

[https://doi.org/10.52326/jes.utm.2023.30\(1\).07](https://doi.org/10.52326/jes.utm.2023.30(1).07)  
UDC 620.9(478)“2010/2020”



## REPUBLIC OF MOLDOVA: ASSESSMENT OF ENERGY POVERTY

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Received: 12. 05. 2022

Accepted: 01. 22. 2023

**Abstract.** Energy poverty is a topic addressed every time when it comes to supplying residential customers with energy - either from traditional or from renewable sources. In the context of the preparations of the Republic of Moldova for the accession to the EU, it is relevant to evaluate the structure of energy consumption of households in the country, the level of related costs, as well as the level of energy poverty. The paper presents data on the evolution of household energy consumption for the period 2010-2020. For a reference year (2019), the level of poverty in the country was assessed under different aspects (by living environment – urban and rural, by socio-economic status (5 categories), by household size (5 cat.) etc.). From the calculations, the average value of the level of energy poverty, characteristic to the Republic of Moldova, as a whole, for the year 2019, was equal to 15.7 % and a slightly higher value for the urban area. The paper also presents the new government initiative to support energy-vulnerable households - the "Help at the meter" program.

**Keywords:** *energy poverty, energy poverty rate, energy vulnerability, vulnerable energy consumer.*

**Rezumat:** Sărăcia energetică este un subiect abordat de fiecare dată când e vorba de furnizarea de energie clienților rezidențiali – fie din surse tradiționale, fie din surse regenerabile. În contextul pregătirilor Republicii Moldova pentru aderarea la UE, este relevant să se evalueze structura consumului de energie al gospodăriilor casnice din țară, nivelul costurilor aferente, precum și nivelul sărăciei energetice. În lucrare sunt prezentate date cu privire la evoluția consumului casnic de energie pentru perioada anilor 2010-2020. Pentru un an de referință (2019) a fost evaluat nivelul sărăciei în țară sub diferite aspecte (după mediul de trai – urban și rural, după statutul socio-economic (5 categorii), după dimensiunea gospodăriei (5 categorii) etc.). Din calculele realizate a rezultat valoarea medie a nivelului sărăciei energetice, caracteristice Republicii Moldova, în ansamblu, pentru anul 2019, egală cu 15,7 % și o valoare un pic mai mare pentru zona urbană. În lucrare este prezentată și noua inițiativa guvernamentală de sprijin a gospodăriilor vulnerabile energetic - programul „Ajutor la contor”.

**Cuvinte-cheie:** *sărăcia energetică, rata sărăciei energetice, vulnerabilitate energetică, consumator energetic vulnerabil.*

## 1. Introduction

In modern society **energy** has great economic, social and political value. The lack of energy has a strong impact on our daily lives.

In the second half of 2021 as the world economy recovered after the restrictions related to COVID-19 were lifted - in Europe, as in the rest of the world, the prices of natural gas and electricity began to rise rapidly. Later, in 2022, Russia's invasion of Ukraine intensified this phenomenon, causing great anxiety regarding energy security in our country - the Republic of Moldova, as well as in the most European states. Russia's decision to suspend gas supplies to some states, as well as to cut supply to many other states, has further worsened the situation. During this period, the price of natural gas in Europe reached record values - about 2500-3000 Euro/th.m<sup>3</sup>.

The sudden increase in the price of gas naturally led to the increase in the price of electricity. In a short time, the majority of the country's population (about 80-90%) became vulnerable. In these circumstances the government comes up with compensations for households to reduce the burden of high energy costs.

The European Green Deal (EGD), which is a package of policy initiatives, launched the EU's goal of achieving climate neutrality by 2050 and aims to put the EU on the transition path to a fair and prosperous society with a modern and competitive economy. The EGD mentions the need to alleviate energy poverty and support the just energy transition for all, so that no one is excluded [1].

## 2. Legal aspects regarding the approach to energy poverty in the Republic of Moldova

In general perception, the term *energy poverty of households*, refers to a situation created by the combined presence of three unfavorable factors:

- low household income,
- low energy efficiency of the housing stock and
- high energy prices (for natural gas, electricity and thermal energy),

when a person or a household cannot afford to heat or cool the home to the preset thermal comfort level.

According to [2] - *the state is obliged to take measures so that every person has a decent standard of living, which ensures the health and well-being of him and his family, including food, clothing, housing, medical care, as well as the necessary social services.*

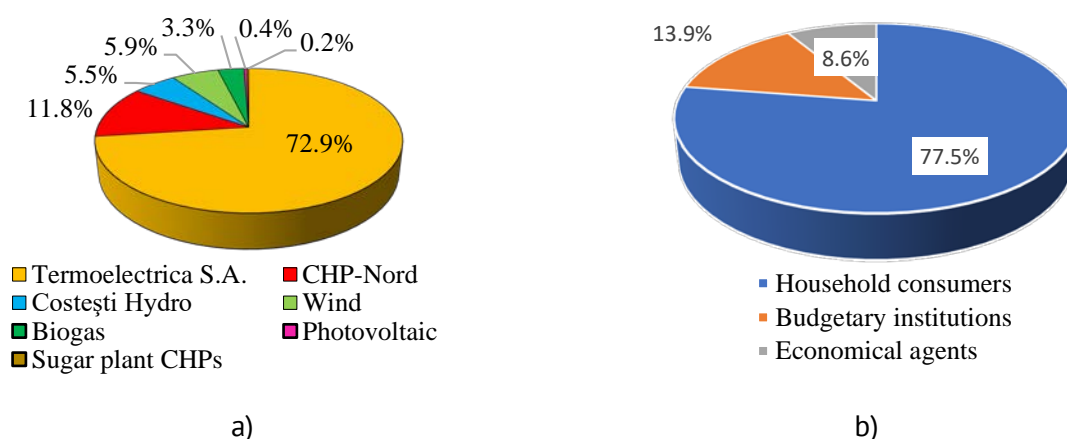
In the two "sister" laws - the Law on Electricity [3] and the Law on Natural Gas [4], the definition of the term *vulnerable consumer can be found: the household consumer who, in accordance with the normative acts in the field of social protection, is considered a disadvantaged person or disadvantaged family member.* Again, in the Law on Energy efficiency [5] *energy poverty is defined as a situation characterized by the final consumer's lack of access to modern sources of energy and technologies and/or by the reduced purchasing power of consumers in relation to (the cost of) energy resources, especially fuels for food preparation, electricity and/or thermal energy, and/or due to the lack of thermal comfort in the home or building.* A successful definition of energy poverty is proposed by *the Convention of Mayors for Climate and Energy, later taken up by the European Committee of the Regions [6].* According to this source - **energy poverty** is "a situation where, due to the combination of low income, high energy costs and low energy efficiency of the home, a person or a household cannot afford basic energy services (heating, cooling, lighting, mobility and electricity supply), which guarantees a decent standard of living".

In the Republic of Moldova, the National Bureau of Statistics (NBS), the central state body in the field of national statistics, annually determines a set of poverty indicators, unfortunately, without separately presenting the phenomenon of energy poverty.

### 3. Developments in the energy supply of households in the period 2010-2020

In the last decade in the Republic of Moldova, there was an evolution of the total energy consumption, in weak growth, at an average rate of about 2%/year, while the practical household consumption held fairly stable values at the level of 1200-1300 thousand tons oil equivalent per year. The variation of annual energy consumption at the level of household consumers is mainly determined by the variation of the climate from year to year.

Figures 1-4 illustrate the evolution over time of the total energy consumption in the country, consumption of electricity, thermal energy, natural gas and energy losses, as well as the evolution of energy delivery tariffs to residential sector. Part of this information has been received from the National Bureau of Statistics, and another part from the National Energy Regulatory Agency (ANRE). The presented consumption curves indicate that residential consumers have the largest share in all three forms of energy consumption (electricity, heat and fuels). In 2020, the share of the population in electricity consumption was 46% and in heat consumption – 78.7%. As a result of the significant increase in the prices of energy and energy resources, residential consumers incur enormous expenses just for the supply of energy.



**Figure 1.** Structure of domestic electricity production (a) and thermal energy supplies by consumer categories (b) in 2020 [7, 8].

### 4. Assessment of the poverty level in the country. General aspects

In the Republic of Moldova, *the standard of living of the population* is determined annually by the National Bureau of Statistics based on a special study known as the *Household Budget Research* (CBGC).

By the notion of *household* (GC), hereinafter - *household*, is meant a group of two or more people who live together habitually, generally having family ties and having a common budget, participating fully or partially in generating income and spending it, or a person who lives and manages separately and does not belong to another household.

As a rule, household poverty is measured on several dimensions, among them:

- by residence environments – urban, rural;
- by groups of quintiles (1, 2, ..., 5);
- according to the socio-economic status of households;
- according to household size – 1, 2, 3, 4 and  $\geq 5$  persons, etc.

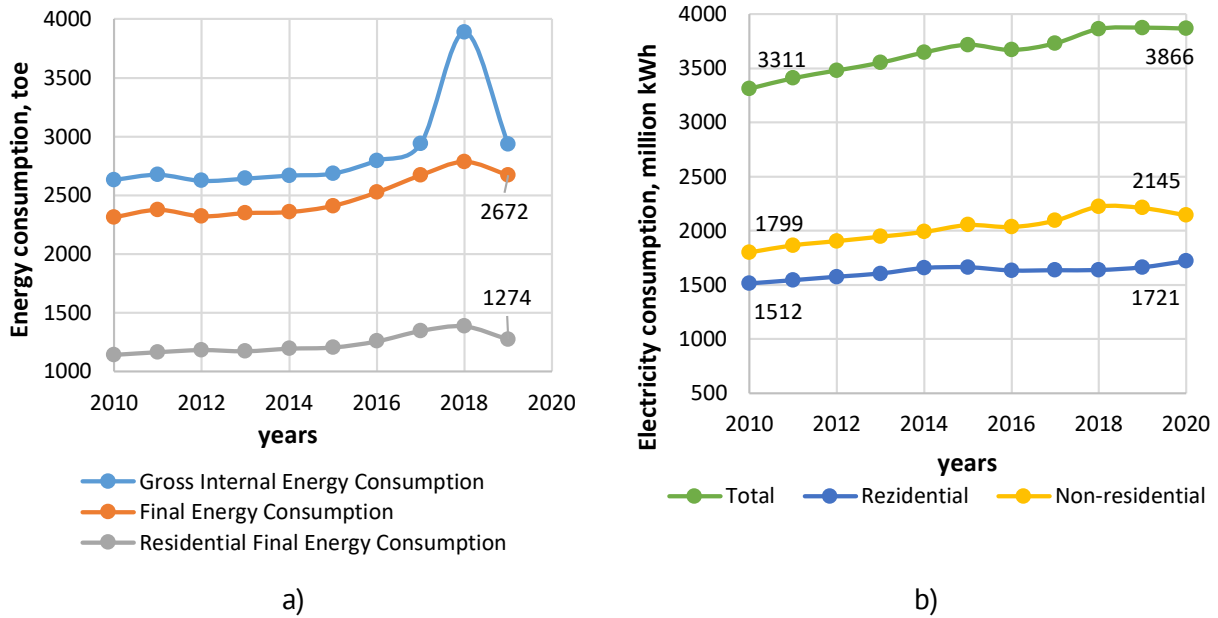


Figure 2. Evolution of total energy consumption (a) and electricity consumption (b) [7, 8].

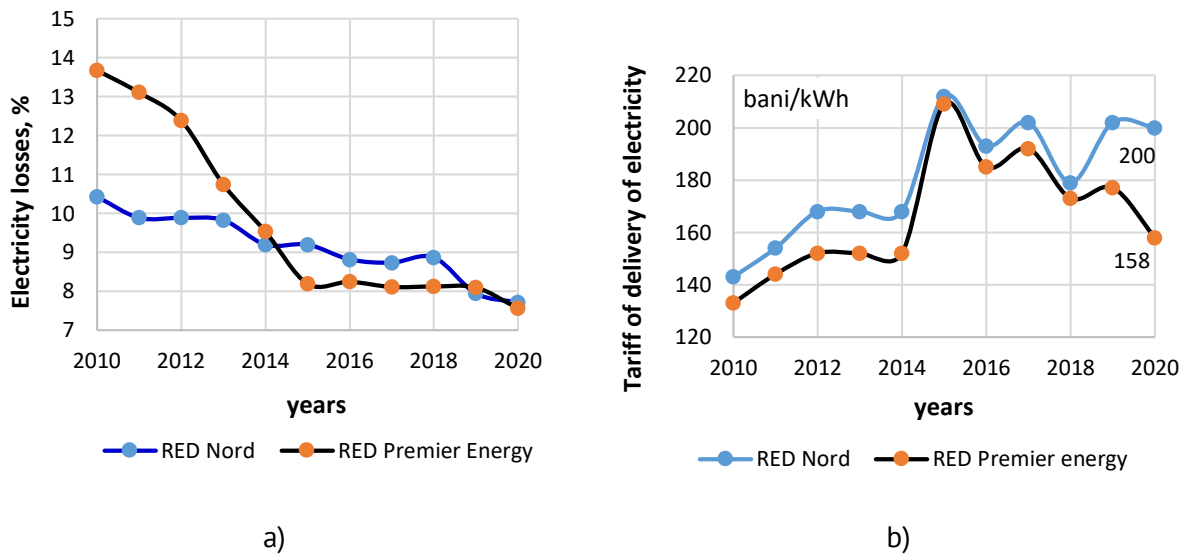


Figure 3. The evolution of electricity losses in distribution networks (a) and the tariff of delivery of electricity to consumers (b) [7].

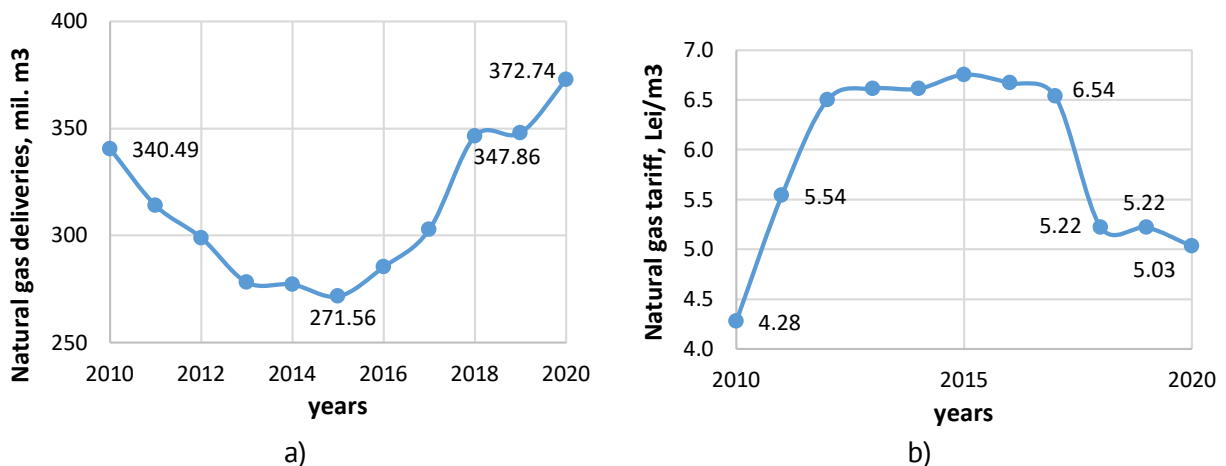


Figure 4. Evolution of natural gas deliveries to household consumers (a) and the average tariff (b) [7].

The determination of energy poverty is based on the following indicators, which result from the CBGC:

- disposable income;
- expenses for the maintenance and furnishing of the home.

The average monthly disposable income of the household represents the totality of monetary and in-kind incomes from salary activity and on own account, various social benefits, from the realization of agricultural production from the auxiliary household, income from property, other current transfers (including goods and monetary sums received for free).

Disposable income are classified into six groups:

- salary activity,
- individual agricultural activity,
- individual non-agricultural activity,
- property income,
- social benefits,
- other incomes.

Monthly disposable income per person, in the country in 2019, they constituted 2880.6 lei, the main source of their formation being the salary activity in a proportion of 50.2%, followed by income from social benefits with 18.7% (of which 14.4% pensions) and income from individual agricultural activity (8.9%). Transfers from outside the country contribute to the formation of disposable income by 12.4%. The level of available revenues related to 2020 are presented in Figure 5.

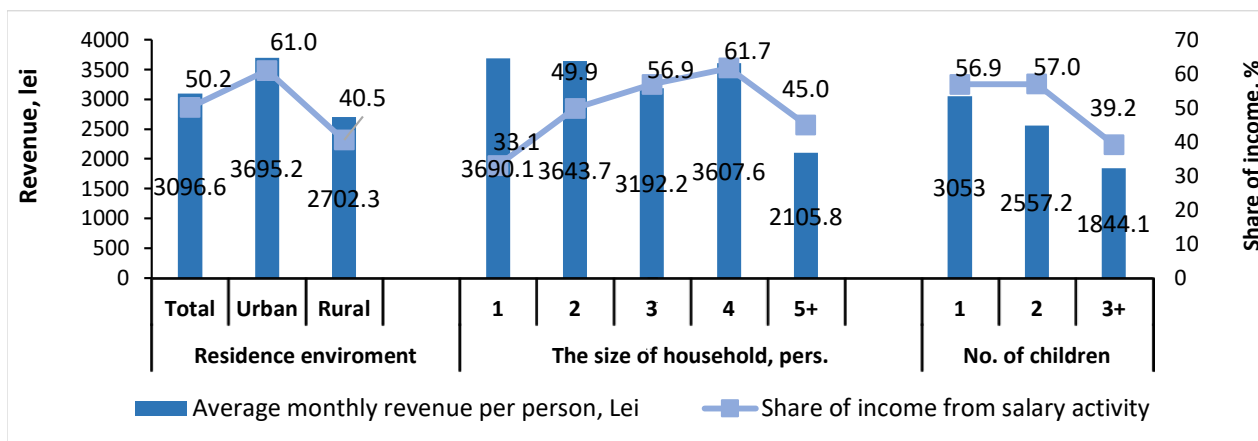


Figure 5. Monthly disposable income by main household characteristics (2020) [9].

Average monthly consumption expenses of the population is divided into expenditures for:

- food,
- alcoholic beverages,
- clothing and footwear,
- home maintenance,
- home furnishing,
- health,
- transport,
- communications,
- others.

Housing maintenance expenses include all expenses incurred for rent, energy, water and other communal services, as well as expenses related to the arrangement and repair of the home.

Expenses for furnishing the home represents the totality of the expenses incurred for equipping and furnishing the home with various durable goods, household items, as well as the payment of services related to their maintenance.

*Quintile* is a term from the field of statistics, she represents *any of the five equal groups into which a population can be divided according to the distribution of the values of a certain variable (income, expenditure)*. The distribution of the population into quintiles is carried out according to income/expenditure per person, separately for each group of the population [9]. Within a category, the population is first ordered according to the values of average consumption income/expenditure per person, then it is divided into 5 equal groups, each comprising 20% of the population. As a result, the *first quintile* represents the least insured group, the second quintile – the next 20%, etc., and the *fifth quintile* - the best insured group - 20% of the population with the highest incomes/consumption expenses per person.

The *socio-economic status* of the household, in poverty studies, is established according to the main source of income of the household head. In this context, when assessing poverty, the following categories are used:

- *Employees* - households for which the main source of income of the head of the household is paid work.
- *Self-employed workers in agriculture (farmers)* – households for which the main source of income of the head of the household is the individual agricultural activity.
- *Self-employed workers in non-agricultural activities* – households for which the main source of income of the head of the household is income obtained from various self-employed activities in the non-agricultural sector (trade, business, crafts, etc.).
- *Pensioners* – households for which the main source of income of the head of the household is the pension.
- *Others* – households for which the main source of income of the household head is various social benefits, income from property, remittances and other income.

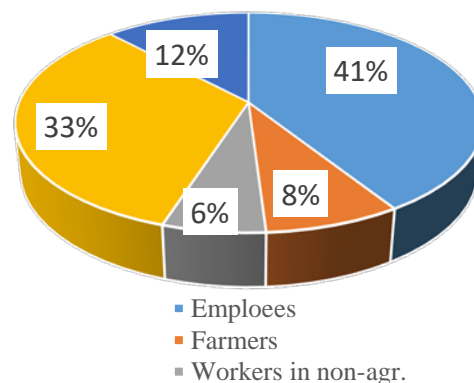
Figure 6 illustrates the weight distribution of households in the Republic of Moldova according to their socio-economic status.

Main indicator for measuring *poverty* is **the poverty rate**, which represents the proportion of people whose consumption expenses are below an **established poverty threshold** (absolute and extreme) and is determined by the availability of the population's means that would allow them to ensure the minimum basic needs, acceptable at national level.

In 2019, *the absolute poverty threshold* in the country was on average per month for one person – 2095.1 lei, and *the absolute poverty rate* – **25.2%** (SDG indicator 1.2.1, Table 1).

At the same time, *the extreme poverty threshold* was on average 1689.7 lei per month per person, and *the extreme poverty rate* was **10.7%**.

Another indicator used to measure poverty is *the poverty depth index*, which represents the average consumption deficit of the population needed to exceed the poverty threshold. In 2019, this indicator was 3.68%, which means that in order to overcome poverty,



**Figure 6.** Distribution of households according to their socio-economic status (2019) [9].

under the conditions of maintaining or reducing the current level of inequality, it is necessary to increase the consumption of the population on average by 3.68% of the value of the absolute poverty threshold. The degree of inequality among the poor is measured by *the poverty severity index*, which represents the distribution of the level of well-being among the poor relative to the poverty line. In 2019, the *severity of poverty* constituted **1.02%**.

Table 1

**The dynamics of the absolute poverty rate in the Republic of Moldova [10]**

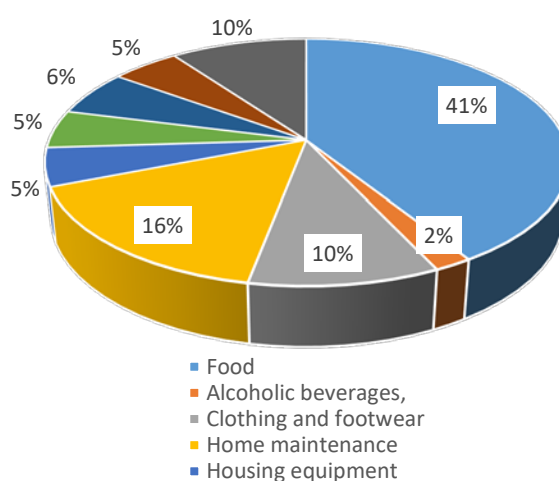
Year	2014	2015	2016	2017	2018	2019
Absolute poverty rate, %	29.5	25.5	26.4	27.7	23.0	25.2

The uneven distribution of income/expenditure on equal population groups is characterized by *the Gini coefficient*. The statistical magnitude of the Gini coefficient varies from 0 to 1, the value 0 refers to absolute equality (uniform distribution) and 1 - absolute inequality (only one person gets all the income). The higher the value of this indicator, the less homogeneous the distribution of the population's income in society.

In 2019, the value of the Gini coefficient, related to available income, was **-0.315**, or 14.0% more than the inequality after consumption expenses, which was **0.276**, which indicates a more uniform distribution of expenses than incomes, this being explained by the availability of stocks of consumer products of GC members.

It should be noted that the ratio between the incomes of the population in quintile V (the best insured group) compared to those of the population in quintile I (the least insured group) in 2019 was 5.1.

Table 2 describes the level of amenities present in our homes. In 2019, the average monthly consumption expenses per person constituted 2786.5 lei (in the urban area – 3469.2, and in the rural area -2335.7 lei). The distribution of expenses in quintiles I and V is presented in Figure 8.



**Figure 7.** Structure of consumer spending (2019) [9].



**Figure 8.** The structure of consumption expenditure by quintile groups (2019) [9].



Table 2

<b>Equipping homes with amenities by residence environment, in % (2019) [9]</b>			
Convenience	Total per country	Urban	Rural
Electric lighting	100.0	100.0	100.0
Aqueduct inside the house	70.6	93.5	55.3
Aqueduct outside the home	10.5	3.5	15.3
Water source - public network	68.8	93.2	52.5
Water source - spring well	30.7	6.5	46.9
Hot water - public network	7.3	18.1	0.0
Hot water - own system	51.8	69.4	40.1
Central heating system	14.6	35.8	0.4
Own thermal heating system	24.5	44.8	10.8
Other type of heating (stove, fireplace, etc.)	61.0	19.4	88.8
Natural gas from the network	59.2	86.3	41.0
Sanitary group with water inside the house	54.2	86.2	32.7
Sewage system - public network	33.0	78.0	2.8
Sewage system - own system	38.4	16.8	53.0
Bathroom or shower inside the home	61.1	88.9	42.5
Phone	79.2	74.3	82.5
Internet connection	60.8	74.8	51.3

### 5. Assessment of energy poverty

**The level of energy poverty (EP)** in the Republic of Moldova is determined by relating the **expenses for home maintenance to the value of the household's available income**.

Below are presented the results of the calculation of the poverty level, characteristic of the Republic of Moldova for 2019, by place of residence (urban, rural), by socio-economic categories of households, by household size and by quintile groups (see Tables 3-7 and Figures 9-10).

#### a) Determination of energy poverty according to the environment of residence

Table 3

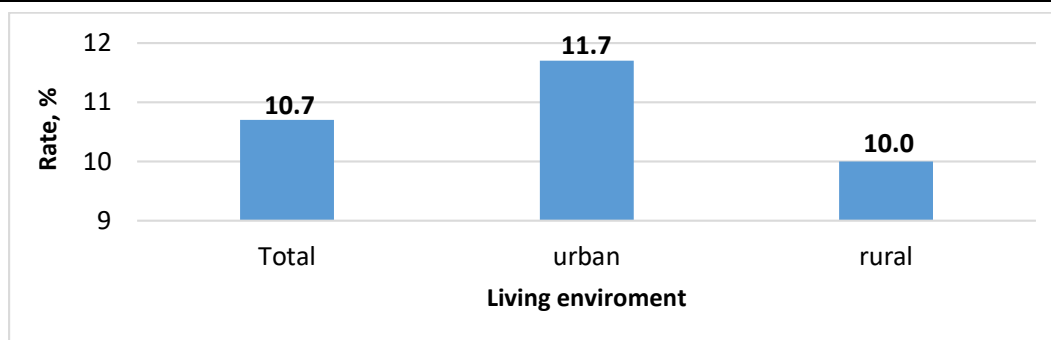
<b>Level of energy poverty by residence environments (2019) [10]</b>			
Indicator type	Total per country	Urban	Rural
Available income, lei/pers.	2881	3522	2457
Home maintenance, lei/pers.	451	547	388
Level of energy poverty, %	15.7	15.5	15.8

Figure 9 shows the share of the population with average monthly expenses for home maintenance that exceed 30% of monthly disposable income, 2020 (SDG indicator 1.2.1).

#### b) Determination of energy poverty according to socio-economic status

Table 4 shows the values of available income, expenses for home maintenance and the level of energy poverty, resulting for each category of households.





**Figure 9.** Energy poverty rate by living environment (2020) (housing expenditure  $\geq$  0.3 disposable income) [9-10].

Table 4

**Level of energy poverty by socio-economic categories of households and on average by country**

Categories of households according to socio-economic status of the household head	The share held	Revenue available	The maintenance costs of the place	Energy poverty level
	%	Lei / pers.	Lei / pers.	%
Employee	41	3478	470	<b>13.5</b>
Self employed in agriculture (farmers)	8	1828	321	<b>17.6</b>
Self employed in non-agricultural activities	6	2837	380	<b>13.4</b>
Retirees	33	2444	475	<b>19.4</b>
Others	12	2399	482	<b>20.1</b>
<b>Total per country</b>	<b>100</b>	<b>2881</b>	<b>451</b>	<b>15.7</b>

Table 4 shows that the lowest level of energy poverty of 13.4% is observed in the *Self-employed category in non-agricultural activities*. The highest level of poverty of 20.1% - refers to the category *Others*; here incomes depend on social benefits, remittances (money received from those who work abroad), income from property (from rent; most often, in the urban environment, housing is rented, and in the rural environment - agricultural land).

c) Determination of energy poverty according to socio-economic status and residence environment

Table 5

**Level of energy poverty (EP) by socio-economic categories of households and residence environments [9-10]**

Categories of households	Urban			Rural		
	Disposable income	Maintenance expenses	EP level	Disposable income	Maintenance expenses	EP level
	Lei / pers.	Lei / pers.	%	Lei / pers.	Lei / pers.	%
Employee	3998.2	541.6	<b>13.5</b>	2898.3	390	<b>13.5</b>
Self employed in agriculture (farmers)	1659.0	412.7	<b>24.9</b>	1838.4	315	<b>17.1</b>

Continuation Table 5

Self employed in non-agricultural activities	3351.0	484.1	<b>14.4</b>	2509	313.8	<b>12.5</b>
Retirees	2718.6	556.5	<b>20.5</b>	2308.8	434.7	<b>18.8</b>
Others	2693.9	620.4	<b>23.0</b>	2255.5	413.0	<b>18.3</b>

From Table 5 it can be observed that the level of poverty in the urban area is higher than in the rural area.

d) Determining energy poverty according to household size and residence environment

Table 6

**Level of energy poverty (EP) according to household size and residence environments**

Type	Total per country					Urban					Rural				
	1	2	3	4	≥ 5	1	2	3	4	≥ 5	1	2	3	4	≥ 5
road sign	pers.	pers.	pers.	pers.	peopl e	perso n	pers.	pers.	pers.	people	person	pers.	pers.	pers.	peopl e
Revenues, lei/pers	366 4	330 3	301 4	244 4	1859	4520	401 0	357 6	291 8	2280	3101	286 6	254 4	206 0	1706
Maintenanc e expenses, lei/pers	733	531	424	345	257	891	653	487	391	355	630	455	371	307	221
EP level, %	20.0	16.1	14.1	14.1	13.8	19.7	16.3	13.6	13.4	15.6	20.3	15.9	14.6	14.9	12.9

e) Determining energy poverty according to quintile groups and residential environments

Table 7

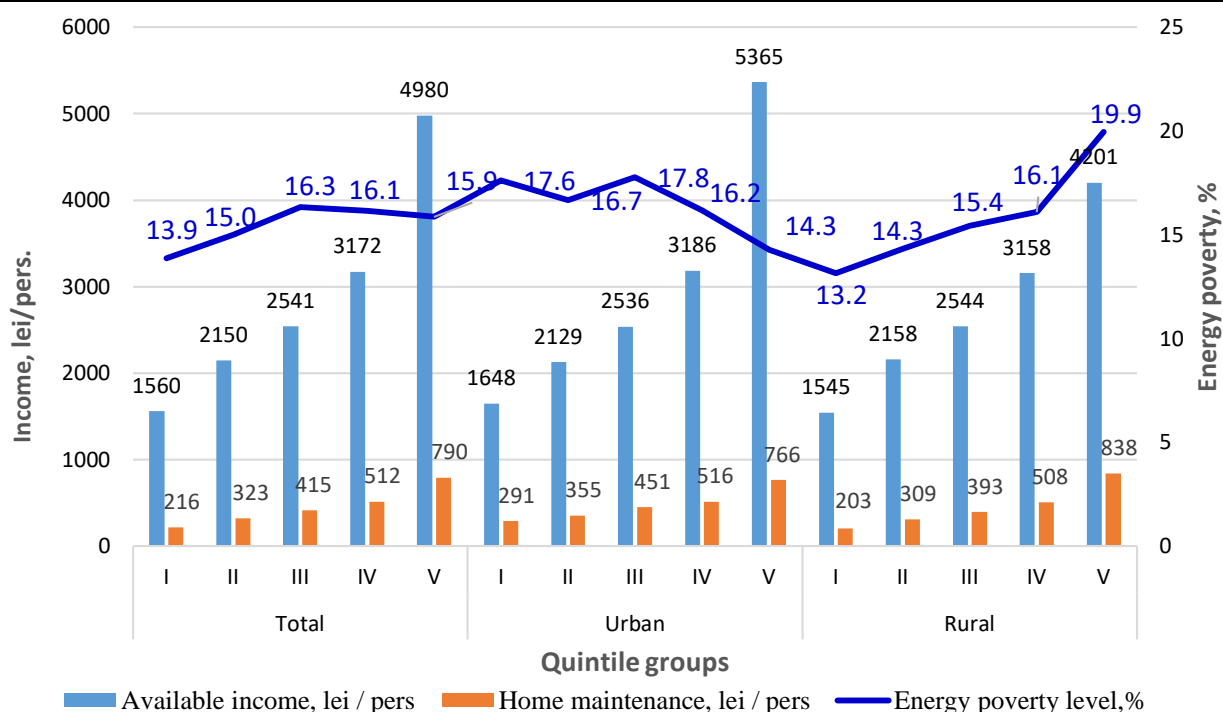
**Level of energy poverty (EP) by quintile groups and residential environments [9-10]**

Indicator type	Total per country					Urban					Rural				
	I	II	III	IV	V	I	II	III	IV	V	I	II	III	IV	V
Revenues, lei/pers	1560	2150	2541	3172	4980	1648	2129	2536	3186	5365	1545	2158	2544	3158	4201
Maintenanc e expenses, lei/pers	216	323	415	512	790	291	355	451	516	766	203	309	393	508	838
EP level, %	13.9	15.0	16.3	16.1	15.9	17.6	16.7	17.8	16.2	14.3	13.2	14.3	15.4	16.1	19.9

**Previously applied energy poverty policies and measures**

The national policy related to social protection, including energy poverty is governed by a series of laws [11-15]. These laws provide for a series of measures dedicated to the social protection of low-income households, including in cases of energy price increases.

The Government of the Republic of Moldova, based on Law 133/2008, currently uses two social assistance programs (cash allowances), known as the *Social Assistance (AS) program* and the *Cold Period Allowance (APR) program of the year*. Social aid is a monthly cash payment granted to the disadvantaged family, and APR – a fixed monthly cash payment granted to the disadvantaged family for the months of January-March and November-December of the year. The responsibility for meeting these objectives rests with the Ministry of Health, Labor and Social Protection.



**Figure 10.** Level of energy poverty according to quintile groups and residential environments [9].

In addition to the national programs to support the vulnerable population, the authorities of the municipalities of Chisinau and Balti used to come with help for heating.

Budgetary allocations for social support programs varied from year to year and ranged from 1-3% of Gross Domestic Product (GDP). The effective coverage of social assistance programs was modest: between 3-10% of the total population.

**Government initiative on household energy vulnerability**

In order to improve the energy vulnerability of the population in 2022 in the Republic of Moldova, a new program was introduced, called "Ajutor la contor", and the so-called Energy Vulnerability Reduction Fund was established and the Energy Vulnerability Register. Shortly after, the Government approved a new method regarding the assignment of categories of energy vulnerability to households and the payment of compensations for the payment of energy bills [16]. The approved regulation provides for five categories of energy vulnerability of household consumers, determined according to the value of the poverty rate R (Table 8).

Table 8

**Energy vulnerability categories of consumers**

No.	Vulnerability category	The value of the poverty rate R, %
1.	Very high	$R \geq 90$
2.	High	$35 \leq R < 90$
3.	Average	$20 \leq R < 35$
4.	Low	$10 \leq R < 20$
5.	Non-vulnerable	$R < 10$

Household consumers in the first four categories of vulnerability can benefit from compensation for the cold period of the year (01.11-31.12 and 01.01-31.03).

According to Regulation [16], the energy poverty rate  $R$  is determined with the formula:

$$R = C_{RE}/V, \% \quad (1)$$

where:  $C_{RE}$  represents expenses for energy resources or energy used in the cold period of the year;

$V$  - the income available to pay the cost of the energy consumed.

$C_{RE}$  energy resources used to heat the residence comprise the cumulative expenses due to the average monthly consumption of fuel or energy (natural gas, thermal energy, electricity and solid fuels).

The expenses for the consumption of natural gas/thermal energy/electricity are determined with the formula:

$$C_{GN/ET/EE} = E_{med} \cdot c_{en}, Lei, \quad (2)$$

where:  $E_{med}$  is the average monthly consumption of fuel or energy in the previous cold period of the year within the limit of the eligible ceiling (Table 9);

$c_{en}$  - the tariff/price in force on November 1 of the current year.

Table 9

**The eligible ceiling for fuel or energy consumption used to heat the residence**

Fuel/energy used for heating	Unity	M.U.
Natural gases	250	m <sup>3</sup> /month
Heat	1.5	Gcal/month
Electricity – for heating	2500	kWh/month
Electricity – for other needs (lighting, etc.)	250	kWh/month

For consumers who do not have data on individual energy consumption for heating, the consumed volume is accepted at the level of 50% of the eligible consumption ceiling (Table 9). In the situation where the monthly consumption is higher than the eligible ceiling, the compensation is granted at the limit of the capped energy volume.

The monthly income available to pay for the energy  $V_{disp.en}$  related to the household is calculated with the formula:

$$V_{disp.en} = V_{GL} - M_{CMI} - R_{Cl}, lei \quad (3)$$

where:  $V_{GL}$  represents the global monthly income of the household, equal to the average value of the global monthly income for the last 6 months;

$M_{CMI}$  - the minimum monthly expenditure level of the household, which represents the sum of the amounts of individual minimum expenditure;

$R_{Cl}$  - the monthly rate of the real estate loan, is considered the last rate paid for the registered property, but not higher than half of the household's minimum expenditure level.

The amount of minimum individual expenses for each member of the household is determined as follows:

- a) consumption expenditure for the 4th quarter of the previous year, total per country, published by the National Bureau of Statistics, excluding expenditure on "housing, water, electricity and gas", increased by the rate of increase in consumer prices in September of the current year compared to December of the previous year, published by the NBS;
- b) 70% of the value of p. a) for each other member of the household.

If the income available to pay energy bills is less than or equal to zero, the household consumer is assigned vulnerability category 1 (very high).

## 6. Conclusions

1. In recent years, energy poverty has been subject to increased attention within the policies of the European Union (EU). Alleviating energy poverty is treated as a key precondition for achieving equitable transitions to sustainability.
2. The accessibility of the population to energy is a constant concern of the government. Over the years there have been social assistance programs in the country. Recently, a new program was introduced, called "Ajutor la contor", devoted to the support of energy-vulnerable households.
3. The period 2010-2020 was a difficult one for the country's economy and the well-being of the population, being marked by the mismanagement of the legally empowered verification and control bodies.
4. In the Republic of Moldova, measures focused on the energy poverty of the population, related to the energy efficiency policies of the housing stock, are to be developed and implemented.

**Conflicts of Interest:** The authors declare no conflict of interest.

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**Citation:** Arion, V.; Leu, V.; Hlusuov, V. Republic of Moldova: Assessment of energy poverty. *Journal of Engineering Science* 2023, 30 (1), pp. 85-98. [https://doi.org/10.52326/jes.utm.2023.30\(1\).07](https://doi.org/10.52326/jes.utm.2023.30(1).07).

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