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THE IDEA BEHIND A SUSTAINABLE BUILDING

DUBLIN, 2022

DECLARATION

I declare that this study that I submit as my final project on the program of my BA (Hons) in Business Studies at Independent College Dublin is an original report of my research and my knowledge and has been written by me. It did not take any advantage of someone else's work, did not breach any law of copywriting, and give the credits to the author when used citations in the paper.

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ABSTRACT

This study is sustainability focused on design and construction and what professionals in the field and companies are doing to be more sustainable. What the basic principles in the development of a green building or environmentally friendly are. The research of the five themes helped to reach the research question What is behind a sustainable building.

The research method consisted of a mix method (quantitative and qualitative) and was carried out with the participation of professionals in architecture and engineering to answer questions about the five themes from this study. After collecting data from the survey and interview, analyses and triangulation with secondary research indicate that companies are trying to be socially responsible, and the use of wind and solar energy are the best options in the construction as they can easily be incorporated in the design.

This study concludes that conserving, reuse, recycle, and protect are important to a sustainable building development, to reduce the pollution in the environment, and depletion of natural resources. Thus, promoting a better balance between environment and society.

LIST OF ACRONYMS

BIM – Building Information Modelling

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1. INTRODUCTION

The negative changes in the environment and ecosystems due to the problems caused by humans, such as deforestation, desertification, depletion of fisheries, and animals' habitat due to climate change has intensified over the years. The increase in population worldwide has positive and negative impacts in the cities. On one hand it has increased the consumption that leads to economic growth. On the other hand, it has intensified desertification and water shortages due to this rapid urban expansion.

To avoid compromising the future and irreparable damage to the planet, the need for commitment within business, government and individuals is urgent. To do this, some businesses are embracing the cause of reducing footprints, using renewable resources, and investing in green projects.

Environmental (planet), economic (business) and social (people) are the core for a sustainable design and a building impacts its users a society's life, and environment.

The perspectives and practices on sustainable designs will be reviewed to explain the importance of sustainability. The definition of green building and the interaction with nature and the use of technology in the design and construction will be described in this paper.

1.1. BACKGROUND OF THE RESEARCH

In the last decades the climate change has intensified, and it is a major challenge for sustainability as it is difficult to find sustainable solutions to problems caused by change in the temperature. Climate change is a stressor to sustainability.

Sustainability is a subject that has been spoken for many years. It seeks to prevent the depletion of natural resources and it is broken into three fundamental pillars: Economic (profit), Environmental (planet), and Social (people). In order to prevent more damages to the planet, businesses are reducing environmental footprints and using renewable sources.

Sustainable architecture dates from the 1970s when architects were pessimistic about a greater use of heating and cooling systems in enclosed glass and steel buildings. Green building is known as sustainable or with a high performance. They are designed to lower the impact on the environment and society, incorporating recycled materials, using water and energy efficiently, reducing waste, and etcetera.

The understanding about the environment fragility and the importance of its protection has increased as society is aware of the issue.

1.2. AIM OF THE STUDY

This study is to bring awareness that we need to do as much as we can to protect our natural resources. Small changes made during the process of building design can transform it into a good that will be not only positive for the environment but also for society and clients. Also, to show whether organisations are doing something or not to help the environment. When businesses balance design and environment, making clients and/or customers lives better without destroying the planet it can lead to its economic growth with new opportunities and assist in local business growth as well.

1.3. THEMES AND SUB RESEARCH QUESTIONS

- Sustainability in Architecture and Construction - *What to expect in a sustainable construction?*
- Green Building - *What's the purpose of Green Building?*
- Design and construction - *What are the factors that you consider important for sustainable construction?*
- Sources of clean and renewable energy - *What are the types of clean energy that you are aware of?*
- Waste and Recycling in Construction - *How can companies avoid waste during the*

construction?

1.4. INFORMATION GATHERING & DATA COLLECTION

The data collection to this study was from quantitative data from forty-four participants and qualitative data from three interviewees, all Brazilians, with a degree in Architecture or Engineering and more than five years of experience in design and construction. For the quantitative data, the questions were developed on Google Forms and the qualitative data was through email due the time difference between Brazil and Ireland and the tight schedule of the interviewees.

1.5. EXPECTED OUTCOMES

The expected outcome of this study is to show the importance of a more sustainable planet. Starting from small changes, such as separating recyclable waste from general waste to big changes, such as organisations being more responsible; using recycled materials and renewable energy in their constructions, trying to be greener and thinking not only in how the construction will affect the organisation (financially and not) but also in the impact in the society and environment.

1.6. CHAPTER OVERVIEW

Chapter 1 – Introduction

This chapter shows a summary of what will be presented in the study. Background, the themes and research questions, the method used to collect data, and what to expect from the study.

Chapter 2 – Literature Review

This chapter is to talk about the themes present in the development of the research question. They are *Sustainability in Architecture and Construction, Green Building, Design and*

Construction, Source of Clean and Renewable Energy, and Waste and Recycling in Construction.

Chapter 3 – Methodology

This chapter explains the approach adopted in the study. Mix methods were chosen for this study. An explanation about the methods, data collected, data analysis and ethics are the subject of this chapter for validation of the research.

Chapter 4 – Findings and Discussion

This chapter shows the analysis of data collected in both approaches (quantitative and qualitative) and triangulation with the literature and review and data collection in order to compare and contrast the acquired information and build a conclusion.

Chapter 5 – Conclusion

This chapter is to show the conclusion of the analysis and triangulation made and to present recommendations about the subject in study.

2. LITERATURE REVIEW

2.1. INTRODUCTION

The research about the topic of this study, “*The Idea Behind a Sustainable Building*” is shown in this chapter. A better understanding about the themes that helped to develop this study is shown in this chapter.

Theory is explained and researchers mentioned in this chapter to create an overview of the topics in question. Critical analysis is made in each theme to find new points of view and solutions not mentioned by the authors.

2.2. SUSTAINABILITY IN ARCHITECTURE AND CONSTRUCTION

Sustainability means to prevent the natural resources from depletion, so they will be available for a long time providing a better quality of life for future generations.

Sustainability in architecture, engineering and construction seeks to reduce the impact on the environment using renewable resources such as, recycled materials and clean energy, and avoid depleting reservoirs and ecological lands.

The challenge is to show to people that it is not only important to understand what happened in the past, what was their role to provide a better place to live but also make them think about what to expect for the future. Also, to ensure that all people have equal distribution of resources where they can live on a daily basis, having a decent quality of life. Sustainable construction contributes to a sustainable environment, protecting the natural resources in order to keep the balance between nature and human beings. Thus, they can live in harmony (Conte, 2008 p.2). However, the growth in population has grown absurdly and this directly affects my environment due to the urban expansion and for a sustainable future, people and industries have

to handle the natural resources efficiently (Bovill, 2014 p.26).

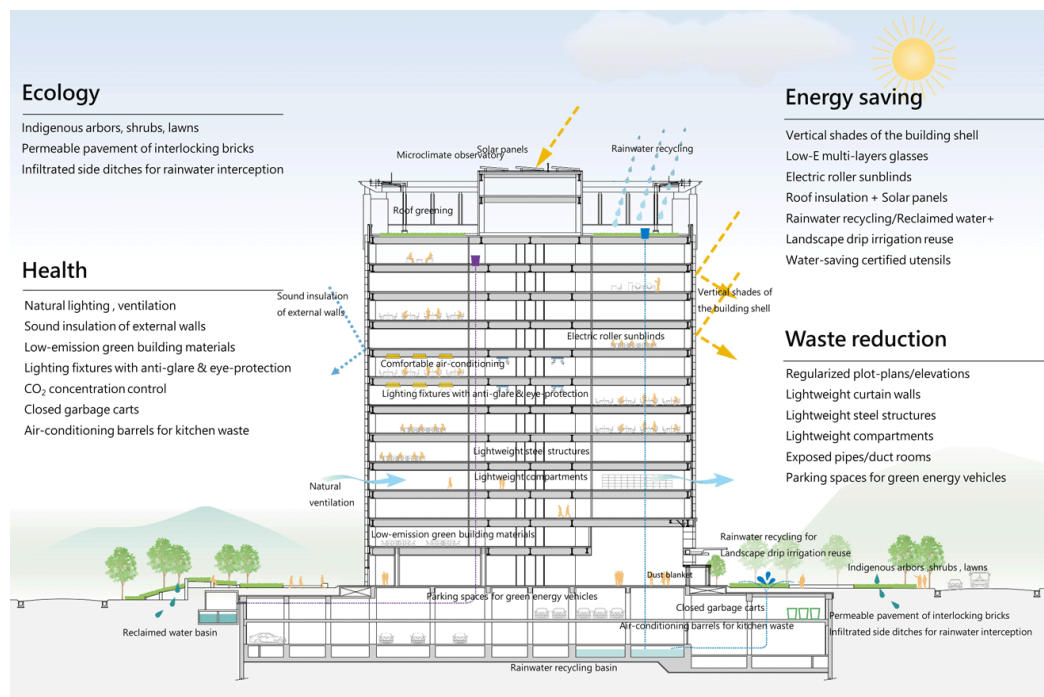


Figure 1 - Sustainable Building (Source: CTCI)

Planning a sustainable building, the designers need to ensure the benefits in the long term for the users. The functionality and aesthetics in remodelling an existing building or constructing one from the scratch must bring benefits. Comfort, security, and health (Lowe 2010: p.57).

According to Kibert (2016 p.11), green building is defined as “*healthy facilities designed and built in a resource-efficient manner, using ecologically based principles*”. The author also compared traditional versus sustainable criteria and set out six principles of sustainable construction that are: conserve, reuse, recycle, protect nature, non-toxics, and quality. The damage caused by humans in the environment is still reversible. The goal is to establish a connection between human and natural life. Thus, sustainable action in the design and construction can help to improve this connection and make a better environment for future

generations and avoid the depletion of the natural resources.

CRITICAL ANALYSIS

All authors mention the importance of protecting natural resources and the use of basic sustainable principles using the resources efficiently in order to keep the balance for the next generations. For this topic, a question about what a designer needs to consider incorporating sustainability in the design.

2.3. GREEN BUILDING

Green building or sustainable building is designed to lower the impact on the environment, to provide better solutions and maximise not only social but economic value over its lifecycle, from the design to demolition.

A green building is seeking quality and use of natural resources such as, sun (to take advantage of natural daylighting), heating and cooling, durable materials/ structure, reducing and recycling construction, using energy-efficient and water saving appliances.



Figure 2 - Features Associated with Green Building (Source: World Green Building Council)

It is the rehabilitation of heritage buildings. Pinheiro (2020 p. 174) says that “the green” should be developed from the sustainable rehabilitation point of view - construction, implementation, maintenance, deconstruction. In order to minimise the impact on the environment the whole lifecycle should be covered.

Green building has some objectives that provide a simple but still effective support for sustainable development. The objectives are under the social, environmental, and economic heading (Gibbert, 2005 p.1608). The acceptance for green building happened only in the early twenty-first century. The materials used in a green building cost more than other materials they replace. For instance, a green substitute for plywood can cost more than four times. The first item to be crossed if the budget goes over the estimate, is the sustainability line (Kibert, 2016 p.17).

“The higher demands placed on true energy efficiency can also be justified by the fact that the technology in buildings and facilities has a great lifespan” (Bauer, 2010 p.12).

The idea behind the green building is to use sustainable sites, water efficiency, energy and atmosphere, materials, and resources, providing better indoor environmental quality but not forgetting the innovation in design.

CRITICAL ANALYSIS

The authors describe that a green building seeks to lower the impact on the environment using natural resources, such as daylight and sustainable materials. However, the materials needed for a sustainable building cost over four times the normal ones increasing the budget of the construction. The sustainable line is always in risk when the budget is over than the expected. Thus, the question that is going to be asked is whether the price in the sustainable

materials could be considered an obstacle for companies to adhere to more sustainable buildings.

2.4. DESIGN AND CONSTRUCTION

Sustainability is for all types of architecture designs and construction. The solutions that can be implemented in the design depends on its complexity. For instance, in a residential design, simple solutions such as use of natural light and ventilation, reuse of water, solar panels to absorb the sun's run (to convert it into electricity or heat), use of LED bulbs, and etcetera put the design on the path of sustainability. In a commercial design, sustainability is a little bit more complex. It involves not only the design but also the management of the construction. The use of software helps the designers to plan a better solution for the implementation of materials and to certify better absorption of daylight, controlling glare, and unwanted solar thermal.

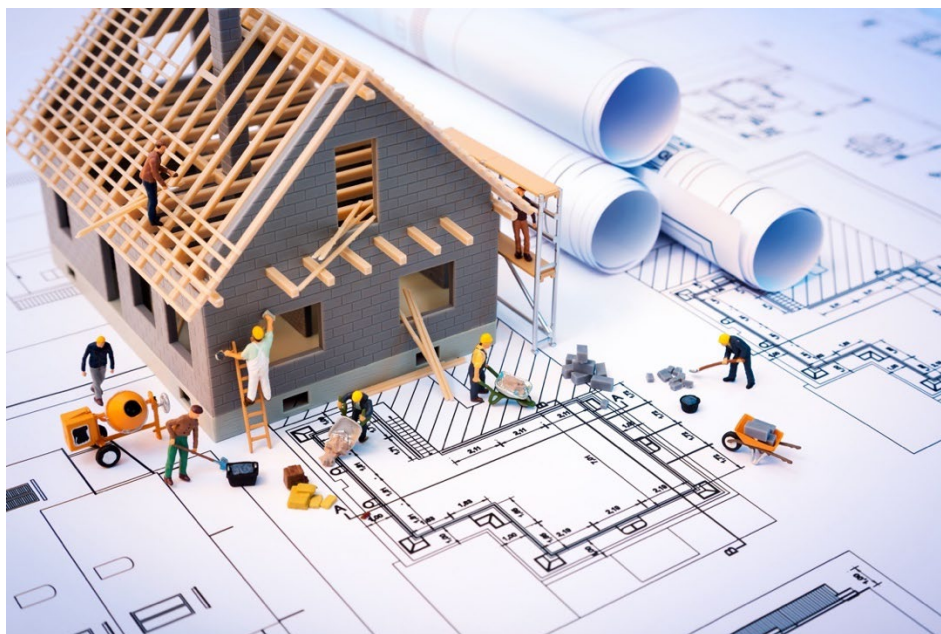


Figure 3 - Construction Design (Source: BIC)

Krajníková et al. (2019 p.1) explain that construction has a great impact on the environment

due to its activity that requires a greater consumption of natural resources and energy. As negative consequences the construction sector contributes to landfill waste, pollution, water pollution and climate change. In order to minimise the impact on the environment and be more sustainable the green building focuses on energy efficiency, reduction of waste production, CO2 emissions and etcetera. To implement this in the design, the designers use Building Information Modelling known as BIM that provides graphical and non-graphical information (Krajníková et al. 2019 p.1-2). Seven established dimensions in BIM allow a greater understanding of the developed design.

1D - Scratch point is focused on research, implementation, and concept design.

2D - Vector is focused on production (2D drawings, documentation and views and plans).

3D - Geometry is focused on the representation of the design. A visual part of the BIM model.

4D - Time is related to the production, time lining, schedule, project phasing, and controlling processes.

5D - Cost is the estimation of budget, life cycle cost, contracts.

6D - Performance is the result of the design. Energy, systems, construction, architectural performances.

7D - Facility Management is to collect relevant information related to maintenance and management of the building during its lifecycle.

This is the first step to develop a sustainable building. In the BIM 5D dimension, the search for durable materials and renewable resources is implemented in the design to assess whether the design is financially and ecologically viable.

According to Conte (2008 p. 4), over the years five steps are the target to improve the design and construction sustainability:

- Reducing the use of non-renewables sources

- Energy efficiency, health, and comfort of occupants
- Minimising energy consumption and maximising internal comfort ensures the right temperature indoors through the seasons.
- Saving energy through the whole building process
- Reducing waste and maximising reuse

The evaluation to determine if a building is successfully sustainable depends on a range of factors, that includes water consumption, use of materials, quality of indoor environment, location, energy performance, contribution to the ecological health system, and impact on the external environment (Kibert, 2016 p.5). Building's life, from design to construction to maintenance is supervised by firms specialised in the complexity of the sustainable building to verify whether the building fits in the criteria of sustainable. The organisation The Green Building Initiative offers "Green Globes", a certification program for building (Davis, 2017 p.2).

Sustainability in general is an important topic that impacts all human life. It is important to develop sustainable design and have a sustainable construction where the impact on the environment can be reduced to provide a better quality of life to all. Nonetheless, not everyone is focused on sustainable design and an architect/ designer who does not support sustainability in their design can lose credibility and can make mistakes throughout their career. Therefore, they will be vulnerable to conflicts in the market (Bovill, 2015 p.3).

Businesses are embracing the cause and thinking more responsible. They are implementing solutions to adequate their business to a more sustainable project. When refurbishing or renovating the use of reusable and renewable materials are implemented. There is a discussion that some companies are changing to be green only to improve business image in front of clients. Nonetheless, actions are being put into practice, no matter the reasons that led these companies to do so.

CRITICAL ANALYSIS

The authors have different sayings about this topic. Nonetheless, all information found is interconnected. The use of software that allows a better understanding of the design and construction is crucial to avoid waste of materials and to reduce non-renewable sources. The software mentioned above is the most important tool to help the construction industry to be more efficient and sustainable. It shows the energy, systems, architectural, and construction performances that can be altered if needed avoiding alterations in the design during the construction. Thus, saving money and having a cleaner construction. Also, they explain that companies are being more sustainable because they are being pressured. Questions about socially responsible is going to be the main topic for this subject in the interviews and survey. The use of the software is going to be questioned in Waste and Recycling in Construction.

2.5. SOURCES OF CLEAN AND RENEWABLE ENERGY

Renewable energy is an endless source of energy. Most renewable energy is considered sustainable. Types of renewable energy are solar, wind, geothermal and hydropower. Biomass is also a type of renewable energy; however, it is not considered sustainable due to the rates of exploitation.

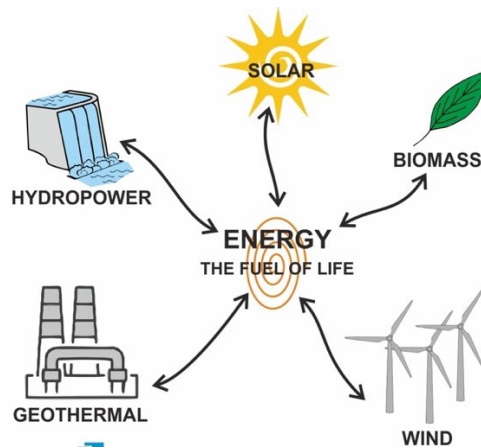


Figure 4 - Renewable Energy (Source: Polarpedia)

Energy, such as solar and wind, is storage and it is available in surplus that can be used later. The storage needs to be evaluated in two factors: the capacity of energy it can store and capacity of the system that can be absorbed and delivered. Both systems need to do well. A big store will not be efficient if they cannot receive or deliver little energy at time (Heinberg and Fridley 2016, p.9). The types of renewable energy are explained as follows:

Solar energy is the absorption of the sun's run that is converted into energy to be used later. The technology used to absorb the sun's run is solar panels and photovoltaic systems. Solar panels and photovoltaic technologies are integrated in the PV cells directly into the material used in the building as part of the skylights, flexible shingles, metal roofing, and semi-transparent and insulated glass windows that can be used in the façade (Kibert 2016, p.308-309). Their durability is expected to be over 30 years. It is a material that can be added, removed, and reused. Displaying this material on the roof and façade creates a greater solar area to collect solar power to transform into electricity that will be used in the building, and it is an actuator for cooling generation. On one hand this renewable energy is low maintenance, reducing the electricity bill and technology development. On the other hand, the cost of solar energy storage is expensive, it depends on the weather, and demands a lot of space.



Figure 5 - Solar Panels (Source: Euronews)



Figure 6 - Buildings Using Solar Panels (Source: Interesting Engineering)

Wind energy or wind power is the use of the wind to generate mechanical electricity. Wind energy is also a result of the warming surface of the earth (Bauer, 2010 p.124). In construction, tall buildings due to the higher altitudes can install wind turbines to produce electricity.

According to Ali (2008 p. 118) *“taller buildings can be shaped to funnel wind into a zone containing wind turbines without having negative effects on the structure, its surroundings, and the occupants. By such profiling of the structure, wind speed can be amplified and produce more energy”*. Wind energy now can compete with conventional power generation technologies as its cost has dropped in the past years. The advantage of this energy is the lowest

kw/h cost, and the disadvantage is due to the turbines being large and demanding significant annual wind speed.



Figure 7 - Wind Turbines used in Skyscrapers (Source: Just Energy)

Geothermal energy is the heat beneath the surface of the Earth. Hot water is the most common manifestation of geothermal energy. It can be used to power plants, heat pumps and heating systems. A process known as “borehole heat exchange” pumps water from the ground through boreholes and returns to the surface to provide space heating (Ali, 2008 p. 119). The advantage is this energy is independent of any seasonal variations or climate change as it mentioned before is beneath the surface of the Earth.

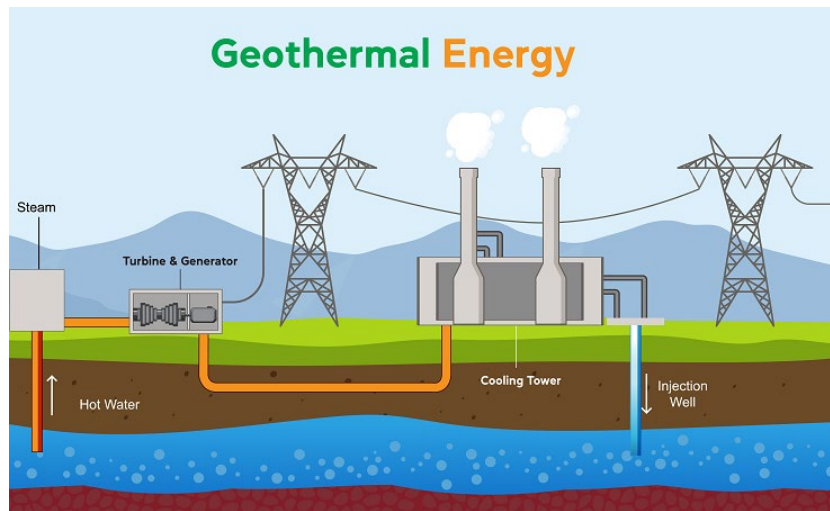


Figure 8 - Geothermal Energy Sketch (Source: Greenesa)



Figure 9 - Geothermal Energy (Source: Ipsgroupbv)

Hydropower energy is one of the oldest forms of renewable energy. Electricity is generated by using the natural flow of water. The use of this energy is not good just because it produces energy, but also helps to control floods, clean drinking water, and provide irrigation support. However, it is an expensive construction, takes a long time to be built, impacts the environment, and displaces animals and people.



Figure 10 - Hydropower Energy (Source: The Scientific World)

Countries based on the coast can use the advantage of the wind to implement wind energy and can explore solar energy due to their weather.

Renewable energies are expected to continue increasing as the demand for power / energy has increased due to the population growth and to provide power to people's homes and businesses. The key to maintaining and protecting the planet from an increase in climate change is the use of renewable energies.

CRITICAL ANALYSIS

This theme shows the different types of clean energy and the advantages and disadvantages of each of them. From the information collected, wind and solar can be easily used in tropical countries as they have favourable weather for these energies. Hydropower is still used but the construction of new ones demands time, large amounts of money and site. Questions about the knowledge of renewable energies are going to be asked. Types, and if companies are using one of them.

2.6. WASTE AND RECYCLING IN CONSTRUCTION

A large amount of waste material is generated in the construction industry. Demolition generates a large amount of waste and that is why one of the main reasons for sustainable construction is to renovate the building without demolishing and trying to use renewable materials with a long lifecycle. Bauer (2010 p. 20) says that planners during the planning stage are able to gather valuable experience in order to make recycling capability of materials. The consumption of natural resources and production of waste needs to be less resourceful (Ali, 2010 p. 114).



Figure 11 - Recover, Recycle, and Reuse (Source: Allied Academies)

The construction industry has been using recycled material but its waste from demolition, construction, and products, that were not used, are disposed of in landfill still.

Technology can help to avoid waste. As mentioned before, the BIM is used not only to develop the design and verify lifecycle and sustainability but also to process the correct quantity of materials that will be used in the construction.



Figure 12 - Waste in the Construction (Source: PBC Today)

Manufacturing has increased for recycled materials (Heinberg and Fridley 2016, p.67) as the use for recycled materials has risen in construction. Materials that can be recycled from demolishing and constructions are plasterboard, metals, plastic, glass, wood, bricks and blocks, steel, floor, and wall covering, and packaging. The intention of using recycled materials is to avoid continuing polluting the environment by throwing the materials away. Recycled materials come from manufacturing recycled materials or recycled consumer products (Bovill, 2014 p. 145). An example of a durable and recycled material is steel. Steel is durable and its high recycled content makes it an excellent material to use in construction. It can be deconstructable and reused (Kibert 2016, p.46). The author also points out that building components still have functional value from the renovation and demolition. The materials can be reused on the currency project or stored in a future one or can be sold in the market.

CRITICAL ANALYSIS

The authors demonstrate the importance of reusing recycled materials in the construction. The steel is mentioned by one of the authors as it is a durable material and can be deconstructed and reused in another place. It is also said that technology helps to control waste and it is going to be asked in the survey and interviews.

3. METHODOLOGY

3.1. INTRODUCTION

This chapter will demonstrate how the data for this study was collected, analysis of the material and interpretation of the results. Also, the process of data collection, sampling, and ethics.

Each method adopted for this study is explained with a brief explanation why they were chosen.

3.2. RESEARCH METHOD

This study was conducted using mixed methods, qualitative and quantitative. The idea to use interviews (qualitative method) was to collect more specific information from professionals in architecture, engineering, and construction helping with a more detailed conclusion of the subjects in question. The use of a survey (quantitative method) was to gather a larger number of materials, as this method does not take long to be responded to and could be responded not only from professionals, but for any person interested in sustainability.

3.3. RESEARCH APPROACH

The research approach follows the use of mix methods, analysing the data collected in the survey to confirm facts cited in the literature review and analysis of the interviews through interpretation and trying to find keywords, patterns between authors, respondents, and interviewees.

3.4. DATA COLLECTION METHOD

The formulated questions for the quantitative and qualitative methods were designed using information from the literature review and secondary research used in this study, such as

articles, reports, studies and etcetera.

The quantitative approach (survey), nineteen closed-end questions were used, aiming to get information about awareness of companies and professionals in the field of construction and design about the need for sustainability in the design and construction. Google Forms was used for the survey that took place for seven days (from 03.10.2022 until 09.10.2022) and was shared between architects and engineers on WhatsApp groups and Instagram.

The qualitative approach, four interviewees were invited to participate in the study, but only three of them participated. They responded to sixteen open questions. The interviews happened via email as the meeting was not possible due the time difference between Brazil and Ireland.

The five themes were included in both approaches and the collections of data helped to identify the behaviour of industries related to sustainability and what they are doing to be more socially responsible and what people think about the subject and what can be done to avoid future complications.

3.5. SAMPLING

In both approaches, the focus was on gathering information about the subject from professionals in the design and construction field.

On one hand, the survey was used to get information about how many of the professionals know about the subject in study and whether they worked in a company that used any type of sustainability in its premises. Even though the links for the survey were shared on WhatsApp groups and Instagram, the sample had only forty-four respondents.

On the other hand, the interviews were used for more in-depth information from professionals who have experience not only in design but in construction as well. The interviewees were:

- ⇒ Interviewee 1: Brazilian engineer with more than twenty years' experience in design and construction, especially in hospital construction. (Document sent in the email by the interviewee on the 12th of October 2022).
- ⇒ Interviewee 2: Brazilian architect with more than ten years' experience in design and public construction, such as urbanisation. (Document sent in the email by the interviewee on the 9th of October 2022).
- ⇒ Interviewee 3: Brazilian engineer with less than ten years' experience in design and construction. (Document sent in the email by the interviewee on the 27th of October 2022).

3.6. RESEARCH PROCESS

The primary data source, the quantitative and qualitative approaches were developed according to the themes in this study and were submitted for approval before they are shared. All questions in both approaches had no problems and no modifications were necessary.

The secondary data source used in this study was collected from reports, case studies, books, and articles that can be found on Google Scholar, Library Genesis, and personal books.

3.7. DATA ANALYSIS

To analyse the data collected, method triangulation was used to have a better understating by comparing primary and secondary research in the themes of this study.

3.8. ETHICS

This study was developed in accordance with ethical standards where the participants received an informed consent with all information about the study and if they were willing to participate or not. For the interviews, the consent was sent by email and in the survey was posted in the beginning as people could have dropped it before even starting it. They could

have drawn any time from the survey or interview without providing any reason for leaving. They also were assured about their anonymity in the study and the data collected about personal information were kept confidential. This study is also considered to give the proper credit to the author when using someone else's work as reference and avoid plagiarism.

4. FINDINGS AND DISCUSSION

4.1. INTRODUCTION

This chapter is an overview of the results from the quantitative and qualitative approaches. To facilitate, this chapter is divided by the literature review's themes where the data collected in the survey and interviews is analysed and then made triangulation with the authors in the literature review. With the findings it will be possible to have a better understanding about sustainability and green building. Comparison and contrast will be prepared when needed to get a better conclusion of the topic in question.

4.2. SUSTAINABILITY IN ARCHITECTURE AND CONSTRUCTION

In the interview, two questions related to this theme were asked to the interviewees. Below it showed the questions and answers from the interviewees.

- What do you expect in a sustainable construction?

“Sustainable construction is one that, during the planning, design, construction, and lifetime processes, minimises damage and integrates holistically into the environment” (Interviewee 1).

“The main expectation is to save energy, reduce resources using, and use of environmentally friendly materials” (Interviewee 3).

- What is the best way for the designer to incorporate sustainability into the design?

“The designer must have specific knowledge of the environment where the building will be located and have extensive knowledge of the building materials that can be incorporated into the project (...)” (Interviewee 1)

“The best way is to know the climatic conditions and the materials available in the region where you intend to build. This will represent better use of resources (...)” (Interviewee 2).

“By using environmentally friendly materials” (Interviewee 3).

DISCUSSION

The triangulation in this topic shows that all interviewees mentioned that for a sustainable design it is important the use of recycled materials and the condition of the environment where the design will be built and materials available. A fact also mentioned by the authors in the literature review. Reuse of materials sustainable and protecting the natural resources, knowing the climate conditions of the place where the building will be set in order to maintain the balanced environment vs human beings.

4.3. GREEN BUILDINGS

For this topic, three questions were elaborated for the survey and four questions for the interviews.

In the survey, the questions “are you familiar with Green Building?” and “Do you think Green Building is designed to lower the impact on the environment?” show that 79.5% of the respondents are familiar with Green Building and 97.7% of them think green building lowers the impact on the environment.

Are you familiar with Green Buildings?

44 responses

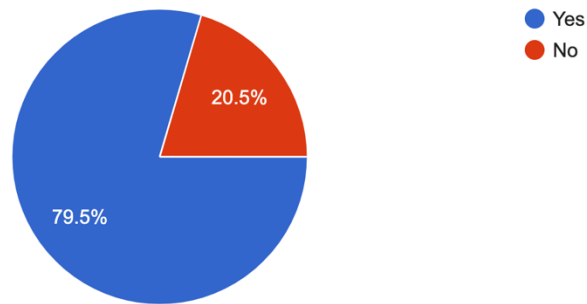


Figure 13: Result of survey about Green Building? Q4 (Source: Google Forms)

Do you think green building is designed to lower the impact in the environment?

44 responses

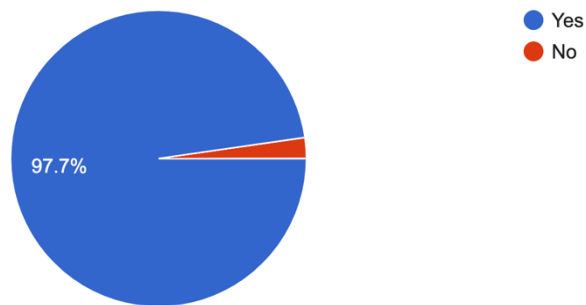


Figure 14: Result of survey about Green Building? Q5 (Source: Google Forms)

The main questions in the interview were the purpose of a Green Building and the limitations faced by the industry. The answers given by the interviewees are shown as follow:

“Integrating users and mitigating damage to the environment during all phases of its lifecycle planning, design, construction, and maintenance” ...

“Entrepreneurs often do not have availability in their budget to invest green. We have already given up on green buildings because of the more expensive materials (...)” (Interviewee 1).

“Ensuring that the resources used in the construction, operation and maintenance of green buildings are preserved, in addition to being efficient in saving water and electricity, reducing the negative environmental impact and ensuring the well-being of future generations” ... “limitations are linked to the type of materials to be used, which can leave the building more or less green and not reach the maximum score” (Interviewee 2).

DISCUSSION

These findings in the survey and interviews show that professionals in the field believe the purpose of a green building is to lower the impact on the environment when avoiding depleting the natural resources and being more sustainable in the lifecycle of the building, from the conception of the design until maintenance. However, as demonstrated in the literature review and interviewees, the use of sustainable materials is still a problem as the cost for implementing them is far too much in comparison to “normal” materials. Due to that companies have given up going green and being more sustainable.

4.4. DESIGN AND CONSTRUCTION

For this topic, three questions were elaborated for the survey and two questions, one of them containing sub-questions, for the interviews. Both approaches asked whether companies are being socially responsible.

In the survey, 56.8% of the respondents believe businesses are trying to be more socially responsible.

Businesses are embracing the cause of reducing footprints, using renewable resources and investing in green projects. Do you believe they are doing this to be more socially responsible?
44 responses

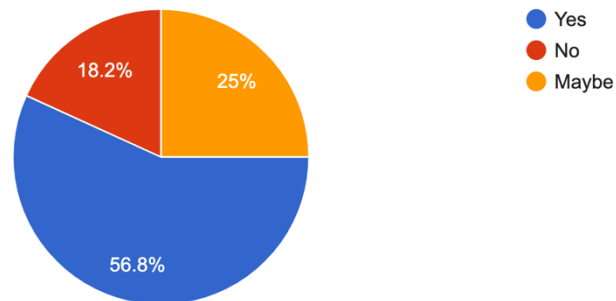


Figure 15: Result of survey about Socially Responsible Q7 (Source: Google Forms)

70.5% believe that companies that are not socially responsible lose credibility in society.

Do you think companies that do not support sustainability can lose its credibility?
44 responses

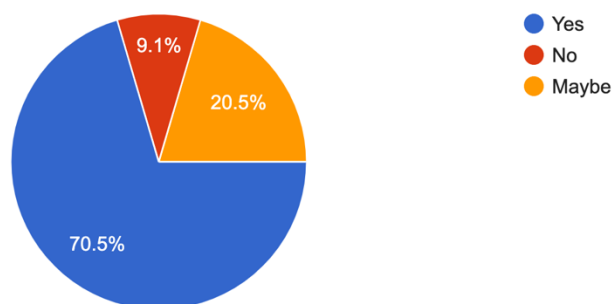


Figure 16: Result of survey about Socially Responsible Q9 (Source: Google Forms)

The answers about the topic for the interview are shown below:

“They are trying to be because society has pressured companies to supply good products and the market has been demanding. Therefore, companies are adapting to the market and to this demand for conscious consumption”
(Interviewee 2).

“Most of the effort comes from the government to make buildings more sustainable through legislation that encourages good practices and sometimes imposition for new developments. Also, big companies adopt these practices to make a good impression on the community” (Interviewee 3).

DISCUSSION

It can be concluded from the literature review, survey, and interviews that the organisation is more socially responsible, trying to reduce footprints on the environment, using recycled materials, and lowering consumption of water and energy. However, it is shown in the literature review and in the interviews that companies are doing this because they are being pressured by society and government to become green. The survey showed that over 70% of the respondents believe that companies lose credibility when not engaged in sustainability.

4.5. SOURCES OF CLEAN AND RENEWABLE ENERGY

For this topic, six questions were elaborated for the survey and four questions for the interviews.

In the survey, 47.7% of the respondents have worked in a design or construction where renewable energy was used and 88.6% believe they are using solar and wind energy.