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Socio-economic analysis of households subject to pollution reduction measures

- Analysis of research data -

August, 2017

Prepared for The United Nations Development Program (UNDP)

With financial Ministry of Finance of the Republic of Slovakia
The City of Skopje
Global Environment Fund (GEF)

and technical support of The United Nations Development Program
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Since January 2017, the UNDP Office is analyzing local pollution and GHG released from the households heating practices in Skopje Valley and is designing and testing local actions for pollution reduction. These activities are implemented under three complementary ongoing UNDP projects, funded by the Ministry of Finance of the Republic of Slovakia, the City of Skopje and the Global Environment Facility.

The second analysis in these series is presented in this document, prepared by Elizabeta Dzambaska, PhD.

Introduction

The economic theory and the high number of economic and empirical research have analyzed the factors influencing the type of energy source which is used for households heating. In fact, the selection of energy source depends on several interconnected factors which affect each other. Generally speaking, the factors may be divided into the following groups:

1. Economic conditions - the economic situation of the households is a key factor which directly influences the selection of energy source.
2. Demographic and culturological features - the size of the household, the age structure and level of education.
3. Factors related to the building insulation, its ownership, the year of construction and its size.
4. Motivational - the habits of the family members, level of comfort, use of new techniques and technologies in the home, awareness and dedication to environment protection and care for the health of the family members.

The questionnaire for the survey on the Skopje Region heating practices, contains questions related to demographic and economic characteristics of the respondents. Besides the information on the place of residence (urban or rural environment) and the type of building (family house or an apartment in an apartment building), the survey gives information also on the sex structure and marital status, the level of education and the average monthly income in the household.

The analysis of socio-economic factors enables modeling of appropriate target groups of respondents. The establishment of these groups is of essence so that recommendations can be formed for every target group, which will make it possible to meet the planned objectives and reduce local pollution.

Households subject to pollution reduction measures

1. Households using coal

Out of the households surveyed, **0.4 %** or **22** households use coal. Households using coal are a small group in the total number of surveyed households, but still are a separate target group because it is necessary to eliminate the use of coal.

Households using coal are present only in several municipalities in Skopje Region:

- Gazi Baba - 6 households or 0.9% of the total number of households surveyed in the municipality,
- Saraj - 4 households or 1.3% of the total number of households surveyed in the municipality,
- Studenichani - 4 households or 2.8% of the total number of households surveyed in the municipality,
- Center - 3 households or 0.7% of the total number of households surveyed in the municipality,
- Chair - 3 households or 0.5% of the total number of households surveyed in the municipality and
- Karposh - 2 households or 0.4% of the total number of households surveyed in the municipality.

If we assess this target group against the total number of households in the Skopje Region (163,633), in Gazi Bana out of 22,352 households there are **201 households using coal**, in Saray out of 10,122 households **132 are using coal**, in Studenichani out of 4,639 households, **130 are using coal**, in Chair out of 18,135 households **91 are using coal** and in Centar out of 13,723 households there are **96 households using coal**.

2. Households using firewood

Firewood is pointed out as the biggest local pollutant, since **44.7% or 2,257** of the households surveyed (5,044) use firewood. According to the analysis of households in Skopje Region, out of 163,633 households, 73,220 use firewood.

The analysis per municipality showed the following results:

- Gazi Baba - 407 households or 59.1% of the total number of households surveyed in this municipality,
- Saraj - 295 households or 94.6% of the total number of households surveyed in Saraj municipality,
- Kisela Voda - 207 households or 42.1% of the total number of households surveyed in Kisela Voda municipality,
- Gjorche Petrov – 197 households or 54% of the total number of households surveyed in Gjorche Petrov municipality,
- Butel – 161 households or 50.6% of the total number of households surveyed in Butel municipality,
- Shuto Orizari – 162 households or 90.5% of the total number of households surveyed in Shuto Orizari.

The 6 municipalities listed above, contain 63.3% of the total number of households using firewood.

Although of we take into consideration the percentage of households in every municipality against the total number of households in the Skopje Region (163,633), in some municipalities such as Shuto Orizari

(90.5%) or Saraj (94.6%) firewood is extensively used, these municipalities are not singled out as specific because in them we have only small percentage of the total number of households. So, 3.5% of the households in Skopje Region are in Shuto Orizari, while Saraj contains 6.2% of the households. According to the calculations there are 5,255 households in Shuto Orizari and 9,570 households in Saraj which use firewood.

Gazi Baba is a priority municipality where more than half of the households use firewood (59.1%), and it contains 13.7% of the households in Skopje Region. In this municipality there are **13,204** households which use firewood.

The municipality of Kisela Voda accommodates 9.8% of the total number of households and 6,715 households use firewood; Gjorche Petrov has 7.2% of the households and 6,391 households use firewood while in Butel out of 10,316 households (6.3% of the total number of households in the Skopje Region), 5,223 use firewood.

2.1. Low income households using firewood

The economic status of the citizens covered by the survey is determined by examining the average monthly income per household. The criterion against which their income is analyzed is the average net salary paid in MKD in the country. According to the data of the State Statistical Office of the Republic of Macedonia the average paid gross salary in May 2017 was 33.640 MKD¹. For our analysis we are using the data on average paid net salary in MKD in the state, and for May 2017 it was 22,889 MKD². The minimum salary is 10,080 MKD and it correlates with the growth of the average salary paid to all employees in the previous year according to the data published in the State Statistical Office of the Republic of Macedonia³. The survey questionnaire offered answers about the average monthly income of households divided into 12 categories, hence the answers were grouped so that they can approximately relate to the data about the average net salary. According to the answers given, the households were divided into groups as follows: the first group has an average monthly income up to 12.000 MKD (which is approximately the amount of the minimum salary), the second group of households has an average monthly income between 12,000 and 24,000 MKD (which is approximately the amount of the average net salary) and the third group consists of households with income higher than 24,000 MKD (households which generate more than the average monthly net salary).

As per these groups, the analysis shows that:

- **15.1% or 341** households out of 2,257 households using firewood have monthly income of less than 12,000 MKD;

¹ State Statistical Office of the Republic of Macedonia, MAKstat base

http://makstat.stat.gov.mk/PXWeb/pxweb/mk/MakStat/MakStat_PazarNaTrud_Plati_MesecnaBrutoNeto/125_PazTrud_Mk_bruto_ml.px/table/tableViewLayout2/?rxid=46ce0f64-2992-4b45-a2d9-cb4e5f7ec5ef

² State Statistical Office of the Republic of Macedonia, MAKstat base

http://makstat.stat.gov.mk/PXWeb/pxweb/mk/MakStat/MakStat_PazarNaTrud_Plati_MesecnaBrutoNeto/175_PazTrud_Mk_netto_ml.px/table/tableViewLayout2/?rxid=46ce0f64-2992-4b45-a2d9-cb4e5f7ec5ef

³ Law on Changing the Law on the Minimum Salary in the Republic of Macedonia, article 1, Official Gazette of the Republic of Macedonia No. 30-14

- **28%** or **633** households out of 2,257 households using firewood have monthly income between 12,000 and 24,000 MKD;
- **32,8%** or **741** households out of 2,257 households using firewood have monthly income higher than 24,000 MKD;
- **24 %** or **542** households of the total number of households using firewood (2,257) did not answer this question.

High percent of the households did not answer the question about the monthly salary, which makes this analysis unsubstantiated. According to this data we cannot claim that households using firewood have generally low monthly income. However, if we analyze the situation individually in different municipalities, we can see that there are some municipalities where the percentage of unanswered questions is low, and they may be targeted. These municipalities are:

- **Gazi Baba – 65.6%** or **267** households out of all households in Gazi Baba (407 households), use firewood and have monthly income up to 24,000;
 - Out of them **16.7%** or **68** households have monthly income of less than 12,000, while **48.9%** or **199** households have monthly income between 12,000-24,000 MKD;
 - **20.6%** or **84** households have monthly income higher than 24,000 MKD;
 - The percentage of unanswered questions in the municipality of Gazi Baba is **13.8%**.

If we reckon that this calculation is valid, as per the estimated number of households in the Skopje Region, the number of households using firewood and having monthly income approximately equal to the average net salary in the country (approximately 24,000 MKD) in different municipalities is:

- 2,205 households in Gazi Baba municipality use firewood and have monthly income of less than 12,000 MKD;
- 6,457 households in Gazi Baba municipality use firewood and have monthly income between 12,000-24,000 MKD;
- **Studenichani – 54.6%** or **71** households out of all households in the municipality (130 households), use firewood and have monthly income up to 24,000 MKD;
 - Out of them 22.3% or 29 households have monthly income of less than 12,000, while 32.3% or 42 households have monthly income between 12,000-24,000 MKD;
 - 29.2% or 38 households have monthly income higher than 24,000 MKD;
 - the percentage of unanswered questions in the municipality of Studenichani is 16.2%.

The assessed total number of households in the municipality of Studenichani for these categories is:

- 940 households in Studenichani municipality use firewood and have monthly income of up to 12,000 MKD;
- 1,362 households in Studenichani municipality use firewood and have monthly income between 12,000 and 24,000 MKD;

The municipalities which are singled out as specific in the target group using firewood in Kisela Boda and Gyorche Petrov according to the category of their monthly income are not the target group with low monthly income. In Kisela Voda 57% of the total number of surveyed households has monthly income higher than 24,000 and in Gyorche Petrov municipality such are 65% of the households surveyed. The respondents in the municipalities of Saraj, Butel and Shuto Orizari have not answered this question in high numbers, so the analysis is not valid. The percentage of unanswered questions for Butel municipality is 56.5% while for Saraj it is 38.6%.

The municipality of Shuto Orizari is very specific. Out of 162 households surveyed, 100 households or 61.7% are in the category with monthly income of less than 12,000 MKD, 14.2% or 23 households have monthly income between 12,000-24,000 MKD and only one household has monthly income higher than 24,000 MKD. However, 23.5% of the respondents did not want to share information on their monthly income. According to the estimates for Shuto Orizari municipality **3,243** households have monthly income of less than 12,000 MKD.

2.2. Households with primary and secondary education using firewood

- **40.3%** (910 households) using firewood have primary and secondary education
- **51.13%** (1,154 households), have secondary education and
- **8.55%** (193 households) have higher education.

Out of 163,633 households in Skopje Region, **29,508** households use firewood and have primary education (referring to the household member who completed the survey questionnaire) while **37,437** use firewood and have secondary education.

The municipalities with highest percentage of households with primary education using firewood are Shuto Orizari, Saraj, Studenichani, Arachinovo and Petrovec.

- Shuto Orizari – 82.7 % or 134 households of the households surveyed use firewood and have primary education;
- Saraj – 77.6% or 229 households of the households surveyed use firewood and have primary education;
- Studenichani – 63.8% or 83 households of the households surveyed use firewood and have primary education;
- Arachinovo – 64.4% or 58 households of the households surveyed use firewood and have primary education;
- Petrovec – 50.9% or 27 households of the households surveyed use firewood and have primary education.

The estimates of households in different municipalities are as follows: Shuto Orizari 4,346 households, Saraj 7,426 households, Studenichani 2,691 households, Arachinovo 1,880 and in Petrovec 875 households.

The percentages of households with primary education using firewood in the five biggest municipalities in Skopje Region, although they range between 15.4% in Aerodrom up to 37.2% in Chair out of the total households surveyed in the respective municipality, are still high. According to the estimates:

- In Gazi Baba municipality out of 22,352 households, 13,204 are using firewood, of which **30.5%** or **4,027** have primary education;
- In Aerodrom municipality out of 19,205 households, 2,530 are using firewood, of which **15.4%** or **390** have primary education;
- In Chair municipality out of 18,135 households, 4,704 are using firewood, of which **37.2%** or **1,750** have primary education;
- In the municipality of Karposh out of 17,518 households, only 2,790 use firewood. Of them **22.1%** or **617** households have primary education and
- In Kisela Voda municipality out of 15,961 households, 6,715 are using firewood, and out of them **23.2%** or **1,558** have primary education.

If we consider these 10 municipalities (municipalities with highest percentage of households having primary education and using firewood and the five municipalities with most households in Skopje Region) the sum of the estimated households having primary education and using firewood is **25,560** households or **34.9 %** out the total estimated households (73.220) using firewood in Skopje Region.

2.3. Households with children younger than 18 using firewood

The care for children and their health condition is the biggest priority for every parent. Research⁴ confirms that parents who are directly informed about air pollution as well as about the harmful consequences of pollution on the health, and on the physical and psychological development of their children change their behavior. So, this target group will much more easily decide to change their heating practices if they see and hear about air pollution indicators, about the fact that firewood is contributing to air pollution, as well as about its impact on development of lung diseases among children, chronic diseases (asthma), increase in the number of malignant diseases and of lung diseases, data on children having these types of diseases on the territory of Skopje, instead of using financial coercion instrument.

These category of households presents **50.2%** or **1,133** households out of the total number of households using firewood (2,257 households). According to the estimates about the total number of households in Skopje Region, it seems that out of 73,220 households there are 36,756 households with children younger than 18, which use firewood.

The analysis for the municipalities shows the following:

- Shuto Orizari has the highest percentage of surveyed households with children younger than 18 which use firewood, **85.8%** or **139** households.
- Saraj – **77.3%** or **228** households in the municipality use firewood and have children younger than 18;
- Chair – **69.7%** or **101** households in the municipality use firewood and have children younger than 18;
- Studenichani – **66.2** or **86** households in the municipality use firewood and have children younger than 18;

⁴ Omar, I Asensio, and Magali A. Delmas, Nonprice incentives and energy conservation, Proceedings of the National Academy of Science of USA, Vol. 112, 6.2. 2015;
 The World Bank and Institute for Health Metrics and Evaluation University of Washington, Seattle, The Cost of Air Pollution – Strengthening the Economic Case for Action, 2016;
 The World Bank Group, FYRMacedonia green growth country assessment, March 2014

- Butel – **56.5%** or **91** households in the municipality use firewood and have children younger than 18;
- Chucher Sandevo – **52.5%** or **31** households in the municipality use firewood and have children younger than 18;
- Arachinovo – **52.2%** or **47** households in the municipality use firewood and have children younger than 18.

According to the estimates for the municipalities, the number of households having children under 18 and using firewood is as follows:

- Shuto Orizari - 4,509 households;
- Saraj - 7,398 households;
- In the municipality of Chair, which is one of the biggest municipalities in the Skopje Region, there are 3,279 such households;
- Studenichani - 2,792 households;
- Butel - 2,951 households;
- Chucher Sandevo - 1,005 households and
- Arachinovo - 1,524 households.

The estimates for the biggest five municipalities, taking into consideration Chair as well, which also has high percentage of households with children under 18 using firewood shows the following:

- Gazi Baba municipality has 38.3% of households with children under 18 which use firewood and estimates show that there are 5,057 households;
- Aerodrom municipality has 41% of households with children under 18 which use firewood, and there are 1,037 such households;
- Karposh municipality has 36% of households with children under 18 which use firewood, and there are 1,004 such households;
- Kisela Voda municipality has 23.7% of households with children under 18 which use firewood, and there are 1,592 such households;

The sum of households with children under 18 using firewood from these municipalities is 32,148 or 43.9% of the total number of households which use firewood in Skopje Region.

2.4. Single parent households with children younger than 18 using firewood

This category of households contains **4.8%** or **51** households out of 1,133 households with children under 18 which use firewood.

According to the information that 50.2% or 1,133 households of the total number of households use firewood and have children younger than 18 we estimated that in the Skopje Region there are in total 36,756 such households. Hence the estimate that 1,764 households are single-parent households (widowed or divorced) with children under 18 which use firewood.

In the analysis Shuto Orizari municipality stands out, since in it there are 9.4% or 13 households out of 139 households with children under 18, which use firewood and are at the same time single parent households, while in the Studenichani municipality there are 11.6% or 10 households from this category.

In Butel municipality there are 7.7% or 7 such households, in Gazi Baba there are 2.6% or 4 such households and in Saraj there are 1.8% or 4 households from this category.

3. Households with inefficient facades

Especially important for the house heating, for maintaining appropriate temperature, as well as for reducing the monthly heating bill is insulation of buildings. Most of the citizens are aware of problems caused by poor insulation and of benefits from having better insulation of buildings and changing the windows. But only 39% of the households surveyed responded that they know in what year the facade was renovated or the windows were changed. 61% responded that they do not know when the last reconstruction of any part of the building envelope was made. Of those who confirmed that some type of improvement was made, 80% of the cases had the improvement done between 2000-2016, 11% between 1986-1999, and 9% between 1963-1985.

According to the data from the survey, **49.3%** or **2,564** of all the respondents⁵ have walls on their dwellings which are not sufficiently insulated. There are also buildings with uncompliant insulation considering the most recent regulations which stipulate that buildings being constructed with bricks must have at least 8-10 cm of thermal insulation and 10-12 cm insulation material. The buildings of **35.8%** or **1,859** of all respondents which have responded to this question (5,196) are like this. If we consider the building insulation standards, only **7.8%** or **403** respondents confirmed to live in buildings which satisfy the prescribed insulation standards. Out of 5,196 answers, **7.1%** or **370** responded that they do not know whether the building had some kind of thermal insulation.

The reasons for lack of insulation is mainly the lack of awareness about the benefits of energy efficient buildings. Most citizens believe that it is sufficient to change the windows and that this is the only measure that they should take in order to have more efficient thermal insulation. The citizens who have insulated their facades have used up to 2 cm, 5 cm or 10 cm of Styrofoam, glass wool or stone wool insulation on the walls which is not sufficient. Having all this in mind, we can conclude that recommendations and measures targeting this group should take into consideration the buildings which do not have any insulation or have insulation which does not comply with the prescribed thermal insulation standards.

4. Households with inefficient roofs

Out of 4,936 responses submitted to questions related to roofs and roof insulation, **52.3%** or **2,583** said that the roof of their dwelling has no thermal insulation. The buildings of **24.1%** or **1,191** respondents have 5 to 10 cm of insulation, while **6.7 %** or **333** from all respondents said that their buildings have 15 or more cm of insulation. **16.8%** or **829** responded that they don't know whether there is an insulation on the roof.

5. Households disconnected from the district heating system

⁵ The questions from the survey relating to insulation of buildings (basic construction, facade and roof) gave an opportunity to the respondent to select several answers and that is why the calculations were made in accordance with the total number of answers obtained, and not according to the number of households surveyed

These are households which used the district heating system in the past, but because of various reasons they decided to disconnect the dwelling from the system. This category can easily connect once again to the district heating system. The piping is there, and the initial investment for connecting with the district heating system is quite low and of course district heating generates much less emissions compared to firewood. The households should be informed about the air pollution that they are causing, but at the same time a financial calculation should be made for their monthly costs, in order for them to see what the heating costs will be if they change their heating practices.