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How house owners in Greece make the decision to opt for a green house

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Abstract

Climatic problems such as global warming are becoming crucial worldwide. Especially in countries like Greece, the combination of climatic conditions and ineffective urban planning has aggravated the situation. High temperatures in common with dense building and lack of green zones have resulted in the Urban Heat Island phenomenon. Especially buildings are considered to contribute to greenhouse gas emissions. In an effort to reduce greenhouse gas emissions, a more environmentally-friendly building concept has emerged. Green buildings have been considered a good option that would help reduce energy consumption and thus mitigate environmental degradation.

This thesis, uses literature that refers to pro-environmental behaviour and elaborates on ten Greek house owners’ decision to live in a green house. Case study research strategy and semi-structured interviews qualitatively analyze how several factors affected the ten house owners’ decision.

Lack of thermal comfort and high energy cost in the previous house had a deep impact on house owners’ decision. Environmental sensitivity and family as well were found to have served as a strong stimulus. Moreover, information provided by the media and by the participants’ workplace proved helpful. The guidelines given by the construction company, also played an important part in the ten Greek house owners’ decision.

Keywords: Global warming, Greek climate, green buildings, pro-environmental behaviour, case study, semi-structured interviews, house owners, qualitative analysis.
1. Introduction

One of the biggest challenges that humanity is facing is climatic changes. The continuous rise of Earth’s temperature entails the risk of hazardous disasters. Undoubtedly, the phenomenon of global warming and consequently several environmental problems have arisen. Global warming has led to the alteration of Earth’s climate and to environmental degradation. Especially in countries such as Greece, where the warm climate intensifies the sense of temperature rise, the consequences of global warming have influenced the quality of life and have led to further environmental degradation.

Global warming which is considered a result of anthropogenic action, has several consequences. Human intervention has led to an increase of greenhouse gases; power generating units, industries, transport and building sector have all contributed to higher amounts of greenhouse gases and therefore to the rise of Earth’s temperature.

The point is not only what happens in the vertical structure of atmosphere, but also how our planet reacts to this change. The ice melting and the consequent sea level rise have led to the extinction of various living and non-living forms; the ecosystem loses its balance. Moreover, storms, hurricanes, floods, drought, water shortage, heat waves and fires are part of the perilous consequences of global warming.

Reducing greenhouse gas emissions and using renewable energy sources (RES) have proved to be strong steps against climate change and its consequences. Environmental protection and energy-saving have been taken into consideration; new legislation, regulations, directives, as well as the adoption of new environmentally-friendly production technologies are part of the national, European and international agenda.

Despite their responsibility for the extensive greenhouse gas emissions, humans have already found solutions to face the consequences of this situation. On the one hand, “hard” initiatives such as the usage of renewable energy sources, hybrid vehicles and green/sustainable buildings have already been taken by many people as part of an effort to improve living conditions and protect the environment. On the other hand, “soft” initiatives such as the use of public transportation and bicycles, the use of energy-efficient appliances, recycling and reforestation are practices that have been followed by a great number of people in different countries worldwide.

The reduction of greenhouse gas emissions and the use of renewable energy sources have also been taken into consideration in the building sector. Given that buildings are responsible for 20% of global greenhouse gas emissions, new techniques that take advantage of renewable energy sources have globally been implemented. In Greece, buildings account for 14% of greenhouse gas emissions, while they are responsible for 45% of CO2 emissions. They also account for 40% of the total energy consumption. However, a different approach that improves building energy performance and protects the environment has been made both in Greece and on a global scale. In an effort to reduce energy consumption, meet the daily energy needs through natural resources and mitigate environmental degradation, the concept of green buildings has come to surface during the last decade. A green (sustainable or bioclimatic) building is built in a way that it does not harm the environment, saves energy and is characterized by indoor-outdoor thermal comfort. These buildings use energy and water in an efficient way, sunlight for heating-lighting, natural ventilation for cooling and can be regarded as autonomous to some extent. A green building is also equipped with high performance insulation materials (shell, frames, glazing).
Moreover, a green building takes advantage of the shade provided by trees and the thermal comfort provided by vegetated (green) roofs. In addition, based on an ecology and sustainability-oriented approach, a green building uses systems that utilize renewable energy sources (RES) such as sun, air and geothermal energy; photovoltaic systems, air-water heat pumps and geothermal heat pumps are environmentally-friendly systems installed in green buildings for heating and cooling.

Considering that buildings constitute an integral part of the built environment, attention has globally been paid to a more balanced coexistence between buildings and environment. Green buildings have both been practically and theoretically considered part of the solution to the problem of greenhouse gas emissions and in the long run global warming.

In practice, the green building concept has globally been adopted in both public and private buildings during the last decade. Especially in Greece, where the climatic conditions in conjunction with dense building have resulted in high temperatures, heat waves and Urban Heat Island phenomenon, green buildings have been constructed at an increasing rate for the last ten years.

Theoretically, an approach towards environmentally-friendly (green) consumption, energy-saving practices and renewable energy sources (RES) usage could indirectly be related to green buildings. The international academic literature has characterized green product purchase, energy-saving investment measures and RES usage as showing pro-environmental/energy-saving behaviour. Likewise, a green building saves energy, makes use of RES and respects the environment. Therefore, the decision on such a house can be considered to portray pro-environmental/energy-saving behaviour.

Moreover, the academic literature has regarded several factors as conducive to such environmentally-friendly behaviour. These factors have academically been described as “determinants of pro-environmental behaviour” and have proved to be influential to people’s willingness to behave in a green way (green and energy-efficient products purchase or house energy performance improvement or installation of RES systems).

Previous researches, using big samples and self-administered questionnaires, focused on people’s willingness to behave in a green way. However, given that willingness does not necessarily depict actual decision, a limited understanding has emerged and thus a research, investigating people’s decision making and not just willingness, is necessary. Besides, the fact that earlier studies have focused on people’s willingness to invest only in single green products, necessitates a research which would give emphasis on a more complete green behaviour. The green building concept seems to provide a more integrated way to approach such a holistic green behaviour.

As a result, such a research, that on the one hand, would incorporate a more integrated green building concept and, on the other hand, would provide literature with a deeper insight into the way the “determinants of pro-environmental behaviour” affect people’s decisions, has to be carried out. For a country like Greece, where low-energy buildings and environmental protection is a necessity, this research is of high importance.
Focusing on ten privately-owned green houses in Greece and following a case-based research analysis, this thesis investigates how the theoretically-based “determinants of pro-environmental behaviour” influence Greek owners’ decision to have a green house built or to have their old one converted.

1.1 Societal relevance

Climatic problems such as global warming are becoming more and more serious nowadays. The contemporary built environment and the way of living have also resulted in the realization that human activities have affected climate balance. Considering the important role of buildings in the contemporary built environment, a different, more environmentally-friendly (green) approach, able to embrace sustainability, seems to be part of the solution to cope with global warming. Green buildings have internationally been considered to be one of the solutions to cope with global warming and mitigate environmental degradation. Especially in Greece, where the natural climate variability along with the increasing urbanization and the destruction of suburban green areas (due to fire) have resulted in high temperatures, the situation is even worse. So, green buildings have emerged as an important tool, a way not only to face global warming, but also reduce greenhouse gas emissions and protect the environment. For the last ten years, many people in Greece have adopted such an environmentally-friendly and energy-efficient building method.

Since green buildings play a significant part in the mitigation of climate change problems, a deep understanding of the factors that affect people’s decisions on a green house is important. Particularly for a country such as Greece, where the climatic predisposition forms the basis for the maximization of global warming consequences, understanding the factors that influence such a green and energy-saving behaviour, is even more important. It could be seen as the missing link that would give an impulse towards sustainability. Given that people as citizens play a pivotal role in the creation of a sustainable future, understanding how they decide on a green house is very important to society and decision-makers. On the one hand, citizens will be happy to see their needs be taken into consideration, and on the other hand, the decision-makers will be able to take effective measures and meet citizens’ needs. Since the significance of green buildings to the sustainability of the built environment is apparent, acquiring a better insight of how specific factors affect people’s decisions is also important for urban redevelopment projects. Planners could re-structure built environment activities and meet sustainability goals. For a country like Greece with particular climatic conditions this study is imperative.
1.2 Scientific relevance

As it was previously stated, the concept of green buildings has indirectly been mentioned on an academic basis. Describing the willingness to purchase green house products as relative to environmentally-friendly and energy-saving behaviour, several studies, at an international academic level, have focused on pro-environmental behaviour. Besides, many studies have identified how several factors (determinants of pro-environmental behaviour) influence people’s willingness to act in an environmentally-friendly way.

Although people’s willingness to behave pro-environmentally has previously been investigated on the basis of both surveys and case studies, the majority of researches has focused on surveys. However, either based on surveys or case studies, most previous researches have provided a superficial understanding of how several factors affect people’s decisions to behave in a green way. That is, literature has indicated several factors that influence the willingness and not the actual decision to behave in such a green and energy-saving way. For instance, several studies both Greek and international have examined people’s willingness to invest in particular energy-saving methods (Kontogianni, Tourkolias, Skourtos, 2012), or in specific renewable energy sources (Pagalou, Nikitaki, Psarakis, Zografakis, Sifaki, Tsagarakis, 2010; Nair, Gustavsson and Mahapatra, 2010) and not their actual decision. In addition, attention has been paid to single green methods and not to a more integrated green aspect. This integrated green aspect could be understood by considering green buildings an option. As a result, contrary to the literature, an important task for this research is to focus on a more integrated green building aspect and examine people’s decision and not willingness to live green. Therefore, a more detailed understanding of how several factors affect people’s decision to live in a green house is needed. Such a detailed understanding can be supported by using case studies. Case studies are a good complement to the existing literature because they can provide an in-depth insight of the way several factors influence people’s decision to live in a green house. This thesis uses case studies to thoroughly examine ten Greek house owners’ decision to have a green house built or have their old house converted into a green one.
1.3 Research objective and research question

In the previous sections the relationship between buildings and climate change, as well as the concept of green buildings were discussed. In addition, the way literature approaches such an environmentally-friendly topic was presented. Using ten privately-owned green houses in Greece, this thesis aims to explain how the literature-based “determinants of pro-environmental behaviour” have an impact on Greek house owners’ decision to opt for a green house. More specifically, the goal of this research is to explain how the academically-based determinants of pro-environmental behaviour affect the ten Greek house owners to have a green house built or have their old house converted into a green one.

The aim of this thesis is also expressed in the following research question:

*How do the academically referenced determinants of pro-environmental and energy-saving behaviour affect ten Greek house owners’ decision to have a green house built or have their conventional houses converted into green ones?*
1.4 Outline of thesis

The outline of this thesis is developed as following: Chapter 2 presents the theoretical framework justifying its selection. Chapter 3 introduces the context on the basis of which this research is carried out. Chapter 4 focuses on the research design, while the used case studies are presented and described. Chapter 5 presents and interprets the findings. Chapter 6 focuses on the conclusions, while Chapter 7 presents several recommendations. Chapter 8 presents the study limitations and suggestions for improvement. Finally, chapter 9 presents a critical reflection of the work undertaken and the difficulties encountered.
2. Theoretical framework

2.1 Relevant theories

The international academic literature abounds with many studies addressing environmentally-friendly action as pro-environmental behaviour. Trying to comprehend pro-environmental behaviour from their own perspective, various researchers of social sciences have developed several theories.

In the field of social and environmental psychology, various theories have supported a better understanding of pro-environmental behaviour (see Vining and Ebreo, 2002; Stern & Dietz, 1994; Schultz & Zelezny, 1998; Stern, Dietz, Abel, Guagnano, & Kalof, 1999; Joireman, Lasane, Bennett, Richards, & Solaimani, 2001; Gärling, Fujii, Gärling, & Jakobsson, 2003). According to Turaga, Howarth, Borsuk (2010) the norm-activation theory and the value-belief-norms theory (V.B.N) are two of the most integrated moral theory - based approaches that have been developed to describe pro-environmental behaviour.

As far as norm-activation theory is concerned, Schwartz (1977) has given emphasis on the operation of individuals’ moral decision making process, by stressing two successive steps (Turaga et al, 2010). The first step constitutes the activation step which is driven by individuals’ awareness of what has to be done; the second step is related to individuals’ responsibility as well as ability to become active (Turaga et al., 2010, 212).

Another relevant theory has been developed on the basis of human values. Value-belief-norms theory (V.B.N) has been considered important when investigating pro-environmental behaviour (Turaga et al., 2010; Vining and Ebreo, 2002). Allport (1963, 454) said that “a value is a belief upon which a man acts by preference”. Olson and Zanna (1993) have described values as significant determinants of people’s specific beliefs, attitudes and behaviours. In addition, egoistic, altruistic and biospheric value orientations have also been formulated (Stern, Dietz and Kalof, 1993; Axelrod, 1994; Turaga et al., 2010; Stern & Dietz, 1994).

Studies on social dilemma and environmental ethics have also contributed to the development of a theory to understand pro-environmental behaviour (Leopold, 1948; Reid, 1962; Singer, 1975 and Naess, 1989; Merchant, 1992). Egocentric, homocentric and ecocentric ethics have been developed. According to De Groot and Steg (2008, 333) an egocentric ethic emphasizes that “individuals, by using natural resources, have to improve their lives and those of other individuals of a society”; a homocentric ethic implies that “human evil should be minimized and social good has to be maximized”; an ecocentric ethic focuses on the ecosystem highlighting that “the ecosystem deserves our attention”.

Trying to understand pro-environmental behaviour, studies on environmental planning – management, economics and consumption have mostly focused on the relationship between energy-saving behaviour and environmental protection (Park and Ha, 2012; Jensen, 2002). These studies present pro-environmental behaviour as an ecology-oriented behaviour, thus emphasizing sustainability. Pro-environmental
behaviour is also described as an environmentally-friendly (green) and energy-efficiency behaviour (Kempton, Harris, Keith, Weihl, 2008; Do Paco, Varejão, 2010; Getzner, and Grabner, 2004; Gladhart, Weihl and Krabacher, 1988).

Although the aforementioned fields have developed different theories to describe pro-environmental behaviour, they all use a similar way to explain what influences such behaviour. A number of factors mainly presented as “determinants of pro-environmental behaviour” has been mentioned in all studies relevant to the above theories. However, depending on the specialization of each study, different categories of factors have been formed. For example, social and environmental psychology studies have distinguished demographic (e.g. age, gender, income, education) from psychographic (values, beliefs, attitudes) factors (Gatersleeben, Steg and Vlek, 2002; Moll et al., 2005; Becker et al., 1981; Abrahamse and Steg, 2009). Environmental planning and management/economics studies have differentiated personal (e.g. gender, age, education, political orientation) from contextual factors (e.g. energy cost, house size, cost of energy-efficient measures) (H’Mida, Chávez and Guindon, 2008; Do Paço & Varejão, 2010). Social and consumption studies have separated occupant characteristics (age, gender, income, home ownership, education, size of house) from occupant attitudes (desire for comfort, motivation to conserve, health concern) (Guerin, Yust & Coopet, 2000).
2.2 Argumentation behind the choice of theoretical framework

The theoretical framework chosen in this thesis is based on the “determinants of pro-environmental behaviour” that have widely been discussed in the international academic literature. Given that this theoretical approach embraces a wide range of scientific branches, it can support the development of several argumentations; it enables literature to describe and explain the drivers of pro-environmental and energy-saving behaviour. It also allows the explanation of how values, beliefs and attitudes affect pro-environmental behaviour.

While the various scientific fields mentioned above seem to advocate a deep understanding of peoples’ decisions and behaviours, this thesis focuses on an environmental planning and management perspective. This thesis is not based on either a psychological or a social dilemma-ethics approach. Attention has actually been paid to the role that specific factors play in house owners’ decision on a green house without focusing on participants’ particular personality traits. Despite the fact that this thesis does not approach the issue from an ethic and/or value-based perspective, the theoretical framework still seems to be the most appropriate. Given that green building concept gives emphasis on the relationship between humans, consumption and environment, pro-environmental behaviour is the most appropriate theoretical framework to describe such a relationship. Pro-environmental behaviour is the ideal theoretical approach to help this thesis meet its goal and answer its research question. However, a different categorization of the literature-based factors was carried out. On the basis of this research, the “determinants of pro-environmental behaviour” are categorized as follows:

- Environmental Factors
- Personal factors
- Social factors
- Technical/financial factors
<table>
<thead>
<tr>
<th>Environmental Factors</th>
<th>Personal factors</th>
<th>Social factors</th>
<th>Technical/financial factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental consciousness</td>
<td>Age</td>
<td>Family</td>
<td>House size</td>
</tr>
<tr>
<td>Environmental knowledge</td>
<td>Gender</td>
<td>Friends</td>
<td>Energy-efficiency awareness</td>
</tr>
<tr>
<td>Environmental Attitudes</td>
<td>Income</td>
<td>Media</td>
<td>Technical barriers</td>
</tr>
<tr>
<td></td>
<td>Education</td>
<td>Culture</td>
<td>Cost of green products</td>
</tr>
<tr>
<td>Political orientation</td>
<td>Provider</td>
<td>Previous investment</td>
<td></td>
</tr>
<tr>
<td>House ownership</td>
<td>(technical) Skills</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermal comfort (health)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy cost</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Determinants of pro-environmental and energy-saving behaviour

It is important to mention that this thesis does not use three of the factors mentioned above:

- Since this thesis focuses on privately-owned houses, it does not take into consideration the factor “House ownership”.
- Given that this study does not aim to make reference to political issues, it does not use the factor “political orientation”.
- Since this thesis focuses on Greece and not on a cross-national research, the factor “culture” is not used.

In addition, this thesis renames three literature-based factors:

- “Provider” factor as “Construction Company-Engineer”.
- “Energy-efficiency awareness” as “Information about green solutions”.
- “The cost of green products” as “Cost of green solutions”.

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2.3 Literature review

2.3.1 Environmental Factors: environmental consciousness, environmental knowledge, government environmental attitudes.

Environmental consciousness has been found to affect green purchasing behaviour (Schlegelmilch et al. 1996; according to Braimah and Tweneboah-Koduah (2011) people consider the environment when purchasing. Stressing a feeling of environmental responsibility, several studies have identified “a relationship between environmentally-active behavior and perceptions of threat” (Mckenzie-Mohr, Nemiroff, Beers and Desmarais, 1995, 141). For Hayward (1990), individuals that act in an environmentally-friendly way, are more concerned about the environment. Environmental behaviour has been identified as an individuals’ characteristic which reveals environmental consciousness (Schlegelmilch, Bohlen and Diamantopoulos, 1996; Kang and James, 2007). For Pietsch and McAllister (2010) consumers are willing to pay more for the protection of the environment. It has also been highlighted that environmental consciousness affects energy saving behaviour (Hori, Kondo, Nogata and Ben, 2013). Participating in “energy-audit programs” was also found to reveal people’s energy –saving behaviour as well as energy consumption change (Guerin, et al., 2000; Laquatra and Chi, 1988; Dunsworth, 1984).

A Hines’s et al. (1987) study revealed a link between environmental knowledge and pro-environmental behaviour. For Gadenne et al. (2011) consumers that are aware of global warming, have a propensity towards environmental behaviour. Environmental knowledge in terms of global warming, has been identified as a significant contributor to the formulation of energy-saving behaviour (Steg and Vlek, 2009; Hori, et al., 2013). It has also been pointed out that being aware of climate change, individuals have higher intention to pay for renewable energy (Zografakis, Sifaki, Pagalou, Nikitaki, Psarakis, Tsagarakis. 2010). However, although the role of consumers’ environmental responsibility and environmental knowledge in energy saving behaviour has long been established (see Arkesteijn and Oerlemans, 2005), some studies have found people to be reluctant to take energy-saving measures (Steg and Vlek, 2009).

Many studies have also focused on the role of incentives, tax credits and subsidies in motivating citizens’ environmentally-friendly behaviour; they alternatively described this support as governmental policies that stimulate consumers’ environmental behaviour (Gadenne et al., 2011). Chan (2001) found that a number of consumers considered government and enterprises as those who have to protect the environment. According to Zaccai (2008), consumers consider that there is a need for higher taxes, as well as that polluters should pay for not acting in an environmentally-friendly way. Moreover, government has been identified to play an important role in house owners’ green and energy-efficiency buying behaviour (Pietsch et al., 2010). In accordance with a study conducted by Drozdenko, Jensen and Coelho (2011), house owners, provided with a 30% tax credit, were willing to install solar panels. It has also been found that governmental financial support reduced the initial cost of house owners’ energy efficiency investments (Gadenne et al., 2011). Other researchers concluded that governmental support has finally led to higher consumers’ response
However, Pitts and Wittenbach (1981) found that house owners’ willingness to invest in house insulation was not significantly influenced by the Residential Energy Tax Credit.

### 2.3.2 Personal factors:

Age, gender, income, education, political orientation, house ownership, (technical) skills, thermal comfort (health), energy cost.

Most studies consider that **age** plays an important role in environmentally-responsible and energy-saving behaviour while others disagree (Hori, et al., 2013). According to Carlsson-Kanyama et al. (2005), age influences house owners’ energy-efficiency behaviour. Mahapatra and Gustavsson (2008) found that older house owners have lower propensity towards energy-efficiency investment measures than younger ones. Nair, Gustavsson and Mahapatra (2010) stated that younger house owners were more willing to take investment measures, than older house owners (over 55 years old). Poortinga, Steg, Vlek, Wiersma (2003) found that homeowners between 20-39 years old have higher probability to adopt energy-saving behaviour than homeowners over 65 years old. Likewise, house owners between 36–45 years old were more inclined to invest in house shell energy performance than house owners over 65 years old who would invest in other “high investment measures” (Nair et al., 2010, 2959). However, Long’s (1993) results show the opposite; for him, elderly (>65 years old) house-owners had invested in energy efficiency methods. For Barr et al. (2005), people at an average age of 55 years are more likely to be involved in investment and non-investment energy-efficiency measures than younger people.

**Gender** is another factor that according to some studies influences pro-environmental behaviour, green consumption and energy-efficiency investment measures. For example, according to Zelezny et al. (2000), in a percentage of 70%, women were found to behave in a more pro-environmental way than men. Mainieri, Barnett, Valdero, Unipan and Oskamp (1997) also claim that women tend to behave more pro-environmentally than men; as they say, women purchase more green products than men; besides, women’s contribution to recycling is higher than men’s. Rausepp (2001) also argues that “women are in general more environmentally aware than men”. Nevertheless, Drozdenko, et al. (2011) reached the conclusion that male house owners’ willingness to invest in solar panels was higher than that of females’, who had propensity towards other green products, for example green mp3-players. Focusing on gas usage during winter, Becker, Seligman, Fazio, and Darley (1981) identified differences between men and women; while men were ready to turn on the heating, women instead preferred to put on heavy clothes to avoid energy consumption. On the contrary, other studies did not find any relationship between gender, pro-environmental and energy-efficiency behaviour (Poortinga et al. 2003; Sardianou, 2007). Van Liere and Dunlap (1980) claim that gender should not be taken into account as an indicator of environmental concern.
**Income** constitutes another factor that, according to several studies, affects pro-environmental behaviour and energy-efficiency investment measures. (Bartiaux et al., 2006; Black et al., 1985; Costanzo et al., 1986; Dillman et al., 1983; Herring et al., 2007; Poortinga et al., 2004). PacEo and Raposo (2009) found that high-income individuals behave in an environmentally friendly way. Larocche et al. (2002) mentioned that high-income individuals have higher propensity for purchasing green products. High-income owners have been found not only to be aware of energy conservation, but also to be more likely to take investment measures than low-income owners (Laquatra and Chi, 1988). Investment measures that improve energy-efficiency, such as energy-saving products and energy-efficient technology systems, were found to be related to high income house owners (Eichner & Morris, 1984; Nair, Gustavsson, Mahapatra, 2010). Nevertheless, income has not always been identified to relate to investment behaviour (Barr, Gilg and Ford 2005; Ruderman, Levine and McMahon 1987; Urge-Vorsatz and Hauff, 2001). Likewise, Hori, et al. (2013) did not find income to play an important role in house owners’ energy-saving behaviour.

The international literature has also presented **education** as a determinant of pro-environmental and energy-efficiency behaviour. Highly-educated house owners were found to be able to understand energy conservation (Black et al., 1985; Laquatra & Chi, 1988). Furthermore, in accordance with Archer, Pettigrew, Costanzo, Iritani, Walker and White (1986) and Johnson-Carroll, Brandt and Olson (1987), a positive relationship between education and energy-saving does exist. However, Hirst and Goeltz (1984) found that less-educated house owners managed to save more energy than more educated house owners. This was also found by Poortinga et al. (2003); according to them, low-educated people are more likely to take non-investment measures in order to improve house energy efficiency than high-educated home owners. Nonetheless, according to Ritchie, McDougall and Claxton (1981) there is no relationship between education and house energy use.

**Political orientation** is another factor affects pro-environmental behaviour (see Dietz, Stern and Guagnano, 1998; Dunlap, Xiao and McCright, 2001; H’Mida et al., 2008; Somma and Tolleson-Rinehart, 1997; Brody et al., 2004). In a study of 2004, Neumayer found that left-oriented individuals had higher propensity towards pro-environmental behaviour (Neumayer, 2004).

**House ownership** is considered to be another factor that can influence energy efficiency behaviour (Guerin, et al., 2000). It is more possible for private house owners not only to conserve energy, but also to take investment measures (Black et al., 1985; John son-Carroll et al., 1987; Kasulis, Huettner, & Dikeman, 1981; and Tienda & Aborampah, 1981).

It has also been found that house owners that have (technical) skills might take energy-efficiency investment measures. Capable of understanding new technology (Costanzo et al., 1986) or getting involved in the installation process of such technology, such house owners might invest in energy-efficiency techniques (Darley and Beninger, 1981). Technical skills proved to be a factor that influences house owners’ energy consumption and energy-saving behaviour (Steg, 2008). Focusing their attention on the link between knowledge of energy-saving practices and appropriate skills, Hines at al. (1987) underlined the significant role of skills “for applying the knowledge into a solution” (Mckenzie-Mohr, et al., 1995, 141).
However, for Mayer (1996), “do-it yourself” consumers might be less likely to invest in unknown energy-efficient products if they find it difficult to install them or if they just feel they do not have the appropriate skills (Nair, Gustavsson, Mahapatra, 2010).

The desire for **thermal comfort** has been identified as an important determinant of house owners’ energy-efficiency behaviour (Becker et al., 1981; Gladhart, Weihl, & Krabacher, 1988; Seligman et al., 1978; Weihl & Gladhart, 1990; Peters, 2000). Lack of thermal comfort has higher impact on conservation-oriented behaviour than conservation-oriented attitudes (Peters, 1990). Furthermore, thermal comfort, air quality and noise protection were found to influence energy-saving behaviour (Banfi and Farsi, 2008). Additionally, investment measures concerning insulation and space-heating resulted from thermal discomfort (Berry et al., 1997; Fuchs et al., 2004; Herring et al., 2007). House owners that have experienced lack of thermal comfort, were found to have high propensity to invest in building’s shell improvement (Nair, Gustavsson and Mahapatra, 2010). Thermal comfort in terms of health issues has also been considered an important factor that influences energy-saving and energy-efficiency behaviour (Seligman et al., 1978; Becker et al., 1981; Weihl & Gladhart, 1990). Gladhart et al. (1988) pointed out the significance of health issues for families with little children and infants. Guerin, et al. (2000) found that “health concerns” affect house owners’ energy-saving behaviour.

**Energy cost** has also been considered a determinant of house owners’ energy-efficiency behaviour (Black et al., 1985). It has been identified that energy cost has not only influenced energy efficiency behaviour, but also the measures that house owners were likely to take; it has been found that the high annual energy cost, as perceived by house owners, “was more likely to lead them to high or low energy-efficiency investment measures, than to building shell adjustments” (Nair, Gustavsson and Mahapatra, 2010, 2959).
2.3.3 Social factors: family, friends, media, culture.

Environmental behaviour has been found to be related to social norms (Bamberg, 2003). For Gadenne et al. (2011) and Ozaki (2011), by following a specific environment-oriented action that is used as a social norm, people “feel as a part of a group” and, as a result, are motivated to continue behaving in an environmentally-friendly way. It was further shown that the way in which house owners used energy was affected by emotional, social and cultural elements (Faiers, Cook and Neame, 2007). Mckenzie-Mohr, et al. (1995) realized the crucial role of society in influencing other individuals towards the adoption of a specific environmental behaviour. As they described, “social diffusion is the process with which family and friends affect the initiation of new activities as well as the adoption of new technologies by other individuals” Mckenzie-Mohr, et al. (1995, 146). Alternatively defined as social interaction/social influence, social diffusion is considered a factor which influences energy-saving behaviour (see Ek and Soderholm, 2010). Likewise, Hori et al. (2013) found a positive correlation between social interaction and energy-saving behaviour. Family and friends were found to affect consumers’ pro-environmental behaviour (Jager, 2006; Pickett-Baker and Ozaki, 2008). While assessing the role of family, H’Mida, et al. (2008) emphasized the importance of environmental values especially for children, who were found to be influenced by family’s values, beliefs and attitudes. Family has been found to depict a degree of environmental consciousness (H’Mida et al., 2008). For Gronhoj (2006) an individual’s environmental awareness, environmental consciousness and environmentally-active behaviour are highly influenced by family.

The role of Media in promoting pro-environmental behaviour has also come to researchers’ attention (H’Mida et al., 2008; Rios et al., 2006). Media support both individual and collective environmental consciousness (Rios et al., 2006) and play the role of mediator between environmental consciousness and ecological purchase behaviour (H’Mida et al., 2008).

Culture is another factor that has been taken into consideration when conducting research regarding pro-environmental behaviour. Although in many studies culture has long been considered to be a determining factor influencing pro-environmental behaviour (see Cleveland et al., 2005; Krause, 1993), researchers have not yet reached a general agreement concerning its actual role.
2.3.4 Technical and financial factors: house size, energy-efficiency awareness (green home attributes), cost of green products, barriers, previous investment.

As far as house size is concerned, several studies have shown that it has a close relationship with energy-saving behaviour. According to Gatersleeben, et al. (2002), house size plays an important role in energy consumption. It has also been found that the bigger the house, the higher the energy usage (Hewett, Dunsworth, & Quaid, 1988; Johnson-Carroll et al., 1987; Morrison, Gladhart, Zuiches, Keith, Keefe and Long, 1978; Ritchie et al., 1981).

The degree of energy-efficiency awareness which constitutes another factor has also been presented by the international academic literature. For Rogers (2003), house owners that are aware of the ways to improve energy-efficiency might decide to implement them. A study by Newbold et al. (2010) has also shown that people aware of green home attributes are willing to pay extra costs for a green home. Furthermore, according to Nair, et al. (2010, 2959), house owners who had less information about building shell insulation, took non-investment measures, while well-informed house owners invested in building shell. It has also been highlighted that individuals well-informed on energy-efficiency measures have higher propensity to pay for renewable energy sources systems (Zografakis et al., 2010).

The cost of green products has also been mentioned in the academic literature (Hopkins, 2009; Drozenko et al., 2011). House owners’ willingness to pay for a green water heater has been spotted (Drozenko et al., 2011). However, Steg and Vlek (2009) found that people did not take energy-saving measures because of their high cost. In another study it was shown that 80% of respondents were aware of solar power systems, but given the high installation cost, there was no willingness to have them installed (Samarasinghe, 2012).

Several academic sources have also stressed certain barriers to pro-environmental and energy-saving behaviour. (Caird, Roy and Herring, 2008; Gardner and Stern, 2008; Jager, 2006; Lane and Potter, 2007; Mills and Schleich, 2009; Niemeyer, 2010; Ozaki, 2011; Salmela and Varho, 2006; Sidiras and Koukios, 2004; Vermillion and Peart, 2010; Young, Hwang, McDonald and Oates, 2010). For instance, economic barriers such as high initial cost and long amortization time hinder pro-environmental behaviour (Faiers and Neame, 2006, 1805; Mills and Schleich, 2009). Lack of information and time (Niemeyer, 2010) as well as lack of knowledge and trust to the provider (Salmela et al., 2006) have been regarded as additional barriers to energy-saving behaviour. Consumers uninformed about the social and environmental performance of products and manufacturers, were found reluctant to adopt a green buying behaviour (Young et al., 2010).

People who have previously invested in energy-saving methods would have the intention to behave in a more energy-saving way (Zografakis et al., 2010; Feng and Sovacool, 2010). Previous investment in building shell has influenced house owners’ decision to take further energy-efficiency investment measures (Costanzo et al., 1986; Ajzen, 1991; Wang et al., 2011).
3. Context

3.1 Greece: climate and green buildings

Greece is a Mediterranean country with a total population of 10,815,197 (EL. STAT, 2011). The climate of Greece is characterized by mild winters with much sunshine during the day and low temperatures during the night, and warm summers with a lower night temperature. Greece is an ideal location for maximizing green buildings energy efficiency. Green buildings in Greece can save almost 70% of the required heating energy in winter and up to 100% of the required cooling energy in summer (Anelixi, 2013).

The green building concept is not new. The need for thermal comfort and energy efficiency has always been of high importance; the most notable approach was made twenty-four hundred years ago by the ancient Greek philosopher Socrates who mentioned the relationship between local climate and buildings:

“Now in houses with a south aspect, the sun’s rays penetrate into the porticos in winter, but in the summer the path of the sun is right over our heads and above the roof, so that there is shade. If, then, this is the best arrangement, we should build the south side loftier to get the winter sun and the north side lower to keep out the winter winds” (Xenophon, 1979).
3.2 Green buildings from a European - Greek perspective

The Greek ministry of Environment, Energy and Climate Change (YPEKA) has realized the need to tackle the increasingly intense environmental problems by developing policies that ensure a balanced present and a sustainable future.

For the last 30 years, Greek government, focusing on the building sector, has developed a framework including regulations and building codes concerning building insulation. Despite the Greek thermal regulation (1981) about thermal insulation of building shell, as well as the technical codes (1986) as regards the installation of heating boilers and cooling systems in buildings, a further improvement has been made on a European level. According to the European Union Directive “Buildings Energy Performance” (2002/91/EU) new standards for building energy efficiency and energy inspection were recommended and a certificate on building energy footprint was introduced. That Directive was incorporated in the Greek legislation as “Measures for reducing buildings energy consumption” (3661/2008).

Focusing on several buildings (residential buildings, offices, sport centers, hospitals and public buildings), the Greek Law 3661/2008 includes several settings: a new regulation on building energy performance, the minimum energy consumption in all new buildings, an Energy Performance Certificate for all new and totally renovated buildings and the inspection of boilers, heating and air-conditioning systems. (YPEKA, KENAK, 2009). As a result of this Law, the Greek government developed the “Energy Performance Regulation for Buildings” known as (KENAK). According to YPEKA, the KENAK establishes the integrated energy planning of buildings. The improvement of building energy efficiency, energy-saving and environmental protection are basic goals of KENAK. (YPEKA, KENAK, 2009).

Besides the Energy Performance Regulation for Buildings (KENAK), the Greek government, in cooperation with the European Union, in 2009 developed the program “Energy Efficiency at Household Buildings” to provide citizens with incentives to improve their houses energy efficiency, save money and increase their value. (YPEKA, E. E. H. B, 2009). Citizens, whose houses are located in areas with an average zone price lower or equal to 2.100 Euros/square meter, can participate in the co-financed program. Citizens can carry out the following interventions: improve the thermal insulation of the building shell, replace the frames, place shading systems and upgrade the heating and hot water supply systems.
3.3 Renewable energy sources in Greece

Greece is a country with high potential in renewable energy sources (RES), such as solar energy, wind energy, biomass and geothermal. Given that they are practically inexhaustible, have low operating cost and are environmentally-friendly, RES are advantageous to a country such as Greece. However, there is a lack of appropriate infrastructures that could support the use of RES (Chegkazi, 2009).

Given that solar power is an important part of renewable energy sources in Greece, a significant number of households’ solar collectors (water heating) have been installed since the early 90’s. As shown in the figure 1, from 1990 until 2000 the solar collectors’ surface in Greece had an increase of 100%. According to the European Solar Thermal Industry Federation (E.S.T.I.F), Greece was in 2010 the second European country with the highest solar heating capacity.

Figure 1. Solar collectors’ surface in the period 1990-2005 in Greece
Besides solar heating (water heating), Greece supports photovoltaic (PV) systems. According to the Hellenic Association of Photovoltaic Companies (H.A.P.C) the total installed capacity of photovoltaic systems in Greece increased between 2001 and 2005. While in 2001 the total installed PV capacity was 1.5 MW, in 2003 it was 3.2 MW. There was a further increase in the years 2004 and 2005 (4.5 MW and 5.2 MW) respectively (H. A. P. C, 2013). In accordance with statistical data derived from the EurObserv’ER Barometer (2012), from 2005 until 2011 the total installed PV capacity in Greece showed the highest increase. The 7 MW in 2006 reached 55 MW in 2009, while the 205 MW in 2010 reached 631 MW in 2011. As a result of this rise, Greece is classified as the eighth European country with the highest total installed capacity of photovoltaic systems between 2005 and 2011.

In addition, according to the Hellenic Association of Photovoltaic Companies (H.A.P.C), the total installed PV capacity in residential roofs (< 10 KWp) was 7.4 MWp in 2010, while in 2012 it reached 297.8 MWp (H.A.P.C, 2011, 2013 b). Moreover, with 136.7 W. installed PV capacity per person in 2012, Greece is classified as the fifth European country with the highest installed PV capacity per capita.
4. Research Design

Pro-environmental/energy-saving behaviour has widely been described and explained on the basis of surveys and case studies. On the one hand, surveys, following a quantitative research analysis and using big samples with impersonal and self-administered questionnaires, have identified a number of factors affecting people to behave in a pro-environmental and energy-saving way. On the other hand, case studies, adopting a qualitative research analysis and collecting data from small samples have resulted in a deeper understanding of what influences the tendency to adopt such a behaviour.

This thesis focuses on the qualitative aspect of doing scientific research and uses case study as research strategy. In addition, this thesis conducts semi-structured interviews to collect the required data. The next sections justify the choices made.

4.1 Type of scientific research

There are two types of scientific research: qualitative and quantitative. Each type has its own characteristics, its own data collection methods and its own degree of flexibility. Qualitative research is appropriate for understanding a problem or a situation from the perspective of the actors involved in it, while a quantitative research focuses on the description of phenomena. Qualitative research is suitable for accumulating specific information about how a particular number of people or populations understand a specific issue or a problem (Mack, Woodsong, MacqQueen, Guest and Namey, 2005).

Given that this thesis focuses both on the problem of global warming and the specific concept of green buildings, and on the particular context of Greece, a qualitative type of inquiry seems ideal.

According to Mack et al. (2005) qualitative research is useful when analyzing factors such as gender, social norms and socio-economic status. Since this thesis analyzes, among others, the role of personal and social factors in house owners’ decision to opt for a green house, a research from a qualitative perspective seems to have a lot to provide. Qualitative research is also used when a better understanding of complex society-based issues is desired. Given that complex society-oriented and real-life issues should be taken into consideration when investigating house owners’ decision to live in a green house, doing qualitative research seems a good choice for this study. In contrast, quantitative research does not seem able to help this thesis explain how several complex society-based factors affect Greek house owners’ decision to live green. Quantitative research describes population characteristics and is therefore inappropriate to explore individuals’ personal experiences.
Apart from the fact that those two types of research analysis have a different way in approaching the investigated issue, there are also key differences in their data collection methods. While qualitative research mainly uses participant observation, focus groups and in-depth interviews to collect its data, quantitative research focuses on questionnaires, secondary data and experiments. For example, while in a survey-based questionnaire, participants are asked to answer with “yes” or “no”, in a case-based questionnaire participants have the opportunity to express their opinion in their own words (Mack et al., 2005, 4). That is, by using “closed-ended” questions, quantitative research methods do not give participants the opportunity to think carefully before they answer; they just have to answer multiple choice questions. In contrast, by focusing on “open-ended” questions, qualitative research methods do result in detailed answers. This kind of questions provides both the interviewer and the interviewees with an important degree of flexibility; in turn this flexibility supports a better and deeper understanding of the issue in question and thus of the entire research.

The acquisition of detailed information is vital so that this thesis can meet its goal. House owners constitute the source that would provide this research with an in-depth insight of their decision to have a green house built, or have their conventional house converted into a green one. As a result, the use of qualitative research methods is necessary to gain an elaborated understanding of house owners’ decision making process. On the contrary, “yes” or “no” answers resulting from quantitative data collection methods do not serve the purpose of this thesis.
4.2 Research Strategy

This thesis uses case study as research strategy. There are several reasons for this choice. Firstly, this thesis follows a qualitative analysis. However, this does not necessarily mean that a case study research strategy cannot be used in a quantitative research; Stake (1994, 1995, 2000, 2005, 2008) says that “both qualitative and quantitative research could be carried out through case study”. Nonetheless, case study research strategy is confirmed to be important in qualitative research (Anne Brown, 2008, 7). According to Merriam (1998) case study is used “as an application of qualitative research. In the field of qualitative research, case study is used as a significant qualitative strategy or tradition along with phenomenology, ethnography, biography, and grounded theory” (Crotty, 1998; Creswell, 1998, 2003; Denzin & Lincoln, 2005, 2008; Guba & Lincoln, 1994; Mertens, 2005; Hatch, 2002; Patton; 1990).

In addition, given that this thesis gives emphasis on words instead of numbers, case study is the most appropriate research strategy. Case study research strategy is suitable for answering “why and how” questions (Gray, 2004), while survey research strategy focuses on, “where, how much and how many” questions (Saunders, Lewis, Thornhill, 2007, 138). Since this thesis aims to answer how specific factors have an impact on house owners’ decision to live in a green house, case study is the ideal research strategy.

Case studies provide an in-depth understanding of the topic studied; they are basically used in explanatory and exploratory research (Saunders et al., 2007). In contrast, a survey research strategy tends to be more descriptive. Since the aim of this dissertation is to explore and explain how several factors affect house owners’ decisions, case study research strategy is the best choice. As Merriam (1998) says case studies “focus on holistic description and explanation” (Merriam, 1998, 29). Moreover, case studies “correspond to the description and examination of complex human affairs” (Stake, 2000, 19), and “provide an integral view of the subject because they analyze the whole situation, not only the subject of research but also the complex interaction of the subject with its context” (Stake, 1995). In addition, capable of providing “a humanistic and holistic understanding of complex situations”, case studies are considered “valuable research tools” to help this research meet its goal (Anne Brown, 2008, 10). In contrast, surveys are unable to “capture the reality” in such a detailed way, and cannot analyse a big number of variables (Galliers, 1992).

Given that this thesis aims to explain how several factors, related to real-life issues, influence house owners’ decision to adopt the green house concept, case study is a useful research strategy. Since the topic this thesis describes is complex and society-oriented (climate change - green buildings – pro-environmental behaviour) and as literature shows, people’s behaviour is influenced by real-life social issues (information, governmental incentives, etc.), an integrated analysis considering all the possible circumstances is important.
Furthermore, contrary to surveys, case studies is a good way to **explain behaviour**. According to Zainal (2007, 1) case study seems to be suitable for going “beyond the quantitative statistical results and understanding the behavioural conditions through the actor’s perspective”; case study strategy provides the researcher with “a detailed analysis of a short number of behavioural situations” (Zainal, 2007, 1). Since this thesis studies the role of several factors in affecting house owners’ decision (behaviour) to embrace the idea of green house, case study is the most useful research strategy. Because it gives this research the opportunity to deeply explain house owners’ decision to have a green house built or have their old house converted into a green one.
4.3 Cases description

This thesis uses ten green houses in Greece as case studies. Thus, the ten green houses constitute the unit of analysis. Greece was chosen due to the fact that, although it is a country with a high potential of renewable energy sources’ usage in buildings, the latter consume more energy and are responsible for higher amounts of greenhouse gas emissions in comparison with other European countries.

The ten green houses (cases) were not randomly selected, but under several conditions. At first, all ten green houses were chosen in a way they represent an integrated and holistic green building concept. That is, each green house was selected on the basis of a high energy-efficiency and sustainability degree. A Greek Construction and Development company, which apart from engineering and architecture also specializes in the design and construction of green buildings, was chosen as the source that would give this thesis access to green houses. The specific Construction and Development company, was selected because of the service package it offers. This company provided its clients with energy-efficiency consulting services (green buildings, RES) and delivered optimum retrofits in all kinds of structures, so it was considered ideal to give this research the opportunity to come closer to new-built green homes and renovated ones.

The green houses selection was carried out under several other criteria. This thesis focuses on detached houses and private apartments both new and existing ones. In addition, all ten houses were chosen in a way they could correspond to different climatic conditions within Greece. Furthermore, all ten green houses were chosen in such a way they could represent different regional units and different urbanization degree.

As a result, five houses are located in Attica region and more specifically the regional units of North Athens, Central Athens and East Attica, four in Islands of Attic region and one in Central Macedonia. The climatic conditions vary and average summer temperatures reveal different living conditions, with much humidity in north Greece and Attica Islands, high temperatures in central and north Athens and middle-high temperatures. The different urbanization degree affects the local climate in the area where the ten houses are located.
The following table presents a detailed description of the ten houses (cases).

<table>
<thead>
<tr>
<th>Region</th>
<th>Regional Unit</th>
<th>Location</th>
<th>Local climate</th>
<th>Urbanization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attica</td>
<td>Islands</td>
<td>Aegina Island</td>
<td>Humid</td>
<td>Thinly-populated area</td>
</tr>
<tr>
<td>Attica</td>
<td>East Attica</td>
<td>Agios Stefanos</td>
<td>Humid and cold</td>
<td>Intermediate density area</td>
</tr>
<tr>
<td>Attica</td>
<td>Central Athens</td>
<td>Kaisariani</td>
<td>Mild</td>
<td>Densely populated area</td>
</tr>
<tr>
<td>Attica</td>
<td>East Attica</td>
<td>Drafi</td>
<td>Mild</td>
<td>Intermediate density area</td>
</tr>
<tr>
<td>Attica</td>
<td>East Attica</td>
<td>Pikermi</td>
<td>Mild</td>
<td>Intermediate density area</td>
</tr>
<tr>
<td>Attica</td>
<td>North Athens</td>
<td>Psychico</td>
<td>Mild</td>
<td>Densely populated area</td>
</tr>
<tr>
<td>Central Macedonia</td>
<td>Chalkidiki</td>
<td>Chalkidiki</td>
<td>Cold</td>
<td>Thinly-populated area</td>
</tr>
</tbody>
</table>

Table 2. Green houses description

Aegina is one of the islands in Attica region 27 km. from Athens. The Aegina Island has a humid climate and the four green houses are located in thinly populated-areas.

Agios Stefanos is on the northern outskirts of Athens, 23 km. from the city centre of Athens. It is entirely residential. In the centre of Agios Stefanos there are shops, public buildings, schools, but in a distance of about 3 kilometers there are only private properties and detached houses surrounded by forest. The green house is located in an intermediate density area and is surrounded by trees.

Kaisariani is a densely populated urban area in the eastern part of Athens about 7 km from downtown Athens. The green house is located in a refugee area without green zones.

Drafi is a North American style suburb located in East Attica. It is residential and it is situated 24 km. east of Athens, on the slopes of the Penteliko Mountain. The two green houses are located in a plot within a green environment in an intermediate density area.

Pikermi is an intermediate density town and a former community of East Attica 25 km. from downtown Athens. The area where the green house is located is surrounded by trees.

Psychico is an urban area 12 km. from the city centre of Athens. It is a densely populated area with some green zones.

Chalkidiki is a peninsula in northern Greece in Central Macedonia region. The green house is located in a rural area within a green environment.
4.3.1 First case: Green house on Aegina Island (115 square meters).

Mrs. Ioannou (38 years old) is a German teacher who lives with her husband and their child on the Aegina Island. They were tenants in a conventional house (on Aegina Island). Being owners of a plot, in 2006 they decided to have a new house built. Since 2009 Ms. Ioannou and her family have been living in their new house on the Aegina Island which makes use of a geothermal heat pump for hot water supply as well as for heating and cooling. Apart from the geothermal heat pump, the house is also supported by under-floor heating-cooling system, high-performance shell and thermal-insulated aluminum systems with low-emissivity glazing. Moreover, a biological wastewater treatment unit as well as a rainwater collector system support garden and outdoor activities. In addition, a dual water supply system for the washing machine and the dishwasher saves energy. All rooms are equipped with energy-saving bulbs, and the roof is properly equipped to accept a prospective photovoltaic system.

4.3.2 Second case: Green house in Agios Stefanos (210 square meters).

Mr. Dialinas (55 years old) is an automobile engineer who used to live with his wife and their two children in a rented apartment in the centre of Athens. Mr. Dialinas and his family decided in 2012 to move to the north suburbs of Athens and start a new life in an energy-efficient and environmentally friendly house. In 2011, Mr. Dialinas bought a property with a semi-finished house (building framework, plastered walls). The shell insulation was improved with the addition of high-quality materials on the exterior walls. In addition, thermal-insulated aluminium systems with low emissivity glazing were also installed. Mr. Dialinas also decided to have an air-water heat pump and an under-floor heating-cooling system installed. Furthermore, the house is equipped with energy-saving bulbs.

4.3.3 Third case: Green house on Aegina Island (110 square meters).

Mrs. Iessen (57 years old) is a journalist who lived with her husband and their two children in Athens. She and her husband decided to have a second house on the Aegina Island that would be energy-efficient and environmentally-friendly. They decided to delegate the design, supervision and building process of their new house to a construction company specialized in green and energy-efficient solutions. For the last five years, Ms. Iessen and her family have been living in their new house on Aegina Island. The house is equipped with a geothermal heat pump which supports the under floor heating-cooling system. The house also has high-quality insulation and thermal-insulated aluminium systems with low emissivity (Low-E) glazing. Moreover, a biological wastewater treatment unit filters the used water making it reusable for several activities.
4.3.4 Fourth case: Green house on Aegina Island (205 square meters).

Mr. Karagiannidis (60 years old) is an engineer in a shipping company and he used to live with his wife and their two children in a rented apartment in Athens. In 2010 they bought an old house on Aegina and decided to have it converted into a green one. The ground floor was made of stone, while the first floor was made of bricks. Then, Mr. Karagiannidis found a construction company that specializes in the construction or conversion of old houses into green and which took on the project. A year ago Mr. Karagiannidis moved to his new house which has high quality insulation, is equipped with under-floor heating-cooling system, supported by an air-water heat pump. It also has low-emissivity (Low –e) glazing, photovoltaic panels to meet electricity needs and an energy fireplace. The house is also equipped with pergolas, energy saving bulbs and appliances class A.

4.3.5 Fifth case: Green house on Aegina Island (145 square meters).

Mrs. Tsenta (58 years old) is a pharmacist and lived in a rented apartment in Athens with her husband and their two children. In 2006 they decided to convert their grandmother’s old house into a green one. So, Mr. Tsenta found a construction company specializing in green houses which undertook the conversion of their house. For five years now they live in their house on Aegina, equipped with an air-water heat pump which feeds an under-floor heating-cooling system. The house has an energy fireplace, high performance shell, low-e glasses and PVC frames without shutters. In the surrounding area and in the parking space there are pergolas and trees for shading. The house is also equipped with energy-saving bulbs and appliances class A. There is also a rainwater collector tank. Also, a biological wastewater treatment unit has been installed which provides water for the garden and the toilet flushing.

4.3.6 Sixth case: Two-storey house in Kaisariani (ground floor-120 square meters, first floor-80 square meters).

Mrs. Mandragoni is a 43 year-old secretary in a public projects-construction company, who used to live in a privately-owned house in Athens. In 2006 she sold her house and purchased an old detached two-storey house in Kaisariani and changed it into a green one. The house was ready four years ago. Since then, she has been living in her converted house which is equipped with high quality insulation, low-e glazing, and is heated by means of natural gas. The house also has ceiling fans, while there are canopies and awnings. There are also energy-saving bulbs and energy-saving appliances.
4.3.7 Seventh case: Two detached houses in Drafí (160 square meters each).

Mr. Labropoulos, a 50 year-old accountant, lived in Moschato with his wife and his two sons. They sold their house and another apartment they owned and in 2007 they decided to have two detached houses built in Drafí. A construction company undertook the building of the house.

Three years ago they moved to their new house which has high-performance shell, is equipped with an air-water heat pump, under-floor heating-cooling system, an energy fireplace, low-e glazing and thermal-insulated frames without shutters. The house also has canopies, energy-saving bulbs, appliances class A., while there are solar bulbs in the garden and the parking space. The house is equipped with a biological wastewater treatment unit and a rain collector. On the roof there is an infrastructure for future installation of photovoltaic panels.

4.3.8 Eighth case: Green house in Pikermi (250 square meters).

Mr. Avdis, a 67 year-old advertiser, used to live on the first floor of his two-storey house in Pikermi with his wife and his two children. In 2009 he made the decision to have his house converted into a green one. In cooperation with a construction company he decided to have an under-floor heating-cooling system and an air-water heat pump installed on both floors. The house is also equipped with low-e glazing and thermal-insulated frames without shutters and high performance shell. Besides, the old fireplace was converted into an energy one. There is also a biological wastewater treatment unit which filters the used water for watering the garden, while the rain water is collected and used for the yard and car washing. The house is also equipped with LED lights and the pool is heated with a special solar system.

4.3.9 Ninth case: Green house in Chalkidiki (235 square meters).

Mr. Vasiliou is a 45 year-old doctor who lived with his wife and his two children in an apartment in Thessaloniki. They sold their apartment and with the help of a construction company they decided to have a green house built on a farm in Chalkidiki. For two years now they have been living in their new green house which is equipped with air-air heat pump and an under-floor heating-cooling system. The wooden frames are equipped with low-e glazing, while the walling is insulated with high quality materials. There are also energy-saving bulbs, Led lights, appliances class A. and an energy fireplace. There is also a biological wastewater treatment unit and a rainwater collector for watering the garden. The house is also equipped with photovoltaic panels.
4.3.10 Tenth case: Two adjoining apartments in a four-storey building in Psychico (155 square meters each).

Mrs. Matzourani, a 51 year-old lawyer used to live in one of her two apartments in Psychico with her family (husband and two daughters). Six years ago they found a construction company which undertook to join the two apartments and turn them into green. For five years now they have been living in the converted apartments which are equipped with under-floor heating-cooling system supported by an air-water heat pump. The two apartments have high performance shell and thermal-insulated frames with low-e glazing. All appliances have been replaced with energy-saving ones, while on the balconies there are canopies and trailers for shading. The house has also a solar heater and an energy fireplace.
4.4 Data collection method

The case study research strategy and the qualitative approach this thesis uses, entail an analogous data collection method, able to provide an in-depth and complete understanding of house owners’ decision to have a green house built or have their old house converted into a green one. According to Saunders et al. (2007, 15), if the aim of a research is to understand “the reasons for the decisions that the research participants have taken, or the reasons for their attitudes and opinions”, a qualitative interview is necessary. Unstructured and semi-structured interviews constitute qualitative (non-standardized) research methods able to advocate such an in-depth and detailed understanding. Nonetheless, a discussion on the main types of interviews, both quantitative and qualitative is necessary to give this thesis the opportunity to choose the most appropriate data collection method.

There are three main types of interviews: structured, unstructured and semi-structured. **Structured interviews** are considered to be an important research method to produce quantitative data (DiCicco-Bloom and Crabtree, 2006, 314). In addition, definite responses such as “yes” or “no” are best working with structured interviews. According to Gill, Stewart, Treasure and Chadwick (2008, 291) “structured interviews are, essentially, verbally administered questionnaires that only allow for limited participant responses and are, therefore, of little use if ‘depth’ is required”.

**Unstructured interviews**, alternatively defined as qualitative or in-depth, are used as an interactive dialogue between the interviewer and the interviewees “when significant depth is needed, or when virtually nothing is known about the subject area” (Gill et al., 2008, 291).

**Semi-structured interviews** are also considered qualitative and in-depth; they are also suitable to work with small samples (Laforest et al., 2009). They give interviewer the opportunity to be immersed in social and personal issues and gain a complete understanding of interviewees’ experiences and opinions. They also have a structure that allows interviewer and respondents to get involved in a discussion able to uncover an in-depth insight of respondents’ experiences. Semi-structured interviews are also flexible since they can be adjusted to respondents, and can provide researchers with valuable information about respondents’ lives and experiences.

Of the three interview types, semi-structured interviews are the most appropriate to provide this research with specific information about the ten house owners. A stable and rigid questionnaire works as a kind of guidance and does not allow interviewees to freely express themselves (structured interviews), while a fully unstructured questionnaire does not provide respondents with an integrated and coherent understanding of the interview’s purpose and structure (unstructured interviews). Therefore, semi-structured interviews is what this research needs. Besides, given that structured interviews are mainly used for the acquisition of quantitative data, while unstructured interviews lack a list of research-oriented questions, semi-structured interviews seem the most suitable data collection method. Since the purpose of this research is to give house owners the opportunity to narrate their own story and describe their own experiences, semi-structured interviews is the best choice.
Ten semi-structured interviews were conducted between April 2013 and August 2013. Nine interviews took place by telephone and one in person. One questionnaire (35 questions) which, however, was adjusted to the characteristics of each green house constitutes the main tool this thesis used. The flexible questionnaire that corresponded to the research question of this thesis was prepared in such a way that it would fit the theoretical framework and it would enable the interviewees to comprehend the aim of the research. The respondents were informed about the reason for the interview through a short introduction on the research goal. The way questions were asked formed the basis for a 30 minute discussion with each interviewee; interviewees were free to narrate their own story and express their own experiences and perspectives concerning their decision to adopt the idea of a green house. Additionally, the interviews were recorded so that they would be reliable, easily transferred and translated.

4.5 Research Approach

This thesis uses an inductive research approach. Since the purpose of this study is to understand how the ten Greek house owners made the decision to invest in a green house, an inductive research approach seems ideal. That is, this thesis aims to understand participants’ actual decision to pay for a green home than simply their willingness to do so. Besides, according to Easterby-Smith, Thorpe and Lowe (2002) inductive research approach is more appropriate to explain why something is happening, while deductive approach is better when just a description of what is happening is needed. Thus, deductive research approach seems more appropriate to describe people’s willingness to live in a green house, while inductive can explain why people decided to live in a green house. In addition, since this thesis explores how specific factors have an impact on the particular context of Greece, an inductive approach is necessary.

It’s worth mentioning that Saunders et al. (2007) characterize the inductive research approach as a theory building approach. As they say, “the researcher aims to get a feel of what is going on, so as to understand better the nature of the problem; the researcher’s task is to make sense of the collected interview data and analyze them. The result of this analysis would be the formulation of a theory” (Saunders et al., 2007, 118).
4.6 A different Research Design

This dissertation uses case study as a research strategy, collects data through semi-structured interviews and develops a qualitative analysis on how several factors influence a specific number of Greek house owners to have a green house built or have their existing house converted into a green one. As previously mentioned, surveys with big samples and quantitative self-administered questionnaires have also been used to describe pro-environmental and energy-saving behaviour. It is interesting to see how such a different research design could have helped this thesis answer its research question.

A survey-based research that would follow a quantitative approach would not be advisable for this dissertation. Firstly, because it would be difficult to find 100-200 participants who have chosen to live in a green house. That is, it would be impossible for the researcher of this thesis to find so many Greek construction companies specializing in green houses that would bring him in contact with such a big number of participants. And the reason for this is that not only such construction companies are few in Greece, but also because most construction companies have closed down, since the building sector has negatively been affected by the financial crisis. The impact of the recent crisis on the building sector can further be realized by the fact that although the Greek regulation on building energy performance (KENAK) has been in effect since 2010, there is a complete lack of interest in both supply and demand regarding the construction of green and energy-efficient buildings.

In addition, given that a quantitative data collection method such as self-administered questionnaires (structured interviews) would focus on close-ended questions that would not allow follow-up questions, house owners would not have the opportunity to narrate their own experiences and describe their decision making process from their own perspective; they would just have to answer “yes” and “no” questions. This would affect not only the content of the questions and the way they would be asked, but also the results; less and simpler questions would be formulated, and an in-depth understanding of house owners’ decision to invest in green and energy-efficiency measures would not be acquired. Besides, since respondents would not have the opportunity to write their thoughts but just answer with “yes”, “no”, “how much” etc., they would not answer in an effective and reliable way. Moreover, it is possible that some of the respondents might misunderstand one or more questions; given that the researcher would not be present to solve the possible misunderstandings, the participants would not answer according to the meaning of the question.

However, hypothetically speaking, even if this thesis finally managed to find the necessary number of companies and house owners to conduct a survey-based research, it would be impossible within such a limited time to collect and interpret the necessary data, and acquire an in-depth insight of the participants’ decision to choose a green house.

Apart from the quantitative data collection method of self-administered questionnaires and the quantitative character of survey research strategy, it is also worth describing how a different but still qualitative data collection method could have been used in this research. Taking into consideration that unstructured interviews, just as semi-
structured interviews, constitute a qualitative data collection method that focuses on an in-depth analysis, another qualitative research design could take place.

Unstructured interviews could also be conducted by telephone or in person and result in a detailed insight of how several factors influenced house owners’ decision to live in a green house. Despite the in-depth exploration of house owners’ experiences that unstructured interviews could provide this research with, the lack of guidance and structure could disorientate this research from the topic studied. The lengthy in-depth interviews could result in discussion about issues irrelevant to the purpose of the research. However, unstructured interviews could be a suitable data collection method for psychology-oriented studies that would analyse the role of several factors in house owners’ decision to approach the green house concept. Psychological studies could take advantage of the lengthy discussion resulting from unstructured interviews to acquire an in-depth understanding of house owners’ values, beliefs and attitudes.

Concluding from the above, a case-based research supported by semi-structured interviews was the most appropriate method to collect the data needed for the purpose of this thesis.
5. Findings

5.1 Factors influencing the decision on a green house

5.1.1 Environmental factors

Knowledge about Global Warming and Urban Heat island effect

The findings of this study show that all ten Greek house owners are aware of climatic problems such as global warming. In addition, they all reported that global warming is of high importance. Six out of ten emphasized that unless solutions are found, planet will not be the same in the future. Besides, all ten interviewees not only underlined their awareness of global warming, but they also claimed to feel its effects.

“These two environmental problems are becoming increasingly important for the future of the planet” (Case 5).

“For the last years I have been feeling these problems. Definitely, they are globally the biggest problems that will lead to Earth’s destruction” (Case 6).

Moreover, all ten interviewees were found to be aware of Urban Heat Island phenomenon (U.H.I) as well as to experience its consequences on a daily basis, especially during summer. Apart from mentioning their awareness and their experiences concerning U.H.I phenomenon, the majority of house owners demonstrated specific knowledge about what causes the effect. Seven out of ten participants pointed out the influential role of ineffective urban planning in the creation of Urban Heat Island phenomenon. Planning authorities were described as the main responsible for both the creation and the deterioration of U.H.I phenomenon. In addition, four out of ten respondents reported a close relationship between urban heat island phenomenon and urbanization. The high urbanization degree, in conjunction with the ineffective planning were considered to be the reason that has led to the rise of temperature in big urban areas.

“Since 1960, people have began to abandon their houses and their occupations in the country and looked for job in big cities; so big apartment blocks with the known consequences were built; concrete, narrow streets without groves and squares. Thus, the phenomenon of urban heat island emerged, for which the state is responsible” (Case 4).
Environmental consciousness

All ten house owners were found to have a well-developed environmental consciousness; not only by choosing to live in a green house, but also by taking into consideration the environmental protection. Apart from mentioning the reduction in energy consumption as one of the determinants of their decision to have a green house built or have their old house converted into a green one, respondents stressed their contribution to the high need for planet preservation. Eight out of ten interviewees had participated in environmental organizations, while all of them considered environmental protection to have been one of the determinants of their decision to opt for a green house.

In addition, while all ten interviewees reported that they have been feeling environmentally responsible since their childhood and/or since the time they studied in university, four out of ten mentioned that for the last 10-15 years they got more and more sensitive to environment.

“My first contact with environmental protection was during my high school years where all my class decided to clean the beach. There, we discussed and our professor told us about the benefits of a clean environment. Since then, I have become concerned and I have been trying not to pollute the environment. Regarding the reduction of energy consumption I have been trying it as long as I can since my childhood” (Case 4).

“I was always careful not to harm nature, but for the last 10 years I have gained what we call environmental consciousness. (Case 8).

“Whenever possible, I participate with my kids. Nature was freely given to us, so was our life. If we do not respect it, it will not respect us” (Case 7).

This research also found that all ten house owners installed systems that utilize renewable energy resources and take advantage of passive lighting and passive heating-cooling. Moreover, two out of ten house owners have a hybrid car.

“Whatever we do, we try to take into account these factors that could protect the environment” (Case 3).

“Creating something green and energy-cost efficient was our goal”. (Case 2).

“We have energy bulbs, LED lamps, solar lamps and electrical appliances energy class A. Additionally, we have a biological wastewater treatment unit from where the purified water is re-used for garden activities and flushing in the toilet” (Case 5).
Views on the role of government and citizens in environment

All ten interviewees reported the contribution of both government and citizens to resolve environmental problems. Emphasis was given on citizens’ role in taking individual initiative, while government was considered the leader in taking measures, in enacting regulations and showing the direction towards environmentally-friendly behaviour. However, although all ten house owners unanimously consider government to be the key-actor in promoting environmental behaviour, two out of ten highlighted its limited role in forcing citizens to behave in a specific way, especially now that the country is going through a recession.

The findings also indicate that three out of ten house owners were influenced by building energy performance regulations. Nevertheless, all ten respondents emphasized that government’s contribution has not been sufficient in incentivizing citizens to act in a pro-environmental way. It was found that despite citizens’ will to act in an environmentally-friendly (green) way, the lack of governmental support do not give them the appropriate motivation. Apart from the lack of incentives, three out of ten participants demonstrated government’s economic interests, time-consuming bureaucratic procedures and the non-or limited use of natural resources respectively, as major obstacles that prevent citizens from behaving in a green way. Furthermore, two out of ten interviewees pointed out the need for a framework that would financially support the construction of green buildings.

“Government should take measures for the protection of the environment and citizens should realize that climate change leads to the destruction of the planet and threats our lives” (Case 6).

“I believe that governments have not taken the steps they should, because they do not want to conflict with large economic interests” (Case 5).

“I think there should be a legal framework that could support this kind of construction; for example, tax credit and subsidies” (Case 3).
5.1.2 Personal factors

**Thermal comfort - energy cost**

All ten participants reported the lack of thermal comfort and the high energy cost in their previous house as a determinant of their decision to have a green house built or have their conventional house converted into a green one. It was found that all ten house owners constantly used the air-conditioner during summer, while seven out of ten used it also during winter. Six out of ten interviewees reported that the temperature is so high in summer that it is impossible to stand the heat without an air-conditioner. More specifically, three out of ten respondents highlighted the feeling of being scorched. On the other hand, during the winter months four out of ten house owners mentioned that they could feel the cold in their previous house, while one out of ten pointed out the need to wear thicker clothes as a result of being unable to stand the cold and humidity inside the previous house.

“During summer I was in the living room, sitting on the sofa and I was ‘scorching’ because of the sun, and during winter I was feeling cold. Having no other choice I used to turn on the air conditioner either to heat or to cool the house”. (Case 2).

Reference was also made on the inappropriate character of the air-conditioner. Emphasis was given on the unhealthy indoor environment in which the use of air-conditioner results, especially for children; it was stressed that the dry atmosphere that is created is not suitable to live in. Besides, three out of ten interviewees reported asthma and allergic rhinitis as important health issues for not using the air-conditioner.

“In summer we were feeling so much heat, like being in a greenhouse. On entering the house we used to turn on the air-conditioner. In winter we used to wear thick clothes and we were feeling the cold air from the windows” (Case 10).

“Both in winter and summer we had thermal discomfort. We used the air-conditioner, while we knew that was not healthy, but having young children we could not do anything else. My little daughter suffered from allergic rhinitis and it was not good for her” (Case 9).
The high energy cost as a result of space heating-cooling in the previous house was also mentioned by all ten house owners. They all demonstrated high bills both during winter and summer as an important factor that led them to decide on a green house. The oil price was identified to play a significant role in their decision to live in a green house, since the amount of money needed for purchasing oil every year was always a problem and created feelings of pressure. Additionally, two out of ten pointed out the fact that they were fed up with running up enormous bills.

“Before moving here we were tenants in a house that had conventional heating system with radiators and finding the amount of money for oil, was the ‘permanent problem’ every winter” (Case 1).

“As for electricity consumption and shared maintenance charges, many times they were too high” (Case 9).

“We pay much money both for power and oil. The result is the same; we freeze in winter and we feel hot in summer” (Case 8).

Apart from the relationship between thermal comfort and energy cost that all ten interviewees pointed out, inconvenience inside the house was also taken into account. Focusing on the use of the air-conditioner, two out of ten respondents stressed the fact that they could not open the windows and ventilate the house for fear of disturbing the indoor atmosphere.

“You cannot ventilate, since by opening (door, windows), immediately you lose what you had already achieved by using air conditioner” (Case 1).

“Our life was not comfortable and we could not make use of the air and light” (Case 6).
Education - work, (technical) skills

This study found that six out of ten house owners have a university degree, while the rest have college education. However, when they were asked about the role they think their education and/or work played in their decision on a green home, eight out of ten reported that they were influenced by their work, while the rest do not have the same opinion. For example, in case 2, the respondent mentioned that being an automobile engineer by profession influenced him to have a green house built. In case 4, the participant’s work as an engineer in a shipping company played an important role in his decision to buy an old conventional detached house and have it converted into a green one. Nine out of ten participants described certain personal experience in their workplace which motivated them to adopt the green house concept. For example, in case 10, the respondent considers her job as a key-factor on her decision to have her old house changed into a green one. She is a layer and as she reported, a specific trial on her career about environmental degradation played a dominant role in her decision.

“I am a lawyer and in a trial I was given the opportunity to prove the destruction of an ecosystem resulted from a factory unit; since then I have been more conscious” (Case 10).

The role of technical and non-technical skills in the decision on a green home was also mentioned. This study identified that only two out of ten could understand the function of several energy-saving techniques and green technology systems (case 2, 4). In case 2, the interviewed house owner was found to be technically skilled to understand low-emissivity glazing. In case 4, the participant had the technical knowledge to understand the operation of heat pumps, under-floor systems and low-emissivity glazing. Eight out of ten interviewees were found to know about several non-technical energy-saving strategies at home such as cross ventilation (case 1, 7), shading through vegetation (cases 4, 5, 6, 7, 8, 10), house orientation (case 3, 4, 5, 7), natural lighting (case 5, 6, 7, 8, 9) and natural heating (case 5, 7).

“During summer, we open the windows late in the night so as to ventilate the house and we closed them early at dawn, and we do not open them again until the night”. (Case 1).

“The house was built in a way in which sun could warm the house in winter and especially the living room which has big glass surfaces; and in summer, with an overshadowing and with the orientation of the house to reduce the solar radiation” (Case 3).
Age, Gender

This research indicates that the choice for a green house does not depend on age. From all ten house owners who invested in green and energy-efficient methods the youngest is 38 and the oldest 67 years old. As far as gender is concerned, this study further found that the ten Greek house owners’ decision to have a green house built or have their old house converted into a green one was not made individually but by both wife and husband. Depending on their knowledge, preferences or needs, the members of each family influenced each other.

“I think that we influenced each other since it was something we both wanted” (Case 1).

“That was our goal and we decided with my wife who is a biologist, to reach out to companies for more information” (Case 9).
5.1.3 Social factors

Family

This research showed that family played a pivotal role in participants’ environmental consciousness and desire for a green house. Nine out of ten interviewees reported that family members influenced their decision. A reference is important to be made to the fact that seven out of nine owners were influenced by their children. However, going back to their childhood, only five out of ten house owners were influenced by their parents in developing environmental consciousness. It is also interesting to notice, that of the nine house owners who reported to have been influenced by their children, only three were also influenced as children by their parents.

“My parents were educated; from my childhood they had taught me to respect the environment, not to throw garbage, not to pollute the beaches and generally to love nature. I remember my father taking me by hand and walked to the mountain” (Case 10).

“My parents lived with us in the city center because of their work. But the weekends we had a little cottage by the sea and we used to go there. Obviously this contact with nature made me more environmentally sensitized” (Case 9).

“Decades ago the environment sector was not a priority”, “only some suggestions related to cost saving (turn off lights)” (Case 2).

Media

When the participants were asked about the role they think Media played in their environmental concern and their decision on a green house, the majority of them reported that they were much influenced. Eight out of ten interviewees mentioned that Media have made them more environmentally aware, while four out of eight pointed out the determinant role of Media in motivating them to live in green houses. The information about the green house concept and about renewable energy sources, mainly derived from the internet, was found to have influenced the four house owners’ decision about a green house.

“Everything you read and you hear makes you create a consciousness about ecology and about its dimensions on a global scale” (Case 3).

“The media play a dominant role in our lives, sometimes positively and sometimes negatively. In the case of the environment they influenced me positively and I got enough information about the target that I had in my mind” (Case 9).

“Yes I have been influenced by the media, especially by internet where there are many articles on the environment and energy-efficiency of machines associated with it” (Case 4).
The responsible Construction and Development company was found to play a key-role in all house owners’ decision to have a green house built or have their conventional house converted into a green one. Although nine out of ten interviewees (Case 2, 3, 4, 5, 6, 7, 8, 9, 10) were aware of specific solutions, they all reported that the engineer of the company recommended them several green solutions and they finally chose the most energy-efficient and cost-effective. The main finding is that all ten house owners were found to have a predisposition towards an ecological house, which was realized with the help and advice of the engineer. Emphasis should also be given on the fact that all ten house owners trusted the engineer, discussed their needs with him, followed his suggestions and finally reached a consensus.

“I discussed with the engineer, we took into account which was the most energy-efficient and cost-effective and we decided”. (Case 2).

“The construction company recommended us some choices and we then decided” (Case 3).
Friends – Neighbours

The findings of this study show that only four out of ten interviewees reported that they were influenced by their friends and/or neighbours concerning a green house. As six out of ten participants mentioned, the majority of their friends and neighbours were not aware of green houses. Specifically, two out of six house owners mentioned that their friends used to tell them that they were simply wasting their money. The other four claimed being affected by some of their friends. Three of them had already visited similar green houses and one of them was actually encouraged to opt for a green house by an environmentally responsible friend.

“Some friends in Kapandriti had built a green house we were really jealous of, in a good sense. From that time we were influenced so much and we thought that maybe we could do the same in Psychico” (Case 10).

“A good friend had built something similar; when we visited him, a green house became our ultimate goal” (Case 9).

“There were some people who had informed us, we had also searched and we had also met someone who had built a similar house in Greece” (Case 3).

Another important finding of this research is the kind of neighbours’ reaction as well as the interest shown in the green house. Half respondents reported that some of their neighbours were staring at the company’s advertising label that described the house without really understanding what was going on, so they started asking questions about it. Four out of ten participants said that friends and neighbours who had paid them a visit were excited about the indoor thermal comfort and had been interested in doing something similar. In addition, two out of ten house owners emphasized that those friends who previously made fun of them, saying they were wasting their money and did not support their decision, after visiting them they changed their mind.

“Neighbours stared at the label, which mentioned bio-climatic house and in general asked about it. I cannot say that there was positive or negative reaction, but there was curiosity” (Case 1).

“Listen, all those who made fun of us before about wasting money without benefit, now, although some of them are not sensitive in environmental protection, just of the reduction we have on energy consumption, and therefore on our expenses they have changed their way of thinking” (Case 7).

“There was curiosity; they cannot believe it and the truth is that even now they cannot understand how it operates. Entering the house in winter when it is warm, they do not see radiators and they do not understand how it works; some of them are excited that in the summer it is cool and they are interested in it” (Case 3).

“Most of them felt that everything we did was extravagant; but now with the economic crisis and the increase in oil price, they vindicated us” (Case 10).
5.1.4 Financial and technical factors

Investment capacity - cost of green solutions

The results of this study indicate a positive relationship between investment capacity and cost of green solutions. Of the ten house owners who decided to have a green house built or have their old house converted into a green one, three belong to a middle annual income group, three belong to a middle-high annual income group, while four belong to a high annual income group. Another important finding is that despite their savings, seven out of ten interviewees reported that they took out a loan to support their endeavour, while one out of ten took out an additional loan. Moreover, it was found that three out of ten house owners sold their previous houses to invest in a green one. As far as the cost of green solutions is concerned, it seems that it did not significantly influence the house owners’ decision to have a green house, since all of them covered the necessary cost.

“We wanted to install an ecological heating type; a system which would be ecological and less expensive. It should be ecological and then we were searching for the most cost-effective; since we also had big area, we finally chose geothermal heat pump system” (Mrs. Iessen).

Information about green solutions

This research identified that nine out of ten house owners were informed about a number of green and energy-saving methods. Particularly, seven out of ten respondents were found to have information about low-emissivity glazing, four out of ten were aware of under-floor heating and cooling systems, while only two out of ten were informed about air-water heat pumps. It’s worth mentioning that the collected data demonstrated that half interviewees had heard about the green house concept.

House size

Respondents were asked to describe if the size of their house determined their decision. All ten house owners reported that there is no relationship between their house size and their decision to take both green and energy-efficient measures. As they all mentioned, even if they had a smaller house they would adopt the green house concept.
**Technical - Financial Barriers**

It was found that all ten participants did not encounter significant difficulties and delays and did not face serious technical and financial problems. However, depending on the location of the house, all ten interviewees reported delays due to weather conditions. For example, all four owners on the Aegina Island mentioned delays due to constant rain. In general, all ten respondents regarded weather events such as rain, high temperature and strong wind, as responsible for delays, which, however, did not determine the flow of the project. Delays were also found to result from loan disbursement. Two out of ten house owners reported the low flow of the amount of money as a factor that resulted in a five and six month delay respectively (Case 9, 7). In addition, one of the two house owners who decided to have a geothermal heat pump installed, said that the time consuming bureaucratic processes for the drilling license was an impediment (Case 1).

Four of the five house owners who had decided to have their conventional houses turned into green ones, said that they faced technical problems. Specifically, two of them described the humidity (Case 6) and the grouting of the stone walls (Case 4) respectively as part of the technical difficulties. The other two demonstrated the separation of the heating systems pipes (Case 10) and the replacement of the floor (Case 8, 10) as technical delays.

Apart from technical barriers, financial barriers were also highlighted by all ten house owners. Although all ten participants had pre-budgeted the whole project, they all reported that it finally cost them a bit more. Especially, three out of ten interviewed respondents reported that they had to pay much more than they expected. As they mentioned, the budget was not fully met because during the construction they decided to change the interior layout of the house (case 4), took more energy-efficient measures (case 9), and due to the inclination of the plot they had to invest in retaining concrete walls (Case 7). The latter might not directly be related to the amount of money needed for the construction of the green house, but it financially affected the house owners in an indirect way. As they mentioned, the high cost of the surroundings prevented them from investing in a geothermal heat pump.

“I would say that bureaucracy created some delays, especially for the permission that was needed for drilling; it was a time consuming process” (Case 1).

An important finding is that although all ten participants finally paid more than they had calculated, three of them are convinced their investment is going to be quickly amortized (Case 1, 2, 3), two of them consider the higher cost to be common characteristic of a building process (Case 6, 10), while one of them has already amortized (Case 6).
Previous investment

Of the ten interviewed house owners only one had previously invested in energy-saving measures (Case 2). As the respondent reported, he had invested in thermal-insulated frames in his previous house. He also said that in his current green house he decided to have better quality frames installed.

“Given that in my previous house I had installed thermal-insulated frames, I knew about them. Now in this house we installed higher quality thermal-insulated frames”. (Case 2).
5.2 New factors

Given that this thesis studied how several factors (determinants of pro-environmental behaviour) affected ten Greek house owners’ decision on a green house and not their willingness for particular green and energy-efficient products, an innovative understanding was provided. Apart from the determinants of pro-environmental behaviour that literature has long established, this research found seven new factors that affected eight out of ten Greek house owners’ decision to choose a green house. Eight out of ten interviewees reported the presence of several factors that among others made them decide to have a green house built or have their old house converted into a green one.

Six out of ten interviewees stressed the need for natural lighting as one of the factors that led them to choose low-emissivity glazing (Case 4, 5, 6, 7, 8, 9), while two out of ten pointed out the further need for natural solar heating (case 4, 7). In addition, three out of ten house owners emphasized their desire to be in contact with nature as an additional reason to opt for low-emissivity glazing without shutters (Case 6, 7, 8).

Two out of ten interviewees mentioned the lack of autonomy in their previous house as another important factor that led them to use a gas heating system and an air-water heat pump for heating, respectively (Case 6, 10).

Space-saving was also identified as another factor that affected two out of ten house owners’ decision to have an under-floor heating system installed (Case 5, 7).

This study further identified the need for maintenance in the previous house as another factor that influenced two out of ten participants to invest in high energy performance shell (Case 7, 8).

Three out of ten participants stressed the inappropriate frames insulation (Case 3, 10), and the inappropriate shell insulation (Case 7) in their previous house as some of the main factors that led them to choose a green house.

The next table demonstrates the new factors that influenced eight out of ten Greek house owners.

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Table 3. New Factors
5.3 Discussion

The findings presented in this thesis indicate how specific factors influenced ten Greek house owners’ decision regarding a green house. Five of them decided to have a green house built and the rest decided to have their conventional house converted into green. Furthermore, the collected data revealed seven additional factors that affected eight out of ten interviewees to have a green house. However, given that each house owner was not influenced by the same factors and in the same way (direct-indirect), a deeper understanding of each case is essential. Before doing this, however, an analysis and interpretation of the findings is of high importance.

Contrary to a current study (Samarasinghe, 2012) which by surveying a sample of 200 Sri Lankans found that thermal comfort does not influence their willingness to live in a green home, this thesis demonstrated lack of thermal comfort as one of the main factors that influenced all the ten Greek house owners to opt for a green house. This difference seems interesting since both in Sri Lanka and Greece, despite the different climate, high temperatures are frequent.

However, the fact that all ten Greek house owners considered the thermal discomfort to result from UHI phenomenon and ineffective urban planning, can further be interpreted. During the last 40 years, in most urban areas Greek government enabled builders to construct small-surface apartments in multi-storey buildings that finally did not comply with several design and insulation regulations. Taking into consideration that the majority of building blocks in urban areas have 2-3 uninsulated small apartments per floor, it is obvious that the residents’ daily activities along with the lack of green zones and the inappropriate design for cross-ventilation and ventilation among buildings increase the temperature. Therefore, that kind of buildings absorb a great deal of heat which in turn deteriorates U.H.I and intensifies the sense of thermal discomfort. Apart from ineffective urban planning, the climate of Greece also played a role in the lack of thermal comfort present in the majority of urban areas. The high housing needs, resulting from the high urbanization degree during the last 40 years, has been conducive to the creation of UHI phenomenon. Additionally, the predisposition of the Greek climate towards high temperatures, along with the frequent thermal air masses coming from Africa continent, especially during summer, make the situation even worse.

Besides the thermal discomfort in all ten participants’ previous houses, energy cost was also found to be one of the most important factors that led them to choose a green house. This can be interpreted by the fact that all ten interviewees had lived in conventional apartments or houses which meant high bills for space heating-cooling due to thermal discomfort. The high cost is again connected with the lack of thermal comfort coming from low building energy performance and ineffective urban planning. That is to say, the thermal discomfort resulting from the building energy inefficiency and the outdoor environment meant that the use of the air-conditioner was necessary which led to high energy cost. This experience with thermal discomfort and high energy cost seems to explain all ten house owners’ awareness of climatic problems such as global warming and UHI phenomenon; having lived under these problems, all of them have understood not only their meaning but also their impacts. Again, this can also be related to the temperature rise and the ineffective planning experienced by all ten respondents.
Apart from the energy consumption and the high oil and electricity expenditures that all ten participants regarded as the result of both heating and air-conditioner usage, the unhealthy indoor atmosphere was also considered determinant of all ten house owners’ decision to opt for a green home. Although this thesis presented thermal discomfort, air-conditioner use and high cost as factors that motivated all ten Greek house owners to live green, previous studies have controversial results. In a survey by Sardianou (2007), the high electricity cost did not seem to stimulate the willingness of Greek consumers to adopt energy-saving strategies. In addition, in a survey-based study by Samarasinghe (2012) thermal discomfort was not a determinant of consumers’ willingness to live in green houses.

The high level of environmental knowledge and consciousness of all ten participants is another important finding of this research that needs further interpretation. The fact that they were all found to be aware of environmental issues such as global warming and U.H.I can be explained by the fact that, they have all lived in a time when climatic problems are acute both in Greece and internationally; all ten participants are familiar with the dramatic temperature rise during the last two decades. Environmental consciousness was also found to characterize all ten Greek house owners; until now in their lives they all have been trying to consider the environment whatever they do. It can further be said that their contribution to environmental protection depicts more than just their participation in environmental activities. That is to say, while one out of ten interviewees simply attended seminars concerning environmental protection (case 3), the rest showed a higher degree of social activism by participating in beach-coastline-stream cleaning, reforestation and in voluntary fire safety organizations. It can be deduced that all ten respondents seem to feel a high environmental responsibility, with one of them (case 8) taking the risk of getting involved in fire-fighting.

Additionally, the fact that six out of ten participants have a biological wastewater treatment unit and a rainwater collector system installed, shows that they care about environment and ecology; not only by recycling and re-using water, but also by purifying it without chemical substances. Such decision-behaviour can be interpreted by the fact that during the last two decades pesticides and detergents have been considered highly harmful and dangerous. In addition, two out of ten house owners have also bought a hybrid car (Case 5, 9). This further explains they environmental consciousness as regards air pollution. Both findings definitely show a well-developed environmental consciousness and green buying behaviour. The interpretation of such findings, however, seems to require a flashback to childhood. That is, environmental consciousness can be considered to be well-rooted in childhood time. Nevertheless, although all ten participants were made environmentally sensitive as children or teenagers the idea of living in a green house did not come up since environmental problems were not as acute as they are today. Therefore, their consciousness was limited to saving energy and preserving the environment. However, since a green home embraces both environmental protection and energy-saving, house owners’ environmental consciousness has presumably affected their decision to live green.

Although the findings of this thesis are consistent with some studies which have shown that people conscious about environmental issues and aware of and energy-related problems have the intention to save energy (Sardianou, 2007), they are not consistent with the results of other studies. For example, according to a recent
research by Eves and Kippes (2010) which investigated the way in which consumers in New Zealand purchase a house, the results showed that buyers had given emphasis on the size of house and number of bedrooms, rather than the green and energy-efficient character of the house.

This thesis further shows that seven out of ten Greek house owners who chose to live in a green house were highly educated (university degree), while the rest had graduated from colleges. Similarly, prior studies (Theodori and Luloff, 2002; Casey and Scott, 2006) found a positive relationship between educational level and environmentally-friendly behaviour; highly-educated consumers have been found to behave in a more environmentally-responsible way. Additionally, the findings of this thesis are consistent with a recent study which has shown that highly-educated house owners would have the willingness to invest in measures such as house shell improvement (Gustavsson, Nair and Mahapatra, 2010). Conversely, other studies demonstrated that highly-educated people have little intention to invest in additional insulation (Beers, McKenzie, Desmarais and Nemiroff, 1995), while Neuman (1986) and Sardianou (2007) did not find any relationship between people’s education and willingness to behave in an energy-saving way. The discrepancy between the result of this thesis and Neuman’s (1986) survey (764 households in Southern California) is not surprising, since Neuman conducted his research at a time when climatic problems such as global warming had not shown up yet. On the contrary, the empirical findings of this thesis in comparison with Sardianou’s (2007) survey (500 households in Greece) were rather unexpected, since both this thesis and Sardianou’s survey were conducted in the same country (Greece) and in a decade (2007-2013) when climatic changes and global warming have set in. The most likely explanation of this contradiction is related to the fact that while this thesis focused on house owners’ actual decision to choose a green and energy-efficient house, Sardianou’s (2007) study simply investigated people’s willingness to take energy-saving measures such as house shell insulation and use of renewable energy sources (RES).

This research also examined house owners’ age as a determinant of their decision to opt for a green house. The results show that there is no evident relationship between interviewees’ age and their decision to have a green house built or to have their existing house converted into a green one. In sharp contrast to an analysis by Getzner and Grabner-Kraeuter (2004) which showed that younger individuals were considered more willing to act in a more environmentally-friendly way than older ones, this thesis indicated that both young and older individuals behaved in an environmentally-friendly and energy-saving way by deciding to live in a green home. The findings of this thesis are explained by the fact that house owners’ decision was found to have mainly been influenced by other factors such as thermal discomfort, high energy cost and by a combination of environmental sensitivity and information.

Likewise, gender does not seem to have played an important role in such a decision. As the interviews showed the decision was made in common by both wife and husband. This finding is consistent with several previous studies which suggest that gender does not necessarily entail the intention to behave in a pro-environmental and energy-saving way (Sardianou, 2007). Similarly, other researches have shown that gender is not related to the willingness to adopt energy-efficient methods (Gustavsson et al, 2010) and systems that make use of RES (Sardianou and Genoudi, 2013).
The empirical results of this dissertation also showed that information provided by the media helped all ten house owners to form environmental consciousness, while it provided eight of them with an insight about specific green and energy-efficiency measures. This finding agrees with other studies which have shown a positive effect of information on consumers’ intention to save energy (Sardianou, 2007) and invest in RES technologies (Claudy, Michelsen, O’Driscoll & Mullen, 2010). It’s worth mentioning that half respondents (5/10) were informed about green home concept. This can be explained by the fact that in last decade national and European regulations indirectly promote “green home” as the solution to environmental protection issues, buildings energy efficiency and in the long run sustainability. As a result, it can be assumed that this energy-efficient and sustainability-oriented building approach indirectly motivated all ten house owners to invest in a green house.

This dissertation confirms that family and friends had a positive effect on respondents’ decision. This result concurs with two other studies which have shown that family and friends stimulated consumers to recycle (Chubb, 1994), as well as to take the initiative to save energy and invest in RES systems (Genoudi et al., 2013). A reference is important to be made to the influential role of family on all ten house owners’ decision, found in this thesis. As it was shown in several cases, children played a good part in the final decision, mainly by giving their parents an important stimulus. This family interaction can be explained by the fact that in Greece family bonds are very strong. This is further interpreted by the fact that children in Greece prefer to live with their parents even after the age of 18, while parents use to help them financially and generally provide for them, especially now with the financial crisis. That’s the reason why seven out of ten interviewees, despite the recession, took out loans to invest in green houses, taking into consideration their children’s future. It has been shown that friends as well played an important role. This is clear from the fact that as three out of ten interviewees reported, they visited some of their friends’ green homes and experienced their benefits. So, it can be said that they got acquainted with the idea of living green and they were presumably convinced to invest in a green house. Thus, it can be inferred that friends’ experiences served as a source of information.

This research, empirically examining how income affected the decision of all ten Greek house owners to choose a green house, found that they all belonged to three different income groups (middle, middle-high and high). It is also important to mention that the empirical data disagree with what has been found by other studies. A recent analysis in New Zealand by Eves and Kippes (2010) showed that middle income group house owners have taken into account neither the house shell insulation nor the green character of house heating system when purchasing a house. Another important finding of this dissertation is related to house owners’ income and investment capacity. It is worth mentioning that although all ten respondents come from three different income groups, all of them took green and energy-efficient investment measures. All ten interviewed participants were found to have paid the cost of energy-efficient and RES systems solutions, while seven of them took out a loan to support their endeavour. This finding, however, is not in agreement with two recent studies. A research by Wang, Zhang, Yin and Zhang (2011) has shown that people are not willing to pay the extra cost for energy-efficient products and systems because of the high cost. Another recent inquiry by Genoudi and Sardianou (2013)
has also demonstrated that house owners are reluctant to utilize RES systems because of the high initial and maintenance cost.

To sum up, this thesis indicated that thermal comfort and energy cost were the main reasons that stimulated the ten Greek house owners to turn to green and energy-efficient solutions. Family and friends also played an important part, showing the power of social interaction. Education was found to form environmental attitude, while workplace proved to be a source of information. The role of the responsible construction company was also important in promoting a number of green solutions and information. This research further discovered that all ten Greek house owners were well-informed on the option of a green house and that investment capacity also matters. It’s worth noticing that finally, environmental sensitivity and awareness of global environmental problems served as a form of driving force.
5.3.1 Direct – Indirect influence

This thesis could not approach the interviewees from a psychological aspect. However, it has managed to make assumptions on the direct and indirect impact that several factors had on the house owners’ decisions.
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Table 4. Direct and indirect influence of factors
Case 1

It was the **lack of thermal comfort** and the **high energy cost** that actually led the 38 year-old German language teacher and her husband to decide to have a green house built on the Aegina Island. The fact that they used to turn on the air-conditioner both in winter and summer resulted in a dry atmosphere inappropriate to live in, as well as in high bills. Besides, as the German teacher reported, their 2,5 year old child (**family**) gave them the stimulation to decide on a house that would be environmentally-friendly and would create a healthy indoor environment. These three factors seem to have directly influenced them.

As the interviewed teacher mentioned, creating something environmentally-friendly was of high importance. It can be assumed that her decision resulted from her general **environmental consciousness**. Taking into consideration that as a child she tried not to pollute the sea or harm the environment, and as an adult she has been trying to save energy, a hypothesis regarding her environmental consciousness can be made. That is, her environmental sensitivity in conjunction with her **participation** in local coast-cleaning groups can be assumed to have directly motivated her to choose a green house.

The **construction company-engineer** seems to have played a key-role in their decision. It can further be assumed that the engineer had a direct influence. This is understood by the fact that the installation of the geothermal heat pump, the under-floor system etc. was not part of the initial design of the house. By providing her and her husband with specific information, the engineer seems to have played a pivotal role.

Education and work might not have had an effect on her decision. However, taking into consideration the woman’s awareness of cross-ventilation, an indirect influence can be presumed.
Case 2

The decision of the 55 year-old automobile engineer to choose a green house was directly made due to lack of thermal comfort and high bills in his previous house in the centre of Athens. This is obvious by the fact that he and his family used to turn on the air-conditioner both during winter and summer. As the interviewed reported, the bills were high enough, while the thermal comfort continued to be inadequate.

His family also played an important role in his decision. He made this choice together with his wife and his children seem to have had a determinant role in the common decision. As he said, his children are very environmentally responsible and especially his daughter; he emphasized that his “greener” daughter actually influenced him in favor of a green house. Therefore, it can be assumed that it was his daughter’s green attitude that directly motivated him.

A direct effect can also be considered to have resulted from the 55 year-old house owner’s education and job. It can be hypothesized that his work enabled him to come closer to the green technologies and the energy-efficient solutions he decided to implement in his house. Although he was aware only of low-emissivity glazing, it seems that his education provided him with the necessary technical skills to understand the operation of several green technology systems such as under-floor heating-cooling systems and air-water heat pumps. In addition, his previous investment in thermal-insulated frames and low-emissivity glazing can be considered to have had a direct effect on his decision on such a house. Taking into account his experience on the benefits of thermal insulated frames and low-emissivity glazing, it can be assumed that he was directly influenced to have them installed in his new green house. Despite his technical knowledge and his previous experience, it can be said that the construction company had a direct effect on his decision. Although he had the ability to understand several energy-efficiency methods and systems, the construction company provided him with a lot more information about green solutions. A direct influence can also be assumed to have resulted from the information he got by the media and by reading books, as well as by his environmental knowledge. As he emphasized, the media brought him closer to environmental problems not only on a national, but also on a global scale. As a result, it can be said that he had acquired an integrated insight into global environmental problems that in conjunction with the influential role of his children made him more environmentally conscious.
Case 3

The 57 year-old journalist and her husband’s decision to opt for an ecological house was directly affected by the lack of thermal comfort and high cost in their previous house. Given the thermal discomfort she used to feel when she was in Athens during summertime, it can be presumed that her decision to move to a green house on Aegina Island shows that she could not stand the high temperatures and the high urbanization degree. It can further be assumed that her experience with inappropriate frame insulation in her previous house in Athens directly encouraged her to have a green house.

Family also seems to have played an important role in their decision. As the 57 year-old journalist said, the decision on the green home had been made in common with her husband, while she used to discuss the building process with her children. It can further be hypothesized that she was influenced by her family in a direct way.

Her work also seems to have directly motivated her to live in a green house. It can be assumed that working as a journalist, she had ease of access to several sources of information. Besides, the fact that she lived and worked in Germany for many years, can be considered to have been conducive to her acquisition of information on global environmental issues and green products. It can also be deduced that her familiarity with the climate in Germany and several energy-saving methods determined her to have a green house built. As she reported, having lived in Germany for many years, she was convinced that her new house should be properly insulated. As shown in the interview, the 57 year-old journalist, by having lived abroad for many years, had experienced the performance of under-floor heating systems, something that had affected her decision in a direct way. Apart from the information she had as regards several energy-saving methods, she also knew about house orientation, which definitely stimulated her in a direct way.

It’s worth mentioning that her concern about the environment indirectly influenced. She had already attended relevant seminars concerning the environment and she took the decision to live in a green house.

Additionally, some family friends directly influenced her and her husband to take this decision. The information they got by a friend who had a similar house in Greece, can be considered to have served as a stimulus.

As far as the construction company is concerned, it can be hypothesized that it played an indirect role in their decision. This is explained by the fact that both she and her husband were already aware of various energy-efficient building methods, as well as of the green house concept.
Case 4

The 60 year-old engineer’s and his wife’s decision to buy a 40 year-old detached house on the Aegina Island and have it converted into green was directly made due to high energy cost and lack of thermal comfort in their previous house in Athens. As he mentioned, the temperature was very high and during the last years he and his family had experienced small heat waves. They used to turn on the air-conditioner and as a result they used to pay high bills.

In addition, his environmental consciousness is hypothesized to have affected his decision in a direct way. This can be explained by the fact that his parents taught him to save energy, love the place he lives in and not fill it up with garbage, while since his high school years he had begun to be active by participating in environmental activities such as coast-cleaning. It can also be presumed that his knowledge of environmental problems such as climatic changes and urban heat island phenomenon directly influenced him to live in a green house. His awareness of the consequences of urbanization might have directly affected his decision. The fact that he had lived in an apartment in the centre of Athens without green zones around might have contributed to his moving out of the city and settle on the Aegina Island.

His work as an engineer has also affected his decision on a green home in a direct way; not only due to his ability to understand technical issues, but also because of his experience at his workplace. Apart from his general knowledge of engineering, working in a building where the under-floor space heating was operated by means of heat pumps, made him familiar with their operation and benefits. His job as an engineer can also be considered to have played a significant role in his understanding of low-emissivity glazing and their benefits. It’s worth mentioning that the need for natural lighting and heating (through sun) directly influenced the 60 year-old engineer to have low-emissivity glazing installed. This can be related to the need for reduction of energy consumption.

Media (the internet) also seem to have directly influenced the owner’s decision to have his conventional house converted into a green one. As a source of information, the internet brought him closer to environmentally-friendly and energy-efficiency systems.

The decision for such a house was made by both him and his wife. However, given his education and technical skills it can be hypothesized that it was him who played the most important role in the common decision.

As for the responsible construction company, it has probably influenced him in an indirect way. The 60 year-old engineer’s skills and knowledge of several green and energy-efficient systems and techniques can be considered to have been the starting point that made him decide on a green home, while the construction company seems to have had a second role.
Case 5

The 58 year-old pharmacist’ and her husband decision to have their conventional stone house on Aegina converted into a green one was mainly because of lack of thermal comfort and high energy cost in their previous house in Athens. As she reported, the house in Athens was cold in winter, while during summer the situation was unbearable. In both winter and summer they used to turn on the air-conditioner which was very expensive. Therefore, it can be concluded that the indoor thermal discomfort and the high monthly expenses directly determined them to opt for the “green home” option.

Furthermore, her environmental consciousness seems to have had a direct effect on her decision. She started to discuss environmental issues with her fellow students during her studies at university, and later on while raising her two children she learned to care more about the environment and tried to save energy. Her two children and especially her elder son had presumably motivated her to have an environmentally-friendly house in a direct way. Her son’s agricultural studies and his love for nature brought her closer to environmental protection and his desire to settle on the Aegina Island further influenced her. The environmental consciousness she gained with the help of her children might have also directly affected her decision to buy a hybrid car.

Her work may also have played a role in her decision to implement green and energy-efficient methods. As a pharmacist she was aware of the way living conditions affect human health and thus she made the decision to live in a green house. Considering that health issues are related to thermal discomfort, which directly influenced her, the direct impact of her work can be hypothesized.

Moreover, the information she had on under-floor heating-cooling systems in common with her awareness concerning house orientation and shading methods may supposedly affected her in an indirect way. Aware of thermal benefits of under-floor systems and in her effort to save space in the house she preferred to have them installed instead of having common radiators which take up a lot of space. She mentioned of under-floor systems, as well as her desire not to lose space as with common radiators. She also placed trees to provide the house with sun and shade in winter and summer respectively. In contrast, the information she and her husband acquired by the construction company influenced them in a direct way. Given that they did not know anything else apart from under-floor systems, the responsible construction company provided them with the information they needed to make their decision.
Case 6

The lack of thermal balance and high expenditure in the previous house directly influenced the 43 year-old secretary and her husband in favour of buying an old conventional two-storey stone house and have it converted into a green one. They used the air-conditioner both in winter and summer and thus they run up enormous electricity bills. The interviewed wife reported her asthma as another important reason for living in a house that would not need an air-conditioner. Thus, her health problems seem to have directly influenced them to opt for a green house.

Another factor that appears to have directly led them to this decision was the lack of autonomy in their old apartment in Athens. As the interviewed secretary reported, they could neither make use of the heating according to their needs, nor reach an agreement with the other tenants on the schedule of central heating operation.

The secretary’s education did not seem to have played a role in her decision to upgrade the energy-performance of the old stone house she bought. Her management studies do not seem to have influenced her. However, her workplace can be considered to be an important source of information on green houses. As she mentioned, the public project-construction company she works for gave her the opportunity to discuss the financial and environmental benefits of green homes with some engineers. This obviously influenced her in a direct way. Apart from the valuable information she gained in her workplace, the secretary’s skills also played a significant role in her decision about a green house. Having heard about low-emissivity glazing and passive lighting directly influenced her to have low-emissivity glasses without shutters installed and have awnings and canopies placed on her yard. In addition, her awareness of the advantageous role of trees which provide shade to the house directly stimulated her to have a garden that contributes to the further cooling of the house. She also did not put shutters in order to be in contact with nature. This seems to have influenced her in an indirect way.

Her environmental consciousness in conjunction with the information she got through media concerning environmental protection might have influenced her in a direct way to follow the green home concept. As she said, during the last 10-15 years the media have positively affected her towards a green home, while during the last 10 years she has become more sensitive to nature preservation. Her participation in reforestation activities can also be considered to have awakened her environmental consciousness.

Another finding was that her husband and her friends influenced her in an indirect way. Her husband as a chemist helped her understand how house heating and cooling works and some of her friends that were aware of environmental problems encouraged her decision. Likewise, the governmental regulation on building energy efficiency can also be hypothesized to have indirectly affected her decision to change her house into a green one. Being familiar with several building regulations as a secretary for a construction company, she was probably given the opportunity to have access to relevant information.
Case 7

The 50 year-old accountant was directly influenced by the **high energy cost**, the **lack of thermal comfort** and the constant **maintenance cost** due to inappropriate insulation and humidity in his previous house.

His **family** also had a direct effect on his decision to have a green house built. As a child he was motivated to respect the environment and save energy, while his mother used to tell him that nature will take revenge for the destruction people cause. Later on, when he made his own family his two children made him more environmentally active and whenever possible they all participate in several environmental activities. His two sons (19, 23 years old) and especially the older one also directly motivated him to have a house built that would be environmentally-friendly and energy-efficient. His older son desired a house with big windows which would also make use of renewable energy resources. Together they searched on the internet about geothermal heat pumps; the internet and in general **the media** had probably affected his decision in a direct way. On the other hand, although his education was not related to the construction of such a house, his workplace presumably had a direct effect on his decision. He worked in a building heated by means of under-floor system, so he had experienced its efficiency not to mention space saving, which possibly stimulated him to have it installed in his own house.

It’s worth noticing that both the media and his workplace served as a source of information.

The 50 year-old accountant’s decision to have a green house built can also be considered to be directly related to his awareness of natural lighting-heating and ventilation. That is to say, his decision to have low-emissivity glazing installed resulted from his desire to take advantage of the sun. Thus, it can be assumed that he was aware of the benefits that low-emissivity glasses can provide. Besides, he chose low-emissivity glasses without shutters to have a better view and feel closer to nature. His awareness of ventilation techniques can also be presumed to have directly determined him to make this decision. He mentioned the air movement technique (stack effect) as part of the house design, emphasizing the capacity of the glazed staircase to transfer the heat to the second floor.

Taking into consideration the information he had about a number of green and energy-efficient systems and techniques, it can further be assumed that the construction company had an indirect effect on his decision.
Case 8

The 67 year-old advertiser’s decision to have his old house converted into a green one was directly determined by the lack of thermal comfort, the high energy cost, as well as by the cost of maintenance. As he reported, the indoor temperature was not suitable to live in both during winter and summer. The constant use of the air-conditioner, especially during the summer, resulted in high bills and did not improve the indoor atmosphere; moreover, they faced health problems. The humidity on the north wall of the house and thus the high cost of its maintenance directly affected his decision to have high quality building insulation installed.

It can further be hypothesized that his environmental consciousness has also directly influenced his decision to invest in green and energy-efficient methods and solutions. His concern about the environment can be explained by the fact that, although he felt partly responsible for the environmental degradation, during the last decade he had made serious efforts to change this irresponsible attitude. As he said, he tries not to harm the environment and to save energy at home. It can thus be assumed that his environmental sensitivity played a key-role in his decision to convert his house into a green one. His love and care for the environment can further be explained by his participation in fire-fighting groups; the fact that he was willing to sacrifice his life for the environment shows a sensitive person. Information derived from the internet seems to have also directly contributed to his environmental awakening. As he reported, during the last ten years the internet has provided him with information about environmental organizations and environmental protection activities.

His work can also be assumed to have directly influenced him. Being an advertiser he was given the chance to contact many people and hear about green houses. As he mentioned, during the last year he has been thinking about the green house concept.

An indirect influence also resulted from his family. The marriage of his daughter was another factor that made him decide to renovate the first floor.

The governmental regulation on building energy performance can be hypothesized to have affected his decision in a direct way. The renovation of his house had taken place before the enforcement of the energy performance regulation, however, his awareness of the future need for reduction of energy consumption led him to convert his existing house into a low-energy one.

The engineer of the construction company seems to have had a direct effect on his decision to invest in environmentally-friendly and energy-efficient solutions. Although he was aware only of low-emissivity glazing, the engineer played a determinant role in his decision to have an under-floor heating system and an air-water heat pump installed.
Case 9

Having directly been affected by the lack of thermal comfort, the high energy cost and the high shared maintenance charges in their previous apartment, the 45 year-old doctor and his biologist wife decided to have a green house built in a farm. Having to use the air-conditioner both during winter and summer months they realized that it was not healthy especially for their children; their little daughter suffered from allergic rhinitis and it caused her problems. As a result, their children also influenced them in a direct way. His education can also be considered to have played a dominant role in his decision to have a green house built. As he reported, the need for a healthy life profoundly influenced him. It can further be hypothesized that his education in conjunction with his little daughter’s health problems directly affected his decision.

Although his profession as a doctor is not related to the building of a green house, his awareness of low-emissivity glasses might have indirectly influenced his decision to have them installed. In addition, as a doctor he was definitely against the use of chemical substances, so he was probably motivated to have a biological wastewater treatment unit installed. It can further be assumed that his knowledge about a healthy life style in conjunction with his wife’s knowledge of biology had a direct effect on their decision.

A direct effect of his environmental consciousness on his decision to have a green house built can be considered to spring from his childhood. As he reported, as a child he used to go to their summer house by the sea at the weekends; he strongly believes that this weekly contact with nature made him more environmentally sensitive. His environmental sensitivity can further be explained by the fact that he has a hybrid car.

Additionally, his sensitivity to environment, and thus his decision on an environmentally-friendly house can further be considered to be the result of the information he acquired from the media. Watching the news concerning environmental degradation, his decision might have been indirectly influenced. Likewise, the building energy performance regulations (B.E.P.R) had directly affected his decision. Although the construction of the house started at the end of 2008, two years before the implementation of the B.E.P.R, the interviewed doctor reported the influential role of B.E.P.R in his decision to have a green house built. As he said, he knew that in the future all building should be energy-efficient.

The contribution of friends in the doctor’s and his wife’s decision to invest in green solutions, seems to have been of high importance. As the doctor said, a good friend who had built a similar house played a key-role in their decision to construct a green home. It can be assumed that their friends directly affected them.
Case 10

The lack of thermal comfort and the high energy cost have directly affected the 51 year-old lawyer to have her conventional house turned into a green one. As she reported, she used to turn on the air-conditioner both in winter and summer. In addition the lack of insulation and the lack of autonomy also influenced her. The frames were not insulated. Her family can also be assumed to have affected her decision on a green house. As she mentioned, both her daughters wanted this change, while the oldest one who studied architecture motivated her to search for companies that specialize in green buildings. It can be said that her children directly influenced her.

Apart from her family, her work can also be considered to have been an important factor. Although her education had nothing to do with green building concept, the lawyer’s job brought her closer to the importance of environmental preservation. As she reported, once in a trial when she had to prove that a factory contaminated a nearby lake, she realized the need for nature preservation. It can be assumed that this fact was a key-moment that made her more environmentally responsible and had a direct impact on her decision to have her house converted into a green one.

Her environmental consciousness had long been raised since her childhood. The fact that she used to turn off the lights to save energy and avoided polluting the beaches, as well as the long walks she had with her father, could be hypothesized to have directly influenced her decision on an environmentally-friendly house.

The 51 year-old lawyer and her husband’s friends, as well as the construction company can also be assumed to have had a direct influence on their decision. Their visit in a friends’ green house was another key-moment that stimulated them to change the house they lived in, into a green one. The responsible engineer also played a very important part by providing them with information about the green methods they could implement.
In general, all ten house owners said that they felt satisfied and that their efforts have been rewarded, not only in terms of thermal comfort, but also as regards energy-saving and saving of money. As they all reported, in their previous houses they had to cope with problems of thermal discomfort, humidity, inappropriate insulation and high energy-maintenance cost.

The majority of the respondents reported that in their previous house, although they used the air-conditioner, they had an unbalanced distribution of cool and warm air. As one of them mentioned (Case 1), the air-conditioned room was too cold in comparison with the outdoor temperature. As she said, when she entered the air-conditioned room “it felt like opening the fridge” (Case 1).

As a consequence, most of them made use of the air-conditioner both during summer and winter months and therefore the indoor atmosphere was dry, stifling and unhealthy. As it was reported by an interviewee (Case 9) his daughter had respiratory problems and suffered from allergic rhinitis. The use of the air-conditioner made things worse.

Some others had serious problems with humidity and inappropriate insulation which meant that they had to warm the house by constantly using the air-conditioner or the heating system. So, the heating and the maintenance of the house resulted in a lot of expenses which sometimes were beyond their means.

“The walls were not insulated and there were enough signs of humidity and as a result, it required maintenance every 2-3 years. This affects the quality of living” (Case 7).

“First of all, our experience of a conventional house showed that there were large costs for heating and cooling but also for its maintenance. We had serious problems with the north walls of the house because of humidity, and we had repaired it twice” (Case 8).

Another problem that usually popped up, was the lack of autonomy. As one interviewee reported:

“During winter, because we could not agree with the flat mates on the schedule of heating operation, we also used the air-conditioner” (Case 6).
Now that all ten families have moved to their green houses, things have changed to the better. They all said that, apart from the thermal comfort, the reduction of energy consumption and reduced bills, which were expected, they have a feeling of satisfaction, they are content with their choice and they feel that it was worth the try. It is important to mention that they are all convinced their investment is going to be amortized, while two of them have already covered the cost.

“This have to say, that in practice, it is better than radiators’ system or air-conditioner. In winter there is a “sweet warmth” inside the house which pervades everywhere and there is not just a warm point, as it happens with radiators. Besides, the atmosphere is not dry” (Case 1).

“I am very satisfied with the house we have built; I wish I had it in Athens” (Case 5).

Besides, all ten house owners mentioned the environmental benefits stemming from such a decision and that their behaviour could set an example to other people. They see their green house as a form of respect to the planet, their own contribution to environmental protection, an ultimate endeavour to improve the quality of life and perhaps a stimulus for others to adopt a “green” lifestyle.
6. Conclusions

This thesis, using literature on pro-environmental behaviour has presented a qualitative study of 10 Greek house owners who made the decision to invest in a green house. The majority of previous studies only investigated people’s willingness to take investment measures such as saving energy, improving their house insulation or installing RES systems. However, only a few studies addressed people’s actual decision to behave in such a way at home and even so, they focused only on single investment measures.

This study explored and analyzed how specific factors affected ten Greek house owners’ decision to adopt a green life style. This study chose a Greek construction company, specializing in green buildings, as the main source of access to green houses and selected ten privately-owned green homes. This thesis can be considered important because it investigated a research topic for which little is known. The innovative tactic of focusing on a holistic green building concept, gave this thesis the opportunity to get a better insight into the ten Greek house owners’ decision making. This acquired insight built theory by revealing six new factors that have affected the Greek owners’ green behaviour. As a result, it adds to the existing literature.

Through a qualitative analysis, this thesis identified thermal discomfort and high energy cost to be some of the main factors that convinced people to opt for a green house. In addition lack of insulation and high maintenance cost were also considered important factors.

It has also been found that environmental consciousness, family, workplace and information worked as a significant stimulus to the decision on a green house. Environmental sensitivity was found to be well-rooted in childhood and teenage hood. Interviewees’ children were found to have played an important part in motivating their parents towards green living. Besides, media, apart from providing awareness of environment-oriented issues, further informed a number of house owners about specific energy-efficiency methods. Information derived from friends also proved to be important and friends’ personal experiences regarding their green houses, served as an additional motive. The responsible construction company played its role in suggesting several green and energy-efficient solutions, adopted by the owners. Additionally, as the participants reported, the engineer’s recommendations and suggestions were based on an environment-oriented aspect. A reference is also important to be made to the fact that most interviewees’ educational level in common with their workplace influenced them to live green.

Many of the respondents working in the city centre or in industrial areas, preferred to move to the suburbs, mainly in green residential areas. This life style change can be related to the general trend of decentralization that has emerged in the last 10 years and people’s need to come closer to nature and thus try to preserve it by adopting green behaviour.
Another important finding is related to the investment capacity and financial barriers. Although three out of ten house owners had not taken out a loan they did not encounter significant difficulties. It’s also worth noticing that half house owners converted their old conventional house or apartment into a green one. This can be explained by the fact that during the last decade there has been a trend towards the purchase of old detached houses, presumably due to the low cost.

Generally, it has been shown in this dissertation how several factors influenced ten Greeks house owners’ decision on a green house. It’s worth pointing out that all ten Greek house owners continue to think green despite the serious financial crisis the country is facing.

To sum up, this thesis managed to answer the research question not only by examining how the literature-based factors had an impact on Greek people’s decision, but also by revealing several new conditions that further influenced them. These factors, influencing people’s environmentally-friendly behaviour may prove essential to readers by making them realize that all the above are to the mutual interest of all parties involved (individuals, environment, national economy) and ensure a sustainable future.
7. Recommendations for practice

This thesis found that the decision of ten Greek house owners to live in a green house was due to by a number of factors. Based on its findings, this thesis further presents several recommendations for practice.

One of the most important findings of this study was the fact that children behaved in an environmentally-friendly way and stimulated their parents to have a green house built. An important task of the Greek educational system would be to add more environment-oriented courses at school. Since children were found to feel a high responsibility for environmental protection, energy conservation and well-being, it is important for them to be further informed about the importance of green houses.

Moreover, given that all ten Greek house owners, who decided to live in a green house, were found to be aware of environmental problems, it can be suggested that further awareness of environmental issues is needed. Information about climatic problems (such as global warming) and energy-saving measures should be provided by both the government and the European Union. Besides, the reduction the energy consumption is the goal of the European Union which should be achieved by Greece and other European countries. It’s worth noticing that since until 2020 all buildings in Greece should be “low-energy”, the adoption of green building concept is of high importance.

Municipal campaigns and programs about the role of green buildings in energy-saving and environmental protection could inform citizens. Additionally, programs that would promote renewable energy sources usage and information about the consequences of climatic changes, could help citizens adopt a “green profile”.

It could further be suggested that apart from the existing buildings, the construction of new buildings should also be financially supported. As all ten interviewees reported, there is lack of governmental incentives for new green houses. Therefore, it is recommended that subsidies and tax credits should be given to citizens who desire a green house.

The fact that the majority of interviewees (8/10) moved to the suburbs and out of city centres, should be regarded as a need for further development of suburban areas and a need for the greening of existing cities and towns. This requires appropriate infrastructure and effective planning.

In general, both government and citizens have to adjust to today’s needs. Government should improve planning and incentivize citizens to behave pro-environmentally, while citizens should comply with several regulations. Despite the financial crisis there is a need for the development of an environmentally-friendly behaviour able to improve living conditions and embrace sustainability. Besides, being optimistic and thinking positively is a prerequisite for life.
8. Study Limitations - Suggestions for improvement

Although, at first sight, it could be said that this thesis, by using a case study research strategy and focusing on a small sample, is not able to generalize its findings, this is not a worry, since the study does not aim to do so. On the contrary, this study aims to examine how the decision on a green house was made by a particular number of Greek house owners. Besides, the choice of case study as research strategy was made according to what the existing literature provided as a theoretical framework. That is, the previous survey-based studies resulted in a limited understanding not only by using self-administered questionnaire, but also by examining only people’s willingness to behave in an environmentally-friendly and energy-saving way. Therefore, these studies have not yet defined whether this willingness can lead to actual behaviour. Taking into consideration this limitation, this thesis had to follow case study research strategy in order to answer its research question. This study, based on ten case studies (green houses) and following semi-structured interviews, examined in detail how ten Greek house owners made the decision to live in a green house.

Apart from the limitations resulting from the literature, this thesis has its own limitations too. At first, one limitation was the small number of existing construction companies and especially of those specializing in green houses, due to the recession in Greece. In addition, the concept of green houses in Greece is still at an early stage. As a result, the availability of green houses was limited which did not enable this thesis to find more than ten green houses.

Another limitation was that the semi-structured interviews had to be carried out by phone, due to lack of time, while a face to face interview would be considered more revealing and helpful. However, this does not mean that the findings of this thesis are not sufficient, since even by phone it was possible for the researcher to assess the participants’ credibility, judging by the tone of interviewees’ voice. Nonetheless, this thesis still gives emphasis on the importance of face to face interviews in disclosing the interviewees’ personal values, beliefs and attitudes. However, given that this thesis is unable to approach this research topic from a psychological aspect, the participants’ personal attributes were not taken into consideration.

As it was mentioned at the beginning of this chapter, although this thesis does not generalize its findings, it has, however, contributed to theory building by adding six new factors that motivated eight out of ten Greek house owners to choose a green house. Besides, according to Campbell (1998), a case study can justify its validity by establishing theory, while as Eckstein (1975) said “case studies are valuable at all stages of theory-building process, especially concerning the stage of theory-building”.
The limitations mentioned above, can be surmounted in future research. As for the limitation resulting from the small sample used in this thesis, there are suggestions to overcome it. Although such limitation could not be overcome in this thesis due to the small number of green houses available in Greece and lack of relevant studies, future researchers investigating the decision on green living could utilize the findings of this thesis. It is further suggested that future studies should investigate how house owners’ decision on a green house is taken in other European and non-European countries with different and/or similar climate and financial status.

Another shortcoming of this thesis is that it did not manage to explore house owners’ personal values and beliefs. Therefore, future research needs to examine how values, beliefs and attitudes influence the decision on a green house.

In accordance with the suggestions mentioned above, an ideal study should follow an integrated green building concept and at the same time make an analysis on people’s personal attributes. A combination of psychological tests and a holistic green building concept would be more appropriate to define green behaviour. This thesis indirectly suggests that psychologists can play an important part in the development of a behavioural model facilitating the shift towards a sustainable future. It would be even more interesting to see how people in different nations make the decision to live in a green house. Future research needs to be carried out in a multi-cultural and cross-national settings, thus providing more detailed information.
9. Critical reflection of the work undertaken and difficulties encountered

The work undertaken in this thesis came across difficulties both in methodology and data collection part. As for methodology, given that most previous studies examined only people’s willingness to behave pro-environmentally and had a psychology-oriented background, this thesis found difficulties choosing its theoretical framework.

Apart from this, this dissertation encountered several difficulties in finding and collecting its data. Although six construction companies, specializing in green buildings, were finally found, only one of them accepted the proposal. Four of the six green building construction companies did not show any interest. The other two companies were willing to respond to this research. However, one of these two companies was unable to participate, claiming that of its clients were either reluctant to be interviewed or unavailable.

Finally, the Construction and Development Company specializing in green buildings that accepted to support this research, provided this study with 12 green houses. However, this thesis managed to come in contact with only 10 house owners, since the rest were not available.

The limited time in conjunction with the high standards and requirements of the research made it even more difficult for this thesis to be completed.
References


Appendix

- Glossary

**Geothermal heat pump / air-water heat pump**
It is a system that makes use of geothermal energy. Geothermal heat pumps move heat from outside to inside and the opposite. In winter they extract heat from the ground and transfer it to the house. In summer, they pull heat from the house and transfer it into the ground.

Air-water heat pumps’ operation is similar to geothermal heat pumps; however, they use heat from the outdoor air and not from ground. In the winter air-water heat pumps extract heat from outside air to indoor, while in summer they pull heat from the house to outdoor.

Both geothermal and air-water heat pumps provide the house with heating, cooling and hot water. They are environmentally-friendly systems because the use renewable energy resources (earths’ heat, heat from air).

**Under-floor system (heating-cooling)**
It is a central heating-cooling system that is installed under the floor and provides the building with heating and cooling.

Under-floor heating-cooling systems are more efficient than a radiators-system. Contrary to radiators that heat only the area around them, under-floor systems can heat and cool a larger surface; as a result they create a more consistent indoor temperature.

**High-performance insulated shell**
It’s about high-quality insulation materials (polystyrene or polyurethane) that are installed in building’s envelope and reduce the energy (heat, cool) transfer from indoor to outdoor and the opposite.

**Thermal-insulated aluminium frames**
Aluminium frames that are equipped with thermal-insulation. A specific material (polyamide) that is installed in frames minimizes the thermal losses.

**PVC frames**
Specific plastic material that is used for frames.

**Low-emissivity glazing (Low-e glass / energy glass)**
Alternatively described as energy glass, low-emissivity glass insulates the building and saves energy. It is specially designed to allow less heat to penetrate the building; it can capture and reflect specific solar heat and as a result it increases building energy efficiency.

**Biological wastewater treatment unit**
Environmentally-friendly system that filters wastewater. After purification, the water can be re-used.
Passive solar heating/lighting
Heat and light that comes to the house directly from the sun.

Vegetated (green) roofs
Building roof that has vegetation for further insulation. It provides a building with thermal comfort.

Low-energy buildings
It’s a building that consumes less energy than a conventional. Its low-energy performance can result from high quality insulation materials, use of natural resources.

KW peak: Unit power of photovoltaic systems
• Questionnaires

Case 1.

-Good afternoon Ms. Ioannou.
-Good afternoon Mr Vlachakis.

Before we start I would like to present myself. My name is Ioannis Vlachakis and I am a master student in Radboud University of Nijmegen (the Netherlands) in the postgraduate program “Urban and Regional Planning”. This research which will be conducted on the basis of your personal experience in your private green residence is part of my master thesis. I chose to pursue this topic for my thesis in order to gain a better understanding of people’s willingness for green living. Becoming familiar with people’s desire for green houses that use less energy and make use of renewable energy sources is very important to me not only as an observer and a critic of the academic research on this field, but also as a future participant in the professional activities of urban planning. Through our discussion I intend to find out and explain the reasons that motivated you to build this green residence.

-Can we start?
-Yes, of course.

1. Do you consider global environmental problems, such as this of global warming and climatic change, important? : Of course they are important. Besides, we realize this change daily. We understand climatic change and how it affects us.
2. Are you aware of the urban heat island phenomenon? : I know a few things; for example how the way buildings and a big city are developed can affect the climate under which its residents live.
3. Do you think that government is responsible for resolving such problems, or do you consider citizens to be the key actors to face these issues? : I think that both government and citizens could help. Citizens by pursuing it and government by encouraging it. On the one hand, citizens by themselves cannot do it, for example due to bureaucratic obstacles or lack of information. On the other hand, each government cannot impose it.
4. Did you understand the temperature rise? Did you feel it? : What we understand, and especially during summer, is sun’s intensity both indoor and outdoor. The only thing I can say is that nowadays no one can survive without air conditioner, or being in a cool room. During my childhood, a few houses had an air conditioner. Opening the windows or using a fan was adequate during the summer. Besides, cars did not have an air conditioner.
5. Did you realize the temperature rise through the monthly electricity bills in your previous house? : yes, because we used air conditioner, which does not offer a healthy indoor atmosphere, both in summer and winter. Atmosphere becomes dry and it is not suitable for living. Besides you cannot ventilate since by opening (door, windows), immediately you lose what you had already achieved by using the air conditioner.
6. Now you live in a house, which would be widely called “green”, or a house which uses less energy than a conventional house and at the same time it does not harm the environment. Your house uses geothermal energy for space heating-cooling and consumes less energy given the further insulation that is provided by double glazing aluminum systems. Would you like to tell me about this choice? When did you make this decision? Who has been involved? Actually, it was not part of the original design of the house, however, during the construction progress while there was discussion concerning the type of heating systems, whether it would be an under floor system or radiators, or how we could make use of hot water, our engineer gave us the idea of making something different, environmentally friendly and in the long run economical. It would be more expensive than what we had thought, but in a long-run there would be money amortization. Besides, the fact that we would not affect the environment was an important reason for this decision.

7. What was your husband’s contribution to this decision? I think that we influenced each other since it was something we both wanted.

8. As you told me a construction company was responsible for the design and construction process of your house. Can you please give me some more specific information about this? From the beginning the building permit, the ground plan design, the supervision and the total process until we got into the house was in the responsibility of a construction company.

9. Would you say that Media influenced you? No; there was no information, and we were not aware of the geothermal heat pumps. Later, we showed interest and we found out for example that in abroad and especially in Germany geothermal energy is used for years now and that the first geothermal system was in Greece (Knossos).

10. Do you think that your family (parents) influenced you as a child? No; firstly because they did not have an idea about these issues and secondly the worry about climate change was not as acute as it is nowadays. There were no discussions.

11. Do you have children? Yes, a two and a half year old boy.

12. As a result you are not able to discuss these problems with him! No I cannot, but I tell him not to waste water.

13. Do you think you will give him environmentally friendly advice, for example to turn off the lights, recycle? Yes of course.


15. Since when do you remember yourself being environmentally conscious, or just think ways of protecting the environment? The only I can tell you is that I always tried not to waste garbage, not to through garbage in the sea. Concerning the way I could build my house, or not to spend gas by using the car, I would say that it’s something that came to my mind 15 years ago.

16. What do you do for a living? I am a German language teacher.

17. Would you say that your work sector influenced your environmental consciousness and more specifically your decision about this type of house you are living now? I would say no. I mean that even if I was doing something else, I do not believe that it would be different.

18. a. Have you ever been involved in any environmental organizations? Yes, in some small local groups regarding coast cleaning.
18. b. it is important and it shows that you care about the environment. : Yes, and besides, it’s not nice to be on beach watching your child collecting cigar butts and broken bottles.

19. Do you believe that your friends and/or relatives influenced or motivated you towards an energy-efficient house? : They did not have any idea what happens, and that something like geothermal heat pumps exists. As a result, having not been informed about these things, I cannot say that my relatives or friends influenced us.

20. As we have already mentioned, the geothermal heat pumps, provides you with hot water and space heating-cooling. How do you feel about this innovative and environmentally friendly way of meeting your daily needs? : I have to say, that in practice, is better than radiators’ system or air-conditioner. In winter there is “a sweet warmth” inside the house which pervades the interior and it’s not just a warm point, as it happens with radiators. Besides, the atmosphere is not dry. In addition, during the summer, it is not this freezing cold you feel when you use the air-conditioner “like opening the fridge”. It’s like getting into a cave where it is cool, or into a basement. It has a “soft cool”, which for sure is better, since it does not have huge thermal difference from outdoor and as a result the organism is not shocked by the inside-outside alteration.

21. Have you been influenced by any regulations, such as the national regulation concerning building energy performance, which as I remember has been enacted in 2010? : No because the building permit was issued in 2007 and in 2009 we had already moved to this house.

22. What do you believe about the financial part of this endeavor? Did you have any financial plan? Did it cost you more than you had estimated? : As I told you we had not planned it. The truth is that that period, given that we took a loan to build our house, we were puzzled. It was difficult to find the further amount of money. However, we managed to borrow another small amount of money. It was more expensive than installing a conventional oil boiler and radiators, but we realized that it was better in all respects; it was environmentally friendly, it would provide us with better interior atmosphere and money saving, since we would not need oil. And we had calculated this before the current oil price. I strongly believe that in a short-term period we will amortize the amount of money we have already given. Moreover, even if we had the amount of money for oil purchase, we would not have achieved the interior atmosphere we have now.

23. Did you face any delays because of extreme weather events (rainfall, wind)? : I would not say that we faced difficulties because of the weather. I would say that bureaucracy created some delays, especially for the permission that was needed for drilling. It was a time consuming process.

24. What about the type of geothermal system, aluminium and glazing system? It was your choice, or the company had the main responsibility? : We discussed what we would like and need and the specialized representative of the company suggested and chose the appropriate systems.

25. How did your neighbours react? : Actually they stared at the label which mentioned “bio-climatic house” and in general they asked about it. I cannot say that there was positive or negative reaction, but there was curiosity.

26. Do you believe that they could be influenced by your decision to build a bioclimatic house? : I do not know; Maybe, I hope!

27. Could you please specify the size of the house in square meters? : 115 sqm.
28. Do you consider that the size of your house is related to the energy consumption? Did you think that, given the house size, your independence from oil, as a conventional mean of heating as well as from air-conditioner for cooling, would be beneficial to you? : Yes, for sure. Firstly, a house of 115 sq. meters is a big house, and in order to be heated in the winter and be cooled in the summer, the cost would be extremely huge. Another benefit is related to the connection of the geothermal system to the under floor system. It’s not only that the warm/cool is diffusing evenly, but also that we have free space; the radiators are usually installed in uncomfortable places, which afterwards are useless!

29. Before moving to this house you need higher amount of money for heating and cooling? : Yes. We were tenants in a house that had conventional heating system with radiators. And finding the amount of money for oil was the “permanent problem” every winter.

30. Do you see difference in the electricity bills? : Yes, and given that geothermal system uses electricity, by making use of the reduced prices during the night, we save even more.

31. So you mean that you provide the house with the heating system especially during the night. : Yes, but you should be careful on how you manage some things. For example, during summer, we open the windows late at night so as to ventilate the house and we close them early at dawn, and we do not open them again until the night. As a result we can keep this temperature the whole day.

32. Do you understand the difference between you house and your work environment and/or your friends’ houses? : Yes, of course.

33. Do you tell them about what you have done in your house, do you motivate them to do something similar? : Look, it’s not so easy, because it is something you should do from the beginning; it is difficult to do it in an already built house. Our friends that have come to our house and have asked us have been already informed by us. Some of them are interested in this. But now the financial situation is difficult for everyone, so even if they wanted it, I do not know if they would be able to do for the time being.

34. Do you think that there may be some other reasons that motivated you towards an energy-efficient and environmentally-friendly house? : When we started the construction process our child had not been born. Now I think we would do it more enthusiastically. I believe that it would also be important for him (their son).

35. Concerning the under floor heating-cooling system, would you say that it provides you and your family with something more than just a heat and cool? I mean do you like walking on the warm and cool floor in winter and summer respectively? : Yes, we love it. And our dog also likes to lie down.

36. Do you consider that your decision for this type of house benefits your neighbours and in general society as a kind of exemplification? : yes of course; why not?

37. As far as environment is concerned, would you say that the protection of the ecosystem and the planet in general was a motivation for you? : Yes, of course. It was related to personal issues; we would save money, the atmosphere inside the house would be better, but the environmental protection also played a role.
38. What else would you consider as a green characteristic that is incorporated in your green-label house; in general it is green! : Look, besides geothermal heat pumps, there are two tanks for rainwater collection, which we constantly use for watering; when the tanks are full, we use the contained water for the washing machine and the dishwasher (when we want to empty them because we know that it will rain). Furthermore, there is a biological wastewater treatment unit, which also contributes to the garden watering. All bulbs are energy saving. There is also dual water supply for the washing machine and he dishwasher operation so as to save energy. In addition, we plan to use photovoltaic panels, without connection to the public power corporation (PPC) in order to meet some house needs and use less from PPC. Imagine that the equipment already exists.

Thank you very much.

Case 2.

- Good afternoon Mr. Dialinas.
- Good afternoon.

My name is Ioannis Vlachakis and I am a master student of “Urban and Regional Planning” program of Radbaoud University of Nijmegen (the Netherlands). We are in Agios Stefanos, north suburb of Athens, where you live in a green residence. This research which will be conducted on the basis of your personal experience in your private green residence is part of my master thesis. I chose to pursue this topic for my thesis in order to gain a better realization of private willingness for green living. Becoming familiar with people’s desire for green houses that consume less energy and make use of renewable resources of energy is very important to me not only as an observer and a critic of the academic research on this field, but also as a future participant in the professional activities of urban planning. Through our discussion I intend to find out and explain the reasons that motivated you to build this green residence.

-can we start?
-Yes.

1. Do you consider global environmental problems, such as this of global warming and climate change, important? : Yes, they are important.
2. Are you aware of the urban heat island phenomenon? : Yes I know about this and I have to tell you that I am familiar with it by personal experience. Especially when you are in a building which is energy intensive you necessarily consume energy to have a tolerable indoor environment.
3. Do you think that government is responsible for resolving such problems, or do you consider citizens as the key actors to face these issues? : I think that
both government and citizens are responsible. Government by giving incentives and citizens by following them.

4. Before moving here you lived in another house in the city? Did you realize the temperature rise? Did you feel it? : yes in the center of Athens and I was feeling the temperature rise in an intense way.

5. Did you realize the temperature rise through the monthly electricity bills in your previous house? How did you react in this temperature alteration? : Yes, not only through the electricity bills, but also psychologically. I used to make use of the air-conditioner both in the summer and in the winter.

6. Now you live in a house (8 months now) which would be called “green”, or a house which uses less energy than a conventional house and at the same time it does not harm the environment. An under floor system provides the house with heating and cooling. In addition, the air-water heat pump is used as a passive mean for heating/cooling. Besides, the house is supported by thermal-insulated aluminum systems in conjunction with low emissivity (Low-E) glazing. Would you like to tell me about this choice? When did you make this decision? Who was involved? : Actually, when I bought the house it was unfinished. Since we wanted to finish the building process, we made this decision. Creating something green, energy-money efficient and environmentally friendly was our goal. Mostly, I had been influenced by me daughter; she is “greener”. Later, given the discussion I had with the engineer about what we wanted, he also played a role.

7. Did you know anything about under floor heating/cooling systems, heat pumps and thermal-insulated aluminium system and low-e glazing? : No, I did not know about under floor systems and heat pumps, and when the engineer suggested it I searched for further information and we decided to continue. However, given that in my previous house I had installed thermal-insulated frames, I knew about them. Now, in this house we installed higher quality thermal-insulated frames.

8. Did you do any research concerning the choices you had about frame’s type? : No; however I discussed it with the engineer, we took into account which were the most energy-efficient and cost-effective and we decided.

9. Have you done any research regarding the under floor system and heat pump system? : This was part of the engineer’s responsibility, who gave me advice. Provided that, on the one hand, I did not have the knowledge and, on the other hand, I fully trusted the engineer, I followed his suggestions.

10. What do you believe about the financial part of this endeavor? Did you have any financial plan? Did it cost you more than you had estimated? : I had a financial plan based on the engineer’s specifications. However, it cost a bit more, but I believe I will manage to amortize.

11. Did you support this effort by means of a loan? : Yes.

12. Would you say that environmental protection as well as living in an energy-efficient house, played an important role in your decision about this, let’s say more expensive building way (in contrast to a conventional house)? : Yes, for sure; citizens have to be concerned about the environment. Besides, we will have a financial benefit in the long run.

13. Which do you think were the main reasons that motivated you to build this type of house? : Look, it was my children’s sensitivity; they are young and they care more about the environment. Watching the news and becoming
informed about what happens worldwide, I realized that to some point citizens should act.

14. As a result you would say that both your family and Media influenced you. : Yes, exactly.

15. During your childhood, do you remember any discussion about environmental problems? : No, unfortunately!; when I was a child there were no incentives;

16. Do you think that your parent’s education/profession played any role in your environmental consciousness? : No, because decades ago the environment sector was not a priority. Only some suggestions related to money saving (turn off lights).

17. As you told me you have children. Do you discuss with them environmental problems? : Yes, we discuss.

18. Do you give them environmentally friendly advice, such as to turn off the lights, to recycle? : Actually, most times they give me advice.

19. Since when do you remember yourself being environmentally conscious, or just to think ways of protecting the environment, or to reducing energy use? : I think for the last 5 years.


21. Would you say that your work sector influenced your environmental consciousness and more specifically your decision for the type of house you are living now? : Yes, of course, for sure. Not only to be environmentally consciousness, but also to have this house built (techniques, green home). My work gave me a motivation to do it.

22. Have you ever been involved in any environmental organizations? : No.

23. Do you believe that your friends and/or relatives influenced or motivated you towards an energy-efficient house? : No, no one. I would say that mostly I was influenced by reading and being informed and by the engineer’s suggestions concerning environmental protection in conjunction with energy and money saving.

24. Did you face any technical delays? : As on every building process, you face some technical difficulties, but you overcome them.

25. Did you face any delays due to extreme weather conditions (rain, wind, snow)? : There were some delays, which however were expected. T progress of the construction phase was a bit late, but this was not important.

26. Did you choose the under floor system type, as well as thermal-insulated aluminums based on your needs, or was it the engineer’s main responsibility? : It was the engineer’s decision and I trusted him. I was informed about some specific characteristics, but as I used to tell him “you are the captain and I am the ship-owner”; “I am the ship-owner-I pay and you will drive the boat”.

27. How did your neighbours react? : Actually, my next door neighbours have also installed under floor heating-cooling system and air-water heat pump. As far as the other neighbours are concerned, I still do not have so close relationship and, as a result, I do not know. However, I have discussed it with other people, who did not know about heat pumps and I informed them about the benefits.

28. What about your next door neighbors? Did they live here before you came? : We bought together the plot with the unfinished houses, but they finished the building process faster than I did.

29. Do you consider that the house size played an important role in your decision for the usage of the above mentioned green technologies? I mean that even if
the house size was smaller, would you make use of these systems?: yes, even if the house was smaller, I would implement them since I had realized that in the long run I would have a benefit, I would amortize and it would be environmentally friendly.

30. Would you say that given the air-water heat pump, thermal-insulated aluminums frames and low-e glazing the electricity bills decrease? : I cannot say it right now, because it’s just 8 months I moved to this house. The only I can say is that comparing the bills I used to pay with the previous house, even if this house now is bigger, I believe I would be benefited from the green technologies.

31. Apart from the bills, what about the thermal comfort of this house? : We do not have to open this topic, we should not discuss this. Of course the interior has thermal comfort.

32. Do you realize this temperature alteration in other houses, buildings, or even your workplace? : I can feel the difference not only in my friends’ houses, but also in my workplace, where the building is conventional and we use air conditioner.

33. Concerning the under-floor heating-cooling system, would you say that it provides you and your family with something more than just a heat and cool? I mean do you like walking on the warm and cool floor in winter and summer respectively? : Yes; especially my son likes it a lot when walking on the floor without socks. And in comparison with a conventional radiator or an air conditioner, the heat and cool spreads better. Mostly, the reduced energy consumption and the feeling you would have inside the house were the factors that influenced me.

34. Was reducing the monthly bills a motivation to adopt these green and high energy-efficient building ways? For example you installed thermal-insulated aluminum frames and low-e glazing only to reduce thermal losses, or also for a personal satisfaction? You desire sun’s penetration without being annoying for living? : Look; it’s a combination; energy-cost saving, green-home benefits and the tolerated and comfortable living. It was the combination that made me decide to implement all these systems at my house. It was a combination. You cannot say that it was only the one.

35. Concerning what you said about thermal comfort what was the feeling you had when you lived in the previous house in the centre of Athens (during summer and winter)? : During the summer I was in the living room, sitting on the sofa and I was “scorching” because of the sun and during the winter I was feeling cold. Having no other choice, I used to turn on the air conditioner either to heat or to cool the house.

36. Are you satisfied with the benefits of all these systems you installed? : Yes, of course. Until now I am satisfied.

37. What else would you consider to be a green characteristic that is incorporated in your green-label house; in general it is green. : THE “well-being”! Everything we do in our home should be related to the quality of living.

38. Do you consider that your decision for this type of house benefits your neighbors, the microclimate, and society (exemplification)? Would you say that this kind of house, on the one hand, does not affect negatively the microclimate and, on the other hand, it could be regarded as an exemplification for neighbours or friends? : Yes, of course; and it should be emulated.
39. Do you personally tell your friends about what you have done in your house? : Yes, I tell them that I used these systems and in general I try to promote the benefits of this practice.

40. As far as the environment is concerned, would you say that ecosystem’s protection and planet in general was a motivation for you? Do you think that similar behavior depicts environmental consciousness? : Yes of course it influenced me. It may be almost the last five years that I hear about environmental issues and I built this house. I believe that citizens should be more sensitive about the environment.

41. How do you feel now after having completed this effort? Do you feel proud that you can provide you and your family with the benefits of green technology and that you contribute to environmental protection?: DEFINITELY I do feel proud and I hope that my children are also proud of themselves, knowing that they help to the environment, and have in their mind the “well-being” we said before, even if sometimes “well-being” is translated into young’s language differently “as being far from the city center and they cannot enjoy or have activities”.

Thank you very much.

Case 3.

-Good afternoon Ms. Jessen.
-Good afternoon

My name is Ioannis Vlachakis and I am a master student of “Urban and Regional Planning” program of Radboud University of Nijmegen (the Netherlands).
This research which will be conducted on the basis of your personal experience in your private green residence is part of my master thesis. I chose to pursue this topic for my thesis in order to gain a better realization of private initiative in green living. Becoming familiar with people’s desire for green houses that consume less energy and make use of renewable resources of energy is very important to me not only as an observer and a critic of the academic research on this field, but also as a future participant in the professional activities of urban planning.
Through our discussion I intend to find out and explain the reasons that motivated you to build this green residence.

-can we start?
-Yes.
Questions
1. Do you consider global environmental problems, such as this of global warming and climate change to be important? : Definitely, and whatever we do, we try to take into account these factors that could protect the environment.
2. Are you aware of the urban heat island phenomenon? : Yes of course, we face it every summer in Athens in an intense way.
3. Do you think that government is responsible for resolving such problems, or do you consider citizens to be the key to handle these issues? : Both of them. I think that citizens should be motivated by government. There should be incentives, so that it would be easier for citizens to behave in that way. And concerning buildings I think there should be a legal framework that could support these kinds of construction; for example, tax credit and subsidies.
4. Before moving here you lived in another house? Did you sense the temperature rise? Did you feel it? : Yes in Athens; and when you are in Athens and you are surrounded by concrete, you can feel that it is warmer than being on a beach during the night when it is open.
5. Now you live in a house (5 years now) which would be called “green”, or a house which uses less energy than a conventional house and at the same time it does not harm the environment. An under floor system provides the house with heating and cooling. In addition, the geothermal heat pump is used as a passive mean for heating/cooling. Besides, the house is supported by thermal-insulated aluminium systems in conjunction with low emissivity (Low-E) glazing. Would you like to tell me about this choice? When did you make this decision? Who was involved? : As far as wall insulation, thermal insulated aluminium frames and low-e glazing are concerned, it was obvious that they had to be implemented. We had lived abroad for many years, so we were aware of insulation’s necessity. Is there any new house with simple glazing? We did not even think about not doing them; the frames as well as the walls should be well-insulated. It was a decision that has been made by me and my husband; it was a common decision.
6. Did you know anything about under floor heating/cooling systems, and geothermal heat pumps? : We learned about this during the design phase of the house; we wanted to install an ecological heating type; a system which would be ecological and less expensive. It should be ecological and then we were searching for the most cost-effective; since we also had a big area, we finally chose geothermal heat pump system.
7. Did you know anything about thermal-insulated aluminium system and low-e glazing? : We were aware of their existence.
8. Did you do any research concerning the choices you had about frames and glazing? : Yes. However the construction company recommended us some choices and we then decided.
9. What do you believe about the financial part of this endeavour? Did you have any financial plan? Did it cost you more than you had estimated? : A house always costs more than you have calculated. I believe that this is the rule. We did not make a first calculation without under floor system, without geothermal heat pumps and without energy glazing and then we were out of the budget. From the beginning we had a plan. Even if we had to pay more in the beginning we knew that we would have amortization after.
10. Did you support this effort by means of a loan? : No.
11. Would you say that environmental protection as well as living in an energy-efficient house, played an important role in your decision about this, let’s say more expensive building way (in contrast to a conventional house)? : Yes, for sure.

12. As a result, you would say that you did not sacrifice the green technologies’ benefits because of their high cost? : No. however, the only thing we did not do, and we wanted, was to install photovoltaic systems; it was not only the cost, but also the uncertainty concerning the public power corporation (PPC).

13. Which do you think were the main reasons that motivated you to build this type of house? : The need for environmental protection and low energy consumption. Given that you build a new house and you do not renovate an old one, you try to do the best. It was a combination, but the main point was not to harm the environment.

14. Do you think that the Media influenced your decision? : Yes of course. I think that everything you read and you hear make you create a consciousness about ecology and about its dimensions in a global scale.

15. How do you think that you family influenced you? I mean, during your childhood, do you remember any discussion about environmental problems? : No, at that time there were no discussions about these issues.

16. Do you think that you parents’ education played any role in your environmental sensitivity and consciousness? : No, I do not think so.

17. Do you have children? : Yes two. They are 18 years old. Do you discuss environmental problems with them? : Yes, we used to discuss and we continue discussing. Not only environmental problems, but also the whole building process.

18. Do you give them environmentally friendly advice, such as to turn off the lights, to recycle etc.? : Yes whenever I can, because at this age (teenage) it’s not always easy. From not buying goods that have big wrappers and plastics, to sort out garbage, if this is meaningful and they do not result together (I do not know this).

19. From when do you remember yourself being environmentally conscious, or just to think about ways to protect the environment, or to reduce energy use? : I think that this started in 70s, it became more obvious in 80s, I think since that time.

20. Do you believe that your friends and/or relatives influenced or motivated you towards an energy-efficient house? : Yes, there are some people who had informed us, we had also searched and we had also met someone who had built a similar house in Greece; we found much information.

21. Would you say that your awareness of the potentials as well as your environmental consciousness played a role in your decision for this type of house you are living in? : Yes, of course.

22. Have you ever been involved in any environmental organizations? : No, but sometimes I participated in some events.

23. Have you ever been involved in any environmental organizations? : No.

24. Did you face any technical or financial delays? : No.

25. Did you face any delays due to extreme weather conditions (rain, wind)? : I do not know, but I do not think more than a building process in general. As it is sensible during a period of time when you have season changes.

26. Did you choose the under floor system type, as well as thermal-insulated aluminium based on your needs, or the engineer had the main responsibility? :
No, this took place in conjunction with the construction company’s support. They suggested it, but we were also aware of the market.

27. How did your neighbours react? : There was curiosity. They could not believe it and the truth is that even now they cannot understand how it operates. Entering the house in winter when it is warm, they do not see radiators and they do not understand how it works. Some of them are excited that in the summer it is cool and they are interested in it.

28. Could you please define the size of the house? : The main house in 110. Actually the building permit mentions 213, but it’s a main house and a small one.

29. Would you consider that the house size played an important role in your decision on the usage of the above mentioned green technologies? I mean that even if the house size was smaller, would you make use of these systems? : Yes; I think yes. Of course we would choose a smaller heat pump, with changes depending on the size of the house. Maybe, if you have a smaller house, and especially on the Aegina Island with such sunshine, with an efficient solar water heater and an energy fireplace (we also have two energy fireplaces) it would be adequate and would not need the under-floor system; but this is a theoretical discussion.

30. Concerning the under floor heating-cooling system, would you say that it provides you and your family with something more than just heat and cool? I mean do you like walking on the warm and cool floor in winter and summer respectively? : yes, I personally like it very much; however, we had heard different opinions; especially in Germany, I know many people who have regretted the under-floor system’s installation. Because, in order to warm a house in Germany with minus 10 degrees (for months), the floor should be very warm. This means that if you have some problems, for example phlebitis, you feel that your legs are burning. But here in Greece, with this climate, I do not feel anything like this, even if I do have this kind of problems.

31. Regarding health issues, would you say that the different climate or/and the different insulation that houses in Germany have, may play a role? : Especially the climate and the old houses are not well-insulated. The problem is that, because this kind of heating is slow, does not fit with what we are doing most times here in Greece. For example in my house in Athens, where I use gas for heating, I turn it on in the morning and at night for one hour; this does not happen with geothermal systems and to this part we had our reservations, if it was a bad choice. Finally, however, the thermostats need a few hours to react in temperature changes during the day, but it’s not annoying and I do not think that they are energy-intensive, I do not think.

32. Would you say that given the energy consumption and thus the monthly bills, low-e glazing in conjunction with the energy aluminium frames led to the reduction of energy losses? : I do believe it. I am telling you again that I do not have a comparative element.

33. Reducing the monthly bills was a motivation for adopting these green and high energy-efficient building ways? : Yes. Knowing that you heat the outside space of your house is a bit strange. For example in this house we live in Marousi all the heat goes out; you can see that the windows do not close.

34. Did you have thermal-insulated aluminium frames and low-e glazing installed only to reduce thermal losses, or also for a personal satisfaction? In other words, you desire sun’s penetration without being annoying for you? :
definitely; actually the house was built in a way in which sun could warm the house in the winter and especially the living room which has big glass surfaces; and in the summer, with an overshadowing and in conjunction with the orientation of the house to reduce the solar radiation.

35. Are you satisfied with the benefits of all these systems you installed? : Yes I am.

36. What else would you regard as a green characteristic that is incorporated in your green-label house? : The biological waste water purification (drainage); in the place where the house is, there is no central sewer system, and we had to install a cesspit. We chose something more ecological and since the Aegina Island faces problems with water supply, we irrigate with the water that comes from the purification system.

37. Do you think that your decision about this type of house benefits your neighbours, the microclimate, and society as a kind of exemplification? Would you say that this kind of house, on the one hand, does not affect negatively the microclimate and on the other hand, it could be considered to be an exemplification for neighbours or friends? : for sure; since you do not produce fuels, for example by using oil for heating; since you do not use so much electricity in summer for air-conditioner as in big cities, I believe that this is good for society.

38. As far as environment is concerned, would you say that ecosystem protection and planet in general was a motivation for you? Would you think that similar behaviour depicts environmental awareness? : yes of course. I think we all should behave in such a way if we want to achieve something

39. How do you feel now after having completed this effort? Do you feel proud that you can provide you and your family with the benefits of green technology and at the same time you contribute to the environmental protection? : Proud is a very big word, I would not use it in this way; I feel satisfied that we did something, which does not mean that we cannot do more. For example, we still have in mind to install the photovoltaic system, or to change our fridge because it’s old and there are some others which use less energy.

Thank you very much.
Case 4.

-Good afternoon Mr. Karagiannidis
-Good afternoon

My name is Ioannis Vlachakis and I am a master student of “Urban and Regional Planning” program of Radbaoud University of Nijmegen (the Netherlands).

This research which will be conducted on the basis of your personal experience in your private green house is part of my master thesis. I chose to pursue this topic for my thesis because I needed a better understanding of private initiative in green living. Becoming familiar with people’s desire for green houses that consume less energy is very important to me not only as an observer and a critic of the academic research on this field, but also as a future participant in the professional activities of urban planning.

Through our discussion I intend to find out the reasons that motivated you to have your existing house converted into a green one.

-can we start?
-Yes.

1. Do you consider global warming and climatic change to be important environmental problems? : Yes of course; the overwhelming use of industry, thermal plants, energy production by burning oil and solid, and the increasing number of conventional vehicles, led to the climatic change and the consequences we know. The environment is in danger and as a result all living organisms.

2. Do you think that government is responsible for resolving such problems, or do you consider citizens to be the key to face these issues? : I believe there should be laws to regulate and resolve such problems. Public awareness should start from school. Then people could be more"active" in environmental issues.

3. Are you aware of the urban heat island phenomenon and that it leads to the rise of cities and buildings temperature? : Since about 1960, people began to leave the province and their rural occupations and looked for a job in big cities; so big apartment blocks with the known consequences were built. Cement, narrow streets without groves and squares. Thus, the phenomenon of urban heat island emerged for which the state is responsible.

4. In the past you lived in another house. Did you feel the heat or cold inside the house? Did you use the air-conditioner in summer and winter? : Yes, I lived in Athens, in an apartment with central heating. I was feeling the temperature rise mainly during the summer months. Then the air-conditioner operated constantly. During the last years we have experienced small heat waves and the situation has been difficult. Of course when we had to pay we realized that the expenses that had to be paid did not correspond to what was provided by the air conditioner. In winter the situation was more bearable because a large proportion of central heating covered our needs.

5. When did you move out to this house? : In Aegina I had relatives who encouraged me to settle there. I always wanted to leave Athens. With the money I had saved and a loan I took out from a bank, I bought the reported
two-storey house. I applied to a construction company that upgraded the house. We moved a year ago and we are happy.

6. You live in a green house which consumes less energy than a conventional and it does not harm the environment. The heating and cooling of the space is by means of under-floor system. Did you know anything about it? How did you choose it? You also installed low-emissivity glazing. How did you make this decision? Did any member of your family affect you? : We have under-floor system which is connected to an air-water heat pump. I knew about heat pumps and what they can offer; the people of the building complex of the shipping company I worked had installed heat pumps; during the summer they provided fan coils with cold water and they had cooling, while during winter the fan coils were operated with hot water from the boiler that was installed in the building. Heat pumps work better with under-floor systems because they provide even distribution of temperature and they do not require special maintenance of the site, like normal radiators that were rusty and blackened the walls in my previous home. Regarding energy glasses, I knew about them; I choose them in order to take advantage of the sun and light, due to the large amount of sunshine we have. I would not say that any member of my family influenced me.

7. Do you have an energy fireplace? : Yes I have. The energy fireplace complements the thermal energy the heat pump provides me with. We do not have smoke inside the house and it does not blacken the surfaces. Recently there has been a serious problem in the electricity supply from the public power corporation (PPC) and the island was left without electricity for several days. The function of the energy fireplace could be lifesaving and could largely replace the heating of the house.

8. Did you have any budget? Did it cost you more? : Basically there was a budget from the company, but it was not fully met because we changed the internal layout of the first floor. We still have to do the outdoor and the garden. It will finally cost us more.

9. Could you afford this investment, or did you take out a loan? : As an engineer I had a sufficient salary, but we took out a loan. Of course now during the economic crisis we face difficulties.

10. Do you think that environmental protection and living in an energy-efficient house were important reasons to have a “more expensive” house built than a conventional? Would you say that you did not sacrifice the benefits of green house because of the cost? : When we started to upgrade our house we had not fully caught on to that an energy-efficient house was related to environmental protection. For sure, the decision to upgrade the building was not affected by the cost. Fortunately, the basics regarding the green house have already been done.

11. For all that you did, you have spent a considerable amount of money. How did you decide it? : Yes we spent enough money. It was mainly my decision, but also my wife’s. Whatever we did we did it to get better living conditions. We live in a more comfortable home and we reduce as much as possible the energy consumption and at the same time we contribute to a better environment.

12. In general what do you think were the main reasons that influenced you and led you to this decision? : I think there are four reasons. First, the better and comfortable living in a pleasant environment. Secondly, the reduction of
energy consumption. Third, environmental protection and final the exploitation of natural resources mainly from the sun.

13. Were you influenced by the media? : Yes I have been influenced by the media, especially by the internet where there are many articles on the environment and the energy-efficiency of the machines associated with it.

14. Did your family influence you? Did your parents’ education or job play any role in your decision? : For sure my parents influenced me; although they were not high-educated they knew that the protection of the environment was important. They taught me to love the place where I live and not fill it up with garbage.

15. Since when do you remember to be environmentally-aware or just think about how you could protect the environment or reduce energy consumption? : My first contact with the environmental protection was during my high school years where all my class went on a trip to clean the beach. There, we discussed and our professor told us about the benefits of a clean environment. Since then, I sensitized and I am trying not to pollute the environment. Regarding the reduction of energy consumption I apply it as long as I can since my childhood.

16. What do you do for living? Would you say your work played a role in your decision? : I'm an engineer in a shipping company. Certainly my job played a role. However, I believe that the general knowledge I had about engineering and energy conservation and consumption, played a significant role in my decision to build, lets say, a green home.

17. Would you consider your income to be incentive to build such a house? : I believe that my income was not the only motivation for my decision on a green house; the need to live in a comfortable home with the least consumption; a house which would be equipped with renewable energy sources such as solar heating and electricity supply etc.

18. Have you been influenced by governmental regulations concerning building energy efficiency? : In recent years the Energy Performance Certificate came into force. However, citizens have not understood its meaning. It will definitely help the engineer to enrich the study of the energy situation of my house that he will upgrade, and for me to become aware of the energy-performance level that my house will finally have.

19. Have you participated in environmental organizations? : No, because I work a lot.

20. How did your friends or your neighbors influence you? : I can say that my friends or my neighbours did not influence me; whatever I did, I did it on my own initiative.

21. What do you tell your friends when they visit you? : As I told you, I moved out here about a year ago. Most of our friends have not come yet and they believe that I moved to change residence. Two friends who visited me were interested in energy saving and in the quality of life that exists inside the house.

22. What about the schedule; did you need more than you had thought? : There were not important delays; only due to the weather.

23. Did you face any technical difficulties? For example in the insulation of the exterior stone walls? : We did not have particular technical difficulties. Everything was according to the schedule. Since we wanted to keep the stone and to reduce as much as possible heat losses, the grouting took us some time.
The plastering was made during the spring and the weather did not hinder so much the project.

24. How did your neighbors react? : Since the house is not in a densely populated area there were no questions and curiosity from the neighborhood.

25. How many square meters is the house? : In total, the ground floor and the first floor are 205 square meters.

26. Do you think that the size of the house was an important reason for your decision? If it was smaller would you also make the same decision? : Certainly the square meters did not play any role in our decision. The area played a role; it was quiet and there were many trees.

27. How do you cope with the heat during summertime? : We placed piping system in the floors of both houses and thus we have sufficient cooling in summer. The proper insulation on the outside surface of the house and the energy glazing have significantly improved the maintenance of an appropriate indoor temperature.

28. Did you notice any difference in the electricity bills? : Surely, our electricity bills are highly reduced. The installation of the array of photovoltaic panels has almost made the power consumption zero. It covers all the needs of the house except for the kitchen which works with LPG.

29. What else would you say that offers to the green character of your house? : Besides the energy glazing, we placed pergolas in the southern parts of the house and deciduous plants to have sun in winter and shade in summer. In future, when the garden would be ready, the microclimate of the surrounding area would be improved. Also, we installed energy-saving bulbs and we use electrical appliances that are class. A.

30. Are you satisfied with the systems that you use? : I am very satisfied.

31. Do you think that your choice benefits you neighbors or society? Would you say that this decision does not affect the microclimate of the area you live and that it could be used as an example for others to follow it? : As I told you, given the distance separating the houses, I would not say that they are affected at an important percentage. Nevertheless, I certainly do not harm the environment or the local microclimate and perhaps this could be used as an example to be followed by other residents.

-Thank you
-You’re welcome
Case 5.

-Good afternoon Mrs. Tsenta
-Good afternoon

My name is Ioannis Vlachakis and I am a master student of “Urban and Regional Planning” program of Radbaoud University of Nijmegen (the Netherlands). This research which will be conducted on the basis of your personal experience in your private green house is part of my master thesis. I chose to pursue this topic for my thesis because I needed a better understanding of private initiative in green living. Becoming familiar with people’s desire for green houses that consume less energy is very important to me not only as an observer and a critic of the academic research on this field, but also as a future participant in the professional activities of urban planning. Through our discussion I intend to find out the reasons that motivated you to have your old house converted into a green one.

-can we start?
-Yes.

1. Do you consider global warming and climatic change to be important environmental problems? : I do not remember to have heard about Global warming and climate change in my childhood and my youth. I remember the first heat wave which occurred in 1987 (26 years ago); the temperature was 39-42 degrees. Since then, every summer we have had small and big heat waves. These two environmental problems are becoming increasingly important for the future of the planet. In my opinion we all should protect the environment in any way. My contribution was by means of my purchasing of a hybrid car.

2. Do you think that government is responsible for resolving such problems, or do you consider citizens to be the key to face these issues? : I believe that governments have not taken the steps they should, because they do not want to conflict with large economic interests. So, powerful trample institutions, laws, etc. without being punished. On the other hand, people are not interested in politics, they have become selfish. Therefore, by being tolerant, people accept impunity of those who harm the environment.

3. Are you aware of the urban heat island phenomenon and that it leads to the rise of cities and buildings temperature? : Unfortunately, the urban heat island is the result of the concentration of most of the population in large cities. Without planning, they created cities with houses as “cages”. As modern Athens has nothing to do with Athens that was designed by Doxiadis. Without green and running water, each building reflects its temperature rise on the other.

4. In the past you lived in another house. Did you feel the heat or cold inside the house? Did you use the air-conditioner in summer and winter? : We live until now in an apartment in Athens, because there is my job. Fortunately, we work many hours per day and we return home at night. During the winter nights, the house is always cold, and in summer the heat is unbearable; so we use the air-
conditioner. This of course corresponded to energy consumption and to our financial benefit.

5. When did you move out to this house? : We moved here about 5 years ago. Certainly we come at weekends, while our children live permanently in this house in Aegina. This house is a stone house with plaster inside – out (1950) which I inherited from my grandmother.

6. The heating and cooling of the space is by means of under-floor system in conjunction with an air-water heat pump. Did you know anything about it? How did you choose it? You have also low-emissivity glazing installed. How did you make this decision? Did any member of your family affect you? : Yes, we knew about under floor systems. An under floor system with an air water heat pump was installed. In addition, the fact that we would not lose space with the radiators was very important to us. We changed the plaster inside – outside with insulated shell. We replaced the frames with PVC and energy glasses. We did not put shutters so that the house would not darken, since it has small windows; natural light was necessary to reduce energy consumption. All these new technologies were something new for us. But we were informed by the engineer, discussed it with him and we decided to have a green house, since one of our sons studied agronomy and settled there permanently. Because of his work he loves nature and he positively influenced us.

7. Do you have an energy fireplace? : The engineer converted our fireplace to an energy fireplace which is very efficient.

8. Did you have any budget? Did it cost you more? : The financial plan was presented from the beginning. It did not cost more; insignificant difference from the original budget.

9. Could you afford this investment, or did you take out a loan? : No, we did not get a loan, we built it with the savings we had.

10. Do you think that environmental protection and living in an energy-efficient house were important reasons to create a “more expensive” house than a conventional? Would you say that you did not sacrifice the benefits of green house because of the cost? : If we compare the green home on Aegina with the conventional one in Athens and see, what provides the one and what the other, I would not say that I sacrificed the advantages of a green home because of the cost. Since my husband and I live every weekend there we can understand the thermal comfort winter – summer; the relaxing live in such a house, the rich natural lighting and certainly the financial profit.

11. For all that you did, you have spent a considerable amount of money. How did you decide it? : The truth is that the amount of money we invested was important, but it was not high enough to be prohibitive for such an energy-efficient home. We had to help our child. Since he chose to stay there, we created a green house that has paid us the money back. Besides, for a conventional apartment or house in Athens we would spend much more.

12. In general what do you think were the main reasons that influenced you and led you to this decision? : First of all, our child’s job. With him, we learned to love the earth, nature, water and we learned to protect the environment. As I told you this house was for us rest, comfort, escaping from the tedious and inhumane life in the center of Athens.
13. Were you influenced by media? : I heard a lot from the media about the risk of environmental pollution, overheating, ice melting, floods, but I had not paid any attention.

14. Did your family influence you? Did your parents’ education or job play any role in your decision? : Since I grew up and lived in the city center, I wasn’t motivated by my parents, who weren’t environmentally aware.

15. Since when do you remember to be environmentally aware or just think about how you could protect the environment or reduce energy consumption? : In the university; because of discussions with my fellow students I sensitized. As I raised my kids, I learned to love and care for the environment, and to save energy.

16. What do you do for living? Would you say your work played a role in your decision? : Yes, for sure; I am a pharmacist and I know how our lives are affected by the place we live. So I made the decision on a green house.

17. Would you consider your income to be incentive to build such a house? : My income was not the only motivation for a green home. The main motivation was the fact that with a substantial amount of money I could have an old detached house converted into a green one. Something new would cost me much more.

18. Have you been influenced by governmental regulations concerning building energy efficiency? : The energy performance certificate was not mandatory 3 years ago. So, we did not take it into account. But while we knew that in 2020 Greece should have minimized its energy consumption, the last governments have not imposed any regulation that could meet this goal.

19. Have you participated in environmental organizations? : I have participated in some environmental actions through Skai Radio.

20. How did your friends or your neighbors influence you? : Some friends told me that we did the best we could; some neighbors do not understand why we did all these.

21. What do you tell your friends when they visit you? : I told a friend of mine, who is a doctor, that what I did is the prevention of severe illness.

22. What about the schedule; did you need more time than you had thought? : No, we did not have important delays; my son was there and we also used to go there. Only the rain delayed us because all the work had to be done in warm weather. You know, in Aegina it rains a lot and it is very humid; it is an island.

23. Did you face any technical difficulties? For example in the insulation of the exterior stone walls? : The technical difficulty was in the grouting of the old stone wall as we removed the old plaster; it cost us more time and much more money. The roof was constructed from scratch and we had problems with the weather conditions (constant rain).

24. How did your neighbors react? : At first they were curious, they were asking several things; later they were used to it. Some of them asked us if we were happy with the house energy-efficiency.

25. How many square meters is the house? : It is 145 sq. meters.

26. Do you think that the size of the house was an important reason for your decision? If it was smaller would you also make the same decision? : 100 or 150 sq. meters! We would make the same decision.

27. How do you cope with heat during summertime? : With the cooling by the under-floor system, we do not feel the heat. Outside you “melt” and inside you
are “in paradise”. The energy glasses protect us and keep the house cool; and even with the insulation of the shell we do not have such problems.

28. Did you notice any difference in the electricity bills? : For a smaller house in Athens we consume much more energy than in Aegina.

29. What else would you say that offers to the green character of your house? : In the surrounding area and the parking area we added pergolas in the proper orientation for shading and we placed climbing trees so that the house would be exposed to the sun in winter and the shade in summer. We have energy bulbs, LED lamps, solar garden lamps and electrical appliances energy class A. Additionally, we have a biological wastewater treatment unit from where the purified water is re-used for garden activities and flushing in the toilet.

30. Are you satisfied with the systems that you use? : I am very satisfied with the house we have built; I wish I had it in Athens.

31. Do you think that your choice benefits you neighbors or society? Would you say that this decision does not affect the microclimate of the area you live and that it could be used as an example for others to follow it? : Undoubtedly, this house does not offer its benefits only to us. It respects the environment; it creates a healthy microclimate for neighbors and the region in general, and contributes to the environmental protection. I wish that other people could do something similar. Times are tough and especially for Greece. But we all must gain environmental sensitivity and the governments all over the world must be willing to save the planet.

-Thank you very much

-You’re welcome
Case 6.

-Good afternoon Mrs. Mandragoni
-Good afternoon

My name is Ioannis Vlachakis and I am a master student of “Urban and Regional Planning” program of Radbaoud University of Nijmegen (the Netherlands). This research which will be conducted on the basis of your personal experience in your private green house is part of my master thesis. I chose to pursue this topic for my thesis because I needed a better understanding of private initiative in green living. Becoming familiar with people’s desire for green houses that consume less energy is very important to me not only as an observer and a critic of the academic research on this field, but also as a future participant in the professional activities of urban planning. Through our discussion I intend to find out the reasons that motivated you to convert your house into a green house.

-can we start?
-Yes.

1. Do you consider global warming and climatic change to be important environmental problems? : 10-15 years ago I had not thought about these issues. But for the last years I have been feeling these problems. Definitely, they are globally the biggest problems that would lead to Earth’s destruction.

2. Do you think that government is responsible for resolving such problems, or do you consider citizens to be the key to face these issues? : Government should take and enforce measures for the protection of the environment and citizens should realize that climate change leads to the destruction of the planet and threats our lives.

3. Are you aware of the urban heat island phenomenon and that it leads to the rise of cities and buildings temperature? : Yes, I know it, but government had to predict it and prevent it.

4. In the past you lived in another house. Did you feel the heat or cold inside the house? Did you use the air-conditioner in summer and winter? : Some time ago we lived in an apartment in Athens with central heating with oil. Unfortunately, we were feeling the lack of thermal comfort both in winter and summer. As a result, during the summer we used the air-conditioner and during the winter, because we could not agree with the flat mates about the schedule of heating operation, we also used the air-conditioner. So we used to pay too much for the electricity bill. Moreover, our life was not comfortable and we could not make use of the air and light. And as you can understand, we did not have autonomy.

5. When did you move out to this house? : About four years ago. I sold the apartment and I decided to repair an old stone detached house that I bought at a good price. It is ground floor and 1st floor, it has a garden, and although it is in a densely-populated urban area you feel you are out of the town.

6. You live in a green house which consumes less energy than a conventional and it does not harm the environment. The space heating is by means of gas and you installed thermal-insulated frames and energy glazing. How did you make this decision? Did your husband influence you? : My husband is a
chemist and he helped me understand about house heating and cooling. Moreover, a gas pipe was close to our new house; this was a stimulus. It is cheaper than oil and we turn it on whenever we want and we have full autonomy and we do not harm the environment. We asked from a company to upgrade our house with insulation, glasses and etc. As far as glazing is concerned I was aware of energy-glazing. At this part the company’s engineer helped us; after our discussions, he chose the category of energy glazing.

7. Why don’t you have shutters? : Because I want to have visual contact with environment-my garden, to have plenty of light and save electricity. That was the reason I installed energy glazing.

8. Did you have any budget? Did it cost you more? : The engineer gave us the cost of the upgrade. Of course, you know that when you have a house built you always have to pay more.

9. Could you afford this investment, or did you take out a loan? : You know, the bank gave me a loan to change the frames, the glazing etc., but I also put some savings I had.

10. Do you think that environmental protection and living in an energy-efficient house were important reasons to create a “more expensive” house than a conventional? Would you say that you did not sacrifice the benefits of green house because of the cost? : Living in an energy-efficient house affects our daily life, our thermal comfort, relaxation, savings in our wallet and basically the hygiene of our living. These all are not redeemed. Besides, the cost was not excessive.

11. For all that you did, you have spent a considerable amount of money. How did you decide it? : First of all, both my husband and I wanted to leave the apartment. The amount of money we spent, we have amortized these four years through power saving.

12. In general what do you think were the main reasons that influenced you and led you to this decision? : Health reasons, reasons of thermal comfort in our daily lives, economic and environmental reasons.

13. Were you influenced by the media? : The last 10-15 years the media inform us about environmental destruction, temperature rise and the future destruction of our planet. So I had positively been affected for a “green house”.

14. Did your family influence you? Did your parents’ education or job play any role in your decision? : When I was a child, urbanization was not so intense, so we did not face the current problems. However, my parents admit that they do feel climate change.

15. Since when do you remember to be environmentally conscious or just think about how you could protect the environment or reduce energy consumption? : For the last 10 years I have been trying to live closer to nature, to protect the environment in whatever way I can, and of course not to waste energy. So I think I’m pretty sensitized about what we call environmental protection; love for nature and life. You know that by destroying the environment we kill our own life.

16. What do you do for living? Would you say your work played a role in your decision? : I am a secretary at a large public projects-construction company, where I was given the opportunity to ask the engineers for the economic-environmental benefits of “green houses” and I was positively affected.

17. Would you consider your income an incentive to have such a house built? : The cost of this house was in the context of an average human. So I cannot
claim that my income was the only motivation; it was certainly a key factor to me to be able to pay my loan.

18. Have you been influenced by governmental regulations concerning building energy efficiency? : Definitely yes. Besides, for three years now it is mandatory.

19. Have you participated in environmental organizations? : Once I was in reforestation in Hymettus Mountain.

20. How did your friends or your neighbours influence you? : Some friends that were aware of environmental problems encouraged me with my decision and this helped me a lot.

21. What do you tell your friends when they visit you? : Living in such a comfortable, healthy, beautiful and “green” house is a dream. When we discuss the cost of the upgrade, they all support my decision. For sure, if they had such an opportunity they would do the same.

22. Regarding the time plan; did you need more than you have thought? : No, because when we started the reconstruction it was late spring and until early winter the house was ready.

23. Did you face any technical difficulties? For example in the insulation of the exterior stone walls? : The old plaster was hard removed due to the uneven surface of the stone. In addition, the extensive humidity had to be restored. This delayed us. I would not say that we faced other difficulties.

24. How did your neighbors react? : The truth is that most of them did not know what exactly it was. When they saw it finished and they learned about its benefits, I think they would really love to have it.

25. How many square meters is the house? : The ground floor is 120sq.meters and the first floor is 80sq.ms.

26. Do you think that the size of the house was an important reason for your decision? If it was smaller would you also make the same decision? : I do not think that the size of the house played a role. I would do it even if I had bought a smaller house.

27. How do you tackle the heat during summertime? : With the insulation and the energy glazing we do not have problems. When we need additional cooling we use ceiling fans. We do not have air-conditioner since its operation causes us allergic problems and especially to me that I suffer from asthma.

28. Did you notice any difference in the electricity bills? : Yes. Although electricity is very expensive, the difference is seen on the consumption of kilowatt hours (KWH).

29. What else would you say that offers to the green character of your house? : I have used awnings, canopies and I have created a very nice garden. The garden was my dream; I took advantage of the garden and I've made a little oasis. All this have contributed to the further cooling of the house. We have also replaced all the bulbs with low energy and we have appliances that are energy class A. We also use the washing machine during the night with hot water supply and during summer we always watered at night to keep the dew.

30. Are you satisfied with the systems that you use? : I am happy because I have all the pros that a “green house” provides and at the same time I protect the environment.

31. Do you think that your choice benefits you neighbors or society? Would you say that this decision does not affect the microclimate of the area you live and
that it could be used as an example for others to follow it? : Definitely yes, I have a comfortable home - warm, cool – with my garden and of course I contribute to the protection of the environment. I hope that my fellow citizens would act in a similar way.

-Thank you
-You’re welcome

Case 7.

-Good afternoon Mr. Lampropoulos
-Good afternoon

My name is Ioannis Vlachakis and I am a master student of “Urban and Regional Planning” program of Radbaoud University of Nijmegen (the Netherlands). This research which will be conducted on the basis of your personal experience in your private green house is part of my master thesis. I chose to pursue this topic for my thesis because I needed a better understanding of private initiative in green living. Becoming familiar with people’s desire for green houses that consume less energy is very important to me not only as an observer and a critic of the academic research on this field, but also as a future participant in the professional activities of urban planning. Through our discussion I intend to find out the reasons that motivated you to concert your house into a green house.

-can we start?
-Yes.

1. Do you consider global warming and climatic change to be important environmental problems? : Look, the truth is that when we lose something, then we appreciate it. So, by trampling some values on the altar of money, we led the planet to global warming and therefore to destruction.

2. Do you think that government is responsible for resolving such problems, or do you consider citizens to be the key to face these issues? : I think that both sides have not done what it should have been done. Although we live in a country with high temperatures, plenty of sunshine and strong winds, both the state and citizens have not really seen the problem.

3. Are you aware of the urban heat island phenomenon and that it leads to the rise of cities and buildings temperature? : The state which urbanized major cities such as Athens without proper infrastructure and urban planning is responsible for the conditions. We had to comply with these conditions because we searched for work.

4. In the past you lived in another house. Did you feel the heat or cold inside the house? Did you use the air-conditioner in summer and winter? : In the past we lived in an old house in Mosxato witch I inherited from my parents. We could
not imagine that one day we would live in an apartment. The house was cold and damp in winter and hot in summer, so we used the air-conditioner. The walls were not insulated and there were enough signs of humidity and as a result, it required maintenance every 2-3 years. This affected the quality of our life.

5. When did you move out to this house? : We moved three years ago. We sold our old house and an apartment and we took out a big loan to have a house built for our children. Our kids (19, 23 years old) were influenced by various environmental organizations concerning environmental protection; they suggested we take the advice of some companies that build green homes. Besides, the area we had the plot was ideal for such homes.

6. The heating and cooling of the space is by means of under-floor system in conjunction with an air-water heat pump. Did you know anything about it? How did you choose it? You also installed low-emissivity glazing. How did you make this decision? Did any member of your family affect you?: Indeed, under the suggestions of the engineer we have under-floor system by means of air-water heat pump installed. We wanted to do something ecological, not to use oil and exploit all the space of the house. Since we decided to have a new house built it was obvious that the interior would be designed according to our needs. We did not want to lose space as with common radiators. Moreover, the sense we would have inside the house would be much better; I know this from my workplace where there is an under-floor heating system. Regarding energy glasses we wanted to take advantage of the sun and the view. That’s why we did not choose to have shutters installed. The house has a full glass facade. In this part, my son influenced me; he desired from the beginning a house with big windows. The engineer also played a role.

7. Do you have an energy fireplace?: Yes we have. The energy fireplace and the glazed staircase are the success of this house. The fireplace warms the entire house that is a two-storey because the staircase works as a vent and transfers the heat into bedrooms.

8. Did you have any budget? Did it cost you more?: The budget is always present in a construction of a house. But we fell well outside our forecasts. This is the reason that the second house is unfinished.

9. Could you afford this investment, or did you take out a loan?: We got a big enough loan to cope with. Now of course with the economic crisis we face difficulties.

10. Do you think that environmental protection and living in an energy-efficient house were important reasons to create a “more expensive” house than a conventional? Would you say that you did not sacrifice the benefits of green house because of the cost?: For sure, there is no comparison between a" green" house and a conventional one. Because we have a constant temperature both in winter - summer we do not need air conditioners, so thermal comfort; sunlight is changing our mood, we are surrounded by nature and finally the financial benefits are many.

11. For all that you did, you have spent a considerable amount of money. How did you decide it?: The amount of money we spent was actually pretty. But thanks to our children’s encouragement we decided to do this task. It’s a life project for which our grandchildren will thank us.

12. In general what do you think were the main reasons that influenced you and led you to this decision?: The reasons that influenced us were the
environmental protection, the comfort of a green house and the low electricity consumption. As I said, the lack of thermal comfort and the high maintenance cost were also two important reasons.

13. Have you been influenced by the media? : We were definitely influenced by the media and we thought about what we could do to help climatic change.

14. Did your family influence you? Did your parents’ education or job play any role in your decision? : My parents were born in the village, came to Athens where they brought us up and when they got their pension they went back. From what they told us they had never felt so much heat in their youth. They hadn’t experienced heat waves, until the last twenty years. My mother used to say that nature will take revenge for the destruction we cause.

15. Since when do you remember to be environmentally conscious or just think about how you could protect the environment or reduce energy consumption? : Since my childhood I have been trying to protect nature, but now, thanks to my children’s encouragement I am more active. I make sure all my activities to be consistent with my environmental awareness. I exploit natural resources and I save energy.

16. What do you do for living? Would you say your work played a role in your decision? : I am an accountant in a large import company. Although the objective of my work is not related to the construction of such a house, my experience of under-floor systems in my workplace played a role.

17. Would you consider your income as an incentive to have such a house built? : I cannot say that my or my wife’s income was the motivation for the decision on a green house. We wanted a new house, comfortable for healthy living, designed in accordance with environmental protection rules. We were not interested in the quantity but the quality. We could have a conventional house built that would be much cheaper. But it would not contribute to the reduction of energy consumption.

18. Have you been influenced by governmental regulations concerning building energy efficiency? : After all what we had been informed about, I think that regulations like this of an energy performance certificate did not affect us. It will definitely compel citizens to respect it.

19. Have you participated in environmental organizations? : Whenever possible I participate in several activities with my kids. The nature was freely given to us so was our life. If we do not respect it, it will not respect us.

20. How did your friends or your neighbours influence you? : I did not have friends or neighbors that have influenced me positively in having a green house built. In contrast, most of them used to tell us that we wasted a lot of money.

21. What do you tell your friends when they visit you? : Listen, all those who made fun of us before, about wasting money without benefit, now, although some of them are not sensitive in environmental protection, just because of the reduction we have on energy consumption and therefore on our expenses, they have changed their way of thinking. It was indeed a great decision, but the benefits are even greater

22. Regarding the time plan, did you need more than you have thought? : We were delayed about half a year until we took out the loan. So we got out of schedule. We were also delayed due to the weather conditions, ie high temperatures, rain and strong wind.
23. Did you face any technical difficulties? : We did not encounter particular technical difficulties. Apart from the weather which delayed the construction of the project, whatever technical problem arose, it can be solved thanks to technology. A major obstacle I could say was related to the heating and cooling system we wanted to have installed. At first, we thought about geothermal heat pumps, but it required a certificate from the geological institute, something time consuming and the cost was quite high. The idea of geothermal energy came to our mind as we were looking with my son on the internet for renewable energy resources. But after these two obstacles we came across, we decided, with the encouragement of the engineer to have an air-water heat pump installed. However, there was also another reason. Due to the inclination of the plot we had to invest in retaining concrete walls. As a result, an important amount of money was invested in this; thus we could not invest in the drilling, necessary for the installation of the geothermal heat pump.

24. How did your neighbors react? : When they saw the company’s advertising label about the construction of energy and green houses many were asking what it was. What I realized was that most of them were informed.

25. How many square meters is the house? : Each house is about 160 sq. meters.

26. Do you think that the size of the house was an important reason for your decision? If it was smaller would you also make the same decision? : The square meters of the house did not play a role in our decision but the area that the plot was, next to the natural environment.

27. How do you cope with heat during summertime? : Thanks to the under-floor system you have the feeling of a cooling much better and healthier than that which you would have through an air-conditioner. Besides, with the bioclimatic design and the appropriate orientation of the houses we do not have problems.

28. Did you notice any difference in the electricity bills? : Certainly, in terms of energy consumption our account is greatly reduced.

29. What else would you say that offers to the green character of your house? : At first we have awnings on the balconies and canopies at entrances installed. The trees are still young but in the long run they will become what we dream about. We have a biological wastewater treatment unit installed and water is cleaned and re-used for irrigation. We also collect rainwater in a tank and after its filtration we re-use in the cleanliness of the surroundings. What else should I tell you; we have energy-saving bulbs, appliances Class A, while in the garden and the parking area there are solar lamps. There is also equipment on the roof of the two houses for future installation of photovoltaic systems. It was something we wanted to do to get out of the PPC (public power corporation).

30. Are you satisfied with the systems that you use? : I am pleased. I cannot think what else I could do to be friendlier to the environment.

31. Do you think that your choice benefits your neighbors or society? Would you say that this decision does not affect the microclimate of the area you live and that it could be used as an example for others to follow it? : First of all, with our choice we do not harm the local microclimate. We contribute to the environmental protection, we re-use water, and so we reduce consumption. We consume much less energy and we try to re-create the natural environment that existed before the great fires that destroyed the whole area. I believe that
those who walk past the house and see what we have done would become sensitive; moreover, this is the aim of the company’s label.

-Thank you very much
-You’re welcome

Case 8.

-Good afternoon Mr. Avdi.
-Good afternoon

My name is Ioannis Vlachakis and I am a master student of “Urban and Regional Planning” program of Radbaoud University of Nijmegen (the Netherlands). This research which will be conducted on the basis of your personal experience in your private green house is part of my master thesis. I chose to pursue this topic for my thesis because I needed a better understanding of private initiative in green living. Becoming familiar with people’s desire for green houses that consume less energy is very important to me not only as an observer and a critic of the academic research on this field, but also as a future participant in the professional activities of urban planning.

Through our discussion I intend to find out the reasons that motivated you to concert your house into a green house.

-can we start?
-Yes.

1. Do you consider global warming and climate change important environmental problems? : Both are equally important environmental problems. And who does not understand it? Heat waves, floods, tornadoes and many others are the consequences of these problems.

2. Do you think that government is responsible for resolving such problems, or do you consider citizens to be the key to face these issues? : Everything starts from governments and their political will to resolve such problems. But given that they act in that way means that they are not interested in the environment. Even if citizens show to be interested in environmental protection, if there is no encouragement and financial support by the state, how much citizens can do? Especially now during the economic crisis.

3. Are you aware of the urban heat island phenomenon and that it leads to the rise of cities and buildings temperature? : It is a chain; urbanization, urban heat island, warming of cities and buildings. Violation of green areas and fires to build.

4. As I know you have been living for many years in this house. Do you feel the heat or cold inside the house? Do you use the air-conditioner in summer and winter? Do you feel the heat through monthly bills? : I have been living in this house for 15 years. It is a two-storey house with conventional central oil heating. The indoor temperature is not suitable for living, both in winter and in summer. The biggest problem is during the summer when we constantly use
the air-conditioner. As a result, we pay much money both for power and oil. The result is the same. We freeze in winter and we feel hot in summer.

5. You decided to have your house converted into a green one. The space heating and cooling is by means of an under-floor system. Did you know anything about this? How did you choose it? In addition, you decided to have thermal-insulated frames and energy glazing installed. Would you like to tell me about your decision? Did any member of your family influence you? : The area where the house is built is suitable for a green home. 15 years now we had tried the “conventional home”. When my daughter got married two years ago I decided to have the entire construction upgraded. I contacted a company that specializing in green houses and after the engineer’s studies I decided to have an under-floor heating - cooling system with air-water heat pump in both houses installed. So, we provided both houses with thermal comfort. Given the mountainous area we decided to have thermal-insulated frames and energy glasses installed to exploit the natural light and also to have constant contact with nature; this is why we made the decision not to have shutters installed. In the first house we had double glazing but not energy glazing. Given that I was aware of energy glasses benefits, I decided to have them installed. In contrast, I did not know so much about heat pumps; I had just heard about them.

6. Do you have an energy fireplace? : We had a fireplace but it was not energy. Its performance was minimal and it did not have duration. Now the new energy fireplace covers the whole house.

7. Did you have a budget? Did the house cost you more? : Clearly there was a plan, but it cost more than it was expected.

8. Could you afford this investment, or did you take out a loan? : I spent the amount of money I had saved; my daughter helped me.

9. Do you think that environmental protection and living in an energy-efficient house were important reasons to have a “more expensive” house built than a conventional? Would you say that you did not sacrifice the benefits of green house because of the cost? : Having some experience from the previous conventional home, on the one hand, with the large costs for heating and cooling and, on the other hand, the environmental damage we brought about like others, we decided to try a green house that promises many benefits and amenities. We were convinced that for the biggest cost of such a house we did not sacrifice its advantages.

10. For all that you did, you have spent a considerable amount of money. How did you decide it? : We thought to invest our money in a proper way it would offer benefits both us and environment.

11. In general, what do you think were the main reasons that influenced you and led you to this decision? : First of all, our experience of a conventional house showed that there were large costs for heating and cooling but also for its maintenance. We had serious problems with the north walls of the house because of humidity, and we had repaired it twice. Beyond this, thermal discomfort, health issues, environmental protection, led us to this decision. Then, we thought that one day they (regulations) would eventually force us to limit energy consumption. So we ought to consider it from the time being.

12. Were you influenced by the media? : Many shows on TV mention environmental pollution, ice melting and more. I am an advertiser; how could I have not been influenced? The concept of “green house” has been in my mind during the last years.
13. Did your family influence you? Did your parents’ education or job play a role in your decision? : My parents were ordinary villagers; how could they know about these issues? I was not influenced by them.

14. Since when do you remember to be environmentally conscious or just think about how you could protect the environment or reduce energy consumption? : For the last 10 years I have heard a lot. By curiosity I have been searching for information on the internet about organizations and environmental protection activities. I was always careful not to harm nature, but for the last 10 years I have gained what we call environmental consciousness. As long as I can, I try to reduce energy consumption at home.

15. Would you consider your income to be incentive to have such a house built? : I think it is wrong to think about our income to decide on a green house. As I told you before, the benefits you get are more than the cost. So, our decision was not influenced by our income.

16. Have you been influenced by governmental regulations concerning building energy efficiency? : Indeed, we were influenced by the regulation of energy efficiency on buildings.

17. Have you participated in environmental organizations? : I was a volunteer firefighter.

18. How did your friends or your neighbours influence you? : I cannot say that they influenced me; I usually follow my own line.

19. What do you tell your friends when they visit you? : They feel the difference, we tell them what we have done and most of them hear us with query, they do not know what "green" home means. Many of them, after we discussed with them, are thinking to follow our example. The only obstacle is the cost, because loans are not given anymore and our salaries have decreased.

20. What about the schedule? Did you need more time than you had thought? : We needed a few months more.

21. Did you face any technical difficulties?: The technical difficulty we faced was that we were staying on the ground floor and we had to have the entire building shell inside – outside insulated and remove the downstairs floor.

22. How did your neighbors react? : They visited us when the repairs were in process to see the new technologies.

23. How many square meters is the house? : The whole house is 250 sq. meters. 120 square meters the ground floor and 130 square meters the first floor.

24. Do you think that the size of the house was an important reason for your decision? If it was smaller would you also make the same decision? : I do not think that fewer square meters would change our decision.

25. How do you cope with heat during summertime? : With under-floor systems we also have cooling. Besides, the energy frames and energy glasses keep the heat out of the house.

26. Did you notice any difference in the electricity bills? : We have energy benefits and this is shown through the electricity bills.

27. What else would you say that offers to the green character of your house? : We have been living here for 15 years; we have a very nice garden with large trees. Now we have a biological system installed from where clean water comes out and it is used for irrigation. We also collect rainwater and we use it for the yard and for washing our cars. We have LED lights installed and we heat the pool through a specific solar system.
28. Are you satisfied with the systems that you use? : Yes, for sure I am happy. Besides, we experience them every day.

29. Finally, which do you think are the personal and social benefits of your decision on a green house? : Firstly, my family and I enjoy a healthier life. You know, I also consider my decision to be important for the future generations, my grandchildren. Besides, imagine if all residents in the area I live decided to do the same. Also, imagine an Athens full of green homes, a green Athens to be the stimulus for a more sustainable future.

-Thank you
-You’re welcome

Case 9.

-Good afternoon Mr. Vasilou
-Good afternoon

My name is Ioannis Vlachakis and I am a master student of “Urban and Regional Planning” program of Radbaoud University of Nijmegen (the Netherlands). This research which will be conducted on the basis of your personal experience in your private green house is part of my master thesis. I chose to pursue this topic for my thesis because I needed a better understanding of private initiative in green living. Becoming familiar with people’s desire for green houses that consume less energy is very important to me not only as an observer and a critic of the academic research on this field, but also as a future participant in the professional activities of urban planning.

Through our discussion I intend to find out the reasons that motivated you to concert your house into a green house.

-can we start?
-Yes.

1. Do you consider global warming and climatic change important environmental problems? : I know about Global warming and climate change and I have been feeling it during the last 15 years very intensely. Two of the most important problems which governments all over the world should have taken into consideration but unfortunately they are not intimidated.

2. Do you think that government is responsible for resolving such problems, or do you consider citizens the key to face these issues? : Clearly, governments play the leading role in solving these problems. These will pass regulations, laws and will punish those who break the law. Citizens follow and are also responsible through their own behavior.

3. Are you aware of the urban heat island phenomenon and that it leads to the rise of cities and buildings temperature? : I know what the urban heat island phenomenon is. I experienced it daily in the city I worked.

4. In the past you lived in another house. Did you feel the heat or cold inside the house? Did you use the air-conditioner in summer and winter? : I lived with
my family in an apartment of 110 sq. meters in Thessaloniki on the 3rd floor of a building. Both in winter and summer we had thermal discomfort. We used the air-conditioner, while we knew that was not healthy, but having young children we could not do anything else. My little daughter suffered from allergic rhinitis and it was not good for her. As for electricity consumption and shared maintenance charges, we had many times overpassed the normal levels.

5. When did you move out to this house? : We moved to Chalkidiki two years ago, so I changed place of living and workplace. We sold the apartment and we built a green home in a farm.

6. The heating and cooling of the space is by means of under-floor system in conjunction with an air-water heat pump. Did you know anything about it? How did you choose it? You have also low-emissivity glazing installed. How did you make this decision? Did any member of your family affect you? : We were given the opportunity to obtain a green house for a healthy living, where my children 6 and 9 years old will grow in a natural environment. That was our goal and my wife and I who is a biologist decided to search in companies for more information. The company that we finally chose advised us under-floor heating cooling system with air-water heat pump. We did not know all these technologies. As for windows, we wanted to keep the timber element and we placed energy glasses. I had heard a lot about energy glasses. But the fact that we would save energy and we would enjoy constantly lighting, affected us enough. We used high quality insulating materials in the shell of the house since it was exposed to different weather conditions all year round.

7. Do you have an energy fireplace? : Yes, a large energy fireplace was installed to meet the needs of most of the house and is actually very efficient.

8. Did you have any budget? Did it cost you more? : All these new technologies cost some money. We had a budget, but because every time we wanted to do something else, we always exceeded the limit.

9. Could you afford this investment, or did you take out of loan? : Because the house was quite big, with the perspective to serve my kids’ needs, the money we had was not enough. So we got a sizable loan.

10. Do you think that environmental protection and living in an energy-efficient house were important reasons to have a “more expensive” house built than a conventional? Would you say that you did not sacrifice the benefits of green house because of the cost? : It's like to compare between day and night. The advantageous points of a green house cannot be compared to the cost of a conventional. What we have gained, firstly the thermal comfort, healthy natural environment, calm and relaxed living and secondly the significant economic benefits by reducing energy consumption is not sacrificed for the increased cost.

11. For all that you did, you have spent a considerable amount of money. How did you decide it? : Our decision was vital for our lives and the lives of our children. Besides, the extra money we spent would be amortized in 5-8 years.

12. In general what do you think were the main reasons that influenced you and led you to this decision? : First of all, we were tired of life in the city. So first environmental reasons, and reasons of healthy living mainly for children led us to this decision. Everything else follows.

13. Were you influenced by the media? : The media play a dominant role in our lives, sometimes positively and sometimes negatively. In the case of the
environment they influenced me positively and I got enough information about the target that I had in my mind.

14. Did your family influence you? Did your parents’ education or job play any role in your decision? : My parents lived with us in the city center because of their work. But the weekends we used to go to a small house we had next to the sea. Obviously this contact with the nature made me more environmentally sensitive.

15. Since when do you remember to be environmentally conscious or just think about how you could protect the environment or reduce energy consumption? : As a child I remember that I used to take part in various social groups dealing with the environment. Recently I have bought a hybrid car. But the house where we lived before could not provide us with what we wanted so as to protect the environment.

16. What do you do for living? Would you say your work played a role in your decision? : I am a doctor. I believe that my profession and my interest for a healthy life, especially for my family, was one of the factors that influenced me to make the decision on a green house.

17. Would you consider your income incentive to have such a house built? : My income helped me, but it was not the main motivation. Of course I did not have the whole amount of money; as I told you I took a large loan from a bank.

18. Have you been influenced by governmental regulations concerning building energy efficiency? : I was affected, because I knew that if I would do something for which I could not have an energy performance certificate, later I would face it.

19. Have you participated in environmental organizations? : Rarely; now I do not have time.

20. How did your friends or your neighbors influence you? : A good friend who had built something similar; when we visited him, a green house became our ultimate goal.

21. What do you tell your friends when they visit you? : We do not say anything; they see themselves and understand the difference in temperature in both winter and summer.

22. Regarding the schedule; Did you need more than you had thought? : There were factors such as weather conditions and the flow of money that delayed us about 5-6 months.

23. Did you encounter any technical difficulties? : No. We did not face any technical difficulties.

24. How did your neighbors react? : Our neighbors are older residents in the area than us and most of them have conventional homes. I would not say that they knew about green houses; whenever they walked past the house they used to read the billboard without understanding what exactly it was; there were many who asked for information.

25. How many square meters is the house? : The house is 235 square meters.

26. Do you think that the size of the house was an important reason for your decision? If it was smaller would you also make the same decision? : No; I would do the same.

27. How do you cope with heat during summertime? : We do not feel heat. Given the bioclimatic design of the house, the insulation in the shell, under-floor cooling, energy crystals and the natural environment with trees and artificial
lakes around the house, a cool environment has been created. With under-floor systems we have adequate cooling.

28. Did you notice any difference in the electricity bills? : Surely there is a reduction in power consumption since we have also solar panels installed. as a result we save money.

29. What else would you say that offers to the green character of your house? : Since there is not central sewerage system in the area, we decided to have a biological water purification system installed; we re-use the water in flushing of the toilet. We have underground rainwater storage tanks for irrigation and consumption in the surrounding area. Also, energy-saving electric appliances, energy saving bulbs and LED lights.

30. Are you satisfied with the systems that you use? : We think we have done everything we could depending on the financial capacity we had.

31. Do you think that your choice benefits you neighbors or society? Would you say that this decision does not affect the microclimate of the area you live and that it could be used as an example for others to follow it? : I want to believe that I've done the best for my family, region and microclimate. I do not know what else I could do. Clearly, my fellow citizens could follow my own example; however, now with the economic crisis people fail to do something related to energy consumption.

-Thank you very much

-You’re welcome

Case 10.

-Good afternoon Mrs. Matzourani
-Good afternoon

My name is Ioannis Vlachakis and I am a master student of “Urban and Regional Planning” program of Radboud University of Nijmegen (the Netherlands). This research which will be conducted on the basis of your personal experience in your private green house is part of my master thesis. I chose to pursue this topic for my thesis because I needed a better understanding of private initiative in green living. Becoming familiar with people’s desire for green houses that consume less energy is very important to me not only as an observer and a critic of the academic research on this field, but also as a future participant in the professional activities of urban planning.
Through our discussion I intend to find out the reasons that motivated you to convert your house into a green house.

-can we start?
-Yes.
1. Do you consider global warming and climatic change to be important environmental problems? : If we want to see how important problems global warming and climate change are, we need to think about where they will lead if we do not face them, in the destruction of the planet, and hence in the extinction of life.

2. Do you think that government is responsible for resolving such problems, or do you consider citizens to be the key to face these issues? : I believe that governments, with a common global decision, should have taken care for not facing the situation we face nowadays. Now, decisions must be determinant for each country. On the other hand, citizens have not shown the sensitivity, concern and care for the environment.

3. Are you aware of the urban heat island phenomenon and that it leads to the rise of cities and buildings temperature? : Yes, unfortunately we had to feel the consequences of urban heat island in order to see, all of us and more governments, that urbanization and cities “concrete” would lead to that.

4. In the past you lived in another house. Did you feel the heat or cold inside the house? Did you use the air-conditioner in summer and winter? : We had been living in one of the two apartments before we integrated them. In summer we were feeling so much heat, like being in a greenhouse. On entering the house we used to turn on the air-conditioner. In winter we used to wear thick clothes, and we were feeling the cold air from the windows. We turned on the air-conditioner, but when we turned it off, there were again the same temperatures. The electricity bill was high, but the result was the same.

5. When did you move out to this house? : We renovated the one apartment five years ago and we moved to it; then, we upgraded the other one and we joined them together.

6. The space heating is by means of under-floor system with air-water heat pump. Did you know anything about this? How did you make this decision? In addition, you installed energy frames and energy glazing. How did you make this decision? Did your husband influence you? : When we decided to upgrade the two apartments we did not have any idea about these things. We discussed with our children; our elder daughter was studying architecture and she suggested us some ideas; so, we decided to search for information from companies that were specialized in the construction of green building; they informed us about the under-floor systems, energy frames and energy glasses and about the insulation of the house shell and they upgraded our two apartments.

7. You have an energy fireplace. : Yes, and it is very efficient and healthier than the previous one that emitted smoke and made the house dirty.

8. Did you have any budget? Did it cost you more? : When you radically upgrade a house the cost is much higher. We had thought about it, but we had to make this decision.

9. Did you have the financial capacity to undertake this investment, or did you take any loan? : We covered the cost ourselves but we needed to take a loan.

10. Do you think that environmental protection and living in an energy-efficient house were important reasons to have a “more expensive” house constructed than a conventional? Would you say that you did not sacrifice the benefits of green house because of the cost? : Because we have lived in the same apartment for many years, we can understand the difference and compare a conventional with an energy efficient home, with regard to environmental
protection. Really, we did not regret for the money we spent, given that we would protect the environment, we would have thermal comfort, mental and physical relaxation and economy.

11. For all that you did, you have spent a considerable amount of money. How did you decide it? : We've spent enough money, but in practice we have two new apartments and extra saving in our pocket. Maybe it was time for us to contribute to the protection of the environment.

12. In general what do you think were the main reasons that influenced you and led you to this decision? : We needed a new house that would be built with new technologies both economic and ecological and it would be autonomous; our children that live here persistently desired it. Especially now that we would have the already existing apartments changed into green.

13. Have you been influenced by the media? : I had heard a lot by the media and I was positively affected. But I had not previously dealt more with it.

14. Did your family influence you? Did your parents’ education or job play any role in your decision? : My parents were educated. Since my childhood they had taught me to respect the environment, not to throw garbage, not to pollute the beaches and generally to love nature. I remember my father taking me by hand and walked to the mountain.

15. Since when do you remember to be environmentally conscious or just think about how you could protect the environment or reduce energy consumption? : Since my childhood, as I said, I was trying to take care of the environment and not waste unnecessary energy. I used to turn off the lights and open the windows to have natural lighting.

16. What do you do for living? Would you say your work played a role in your decision? : I am a lawyer and in a legal trial I was given the opportunity to prove the destruction of an ecosystem by the infection that was brought about by a factory unit. After that i have been very sensitive on environment.

17. Would you consider your income to be a stimulus for a green house? : No; our income was not a motivation but our love for nature, environment and for a green house.

18. Have you been influenced by governmental regulations concerning building energy efficiency? : No; we did it without government regulations. Besides, the upgrade was done before the building energy performance certificate was voted.

19. Have you participated in environmental organizations? : I followed the example of my father to my children. So, when we had the chance we used to take part in activities regarding the cleaning of parks and streams.

20. How did your friends or your neighbors influence you? : Some friends in Kapandriti had a green home built we were really jealous of in a good sense. Since that time we were influenced so much and we thought that maybe we could do the same in Psychico.

21. What do you tell your friends when they visit you? : No need to say much. Whether they visit us in winter or in summer, they can feel the thermal comfort, the pleasant environment inside the apartment and outside on the balcony.

22. Regarding the schedule did you need more than you had thought? : We needed more time for two reasons. Firstly because by living in the apartments we had to empty the one and upgrade it, then to join it with the other, then, move to
the other and so upgrade the other. The other reason was that because it was an inhabited building, we had to keep the quiet hours.

23. Did you face any technical difficulties? We encountered technical difficulties but we overcome them. We had to separate the pipes from the previous central heating system, insulate the exterior walls, remove the old floor and change the frames.

24. How did your neighbors react? Most of them felt that everything we did was extravagant; but now with the economic crisis and the increase in oil price, they vindicated us.

25. How many square meters is the house? Each apartment is 155 square meters. In total 310 square meters.

26. Do you think that the size of the house was an important reason for your decision? If it was smaller would you also make the same decision? We would also make this decision in a smaller house. Our reservations were if we could have a green house in a block. Eventually, the technology has been advanced so much that everything is possible.

27. How do you cope with heat during summertime? With the energy upgrade of the house we do not feel the heat we used to feel before.

28. Did you notice any difference in the electricity bills? Although the price of electricity is now double, we pay less than before.

29. What else would you say that offers to the green character of your house? We have placed awnings on the balconies, and climbing plants. We replaced all the electrical appliances and we have solar heater for additional hot water.

30. Are you satisfied with the systems that you use? It’s what I always wanted and I really enjoy it. I have thermal comfort, passive lighting, cost-saving, clean environment inside and outside the house, insulation from outside noises.

31. Do you think that your choice benefits you neighbors or society? Would you say that this decision does not affect the microclimate of the area you live and that it could be used as an example for others to follow it? I think that our decision is emulated. Some other people on the 1st floor of the building wanted to do something similar to us in a smaller apartment but due to financial difficulties they have not made the decision. Now of course, with the economic crisis, everything has changed and upon this I want to say the following. I believe that we all want to protect the environment; however, governments do not help so much with.

-Thank you very much

-You’re welcome
Construction and Development Company

Good evening Mr Panagoulas,

Firstly I would like to thank you for your time.

You are the founder of the Construction and Development Company under the name Effective development.

1. Could you please tell me a few words about your company? Is it a company of engineers, architects, designers? How many people work at your company? What services do you provide your clients? Do you specialize only in green buildings? How do you keep your skills up to date?: In our company all kinds of engineering are met, as long as architectural. We occupy 4 senior engineers, 2 junior ones, 2 foremen and keep 11 different groups of workers in respect to their specialty. We offer turn-key solutions in construction and development from scratch. We also offer energy efficiency consulting services and we deliver optimum retrofits in all kinds of structures. Our activities include the majority of building types, but the last 5 years we execute green building in a continuous increasing rate. We participate in certain forums and we constantly perform market and competitor analysis to keep our services on the top.

2. Why did you choose to specialize in green buildings? Why do you give emphasis on buildings' bioclimatic design and renewable energy resources usage?: We started our involvement in green building due to our vision for a better and sustainable future. We emphasize in bioclimatic design and the incorporation of RES, because in this way we deliver a holistic approach to our clients, which leads to a high-efficiency model.

3. How many of your clients decided to implement energy-efficient and environmentally-friendly systems?: Well, since 2008, the majority of our clients approach us with the concept of sustainable building already developed. We can say that they proceed to adopt energy efficiency and environmental friendly solutions in about 90%.

4. Do you provide your clients with the same information and advice about the green and energy-efficient systems they could use, or do you differentiate your advice depending on their (clients) desires, needs and financial capacity?: We generally listen to their needs as long as to their desires. We then try to accommodate the optimum model for each one of them, always focusing to the implementation of a value proposition.

5. What is your normal way of working; do you look for clients or clients come to you? Do they have fixed ideas about what they want? Or do they follow your advice?: Since we are in the general business for more than 25 years we believe we have created a brand which is synonymous to green building and delivery of the most sustainable solutions. All the blend that came out of the years together with our selected activities in bioclimatic structures is taken as benefit to the marketing and sales strategy that we implement. Our clients are from private sector: residential, C&I. Since the sustainable solutions tend to be a trend nowadays, many of them come to us with an already formatted concept, which of course gets filtered right away through
our system of working and the internal procedures that we follow with discipline.

-Ok, well, thank you very much
-You’re very welcome, thank you very much