ASSESSMENT OF THE AWARENESS AND KNOWLEDGE OF THE CITIZENS OF LISICHE ON AIR POLLUTION ISSUES

THE RESEARCH WAS CONDUCTED BY AGENCIJA RAITING

WITHIN THE PROJECT

TACKLING AIR POLLUTION IN THE CITY OF SKOPJE

November 2020, Skopje

Contents

This report is prepared by Agencija Raiting within the project Tackling Air Pollution in the City of Skopje, implemented by the United Nations Development Programme (UNDP) in partnership with the Ministry of Environment and Physical Planning and the City of Skopje. The project is funded by the Swedish International Development Cooperation Agency (SIDA). The views expressed in this document are those of the author and do not necessarily reflect the views of SIDA, UNDP or the other project partners.

1. INTRODUCTION AND RESEARCH GOALS

Healthy and clean environment is one of the fundamental conditions for quality life of all citizens. Quality life contributes a lot to the proper growth and development of the individual but also speaks to the values nurtured by society as a whole. Clean air is one of the main components in our country that has high values in recent decades. Air pollution in the country is a continuous and major problem that intensifies every year and in excessive scale and has its greatest rise during the winter months. Air pollution is the biggest cause of premature death and the increasing number of diseases in humans. In fact, air pollution is the greatest risk to human health in the field of the environment. Socio-economic factors directly influence air pollution to increase from year to year, and the situation is becoming alarming[1]. Certain analyzes of the emissions of pollutants for the household heating sector in the Skopje valley, showed an assumption that the pollution will increase by 30% by 2025 if urgent systemic measures are not taken to reduce emissions. Many stakeholders are involved in the fight against air pollution, like international organizations that act globally and locally, the state - primarily as a guarantor of the fundamental values of the Constitution[2], including the protection and promotion of the environment and nature, then civil society organizations, various associations and initiatives in this area, other interest groups, as well as citizens.
The main purpuse of this report is to make an analysis of three pre-targeted levels, i.e. target groups, which will be beneficiaries but also factors in implementation of the project Tackling Air Pollution in the City of Skopje[3] to address the problem of air pollution in the country. *The first target group* in the first survey are *retailers* selling heating devices, surveyed in the entire territory. The *second target group* are the *citizens of Lisiche*, a territory that is marked as a significant field of action by UNDP in this area. Finally, *the third target group* consists of the *civil society organizations in the country* that operate in the field of air pollution at the national level.
The results obtained from the conducted surveys, i.e. researches created databases through which it will be possible to analyze many different aspects, cause-effect relationships and factors in the field of air pollution.

For the needs of this project, Rating Agency conducted three surveys whose main goal was to make:

1. Assessment of retailers' technical knowledge about the products they offer in the market and retailers' perception of customers' purchasing decisions. Analysis of retailers' attitudes regarding possible solutions or practices to be adopted in order to increase the level of procurement of energy efficient heating devices and the like. Furthermore, the type of heating devices offered by authorized distributors and retailers, as well as an assessment of awareness of the sources and effects of air pollution.
2. Assessment of the awareness of the citizens in Lisiche about the sources and effects of air pollution and the impact of household heating practices on air pollution. Their willingness to invest in heating devices with higher energy efficiency, as well as assessment of the main motives and priorities that influence their decision when purchasing a heating device. Special attention will be given to the use of subsidies that have been used in recent years as a model

[1] Clear Air Plan/План за чист воздух, https://vlada.mk/PlanZaChistVozduh
[2] Constitution of the RM, Article 8, Fundamental values of the constitutional order, para. 10 the arrangement and humanization of space and the protection and promotion of the environment and nature
3 This survey is prepared within the project *Tackling Air Pollution in the City of Skopje*, implemented by the United Nations Development Programme (UNDP) in partnership with the Ministry of Environment and Physical Planning and the City of Skopje. The project is funded by the Swedish International Development Cooperation Agency (SIDA).

to encourage the purchase and sale of energy efficient heating devices, whose ultimate goal is to reduce air pollution.

3. Assessment of the awareness and perception of civil society organizations operating in the field of air pollution in the country, i.e. the perception of their founders, executives or management staff about air pollution sources. Knowledge of their capacities for dealing with complex problems such as air pollution, by creating partnerships and participation in constructive decision-making processes, as well as assessing the level of trust of civil society organizations in the organizations/institutions dealing with air pollution issues. Insight into the type and level of information that these organizations receive (through various communication channels) and opportunities for participation in decision-making processes and other topics.

The collected and analyzed data from these three surveys, as well as all relevant information that could later be used for the preparation of awareness raising activities and other related activities, preparation of various documents/models for the needs of UNDP North Macedonia, as well as proper implementation of strategic planning and decision-making processes will be presented in this report separately for each target group.

1.1 Research methodology

For the needs of each of these three surveys, Rating Agency followed the approach: creating a sample, creating a questionnaire, reporting on activities undertaken, data analysis and report writing.
As indicated above, three separate target groups are the subject of this research:

- The citizens of Lisiche;
- CSOs working in the field of air pollution (national level);
- Retailers selling heating devices (national level).

The research aimed at the citizens of Lisiche is quantitative, and was conducted by face-to-face method on a representative sample of 300 respondents.
The survey for retailers is also quantitative and was conducted with the primary method face-to-face on a representative sample of 100 respondents - representatives of the companies. For the quantitative studies, samples were created in accordance with the prepared methodology used to collect, analyze and present the findings and the appropriate data quality management plan.
Regarding the civil society organizations working in the field of air pollution, a qualitative research was conducted - 3 focus groups.
Additional constituent materials that support these surveys are statistical books in Excel format for both quantitative surveys, which show the general and cross-sectional results of the survey. Audio recordings are an integral part of the qualitative research for civil society organizations, which served to prepare an in-depth analysis of the participants' responses.

This version of the report presents the key findings from the analysis of the survey that was conducted on the citizens of Lisiche.

2. RESEARCHING CITIZENS OF LISICHE: RESULTS AND TOPIC ANALYSIS

Within the Second Biennial Report[4] on Climate Change, a study for analysis of the reduction of local pollution in the city of Skopje was prepared (Study for heating of the city of Skopje analysis of policies and measures - STUGRES). According to this study, by applying three measures in the city of Skopje (construction of energy efficient buildings, change of fuel and heating method and increased acceptance of central heating) an enormous reduction of PM10 and PM2.5 emissions from household heating can be achieved by about 60% in 2025 compared to emissions in 2015.

According to the air quality study[5] for the period 2005-2015 prepared with the support of the Finnish Meteorological Institute, the most critical pollutant in Skopje is the suspended particulate matter (PM), of which PM10 concentrations exceed the daily and annual limit values. According to the study, the air quality in Skopje has a seasonal trend, with concentrations of PM10 and PM2.5 higher during the heating season from October to April. The sector most responsible for PM emissions is household heating. Heating by burning wood contributes approximately up to 30% of the particle concentration. Furthermore, household air pollution from inefficient stoves could be expected to have a significant impact on women and children, depending on the hours spent indoors. According to the data from the regular measurements of the level of air pollution, Lisiche is one of the most polluted locations in Skopje and the Republic of North Macedonia. This is the reason why one of the target groups of this research is the area of individual residential buildings in Lisiche, as a suitable location for the planned interventions within the project.

The sample of 300 respondents on the territory of Lisiche was designed to representatively cover all households that were represented by a household member in charge of home investment, i.e. a person who is well acquainted with home investment or renovation plans. According to the demographic structure in the table below, it could be noticed that twice as many men as women are represented in the research and mostly older people, which is expected according to the sample selection method. According to the household income, it could be concluded that on the territory of Lisiche the residents are mostly families of lower social category. Over 50% of the surveyed households have an income of up to 30,000 MKD per month, which in practice means two minimum wages, an amount that is quite low for living on the territory of the city of Skopje. Additionally, 56% of households have 3 or more members, which means that their per capita income is below average. The funds they set aside for heating are not low at all. Thus, 59% of households pay between 2000 and 5000 MKD per month for heating and even 21.7% pay between 5000 and 8000 MKD. This leads to the conclusion that the heating cost is extremely high thing for these families if we calculate the percentage they pay for heating out of their total monthly income.

[4] Macedonian's Second Biennal Update Report on Climate Change – SBUR UNDP (2016–2017)
[5] Report on air quality assessment in the Republic of Macedonia for the period 2005-2015 http://air.moepp.gov.mk/wp-content/uploads/2017/07/AirQualityReport_MK.pdf

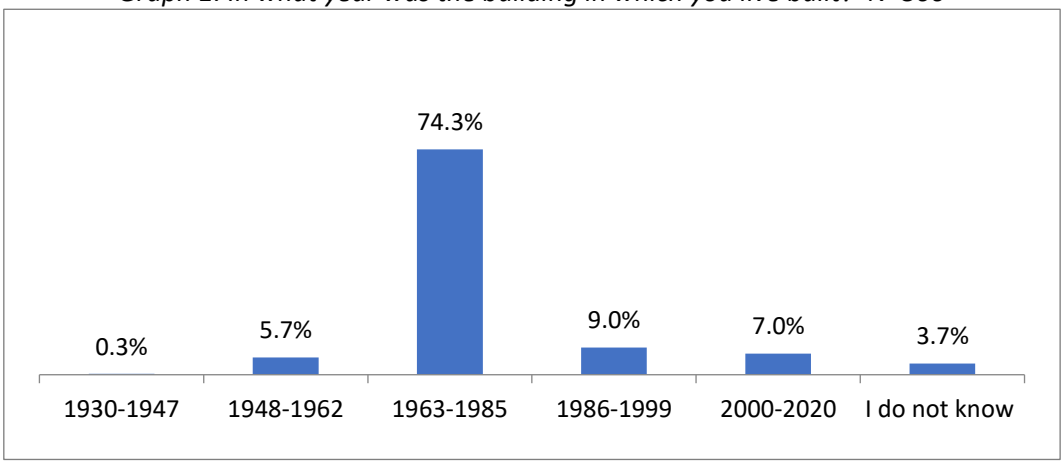
Table 1. ***Demography***		**%**
Gender	Male	62.0%
	Female	38.0%
Age	18-29	4.3%
	30-49	25.0%
	50-64	36.0%
	Over 65	34.7%
Ethnicity	Macedonian	96.0%
	Albanian	0.7%
	Other	3.3%
Education	Primary and less than primary	7.3%
	High	67.3%
	Secondary, University, M-r, PhD	25.3%
Employment or other status	Public sector employee	11.3%
	Private sector employee	37.3%
	Business owner	3.0%
	Freelancer	0.3%
	Farmer	1.0%
	Housewife	1.7%
	Pensioner	37.0%
	Pupil, student	0.3%
	Unemployed	7.7%
	Other	0.3%
Marrital status	Married/With a partner	69.3%
	Unmarried	9.3%
	Divorced	3.7%
	Widow/widower	17.0%
	Refuses to respond	0.7%
Number of members in the household	1	14.0%
	2	29.0%
	3	17.3%
	4	25.3%
	5	7.0%
	6+	7.3%
What was the average monthly (net) income in your household during the last three months?	Up to 15,000 MKD	15.3%
	15,001-30,000 MKD	36.7%
	30,001-54,000 MKD	27.3%
	54,001-70,000 MKD	6.3%
	Over 70,000 MKD	2.0%

	I don’t know	1.3%
	Refuses to respond	11.0%
How much do you pay for heating on average per month?	Up to 2,000 MKD	7.0%
	2,001-5,000 MKD	59.0%
	5,001-8,000 MKD	21.7%
	Over 8,001 MKD	3.7%
	No response	8.7%

A. Features of a housing facility

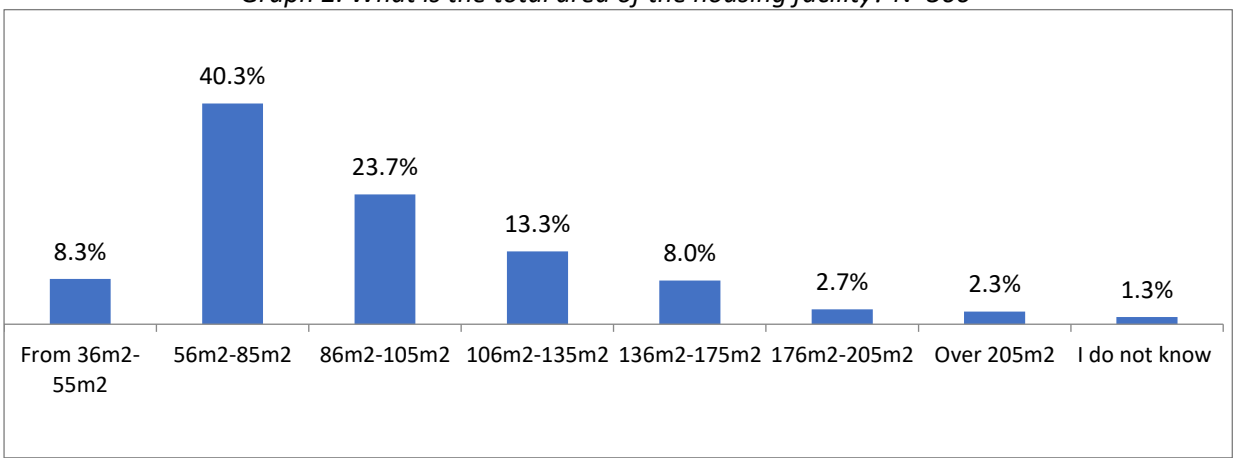
The first set of questions referred to the features of the building, the insulation and the general condition of the home in which the households are located. What could be noticed from the answers to the question: "*In what year was the building in which you live built?*" is that most of the buildings were built between 1963 and 1985, i.e. they are between 35 and 50 years old, and only 16% were built after 1986, which indicates that most of the buildings are relatively old.

Graph 1. In what year was the building in which you live built? N=300



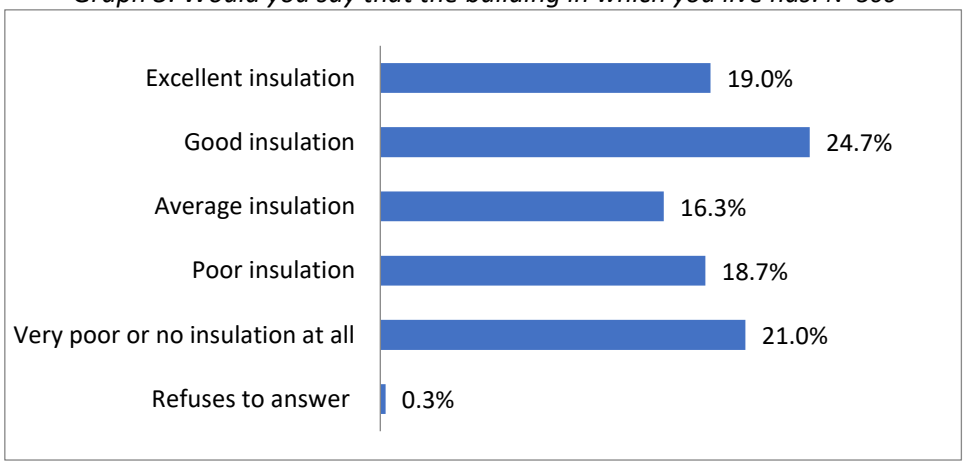
However, what could be noticed from the next question is that most of the buildings that were originally only sheds in the settlement are now partitioned or renovated using bricks. Two thirds of the houses or 64.4% are built of brick, 12% of concrete, 9.3% are sheds, while 14.3% are sheds with extensions. Regarding the size of the buildings, it could be noticed that the largest percentage are with the standard size of an average apartment, i.e. 40.3% are with an area between 56 and 85 m2. However, the percentage of larger homes is significant, so 23.7% of the homes are with a surface of 86 to 105 m2, while over 26% or a quarter of the homes have an area of over 106 m2. This leads to the conclusion that a serious percentage of the households in this neighborhood have large heating facilities, which means that they are exposed to higher costs during the winter or are forced to heat only certain parts of the home.

Graph 2. What is the total area of the housing facility? N=300



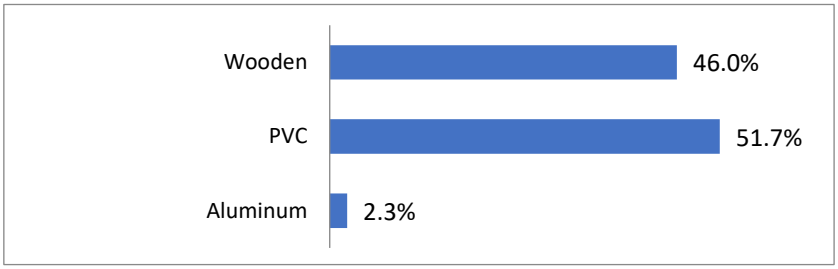
Regarding the type of insulation, the respondents were asked to evaluate how good the insulation of the home in which they live is. According to the obtained data, it could be concluded that 43.7% of the houses have excellent or good insulation but high 39.7% have poor or no insulation at all. To the next related question that read: "*What kind of insulation of the walls in the building do you have?*" as many as 41.3% confirmed that they have no insulation, 47.3% said that they have styrofoam, 6.3% tervol and 5% stated other types of insulation. Such data leads to the conclusion that in addition to the ecological heating systems that are certainly necessary, it should be of primary importance to provide better insulation for homes in this neighborhood.

Graph 3. Would you say that the building in which you live has: N=300



Half of the homes do not even have adequate thermal insulation windows. According to the data, 46% of households still have wooden windows, 51.7% said they have PVC windows, while 2.3% said they have aluminum windows. This means that in addition to the poor or non-existent external insulation, many households do not have adequate windows, too.

Graph 4. Type of windows N=300



The analysis of the cross-sectional data indicates that there is a close correlation between the level of income and the quality of insulation in households, i.e. households with higher incomes have significantly better insulation in their homes compared to those with low household incomes, that in a large percentage have poor or no isolation at all.

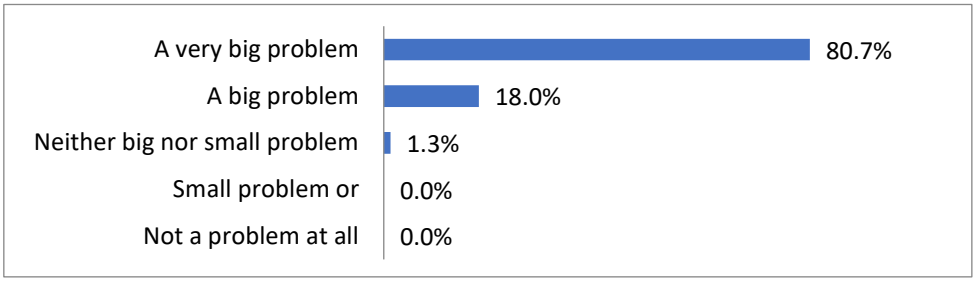
	Up to 15,000 MKD	15,001-30,000 MKD	30,001-54,000 MKD	54,001-70,000 MKD	Over 70,000 MKD
Excellent insulation	11%	18%	22%	26%	50%
Good insulation	7%	19%	39%	37%	33%
Average insulation	17%	17%	12%	16%	17%
Bad insulation	22%	20%	20%	5%	0%
Very bad or no insulation at all	44%	25%	7%	16%	0%

The table clearly shows that in the group of households with a total income of up to 15,000 MKD, only 18% said they have excellent or good insulation compared to households with 54,000 to 70,000 MKD of which 64% said they have excellent or good insulation and households who have incomes over 70,000 MKD, of which high 83% stated that they have good or excellent insulation.

B. Assessment of citizens' awareness of the sources and effects of air pollution

The negative effects on the health of citizens from air pollution as well as the causes of the pollution have been a central topic in the media during the winter months for many years. Citizens are already well informed and aware of the existence of the problem, as well as the health consequences of air pollution. Their anxiety is also high but the consequences they feel to their own health are becoming more common. In this set of questions, the awareness and the consequences of pollution among citizens were measured, as well as their level of perception about the sources of the problem. According to the survey, a high 80.7% of respondents believe that air pollution is a very big problem, while an additional 18% believe it is a big problem.

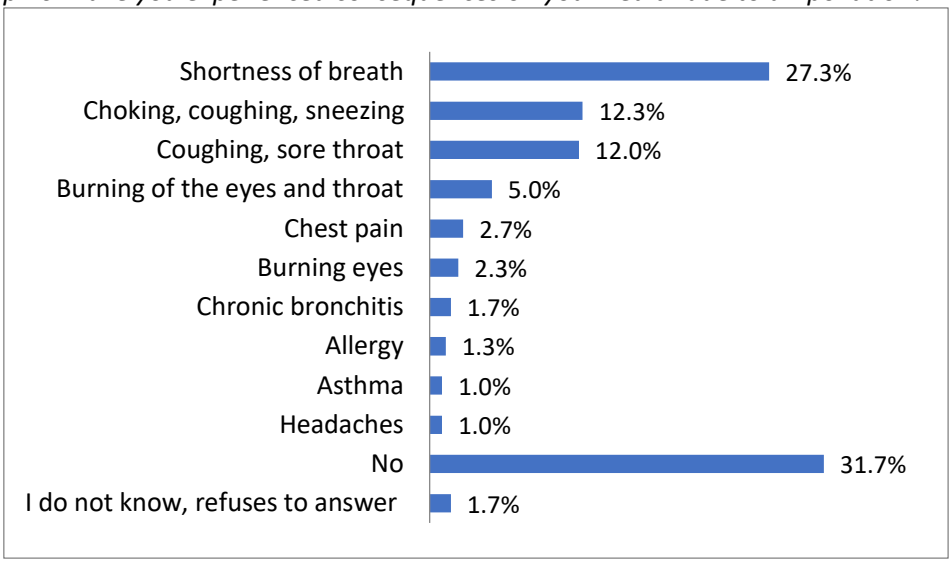
Graph 5. Do you think that air pollution is: N=300



The percentages are almost identical to the question: "*How concerned are you personally about the health consequences that air pollution causes or could cause?*" where almost 100% of respondents said they were very concerned (80%) or mainly concerned (19%). Regarding these questions, there is no difference in the answers of different groups of respondents according to demographic characteristics. This leads to the conclusion that the residents of Lisiche are highly aware and concerned about the existence of the problem of air pollution. It should be noted that the research was conducted at a time of high air pollution which further affects the results, i.e. the high percentage of positive answers to these two questions.

The data regarding the effects that the citizens stated that they felt from air pollution are also worrying. Almost 70% of all respondents said they felt some negative effects on their health. Most often, the citizens state that due to the air pollution they felt shortness of breath (27.3%), then suffocation, coughing or sneezing (12.3%) and the same number or 12% said that they were coughing or had sore throat. Only 31.7% of respondents said they did not feel any effect on their health from air pollution.

Graph 6. Have you experienced consequences on your health due to air pollution? N300

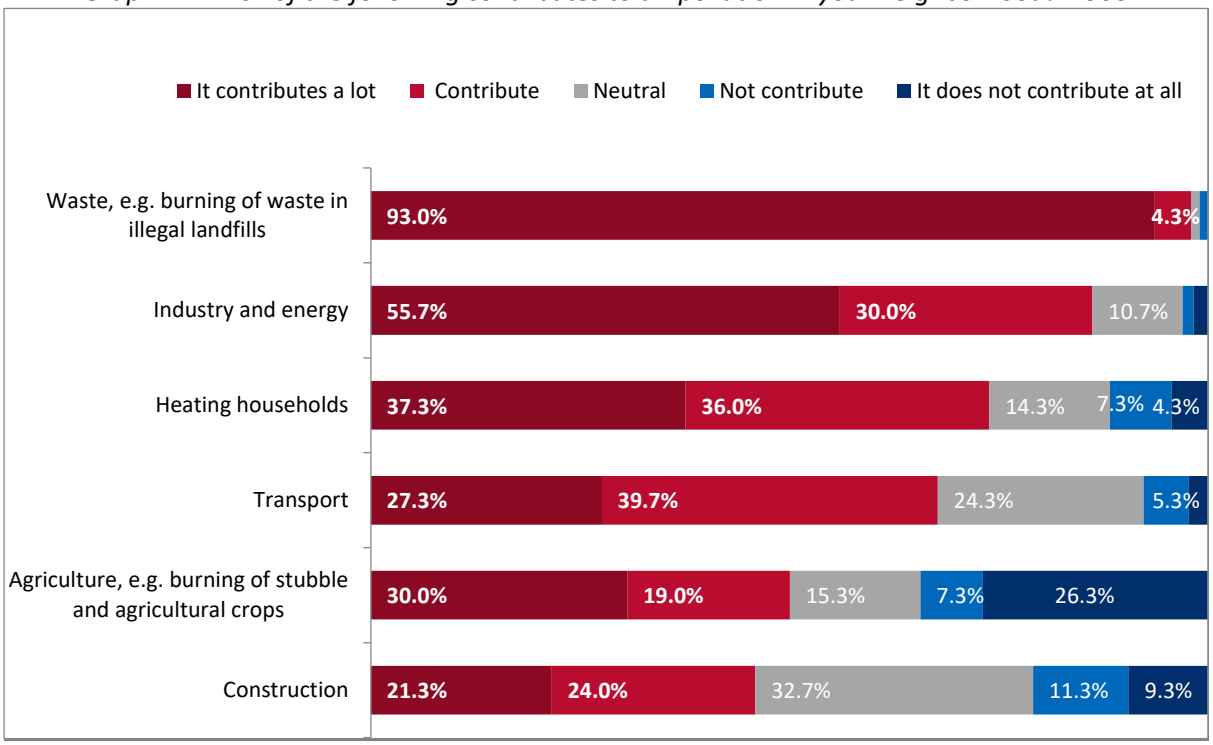


Regarding the answers of different groups of respondents, it could be noticed that the older respondents are the ones who feel more consequences than the younger ones. This is certainly an expected result if we take into account that older citizens mostly suffer from chronic diseases and have impaired health. They are the ones who are at the highest risk of air pollution, as well as all citizens with chronic respiratory diseases.

The next set of questions measured the citizens' perception of the main sources of pollution in the neighborhood. According to the answers, it could be noticed that the citizens in the highest

percentage (97%) believe that incineration of waste and incineration of illegal landfills greatly contributes or contributes to pollution, followed by industry and energy (85.7%), and in third place heating of households (73,3%). According to the citizens of the settlement Lisiche, the construction, which is ranked last on this list, contributes the least.

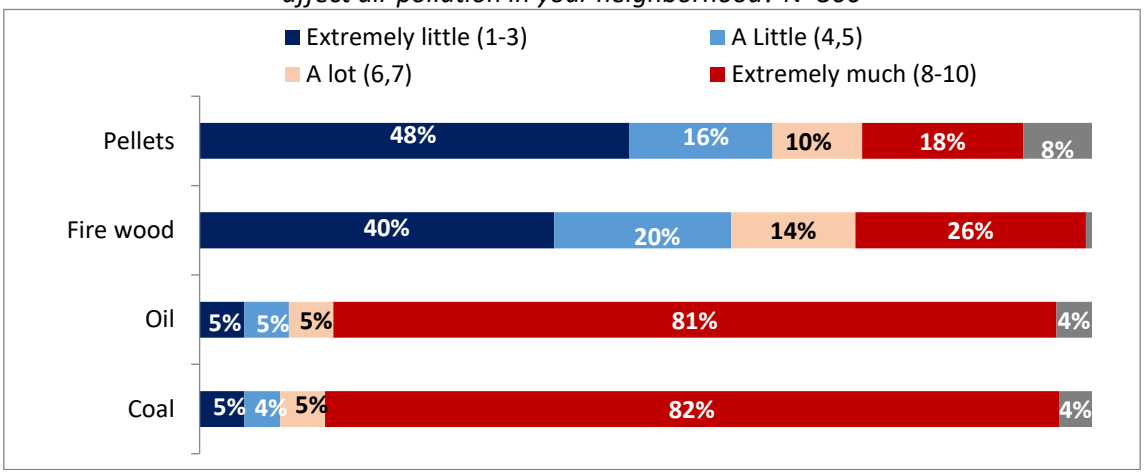
Graph 7. Which of the following contributes to air pollution in your neighborhood? N300



Regarding the different groups of respondents, no statistically significant differences in the answers could be noticed. The only difference that is statistically significant is that there is a slightly higher percentage of respondents with unfinished primary or completed primary education who believe that firewood does not contribute to pollution (19%) compared to respondents with completed university education of which only 8% share this opinion. However, according to the analysis of all other data, it could be concluded that the level of awareness about sources of pollution, its consequences and the level of concern is equal among all groups of citizens, and there is a high level of awareness and proper information that points to conclusion that ignorance or lack of information is not a problem.

Citizens believe that oil and coal are the biggest polluters and they contribute the most to air pollution as energy sources. In the graph below it could be seen that over 80% of the respondents assessed that they have a lot of influence, i.e. answered on a scale from 1 to 10 with 8, 9 or 10. What is worrying is the perception of citizens that firewood is far more environmentally friendly energy where even 40% of the respondents said that it has no or very little effect on the pollution, i.e. on a scale from 1 to 10, they answered with 1, 2 or 3. The least polluting energy is considered to be the pellets that 46% of the respondents said have little or no effect on the pollution.

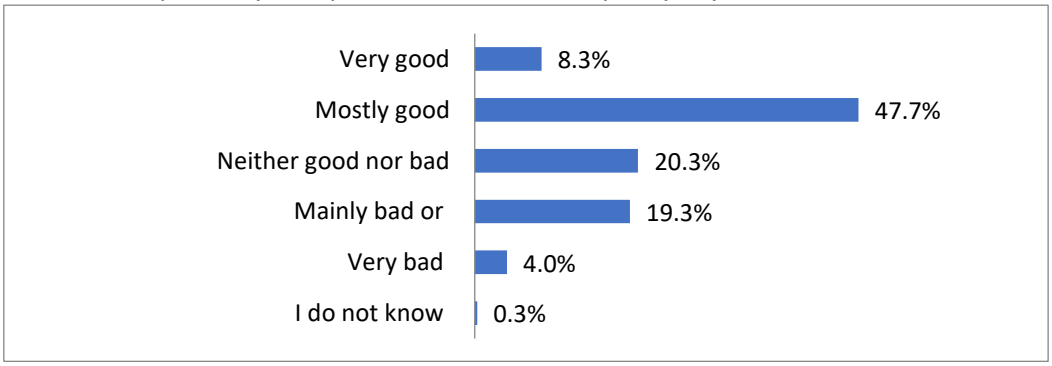
Graph 8. To what extent do each of the listed energy sources that could be used to heat households affect air pollution in your neighborhood? N=300



This finding and perception of the low impact of wood on pollution may be due to the fact that a high percentage of households use it as energy and thus do not want to say that they contribute to pollution by the way they heat their household. In order to test this thesis, we analyzed the responses of only those citizens who primarily heat their households with wood and compared them with the responses of citizens who primarily heat the households with other environmental energy sources, such as electricity and pellets. The analysis indicates that as many as 60% of those who are primarily heating their households with wood believe that this way of heating does not contribute to air pollution or on a scale of 1 to 10 answered with 1, 2 or 3. On the other hand, only 20% of the respondents who heat their homes with other environmentally friendly believe in this. Compared results from the analysis with different groups of respondents show that for most of the respondents with monthly incomes up to 15000 MKD, firewood does not affect air pollution at all (59% in total with a score of 1-3). For respondents with a monthly income of 15,000 - 30,000 MKD, 35% of them believe that firewood is an energy that does not pollute the air. Regarding the level of education, more than half of the respondents (64% with a grade of 1-3) who are without or with primary education believe that this way of heating does not contribute to air pollution. 42% of the respondents with secondary education believe that firewood does not affect air pollution at all, while at higher levels of education this percentage is significantly lower, i.e. 26%.

In the next set of questions, the perception of air quality in the home of the respondents was measured and the results show that only 8.3% of the respondents think that ambient air in the home is very good and an additional 47.7% that it is mostly good. Almost a quarter of the respondents or 23.3% rated the air in the home as very bad or mainly bad.

Graph 9. In your opinion, what is the air quality in your home? N=300



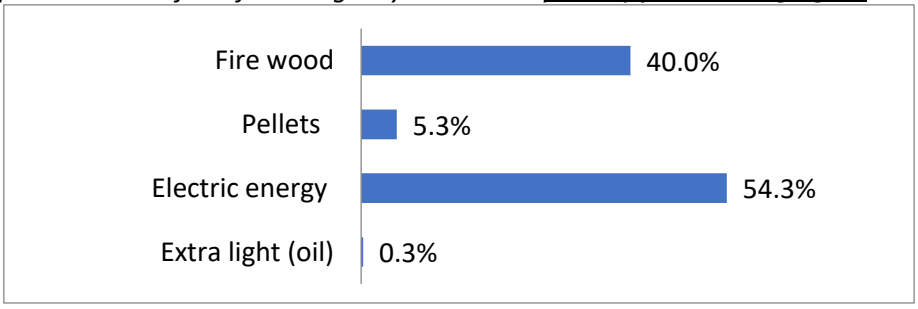
The main reason for that is the polluted air outside, which was reported by 92.9% of the respondents, while only 1.4% said that it was because of the device they use, and 5.7% said that it is a combination of both the device and of polluted air entering from outside. Furthermore, the respondents were asked if they have an air purifier in the home, to which 11% of the respondents answered affirmative, while 89% said that they did not have an air purifier. From respondents that have air purifiers in their homes, there are differences regarding this issue according to the income in the home, so only 7% of the households with low incomes up to 15,000 MKD have a purifier, while those with a higher income over 54,000 MKD have twice as many purifiers in the household or 17% in total, while 83% from this group said they do not own this kind of device. This once again confirms the close connection of economic power with the possibility of providing devices for protection against pollution. This conclusion is once again confirmed by the analysis of the answers to the following question which reads: "*If you had the opportunity, would you buy an air purifier for your home?*", a question asked only to those respondents who do not have a purifier. According to the answers, as many as 53.6% of the respondents said that they would buy a purifier if they had the opportunity to do so. The last question from this group referred to the perception of the citizens regarding whether the air purifiers themselves are effective. According to the analysis, more than half or 56% of respondents believe that air purifiers affect the improvement of air in the home.

C. Practices for household heating

The energy used by households as well as the practices of burning waste and landfills are the most important in the fight against pollution. This set of questions explored the ways of heating households, the problems with burning waste and landfills and the presence of the use of hazardous waste for heating homes in the settlement of Lisiche. The first question, where multiple answers were possible, was how homes are heated and what households use as a heating source. From what could be seen in the graph, 66.7% of households use electricity as a primary or secondary source of heating, while high 42.3% said they use firewood, 5.7% use pellets and only 1 % said they use oil as an extra light fuel.

The next question referred to which source is used as the primary heating energy and this data is practically a priority for analysis because as many as 83% of households have only one heating source, i.e. they do not use any secondary heating source. To the question: "*Which of the following do you use as primary fuel for heating?*" 40% of the respondents answered that they use wood as primary energy, 54.3% that they use electricity, 5.3% pellets and 0.3% extra oil as an extra light fuel.

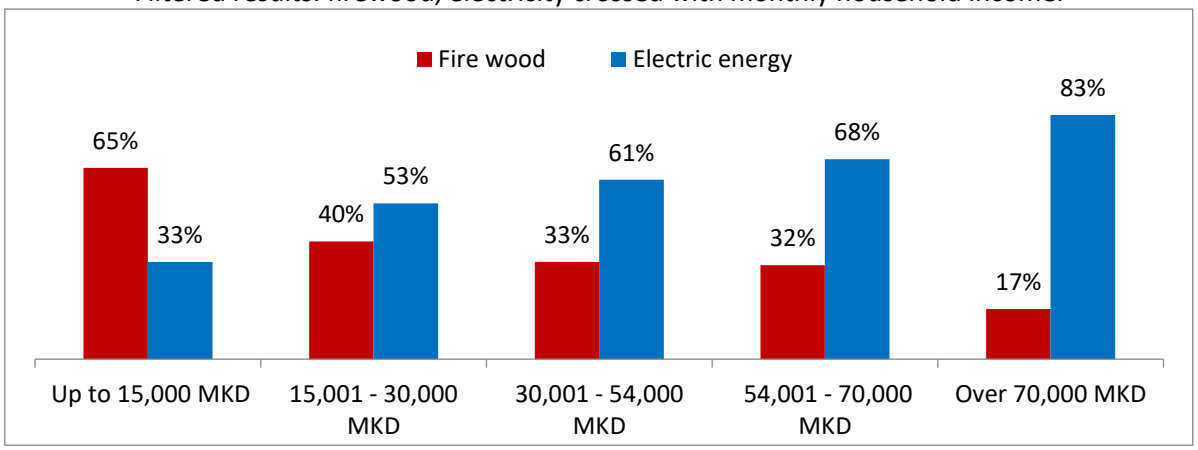
Graph 10. Which of the following do you use as a primary fuel/heating agent? N=300



Analysis of the answers of different groups indicates that there are serious differences in the answers of households' owners according to the level of monthly income. According to the analysis below, it is

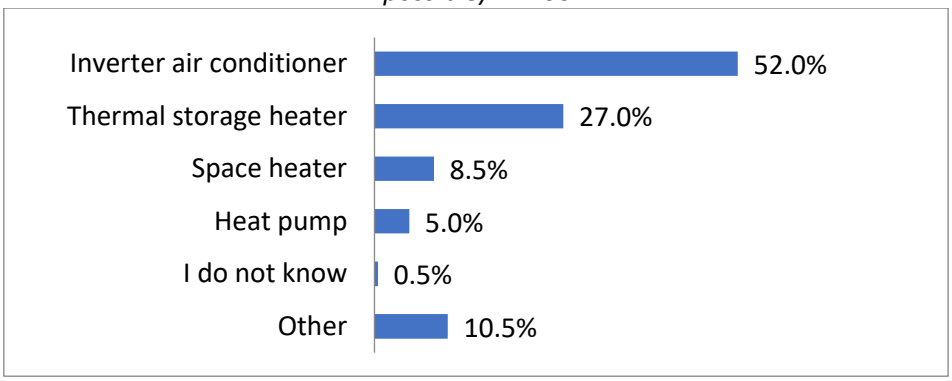
clear that lower income households are much more likely to heat with wood while those with higher incomes are much more likely to heat with electricity. Thus, as much as 65% of those who have household incomes up to 15,000 MKD are heated primarily on wood, while only 33% on electricity. Households that have an income of over 70,000 MKD, as much as 83% are heated by electricity as the primary source of heating and only 17% by wood. This is another analysis that confirms the conclusion that households are strongly conditioned by their own financial situation when choosing the method of heating.

Graph 11. Which of the following do you use as a primary fuel/heating agent?
Filtered results: firewood, electricity crossed with monthly household income.



In the group of households that heat with electricity, the largest percentage are heated by inverter air conditioners, i.e. 52%, then 27% are heated by a thermal storage heater, 8.5% by a heater, 5% by heat pumps and 10.5% by other types of electric heating devices. This finding is positive and indicates that most of the households that primarily heat with electricity already have energy efficient heating systems. However, even on this issue, there is a discrepancy in the answers of different groups of households according to their income. Namely, households that have incomes over 54,000 MKD have significantly more inverter air conditioners (60%) compared to those that have up to 15,000 MKD (32%).

Graph 12. What kind of heating device/s that run/s on electricity do you use? (multiple answers are possible) N=200

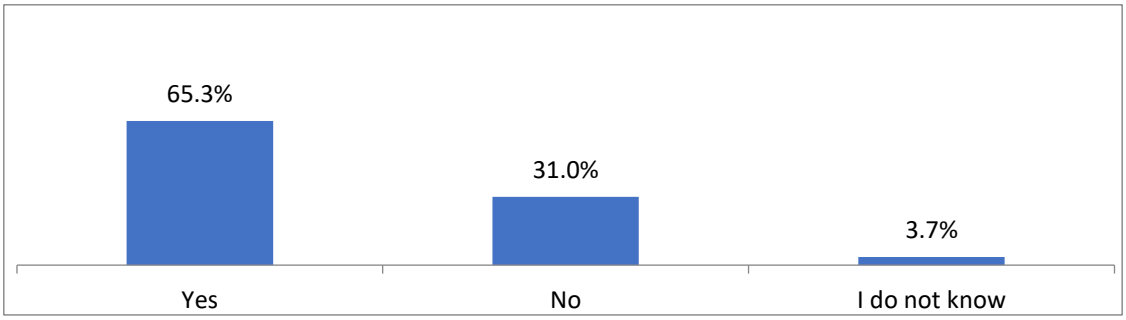


On the other hand, wood-fired households still use inefficient heating devices that also contribute to air pollution in the home. Namely, 59.2% of the households that are primarily heated by wood do it with a wood stove, while only 26.7% have a wood-burning stove. The rest use the regular wood stoves (7.5%) and fireplaces (6.7%).

Households in Lisiche rarely use chimney cleaning subsidies, i.e. only 6.7% of respondents confirmed that they used chimney cleaning subsidies. The main reason why they do not use subsidies is because 80% of respondents claim that they clean the chimneys by themselves, while 10.7% said that they do not need it.

The last questions in this set were about the incineration of harmful waste and reagents, a phenomenon that greatly affects the pollution during the winter. According to the data from the research, this phenomenon is very present on the territory of the settlement Lisiche and the respondents in a huge percentage claim that it happens in the immediate vicinity of the place where they live. To the question *"Have you noticed burning or heating of harmful waste or energy sources in Lisiche?"* two thirds of the respondents said they noticed that, while 31% said they did not notice any of that. This extremely high percentage of affirmative responses indicates a widespread problem that obviously contributes a lot to pollution in this part of the city.

Graph 13. Have you noticed burning or heating of harmful waste or energy sources in Lisiche? N=300



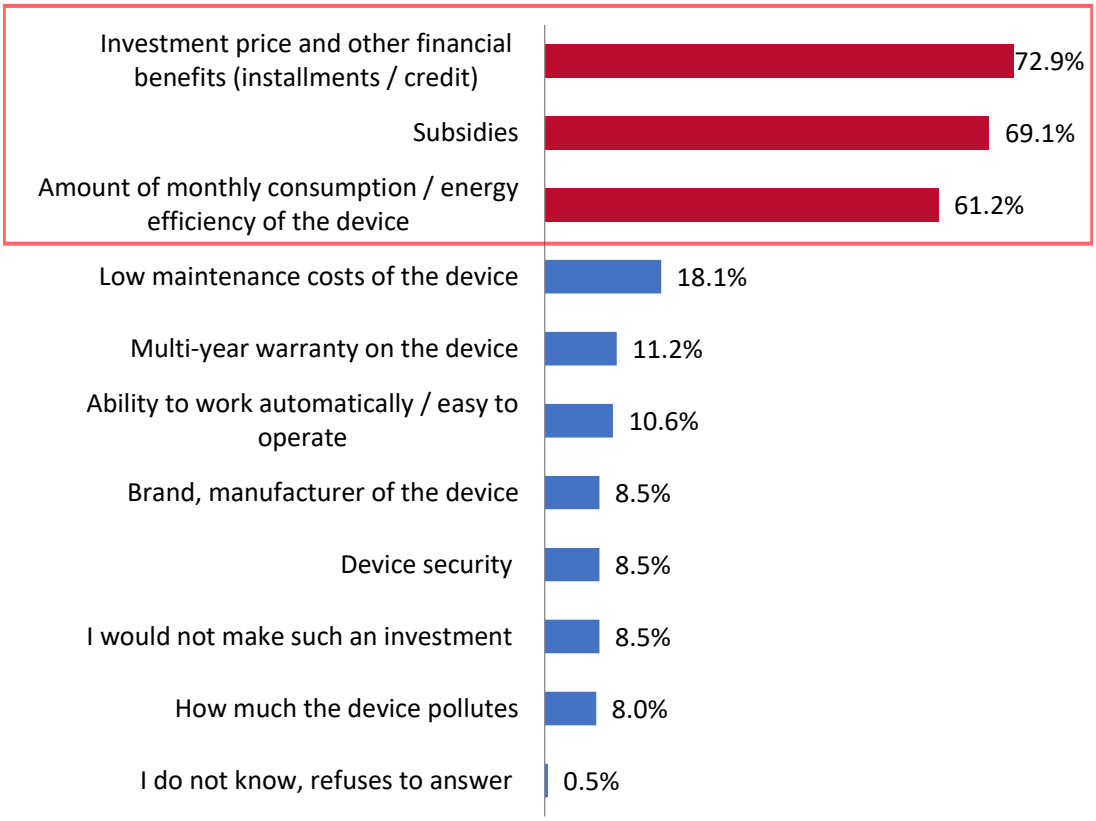
The data on the question *"Have you noticed this type of combustion near the place of residence, i.e. do your neighbors do it?"* is almost identical. A high 63.3% of the respondents said that the neighbors do that, i.e. they noticed burning of unsuitable energy resource in the immediate vicinity of their living. These worrying data indicate that more control is needed on the way of heating in this part of the city as well as sanctions if there is burning of illegal landfills and stricter control of small industrial plants and businesses that are in large numbers in the neighborhood.

D. Influence on the decisions when purchasing a heating device

This set of questions aimed to investigate the opinion of respondents and the factors that influence the choice or investment in new heating systems. The questions were structured to provide an accurate insight into the financial strength of citizens to invest in new systems or energy efficiency, as well as what the basic drivers are when choosing. From the data it could be concluded that the inhabitants of this settlement, due to the low standard, *are extremely influenced by the investment cost factor,* whereas financial benefits and conditions are only important when choosing whether and in what to invest.

The first question in this analysis explored the three main criteria according to which citizens would decide to invest in energy efficient home heating. As could be seen from the graph, almost all citizens indicated a financial criterion in the selection and the most favorable was price and other financial benefits (72.9%), subsidies are in second place (69.1%) and in third place is the amount of monthly consumption of the device chosen by 61.2% of the respondents. The criterion about how much the device pollutes could be seen at the bottom of the list with only 8%.

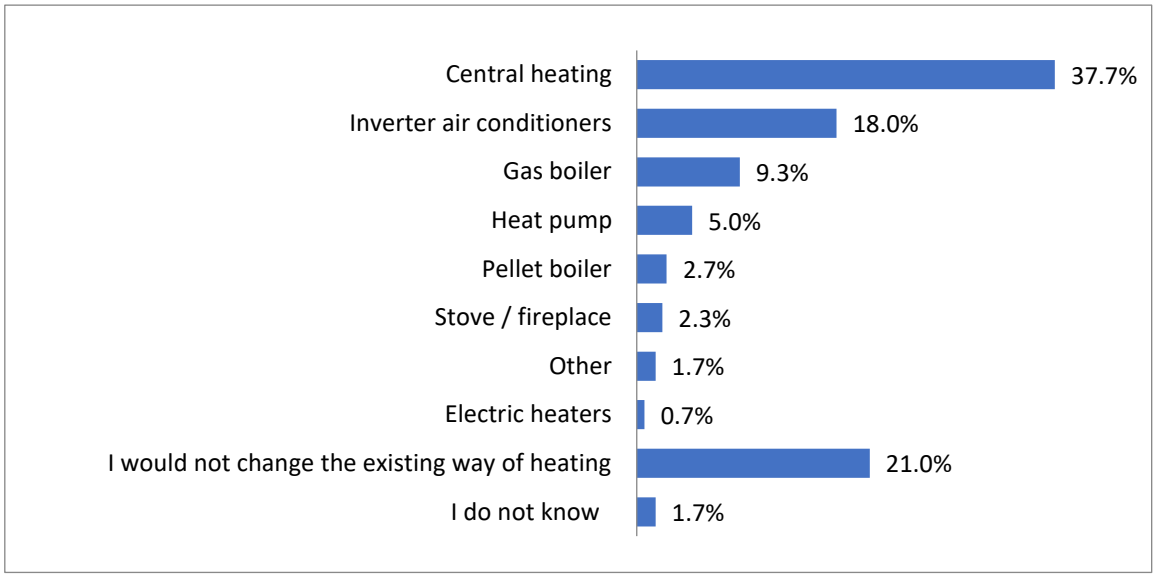
Graph 14. If you were to invest in energy efficient heating in your home, what would be the criteria for doing so? (multiple answers are possible)
3 most important criteria; N=300



The analysis of cross-referenced data and responses of different demographic groups does not indicate significant statistical differences in respondents' responses. Interestingly, even families with above-average monthly incomes do not have different criteria than the overall average. The analysis we made and referred to the answers of those respondents, who said that they do not have energy efficient heating systems and are heated primarily on wood, also does not show significant differences from the overall average.

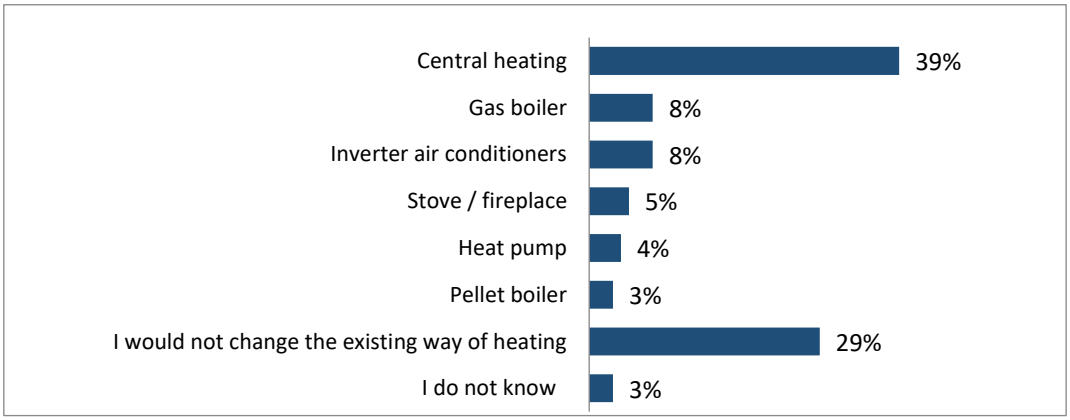
To the question: "*If you could choose, regardless of the cost of installation of the equipment and the monthly cost, which way of heating would you choose for your home?*" Most of the respondents would choose central heating (37.7%). After them, 18% would choose inverter air conditioners, and 9.3% would opt for a gas boiler as a way of heating their home. However, 21% of respondents said they would not change the existing way of heating the home.

Graph 15. If you could choose, regardless of the cost of installing the equipment and the monthly cost, which way of heating would you choose for your home? N=300



If the answers of the respondents are analyzed according to the type of construction in which they live, significant differences could be noticed in terms of what kind of construction is the building in which the households are located. Thus, those who live in sheds or sheds with an extension, significantly prefer inverter air conditioners than anything else. As many as 43% of the respondents who live in a shed or shed with an extension said that if they could choose, they would choose an inverter compared to the total average of 18%. Furthermore, the data from the analysis of answers to the question what is the primary energy source they use, indicates that a serious percentage of households that heat with non-environmentally friendly fuels would not change the way of heating at all even if they could do so regardless of price. As many as 29% of those who heat with wood as a primary energy source would not change the way of heating, while 39% would change for central heating.

Graph 16. Answers of the respondents who heat with wood as primary fuel for heating the home



Regarding the other data from the cross-analyzes, it could be concluded that there is less readiness for change in the lower social groups that have lower monthly incomes up to a total of 15,000 MKD and people with lower education. Thus, as many as 30% of the households with an income of up to 15,000 MKD answered that they would not replace the existing heating even if there was a chance to do so regardless of the price, unlike households with higher incomes over 54,000 MKD, of which only 9% said that they would not change it. The data are also similar according to the educational status of

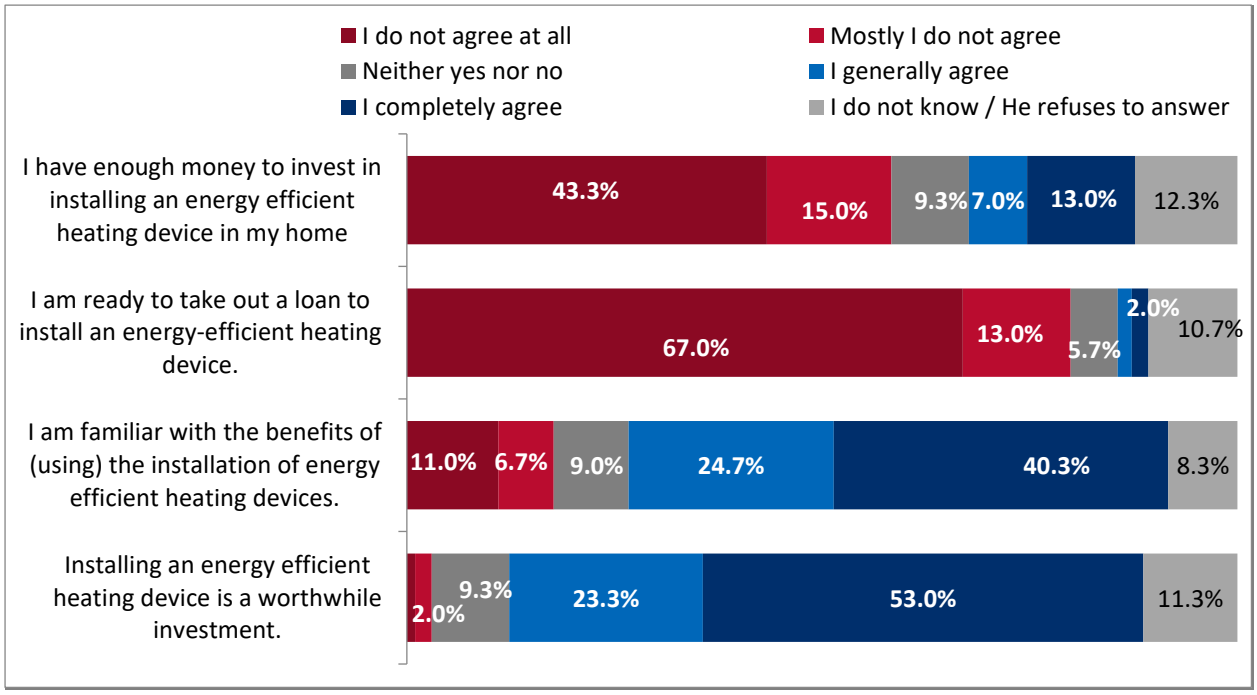
the respondents, where 32% of those with only primary education would not make a change in heating, 24% of those with secondary and only 11% of those with completed university education. *These analyses show that although lower social groups are strongly conditioned by finances and the inability to invest more in renovation or energy efficiency, they would also find it more difficult to make a change even when finances are not an obstacle.* This finding needs to be further explored through qualitative research to analyze the problem in depth, but past research and analysis show that people with lower education and lower income generally express greater distrust and/or skepticism about any change that may be risky. They are much less likely to make changes and try new things because they fear an unpredictable outcome, hidden risks or in this case financial consequences.

E. Willingness to invest in heating devices with higher energy efficiency

The next set of questions examined the level of readiness of the respondents to invest in new heating systems and the plans they have in this regard. According to the data, it could be concluded that there is an extremely low willingness to invest in new energy efficient heating systems and that the priorities of citizens are primarily in terms of improving the insulation of homes and less in terms of heating the home. In the first set of questions, the level of financial readiness of the citizens for investment was measured through a series of claims. According to the data in the chart below, it could be seen that only 13% of respondents fully agree with the statement: "I have enough funds to invest in an energy efficient device in the home."

Of the respondents who use firewood as their primary heating source, about 70% agree (41% strongly agree, 29% largely agree) that installing an energy efficient heating device is a worthwhile investment. However, the vast majority of the respondents (89%) are not ready to take a loan to install a heating device that will be energy efficient (73% do not agree at all, 17% generally disagree with the view: I am ready to take out a loan to install an energy-efficient heating device.).

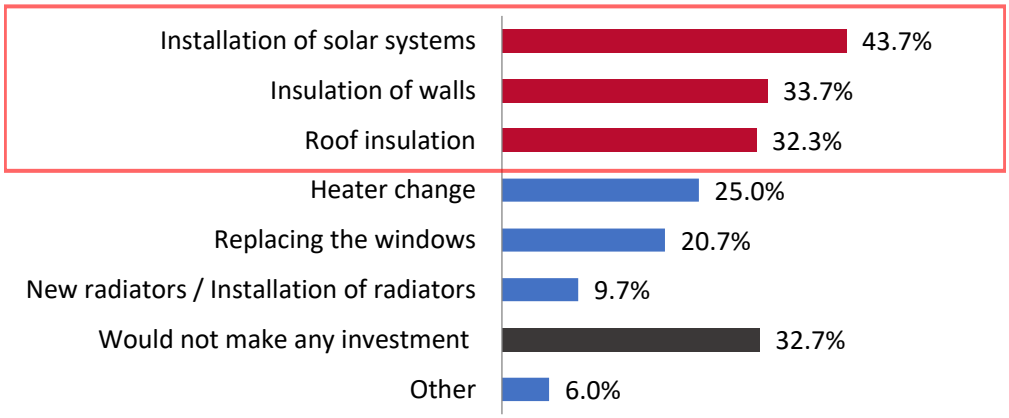
Graph 17. How much do you agree with the following claims? N=300



Additionally, although most respondents agree with the statement that installing an energy efficient device is a worthwhile investment, i.e. 76% fully or largely agree with this statement, only 3.7% of respondents fully or generally agree with the statement that they are ready to take a loan to install an energy efficient heating device. Quite a solid percentage of respondents, i.e. 65% said they fully or mainly agree with the claim that they are aware of the benefits of installing energy efficient systems. In summary, these data show that although the respondents are well acquainted with the benefits and aware of the profitability of the investment, they are still not ready to take a loan to make such an investment. This indicates that there is fear and uncertainty among households about loans but also about the outcome of the investment itself. The answers are extremely negative for the lower social groups and those who heat with wood. Thus, even 93% of households with incomes up to 15,000 MKD and 87% of those with incomes up to 25,000 MKD per month are not ready for loans or credits for this purpose. A high 70% of those who use wood as their primary heating energy source also stated that they are not ready to take a loan to install energy efficient heating devices.

The next set of questions aimed to find out what are the priorities of citizens regarding the investments related to energy saving, i.e. the citizens had to choose three investments that they would make first if they had a chance to do so. The data show that respondents would invest the most in better home insulation and solar panels.

Graph 18. If you could make three investments in your home to save more energy, what would those three investments be? (multiple answers are possible) **investments** *N=300*



It could be noted from the graph that only about 25% of the respondents mentioned that they would invest in replacing a radiator, and much more in investments related to insulation. It is interesting that as much as 43.7% would invest mostly in solar systems. This may mean that households want a one-time investment from which they could be further assured that they would have savings. From these data it is obvious that the perception of energy savings is much more related to insulation or solar systems than changing heaters. The fact is that wood is still the cheapest energy source that could be seen from the monthly costs of households and therefore the change of heaters is not perceived as a direct saving.

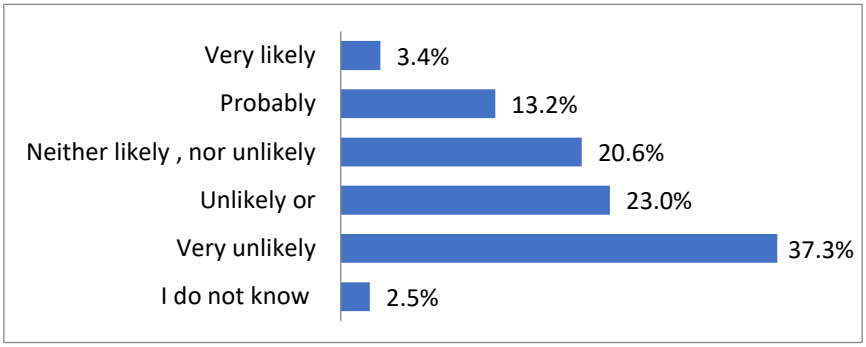
The general conclusion also applies to respondents who use firewood as the primary heating energy. Thus, from this category of respondents as many as 43% stated that they would not make any

investment to save energy, 34% of respondents said they would install insulation on walls, while in 32% of the cases they would install solar systems.

If you could make three investments in your home to save more energy, what would those three investments be? (multiple answers are possible) investments, answered respondents who use firewood as the primary fuel for heating	Firewood
Installation of solar systems	32%
Heater change	18%
Insulation of walls	34%
Roof insulation	28%
Replacement of windows	23%
New radiators / Installation of radiators	8%
Other	5%
I would not make any investment	43%

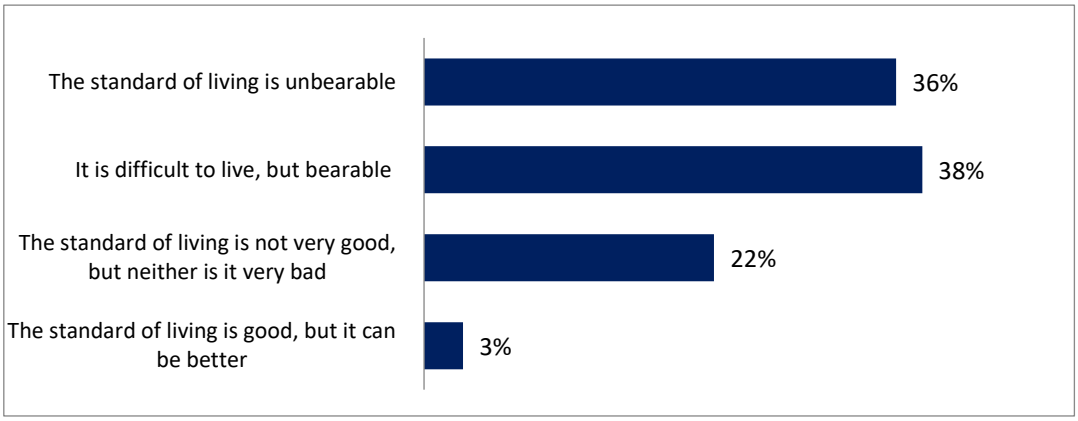
Therefore, the answers to the next question are expected as follows, i.e. only 3.4% of households' representatives answered that it is very likely in the next 12 months to make some of the preferred investments mentioned earlier. An additional 13.2% said it was likely to happen while everyone else did not give a positive answer to this question.

Graph 19. Based on the investments mentioned before, how likely is it that in the next 12 months, you will decide to make one of them? N=300



The analysis of the cross-sectional data on this topic shows that as expected, 95% of low-income households do not plan any investments during the next 12 months. These data are fully expected if we analyze the answers to the next set of questions related to the economic situation of the households. Namely, according to the answers to the question for evaluation of current living standards, the received answers indicate that the households living in this settlement belong to the low social stratum and live in below-average economic conditions compared to the average standard in the country.

Graph 20. Which of the following statements best describes the current living standard in the country? N=300



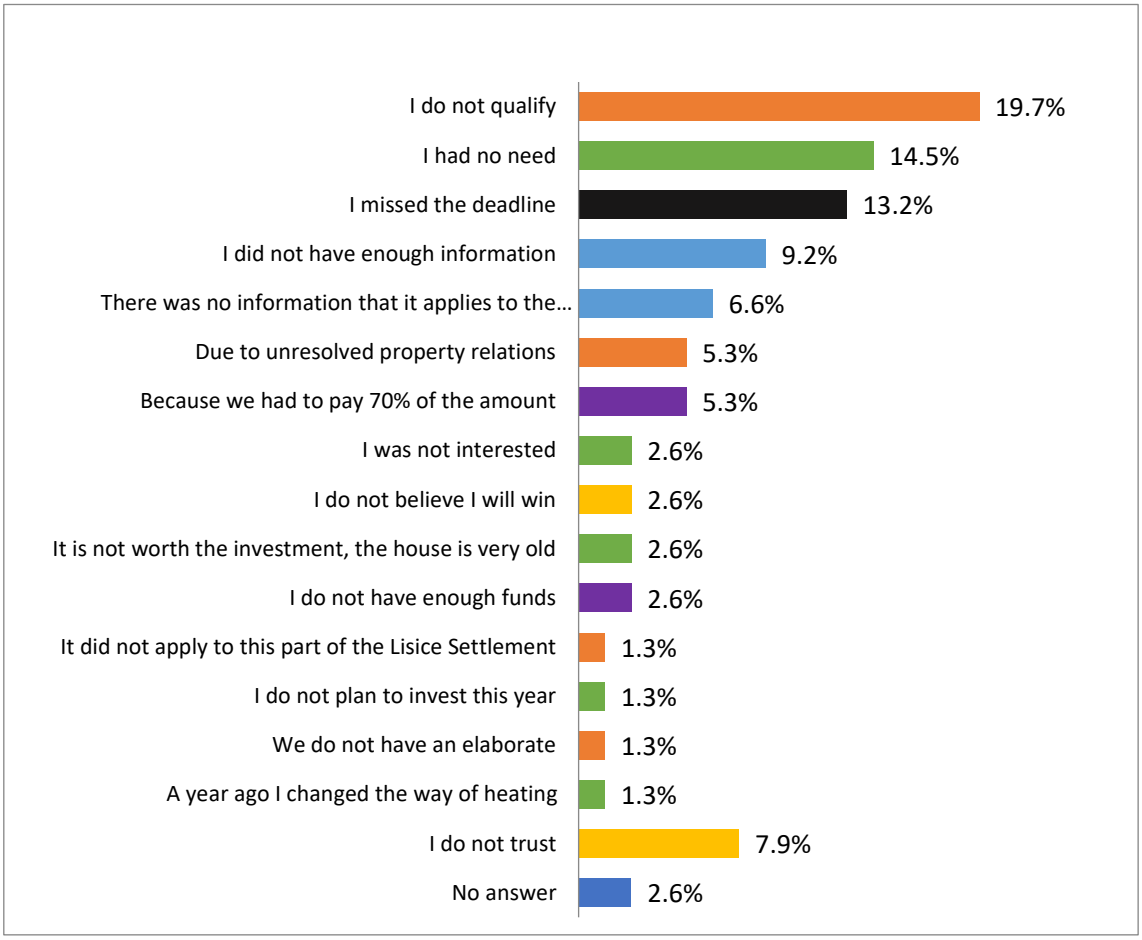
What could be seen from the graph is that three quarters of the households assess the standard of living as unbearable or as difficult. Only 3% of the surveyed households rated the standard as good and 0% said that the standard is excellent. The same trend could be also noted in the next two questions from this set. Two out of three households or 64% said that they could buy only what is necessary for life and 14% answered that sometimes they could not even afford what is necessary. Only 19% of surveyed households said they could buy a little more than necessary and 2% said they could buy whatever they wanted. As for the expectations for how their standard of living will change next year, it could be concluded that there is apathy regarding the improvement of the economic situation. As many as 70% of the respondents said that they do not expect the situation to change, i.e. it will remain the same, 12% said they expect it to worsen and only 9% said that they expect the economic situation to improve.

F. Information related to UNDP's call for support to households in Lisiche and the subsidies provided by the institutions

There is low awareness among households about the call and financial support from UNDP and only 30% of the surveyed households said that they heard about the first call, while 70% said that they did not hear about that call at all. The low information of households should not be surprising given that the first UNDP call referred only to households from Naselba Lisice, and the sample of this research is expanded and is a representative sample for Lisice. However, a significant part of the sample includes Naselba Lisice and the results are an indicator that there is room for significant improvement of information among the population through direct communication and a campaign for future calls.

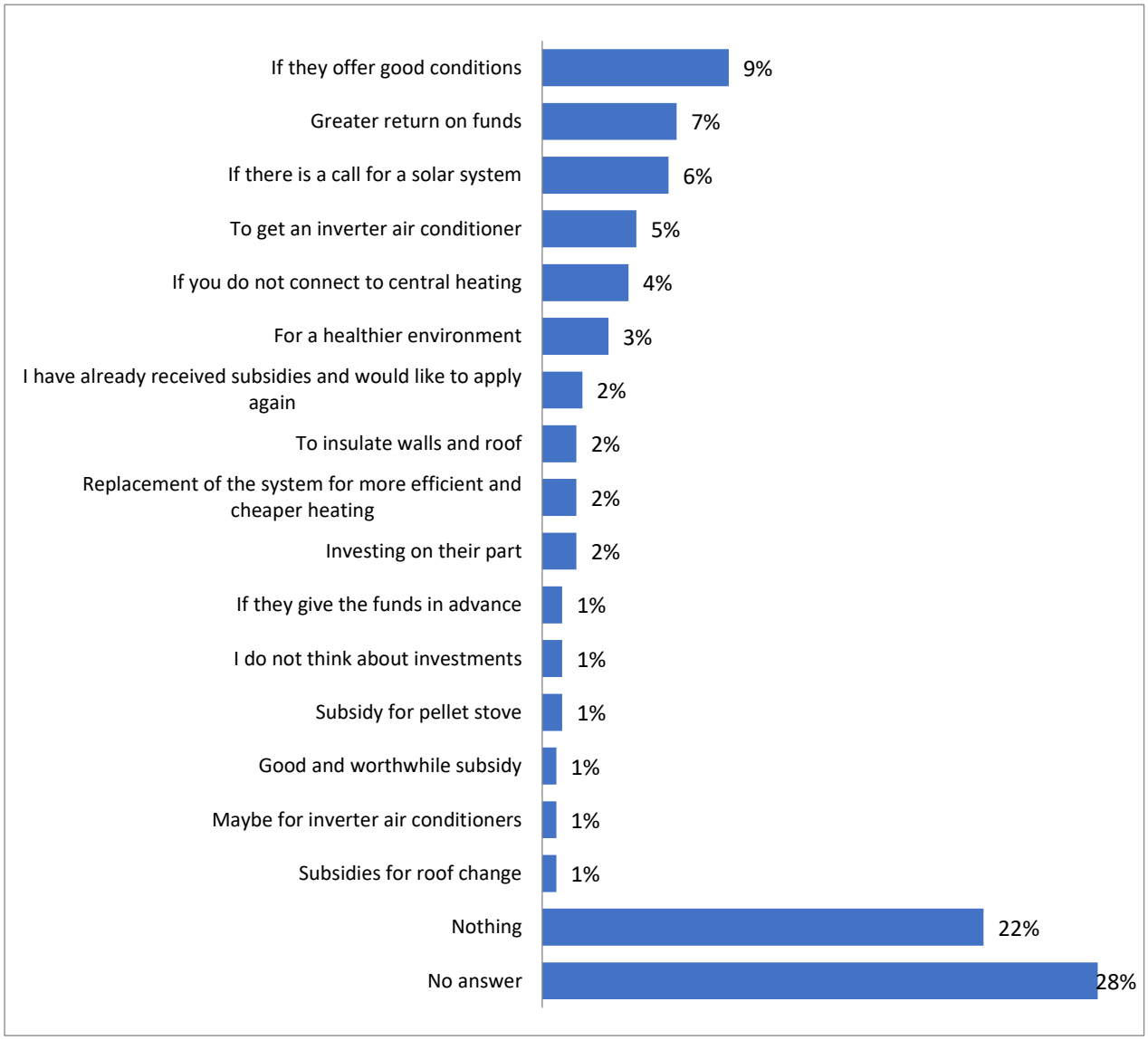
About 16% of those who heard about the call said they applied to the call, i.e. 4.6% of the total number of households that participated in this survey. Those who heard about the call but did not apply were asked why they did not apply. The answers to this question could be grouped into several sections or reasons: lack of information 15.6%, non-fulfillment or lack of criteria 27.6%, no need for it 22.3%, missed deadline 13.2%, lack of funds and distrust that they will be selected 10.5%.

Graph 21. Please explain, why you did not apply? (open question) N=76



The percentage of households that applied to other calls for energy efficient devices subsidies is slightly higher, i.e. 16% of the respondents said that they applied to some of the other calls and most often it was the call of the City of Skopje. From the 16% who applied, as many as 87.5% applied to the calls of the City of Skopje and 6.2% to the calls of the Municipality of Aerodrom and the Ministry of Economy. When asked what would motivate them to apply for the next call, **most of the citizens said that they will be motivated if there are better financial conditions or refund (16% in total), then if there is a call for solar panels (6%) and if there is a call for inverter air conditioners (5%). Every second respondent did not give an answer, i.e. he said that nothing would motivate him/her to apply.**

Graph 22. If there is a new call for subsidizing energy efficient heating devices, what would motivate you to apply? N=300



# # #