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DEMOGRAPHIC AND SOCIOECONOMIC CHARACTERISTICS OF HOUSEHOLDS AND ENERGY POVERTY IN SERBIA

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Abstract: Energy issues and energy poverty became very important when dealing with global development challenges and sustainable development agenda, and as the years pass more precise indicators are formed to follow this phenomenon from various perspectives. One way to follow and analyze energy poverty is through the indicators proposed by the European Commission and the Survey on Income and Living Conditions (EU-SILC). Based on the main EU-SILC indicators for Serbia for 2020, this analysis explored a relationship between energy poverty and household income disaggregated by available data about regions, degree of urbanization, household types, and sex-age structure. It also tended to position Serbia within the European context regarding energy poverty. Based on the available data, it was found that people living in thinly populated areas expressed a higher share of vulnerabilities than those living in densely populated areas. Also, persons at risk of poverty are more vulnerable than the total population. When it comes to household types, people living in a single-person household are the most vulnerable, followed by the single-parent household with dependent children.

Keywords: households, energy poverty, EU-SILC, Serbia, regional analysis

Apstrakt: Pitanja vezana za energiju i energetsko siromaštvo su postala veoma važna u kontekstu globalnih razvojnih izazova i održivog razvoja, a kako godine prolaze, sve precizniji indikatori se razvijaju kako bi se fenomen energetskog siromaštva pratio iz različitih perspektiva. Jedan od načina za praćenje i analizu energetskog siromaštva jeste kroz indikatore koje je predložila Evropska komisija i mogu se pronaći u Anketi o prihodima i uslovima života (EU-SILC). Na osnovu glavnih EU-SILC indikatora za Srbiju za 2020. godinu, ova analiza je istražila odnos između energetskog siromaštva i dohotka domaćinstava, razdvojenih prema dostupnim podacima prema regionima, stepenu urbanizacije, tipovima domaćinstava, polu i starosti. Pored toga, prikupljeni i izračunati podaci imali su tendenciju da pozicioniraju Srbiju u evropskom kontekstu u pogledu energetskog siromaštva. Na osnovu podataka za 2020. godinu, izračunato je da stanovništvo koje živi u područjima male gustine naseljenosti ima veći udeo ranjivosti od onih iz gusto naseljenih područja, a takođe je ranjiva i populacija koja se nalazi u riziku siromaštva. Kada su u pitanju tipovi domaćinstava, najugroženiji su ljudi koji žive u jednočlanim domaćinstvima, a zatim samohrani roditelji sa izdržavanom decom.

Ključne reči: domaćinstva, energetsko siromaštvo, EU-SILC, Srbija, regionalna analiza

INTRODUCTION

Addressing the energy issues in the last couple of decades has become central to dealing with many global development challenges. Regarding the international development agenda, the question of energy efficiency has been recognized in Millenium Development Goals (MDGs), within goal number seven: Ensure environmental sustainability (United Nations, 2014). The relationship between energy and MDGs has been discussed in various literature (Modi et al., 2005; Nussbaumer et al., 2012), with the idea that energy services are a key to achieving economic and social development and access to them are essential in achieving all eight MDGs. The 2030 Agenda for Sustainable Development, adopted in 2015, replaced the Millennium Development Goals, and instead of eight, it defined 17 goals that contain indicators for monitoring progress in achieving the Sustainable Development Goals by 2030. This Agenda envisages that by 2030 a world will be created in "which people have universal access to affordable, reliable, sustainable and modern energy services "(United Nations, 2015).

At the heart of the story of sustainable development and affordability, there is also the issue of the level of energy consumption that cannot meet the population's basic needs, and the term coined to explain this situation is usually called "energy poverty" (González-Eguino, 2015). This phenomenon usually withdraws social, economic, infrastructural, educational and health concerns (Bouzarovski & Petrova, 2015), indicating its high complexity and many factors influencing its occurrence and scope. Some of the factors usually associated with energy poverty are low income, unavailability of specific energy sources, high energy costs, lack of energy-efficient equipment, as well as the failure of public policies that should address this issue (European Commission et al., 2022).

Throughout history, "energy poverty" and "fuel poverty" have often appeared as synonyms in academic circles and debates. However, some studies claim that they are not and that the term "fuel poverty" (which dates back to the late 1970s) is mentioned exclusively in the context of supplying energy to the household, and the concept has been greatly surpassed and expanded (Bouzarovski & Petrova, 2015). The term "energy justice" has also been used in the literature to explain the conditions related to energy needs, the right to sustainable, affordable and secure energy for all, and is related to taking into account all of the issues, from production and distribution to ethical consumption and government regulation (Hernández, 2015). As a result of a large number of influencing factors on the one hand, as well as the observation of this phenomenon from different angles and perspectives on the other, the formal definition of energy poverty, which is common to the member states of the European Union, does not exist. To date, energy

poverty usually refers to "the impossibility of providing adequate heating in the household" (Thomson & Bouzarovski, 2018).

In October 2020, the European Commission adopted "Recommendations on energy poverty", which contain measures that member states should undertake to solve the problem of energy poverty, as well as proposals for indicators to monitor the various dimensions of energy poverty. The Recommendations also state that the member states should evaluate the number of households in a state of energy poverty in their National Energy and Climate Plans (NECP), and if it is shown that the country has a large number of those households, it should propose and set concrete measures and strategies for fighting energy poverty (European Commission, 2020a). It is essential to note that these Recommendations are a part of the broader development strategy of the European Union - the European Green Deal. The European Green Deal contains a set of measures and policies that should transform the EU countries into sustainable and carbon neutral by 2050, with the idea that no one is left out of this idea (European Commission, 2019).

In November 2020, Serbia, together with the other Western Balkans economies, signed the Sofia Declaration, thereby accepting the Green Agenda for the Western Balkans and committing to the implementation of a series of measures provided for in the European Green Deal (European Commission, 2020c). The first pillar (out of five) of the Green Agenda for the Western Balkans, which deals with the issue of climate, energy and mobility, states the goal that the signatory economies will work towards achieving carbon neutrality by 2050 and one of the actions towards achieving the energy transition includes developing programs for addressing energy poverty (Regional Cooperation Council, 2020).

The energy poverty concept is interlinked with broader concepts of material and social deprivation and poverty, where household income could be a key variable (European Commission et al., 2022). Having that in mind, it could be assumed that the population at risk of poverty[1], or materially and socially deprived, has a higher probability of being energetically poor. A study based on the Survey on Income and Living Conditions for Serbia identified a few groups that are the most vulnerable: people living in a single-person household, single parents with children, families with two or more children, and older women living in a single person-households (Matković et al., 2015).

[1] At risk of poverty rate includes the share of people with an equivalised disposable income below the at-risk-of-poverty threshold, which is set at 60 % of the national median equivalised disposable income after social transfers (Eurostat, 2022).

METHODOLOGY

This paper's main idea is to identify households at the greatest risk of energy poverty based on the selected socioeconomic indicators available in the Survey on Income and Living Conditions (EU- SILC). As mentioned above, the European Commission Recommendations on energy poverty contain indicators that should enable efficient monitoring of energy poverty at the level of the European territory (European Commission, 2020b). These indicators are analyzed more recently within the Report prepared by the Energy Poverty Advisory Hub (EPAH), and this analysis uses those indicators with the proposed disaggregation (Energy Poverty Advisory Hub, 2022).

The focus is on the in-depth analysis of the three indicators based on the microdata from the EU-SILC for 2020 and the Statistical Office of the EU (EUROSTAT) database. The indicators are extracted from the survey questions and are related to the ability of a household to keep the home adequately warm, arrears on utility bills and share of the population with leaks, dampness, or rot in their dwelling. All the data are disaggregated by age groups, sex, type of households, degree of urbanization[2], and regions of Serbia (NUTS 1[3]), and where possible, the data for Serbia were compared with other EU countries.

The following hypotheses were tested through the descriptive and comparative analysis:

H1: Elderly households are at a higher risk of energy poverty; and

H2: Households from rural areas have a higher risk of experiencing energy poverty.

RESULTS

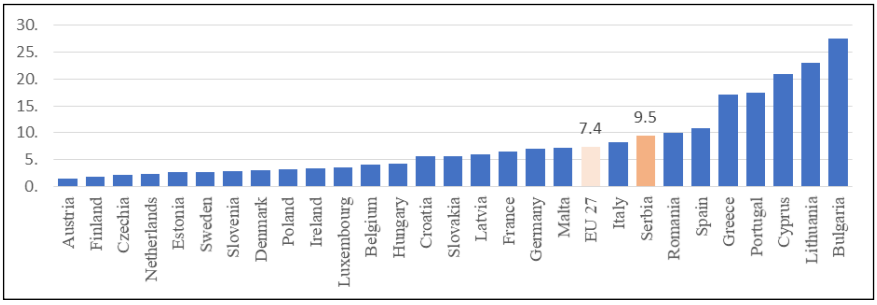
Regarding the ability of households to keep their home adequately warm, there was a notable difference between EU countries and Serbia in 2020. (Figure 1). Regarding the total population, Serbia had a higher share of the population who could not keep their home adequately warm than the EU countries (9,5% compared to 7,4%). Countries with higher shares of the population than Serbia when it comes to this indicator were Greece (17,1%), Portugal (17,5%), Cyprus (20,9%), Lithuania (23,1%), and Bulgaria (27,5%) (Eurostat, 2021b). As expected for the population at risk of poverty in 2020, a larger percentage of people from this group could not afford adequate

[2] The degree of urbanisation classificates all of the local administrative unites into three categories: cities (densely populated areas), towns and suburbs (intermediate areas) and rural areas (thinly populated areas) (Eurostat, 2018)

[3] Serbia – North and Serbia - South

heating (26,2%), which was 8,4 percentage points (pp) higher than the EU average. On the other hand, Serbia's position in this category was worse than for the total population level, and Lithuania, Portugal, Greece, Cyprus and Bulgaria had higher rates than Serbia (Eurostat, 2021b).

Figure 1. Share (%) of the population unable to keep home adequately warm in 2020, EU-SILC



A more detailed picture of this indicator for Serbia can be seen in the following tables (Table 1 and Table 2):

Table 1. Share of Serbian population unable to keep home adequately warm, by disaggregation types in 2020, EU-SILC

Category	Disaggregation	2020
Region	Serbia - North	11,7
	Serbia - South	7,2
Degree of urbanization	Densely populated area	7,2
	Intermediate area	11,4
	Thinly populated area	10,2
Income situation concerning the risk of poverty threshold	Below 60% of the median equivalised income	26,2
	Above 60% of the median equivalised income	4,8

Source: Author's calculation

Based on the tables above, it can be noticed that the inability to heat the apartment adequately increases considerably if the person is at risk of poverty. The population living in the Serbian North declared that they could not keep their home adequately warm (11,7% compared to 7,2%). Regarding the degree of urbanization, those living in densely populated areas declared less that they could not keep their home adequately warm compared to those living in intermediately and thinly populated areas.

Table 2. Share (%) of the population unable to keep home adequately warm, by the type of households and income

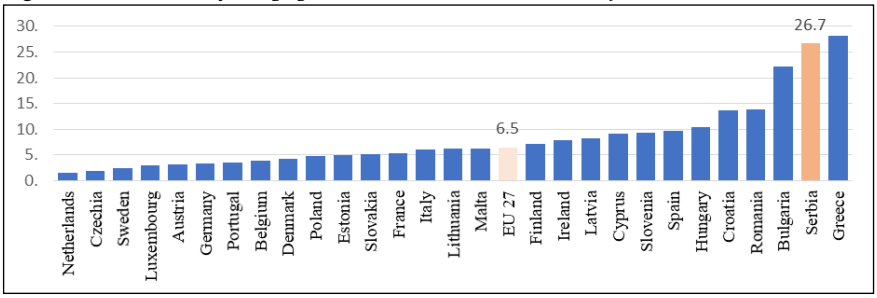
Type of household	Total population	Population at-risk-of-poverty
One adult younger than 65 years	21,9	42,2
Single female	17,5	29,3
Single person	16,5	32,7
Single females older than 65 years	15,2	24,7
Single male	15,1	38,7
A single person with dependent children	14,5	40,5
One adult older than 65 years	13,4	26,3
Two adults younger than 65 years	12,8	30,3
Households without dependent children	11	28,2
Two adults	10,4	28,5
Single males older than 65 years	9,2	31,5
Two adults, at least one aged 65 years or over	9,1	27,3
Households with dependent children	8,2	24,6
Two adults with two dependent children	4,5	15,3

Source: (Eurostat, 2021b) and author's calculation

When it comes to the type of household, it can be seen that single-member households in the total population and at risk of poverty were the ones with a problem with adequate apartment heating. A notable share was also found in households with single parents with children. Table 2. shows that among the population at risk of poverty, the share of single male households unable to heat their homes adequately was higher than that of single female households, while in the general population, it was the opposite.

The second indicator in this analysis is related to arrears on utility bills. The share of the population that was late in paying bills for communal services can be seen in Figure 2. According to this indicator, Serbia was among the three countries with the highest rates (26,7% of the total population and 43,8% of the population at risk of poverty) (Eurostat, 2021a). Compared with the average of EU countries, this rate was higher in Serbia by 20,2 pp for the total population and 28 pp for the population at risk of poverty.

Figure 2. Share (%) of the population with arrears on utility bills in 2020, EU-SILC



As for the previous indicators, a more detailed picture of the indicator for Serbia can be seen in the following tables (Table 3 and Table 4).

Table 3. Share of Serbian population with arrears on utility bills, by disaggregation types in 2020, EU-SILC

Category	Disaggregation	2020
Region	Serbia - North	20,3
	Serbia - South	33,4
Degree of urbanization	Densely populated area	21
	Intermediate area	25,5
	Thinly populated area	32,6
Income situation concerning the risk of poverty threshold	Below 60% of the median equivalised income	43,8
	Above 60% of the median equivalised income	21,9

Source: Author's calculation

It can be noticed that, when it comes to arrears on utility bills, there was a higher share of people living in the Serbian South region in comparison to the Serbian North (33,4% compared to 20,3%). Regarding the degree of urbanization, there was a much higher share of people living in thingy populated areas than in densely populated arrears. Notably, a higher share of people with arrears on utility bills was at risk of poverty in 2020. Additionally, based on household type data, it can be noticed that the older population usually has fewer arrears on utility bills, and the ones with the highest share were people living in single-person households younger than 65 years.

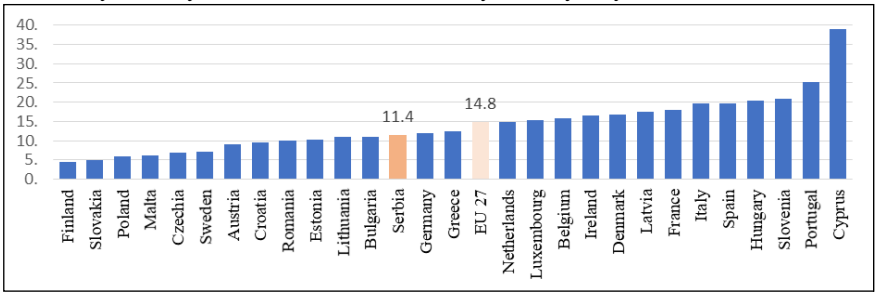
Table 4. Share (%) of the population with arrears on utility bills by the type of households and income

Type of household	Total population	Population at-risk-of-poverty
One adult younger than 65 years	36,8	54,6
A single person with dependent children	35,1	54,2
Two adults younger than 65 years	31,1	50,8
Single male	29,5	45,9
Households with dependent children	28,6	45,9
Two adults with two dependent children	27,5	49,3
Households without dependent children	24,4	41,2
Two adults	23,2	40,8
Single person	22,7	43,8
Single males older than 65 years	20,1	31,3
Two adults, at least one aged 65 years or over	19	34,4
Single female	18	29,6
One adult older than 65 years	14,9	22,7
Single females older than 65 years	12,7	20,1

Source: (Eurostat, 2021b) and author's calculation

Finally, the last indicator in this analysis relates to the population living in a dwelling with a leaking roof, damp walls, floors or foundation, or rot in window frames of the floor (Figure 2). According to this indicator, Serbia in 2020 was precisely in the middle - half of the countries had a higher share of residents living in an apartment with a leaking roof, dampness or rotting, and half had a lower share (with a share of 11,4%). The situation was similar to the share of persons at risk of poverty (with a share of 21,6%) (Eurostat, 2021c).

Figure 3. Share (%) of the population living in a dwelling with a leaking roof, damp walls, floors or foundation, or rot in window frames of the floor 2020, EU-SILC



A more detailed picture of this indicator for Serbia can be seen in the following tables (Table 5 and Table 6).

Table 5. Share of Serbian population living in a dwelling with a leaking roof, damp walls, floors or foundation, or rot in window frames of the floor, by disaggregation types in 2020, EU-SILC

Category	Disaggregation	2020
Region	Serbia - North	16,1
	Serbia - South	6,4
Degree of urbanization	Densely populated area	11
	Intermediate area	10,4
	Thinly populated area	12,4
Income situation concerning the risk of poverty threshold	Below 60% of the median equivalised income	21,5
	Above 60% of the median equivalised income	8,5

Source: Author's calculation

Table 6. Share (%) of the population living in a dwelling with a leaking roof, damp walls, floors or foundation, or rot in window frames of the floor, by household types in 2020, EU-SILC

Type of household	Total population	Population at-risk-of-poverty
Single females older than 65 years	20,7	26,3
One adult older than 65 years	19,5	27,3
Single female	19,4	26,2
Single person	18,9	27
One adult younger than 65 years	17,8	26,2
Single male	17,3	28,3
Single males older than 65 years	16,7	30,6
Two adults younger than 65 years	14,4	21,7
Two adults	12,6	18,5

Source: Author's calculation

Regarding this indicator, a higher share of people living in the Serbian North reported living in a dwelling with a leaking roof, damp walls, floors or foundation, or rotting window frames (16,1% compared to 6,4%). There was not a high difference within the degree of urbanization category, and as expected, those at risk of poverty made a higher share than the total population. Regarding the calculated shares for some household types, it can be noted that older population living in a single-person household reported a higher share.

DISCUSSION

In comparison to the EU countries and based on the analyzed indicators, it can be noticed that Serbia is one of the most vulnerable countries regarding energy poverty. However, before the conclusion, it is worth mentioning that some results should be interpreted cautiously. The indicator of arrears on utility bills should represent the household's ability to pay for energy services, but in reality, it does not catch a lot about actual energy needs. For example, Lithuania and Portugal reported a high portion of people unable to keep their homes adequately warm but a low share of persons who had arrears on utility bills. As discussed in a study (Cong et al., 2022), that could indicate the underconsumption of households who express energy-limiting behaviour in that manner, which enables them to satisfy some more critical basic needs. On the other hand, households could be engaged in overconsumption of energy services because of the higher energy needs and poor energy performance of their households (Energy Poverty Advisory Hub, 2022). The analysis of material deprivation indicators suggested that a higher share of arrears on utility bills may result from negligence rather than a problematic income situation (Matković et al., 2015). The confirmation of this claim in the Serbian context can be seen in the fact that a high share of persons who were not at risk of poverty was also late in paying their bills (Figure 2).

It can be potentially discussed that the other two indicators also have limitations. For instance, all the questions are given on a yes/no scale, leaving no space for further interpretation and exploration of the intensity of the indicators. In terms of keeping homes adequately warm, people could have a subjective interpretation of what the term "adequately warm" means (Energy Poverty Advisory Hub, 2022). The question about living in a dwelling with a leaking roof, damp walls, floors or foundation, or rot in the floor's window frames could also be subject to subjectiveness and not give enough information about energy poverty, but rather energy efficiency. The literature has discussed that a follow-up question about the intensity formed in a Likert scale[4] could help determine the severity of energy poverty based on the EU-SILC database. All of the abovementioned indicates that interpretation of the results should be made with respect to the nationally specific context.

[4] Type of a rating scale used for measuring attitudes or opinions (usually with five items, where the first indicates strongly disagreeing and the fifth strongly agreeing with the claim)

With the Law on Energy Efficiency and Rational Use of Energy, passed in 2021, Serbia set the primary goal of "*creating conditions for efficient use of energy and improving energy efficiency*" (which would contribute, among other things, to the reduction of energy poverty). The law defines energy poverty as "the result of a combination of low household income, high consumption of available income on energy and insufficient energy efficiency" (Government of the Republic of Serbia, 2021a). One of the things that come out of the results is that energy efficiency measures and social policy measures should be interlinked and aligned with one another. In that manner, Serbia has recognized the concept of "energetically vulnerable customers" and defined them through the Law on Energy and the Regulation (Government of the Republic of Serbia, 2021b, 2021c). Households that gain the status of energetically vulnerable customers have the right to have their energy bills reduced. In 2019, most people who gained this status lived in single-person households, with a significantly higher portion of women. After that, households of four members had the highest share of people eligible to have reduced energy bills (RES foundation, 2021).

It could be discussed that this measure, although helpful, does not contribute to reducing energy poverty. Some of the other important social policy measures mentioned in the literature that are considered effective in reducing energy poverty are subventions for heating costs, subsidized loans for improving the performance of residential buildings and other types of support for poor and vulnerable households (Petovar, 2022). In that way, financial aid directed towards paying the bills for energetically vulnerable customers would be redirected towards improving the energy efficiency of those households.

CONCLUSION

Analyzing the three selected EU-SILC indicators of energy poverty has revealed that certain groups are more vulnerable than others. Based on the analysis in the previous chapters, it can be concluded that both starting hypotheses can be confirmed – elderly households are at a higher risk of energy poverty, together with persons living in rural areas.

Without any doubt, persons at risk of poverty, or in other words, persons whose income was below 60% of the median equivalised income, are more vulnerable and unable to live in energy-efficient and adequately warm households. Regarding household types, people living in a single-person household in general and in all categories (regarding sex and age) were the

most vulnerable when it came to energy poverty, followed by single parents with dependent children within the household. In that context, household types had larger differences rather than differences by sex and age.

When comparing the Serbian North and Serbian South regions, the results are inconclusive, and further reading is needed to understand the differences more. For two indicators, inability to keep the home adequately warm and living in a dwelling with a leaking roof, damp walls, floors or foundation, or rot in window frames of the floor, people living in the northern part of Serbia expressed a higher share, whereas more people from the southern part of Serbia had the issues of paying their utility bills on time. On the other hand, according to the degree of urbanization, people living in thinly populated areas expressed more vulnerabilities than those living in highly dense areas.

One of the vital missing data for the analysis and overall understanding of energy poverty and energy efficiency is related to the appliances used for heating, as non of the national surveys is not following that area. Also, there are no available data for the local level, which significantly limited this analysis. Despite that, based on the analysis, it can be concluded that there is a clear linkage between energy poverty, material and social deprivation and risk of poverty, regarding all three observed energy poverty indicators in Serbia.

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DEMOGRAFSKE I SOCIOEKONOMSKE KARAKTERISTIKE DOMAĆINSTAVA I ENERGETSKO SIROMAŠTVO U SRBIJI

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REZIME

Pitanja vezana za energiju i energetsko siromaštvo su postala veoma važni u kontekstu globalnih razvojnih izazova i održivog razvoja, a kako godine prolaze, sve precizniji indikatori se razvijaju kako bi se fenomen energetskog siromaštva pratio iz različitih perspektiva. Jedan od načina za praćenje i analizu energetskog siromaštva jeste kroz indikatore koje je predložila Evropska komisija i mogu se pronaći u Anketi o prihodima i uslovima života (EU-SILC). Ova analiza je bila prevashodno fokusirana na indikatore koji se tiču mogućnosti da se priušti adekvatno zagrevanje doma, kašnjenja u izmirenju računa za komunalne usluge, kao i života u stanu sa krovom koji prokišnjava, vlagom ili truljenjem u svom stanu, koji su izračunati kako za ukupnu populaciju, tako i za stanovništvo koje se nalazi u riziku od siromaštva, tj. lica čiji je ekvivalentni dohodak manji od 60% medijane ekvivalentnog dohotka. Na osnovu izabranih EU-SILC indikatora za Srbiju za 2020. godinu, ova analiza je osvetlila odnos između energetskog siromaštva i dohotka domaćinstava, posmatranih prema dostupnim podacima o stepenu urbanizacije, tipovima domaćinstava, regionu, polu i starosti. Cilj ovog rada bio je da se identifikuju domaćinstva koja su u najvećem riziku od energetskog siromaštva, uz polazne hipoteze da su staračka domaćinstva ona koja su najugroženija, kao i domaćinstva iz ruralnih područja. Pored toga, podaci su prikupljeni i izračunati sa namerom da pozicioniraju Srbiju u evropskom

kontekstu u pogledu energetskog siromaštva. Na osnovu podataka za 2020. godinu, utvrđeno je da stanovništvo koje živi u područjima male gustine naseljenosti ima veći udeo ranjivosti od onih iz gusto naseljenih područja, a takođe je ranjiva i populacija koja se nalazi u od riziku siromaštva. Kada su u pitanju tipovi domaćinstava, najugroženija su lica koja žive u jednočlanim domaćinstvima i to najpre jednočlanim staračkim domaćinstvima. U ukupnoj populaciji, u 2020. godini su bile ugroženije žene stare 65 i više godina koje žive u jednočlanim domaćinstvima kod dva od tri indikatora, dok kada je reč o populaciji koja se nalazi u riziku siromaštva, muškarci stari 65 i više godina koji žive u jednočlanim domaćinstvima bili su ugroženiji od žena po osnovu sva tri analizirana indikatora.

Ključne reči: domaćinstva, energetsko siromaštvo, EU-SILC, Srbija, regionalna analiza.