SOCIALWATT

CONNECTING

OBLIGATED PARTIES

TO ADOPT INNOVATIVE SCHEMES TOWARDS

ENERGY POVERTY ALLEVIATION

D2.5

Evaluation of schemes to tackle energy poverty by EDP

July 2022

The SocialWatt project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No 845905

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PREFACE

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. SocialWatt also enables obligated parties under Article 7 of the Energy Efficiency Directive across Europe to develop, adopt, test and spread innovative energy poverty schemes.

SocialWatt contributes to the following three main pillars:

1. Supporting utilities and energy suppliers contribute to the fight against energy poverty through the use of decision support tools.
2. Bridging the gap between energy companies and social services by promoting collaboration and implementing knowledge transfer and capacity building activities that focus on the development of schemes that invest in Renewable Energy Sources / Energy Efficiency to alleviate energy poverty.
3. Implementing and replicating innovative schemes to alleviate energy poverty.

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CONSORTIUM

ICCS	INSTITUTE OF COMMUNICATION & COMPUTER SYSTEMS	EL
IEECP	INSTITUTE FOR EUROPEAN ENERGY AND CLIMATE POLICY STICHTING	NL
RAP	REGULATORY ASSISTANCE PROJECT	BE
E7	E7 ENERGIE MARKT ANALYSE	AT
ISPE DC	ISPE PROIECTARE SI CONSULTANTA SA	RO
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CONNECTING OBLIGATED PARTIES TO ADOPT INNOVATIVE SCHEMES TOWARDS ENERGY POVERTY ALLEVIATION

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Table of Contents

Figures

Tables

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1 INTRODUCTION

1.1 THE SOCIALWATT PROJECT

SocialWatt, a project funded by the EU's Horizon 2020 Research and Innovation Programme, aims to enable energy suppliers and utilities to develop, adopt, implement and spread innovative energy poverty schemes across Europe. More specifically, the project aims to enable energy suppliers and utilities build their capacity and use tools developed within the framework of the project to effectively engage with their customers and implement schemes that alleviate energy poverty.

Three different user-friendly decision-support tools have been developed and tested as part of the project to support utilities to alleviate energy poverty:

- SocialWatt Analyser for identifying energy poor households among clients, based on utilities' real energy consumption and cost data as well as other readily available data;
- SocialWatt Plan for evaluating the performance of several actions/schemes and selecting the optimal ones (in terms of cost and effectiveness) to implement, in order to elaborate energy poverty action plans; and
- SocialWatt Check for monitoring and assessing the effectiveness of schemes implemented.

The three tools are designed to be used jointly to support utilities efforts to alleviate energy poverty in an integrated way. They can also be used independently to meet specific needs. Figure 1 illustrates the interaction of the tools.

Figure 1: The SocialWatt tools

The SocialWatt tools have been developed following a long process. Model requirements and specifications were developed, the tools were tested by developers and users, and subsequently the tools were improved to meet users' needs and offer the necessary flexibility.[1] It should be noted that the tools are in compliance with the General Data Protection Regulation 2016/679 (GDPR), as they were developed and tested using

[1] More details on the process and methodology employed are available in the report developed on the SocialWatt decision-support tools. https://socialwatt.eu/en/socialWatt-tools

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anonymised data, respecting data ownership, privacy and security.

The SocialWatt utility partners have used the SocialWatt Analyser and Plan tools to support their analysis of energy poverty within their customer databases and assess the suitability of schemes and finance mechanisms to alleviate energy poverty. As part of this process the SocialWatt tools have been further refined and improved, in response to the utility partner needs and experiences.

The results produced by the tools were presented in the report named "Evaluation of schemes to tackle energy poverty"[2], whilst the current report presents EDP's analysis of energy poverty and assessment of schemes to alleviate it. The analysis in this report will help inform the development of EDP's energy poverty action plan, which will guide it's energy poverty alleviation work for the duration of the project and beyond.

1.2 SocialWatt Analyser and Plan tools

This chapter provides an overview of the SocialWatt Analyser and Plan tools in order to enable a better understanding of the results presented in the next section.

1.2.1 SocialWatt Analyser

The aim of SocialWatt Analyser is to help utilities identify energy poor households among their clients. Besides evaluating whether each household in the dataset can be considered energy poor, it provides an assessment of energy poverty at national, regional and municipal level.

The minimum data required for the SocialWatt Analyser are energy consumption (electricity and/or natural gas), energy costs (€), date of measurement, customer location, and income per capita at municipal, regional or county level from external data.

The Social Watt Analyser tool incorporates six energy poverty indicators that can be used for the analysis. The ability to use multiple indicators is important in the measurement and targeting of energy poverty as no single indicator of energy poverty is perfect and suitable for all contexts.[3] More specifically, the tool includes the following indicators:

- 10% approach: A household is classified as energy poor if it spends more than 10% of its income on energy to maintain an adequate level of thermal comfort.
- Low income high costs (LIHC): A household is classified as energy poor if its actual energy costs are above average (national median level) and its residual income (i.e., energy costs subtracted from income) is below the official poverty line.
- High share of energy expenditure in income (2M): A household is classified as energy poor if its share of energy expenditure in income is more than twice the national median share.

[2] Evaluation of schemes to tackle energy poverty, October 2020 https://socialwatt.eu/sites/default/files/news/D2.1%20Evaluation%20of%20schemes%20to%20tackle%20energy%20poverty.pdf

[3] For a discussion of the datasets and indicators available to measure energy poverty see Sunderland et al., 2019, *Report on the status quo of energy poverty and its mitigation in the EU*, https://socialwatt.eu/sites/default/files/2020-01/D1.1%20Status%20Quo%20of%20Energy%20Poverty.pdf

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- Low absolute energy expenditure (M/2): A household is classified as energy poor if its absolute energy expenditure is below half the national median.
- Arrears on utility bills: A household is classified as energy poor if it has arrears on utility bills.
- SocialWatt indicator: A household is classified as energy poor if its actual energy consumption (e.g. electricity, natural gas, etc.) is lower than the theoretically required level for maintaining thermal comfort (heating/cooling/ventilation). If consumption is not lower than the theoretically required level, the ratio between energy cost and income is taken into consideration.

1.2.2 SOCIALWATT PLAN

SocialWatt Plan enables the evaluation of different energy poverty schemes. The tool provides utilities with a set of optimal portfolios, comprising different combinations of conventional and innovative schemes to alleviate energy poverty, along with a budget allocation for each scheme and the expected number of energy poor households to be involved.

Overall, 10 schemes are incorporated in SocialWatt Plan, with each of the schemes bundling a number of individual energy poverty alleviation actions. The tool also considers different financial mechanisms. The optimisation includes a set of predefined targets and constraints, which can be customised by the user to enable the tool to propose an appropriate selection of the schemes. These include:

- Maximum utility budget per year (2021-2030)
- Energy savings target in kilowatt hours (kWh)
- Number of energy poor households to engage
- Share of total interventions in old/new buildings
- Share of total energy savings in old/new buildings
- Share of small/large-scale interventions
- Minimum and maximum renewable energy production

The final output of the SocialWatt Plan tool is a full breakdown of all possible combinations of schemes and actions that would deliver against set targets and constraints, including an optimal cost-driven portfolio. For each scheme, the cost, number of energy poor households to be involved/number of interventions to be implemented, and the total energy savings are estimated.

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2 EDP NEW EVALUATION OF SCHEMES TO TACKLE ENERGY

2.1 EDP NEW, PORTUGAL

EDP Centre for New Energy Technologies (EDP NEW) is a subsidiary of the EDP Group with the mission to create value through collaborative research & development in the energy sector. EDP NEW is entirely committed to research and development with a strong focus on technology demonstration projects. EDP NEW is established inside EDP Labelec – EDP's laboratorial facilities and technical excellence centre.

EDP NEW joined SocialWatt in March 2022. Through its' participation, EDP continues its path as a leader in the energy sector, not only in Portugal but across Europe, and joins the fight against energy poverty. Within the framework of the project, EDP will improve its knowledge about energy poverty, and develop its own Energy Poverty Action Plan, in line with the company vision. This will include schemes designed to encourage the efficient use of energy and to facilitate the uptake of energy efficiency interventions /renewable energy sources.

2.2 STATUS QUO OF ENERGY POVERTY IN PORTUGAL

Portugal has a temperate maritime climate influenced by the Atlantic Ocean, though it is mostly referred to as a Mediterranean climate.

The population of Portugal is 10.3 million, made up of 5.98 million households (2021), representing a decrease of 2,1% and an increase of 1,7%, respectively, compared to 2011.

In Portugal, there is no official definition of energy poverty, although the concept of vulnerable customer is well defined. A vulnerable customer is a citizen that has social and financial difficulties, such as economic problems and inefficient housing. Therefore, they are unable to pay for their energy supply. In this sense, the government created strategies to identify vulnerable customers in order to offer benefits. For example, vulnerable customers are eligible to be included in the Electric Energy Social Tariff, which grants them a discount of 33.8 % (2022) in the electric bill excluding taxes. In order to have access to the Social Tariff, the consumer needs to have an electric supply contract in their name, intended for domestic use in permanent housing, with electricity installed at normal low voltage equal to or less than 6.9 kilo Volt Ampere exclusively, and needs to receive one of the following types of support from social security:

- Solidarity supplement for the elderly;
- Social Integration income (a benefit to protect someone who is facing an extreme poverty condition) [4];
- Social unemployment benefit;
- Family allowance;
- Social disability pension;
- Old Age Social Pension.

[4] https://en.seg-social.pt/social-integration-income-rsi

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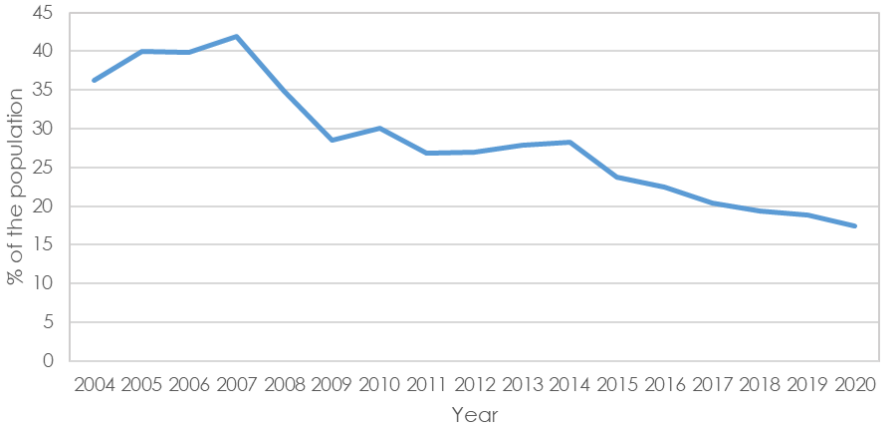
Moreover, the social benefit can be granted to the beneficiary if the total annual income of their household is equal to or less than €5,808, plus 50% of this amount for each member of the household (up to a maximum of 10) [5]. In July 2022 there were 767,628 beneficiaries of the Electric Energy Social Tariff in Portugal [6].

As shown in Figure 2, energy poverty in Portugal – as measured by data on the inability to keep warm, one of the main European indicators - has fluctuated since 2004 and has gradually improved since 2007. Though Portugal has faced some financial troubles in the beginning of the past decade, several subsidiary mechanisms implemented by the Portuguese Government justify this positive evolution. Despite this, in 2020 Portugal ranked fourth in the European Union, in terms of people's inability to keep their homes properly warm, with about 17.5 % of Portuguese living in a situation of energy poverty under this indicator[7]. Finally, it should be noted that the data presented are from before the 2021 price crisis, thus, levels of energy poverty may have increased since then.

Figure 2 Inability to keep home adequately warm over time in Portugal



The following figure presents the Energy Poverty Observatory (EPOV) indicators for Portugal, compared to the EU average. As it can be seen, in 2019, less than five percent of households were in arrears on energy bills in Portugal, which is below the European average. The same trend is evident with other energy poverty indicators. On the other hand, the number of households unable to keep comfortably warm is still above the EU average (19,4 % in Portugal and 7,3 % in the EU in 2019), although this has decreased in the past decade as noted above.

[5] https://www.dgeg.gov.pt/pt/areas-transversais/politicas-de-protecao-ao-consumidor-de-energia/tarifa-social-de-energia/quais-as-condicoes-de-atribuicao-da-tarifa-social-de-energia/
[6] https://www.dgeg.gov.pt/pt/areas-transversais/politicas-de-protecao-ao-consumidor-de-energia/tarifa-social-de-energia/estatisticas/
[7] https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_mdes01&lang=en

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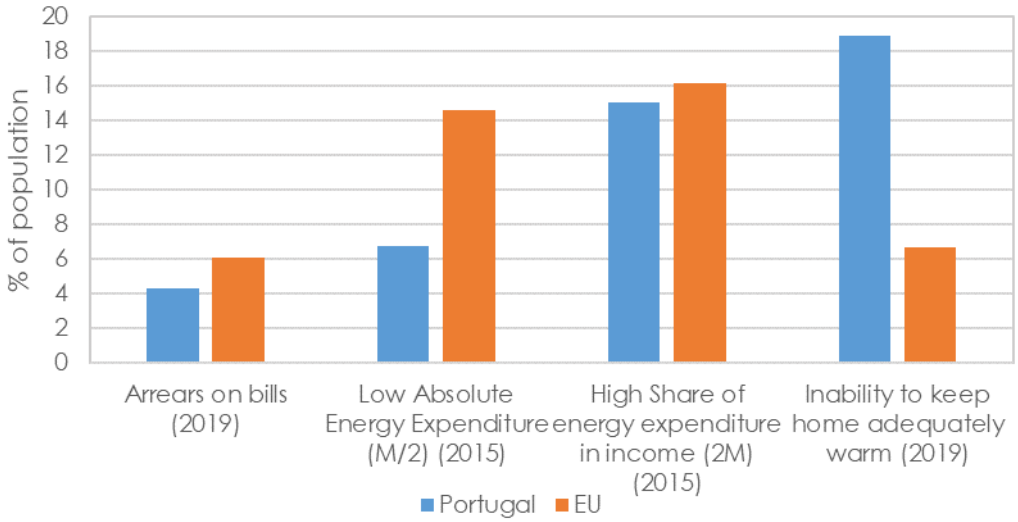
Figure 3 Energy poverty in Portugal and in Europe using the four primary EPOV indicators



Energy poverty is addressed in national policies in the form of special protective measures for vulnerable customers, for instance with the social tariff and social benefit payments. However, to mitigate energy poverty, it is necessary to facilitate and support more the implementation of energy efficiency interventions.

2.3 ASSESSMENT OF ENERGY POVERTY

Two of the energy poverty indicators incorporated in the SocialWatt Analyser were used by EDP to identify energy poor households: the low absolute energy expenditure (M/2) indicator and the SocialWatt indicator. These indicators were selected as they do not rely on income data or in the case of the SocialWatt indicator do not strongly rely on income data.

Due to the absence of a national energy poverty definition, it was deemed important to first assess whether EDP's direct customers included in the social tariff, are likely to also be energy poor. As such, 2021-2022 data from a total of 1,000 residential household customers under the social tariff were included in the analysis. At a second stage, EDP plans to re-run the tool to assess the rest of its customer base.

Specific customer data imported to perform the analysis included: electricity consumption, total electricity bill costs covering one year and household location (by administrative region).

In addition, the following input parameters per indicator were used for the analysis:

- Low absolute energy expenditure (M/2): National average annual energy expenditure: 1,011€
- SocialWatt indicator:
  - Average annual regional household (dwelling) income data.
  - Floor area of a typical household: 95 m^2
  - Lowest energy consumption: 40%

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- Building evaluation index (min/max): 90/110 %[8]
- Household evaluation index (min/max): 9/11 %[9]

Energy poverty assessment

The results obtained from using the SocialWatt indicator with the dataset available for the Portuguese households are summarized in Table 1.

Table 1 - SocialWatt Analyser: Results when using the SocialWatt indicator

Energy Poverty	Result	Percentage [%]
At risk of energy poverty	31	3.1
Energy poor	561	56.1
Not energy poor	408	40.8
Total	**1000**	**100**

Source: EDP and SW Analyzer

Of the total customer base, about 56% of customers were identified as energy poor with a further 3% identified as at risk of energy poverty. This means that 56% of customers actual energy consumption was lower than the theoretically required level for maintaining thermal comfort (or although their actual energy consumption was higher than the theoretically required, their share of energy cost in income was higher than 11%). The high percentage of energy poor can be justified by the fact that the dataset only included customers that are or were at some time included under the Portuguese Social Tariff.

The analysis by region, presented in Table 2, includes the 5 municipalities in Portugal with the highest number of EDP customers in the last 12 months.

Table 2 - SocialWatt Analyser: Results by region when using the SocialWatt indicator

Region	Energy Poor [%]	Non Energy Poor [%]	At risk of energy poverty [%]	Number of Energy Poor
Lisbon	63.8	34.0	2.1	30
Sintra	53.3	46.7	0	16

[8] The Building Evaluation Index (BEI) compares the actual energy consumption of a household to the latter's modelled energy needs. In this respect:

- If a household's actual energy consumption is below the minimum BEI threshold, then the household is classified as 'Energy Poor'.
- If a household's actual energy consumption is between the minimum and the maximum BEI thresholds, then the household is classified as 'At risk of poverty'.
- If a household's actual energy consumption is greater than the maximum BEI threshold, then and only then, the analysis moves on to the next stage ('HEI index').

[9] The Household Evaluation Index (HEI) considers a household income and energy costs:

- If a household spends less money on energy than the minimum HEI threshold (expressed as a share of income), then it is classified as 'Non-energy poor'.
- If a household's energy costs are between the minimum and maximum HEI threshold, then it is classified as 'At risk of poverty'.
- If a household spends more money on energy than the maximum HEI threshold, then it is classified as 'Energy poor'.

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Region	Energy Poor [%]	Non Energy Poor [%]	At risk of energy poverty [%]	Number of Energy Poor
Porto	48.3	41.4	10.3	14
Vila Nova de Gaia	58.3	29.2	12.5	14
Braga	66.7	28.6	4.8	14

Source: EDP and SW Analyzer

Interestingly, these five municipalities, besides EDP having most customers there, are the largest in Portugal and have the highest number of energy poor consumers in the dataset, in absolute values.

The low absolute energy expenditure (M/2) indicator was also used. This indicator identifies households whose absolute energy expenditure is below half of the national median. The analysis revealed that 82.1% of customers that receive a social tariff were identified as energy poor. This means that about a fifth of these households spend above half the national median electricity costs. Once again, the high percentage of energy poor households, particularly when compared with the national statistic for the same indicator (6.8% in 2015), can be partly justified by the fact that the dataset only included customers that are or were in the past included under the Portuguese Social Tariff.

Conclusion

The analysis has identified a high number of customers, which are or were included in the Portuguese Social Tariff, as energy poor. These results are in line with expectations, as one would expect that a high percentage of households under the Social Tariff, are also energy poor households.

It should be noted, that EDP plans to use the tool to analyse a bigger customer dataset in the next few months, in order to inform its Strategy on Energy Poverty and the Energy Poverty Action Plan that are under development.

Thus, the initial focus of EDP's energy poverty alleviation work will be within its direct customer base, with a particular focus on recipients of the social tariff and those identified by SocialWatt Analyser. The engagement of customers will be a longer-term activity, which is expected to be achieved by working with them directly to encourage their participation in the energy poverty schemes that will be developed. Additionally, EDP will explore alternative approaches to engage with energy poor households, in particular through the involvement of social welfare centers and local government.

2.4 ANALYSIS OF ENERGY POVERTY SCHEMES

The SocialWatt Plan tool was used to explore several possible schemes to be considered for Portugal to mitigate energy poverty. For running the SocialWatt Plan tool, two main sets of input parameters have been defined: targets to be achieved and constrains.

Targets:

- 16,190 beneficiaries to be supported through the schemes to be designed
- 16.1 GWh energy savings (electricity)

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- 4.6 GWh renewable energy production
- €1.32 million investment into renewable energy/energy efficiency per year
- 12.7kt CO_2 emission savings

Constraints:

- 30% of interventions to be in new buildings, built after 1980
- All interventions are to be small scale; no large-scale interventions
- 80% of energy savings to be made in old buildings, built before 1980, and a maximum of 20% of energy savings to be made in new buildings, built after 1980.
- Maximum risk of each extracted portfolio: 40%

Evaluation of schemes

The first simulation showed that EDP could consider schemes to help alleviate energy poverty in 16,190 households in Portugal with a total €128,123 investment over the period 2021-2030.

The SocialWatt Plan tool identified three actions as the most appropriate to consider, under the cost driven assessment:

- Efficient lighting, included in the Renovate your Home scheme. This action relates to the replacement of old inefficient lighting with LED lamps.
- Smart thermostats, included in the Smarter Home scheme. This action relates to the installation of thermostat that are enabled by Wi-fi or another (home area network) communications protocol to gather and transmit in-building temperature data in a two-way format that can be accessed remotely via a web portal or mobile application. Smart thermostats ultimately help achieve energy savings, without compromising thermal comfort of the occupants.
- Photovoltaics (PV), included in the RES4ALL scheme. This action relates to the Installation of a small-scale PV system (i.e., 1-10 kWp of nominal power, selected according to the electricity needs of each building under study).

The optimal financial mechanism proposed by the tool was crowdfunding.

Under the cost-optimal portfolio, the impact of the three schemes proposed is as follows:

- Efficient lighting – A total of 12,889 interventions (replacing lighting bulbs), with a total cost for the scheme (independently of the financial instrument) of € 38,667, is expected to result in 9,929 MWh energy savings. This equates to a cost of € 3.89 for every MWh of energy saved.
- Smart thermostats – A total of 3,112 interventions, with a total cost of € 74,714, is expected to result in 35,415 MWh energy savings. This equates to a cost of € 2.11 for every MWh of energy saved.
- Photovoltaics (PV) – A total of 189 installations, with a total cost of €14,742, is expected to result in 4,593 MWh energy produced. This equates to a cost of € 3.21 for every MWh of energy produced.

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Considering the results from the SocialWatt Plan tool, smart thermostats is the most favourable scheme, with the highest cost-effectiveness, i.e. a cost of implementation of €2.11/MWh energy savings.

Conclusions

EDP is planning to re-run SocialWatt Plan and explore results based on different targets and constrains, as well as excluding specific deselected actions.

Based on this and future analysis from the SocialWatt Plan tool and considering business strategies and priorities, budget, risks and constrains, EDP will consider different schemes to develop and include in its' Energy Poverty Action Plan, currently under development. Innovative options for financing these schemes will also be explored.

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