

## **Abstract of contents**

This paper is titled “How to increase the use of certain renewable energy sources in households?” and it aims to answer this question. This paper is bachelor’s degree thesis from the Hungarian University of Life Sciences, Environmental Engineering department.

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This study consists of partial literature review to shed light on the topic of solar panels and the benefits and challenges around installing them by households in Europe, especially Hungary. Taking into account the limitations present, two practical methods were implemented to reach optimum results which is to answer the research questions introduced in the next section: a survey and a 3D model. The results are further explained in the paper.

This thesis will present various possibilities and difficulties found in the domestic utilization of renewable solar energy within the European Union, especially Hungary. A qualitative approach was used to demonstrate possible locations for solar panels, together with a cost-benefit analysis for the 3D-modeled home. Quantitative data came from a survey of 140 participants. The results suggest decisions by householders to adopt solar are complex and multifaceted, involving a wide set of influences with far-reaching consequences for the industry participants and policymakers alike. Based on the results of the survey, it was concluded that the main deterrent for individuals to install solar panels are their upfront costs. In 2022, Hungary suffered from a dreadful inflation rate of 14.61%, exacerbating the financial strain on households and rendering the initial investment in solar energy increasingly unsustainable for numerous individuals. This economic hardship, combined with escalating energy bills, has rendered the environment unfavorable for the widespread adoption of solar technology.

The data in this survey testifies to rather good awareness of solar energy and its environmental benefits. This, however, does not translate directly into wide usage. There is a major disconnection between knowledge and action, orchestrated mainly by high starting costs and a

lack of easily accessible financial mechanisms. While the questionnaire revealed that the high proportion of the respondents held university degrees, which points to a higher level of environmental awareness, knowledge alone cannot surmount such a sizeable enough financial barrier. This therefore points to one crucial need for policy intervention in terms of affordability matters rather than merely information dissemination.

Regardless of that, the results obtained from the survey showed that Hungarian residents are indeed very interested in renewable energy solutions because of environmental concerns and financial savings that can be attained in the long run with solar panels after initial costs are surmounted. Promotion by subsidies or incentives to encourage setting up solar installations with public education about long-term savings could thus be quite instrumental in the development of this type of energy not only in Hungary but also in the European Union in general.

Further evidence of the economic challenges facing those who would adopt solar energy comes from the analysis of the 3D-modeled household. The simulation revealed a huge saving in both June and July peak sunlight periods of the electricity bills in this particular household. On the other hand, it also shed light on the considerable initial investment required. The upfront costs involve not just the panels but also their installation, ancillary equipment such as inverters and batteries, and possible grid-connection charges. This rather sizeable upfront expense can be a very important entry barrier for most households, especially for those of modest means.

These results also show the lack of harmonization among states regarding their legal frameworks in the EU. Different procedures for obtaining permits, various rules to connect to the grid, and metering requirements have raised uncertainty, potentially discouraging or delaying implementation. The lack of harmonization suggests a requirement for directing implementation regulations at a European level that would ease installations and reduce associated costs.

Solar energy offers many benefits, opening up the possibility for a wide range of studies and research to be done. Longitudinal study on adoption rates and economic-cum-environmental impacts of the solar panel across various EU member states is required to appraise the effectiveness of various policy interventions. Comparative case studies that analyze successful solar energy adoption strategies across different contexts would offer real value for drawing

insights into best practices. The added value of deeper investigation into social and psychological factors that influence household decisions to adopt solar energy-risk-aversion, trust in technology, perceived benefits-may add significant value to understanding and communication strategy. This would be further followed by a detailed cost-benefit analysis at the full life cycle of solar panel systems-manufacture, installation, operation and maintenance, and eventual disposal-to have a better understanding of the long-term economic viability of solar energy and also to inform better policy design.