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**Policy Gaps and Financial Barriers
Impeding Deep Energy Renovations in Cyprus and Greece**

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Abstract

Deep energy renovations (DER) are key for the European Union to turn climate goals into concrete actions and cut carbon emissions by 55% by 2030 as well as to help Europe's economic recovery following the pandemic outbreak. Buildings became society's focal point, structures under severe strain that had to adapt to changes as millions of people use their homes not only as resting places, but also as their working spaces. However, to significantly reduce carbon emissions by 2030 and achieve a carbon neutral building stock by 2050 a better understanding of the impediments to the application of energy-efficient solutions in buildings is required, which in turn will boost deep energy renovations. Within the framework of UPGREAT project, a targeted survey for building experts has been conducted, aiming to identify policy gaps and financial barriers for energy efficiency implementation methods to further boost building renovations in Cyprus and Greece. According to the findings, more than half of the respondents stated that very few ambitious policy packages have been defined but there's not enough development whereas the main policy gap is the poor national legislative framework for renovation of existing buildings. A mix of high capital costs, poor financial incentives, and lack of funds hinder DER while based on the results, improved financing solutions coupled with consultancy and training are deemed from the majority as necessary tools to step up the pace of building renovations in these two countries indicating the role universities may play in this complex environment.

Keywords: buildings, renovations, policy gaps, financial barriers, survey.

JEL Classification: I25, J24, K32, L74, O18.

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1. Introduction

Society is currently grappling with two critical issues: challenges related to climate change and the socioeconomic crisis caused by recent events, the outbreak of COVID-19, and the conflict-triggered hydrocarbon crisis. Rising costs, financial instability, and the increased demand for energy, all highlight the benefits of energy efficiency in buildings as a practical approach to reducing greenhouse gas emissions, promoting sustainability through the decrease of natural resources' consumption, and ultimately lowering individual utility bills (Santamouris, Vasilakopoulou, 2021). As housing, offices, retail establishments, and other buildings make up about 40 % of final energy consumption and 36 % of greenhouse gas emissions (Commission Recommendation (EU), 2019), the European Union during the last decades has adopted a number of directives focusing on the energy efficiency of public and private buildings in order to develop a sustainable, energy secure, and carbon-free built environment. Since 2002, in order to encourage building renovations that will pave the way for the green transition, European policies have focused on encouraging energy retrofits in buildings.

One of the most cost-effective methods to remove obstacles to energy efficiency is to implement relevant policies. Because of this, energy efficiency policies have been crucial components of energy sector reform for many nations since the late 1970s. Still, in many studies, the need for robust policies that make capital resources available and remove upfront investment costs is highlighted (Yeatts et al., 2017). Nevertheless, barriers to energy efficient renovation exist at various points along the value chain, from the decision to start renovating to financing and finishing the project. For instance, benefits from energy savings may not be clear or may not be well explained and understood, especially by end users, when considering a renovation as these might be challenging to be quantified and monetised (Shnapp et al., 2020). Renovations can also be expensive, challenging to plan, and time-consuming to complete. It can be challenging to raise money, particularly at the local and regional levels. Due to regulatory hurdles and a lack of capacity in public administrations, public funds are frequently scarce and challenging to blend.

Since the primary research focus frequently lies on the cost-effectiveness and payback period of renovation investments, the lack of adequate access to financing is frequently ignored (Tuominen, 2012). Multiple studies have revealed that the most significant barriers to energy renovations, particularly for homeowners of young age, are primarily economic constraints and the household's budget limitations (Yeatts et al., 2017; Jakob, 2007; Stieß, Dunkelberg, 2013). Albrecht and Hamels in their 2021 notable study, showed through a 'stochastic sampling' approach of 100.000 households in the Flemish region, Belgium, that about half of the home-owning households are not able to financially support the required energy retrofits towards the 2050 standard whereas for the other half the real short-term challenge may be resolved through successful policy measures that motivate homeowners with sufficient resources (Albrecht, Hamels, 2021).

With the weighted annual energy renovation rate being rather small, around 1 %, and with only 0.2 % of the building stock in the EU undergoing extensive

renovations every year that reduce energy consumption by at least 60 % (Commission Recommendation (EU), 2019), urgent action is required to be taken not only in the form of sophisticated policy making, but also in the form of extensive research toward unveiling hidden policy gaps and financial barriers in order of a carbon neutral society to be realised in the next decades.

In this context, this article is based on the joint European research project: “UPGREAT – Upskilling Professionals for deep energy efficiency Renovations: A Tool for better schools” part of the European Climate Initiative (EUKI) of the German Federal Ministry for Economic Affairs and Climate Action (BMWK), in which the National and Kapodistrian University of Athens, Hellenic Passive House Institute, Cyprus Energy Agency and Da-Di-Werk municipal enterprise in Darmstadt – Dieburg, Germany, are involved. The overall capacity development in UPGREAT includes the upgrade of knowledge and experience on energy efficiency measures in building renovations with a focus on schools, as well as the strengthening of national and international interaction between stakeholders in the building sector.

2. Problem Statement

In order to address the climate crisis and accelerate Europe's economic recovery following the pandemic outbreak, deep energy renovations (DER) in buildings are now necessary to meet the low carbon emission efficiency standards set by the European Union. The building sector is anticipated to undergo significant change in order to meet ambitious energy efficiency targets by 2050, with annual energy renovation rates expected to double over the next 10 years according to the European Commission’s communicated policy "A Renovation Wave for Europe - Greening our Buildings, Creating Jobs, and Improving Lives" in 2020 (Communication, 2020). More recently, a legislative proposal to revise and recast the Energy Performance of Buildings Directive – EPBD, was adopted by European Commission officials on December 15, 2021, as part of an overall revamp in EU climate and energy legislation, which is known as the "Fit for 55" package. The implementation of DER is, however, greatly hampered by both policy and financial issues in national level and it has become clear over time that the majority of EU Member States encountered numerous challenges in transposing the EPBD, the main EU’s legislative instrument for improving the energy efficiency of the European building stock, into national laws since 2010, and some are still having difficulties (Zangheri, 2021). In this study, the main policy gaps and financial barriers that hold back the delivery of successful deep energy renovations in Cyprus and Greece are investigated in an attempt to map the hindrances that may hamper the renovation wave in these countries.

3. Research Questions / Aims of the Research

The aim of this study is to identify financial and policy gaps that may put challenges on implementing deep energy renovations in buildings in Cyprus and Greece. The research questions, targeted at building professionals, include inquiries about their perception of national energy efficiency policies, the most important gaps

that exist in Cyprus and Greece regarding the implementation of national energy efficiency (EE) policies, the most prominent barriers for financing deep energy renovation of buildings as well as the drivers that may boost deep energy renovations in these countries.

4. Research Methods

For the identification of the aforementioned gaps and barriers, an online survey was conducted from April 2022 until September 2022, addressed to white and blue collar professionals of the building sector from Cyprus and Greece. This purposeful sampling technique was used to identify information-rich cases for the most effective use of limited resources.

The survey was distributed from the beginning of April until the end of September 2022. The questionnaires were disseminated through i) by-weekly social media posts, ii) dissemination in international and national conferences, iii) blog articles in project's website, iv) social media posts in project's social media and v) email's to the consortium's partners mailing lists. Online versions of the questionnaire surveys were created on LimeSurvey (2023). The responses were processed using Microsoft Excel (2018) and IBM SPSS (2015) software.

The questionnaire included multiple-choice questions in which participants of the survey had some possible options to choose from. A two-proportion z-test was used for testing the proportions between the responses of participants from the two countries, whereas a significance level to either reject or accept the alternative hypothesis is set at 0.05.

Out of a total of 830 who opened the survey, 501 answered at least one deep energy renovation-specific question and were considered valid. Of the 501 participants, 107 were from Cyprus and 394 were from Greece.

5. Findings

In this chapter, the main findings of this study are presented. Respondents' perception of their national energy efficiency policies in deep energy renovations (DER) is illustrated in Figure 1, the most important energy efficiency policy gaps in Greece and Cyprus according to the participants are listed in Figure 2, the most prominent barriers for financing deep energy renovations are shown in Figure 3, whereas the determining factors that may support and further push up DER are presented in Figure 4.

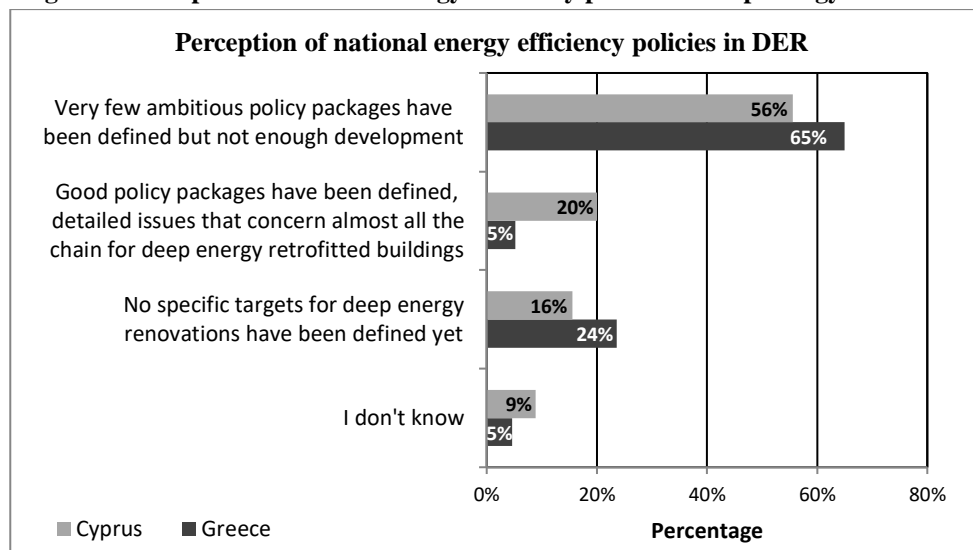
5.1 Perception of Energy Efficiency Policies and Respective Gaps

Survey participants were asked how they consider the energy efficiency policies in their countries regarding the encouragement of deep energy renovations in existing buildings. The results are presented in Figure 1.

The majority of respondents in Cyprus and Greece stated that "Very few ambitious policy packages have been defined but not enough development" with 56 % and 65 % respectively. Interestingly, statistically significant different shares

of respondents stated "Good policy packages have been defined, detailed issues that concern almost all the chain for deep energy" with a difference of 15 % (20 % Cyprus, 5 % Greece, $z = 3.228$, $p < 0.01$). Sixteen percent (16 %) of the participants in Cyprus and 24 % in Greece reported that "No specific targets for deep energy renovations have been defined yet". Finally, 9 % from those surveyed in Cyprus and 5 % in Greece didn't know if energy efficiency policy packages were defined in their country.

Figure 1. Perception of national energy efficiency policies in deep energy renovations



Source: Authors' own contribution.

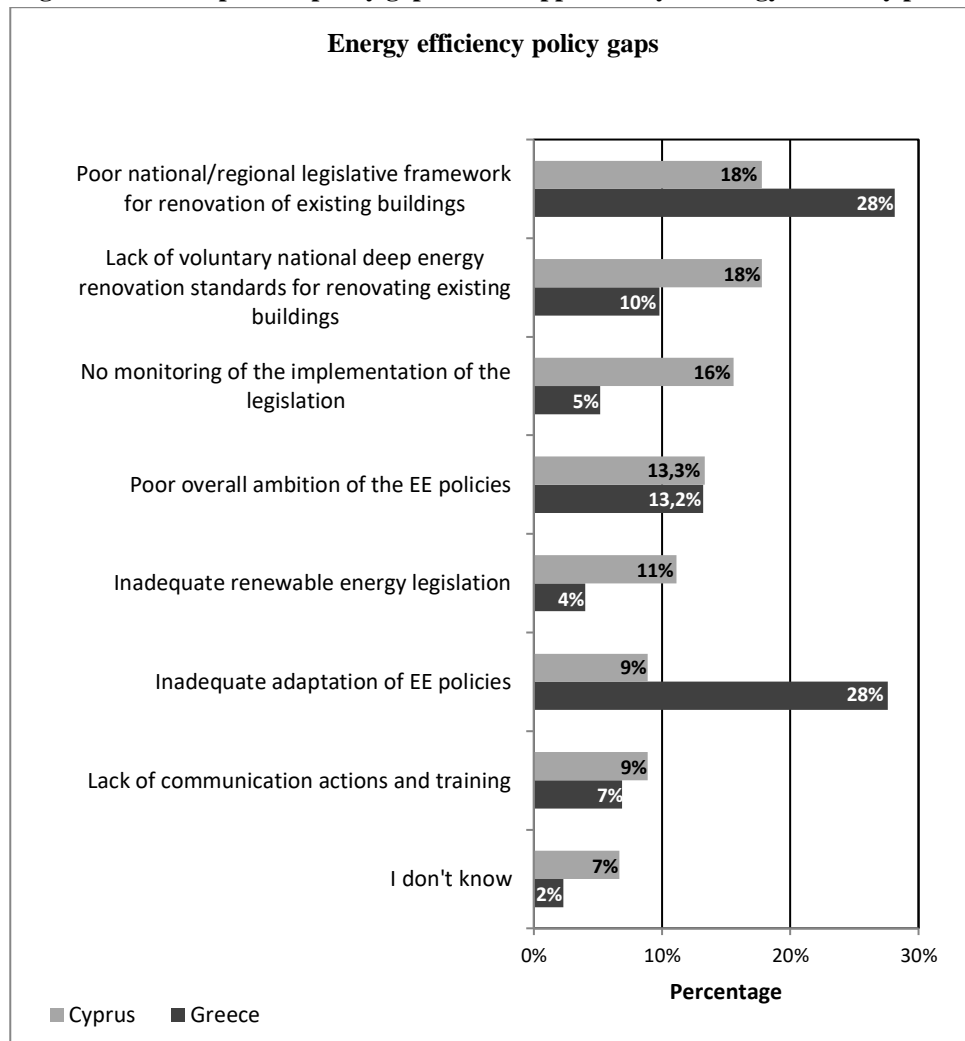
Consequently, survey participants were asked to select the most important gap in their country's policy on the implementation of energy efficiency (EE) policies. The results are illustrated in Figure 2.

According to the findings, the three most important policy gaps for the applicability of energy efficiency policies in Cyprus were "Poor national/regional legislative framework for renovation of existing buildings" (18 %), "Lack of voluntary national deep energy renovation standards for renovating existing buildings" (18 %) and "No monitoring of the implementation of the legislation" (16 %). Slightly higher than 13 % considered "Poor overall ambition of the EE policies" as a gap in Cyprus. Interestingly, 9 % of the participants in Cyprus stated that the "Lack of communication actions and training" was another policy gap and this share might be coupled with that 9 % who did not know if energy efficiency policy packages were defined in their country in the previous question.

In Greece, an equal share of 28 % reported that the top two energy efficiency policy gaps were "Poor national/regional legislative framework for renovation of existing buildings" and "Inadequate adaptation of EE policies". About 13 % considered that the "Poor overall ambition of the EE policies" was another gap in

energy efficiency policies, whereas 10 % said that the "Lack of voluntary national deep energy renovation standards for renovating existing buildings", was an important gap for the implementation of energy efficiency policies in Greece.

Figure 2. Most important policy gaps for the applicability of energy efficiency policies



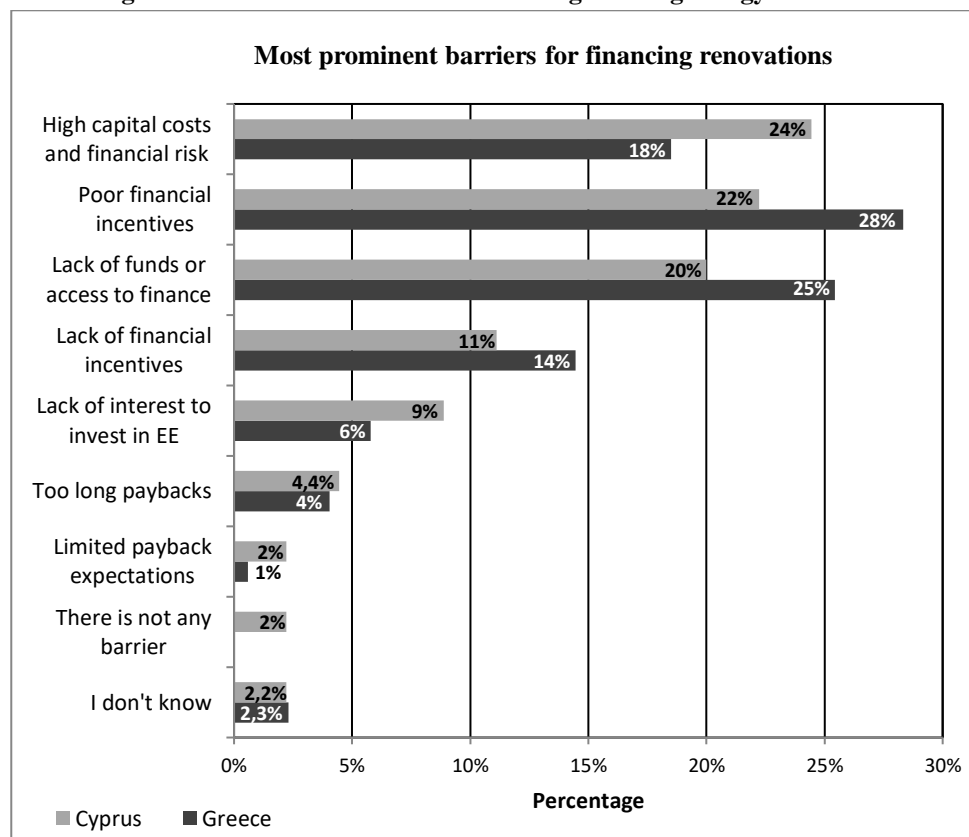
Source: Authors' own contribution.

Statistically significant differences in the responses of the participants between Cyprus and Greece were observed with regard to "Inadequate adaptation of EE policies" with a difference of 19 % (9 % Cyprus, 28 % Greece, $z = -2.627$, $p = 0.004$) and "No monitoring of the implementation of the legislation" with a difference of 11 % (16 % Cyprus, 5 % Greece, $z = 2.386$, $p = 0.009$).

5.2 Financial Barriers

Those surveyed were asked about the most prominent barrier to financing the deep energy renovation of buildings in their countries. The results are presented in Figure 3.

Figure 3. Prominent barriers for financing building energy renovations



Source: Authors' own contribution.

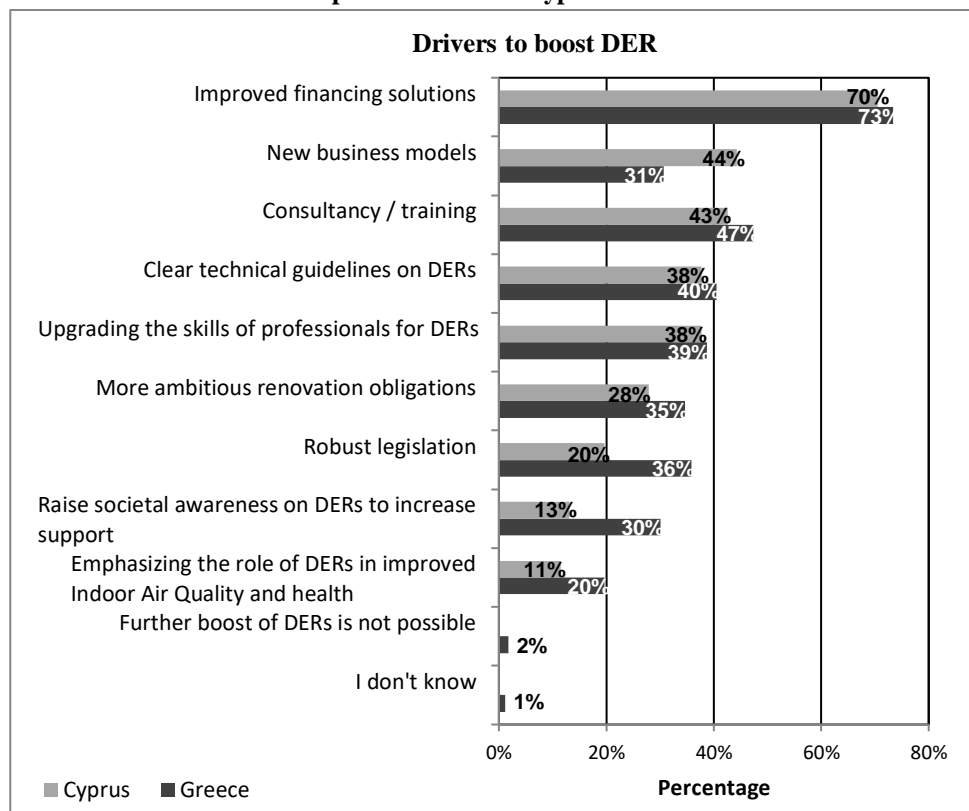
In Cyprus, "High capital costs and financial risk", was considered as the most prominent barrier selected by 24 %. "Poor financial incentives" followed with 22 % while "Lack of funds or access to finance" was chosen by 20 % making it the third most important barrier for financing deep energy renovations in Cyprus.

In Greece, the given answers were similar to those in Cyprus. Participants reported "Poor financial incentives" with 28 % as the top financial barrier for energy renovations followed by "Lack of funds or access to finance" with 25 % and "High capital costs and financial risk" with 18 %. Lack of financial incentives is considered as a barrier for a 14 % in Greece and 11 % in Cyprus showcasing the importance of incentives for deep energy renovations.

5.3 Drivers to Boost DER

Finally, those who participated in the survey were asked about the drivers that could boost the deep energy renovation market in renovation projects in their country. The results are presented in Figure 4.

Figure 4. Drivers that may boost the deep energy renovation projects. A comparison between Cyprus and Greece



Source: Authors' own contribution.

The majority, 70 %, of those surveyed in Cyprus selected "Improved financing solutions" followed by "New business models" with 44 %. The third most popular driver that could boost the market, according to respondents in Cyprus, was "Consultancy / training" receiving 43 %. "Clear technical guidelines on DERs" and "Upgrading the skills of professionals for DERs" received 38 % each. In addition, 28 % of participants in Cyprus stated that "More ambitious renovation obligations" could empower the deep energy renovation market, as well as "Robust legislation" which gathered 20 %.

The most frequent answer given in Greece, as in Cyprus, was "Improved financing solutions" with 73 %. "Consultancy/training" followed with 47 % whereas the third and fourth most popular responses received similar shares. "Clear

technical guidelines on DERs" and "Upgrading the skills of professionals for DERs" were selected by 40 % and 39 % respectively. "Robust legislation" was chosen by 36 % closely followed by "More ambitious renovation obligations" that was selected by 35 %.

6. Conclusions

This research leads to a better understanding of the policy and financial impediments to the application of energy-efficient solutions in buildings. However, due to the sample size, generalisations should be frugal and the findings should be considered as indicative of the entire building professionals' universe in Cyprus and Greece. According to the results, progress toward more energy-efficient buildings is hampered not only by building professionals' inadequate knowledge depicted in higher than 43 % share of respondents perceiving consultancy and training as a driver that may boost deep energy renovations, as well as a lack of innovative financial services. A mix of high capital costs and financial risks associated with deep energy renovations, poor financial incentives, and lack of funds hinder the renovation wave in both countries, and it is of no surprise that more than 70 % of those surveyed in each country stated that improved financing solutions may enhance the rate of deep energy renovations. Inadequate legislation and bureaucratic procedures compound these issues, creating roadblocks that are only likely to be surmounted with considerable personal effort by building professionals. It requires a combination of training, financial incentives, organisation, as well as sophisticated policy making based on an in-depth comprehension of each player and how they interact, to effectively resolve this problem.

As a result, there is an urgent need to instruct building experts not just on the technical elements of a significant renovation, but also on the effects of energy costs on project profitability and how to convey this to end users. Universities may play an important role in this context by continuously improving the abilities of professionals through up-to-date lifelong educational programs and specialised technical workshops. As a result, the creation of innovative learning methods, the delivery of educational seminars and the revision of existing knowledge to follow recent technological advances, the development of guidelines for deep energy renovations based on experience gained through relevant pilot project, and the effective communication of information to all actors of the renovation market, with public authorities and the general public included, are all considered essential.

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