

SHORT TERM SCIENTIFIC MISSION (STSM) SCIENTIFIC REPORT

This report is submitted for approval by the STSM applicant to the STSM coordinator

Action number: CA16232-47397

STSM title: Energy poverty vulnerability index in Poland

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PURPOSE OF THE STSM:

The main goal of the STSM was to conduct joint research on the energy poverty prevalence in Poland. Researchers from the Cracow University of Economics (invited part) and the NOVA University of Lisbon (the host institution) united their efforts to examine the regional vulnerability to energy poverty in Poland. The study is based on the knowledge that we have on the situation in Poland at the regional level (districts) complemented with the approach and methods already implemented for Portugal. The research has to provide policy-makers with valuable information on the distribution of energy poverty in Poland. The vast majority of studies carried out so far rely on the Household Budget Survey and the EU Survey and Living Conditions that limit the geography of energy poverty to regions (NUTS2) level. Our research is intended to overcome that difficulty and give insights about the situation in 380 Polish districts.

DESCRIPTION OF WORK CARRIED OUT DURING THE STSM

During the STSM, we produced a paper titled Mapping regional vulnerability to energy poverty in Poland. The study presents our research on the regions vulnerability to energy poverty based on three datasets, the Household Budget Survey, the EU Survey and Living Conditions, and the Local Data Bank. The methodology could be described in two steps.

First, we compute households' energy poverty in Poland and identify the most affected regions (there are 16 regions in total in Poland). Households' energy poverty is considered to be hidden in Poland for two main reasons: i) people extensively use cheap solid fuels, such as coal and waste ii) the strategy of the poor is to reduce energy usage if there is not enough money to subsist on. That is why energy expenditures are usually low in many households. We estimate the required energy costs in the regression model, accounting for the structure of a household and building's parameters *inter alia*. The required energy costs show the level of energy expenditures necessary to maintain a comfort temperature inside. After we compute the required energy expenditures, we subtract them from the disposable equivalised income and determine whether a household falls below a poverty line. The poverty line is the same as accepted by Eurostat, i.e., 60% of the nation median value.

Second, we assess the vulnerability to energy poverty of 380 Polish districts. To that end, we choose 7 indicators from the Local Bank Data that point to energy poverty. These are the number of respiratory diseases, social benefits recipients, average monthly gross salary, single-family houses, people in post-productive age, population density, and rent arrears. Each indicator aggravates the situation in the district when positively linked to energy poverty. To reduce the number of indicators and combine them into the

most important dimensions, we apply the Principal Components analysis. We choose four dimensions that explain 78% of data variability. The indicators, including hidden energy poverty rate, are standardized to obtain the same range from zero to one. We produce six maps showing the situation in 380 districts in Poland regarding energy poverty vulnerability. These maps indicate areas where energy poverty rate is already high and the ability to resist energy poverty is low.

DESCRIPTION OF THE MAIN RESULTS OBTAINED

The results of our research present the regional distribution of vulnerability to energy poverty at a district-level. We discover 4 dimensions of regional vulnerability to energy poverty, such as degree of urbanization and buildings' types, elderly people in rural areas and respiratory diseases, urbanized suburbs and small cities with poor air quality and low salaries, inhabitants of populated areas in post-productive age earning low income, relying on social assistance, and disparities in the economic development of some cities. According to our estimations, some districts in the Eastern-Northern part of Poland are worse off (districts in Kujawsko-Pomorskie, Podlaskie, and Warmińsko-Mazurskie regions). We propose an alternative to database crossing identification method, which is geographical identification rarely explored in the Polish context due to data availability limits. The results we obtained earlier regarding the hidden energy poverty prevalence could be enhanced with geographical distribution per district. We also think that this research can be updated if the relevant data at the municipal level appear.

FUTURE COLLABORATIONS (if applicable)