Article

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How Sustainable Design May Affect the Real Estate Market

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Simple Summary: It is vitally important that scientists are able to describe their work simply and concisely to the public, especially in an open-access on-line journal. The simple summary consists of no more than 200 words in one paragraph and contains a clear statement of the problem addressed, the aims and objectives, pertinent results, conclusions from the study and how they will be valuable to society. This should be written for a lay audience, i.e., no technical terms without explanations. No references are cited and no abbreviations. Submissions without a simple summary will be returned directly. Example could be found at http://www.mdpi.com/2076-2615/6/6/40/htm.

Abstract: During the last years the desire and the need for green buildings have been increased. The rise of energy cost, the higher transportation expenses and the international challenges along with the climate change are related with the green buildings market but are also affecting the cost of construction. The aim of this research is to discover and confirm the increased request of green properties and to investigate whether this is related to a new need or just a desire of the buyers. Moreover, the paper examines the people's knowledge of greenness and sustainability and their wish to live and work in sustainable buildings. Finally, do the buyers will to pay extra in order to purchase a sustainable property and how sustainability can affect the market value and the construction industry.The participants who took part in this research were people that are living and working in Cyprus. One of the significant outcomes was the fact that people who have the knowledge and awareness related to sustainability are willing to pay extra to purchase green properties.

Keywords: green buildings; sustainable buildings; valuation; real estate

1. Introduction

In recent years, the increasingly visible effects of climate change, economic instability and changing political conditions have dynamically brought sustainability in the fore. Sustainable development refers to economic, social and environmental aspects as per the United Nations Commission (Garren, 2018). However, characterizing and measuring sustainability involves making choices about how to define and quantify what is being developed, what is being sustained, and for how long (Parris, 2003). Sustainable development presupposes the development of the productive structures of the economy alongside the infrastructures for a sensitive attitude towards the natural environment and ecological problems.

One quarter of the entire global carbon dioxide emissions is caused by buildings, and therefore they are considered to be the main contributors to the climate change (Levine, 2007). In Europe, 40% of the energy consumption is consumed by building (Zancanella, 2018). Therefore, buildings with the correct measures have a high potential to lower their carbon footprint and consequently the energy consumption (Enkvist, 2007). During the last decades the interest in green developments is growing rapidly and this is the main reason that the real estate housing market has faced a paradigm shift (Heinzle, 2013). In fact, the field of the real estate illustrate lately an increased interest for green and

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sustainable buildings. Besides, the World Green Buildings Council and the network it encompasses in Europe, are dynamically investing in communicating the profits of green residential properties to buyers and tenants (Hartenberger, 2017). Though, until now there are still barriers towards green and nearly zero energy projects like the high construction costs (Heinzle, 2013).

This paper examines the current status and the awareness on green and sustainable buildings in Cyprus. It investigates also the desire and the need, if any, of the people to live and work in green and sustainable buildings. One of the main results reflect the willingness of potential buyers to pay extra to purchase a green development. Also, the research outcome will highlight the possibility to have higher request of green developments from now on since the people will ask for them and will be ready to pay extra for such offices or homes. More details of the study are presented in the Methodology Chapter.

1.1. Literature Review

The quality of life that homes offer to their occupants is a major factor in shaping real estate market (Arif, 2016). To begin with, the impact of air pollutants on real estate market values is substantial and in the future is set to increase as homeowners become increasingly aware of the importance of a cleaner environment (Assylbekov, 2021). Furthermore, noise pollution can also influence real estate values and a significant decrease in values can be observed in newly built buildings in areas of high noise pollution (JLL, 2022). Finally, a large environmental burden appears to exist from existing properties that have not installed environmentally friendly and energy efficient technologies and systems, resulting in lower growth in property values for these properties and the area in general (JLL, 2022).

Green building trends are now beginning to shape the real estate market, with home buyers preferring to invest in more sustainable homes (O'Mara, 2012). These buildings, have technologies for improved energy efficiency and are changing the way people buy real estate. Developers and sellers are noticing the growing demand for sustainable living and are responding with more high-tech, energy-efficient buildings (Falkenbach, 2010). These projects are equipped with solar panels for water heating, photovoltaics, home energy screens, leak detectors to alert for any pipe leaks, along with motion sensors for light control and low flow water features. These new technologies not only save on energy and water costs but can also deliver a healthy return on investment.

The government of Cyprus, as well as other countries, have been promoting green and sustainable development by offering funds and incorporating new laws (Mirror, 2019). The EU Directive (2010/31/EU) that has been included in the national law of Cyprus from 2010 and has as a main purpose the improvement of the energy performance of buildings, new and existing, whilst considering the climate conditions of the external environment and the climate requirements of the internal environment of the building (Serghides D. K., 2022) (Taliotis, 2020). Moreover, the European Union has implemented the European Green Deal to be applied to all its member states, which aims to ensure the sustainability of the EU's economy (Tutak, 2021). The European Climate Law is one of the main elements of the European Green Deal published by the Commission in December 2019 (Union, Green Deal, 2023). The goal is to achieve a climate neutral Europe by 2050. In Cyprus, the government approved the new National Governance System for the European Green Deal and the implementation of National Energy and Climate Plan "NECP" was introduced under the Regulation on the governance of the energy union climate action which will be enforced for the years 2021- 2030 (Cyprus Action Plan, 2020). The National Energy and Climate Plan for Cyprus is a detailed roadmap for achieving Cyprus Energy and Climate targets by 2030. In addition to Cyprus Energy and Climate targets, the NECP also sets out key policy priorities which will be put in place to allow the country to succeed in reaching its targets. By doing that, they aim to restore the biodiversity and well-functioning ecosystems. Besides, the Climate Action Plan, is an action plan that enhances the effective use of resources, through transmitting to a "clean circular economy, restore biodiversity and reduce pollution" (Cyprus Action Plan, 2020). The path towards this plan has been reinforced by the establishment of several actions that have been implemented or are under development related to the building industry. More specifically in the NECP Cyprus has committed to increasing the share of

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renewable energy in its final energy consumption to 22% by 2030. The country also aims to achieve a 32.5% reduction in final energy consumption by 2030 compared to the business-as-usual scenario. (Cyprus Action Plan, 2020) This target includes energy efficiency improvements across sectors, such as buildings, industry, and transport. Regarding the buildings efficiency Cyprus has committed to promote the energy efficiency of buildings by promoting renovations and upgrades. The goal is to achieve a 30% reduction in energy consumption in buildings by 2030 compared to 2007 level (Cyprus Action Plan, 2020). Building industry is now familiar with the photovoltaic system installations on residential and commercial buildings, the thermal insulation of on the building envelope and the installation of smart and energy saving technologies. Government is promoting green buildings through low-interest loans and subsidies, information campaigns and incentives. Cyprus also made the Energy Performance of Buildings mandatory and new projects must achieve Energy Category A or B to receive their building permit (Katafygiotou, 2014) (Serghides D. K., 2016).

Besides the government's efforts to redirect the real estate market towards green and sustainable building development, some real estate investors seemed to demonstrate a lack of awareness and also a lack willingness to invest green solutions. The main reason is probably the additional cost that put a burden on the green building construction (Heinzle, 2013). As a matter of fact, according to the investor's point of view, the property buyers used to show low levels of interest on sustainable buildings, and therefore they are unwilling to invest more on them (Heinzle, 2013). At present, about 35% of the EU's buildings are over 50 years old and almost 75% of the building stock is energy inefficient (Union, Official Website of EU, 2023) (Zancanella, 2018). The renovation rate of the buildings that are becoming sustainable and energy efficient is 1% per year, this fact illustrates that it would take around 100 years in order to reduce the carbon levels of the existing buildings in Europe (Union, Official Website of EU, 2023). The green and sustainable buildings, especially a quicker renovation of the existing stock is one of the key factors that can lower the global pollution levels and the greenhouse gas emissions (Zhang, 2018).Therefore, since now the environmental awareness is increasing (Skordoulis, 2020), is the ideal time to prioritize the green developments (Khan, 2019). That's why "Green Deal" has triggered the growth of the interest around green and sustainable buildings amongst real estate developers.

Recent studies shows that the homeowners have now a growing interest in buying green buildings and it looks that real estate is maybe ready to priority green buildings (Sichali, 2017). Subsequently, the green building technology has been incorporated by the real estate developers, in order to gain a strategic positioning within the housing market. However, as aforementioned, although the green buildings offer lower energy costs in the long term, they still cost more than the conventional buildings during the construction phase (Chegut, 2019). These building costs, according to researchers, are based on the high costs of the sustainable building materials, in addition to the expensive prices of the efficient mechanical systems (Nagrale, 2020). The higher the market cost of the building, the higher is its market value, which is a term used to indicate the price that green and sustainable buildings can gain from the benefits they offer and the willingness of the community to pay extra for such properties (Chen, 2022).

2. Methodology

The methodology used for this research is based on quantitative research methods. In order to capture participants opinions, a questionnaire was used, which was drawn up after a study of the existing literature and also a search for similar studies that had been carried out in the past, with the aim of more accurately capturing the subjects' opinions (Madad, 2019) & (Assylbekov, 2021).

With the collected data, both descriptive and factorial analyses were carried out with the aim of extracting useful information for inference research. Therefore, the data received have be tested and critically analysed according to each hypothesis of this research. A survey statistical analysis was used for this primary empirical quantitative analysis, and the data was coded using IBM SPSS (Statistical Package for Social Studies), Windows version. For the purposes of this research a descriptive analysis was conducted along with Pearson's correlation and multiple linear regression analysis (Kafle, 2019). The regression analysis via SPSS has helped on the examination of the

relationship between the independent variables and the dependent variables that were set to test the hypothesis of this research project.

The questionnaire has been based on two types of closed-ended questions, multiple choice and five-point Likert scale (Bertram, 2007). In this research, the results of the responses of the sample of one hundred thirteen people in Cyprus are presented. In the present research the sample belongs to the non-probability category and in particular it is a convenience sample. Cyprus was selected for this research since although its small size is an appealing destination for investment opportunities through property purchases. As per PWC 2022 Real Estate report, Cyprus economy has maintained solid growth during the last years. The small size of the Cypriot economy, its flexibility and extroversion, provides agility to effectively adapt to and overcome difficulties. In this changing landscape, the Cyprus real estate market has proved to be particularly resilient, with transaction activity levels in 2022 exceeding expectations, reaching a record-high of €5,2bn in value of real estate transactions. Demand appears to be fueled by the ongoing demographic shifts, in the context of a continuously growing appetite of foreign companies to relocate to Cyprus. The need for fast evolution in the face of a fluctuating global landscape, creates an urgency to pursue a more radical transformation of the sector, and for the industry participants to continue revisiting their strategies and priorities, focusing on concepts, products and infrastructure solutions that are sustainable and fit for the future (PWC, 2022).

The distribution of the questionnaire was made mainly online, by email, and other types of virtual messages that were published through various online platforms and social media. Google forms was the instrument that was employed in order to construct the questionnaires, distribute them and collect the data output from it. The sampling process had a fairly smooth pace and the majority of recipients of the questionnaire completed and submitted it and did not refuse to participate. This was certainly helped by the fact that the questionnaire was structured so that it did not require a lot of time and the questions were formulated in a simple and understandable format. Every participant was informed that they have had the right to withdraw from the study at any moment they felt they should do so. Regarding ethics, the anonymity of each participant was ensured, since their personal information was not needed at any point of the study and they did not receive an email with their answers at the end of their participation in this research. Moreover, if there were personal reasons, the participants could avoid answering questions that they did not want to answer.

The people that received the questionnaire were people who have been living and working in Cyprus for at least one year. The participants of this research project included architects and designers, engineers, estate agents, property valuers, property developers, end users (owner, tenant, and/or property potential buyer), owners (potential sellers), and other (including other people of the general public of Cyprus), who have been asked to identify their occupation. Moreover, the level of education of the subjects included all levels of education. The age of the participants ranged from 20 to over 60 years old. Since Cyprus is a country that attracts a considerable number of immigrants (Refugees., (2020, 06)), it has been decided to publish this questionnaire in the English language. The reasons why this method was chosen were:

The use of questionnaires was chosen in order to understand better the residents awareness, needs and desires related to sustainability and green buildings.

The use of the internet as a means of easy and quick distribution of the questionnaires, thought email and social media.

Ability to quickly and continuously monitor the process of collecting research results.

Avoiding mistakes and omissions in the questions, thanks to the existence of mandatory answers of the specific program used.

Saving paper by not having to print out hundreds of multi-page questionnaires.

Quick input of the data generated by the editor used.

The research was based on the following four hypothesis:

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Hypothesis 1: Increased knowledge of greenness and sustainability in buildings, in the country of Cyprus, can affect their market value.

Hypothesis 2: Increased desirability and need for green and sustainable buildings increase the building's market value in that people is more willing to pay extra for green and sustainable buildings in Cyprus.

Hypothesis 3: The people of higher annual income desire Green and Sustainable buildings more than the people of lower annual income.

Hypothesis 4: Greenness and sustainability are more important in residential buildings than in commercial buildings for the people living and working in Cyprus.

These self-reported questionnaires were separated into four sections. The first section included five demographic questions, which have helped to identify the demographic characteristics of the participants in terms of their age, their gender, their level of education, their occupation and the annual income of their household. These questions helped to create a profile of the participants. All the demographic parameters would be used as an independent variable in order to discover the way the age, the gender, the educational level, the occupation and the annual household income can affect the level of need and desire for green and sustainable buildings.

The second section of the questionnaire included fourteen sustainability and "Greenness" questions, which were divided into four themes.

1. Understanding and awareness of Greenness/Sustainability
2. Cost implications.
3. Greenness Desirability and need
4. Residential versus commercial.

These themes have helped to clearly categorize the views of the people's opinion on the subject. The questions on this section were based on five yes or no questions, eight five-point Likert scale questions, and one multiple choice question. Every degree of agreement was represented by a numerical value from one to five (See full questionnaire attached as appendix). Thus, the collected data included a total numerical value that was able to be summed from the total number of responses.

Nine participants who had not answered the majority of the questions included in the questionnaire were excluded from this research. At the end of this process, the total number of questionnaires that consisted of a suitable sample and were taken under consideration were 104 participants.

Survey Results

The total number of the participants who have answered the questionnaire were 113. The 104 of these participants were able to provide a completed questionnaire and hence their answers were taken into account for the purposes of this research. As it can be observed from the Table 1 below, almost half of the participants, at 48%, were aged at the higher groups of 40 to 60 years old. 27% of them ranged between 30 to 40 years old, whilst a fourth of them were between either at the lower aged group of 20 to 30 years old or at the highest age of over 60 at 13% and 12% respectively. The majority of the participants were male citizens at 64%, with the female participants being slightly less than a third at 31%, and the remainder who did not wish to justify their gender covered only 5% of subject answers. Identifying the level of education, less than half at 41%, were people who have obtained their Bachelor's degree. Next, 36% of the participants have acquired their master's degree, and 5% were at doctorate degree level. It is worth mentioning that there was a small number of participants, and more specifically 18 of them at 17%, with a lesser standard of education having finished high school level or less. The minority of the participants at 22% categorized themselves as 'end-users'. This means that the majority of the participants were either owners or tenants, who could be considering to purchase a property in the future, identified as property potential buyers. Next comes the people who have an occupation of 'other sectors' that amount to 20% of the participants.

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The number of engineers was 16 in total and account for the 15% of the participants. The number of participants who are occupied as estate agents are 12 accounting for 12%, who are matching the potential sellers who also consist of 12 participants at 12%, who currently own a property. The number of architects and designers who have participated in this research project was 9 at 9%, followed by 6 property developers at 6%. Finally, property valuers number only 5, with the least participation at 5% of the total data set. Data of annual household income for each participant has been acquired and the results present that 25% of the participants earn €31,000 to €40,000 per year. Next, 20 out of the 104 of participants, which account for 19% earn between €21,000 and €30,000 annually, and 19 or 18% earn between €41,000 and €50,000. Subsequently, some of the people with the higher spending power at 17% are in the privileged position with earnings of over €60,000 within the Republic of Cyprus. People who have the lowest annual household income, comprise 13% of participants and lastly, the smallest sub-set of participants at 7% indicate earnings of 51,000€ to 60,000€ per year. Table 1 presents all the demographic results of the research; age, gender education level, occupation and income.

Table 1. Demographic results of the research survey including age, gender, education level, occupation and income.

Age	Frequency	Percent (%)
20-30	14	13.5
30-40	28	27
40-60	50	48
60 or over	12	11.5
Gender		
Male	67	64
Female	32	31
Other	5	5
Education Level		
High school or less	18	17
Bachelor's Degree	43	41
Master's Degree	38	36
Doctorate	5	5
Occupation		
Architect & Designer	9	9
Engineer	16	15
Estate Agent	12	11
Property Valuer	5	5
Property Developer	6	6
End User (Owner, Tenant, and/or property potential buyer)	23	22
Owner	12	12
Other	21	20
Household annual income		
Below 20,000 €	14	14
21,000-30,000 €	20	19
31,000-40,000 €	26	25
41,000-50,000 €	19	18
51,000-60,000 €	7	7
Over 60,000 €	18	17

The first topic of the survey was related to the "Understanding and Awareness of Greenness/Sustainability". More specifically, the first question aims to clarify whether the participant understands the meaning of greenness in regards to the building sustainability and efficiency. The outcome of this question indicates that the majority of the people who have participated in this

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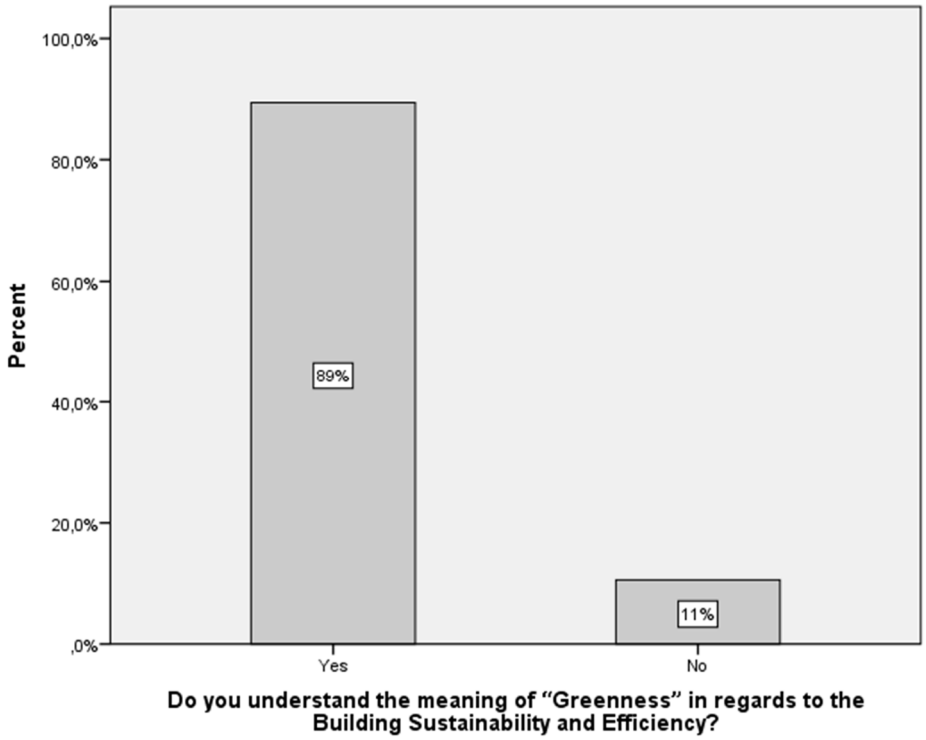
research, at 89%, appear to comprehend what the term greenness as applied in the real estate sector (Graph 1).



Graph 1. Participants understanding of the meaning of greenness in regards to the building sustainability and efficiency.

The next question referred to the participant's understanding on the levels of sustainability in the real estate market of Cyprus. This was a five Likert scale question, where the participants could express the levels of their understanding. The majority of the answers to this question indicated that 75% of the people who have answered the questionnaire have a moderate to in depth understanding. These results indicate that even people who are not closely related to the construction and marketing of green and sustainable buildings are in the position to have an understanding of the levels of greenness. Graph 2 below shows these results in further detail.

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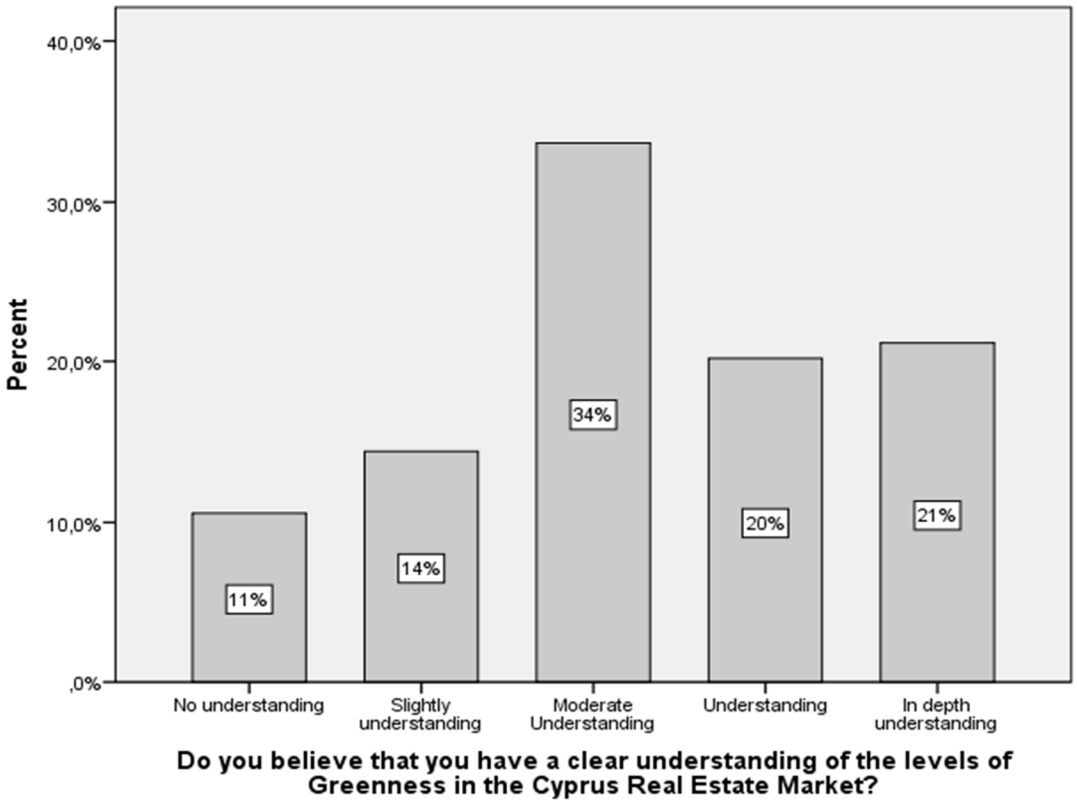
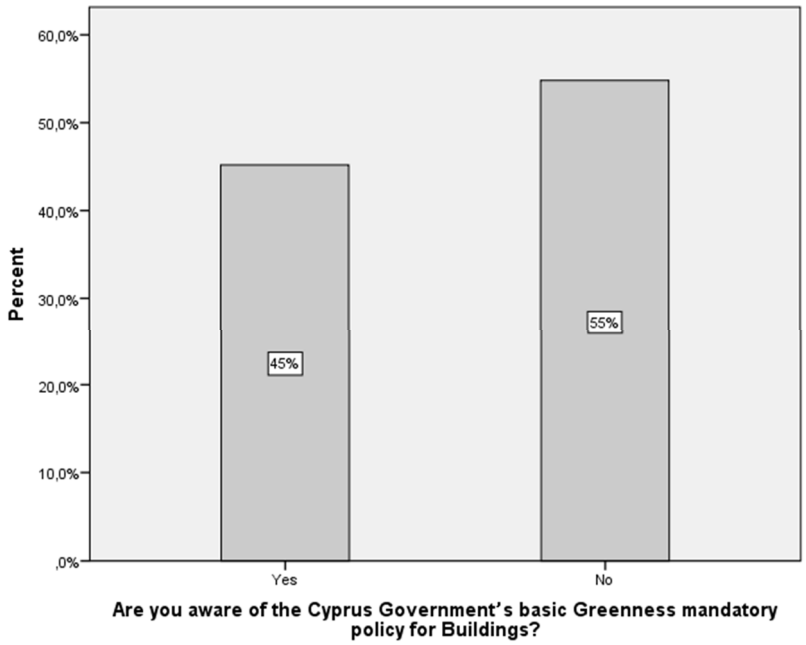


Graph 2. Participants understanding of the levels of greenness in the real estate market.

The next question relates to the participant's awareness of the Cyprus government's greenness mandatory policy for buildings. This was a Yes or No question, where almost half of the participants at 45%, have been aware of the greenness mandatory policy in Cyprus, whereas 55% have not. Graph 3 illustrates the results of this question.



Graph 3. Participant awareness of the Cyprus government basic greenness mandatory policy.

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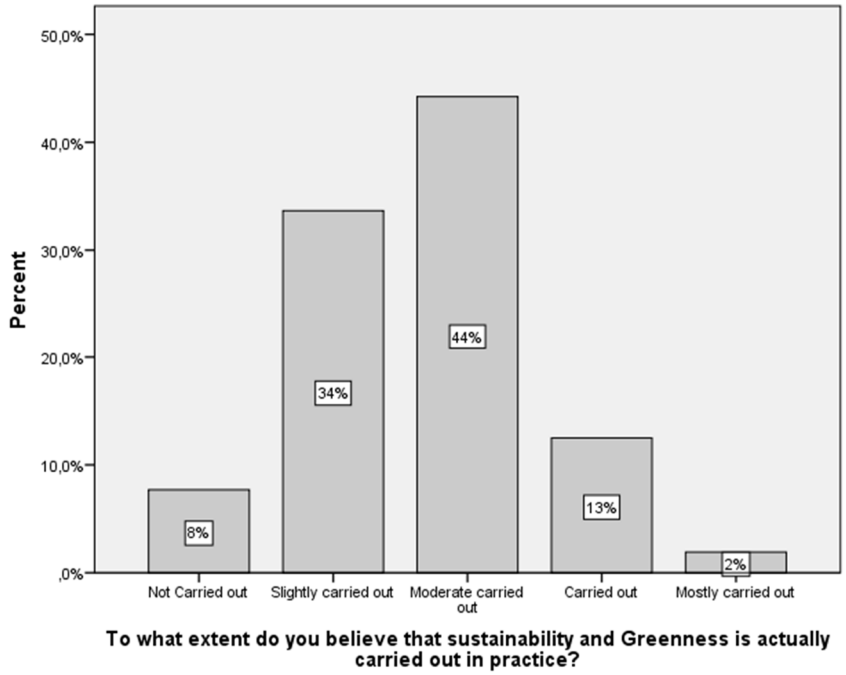
The following question referred to the participant's personal judgment on the extent that sustainability and greenness is carried out in practice in the country of Cyprus. Here, 42% thinks that the measures are not adequate or only few measures are in place.



Graph 4. Participant belief on the extend that greenness is carried out in practice, in Cyprus.

The following question was again a Yes or No question, where the participants would have to indicate whether they believed that a property that is constructed according to the sustainability and greenness standards, could be more privileged than other properties. Here, almost 88% of the participants have agreed to the understanding that a property following the greenness standards can be more privileged. These results are quite encouraging since participants seem to be aware of privileges that green properties offer to the people and the environment. The term "privileged" typically refers to having certain advantages or benefits that others do not possess. In the context of sustainability and buildings, there are different aspects to consider:

Economic Privilege: Sustainable buildings might initially require higher upfront costs, which can be seen as a form of economic privilege. Implementing energy-efficient technologies, renewable energy systems, and eco-friendly materials could increase the construction expenses. However, over the long term, sustainable buildings often result in reduced operational costs due to lower energy consumption and maintenance requirements.

Access to Information and Technology: Developing sustainable buildings may require access to advanced technologies, materials, and expertise. In regions where access to these resources is limited, there might be an element of privilege associated with building sustainably.

Social and Environmental Privilege: Sustainable buildings can have positive social and environmental impacts, such as reducing greenhouse gas emissions, conserving resources, and improving indoor air quality. In this sense, those living or working in sustainable buildings may experience better health and well-being, which could be seen as a form of privilege. Graph 5 below illustrate these results.

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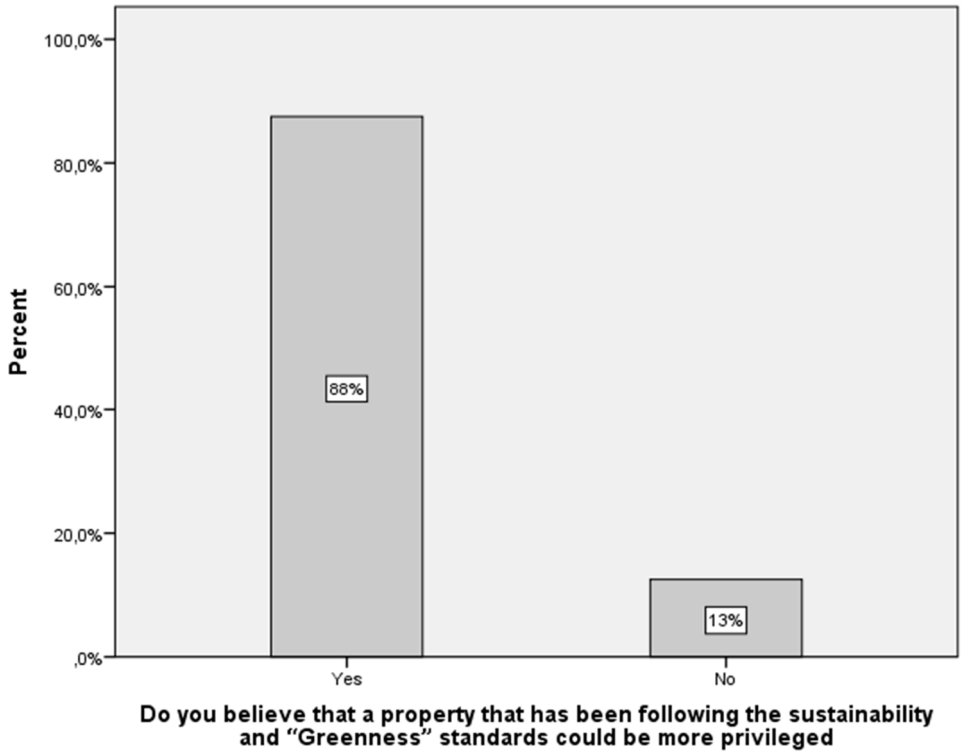

Graph 5. Participant belief on the privileges or not of green properties.

The next four questions within the second section consider the cost implications of green buildings. The initial question of this set the participants could state their belief as to whether the development of green and sustainable buildings is affordable to the general public. Here less than half of the participants at 45% answered affirmatively that green buildings are affordable to the general public of Cyprus, whilst the majority of 55% did not share the same opinion and responded negatively. Graph 6 indicates these results.

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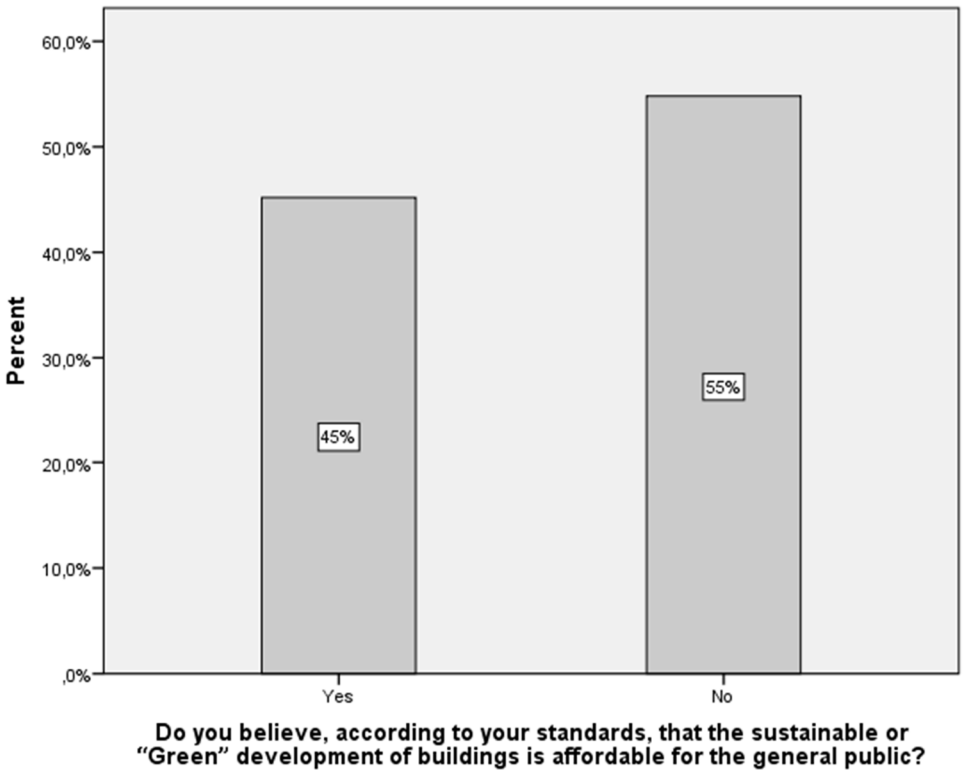
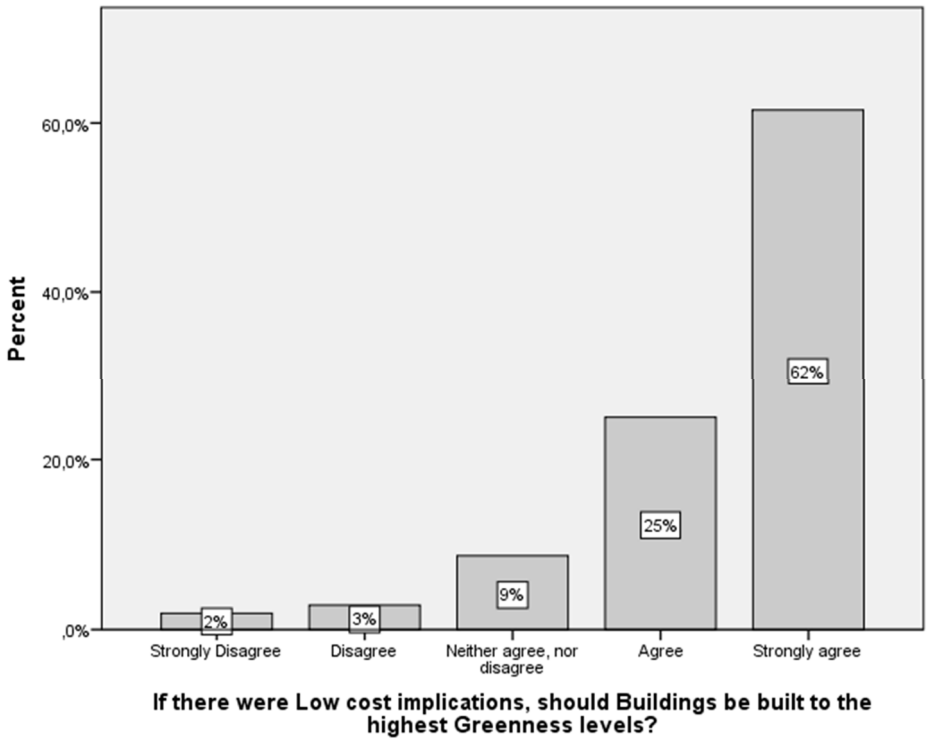


Graph 6. Participant belief on the affordability of a green property for the general public of Cyprus.

Then the participant's answer whether or not buildings should be built according to the highest greenness levels on condition that there are low-cost implications. In this Likert scale question 62% strongly agreeing to the construction of green buildings when low costs apply.



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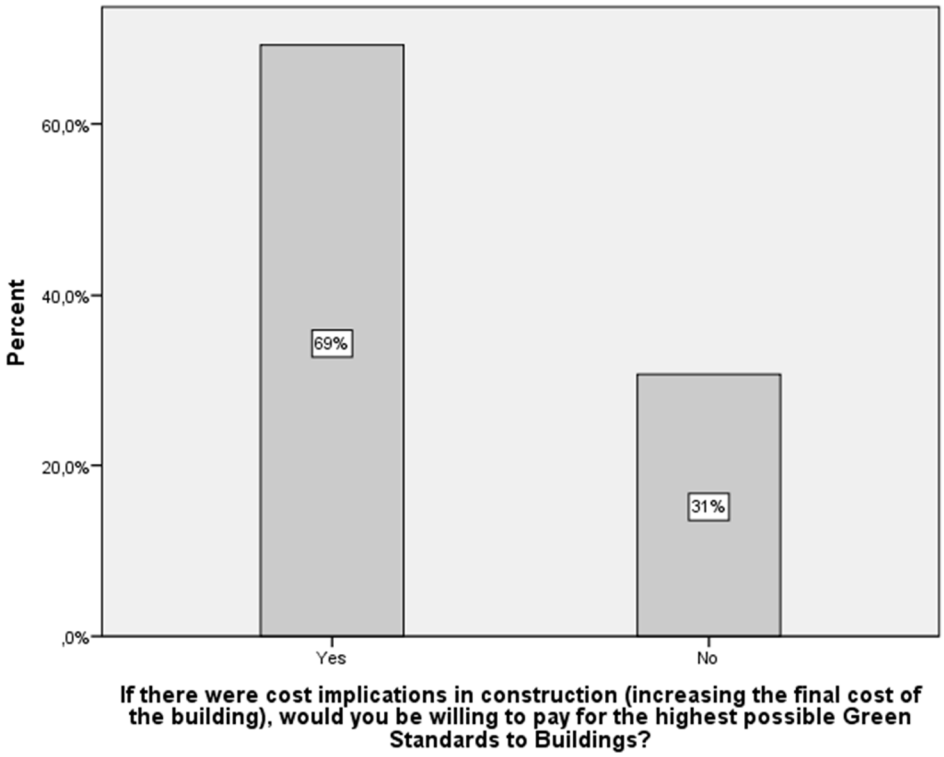
Graph 7. Participant belief on the construction of green buildings of high standards in case there are low-cost implications.

The next question people expressed their willingness to pay extra for the construction of a building according to the highest possible standards. Here, 69% of the participants seem to have the willingness to pay more money in order to purchase a property of the highest possible greenness standards, whilst 31% have not. Graph 8 contains a demonstration of these results.



Graph 8. Participant willingness to pay extra for the highest possible green standards to purchase a building/property.

The last question of this section is a 5 Likert scale question, where participants expressed their willingness to pay extra money in order to purchase a green and sustainable property. The results of this question indicate that the majority of the participants at 36%, are either willing to pay extra, or else very willing to do so, at 19%. Moreover, 30 out of 104 participants show moderate willingness to pay extra, and the rest 17% of the participants are either slightly willing at 11%, or not willing at 6% to pay extra. Graph 9 illustrates these results.

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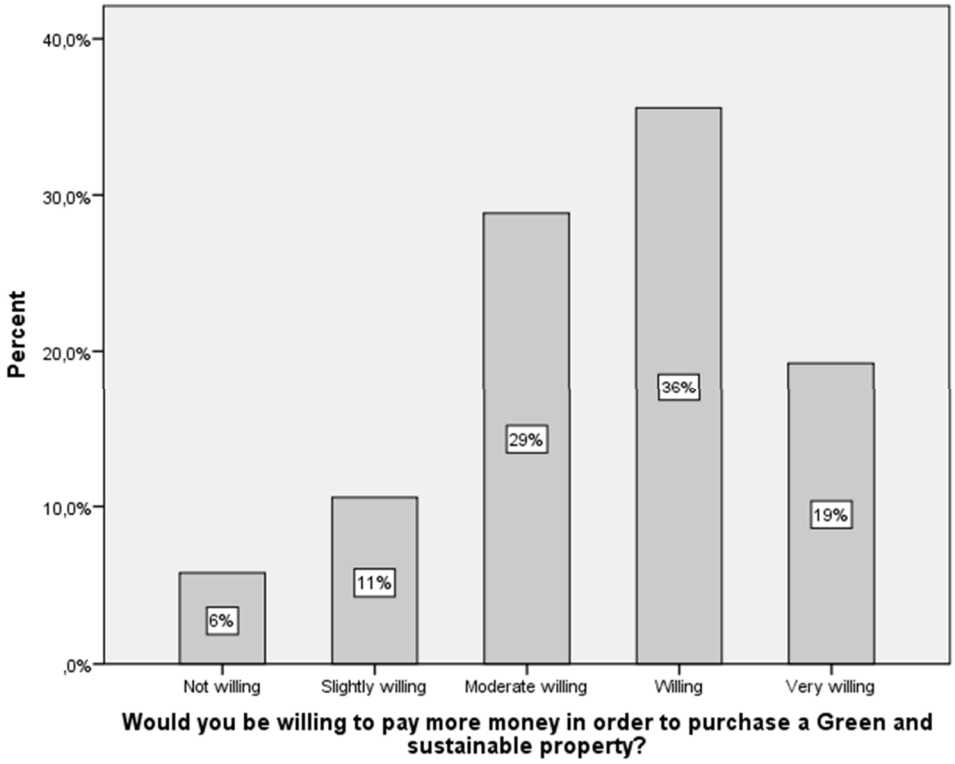

Graph 9. Participant willingness to pay extra in order to purchase a green and sustainable property.

The next three questions that follow are placed under the greenness desirability and need section, where the participants have expressed their levels of need and desirability for purchasing a green and sustainable property. The first of this set of questions is a 5 Likert scale question where the 43% of the participants clarified that they desire very much to live and work in a green environment, 32% of them show desire, and 13% show moderate desire to do so. It is encouraging to see that the greater majority of the participants express a desirability to pay more money in order to spend time in a green property, leaving only 5% of them expressing no desire at all to do so. Graph 10 underneath shows the results of this question.

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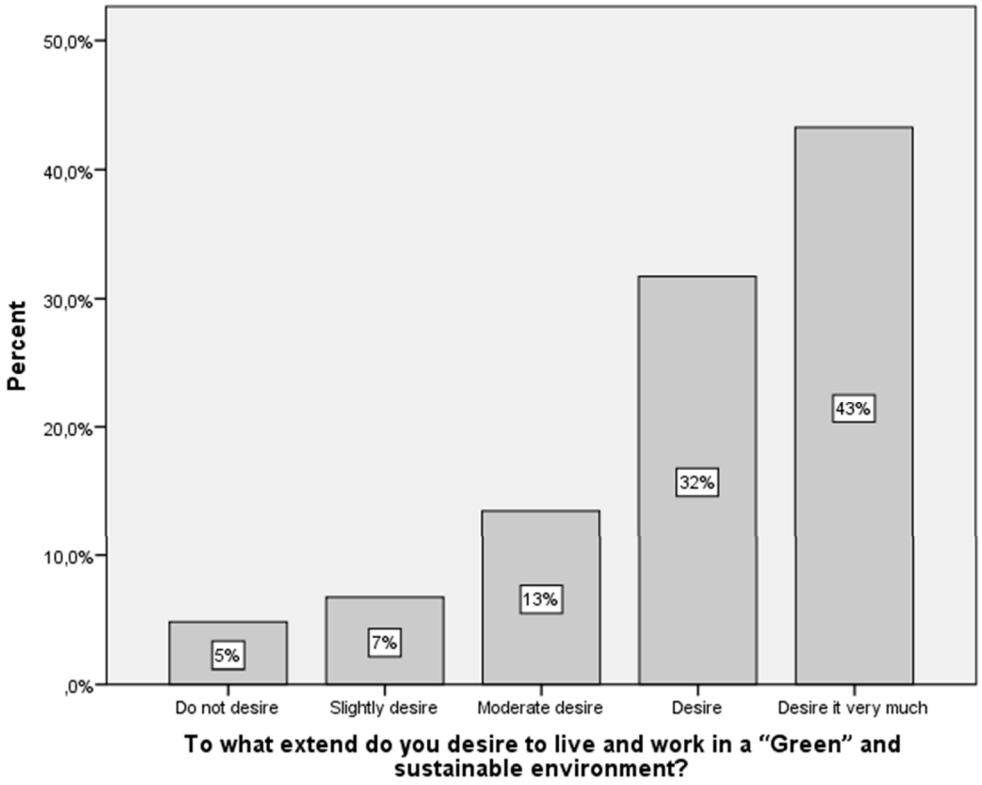

Graph 10. Participants desire to live and work in a green and sustainable environment.

The following question was similar but more related to the levels of their need to live and work in a green and sustainable environment. The need is translated to economic reasons, upgraded indoor environmental quality or resilient factors. Sustainability is not a luxury issue, sustainable buildings are crucial for creating a greener, healthier, and more resilient future for both the environment and humanity. Therefore, at this question again the greater majority of the participants expressed a great need (39%) to live and work in a greenenvironment, 27% expressed a need, and 21% stated to have a moderate need to do so. The results of this question seem to have similarities with the results of the previous one (Graph 11).

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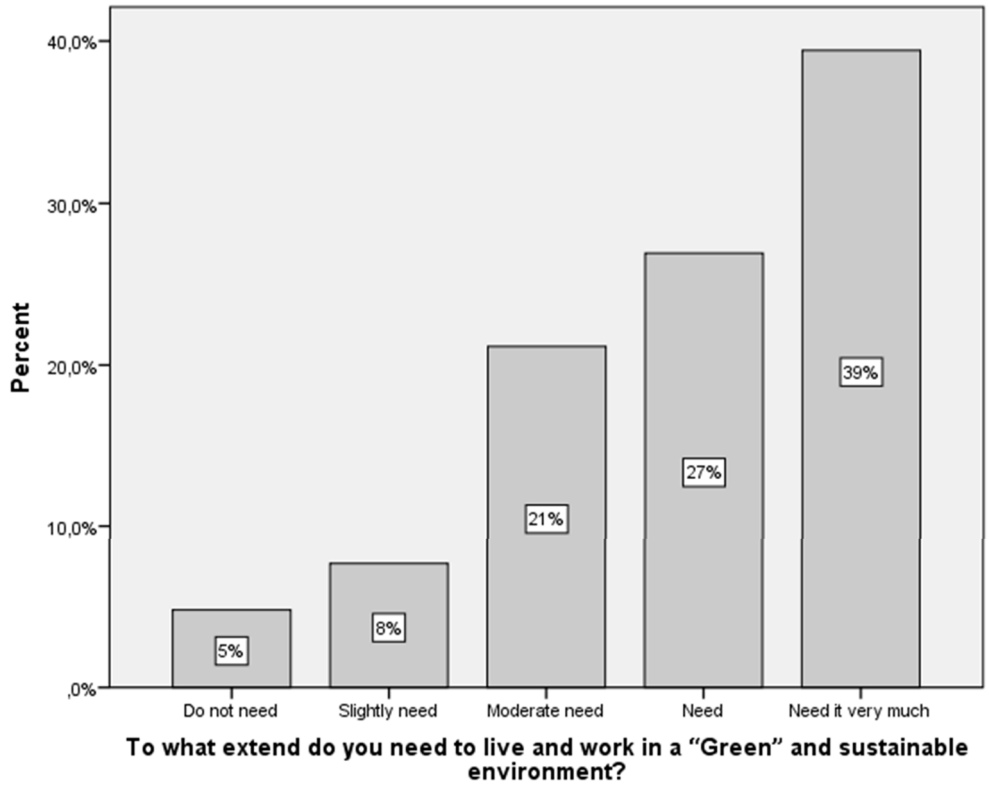

Graph 11. Participant need to live and work in a green and sustainable environment.

This section ends with a multiple-choice question, where the participants had to pick the most important factor, according to their awareness that influences the application of sustainability and greenness in practice, in the country of Cyprus. Here, 39% of the subjects believed that the government's imposition through law was the most influential factor of all, with the financial benefit factor to follow with a slightly less percentage. The need at 13% and desire at 9% seem to be the less influential factors and cannot really make the difference in the real estate market. These results contradict the results of the two previous questions, where the participants expressed their need and desire to live and work in a green environment, implying that although the need and desire of the participant is high, it is not the actual driver factor that influences the application of greenness in practice.

For the final section of this questionnaire, there are two questions that indicate the level of importance of Commercial versus Residential properties according to each participant. Both questions were 5 Likert scale questions, where the participants expressed the level of importance of greenness to residential and to commercial buildings respectively.

One question was on how important participants think that greenness is for residential buildings, the results indicate that the majority, think that greenness is very important for residential properties (Graph 12).

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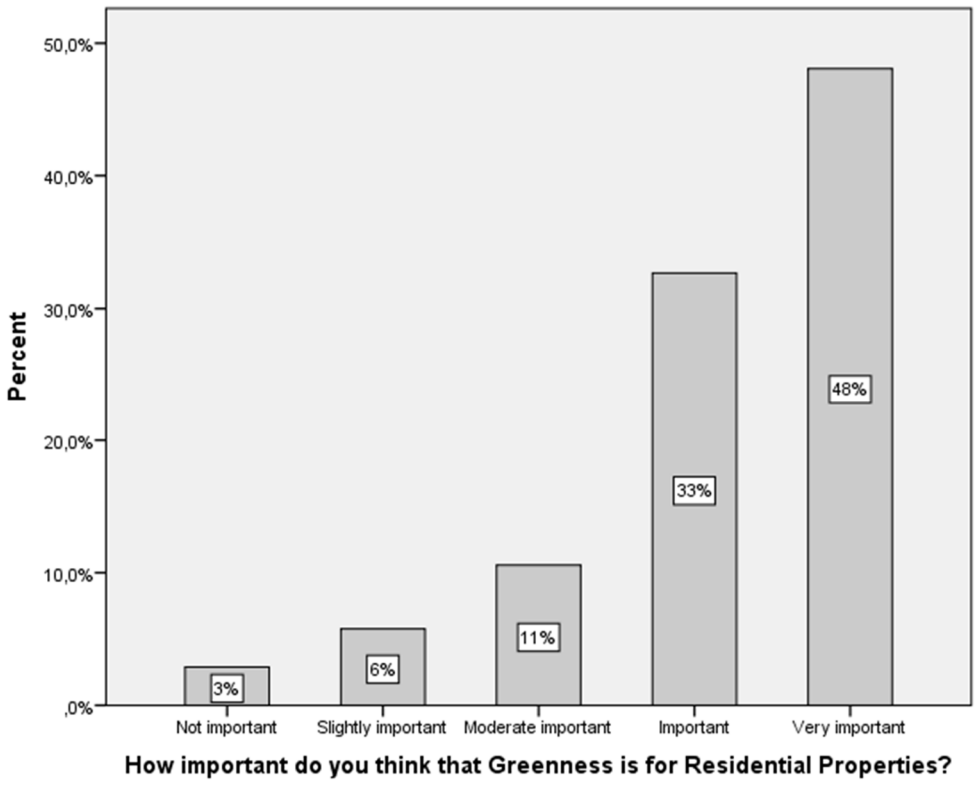

Graph 12. Importance of greenness in residential buildings.

Finally, the questionnaire of this research ends with the question of how important greenness and sustainability are for the commercial buildings. The answers to this question seemed to be relevant with the answers of the previous questions, where the majority of the participants, believe that greenness is very important for commercial buildings.

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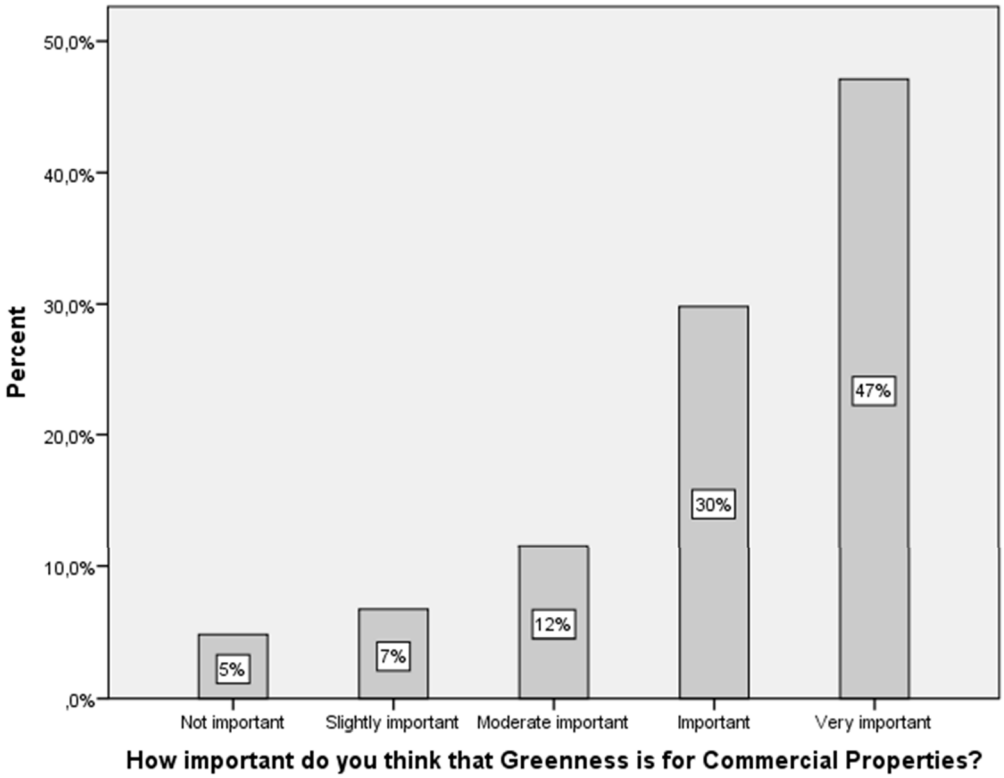

Graph 13. Importance of greenness in commercial buildings.

From the last two graphs it can be observed that it is equally important to have green and sustainably constructed residential and commercial buildings, according to the Cypriot citizen's opinion. Therefore, the 4th hypothesis of this research project, suggesting that green residential buildings are more important than green commercial buildings, it does not seem correct following the participants answers.

From the analysis above it can be detected that the desire of the participants to live and work in a green and sustainable environment is the most important factor that can influence the market value of green buildings, as well as the people's opinion on the importance of greenness in residential and commercial properties. The next important factor that influences the participant's opinions is their understanding of greenness in buildings, which can also affect the market value of the building, as well as the understanding of how important greenness and sustainability is to residential and commercial buildings. This research shows that the awareness of people on the benefits of green and sustainable properties, is a factor that influences their desire to live and work in such buildings, and their willingness to pay extra in order to do so. In Cyprus, just like in other countries, certified green buildings acquire higher renting and selling costs. This is because of the great benefits they offer to their occupiers, who can amongst other benefit from their reduced operational costs.

This research constitutes a starting point from where several factors can be further analysed. Legal framework and local regulations can be re-evaluated in order to enhance the sustainable practices in the real estate market.

3. Regression analysis and discussion

The multiple linear regression analysis of the data through the use of SPSS can help to discover the relationship between several factors that could have influenced the decisions of participants to provide their answers. In order to do that, the identification of the dependent (DV) and independent variables (IV) was necessary. Table 2 indicates the DVs and IVs of this multiple linear regression analysis.

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Table 2. DVs and IVs.

DV	IV
Theme 2 - Cost Implications (Including Q. 6 - 9)	Demographic Questions (Including Q. 1 - 5) Theme 1 - Understanding and awareness of greenness/sustainability (including Q. - 5) Theme 3 - Greenness desirability and need (including Q. 10 - 12)
Theme 3 - Greenness desirability and need - Q. 10 To what extend do you desire to live and work in a green and sustainable environment?	Demographic Questions (Including Q. 1 - 5)
Theme 4 - Residential versus commercial - Q. 13 How important do you think that greenness is for residential properties?	Demographic Questions (Including Q. 1 - 5) Theme 1 - Understanding and awareness of greenness/sustainability (including Q. 1 - 5) Theme 3 - Greenness desirability and need (including Q. 10 - 12)
Theme 4 - Residential versus commercial - Q. 14 How important do you think that greenness is for commercial properties?	Demographic Questions (Including Q. 1 - 5) Theme 1 - Understanding and awareness of greenness/sustainability (including Q. 1 - 5) Theme 3 - Greenness desirability and need (including Q. 10 - 12)

The DVs in this research were four. The first of the DVs was the questions included in the 3rd theme of the questionnaire called "cost implications" (See Appendix A). As aforementioned, this variable was linked to the market value of the green properties. This multiple linear regression analysis has helped to test the two first hypothesis (H1 and H2) of this research project. The alternative hypothesis is accepted here. The following figures illustrate the results of this analysis.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,753[a]	,567	,505	,29483

Figure 1. Model Summary from SPSS - DV Cost implication.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10,261	13	,789	9,081	,000[b]
	Residual	7,823	90	,087		
	Total	18,084	103			

Figure 2. ANOVA DV Cost implication.

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Coefficients[a]

Model		Unstandardized Coefficients B	Std. Error	StandardizedCoefficients Beta	t	Sig.
1	(Constant)	2,943	,409		7,191	,000
	What is your age?	-,055	,041	-,114	-1,366	,175
	What is your gender?	-,048	,057	-,067	-,837	,405
	What is your education level?	-,085	,040	-,163	-2,111	,038
	What is your occupation?	,047	,015	,270	3,123	,002
	What is your household annual income?	-,046	,023	-,178	-1,962	,053
	Do you understand the meaning of "Greenness" in regards to the Building Sustainability and Efficiency?	-,204	,123	-,151	-1,663	,100
	Do you believe that you have a clear understanding of the levels of Greenness in the Cyprus Real Estate Market?	,046	,036	,138	1,281	,204
	Are you aware of the Cyprus Government's basic Greenness mandatory policy for Buildings?	-,273	,080	-,326	-3,415	,001
	To what extent do you believe that sustainability and Greenness is actually carried out in practice?	-,033	,043	-,069	-,787	,434
	Do you believe that a property that has been following the sustainability and "Greenness" standards could be more privileged	-,077	,101	-,061	-,759	,450
	To what extend do you desire to live and work in a "Green" and sustainable environment?	,276	,050	,745	5,502	,000
	To what extend do you need to live and work in a "Green" and sustainable environment?	-,086	,052	-,238	-1,663	,100
	Which of the following do you believe is the most important factor that influences the application of sustainability and Greenness in practice?	-,008	,023	-,027	-,366	,715

Figure 3. Coefficients DV Cost Implication.

The coefficients that have p-values less than 0.05 are considered to be of a statistical significance (Ye, 2022). From the figures above it can be observed that the factor of greater significance, which can influence the participant's opinion the most in paying more money in order to purchase a green property (adding market value), is their desire to live and work in a green and sustainable environment (Theme 3 Q.10) because its p-value is 0.000. The next factor that has proven to be of great significance having the p-value of 0.001 is the level of awareness of the Cyprus government's basic greenness mandatory policy for buildings, Theme 1 Q.3. This means that the more aware the people are, the more willing they are to pay extra for purchasing a green property.

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Next, the occupation of the participants seems to be significantly important since it had a p-value of 0.002 (less than 0.05). This variable is closely related to the previous variable, since the awareness of the green policy is correlated to the occupation of the participants. Last, the educational level of the participants seems to have a significant importance in the cost implications and the market value of the building, since its p-value was 0.038 <0.05. This means that the participants with a higher educational level are more willing to pay extra for a green and sustainable property than the rest, maybe because they learn the benefits of green developments. The coefficients with the least statistical significance here are Theme 3 Q. 12 with p-value 0.715, and the Theme 1 Q5 with p-value 0.450. The least statistical significance seems to have the coefficient of Theme 3 Q.12 with p-value 0.715>0.05.

The next DV that has been examined was the first question (Theme 3 Q. 10) of the 3rd theme (see appendix), which referred to the participant's desire to live and work in a green and sustainable environment, correlated to the IV demographics of the participants. This multiple linear regression analysis can help prove the third hypothesis, set for this research, indicating that the higher income of the participants can affect their desire levels to live and work in a green environment. The following figures show this regression analysis. The alternative hypothesis is accepted here.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,333[a]	,111	,065	1,09420

Predictors: (Constant)
What is your household annual income?What is your education level?
What is your occupation?What is your gender?
What is your age?

Figure 4. Model Summary DV participant desire to live and work in a green environment.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	14,629	5	2,926	2,444	,039[b]
	Residual	117,333	98	1,197		
	Total	131,962	103			

a. Dependent Variable: To what extend do you desire to live and work in a "Green" and sustainable environment?
b. Predictors: (Constant), What is your household annual income?
What is your education level?, What is your occupation?, What is your gender?, What is your age?

Figure 5. ANOVA DV participant desire to live and work in a green environment.

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Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized CoefficientsBeta	t	Sig.
1	(Constant)	2,891	,722		4,003	,000
	What is your age?	,072	,145	,055	,500	,618
	What is your gender?	,223	,206	,115	1,083	,281
	What is your educationlevel?	,220	,140	,157	1,568	,120
	What is your occupation?	-,080	,047	-,172	-1,723	,088
	What is your householdannual income?	,156	,076	,223	2,056	,042

a. Dependent Variable: To what extend do you desire to live and work in a "Green" and sustainable environment?

Figure 6. Coefficients DV participant desire to live and work in a green environment.

The constant here is significantly different from 0 at the 0.05 alpha level (Ye, 2022), as it has been to the other multiple linear regression analysis in this research project. From the data analysis above, it can be detected that the coefficient that has shown a statistical significance is the household annual income of the participants, which has a p-value of 0,042<0.05. This multiple linear regression analysis was established in order to prove whether or not the 3rd hypothesis of this research was correct. The rest of the coefficients did not have a statistical significance, with the least significant ones to be the age coefficient (p-value 0.618) and the coefficient of the gender (p-value 0.281). The following multiple linear regression analysis was established in order to statistically correlate the DV (Theme 4 Q. 13) of the importance of greenness in residential buildings, with the IVs in order to discover the statistical significances that could have an effect on the participant's opinion. The last three figures that follow illustrate the result of the regression analysis. The null hypothesis is accepted here.

Model Summary

Model	R	R Square	Adjusted RSquare	Std. Error of theEstimate
1	,856[a]	,732	,694	,56908

Figure 7. Model Summary DV Importance of greenness in residential buildings.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	79,738	13	6,134	18,939	,000[b]
	Residual	29,147	90	,324		
	Total	108,885	103			

Figure 8. ANOVA DV Importance of greenness in residential buildings.

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Coefficients[a]

Model		Unstandardized Coefficients B	Std. Error	StandardizedCoefficients Beta	t	Sig.
1	(Constant)	4,426	,790		5,603	,000
	What is your age?	-,089	,078	-,075	-1,137	,258
	What is your gender?	-,078	,110	-,044	-,706	,482
	What is your education level?	-,207	,077	-,163	-2,677	,009
	What is your occupation?	-,010	,029	-,024	-,360	,720
	What is your household annual income?	-,052	,045	-,082	-1,142	,257
	Do you understand the meaning of "Greenness" in regards to the Building Sustainability and Efficiency?	-,739	,237	-,222	-3,118	,002
	Do you believe that you have a clear understanding of the levels of Greenness in the Cyprus Real Estate Market?	,075	,070	,091	1,071	,287
	Are you aware of the Cyprus Government's basic Greenness mandatory policy for Buildings?	-,260	,154	-,126	-1,685	,095
	To what extent do you believe that sustainability and Greenness is actually carried out in practice?	-,045	,082	-,038	-,546	,586
	Do you believe that a property that has been following the sustainability and "Greenness" standards could be more privileged	-,449	,195	-,145	-2,311	,023
	To what extend do you desire to live and work in a "Green" and sustainable environment?	,578	,097	,637	5,976	,000
	To what extend do you need to live and work in a "Green" and sustainable environment?	-,069	,100	-,078	-,694	,490
	Which of the following do you believe is the most important factor that influences the application of sustainability and Greenness in practice?	,132	,044	,174	2,996	,004

Figure 9. Coefficients DV Importance of greenness in residential buildings.

The coefficients that have p-values less than alpha (0.05) are considered to be of a statistical significance (Ye, 2022). On Figure 9 above, it can be identified that there is a significant statistical value on the desire of the participants to live and work in a green environment, Theme 3 Q.10, were the p-value is 0.000 <0.05. Following, the coefficient for Theme1 Q.1 is also of great statistical significance since its p-value is 0.002<0.05. Subsequently, the coefficient Theme 3 Q. 12, showed also a statistical significance as its p-value was 0.004<0.05. This result contradicts to the statistical significance of this coefficient in the previous DV cost implications, since it was the least significant coefficient. Next, the coefficient of the educational level is statistically significant because its p-value is 0.009. Last, the coefficient Theme 1 - Q5 is also statistically significant because it has p-value 0.023.

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The less significant value in this DV seems to have the coefficient of the occupation with p-value 0.720. This contradicts with the results of the analysis performed with DV cost implications, where the coefficient of occupation had a great significance.

The next multiple linear regression analysis is based on the DV of the importance of commercial properties (Theme 4 Q. 14) of the 4th theme (See appendix). This is described on Figures 10 to 12. In this multiple linear regression, the null hypothesis is being accepted.

Model Summary

Model	R	R Square	Adjusted RSquare	Std. Error of theEstimate
1	,808[a]	,652	,602	,71795

Figure 10. Model Summary DV Importance of greenness in commercial buildings.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	86,994	13	6,692	12,983	,000[b]
	Residual	46,390	90	,515		
	Total	133,385	103			

Figure 11. ANOVA DV Importance of greenness in commercial buildings.

Coefficients[a]

Model		Unstandardized Coefficients		StandardizedCoefficients Beta	t	Sig.
		B	Std. Error			
1	(Constant)	4,545	,996		4,561	,000
	What is your age?	-,272	,099	-,207	-2,754	,007
	What is your gender?	-,073	,139	-,037	-,522	,603
	What is your educationlevel?	-,240	,098	-,171	-2,460	,016
	What is your occupation?	,038	,037	,080	1,037	,302
	What is your householdannual income?	,048	,057	,068	,837	,405
	Do you understand the meaning of "Greenness" inregards to the Building Sustainability and Efficiency?	-1,088	,299	-,295	-3,635	,000
	Do you believe that you have a clear understandingof the levels of Greenness in the Cyprus Real Estate Market?	,037	,088	,040	,418	,677
	Are you aware of the Cyprus Government's basicGreenness mandatory policy for Buildings?	-,368	,195	-,162	-1,890	,062
	To what extent do you believe that sustainabilityand Greenness is actually carried out in practice?	-,052	,104	-,040	-,505	,615
	Do you believe that a property that has been following the sustainability and "Greenness" standards could be more privileged	-,103	,245	-,030	-,421	,675
	To what extend do you desire to live and work in a"Green" and sustainable environment?	,583	,122	,580	4,777	,000
	To what extend do you need to live and work in a"Green" and sustainable environment?	-,047	,126	-,048	-,376	,707
	Which of the following do you believe is the most important factor that influences the application of sustainability and Greenness in practice?	,112	,056	,133	2,008	,048

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Figure 12. Coefficients DV Importance of greenness in commercial buildings.

Again, on this multiple linear regression analysis every coefficient that has a p-value less than alpha (0.05) is considered to be statistically significant (Freund, 2006). From Figure 12 above, it can be observed that the coefficient of the desire to live and work in a green environment is statistically great since it p-value is 0.000. The results here come in line with the results on the previous regression analysis. The next coefficient of statistical significance is Theme 1 Q. 1 with p-value again being 0.00. This result is relevant with the result of the previous multiple linear regression analysis. Next the coefficient of age seems to show a statistical significance here (p-value 0.007<0.05). This factor is actually appearing to have a statistical significance for the first time. Following, the coefficient of the educational level is statistically important (p-value 0.016<0.05) and the coefficient Theme 3 Q.12 (pvalue 0.048<0.05). These two coefficients have also been statistically significant in the previous multiple linear regression analysis too (DV importance of greenness in residential buildings), although the coefficient Theme 3 Q.12 was the least statistically significant in the regression analysis with DV cost implications. The least statistical significance has shown the coefficients of the need to live in a green environment, Theme 3 Q.11 (p-value 0.707>0.05) and the understanding of the levels of greenness, Theme 1 Q.2 (p-value 0.677>0.05).

As an outcome, the results of the first regression analysis that have been analysed can be related to the first hypothesis of this research, where it is stated that the increased knowledge of greenness and sustainability in buildings may affect their market value. In other words, it seems that people are more willing to pay extra money to purchase a green property when they are educated and are aware of the benefits of the green properties and moreover when they know their country policies for buildings.

The occupation of the participants since a lot are related to the construction can be translated to the outcome that the more knowledge is driving to a more sustainable future for the real estate industry. For example, the architects and designers, the engineers, the estate agents, the property valuers, and the property developers (46% of the total participants) are participants who are mostly aware of the greenness and sustainability policy for buildings, and are more willing to pay extra in order to buy a green and sustainable property, as it has been observed by the cost implication theme of the questionnaire.

Taking under consideration the results of the first multiple linear regression analysis again, where the DV was the questions under the cost implication theme of the questionnaire, the desirability of the participants seems to be statistically significant (0.000<0.05). This fact probably proves the second hypothesis, where it was assumed that the higher levels of desire for green and sustainable buildings increases the market value of these buildings. It looks like the desire of the participants to live and work in green buildings, is a driver that makes them more willing to pay extra in order to purchase such properties, the question to investigate more is how much is this extra payment. On the other hand, the participant's need did not seem to have any statistical significance since its pvalue was 0.10>0.05 for. These results show that the need of the participants is not a factor that could affect the market prices of the green and sustainable properties or it shows that people didn't connect green properties with other needs like the need to overcome energy crisis, the need to deal with climate change etc.

The third hypothesis was tested through the second multiple linear regression analysis.

Here it was suggested that the participants who earn higher annual incomes, desire green and sustainable buildings more than the participants who earn lower annual incomes. According to the results, this hypothesis was proven to be correct. In fact, it was discovered that the annual income of the participants was the only coefficient that had a statistical significance out of the demographic questions. Therefore, it can be concluded that the higher the annual income of a person is the more desire he/she has to live and work in a green environment.

Finally, the fourth hypothesis of this research stated that greenness and sustainability is more important in residential than in commercial buildings for the people living and working in Cyprus. This hypothesis is seeming not to be true based on the survey outcomes. Indeed, participants stated that is equally important for them to be in green and sustainable residential and commercial properties. According to the multiple linear regression analysis that has been established in the

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previous chapter, on the DV Theme 4 Q.13, the coefficients that have shown a statistical significance on these results are the desire of the participants to live and work in a green environment. According to the regression analysis on the DV Theme 4 Q.14, it was found that the desire to live and work in a sustainable environment (Theme 3 Q.10) was proven to be again the most important factor that had a statistical significance (0.000). Moreover, the same statistical significance also had the coefficient of Theme 1 Q.1 (0.000), followed by the coefficient of age that showed a statistical significance of 0.007<0.05).

From the analysis above it can be detected that the desire of the participants to live and work in a green and sustainable environment is the most important factor that might influence the market value of green buildings, as well as the people's opinion on the importance of greenness in residential and commercial properties. The next important factor that influences the participant's opinions is their understanding of the meaning and the benefits greenness in buildings. This research constitutes a starting point for other researches to be conducted on this subject, which will be further analyzing the factors that drive the people's desire to live and work within a green and sustainable environment.

4. Conclusion

Green and sustainable properties have entered our lives in the efforts of reducing the human negative footprint on the planet. The outcome of this research project has revealed that the meaning of greenness and sustainability has reached the majority of the population living and working in Cyprus, since 75% of the participants in this research have a moderate to in depth understanding of the levels of greenness in the real estate market in Cyprus. Moreover, in the country of Cyprus, the government has a set of policies for sustainable buildings. Half of the population of Cyprus is aware of the policies regarding greenness and sustainability in the real estate field. Although the government of Cyprus seems to have been making an effort to ensure that sustainability is carried out in practice, the people living and working in Cyprus seem to believe that these efforts are somehow fruitless. Therefore, further research on this matter should be carried out in the future in order to find the ways every practice to take place on the correct way, that might include audits, expansion of policies, engagement of the public etc.

The majority of the participants understand the privileges of sustainable properties and they also believe that the cost of such buildings is quite high, therefore the buyers cannot afford to buy such properties. There is therefore the need for further investigation to understand the cost difference and how much the buyers are willing to spend for sustainable features. It was clear that in case the general cost of a green property was lower, then the majority of the participants would be willing to buy such a property.

Furthermore, this research has come to agree with other researches established in other countries, which have also demonstrated that the people's desire is the strongest driver, which can influence them to pay extra in order to purchase a green property in the real estate market (Saeed & Mullahwaish, 2020). Moreover, this fact illustrates that the desire of the people can also add market value to the green and sustainable properties. The knowledge and understanding of greenness have also proven to be a significant factor that can have an effect on the market. Thus, the real estate market in Cyprus, should make a bigger effort to promote the advantages of greenness in the residential and commercial buildings, in order to increase the awareness of people living and working in Cyprus. Living and working in a green building, may result to energy savings, increased productivity and health, resilient against climate change weather events and this should be spread among the people.

Appendix A

Research Questionnaire

This questionnaire refers to the people of the general public who are living and working in Cyprus for at least a year. Since Cyprus is a country that attracts a considerable number of immigrants, it was decided to publish this questionnaire in the English language, since English is

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considered to be the international leading language. Your answer is anonymous and the data will be used for research purposes only.

Definition of Green Building & Sustainability

For the purpose of this research definitions for Green Buildings and Sustainability from United States Environmental Protection Agency have been used.

Green building is the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's life-cycle from siting to design, construction, operation, maintenance, renovation and deconstruction. This practice expands and complements the classical building design concerns of economy, utility, durability, and comfort. Green building is also known as a sustainable or high-performance building.

Questionnaire

- Demographic questions
  1. What is your age?
     20-30
     30-40
     40-60
     60 or over
  2. What is your gender?
     Male
     Female
     Other
  3. What is your level of education?
     High school or Less
     Bachelor's Degree
     Master's Degree
     Doctorate
  4. What is your occupation?
     Architect and Designer Engineer
     Estate Agent Property
     Valuer Property Developer
     End User (Owner, Tenant, and/or Property Potential Buyer)
     Owner (Potential Seller)
     Other
  5. What is your household annual income?
     Below 20,000 Euro
     21,000 – 30,000 Euro
     31,000 – 40,000 Euro
     41,000 – 50,000 Euro
     51,000 – 60,000 Euro
     Over 60,000 Euro

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- Sustainability and Greenness Research Questions

Theme 1 – Understanding and awareness of Greenness/Sustainability

1. Do you understand the meaning of "Greenness" in regards to the Building Sustainability and Efficiency?
   Yes
   No
2. Do you believe that you have a clear understanding of the levels of Greenness in the Cyprus Real Estate Market?
   Please answer the Likert Scale question from 1 not understand to 5 understand in depth. ((1) no understanding; (2) Slight understanding; (3) Moderate understanding; (4) Understanding; (5) In depth understanding.)
   1 2 3 4 5
3. Are you aware of the Cyprus Government's basic Greenness mandatory policy for Buildings?
   Yes
   No
4. To what extent do you believe that sustainability and Greenness is actually carried out in practice?
   Please answer the following Likert Scale question from 1 the less to 5 the most. ((1) not carried out; (2) Slightly carried out; (3) Moderate carried out; (4) Carried out; (5) Mostly carried out.)
   1 2 3 4 5
5. Do you believe that a property that has been following the sustainability and "Greenness" standards could be more privileged?
   Yes
   No

Theme 2 – Cost Implications

6. Do you believe, according to your standards, that the sustainable or "Green" development of buildings is affordable for the general public?
   Yes
   No
7. If there were Low cost implications, should Buildings be built to the highest Greenness levels?
   Please answer the following Likert Scale question from 1 strongly disagree to 5 strongly agree. (1) Strongly disagree; (2) Disagree; (3) Neither agree nor disagree; (4) Agree; (5) Strongly agree.)
   1 2 3 4 5
8. If there were cost implications in construction (increasing the final cost of the building), would you be willing to pay for the highest possible Green Standards to Buildings?
   Yes
   No
9. Would you be willing to pay more money in order to purchase a Green and sustainable property?
   Please answer the following Likert Scale question from 1 not willing at all to 5 very willing. ((1) not willing; (2) Slightly willing; (3) Moderate willing; (4) Willing; (5) Very Willing.)
   1 2 3 4 5

Theme 3 – Greenness Desirability and Need

10. To what extend do you desire to live and work in a "Green" and sustainable environment? Please answer the following Likert Scale question from 1 the less to 5 the most. ((1) Do not desire; (2) Slightly desire; (3) Moderate desire; (4) Desire; (5) Desire it very much.)
    1 2 3 4 5
11. To what extend do you need to live and work in a "Green" and sustainable environment? Please answer the following Likert Scale question from 1 the less to 5 the most. ((1) Do not need; (2) Slightly need; (3) Moderate need; (4) Need; (5) Need it very much.)
    1 2 3 4 5
12. Which of the following do you believe is the most important factor that influences the application of sustainability and Greenness in practice?
    Please choose the most appropriate factor from the following.
    A - Government imposition through Law
    B - Desire
    C - Need
    D - Financial Benefits

Theme 4 – Residential versus Commercial

13. How important do you think that Greenness is for Residential Properties?
    Please answer the following Likert Scale question from 1 the less to 5 the most. ((1) Not important; (2) Slightly important; (3) Moderate important; (4) Important; (5) Very important.)
    1 2 3 4 5
14. How important do you think that Greenness is for Commercial Properties?
    Please answer the following Likert Scale question from 1 the less to 5 the most. ((1) Not important; (2) Slightly important; (3) Moderate important; (4) Important; (5) Very important.)
    1 2 3 4 5

Thank you very much for participating in this research. Your opinion is very valuable for the purposes of this research project.

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