Twinning « Improvement of the Energy Efficiency in Turkey »

SECTOR BUILDING WORKSHOP
Thermal Rehabilitation of Existing Buildings and Energy Building Code

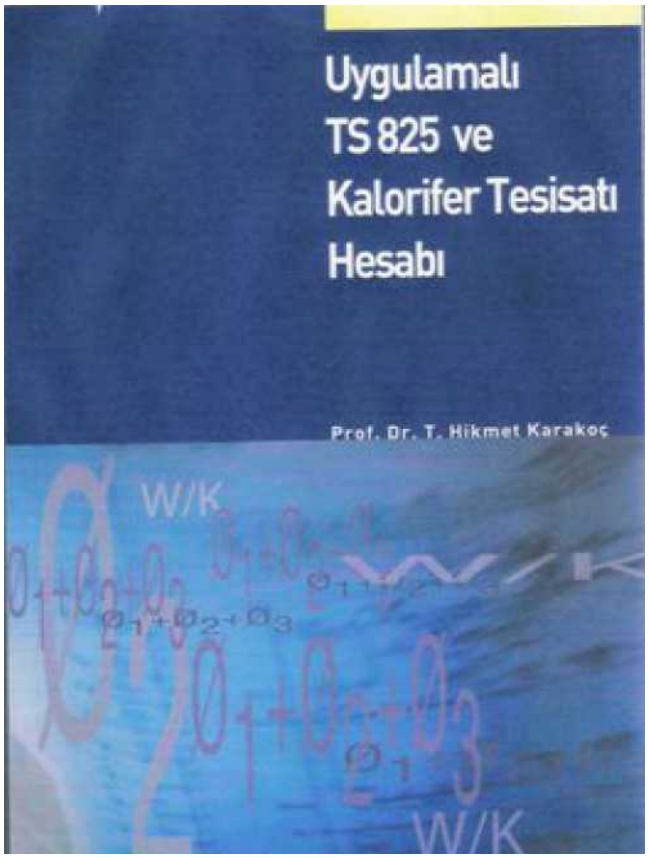
Residential energy efficiency overview in Ankara:
Characteristics of dwellings, energy consumption and where to search for energy saving?

By Adel Mourtada

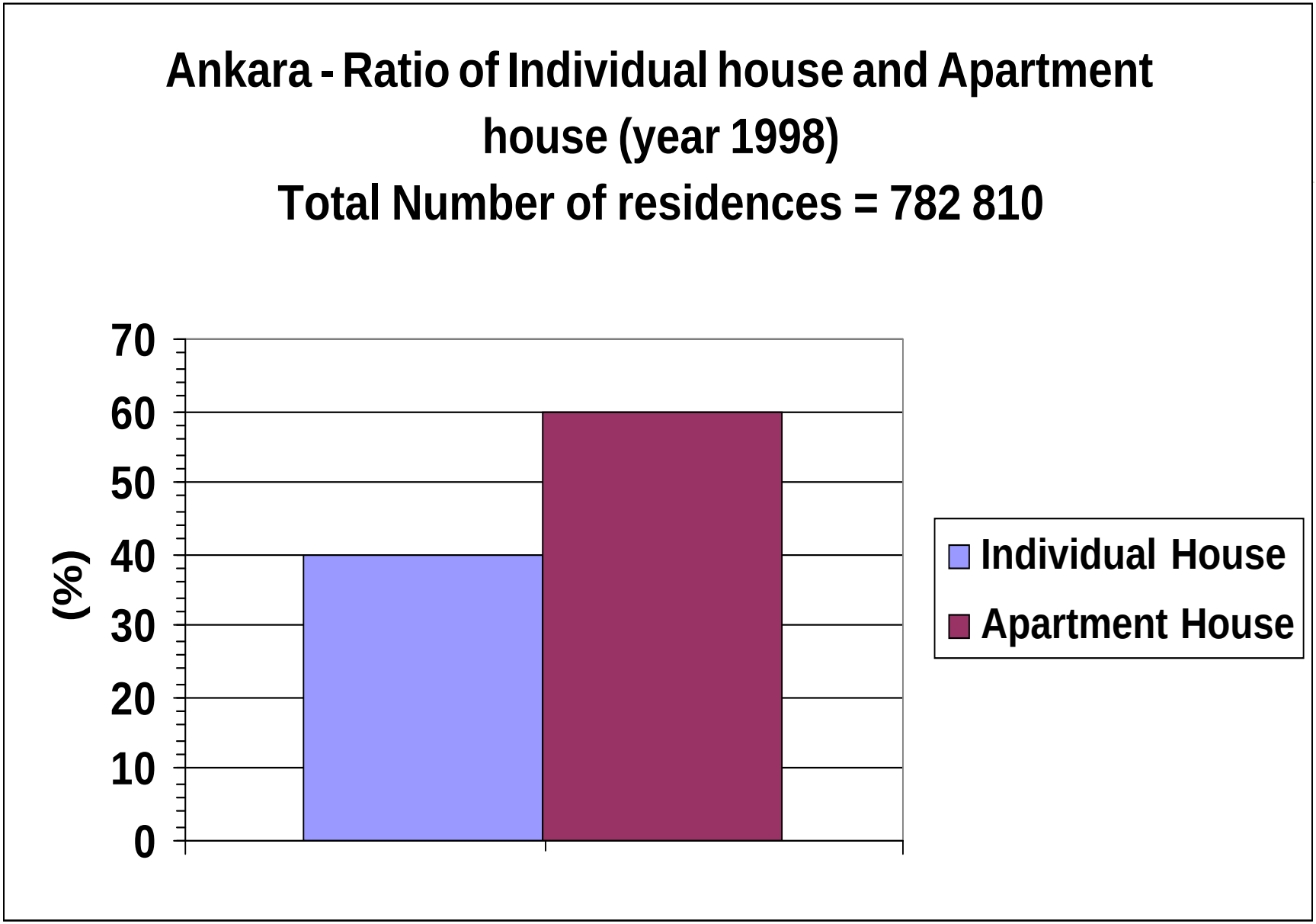
Energy Efficiency Building Expert

Characteristics of Dwellings in Ankara

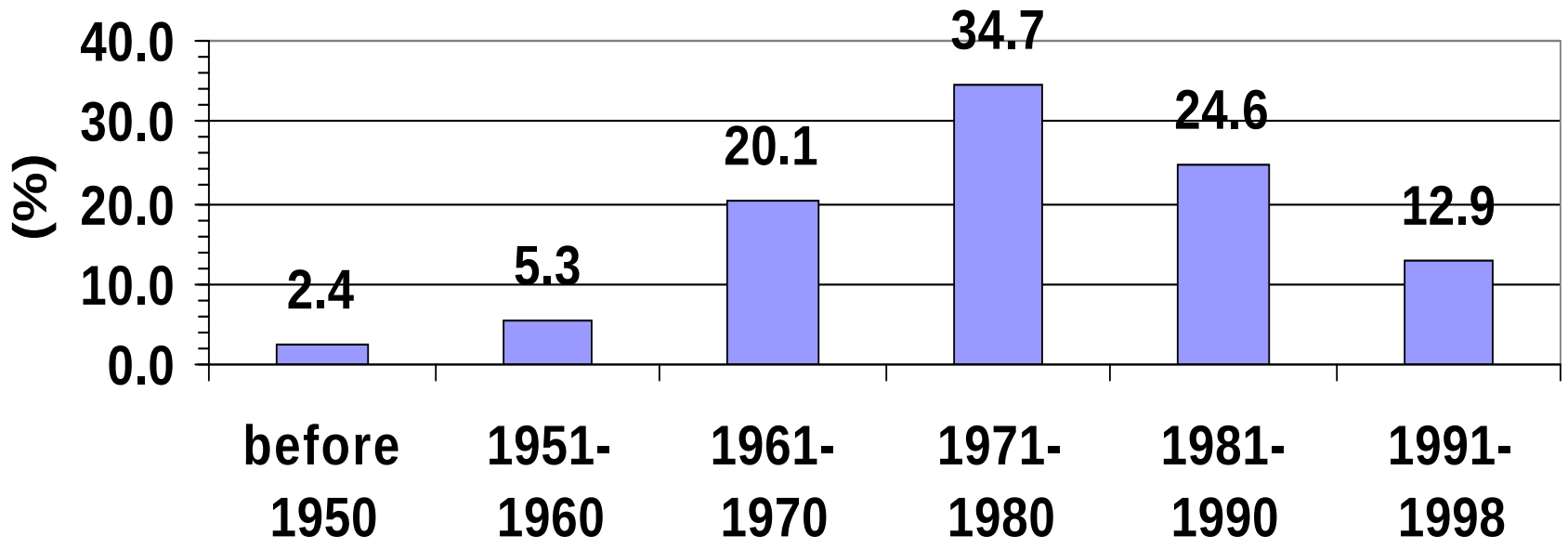
State of play is residences built before The mandatory application of the TS 825 (year 2000)



- The Thermal Standard TS 825 regulates the design and selection of the building envelope (insulation + double glazing).
- It is mandatory application started in June 2000.
- We assume that residences built since 2000 are insulated.


Ankara - Ratio of Individual house and Apartment house (year 1998)
Total Number of residences = 782 810
70
60
50
40
30
20
10
0
(%)
Individual House
Apartment House

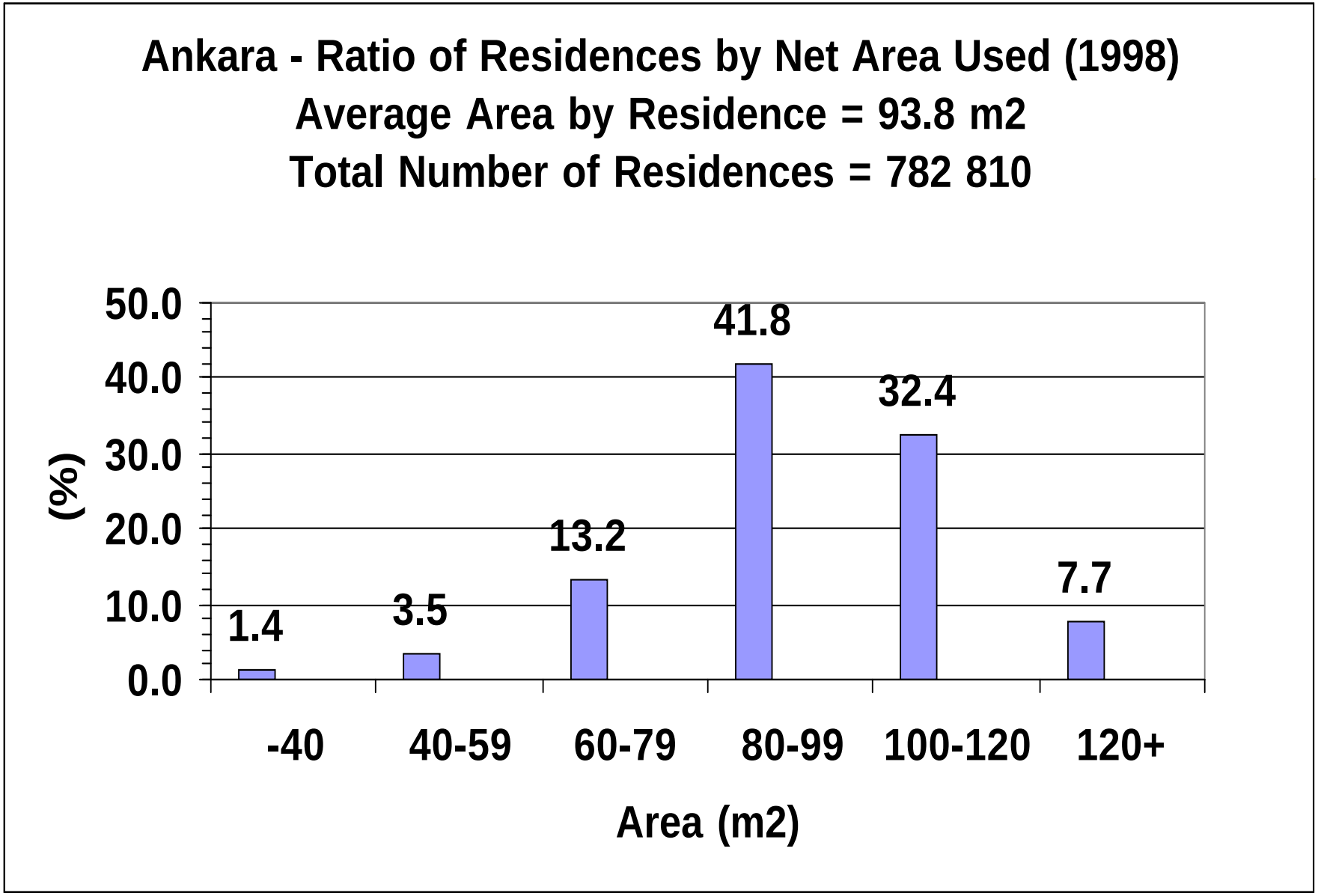
Ankara: Ratio of Residences by Date of Construction Building (1998)

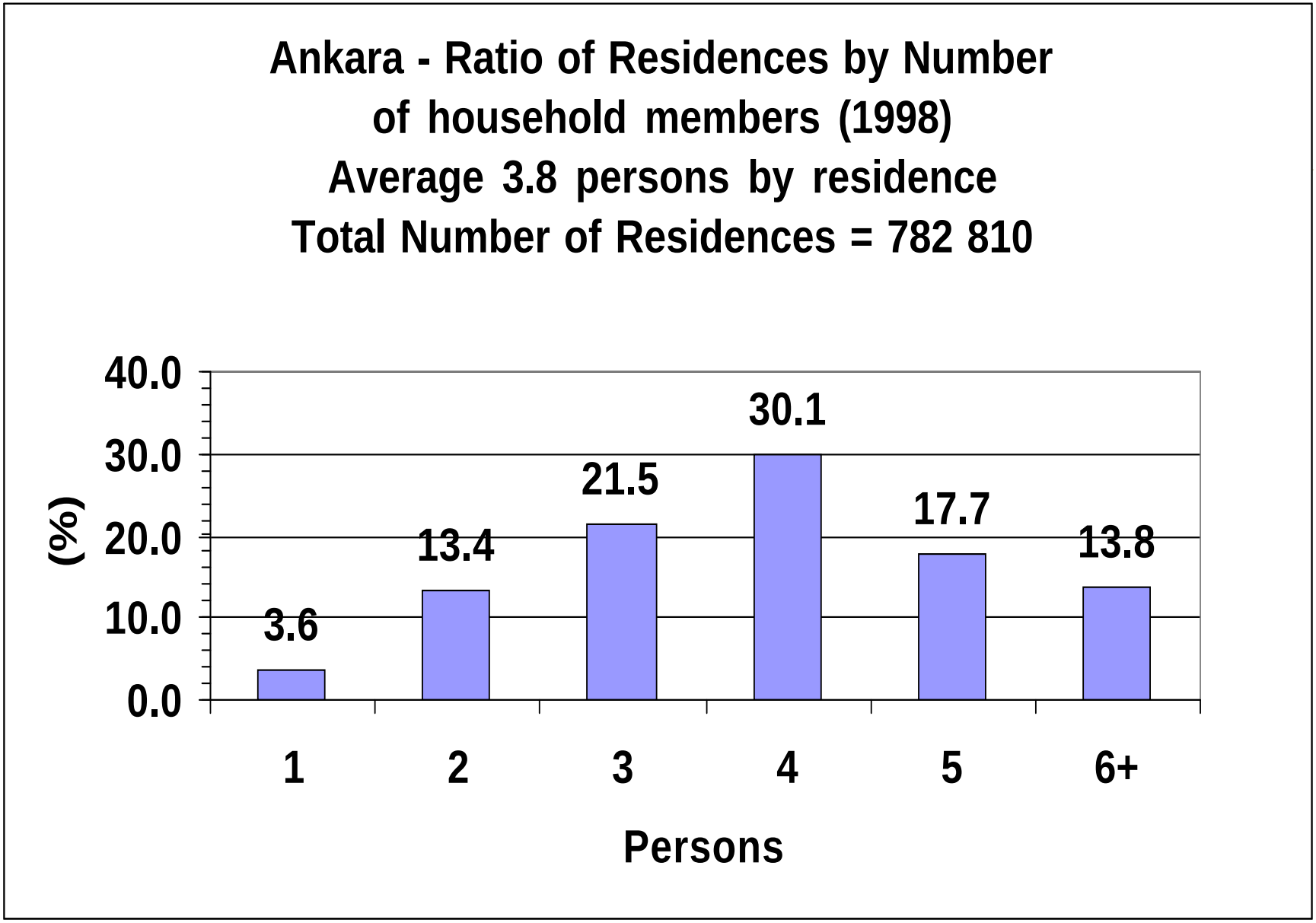


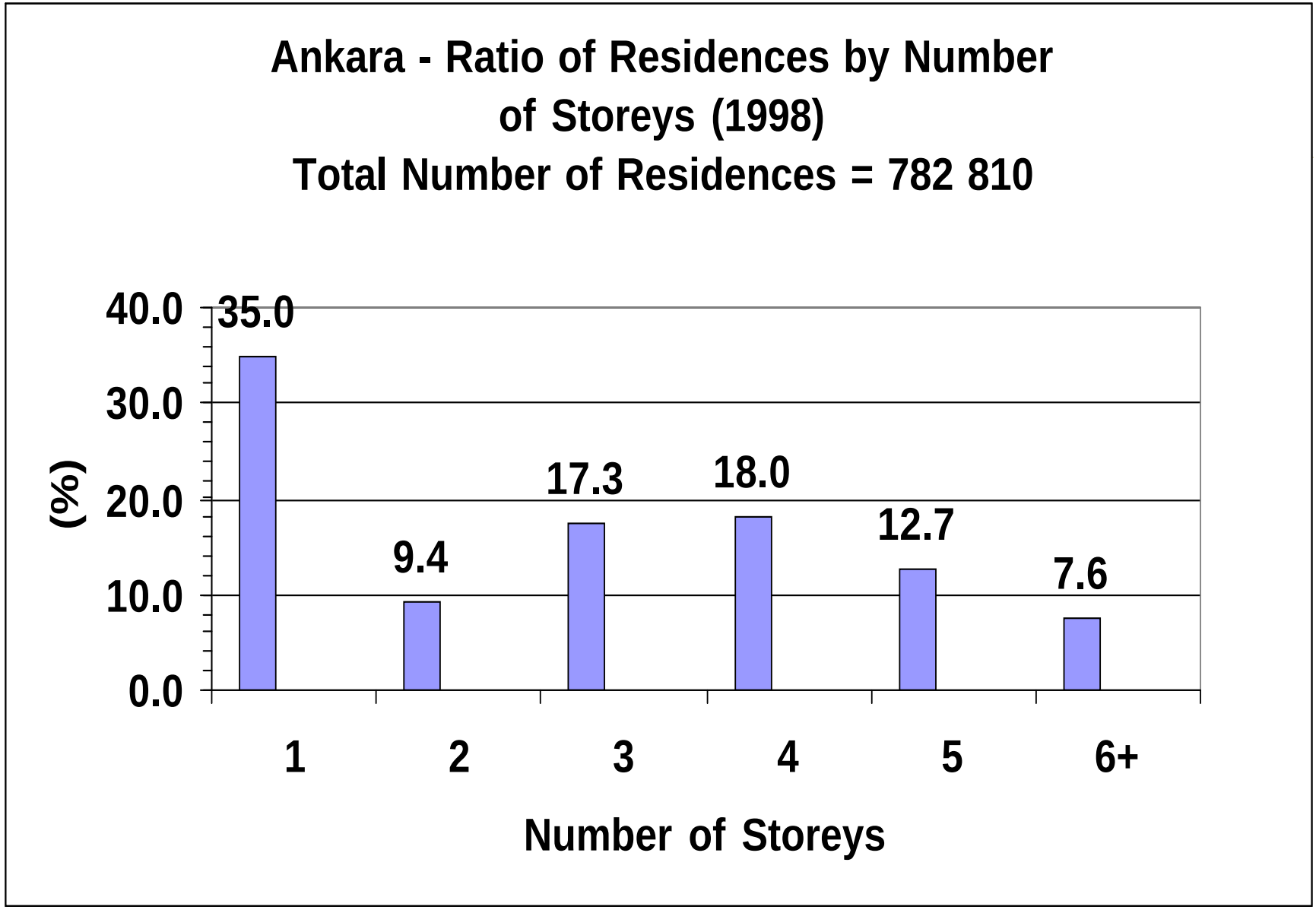
(Source : Turkish Statistical Institute)

New ad old residential buildings

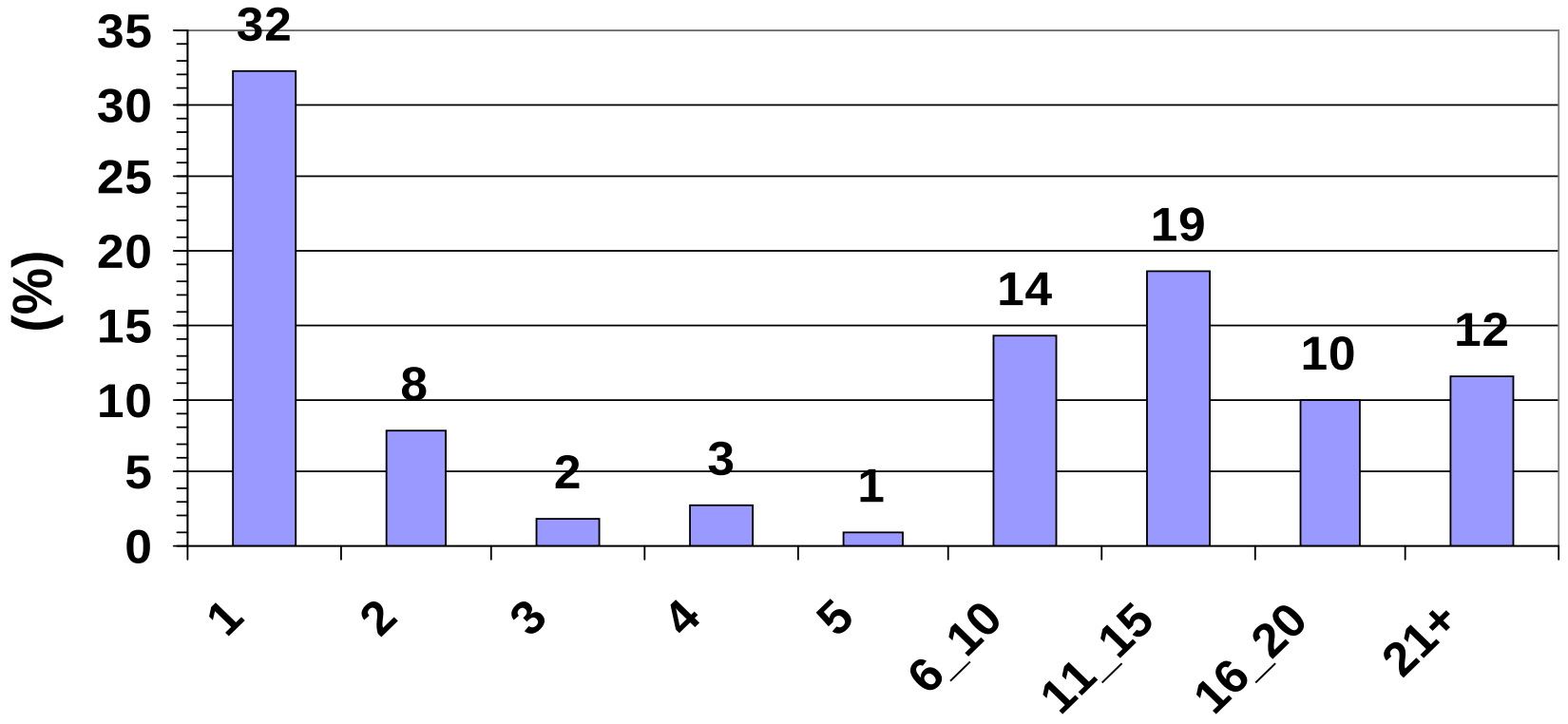
Common residential buildings in Ankara


Ankara - Ratio of Residences by Net Area Used (1998)
Average Area by Residence = 93.8 m2
Total Number of Residences = 782 810
50.0
40.0
30.0
20.0
10.0
0.0
(%)
1.4
3.5
13.2
41.8
32.4
7.7
-40
40-59
60-79
80-99
100-120
120+
Area (m2)


Ankara - Ratio of Residences by Number of household members (1998)
Average 3.8 persons by residence
Total Number of Residences = 782 810
40.0
30.0
20.0
10.0
0.0
(%)
3.6
13.4
21.5
30.1
17.7
13.8
1
2
3
4
5
6+
Persons

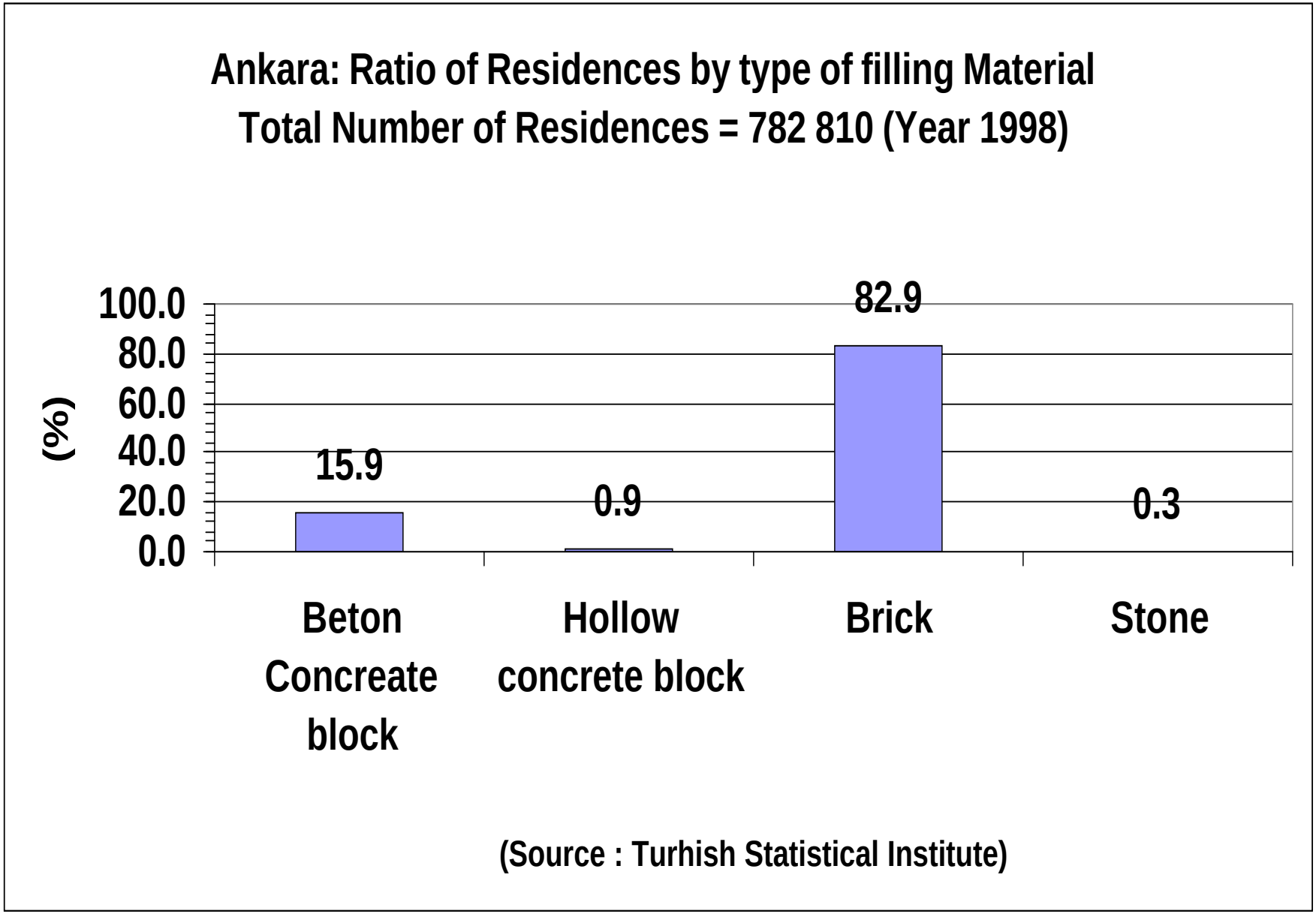

Ankara - Ratio of Residences by Number of Storeys (1998)
Total Number of Residences = 782 810
40.0
30.0
20.0
10.0
0.0
(%)
35.0
9.4
17.3
18.0
12.7
7.6
1
2
3
4
5
6+
Number of Storeys

Ankara - Ratio of Residences by Number of flats in the Building (1998)



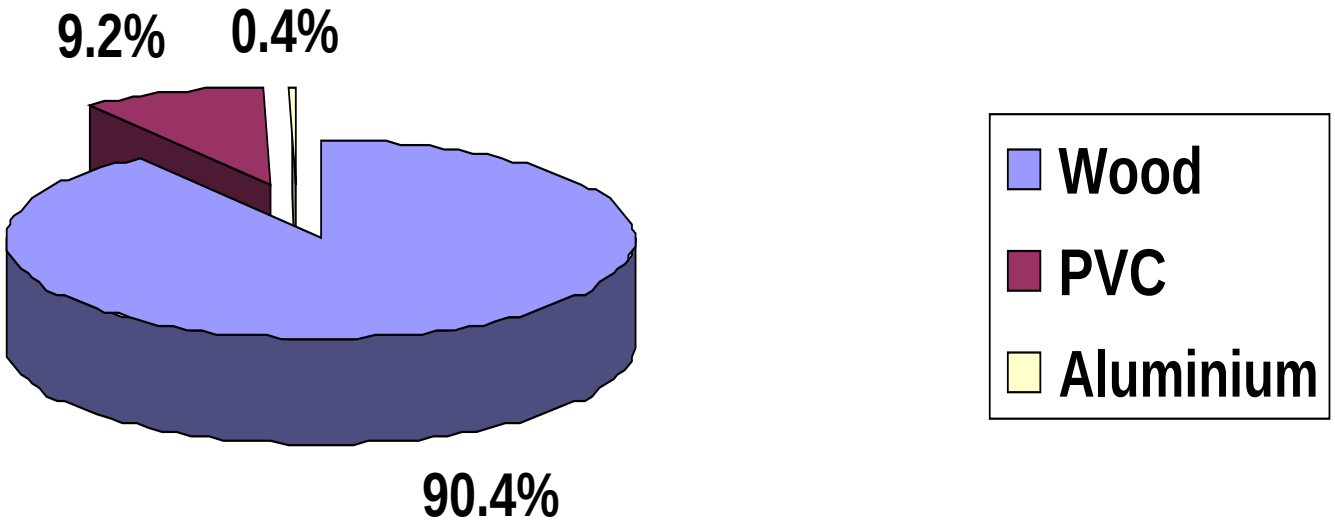
(Source : Turrkish Statistical Institute)

High Number of flats in new buildings

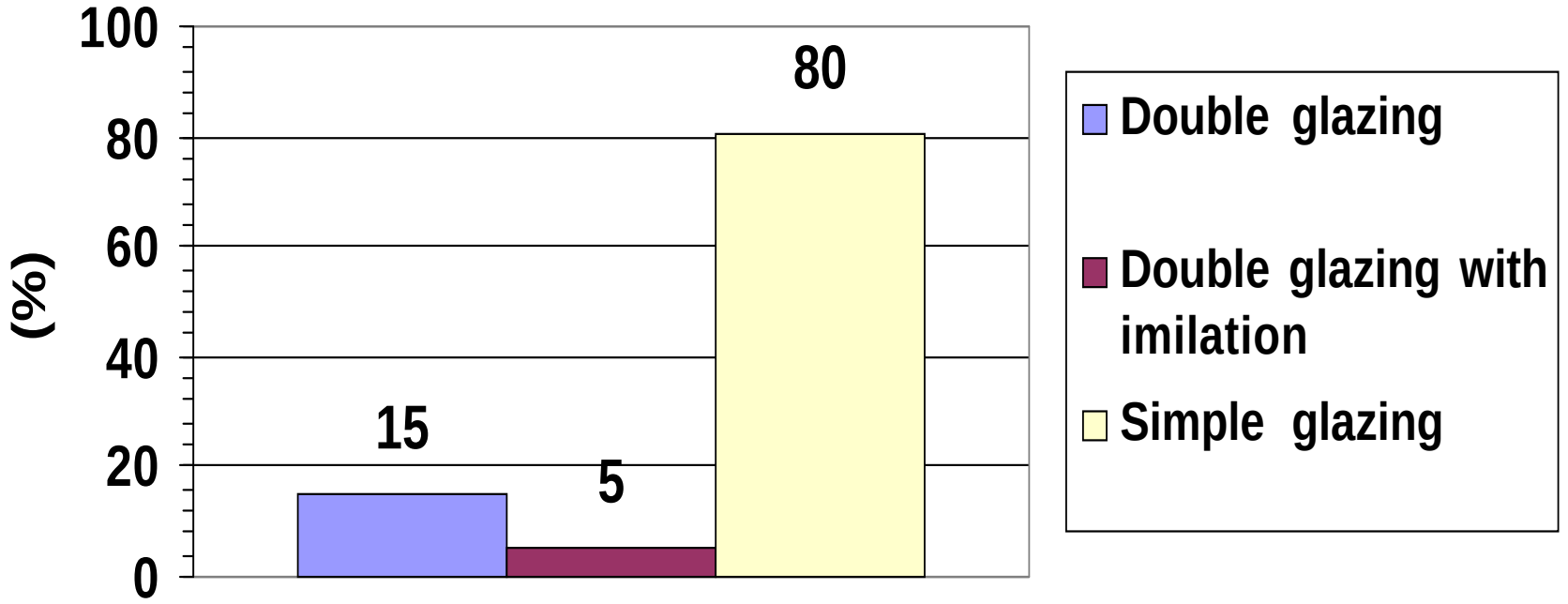

Ankara: Ratio of Residences by type of filling Material
Total Number of Residences = 782 810 (Year 1998)
100.0
80.0
60.0
40.0
20.0
0.0
(%)
15.9
0.9
82.9
0.3
Beton Concreate block
Hollow concrete block
Brick
Stone
(Source : Turhish Statistical Institute)

Type of filling material

Ankara - Ratio of Residences by type of window frames (year 1998)
Total Number of Residences 782 810



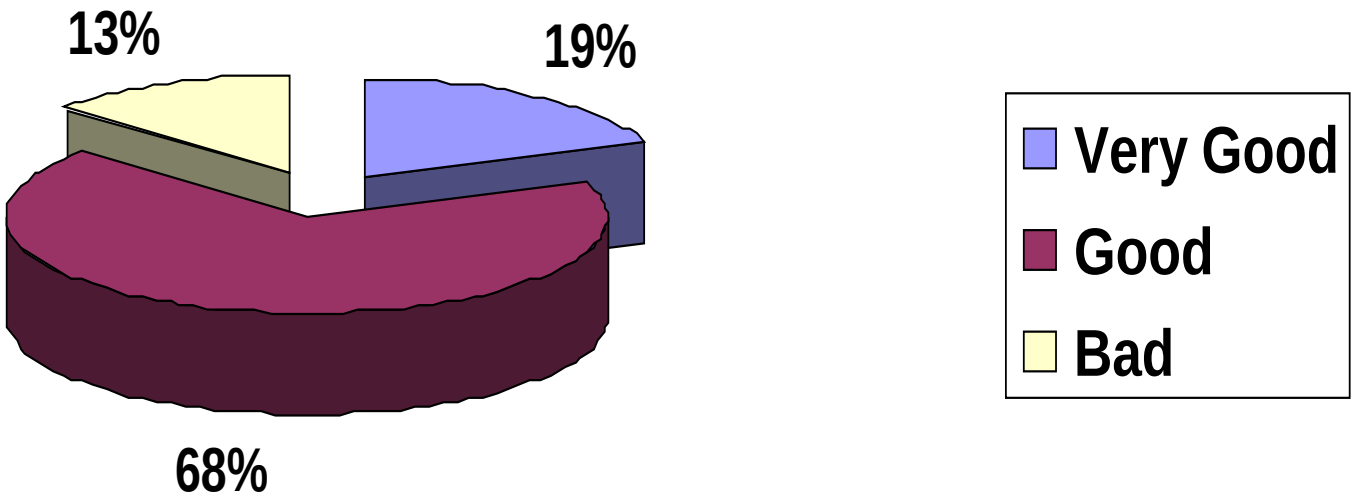
Ankara - Ratio of Residences by type of glazing for window (year 1998)
Average 5 windows by residence
Total Number of Residences = 782 810

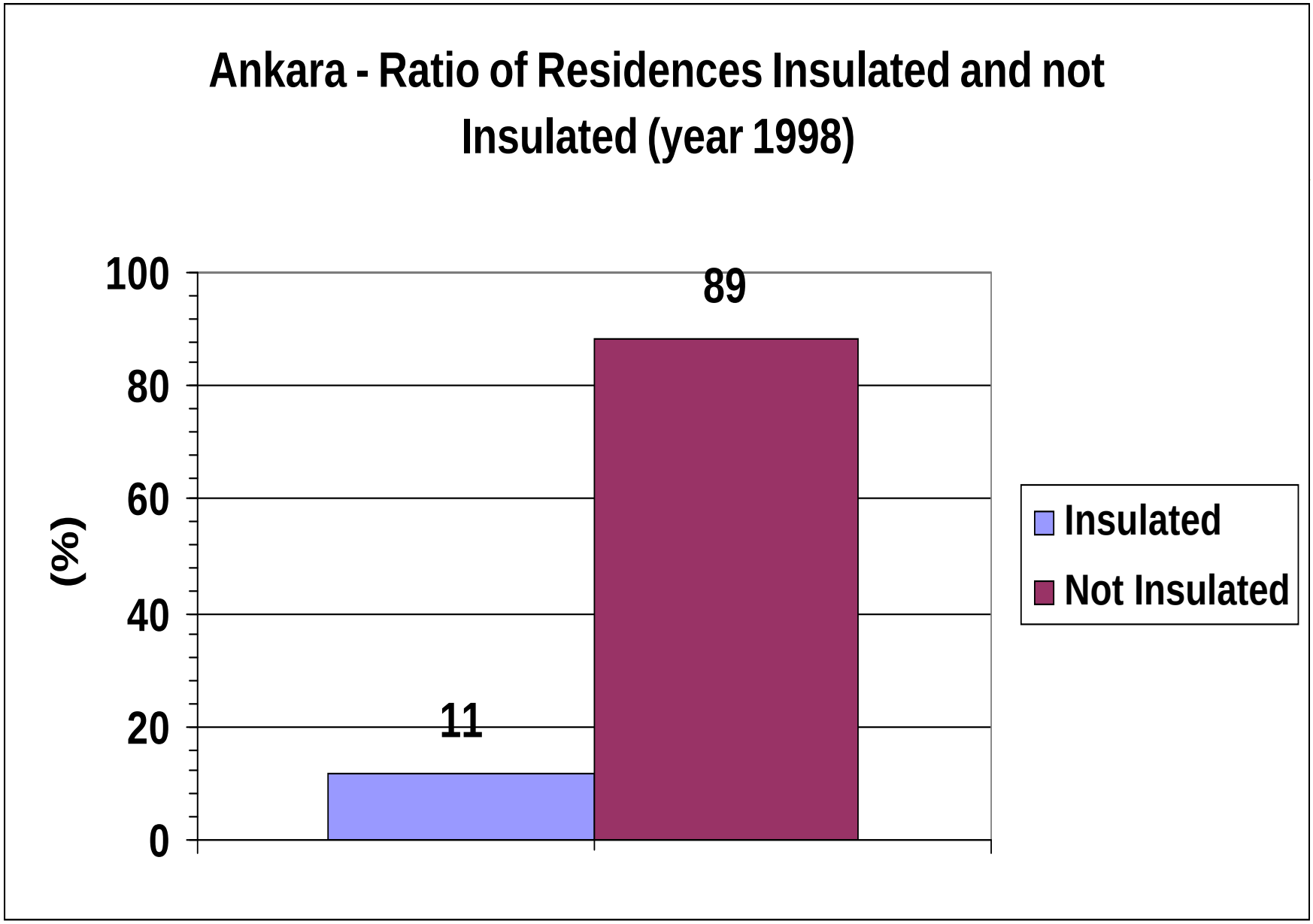


Double glazing

Simple glazing

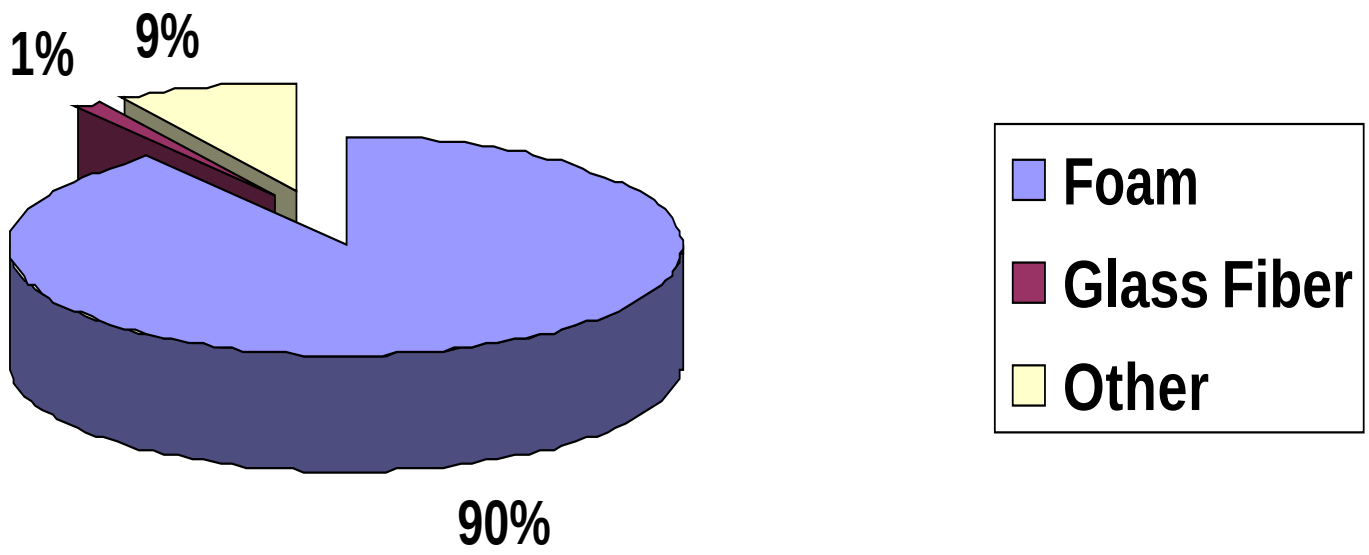
Ankara - Ratio of Residences with roof insulation by Situation of insulation (year 1998)
Total Number of Residences with roof insulation = 220 003




Ankara - Ratio of Residences Insulated and not Insulated (year 1998)
100
80
60
40
20
0
(%)
89
11
Insulated
Not Insulated

Building Insulation materials and techniques

Ankara - Ratio of Residences by insulation material use for Walls (year 1998)
Total Number of Insulated Residences = 89 411 (11%)



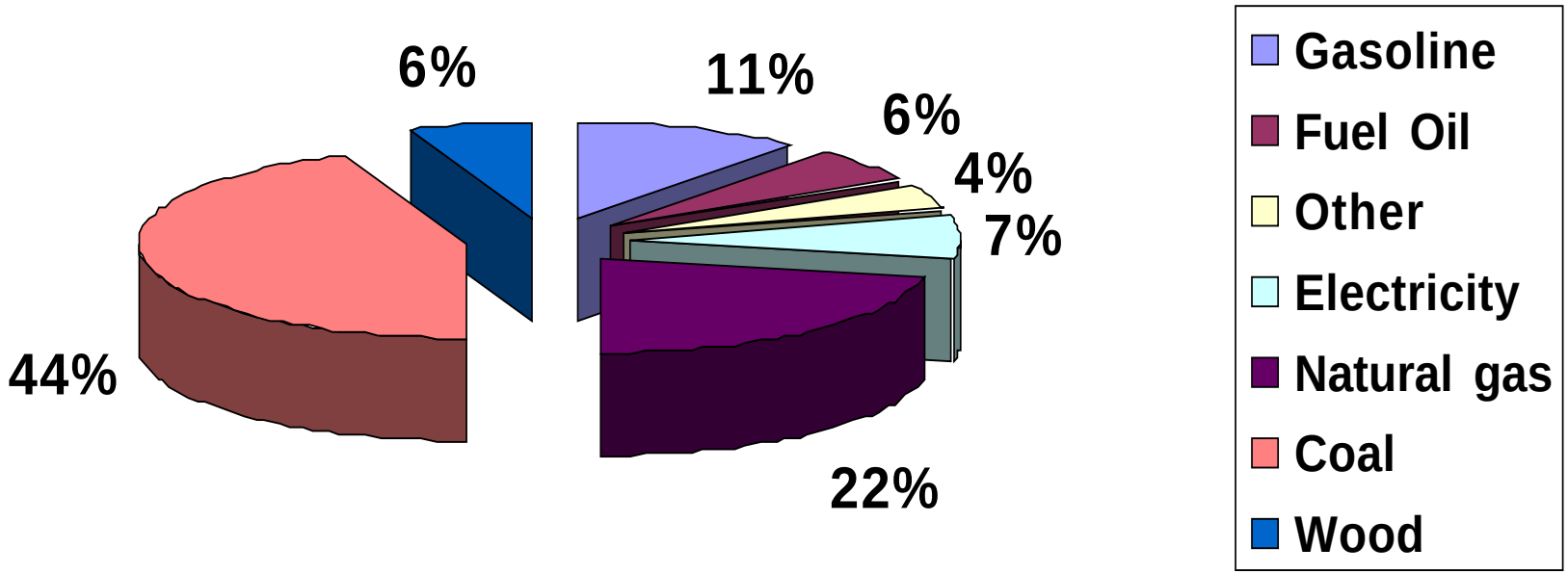
Energy consumption in Dwellings in Ankara

Energy consumption at the residences by heating, lighting, appliances and private car in Ankara (1998)

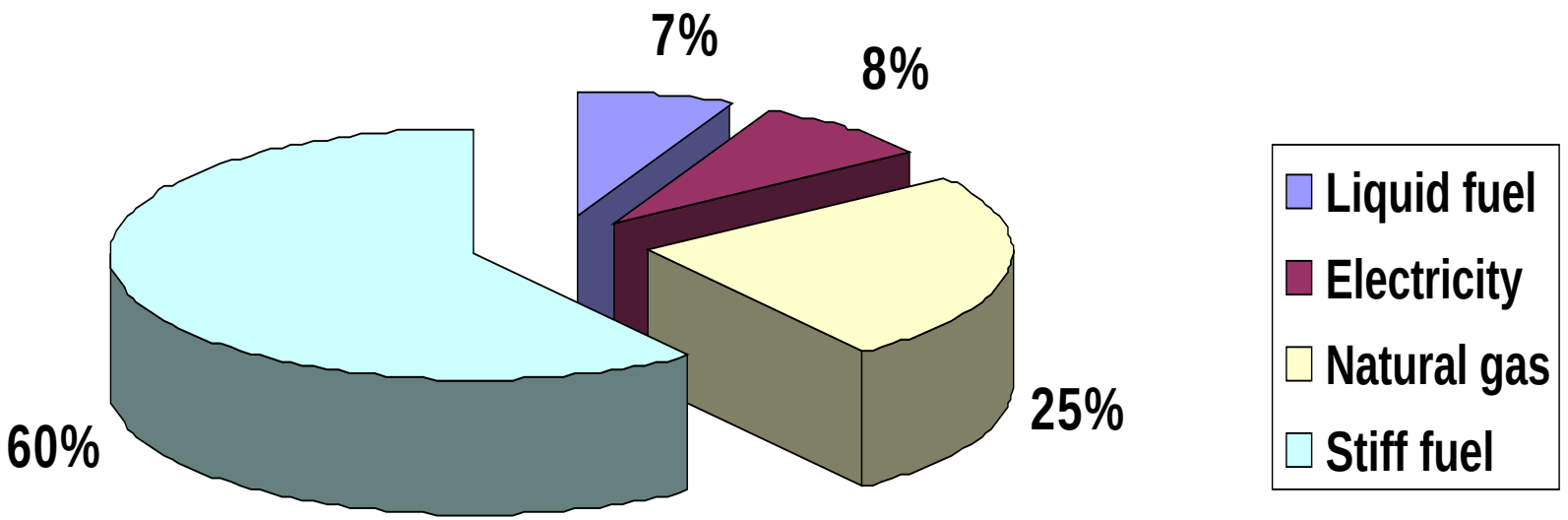
	Total Energy consumption (TOE)	1802748	%
Electricity	Electricity	119383	7
Gas	Natural gas	390257	
	LPG	3589	22
Stiff Fuel	Hard coal	12017	
	Imported coal	525511	
	Coke	534	
	Coal	243446	
	Lignite	11687	
	Wood	116350	
	Wood Dust	0	50
Liquied Fuels	Fuel oil	102872	
	Kerosene	0	
	Diesel Oil	303	6
Plant and animal wastes	Plant waste	3051	
	Animal Waste	156	0
Fuel for Trasportation	Diesel Oil	30079	
	Gasoline	201476	
	LPG	7247	13
Other	Other	34790	2

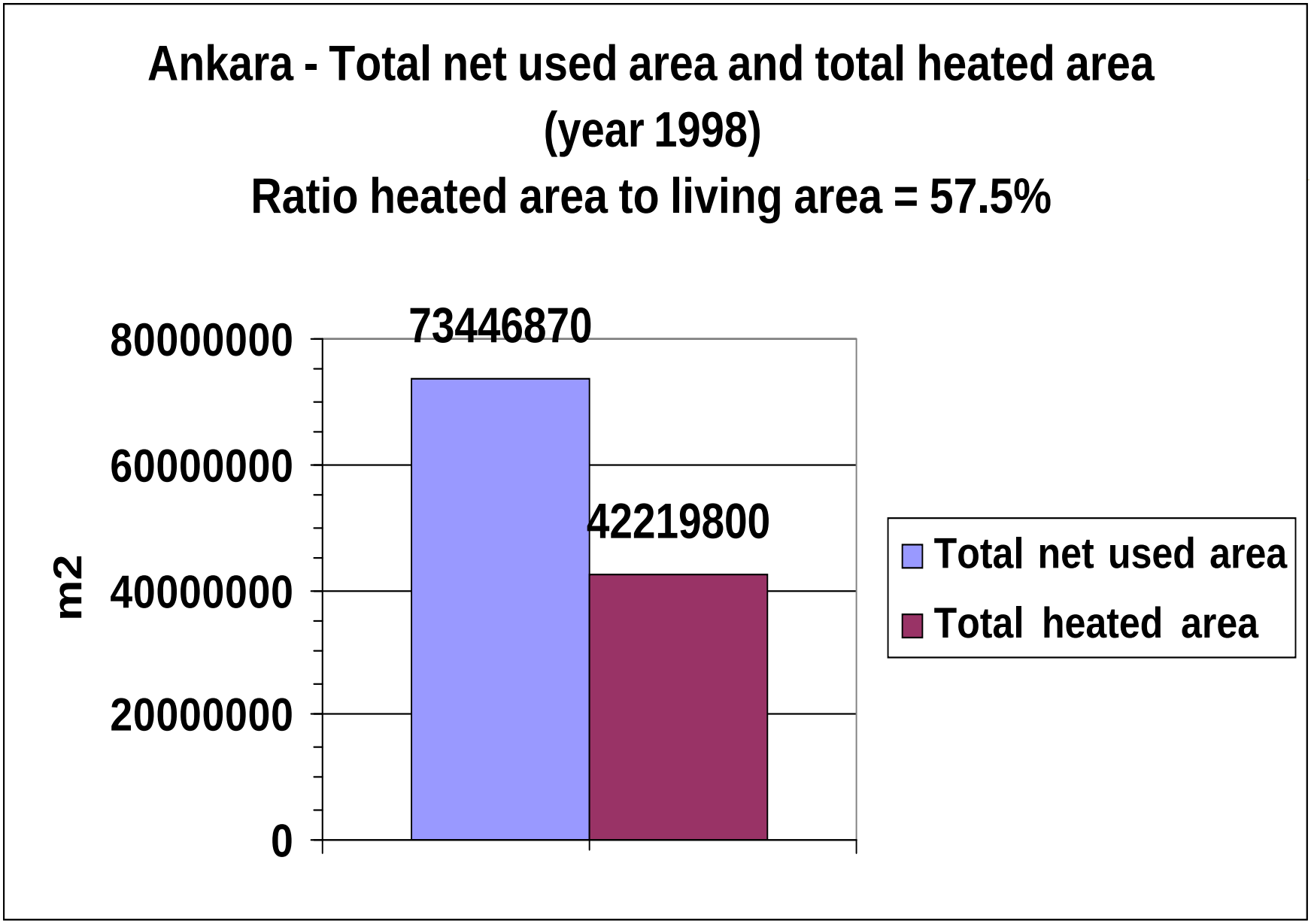
Source : Turkish Statistical Institute

Final Energy Consumption of Residential Sector by Type of fuel in Ankara (year 1998) Total 1,8 million TOE



Final Energy Consumption of Residential Sector by Type of Fuel Excluding Private Transportation in Ankara (year 1998) Total 1,5 million TOE

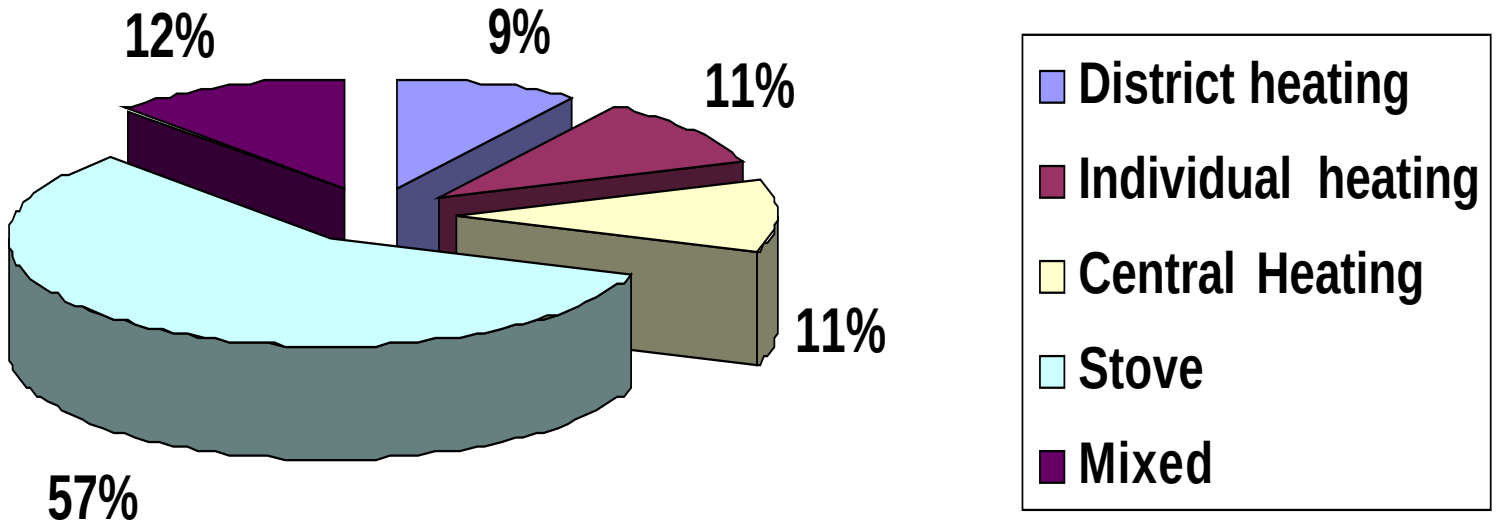



Ankara - Total net used area and total heated area
(year 1998)
Ratio heated area to living area = 57.5%
73446870
42219800
80000000
60000000
40000000
20000000
0
m2
Total net used area
Total heated area

Mains indicators of space heating energy consumption in residential buildings in Ankara (1998)		
Number of persons living at the residences	nbr.	3106012
Total net used area	m2	73446870
Total heated area	m2	42219800
Average living area per person	m2	23.647
average heated area per person	m2	13.6
Ratio heated area to living area	%	57.5
Total primary energy consumption for space heating (65% of total)	TOE	991800
Energy consumption per person	TOE	0.319
Primary Energy consumption per living area (not insulated building)	kWh/m2	190.8
Finaly Energy Consumption per leving area (EE 71%) (not insulated)	kWh/m2	135.5
Primary Energy consumption per living area	TOE/m2	0.014
Primary Energy consumption per heated area	TOE/m2	0.023

Source : Calculated by Mourtada based on data from **Turkish Statistical Institute**

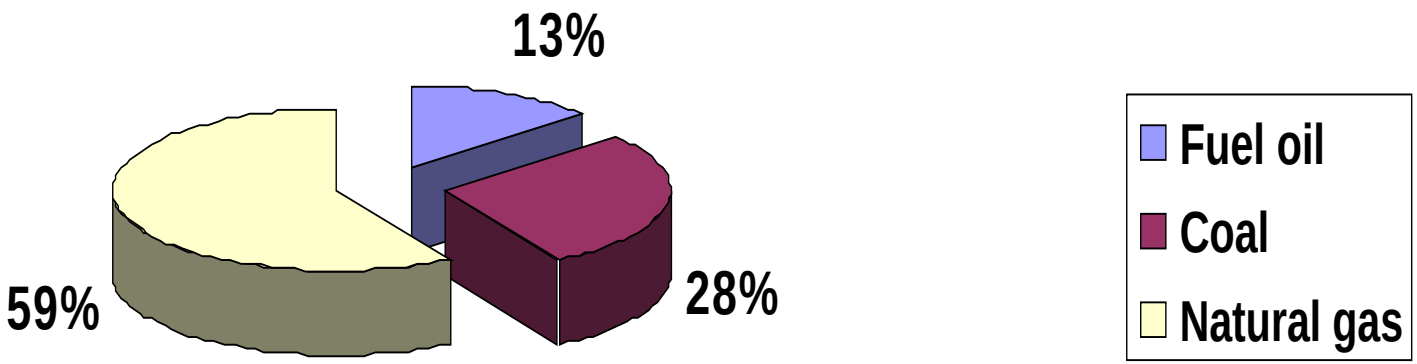
Ratio of Residences by Heating System (1998)
(Total Number of Residences = 782 810)
469 686 residences with coal stove



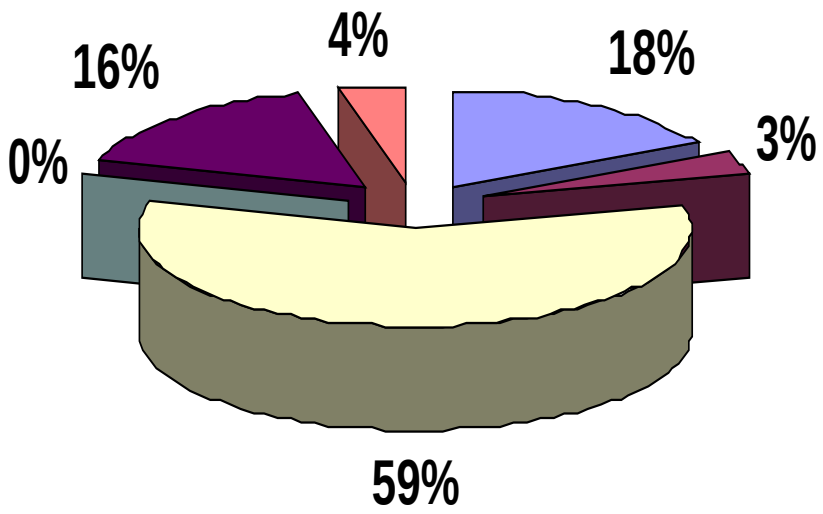
Ratio of Residences with Heating Central Heating System by Type of Fuel (1998)

(Total Number of Residences = 156 933)

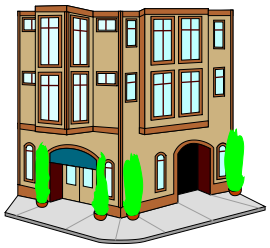
38% with automatic control system according to outside temperature

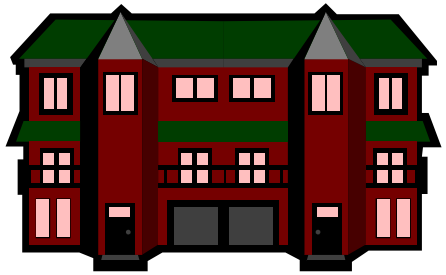


Ratio of Residences by System of Hot Water in Ankara (1998) (Total Number of Residences = 782 810)



Where to search for energy saving in residential sector in Anatolian Region?





FINDINGS OF THE ENERGY CONSUMPTION SURVEY (1998)

- The average size of a dwelling is 94 m2. The average number of people per household in 1998 is around 3.8.
- Dwellings in Ankara consume more than 2.5 times more energy per square meter of living space than countries in Northern parts of the EU.
- The average heat consumption is over 190 kWh/m2 and year in not insulated building. In addition people heat only parts (57%) of their apartments to save energy.

FINDINGS OF THE ENERGY CONSUMPTION SURVEY (1998)

- In Ankara only 9% of the total residential stock were connected to the district heating and 12% to natural gas networks (year 1998).
- More than 57% of households were using solid fuel primary heating systems.
- Presently 80 to 90% of the residential stock are connected to natural gas, and
- there is a strong increase in the number of air conditioning units.

FINDINGS OF THE ENERGY CONSUMPTION SURVEY (1998)

- In the residential area from the 1998 statistic, about:
- 700.000 flats, would need additional insulation of walls,
- 128.000 flats, would need additional insulation of roofs,
- 625.000 flats, would need double glazed doors and windows.
- Concerning heating there is a potential of connecting more dwelling to the gas grid substituting oil and stove heating systems.
- There is also a potential for solar water heater.

Thank you

Questions ?