Policies and Measures to address Energy Poverty in the Greek Regions

Energy poverty emerges as a complex socioeconomic phenomenon, affecting millions of households worldwide. Although at the European Union level, there is no unified and official definition of energy poverty, some member states have established national definitions, such as the United Kingdom, France, Spain, Cyprus, Slovakia and Ireland. This refers to the situation where a household is unable to access basic energy services such as heating, cooling, cooking, lighting, and the use of household appliances.

Factors contributing to the emergence of energy poverty include the geomorphological and climatic characteristics of Greece and the sharp altitude differences, which create variations in the energy needs of households. To address regional and municipal differences and to implement targeted policies to combat energy poverty, the country has been divided into four (4) climate zones.

Increases in fuel and electricity prices exacerbate the phenomenon of energy poverty with serious repercussions on the economy and society. Households are financially burdened as they have to cover their energy needs at a higher cost. Greece faces a double challenge in the energy sector, with fuel and electricity prices showing significant increases. Additionally, the country's dependence on imported fossil fuels and tax policy contribute to the increase in costs for consumers. Regarding electricity, the increase in natural gas prices, which is used for electricity generation, and the limited penetration of renewable energy sources have led to an increase in tariffs.

Also, employment and unemployment are factors that affect energy poverty, as employment provides income that can be spent on covering energy expenses. According to ELSTAT data, there are inequalities in the distribution of employment among regions, with the Attica region and the Central Macedonia region concentrating the largest part of the workforce. However, the analysis of employment rates in each region separately for the period 2011-2023 does not reveal significant fluctuations. Furthermore, the examination of unemployment rates in the Greek regions, based on Eurostat data for the period 2013-2022, shows a downward trend in most regions, although they remain at high levels.

Energy poverty is significantly exacerbated by the condition of the building stock, with age and low energy efficiency being critical factors. In Greece, the majority of dwellings fall into energy classes E-H, indicating significant room for improvement. Additionally, the construction period of most dwellings in Greece is between 1961 and 1990.

This paper examines descriptively and quantitatively the phenomenon of energy poverty in the Greek regions. The indicators used at the level of Greek regions are the Low Absolute Energy Expenditure (M/2) indicator, the High Share of Income in Energy Expenditure (2M) indicator, the Inability to keep home adequately warm (IKHW) indicator, the Arrears on utility bills (AUB) indicator and the Presence of leak, damp, rot in dwelling indicator.

Specifically, the M/2 indicator is calculated based on data from the Household Budget Survey of the Hellenic Statistical Authority (ELSTAT). This measures the number of households that spend less than half of the national median on the purchase of energy products. Therefore, it reflects households with unusually low energy expenditures compared to national data. Consequently, it highlights households that can no longer meet basic levels of thermal comfort and, consequently, consumption.

Additionally, using data from ELSTAT's Household Budget Survey, the 2M indicator is calculated. More specifically, this measures the number of households whose percentage of expenditure on the purchase of energy products in their income is higher than twice the median value of the corresponding percentage at the national level. This highlights households that spend an unusually large portion of their income on energy expenses.

Regarding the qualitative indicators for measuring energy poverty, the calculation of the Inability to keep home adequately warm (IKHW) indicator, the Arrears on utility bills (AUB) indicator, and the Presence of leak, damp, rot in dwelling indicator was chosen, which were calculated based on anonymized microdata from the Household Income and Living Conditions Survey, conducted by ELSTAT every year.

The Inability to keep home adequately warm (IKHW) indicator measures the percentage of households that are unable to keep their home warm enough. The Arrears on utility bills (AUB) indicator reflects the percentage of households that in

the last twelve (12) months had difficulties in paying electricity, water, gas, etc. bills. While the Presence of leak, damp, rot in dwelling indicator records the percentage of households that face leaks in the roof, dampness in the walls, floors, foundations, or if there are rotten window frames or rotten floors.

The results of the analysis of the M/2 indicator for the period 2014-2021 in the thirteen (13) Greek regions reveal instability, without a clear trend emerging. The South Aegean region after 2016 records the highest percentage of households that are unable to meet basic thermal comfort needs. In contrast, the Western Macedonia region shows the lowest M/2 indicator, indicating that its households have a greater ability to meet basic thermal comfort needs.

Regarding the 2M indicator for the period 2014-2021, fluctuations are observed in most regions, with some exceptions. The Western Macedonia region records the highest value of the indicator, indicating that its households spend a disproportionately large portion of their income on energy needs among the Greek regions. In contrast, the Attica and South Aegean regions show the lowest values of the indicator, i.e., they comparatively have the smallest percentages of unusually large portions of their income on energy expenses. Additionally, a significant deviation was observed between the maximum and minimum values of the 2M indicator in the Greek regions.

The analysis of the Inability to keep home adequately warm (IKHW) indicator for the period 2011-2021 reveals a significant upward trend during the years 2011-2014. Specifically, the percentage of households that were unable to keep their home warm increased significantly, with the peak recorded in 2014 in many regions. From 2016 onwards, a gradual decline in the percentage of households facing this problem is observed. However, regions such as the North Aegean and Epirus continue to show high rates of energy poverty even after 2017. A significant increase in percentages is observed in 2019, with the exception of the North and South Aegean regions, while in 2020 a downward trend is recorded again.

Regarding the Arrears on Utility Bills (AUB) indicator, it is observed that during the economic crisis, and particularly between 2012-2014, a sharp increase is recorded in the percentage of households that were unable to meet their utility bill payment obligations. In the years 2015 and 2016, a relative stagnation is observed, without

significant changes being recorded. However, after 2017, a gradual decrease in the percentage of households facing financial difficulties is observed. Nevertheless, the heterogeneity between the regions regarding the AUB indicator highlights that the economic impacts were not distributed evenly across the Greek territory.

At the regional level, during the period 2011-2020, high percentages of households facing problems with roof leaks, dampness in walls, floors, and foundations, as well as damage to window frames or rotten floors, are observed. Although there are variations between the regions, the regions in which the Presence of leak, damp, rot in dwelling indicator records the highest percentages in the period 2011-2020 are the Ionian Islands and South Aegean regions.

In addition to measuring energy poverty in the Greek regions, the article focuses on the analysis of existing national and EU policies and programs implemented at the regional level in Greece. To alleviate energy poverty in Greece, policies are implemented that focus on both short-term and long-term solutions.

The most important short-term measure, which contributes to reducing heating costs and indirectly limits the rise in fuel prices, is subsidies. In Greece, the heating allowance for the supply of oil, natural gas, LPG, firewood, and biomass, the heating allowance for electricity, the housing allowance, and the Social Household Tariff for electricity contribute to the short-term relief of the problem.

Additionally, short-term energy poverty mitigation policies include information campaigns for households, which focus on sustainable practices aimed at improving living conditions, indirectly increasing income, and rationally using resources and avoiding waste. Indicative practices include turning off lights when not in use, turning off devices and not leaving them on standby, turning off the tap when not using water, and removing obstacles from radiators during their operation.

To address energy poverty, information campaigns are implemented to inform people about ways to improve the energy efficiency of their homes. Upgrading can be done through actions such as replacing light bulbs with new LED bulbs, replacing electrical appliances with higher energy class ones, installing a solar collector, installing external and internal shading systems, installing thermal insulation windows, and thermal insulation of the building envelope. The above interventions

can be implemented either with own funds or through the subsidy of part of the expenses by joining a residential energy upgrade program.

In Greece, the programs that have been implemented, aimed at upgrading homes (detached houses, individual apartments, and apartment buildings) and long-term combating energy poverty, were "Exikonomo kat' oikon I", "Exikonomo kat' oikon II", "Exikonomo 2021","Exikonomo - Aftonomo", " Exikonomo - Renovating for young people", and "Exoikonomo 2023". It is worth noting that through these programs, approximately 240,000 homes have been renovated. According to the National Energy and Climate Plan, the national goal is to renovate an additional 350,000 homes by 2030. Additionally, the " Exikonomo 2025" program is in the application submission stage. Despite the adaptation of the programs to European directives and modern challenges, the first direct reference to combating energy poverty was made in the "Saving 2021" program, which allocated specific resources for its mitigation. Subsequent programs continue to focus on combating energy poverty, without, however, referring to specific funding from them.

The exploitation of Renewable Energy Sources (RES) emerges as a fundamental factor in addressing energy poverty. Self-generation and self-consumption enable households to produce the required energy through the installation of photovoltaic systems on rooftops, solar water heaters for the production of domestic hot water, and other RES technologies. At the same time, energy communities strengthen cooperation between citizens and local authorities for the production and distribution of energy from RES. Through these, households can participate in joint RES projects, such as photovoltaic parks or wind farms, and benefit from energy production.

In conclusion, addressing energy poverty in the Greek regions requires a holistic approach that combines short-term and long-term measures. Strengthening existing energy upgrade programs, promoting self-generation and self-consumption of energy, encouraging energy communities, and implementing targeted information actions are critical interventions to alleviate the problem.