1. INTRODUCTION

Housing development must be conducted with respect of sustainable urban design, since areas dedicated for housing are the largest parts of cities [O’Leary in: 1, 14]. Contemporary urban planning in Poland faces several different problems with housing developments such as: suburbanization, sustainability issues, low design and implementation quality. They are all connected with various factors: local and construction law, local traditions, real estate market, wealth level and others. In fact, many of the existing publications regarding qualitative and quantitative research on housing are being conducted in the field of economy. According to Horsewood [10] there is a fundamental difference between both approaches: in quantitative approach numerical values need to be collected to enable statistical analysis while in qualitative analysis information has to be collected in a non-numeric form. However, that does not necessarily occur in the
field of urban design, where quantitative values may represent qualitative values.

Most of contemporary publications on housing estates show great interest in density, as it is one of the most important issues for urban planning. One of the most interesting exercises focused on density issues are “Farmax” by MVRDV[13], “Density” [16] series by a+t edition and “Spacemate” by Permeta Architecten [15]. “Farmax” [13] is an overall presentation of urban densities from all over the world showing how far the FAR (Floor Area Ratio) may be pushed and what the limits are. The “Density” series [16] shows a selection of various examples of European housing estates presented in a catalogue-like graphic manner that allows to make a comparative analysis. “Spacemate” is an online calculator [15] – a tool for density comparisons, which can be used in the quantitative approach. These publications seems to be very helpful in quantitative urban analyses and architectural researches, however, they do not show the wider urban perspective. Very few publications show a connection between housing density and the transport system, though they both depend on each other. Access to different means of transport and to public transport may lower the total travelled distance. Barret [12] showed that the average distance that people travel depends on density. Therefore, transport solutions (public transport and car park provision) exert influence on the housing layout.

Since there were so many interesting, well recognized publications, the authors decided to develop their own methodology for research on housing estates. The research method was designed to compare most of urban factors for different housing types. All of the research has been published in 2013 in a book “Residential areas development 0 current trends: “Spacemate” is an online calculator [15] – a tool for density comparisons, which can be used in the quantitative approach. These publications seems to be very helpful in quantitative urban analyses and architectural researches, however, they do not show the wider urban perspective. Very few publications show a connection between housing density and the transport system, though they both depend on each other. Access to different means of transport and to public transport may lower the total travelled distance. Barret [12] showed that the average distance that people travel depends on density. Therefore, transport solutions (public transport and car park provision) exert influence on the housing layout.

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In Poland, after year 2000, due to economic growth, land demand increased significantly. Before 2000 less than 0.8% of the total number of flats were newly built and later (2004–2008) it was more than 1.2%, while 20% of the total residential growth was in the Silesian Metropolitan Area. This led to many controversial decisions which released large areas of land for housing. New estates were often constructed without the necessary services and appropriate roads. Since there are no housing standards in Poland (the last valid set of standards was withdrawn in 1981), a vast part of new housing estates was of low quality and was located on the city outskirts, with no connection to the existing social or technical infrastructure. That fits the broader image presented in the EU housing report [7] which stated that the growth of built-up areas has been expanding much faster than population growth.

In 2003 a new planning law was adopted in Poland: from that moment on obligatory Development Frameworks and Local Development Plans were to be prepared. Urban indicators, such as housing density, number of floors, car park ratio should be set in LDPs and thus they would limit the urban form. However, as far as LDPs are not precise masterplans (showing precise layout with all urban indicators specified in details) it is still common that housing estates are being built with minimum standards. According to the obligatory Planning System in Poland, quality issues in urban design may not be major drivers determining the final site layout. Housing Quality Indicators (HQI) focus on housing usability and performance [11] – it is a measurement and assessment tool for housing schemes. Although the HQI is not being used, some of the obligatory regulations (building standards in Poland) meet the HQI criteria. Nevertheless, the major HQI criterion is location, which plays a major role for high quality housing.

For housing estates sustainability does not only mean energy efficiency but also balanced (sustainable) local communities. For ages, till the 19th century, people lived where they worked and shared the public realm [18]. Nowadays, when places of work and living are often separated, a good transport system is crucial, and no housing development should be constructed without it. Sustainability also stands for social diversity: good neighbourhood can only be achieved with a mix of people of different ages, wealth and needs [6]. However, this target is hard to achieve if proper policies are not implemented [4]. The most developed social policies can be observed in the UK (affordable housing system) and in France (HLM: “Habitation à Loyer Modéré”, meaning “housing at moderated rents”). In some cases new developments are allowed on the condition that a part of each scheme is dedicated for the affordable housing scheme. There is also great care for diversification of flat sizes and tenure mix.

Since the housing sustainable development theory is quite well described, there are quite a lot of ideas on how to implement/apply the concept of sustainable development (e.g.: Compact City, New Urbanism, Smart Growth, La Nouvellle Charte d’Athens, Urban Village, Urban Renaissance, etc.). There was a need to check why the new Polish housing development is
considered to be of low quality: whether it is a matter of subjective evaluation due to lack of actual research, or a matter of fact.

2. RESEARCH

The Silesian Metropolitan Area has been chosen for the research. It covers the area of 1218 sq km with over 2 million inhabitants. It is an industrial site, which generates more GDP than any other industrial region in Poland. Silesia is one of the densest areas: the population reaches 1640 persons per hectare, which is one of the highest values in Poland and relatively high compared to Europe (the average is 166 persons per ha). 41 different locations were chosen for the case studies, among them single and multi-family housing estates from 14 different cities from all over the Silesian Metropolitan Area (SMA). The location of SMA, its structure and housing areas are presented below (Fig. 1). The selection criteria were the following: built after 2000, relatively dense site use (depending on typology, not to be understood as only a high density case), extraordinary values (to show that some cases may pretend to be ordinary buildings, but still some of the aspects or values may not be standard ones).

Research methodology has been developed to present both sustainability and density issues of housing. The following research methods were used: general research about recent developments, observation, research on site and measurement (satellite aerial photos were used, and maps from local GIS systems: Polish cities share some of the data, such as plot layouts, via web systems). Most of the collected data were set in a standardized layout with various parameters (see Fig. 2 and Tab. 1).

![Figure 1. Silesian Metropolitan Area, Silesian Voivodship, Poland [3]](image)

<table>
<thead>
<tr>
<th>Table 1. Standardized layout for housing case studies [3]</th>
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<tbody>
<tr>
<td>Site area [m²/ha]</td>
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<tr>
<td>Built-up area [m²/ha]</td>
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<tr>
<td>Green area</td>
</tr>
<tr>
<td>Circulation area</td>
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<td>Other use area</td>
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<tr>
<td>No. of floors</td>
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<td>Site use</td>
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<tr>
<td>Density ratio</td>
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<tr>
<td>No. of flats</td>
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<tr>
<td>Density [units per hectare]</td>
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<tr>
<td>Parking spaces (ground-level /undercroft)</td>
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<tr>
<td>Parking spaces (common/private)</td>
</tr>
<tr>
<td>No. of parking spaces per flat</td>
</tr>
</tbody>
</table>
Figure 2.
Photographs of one the blocks in Bajkowe neighbourhood, also site plan and site diagram

Figure 3.
Site use graph [3]
All case studies were assigned to one of three types of locations (inner city / city centre, the adjacent city area and the outer city / suburbs, similar classification to Gehl, Gemzoe, 1996), three types of occupancy (private, housing association implementations and social housing).

Some of the parameters used in the table need to be described: built-up area – measured as area covered by buildings. Density ratio – shows the use of space on the plot (built-up area x the number of floors/site area). Density – shows the number of flats per hectare – this indicator shows the value, which determines whether it is low (0-40 f/ha), medium (40-90 f/ha) or high (90 and more f/ha) [16]. Some indicators that were used, such as proximity to commercial services (such as shops) or a bus stop, show the location’s potential. According to the planning system in Poland LDFs may limit development with all possible urban factors, listed above. Nevertheless, research showed that in most cases the factors were either not used or not precise, which allowed various implementations.

3. RESEARCH RESULTS

According to the planning system in Poland each community is obliged to prepare a proper LDP. The most unexpected result was the fact that most (65%) of the newly built housing estates were planned on the basis of special planning permits (granted for the purpose of particular investments) and were not planned according to the binding LDP. This means that even though the new planning system was implemented in 2003, new LDFs were not prepared to allow more precise, planned site use and it led to lowering the housing standards.

The results showed some unexpected values in a few case studies and it turned out that such research was essential to present contemporary practice. Site use showed that in some cases there is less than 20% of green area, and in most cases the parking space and circulation area take up most of the site (see Figure 3).

The number of trees was a surprising result in most of the studied cases. Most of the trees had originally been growing there, while only some/few were planted. 11 cases (26%) showed that there were no trees on the site at all (see Fig. 4). Very few of the studied cases represented attractive greenery and site landscape layout (see Fig. 5). Also, very few cases had playgrounds, even though building law states that this is obligatory.

Observation showed that in most studied cases there was too little parking space (example: Fig. 6). The issue of the parking spaces per flat ratio needs to be considered: many cases showed that a large part of land is used for circulation and car parks. These facts stand in opposition to sustainable development. Only 34% of the studied cases had an undercroft car park (Fig. 7).
The research on density showed that in some cases single-family housing may provide comparable density to multifamily housing (see Fig. 8). The research also showed that the number of floors does not always provide high density (see Fig. 9).

In very few of the studied cases there was a mix of tenures. Most cases were commercial developments for sale (private) with one type of flat volumes. That often results in homogenous neighbourhoods with inhabitants of similar wealth, age and needs. The share of affordable housing in the housing market in Poland is very little compared to other countries (France 16%, UK 18% 3.9 million flats belong to the social housing sector, 2 million (9%) belong to municipalities, 1.9 million of flats (9%) belong to Registered Social Landlords [Barker 2006]). Only 29% of the studied cases had commercial services for rent. This does not meet the idea of mix of use – in some cases the distance to the closest shop was too big to walk and so sustainability could not be achieved. Some of the cases were gated estates – some of them covered large areas fenced around with an entrance only from one or two sides. Very often the contrast between inner and outer area was huge: high quality landscape inside and pavement holes with litter outside. This deepens social gaps and creates unsafe areas in the cities. In the case study of the Dębowe Tarasy estate – it takes a 10-minute walk to encircle the entire site, and it does not help the inhabitants in the near neighbourhood since access to local shops is much more difficult than before. Most of the case studies did not present good urban design, which is a shame as good urban design contributes to place attractiveness [9].

![Figure 7. Good example: undercroft car park and maximum density (Z2, Zabrze, Urbana Street) [3]](image7)

![Figure 8. No. of flats per ha in each case study [3]](image8)

![Figure 9. Density/weighted average number of floors graph [3]](image9)
4. CONCLUSIONS

All the findings have been published in “Residential areas development – current trends: case studies from the Silesian Metropolitan Area” [3], but still some of the research results were unusual and the authors believe they are worth publication worldwide, as the original publication was originally in the Polish language. Some of the conclusions might also be worth popularization outside Poland.

Although many features of urban layout may be quantified or described by factors and ratios, observation of selected sites also provokes comments and provides conclusions. The research showed that in many fields new plans and implementations do not meet the European spatial development perspective (2010). Housing quality assessment (partially the subject of the research) needs to be performed and it should be obligatory to improve the housing quality in Poland. The more densely developed the land is, the less need for transport people will have. Several different studies, following various approaches, were carried out. Urban factors for car park provision and density set in LDP should include access to public transport and bicycles. In dense urban areas parking space ratios should be lower if public transport is considered. Links also play a major role in how people use the space. Access to basic services should be provided both for pedestrians and vehicles: if the distance is too long, the most probable scenario is vehicle movement. Both connectivity and provision of positive public space for pedestrians can be done by urban design and space sharing. Very few of the studied cases may be considered as outstanding urban layout: most of them were average and some of them were below obligatory standards (against the law).

This shows that not only does the building law need to be changed, but also, a special Housing Quality Assessment should be performed and a set of standards should be written down for future implementations.

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