

# Smarter Stoves Partnership

Author: Darko Stojilović

Behavioural patterns related to  
household-heating practices in Serbia

August 2021



This Report was prepared within the project "Smarter Stoves Partnership", which aims to create a regional knowledge platform to replace inefficient individual heating devices in households across the Western Balkans. The project is being implemented by RES Foundation, funded by the Austrian Ministry of Climate and European Climate Foundation (ECF). Attitudes and opinions expressed in this report are solely the views of the author and do not necessarily represent the views of RES Foundation or the project donors.

## Table of Contents

<b>Behavioural patterns related to household-heating practices in Serbia</b> .....	<b>3</b>
Literature review.....	3
Factors that may influence fuel use and energy transition.....	4
Methodology.....	6
The list of items in aforementioned focus groups .....	7
<b>Results</b> .....	<b>9</b>
Description of household .....	9
Heating habits of neighbours.....	10
Heating habits and stove perceptions.....	11
Perception of negative effects of using stoves.....	15
Perception of health hazards .....	16
Alternative heating and willingness to switch to a cleaner heating source .....	17
<b>Conclusions</b> .....	<b>21</b>

# INTEGRATED ANALYSIS REPORT

*Project name:* Smarter Stoves Partnership Project

*Consultant:* Darko Stojilović, social behaviour expert

## **Behavioural patterns related to household-heating practices in Serbia**

### **Literature review**

Literature review offers two main theories that aim to describe the behaviour of people regarding fuel and stove use, as well as energy transition from one source to another. According to the dominant approach, **the energy ladder model (ELM)**, people are perfectly rational actors, and have ranked preferences for different fuels based on several factors (cost, ease of use, efficiency, etc.). This model is derived from the highly influential theory of human rationality *Rational choice theory* whose main assumption is that people try to maximize their own utility. Another implication of ELM is that they also make a *complete transition* from one fuel to another, i.e. they switch to a better fuel as their income grows. For example, people will try to obtain the most affordable and most available fuel; they will first use whatever they can obtain (e.g. wood, coal), and as their socio-economic status grows, they will “climb the energy ladder” and make a *complete transition* to kerosene, then to gas and ultimately to electricity. So, income is positively correlated to adoption of more efficient and more costly energy sources.

However, there are studies showing that income is not the key explaining variable and, in some countries, socio-economic status is not at all linked to fuel consumption. In other words, some empirical data cannot be explained by the energy ladder model, as there are other factors that may outweigh the importance of income (e.g., fuel availability). Critics of ELM show that **in reality people often diversify their fuel use and don't make a complete transition to one fuel source**. For example, people may continue to use wood if it is cheap and easily available even if they have the money to switch to cleaner and more expensive energy sources. In other cases, even the people with low socio-economic status use electricity if they have access to it. In other words, people usually don't make a complete transition to one fuel, but rather use multiple fuel

sources.

Second approach posits that people diversify their fuel and stove use. Although the new and improved stove types can be added, traditional ones are rarely abandoned. Based on different tasks and needs, people may use different fuel or stove options. According to the multiple fuel use model, income is not a crucial factor, and people are more constrained by different factors (e.g., fuel availability), than they are guided by maximum utility. People often stack lower-level fuels, e.g., wood, coal, or use whatever they have available (tires, clothes). This model is derived from cognitive-ecological perspective on human rationality, whose main assumption is that people don't act as rational agents according to some norm (e.g., logical norms), but rather use **heuristics (i.e., intuitive reasoning) that provide good enough solutions**. Because people live in an uncertain world where gains and losses cannot be computed, they develop heuristics through interplay between the cognitive processes and structure of the environment. Metaphorically speaking, they use a pair of scissors, where one blade is their cognitive limitations, and the other is the structure of the environment. For example, people may draw samples from their social environment (e.g., neighbourhood) and base their decision on other people's habits regarding fuel and stove use. Socio-cultural factors also play an important role according to this theory. For example, an improved ceramic stove that was successfully implemented in one country often won't be as effective in other countries with different cultural patterns. People in the Balkans often use their stove for making traditional meals or preserved food (beans, ajvar, sarma, etc.), even when they have a cleaner fuel stove they primarily use. The reasons for this will be underlined below, along with descriptions of other factors which have been found to influence fuel use and energy transition behaviour.

### **Factors that may influence fuel use and energy transition**

***Income.*** Studies show that low income can be a crucial determinant of solid fuel use. **Cleaner fuel sources require up-front investments, which is not feasible for people with low income.** People with low income usually obtain cheap fuel in small quantities to get through the winter, and do this every year. However, although the literature shows a link between income and the transition to better fuels, this link is not

entirely linear. More precisely, some findings indicate that people with higher income will not necessarily switch to the best and cleanest source of energy but rather use a combination of fuels.

**Family/community.** The influence of the family and the community (particularly neighbours) on heating choices can be both positive and negative. Certain activities such as collecting and preparing firewood can play an important role in the community and are part of the local tradition. Therefore, some people may refuse to switch to a more modern way of heating in order not to stand out or be perceived to signal a higher social status. On the other hand, it is possible that people would be more willing to switch to cleaner energy sources if their neighbours do it first, after they get familiar with new technologies and after they have the opportunity to hear other people's testimonies.

**Household size.** Data on household size as a factor that can influence fuel use is *inconclusive*. Some studies show no correlation, others indicate that larger households prefer traditional fuels over modern ones. Some studies show that *type of area* (urban or rural) is a moderating variable. It seems that on its own household size is not that important of a factor, but is correlated to some other factor which determines whether it's positively or negatively correlated with the fuel transition (e.g. type of area).

**Fuel availability and security.** In some studies, especially in rural Africa, fuel availability and access is observed to be the main determinant of fuel use. In addition, even when people have access to cleaner fuels, they often stock wood and coal *just in case*, e.g. in the event of electricity shortage. In other words, they are **risk averse**, and try to be prepared for every eventuality.

**Gender roles.** Studies show that women's and men's roles are different when it comes to fuel and stove use. Women are mostly engaged in cooking, while men usually decide which fuel and technology is used for heating purposes.

**Cooking.** The use of solid fuels for cooking is a practice that has been passed down through the generations and has been the standard for a long time. **People are**

**often satisfied with the stove their grandmothers used and often do not want to deviate from tradition.** In addition, people have often emphasised the **economical aspect of the stove, which can handle several pots of food at the same time, which can save time.** The food is often perceived as more delicious when prepared on solid fuel stoves. The economical aspect is also reflected in the fact that in winter the stove heats the room and serves for food preparation. In the Balkans, even people who do not use the stove for cooking and heating in winter, may use it to prepare preserved food in the yard.

***Perception of health hazards.*** Studies show that people generally do not see the connection between their choice of fuel and stove and the health problems they have. Moreover, in some studies, respondents did not perceive ash and smoke as something bad, but something that could be useful to them, e.g. because it protects them from insects.

These results and correlations are *not unambiguous*. More often than not, different studies show different results, which is understandable bearing in mind that studies are done in many different contexts and countries. Also, there are only a few experimental studies. Most of the studies are observational and methodologically far from perfect. Given that the research on fuel and stove use in the Western Balkan markets is non-existent, literature review was followed by qualitative study of Serbian citizens' attitudes and behavioural patterns, to be able to provide a better understanding of behavioural patterns of the people in the Balkans.

## **Methodology**

The goal of the study was to examine the importance of numerous factors (psychological, cultural, social, etc.) in the specific context, which according to previous research influence people's decisions regarding fuel and stove use. This was done by determining important factors and the perception of citizens in the specific context of the West Balkans.

## **Sample**

Four focus groups were conducted. Participants were selected based on their use of the biomass for household heating (“energy of the poor”), e.g. wood or coal. They were divided by gender and type of settlement, to allow comparison. Rural groups consisted of 4 participants, and urban groups consisted of 5 participants each. Group 1 comprised 4 women from rural area, group 2 comprised 4 men from rural area, group 3 comprised 5 women from urban area, and group 4 comprised 5 men from urban area. Participants from rural areas were less educated than participants from urban areas, half of them having finished only primary school and the other half finished secondary school. Participants from urban areas, on the other hand, all finished secondary school, and three of them have a faculty diploma. People from rural areas also have lower income compared to participants from urban areas. Most of them earn less than 20.000 dinars (RSD) per month, and all of the rural participants have less than 40.000 per month. Only three participants from urban areas have between 20 and 40.000 rsd per month, four of them have between 60 and 80.000 rsd and two participants have between 80 and 100.000 rsd.

### **The list of themes in aforementioned focus groups**

#### *1. Description of household*

Participants described what their household looks like, who they live with, how many rooms they have and how many of those rooms are being heated during the winter. They assessed the condition of the joinery they have, pointed out what needs to be changed in their home in order for it to be more comfortable, whether they recently considered investments in some larger installations and repairs, what are the obstacles for that, etc.

#### *2. Heating habits of neighbours*

Respondents described the most common ways of heating in the neighbourhood, assessed how often wood is used and how often other materials are used by their neighbours, and whether there are any neighbours who use modern appliances for household heating.

#### *3. Heating habits and perceptions of stoves*



Participants were asked how long do they use a stove, why do they use that stove, when and how do they use it, do they use it for cooking, how many rooms do they heat during the winter, how often do they ventilate the rooms that are heated, where do they buy firewood, how much do they plan in advance, what it depends on, who makes the decision on fuel that will be used, how important finances are in the decision-making process, how big of a problem is the purchase of fuel for them.

Participants were also asked what determines their choice and what their experiences with other ways of heating are. They were then asked what a “wood burning stove” reminds them of, to describe how they feel about it, to describe how they use it, what they think are the best energy sources for heating and why; then they were asked what they most often use, what they like most about wood stoves, are there any bad sides of the stove, who spends the most time around the stove and how generally satisfied they are with their thermal comfort.

#### *4. Perception of negative effects of using stoves*

Questions for participants also covered their familiarity with the possible negative effects of using solid fuels and types of those effects, whether they have experienced it or heard from neighbours and family, whether they have knowledge about air pollution due to the use of solid fuels, how much they are familiar with pollution problems in general, whether they are interested in it.

#### *5. Perception of health hazards*

Among the questions were if participants perceive pollution as a problem at all, what are their concerns when it comes to air pollution and the use of energy sources which were mentioned earlier, and have they ever linked their health problems to their heating practices or has their doctor suggested that it could be a problem.

#### *6. Alternative heating source*

Participants were asked how familiar they were with other ways of heating, whether they had experiences with something other than traditional stoves, whether those experiences were positive or negative, whether they are familiar with heat pumps, solar panels, air conditioning, what they thought are the good and bad sides of these

technologies, how often do they think they would be able to use these appliances, what worries them about the potential transition to these alternative types of heating.

#### *7. Willingness to switch to a cleaner heating source*

Would they be interested in changing the way they heat, what and how would they change, what would be the motivation to do it; is it saving time, money, easier maintenance, a recommendation by someone from their environment or from the authority (and whom?) Would they be willing to switch to a better appliance if the neighbourhood opted for alternative types of heating? If not, what would be the main reasons? From whom would they expect an incentive to change the way of heating, whether from local self-government, centres for social work, states? Who has, in their opinion, the greatest authority in this area?

## **Results**

### **Description of household**

Even in a small sample of people, there are differences in what their living conditions are like and what their household looks like. So some live in old family houses, which they share with the rest of the family, others live in apartments or houses built 10-20 years ago, while some respondents from rural areas live in earthen houses (so-called Swabian houses) which are in very poor condition. Respondents from rural groups point out that not all rooms are heated, although most of them have four or more rooms, on average they heat about 50% of their living area. On the other hand, respondents from urban groups heat about 80% of rooms on average.

When it comes to insulation, citizens from rural areas all have wooden joinery, which is often very bad and old. They are in a terrible material situation, so their houses need new doors, windows and insulation. It seems to them that overall it is very expensive and represents a huge investment, which they cannot afford. Therefore, replacing the heating source is not their top priority, because even if they had money to spend, they would invest in joinery first.

In the urban group of respondents, there are those who have PVC joinery and are satisfied with it. However, in all four groups that participated in the research, there are people who think that wooden doors and windows are superior compared to PVC ones.

In the rural group, one woman pointed out that, even if she could afford it, she would not be able to install PVC joinery because she would be bothered by artificial material due to health problems. Another woman from the rural group pointed out that she would prefer her new doors and windows to be made of wood. The reason for prioritizing wood over PVC can best be understood when looking at the responses of respondents from the urban group.

“I am against PVC, I am for wood. It seals well, but it’s not that permanent. It can’t last like wood, which you coat with oil paint... and it breathes, breathes. We install PVC windows, close houses, but where is the ventilation? And then there is condensation, mold and other things... I’m against PVC, that rubber can’t last fifty years.”

*Woman, urban*

“If you ask me, woodwork is the king. Firstly, it is healthier. PVC is better because it seals better, it is more modern, it has its advantages, but it is plastic. Wood is wood after all, it’s alive, just like you have the parquet floor. Parquet and laminate can never be the same. Laminate is plain cardboard, and parquet is parquet, it is living wood.”

*Man, urban*

This is where the first heuristic that some people use when making a decision regarding household heating appears. We will see below that it is also used when thinking about the type of fuel that is used. **The “natural is better” heuristic allows people to be guided by the fact that if something is natural, in this case *made of wood* - that it is a priori better and healthier than something new, “artificial” and more modern.** They often use this heuristic instead of informing, studying and considering various options which the energy ladder model posits.

It is important to point out that all people who are against PVC have never had PVC joinery. This line of thinking is repeated when they talk about how they heat.

### **Heating habits of neighbours**

All respondents live in settlements where there are no apartment buildings, only

houses. Respondents point out that their neighbors usually use wood, less frequently coal, and gas or pellet heating to a much lesser extent. **They often notice that there are people who burn clothes and tires.** People who do that are in very poor financial condition, or have no income at all.

“People burn everything, they suffocate you! I have a neighbour that burns railway sills... so when he burned it, I needed a mask before this coronavirus. Tires, *opanak*, shoes, everything is burned.”

*Man, rural*

One participant points out that his neighbour uses gas, but it is often cold in his house, so he has to supplement it with air-conditioning. An additional problem is that it has old wooden joinery, so the house cools down quickly.

Respondents say that they are not directly guided by what their neighbors do when choosing a heating method. They point out that there is more of a kind of competition than modeling in a positive sense. For example, if a neighbor introduces gas, they start to raise questions about where he/she got the money to install gas, and then they see if they can also install it. But when it comes to gathering information about different energy sources, neighbours have the main role, even though participants won't admit directly they are influenced by their neighbour's choice of heating. This is the case particularly if it is a modern solution; they often learn new information and have the opportunity to witness its effectiveness first-hand, which can influence their decision-making in the future.

### **Heating habits and stove perceptions**

Participants stated that they most often use a tiled stove (in rural areas), of one or the other most common manufacturers: “Smederevac” (“Milan Blagojević Smederevo”, MBS) and/or “Alfa-plam” (Alfa-plam, Vranje). One respondent from urban male groups uses central heating, but all respondents, including him, use wood as main fuel. One woman from the urban area uses a storage heater, but since she cannot heat the whole house when it is very cold, she heats it with a coal and wood furnace. Another woman from an urban area uses “kreka” and burns wood and coal at the same time, while she

uses air-conditioning in spring/fall. Apart from wood, the respondents point out that they most often use coal, but that they avoid it because it pollutes. “Smederevac” is most often used because of tradition, since they inherited it from their family and are fond of it. **They understand that it is best to buy wood in the spring-summer in order to have enough time for it to dry before winter, but they often cannot afford to.**

Participants believe that burning wood is better than anything else they can afford, and they believe that wood pollutes the least, especially compared to coal. In addition, **electricity is saved during cooking.** Respondents notice well that dry wood is better for burning, that is, that wet wood creates soot and clogs the room. However, they always compare wood to coal. For example, the advantage is that the wood heats up quickly, but maintains the fire poorly, although it does not smell like coal. Coal returns smoke from the chimney that causes discomfort for eyes and creates a lot of ash. Respondents think that the quality of coal is declining nowadays. They notice smoke and pollution from burning coal in the neighborhood, and they can't breathe.

“I am more for that “Smederevac” and wood and nothing else. Because it heats up nicely. And when you look at it, it's not too expensive now. And honestly, it pollutes much less than coal and gas.”

*Woman, rural*

“I started with oil furnaces, gas, coal, I tried everything. Everything that could be tried, I have tried it.... Now I heat exclusively with wood. All that I have listed, it is not healthy... It all emits gases... The wood does not have it, the wood burns clean. That gas won't suffocate you, and everything else can. Wood cannot harm you.”

*Man, urban*

Only one woman from the rural area praised coal as an energy source, while all the others pointed out that it was dirty, and that it polluted a lot.

“Permanently burning stove... it burns so well, especially coal, that I can't describe it to you... six or seven tons from October to April... and I can tell

you that we could be in T-shirts and shorts how warm it is... especially when the chimney is cleaned, when it is all clean, when there are no lumps of coal, then it heats up so nicely... **coal is natural**"

*Woman, rural*

Participants have very positive associations of using wood. They emphasise the **warmth of home, childhood memories, the smell of food that permeates the rooms. This is especially emphasised by women.**

"Soup whispers when cooked... That's what my grandmother would say."

*Woman, rural*

"The warmth of home... especially when I'm upstairs in the room and mom downstairs baking cakes."

*Woman, rural*

"There's a charm to it, **when it's warm, and then you all get together in the room and you actually get closer because you're all together in that one room there, warming up and still hanging out.**"

*Woman, urban*

On the other hand, men more often emphasise the practicality and instrumental function of the stove, that is, how well it heats and how it pays off. In general, men know more about different technologies and have more information about different appliances compared to women, while women talk more about the emotional connection with the stove.

"You cook, you heat, you bake, you do everything on it"

*Man, rural*

“I am very satisfied with the heating, “Smederevac” heats very well. It is a very old brand and **many of them tried to copy it and failed**. And that's why the newer ones were built to look nicer, but the shape is the same, and it manages to heat the entire bottom floor, the house has a total of about 130 square meters. And the whole bottom floor with five rooms managed to heat up to be equally warm.”

*Man, urban*

People point out that they enjoy the whole experience of heating and spending time in a room with a stove and it gives them some sort of psychological satisfaction. **A stove or furnace in which the flame can be seen has a positive psychological effect on people, who point out that looking at the flame calms them down.**

“By nature I get cold easily... When it's coldest, when I open my stove and put wood inside to light it, when I start to light that match and the flame starts, heat... they say you won't heat properly without wood, you **cannot heat without fire.**”

*Woman, rural*

Some participants pointed out that owning a stove and purchasing wood enables them to **feel secure. Namely, the old stove is not thrown away and is kept just in case** even when not in use.

“I still have the “kreka” in the garage, I won't give it away, I don't know what will happen tomorrow!”

*Woman, rural*

“And why is wood the most appealing... because you **don't depend on**

**anyone.** Buy wood now... put it in the shed and sleep peacefully the whole winter. **You don't have to think about whether someone from Russia will turn on the gas...** Or whether the power will go out so you can't warm up... [in these situations] you depend on others. You don't depend on anyone [if you use wood]. Get firewood and sleep peacefully until next year... **You are your own boss when you use wood.**"

Man, rural

People see an advantage in the stove because it can be used for cooking. Not only that, but they point out that the **taste of food is better when it is prepared on a wood stove.** Men emphasised the importance of food taste to a lesser extent, but there were some among them who pointed it out as well.

"When we use a heating stove in the winter, it means I can put five pots for lunch and use the oven... You have electricity savings."

Woman, rural

"What I always say and stand behind is the taste, it's not the same to cook on wood, on that stove... when I bake a pie that I made by hand and when I take it out of this wood stove or from an electric one - the taste is different".

Woman, rural

"And it is more practical because when you use "Smederevac", you can put two or three pots on top and use an oven for baking".

Woman, urban

### **Perception of negative effects of using stoves**

The main problem that people see regarding stoves and burning **solid fuels is related to preparation, maintenance, and the time that takes.** Participants point out that the problem is that the **stove must be constantly monitored and heated, which means**



**that they are practically tied to the stove all day.** Ash should also be thrown out, and the stove should generally be cleaned, as it often happens that some people clog a chimney or stove.

**“The chimney must be cleaned, there will be dust... you wipe, but after two or three days [the dust reappears] again... and it is the same with curtains.”** *Woman, rural*

**“Above the stove, the ceiling darkens, because our stove opens upwards, so that the smoke goes up to the ceiling when it comes out. Walls needs to be painted more often”**

*Woman, urban*

Participants especially point out that preparation is a problem, **especially if you are older, you need someone to help you, e.g. to cut wood, to bring wood into the house.** If you don't have someone who can help, then it all requires additional costs. In addition, the citizens notice that there is a **danger of injuries, since they used to burn themselves on overheated “Smederevac” when they were younger.** Some people are bothered by the fact that the firebox is small, narrow, so large pieces of solid fuel cannot be inserted. Respondents are aware that burning harms the environment, but they are convinced that by burning wood, they do so to the least extent. For that reason, the respondents **rarely ventilate the rooms when they burn wood (which is not the case when they burn coal).** They point out that the house never stinks when it is burned on wood, so the rooms are usually ventilated in the morning and sometimes in the evening.

### **Perception of health hazards**

Participants from all four groups agree that heating on solid fuels pollutes the environment, which they especially notice in the winter when they go outside.

**“I take the white T-shirt outside to dry and after two minutes I return the same T-shirt for washing because of the soot.”**

*Man, rural*

However, they point out that this pollution does not come from burning wood, but from fuel, oil, coal, rubber, etc. They know exactly who burns coal, because black smoke comes out of their chimney, which suffocates and contaminates the neighborhood. In addition, respondents who burn wood do not notice pollution in their household, in their rooms more precisely.

**Respondents point out that the reason wood does not pollute so much is that it does not produce gas and that there are fewer ash particles when wood is burned. That is why wood is the least polluting.**

“But to burn everything is dangerous, it is not good, it is pollution, no doubt about it. But if you burn quality beech, oak... But you put in the stove that you haven't cleaned for five years and railway sills and wooden coal, you don't heat up properly, but you instead have poisoned half the street... “

*Man, rural*

“Coal, that dried one, it pinches your eyes exactly when you load it. It's big gas, it's gas. When it comes to wood, there is no gas.”

*Man, rural*

**One woman from a rural area pointed out that the doctor told her that the baby should not stay in the room where the tile stove is lit.** Other respondents did not receive advice of this type from their doctors, nor did they associate any health issues with burning wood.

### **Alternative heating and willingness to switch to a cleaner heating source**

Participants from the rural women's group have no experience with alternative types of heating, so their perception is based on what they heard on television, read on the Internet or saw in the neighbourhood. However, their encounters with gas, air conditioning, pellets and the like are not frequent.

They are mostly skeptical of air-conditioning and gas, which they see as something **“artificial” - a heuristic we've mentioned before.** They also have the impression that the air-conditioning cannot provide thermal comfort as much as a stove or furnace can – “you get warmer when you heat up by a “Smederevac” .”

“In my opinion, that is artificial heating [air-conditioning and gas]. It cannot replace natural heating in any way, such as wood in the first place, then coal in the second place.”

*Woman, rural*

Other ways of heating, which are even more abstract in terms of how they work, are somewhat more tempting to them because they see them as **natural ways of heating**, e.g. underfloor heating with pellets or solar energy.

“I was attracted to that pellet... It even has a remote control, you adjust the temperature to the needs of the room... Maybe that would be the kind of heating I would want... The pellet makes me think of something natural...”

Ecologically speaking, it is more suitable. They say it covers a lot of square meters.”

*Woman, rural*

Most had no experience with pellet heating, but one respondent had an exceptional knowledge of it and had a very positive impression.

“You know what’s a good thing - a pellet stove. It's on radiators, too, you adjust it to a mobile phone. You pour two of these glasses and you're calm all day... Plus you're not home, you fill it up, you go to work in the morning, you pick up your cell phone, you type, you leave, come back from work, turn it on, you set the temperature you want, you come home – and it is already warm.”

*Man, rural*

On the other hand, one respondent who knows nothing about pellet heating has a fear of technology and is afraid to forget whether he turned it on or off over the phone when he left the house.

“I wouldn't try it [pellet], so that the whole place wouldn't go boom”.

*Man, rural*

Male respondents from rural areas are significantly more informed about different methods of heating than female respondents. They believe that it is best to heat with gas or electricity, and that would be ideal for them if they could afford it. But they **can't pay for electricity regularly, they can pay a higher bill once, but they can't do it every month**. As for the air-conditioning in particular, they do not know if it pays off, they do not have air-conditioning, so they **cannot estimate how much they would need to pay for electricity**.

Still, money plays a key factor in rural groups. They are generally interested in any modern type of heating, be it underfloor heating, pellet heating, air-conditioning, etc. But the crucial factor is money. **They don't have enough money to invest, even though they know it would pay off in the long run**. Most respondents from rural areas cannot invest in changing heating appliances at all. **The only thing that would suit them is for the local authorities or the state to replace the appliance and offer them a new one**.

“I like these new technologies... but it all depends on the money.”

*Man, rural*

When it comes to citizens from urban areas, they are generally more versed in modern technologies than citizens from rural areas. **They also heard about transparent solar panels, which are currently available in Slovenia**, but they also heard about the heat pump, of which they have a very positive impression. However, they think they cannot afford it. A woman from a rural area is thrilled with the inverter air-conditioning, because her friend uses it and consumes a kilowatt or two to heat 100 square meters of space. Men prefer electricity.

“The only replacement for wood is electricity. The electricity is the cleanest, the safest, everything else is not safe. Gas is not safe, it is poisonous, coal is poisonous...”

*Man, urban*

However, a few of them are extremely happy with the stove they use and would not

change it, despite the fact that new technologies sound tempting. Respondents from the male urban group point out that for safety reasons, one should never have only one heating source.

**“Electricity is most efficient if it is stable. And the safest is the wood because you are its master.”**

*Man, urban*

“I would never stay on a single heating source, not even on a wood. The best solution is when you have at least two heating appliances. You must never stick with only one.”

*Man, urban*

In urban areas, they evaluate gas and electricity most positively, although one respondent points out that he is **afraid of gas and potential explosions**. In addition, they have positive impressions from neighbors who use pellet heating. One person from the women's urban group pointed out that she prefers natural to artificial heating methods such as gas. **The older person from this group says that she no longer decides about it, but that the younger ones from her house decide.** Also, compared to respondents from rural areas, people from urban areas have greater ability to invest in new sources. Respondents think that gas is the cheapest, but it is necessary to invest much in advance - 3000 €, which not everyone can afford. They also believe that it pays off to invest, but they simply do not have enough. These respondents would still need 50% assistance from the state or local government.

**People generally do not see that there are authorities in this area, they rely only on themselves and do not believe that anyone wants and can help them.** One woman from the urban environment only mentioned the dean of the Faculty of Forestry as a person of authority whom she listens to. If there was some kind of help, they would **expect that help to come from the local self-government and the state, but they do not have much hope that such a thing is feasible, especially since some families cannot invest absolutely nothing for these purposes.**

**“I'm not asking for money. Come, see, replace. I don't need money, I**

**need this and that to be done.”**

*Man, rural*

## **Conclusions**

The use of wood stoves or furnaces primarily provides people with comfort and warmth, reminds them of childhood and gives them the opportunity to get closer to other household members and create a sense of intimacy. The crackling of wood and looking into the flames gives them comfort and psychological peace. Another important function of using firewood is the security it brings. Respondents note that other types of energy may depend on external factors and technology, and when they have wood, they depend on no one. Even if the power goes out or the heater breaks down, the wood and the stove can provide heating during the winter. The third function that the respondents emphasise concerns practicality, since the stove enables cooking and thus saves energy. Cooking has an additional function because it serves as another factor that gathers the household and, according to the respondents, using firewood even makes the food taste better.

The difference between men and women is primarily reflected in the fact that women much more often emphasise the importance of the stove for cooking and talk about the emotional connection they have with this appliance, while men emphasise the usefulness and usability of the stove for its basic function - heating.

Certain differences can be noticed between the respondents living in rural and urban areas, which, of course, should be checked by quantitative methods so that they can be generalized. In our sample, citizens from rural areas were on average less educated and had significantly lower income or don't have income at all. This is important to note, because these two groups do not have the same starting positions. People from rural areas do not have the opportunity to invest in new technologies, and the condition of their houses, and especially the insulation and joinery is very bad. It is a priority for them to improve the condition of their house, primarily windows and doors that are made of old wood, as well as to install insulation. Unlike citizens from urban areas, respondents from rural areas do not even have enough thermal comfort, because they

have to save on the use of fuel. Investing in a new, less polluting heating source would not solve their primary problems regarding the poor ability of the house in which they live to retain heat and the inability to afford to keep it warm throughout the winter. Even if they received financial aid for a new appliance, the monthly costs for this type of heating should not be higher than the current ones. Respondents from rural areas who are in poor financial condition would not necessarily be interested in the 50% subsidy to replace the appliance, nor could many citizens be expected to get involved in such an action if it were proposed.

As the most tempting option of alternative technologies, respondents from rural areas choose pellet heating, as it is most similar to their experience of heating up a stove or a furnace. Namely, in this case, too, there is something that is inserted into the appliance (a bag containing pellets), which corresponds to inserting wood or coal into the stove. For that reason, this option is the closest to them psychologically, while options such as gas heating or air-conditioning are psychologically distant and “artificial”, and for that reason is not that tempting to them. They do not perceive electric heating as a real possibility at all, considering the finances, although they potentially see it as an ideal solution.

**People who have been retired for some time are the main advocates of using only wood heating.** They are reluctant to try new things, especially when they believe that the stove and wood have served them well throughout their lives. However, it seems that some respondents are rationalising some of their decisions and attitudes, in the sense that if they know that they cannot afford better and more modern ways of heating - then the methods they currently use will seem good enough or even ideal - they will be willing to find a wide variety of reasons why using firewood and stove is the best option. **They are trying to justify their choice, which is not really a choice in the true sense because they are forced to use a stove and wood due to a bad financial situation.**

**Citizens living in urban areas can afford certain investments, and it would mean a lot to them if they could get 50% financial aid from someone. In most cases, respondents from this group would ideally like to heat with electricity.** This group also needs incentives, given that they are very satisfied with wood as a fuel and do not

think that it affects pollution to a greater extent. However, although they are satisfied with wood heating, there are some disadvantages of this method of heating that the respondents pointed out, which could be used for communication. Namely, stoves and wood require a lot of work around preparation, maintenance, cleaning, etc., which is not the case with some alternative types of heating that sound tempting to them.

A positive feature of modern appliances that would be worth emphasising in communication is the ease of use, especially temperature optimization via remote or mobile phone. Respondents liked this aspect the most, although some were sceptical, primarily because they cannot really imagine exactly how it works and are afraid of some things that are not a problem in reality. That is why it is important to inform citizens about these alternatives in an appropriate way. In any case, citizens do not think that they would have a problem learning to use modern technologies, but it is important that they have contact with them in order to become psychologically close to them and thus more acceptable.

So, people who have no experience with modern technologies, whether when it comes to joinery or when it comes to heating appliances, are generally sceptical about such technologies. In addition, they do not have a lot of information about alternative sources of heating, so they base their attitudes exclusively on the emotional component and impression. **In a situation like this when they can't rely on information and experience, people tend to be guided by intuitive thinking, and our results show that the dominant heuristics used by them is a heuristic "natural is better".** Namely, in choosing between modern and traditional technologies, people rely on what is natural (e.g. wood), while they reject what seems artificial to them as worse alternatives (e.g. gas), but also less healthy (PVC). On the other hand, it seems that people who are more familiar with different types of heating, as well as those who have PVC joinery or have had a close encounter with alternative heating methods - do not use this heuristic in reasoning, or at least do not use it as often as the first group of people.

Finances are *the most important factor* influencing the decision-making and attitudes about different ways of heating. However, increasing revenue does not necessarily lead to the choice of better energy sources in a linear manner as the Energy Ladder



Model (ELM) assumes. In reality, people often use several different heating sources, especially if they're in a bad financial situation, both for security and for different reasons and needs. People do not lay out all the options, calculate gains and losses for each of them and then decide on the best possible one, and they don't necessarily make a complete transition to a better fuel. Rather, they diversify their fuel and stove use and use multiple fuels and heating appliances. **They adapt** to the environment and, depending on the circumstances and different needs, use one or the other appliance.

These findings indicate that when creating a communication strategy, it should be taken into account that different groups of people are to be approached in different ways. A successful strategy for influencing behaviour change would probably need to include some kind of choice between several different alternatives to traditional stoves and firewood. Some research shows that offering a choice between **free trials** or payments in **installments** can increase adoption of new technologies, especially if there is an **option to return it and stop payments at any point**. The free trial enables people to try the new technology and witness first-hand the benefits of using a cleaner and more efficient heating appliance. For people who use old and outdated stoves, this could be a good way to significantly influence the decision to switch to cleaner and better heating sources.