

FUEL POVERTY AND PERCEPTION ON HOUSING AND ENVIRONMENTAL QUALITY IN BELGRADE'S INFORMAL SETTLEMENT KALUĐERICA

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Informal development is a specific form of urban sprawl and one of the main challenges for the sustainable development of major cities in Serbia. In this paper we examine this phenomenon with regard to the influence of spatial and urban vulnerabilities of the informal settlements on the housing and environmental deprivation, especially in the context of inhabitants' vulnerability to fuel poverty. The empirical research was carried out on the example of Belgrade's suburban settlement Kaluđerica. The statistical analysis of the results has shown that the observed energy characteristics of housing have no relevant influence on households' financial burden of energy expenditure, but that they considerably influence households' perception on thermal comfort. The relation between a limited access to public services and the lack of amenities in the settlement and noted high household expenditure on transport has proved to be a particularly important indicator. Based on the perception on overall life commodities, a poor quality of the environment has been recognized as a key factor of deprivation related to housing.

Key words: urban sprawl, informal development, deprivation, fuel poverty, Kaluđerica.

INTRODUCTION

The incidence of informal or illegal development is present in different forms in the majority of South East European (SEE) countries, while in Serbia it represents one of the main features of the process of urbanization from the second half of the 20th century onwards. In Serbia, residential settlements of low or medium density, which emerged owing to the uncontrolled construction of single-family housing on mostly private agricultural land in suburban areas of major cities, represent the dominant form of informal development.

Numerous problems these informal settlements face – legal, administrative, financial, socio-economic, environmental and spatial and urban – represent an obstacle to sustainable urban development, while at the same time they have an adverse effect on the quality of life of its residents. These challenges are recognized in a global context in different international documents (e.g. *Global Strategy for Shelter to the Year 2000* (1988); *United Nations Millennium Declaration* (2000); *Ministerial Declaration on Social and Economic*

Challenges in Distressed Urban Areas in the UNECE Region (2006)), and in the region of SEE in the Vienna Declaration on Informal Settlements in South Eastern Europe (Stability Pact for South Eastern Europe, 2004). According to the provisions of this Declaration, with Serbia being one of the undersigned, the urban, social and economical integration of informal settlements within the overall city structure is a key factor in preparing for accession to the EU, including undertaking necessary actions for their regularisation (legalisation), sustainable improvements and prevention of future informal development (ibid.:1).

Informal development is recognized as one of the most important topics in scientific and professional research in the field of urbanism and housing in Serbia (Mojović, 2011; Ferenčak, 2006; Milić *et al.*, 2004; Petovar, 2003). However, the number of empirical research on current housing problems and life conditions in informal settlements is insufficient, barring the studies dedicated to the analysis of the so-called “unhygienic” or “Roma” settlements (Petrović *et al.*, 2012; Vuksanović Macura and Macura, 2007; Jakšić and Bašić, 2005).

This paper is based on the assumption that spatial and urban deficiencies of informal suburban settlements, such as

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lower construction standards, poorly planned environment of dwellings and limited access to various urban resources, contribute to the deprivation of the population, with the risk of fuel poverty being one of the main indicators. In the analysis of this assumption we used the example of Kaluderica settlement on the outskirts of Belgrade, and the results of two survey questionnaires conducted in 2014 and 2015 by the authors. A general goal of the research is to contribute to a greater understanding of negative social, energy and environmental influences of informal development in Serbia and to show the need for them to be recognized and resolved in the future through planned activities of sustainable improvement.

BACKGROUND

Urban sprawl through the lenses of informal development in Serbia

The model of urban sprawl in post-socialist European countries, including Serbia, differs significantly from the one in developed West European countries (e.g. Hirt, 2007; Slaev and Nikiforov, 2013; Petrić, 2013). According to Hirt (2007:757), these two models differ in at least three key characteristics: (1) *demographic* (i.e., who moves to the urban fringe?); (2) *functional* (i.e., how are the center and the fringe economically linked – where do the peri-urban residents work?); and perhaps most notably, (3) *locational and motivational* (i.e., where did the peri-urban residents come from and why did they move?). Residential preferences point to obvious differences in the process of urban sprawl of capitalist and former socialist cities (Petrić and Bajić, 2015). In the first case, migration of middle and higher social classes towards suburban areas is primarily motivated by their desire for high quality housing in natural environment. In the case of former socialist countries, main factors of urban sprawl in the socialist era were late urbanization and prioritization of industrial development, which contributed to a mass influx of rural populations in search for jobs and more affordable housing on the outskirts of major cities. With the beginning of transition, economical motives remained dominant, so in some cases it was more of a question of induced residential choice than a preferred one (ibid.).

Informal development is one of the main characteristics of the incidence of urban sprawl in Serbia, as well as in the region of SEE. This notion actually represents a form of individual residential development without obtaining the required legal documents (building permits), and on unassigned land (Saveljić, 1989). According to Ferenčak (2006), individual residence buildings erected on mostly agricultural or development land (illegally divided) in suburban areas, which Milić *et al.* (2004) refer to as “compact illegal settlements of newer date”, are a dominant form of informal development in Serbia. The settlements in question mostly belong to the so-called “upgraded squatter settlements” (Tsenkova, 2012), which, in time, managed to acquire a certain degree of legality and security of tenure by connecting themselves to the basic infrastructure, obtaining formal land titles, gradual legalization of buildings, inclusion in the new master plans of cities, but also owing to the fact that illegally developed buildings were not demolished.

Large demographic influxes, in the first place owing to mechanical migrations from villages to towns during the socialist urbanization in the second half of the 20th century, and forced migrations from the war-torn areas of the former Yugoslavia in the 1990s, served as the impetus for urban sprawl through illegal development in Serbia. Different factors contributed to this process, such as the inadequate residential and land politics during socialism, outdated and inflexible system of planning in the period of economic and social transition, the advancement of economic crisis and poverty, politically motivated tolerance of illegal development as an informal measure of social politics, insufficient administrative capacities and models of legalization, etc. (Milić *et al.*, 2004).

Indicators such as almost triple decrease in urban density and the same increase in urban land consumption, as well as inefficient land use, illustrate the intensity of the process of urban sprawl in the Belgrade metropolitan area in the period spanning over last three censuses (1991-2011) (Zeković *et al.*, 2015:71). It is estimated that the area of illegal development occupies more than 40% of the area assigned to residential use within the limits of the Master plan of Belgrade. According to the most recent data published in 2015 by the Ministry of Construction, Transport and Infrastructure, there are 1,476,433 illegal buildings in Serbia, making up around one third of the total number of buildings in the country, and there have been around 771,000 submitted requests for legalisation, that is, around half of the total number of illegal buildings. It is estimated that in Belgrade alone there are around 400,000 illegal buildings, or, around 27% of the total in the whole Serbia, for which around 237,600 request for legalization have been submitted (BETA, 2016).

Spatial and urban factors of deprivation and the problem of fuel poverty in informal settlements

The negative effects of urban sprawl on the environment mainly include the influence of car transport on the air pollution, higher energy expenditure, land and water use (Wilson and Chakraborty, 2013). The model of “informal” suburbanization in Serbia and SEE is characterized by additional spatial and urban vulnerabilities, such as inadequate transportation, utilities and social infrastructure and lower construction standards (Mojović, 2011:127), which, besides negatively affecting the environment and sustainable urban development, contribute to the deprivation of local populations. A high risk of fuel poverty can be deemed as an important indicator of deprivation in informal settlements in Serbia, arising under the influence of both socio-economic and spatial and urban factors. Nowadays this social and energy problem is globally recognized, but still insufficiently discussed in Serbia, even though its presence and adverse effects on our environment had been recognized more than a decade ago (UNDP, 2004).

In this context, deprivation is defined according to Townsend's (1979) broader definition of this notion, as the absence or inadequacy of certain living conditions (diet, amenities, standards, services and activities) which are common or customary in society. Contrary to poverty, which occurs due to the lack of income and other resources,

Townsend (1979:249–251, 1173–1176) proposes a much more complex concept to define deprivation (material and social), the one which includes several different spheres of life. The concepts of housing and environmental deprivation are of great importance for this research as different aspects of material deprivation (MD).² The first concept analyses the adequacy of housing conditions and the financial burden of living expenditures per household, while the second measures the quality of housing and the environment. When measuring both aspects of the MD, regional differences and the degree of urbanization are taken as important factors of influence.

The results of the Survey on Income and Living Conditions in Serbia conducted in 2013 in accordance with this methodology showed that compared to cities, the risk of poverty was two times higher in other settlements (34.6% versus 17.8%), and that it increased with the increase in urban density (SORS, 2015:23–24). However, measuring of the MD showed that the standard of living in densely populated Belgrade region was not much higher in comparison with other regions, despite higher monetary earnings, which can be explained by lower non-monetary earnings and “higher living expenses” and greater aspirations.

Spatial and urban deficiencies of informal settlements are directly related to the elements of housing vulnerability, both from the aspect of the quality of housing and environment of the dwelling, and from the aspect of living expenditures. Due to the lack of public services (schools, hospitals, libraries, recreational spaces, green/open spaces, etc.), the residents of these settlements are forced to use these services in nearby urban areas, which, besides overburdening the social infrastructure of the cities, contributes to the increased need for travelling among peri-urban populations (Mojović, 2011). Apart from polluting the air, a frequent use of private cars contributes to higher household expenditures on transport. The lack of remote heating systems and a common use of traditional solid fuels whose burning contributes to both outdoor and indoor air pollution, are specific housing problems of informal settlements. Lower construction standards and uncompleted residential buildings additionally affect the comfort of living and the health of the residents, and contribute to higher household energy expenditure, which is recognized as the key indicator of fuel poverty.

The most commonly used definition of fuel poverty, given by B. Boardman, states that “fuel poor households are unable to obtain an adequate level of energy services, particularly warmth, for 10 percent of their income” (Boardman, 1991:207). However, the definition relevant for this research is a broader one, the one that includes household energy and transport expenditures (e.g. the term “energy precarity” in France), due to its additional connections to the problem of urban sprawl. The main factors affecting the incidence of fuel poverty are low household income, high energy prices

and poor energy performance of housing stock. The factor of location is likewise very important, albeit it is mostly related to rural areas. Among numerous adverse effects of fuel poverty on the quality of life and health of the population (EU Fuel Poverty Network, 2011), there are several indicators that showcase material and especially housing deprivation, such as: poor thermal comfort, arrears on utility bills and the reduction of other basic life necessities in households.

The data collected in the Survey on Income and Living Conditions show that in Serbia 18.3% of respondents cannot afford adequate heating, and as many as 37% of the households are in arrears on their utility bills, which is far more than the EU average (SORS, 2015). According to the results of the 2013 Household Budget Survey (RZS, 2014), and the West European definition of fuel poverty, the whole population of our country is fuel poor because an average Serbian household spends more than 10% of its income on household energy expenditures. The share of the total household income spent on home energy bills and transport in urban areas amounts to approximately 16%, while in other areas it makes up almost 18%. This difference, caused primarily by transport expenditures, clearly indicates that the factor of location significantly contributes to the vulnerability of rural and suburban populations to fuel poverty. According to the household income levels and total household expenditure on energy, the Belgrade region is in the lead, particularly with regard to expenditure on electricity, central heating and public transport.

A CASE STUDY OF KALUĐERICA SETTLEMENT

Belgrade suburban settlement Kaluđerica (Figure 1) is considered to be the largest informal settlement of this kind in the Balkans (Saveljić, 1989). According to the 2011 Census, nowadays the settlement has 27,000 inhabitants (although it is estimated that the actual number surpasses 45,000), and around 8,800 households. In a comparative review of the number of inhabitants in Serbia from 1948 to 2011 per settlement, the largest relative increase in the number of inhabitants was recorded in Kaluđerica, which saw the 20 times increase in its size in this period (from 934 inhabitants in 1948 to 26,904 inhabitants in 2011) (Figure 2). If we consider only the last two decades, the number of permanently occupied residences has doubled – from 5,557 in 1991 to 10,775 as recorded in 2011. Family residential buildings mostly built by the residents own hands, or with the help of their friends and family, are prevalent in the existing housing stock, while the construction of multi-family houses is still rare. The average size of residences is approximately 75 m², which is around 9 m² more than the average size of apartments in the Belgrade region.

Intensive urban and demographic development of Kaluđerica started after 1966, with the key reasons being: 1 – shortage of available apartments in the city under the pressure of mechanical influx of residents; 2 – proximity of Kaluđerica to Belgrade (it is located around 10 km from the city); 3 – good traffic connections; and 4 – lack of adequate planning policies (at the time of the adoption of the Master plan of Belgrade in 1969 and 1970, the demarcation line precluding the construction of individual residential buildings was drafted right in front of Kaluđerica (Žerjav, 2014).

² According to the *EU-SICL* methodology, the basic dimensions of the MD include economic limitations, accessibility of consumer durables, housing deprivation and, in addition, the aspect of the environment of the dwelling. The last aspect is related to the problem of social exclusion, which, as a rule, does not affect only the poor, but sometimes entire cities (Guio and Maquet, 2007).



Figure 1. Belgrade municipalities and the position of Kaluderica settlement

(Source: https://commons.wikimedia.org/wiki/File:Belgrade_municipalities02.png, processed by authors)

Number of inhabitants in Kaluderica in the 1844-2011 period

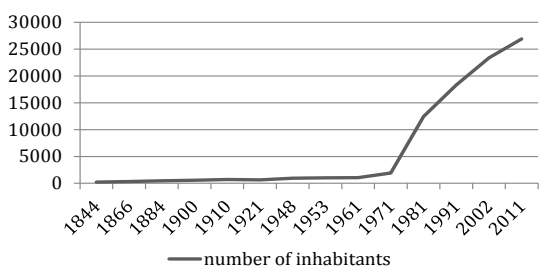


Figure 2. Number of inhabitants in Kaluderica in the 1844-2011 period.
(Source: authors, according to: Saveljić, 1989 and RZS, 2011)

The last empirical research on the roots of development of Kaluderica settlement and its spatial and social characteristics was conducted in the late 1980s using a survey questionnaire on the local population (Saveljić, 1989). According to Saveljić, urbanistic plans of the settlement were designed with great delay and their primary purpose was recovery, instead of planning and guidance, and since there were no corresponding preliminary researches, they were based on unrealistic assumptions (ibid.:133). According to the data from this study, in that time in Kaluderica there was no water supply nor sewage network. Households had septic tanks and the water was supplied from an old public drinking-fountain connected to the city water supply system, or from private wells with chemically and bacteriologically polluted water. The social infrastructure was also insufficiently developed, especially with regard to the capacity of the elementary school (classes were organized in three shifts) and the community health care center, and owing to the lack of amenities for the young, and for sports and recreation. Apart from substandard streets (narrow, without sidewalks, usually unpaved), the transportation network was characterized by an inadequate public transport with timetable and vehicle capacity which did not fulfil the needs of daily migrations. Even though in the course of last several decades there have been some improvements with regard to utilities and public

infrastructure in the settlement, numerous problems dating back to the 1980s can be recognized today by the local population, as witnessed by the results of a more recent survey (Petrić *et al.*, 2014). Among other things, this survey showed that the main motives for settling in Kaluderica were: 1 – property in ownership, 2 – size and quality of the house, and 3 – property values/re-sale values (ibid.).

METHODOLOGY

In this paper we used the data obtained from two questionnaire surveys conducted in Kaluderica settlement (Petrić and Bajić, 2015; Bajić and Petrić, 2015). Based on the first survey conducted in February/March 2014 on a representative sample of 90 households (making up 1% of the total number of households according to the 2011 Census), we analysed residential preferences of the population living in Kaluderica, as an important factor of urban sprawl in the post-socialist Belgrade. The main tasks of this research were to establish motives for settling in Kaluderica, the satisfaction with different neighborhood amenities, and variability of suburban residential preferences. The second survey was carried out in February 2015 on a sample of 50 households, with the aim to examine the problem of fuel poverty in this suburban area. We examined the following key indicators: household energy expenditure (in % of monthly income), electricity and transport expenditure, energy services arrears, general energy characteristics of residential buildings and indicators of thermal comfort, whereby the last two indicators were defined according to the national methodology used in the TABULA project (Jovanović Popović *et al.*, 2012).

In both surveys the sample was formed by the random sampling method, taking into account only the criterion for balanced distribution of households in the settlement according to the previously designated spatial zones (Figure 3). For the most part the research was conducted as door to door survey questionnaire, while a smaller part of respondents were surveyed by email. Both surveys were anonymous, and the answers to the questions were given only by one member of the household, i.e. its representative.

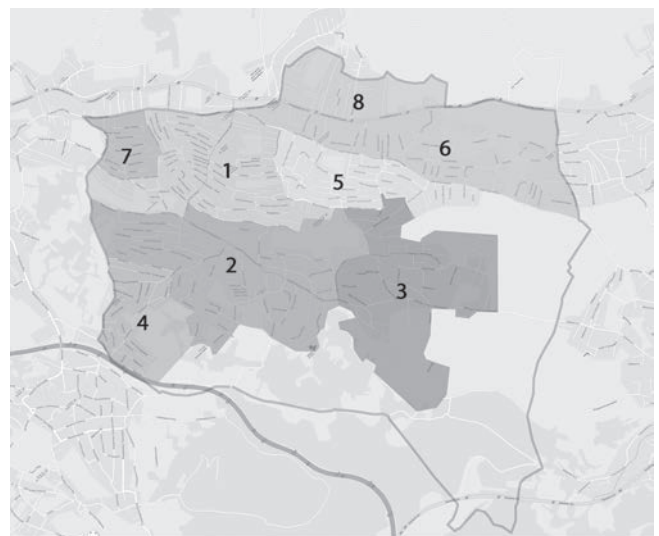


Figure 3. Division of the settlement into zones
(Source: authors)

This paper is primarily focused on the analysis of relations between recognized spatial and urban problems in the areas of informal development and indicators of deprivation with regard to fuel poverty, as well as inhabitants' perception of the quality of life in Kaluderica. Statistical analyses of the results included parametric tests (Pearson's Correlation) and non-parametric tests (Chi-Square) within the SPSS (Statistical Package for Social Sciences), Version 21.0.

RESULTS

Fuel poverty factors

Factors of household energy expenditure and achieving thermal comfort

The results of the Survey on Fuel Poverty in Kaluderica show that 66% of the respondent households spend over 20% of their total monthly income on household energy and transportation. Applying Pearson's Correlation in examining the relations between the household size and energy consumption, a small positive correlation is noted between the variables, which shows that larger households, i.e. households with more than four members, mostly set aside a greater share of their income for energy expenditure (Figure 4). The same method has been used to establish that these households also have a smaller share of persons who earn a regular monthly income compared to three-person households, which generally proves their greater vulnerability to fuel poverty (Figure 5). According to the respondents' answers, only 12% of the surveyed households have electricity bill arrears. Comparing arrears with the size of households, it has been established that households with more than four persons on average have less arrears for the electricity consumption than households with up to three persons (Figure 6).

In approximately two thirds of the households surveyed, the use of solid fuels (wood and coal) is a dominant source of household heating, where firewood is the most represented fuel, used by 66% of the households. Even though over one half of the households have individual central heating, as much as 36% of the homes are still heated by solid fuel stoves. On average, households spend RSD 5,800 (cca. EUR 48) monthly on electricity, with one third of them spending between RSD 5,000 and RSD 15,000 on electricity (cca. EUR 41 to 123).

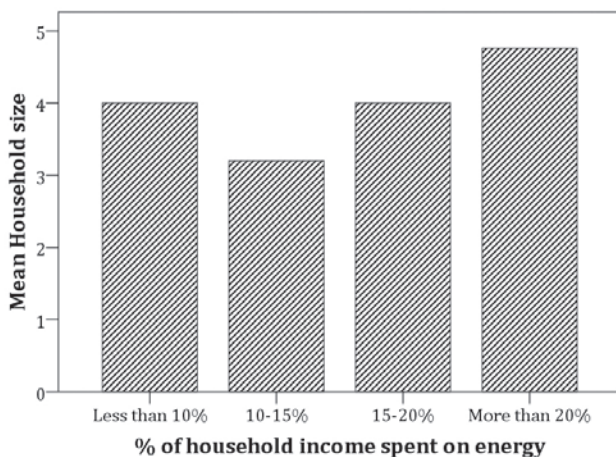


Figure 4. % household expenditure on energy compared to the household size (Source: authors)

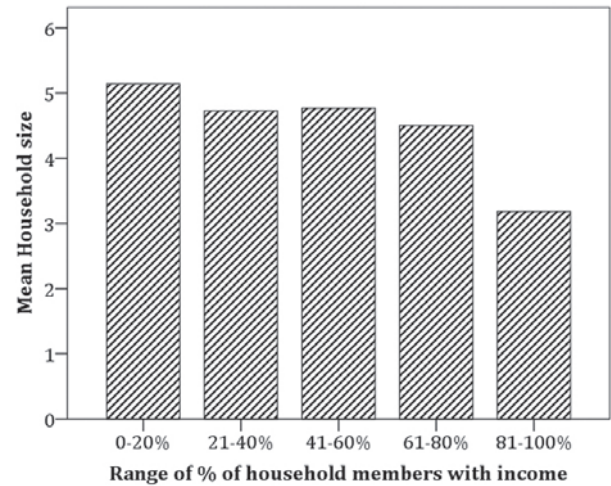


Figure 5. % persons who earn income compared to the household size (Source: authors)

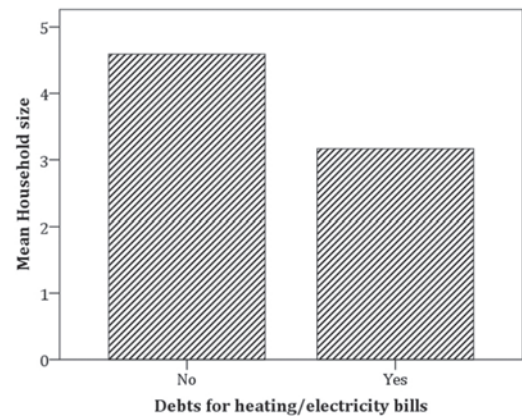


Figure 6. Electricity bills arrears compared to the household size (Source: authors)

The applied Chi-Square test has shown that there is no significant relation between heating systems and energy sources on one hand, and the cost of household electricity on the other. However, in the category of higher electricity costs (RSD 5,000-15,000) there are significantly less households using solid fuel and electricity stoves for heating than the houses with individual central heating or apartment-contained central heating. The data prove that the usage of cheaper firewood and traditional heating systems, as well as electric thermal storage heaters, at favorable night rates still represents the most available and economical type of heating in Kaluderica.

The analysis of the general energy characteristics of housing stock indicates a relatively low level of energy efficiency of residential buildings, mainly due to the lack of financial resources of the residents for completing the construction of their houses (Bajić and Petrić, 2015). Approximately two thirds of the houses are detached and almost square-shaped at the base, while the majority of the houses have sloping roofs and attics that are in 28% of the cases used for dwelling. Unfinished roof, i.e. temporary roof structures are recorded in 12% of the houses. The finished facade is present at 56% of the houses, while the share of openings on the facade and unfinished facades of all the houses is 22% each. Customary thermal insulation of the finished facades is 5 cm thick

polystyrene. Additional measures of thermal insulation of the houses are applied in smaller portion, therefore thermal insulation of floors on the ground exists in only 40% of the houses, while only 26% of the houses have roof heat insulation.

The Chi-Square test applied to measure the extent of the influence of thermal insulation used for the facade on household electricity expenditure, as well as on the share of energy consumption in relation to income earned, has proved that there are no significant relations between these category variables. However, it is interesting to note that households living in the residences with partially finished thermal insulation or in non-insulated homes, generally incur lower electricity costs (up to RSD 5,000), while the households in thermally insulated houses incur higher costs (RSD 5,000 – 15,000). This can be explained by the obtained results that the households which live in houses with partial thermal insulation or without insulation of the facade, use in vast majority wood as a primary source of heating (86%) alongside with coal (9%). Moreover, out of all the households which spend over 20% of their income on energy, as much as 66.7% live in thermally insulated houses, whilst in the category of households which spend less than 20% of their

income on energy, the houses with unfinished thermal insulation are predominant. At the same time, around one half of the households living in thermally non-insulated houses spend more than 20% of their income on energy.

The data on thermal comfort also indicate that less than one third of the surveyed households heat the entire living area during the heating season, whereby more than 70% of them live in a house with average net usable space of 100m². Approximately 28% of the households living in the house with average net usable space of 100m² heat up to 50% of this area. Around 50% of the respondents expressed that they were satisfied with the thermal comfort in their homes during winter months, 44% of the respondents were only partially satisfied, while 6% of the respondents were not satisfied. They cited unfinished facade and roof, as well as decrepit windows as the main reasons for their dissatisfaction.

The applied Chi-Square test has found a significant relation between the existence of thermal insulation and satisfaction with thermal comfort in homes (either flats or houses), i.e. that there is a significantly higher percentage of those who are satisfied with the indoor air temperature whilst having thermal insulation of facade (64.3%), compared to the

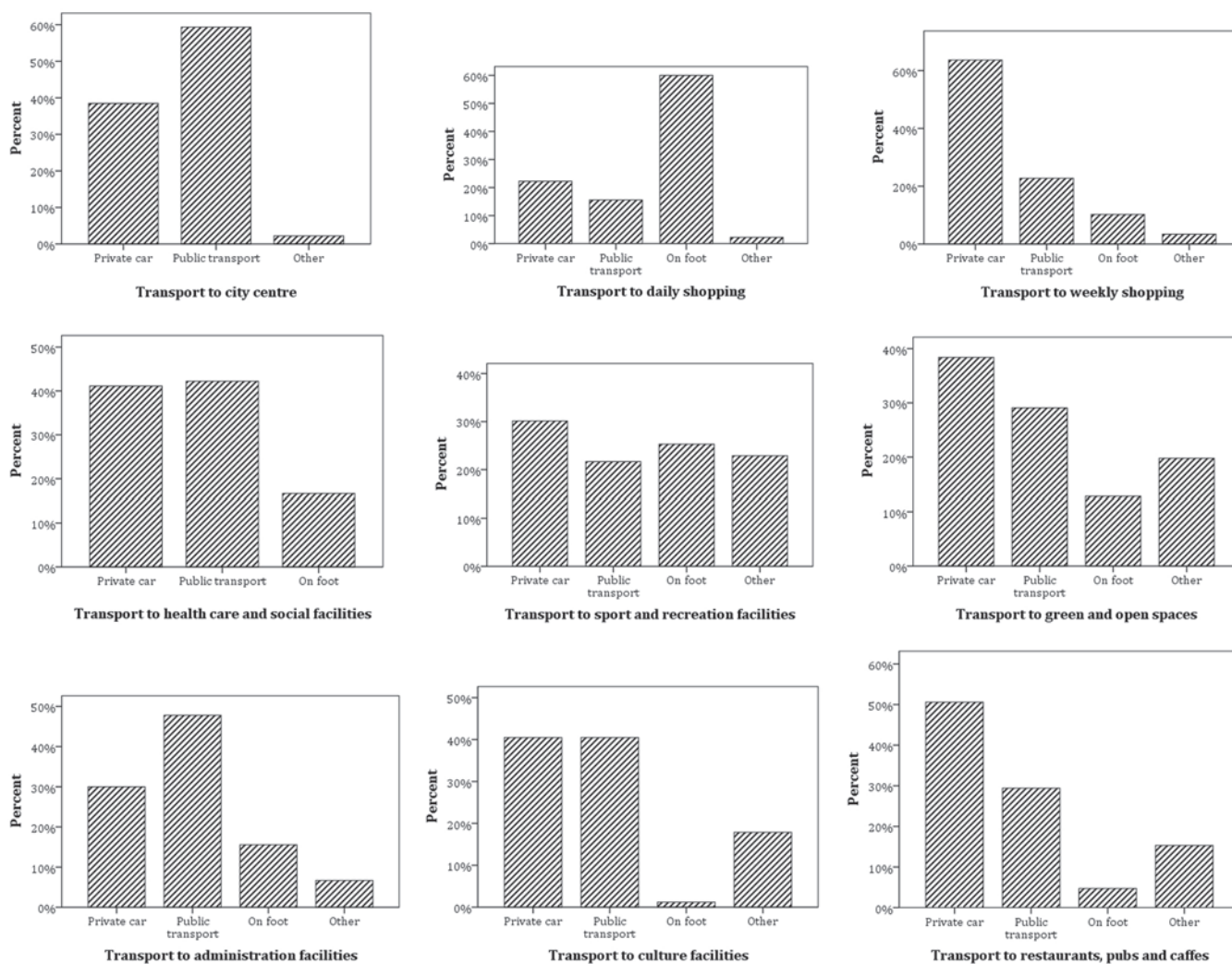


Figure 7. Means of transportation of the inhabitants of Kaluderica as per the type of activity (Source: authors)

percentage of the respondents without thermal insulation or with partial facade thermal insulation (31.8%). It has also been established that the satisfaction with thermal comfort is increasingly higher in the households which heat from 50% to 100% of the living space than in the ones heating less than one half of the living space (80% versus 20%), as well as that the satisfaction is higher in the households heated by the central heating or apartment contained heating systems than in the households using solid fuel and electricity for heating (64% versus 36%).

Factors of transportation fuel expenditure

The survey results show that, even though the residents of Kaluderica mostly travel by public transport, as many as 70% of the surveyed households regularly use cars, thus incurring monthly fuel costs of around RSD 10,000 (cca. 82 EUR), which is four times the city average.

The lack of public infrastructure and amenities along with poor traffic connections of the settlement with the local public transport network highly influence the significant expenditure on the use of private cars as means of transportation in dealing with residents' everyday activities (Figure 7). The average distance 34% of the respondents cover while performing their daily activities ranges from 6 to 10 km, while 9% of the respondents daily cover the distance greater than 21 km (Figure 8).

Public transport is primarily used for travelling to the city center (around 60%), visiting Community Health Center and other social (42%) and administrative facilities (4%).

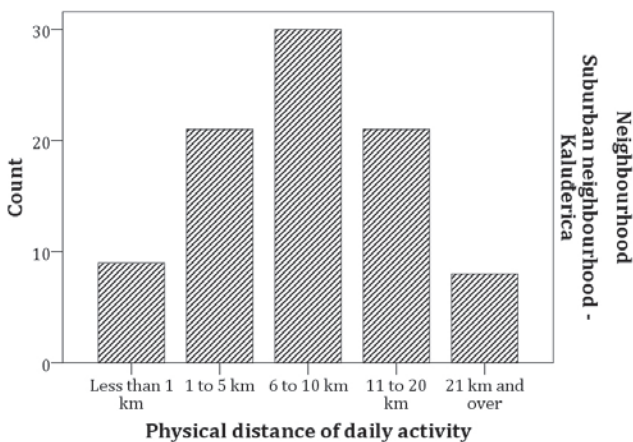


Figure 8. Average distance covered while performing daily activities in Kaluderica (Source: authors)

On the other hand, the usage of individual car transport is predominant in large scale weekly shopping for supplies (64%), use of sports and recreational facilities (30%), green areas and open spaces (38%), and restaurants, pubs and cafes (51%). Both means of transportation are used in equal share when visiting cultural facilities (around 40%). Walking is predominant for everyday shopping, although in this case around 22% of the respondents also use car as means of transportation, which shows inadequate accessibility and spatial distribution of large supermarkets in the settlement.

Perception on housing and environmental quality

The survey of the inhabitants' perceptions on the overall housing commodities of Kaluderica suburban settlement showed that most of the respondents expressed relative and absolute satisfaction (42%), mainly due to the following: favorable position of Kaluderica, which is secluded from the city and noise; good transport; ownership of the land and arable land for cultivation. As many as 30% of the respondents expressed neutral stand and indifference with regard to this topic, noting that in today's Kaluderica "it is, nevertheless, better than it was" and that despite deficiencies in infrastructure, there was a certain degree of satisfaction due to relatively close position of institutions and facilities. On the other hand, 28% of the respondents were not satisfied with the overall amenities of living in the settlement, stating as key reasons the lack of activities for the youth, few cultural and sporting events, narrow streets and other infrastructure issues. Out of the seven advantages offered in the survey, the respondents marked the highest satisfaction with well-organized public transportation (74%), good neighbors (68%) and favorable location of Kaluderica (60%), while by far the largest dissatisfaction was with the environmental quality and the level of hygiene (76%) (Figure 9).

The most common sources of pollution include: incomplete and inadequately developed draining and sewage networks in the settlement; Kaluderica stream flowing through the settlement, which represents a burning issue because it is contaminated by the inflow of faecal matter making it a source of disease spread; unsuitable waste disposal – irregular transport of waste, insufficient number of garbage bins and containers and their inadequate arrangement, burning of waste; air pollution, especially during the winter due to private boiler rooms; the vicinity of the solid waste landfill site at Vinča; and the like.

The results of a conducted survey on the inhabitants' attachment to this settlement additionally attests to the

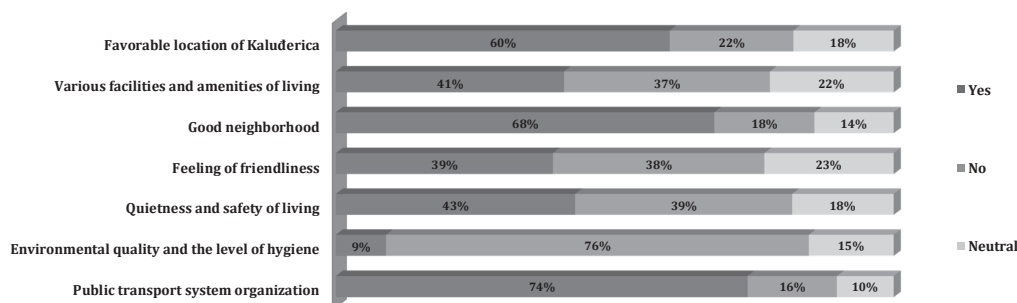


Figure 9. Satisfaction with the amenities in Kaluderica (Source: Petrić and Bajić, 2015)

perception of the quality of housing in Kaluderica, whereby around 60% of the respondents said they would move to a more urban part of the city, provided they had the means to do it.

CONCLUSIONS

This paper analyses the influence of spatial and urban issues of the informal suburban development in Serbia on certain aspects of the inhabitants' deprivation in these areas. As a specific indicator of housing and material deprivation in informal settlements, the risk of fuel poverty has been examined, taking into consideration a low level of energy efficiency of the housing facilities, the lack of efficient heating systems, higher transportation costs, as well as a significant share of the households with lower income. The Survey on Fuel Poverty directly addressed the indicators of this phenomenon, while the Survey on Residential Preferences included the indicators of the population's perceptions on housing amenities of the settlement, especially the ones relevant for the aspect of deprivation in relation to the housing environment. The assumption of households' vulnerability to fuel poverty has been confirmed in Kaluderica, since 66% of its households spend over 20% of their monthly income on energy and transportation (Bajić and Petrić, 2015).

The research results show that spatial and urban factors have a significant influence on the transport expenditure, while on the other hand they have a limited influence on energy expenditure of the household. The lack of public and commercial amenities in Kaluderica increases the need for inhabitants to use private cars, especially for weekly shopping, sports and recreation, use of green and open spaces, and to reach restaurants, pubs and cafes and cultural facilities. This need is certainly emphasized by an inadequate coverage of the public transportation network, i.e. by a considerable distance of the newly built parts of the settlement from the nearest bus stops. Applied statistical analyses established that heating systems and energy efficiency characteristics of the buildings, primarily in terms of the applied thermal insulation, had no relevant influence on the household electricity expenditure, nor on the share of electricity costs compared to household income. However, it has been noted that the households living in unfinished homes and using solid fuel stoves, often combined with electric thermal storage heaters, have significantly lower expenditures and set aside a smaller share of their income for energy than the households living in thermally insulated houses heated by the central heating systems. On the other hand, it has been proved that these two variables influence thermal comfort to a significant degree, i.e. that satisfaction with the air temperature in flats or houses is much higher with the respondents living in houses with thermal insulation or with the central heating system, which is directly linked to the possibility of heating larger living spaces during the heating season. These findings imply that for many households in Kaluderica facing the issue of fuel poverty means recouring to risky methods of energy saving, i.e. the reduction of living space to be heated and the usage of cheaper and lower quality fuel for heating, which besides inadequate thermal comfort, also involves a high risk on the health of the inhabitants (UNDP, 2004).

Electricity bills in arrears have not been recorded, but there is a possibility that the respondents have not been completely honest in presenting possible financial issues. In this, as well as in other indicators of fuel poverty, we should bear in mind a limited sample of the surveyed households as a potential restriction in determining the relevance of the obtained results.

Based on the respondents' perceptions on the overall living and housing amenities, low hygiene levels and environment protection recognized as important factors of the housing deprivation have been singled out as key factors of dissatisfaction with the housing neighborhood. This is another crucial indicator of the current state of urban sprawl in Serbia, where living on the outskirts does not imply achieving a "higher" quality of life in a natural, unpolluted environment.

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