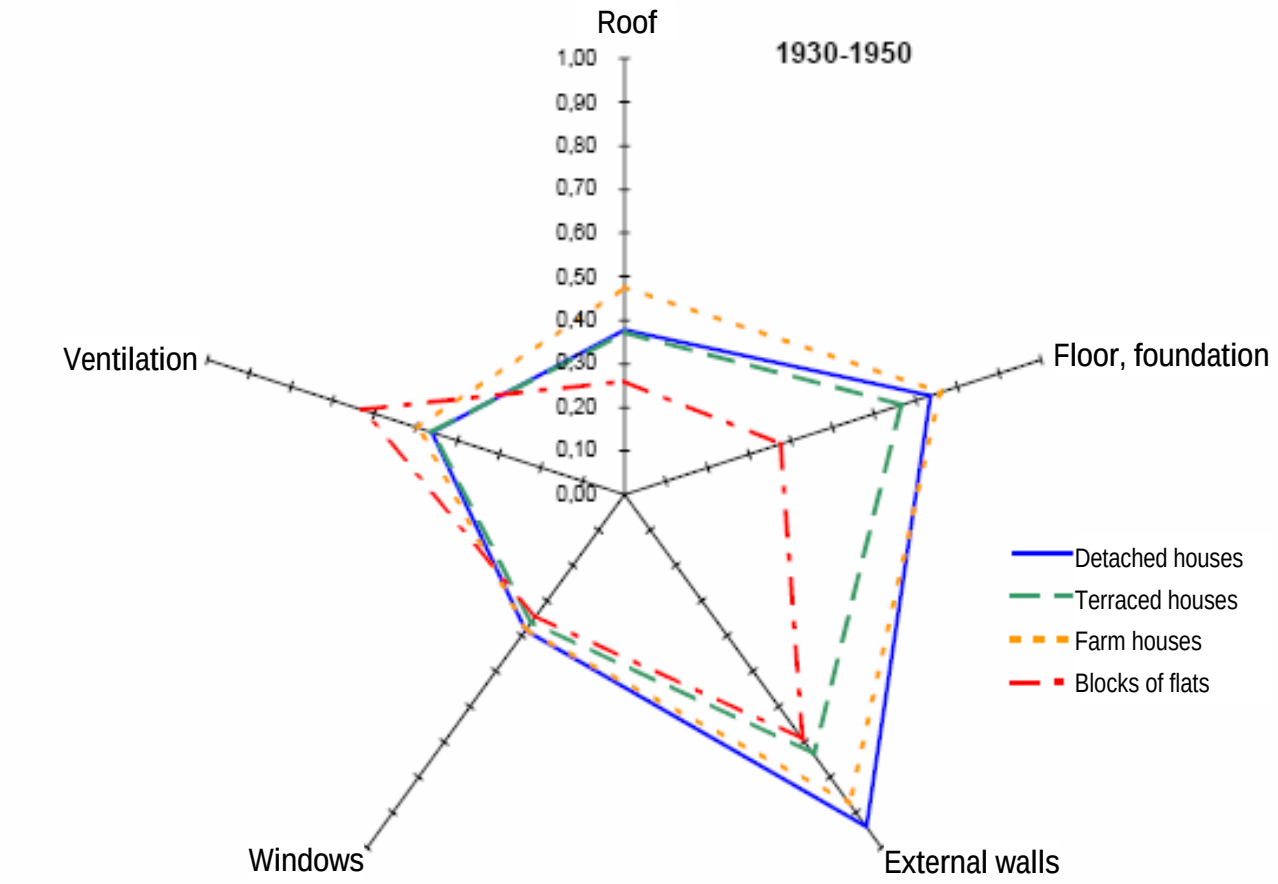
EM: Windows 1998-2003



Building models

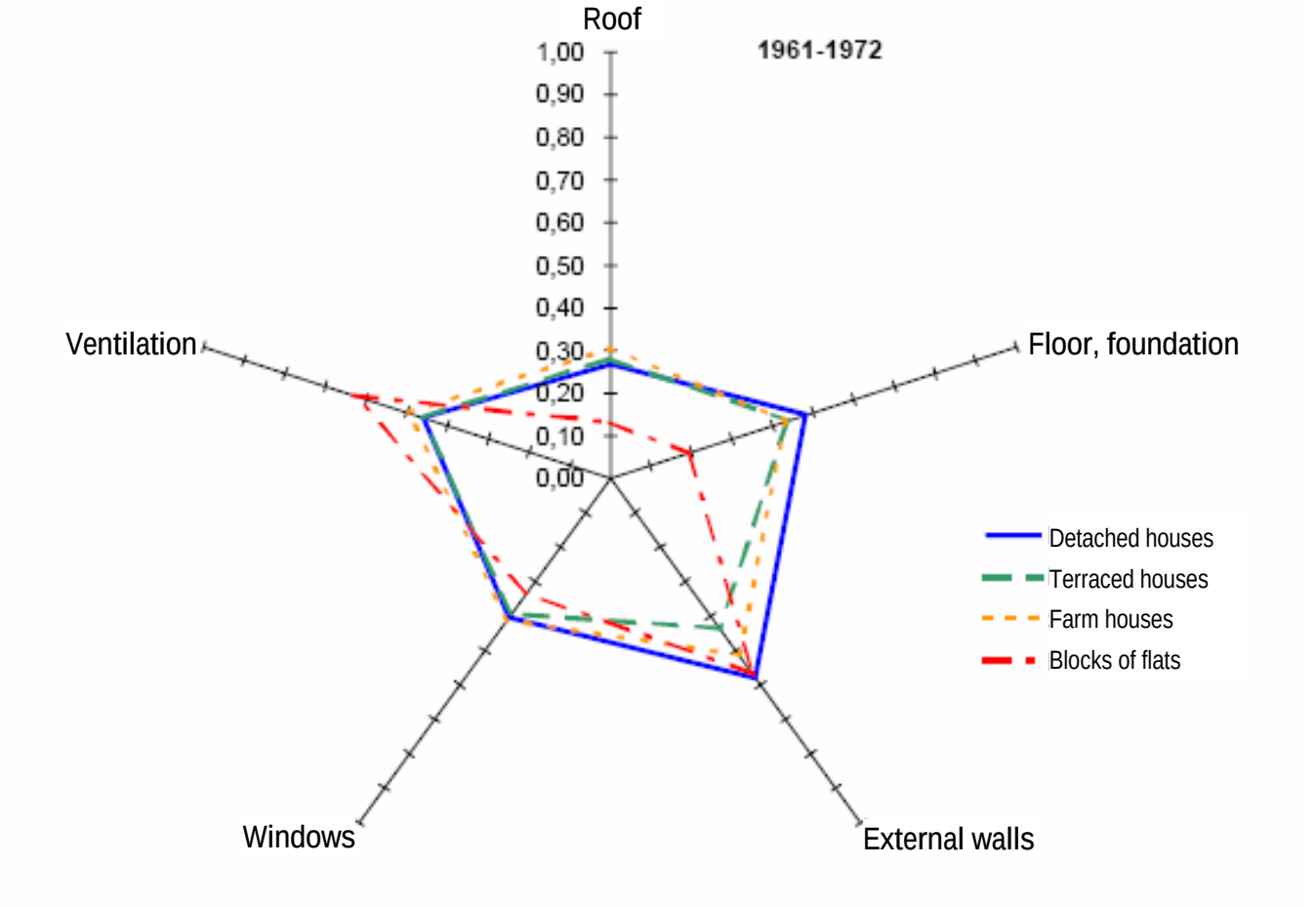
- Model for average buildings
- Estimation of heat losses through the thermal envelope by use of the P-faktor method
  - The p-factor expresses the heat loss through the building construction in W/m^2K.
- The data from the labelling is used to create an overview over the P-factors

1931 - 1950

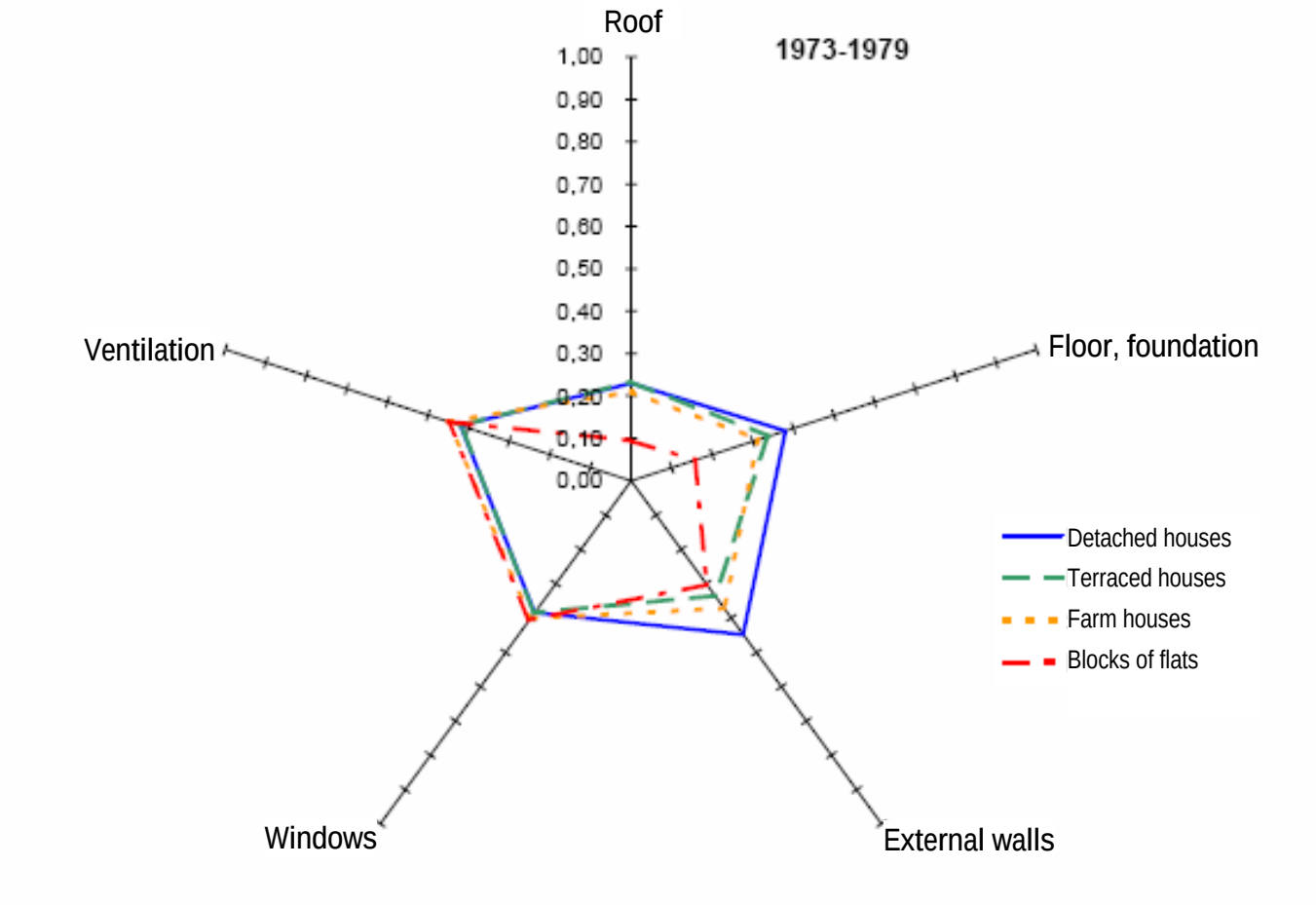


P-factor for dwellings 1931-50. External walls cause the largest heat loss pr m^2 heated floor.

1961 – 1972


Roof
1961-1972
1,00
0,90
0,80
0,70
0,60
0,50
0,40
0,30
0,20
0,10
0,00
Ventilation
Floor, foundation
Windows
External walls
Detached houses
Terraced houses
Farm houses
Blocks of flats

1973 - 1979


Roof
1973-1979
1,00
0,90
0,80
0,70
0,60
0,50
0,40
0,30
0,20
0,10
0,00
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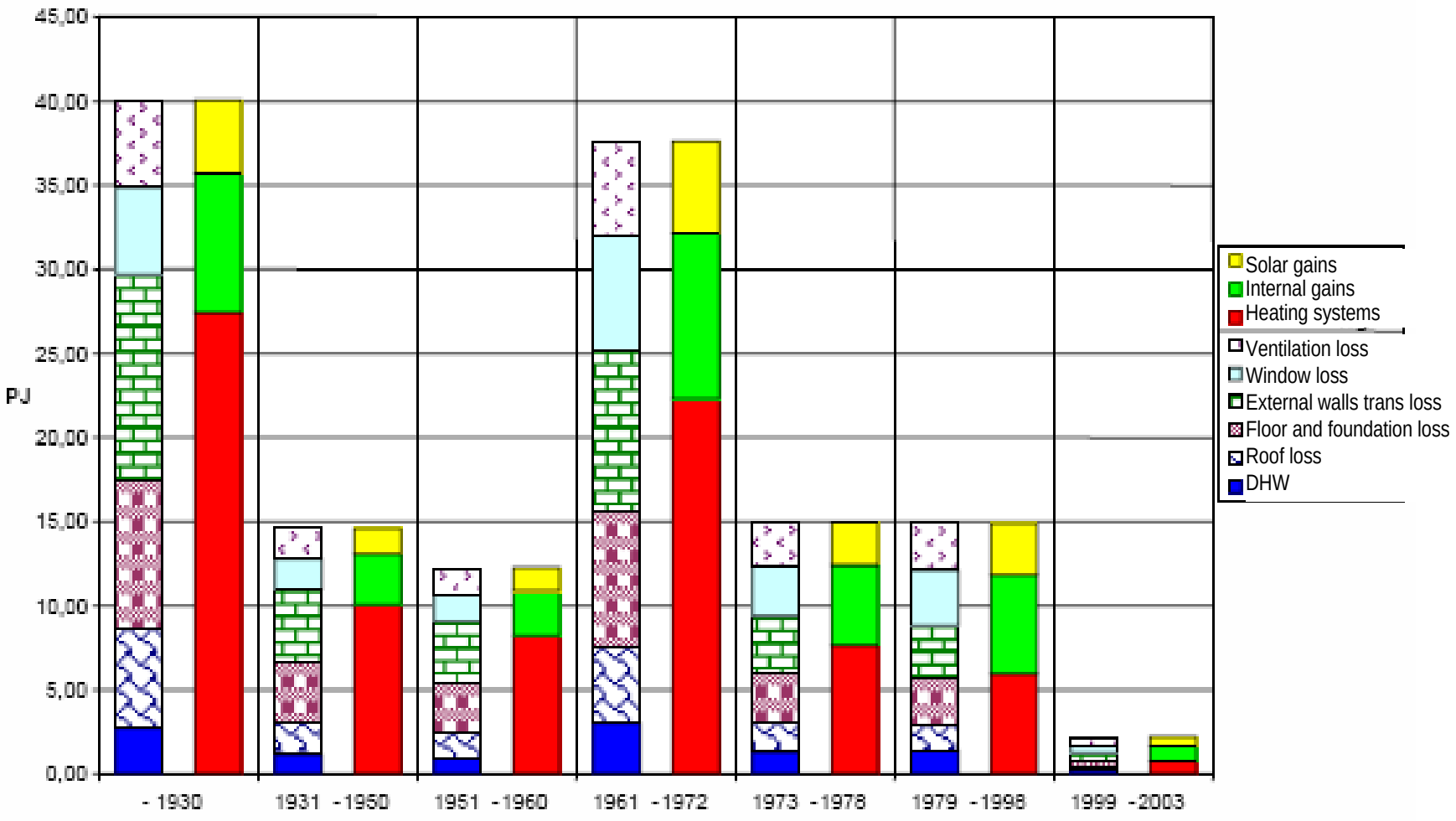
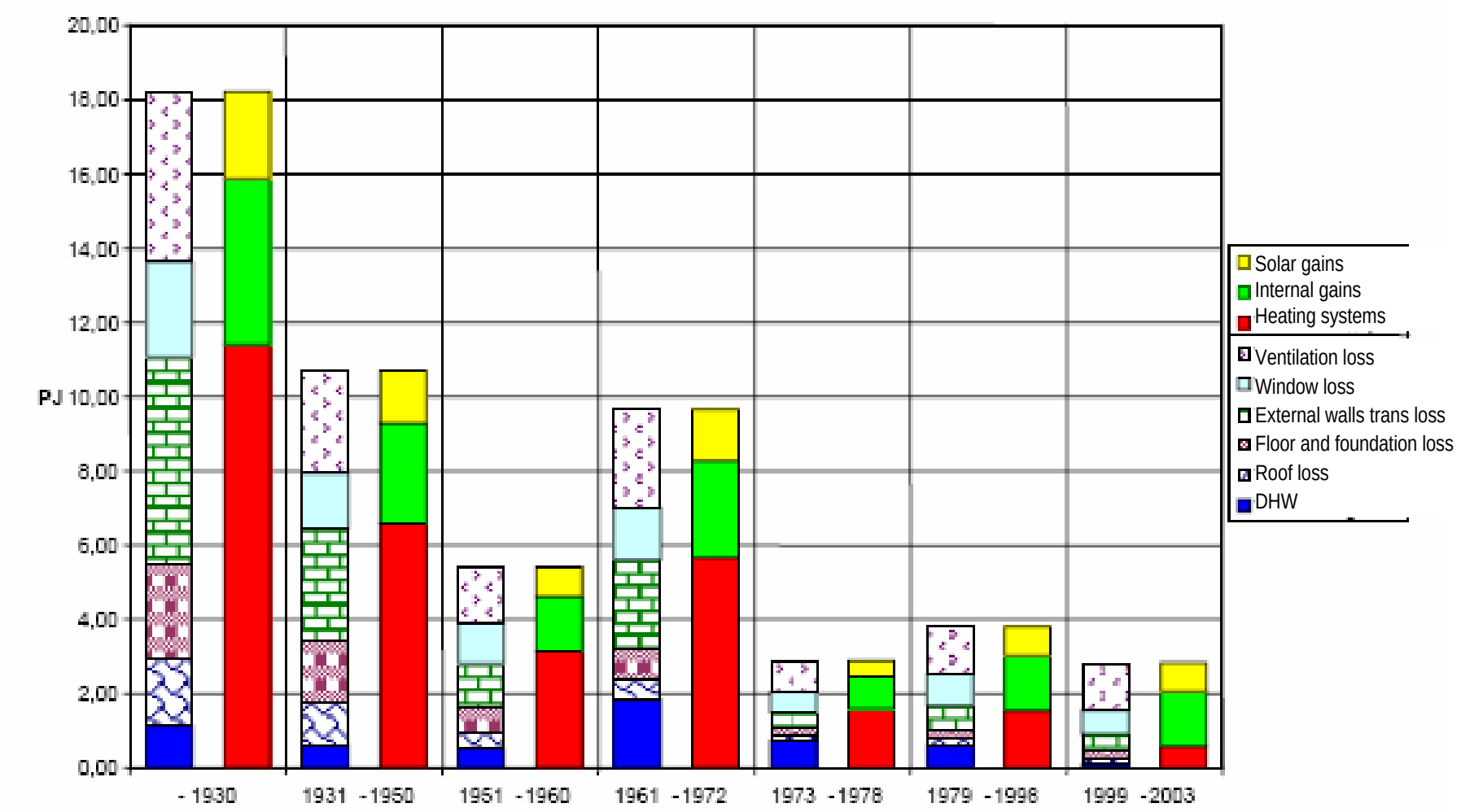
Energy balance for single family houses



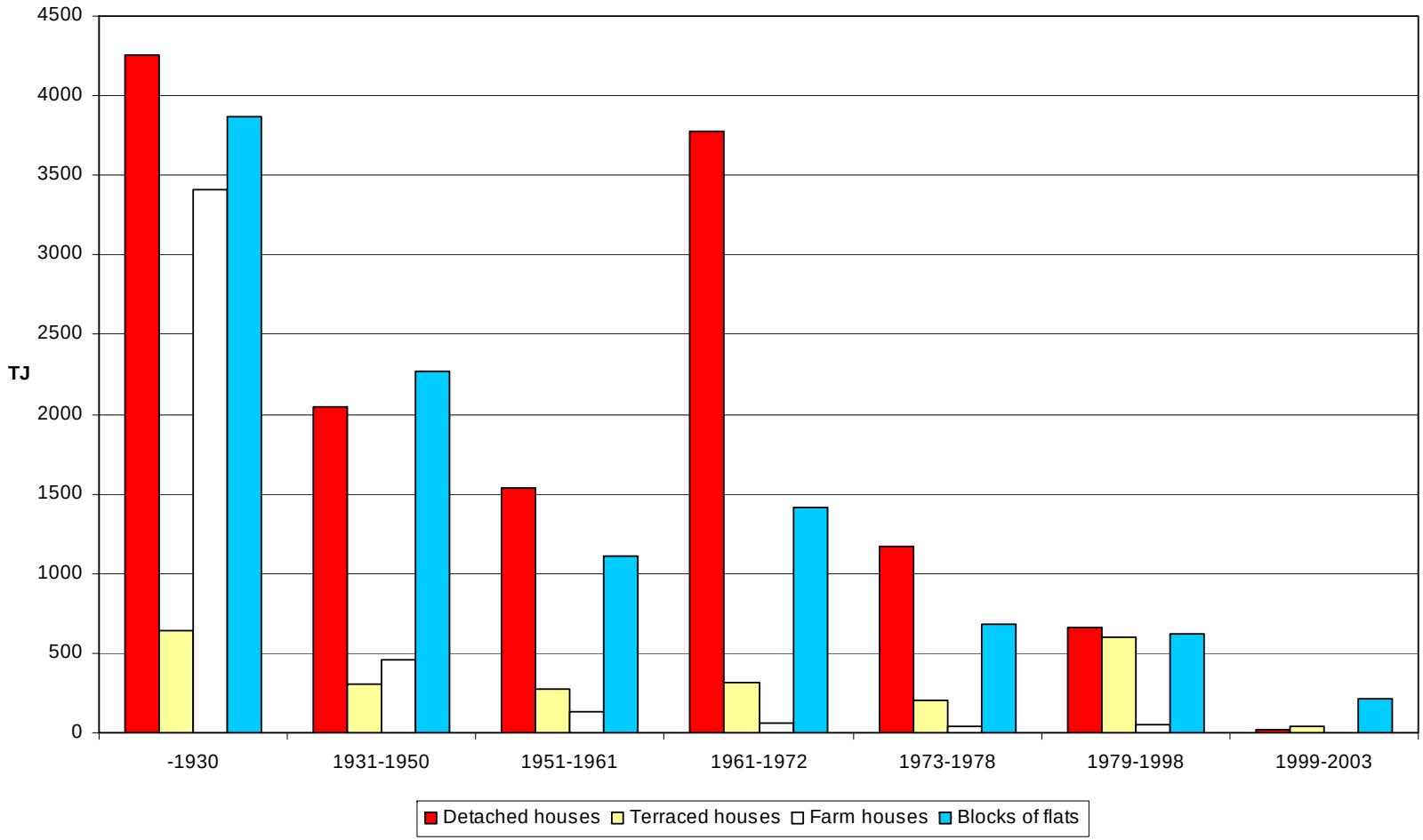
Energy balance for blocks of flats



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

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 certification schemes.

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

Important elements

Central Authority

Standard forms

Computer forms

Authorised energy consultants

Use of handbook

Quality control

Public access

Approaches to data collection

Use of calculation and metered values

Establishment of databases

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)