

Changes in MSW (Municipal Solid Waste) Composition in the Czech Republic in Period from 2000 to 2008



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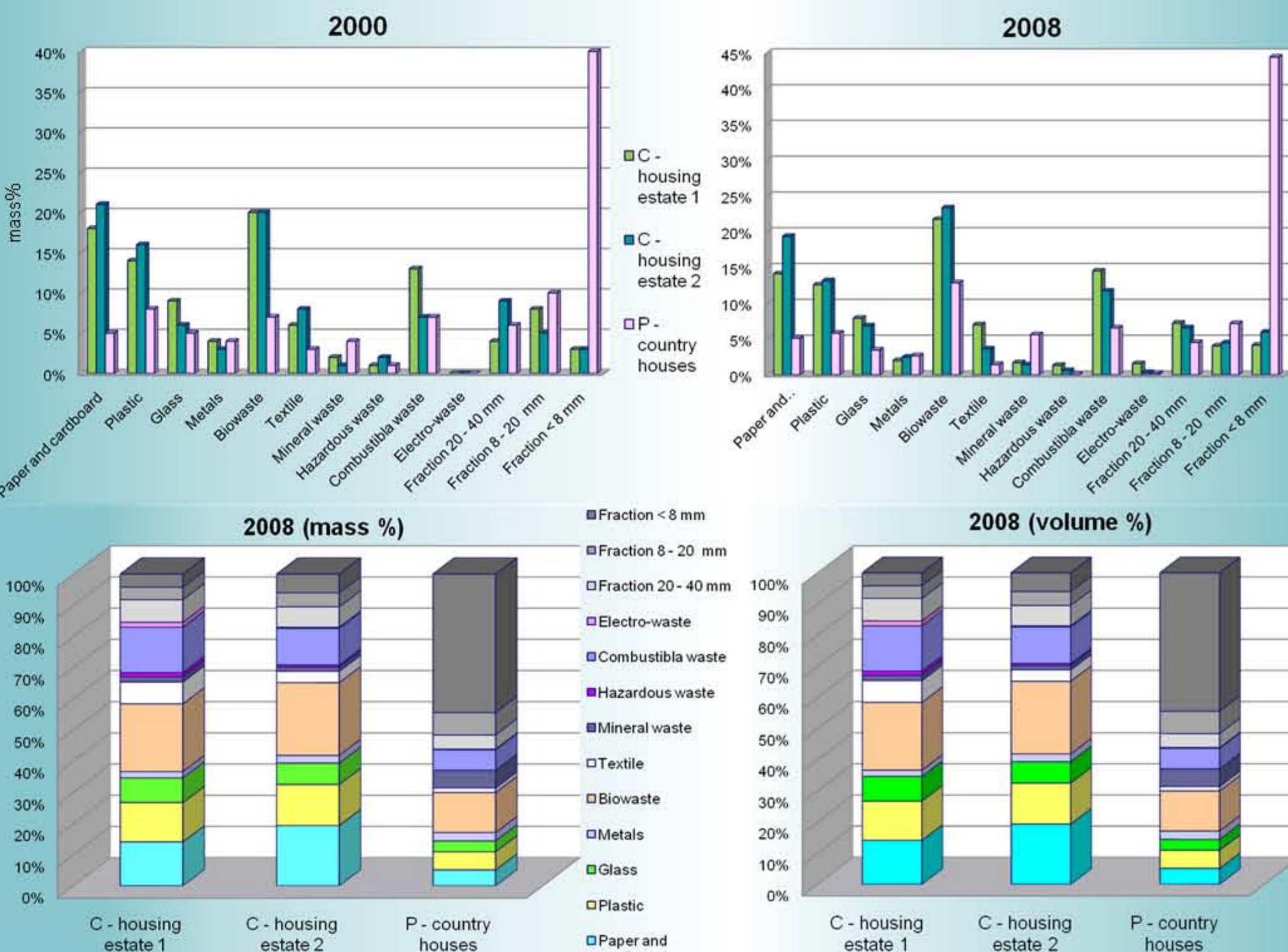
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Introduction

The study focuses on the composition of municipal waste, primarily the mixed household waste from different types of building-houses in Czech Republic (CR) in period 2000-2008. The urgency of the new observation of waste composition has arisen mainly from the requirements to reduce the amount of biologically degradable waste landfilled. The composition of municipal solid waste (MSW) varies very significantly in relation to the type of house-building. The increase in municipal waste production in CR, together with strict requirements for household waste recycling and reducing biodegradable municipal waste going to landfills, would suppose intensive investment activity in the area of municipal waste recovery facilities in CR.

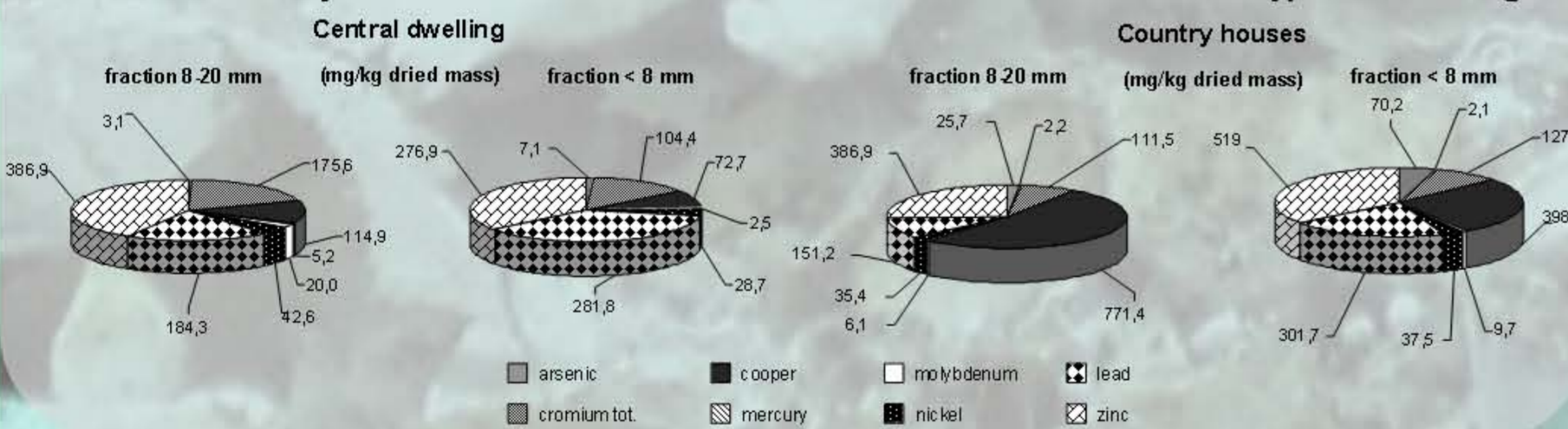
Results

Representation of waste material groups of household waste in different types of dwellings



The composition of MSW varies very significantly in relation to the type of house-building. The biggest differences are between the house-buildings with the centralised heat supply, where does not exist any possibility to recover waste at source, and the suburban and country house-buildings primarily with solid fuel heating, where it is possible to incinerate, treat by composting or feed the great deal of waste.

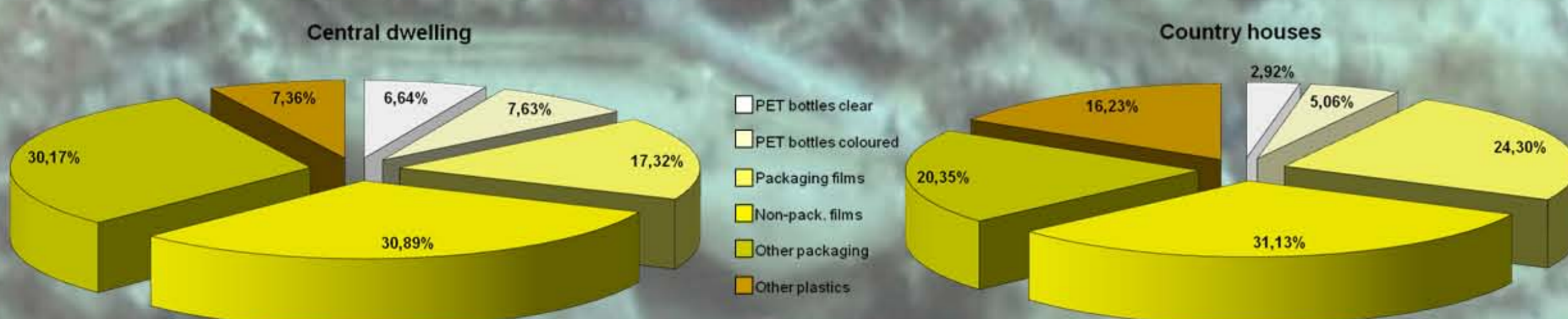
Distribution of heavy metals in fraction 8-20 mm and fraction < 8 mm in different types of dwellings



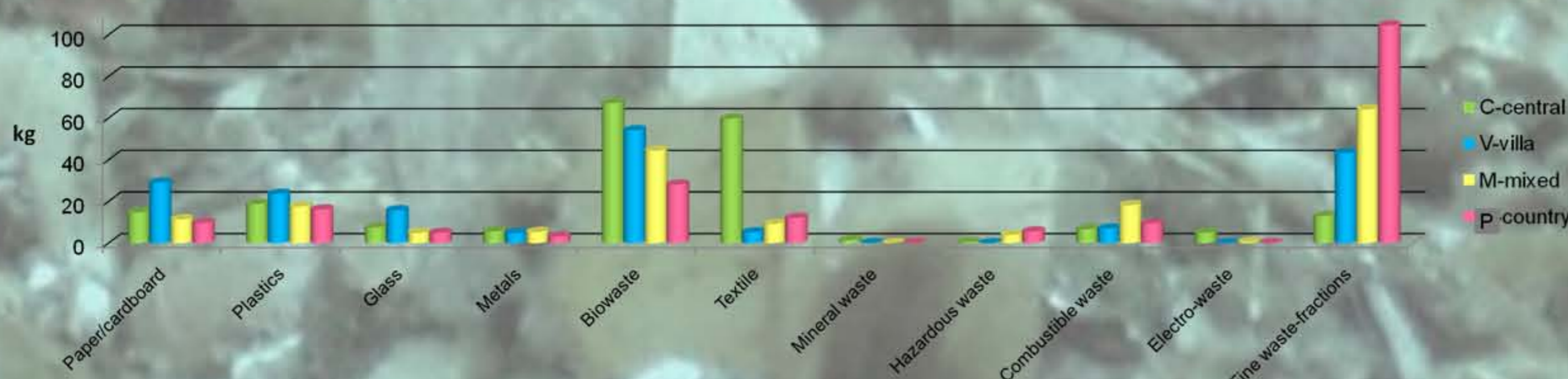
Average representation of material groups in Paper/cardboard group (mass %)



Average representation of material groups in Plastics group (mass %)



Example of mass composition of household waste in different types of dwellings (August 2008)



Methods

- The composition of mixed household waste is determined by the method of sieving analysis and manual sorting in the pre-determined set of material groups
- In every pursued house-building three sieves of size 40, 20 and 8 mm are used uniformly
- The household waste collected in the pre-determined region which has 1.000 up to 3.000 inhabitants is analysed. The amount of waste collected matches the full haulage vehicle (4 to 8 t according to the type of vehicle and house-building). The mass and volume of the waste collected is determined
- The average sample of weights 100-200 kg according to the type of house-building and waste homogeneity is taken for the sieving analysis
- The oversize fraction above 40 mm is fully materially analysed. From fractions of 20-40 mm and 8-20 mm a homogenized sample of approximately 20 % mass is taken which is materially analysed only after drying (and re-calculated according to original sample). The fraction smaller than 8 mm is not materially sorted
- The mass is measured for all groups of grain sizes and materials. The volume is measured only in material groups of the fractions above 40 mm

List of the analysed material groups:

1 st sorting stage	2 nd sorting stage	3 rd sorting stage
Paper/cardboard/carton	Paper packaging Prints Other paper	Carton/cardboard, Combined packaging, Other packaging Newspaper/journals, Books, Advertising brochures/leaflets
Plastics	Plastic packaging Other plastics	PET bottles clear, PET bottles coloured, Packaging films, Non-pack. films Other packaging
Glass	Non-return glass packaging Returnable glass packaging Other glass	Clear glass, Brown glass, Green glass
Metals	Metal packaging Other metals	Fe - metals, Al - metals
Organics	Kitchen waste Garden waste	
Textile	Natural fibre Mixed fibre	
Mineral waste		
Hazardous waste		
Combustible waste	Leather/rubber/cork/wood Sanitary products	
Electro-waste		
Fine waste	Residue 20-40 mm Residue 8-20 mm Fraction smaller than 8 mm	

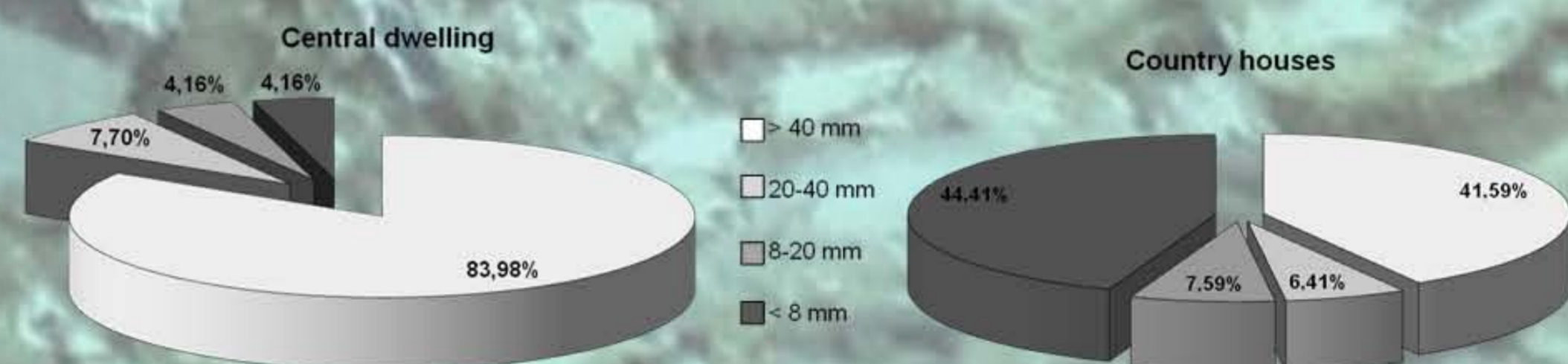
For the observation four types of building-houses have been appointed that can be characterised as:

Category	Description
C (central)	Residential area, town above 100.000 inhabitants, centralised heat supply systems, without the possibility of any recovery of waste at source
M (mixed, sundry)	Older district house-building, town above 20.000 - 30.000 inhabitants, various heating systems (gas, oil, electricity), central heating systems by means of housing and block boiler-rooms or individual (local) heating systems
V (villa-houses)	District house-building of family houses and villas, town with 20.000 - 50.000 inhabitants, local heating systems, incineration of combustible components and composting
P (provincial, country)	Suburban and country house-building, heating systems mostly by solid fuels, with the possibility to incinerate, treat by composting and feed a great deal of the waste.

The monitoring was carried out regularly once a month in every house-building during 12 months. Laboratory analysis of the sorted MSW has included both the physical and chemical indicators:

- humidity (gravimetrically partly at 65 °C and partly 105 °C)
- combustible substance (gravimetrically in the furnace at the temperature of 550 °C)
- heat of combustion (total heating value)
- humidity of particular commodities - paper, textile and biowaste
- In fraction < 8 mm and fraction 20-8 mm: total chlorides, total nitrogen, total fluorides, total sulphur, selected heavy metals - As, Cd, Cr, Cu, Hg, Mo, Ni, Zn, Mn, Ti and Pb (after microwave decomposition by aqua regia, detected by AAS method)

Granulometry - average representation of waste fractions (mass %)



Conclusions

- The biggest differences in the composition of MSW are between the house-buildings with the centralised heat supply and country house-buildings, where it is possible to incinerate, treat by composting or feed the great deal of waste.
- Heating values are at the range of 6.5-16.5 MJ/kg, depending on the year season and type of the house-building. The lowest values have been measured in country house-buildings, whilst the highest levels are in the central residential areas.
- The highest levels of biowaste occur in central house-buildings during summer months, and the lowest levels are in country house-buildings.
- The results of heavy metals analysis vary very strongly not only in particular types of the house-buildings, but also in the individual fractions. This is caused relatively by both the heterogeneity of municipal waste and the high proportion of hazardous waste to municipal waste.
- The results show that CR is still at the level of the countries with low waste production. The average level of waste production in the CR varies about 400 kg /inhabitant /year, whilst in the developed European countries the average waste production is approximately 600 kg/inhabitant/year.
- However, since the correlation between municipal waste production and economic growth (GDP) has been proved, we can expect an increase in total waste production, mainly recoverable components in the form of packaging waste.
- At present, the government of CR has not supported the construction of new municipal waste incinerators. It is thus impossible for CR to meet the requirements of european legal regulations by the years 2010 and 2013, and even unlikely for the year 2020.