

NATIONAL INITIATIVES REGARDING THE ADOPTION OF INNOVATIVE MEASURES TO REDUCE ENERGY POVERTY, IN THE CONTEXT OF ARTICLE 7 OF THE EUROPEAN ENERGY EFFICIENCY DIRECTIVE – WORK DONE UNDER THE EUROPEAN SOCIALWATT PROJECT

INIȚIATIVĂ LA NIVEL NAȚIONAL PRIVIND ADOPTAREA UNOR MĂSURI INOVATOARE PENTRU REDUCEREA SĂRĂCIEI ENERGETICE, ÎN CONTEXTUL ARTICOLULUI 7 AL DIRECTIVEI EUROPENE DE EFICIENȚA ENERGETICĂ – ETAPE PARCURSE ÎN CADRUL PROIECTULUI EUROPEAN SOCIALWATT

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Abstract: *In 2018, about 10% of the EU population experienced energy poverty. The extent of the problem has attracted a significant amount of scholarly attention and advocacy work, calling for urgent action at EU and Member State levels, either through social and energy policies or even both.*

The paper aims at making a radiography of energy poverty in Romania by reviewing the different attempts of defining it and by making an analysis of the EPOV four key primary indicators. Furthermore, the paper introduces the three tools developed by the SocialWatt project for facilitating utilities alleviate energy poverty. Finally, the assessment of energy poverty by identifying energy poor households through the use of SocialWatt Analyser is explored.

Keywords: energy poverty, energy poor households, article 7, energy efficiency directive

Rezumat: *În anul 2018, aproximativ 10% din populația UE a suferit de sărăcie energetică. Amploarea problemei a atras atenția comunității științifice și activități de susținere, solicitând acțiuni urgente la nivelul UE și al statelor membre, fie prin politici sociale și energetice, fie chiar ambele.*

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Lucrarea se concentrează pe realizarea unei radiografii a sărăciei energetice în România prin revizuirea diferitelor încercări de definiție a acesteia și prin analiza celor patru indicatori ipali pentru identificarea sărăciei energetice. În plus, lucrarea introduce cele trei instrumente dezvoltate de proiectul SocialWatt cu scopul susținerii furnizorilor de utilități în reducerea sărăciei energetice. În final, se prezintă cum s-a realizat evaluarea sărăciei energetice prin identificarea gospodăriilor afectate de aceasta cu ajutorul SocialWatt Analyser.

Cuvinte cheie: sărăcie energetică, gospodărie aflată în sărăcie energetică, articolul 7, directiva de eficiență energetică

1. Introduction

In recent years, energy poverty has become a widely recognised societal challenge in the European Union and according to the latest data, more than 50 million people in the EU experienced energy poverty in 2018 [1].

Energy poverty is recognised in the two key EU energy efficiency directives: the Energy Performance of Buildings Directive (EPBD) requires that relevant actions to alleviate energy poverty be outlined in the national renovation strategy and the Energy Efficiency Directive (EED) requires a share of measures under Article 7 (energy efficiency obligations or alternative measures) to be implemented amongst vulnerable households, including those affected by energy poverty. Finally, the role of renewable energy communities to help fight energy poverty through reduced consumption and lower supply tariffs has been recognised in the revised Renewable Energy Directive.

The extent of the problem has attracted a significant amount of scholarly attention and advocacy work, calling for urgent action at EU and Member State levels, either through social and energy policies or even both. This problem has been aggravated by the Covid-19 outbreak, because confinement measures have caused the energy needs of households to grow due to both increased conventional demand (space heating, hot water, cooking and dishwashing) and new energy demand (as the one related to teleworking). In addition, Covid-19 has entailed an economic and social emergency, due to the huge contraction in the job market, with many people losing their employment, either temporarily or permanently.

Energy poverty is caused by the interplay of three main factors: low incomes, high energy need (due to inefficient housing) and high energy prices. In addition to the three central causes, there are a large number of other causal factors that illustrate the regional, structural, economic and social specificities that can have a large bearing on energy poverty. These include extreme climatic variation, fuel availability, tenure (in particular reliance on privately rented accommodation), high living costs (particularly housing costs), household composition, under occupancy of the home (particularly relevant to Europe's aging population), low levels of energy literacy and low levels of engagement in the energy market, unclear billing and personal vulnerability leading to high energy need. [2] The

experience of energy poverty has a wide range of negative effects, including health and social well-being impacts. The inability to afford energy bills can result in energy rationing (both through temperature reduction and partial heating of the home), energy bill debt, disconnection and debt or rationing on other areas of the household budget. The multiple causal factors and multiple effects of energy poverty cross policy boundaries. Therefore, energy poverty is a complex concept that sits between economic, social and energy policy.

Although there is no agreement yet on a common pan-EU definition of energy poverty, it is commonly accepted that energy poverty is when ‘individuals or households are not able to adequately heat, cool, or provide other required energy services in their homes at affordable cost’ [3]. Although the number of countries that recognise energy poverty formally in legislation or policy is rising, the majority of Member States do not have a formal definition.

In this context, the SocialWatt project was initiated. SocialWatt aims to develop and provide utilities and energy suppliers with appropriate tools for effectively engaging with their customers and working together towards alleviating energy poverty. It will also enable obligated parties under Article 7 of the Energy Efficiency Directive to develop, adopt, test and spread innovative energy poverty schemes. By identifying the energy poor households and understanding their needs and motivations, utility providers can design measures and schemes that engage low-income customers, enable them to receive the help they need and influence them to view their utility as a trusted partner and service provider.

The paper aims at making a radiography of energy poverty in Romania by reviewing the different attempts of defining it and by making an analysis of the EPOV four primary indicators by income, household composition, tenure and dwelling condition. Furthermore, the paper introduces the decision-support tools developed by the SocialWatt project for facilitating utilities alleviate energy poverty. Finally, the assessment of energy poverty by identifying energy poor households through the use of SocialWatt Analyser is explored.

2. Energy poverty in Romania

In Romania, there is no official definition for energy poverty. The primary law (*Law 123/2012 on energy and natural gas*), with its subsequent amendments and completions does not define energy poverty as a distinct term but defines the vulnerable client as “the final customer belonging to the category of household customers who, for reasons of age, health or low incomes, are at risk of social exclusion and who, to prevent that risk, benefit from social protection measures, including of those of financial nature.” Social protection measures, as well as the eligibility criteria for these are established by normative acts.

In the former “*Energy Strategy 2016-2030 with the perspective of 2050*” it was specified that energy poverty refers to the situation of households that cannot

heat their homes to a sufficient level and/or cannot cover the costs of other basic energy services. However, the strategy was not adopted by the Romanian Parliament and now a new one, the “*Energy Strategy 2019-2030 with the perspective of 2050*”, is currently under public debate but provides no definition.

A 2015 study carried out by the Romanian Academy defines energy poverty as “the impossibility of a person or household to meet the minimum energy needs: lighting, optimum house heating during the cold periods, use of cooking facilities and hot water preparation, as well as the use of the energy-based communication means” [4]. However, this definition was only partially adopted in “*Law 196/2016 regarding the minimum income for inclusion*”, where energy poverty was defined as the impossibility of the vulnerable consumer to meet their minimum energy needs for the optimal heating of the home during the cold season. Nevertheless, this law is not active yet; it will come into force in April 2021.

Energy poverty is caused mainly by three distinct sources: a low level of current income, the lack of the necessary infrastructure and technologies or the inaccessibility to the energy system for reasons other than lack of money, as well as living conditions that do not ensure an efficient use of energy (especially a home with energy deficits). Despite the international recommendations, in Romania the indicators for measuring energy poverty are based exclusively on the measurement of household incomes, not on the share of energy expenditure in household incomes, or on the technical status of the home and the heat requirements. In practice, the income indicators are reflected only in the heating aids granted by the Ministry of Labour. [5]

The final price of energy in Romania is considerably below the European average, both for natural gas and electricity. Romania has one of the lowest average prices of electricity for households in the EU. However, given the relatively low purchasing power, price affordability is a major problem, leading to a high level of energy poverty.

The average purchasing power in Romania is also well below the European average. The GDP per capita in Romania, at purchasing power parity, it is 64% of the EU average [6]. At the same time, Romania has one of the greatest degrees of inequality in income distribution across the EU, after Bulgaria, Lithuania and Latvia, with a Gini coefficient of 35.1 in 2018, significantly above other EU countries.

One aspect that cannot be neglected in the analysis of energy poverty in Romania, in addition to the coverage of heating costs in winter and the universal access to energy services is the high share of electricity costs as a percentage of overall energy consumption of households (urban 46%, rural 81%, poor households, first income decile 87%). Additionally, according to the 2011 census in Romania, 287,434 homes (3.4% of the total conventional housing at national level) appear as not being equipped with an electrical installation. This category of housing may also include homes that are not connected to the electricity network.

This data suggest that Romania does not face a structural problem of high energy prices, as other European countries do, but rather a structural problem of energy poverty. A 2016 study by the Center for the Study of Democracy (CSD) [7] shows that 23% of households in Romania are affected by energy poverty, that is, they are having difficulty in ensuring their energy needs at affordable costs. Also the social protection policy in place and the regulated energy prices were inefficient and of limited effect.

3. Energy poverty indicators

In order to accurately measure the level of energy poverty in the EU member states, the EU Energy Poverty Observatory (EPOV) requires the use of key indicators, among which there are four primary indicators. The indicators for which there is sufficient data available at country and EU level and are based on self-reported experiences of limited access to energy services are the percentage of arrears on utility bills and the inability to warm the household at an adequate level. The other two indicators, the high share of energy expenditure in income (2M) and the low absolute energy expenditure (M/2), are calculated using household income and/or energy expenditure data. The following data and charts are taken from the EPOV analysis. [8]

In 2018, Romania performs worse than the EU average on the household-reported indicators (

Figure 1). 9.6% of households were unable to keep the home adequately warm in 2018, and 14.4% were in arrears on utility bills. Romania also scores above the EU average for the expenditure-based indicators. 18.6% of households spent more than twice the median on energy, and 17.5% spend less than half the median.

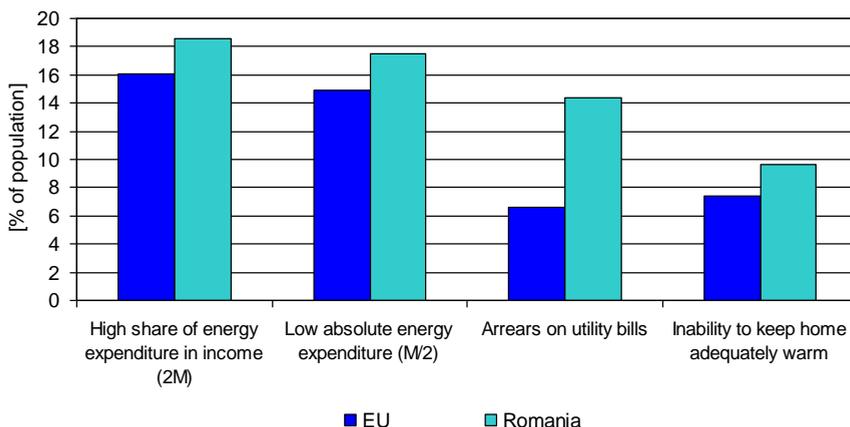
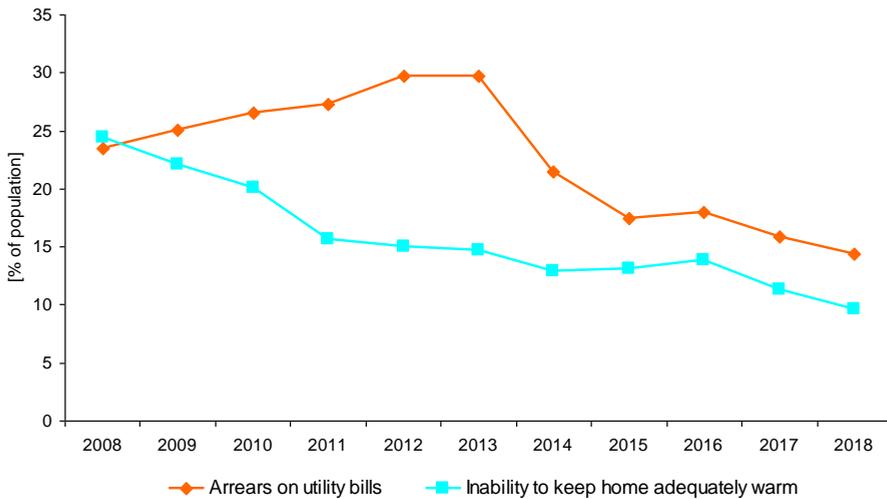


Figure 1. Results of EPOV primary indicators, 2018

Analysing the household-reported indicators for the last 10 years (Figure 2), it can be seen that, in Romania, the percentage of households unable to keep the home adequately warm has decreased in recent years, from 24% in 2008 to almost 10% in 2018. The number of households in arrears on utility bills increased from 24% in 2008 to 30% in 2013, but decreased more recently to 14% in 2018.

**Figure 2.** Energy poverty over the last 10 years

a) *Income*

In Romania energy poverty is closely correlated with income poverty.

Figure 3 presents the energy poverty by income deciles in 2018. The M/2 indicator (low absolute energy expenditure) is the most sensitive to the household equivalised income. Under this indicator more than 45% of the households in the lowest income decile are energy poor and almost 30% for the second income decile, compared with only 7% for the highest income decile.

For the 2M indicator (high share of energy expenditure in income) the households from the first and the fourth income deciles are the most energy poor (about 25%), while for the highest income decile only around 6% spend more than twice the national median.

The highest share of population having arrears on utility bills is registered by the second and the fifth income deciles (23%) followed closely by the first

income decile with 22%. Almost 21% from the lowest two income deciles are unable to keep their house warm.

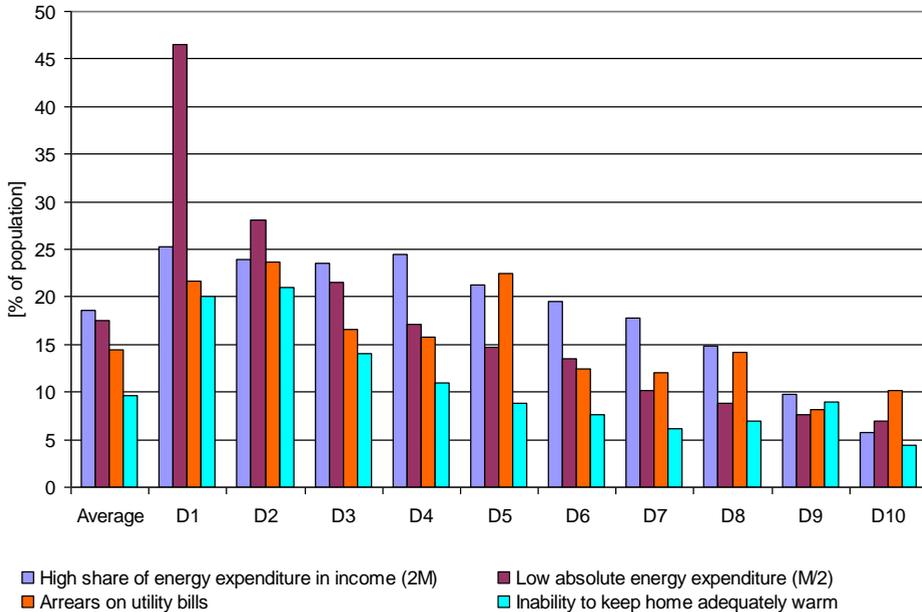


Figure 3. Energy poverty by income deciles, 2018

b) Household composition

The energy poverty by household composition data, presented in

Figure 4, shows that 14.4% of Romanian households presented repeated arrears on utility bills, mainly caused by low financial situation. However, only 3.5% received aid for home heating in 2018. [9] Although it was less than in 2017 (15.9%), the rate of energy poverty in 2018 was more than twice the average at European level (6.6%). [8]

Single-parent households are the most vulnerable to energy poverty (22.9%). These are mostly mothers with dependent children and are significantly more vulnerable than couples with dependent children (14.6%). Single-parent households count for only 2% of the Romanian population but almost one quarter is in energy poverty. Other types of households that face the highest difficulty in paying the current utility bills are those with members aged 65 years or over and single female households (18.5%) and those with two adults with three or more dependent children (15.9%).

Households of three or more people are the least affected by energy poverty (10.2%) followed by households of couples with two dependent children.

In terms of inability to keep home adequately warm, the most affected are adults 65 years or more (17.2%) and single females (16.1%).

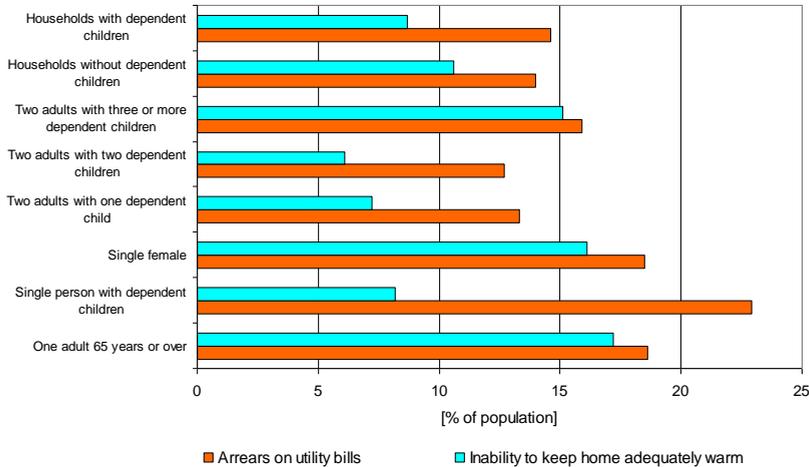


Figure 4. Energy poverty by household composition (selected household types), 2018

c) Tenure

In 2018, the majority of households owned their homes and only 4% were tenants. The share of rented households is higher by 1.9% in the urban area compared to the rural area.

Disaggregated data of the household-reported indicators suggest that energy poverty in Romania is a larger problem for households that rent their housing. Energy poverty in terms of arrears on utility bills is more than twice higher amongst Romanian tenants than those at EU level (6.6%).

As shown in

Figure 5, 22% of private tenants and 20% of social housing have difficulties on paying the utility bills, while 16% of those with reduced or free rent and 12% of those renting at market price are unable to keep their home adequately warm.

d) Dwelling condition and type

Romania ranks first among EU member states in terms of private ownership of a home (96% compared to the EU-28 average of 70% in 2018). However, this situation has certain disadvantages including difficulties in the housing maintenance for part of the owners.

Almost one in seven Romanian households is facing one or more serious housing problems. This is more common in the rural areas where 17.5% of households are affected, while in the urban areas these problems are met in 9.3% of households. Among the most common problems affecting the quality of housing are damaged window frames, walls and floors (53.5% of the total households that

claim the existence of housing problems), leaks through the roof or walls (29.4%) and damp on walls, floors or foundation of the house (48%). [10] The comparison between the residential areas shows that, generally, in rural areas, the share of households with housing problems, especially those related to the damaging of walls, floors or windows and of dampness, is higher than in the urban area. This is understandable to a certain extent, considering the construction characteristics of individual houses that are found predominantly in the rural localities.

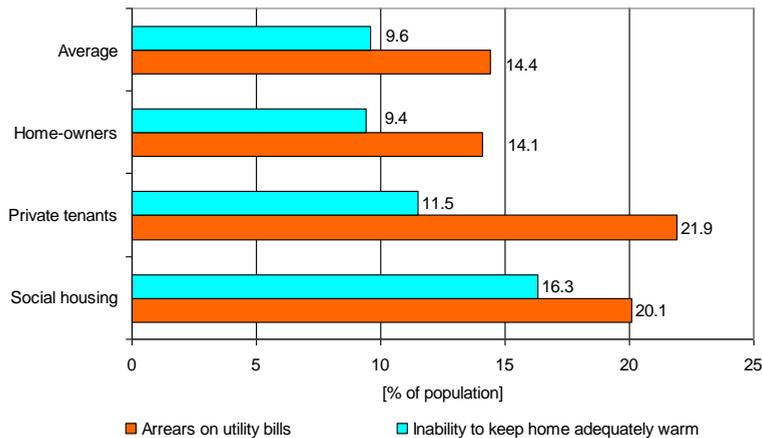


Figure 5. Energy poverty by tenure, 2018

The disaggregation by dwelling type of the household-reported indicators presented in

Figure 6 points to semi-detached housing (closely followed by apartments) as being the dwelling type most susceptible to energy poverty. The results show that households living in smaller dwellings are significantly more likely to suffer energy poverty.

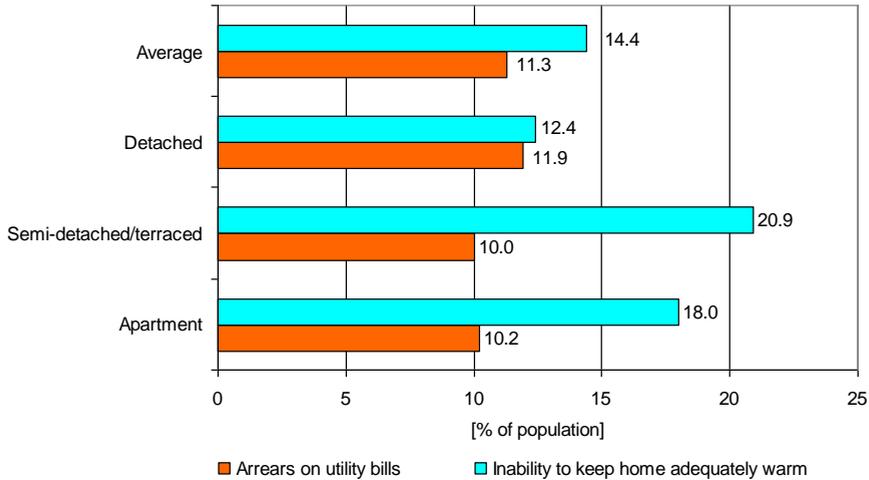


Figure 6. Energy poverty by dwelling type, 2018

3. The SocialWatt Tools

Three different decision support tools have been developed in SocialWatt project to facilitate utilities alleviate energy poverty. More specifically:

3.1. SocialWatt Analyser

The aim of SocialWatt Analyser is to help utilities identify energy poor households among their clients, based on utilities' real energy consumption and cost data as well as other readily available data. It is designed to facilitate users to more effectively target and engage with consumers in actual need.

Therefore, the key objectives of SocialWatt Analyser are:

- To identify energy poor households amongst utilities' customers.
- To provide in depth information about energy poverty at national, regional and municipal level.

3.2. SocialWatt Plan

SocialWatt Plan aims to enable the evaluation of the performance and potential replicability of different actions/schemes considered to tackle energy poverty and select the optimal ones (in terms of cost and risk minimisation) to implement, in order to elaborate Energy Poverty Action Plans.

Thus, the fundamental objectives of SocialWatt Plan are:

- To enable the evaluation of different energy poverty schemes, which consist of behavioural measures, low and high-cost energy efficiency actions as well as renewable energy sources;
- To provide utilities with a set of conventional and innovative optimal portfolios, comprising different combinations of energy poverty schemes, along with a budget allocation for each scheme and expected number of energy poor households to be involved. The optimisation of solutions considers targets and constraints set and aims to minimise both investment costs and associated risks from the utilities' perspective.

3.3. SocialWatt Check

The aim of SocialWatt Check is to assist utilities and other stakeholders effectively monitor and assess the effectiveness of implemented schemes.

The objectives of SocialWatt Check are:

- To monitor the effectiveness of schemes and evaluating their actual impact, in terms of energy savings, CO₂ emission reductions, energy cost reductions and increase of renewable energy production.
- To enable utilities track progress, identify in a timely manner risks/threats, exploit opportunities and safely meet targets in a sustainable way.
- To predict the long-term impact of the examined schemes based on their current performance, using special extrapolation methods.

Overall, the SocialWatt tools are a set of user-friendly decision support tools, with intelligible features to ensure ease of use. The three tools are designed to be used jointly, in order to support utilities efforts to alleviate energy poverty in an integrated manner. Nevertheless, these can also be used independently, to meet specific needs of users.

Figure 7 illustrates the interplay between the SocialWatt tools, where the number of energy poor households identified by SocialWatt Analyser has a key role. This number can be used in SocialWatt Plan (alternatively the user needs to set a target in terms of number of energy poor households), along with other data and inputs, in order to provide users with a set of conventional and innovative optimal portfolios, comprising different combinations of schemes to alleviate energy poverty. On the other hand, SocialWatt Check can use the optimal scenarios produced by SocialWatt Plan (or alternatively the scenarios implemented by utilities if these are not the modelled optimal ones) to evaluate the performance of the schemes, using key performance monitoring indicators, such as CO₂ emission reductions, energy savings, and cost reductions.



Figure 7. The SocialWatt Tools

The SocialWatt Tools are in compliance with the General Data Protection Regulation 2016/679 (GDPR), as these were developed and tested using anonymised data, respecting data ownership, privacy and security. In addition to this, SocialWatt Analyser is developed as a Desktop Application, thus each user downloads and uses this locally, so any personal data and information imported and analysed are not shared with any other organisation or stored in any open database or repository.

4. Assessment of energy poor poverty among CEZ Vânzare customers

In order to better address and identify the energy poor customers of CEZ Vânzare, all 6 indicators defined in the SocialWatt Analyser (10% approach, Low Income High Cost (LIHC), High Share of Energy Expenditure (2M), Low Absolute Energy Expenditure (M/2), SocialWatt Indicator, Arrears on Utility Bills) have been analysed and cross checked the results to have a more realistic overview of the analysis. Data used in the SocialWatt Analyser tool, represent 1,039,080 records from CEZ Vânzare's regulated and eligible customers database that includes the most important parameters: annual electricity and gas consumptions, annual electricity and gas value, owner's age, location and disconnection notices.

According to SocialWatt Analyser, overall energy poor percentages related to total households, are presented in

Table 1. The highest number of energy poor households results from the analysis of the Low Absolute Energy Expenditure indicator, whilst the lowest number results from the Low Income High Cost (LIHC) and High Share of Energy

Expenditure (2M) indicators. SocialWatt Indicator, 10% approach and Arrears on Utility Bills reveals almost same households poverty level.

Table 1. SocialWatt Analyser outcome: Energy poverty/indicators

Indicator	Energy poor (%)	Energy poor (# households)
10% approach	17.1%	177,888
Low Income High Cost (LIHC)	0.3%	3,635
High Share of Energy Expenditure (2M)	0.8%	7,801
Low Absolute Energy Expenditure (M/2)	51.3%	532,886
SocialWatt Indicator	18%	187,326
Arrears on Utility Bills	11.8%	122,175

Regarding the 1,120 locations analysed, top 5 poor municipalities are: Craiova, Pitești, Drobeta-Turnu Severin, Râmnicu Vâlcea and Târgu Jiu. The detailed values are presented in Table 2. The percentage distribution between indicators analysed, maintain the same trend as Table 1 outcome. Considering the results related to poor households, Craiova is the poorest city, followed by Drobeta-Turnu Severin.

Table 2. SocialWatt Analyser outcome: Top 5 poor municipalities (related to total households)

Indicator	Top 5 energy poor households/ municipalities - from total households				
	Craiova	Pitești	Dr. Tr. Severin	Rm. Vâlcea	Tg. Jiu
# Households	111,205	50,535	41,129	29,904	22,827
10% approach	17.8%	14.3%	28.7%	12.4%	14.3%
Low Income High Cost (LIHC)	0.5%	0.3%	0.5%	0.2%	0.3%
High Share of Energy Expenditure (2M)	1.1%	0.6%	1.1%	0.5%	0.5%
Low Absolute Energy Expenditure (M/2)	58.8%	52.1%	60.7%	42%	47.7%
SocialWatt Indicator	18.4%	16.5%	28.5%	13.3%	15.7%
Arrears on Utility Bills	10.7%	4.9%	4%	2.9%	2.2%

Furthermore, based on complex and cross check analysis of all 6 indicators defined in SocialWatt Analyser, 24,189 households are classified as energy poor as follows:

- 777 households according to each 6 indicators;

- 23,412 households according to 4 indicators (10% approach, Low Absolute Energy Expenditure (M/2), SocialWatt Indicator, Arrears on Utility Bills).

In the analysis, statistical income data is used. In the future, for a complete understanding of energy poverty, the real incomes per each household would reveal a correct overview of the entire energy poverty situation. This information is confidential and available only at authorities' level and will be useful only by integrating them in a dedicated program, in compliance with national and European laws.

Considering the assessment and analysis resulted from SocialWatt Analyser tool, the energy poverty focus in the Energy Poverty Action Plan of CEZ Vânăre will be represented by:

- 24,189 poor households identified as a result of all 6 indicators analysed
- Top 5 cities, with emphasis on the poorest ones (Craiova and Drobeta-Turnu Severin).

6. Conclusions

Energy poverty, understood as the difficulty in paying utility bills but also as poor access to modern means for ensuring home comfort, is an important factor of social marginalization. The existence of arrears on utility bills or lack of access to modern energy technologies generates obstacles in the socioeconomic course of individuals and can lead to higher levels of poverty and exclusion in a broader sense.

In Romania, energy poverty is a rather unclear concept in terms of its definition and inclusion in public policy or legislative documents. Since there is no official definition, the identification and monitoring of areas, populations, or households affected by energy poverty is very difficult.

Energy poverty during winter is a more significant issue in Romania, considering the high use of energy for space heating. Especially for home heating in urban areas, the inability of families to adequately heat their dwellings is correlated with low income and difficulty in paying bills.

In Romania, the indicators for measuring energy poverty are based exclusively on the measurement of household income. Therefore, on a national level, energy poverty is addressed mainly through financial support to low-income households. By analysing the energy poverty indicators for 2018 it results that Romania performs worse than the EU average on all indicators.

Romania lacks a strategic approach on energy poverty alleviation. Energy poverty is only briefly addressed in Romanian policies and programmes; therefore, an adequate legislative framework should be developed and efficient protection measures should be adopted in the near future. The first step is drawing up an

action plan on energy poverty required by the legislation already in force. In the action plan, it is important to clarify the methodological tools by which relevant data is collected and aggregated for the identification of energy-poor households.

Meanwhile, the SocialWatt tools are a good starting point for the utilities to identify the energy poor customers, understand their needs, and design appropriate measures and schemes for enabling them to overcome energy poverty.

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