Sustainable Performance of Selected Hostels in Lisbon, Cascais and Sintra

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Resumo

O turismo do hostel é um fenómeno vincado em países como Austrália e EUA, mas em Portugal é um mercado recente, tendo crescido consideravelmente nos últimos anos, não só nível nacional como internacional. Portugal está integrado na maior região turística do Mundo, a Europa, recebendo 52% das viagens internacionais registadas mundialmente. Actualmente é o 3º país mais visitado da Europa, ultrapassando a Itália. Este crescimento é um motor económico e cultural, trazendo importantes benefícios e oportunidades para um país a recuperar da grave crise de 2008. Em termos ambientais, o turismo é uma indústria que nunca deixará de ter impactos negativos no ambiente, sendo cada vez mais necessário encontrar soluções viáveis que mantenham o balanço entre a economia, ambiente e contexto social, a designada sustentabilidade.

O objectivo deste trabalho é compreender o segmento do hostel na região de Lisboa-Cascais-Sintra, e avaliar o seu nível de sustentabilidade através de um estudo de ciclo de vida, largamente aplicado em Portugal, o LiderA. Posteriormente, é feita uma comparação com os hostels estudados na Catalunha em 2015 no trabalho intitulado "Sustainable Hostels and Backpackers Behaviour Case Analysis: Catalonia selected hostels", indicando em seguida medidas de melhoria alocadas a cada caso. Um guia de soluções sustentáveis aplicáveis a qualquer hostel é também um ponto importante deste trabalho, visto que os estudos em Portugal neste segmento, em relação aos disponíveis noutros países e em relação à sustentabilidade, são escassos. Nesse sentido, foram contactados inúmeros hostels da região acima mencionada, e posteriormente visitadas as suas instalações e serviços, de modo a realizar o estudo do LiderA. Após a avaliação foram sugeridas medidas ou melhoramentos para cada hostel, tendo em conta os critérios mais fracos registados. Por outro lado, os pontos mais fortes também foram analisados.

Os resultados analisados indicam-nos que a comunidade hosteleira está progressivamente a incrementar medidas eco-friendly em muitas áreas de funcionamento do hostel, mas verificam-se deficiências em praticamente todos os casos estudados, na gestão de água, nomeadamente no seu consumo e tratamento, assim como na falta de estruturas e espaços verdes em relação à área impermeável, uso de energias renováveis e mobilidade de baixo impacto. Parte da resolução ou melhoramento destes problemas é localizada, ou seja, da responsabilidade e sensibilidade de cada hostel, mas outros parâmetros terão de ser abordados ao nível das localidades, de modo a promover outras formas mais sustentáveis de mobilidade, de novos acessos a todos, e uma aposta cada vez maior em tirar proveito dos vários recursos naturais disponíveis, adaptando os meios urbanos ao ambiente, e não o contrário.

Palavras-chave: turismo; turismo internacional; turismo sustentável; hostel; avaliação ciclo de vida; sustentabilidade.

Abstract

The hostel tourism is a strong phenomenon in countries like Australia and the USA, but Portugal is a new market, having grown considerably in recent years, not only nationally and internationally. Portugal is integrated in the largest tourist region in the world, Europe, receiving 52% of international travel registered worldwide. It is currently the 3rd most visited country in Europe, surpassed Italy. This growth is an economic and cultural engine, bringing important benefits and opportunities for a country recovering from the severe crisis of 2008. In environmental terms, tourism is an industry that will never stop having negative impacts on the environment, being more than ever necessary to find viable solutions to maintain the balance between the economy, environment and sociology, the also called sustainability.

The aim of this work is to understand the hostel segment in the Lisbon-Cascais-Sintra, and assess its level of sustainability through a life cycle study of life, widely applied in Portugal, the LiderA. Subsequently, a comparison is made with the hostels studied in a similar work in Catalonia in 2015, in the project entitled "Sustainable Hostels and Backpackers Behaviour Case Analysis: Catalonia selected hostels", indicating then improvement measures allocated to each case. A guide to sustainable solutions applicable to any hostel is also an important part of this work, as the studies in Portugal in this segment, compared to the ones available in other countries, and in relation to sustainability, are scarce. In this sense, were contacted numerous hostels in the aforementioned region, and later visited their facilities in order to carry out the study LiderA. After the evaluation were suggested measures or improvements for each hostel, taking into account the weaker criteria registered. On the other hand, the strengths were also mentioned and analysed.

The analysed results indicate to us that the hostel community is progressively increasing eco-friendly measures in many areas of functioning of the hostel, but there are clear disabilities in nearly all cases studied, mainly the water management, particularly in consumption and treatment, as well as in the absence of structures and green spaces in relation to the impervious area, use of renewable energy and low impact mobility. Part of the resolution or improvement of these problems is particular, i.e., a responsibility and sensitivity of each hostel, but other parameters have to be addressed at the level of locations, in order to promote more and sustainable ways of mobility, better access and for all, and the promotion of taking advantage of the many available natural resources, adapting urban areas to the environment, not the other way around.

Key-words: tourism; international tourism; sustainable tourism; hostel; life cycle assessment; sustainability.

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1. Introduction

1.1. Tourism, hostels and thesis motivation

Since the mid-1990s, the tourism industry has become aware of the economic 'phenomenon' of backpacker tourism and the extent to which it contributes financially to both developed and developing countries (Scheyvens, 2002).

According to World Tourism Organization, nowadays tourism is seen as the key for development, prosperity and well-being. There is a growing trend for new worldwide destinations, making tourism as a key factor in socio-economic progress by achieving operating revenues, creating jobs and companies, as well as new infra-structures.

Europe continues to be the most visited region in the world, with 52% of the total of international tourists' arrivals from many and diverse destinations. In terms of regions, the leader is Southern and Mediterranean Europe, which recorded about 11 million international arrivals more than in 2013. The main destinations are Spain, France, Portugal and Italy, in 2013 (Organizacion Mundial del Tourismo, 2014). Thus, this sector is very important to Portugal, and also for the economic centres like Lisbon and Porto, generating jobs and creating the need for associated services such as international airports, transport and accommodation, services which need to be more efficient and with better quality. As such, the pressures and threats are increasing and diversified, reinforcing a major concern of modern society, the environment.

Tourism is an industry highly dependent on the environment that surrounds it, then its quality and all the resources it needs. So has been observed a growing concern for environment by hoteliers, managers, owners and other related entities. These factors greatly contribute to the beginning of adoption of environmental practices and consolidation of environmental management as a necessary condition for the improvement and development of this industry.

With the globalization in continuous expansion and development, there will be more and more ways of how people can move, creating different styles of tourists. Today people experience globalization differently, representing different roles in the world, taking into account their background, education and the position occupied in the world. There are tourists of all kinds, from the most conventional who organize their trips through agencies and high levels of security, to the tourists called, and previous mentioned, backpackers, who travel with a backpack, low budget and without a return ticket.

This project is focused in the hostel, a segment dedicated to the backpacker movement that since the first studies is considered a place for independent travellers, travelling alone or with a small group of companions, looking for sharing experiences.

The hostel is not just a place to sleep, its purpose is to promote communication, share stories and the closest local experiences in the destination. That can be achieve by their usual perfect location considering the historical centre, low cost prices, the special disposition and typology of spaces. The bedrooms are usually dorms, where guests sleep in bunk beds and share bathrooms. The kitchen is called 'guest-kitchen' where people can prepare their meals and eat

together in the common living or meals room. Sometimes there is a common table to promote even more contact. The common spaces can have games, books, TV or any activities to encourage people to socialize with each other, and terraces, balconies and bars are also essential places and most appreciated to guests.

In Portugal, this touristic segment had a significant growth in the last 6 years, having Lisbon at least 70 hostels, compared to 2 in 2008. Besides that, Portugal is now the 3rd country most visited in Europe, registered 14 million guests and 41 million overnights in 2013 (Turismo de Portugal I.P. (TdP), 2015). In an economic perspective, this evaluation means 9.8 billion € in touristic revenues, but regarding the environment is the synonymous of more pressure and impacts.

So, to keep up this growth, and to follow the goals of sustainable tourism, is more and more needed a good management of touristic accommodations, especially hostels for this study, in relation to their impacts. Since hotels are an older and experienced type of accommodation in Portugal, and in the region of Lisbon-Cascais-Sintra, there are more studies available, awareness and more information about sustainable solutions adapted to hotels. Also there is legislation about it and strict rules. For hostels still doesn't happen the same, thus the time is crucial to understand their main environmental loads and weak areas, and find adequate solutions to achieve sustainability. This work can be starter to overcome the lack of information about hostels and their relation with sustainability.

In Portugal the studies related with hostels are in fact about the backpacker tourism, but even though scarce. Perhaps, the one of the pioneer studies in Portugal, and also Iberian Peninsula, written for Cátia Rebelo from Tourism School of Leiria (Rebelo, 2012), tried to understand the identity of the backpacker who visit Portugal, their motivations and consumption patterns, but still isn't focused in the hostel, their structure and facilities. Also, the studies about sustainability concerning touristic accommodations like hostels are barely countable, which reflect the lack of knowledge and information in the segment. Therefore, it is intended to contribute to reducing this deficit of information and knowledge about this segment, specifically in these tourist areas of Metropolitan Area of Lisbon, divulging this study among the hostels that have contributed to its development.

So one of the important questions is if Lisbon-Cascais-Sintra hostels facilities integrate sustainability, what managers and owners have been doing to embrace this topic, what measures are possible to implement.

1.2. Thesis objectives

The global purpose of this study is to understand if a sample of north Metropolitan Area of Lisbon (Lisbon-Cascais-Sintra) hostels facilities, consider sustainability and in what terms, besides providing a guideline of sustainable solutions applicable in their business, and finding some possible solutions for their lower criteria rating. Specific objectives are to understand the select cases of hostels, what kind of sustainable measures are incorporated; ranking the

performance of sustainability building facilities using a tool currently used in Portugal, which is LiderA sustainability assessment system.

1.3. Methodology

To achieve those objectives, the following methodological steps are defined:

- Review the state-of-art focus on current international and national tourism, sustainable tourism and hostels;
- Select hostels cases, including contact to have permission to visit the buildings;
- Visit, involving interview with responsible and obtain data;
- Assess the building facilities in a ranking sustainable perspective;
- Critical review and results discussion;
- Comparison with Catalonia selected hostels;
- Conclusion, limitations and further development.

The review of state of the art was done reviewing scientific journals, books, thesis and other sources of information to make a brief state-of-art focus in nowadays tourism data, sustainable tourism and description of a hostel and its market in Portugal.

In order to define the sample of hostels in Lisbon-Cascais-Sintra region, the following methods were used. For getting the best hostels' sample, all of interesting hostels were contact by e-mail, and after scheduled a meeting with the manager or owner. In total, 12 hostels were visited and analysed, during the last 6 months. During the visits, the aim was to meet the facilities and get detailed information about the hostels' operation, adopted policies and conditions of buildings and services. To do that, was used a table of precise and detailed criteria from a Portuguese volunteer system called LiderA, which aims to make efficient and integrated support, evaluation and environmental certification built that seeks sustainability. The system evaluates different areas as soil, energy, water, waste, etc. With this kind of information is possible to understand the level of sustainable solutions that are present in the hostels and categorized them in energy levels, from A^{++} to F, being E the common level for buildings (a more detail explanation is available in 3.3).

After getting all the needed information for the LiderA assessment, the worst and best criteria were selected, highlighting what has been done better and analysing the lower scores in order to understand which the possible solutions to improve are. A discuss and comparison with the previous studied cases of Calatonia were also conducted.

In the end, after a critical analysis, conclusions are taken about how the sample of Lisbon-Cascais-Sintra hostels facilities consider sustainability and in what terms, which are the possibly solutions for the lower rating levels, what is the limitation of the work and further developments.

1.4. Structure

This dissertation is divided in seven chapters.

The first chapter, the present one, includes an introduction and context of international tourism and the hostel market segment, followed a section dedicated to the thesis motivation and its objectives of the present work are showed.

Chapter two presents a bibliographic review, focused on the current international and national tourism context, as well as a detailed explanation for the selection of the region in study: Lisbon-Cascais-Sintra. The next section dedicates to the concept of sustainable tourism, and how its increasing application has driven worldwide organisations, institutions and NGOs to join together with a shared goal of encourage this practice in order to mitigate the negative effects of tourism on climate. Last, a brief description about the concept of hostel and its current market situation in Portugal, mainly in the region already mentioned.

Chapter three presents an introduction of sustainable analysis of hostel buildings, the description of the LiderA assessment used for buildings.

Chapter four presents the case studies in the region of Lisbon, the description of the hostel and its operation, and the LiderA assessment.

Chapter.five presents the case studies in the region of Cascais and Sintra, the description of the hostel and its operation, and the LiderA assessment.

In chapter six a critical analysis and discution of the results is made, comparing the Lisboa-Cascais-Sintra cases with Catalonia cases.

Finally, chapter seven summarises the main findings and discusses future research and application perspectives.

2. State of the art

2.1. Tourism in Portugal

2.1.1. International framework: tourism in numbers

In 2009 the world got into a deep crisis, and since then in all corners countries and nations have struggle to overcome it. Yet in spite of the many challenges the world faced in the last 7 years, international tourism continued to propel ahead. At the 2014´s close, the number of tourists travelling internationally grew by 4.4%, reaching a new milestone increase since the global economic crisis of 2009, with an additional 48 million more than in 2013. Once again, these results have surpassed U.N. World Tourism Organisation's (UNWTO) long term projection of 3.8% growth for the period 2010 to 2020, well on track to reach the projected 1.8 billion international tourists by the year 2030 (World tourism Organisation, 2015).

With over 1.1 billion tourists taking an international trip every year, tourism continues to be an unstoppable force and a key driver of the global economic recovery. Yet tourism´s record growth is not merely absolute numbers. Tourism´s continued progress and expansion represents an effective solution for many of the world´s greatest challenges.

The chart 1 shows the importance of tourism in world's economy. Indeed, few sectors are as strategically positioned as tourism to contribute decisively to job creation, poverty alleviation, environmental protection and multicultural peace and understanding.

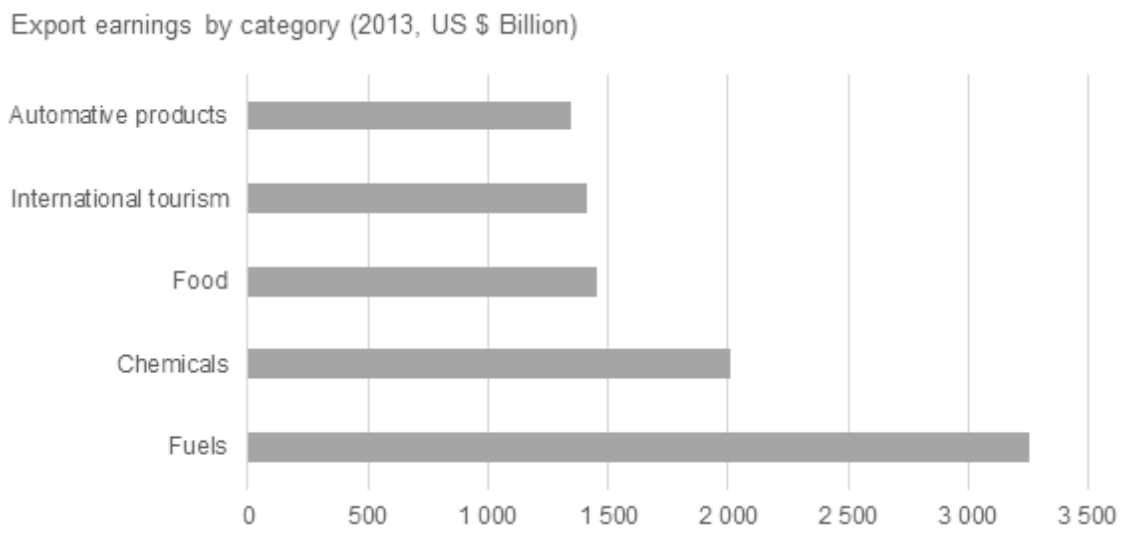

Chart 1: Export earnings according to the main profitable categories (World tourism Organisation, 2015).

As so, tourism's increasing relevance, consistency and strong connection with the environment, are a turning point for the Millennium Development Goals (MDGs) shared by the UNWTO. Fortunately, UNWTO is shifting the MDGs into the Sustainable Development Goals (SDGs), which is a remarkable tool in a crucial time to achieve the ambitious goals of sustainable development, green growth and more resilient global economy.

In a world looking for new models of economic growth, development and environmental sustainability, the need for global solutions is undeniable, where fighting climate change and adopting sustainable management practices is no longer an option, but a condition for our future, survival and success.

2.1.2. How global international tendencies are transforming tourism

There are several tendencies that are changing and conditioning international tourism and how people travel, and they are included in following 5 categories (Turismo de Portugal I.P. (TdP), 2015):

- Demographic and sociocultural
- Economic
- Environmental
- Technological
- Transports

This 5 categories of international tendencies are the driving forces of today tourism, and are helping important entities around the world to understand and adapt strategies according to what people want and are looking for in tourism. For this thesis concern, only 4 of them are going to be analysed in more detail due to its importance for the topic.

2.1.2.1. Demographic and Sociocultural tendencies

The changes in behaviour and culture are one of the most significant tendencies for tourism since it depends directly on people, and people change according to global events. What has been verified is the evolution and modification of tastes, needs and preferences, mainly translated into growing concerns about health, well-being, as well as social interaction and environment. These facts give specific indicators to the touristic industry: people are looking and interested in healthier destinations and their interest in cultural tourism and specific programmes segmented to different publics.

Also, the will and demand for unique and truthful experiences leads to the desire for more active experiences and adventure tourism, an aspect deeply linked with sustainable tourism. In section 2.2. Sustainable tourism topic will be developed more in detail.

2.1.2.2. Economic tendencies

The economic tendencies are probably the ones with more power to change, define and dictate the destiny of touristic industry.

Currently, and in future perspectives, the growth of the income per capita in developed countries gives the opportunity to emerging economies, which leads to new destinations and new markets. Also, at global level, is verified the appearance and development of new and distinct markets. These phenomena increase the travel expectations of young people, the number of trips to visit friends and family, and the exchange between students.

Usually young people don't use hotels when travelling but other kind of accommodation, more suitable for their needs, economic power and travel style, for example the hostel. This is a proof how economic tendencies are changing the future of tourism, and how important is study this target market, the hostel and its guests, which this thesis is focused on.

2.1.2.3. Transport tendencies

The transports, and its evolution, are the connection between the needs, the desires and wills of people with their destinations. Nothing could support better tourism than transports, so without a vehicle and its adaptations to the needs, tourism couldn't evolve. With the development of fuels and alternative energies more economical, emerged the possibility of solutions for sustainable transports. These tendencies reinforce the emergence of new destinations due to the development of accessibility and transport solutions. Also the continue increasing of airlines in low-cost secondary airports and new routes, increase new markets of visitors and encourages young people to travel more easily, which in other hand enhances the hostel market.

2.1.2.4. Environmental tendencies

Fortunately, in the last few years, the consequences of bad human habits started to weight in people's mind, and with all the propaganda and environmental campaigns seems to take place some consciousness among travellers.

Surprisingly, people are revealing more environmental concerns, which can also be verified in businesses and governments. This situation leads to a gradual adoption of more sustainable behaviours, which can be translated into new requirements from people who are using services, namely touristic accommodations. Therefore, good environmental practices stopped from being a choice to be a priority. The valorisation of recycling and the implementation of efficient energetic systems are good examples that lead to a greater environmental awareness among tourists, and consequently an increased demand for activities associated with natural tourism, sustainable practices and solutions in accommodation services, and a greater tendency for more natural and organic products. Above that, there is a proliferation and pressure of environmental certification, increase of norms of environmental regulation, and a continuous necessity for rationalisation of resources, and development and increase use of alternative energies. The pressure among touristic services is now huge, not only due to people's concerns but also to the government and world organisation like UNWTO, with the goal of overcome the generalised crises we have been through.

2.1.2.5. Final conclusions

After analysing the most important international tendencies, it is now clear how they are leading the way how tourism is evolving.

First, the economic scenario is the most important tendency today regarding the crises of 2009, achieving almost every country. A lot of nations are still struggling with difficulties, and tourism is without doubts a good way of overcoming it. So, the investment in this area is crucial

for countries like Portugal, highly blessed with natural resources, where one of the greatest income comes from touristic services. With the growth of income per capita, opportunities for emerging economies are real, and new destinations and markets arise. To maintain the international regular flow of people, transports need to go along with economy, because they are the link between people and their destinies.

Today, the transport possibilities are immense, not only because the type of transport available, but also to the fuel and energy alternatives that create more economical ways of travelling. Besides that, the continue increasing of low-cost airlines, enhancing new routes, markets, and of course new visitors, especially the youngest. This easiness of travel boosts young people to not only visit other countries but also to study abroad for some periods, which encourages their family and friends to travel too. This phenomenon is one of the reasons why other kinds of touristic accommodations are becoming more popular, like hostels. Another reason is the continuous offer, improvement and popularity of their facilities and infra-structures which can be preferred in relation to hotels, depending of the value for money, the experience you are trying to find and your style of travelling. Fortunately, this movement is spreading fast in Portugal, being extremely important to study what the hostel's market is providing and what kind of people are they receiving.

It is also relevant understand how the sociocultural and environmental tendencies are being applied in this market. Not only the hostel's market is barely studied, but above all the knowledge of sustainability among them is inexistence. Being environmental concerns and laws so present today, and being tourism in Portugal deeply linked with its natural resources, it is now a priority to collect data among the hostels' offer, and study their structure, facilities, management and practices according to sustainability. Having this information, managers, hostellers, owners and entrepreneurs will know what the possibilities are and what they can implement or improve. To make this data base possibly is crucial to understand the sample of hostels available in the study area, and evaluate it according to a life cycle assessment to be presented later in the chapter 4.

2.1.3. International and national framework

In terms of regions, the leader is Southern and Mediterranean Europe, which recorded about 11 million international arrivals more than in 2013 (Organizacion Mundial del Tourismo, 2014). The main destination is Spain with an important increase of 6% in 2013 (Organizacion Mundial del Tourismo, 2014). Thus, this sector is very important to Spain and also for the economic centres like Barcelona and Madrid, generating jobs and creating the need for associated services such as international airports, transport and accommodation, services which need to be more efficient and with better quality.

Portugal is integrated in the biggest touristic region in the World- Europe (with more than 50% of the international tourism).

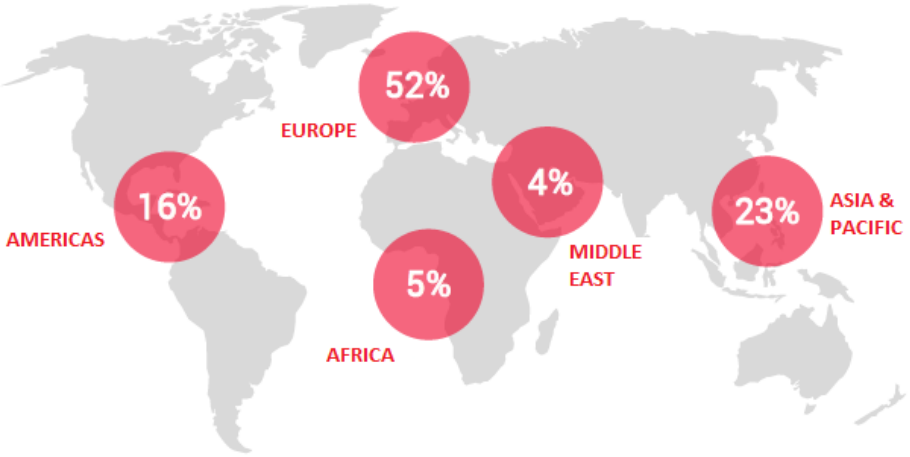

Figure 1: International tourism arrivals (Turismo de Portugal I.P. (TdP), 2015).

Today, according to recent studies, Portugal is in the top 20 of the most competitive destinations of the world, occupying the 36º place in 2014 in the Economic Competitiveness Index. Is well known that Spain and France are the top visited countries, but Portugal is now the 3rd place against its main competitors, overcoming Italy. This data gives Portugal the opportunity to overcome part of its economic problems, taking advantage of the available resources and its potentialities to be a region of touristic excellence (Turismo de Portugal I.P. (TdP), 2015).

Some results can already be seen concerning the overnights and revenues connected with the touristic industry. As we can see in the charts 2 and 3, after the pinnacle of the crises, in 2010, overnights, guests and revenues increased with special intensity.

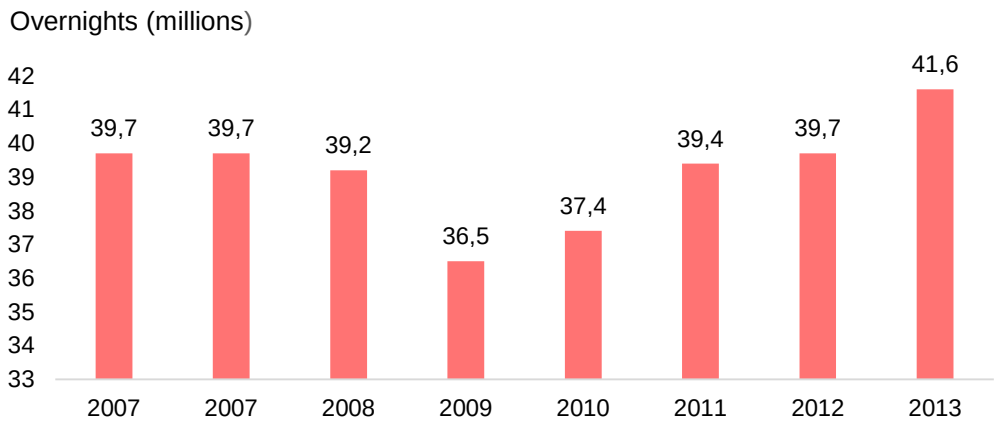

Chart 2: Growing of overnights and guests in Portugal (Turismo de Portugal I.P. (TdP), 2015).

Analysing, is clearly visible the recovery after 2009, achieving in 2013 the following data (Turismo de Portugal I.P. (TdP), 2015):

- 14 million guests, representing a positive balance of 6.2 billion €;
- 41 million overnights registered;
- 9300 million € in touristic revenues, which is a regional development factor.

To support this amazing recovery, infra-structures and services were needed, so the offer and touristic resources have (and has) to face an evolution of accommodation capacity. According to the Portuguese Statistics National Institute, in the last few years were registered a quantitative and qualitative increase in this parameter, being possible to observe it in the next chart.

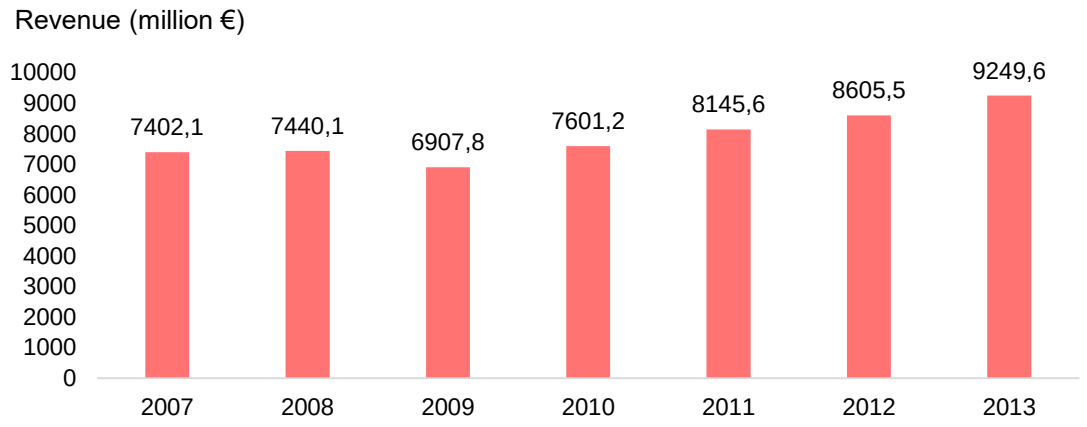

Chart 3: Revenues, in million €, associated with tourism in Portugal (Turismo de Portugal I.P. (TdP), 2015).

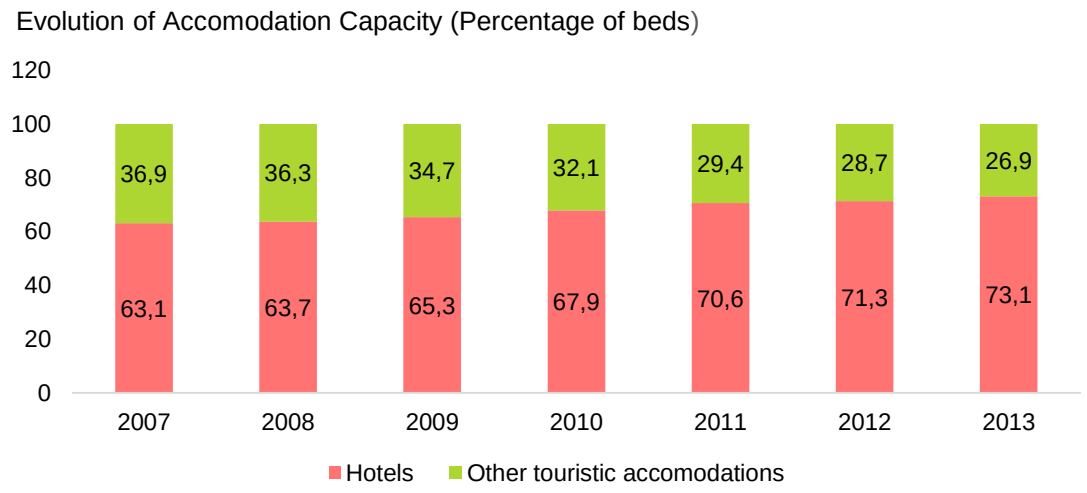

Chart 4: Evolution of accommodation capacity of hotels and other touristic accommodations in Portugal (Turismo de Portugal I.P. (TdP), 2015).

Hotels in Lisbon are the touristic accommodation with more investment and logically the offer is bigger. Although being the main touristic accommodation chosen by tourists, the hostels' offer is growing fast in Portugal, being the main and diverse offer placed in Lisbon. For this thesis concern, is not going to be considered the hotel business but the hostels one correspondent to the 49% of the offered touristic capacity. In section 2.3., the subject of hostels is going to be more developed.

2.1.4. Portugal: Touristic resources

Portugal has a pleasant climate, 3000 hours on sunlight per year and 850 km of splendid beaches bathed by the Atlantic Ocean. These characteristics make Portugal a perfect destination for all seasons, a few hours trip from any European capital. In this country, that has the oldest borders in Europe, from north to south, until the islands, Portugal has a great diversity of landscapes within walking distance, many leisure and unique cultural heritage, where tradition and the contemporary come together in harmony. Although, not all the regions in Portugal provide the same offer of services and touristic infra-structures, being important to understand the strong points, opportunities and flaws of each region, in order to give support to the ones that need improvement, and to enhance and value the others already having success.

Portugal is divided in 7 distinct regions regarding tourism: North, Centre, Lisbon, Alentejo, Algarve, Autonomous Region of Madeira, and Autonomous Region of Azores. The figure 2 is referent to the characteristic differentiating elements that these regions are providing, which guarantee to Portugal a modern authenticity perspective, security and quality different, and consequently relevant offers for all styles of tourists and travellers.

Climate and Light

History, culture and tradition

Hospitality

Concentrated diversity

Figure 2: Differentiating elements offered by Portugal.

What is important to realise is how the distribution of the total overnights (41.6 million) is spread between the regions, in order to understand which regions have the best offer in quantity and quality. According to a study of Turismo de Portugal (2015), only 3 regions represent 74% of the overnights of the country, like is possible to see in the table 1 and figure 3. The regions are the Metropolitan Area of Lisbon, Algarve and the Autonomous Regional of Madeira.

Table 1: Overnights registered in Portugal (thousand units, 2013)

Region	Total	Residents in other countries
	41 735,9	29 359,8
Norte	11,8%	8,5%
Centro	9,0%	5,1%
Lisboa	24,1%	25,9%
Alentejo	2,7%	1,3%
Algarve	35,5%	38,7%
A.R. Madeira	14,3%	18,2%
A.R. Açores	2,5%	2,3%

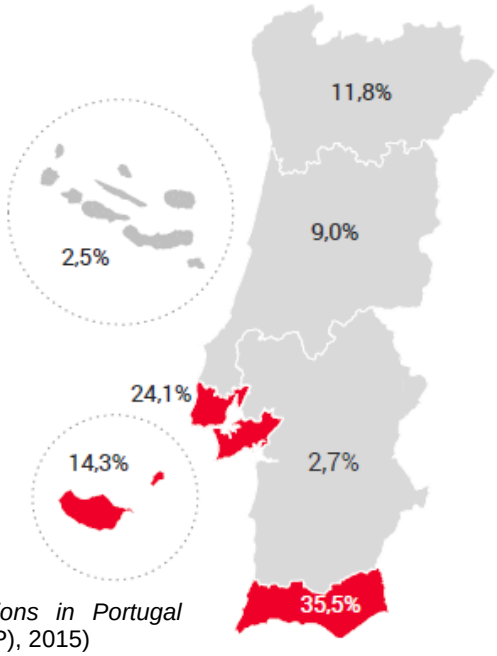

Figure 3: Most visited regions in Portugal
(Turismo de Portugal I.P. (TdP), 2015)

Observing in more detail the table 1, the Metropolitan Area of Lisbon reveals 24,1% of the total overnights, which can be translated in a capacity for 57.4 thousand people, registered 10 million overnights and generating almost 590 billion[1] €, according to the Portuguese Statistics National Institute (2014). All these data and numbers are a proof that the Metropolitan Region of Lisbon is a region to study and improve, with the goal of elevate it and increase even more the quality of the touristic diversity and capacity. Although Algarve has the bigger percentage of the total overnights, the studies about this region are several and the intention of this thesis is to understand better the region of Lisbon and hopefully fill some gaps about it.

[1] 1 billion = 1000 million

2.1.5. Lisbon: Territorial distribution and touristic offer

As referred previously the Metropolitan Region of Lisbon is one of the most representative regions in Portugal concerning accommodation capacity, showing 18,4% of the total weight capacity. Being a region with so many landscapes and attractions is certain the presence of different styles of tourists, which can be translated among other things, different styles of accommodation. In the following chart it's possible to see this discrimination, made according the demand.

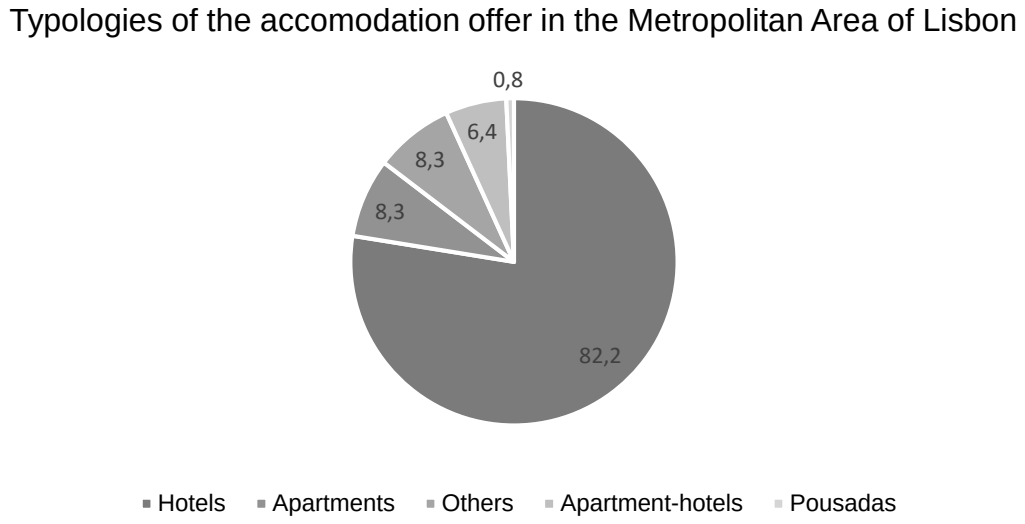

Chart 5: Typologies of the accommodation offer in the Metropolitan Area of Lisbon (Turismo de Portugal I.P. (TdP), 2015).

Like explained for table 1 and figure 3, although hotels have the bigger representative sample among touristic accommodation, the percentage relative to "Others", which are included the hostels. Hostels are the category to take into account for the significant rise in demand for these tourist facilities in recent years, especially since 2015. Because there is this growing interest, it is important to study and understand this market, providing entrepreneurs and managers more and better information about their business.

Today, there are more than 77 hostels just in Lisbon, just registered in Hostelsworld (2016), but crossing this information with Booking.com the numbers can go until 250 hostels, being at least 47 registered in 2015, since the entry of the new law of local accommodation, according to the State Secretary of Tourism Adolfo Mesquita Nunes (Idealista, 2015). Some of the hostels were already in activity, but are now updating its register in the new law, effective since August 2014. This law is a change to the legal framework of the operation of local accommodation facilities (apartments, villas and hostels).

2.1.5.1. Touristic areas in the Metropolitan Area of Lisbon

The Metropolitan Area of Lisbon (MAL) is a perfect destination for an intense and complete trip, having the possibility of enjoying the long sandy beaches, to relax on the beach or

play sports, enjoy lush landscapes, protected landscapes areas, plains, classified monuments by UNESCO as World Heritage, to the most picturesque countryside.

The MAL is divided is represented by 3 major regions, all of them with unique characteristics what makes them special and unique in its own way. The regions included are:

- Lisbon
- Cascais
- Sintra

Figure 4: Famous views of Lisbon, Cascais and Sintra, respectively.

Although, heading to the south margin of Tagus River and continue to Sado River, it is possible to discover the beauty of its banks in a unique estuary, marking the beaches of Caparica and Sesimbra, until the ones in Setúbal and Arrábida. The Sado Estuary is one of the most beautiful in Portugal, where you can still see dolphins from the beaches, but it is on its banks that is possible to find a wild richness of plants and animals. The minor regions are the following:

- Neighbouring municipalities (Mafra, Oeiras and Almada)
- Arco do Tejo (Vila Franca de Xira, Montijo, Alcochete, Seixal, Moita and Barreiro)
- Arrábida (Setúbal, Sesimbra and Palmela)

Figure 5: Famous views from south side of Tagus River regions: Almada, Setúbel, Sesimbra, respectively.

In order to understand the potentialities of each region, the table 2 shows the most important touristic resources of each of the previous regions.

Table 2: List of touristic resources of Metropolitan Area of Lisbon's regions.

Region	Touristic resources
Lisbon	• Cruise port of Lisbon, docks and marinas; • Museums and monuments, congress centre; • Gastronomy, shopping, casino • Activities, animation events, surf, golf
Cascais	• Museums and monuments • Natural Park of Sintra Cascais, beaches, golf • Congress centre, Cascais Marina, casino • Activities, animation events, gastronomy
Sintra	• Museums and monuments Mundial Patrimony • Typical gastronomy, animation events • Sintra's Mountain, Parque da Pena, Cabo da Roca • Enotourism, golf, sports tourism
Neighbouring municipalities	• Complementary offer of museums and monuments • Surf • Parties and typical festivals • Gastronomy
Arco do Tejo	• Reserved Area of the Estuary of the Tagus river • Samouco saline and rice paddies • Equestrian tourism • Nautical tourism in estuary of Tagus river
Arrábida	• Natural Park of Arrábida, Marine Park of Arrábida • Reserved Area of the Estuary of the Tagus river, Cabo Espichel • Equestrian tourism, nautical sports, golf • Enotourism

Has seen in figure 3, the metropolitan region of Lisbon doesn't include just the cities and towns in the north margin of Tagus river, but also the south margin. According to data of Turismo de Portugal (2014), the region of Lisbon has a capacity for 57 275 beds, which correspond to 90,58% of the existence offer. As so, the peninsula of Setubal has a minimum percentage of the offered capacity, which implies that the case studies of this thesis will be focused on the region of Lisbon.

2.2. Sustainable Tourism

2.2.1. Introduction to sustainable tourism

Like referred before, tourism development and its operations strongly dependent on natural resources. What is regrettable is the contribution of tourism and its associated operations and services, to the depletion of natural resources, leading to water shortages, loss of biodiversity, land degradation and estimated at 5% of total worldwide CO_2 emissions. Trends and forecasts suggest that will the continued expansion of the sector, potential negative effects are also likely to increase in the coming years. Emerging destinations can also be especially affected by direct and indirect environmental impacts.

Until the 1970's tourism remained largely immune from environmental criticism, the image of tourism being of an environmentally friendly activity. After that, questions about the environmental impacts began to be raised more widely, as tourism expanded internationally and the negative effects of tourism lead the Organization of Economic Cooperation and Development to established, in 1977, a group of experts to examine the interaction between tourism and the environment (Holden, 2009; Page & Dowling, 2001).

In the 80s the spread of mass tourism into new areas, including Southeast Asia, Africa and Caribbean, meant that there was increasing focus on tourism as a form of economic development in less developed countries, which included concern over the environmental and cultural consequences of tourism development (Holden, 2009). Thus, groups were established to promote ethically based tourism for both indigenous peoples and the environment, such as Tourism Concern and the Ecotourism Society.

Finally, in the 1990's, the tourism industry began to take action over the environment, with many operators, hotels and airlines attempting to improve their environmental credibility (Holden, 2009; Page & Dowling, 2001)

According to some tourism organisations, the scenario to 2050 projected tourism growth rates implies an increase of energy consumption (154%), greenhouse gas emissions (131%), water consumption (152%) and solid waste disposal (251%). However, shifts in tourism practices and policies can reverse these negative impacts and yield major benefits, stimulating change towards greater sustainability within the tourism supply chain and in other sectors. The importance of such shifts is the key to sustain and enhance the important economic and social benefits that the sector delivers (UNEP, 2014).

Fortunately, the international community is taking combined actions against climate change around a commonly agreed framework led by United Nations. The tourism sector has an important place in this framework, given its global economic and social value, and its role in sustainable development and its strong relationships with climate. Taking actions in such a complex and global sector as tourism, is not an easy task, so in Davos, Switzerland, from 1 to 3 October 2007, the UNWTO, jointly with the United Nations Environmental Programme (UNEP) and the World Meteorological Organisation (WMO), with the support of the World Economic Forum (WEF) and the Swiss Government convened the Second International Conference on

Climate Change and Tourism. This conference was built on results of the First International Conference in Tunisia 2003, where the organisers commissioned a report to provide an extensive review of current impacts and analyse options for possible actions.

Currently the UNWTO is developing the Sustainable Tourism Programme, which will work with partners to improve resource efficiency, management effectiveness, use of new technologies, and support changes to national policy and legislation, thus promoting sustainable development. The Sustainable Tourism Programme was developed based on regional consultations, stock taking exercise and global survey on existing data and initiatives on sustainable tourism, engaging nearly 400 actors, as well as relevant UN agencies, resolutions and programmes.

2.2.2. Climate change and tourism

Today have become more evident, the growing international awareness about the fast pace of climate change taking place on our planet, together with the impacts that such changes are having on the natural environment, on human and their economic activities. For tourism, climate change is not a remote event, but a phenomenon that already affects the sector and certain destinations in particular, mainly mountain regions and coastal destinations, like Portugal, among others. At the same time, the tourism sector is contributing to greenhouse gas emissions (GHG), especially through the transport of tourists. As so, the necessity of reducing these two apparently divergent systems is more and more relevant, and is mandatory consider them as complementary.

Climate and natural resources are an essential source for tourism, and especially for the beach, nature and winter sport tourism segments. The climate change and weather patterns at touristic destinations and tourist generating countries can significantly affect the tourists' comfort and their travel decisions. Changing demand patterns will change tourist flows, which will have impacts on tourism business and on host communities, as well as knock off effects on related sectors such as agriculture, handicrafts or construction. The consequences for small island states and developing countries, where tourism is a major economic activity, are even worst because any significant reduction in tourist arrivals will have serious employment impacts and generate further poverty.

Although, not only climate change causes negative impacts on tourism, also tourism, if not properly managed, have several negative implications and contributions to climate change. This ambiguous situation is not pleasant to anyone, being for that mandatory a partnership and creation of symbiotic relations between the climate and tourism. Climate can survive without tourism, but there is not the goal of sustainability, sustainability doesn't break economic chains, but it's a combination of actions and solutions to find a balance where both coexist. The recognition of this need already took place with the first environmental conferences in 1972, in Stockholm, but today the amount of knowledge is incredibly bigger and therefore the urgency of national governments and international organisations to develop and implement strategies to face the changing climate conditions and to take preventive actions for future effects, as well as to

mitigate tourism's environmental impacts contributing to climate change. That is the purpose of most of the environmental conferences, namely the ones are mentioned International Conference on Climate Change and Tourism, convened by UNWTO in Djerba, Tunisia in 2003, and Davos, in Switzerland in 2007.

2.2.2.1. Tourism Environmental Impacts

Impacts on environmental must be the most adverse cause by the tourism sector, due to the particular attraction for natural and sensitive environments. With bad management, phenomena like overcrowding, overdevelopment, unregulated recreation, pollution, wildlife disturbance, and vehicle use are the main impacts on environment (Page & Dowling, 2001). As tourism in general is highly dependent on natural environments, or its chain of action are deeply related or dependent on natural resources, these adverse effects are maximised because tourists want to visit and explore sensitive areas, during sensitive seasons, and may cause off-site, as well as on-site impacts (Page & Dowling, 2001).

What is unpleasant to realise it's that the development of tourism, even in ecotouristic destinations, is not acting according the patterns of ecological preservation and local use, since the sector is diverting resources (water, land and energy) away from the local population to accommodate the touristic sector (McLaren, 1998). Thus, these actions puts heavy stress on the environment, since tourist sites require construction of the landscape and increased use of petroleum products and toxins (Page & Dowling, 2001). Even ecotourism, defined as a responsible travel to natural areas that conserves the environment, sustains the well-being of the local people, and involves interpretation and education, by The International Ecotourism Society (TIES), has consequences because ecotourists like to hike and camp, which have measurable impacts in protected areas, impacts that are often compounded with those of other tourists, recreationists and even local residents (Page & Dowling, 2001).

Figure 6: Activities related with sustainable tourism.

2.2.2.2. Tourism Social Impacts

According to Fox (1977) cited in Mathieson and Wall (1982: 133) cited in Page and Dowling (2001: 170): “The social and cultural impacts of tourism are the ways in which tourism is contributing to changes in value systems, individual behaviour, family relationships, collective lifestyles, safety levels, moral conduct, creative expressions, traditional ceremonies and community organizations.”

These impacts result from the introduction of tourists to host communities. The analysis of social and cultural impacts in tourism involves not only the tourist and host analysis, but also the relation between them (Page & Dowling, 2001). The natural environment is home of host communities, but at the same time an attraction and a destination for tourists, which could create negative social and cultural impacts compromising the local sustainability. Most of the touristic facilities are not created with the aim of integrate the local community, they are created to explore the local environment but most of the times the reality inside of the facility is completely different from the original, which leads to a discrepancy. However, when talking about ecotourism industry one of the main concerns is to make sure that the local population is not alienated or adversely impacted, to the point that they may want to deny or limit tourist access to a particular resource or area (Page & Dowling, 2001). Recently, Thailand Government forbidden the access to one of the most famous and touristic island Koh Tachai in the Andaman Sea in an attempt to ease the negative effects of tourism on its once-pristine beaches and surrounding coral reefs (Holmes, 2016).

Ecotourism especially in small-scale developments provides opportunities for local empowerment, encourages the use of local knowledge and labour, promotes local ownership, perpetuates local identity and strengthens economic equity, which clearly is providing local benefits to communities (Page & Dowling, 2001; Scheyvens, 1999). Also has the possibility to be an important and powerful social force, improving individual well-being, fostering cross cultural understanding, facilitating learning, contributing for protection of culture and traditions, supplementing development, fostering environmental protection, promoting peace and inspiring a global consciousness which contributes to the formation of a global society (Higgins-Desbiolles, 2006). Nevertheless, authors like Scheyvens (1999) noted, for ecotourism to be successful must integrated local communities in its business and share equitably in the benefits.

2.2.2.3. Tourism Economic Impacts

Tourism in general is seen as a way to aid ailing economies, and in sub-develop countries can stimulate economic development, and so do ecotourism. For local and national governments, tourism is a synonym of economic benefits, spreading new businesses and therefore employment opportunities and stimulating dynamics and the process of development. Thus, is seen as a major positive contribute to local economy (Page & Dowling, 2001). Although tourism will always create an infusion of money into local economies, the stability of that income is subject to a number of defining factors (Fennel, 1999).

As known, tourism is a shifting industry, being highly seasonal which implicate fluctuations for the investment and the type of employment created (Page & Dowling, 2001). Besides that, tourism employment is many times characterized as being low skill, poorly paid, and lacking stability. Noticing that tourism can also be easily influenced by natural phenomena, beyond the human control, like tsunamis, hurricanes and floods (Page & Dowling, 2001). Also, and not less important, the motivations for travelling and destinations are complex and variable, being unpredictable in the competitive market.

2.2.3. The Davos Conference 2007

After analysing some of the most important impacts caused by tourism is now more clear the need of regular conferences among all countries to settle the main environmental-touristic issues, and figure out the ways to mitigate, eliminate or overcome it.

The Davos Conference of 2007 has almost 10 years' age, but even today its premises and multidirectional actions related to the impacts of tourism are current and relevant. After 3 days of conference, all participants agreed in the following 4 major ideas:

- Climate is a key resource for tourism and the sector is highly sensitive to climate change and global warming, being many elements of which already affected. It is estimated that tourism contributes with 5% of global CO2 emissions;
- Tourism - business and leisure - will continue to be a crucial component of the global economy, an important contributor to the Millennium Development Goals and an integral, positive element in our society;
- Considering the tourism' importance in the global challenges of climate change and in poverty reduction, there is a need to urgently adopt a range of policies which encourages truly sustainable tourism that reflects a "quadruple bottom line" of environmental, social, economic and climate responsiveness;
- The tourism sector must respond rapidly to climate change, within the evolving UN framework and progressively reduce its GHG emissions, if it is to grow in a sustainable manner. This action also requires measures:
    - Find solutions for transports and accommodation activities;
    - Adapt tourism business and destinations to changing climate conditions;
    - Apply existing and new technology to improve energy efficiency.

To achieve the previous goals, the Conference called for the following actions, divided by 4 categories. For this matter only 3 are going to be considered.

1) Government and International Organisations:

- Provide financial, technical and training support to tourism destinations and operators in developing countries to ensure that they can participate in the global climate response framework;

- Promote, at all levels, interdisciplinary partnerships, networks and information exchange systems essential to sustainable development of the sector;
- Collaborate in international strategies, policies and action plans to reduce GHG emissions in the transport, accommodation and related tourism activities;
- Introduce education and awareness programs for all tourism stakeholders – public and private sector – as well as consumers;
- Develop regional and local climate information services tailored to the tourism sector and promote their use among tourism stakeholders.

2) Tourism Industry and Destinations:

- Take leadership in implementing concrete measures (such as incentives) in order to mitigate climate change throughout the tourism value chain and to reduce risk to travellers, operators and infrastructure due to dynamic climate variability and shift;
- Promote and undertake investments in energy-efficiency tourism programmes and use of renewable energy resources, with the aim of reducing the carbon footprint of the entire tourism sector;
- Integrate tourism in the formulation and implementation of regional, national and local level adaptation and mitigation strategies and implementation plans;
- Strive to conserve biodiversity, natural ecosystems and landscapes in ways which strengthen resilience to climate change and ensure a long-term sustainable use of the environmental resource base of tourism;
- Seek to achieve increasingly carbon free environments by diminishing pollution through design, operations and market responsive mechanisms;
- Raise awareness among customers and staff on climate change impacts and engage them in response processes.

3) Consumers:

- In their choices for travel and destination, tourists should be encouraged to consider the climate, economic, social and environmental impacts of their options before making a decision and, where possible to reduce their carbon footprint, or offset emissions that cannot be reduced directly.
- In their choices of activities at the destination, tourists should also be encouraged to opt for environmentally-friendly activities that reduce their carbon footprint as well as contribute to the preservation of the natural environment and cultural heritage.

2.3. Hostels

Hostel is a genus of low cost accommodation primarily aimed at young travellers, which includes a very simple concept: sharing all spaces, from the rooms, specifically designed for bedrooms, the bathrooms, the kitchen, where you can prepare your own meal, to the living room. So we have that the genesis is the socialization and that proximity is a determining and unifying factor.

According to the study Loker-Murphy & Pearce (1995) the practice of backpacker tourism – the one practice first in hostels - as we know it is very recent, not having more than two decades (Loker-Murphy & Pearce, 1995). As a result, the tourism industry around it is too. The first youth hostel, non-profit establishment for the hosting of young people or limited groups (Rebelo, 2012) of Lisbon was inaugurated in 1993 and later in 1998 opened the Youth Hostel of Parque das Nações.

The private offering targeted to the youth segment, in Lisbon, only arises in 2005 with the first hostel “lisboeta”, the Lisbon Lounge Hostel. According to Portuguese newspaper Público when the Lisbon Lounge began its activity there was no hostel market or even legislation (Public, 2009), and although Youth Hostels operate with a similar system to the hostel, there is a specific and government legislation for them since the 70s, but for hostels there is no legal framework.

In the same year appeared the Lisbon Poets Hostel, breaking the exclusivity to the Lisbon Lounge, and in 2006 the Oasis Backpackers Mansion, a case study in this dissertation. This trend become frenetic in Lisbon, emerging all kinds of hostels in Lisbon, and is currently more than 70 hostels.

Only in 2008 arose the resolution for the problem of hostels’ clandestinely, has been founded the Portuguese Hostels Association. Has created a specific legislation (decreto lei nº39/2008) to this kind of touristic accommodation, been considered Alojamento Local (portaria nº517). The licence is provided by the City Council. This law requires that dorms in hostels need to have “direct lighting and ventilation with the exterior through a window”, common spaces, like a kitchen and dining areas, among other things.

The Portugal Hostels Association already represents a worldwide recognized excellence in this sector, a special concept of hotel’s business, with several awards that changed even the way people travel and settle. Represented, in 2012, 21 Hostels in Lisbon, seven in Porto, and also represents other units in Peniche, Aveiro, Aljezur, Figueira da Foz and Sintra. The Association is responsible for the creation of a quality mark of distinction of the associate members in Lisbon, and also in Porto.

According to Tourism revised Lisbon (No. 63 March 2009), the diversified tourist offer of Lisbon has conquered different audiences, including younger segment, following the growth of this type on a global scale. To meet the accommodation needs of this segment the Portuguese capital offers a wide and qualified range of hostels. Some of which awarded the "Hoscars" at Hostelworld.com.

For the Hoscars of 2016, Portugal has 8 of the best hostels in the world such as Tattva Design Hostel, in the category Best Large Hostel. For small hostels (maximum 75 beds) the top

10 includes Yes! Porto Hostel and Gallery Hostel Porto, in 8th and 10th place, respectively. For best Medium hostels (75-150 beds), Home Lisbon Hostel is in 1st place since 2014, Good Morning Lisbon Hostel in 2nd place, Yes! Lisbon Hostel in 4th, Lost Inn Lisbon in 5th, Lisbon Destination Hostel in 6th, and finally Sunset Destination Hostel in 8th (later studied).

2.3.1. Hostels and the search of sustainability

Hostelling International

In 1932, the federation Hostelling International (HI), formerly known as International Youth Hostel Federation (IYHF) was created. HI is a federation of more than 70 National Youth Hostel Associations in more than 80 countries which have over 4 000 affiliated hostels around the world. It's a non-governmental, not-for-profit organisation working closely with United Nations Educational, Scientific and Cultural Organisation UNESCO and the World Tourism Organisation UNWTO. HI is also known for being the sixth largest provider of travel accommodations in the world, in the begging just for backpackers, today the movement it's spreading and reaching other type of travellers. Today, HI has a recognise quality management system, HI-Q, which taking the best practice from quality systems around the world and enables hostels to consistently improve and deliver high standards (Federation of Hostelling International, 2015).

Since its creation in 1932, Hostelling International, together with Member Associations, has been working to promote a greater understanding of people, places and cultures through the education of peace, environment and global friendship. Mostly, the international network of HI hostels enables people, but particularly the young, of different nationalities, cultures and social backgrounds to meet informally, share experiences and to learn about themselves, each other and their surroundings.

As HI can reach so many people, with different educations, backgrounds, opportunities and behaviours, the federation understood that it could have a bigger role for the world providing good examples through young people, because they're the future. One of the steps was understating that tourism will never be completely sustainable, since every industry has impacts, but HI could do a lot of things to become more sustainable. Sustainable tourism is about rethinking, adapting and changing, and a balance must be found between limits and usage to ensure that tourism effects the environment as little as possible. The HI mission, defined in 1932, was one of the earliest examples of sustainable tourism by encouraging a greater knowledge and care of the countryside and an appreciation of the social and cultural values in all parts of the world.

Currently, many hostels are affiliated with HI, which gives to the costumer the insurance that the hostel is promoting sustainable tourism practices and it's committed to achieving a worldwide network of sustainable organisations and hostels.

In Portugal, hostels like Green House and Tribo da Praia Eco Hostels in Peniche, Almáa Sintra Hostel, Aveiro Rossio Hostel, Gallery Hostel in Porto, and Dream on Coimbra, are good examples where the sustainability is being taken seriously. Also, hostels administrated for public

entities are well known for its sustainable practices and educational examples and activities for different kinds of people, having received a badge of environmental quality.

HI has been given a good example for sustainability, embracing its 3 main components: economy, ecology and sociology. The economical aim is to ensure financially sustainable independent hostels with assured quality and standards worldwide; the ecologic aim is to reduce the carbon footprint of hostels worldwide and work towards achieving carbon neutrality; and not least the social aim is to provide the basis for continuous development of important social and cultural objectives (examples are: participation in local activities; employ local people; use the community to source supplies such as seasoned food).

There are several labels around the world certifying businesses in terms of sustainability, helping creating better sustainable standards and environmental quality in businesses, some specifically linked with touristic accommodations. Some examples are Ecolabel, the European Label which encourage all kinds of industries to use environmental friendly products and services; Energy Star, Green Key Eco-Rating Program; Green Tourism; The Green-Key, among others.

Staying in a hostel with one or several of the above labels can guarantee reduction in energy, water, and waste, as well as, for Ecolabel, confirms that the hostel uses only ecological materials and supplies itself with goods compatible with the environment.

Figure 7: Examples of worldwide environmental labels possible to apply in touristic accommodations

As concluded in Laurie Loker-Murphy and Philip L. Pearce study (1995) about young budget travellers in Australia, the travellers who used to stay in hostel were backpackers, and were mostly related with camping and hostels, having tendency to behave sustainably and carry about the locals. They believe that for enjoying different places and learning with other cultures is necessary to preserve and understand them, so generally they are more aware and act better considering the circumstances. So, maybe still remains some of this old sustainable spirit with the nowadays guests.

Nevertheless, hostels in Portugal have been doing serious efforts in including sustainability in the daily basis of their facilities, becoming a regular practice, or some could adopt good practice in several areas like local integration, energy (bioclimatic, efficient energy use, etc.). Some have been use guidelines and certifications systems like LiderA, and addressing general knowledge to adopt solutions. To help clarifying and understand what can be done in a touristic accommodation such as a hostel, a research and guidelines were made, and are present in the annex III.

3. Sustainable analysis of hostel buildings

3.1. Life Cycle Assessment

Life Cycle Assessment (LCA) is the system approach of looking at a product's complete life cycle, from raw materials to final disposal of the product. It offers a "cradle to grave" perspective at a product or process, considering environmental aspects and potential impacts. The first LCAs were developed in the 1960s, but not by the same reasons as today. LCA were motivated by the economic struggles of the time. Nowadays, LCA concept has once again become important to industry, after its lack of popularity in the 70s and 80s.

In the recent past, industries and businesses started to assess how their activities affect the environment, as environmental awareness increases. Also, society has become concerned about the issues of natural resource depletion and environmental degradation. To give response to this phenomenon, many businesses have provided "greener" products and used "greener" processes. As so, the environmental performance of products and processes has become a key issue, which is why some companies are investigating ways to minimise their effects on the environment. There're different approaches to achieve the "green" status, such as exploring ways of moving beyond compliance using pollution prevention strategies, as many companies have found it advantageous, and environmental management systems to improve their environmental performance. One such tool is LCA (Life-cycle Assessment), which consider the entire life cycle of a product (Curran, 1996).

Life Cycle Assessment: Principles and Practice, published by the U.S. Environmental Protection Agency (US EPA) in 2006, and provides a guideline for a systematic LCA approach. According to this guideline, LCA enables the estimation of the cumulative environmental impacts, because its evaluation focus on all stages of the product's life cycle, often including impacts not very traditional (e.g. raw materials extraction, materials transportation, ultimate product disposal, etc.). Also, LCA considers that all stages are connected with each other, meaning that one operation leads to the next. The advantages of LCA include a clear view of the environmental aspects of the product or process, and a more accurate picture of the true environmental trade-offs in product and process selection (US EPA, 2006).

The Life Cycle Analysis is focused in the major stages of a product's life and examines their environmental impacts. The stages are:

- **Raw materials acquisition**, which includes material harvesting and transportation to manufacturing sites;
- **Processing**, which involves materials processing and transportation to production sites;
- **Manufacturing**, which includes product manufacture and assembly, packaging, and transportation to final distribution;
- **Product life**, which includes energy and emissions during normal product life, required maintenance, and product reuse (refurbishing, material reuse,); and

- **Waste management/end of life**, which includes recycling, landfills, liquid waste, gas emissions, etc.

When designing a life cycle analysis, it is important to clearly define the inputs and outputs of a process or product. Inputs include energy and raw materials. Outputs include various types of products and wastes. The figure 8 illustrates the possible life cycle stages that can be considered in an LCA and the typical inputs/outputs measured.

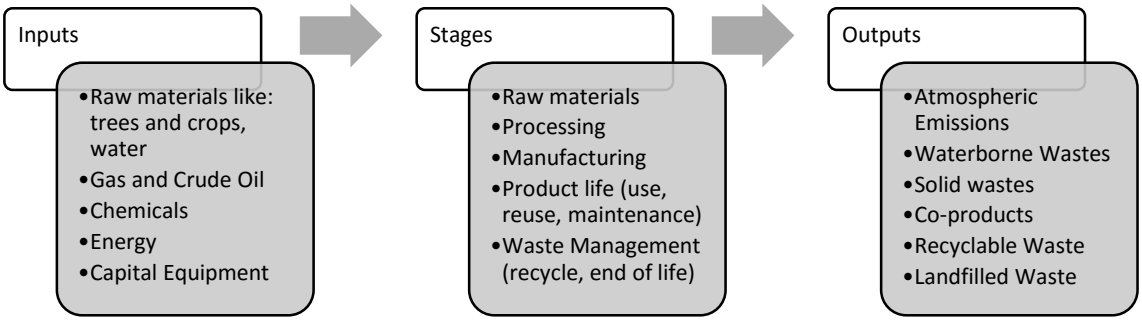

Figure 8: Life Cycle major stages (US EPA, 2006)

Some of the following elements are considered as input or output, when talking about LCA (Williams, 2009):

- **Energy (Input and Output)**
  - Process energy: Energy to operate subsystems (pumps, reactors, heat exchanges, blowers, boilers, etc.)
  - Transportation energy: Energy for trucks, trains, boats, plains etc.
  - Energy combustion: Energy for combustion during a process or manufacture
  - Energy pre-combustion: Energy used to deliver a useable fuel for combustion
    - Energy sources: electricity; coal; nuclear power; natural gas; wind; solar; biomass; hydropower; oil; petroleum

- **Environmental impacts (Output)**
  - Atmospheric emissions (reported by unit of weight of input and output): particulates, nitrogen oxides, volatile organic compounds, sulphur oxides, carbon monoxide, aldehydes, ammonia, and lead
  - Waterborne waste (reported by unit of weight), includes biological oxygen demand (BOD), chemical oxygen demand (COD), suspended solids, dissolved solids, oil, grease, sulphides, iron, chromium, metal ions, cyanide, fluorides, phenol, phosphates, and ammonia
  - Solid waste (reported by unit of weight)
    - Industrial: Waste generated during production
    - Process: Waste generated within a process and not recycled

- Fuel-related: Waste produced from combustion and product production (includes transportation and operating processes)
- Post-consumer: Product and packaging waste within is discarded purchase

The LCA method provides researchers or companies with quantitative data for their current products. By looking at a product's life from the raw material extraction to its disposal, the environmental impact of each process and material can be analysed. The LCA allows analysts to determine and analyse the technological, economic, environmental, and social aspects of a product or process necessary to manage the complete life cycle. With this quantitative data, desired changes can be justified with respect to the cost and environmental impacts of a product or process. For an LCA can be effective its analysis should contain (Williams, 2009):

- Calculate a product's environmental impact;
- Identify the positive or negative environmental impact of a process or product,
- Find opportunities for process and product improvement;
- Compare and analyse several processes based on their environmental impacts;
- Quantitatively justify a change in a process or product.

Although, to complete LCA technique four more steps should be considered, which address one or more of the product's life stages at a time:

1. The definition and scope is determined along with information needs, data specificity, collection methods and data presentation;
2. The life cycle inventory (LCI) is completed through process diagrams, data collection, and evaluation of the data;
3. The life cycle impact assessment (LCIA) is determined with impact categories and their weights, as well as any subsequent results;
4. The final report should include significant data, data evaluation and interpretation, final conclusions, and recommendations.

Considering, as mentioned before, inputs like energy and raw materials, and outputs any material emissions to the environment, such as water, air, and solid waste. A LCI is a process which quantifies all inputs and outputs of a process or product. It is also a way for finding improvement opportunities, supporting design changes, and developing new regulations, comparing the environmental impacts and potential improvements of the process or product.

LCIA is the interpretation how the process and products in the LCA impact human health and the environment. The LCIA considers the LCI data but gives it a more meaningful basis for comparison, by addressing concepts like the depletion of resources and possible health effects by analysing stressors agents found within the manufacturing process or product.

Finally, utilizing information from LCI and LCIA is possible to draw conclusions on processes and make appropriate recommendations from their results.

With this information, business have options and alternatives to improve processes, support policy and provide a sound basis for informed decisions. Also, the information can be used with other factors, such as cost and performance data to select a product or process. LCA data identifies the transfer of environmental impacts from on media to another (e.g., elimination air emissions by creating a wastewater effluent instead) and/or from a life-cycle stage to another (e.g., from use and reuse of the product to the raw material acquisition phase) (US EPA, 2006).

3.2. Life Cycle Costing: a complementary study

Life Cycle Costing (LCC) is a technique used to estimate the total cost of ownership. It allows comparative costs assessments to be made over a specific period of time, taking into account relevant economic factors both in terms of initial capital costs and future operational and asset replacement cost, following the life cycle of processes or products.

The conventional LCC techniques most widely used by companies and/or governments is based on a purely financial valuation. Four main cost categories are assessed: investment, operation, maintenance and end of life disposal expenses. But an environmental LCC methodology takes into account the above four main cost categories plus external environmental costs. The latter may come from LCA analyses on environmental impacts, which measure for example the external costs of global warming contribution associated with emissions of different greenhouse gases. Environmental costs can be calculated also in respect of acidification, eutrophication, land use or other measurable impacts (US EPA, 2006).

The use of environmental costs in a whole-life analysis allows a true comparison options, especially where both are quoted as “good” for environment. For a major project such as the construction of a nuclear power station it’s possible to calculate the environmental impact making the concrete containment: the water required for refining the copper for the power plants and all the other components. Only by undertaken such an analysis, it’s possible to determine whether one solution carries a lower or higher environmental cost than another.

In 2006, a project was undertaken by Davis Langdon Management Consulting under contract to the European Commission, in order to contribute to sustainable construction and a common methodology. The origins of the project lay in the Commission’s Communication ‘The Competitiveness of the Construction Industry’ and, more specifically, in the recommendations of the Sustainable Construction Working Group established to help take forward key elements of the Competitiveness study (UNWTO, 2007).

The LCC analysis can be represented in figure 9. To be effective, the LCC process should be undertaken collaboratively between all key stakeholders in the project.

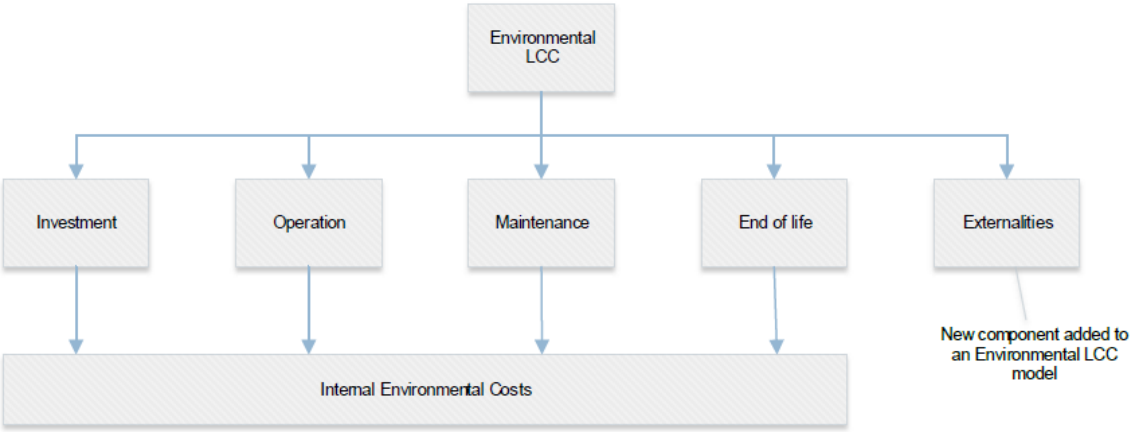

Figure 9: Environmental LCC structure (Langdon, 2007)

The application of life cycle assessment is a growing area and a very useful perspective approaches like LCA and LCC are intensive in data that in some cases are difficult to obtain. Other approaches begin to integrate the concept and LCA tools. Examples are green and sustainable assessment systems like LEED, BREEAM, and LiderA.

3.2.1. Examples of Sustainable Assessment Methods

3.2.1.1. LEED

LEED, or Leadership in Energy and Environmental Design, works for all buildings – form homes to corporate headquarters – at all phases of development, and has been contributing for the way people think and see buildings and communities. Planning, construction, maintenance and operation are the phases possible to pursuing LEED certification by earning points across several areas that address sustainability issues. Based on the number of points achieved, a project then receives one of the four LEED rating levels: Certified, Silver, Gold, and Platinum. Using this kind of certifications, buildings are resource efficient, using less water, energy and reducing greenhouse gas emissions. As an added bonus, they save money (USGBC, 2016).

The basis analysis of this method is LCA, as the most sustainable assessment methods.

3.2.1.2. BREEAM

BREEAM is the World's leading sustainability assessment method for master planning projects, infrastructures and buildings. It addresses a number of lifecycle stages such as New Construction, Refurbishment and In-Use.

BREEAM is a worldwide assessment method with almost 2 243 500 buildings, and 5 43 900 certified developments since it was first launched in 1990. This assessment process evaluates the procurement, design, construction and operation of a development, rating and certifying them on a scale of Pass, Good, Very Good, Excellent and Outstanding (BREEAM, 2016).

LiderA has been applied in Portugal to different hotels and hostels and is going to be the highlight in methodology, explain in the next sub-chapter.

3.3. Sustainable assessment criteria system – case of LiderA

LiderA is a system developed during a research conducted in 2000 by Prof. Manuel Duarte Pinheiro, in Civil Engineering and Architecture Department of Instituto Superior Técnico (Lisbon, Portugal), by the need to create a system that can help to evaluate and contribute to sustainable design and environmental management of buildings. It is a support and evaluation system for sustainable construction at national level, with particular emphasis on buildings and businesses, being a Portuguese acronym of Lead for the environment in search of sustainability construction. To achieve that, LiderA provide the support and development of alternative solutions that contain a certification, proving the environmental performance of developments.

The system has been used since 2005 in different types of projects and by different agents, and has having projects from the initial design phase to the construction and operation phases.

3.3.1. Categories and Areas

The system aims to become a distinct mark in buildings with levels of environmental performance and sustainable construction, both in Portugal and in Portuguese-speaking countries. It evaluates residential developments, tourism, commercial and services at each stage of their life cycle, including large projects. The system assumes that buildings to be sustainable must follow the next principles:

- **Principle 1** - To improve local dynamics and promoting appropriate integration;
- **Principle 2** - To promote the efficient use of resources;
- **Principle 3** - To reduce the impact of environmental loads (both in value and in toxicity);
- **Principle 4** - To ensure the environments' quality, by focusing on environmental comfort;
- **Principle 5** - To promote sustainable socio-economic experiences;
- **Principle 6** - To ensure the sustainable use of the built environment, through environmental management and innovation.

It is based on a set of six categories of sustainable performance:

- **Site and integration** (soil, natural ecosystems and landscape);
- **Resources** (energy, water, materials and food production);
- **Environmental loadings** (waste, atmospheric and noise emissions, wastewater, thermal and light pollution);
- **Environmental comfort** (air quality, thermal comfort and lighting and acoustics);
- **Socio-economic Experience** (economic diversity, access for all, amenities and social interaction, control and participation and life cycle costs); and
- **Sustainable use** (environmental management and innovation).

These principles are translated into 22 areas and 43 criteria, in which the built environment will be evaluated in terms of environmental performance. Nevertheless, each criterion should include the above principles that will regulate the entire project through the design stages and throughout all stages of approval.

LiderA classifies sustainability according to different performance levels (C, B, A, A+, A++) which will result in the level achieved and the type of use. The system is then classified in a range from A to G. The level E is the common practice for any building. If there is an improvement of 25% the level is C, level A corresponding to a yield of 50% greater than E, A+ corresponds to a factor of 4 (75%) and finally, to factor 10 improvement Class A^{++}. After independent verification of LiderA, the system will make a recognition during the phases of design and planning and/or during construction and operation phases of the building, and environmental performance is C or higher class.

Regarding the assessment costs, these depend on the type and size of the project, according to each different process, which could consist on supporting the development of solutions, environmental management, prior assessment and certification, in which the costs will be determined on a case by case. Certification costs are summarized in 1500 €/case + 0.3 €/m^2 of gross built area (GBA). The process values are reduced by 50% if an official LiderA is involved, then the total price will be reduced by 50% if there is an agreement with the municipality involved.

3.3.2. Criteria

As previously mentioned there are six categories of performance, each with different weights. In turn, the categories are composed of areas, with their respective weights. Finally, each area includes criteria. In general, within each area, the criteria have equal importance. In order to obtain an overall performance level, the final score is obtained by weighting the 22 areas' levels. To that end, through the examination and approval process, we developed the weights for each of the areas. Between all the areas, the area of greatest importance is energy (with a 17% weight), followed by water (8%) and soil (7%).

3.3.2.1. *Site and Integration*

The location of the project is one of the key elements in the beginning of the project. The conditions of soil occupancy, ecological land changes and landscape, the ecological network, and landscape and heritage enhancement are important criteria to choose the location of the building initial development.

The Table 3 refers to the present category, areas and corresponding weights, and criteria. The aspects that support all the criteria (Site and Integration, and all the others) are developed in the Annex IV.

Table 3: Site and Integration: considered areas and criteria (Source: LiderA, 2011).

Category	Area	Wi	Pre-Req.	Criteria	Criterion No.
Site and Integration	Soil	7%	S	Territorial valorisation	C1
				Environmental deployment optimization	C2
	Natural ecosystems	5%	S	Ecological valorisation	C3
				Habitats connection	C4
6 criteria	Landscape	2%	S	Landscape integration	C5
14%				Heritage protection and enhancement	C6

3.3.2.2. *Resources*

One of the most important categories for LiderA are resources. Energy, water, materials and food have a key role in sustainability, and their bad management leads to unnecessary consumption, unbalance and several and significant impacts, in all the stages of the project life cycle.

The Table 4 refers to the present category, areas and corresponding weights, and criteria.

Table 4: Resources: considered areas and criteria (Source: LiderA, 2011).

Category	Area	Wi	Pre-Req.	Criteria	Criterion No.
Resources	Energy	17%	S	Efficiency in consumption – Energy certification	C7
				Passive design	C8
				Carbon intensity (equipment efficiency)	C9
	Water	8%	S	Potable water consumption	C10
				Local water management	C11
	Materials	5%	S	Durability	C12
				Local Materials	C13
9 criteria				Low impact materials	C14
32%	Food production	2%	S	Local food production	C15

3.3.2.3. *Environmental Loadings*

The use of resources in the built environment, and all the activities related, generate impacts of loads, resulting in wastewater and air emissions, solid waste, and thermal and light pollution. A detailed study and adapted management on buildings and their structures are crucial to decrease the impacts on outdoor areas.

The Table 5 refers to the present category, areas and corresponding weights, and criteria.

Table 5: Environmental Loads: considered areas and criteria (Source: LiderA, 2011).

Category	Area	Wi	Pre-Req.	Criteria	Criterion No.
Environmental loadings	Wastewater	3%	S	Wastewater treatment	C16
				Wastewater use	C17
	Atmospheric emissions	2%	S	Air emissions control	C18
	Waste	3%	S	Waste control	C19
				Waste management	C20
				Waste valorisation	C21
9 criteria	Noise emissions	3	S	Noise emissions control	C22
12%	Thermal and light pollution	1	S	Thermal and light pollution	C23

3.3.2.4. *Environmental Comfort*

The aim of sustainability is to guarantee that natural resources satisfy the nowadays necessities without compromising the future generations, which means the necessity of finding a balance between natural ecosystems and humans. In the built environment it's the same, it is essential to understand that buildings and outdoor environments should not only meet the demands of efficiency but also customer satisfaction, namely his comfort and well-being.

So, there should be a category that take into account effectiveness and efficiency while consider human comfort. Air quality levels, thermal comfort, correct use of lighting and capacity of the building to isolate indoor spaces from outdoor (acoustic insulation).

The Table 6 refers to the environmental comfort category, its areas and corresponding weights, and criteria.

Table 6: Environmental Comfort considered areas and criteria (Source: LiderA, 2011).

Category	Area	Wi	Pre-Req.	Criteria	Criterion No.
Environmental comfort	Air quality	5%	S	Air quality levels	C24
	Thermal comfort	5%	S	Thermal comfort	C25
4 criteria	Lighting and acoustic	3	S	Lighting levels	C26
15%				Acoustic insulation/noise levels	C27

3.3.2.5. Socioeconomic experience

The experiences of socioeconomic activities are the direct link to connect the society with the space where they leave. Without experiences we will be just talking about resources and their environmental loads, and lot about this deep connection between nature and people. The quality of social and economic experiences will indicate the bigger or smaller variety of spaces with different functions and economy.

It is intended that all the aspects are approached in order to ensure a structure and quality of experiences good enough for the residents and floating population. Some aspects are: accessibility and mobility; the life cycle costs, establishing a closer relationship between quality and price; control and security, among others.

The Table 7 refers to the present category, areas and corresponding weights, and criteria.

Table 7: Socioeconomic Experience: considered areas and criteria (Source: LiderA, 2011).

Category	**Area**	**Wi**	**Pre-Req.**	**Criteria**	**Criterion No.**
Socioeconomic Experience	Access for all	4%	S	Public transportation access	C28
				Low impact mobility	C29
				Accessibility to disable people	C30
	Economic diversity	4%	S	Flexibility/Adaptability	C31
				Local Economic dynamics	C32
				Local work	C33
	Amenities and Social Interaction	4%	S	Local amenities	C34
				Community Interaction	C35
	Control and participation	4%	S	Controllability	C36
				Participation and governance conditions	C37
13 criteria				Natural Risks - Safety	C38
				Human Threats – Security	C39
19%	Life cycle costs	2%	S	Life cycle costs	C40

3.3.2.6. Sustainable Use

This category cares about environmental management and innovative sustainable solutions, such as the level of information that facilitates good conditions of use and awareness. These factors contribute to the spread of environmental practices and ensure that the projects and areas are properly used and are adapted, or have the ability to adapt over time to the needs of its occupants and users.

The adoption of environmental management methods and practices of innovation, guarantee a good performance of the building and at the same time testify to its ability to adapt over time, thus contributing to sustainability issues.

The Table 8 refers to the present category, areas and corresponding weights, and criteria.

Table 8: Sustainable Use: considered areas and criteria (Source: LiderA, 2011).

Category	Area	Wi	Pre-Req.	Criteria	Criterion No.
Sustainable Use	Environmental Management	6%	S	Environmental information	C41
				Environmental Management System	C42
3 criteria	Innovation	2%	S	Innovative solutions	C5
8%					

3.3.3. Recognition and Certification

The LiderA system can be used either to develop plans, projects and sustainable building solutions, or to make assessments in order to reach a final output, by weighting the different areas. Otherwise, this system can be applied also to various stages, and in fact, it is particularly relevant in enterprises' design phase, as it can obtain a performance value that can be improved for the construction phase.

It's important to know that, since its early stages, each enterprise must adopt an environmental policy, which should be suitable for its development and environmental characteristics, when considered the sustainable principles referred before.

For receive recognition and certification, enterprises need to show good performing solutions, at the design or plan stage, proven through a prescriptive form or through their performance. If they show performance levels in the categories and areas considered, or in their overall performance achieve level C or above, they can be recognized by LiderA. Nevertheless, enterprises must have the evidence that concurs such performance and supply it to Team LiderA for the verification process. In the case of construction and operation phases, the system's approach focuses on actual available evidences. If the verification process allows overall performance levels equal or greater than Level C, enterprises can be certified by LiderA (Pinheiro, 2006).

Thus, each of the following case studies was evaluated according to the 43 LiderA criteria (Annex IV), and analysed in detail in the following chapter. After the assessment is possible to understand how sustainability is being approached for these built environment, giving them precise results where they are better and in which of them they can improve.

4. Case studies: Lisbon-Cascais-Sintra region – Hostels Cases

The twelve select hostels are located in different areas, namely Lisbon (10 hostels), Cascais (1 hostel), and Sintra (1 hostel). The following sections of this chapter are intended for their presentation and analysis with the sustainable assessment criteria LiderA.

4.1. Lisbon Select Hostels

4.1.1. Golden Tram 242 Hostel

4.1.1.1. The hostel

The Golden Tram 242 is located in one of the most famous neighbourhoods of Lisbon, Baixa, being extremely well located, as the vibrant city centre of the city is here. The Áurea Street, where the building is located, is a commercial street that connects the Rossio Square to Terreiro do Paco, housing shops of different qualities, among other businesses. In front of the hostel is the Santa Justa Elevator, further increasing the importance of the Golden Tram 242 location.

The table 9 compiles some of the hostel's characteristics, which are further developed:

Table 9: Main characteristics of Golden Tram 242 building.

Hostel's name	Building's age	Nº Floors	Area (m^2)	Typology of spaces	Capacity Typology of rooms
Golden Tram 242	1922	5 (including ground floor)	1000	Dorms, Suites, Kitchen, Living and dinner room, WCs	123 beds: 15 Dorms (10, 8, 4 beds), 5 Suites (2, 3 beds)

Although the building is from 1922, according to the owner of the hostel, is certainly from the Marquês de Pombal time, having the characteristics of a building from that period, but it was rehabilitated and subsequently amended to be the building it is today. The fact that is a building with 4/5 floors confirms the later interventions in the Pombalino urban planning, where all buildings had equal heights, with the ground floor, three floors and mansard.

As a hostel, the building serves the purpose since May 2013 having suffered remodelling and adaptations to be able to accommodate people. Therefore, the interior walls have thermal insulation and part of the plumbing is new. Counting on all the infrastructure and floors, the Golden Tram 242 has an area of 1000m^2 with different types of areas, namely the reception (ground floor), kitchen, dining and living room, and laundry room (1st floor) and from the 2nd floor bedrooms and bathrooms.

The hostel has capacity for 123 people, with the option to choose between shared rooms (dorms) and private ones. In shared rooms are used bunk beds and locker systems to keep saved personal items, totalising15 bedrooms. As for private, they are called suites, with a choice of rooms with 2 and 3 beds. Each floor has shared bathrooms, each decorated differently, giving an identity to the spaces. Along the corridors there are sentences and words referring to Lisbon, helping to create the hostel experience more unique. Each floor has a colour and each room a name, referring to parts of the city.

The kitchen is available to guests, with a large and common table, where everyone can sit and share their stories, as is traditional for a hostel. In the kitchen new appliances are visible, as well as in the laundry the washing machines and dryers, and the selective separation of containers of waste, including organic waste. Also in the dining room area there is a bar and a sound system and lights to make the room a disco when the guests so desire. An LCD delimits the zone of couches where you can watch calmly concerts, football games, etc. Sometimes these areas are used for larger dinners, with the possibility of hiring a catering service.

The hostel currently receives any guest of any age and lifestyle, differing slightly from the initial concept of hostel, target for young people and backpackers. Some are backpackers, collecting experiences and stories, others look for a cheaper overnight accommodation just for attending a concert in the city, for example. Everyone is welcome.

Figure 10: Golden Tram 242 main divisions.

4.1.1.2. LiderA Assessment

After visiting the facilities and observe in detail the constructive aspects and functioning of the hostel, it was possible to assimilate the information and assess the level of sustainability of the building. Among the 43 criteria, there are categories with more weight than others, so on the table 10 are the best and worst ratings (A^{++} and E/F, respectively) for Resources, Environmental Comfort and Socioeconomic experiences:

Table 10: List of best and worst classifications of LiderA Assessment of Golden Tram 242 Hostel.

Category	Area	Criterion	C number	Level
Resources (32%)	Energy	Carbon intensity	C9	A+
	Water	Local water consumption	C11	F
	Materials	Local materials	C13	A+
Environmental Comfort (15%)	Lighting & Acoustic	Lighting level	C26	A+
Socioeconomic experiences (19%)	Control & Participation	Human threats	C39	A++

Energy – Carbon intensity (A+)

One of the areas where hostels most can improve is in the choice of equipment (appliances, lamps) to reduce emissions of CO_2 and other GHG. In the case of Golden Tram 242 there is no existence of any combustion equipment such as heaters, water heaters, stoves and gas ovens. Instead, the water is heated by hot water storage heaters (6) by solar energy from the solar panels 12 installed at top of the building. The stove and oven are electric and all appliances have class A or superior (refrigerator, washing and drying machines, microwave, etc.). Furthermore, the entire electrical installation has LED lamps, and in some areas such as corridors and bathrooms there are motion detectors, which significantly reduces the energy consumption and consequently greenhouse gas emissions as well. Two possible ways to further reduce emissions would be use electricity from the grid with origin in renewable sources (e.g. there are some electricity companies that guarantee that the electricity is provided by renewable energies) or install a power generation system in the building, using solar energy.

Water – Local water consumption

The whole area of the hostel is fully waterproofed, as well as the surrounding, result of other buildings and pavements. This fact does not allow the existence of a water retention area by the absence of green/permeable areas, which contributes to the runoff of rain water that cannot infiltrate. The fact there isn't also collection of rainwater from the rooftops, contributes to the above phenomenon. Besides, does not allow its reuse for other purposes such as recirculating water in discharges of toilets or for wash the interior spaces, which means higher consumption of drinking water from the network.

The lack of permeable areas is a problem for most of the studied hostels due to its urban location, as can be seen below, which gives very negative ratings in this category. For these cases, where there is no possibility of creating permeable zones, the best solution is to install a system for the collection of rainwater through pipes in order to direct it to recirculation. For hostels with access to the roof may be possible to create a green roof and other green infrastructure.

Materials – Local materials

The origin of this hostel building materials is difficult to know by the age of the building, but precisely for this reason the probability of the structure has been made with materials from the area is large, so it is assumed that they are at least national. As for the interior refurbishments

there is such guarantee for the part of the owner, as well as the furniture in the rooms and public areas. Some parts of furniture and structures are even made by the hostel, as pladurs with iron supports.

The importance of using domestic materials is immense, as it will support local commerce, which does not involve imports and overspending in materials transportation. Furthermore, by reducing imports the use of energy is also minimized, in particular in fuel and electricity. Another possibility to reduce impacts is to reuse materials not only in construction but also in the decoration. Recycled wood boards are common and a lot of decoration is available in antique shops and fairs. Reuse is one of the best solutions to reduce consumption of raw materials and energy resources.

Lighting & Acoustic – Lighting level

The lighting level of a space is one of the most important factors in terms of environmental comfort, it is essential to provide adequate levels for each type of space. In the tourist accommodation shall be the same.

The building of the Golden Tram 242 has the main facade with West orientation, although not all divisions are so. Guest rooms and common spaces are located on the same facade, the main one, facing the street, which provides natural light most of the day. In these divisions there are large windows that take full advantage of daily sunlight, where there are also shading interior elements – curtains - when so is needed. However, other divisions such as toilets, most of them have windows to the exterior but not facing south or west, but provides sufficient light for its function.

During the night, the artificial lighting is also very important and must be adapted to the use and frequency of spaces. Work areas such as offices and reception, kitchens, living rooms and bedrooms are spaces that require more lighting, while corridors and circulation areas less. In Golden Tram 242 were correctly dimensioned all areas, as well as the energy efficiency of lamps (LED) and the intuitive and automatic control mechanisms where appropriate.

No less important are the colours that are used on the interior walls, being the better the clearer, due to the reflection of the light that ensure more lighting. Darker colours should then be avoided when the aim is to provide maximum light. In buildings with the proper orientation, with easy access to sunlight, there may not be any disadvantage to use darker colours on the surfaces. Most of the rooms of the hostel, rooms and common areas, light colours are used only.

Socioeconomic experiences – Human threats

The importance of security in places such as tourist accommodation is crucial, given the variety and quantity of people that every day uses the services of the hostel, being humanly impossible to control both the less good intentions of the guests as the spaces that they use. As such, the hostel has only one entrance into the interior, and that is the main facade, which facilitates the control of the flow of people. The reception is open 24 hours a day, and there are

surveillance cameras at strategic points. The Golden Tram 242 also provides fire detectors and intrusion, which gives you a pretty good rating on this criterion.

4.1.2. HUB New Lisbon Hostel

4.1.2.1. The hostel

The hostel HUB New Lisbon is one of the newest hostels in Lisbon, with only 4 months old. It is located in the famous area of arts and culture during the day and nightlife, the Bairro Alto. The Street O Século, where lies the hostel, is a transverse street of the Bairro Alto connecting the Príncipe Real neighbourhood and the southern region of the neighbourhood. Despite everything is a quiet area without the extreme agitation of other parallel streets from the bars.

The table 11 compiles some of the hostel's characteristics, which are further developed:

Table 11: Main characteristics of HUB New Lisbon's building.

Hostel's name	Building's age	Nº Floors	Area (m^2)	Typology of spaces	Capacity Typology of rooms
Golden Tram 242	At least 100 years old	5 (including ground floor)	1400	Dorms, Double rooms, Kitchen, Living and dinner room, WCs, Games room, Reading room, Terrace, lobby, Reception, Lockers room, Sitting area	162 beds: 20 Dorms (12, 8, 6, 4 beds), 13 Double rooms

Despite the age uncertainty of the building where the hostel is located, is known that it is very old, with more than 100 years. This led to significant interior renovations for improvement of spaces and services, and creating others. Given that the hostel has 4 months of activity, new renovations will not be necessary in the short / medium period of time.

It's a hostel with capacity for 162 people, divided into 33 rooms over 4 floors (the ground floor has no rooms). The rooms are of 2 types: dorms (20) and doubles (13). In shared rooms are used bunk beds and locker systems to keep saved personal items. The ground floor includes the lobby, reception, offices, locker room, reading room and games, sitting area, bar and technical area. The upper floors include bedrooms, kitchen, reading room, living and dining room, terraces and bathrooms. The kitchen is available for guests to cook whenever they want and all the equipment is new, including appliances. The separation of waste is also very important to the hostel, and the hostel tries that everyone is aware of this. Along the walls of the common areas, corridors and rooms you can still see traces of the time when the building was constructed as tiles and some arcades.

According to the style of the spaces provided, and the location, most of the guests are young (something also observed in site visits). Despite the quiet area, a few meters away there are shops, restaurants and cultural venues.

Figure 11: HUB New Lisbon Hostel main divisions.

4.1.2.2. LiderA Assessment

Among the 43 criteria, there are categories with more weight than others, so on the table 12 are the best and worst ratings (A^{++} and E/F, respectively) for Resources, Environmental Comfort, Environmental Loads and Socioeconomic experiences:

Table 12: List of best and worst classifications of LiderA Assessment of HUB New Lisbon Hostel.

Category	Area	Criterion	C number	Level
Resources (32%)	Water	Local water consumption	C11	F
Environmental Loads (12%)	Wastewater	Wastewater management	C16	F
Environmental Comfort (15%)	Lighting & Acoustic	Lighting levels	C26	A+
Socioeconomic experiences (19%)	Amenities & Social Interaction	Locals Amenities		A++
	Life cycle costs	Life cycle costs	C39	A++

Water – Local water consumption (F)

Just as with the hostel Golden Tram 242, HUB is in the building in a completely urbanized area of Bairro Alto, which does not allow the existence of permeable areas. Once again there is no water retention, leading to increased run-off water, which cannot infiltrate in the soil.

One possible solution to reduce runoff is collect rainwater for own consumption, which also reducing the consumption of public water.

Wastewater – Wastewater management (F)

Although environmental loads are not the category with the highest weight in LiderA evaluation, there is a very low overall ranking on criteria Wastewater management.

Once again, the waterproofing characteristics of the urban areas does not allow the existence of large spaces for permeable zones, for implementing a local treatment of wastewater there will be much less. Taking into account the number of people than a hostel with 162 beds receives only in a month, in high season, water consumption is quite high, and much higher the worse are the habits of the guests (something we cannot control) and the smaller the implementation of flow reducers in taps and toilets discharges. As such, this criterion is closely linked with domestic water consumption (C10). Thus, the higher the consumption, the greater the needs of water treatment, before it can return to be consumed.

The existence of a treatment plant for wastewater at the site of tourist accommodations, would significantly reduce the pressure allocated to municipalized treatment. However, this is not possible according to the space such systems require. It can be applied in rural areas more easily where the area available is much larger. Possible solutions to urban hostels will be the implementation of flow reducers, timers on taps when necessary and convenient, dual flush in toilets systems, sanitary systems "waterless", preliminary treatment systems wastewater (SANIPRO XR - Annex V), and later reuse of water for new discharges, and not least the collection and reuse of rainwater for secondary consumption.

With these measures would be saved thousands of litres of drinking water at the local level, significantly reducing the need for chemical and biological treatments, also winning the hostel with this investment to consume less public water.

Lighting & Acoustic – Lighting level (A+)

As the Golden Tram, the main facade of the HUB hostel has West orientation, just having areas facing west and east. This ensures sunlight most of the day, on floors 1-4, especially in rooms as well as in dining rooms and kitchen, also influenced by the presence of the terrace on the 2nd floor. Windows are frequent in all divisions with natural lighting as well as interior curtains to provide shade. The surfaces and interior finishes have all light colours (walls, ceilings and floors), which allows greater advantage of natural light. Some double rooms have a darker colour wall, but with the amount of light available in no way affects the comfort.

Artificial lighting is also well distributed, being stronger in common areas, work spaces and rooms. Corridors and circulation areas have only presence lights. However, in any of the spaces, the LED lamps are used.

Amenities & Social Integration – Local amenities (A++)

As stated above, the geographical location of the hostel is quite good with regard to proximity to amenities, both human and natural. Exactly in front of the hostel building is the Museum of the Convent of Cardais down or up the street there are several restaurants, grocery stores and other shops. In 180m is the Principe Real Garden, 300m the São Pedro de Alcântara Garden and 350m the Botanical Garden and the National Museum of Natural History and Science. Universities, pharmacies, and other services are also close.

The diversity and quantity of amenities location within walking distance gives the hostel a qualification A ++.

Life cycle costs (A++)

The choice of equipment and systems appropriate to the dimensions of a hostel, or any building that receives many people is an added value because it avoids energy costs and the unnecessary use of resources. The efficiency of the lamps (LED), the amount of those, the size of washing machines and dryers, refrigerators and water heaters were aspects taken into account for the capacity and needs of the HUB hostel. Also constructive solutions and materials must be studied in order to avoid the need for frequent maintenance and energy needs. It has been implemented in some areas thermal insulation in roofs, reducing energy needs, and some materials used for furniture are recycled, like the wood boards for the tables in the kitchen and dinner rooms.

The choice of durable furniture at the hostel is a very important factor, which is used by thousands of people every year, so their wear rate is higher than in any other building not accommodating people. The materials used in the refurbishment before opening were also chosen so as to be easy to maintain and providing long durations.

4.1.3. Jardim de Santos Hostel

4.1.3.1. The hostel

This hostel is a little different from the previous, for different reasons. Is located in a city area somewhat quieter during the day, the district of Santos, running a little from the hubbub of Bairro Alto and Baixa districts. Nevertheless, it is quite close to the historical centre, therefore is not a problem to walk there. The old district of Madragoa is your neighbour, and the Tagus River is just a few meters away. At night, Santos buzzes with young people and is host to numerous bars and restaurants, the path of the most famous clubs of the city.

The table 13 compiles some of the hostel's characteristics, which are further developed:

Table 13: Main characteristics of Jardim de Santos's building.

Hostel's name	Building's age	Nº Floors	Area (m^2)	Typology of spaces	Capacity Typology of rooms
Jardim de Santos	At least 100 years old	1	300	Dorms, Double and triple rooms, Kitchen, Living and dinner room, WCs, Reading room, Lobby, Reception, Laundry	32 beds: 4 Dorms (10, 8, 6, 4 beds), 1 Double room, 1 Triple room

Not being sure about the age of the building, observing the constructive and architectural characteristics seems to be old. The coarse stone structure, the thickness of the facades, the wide and fresh entrance of the building and its staircase, where high and decorated ceilings are part of the typical rustic style of Lisbon's buildings. The large rooms are also a standard, which allows you to take good use of spaces.

Due to the hostel be only in one floor, a closer atmosphere between the spaces but also among guests is created, running away a little the concept backpacker hostel. In the morning and the evening, everyone can join in the kitchen or living room, calmly talking.

The hostel can accommodate 32 people, having the possibility to choose between dorms (4) or private bedrooms (2). The dorms have 10, 8, 6 or 4 bunk beds system, while private are doubles and triples, with antique iron beds.

The hostel includes spaces such as the reception and lobby, rooms, kitchen, bathrooms, and common room, where the décor is based on simple lines and antique furniture, such as tables, beds, chairs and other personalised elements. The whole atmosphere is soothing and an invitation to any guest.

Figure 12: Jardim de Santos Hostel main divisions.

4.1.3.2. LiderA Assessment

Among the 43 criteria, there are categories with more weight than others, so on the table 14 are the best and worst ratings (A^{++} and E/F, respectively) for Resources, Environmental Comfort, Environmental Loads and Socioeconomic experiences:

Table 14: List of best and worst classifications of LiderA Assessment of Jardim de Santos Hostel.

Category	Area	Criterion	C number	Level
Resources (32%)	Water	Local water consumption	C11	F
Environmental Loads (12%)	Wastewater	Wastewater management	C16	F
Environmental Comfort (15%)	Lighting & Acoustic	Lighting levels	C26	A+
Socioeconomic experiences (19%)	Amenities & Social Interaction	Locals Amenities	C34	A++
	Life cycle costs	Life cycle costs	C39	A++

Water – Local water consumption (F)

Just as with the previous hostels, Jardim de Santos is a hostel not even in the ground floor or top, which means it's impossible to have permeable areas. So the hostel is not contributing for water retention, leading to increased run-off water. For these situations, in which hostel doesn't have access to the roof or ground floor, it's almost impossible to implement any solution to reduce the runoff, although can be designed a harvesting system for the entire building and taking advantage of rainwater for own consumption, also reducing the consumption of public water. With this solution, not only the hostel could save money but also the entire community of the building.

Wastewater – Wastewater management (F)

Although environmental loads are not the category with the highest weight in LiderA evaluation, there is a very low overall ranking on criteria Wastewater management, also for Jardim de Santos.

Jardim de Santos is a much smaller hostel, with capacity for 32 people. Nevertheless, can receive hundreds of people in one month, in high season, which implies high consumptions of public water.

Like for HUB and Golden Tram 242 isn't possible to implement a treatment plant for wastewater on site, but it's reasonable to consider implementing flow reducers, timers on taps when necessary and convenient, dual flush in toilets systems, sanitary systems "waterless", preliminary treatment systems wastewater (Annex III), and later reuse of water for new discharges, and not least the collection and reuse of rainwater for secondary consumption. With these measures would be saved thousands of litres of drinking water at the local level, significantly reducing the need for chemical and biological treatments, also winning the hostel with this investment to consume less public water.

Jardim de Santos already has flow reducers in taps and showers in toilets and in the kitchen, which allows significant local water consumptions reductions. The flow of a traditional tap is between 11 to 19L, with flow reducers consumption can drop until 50%. However, the hostel

still didn't use dual flush toilet systems which can reduce flow to 3 to 6L, compared to the 7 to 15L in a traditional flush.

Lighting & Acoustic – Lighting level (A+)

The main facade of the Jardim de Santos hostel has north orientation, which in terms of natural lighting is not the perfect orientation for taking advantage of the sunlight in indoor spaces. Five bedrooms are facing north, two and living room facing west and the kitchen, WCs, and one-bedroom south. The reception, lobby and a reading area are placed in the centre of the floor where there isn't direct light. Although some areas facing west and south, which have the entrance of sunlight all day, allows its penetration until the interior areas (Hostel's plants – Annex II).

There are windows in all divisions as well as interior window doors to provide shade. The surfaces and interior finishes have all light colours (walls, ceilings and floors), which allows greater advantage of natural light. Some bedrooms have a darker colour wall, but with the amount of light available in no way affects the comfort.

Artificial lighting is also well distributed, being stronger in common areas, work spaces and rooms. Corridors and circulation areas have only presence lights. However, in any of the spaces, the LED lamps are used.

Access for all - Public transports access (A+)

The area of Santos is quite busy both day and night, which requires an appropriate transport network, to meet the needs. Near the hostel there are at least four types of public transportation available: bus, train, tram and taxi. In a longer distance there is also the metro.

The existence of this variety of accessible transport to all, leads to a pretty good score in terms of accessibility to public transport.

Amenities & Social Integration – Local amenities (A++)

As stated above, the geographical location of the hostel is quite good with regard to proximity to amenities, both human and natural. Exactly in the same block there are art galleries, Mc Donalds and other businesses. Universities, restaurants, and gyms are located less than 300m from the front door of the hostel's building, among other services are also close. Ten metres from the doors there is the Garden of Santos, and in 330m the Tejo River.

The diversity and quantity of amenities location within walking distance gives the hostel a qualification A ++.

Life cycle costs (A++)

The choice of equipment and systems appropriate to the dimensions of a hostel, or any building that receives many people is an added value because it avoids energy costs and the unnecessary use of resources. The efficiency of the lamps (LED), the amount of those, the size of washing machines and dryers, refrigerators and water heaters were aspects taken into account for the capacity and needs of the Jardim de Santos hostel. Also constructive solutions and materials must be studied in order to avoid the need for frequent maintenance and energy needs.

Unfortunately, there is no specific information about the constructive materials being difficult to evaluation if they are the right choice in terms of life cycle costs, but since the aim of the building is to provide accommodation the materials used refurbishment before opening were possibly also chosen to be easy to maintain and providing long durations

The choice of durable furniture at the hostel is a very important factor, which is used by thousands of people every year, so their wear rate is higher than in any other building not accommodating people.

4.1.4. Lisb'on Hostel

4.1.4.1. The hostel

The Lisb'on hostel has the same style of Golden Tram 242 and HUB, taking into account its size and location. It is located in Baixa-Chiado, already in connection with the streets near Caís do Sodré, which enables be close to the nightlife of Caís and Bairro Alto, but also to the historic center. However, the street of the hostel is very quiet because it is not located in the nucleus of any of these areas, avoiding the tourist and night parties' confusion.

The following table compiles some of the hostel's characteristics, which are further developed:

Table 15: Main characteristics of Lisb'on's building.

Hostel's name	Building's age	Nº Floors	Area (m^2)	Typology of spaces	Capacity Typology of rooms
Lisb'on Hostel	At least 150 years old	4 (including ground floor)	Each floor: 300 Garden: 100-120 Terrace 90; Total 1300	Dorms, Double and family rooms, Guest-kitchen, Dining room; Common and TV room, WCs, Terrace; Garden, Lobby, Reception, Self-service Laundry	104 beds: Dorms (10, 8, 6, 4 beds), 5 Double rooms, Family rooms

The Lisb'on hostel is located in a building with at least 150 years, evidenced by its robust structure of stone, high ceilings and spacious rooms. Its quality infrastructure and the state of finishes reveals the recent refurbishment and careful maintenance, engineering excellence environments in the hostel's market. It's possible to admire in the walls and ceilings of common areas the extraordinary ancient relief decoration, carefully preserved as a cultural reference.

It consists in 4 floors, a garden and a terrace, being one of the urban hostels with the largest area of this study. Each floor has 300m^2, the terrace about 90m^2 and garden between 100-120m^2. The different spaces are distributed through the floors such as the lobby and reception, kitchen and dining room, common room with bar, games and books, TV room, garden, terrace, laundry rooms and bathrooms. The kitchen is fully equipped and can be used by guests and is connected to a large meals room full of colourful furniture. The living room is a reading area, a familiarity space, where you can eat and drink something, playing guitar or snooker.

Attached is a smaller room with sofas, TV and computers for guests. The terrace is one of the most admired areas, due to contact with the beautiful view of the riverside area of Lisbon, being able to observe the Cristo Rei, 25th April Bridge and the surrounding buildings. It is a very large space, with seats and with the possibility to hold parties. The garden is another election area, providing moments of relaxation and some contact with nature. It has tables, chairs, umbrellas, hammocks, and other places to enjoy the magnificent urban garden.

It has capacity for 104 beds in 3 types of guest rooms: dorms (10, 8, 6 and 4 beds), double rooms (5) and Family. The dorms have bunk beds with good mattresses and sturdy wooden structure, and a common table. The double and family rooms have tables and sofas in addition to the beds.

Figure 13: Lisb'on Hostel main divisions.

4.1.4.2. LiderA Assessment

Among the 43 criteria, there are categories with more weight than others, so on the table 16 are the best and worst ratings (A^{++} and E/F, respectively) for Resources, Environmental Comfort, Environmental Loads and Socioeconomic experiences:

Table 16: List of best and worst classifications of LiderA Assessment of Lisb'on Hostel.

Category	Area	Criterion	C number	Level
Resources (32%)	Energy	Passive design performance	C8	A+
	Materials	Durability	C12	A+
Environmental Loads (12%)	Wastewater	Wastewater management	C16	F
Socioeconomic experiences (19%)	Access for all	Public transports access	C28	A++
		Low impact mobility	C29	E

Energy – Passive design performance (A+)

The basis of passive design is the use of natural energy sources available, instead of resorting to energy such as electricity or natural gas. The design of the building will be done in accordance with the natural energy sources available in order to make the most of them. Some strategies include daylighting, natural ventilation, and solar energy. The study areas are focused on building massing and orientation, passive heating and cooling, among others (Passive Design – Annex III). Within the field of structural buildings, hostels may be unable to intervene, given that the buildings were already built before they adapt to hostels. Therefore, the buildings will have the orientation and correct shame if there were some concerns in this topic at least 150 years ago.

The main facade faces north, where the reception is located and the lobby, on the ground floor, and the living and TV room on the 1st floor. Through south are facing the terrace, kitchen and dining room, as well as some rooms. The other divisions Faces-East, without any on West, since there is another building next to Lisb'on hostel. In an urbanized area as the Baixa-Chiado, buildings typically only have divisions allocated in two directions, by the absence of independence between the buildings. However, the Lisb'on has divisions in 3 directions by the height difference between the side buildings, allowing solar gain to the east in the morning, and avoid exposure to sunlight warmer west in the afternoon.

In the northern hemisphere it is important that the buildings have south orientation to take full advantage of solar energy since sunrise at East, to the sunset at West. However, in hot climates, such as Portugal does and all the countries of southern Europe, in the summer is essential to take measures to reduce excessive energy gain by the bodies, in this case the building. The choice of the thermal mass of a structure is also an important factor for the use of sunlight, taking into account that not all materials have the same resistance to temperature changes. Stone structures are the most common in the old buildings of Lisbon, considered a high thermal mass material, i.e. has the ability to absorb and store heat during the day, in the hot periods, and then release it slowly, at night time. This is the case of Lisb'on hostel building. Still,

the walls and other building elements continue to allow the entrance of heat to the interior spaces, and is need to find the best strategies to avoid excess energy gain.

The thermal insulation of the affected areas as exterior walls, roofs and indoor pavements is one way to avoid the excessive absorption and heat loss when it is more needed (night-time). The Lisb'on has no insulation in these areas, and therefore have to resort to other methods.

Proper sizing of windows is a solution, in order to maximize solar heat, gain in winter, but it is also necessary to protect them in summer - by using of flaps, window doors, blinds or shutters. In the latter case the inner curtains can be used, as these do not prevent the heat entrance between the divisions, as opposed to the outer shading elements. The Lisb'on hostel, beyond the proper sizing of windows, implemented double glazing at least on 50% of windows (facing south), apart from the indoor protection, which considerably reduces the solar heat gain. When using double glazing there is also the guarantee of proper insulation against air leaks by the frames of the well-sealed windows. When there are no frames sealed, the interior temperature can vary significantly with the air inlet. Proper placement and sizing of windows, also guarantees the use of natural ventilation for air renewal in the interior spaces. Natural ventilation is important because it can provide and move fresh air without fans. For warm and hot climates, it can help meet a building's cooling loads without using mechanical air conditioning systems. This can be a large fraction of a building's total energy use. Successful natural ventilation is determined by having high thermal comfort and adequate fresh air for the ventilated spaces, while having little or no energy use for active HVAC cooling and ventilation.

No less important will be the colour of the surfaces exposure to the sun, because the amount of sunlight absorbed by material (and thus converted to heat) depends on that. Light coloured surfaces will bounce light around within the space distributing it over a greater number of surfaces. Dark coloured materials will absorb it. So to the exterior surfaces of Lisb'on hostel there was this attention, and these have light tones. In the case of roofs happens the same, light colours should also be used in warm climates, to increase the reflection, since a surface with a dark ceiling can easily set 40 ° C hotter than the surface of the light colour roof, on a sunny day. Cool roof surfaces are often far more effective than simply adding proof insulation, and effectively much cheaper. The roof material can also be selected according to the weather, and the brick is the material regularly used in Lisbon area. The brick can reflect nearly 80% of solar (shortwave) and radiation also emit large amounts of heat (longwave).

Materials - Durability (A+)

The durability of materials and equipment is an essential point when talking on the sustainability of resources, it is extremely important the proper choice of them and do their maintenance often. When selecting the appropriate materials to the functions and ensuring its performance to 100%, we can save in the long term new materials.

The structure of the hostel is quite old, as mentioned above, but at the same time is made by one of most resistant materials considering time and climatic conditions, the stone. Not knowing the state of the building prior to the opening of the hostel, it is supposed to have

undergone some renovations especially in finishes and maybe some internal structural changes to adapt the operation of the hostel. Anyway, the hostel opened in December 2010 and being also recent the finishes. The plumbing system has also been partially replaced and added in some areas, having about 5 years. The elevator, systems and electrical installations, solar panels, boilers, and other equipment are also very recent, also five years old. This evidence guarantees a certain durability and guaranteed not to purchase new equipment, as long as regularly inspected, and possible new renovations which requires acquisition of new materials.

Wastewater – Wastewater treatment (F)

Although environmental loads are not the category with the highest weight in LiderA evaluation, there is a very low overall ranking on criteria Wastewater management, also for the Lisb'on Hostel. This hostel has almost the same capacity as Golden Tram 242 and HUB New Lisbon Hostel, receiving probably thousands of people in one month, in high season, which implies high consumptions of public water.

Like for HUB and Golden Tram 242 isn't possible to implement a treatment plant for wastewater on site, but it's reasonable to consider implementing some elements that would save thousands of litres of drinking water at the local level, significantly reducing the need for chemical and biological treatments, also winning the hostel with this investment to consume less public water. The Lisb'on Hostel already has flow reducers in showers and sensors or timers in taps of bathrooms, which allows significant local water consumptions reductions, around 50%. Also, the hostel applied dual flush toilet systems which can reduce flow to 3 to 6L, compared to the 7 to 15L in a traditional flush. Monitoring these systems is regular event and the equipment is as efficient as possible, according to the needs. Other possible solutions to urban hostels will be the implementation of "waterless "sanitary systems, preliminary treatment systems wastewater (Annex III), and later reuse of water for new discharges, and later collection of rainwater to reuse it for secondary consumption.

Access for all - Public transports access (A++)

The area of Baixa-Chiado is one of the most seething areas of Lisbon, both day and night, which requires an appropriate transport network, to meet the needs. Near the hostel there are at least 5 types of public transportation available: metro, bus, train, tram and taxi. Also is possible to bicycle hire, besides not being a public transport. The existence of this variety of accessible transport to all, leads to a pretty good score in terms of accessibility to public transport.

Access for all – Low impact mobility (E)

The mobility of low impact or sustainable mobility search "satisfying the needs of the generation without compromising the ability to satisfy the needs of future generations", in the Brundtland Report (1987). Mobility is one of the activities that consume more energy and also one of the main sources of emissions of polluting gases and greenhouse, territorial space occupation and noise generation. Then, according to the above quote, sustainable mobility is the model que Enables movement with minimal environmental and territorial impact.

The current model applied in cities like Lisbon is unsustainable as it is fundamentally based on motorised transport and, specially, the use of private vehicles. A model of sustainable mobility would be one in whose means of transport consume the least energy and produce less pollution per kilometre travelled and passengers have greater recognition (travel on foot, by bicycle, collective transport and shared car). The environmental impacts of transports can be reduced by improving the walking and cycling environment in cities, and by enhancing the role of public transports, especially electric rail.

Like mentioned, the low mobility in Lisbon is not applied has it should, being slowly implemented in areas outside the historical centre, where the mobility is much easier and organised. On the opposite the in Bairro Alto, Baixa and Alfama districts are still old and the slop in is too high, making difficult to adapt. Therefore, the low mobility in the hostel's area is poor. Being the motorised vehicles still the main transport used, generates traffic and less pedestrian paths for people. Although there are pedestrian paths in the area with appropriate dimensions to the flow of people, there aren't fully pedestrian ones, which means people continue to struggle along with the circulation of cars and other vehicles in the surroundings of the building.

Besides that, there isn't any bike lanes nearby the hostel or parking areas for bikes, neither services of car/moto/bike sharing, which decreases a lot the score for this criterion. Also there is a big lack of exclusive parking spaces for ecological vehicles and charging points for electric cars in the area (Map – Annex I). Nevertheless, there is a local transfer service in the hostel, even not being ecological.

Especially in the historical centre, sustainable mobility should be implemented by the reasons above and to avoid unnecessary maintenance of monuments caused by the gases' emissions.

4.1.5. Locals Hostel & Suites

4.1.5.1. The hostel

The location of the Locals hostel is remarkable for the diversity and dynamics of the streets surrounding the building, standing a few meters from everything: restaurants, supermarkets, coffee shops, theatres, museums, along with the nightlife either Bairro Alto, or Cais do Sodré. As stated above, the Bairro Alto is a synonym of art, culture, tradition, combining all in a friendly symbiosis, which guests can use easily.

The following table compiles some of the hostel's characteristics, which are further developed:

Table 17: Main characteristics of Locals' building.

Hostel's name	**Building's age**	**Nº Floors**	**Area (m^2)**	**Typology of spaces**	**Capacity Typology of rooms**
Locals Hostel	18th Century	2	Around 200	Dorms; Guest-kitchen; Dining and living; WCs, Interior patio; Reception	11 Bedrooms with 24 beds: 5 Dorms (8, 6, 4 beds) and 6 Double rooms

The hostel is set in a traditional building of the famous Bairro Alto, retaining its picturesque style and natural charm. It was home to the peculiar Portuguese actor Vasco Santana, of the national cinema gold time, being a brand present in the interior of the hostel spaces. Its yellow facade and balconies make the hostel unique and ensures a closer experience to the locals and the true everyday life of a “lisboeta”.

The hostel’s services begin on the 1st floor where the common areas are concentrated: living room, kitchen and meals area. The kitchen is available for guests, as well as the washing machine, among others. The reception, bar and restaurant are also in this area, where sometimes there are events, dance lessons, food tasting, among other activities.

The decor is almost idealized with old and “epoch” items such as sofas, armchairs, radios, suitcases, typewriters, among others. One wall is dedicated exclusively to Vasco Santana, with a cartoon of himself and dozens of hats alluding to the one the actor wore, being hung by the wall. There is also a small patio between the 1st and 2nd floor. Thus, the 2nd floor is completely dedicated to the bedrooms and bathrooms.

The Locals is a hostel with low capacity, about 24 beds in dorm style, with 4, 6 or 8 beds. However, the Locals also has some private rooms which are not in this building, and therefore are not going to be studied. The dorms’ beds are wooden bunk beds, coming from a producer of the Greater Lisbon area, being the beds built by the hostel staff.

There were some internal renovations, but the purpose of the owners was always preserve the history of the building to give it more originality. The wooden staircase continues to be the original.

Figure 14: Locals Hostel main divisions.

Figure 15: Locals Hostel main divisions (continuation).

4.1.5.2. LiderA Assessment

Among the 43 criteria, there are categories with more weight than others, so on the table 18 are the best and worst ratings (A^{++} and E/F, respectively) for Resources, Environmental Comfort, Environmental Loads and Socioeconomic experiences:

Table 18: List of best and worst classifications of LiderA Assessment of Locals Hostel.

Category	Area	Criterion	C number	Level
Resources (32%)	Water	Local water consumption	C11	F
	Materials	Local materials	C13	A+
Environmental Loads (12%)	Wastewater	Wastewater treatment	C16	F
	Atmospheric emissions	Atmospheric emissions control	C18	A++
Socioeconomic experiences (19%)	Amenities & Social Interaction	Local amenities	C34	A++

Water – Local water consumption (F)

Just as with the previous hostels, Locals is in the building in a completely urbanized area, which does not allow the existence of permeable areas. Also like in Jardim de Santos hostel, Locals is placed not even in the ground floor or top, which means it's impossible to have permeable areas. So the hostel is not contributing for water retention, leading to increased run-off water. For these situations, in which hostel doesn't have access to the roof or ground floor, it's almost impossible to implement any solution to reduce the runoff, although can be designed a harvesting system for the entire building and taking advantage of rainwater for own consumption, also reducing the consumption of public water. With this solution, not only the hostel could save money but also the entire community of the building.

Materials – Local materials (A+)

The origin of the building materials is difficult to know by the age of the building, but precisely for this reason the probability of the structure has been made with materials from the area is large, so it is assumed that they are at least national. As for the interior refurbishments there is such guarantee for the part of the owner, as well as all furniture in the rooms and common

areas, some are handmade, like the beds, others came from antique shops, fairs and somethings from the streets.

The importance of using local materials and recycling objects is immense, as it will support local commerce and reduce the use of raw materials and energy resources. Furthermore, by reducing imports the use of energy is also minimized, in particular in fuel and electricity.

Wastewater – Wastewater treatment (F)

Although environmental loads are not the category with the highest weight in LiderA evaluation, there is a very low overall ranking on criteria Wastewater management, also for the Locals Hostel. This hostel has almost the same capacity as Jardim de Santos Hostel, receiving probably a few hundreds of people in one month, in high season, which implies high consumptions of public water.

Like for the previous studied hostels, isn't possible to implement a treatment plant for wastewater on site, but it's reasonable to consider implementing some elements that would save thousands of litres of drinking water at the local level, significantly reducing the need for chemical and biological treatments, also winning the hostel with this investment to consume less public water.

The Locals Hostel still doesn't apply flow reducers in showers and sensors or timers in taps of bathrooms, which allows significant local water consumptions reductions, around 50%. But has applied dual flush toilet systems which can reduce flow to 3 to 6L, compared to the 7 to 15L in a traditional flush. Other possible solutions to urban hostels like the Locals will be the implementation of "waterless "sanitary systems, preliminary treatment systems wastewater (Annex III), and later collection of rainwater to reuse it for secondary consumption.

Atmospheric Emissions – Atmospheric emissions control (A++)

This criterion consists in the elimination or reduction of equipment, activities or combustion elements, which are associated with the consumption of a fuel and emission of resulting dust and particles. By reducing the use of this equipment, it is possible to minimize emissions of SO2 and NOx.

In Locals hostel there are just 3 elements using fossil fuels: barbecue, stove and water heater. The barbecue does the burning of coal, then emits polluting gases, however is a device that is not used regularly compared to a gas water heating system, for example. However, the stove will certainly be used every day, more than once, having a greater impact, and it should be replaced by electric plates, in order to reduce emissions. The gas water heater is another device that by its function is used several times a day, it is not advisable for tourist accommodation, as it consumes a lot on the start-up and loses efficiency the more distant are the points of water consumption. But fortunately, there is a device that in case if the water heater fails.

Fireplaces, heaters and any other gas appliances are non-existent at the hostel, which reveals a relative effort to prevent emissions of air pollutants.

Amenities & Social Integration – Local amenities (A++)

As stated above, the geographical location of the hostel is quite good with regard to proximity to amenities, both human and natural. Exactly in the same street there are libraries, supermarkets, restaurants, several kids of stores, coffee shops, bars, pharmacies, and other businesses and facilities. The S. Bento, S. Pedro de Alcântara e D. Luís Gardens are close, as well as some sight views through the city, and the river itself.

The diversity and quantity of amenities location within walking distance gives the hostel a qualification A ++.

4.1.6. Music Hall Lisbon Hostel

4.1.6.1. The hostel

The Music Hall Lisbon hostel is placed outside the area of the previous hostels, running away from the historical centre. Although it is an extremely pleasant part of Lisbon between Marquês de Pombal, Saldanha and Praça de Espanha, being at the same time central and close to monuments and locals of interest. It is a walking distance from the famous Calouste Gulbenkian Foundation, a centre of culture and education; the shopping centre El Corte Inglés, among others; Parque Eduardo VII, with a gorgeous view through the Liberdade Avenue and the river. It's also the place for many hotels, companies and other important businesses in Lisbon.

The following table compiles some of the hostel's characteristics, which are further developed:

Table 19: Main characteristics of Music Hall Lisbon's building.

Hostel's name	**Building's age**	**Nº Floors**	**Area (m^2)**	**Typology of spaces**	**Capacity Typology of rooms**
Music Hall Lisbon Hostel	At least 100 years old	1	Around 200	Dorms and private rooms; Guest-kitchen; Common room with bar; Bathrooms, Small outdoor terrace; Reception	26 beds: 3 Dorms (8, 6, 6 beds) and 2 Triple rooms: triple (4 sleeping places if needed) and 1 Double

The hostel is in a building with at least 100 years old, in a corner of Antonio Augusto de Aguiar Avenue, made of stone and marble on balconies. The entrance door it's original, with thick glass and iron decorations. The area might not be known but the hostel is placed in the 1st floor with capacity for 26 beds, in resemblance with Jardim de Santos and Locals Hostel. There are 2 dorms of 6 beds, 1 masculine and other feminine, 1 mixed dorm with 8 beds and 2 private rooms, double and a triple. Each bedroom has a name related with a music gender, and the decoration inside is according to that. Boogie Nights, Country, Jazz, Rock and Electronic are their names. The dorms have bunk beds, each one with a different artistic references related with the music gender of the bedroom.

As for common areas, there is a living room with all needed comfort to relax, sofas and chairs, while listening to some music and drinks from the bar. The kitchen is just next door with an amazing tribute to the most known and traditional style of music in Portugal, Fado, and its

queen Amália Rodrigues, with all the equipment necessary for guests' meals. There is also a small outdoor terrace for the ones who appreciate fresh air and a nice spot to sing or talk with other guests. The bathrooms are 2 and dedicated only for ladies and another for gentlemen.

What is remarkable is the music concept always present in every division, creating one of the nicest atmospheres so far. The decoration is original and made by local artists, being possible to find recent art elements and also old school objects like radios, bottles, chandeliers, TVs, paintings, and above all music instruments.

Figure 16: Music Hall Hostel main divisions.

4.1.6.2. LiderA Assessment

Among the 43 criteria, there are categories with more weight than others, so on the table 20 are the best and worst ratings (A^{++} and E/F, respectively) for Resources, Environmental Comfort, Environmental Loads and Socioeconomic experiences:

Table 20: List of best and worst classifications of LiderA Assessment of Music Hall Lisbon Hostel.

Category	Area	Criterion	C number	Level
Resources (32%)	Energy	Passive design performance	C8	A+
	Water	Local water consumption	C11	E
Environmental Loads (12%)	Wastewater	Wastewater treatment	C16	F
Environmental Comfort (15%9	Lighting & Acoustic	Lighting levels	C26	A++
Socioeconomic experiences (19%)	Access for all	Public transports access	C28	A++

Energy – Passive Design Performance (A+)

Like said for Lisb'on Hostel, passive design focus on 3 areas: massing and orientation, passive heating & cooling, among others. So for this criterion are going to be mentioned the solutions found for taking advantage of natural energy resources present in the area.

Regarding the construction style, we can affirm that is the traditional Lisbon building, made of stone and marble. The choice of this materials, according to thermal mass, is one of the best materials to avoid the excessive energy gain of the structures, being able to absorb and store heat during the day, and releases it at night. The high ceiling on the entrance of the building also helps to dissipating temperature, that can't reach the rest of the building, working like a tampon.

About the orientation, the main facade is facing west, as well as 2 bedrooms; 1 is facing southwest, in the corner of the building, and the remaining 2 facing south. The common room, kitchen and terrace are east-facing. The orientation of the building is one of the most appropriate, compared to the previous hostels, since the majority of the building can take advantage if the sunlight in at least one part of the day. Thus, all the divisions have access to natural light, but having access to so many hours of sunlight can be too much, so it is essential to find solutions to control the energy gain.

In Music Hall hostel, the windows are large enough to maximize solar heat and light entrance in winter, but without any protection in summer, can be too much. So, there are double glass in all windows, instead of the regular one, besides the door windows in the interior for provide some shadow. Double glazing structures also provide well-sealed windows, avoiding air leaks, which helps maintaining the temperature. The correct disposition and size of windows is one way of contributing to passive cooling because they provide natural ventilation and the proper air renovation of indoor spaces, without the need of using mechanical devices, like fans and air conditioning.

Also the colour palette is important no matter the country or the region because light colours bounce light around within and dark colours absorb it. So, for the climatic conditions in Lisbon, it is crucial to have light colour tones in the surfaces in direct contact with sunlight, in order

to regulate the energy gain. The exterior walls of the Music Hall hostel's building are soft and light, being perfect for the situation.

Water – Local water consumption (E)

Just as with the previous hostels, the Music Hall hostel is in the building in a completely urbanized area, which does not allow the existence of permeable areas. Although Music Hall is placed in the ground floor of the building, the area simply doesn't allow the existence of permeable areas. There is a road just next to the building, as well as pedestrian paths. So the hostel is not contributing for water retention, leading to increased run-off water. For these situations, in which hostel doesn't have access to the roof, it's almost impossible to implement any solution to reduce the runoff, although can be designed a harvesting system for the entire building and taking advantage of rainwater for own consumption, also reducing the consumption of public water. With this solution, not only the hostel could save money but also the entire community of the building.

Wastewater – Wastewater treatment (F)

Although environmental loads are not the category with the highest weight in LiderA evaluation, there is a very low overall ranking on criteria Wastewater management, also for the Music Hall Hostel. This hostel has almost the same capacity as Jardim de Santos and Locals Hostels, receiving probably a few hundreds of people in one month, in high season, which implies high consumptions of public water.

Like for the previous studied hostels, isn't possible to implement a treatment plant for wastewater on site, but it's reasonable to consider implementing some elements that would save thousands of litres of drinking water at the local level. The Music Hall Hostel still doesn't apply flow reducers in taps of bathrooms and kitchen, but there is already the plan to do it soon. But it has already applied dual flush toilet systems which can reduce flow to 3 to 6L, compared to a traditional flush. Other possible solutions to urban hostels will be the implementation of "waterless "sanitary systems, preliminary treatment systems wastewater (Annex III), and later collection of rainwater to reuse it for secondary consumption.

Lighting & Acoustic – Lighting levels (A+)

The main facade of the Music Hall hostel has south orientation, which in terms of natural lighting is the perfect orientation for taking advantage of the sunlight in indoor spaces, for countries in north hemisphere. Like mentioned before, all divisions are facing either south or east which guarantees natural lighting during the day everywhere. There are windows in all divisions as well as interior window doors to provide shade. The surfaces and interior finishes have all light colours (walls, ceilings and floors), which allows greater advantage of natural light.

Artificial lighting is also well distributed, being stronger in common areas, work spaces and rooms. Corridors and circulation areas don't need so much light, however, in any of the spaces, the LED lamps are used.

Access for all - Public transports access (A++)

The area of Marquês de Pombal and Saldanha are one of the busiest areas of Lisbon, having dozens of different businesses, working and shopping areas of Lisbon, which requires an appropriate transport network, to meet the needs. Near the hostel there are at least 3 types of public transportation available: metro, bus, and taxi, in less than 500m. Nevertheless, taking the metro in Marquês easily we go to the downtown where we have trains and trams too. The existence of this variety of accessible transport to all, leads to a pretty good score in terms of accessibility to public transport.

4.1.7. Nest House Hostel

4.1.7.1. The hostel

Nest House hostel, like Music Hall, is not in the historical centre but right next to Saldanha square. This recent renovated area of Lisbon is still its heart, near to the best bakeries, dozens of restaurants, shopping centres, cinemas, museums, gardens, theatres, galleries, supermarkets, and even a bicycle path. It is also the place for companies, bookstores, schools, and universities.

The following table compiles some of the hostel's characteristics, which are further developed:

Table 21: Main characteristics of Nest House's building.

Hostel's name	**Building's age**	**Nº Floors**	**Area (m^2)**	**Typology of spaces**	**Capacity Typology of rooms**
Nest House Lisbon Hostel	At least 100 years old	1	Around 300	Dorms and private rooms; Guest-kitchen; Common room with TV; Bathrooms, Small indoor garden; Reception	38 beds: 4 Dorms (9 beds), one only for girls, and 1 Double room

Once more, the building still has the same structure of an old building, having at least 100 years old. It is located in the beginning of República Avenue, connecting Saldanha square to other important areas like Campo Pequeno until Campo Grande. The entrance is still the same, with a high ceiling and a wooden staircase that take us through the upper floors. The hostel is in the 1st floor, like Locals and Jardim de Santos hostels. There are 38 beds available, spread by 4 dorms of 9 beds and 1 double room. The dorms have brand new bunk beds and lockers inside.

As common areas, there is a living room, and well illuminated division with 2 windows and balconies, where guest can enjoy the sofas, reading, playing board games or watching TV. In the opposite side of the floor is the fully equipped guest kitchen and a cosy meals room with connection to an indoor garden, the "winter garden". The attention to detail and the simplicity of light colours and decorative elements provide pleasant experiences and a peaceful environment, which gives singular characteristics to the hostel.

Figure 17: Nest House Hostel main divisions.

4.1.7.2. LiderA Assessment

Among the 43 criteria, there are categories with more weight than others, so on the table 22 are the best and worst ratings (A^{++} and E/F, respectively) for Resources, Environmental Comfort, Environmental Loads and Socioeconomic experiences:

Table 22: List of best and worst classifications of LiderA Assessment of Nest House Lisbon Hostel.

Category	Area	Criterion	C number	Level
Resources (32%)	Energy	Carbon intensity	C9	A+
	Water	Local water consumption	C11	E
Environmental Loads (12%)	Wastewater	Wastewater treatment	C16	F
Socioeconomic experiences (19%)	Access for all	Public transports access	C28	A++
	Control & Participation	Human threats	C39	A++

Energy – Carbon intensity (A+)

One of the areas where hostels most can improve is in the choice of equipment (appliances, lamps) to reduce emissions of CO_2 and other GHG. In the case of Nest House hostel there is only 1 equipment using gas has fuel, and it is a heater. Sometimes, when the buildings are made of stone, like this one, the structure can't absorb enough solar energy, so in winter that can be a problem, having the necessity of heating the divisions either with heaters or air conditioning. The water is heated by electric boilers (2). The stove and oven are electric and all appliances have class A or superior (refrigerator, microwave, etc.). The washing machine and the dishwasher have class A++ machines Furthermore, the entire electrical installation has LED lamps, and in some areas such as corridors and bathrooms there are motion detectors, which

significantly reduces the energy consumption and consequently greenhouse gas emissions as well. The only way to further reduce emissions would be use electricity from the grid with origin in renewable sources or install a power generation system in the building, using solar energy.

Water – Local water consumption (F)

Just as with the previous hostels, the Nest House hostel is in the building in a completely urbanized area, which does not allow the existence of permeable areas. Also like in Jardim de Santos and Locals hostels, the Nest House is placed not even in the ground floor or top, which means it's impossible to have permeable areas. The surrounding area are just pedestrian paths. So the hostel is not contributing for water retention, leading to increased run-off water. For these situations, in which hostel doesn't have access to the roof, it's almost impossible to implement any solution to reduce the runoff, although can be designed a harvesting system for the entire building and taking advantage of rainwater for own consumption, also reducing the consumption of public water. With this solution, not only the hostel could save money but also the entire community of the building.

Wastewater – Wastewater treatment (F)

Like for the previous studied hostels, isn't possible to implement a treatment plant for wastewater on site, but it's reasonable to consider implementing some elements that would save thousands of litres of drinking water at the local level. The Nest House Hostel still doesn't apply flow reducers in taps of bathrooms and kitchen, just in showers. But it has already applied dual flush toilet systems, in the majority of flushes, which can reduce flow to 3 to 6L, compared to a traditional flush. Other possible solutions to urban hostels will be the implementation of "waterless "sanitary systems, preliminary treatment systems wastewater (Annex III), and later collection of rainwater to reuse it for secondary consumption.

Access for all - Public transports access (A++)

The area of Saldanha are one of the busiest areas of Lisbon, having dozens of different businesses, working and shopping areas of Lisbon, which requires an appropriate transport network, to meet the needs. Near the hostel there are at least 3 types of public transportation available: metro, bus, and taxi, in less than 500m. Actually, there are 2 metro stations from different lines, and more than 12 different buses routes in the intermediations. Taking the metro just in front of the building's entrance, guest can go to the downtown where we have trains and trams too. The existence of this variety of accessible transport to all, leads to a pretty good score in terms of accessibility to public transport.

Socioeconomic experiences – Human threats

The importance of security in places such as tourist accommodation is crucial, given the variety and quantity of people that every day uses the services of the hostel, being humanly impossible to control both the less good intentions of the guests as the spaces that they use. The area is pretty much safe, however it's important to prevent unpleasant situations. As such, the

hostel has only one entrance into the interior, the main entrance of the building in the main street, which provides a well illuminated place by the indoor lighting and facilitates the control of the flow of people. The reception is open 24 hours a day, and key card access is available. Furthermore, there are surveillance cameras at strategic points. The Nest House also provides fire detectors, which gives you a pretty good rating on this criterion.

4.1.8. Oasis Backpackers Mansion Lisboa

4.1.8.1. The hostel

The Oasis Backpackers Hostels is a European hostel chain spread mainly in Spain (Granada, Malaga, Sevilla and Toledo) and Portugal (Lisbon and Sintra). The Oasis Lisbon is located in the centre of Lisbon, the vibrant, exciting and pack full of laid back charm, western European capital. Close to the cultural heart of the city and steps from the famous nightlife scene in Bairro Alto, the Oasis Backpackers offers low cost accommodation with high quality services and facilities, in a completely restored 100 years Old Portuguese mansion, designed for interaction with other travellers. The philosophy behind the chain's concept is to create hostels that are: cheap accommodation in the best location in the city, within walking distance of everything worth seeing. It should provide a clean environment and most important be cool in its own way, creating a unique personality that never goes out of style. Unlike hotels, a hostel is more than a place to sleep, should be a place that helps people to feel what's it's like to actually live in a city, and to make sure that guests meet other interesting people to share their stories with.

The following table compiles some of the hostel's characteristics, which are further developed:

Table 23: Main characteristics of Oasis Backpackers Mansion's building.

Hostel's name	**Building's age**	**Nº Floors**	**Area (m^2)**	**Typology of spaces**	**Capacity Typology of rooms**
Oasis Backpackers Mansion Lisboa	At least 100 years old	4 (including ground floor)	Floors: around 250 each; Outdoor patio: 71.42	Dorms and private rooms; Guest-kitchen and 3 private kitchens; Common room with book exchange; Bar and meals room; Bathrooms, Outdoor patio; Reception	74 beds: 9 Dorms (4, 6, 8, 10 and 12 beds), and 3 Double rooms

The Oasis Backpackers Mansion is the perfect image of the called "hostel", dedicated to young people, great conditions, common areas and the best location. Although is a mansion, it's not one of the biggest hostels of the case studies, but provides 74 beds in a unique Portuguese building style in Santa Catarina Street, right next to one of the greatest sight views of Lisbon.

There are 4 floors, having around 250m^2 each, including the ground floor, with different kinds of spaces. The ground floor includes the reception, 2 dorms, laundry room, a bathroom, and the garage; while the 1st floor consists at living room, a bar and meals area, the outdoor patio, and the guest's kitchen. Guests can choose between dorms or double rooms. There are 9 dorms

with 4, 5, 8, 10 and 12 beds sleep style, with lockers available. Some dorms have private bathroom and kitchen, and terraces, others shared bathrooms. The double rooms have a private living room with TV and movie library, as well as a private kitchen.

Figure 18: Oasis Backpackers Mansion Lisboa main divisions.

4.1.8.2. LiderA Assessment

Among the 43 criteria, there are categories with more weight than others, so on the table 24 are the best and worst ratings (A^{++} and E/F, respectively) for Resources, Environmental Comfort, Environmental Loads and Socioeconomic experiences:

Table 24: List of best and worst classifications of LiderA Assessment of Oasis Backpackers Mansion Lisboa.

Category	Area	Criterion	C number	Level
Resources (32%)	Energy	Passive design performance	C8	A+
	Water	Local water consumption	C11	F
Environmental Loads (12%)	Wastewater	Wastewater treatment	C16	F
Socioeconomic experiences (19%)	Economic diversity	Local work	C33	A++
	Amenities & Social Interaction	Local amenities	C34	A++

Energy – Passive design performance

Like said for Lisb'on Hostel, passive design focus on 3 areas: massing and orientation, passive heating & cooling, among others. So for this criterion are going to be mentioned the solutions found for taking advantage of natural energy resources present in the area.

Regarding the construction style, we can affirm that is the traditional Lisbon building, made of stone, with lots of windows and balconies. As the structure is made of stone, and only refurbishments were made, the main material's characteristics were maintained, which mean the building can avoid the excessive energy gain, because stone is able to absorb and store heat during the day, and releases it at night.

About the orientation, the main facade of the hostel is facing south, as well as the living room and kitchen in the 1st floor, as well as 2 dorms in the 2nd floor; a finally 1 in the 3nd. The remaining divisions are facing east and north. Fortunately, the majority of the divisions are south or east, which means these divisions have direct natural lighting during the all day or part of it. During winter the orientation can help a lot gaining solar energy and get warm the indoor spaces, but in summer having access to so many hours of sunlight can be too much, so it is essential to find solutions to control the energy gain.

All divisions have at least one window, having just the right size to maximize solar heat and light entrance in winter, but without any protection in summer, can be too hot inside. So, there are double glass in all windows, instead of the regular one, which can reduce significantly the energy gain. Besides, there are door windows in the interior for provide some shadow. Double glazing structures also provide well-sealed windows, avoiding air leaks, which helps maintaining the temperature.

Regarding the colour palette, the exterior walls of the Oasis Backpackers is not white but yellow, absorbing so some solar energy, however still can reflect some radiation.

Water – Local water consumption (F)

Most of the area of the hostel is fully waterproofed, as well as the surroundings, result of other buildings and pavements. Although, the Oasis has an outdoor patio with some permeable areas, which can absorb rain water and diminish the runoff. But comparing the area of the building, causing an immediate soil sealing after being built, with the area of the permeable zone, the latter becomes negligible. The fact there isn't also collection of rainwater from the rooftops, contributes to the above phenomenon, like in all the other hostels. Besides, does not allow its reuse for other purposes such as recirculating water in toilets' discharges or for wash interior spaces, which means higher consumption of drinkable water.

For these cases, where there is no possibility of creating permeable zones, the best solution is to install a system for the collection of rainwater through pipes in order to direct it to recirculation. For hostels with access to the roof may be possible to create a green roof and other green infrastructure.

Wastewater – Wastewater treatment (F)

Like for the previous studied hostels, isn't possible to implement a treatment plant for wastewater on site, but it's reasonable to consider implementing some elements that would save thousands of litres of drinking water at the local level. The Oasis Lisbon still doesn't apply flow reducers in taps and showers of bathrooms and kitchen, but there is already the plan to do it soon. Also there aren't dual flushes toilet systems. This last parameter can easily be implement, and help reducing flows to 3 to 6L, compared to a traditional flush. Other possible solutions to urban hostels will be the implementation of "waterless "sanitary systems, preliminary treatment systems wastewater (Annex III), and later collection of rainwater to reuse it for secondary consumption.

Economic Diversity – Local work (F)

The hostel is an excellent job provider, where people can apply and work in several areas. Oasis Lisbon accept locals, to guarantee the full and complete Lisbon experience; and foreigners for working in the reception and bar, to do breakfast and beds, and all kinds of tours and activities, like pub crawls, food tasting, street art and Fado experience, etc. Also volunteers from online platforms can come to Lisbon and find a job here. In total, the Oasis Lisbon provide jobs to 15 people, at least, from management department, services, to culture, and cleaning.

As the purpose of the hostel is to allocate and give travellers the best local experience, the existence of all these qualified jobs is a clear guaranty of the enhancement and development of the region. Besides the hostel, there are several human amenities, as mentioned, which can be considered relevant employment opportunities.

Such central location allows the hostel to have a very high rating in "Local work" criterion.

Amenities & Social Integration – Local amenities (A++)

As stated above, the geographical location of the hostel is one of the best of the studied hostels, regarding to proximity to amenities, both human and natural. Exactly in the same street there are restaurants, hotels, museums, coffee shops and bars. Walking in the direction of Bairro Alto guests can find more restaurants, markets, libraries, pharmacies and other businesses and facilities. The famous street of Bica Elevator is just 250m away. The Santa Catarina sight view, Dom Luís Garden in Cais do Sodré, and the river, are all within less than 500m walking.

The diversity and quantity of amenities location within walking distance gives the hostel a qualification A ++.

4.1.9. PH in Chiado Hostel

4.1.9.1. The hostel

The PH in Chiado hostel has the same style of Golden Tram 242 and Lisb'on hostels, taking into account its size and location. Located in Chiado, right next to the Praça de Camões, it couldn't be more central within the historical area. The most important museums, churches, theatres, cafes and most beautiful landscapes complete the surroundings of the hostel. It is in the connection between the streets going down to Caís do Sodré and the ones going up to Bairro Alto, which enables be close to the nightlife of both districts. However, the street of the hostel is very quiet because it is not located in the nucleus of any of these areas, avoiding the tourist and night parties' confusion.

The following table compiles some of the hostel's characteristics, which are further developed:

Table 25: Main characteristics of PH in Chiado's building.

Hostel's name	**Building's age**	**Nº Floors**	**Area (m^2)**	**Typology of spaces**	**Capacity Typology of rooms**
PH in Chiado	400 years old	2	-	Dorms, Private rooms, Guest's kitchen, Living and dinner room, WCs, Reception	17 beds (capacity for 19 people): 1 Dorm (8 beds) and 5 Private rooms (2 Double, 2 Twins and 1 Single)

The hostel is housed in a building with over 400 years old of history, where the modern walls meet the old murals from the time of tits construction. In both floors is visible the care in keeping the original facades, their embossed decorations and drawings, high ceilings and wide spaces, as well as the marble staircases of the building and the wooden ones inside the hostel. Balconies are also a trend in these kind of buildings.

On the 1st floor is the reception, the living room with TV and reading area, and 2 rooms. The living rooms is a masterpiece of the magnificence of the old buildings, characterised by the enormous white doors, the fireplace and the ancient wall drawings. The decoration also add value, focused in antique objects like tables, mirrors and shelves. Going up to the 2nd floor is the guest kitchen connected with the dining rooms, and right next to the laundry area. The kitchen is one of the most beautiful divisions of the hostel, with very colourful furniture and decoration, along with some original tides on the bottom of the walls. Facing north there are 2 bedrooms and facing south 2 more. In total, there are 6 bedrooms: 1 dorm with 8 beds, 2 double rooms, 2 twins and 1 single, which means 17 beds for 19 people. Only 1 bedroom has access to a private bathroom, the double room on the 2nd floor. This bedroom has also a special spatial disposition: 2 floors, the lower is a living room with a table and 2 chairs. Upstairs there is the actual bedroom with the double bed and beside tables. The bedrooms facing north have the main street view, the south ones have the privileged view over the Tagus River.

Figure 19: PH in Chiado main divisions.

Figure 20: PH in Chiado main divisions (continuation).

4.1.9.2. LiderA Assessment

Among the 43 criteria, there are categories with more weight than others, so on the table 26 are the best and worst ratings (A^{++} and E/F, respectively) for Resources, Environmental Comfort, Environmental Loads and Socioeconomic experiences:

Table 26: List of best and worst classifications of LiderA Assessment of PH in Chiado Hostel.

Category	Area	Criterion	C number	Level
Local integration (14%)	Soil	Environmental deployment optimisation	C2	F
Resources (32%)	Water	Local water consumption	C11	F
Environmental Comfort (15%)	Lighting & Acoustic	Lighting levels	C26	A++
Socioeconomic experiences (19%)	Access to all	Public transports access	C28	A++
		Low impact mobility	C29	E

Soil – Environmental deployment optimisation (F)

This criterion is one of the most neglected among urban hostels, like also the Ecological Valorisation, Habitats Connection, and Local Water Consumption. These mentioned criteria are all connected by the inexistence of permeable areas in the lot, in this case the total area of the hostel. As we can conclude, the inexistence of permeable areas can lead to very negative ratings in more than one perspective.

During rain storms and other precipitation events, the impervious surfaces (roads, parking lots and sidewalks), built from materials such as asphalt and concrete, along with roof tops, carry polluted storm water to storm drains, instead of allowing the water to percolate through the soil. This causes lowering of the water table, because groundwater recharge is lessened, and flooding since the amount of water that remains on surface is greater. This excess water can also make its way into people's properties and other buildings, through basements backups and seepage through building walls and floors.

A 75-100% impervious cover increases to 55% the runoff, decreases to 30% evapotranspiration and to 10% shallow infiltration, compared to 10%, 40% and 25% in a natural ground cover, respectively.

Pollution prevention practices include low impact development or green infrastructures techniques, such as installation of green roofs and runoff mitigation systems like infiltration basins, bio retention systems, constructed wetlands, retention basins and similar devices.

The PH in Chiado hostel, like the majority of previous studied hostels, doesn't have permeable sol considering the total area, leading to a very low score for this criterion. The consequences are also the habitats fragmentation and ecological depreciation.

The processes of urbanisation have left a fragmented mosaic of habitat patches of varying size, shape and character, with the result that from location to location the number and quality of contacts between patches varies considerably. This fragmented mosaic is common in most urban areas, where the wildlife habitat is rarely connected and therefore creates a dangerous environment, because there are no opportunities for safe migration. The "habitat corridor" is an

essential natural structure to provide to any species to migrate safely, being define as: a linear habitat, embedded in a dissimilar matrix, that connects 2 or more blocks of habitats, and that is proposed for conservation as it enhances and maintains the viability of specific wildlife populations.

That being said, is more than ever important to establish a sustainable urbanistic plan, replacing or creating green spaces and structures to compensate the continues growth of urban areas.

Water – Local water consumption (F)

Just as with the hostel Golden Tram 242 and HUB, PH in Chiado is in the building in the completely urbanized area of Baixa-Chiado, which does not allow the existence of permeable areas, unless there is already a patio or garden that is part of the building since its construction (fortunately there are some in the area). Once again there is no water retention, leading to increased run-off water, which cannot infiltrate into the soil.

One possible solution to reduce the runoff is implement a harvesting rainwater system r for own consumption, which also reducing the consumption of public water.

Lighting & Acoustic – Lighting levels (A+)

The main facade of the Ph in Chiado hostel has north orientation, which in terms of natural lighting is not the perfect orientation for taking advantage of the sunlight in indoor spaces, nevertheless the living room and some bedrooms still can get the indirect light. Adjusting the size and positioning of windows in the north facade is possible to maximise the entrance of natural lighting. The divisions facing east and south, like the kitchen and the remaining bedrooms have access to sunlight all day or partially. When the lighting entrance is too much, is possible to make use of the interior window doors to provide shade. Mostly of the surfaces and interior finishes have all light colours (walls, ceilings and floors), which allows greater advantage of natural light.

Artificial lighting is also well distributed, being stronger in common areas, work spaces and rooms. Corridors and circulation areas don’t need so much light, however, in any of the spaces, LED or compact fluorescent lamps are used.

Access for all - Public transports access (A++)

The area of Baixa-Chiado is one of the most seething areas of Lisbon, both day and night, which requires an appropriate transport network, to meet the needs. Near the hostel there are at least 4 types of public transportation available: metro, bus, tram and taxi. Walking in the direction of the river there is also the possibility of catch a train to the beaches in Cascais and Estoril, or the boat from crossing to the south riverside of Tejo. The existence of this variety of accessible transport to all, leads to a pretty good score in terms of accessibility to public transport.

Access for all – Low impact mobility (E)

Like mentioned, the current model applied in cities like Lisbon is unsustainable as it is fundamentally based on motorised transport and, specially, the use of private vehicles. Slowly are being implemented bicycle paths in areas outside the historical centre, but in Baixa, Bairro Alto and Alfama districts, where the roads are still old and the slop is too high, the adaption is more difficult. Therefore, the low mobility in the hostel's area is poor. Being the motorised vehicles still the main transport used, generates traffic and less pedestrian paths for people. Although there are pedestrian paths in the area with appropriate dimensions to the flow of people, there aren't fully pedestrian ones, which means people continue to struggle along with the circulation of cars and other vehicles in the surroundings of the building.

Besides that, there isn't any bike lanes nearby the hostel or parking areas for bikes, neither services of car/moto/bike sharing, which decreases a lot the score for this criterion. Also there is a big lack of exclusive parking spaces for ecological vehicles and charging points for electric cars in the area (Annex I). Besides, there isn't any local transfer service in the hostel, to provided shared transportation to the airport, e.g. Especially in the historical centre, sustainable mobility should be implemented by the reasons above and to avoid unnecessary maintenance of monuments caused by the gases' emissions.

4.1.10. Sunset Destination Hostel

4.1.10.1. The hostel

The Sunset Destination Hostel is part of a chain called "Destinations Hostels", which includes 3 more hostels in Lisbon and one in Arrifana, Algarve. The Lisbon Destination Hostel and Alfama Patio are placed in the neo-gothic Rossio Train Station and in the oldest district of Libson – Alfama, respectively. The Sunset Destination is located by the river, inside of Cais do Sodré Metro and Train Station. This station is a place full of history, where centuries ago, many of the Portuguese explorer's ships were built.

With a breath taking view over the Tagus River, guests are already on the track to the famous beaches of Carcavelos, Estoril and Cascais, just a few steps from the trains. Also, right across the square is the famous Pink Street, where most of Lisbon clubbing nightlife happens.

In 2015, this hostel was distinguished as the 6th Best Hostel in the World, in the category of best medium hostels (76-150 beds), by worldwide website Hostelsworld.

The following table compiles some of the hostel's characteristics, which are further developed:

Table 27: Main characteristics of Sunset Destination's building.

Hostel's name	Building's age	Nº Floors	Area (m^2)	Typology of spaces	Capacity Typology of rooms
Sunset Destination Hostel	Decades of 1930-1940	1	Around 670	Sunset terrace & Zebra bar; Kitchen & Dining room; Retro lounge; Massage & Beauty Area; Dorms and private rooms; Bathrooms	82 beds in 19 rooms: 11 Dorms (4, 6, 10 beds) and 8 Private rooms (Single, Twin, Double, Triple and Family)

Curiously, Destination Hostels chain as a taste for housing hostels in train stations, which is and extraordinary way of improving urban spaces and bring a new dynamic through services, activities and costumers.

The Sunset Destination is an operation since 2012, but the train station was inaugurated in 1895, 5 years after the opening of Cascais train line. The metropolitan area was only inaugurated in 1998, being one of the most important stations of the Lisbon transports system.

The hostel consists in only 1 floor, in a building right next to the train station. Not only is next to it, but for going to some bedrooms we need to cross the big hall of the station in an upper level. So part of the station is the hostel, and the hostel is also part the station at the same time.

Part of the building faces south, as well as the terrace, but other parts are facing north, into the main street, and east to the square. The facades facing north and east is the 2 parts of the hostel that only have bedrooms. On the contrary, the south facade, in addition to the terrace, also contains the lounge and reception, kitchen and dining room.

The Sunset Destination offers 82 beds in 19 bedrooms, can guests choose between dorms, en-suites, private and family. The view can also be considered a key factor while choosing the rooms: riverside, train station, terrace, or the streets of Lisbon. All rooms are accessed by key card only, and each bed has a locker, access also by key and padlock. Dorms are 11 with 4, 6 or 10 beds, some have bathroom inside, but all beds are custom-designed, eco-friendly and noise reducing bunk beds, with locker bunk curtains, reading light and large lockers bellow. The private rooms have a bedside table, lamp and towels, and some indoor or shared bathroom. The family room has 1 double bed and 2 bunk beds for maximum 4 people. It has also a bathroom.

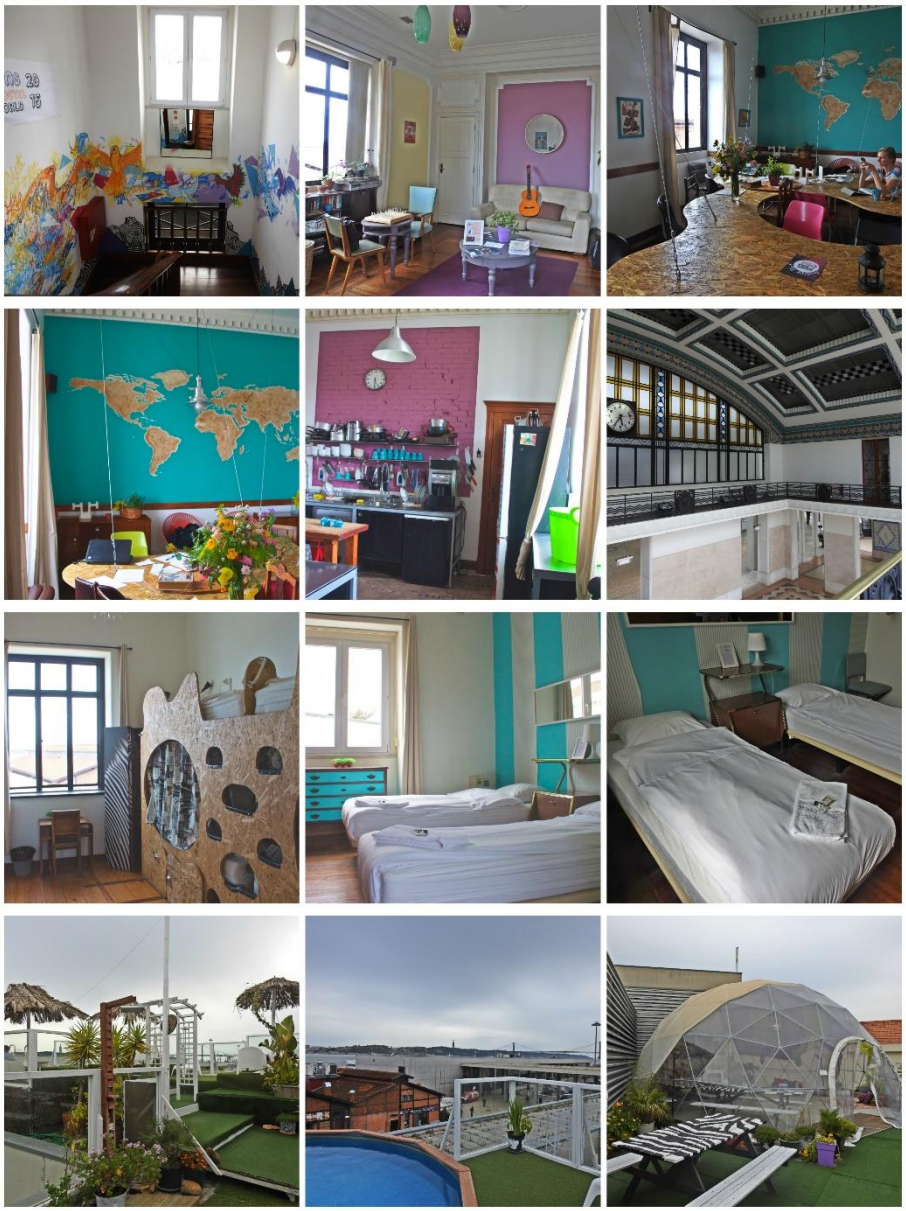

Figure 22: Sunset Destination Hostel main divisions.

Figure 21: Sunset Destination main divisions (continuation).

4.1.10.2. LiderA Assessment

Among the 43 criteria, there are categories with more weight than others, so on the table 28 are the best and worst ratings (A^{++} and E/F, respectively) for Resources, Environmental Comfort, Environmental Loads and Socioeconomic experiences:

Table 28: List of better and worst classifications of LiderA Assessment of PH in Chiado Hostel.

Category	Area	Criterion	C number	Level
Resources (32%)	Energy	Passive design performance	C8	A+
	Water	Local water consumption	C11	F
Environmental Loads (12%)	Wastewater	Wastewater treatment	C16	F
Socioeconomic experiences (19%)	Access to all	Public transport access	C33	A++
	Economic diversity	Local work	C33	A++

Energy – Passive Design Performance

Like said for Lisb'on Hostel, passive design focus on 3 areas: massing and orientation, passive heating & cooling, among others. So for this criterion are going to be mentioned the solutions found for taking advantage of natural energy resources present in the area.

Regarding the construction style, we can affirm that the building is no longer traditional. Not even the area is not similar to the ones in study, such as Baixa-Chiado, Bairro Alto and Marquês de Pombal-Saldanha, but also the time when the building (and the station) was built. According to records trains started to work in 1895, but 5 years later pictures show that there wasn't any building in the area. Although, in 1947 the station and adjacent buildings are already registered in photographs, so the building where now is the hostel might be around 70 years old.

According to Civil Engineering National Laboratory (LNEC, 2005), around 1930 begins the appearance of concrete structures, so probably this building had mixed structure of masonry and concrete. Since its construction only refurbishments were made, so the main material's characteristics were maintained. Concrete and masonry are good choices when we want to avoid excessive energy gain, because they work as a cover to direct solar energy gain, like stone.

About the orientation, the main facade of the hostel is facing east, where are the lounge and reception. The kitchen, living room, the terrace, and 2 bedrooms are facing south. The remaining parts of the building are covered by rooms facing the station. Fortunately, some of the divisions facing south and east have direct natural lighting during the all day or part of it. The ones facing the station just have indirect sunlight, which sometimes might not be enough. So it's important to understand the natural lighting needs of each division. Nevertheless, since the location of the hostel is right next to the riverside, and no big buildings are located in the surroundings, the light is enough to provide comfort.

All divisions have at least one window, having just the right size to maximize solar heat and light entrance in winter, but without any protection in summer, south facing divisions can be too hot inside. So, there are curtains in the interior for provide some shadow. In the bedrooms facing the station there are double glassed windows to insulate acoustically. Double glazing

structures also provide well-sealed windows, avoiding air leaks, which helps maintaining the temperature.

Regarding the colour palette, the exterior walls of the Sunset Destination are all light, reflecting the excess of solar radiation.

Water – Local water consumption (F)

The case of Sunset Destination Hostel is quite different compared to the other hostels. The location of the building is not so urbanised like the previous, the area is not residential neither historical so the amount of buildings is less. Besides, the local selection as nothing to do with the ones chosen to accommodate the other hostels, the Sunset Destination is part of the train station. Studying the plant, it's possible to affirm the possibility of using the rooftop connect to the hostel's building to do a green roof in order to create a permeable area and provide some water retention. This measure could help to decrease the superficial runoff. Another possible solution would be the implementation of a harvesting rainwater system to use the water for own consumption, which would reduce the necessity of using public water.

Wastewater – Wastewater treatment (F)

Like for the previous studied hostels, isn't possible to implement a treatment plant for wastewater on site, but it's reasonable to consider implementing some elements that would save thousands of litres of drinking water at the local level. The Sunset Destination already has flow reducers in showers and sensors or timers in taps of bathrooms, which allows significant local water consumptions reductions, around 50%. Also, the hostel applied dual flush toilet systems which can reduce flow to 3 to 6L, compared to the 7 to 15L in a traditional flush. Other possible solutions to urban hostels will be the implementation of "waterless "sanitary systems, preliminary treatment systems wastewater (Annex II), and later collection of rainwater to reuse it for secondary consumption.

With these measures would be saved thousands of litres of drinking water at the local level, significantly reducing the need for chemical and biological treatments, also winning the hostel with this investment to consume less public water.

Access for all - Public transports access (A++)

The area of Cais do Sodré is one of the most important stations of the Lisbon transports system, both day and night, which requires an appropriate quantity and quality of service, to meet the needs. Near the hostel there are at least 5 types of public transportation available: metro, bus, train, taxi and boat. The boat can take you to the south riverside of Tagus River, and the train to the famous beaches of Cascais and Estoril. The existence of this variety of accessible transport to all, leads to a pretty good score in terms of accessibility to public transport.

Economic Diversity – Local work (F)

The hostel is an excellent job provider, where people can apply and work in several areas, in a relaxed and young atmosphere. The Sunset Destination has locals, to guarantee the full and complete Lisbon experience; and foreigners for working in the reception and bar, to do breakfast

and beds, and all kinds of tours and activities, like pub crawls, free walking tours, Belém on bike, Sintra tours, among others. Also volunteers from online platforms, and national and international trainees can come to Lisbon and find a job here. In total, the Sunset Destination provide jobs to 10 people in the low season, and 18 in high season, from management department, services, to culture, and cleaning.

As the purpose of the hostel is to allocate and give travellers the best local experience, the existence of all these qualified jobs is a clear guaranty of the enhancement and development of the region. Besides the hostel, there are several human amenities, which can be considered relevant employment opportunities. Supermarkets, coffee stores, bars, clubs, restaurants are a just a sample of job opportunities in the surrounding area.

Such central location allows the hostel to have a very high rating in “Local work” criterion.

5. Case studies: Cascais-Sintra region – Hostels Cases

5.1. Cascais Select Hostels

5.1.1. Fundação, o Século

5.1.1.1. The hostel

O Século is a special kind of touristic accommodation in São Pedro do Estoril. Before providing affordable accommodation it was only a foundation with the aim of promoting and contribute to the creation of conditions and opportunities that enable not only the creation of conditions and opportunities that enable not only the socio-cultural development of children, such as social care for the elderly and disadvantage people or in social risk.

So, part of the building was refurbished and transformed in a hostel. Although there is also accommodation for schools and other special groups. In a regular week day, it's possible to have breakfast with a group of kids or disable people, and in the afternoon pass by the kids hanging and playing in the playground of the backyard.

O Século is located in the marginal road connecting Lisbon with Estoril and Cascais, having direct access to the São Pedro do Estoril beach. The scenic town of Sintra is 10 km away and features a variety of national landmarks, such as the Pena National Palace and the Capuchos Convent. The Estoril Casino is a 5-minute drive away and features gambling opportunities and regular live entertainment shows.

The following table compiles some of the hostel's characteristics, which are further developed:

Table 29: Main characteristics of O Século's building.

Hostel's name	Building's age	Nº Floors	Area (m^2)	Typology of spaces	Capacity Typology of rooms
Fundação, O Século	At least 100 years old	2	-	Reception; Kitchen & Dining room; Living room; Dorms and private rooms; Shared bathrooms; Balcony; Patio, garden and backyard	72 beds in 27 rooms: 6 Dorms and 21 Private rooms

The Foundation is housed in a building with at least 100 years old, evidenced by its robust stone structure. It is not a typical Lisbon building, with high ceiling, wide lobby entrances, but has also wide spaces according to the functions. The purpose of this building was never to be a palace, a mansion or any other residence building. So, the style and disposition of spaces is totally different.

The building consists in 2 floors, a backyard with a playground, parking spots and a garden, in a wide property. The lower floor is dedicated to the common areas, such as: kitchen and dining area; living room, backyard and garden. There is the option to enjoy the traditional Portuguese meals in the Seculo's in-house restaurant, but the kitchen is only used by the staff. During the day it's possible to meet groups doing activities and enjoying themselves in the living room. The upper floor assembles the bedrooms, shared bathrooms and the balcony.

The hostel has capacity for 72 people with 4 different options of bedrooms: twin (2 people), double (2 people) and dorms of 4 and 6 people. Some of the bedrooms have an inside bathroom, others shared. The bedrooms were all decorated by a team of 17 designers and artists who dedicated themselves to customizing each room. The ones facing east have a window with view to the balcony and the shore, where is possible to relax in outdoors beds and chairs while the sun sets.

Figure 23: O Século main divisions.

5.1.1.2. LiderA Assessment

Among the 43 criteria, there are categories with more weight than others, so on the table 30 are the best and worst ratings (A^{++} and E/F, respectively) for Resources, Environmental Comfort, Environmental Loads and Socioeconomic experiences:

Table 30: List of best and worst classifications of LiderA Assessment of Fundação, O Século.

Category	Area	Criterion	C number	Level
Resources (32%)	Energy	Passive design performance	C8	A+
	Water	Local water consumption	C11	E
Environmental Loads (12%)	Wastewater	Wastewater treatment	C16	F
Environmental Comfort (15%)	Lighting & Acoustic	Lighting Level	C26	A+
Socioeconomic experiences (19%)	Access for all	Inclusive design	C30	A+

Energy – Passive design performance

Like said for Lisb'on Hostel, passive design focus on 3 areas: massing and orientation, passive heating & cooling, among others. So for this criterion are going to be mentioned the solutions found for taking advantage of natural energy resources present in the area.

Regarding the construction style, we only can affirm that is old building, with a thick structure made of stone. Considering the thermal mass of the stoned structures, and only refurbishments were made, the material's characteristics can avoid the excessive energy gain, because stone is able to absorb and store heat during the day, and releases it at night.

About the orientation, the main facade of the hostel is facing southwest, as well as the dining area, kitchen, garden and backyard in the ground floor, as well as some bedrooms and the balcony, in the 1nd floor. Fortunately, this orientation is adequate to the energy needs, which means these divisions have direct natural lighting during the all day or part of it. During winter the orientation can help a lot gaining solar energy and get warm the indoor spaces, but in summer having access to so many hours of sunlight can be too much, so it is essential to find solutions to control the energy gain.

The majority of the divisions have at least one window, having just the right size to maximize solar heat and light entrance in winter, but without any protection in summer, can be too hot inside. So, there are double glass in windows, instead of the regular one, which can reduce significantly the energy gain. Besides, there are indoor curtains for providing some shadow. Double glazing structures also provide well-sealed windows, avoiding air leaks, which helps maintaining the temperature. On the ground floor there is an outdoor corridor covered by arcades, along with the kitchen and dining area until the entrance, which allows permanent solar protection. Besides that, is also made of stone.

Regarding the colour palette, the exterior walls of O Século are not white but light yellow, reflecting enough solar radiation.

Water – Local water consumption (F)

Most of the area of the foundation is fully waterproofed, as well as the surroundings, result of other buildings, roads and pavements. Although, around 380 m^2 are a garden which implicates permeable areas. So, the existence of uncovered soil guarantees absorption of rainwater and diminish the superficial runoff, result of the impossibility of percolation through the soil.

The fact that there isn't also collection of rainwater from the rooftops, contributes to the above phenomenon, like in all the other hostels. Besides, does not allow its reuse for other purposes such as recirculating water in toilets' discharges or for wash interior spaces, which means higher consumption of drinkable water.

For these cases, where there is no possibility of creating more permeable zones, the best solution is to install a system for the collection of rainwater through pipes in order to direct it to recirculation. For hostels with access to the roof may be possible to create a green roof and other green infrastructure.

Wastewater – Wastewater treatment (F)

Like for the previous studied hostels, isn't possible to implement a treatment plant for wastewater on site, but it's reasonable to consider implementing some elements that would save thousands of litres of drinking water at the local level. The Oasis Lisbon still doesn't apply flow reducers in taps and showers of bathrooms and kitchen, but there is already the plan to do it soon. Also there aren't dual flushes toilet systems. This last parameter can easily be implement, and help reducing flows to 3 to 6L, compared to a traditional flush. Other possible solutions to urban hostels will be the implementation of "waterless"sanitary systems, preliminary treatment systems wastewater (Annex III), and later collection of rainwater to reuse it for secondary consumption.

Lighting & Acoustic – Lighting levels (A+)

The main facade of O Século has southwestern orientation, which in terms of natural lighting is perfect orientation for taking advantage of the sunlight in indoor spaces, nevertheless there are some bedrooms without windows. For rooms with limited access to natural light is important to adjust the size and positioning of windows for maximising the entrance of natural lighting. The divisions facing south, like the kitchen and the remaining bedrooms have access to sunlight all day or partially. When the lighting entrance is too much, is possible to make use of the interior curtains in windows to provide shade. Mostly of the surfaces and interior finishes have all light colours (walls, ceilings and floors), which allows greater advantage of natural light.

Artificial lighting is also well distributed, being stronger in common areas, work spaces and rooms. Corridors and circulation areas don't need so much light, however, in any of the spaces, LED or compact fluorescent lamps are used.

Access for all – Inclusive design (A+)

Since O Século is a foundation and receives groups of all kinds of special necessities, inclusively disable people, is essential to provide equal access to all. So, the access to all different areas intervened is 100% provided due to the flat accesses, ramps and inexistence of staircases and inacceptable slops. The foundation believes everyone deserves a chance to enjoy all the divisions and areas.

Furthermore, is possible to park inside of the foundation's area, which allows a safer mobility, not only for groups of disable people, but also for kids.

Although there is a ramp taking people to the upper floor, there is enough space for install a chair elevator, even not being strictly necessary.

5.2. Sintra Select Hostels

5.2.1. Almáa Sintra Hostel

5.2.1.1. The hostel

The Almáa Sintra hostel is located in the heart of Sintra Mountain Range, among oaks, hollies and arbutus, within the Quinta dos Lobos a vast area that once was part of Almosquer Forest, given by D. Afonso Henriques to the Knights Templar, the XII century. It is considered an eco-hostel by the numerous projects in which it is involved, as well as all sustainable solutions found to be what it is today. It is an example of what can be done within the hostel community by their passion for sustainability and mutual aid, being linked to entities such as charities, voluntary Organisations and social enterprises, which are also its main suppliers. For example, the beds are made of recycled pallets given by Banco Alimentar contra a Fome and developed by O Companheiro, an institution supporting prisoners. The matches and other objects were bought to Remar, an institution for former drug addicts.

Their participation in projects related to nature is remarkable, having made environmental education activities (ringing birds, amphibians' recognition, etc.), projects with the Institute for Nature Conservation, Quercus, among others. Almáa was also the first hostel in Portugal concluding a biodiversity check, enrolled by Quercus and Global Nature Fund. For all this and other examples, the Almáa earned major awards as the "Green Key" Award, "GreenLeaders Gold 2014" by TripAdvisor, Green Initiatives Awards and was a finalist for the award "Stay Long Responsible Tourism", the most important sustainable tourism award. The hostel is also part of the Consulting Council of Bio+ Sintra, and Environmental Program, as well as regular speakers in congress and workshops, in events such as International Fair of Lisbon (FIL).

Almáa Sintra hostel is located 10 minutes walking from town centre, in half way to the unequalled Quinta da Regaleira.

The following table compiles some of the hostel's characteristics, which are further developed:

Table 31: Main characteristics of Almáa Sintra's building.

Hostel's name	Building's age	Nº Floors	Area (m^2)	Typology of spaces	Capacity Typology of rooms
Almáa Sintra Hostel	16th century	3 (including ground floor)	Around 750	Dorms, Suites, Kitchen, Living and dinner room, WCs; Tank for swimming; Gardens	34 beds in 10 bedrooms: 1 Dorm (5 and 8 beds), 5 Double rooms, 2 Triples

Almáa Sintra is the only rural hostel in this study, completely inserted in a permeable area of Sintra Mountain Range. The building is dated from the XVI century but was mostly refurbished in the 20s, but recent finishes are from 2011. The farm has 3.5 ha and the hostel's building around 900m^2. The remaining area includes 2 others buildings: Casa do Fauno and cottar's house; and green areas. There is a tank sink water to swim, a greenhouse and infinite well-preserved gardens.

The hostel consists in a singular 3 floors building, right next to the gardens. In the ground floor are the office, reception, lounge area, guest kitchen and dining area. The 2nd and 3rd floor has the bedrooms, bathrooms and some living rooms, with a great view to the gardens.

Entering through the main door is the reception, a cosy area with maps, information about activities, book exchange and handicrafts selling. In the walls are exposed the majority of the awards and recognitions achieved. Side by side is the lounge area decorated with 2 bookshelves, a fireplace, colourful pillows spread on the floor and tables made of recycled pallets. Along the walls, until the dining area, is possible to admire the unusual decoration made of garbage found on the local beaches, which make this hostel even more special. The kitchen is almost made of recycled objects or reused structures, like the dishes shelves, tables and a bathtub reused as a dish sink. Other surfaces and pavements are made of marble and stone, and walls have white and blue tiles from the XVI century.

On the upper floor are the 10 bedrooms available, all facing north-west. Guests can choose between a dorm with 8 beds or 3 different kinds of private rooms: doubles, triples and a family room. The furniture and decoration elements are mostly recycled or reused, like the beds made of pallets, the old school radio and recording system working as the lighting bed system. Wardrobes, commodes, bedside tables and lamps are handmade, made of reused materials or purchased in antique stores. Tiles in bathrooms seems to be a standard walls decoration.

Figure 24: Almáa Sintra Hostel main divisions.

5.2.1.2. LiderA Assessment

Among the 43 criteria, there are categories with more weight than others, so on the table 32 are the best and worst ratings (A^{++} and E/F, respectively) for Resources, Environmental Comfort, Environmental Loads and Socioeconomic experiences:

Table 32: List of best and worst classifications of LiderA Assessment of PH in Chiado Hostel.

Category	Area	Criterion	C number	Level
Resources (32%)	Energy	Energy certification	C7	E
	Water	Local water consumption	C11	A+
	Materials	Local Materials	C13	A++
Environmental Loads (12%)	Wastewater	Wastewater treatment	C16	E
Socioeconomic experiences (19%)	Life cycle costs	Life cycle costs	C40	A++

Energy - Energy certification

From all studied hostels, none has an energy certification. Almáa Sintra Hostel also doesn't have one, but has serious potential to have more than just Green Key. There are many energy certifications, can be LiderA one of them.

Basically, an energy certification is an evaluation of energetic performance of buildings according to ratings on how efficient (or inefficient) they are in relation to the amount of energy weeded to provide users with expected degrees of comfort and functionality. The degree of efficiency depends on many factors including: local climate; the design of the building; construction methods and materials; systems installed to provide heating ventilation, air conditioning or hot sanitary water; and the appliances and equipment needed to support the functions of the building and its needs (International Energy Agency, 2010)

The certification is a complex procedure, requiring in depth knowledge of building components, reflecting also the recognition of the need to hink of buildings as "integrated systems", rather than simply the sum of their parts.

As much of the existing buildings stock wore built before energy efficiency became a focus of government policy, certification of existing buildings can do more than provide ratings: it can identify measures to improve energy performance ((International Energy Agency, 2010). This might be the case of Almáa Sintra.

Having conducted the energy performance assessment, the hostel obtains an assessment level of A+, which should guarantee afterwards an energy certification with LiderA.

There are other kinds of certifications that might fit in Almáa such as: ISO 14001 (Environmental Management Systems), ISO 9001 (Quality Management of Systems), Ecolabel (with some improvements), among others related with hygiene and food safety, quality of products and services, etc.

Water – Local water consumption (A+)

The case of Almáa is completely different compared to the other hostels. The location of the building is in the heart of Sintra Mountain Range, which means inside of a forest. This is the

perfect example on how to reduce runoff from rainwaters and waterlines, since the soil provides a retention and drainage area, avoiding runoff. The tank sink also helps in retention. The autochthonous vegetation is adapted to the site features helping in retaining water, which also means that there is no need of irrigation systems.

The only thing that is not implemented is the collection of rainwater in impermeable areas where there is no circulation, including roofs and terraces. With this measure would be possible to use the water for own consumption like recirculation, washing floors, discharges in toilets, etc; which would reduce the necessity of using public water.

Materials – Local materials (A++)

The origin of the building materials is difficult to know with accuracy by the age of the building, but precisely for this reason the probability of the structure has been made with materials from the area is large, after all it was built in the XVI century. So it is assumed that they are at least national. As for the interior refurbishments there is such guarantee for the part of the owner, as well as all furniture in the rooms and common areas, some are handmade, like the beds, others came from antique shops, fairs and somethings from the streets.

The importance of using local materials and recycling objects is immense, as it will support local commerce and reduce the use of raw materials and energy resources. Furthermore, by reducing imports the use of energy is also minimized, in particular in fuel and electricity.

Wastewater - Wastewater treatment (F)

With such a big area available would be possible to implement an adequate treatment plant for wastewater on site, besides considering implementing some elements that would save thousands of litres of drinking water at the local level.

Almáa already has flow reducers in showers, which allows significant local water consumptions reductions, around 50%, and also applied dual flush toilet systems. Independently of the hostel be urban or rural, the possible solutions for reducing water consumption and impacts on water bodies, are the already mentioned before for other hostels: alternative sanitary systems, preliminary treatment systems, collection of rainwater to reuse it for secondary consumption.

Life cycle costs (A++)

The choice of equipment and systems appropriate to the dimensions of a hostel, or any building that receives many people is an added value because it avoids energy costs and the unnecessary use of resources. The efficiency of the lamps (LED), the amount of those, the size of washing machines and dryers, refrigerators and water heaters were aspects taken into account for the capacity and needs of Almáa Sintra hostel. Also constructive solutions and materials must be studied in order to avoid the need for frequent maintenance and energy needs. Unfortunately, there is no specific information about the constructive materials being difficult to evaluation if they are the right choice in terms of life cycle costs.

The choice of durable furniture at the hostel is a very important factor, since the Almáa has a deep commitment with sustainable tourism, so most of the furniture is made of wood which

had completely different purposes before being a bed, table or shelf. Besides being recycled materials they don’t need any maintenance.

6. Discussion

6.1. Hostels buildings assessment: Lisbon-Cascais-Sintra

In this chapter a few patterns were possible to find between hostels, with some of the implementations in the hostels' buildings. In order to simplify this comparison, the hostels are going to be split in groups: Lisbon group, Cascais group, and Sintra group. The table 33 represents this distribution:

Table 33: List of hostels in groups of regions.

Official Hostel's Name	Region group and Shorter Name
Golden Tram 242	Lisbon – L1
HUB New Lisbon	Lisbon – L2
Jardim de Santos	Lisbon –L3
Lisb'on Hostel	Lisbon - L4
Locals Hostel	Lisbon – L5
Music Hall Lisbon Hostel	Lisbon – L6
Nest House Hostel	Lisbon – L7
Oasis Backpackers Mansion	Lisbon – L8
PH in Chiado	Lisbon – L9
Sunset Destination Hostel	Lisbon – L10
Almáa Sintra Hostel	Sintra – S1
O Século	Cascais – C1

Each criterion will be analysed in order to understand the patterns between hostels, that way will be much easier to understand which the common problems are and how to solve or find solutions adapted to them.

6.1.1. Local integration

The criterion C1 is more difficult to study since the hostels' building are old and there is no information about the conditions of the soil previous of its construction, but all buildings have established a maximum contact with developed areas, and are built in infrastructure areas, following the requirements and specifications of the master plan. The master plan maybe is not the current one, but for sure there was one.

It's clear to see that criteria related with the environment, ecology and habitats (C2, C3 and C4) have better classifications in hostels not located in city centres or very urbanized areas, because the probability of having wide areas outside the perimeter of the building are higher, and usually there are green areas, such as S1 and C1. On the other side, the hostels in Lisbon are located in the centre of urbanised areas where the concentration of buildings is higher and there is lack of space for green areas. The only possible solution to contribute for ecological valorisation will be implement a green structure in a roof, terrace or walls. L1, L2, L4, L8 and L10 have access to the roof but they didn't implement this green structures or any other else. L10 has some green

spots, but not with enough dimension to create impact. The hostels S1 and C1 have better levels on this criterion exactly because they have green areas in their territory.

Another pattern is that all the hostels for being housed in old buildings have a great value for the heritage protection and maintain their design, architecture style and aesthetics is the best way to enhance the built heritage. Not changing colour pallets, materials and enhance the valorisation of local scenic views is a way of guarantee local integration.

Table 34: Classification of each criterion for local integration category, comparing hostels.

Criterion	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	S1	C1
Territorial valorisation (C1)	A	A	A	A	A	A	A	A	A	A	A+	A
Environmental deployment optimisation (C2)	F	F	F	D	D	E	D	E	D	E	A	D
Ecological valorisation (C3)	E	E	E	D	F	E	E	D	E	E	A++	A
Habitats connection (C4)	F	F	F	C	F	F	F	E	F	D	C	A
Landscape integration (C5)	A++	A++	A++	A++	A++	A++	A++	A++	A++	A++	A++	A++
Heritage protection and enhancement (C6)	A+	A+	A+	A+	A	A	A	A	A	A	A	B

The hostels analyses in the assessment have an excellent landscape integration (12A+), major heritage protection and enhancement (4A+ and 7A); good territorial valorisation (11A), urban hostels with poor assessment in ecological valorisation (10E, 1F and 2D), as well as habitats connection and environmental deployment optimisation.

6.1.2. Resources

None of the studied hostel has an environmental certification or any other kind of certification, even if they deserve to have one, like S1. For receiving certifications and labels, many different components in the hostel need to be very high standard.

Nevertheless, there are 5 hostels with the ideal or very good building orientation, considering the climate conditions and sunlight, which guarantee very good classifications for passive design performance. Most of the hostels have a good orientation related to the topography, sunlight and local winds. Due to their wide areas, patios and balconies, there is free circulation of air inside of the building, also because of the tall and large windows, placed strategically for giving the maximum sunlight possible without the necessity of artificial lighting during the day. Double glazing and well-sealed frames on windows is a plus, but none of the hostels has introduced passive systems that worth attention.

In ‘Carbon intensity’ criterion there are hostels with better performances than others, but the majority has a good classification. L1 for example is a hostel where there is no equipment using gas for heating water and heating, hot sanitary water is provided by solar panels, appliances have all A or superior energy ratings, and LED bulbs are a regular basis. This systems and measures allow the decrease of carbon emissions and GHG. Other hostels just implement one of the previous measures (L7, L6 or L3) and some needs some improvements, such as L5.

The materials used in older buildings probably are national or had its origin in the region where the hostels are located, but most of them have more than 100 years old, so there is no clear information about this. Although the structure of the building is old, it is resistant because is made of stone, but there were also some improvements in finishes. The equipment is recent due to the fact that the older hostels in activity not even have 10 years (L8 started in 2008), with exceptions only for old elevators, but functional. L6, L8, L10, L11 and S1 use recycled or reuse materials, not only in some finishes but also in decoration and furniture. Hostels L1, L3, L5, L5 and S1 use national materials and sometimes produce their own furniture.

Considering water resources, the results vary a bit according to the dimension of the installations of the hostel and existence or not of green areas. L4, L10 and S1 have all taps and showers with flow reducers, presence sensor or timers, dual flushes for toilets, being all the equipment recent and efficient, but there are others that just implement some of the elements (L1, L2, and L3). Unfortunately, the majority has not reducers or dual flushes, and also don't have green areas or collection of rainwater for secondary consumption. When talking about the reuse of greywater, there isn't any hostel that treat waste water properly because there is no implemented system in the old areas of Lisbon, and also not enough available free areas to do it. However, L9 implemented a system capable of do a simple primary treatment, which can clean 30% of the wastewater and reuse it for other purposes.

All hostels outside urbanizes centres have permeable areas, which allow water to infiltrate, the opposite happen in hostels located in the centre of Lisbon. The urban hostels are located in a very dense urban network, which interrupts the natural water cycle. Above that there isn't any system to collect or drain water.

Finally, not even one of the urban hostels does food production, because the area where they are located is small and they don't have permeable areas. Some, even having great green and permeable areas, such as S1 and C1, don't take advantage of it. Having a garden not only could give some products to use in the kitchen but also recreational and educative activities with local children or young users.

Table 35: Classification of each criteria for resources category, comparing hostels.

Criterion	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	S1	C1
Energy efficiency (C7)	E	E	E	E	E	E	E	E	E	E	E	E
Passive design perform (C8)	B	B	A	A+	B	A+	A	A+	B	A+	A	A+
Carbon intensity (C9)	A+	A+	C	A	E	C	A+	A	A	A+	C	B
Domestic water consumption (C10)	E	E	E	A	D	C	D	D	C	A	A+	D
Local water consumption (C11)	F	F	F	D	F	E	E	F	F	F	A++	E
Durability (C12)	A	A	A	A+	A	A	A+	B	A	E	A	B
Local materials (C13)	A+	C	A+	D	A+	A+	B	B	B	B	A++	C
Low impact materials (C14)	E	E	E	E	D	A	E	B	D	B	A+	E
Local food production (C15)	E	E	E	E	E	E	E	E	E	B	B	A

The level of energy efficiency E for all hostels, even that two of them have excellent passive design performance (5A+) and the others a good passive design (4A and 4B). In water area there is a variable situation (A++ to E). In general, they have materials with durability, use

local materials and have a variable use of low impact materials. In none of the hostels have local production (neither aromatic herbs).

6.1.3. Environmental loads

The area of wastewater is the less present between the hostels. For this case, the region of the building is not significant because only one hostel of the sample has a primary system for treat wastewater and reuse it in the building, L9.

The utilisation of gas appliances is almost inexistent, the majority of them are electrical systems. In L1, L2, L4, L10 and C1 there are solar panels to provide hot sanitary water. Some hostels still have ovens and stoves using gas (L5 and C1).

In this category, waste is the area better represented by theses hostels, without any classification below A. In fact, every hostel tries to control the waste buying bulk materials and avoid individual packages, and adopting consumable recharging systems. Also, the utilisation is hazardous materials is controlled.

In terms of waste valorisation, every building has implemented the recycling system. Each one has in common and main areas and kitchens yellow, green, blue and undifferentiated waste containers, such as the vicinity. Although, in any hostel common areas and neighbourhoods have containers for batteries and electronic materials, most of hostels collect the last two types of waste, as well as oil in the kitchen. In the neighbourhood, organic, electronic and batteries containers are inexistent, not collection of undifferentiated waste. Some area has better waste collection than others, but in urban areas overall the system works well.

About noise emissions, all buildings have silent indoor and outdoor equipment and pavements, and appropriate location of the noisy elements in areas of the hostel not close to the rooms and main areas. Acoustic insulation is not very common among the sample of hostels, in any area, but double glazing is. Most of the buildings are made of stone and the thickness of the all is about 60 cm, so the noise coming from outside can be mitigated.

Sidewalks, paths, roads and exterior common spaces have light colours to promote the reflection of the light, but any of the buildings has vegetation in facades, roofs, terraces and balconies, just light colours on the walls.

To provide the air circulation, most of the hostels have adequate natural ventilation, and proper disposition and organisation of the interior spaces that enhances natural ventilation.

About the lighting elements, the exterior and surrounding lighting elements have the appropriate intensity and are adapted to the area to guarantee that human and natural habits are not bothered and disturbed. Inside the buildings and the hostel’s area, is possible to control the lighting elements through a fixed manual schedule.

Table 36: Classification of each criterion for environmental loads category, comparing hostels buildings.

Criterion	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	S1	C1
Wastewater treatment (C16)	F	F	F	F	F	F	F	F	C	F	E	F
Wastewater use (C17)	E	E	E	E	E	E	E	E	C	E	E	E
Atmospheric emissions (C18)	A+	A+	A+	A	A++	A	A+	B	A+	A+	A+	B
Waste control (C19)	A++	A+	A++	A+	A	A+	A++	A++	A++	A++	A++	A++
Hazardous waste management (C20)	A++	A+	B	A++	A+	A++	A+	A++	A+	A+	A++	A+
Waste valorisation (C21)	B	A+	A	A	B	A	B	A	B	A+	A	B
Noise emissions (C22)	A	A+	A	A	A	A	A	A	A	A	B	B
Light and thermal pollution (C23)	C	B	B	A	B	A	D	A	B	A+	A	A

L9 is the only hostel that does some treatment of wastewater and reuse, so it's an example to flow. There is a general trend and careful in the hostels to reduce and reuse waste, noise control and effort to reduce thermal and light pollution.

6.1.4. Environmental comfort

Natural ventilation is a very important parameter when talking about air quality, and is present and significant in all studied hostels. In fact, the majority of them were constructed to take advantage of one of the best qualities Lisbon climate, the sunlight. The main source of quality air is natural ventilation, but some hostels have air conditioning. Also, the old buildings have wide common spaces, a proper disposition of the interior divisions, glazed areas and shade elements in all of them. There is a correct implementation and dimensioning of lighting devices and efficiency. In all hostels, the materials used in construction and finishes don't have VOCs components or are controlled, allowing better interior air quality. Unfortunately, green façades, roofs and terraces are not present in any of the analysed hostels buildings, but green adjacent areas are common in hostels which are not located in urban centres.

Regarding thermal comfort, old buildings have walls made of stone, this kind of material has a high thermal mass being able to maintain the indoor temperature, also because of its thickness. These kind of buildings endure the high temperatures, but when the building start to get harmer inside is difficult to cool it quickly. The shading elements are located inside in all buildings, such as curtains or window doors. Also double glazing is implemented.

About the lighting levels, all the hostels buildings have use light colours in walls, ceilings and pavements, and also good orientation in relation to the local lighting conditions. Regarding natural lighting, all the rooms, common spaces and most of secondary divisions have natural lighting for being in upper floors, but also hostels with divisions in the ground floor have good access to sunlight. Double glazed windows and indoor shading elements are common.

Like mentioned before, all the spaces inside of the buildings are properly organised according to the noise existent, such as elevators, kitchen and equipment rooms. This measure seems to be enough to provide acoustic comfort and there is no need of acoustic insulation. Double glazing once again, helps in insulation regarding the outdoor noises and disturbances.

Table 37: Classification of each criterion for environmental comfort category, comparing hostels buildings

Criterion	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	S1	C1
Air quality (C24)	A	B	A	A+	A	A	A	A+	A	A+	A+	A
Thermal comfort (C25)	A	B	C	B	A	A	B	A	A	A	A	A
Lighting levels (C26)	A+	A+	A+	A+	A++	A++	A++	A++	A++	A++	A++	A++
Acoustic comfort (C27)	B	B	B	B	B	B	C	B	B	C	C	C

The results of environmental comfort and measures are the similar for air quality ranges from A+ to A, acoustic comfort from B to C; thermal comfort from A to C, lighting levels are mainly high from A++ (8), A+(4).

6.1.5. Socioeconomic experiences

As is possible to see in table 38, from L1 to L10 hostels have the best classifications for public transportation. As these hostels are located in the city centre, here is where the public transportation network works better. Different kinds of transports are available in the same area, giving to the people several options to choose according their needs and preferences. Metro stations, bus stops, trains and taxis every minute are the reality of Baixa-Chiado, Bairro Alto, Cais do Sodré or Marquês de Pombal. Although, the hostels located not in the city centre – S1 and C1 – have a different reality. S1 is located in a farm with 3.5ha and at least 1km far from the town centre, so there is the possibility of walking or car. The public bus doesn't go until this area. Taxis are more difficult to find, but possible, and trains don't pass here. The location of C1 is better in terms of possible transports, but still the network doesn't allow too many options. There is a train station 10/15min walking from the hostel

The pattern maintains referring to low impact mobility, as the city centre hostels have more options than the others. In the first mentioned districts there are pedestrian paths with appropriate dimensions to the flow of people, but fully pedestrian paths are rare in the surrounding areas of the building. Just in Saldanha area are starting to be considered this pedestrian structures. Regarding bike lanes, Lisbon is still very weak, as we can see in the map in Annex 1-D. In Marquês-Saldanha and Santos area are starting new bike lanes, close to L6, L7 and L3. But there is no access to bicycle sharing services yet. What all of the hostels have in common is the lack of access to car sharing or moto sharing services. Some districts already have existence of charging points for electrical car, and exclusive parking spaces for ecological vehicles. Local transfer or mini-bus services are only available in L2 and L4.

The inclusive design is a criterion that changes according to the hostel. In general, all the buildings have staircases, not only to go to an upper floor, in case the hostel has more than 1, but also in the main entrance has. Unless there is an elevator, staircases can be a problem for people with low mobility people. Only L1, L4 and L8 have elevators, and not even they have the proper dimensions to take a wheelchair. The only hostel capable of assure perfect mobility to all kinds of people is C1, because it is also a foundation which receives lots of groups, with kids, disable and older people. This is possible due to the existence of ramps and not too many steps impeding the

mobility. Any of the hostels have visual and sound signs for disable people, and only a few districts have parking places in prime locations.

Local economic dynamics creates another pattern between the hostels. The hostels furthermost from the city centres and big cities demonstrate having less changes to promote and stimulate the local economic activities. S1 have no contact with economic activities in the area, because the farm is at least 1km far from any economic activity. C1, even located in Estoril, misses the strong economic system present in Lisbon centre, but provides a relaxed stay. Although, the previous hostels are the ones who provide a closer relationship with the local communities, enhancing and promoting activities related to it. On the other hand, urban hostels are excellent providers of diverse indoor spaces and have several partnerships and collaborations with local entities and companies, especially in winter.

Being a very diverse market segment and full of opportunities, there isn't oscillations in the number of employees, only when passing from the high season to the low season. However, there is a fix number of people in all hostels. Hostels are a jog provider, either considering culture, services, cleaning, cooking, maintenance, etc. What is common in hostels is the demand for local employees, for their local knowledge, but in high season probably part of the staff is foreigner, if hostels accept volunteers from only platforms. Also, trainees from national and international schools and universities are a trend. Like in any urban area, the range of relevant job opportunities is remarkable, and Lisbon is no exception, being possible to choose between restaurants, stores, supermarkets, bars, companies, etc.

Following the same logic, urban hostels have more contact with human amenities, but is better having a balanced combination of human and natural. The majority has a good performance on both amenities, but it's possible that the level drops if the natural amenities aren't close or inexistent. S1 his inside a natural amenity but doesn't have close human amenities as desirable, so the hostel has the lower performance.

Regarding the control of comfort levels, all hostels present mostly manual systems for control the 5 main areas in buildings: temperature, humidity, ventilation, shading and lighting. The ventilation artificial systems are used but rarely, but in L4 and L8 can make a difference. Temperature and humidity are controlled by natural ventilation, and manual shading elements. Natural lighting can be controlled according to available shading elements, and artificial one is also by manual switch.

Natural risks are a criterion where there is less information, because 5 of the 6 buildings were built in the beginning of 20th century, so there isn't information about that, so we assume E level.

Considering the level of security provided by the hostels, all have implemented measures to control and/or inhibit crime and vandalism, considering different but complementary categories: building(s) and adjacent public areas. The measures can be organized in lighting, surveillance and spaces permeability and visibility. All have well illuminated, and with good visibility areas, and the facade is located in the main street. Besides, all hostels have surveillance systems indoor and outdoor, and defined hours to open and close areas harder to control. In some cases users have

a code for opening the door, or cards to get inside, but the majority of the hostels have 24h reception. Fire detector are mandatory for medium and large size hostels, so exist in L1, L2, L4, L8 and L10. L1 and L5 also have intruder's detector, like Securitas.

For having sustainable businesses and buildings some measures considering life cycle costs are very important achieve the goal. Efficient lamps and equipment, saving water systems are common measures, as also resistant, durable and adequate materials.

Table 38: Classification of each criterion for socioeconomic experiences category, comparing hostels buildings.

Criterion	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	S1	C1
Public transportation (C28)	A+	A	A++	A++	A+	A++	A++	A+	A++	A++	C	C
Low impact mobility (C29)	E	C	B	E	D	D	A	D	E	D	B	B
Inclusive design (C30)	A	D	C	B	E	A	D	A+	B	C	B	A+
Flexibility (C31)	A	A	A+	A+	A	A	A	A	A	A+	A	A+
Local economic dynamics (C32)	B	B	B	A	A	A	C	B	A	A	A	A
Local work (C33)	A+	A+	A+	A+	A+	A+	A+	A++	A+	A++	A+	A
Local amenities (C34)	A	A++	A++	A++	A++	A++	A+	A++	A+	A+	B	A
Community interaction (C35)	A	A+	A	A	A	A+	A	A+	A	A+	B	A
Controllability (C36)	A	B	B	A	B	A	B	A	A	A+	A	B
Participation and governance conditions (C37)	B	B	D	D	D	D	D	D	D	D	D	D
Natural risks (C38)	E	E	E	E	E	E	E	E	E	E	E	E
Human threats (C39)	A++	A+	B	A	A+	A	A++	A+	A	A	B	A+
Life cycle costs (C40)	A++	A++	B	A	A+	A+	A	A	B	A	A++	A

The socio economic have aspects present in all off the hostels sample, namely public transportation, local work and amenities, control human security and life cycle costs, all of others have a variable range and different strategies and solutions resulting from the hostel and local where it is.

6.1.6. Sustainable use

As touristic accommodation buildings, is very important that every hostel quantify the information related to the operation and management of the buildings. Let it available to its users, is part of the sustainable use. So, make the architectural drawings, electrical, heating/cooling installations and plumbing plans; create a manual for the use of the equipment by fraction (air conditioning, appliances, etc.); for the use of the common equipment is crucial; but also provide information regarding the use, profitability and maintenance of special elements or included in the structure (for example solar panels, sensors, etc.), the structural elements and its maintenance and the deactivation of equipment and materials and its correspondent revalorization. In general, every hostel building, no matter their location or age, have this information organized and available in case of need.

But, regarding environmental monitoring or any other certification, this sample of hostels is very poor for this criterion. Only S1 was assessed by LiderA, but still doesn't have the certification. Although, with the right improvement, and interest from owners and managers, it's possible to elevate this sample to another level of sustainability.

Finally, from 12 hostels, only S1 has an environmental policy, but some of them showed awareness and sensibility for sustainability, being implemented some eco-friendly solutions. L1, L2, L4L, L10 and C1 have solar panels for hot sanitary water, and L9 has a preliminary wastewater treatment in toilets.

Table 39: Classification of each criterion for sustainable use category, comparing hostels buildings

Criterion	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	S1	C1
Environmental information (C41)	D	D	D	B	E	B	C	B	B	B	B	D
Environmental management (C42)	E	E	E	E	E	E	E	E	E	E	E	E
Innovative solutions (C43)	D	D	E	D	E	E	E	E	E	D	A+	D

The hostels don't have a special interest in provide information to guest, but architectonical drawings, electrical and plumbing system's record are available (6B, 3D and 1CB). Environmental management it's basically the average E level.

6.2. Comparing Lisbon-Cascais-Sintra vs Catalonia hostels

Last year, a similar work was conducted in Catalonia region, untitled “Sustainable Hostels and Backpackers Behavior Case Analysis: Catalonia selected hostels”, where a sample of 6 hostels were also studying in exactly the same standards as the present work. The region of Catalonia is a region of contrasts regarding climates and landscapes, and the work tried to cover these differences. From the 6 hostels, 3 of them are located in Barcelona: 2 in the dense urban area, and 1 close to a region of parks; 1 in the Pyrenees; and 2 on little towns on the coast. The table 40 represents each hostels were studied and this distribution according to regions:

Table 40: List of Catalonia’s hostels in groups of regions

Official Hostel Name	Region group and Short name
Mare de Déu de Monserrate	Barcelona – B1
Sleep Green	Barcelona – B2
Twentytú Hi-Tech	Barcelona – B3
Costa Brava	Barcelona Coast – CB1
Santa Maria Del Mar	Barcelona Coast – CB2
Mare de Déu de les Néus	Mountains – M1

Since the assessment was made with LiderA, and after a deep analysis, is possible to compare these two important regions, for tourism in Portugal and Spain, two of the most visited countries in Europe. Comparing hostels in similar regions can help both to understand and learn with each other new and good examples, and solutions for the several challenges. The following paragraphs are dedicated to brief analysis and comparison between the 2 regions.

6.2.1. Local integration

This area of LiderA assessment reveals similar results in both areas, since the considered urban hostels, B2 and B3, have lower ratings for the criteria linked with the environment such as environmental deployment optimization, ecological valorization and habitats connection, due to the lack of green areas and connections with green surroundings areas. For hostels B1, C1, C2 and M1 is verified the opposite result because of the existence of green areas and structures that create a better environmental relationship, and avoid the regular discontinuities of the urban areas. Nevertheless, all show high results for territorial valorization, landscape integration and heritage protection, mainly for the maintenance of the old structures of the buildings, colors, materials and heritage if present in interior and outdoor spaces, similar to what happens with the buildings of hostels in Lisbon, Cascais and Sintra. The hostel B3 is the only one that is not housed in an old building, it was design and built from scratch, which can mean lower landscape integration and heritage protection.

6.2.2. Resources

In contrary of all the hostels in Portugal, B2 and B3 are hostels with energetic certifications, but at least 3 more hostels in Catalonia sample have other kind of certifications. This criterion reveals a significant difference between both samples, since the hostels in Lisbon-Cascais-Sintra region don't have any certification, mainly energetic. The regular application of flow reducers and dual flush toilets is verified in Catalonia hostels, and less in Lisbon-Cascais-Sintra hostels, one of the most basic rules in reduce domestic water consumption. But there is the same pattern related with local water consumption since the urban hostels B2 and B3 are in completely urbanized areas enhancing the runoff, such as the hostels L1-L10; although B1, M1, C1 and C2 have permeable areas inside the hostels' lot which increases substantially the percolation of rainwater. The same happens for hostels C1 and S1 in Portugal.

Although, regarding carbon intensity and atmospheric emissions, the Portuguese sample seems to be more aware of the right appliances and efficient equipment to use in their facilities, while hostels B1, M1 and C2 still use gas boilers for providing hot sanitary water, and low efficiency appliances. B2 uses a distinct system for hot sanitary called Districlima, which uses the gas released from the collected district waste, and all the appliances and lighting are top notch in energetic efficiency. B3 uses an electric system to hot sanitary water, but the energy provided comes from renewable energies. The appliances and lighting are highly efficiency too.

The use of local materials and their durability, adapted to the location and purpose, is a constant in all the hostels of the two samples, and the absence of food production too, either the hostels are urban or rural. But, low impact materials in construction and finishes are only seen in the hostels B2 and B3 in Catalonia. Recycled and reuse materials is more common in the Portuguese hostels.

6.2.3. Environmental loads

Taking into account the two samples, only the hostel B3 has a positive rating for the both criteria regarding wastewater treatment and use, but some other others have positive systems to help these criteria. B3 uses a depuration system, collecting water from the showers, cleaning and recycling it, and then use it for the toilet flushes. C2a has a septic fosse that clean wastewater from all origins, but the water is not reuse for their own benefit, being sent to the public water network and the waste delivered to a company for further treatment. M1 don't have a wastewater treatment, but is a hostel located in the mountain where snows a lot in winter. So, in order to avoid the accumulation of snow on roofs, roads and entrances, M1 collects the accumulated snow and places it in permeable area. Either being in the snow form, the water will melt and infiltrate. Also, instead of using potable water for irrigation, M1 also uses the water from the well for toilet flushes. On the contrary, only L9 has a simple preliminary wastewater treatment, and none reuses for secondary functions like toilet flushes.

Like for Lisbon-Cascais-Sintra, all hostels in Catalonia have a great awareness and sensibility for waste control and valorization, and to avoid and recycle hazardous waste, as well as, an adequate control of noise emissions and light and thermal pollution.

6.2.4. Environmental comfort

Like for Lisbon-Cascais-Sintra, Catalonia's hostels overall have high rantings for air quality levels, thermal comfort and lighting levels, because the building orientation, the materials used, and openings, try to take advantages of the landscape, the winds and natural lighting provided by the hostel's location.

6.2.5. Socioeconomic experiences

Like in all urban areas, the diversity of public transports is much bigger than in rural and not so urbanized areas. So, like for hostels L1 to L10, B2 and B3 have available more than 3 different types of public transports each, having even B2 like 5. Precisely because of being in urban areas the dynamics created are exponentially more, so urban hostels in both samples have much higher local economic dynamics. The remaining hostels in Catalonia have lower ranting, such as the Portuguese C1 and S1, for being faraway from urban centers, for both criteria.

But regarding low mobility impact Lisbon-Cascais-Sintra region stills seems to not be adapted to low mobility vehicles mainly regarding bike lanes, and in Catalonia is the opposite: almost everyone has a bike and uses it every day, so that means there are good and enough bike lanes and parking, or uses the bike sharing system available.

Hostels in Catalonia have overall better rating in inclusive design. B3, M1 and C2 have access and facilities adapted to disable people, such as elevators, low slopes and obstacles, as well as B1, that receives lots of groups of kids and disable people. In Lisbon-Cascais-Sintra hostels the presence of inclusive design is not so strong, since most of the accesses to upper floors and some divisions are not adapted to all kinds of motilities and needs. In some cases, not even exists elevator or with the ideal dimensions to support a wheelchair, for example.

The urban hostels, doesn't matter the region in the world, have a great access to human amenities, and rural hostels have a greater access to natural. The secret for having a good rating in Local Amenities is the balance between the existence of human and natural close to the hostel. B2 and B3 are not close to at least 3 natural amenities like gardens, parks and the sea, but have an enormous quantity and quality of human. The opposite happens with hostels B1, CB1 and CB2 that have a good balance of natural and human. The remaining have only a good relationship with natural.

What seems to be consensual is a good control of human threats such as cameras in all commons areas, reception 24h or security devices like electronic cards to open the entrance and bedrooms doors. Also, the adaptation and choice of the right furniture and equipment gives high rating in life cycle costs criterion.

6.2.6. Sustainable use

In Catalonia hostels there is environmental information in most of the divisions alerting people for better water and energy consumption and recycling, something that is not much applied in the Portuguese sample. Only B2 and N3 have environmental or energetic certifications, but other hostels have certifications related with hygiene and food safety like M1, B1 and CB2.

Finally, B3 is the hostel building who have more innovative solutions that, not only contributed to the good performance of the project, but also to a certain "brand image". The Districlima and depuration system, and the reuse of greywaters, the low impact materials used, the controllability of each comfort levels controlled by a smart device and the best efficient equipment are some of the reasons why B3 is an excellent example how a hostel can contribute to a sustainable tourism industry. B2, having the Ecolabel, doesn't present innovative solutions in a way that the measures implemented aren't exclusive and outside the box, but for touristic budget accommodation segment its solutions contributed to the good performance of the project and also being a good example of a sustainable hostel buildings. CB2 has a wastewater treatment system on site, which distinguished him from the other hostels buildings, having potential for apply other sustainable measures. Lastly, M1 with his system for collecting rainwater and use of water from the well has also potential. B1 and CB1 are the only hostel who doesn't present any particularity in this field.

6.3. Hostels and sustainable tourism – results and limitations

The sample of the hostels achieved a very high classification, namely S1 with A+ for LiderA standard, means a factor 4 increase when compare with the average cases. This can be international reference in the field. The remaining hostels achieve also an A class that is also a good performance. The table 40 present the assessment level obtained for each hostel.

Table 41: Final assessment level obtain of each hostel, Portuguese sample.

Case studies	Assessment level obtained
Golden Tram 242	Class A
HUB New Lisbon	Class A
Jardim de Santos	Class A
Lisb'on Hostel	Class A
Locals Hostel	Class A
Music Hall Lisbon Hostel	Class A
Nest House Hostel	Class A
Oasis Backpackers Mansion	Class A
PH in Chiado	Class A
Sunset Destination Hostel	Class A
Almáa Sintra Hostel	Class A+
O Século	Class A

The Catalonia sample achieved a very high classification, namely B2 and B3 (A+) for LiderA standard, means a factor 4 increase when compare with the average cases. Four of the others hostels achieve also an A class that is also a good performance. The table 42 present the assessment level obtained for each hostel.

Table 42: Final assessment level obtain of each hostel, Catalonia sample.

Case studies	Assessment level obtained
Mare de Déu de Montserrat	Class A
Twentytú Hi-Tech Hostel	Class A+
Sleep Green	Class A+
Mare de Déu de les Néus	Class A
Costa Brava	Class A

The use of LiderA allows understanding the environmental and sustainable hostel performance and search. Nevertheless, there is strong potential to improve, adjust to hostels and specific local aspects. Another essential point is that the approach will gain if a detail LCA and

LCC analysis is use. That is not possible since most of the information is not available, being an important limitation that in the future will be useful if a specific study and process is in the field.

The results show that hostels (namely the select that agree in participate in the study) begins to adopt good environmental practices, the main question is if the hostels are representative of the hostels of the region of Lisbon-Cascais-Sintra or sustainable hostels, potential the hostels involve are hostels that have already good practices. So will be useful to enlarge the sample.

Another essential point is that the approach will gain if a detail LCA and LCC analysis be use. That is not possible since most of the information is not available. That is an important limitation that in the future will be useful if a specific study and process is in the field.

After visiting all hostels, getting their information and analysing the available possibilities for improving the performances, can be said that a lot of solutions can be immediately applied changing a few elements, adapting some structures, with the right motivation and investment. Although, other negative issues belong to the domain of cities' dynamics, and the solution is much more complex and complicate to solve.

Urban planning is today an essential tool for improving cities in so many levels, and might be a way to ensure the correct use of land, protection and use of the environment, public welfare and the design of the urban environment, while includes a sustainable use of air, water, and infrastructures, passing into and out urban areas such as transportation, communications and distribution networks. The current region in study needs a plan, and having a plan means the city will be well prepared for future possible challenges, and city leaders are already prepared to see opportunities and manage risks from advance. With reliable information on the current situation, they will be able to make connections between the long-term vision and short term actions. On the other hand, cities that don't actively plan for their future will likely be left behind. Also, planning identifies pressing issues and available resources, and makes sure that initiatives are not redundant or going in different directions, which improves impact and waste of resources. Not less important is the existence of an appropriated urban form. With the right design for a spatial pattern and the right policies on density, land use, public space and the layout of infrastructures and service, can make a difference in delivering quality of life at the right price point, and deliver a better city, not only for its inhabitants but also for their regular visitors.

7. Conclusions

In this work is carried out an exploratory study using the combination of quantitative and qualitative methods in order to obtain deeper and more detailed information about the market of hostels in the Lisbon-Cascais-Sintra, and their level of sustainability, in order to contribute to decrease the information gap on this segment in the Portugal. Were visited 12 hostels were in the aforementioned region, Lisboa-Cascais-Sintra, in the 1st semester of the year 2016. To assess the level of sustainability, the buildings where hostels are allocated were assessed with a sustainable ranking system - LiderA.

The results of this research allow us to understand the size of the hostel market in the most visited region of Portugal, and how sustainability is being applied in various aspects. It is known that the number of hostels has increased exponentially since 2007, with more than 100 at the moment. In order to support the intensive demand for these low cost tourist accommodation, appropriate in young people around the world, and people who like to hang out and share stories. This increase causes significant pressures, in addition to already existing in the surrounding environment, which need to be evaluated, studied and mitigated. The hostel, just like any other tourist accommodation will never cease to have a negative impact on the environment, but there are numerous measures and solutions that can be applied and adapted. This study we came to the conclusion that is being made an effort in this sense, part of the reason is due to the reduction of associated costs and not specifically related to a deep environmental sensitivity.

The search of sustainability in the hostels is achieved in the study cases using different strategies even that local integration, energy, waste, noise, human security and low cost are key in this process. The sample of the hostels achieved a very high classification, namely Almáa Sintra Hostel (A+) for LiderA standard means a factor 4 increase when compare with the average cases. This can be national and international reference in the field. The remaining hostels achieve also an A class that is also a good performance. From all 43 criteria assessed with LiderA, there are some highlights, for better and worse, which can define what was been done for sustainable tourism and which failures buildings and locations have.

The hostels' sample have achieved a high level of sustainability, due to the following list of the positive results from the assessment of hostels buildings:

- Landscape integration and heritage protection: because all hostels are housed in old buildings they have a great value for the heritage, being a priority the maintenance and protection of their design, architecture style and aesthetics. The maintenance of the building's qualities, exterior and interior, is the ideal way to guarantee local integration. Same size, same colour pallets, same construction materials are elements that promote the alignment of the building with the surroundings not only in a structural way but also visual insertion and contribution to the aesthetical value of the area;

- Carbon intensity and Atmospheric emissions: regarding carbon intensity it's crucial to choose the right equipment, and its efficiency. For providing hot sanitary water, any of the hostels use gas, are used or there are water tanks or boilers heated by solar panels. Efficiency

in lamps are also be considered, such as LED or economic bulbs, and appliances (Washing machines, dishwasher, dryer machine, fridges, microwaves) with high levels of efficiency A or superior. These measures can reduce significantly CO_2 and GHG emissions, as well as atmospheric emissions of SO_2 and NOx;

- Waste control, hazardous waste management and waste valorisation: most consensual criteria among all hostels and the easiest one too. The percentage of reduction of waste is easy to do if people are well aware of what they can do to not create waste. This criterion is very important for touristic accommodation since they receive lots of people and if they serve breakfast, for example, there is going to be produced considerable amounts of packages. So choosing bulk materials, consumable recharging systems, purchase in control amounts is crucial to succeed in waste control. Also, reuse bottles, jars, and other materials will help. Not least, the existence of points of recycling is the most known eco-friendly action, so the fact that containers are present in common areas is half way to success, because people will feel the need to do it. The three basic containers, green, blue and yellow, were present in 90% of the hostels, besides they are also available in the building, and later collected by the municipality in specific weekdays. Containers for hazardous substances like batteries, oils, bulbs, corks, and others, aren't present in any of the hostels, but this kind of waste is not produced in large quantities, so for this reason the container is not necessary but all the substances are collected and correctly disposed by the staff;
- Lighting levels and air quality: most of the buildings have a good orientation regarding the local winds and natural sunlight, as well as good distribution of glazed areas, which guarantee natural lighting in most of main, secondary and common divisions in the hostel. Artificial lighting has a correct implementation and dimensioning in common areas, bedrooms, and corridors. Both combined give to each hostel a high level in lighting levels. The adequate orientation and distribution of glazed areas also promotes natural ventilation, providing it to most of spaces, enhancing the air quality levels.

Unfortunately, the sample also has low level of sustainability, given by the following list of negative results from the assessment of LiderA:

- Energy efficiency: none of the studied hostels has an energy certification of efficiency, even Almáa Sintra Hostel that already pass through the assessment of LiderA. This study can be a good opportunity to this hostels to improve and put into practice some of the sustainable suggested solutions. After that they can apply to a certification of any life cycle assessment available, being LiderA one of them;
- Local water consumption: is one of the biggest problems related with urban areas, due to the impervious soil created by construction. Since the majority of the hostels are in the historical urban centre of Lisbon there is much harder to reduce the runoff resulting from rainwater. Water can't simply percolate into the soil, leading to runoff, but also it's not retained and collected, being this measure a better solution compared to doing nothing. The collection of rainwater from roofs, terraces and other impermeable surfaces can diminish runoff, and also the

consumption of public water, because being collected can be reused for irrigation, recirculation and washing floors. This criterion gets a better level for Almáa Sintra Hostel and O Século precisely for having permeable areas in their lot;

- Local food production: being an urban or rural hostel in this criteria is the same, since they don't produce any food that is worth to be mentioned. Nevertheless, Almáa Sintra Hostel has more than enough space to do it, so could be interesting produce some fruits, vegetables or herbs, and use it for own consumption or to sell them in local markets. Also Sunset Destination has some flowerbeds in the terrace with lettuces, strawberries, garlic, and others. For rural hostels not having a high level in this criterion is worst scenario because precisely because of its nature should be normal to produce their own food. In urban hostels is possible to do it in roofs, terraces and balconies;

- Wastewater treatment and use: the lack of wastewater treatment and its reutilisation is also serious failure in this sample of hostels, where any wastewater is treated on site and reused to recirculation, which implies that the water after being used goes directly to the wastewater plumbing system and needs to be treated before returning to the drinking water system, each means lots of investment on unnecessary treatment if the water was instead reuse for secondary consumption with a preliminary treatment on site. There are a few solutions in Attachment III;

- Environmental management: aside with the inexistence of energy certification, there is also environmental management systems present in the hostels' sample, either they are ISOs or EMAS. Also any life cycle assessment was applied in the design, construction and operation of the buildings, the first two phases because the buildings have at least 100 years old. Again, this study might be an opportunity to implement LiderA in the operation phase and get an environmental management certification.

After analysing the life cycle assessment results, they indicate that the hostel community in the region is progressively increasing eco-friendly measures in many areas of functioning of the hostel, but there are clear disabilities in nearly all cases studied, such as water management, particularly in consumption, treatment and reuse, as well as in the absence of structures and green spaces in relation to the impervious area, which lead to ecological depreciation and habitats disconnection, and increase of runoff; improvement of inclusive design in indoor spaces and accesses; use of renewable energy and low impact mobility. Part of the resolution or improvement of these problems is particular, i.e., a responsibility and sensitivity of each hostel, being possible to implement solutions relatively easy, like dedicate a part of the building to a green area, install flow reducers and dual flushes, solar panels and photovoltaic cells, some preliminary wastewater treatment, collecting system of rainwater and reuse, as well as reinforce the environmental management policy and awareness campaign.

But other parameters have to be addressed at the level of locations, in order to promote more and sustainable ways of mobility, better access and for all, and the promotion of taking

advantage of the many available natural resources, adapting urban areas to the environment, not the other way around.

Comparing the Portuguese sample with Catalonia sample, there are a negative pattern among urban hostels, mainly in criteria regarding ecological valorisation and habitats connections, wastewater treatment and use, domestic and local water consumption, due to the lack of permeable areas, inexistence of treatment in situ and flow reducer elements for water consumption. Some positive patterns are landscape integration and heritage protection; a special concern for decrease the emissions of carbon and other GEG pollutants substituting appliances for heating and hot sanitary water; waste management, valorisation and control; good network of public transports and human amenities, among others.

On the other hand, hostels located away from the urban centres show similarities in the valorisation of natural environments, with good habitats connections and ecological deployment, which also results in high levels in local water consumption, contributing for the continuity of water cycle, and a perfect connection with green spaces and natural amenities. But the network of public transports is much weaker and the access to human amenities lower, in contrary of urban hostels.

Nevertheless, the majority of hostels in both samples don't have energy certification and a serious environmental policy. Only 3 hostels have achieved Class A+ with LiderA assessment, 1 in Sintra and 2 in Barcelona, being an example for others in sustainability applied to hostels.

Step by step, sustainability needs to be part of everyone's life, needs to be a premise in any industry, mainly in tourism for all the stakeholders and environmental loads, and should be a basic rule for redesigning and restructuring urban centres, by the remarkable chances of changing their dynamics, and its districts.

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Attachments

I – Selected hostels local historical perspective

According to a SWOT analysis of Turismo de Portugal (2014), the region of Lisbon-Cascais-Sintra has strong points and good opportunities to become even important and relevant among Portugal but also in Europe and other international destinations.

The Lisbon-Cascais-Sintra region is a consolidated touristic destination and well-known internationally, which its diversity of resources and attributes satisfy the most diverse segments and niches of touristic demand. Its strong historic-cultural identity and attractive image of the region, gives economical potential to the region, attracting not only looking for cultural tourism but also for the offer of sports modalities and equipment, superior to the national average, and existence of emblematic spaces concentrating cultural and creative industries.

Besides its already known strong points, this region still holds very good opportunities that are the key for the development and consolidation. Like in other times, Portugal continues to have one of the most important geostrategic position, being a prime location as a platform between Europe and the rest of the world. Its geographic position offers the potential to be an touristic destination of excellence, as mentioned, with particular emphasis to the cultural, sports, nautical and business tourism, and the existence of so many historic and cultural elements that creates brands (Fado, Pessoa, Discoveries and the oceans, Marks of different ages and civilisations, etc) are a powerful call for the ones attracted by activities highly associated with valorisation of the patrimony, artistic and cultural creation, recreation tourism and urban realities.

With all these diversity of offers, the region Lisbon-Cascais-Sintra is a stage for different groups of tourists, being them the mirror of the international tendencies dictating tourism, and the groups that deserve to be study.

A. Lisbon

Introduction

Lisbon is the capital of Portugal and the most populous city in the country. It has a population of 547,733 inhabitants within its administrative limits. In Lisbon Metropolitan Area, reside 2,821,697 people (2011) and is therefore the largest and most populous metropolitan area in the country.

It is one of the main economic centres of Europe, thanks to a growing financial progress favoured by the largest container port on the Atlantic coast of Europe and most recently by the Portela Airport, which receives more than 20 million passengers annually (2015). Lisbon has a network highways and high-speed rail system (Alfa Pendular) linking the main Portuguese cities to the capital. The city is the seventh most visited Southern Europe, after Istanbul, Rome, Barcelona, Madrid, Athens and Milan, with 1.74 million tourists in 2009, and in 2014 exceeded the mark of 3.35 million.

Lisbon is an illuminated city, having the sun and the Tejo River often playing in its favour. The Portuguese capital is seen by many as a mirror of colour, where historical beauty and architecture singularity combine.

Historical context

Lisbon is a city with enormous historical burden, since went through many of the most important civilizational periods of European history. The Portuguese capital was populated for many centuries by the Roman Empire, and was considered as Roman citizenship, a very rare privilege for non-Roman populations at the time. At the end of the Roman Empire, the city was a victim of barbarian invasions and later taken by the Visigoths from Toledo.

In 711, the Moorish troops invade the Iberian Peninsula and according to some versions, in the year of 714, Lisbon is taken by the Moors of North Africa.

After many centuries of Moorish occupation, and after two failed attempts, Dom Afonso Henriques, 1st King of Portugal, reconquer the city in 1147, the capital and being made in 1255, for its strategic location.

After the era of discoveries, Lisbon was almost completely destroyed the November 1, 1755 by an earthquake, and later rebuilt according to the Marquis of Pombal plans, current Ministry of War and Foreign Affairs. The reconstructed central portion is the Baixa Pombalina, which were also designed the squares of Rossio and Terreiro do Paco. This landscape remains to this day.

Geography

Lisbon is a city located on the right bank of the Tagus River estuary, with well-defined limits, contrary to what may seem, because of its historical perimeter. Today, other cities such as Loures, Odivelas, and Oeiras are part of the metropolitan perimeter of Lisbon, as well as in the south of the Tagus, the towns of Almada, Seixal and Barreiro, albeit with a completely different identity.

The historic centre consists on seven hills, where some of the streets are too narrow and steep for circulation of vehicles. The western part is occupied by the Monsanto Forest Park, one of the largest urban parks in Europe with an area of $10km^2$.

Culture

For all the civilizations that have passed through the city, Lisbon has a rich cultural life. By being the epicentre of the discoveries from the fifteenth century, Lisbon was, and is a meeting point of different cultures, and at maintaining close links with former colonies, it is one of the most cosmopolitan cities in Europe.

Monuments and historical districts

The Baixa Pombalina and Chiado are the "heart" of the city. It was built on the ruins of the ancient city of Lisbon destroyed by the great earthquake of 1755. Its construction followed a strict urban plan, according to a reticular model street / block. The rebuilding of the downtown of Lisbon after the earthquake was the first case typified construction, standard and "series" of humanity. The Baixa is also the biggest commercial district of Lisbon.

Nearby and of historical interest are still Praça dos Restauradores and the Santa Justa ElevatorSanta Justa, designed in the late nineteenth century by Mesnier du Ponsard. In Baixa is also located Praça do Comércio, also known as the Palace Square, Rossio or Praça Dom Pedro V, Chiado and the Carmo Convent.

Figure 25: Main Lisbon districts: Bairro Alto, Baixa-Chiado and Marquês de Pombal.

Alfama is one of the most typical quarters of Lisbon, with its typical architecture of Arabic and medieval city with narrow streets, one of the few places in Lisbon that survived the Lisbon earthquake of 1755. It is in Alfama that are located most of the houses of Fado, where you can enjoy several live shows. In Alfama, are distinguished the São Jorge Castle, on the highest hill of the city centre, the main Lisbon Cathedral, the National Pantheon, Feira da Ladra and Miradouro of Santa Luzia.

The Bairro Alto is a typical neighbourhoods of Lisbon, located in the city centre, above Baixa Pombalina. It's a trade area, entertainment and housing. Currently, Bairro Alto is a place of "meeting" between the youth of the city, and one of the main areas of the capital night entertainment. Here are concentrated urban tribes, which have their own meeting places. Fado, still survives in the evenings the neighbourhood. People visiting the Bairro Alto at night are a mix of local and tourists.

Figure 26: Alfama, St. George Castel and Estrela Cathedral.

Next to the Tagus riverfront, to the west of the city centre, is the parish of Belém city representative of era of the Discoveries. We can see in this area two buildings classified by UNESCO as World Heritage: The Mosteiro dos Jerónimos, built by King Manuel I in 1501 and the best example of the so-called Manueline style, whose inspiration comes from discoveries, and is also associated with the Gothic style and some Renaissance influences.

Very close to the Monastery of Jerónimos, is the Tower of Belém, a military construction for vigilance purposes on the Tagus bar, the great "ex-libris" of Lisbon, and an architectural preciousness. In addition, are the Discoveries' Monument, the Belém Palace, and the official residence of the President of the Republic, the National Coach Museum, the Museum of Electricity, the Memorial Church, and the Belém Cultural Centre.

Estrela district includes one of the most famous and oldest parks of the capital, the Star Garden, which was created more than 100 years, and was inspired by Hyde Park, in London. The Estrela Cathedral, with a Baroque-Neoclassical style, is the main attraction of this town.

The early eighteenth century the most significant monument is the Águas Livres Aqueduct. Also note the royal palaces of Needs and Help, in the western part of the city. In the late nineteenth century the urban plans have allowed the city to extend beyond the Lower down the valley of the current Avenida da Liberdade. In 1934 is built the Plaza Marques de Pombal, top shot of the avenue.

Figure 27: Belém Tower, Discoveries Monument, Águas Livres Aqueduct.

Representative of modern Lisbon, the Parque das Nações was born in 1998 to host the world exhibition Expo 98 on the theme of the Oceans. The exhibition opened on May 22, 1998, the day that celebrated the 500th anniversary of the discovery of the sea route to India by Vasco da Gama. With all this, the eastern part of the city received the name of Parque das Nações, and became the most modern area of Lisbon and even in Portugal. The main attractions of the neighbourhood are: the Lisbon Oceanarium, the Atlantic Pavilion, the Pavilion of Portugal, the Tower Vasco da Gama, the Vasco da Gama Bridge and the Gare do Oriente, designed by the architect Santiago Calatrava.

Figure 28: Oriente Train Station, Oceanarium, Vasco da Gama Bridge.

B. Sintra

Sintra is a Portuguese village in the district of Lisbon, sub-region of Lisbon and part of the Metropolitan Area of Lisbon. It is home of a municipality with about 377,835 inhabitants, divided into 11 parishes, bordered on the north by the municipality of Mafra, on the east by Loures, Odivelas and Amadora, southwest by Oeiras, south by Cascais and in the west by the Atlantic Ocean. It is the village of Portugal with more inhabitants, followed by Cascais and Oeiras.

The designated Cultural Landscape of Sintra is a site registered in 1995 as a UNESCO Heritage of Humanity, which includes part of the Sintra Mountain Range the beautiful historic center, as well as many historical monuments and the abundant natural and exotic vegetation of the mountain parks.

Figure 29: National Sintra Palace, Quinta da Regaleira, Pena Palace.

In the context of nature framework, architecture and human occupation, Sintra shows a unique personality, a result of combined reasons, including the peculiar climate provided by the orographic mass which constitutes the Sintra Mountain, and the fertility of the land deposited surrounding floodplains. Additionally, the relative proximity to the Atlantic Ocean, leads to Sintra is described as "permanently immersed in a mist that does not dissipate"

In the village one can find testimonies of almost all periods of Portuguese history, recording testimonies from the Neolithic to the Bronze Age, the Roman Empire (second century bc tombstones), Muslim Empire (the Moorish Castle) and Reconquest, from the centuries of

Discoveries, to the golden days of the rediscovery of magical Sintra by foreign travellers and Portuguese aristocrats, due to its exoticism and unique climate.

From the eighteenth century it was built true architectural and artistic masterpieces, such as the Monserrate Palace, Pena National Palace, Quinta da Regaleira, Queluz, among others.

Sintra is considered a World Heritage, being one of the lushest and romantic villages that has inspired poets and writers.

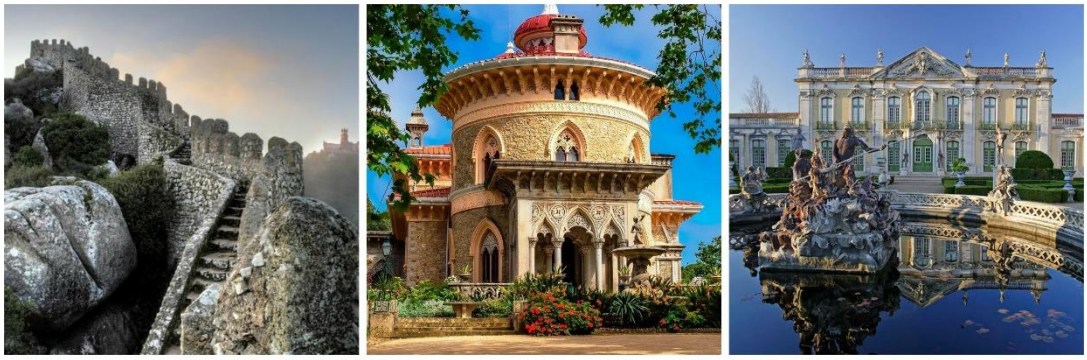


Figure 30: Mourish Castel, Monserrate Palace, National Palace of Queluz.

C. Cascais

Cascais is a town in the district of Lisbon, with about 206,479 inhabitants, part of the metropolitan area of Lisbon. It is a municipality divided into 4 parishes, and bordered to the north by the municipality of Sintra, east by Oeiras and the south by the Atlantic Ocean, in the famous Estoril Coast. It is located about 30 minutes from Lisbon, along the seafront. The most recognized are the parishes along the coast: Carcavelos and Paredel, and Cascais and Estoril.

Today, it is one of the Portuguese popular tourist destinations for domestic and foreign, since visitors can enjoy a warm climate, beaches, landscapes, hotel and gastronomic offer.

Figure 31: Cascais bay, Cascais beaches, Boca do Inferno.

Being a town located on the coast, much of its architectural heritage relates to the defence and navigation. As such, in terms of architectural highlights are the many forts, located between the beach of Abano and São Julião da Barra (already in Oeiras) and that were, until the nineteenth century, of extreme importance for the defence of Lisbon. Besides these, there are the many Roman and Visigoth ruins (villages and necropolis), churches and chapels, and houses in the

former Portuguese nobility, from the late nineteenth century, it began to use this coast as vacation area. Other acclaimed public spaces Guincho Beach, Boca do Inferno and Roca Cable.

It is one of the windiest beaches in Portugal, and one of the most sought after by surf enthusiasts, windsurfing, kite surfing and wind kites. It has an extensive dune system constantly changing, and a huge sandy area, having as background the Cabo da Roca and Sintra Mountain.

Figure 32: Cascais by night, Cabo da Roca, Guincho Beach.

D. Geographic representation of hostels, bike lanes, prime locations and electricity charging points in Lisbon, Cascais and Sintra

The hostels are mostly located in Baixa / Chiado and in other surrounding areas such as Bairro Alto, the Marques de Pombal, and the Cais do Sodre. In Cascais

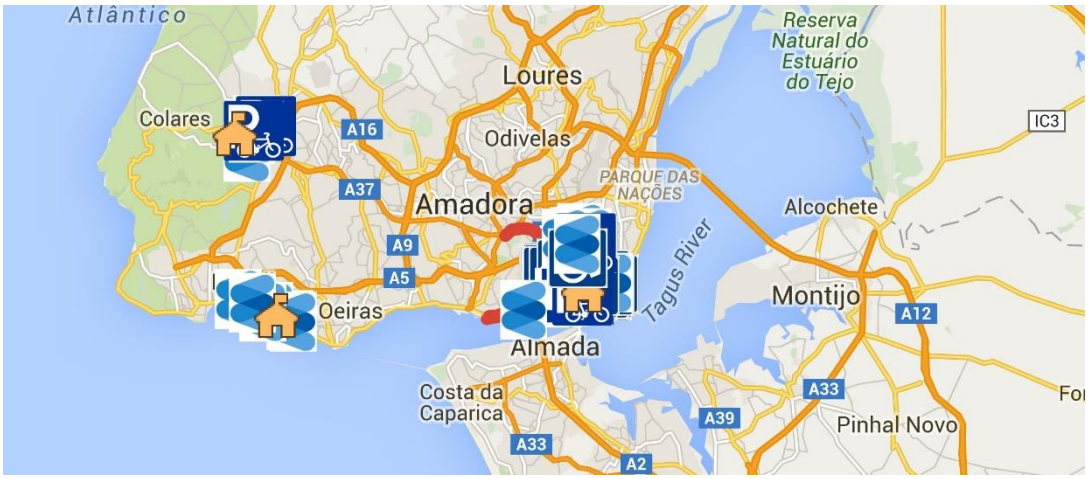


Figure 33: Hostel's, bike parking spots, electrical charging points, and prime parking location, Lisbon-Cascais-Sintra region.

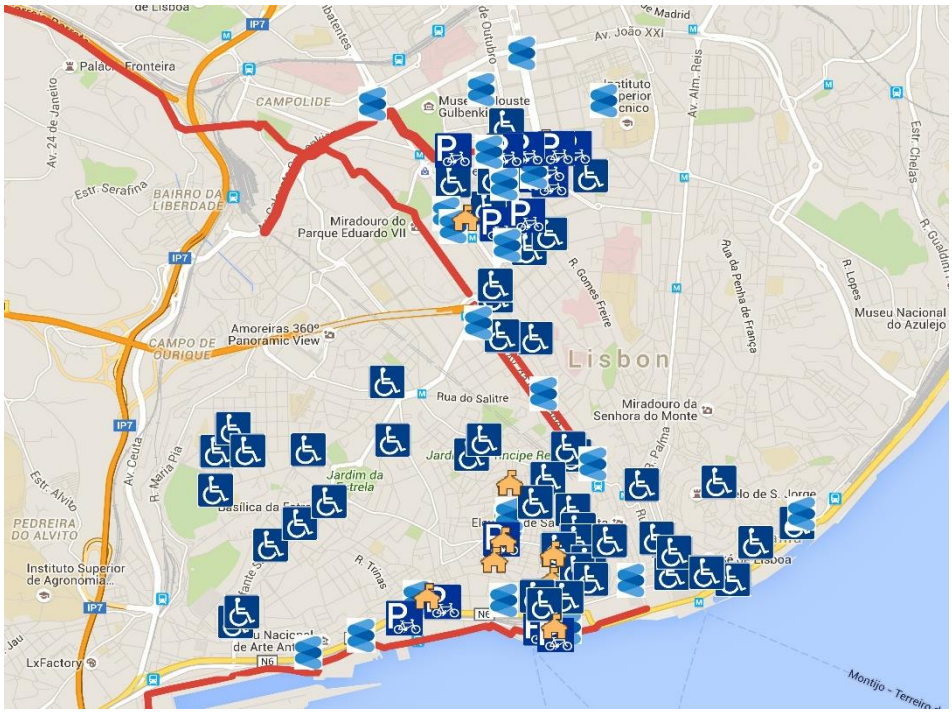


Figure 34: Hostel's, bike lanes and parking spots, electrical charging points, and prime parking locations, Lisbon.

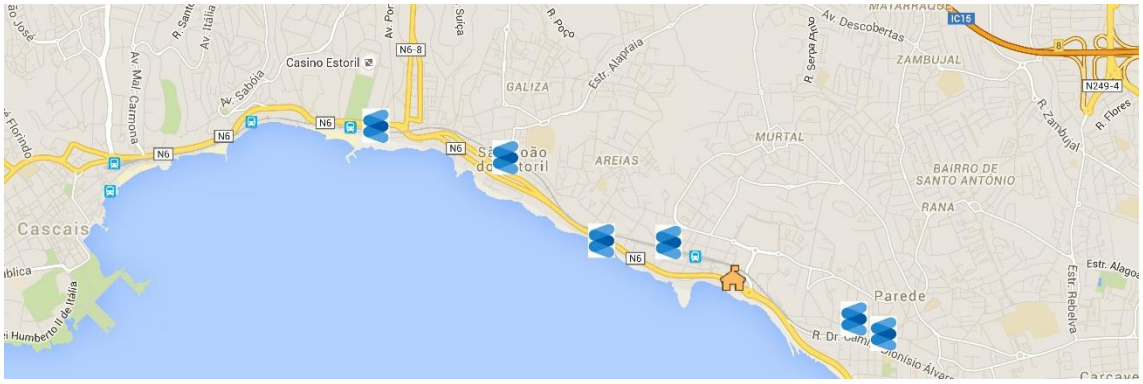


Figure 35: Hostel and electrical charging point's location, Estoril (Cascais).

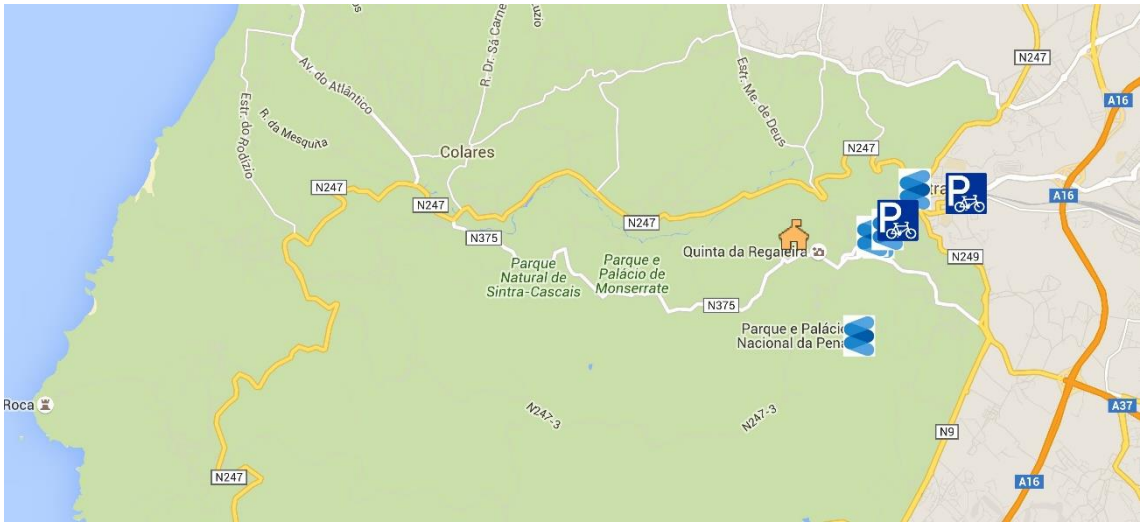
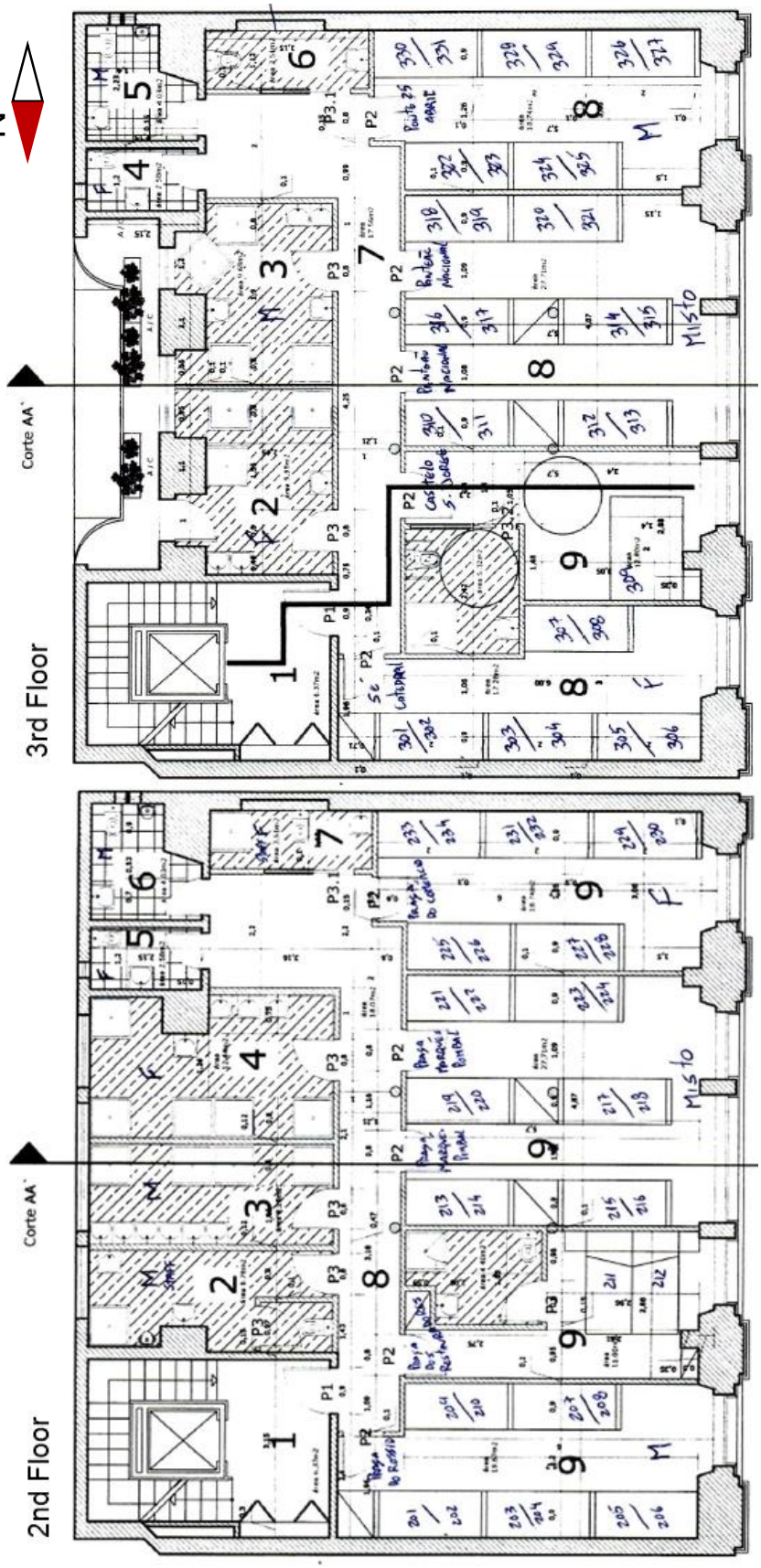


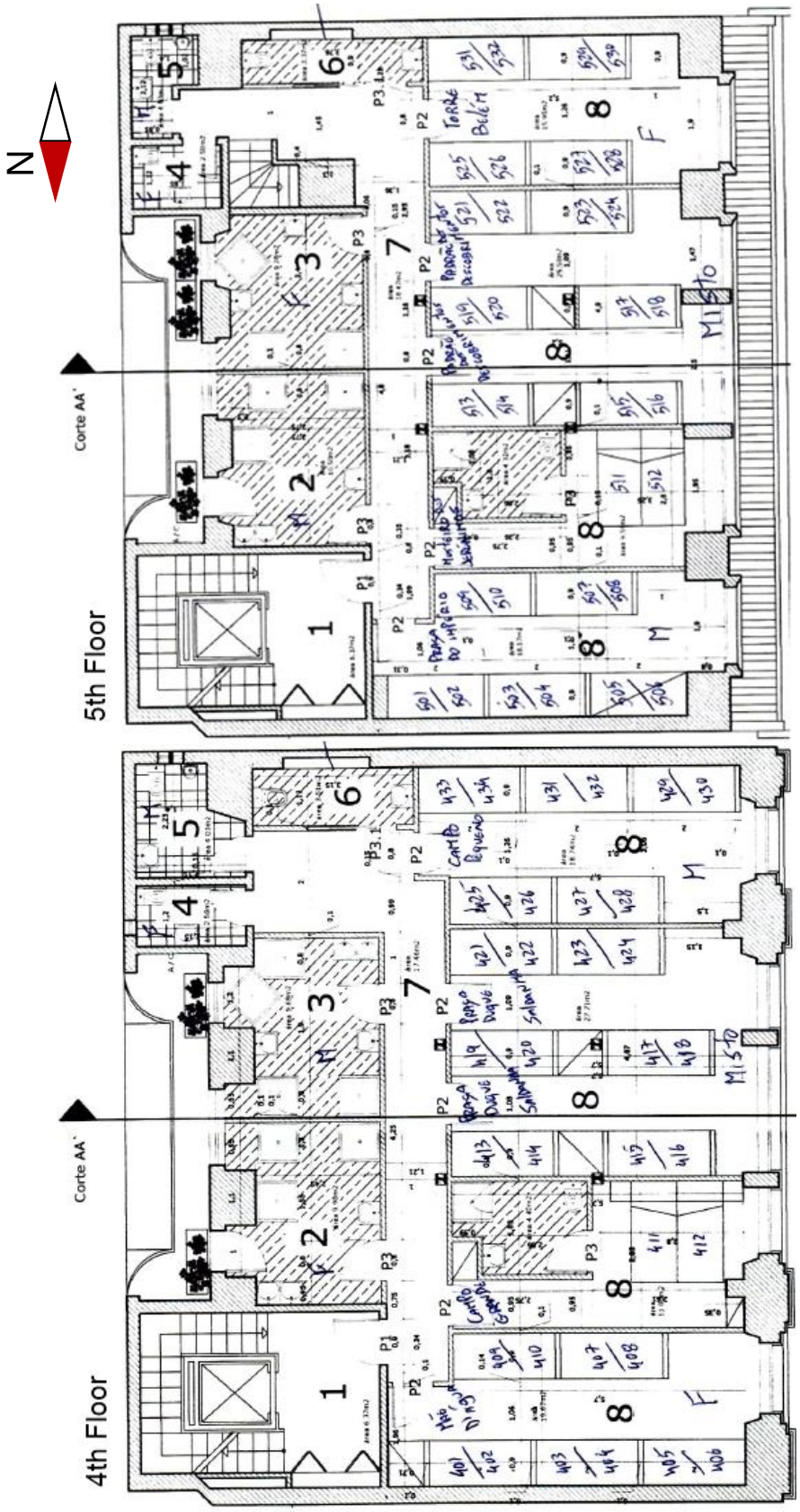
Figure 36: Hostel, bike parking spots and electrical charging point's location, Sintra.

II – Plants of hostels' buildings

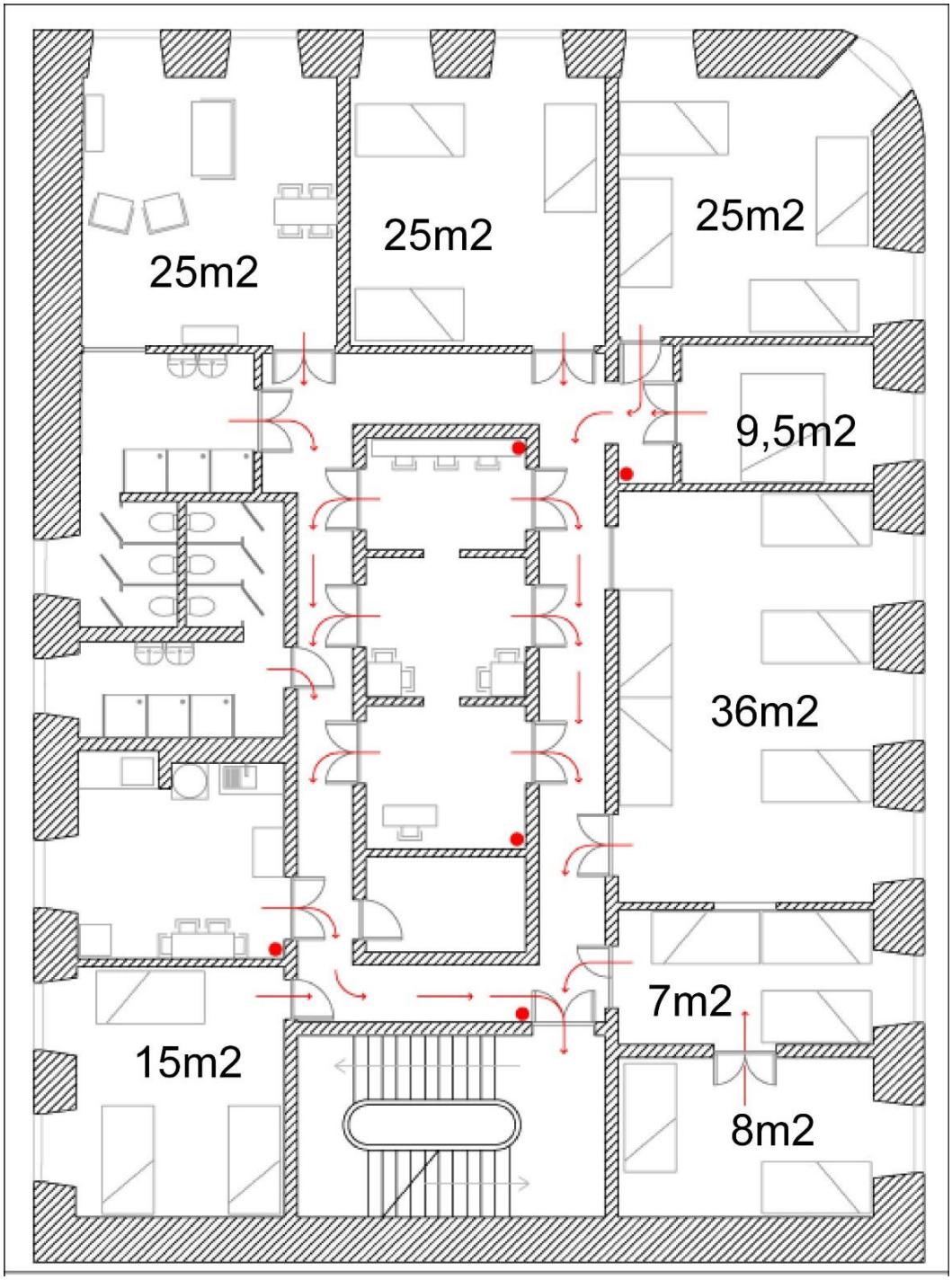
Golden Tram 242 Hostel (2nd and 3rd floor)



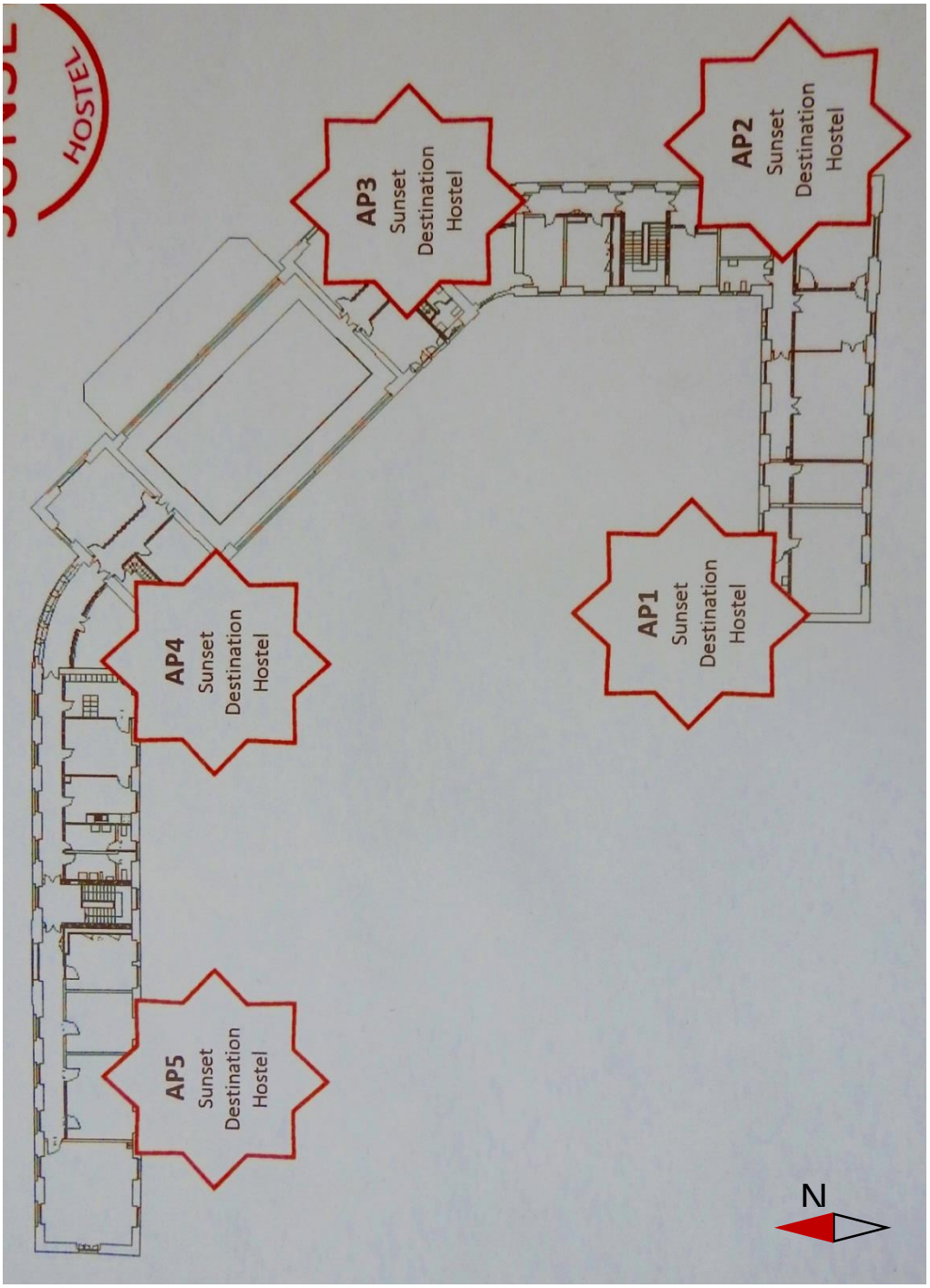
Golden Tram 242 Hostel (4th and 5th floor)



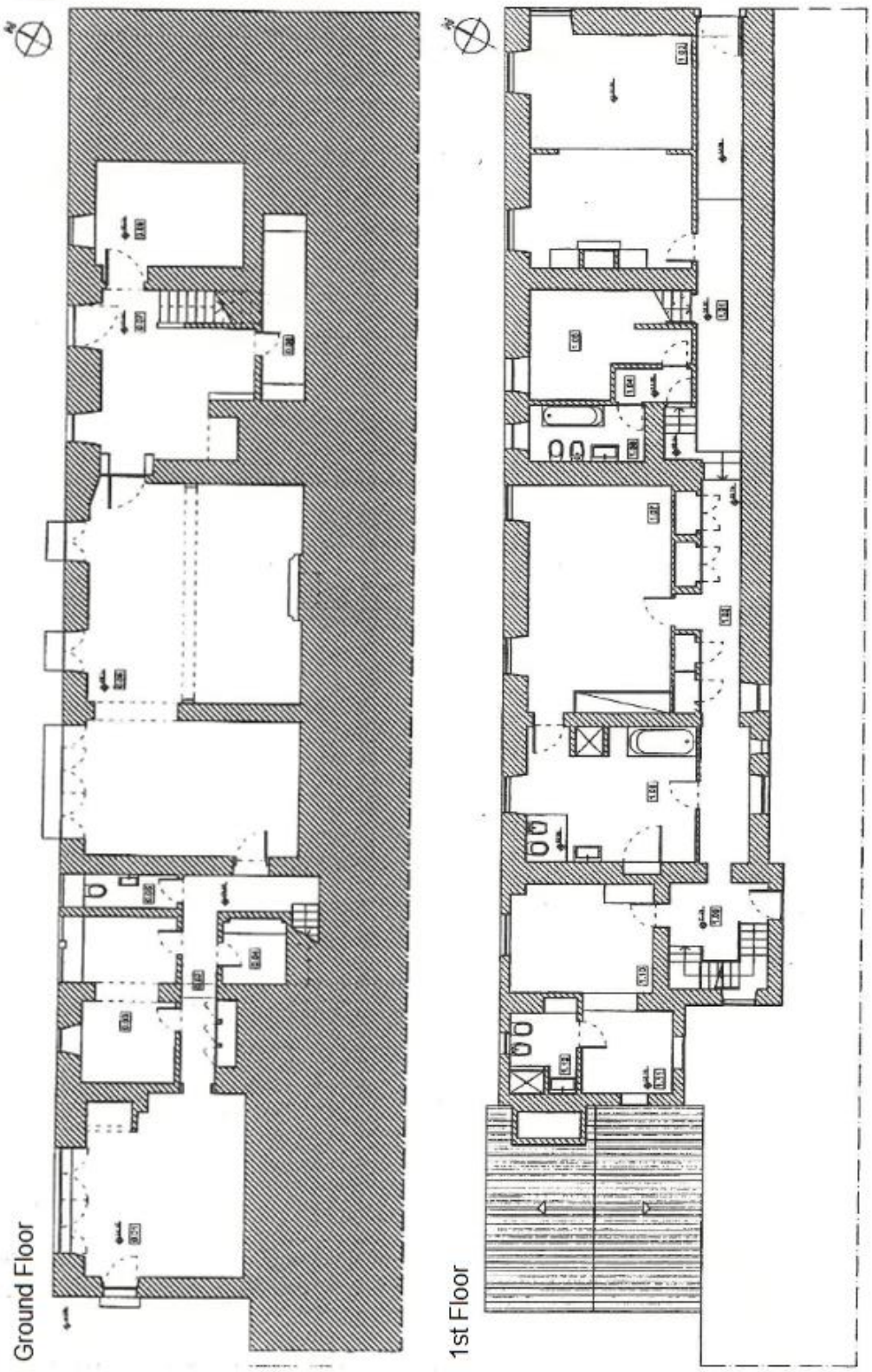
Jardim de Santos Hostel



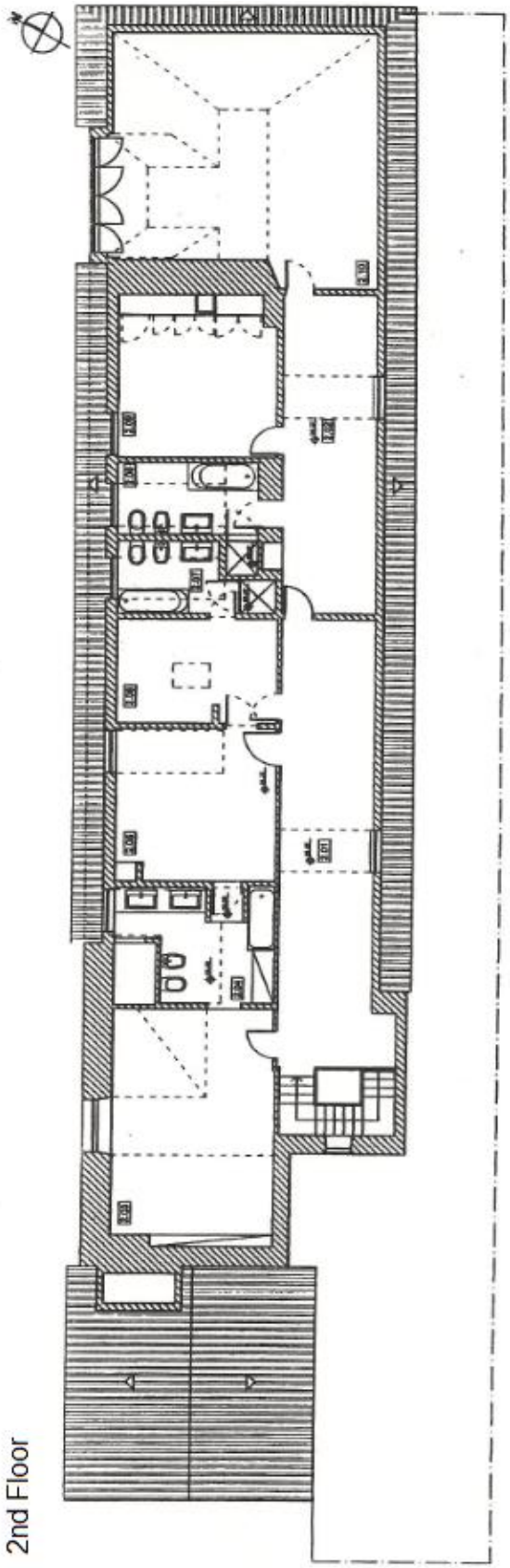
Sunset Destination Hostel



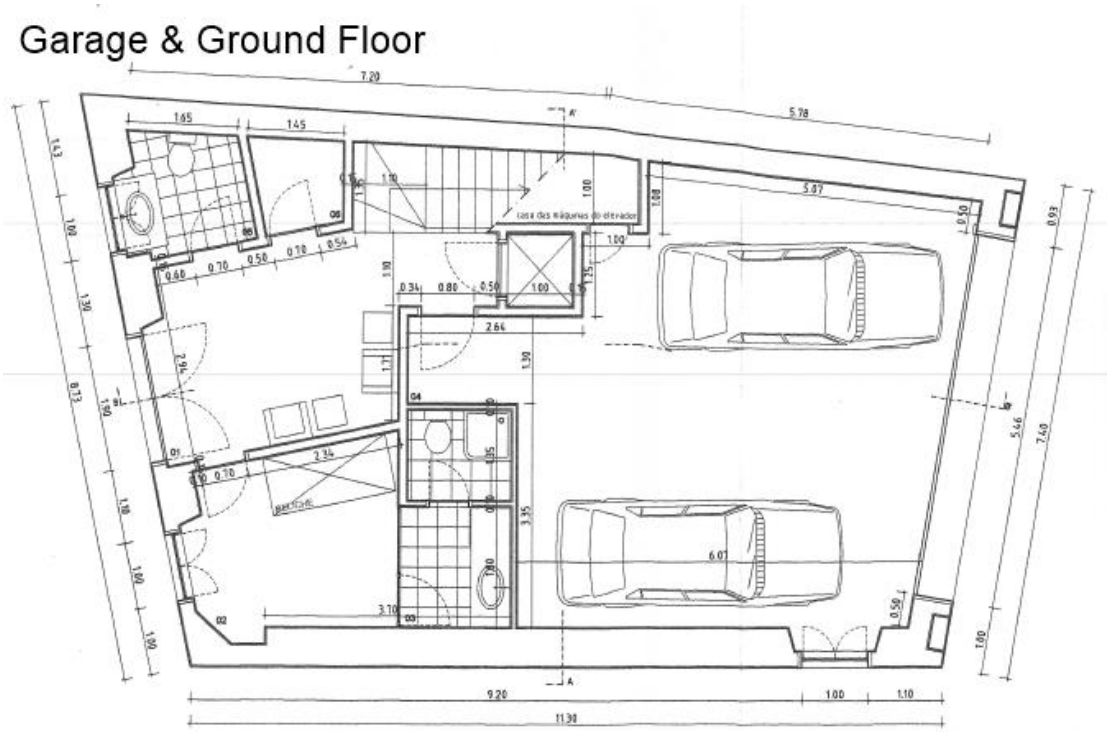
Almáa Sintra Hostel (Ground and 1st Floor)

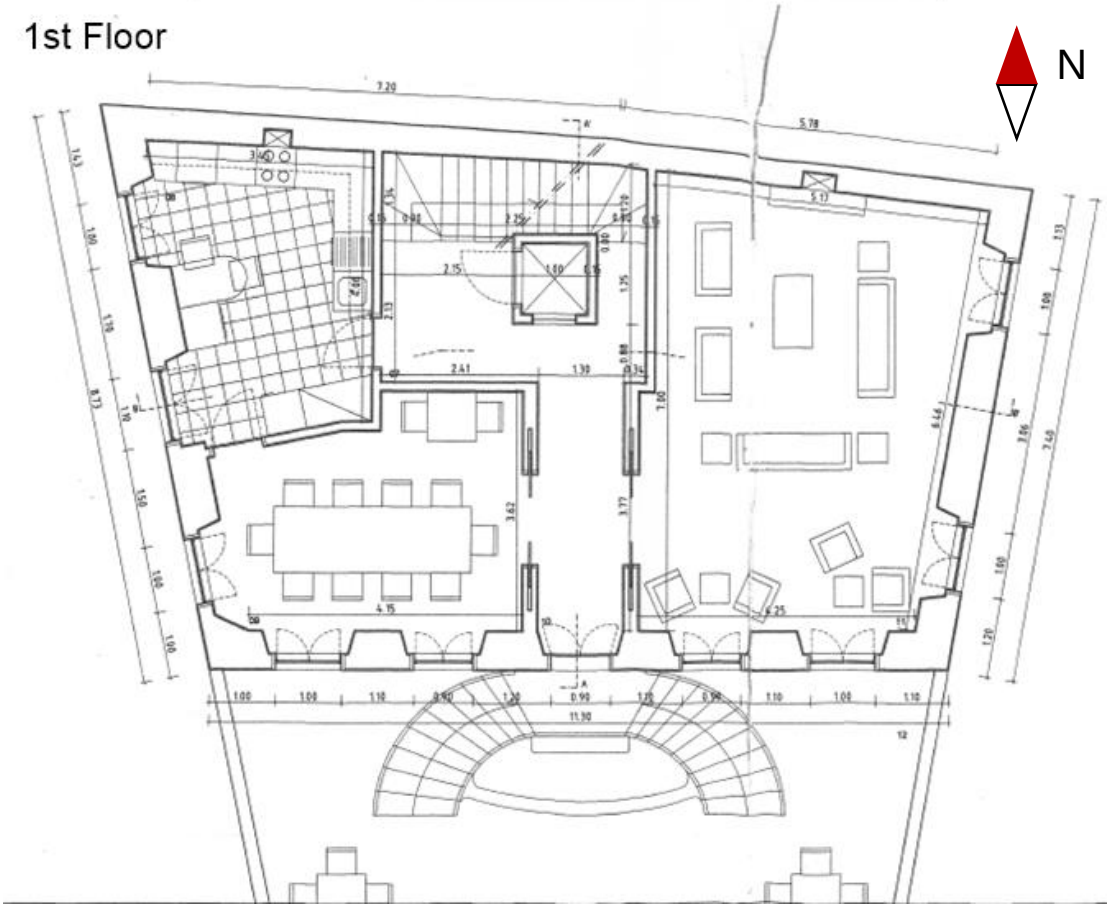


Almáa Sintra Hostel (2nd Floor)



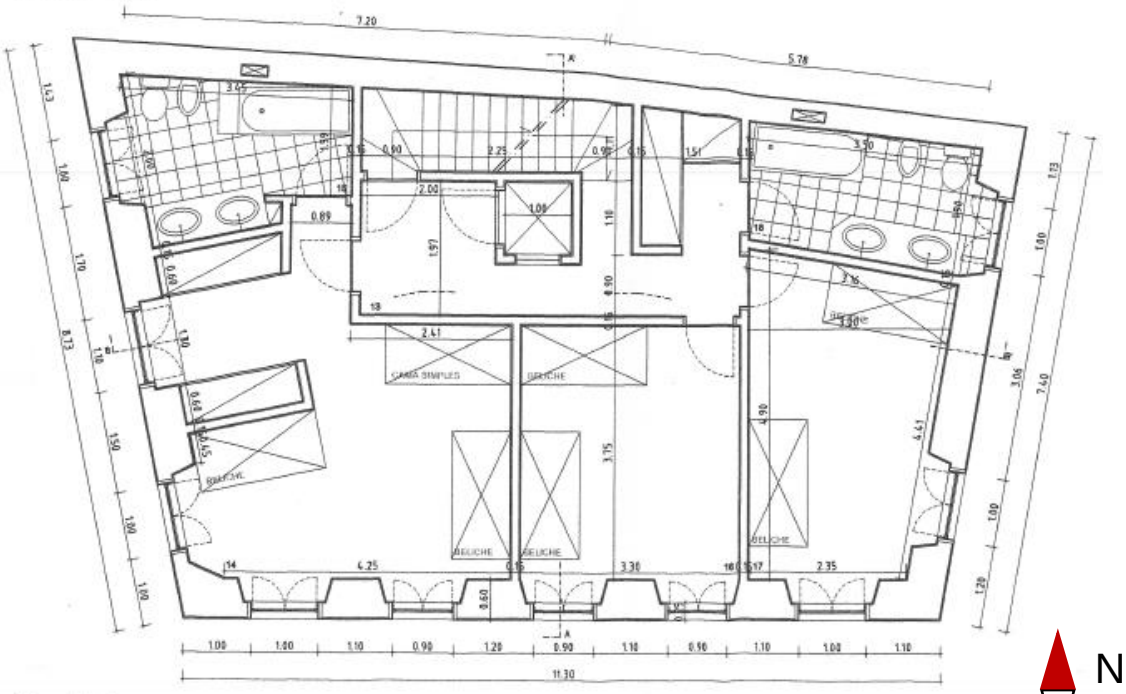
Oasis Backpackers Mansion Lisbon (Garage, Ground and 1st Floor)



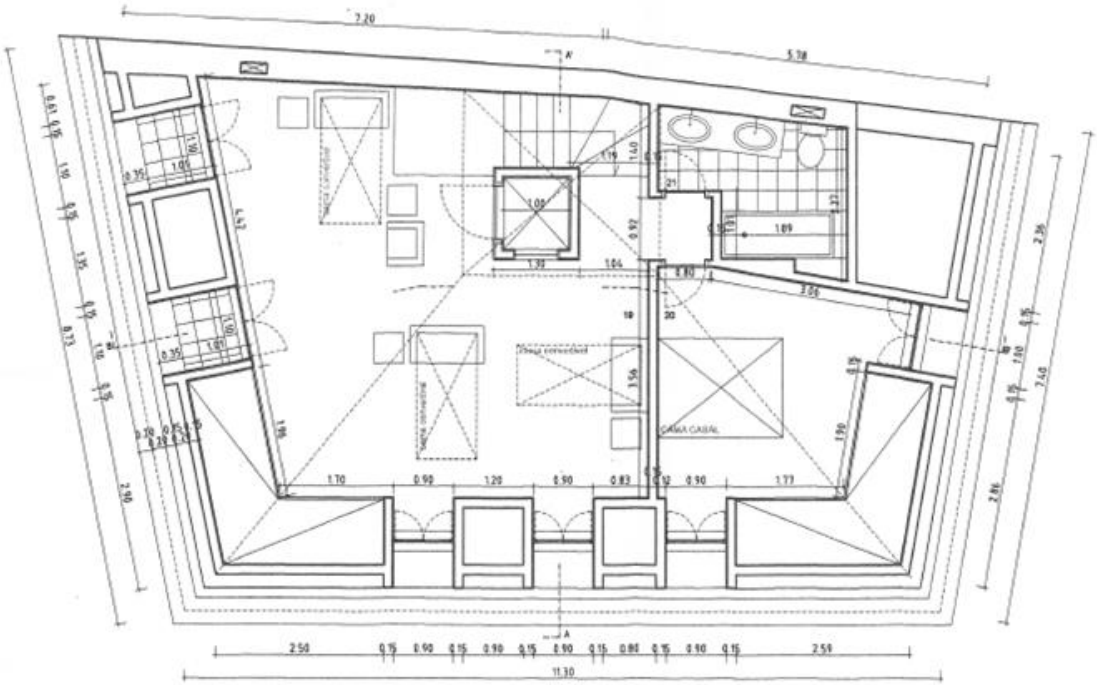


Oasis Backpackers Mansion Lisbon (2nd and 3rd Floor)

2nd Floor



3rd Floor



III – Guideline of Sustainable - Solutions applying to touristic accommodations

This guideline is a support material to help touristic accommodations, like hostels, understand which are their strengths and weaknesses regarding sustainable solutions, and where they can find ideas, advices and facts about ideal appliances, water consumption elements and hot sanitary systems, renewable energies available and adequate to touristic accommodations, among others.

For each category: energy, water, waste and bioclimatic architecture, are going to be described some elements and they are going to be associated with the criteria that can be improvement through them.

1. Efficient use of energy

The white line appliances (washing machines, refrigerators, etc.), electric ovens, air conditioning and light sources are of common use in homes, but also in tourist accommodations. The following equipment presence is frequent, if not a general rule, in hostels, where usually guests are staying a few days and have the opportunity to cook their own meals in the common kitchen, and wash their clothes in the hostel's laundry affordably.

1.1. Appliances

1.1.1. Refrigerators

This is the appliance that consumes more energy. By having a continuous consumption (only turns off for cleaning or due to prolonged absences), it has a considerable consumption, yet not having a high power (200W) compared to a hairdryer which can even reach 2000W power. However, the use time of the hairdryer is much lower, as their consumption over the year.

In order to achieve lower costs, there are a number of practical advices that will reduce by more than 40% power consumption and consequently reduce energy bills and emissions of greenhouse gas (GHG) emissions. The following list summarizes the advice that should be followed:

1. Buy refrigerators with energy label A^+ class or higher. Energy savings and money is guaranteed
2. Calculate the refrigerator capacity or the number of refrigerators to have, it should be based on the hostel capacity, to avoid buying equipment with higher capacity than what is needed
3. Place the refrigerator in a cool and ventilated place, away from possible heat sources: solar radiation, oven, etc.
4. Clean at least once a year, the back of the unit.
5. Thaw before the ice has 3 mm thick. With this, you can achieve savings up to 30%.
6. Make sure that the rubber doors are in good condition and close properly, to avoid cold loss.

7. Set the thermostat to maintain the temperature of 5°C in the refrigerator compartment and the freezer 18ºC.

1.1.2. Dishwasher

It is one of the appliances that consume more energy, representing about 90% of its consumption to water heating. All dishwashers placed on the market since December 2011 are mandatory class A for washing efficiency or higher.

In order to achieve lower costs, there are a number of practical advices that will reduce by more than 50% power consumption and consequently reduce energy bills and emissions of greenhouse gas (GHG) emissions. The following list summarizes the advice that should be followed:

1. Dishwashers with energy label A + class save money and energy
2. Choose the capacity of your machine according to your needs
3. Try to use the machine when it is completely full
4. With half load, use short or economic programs (eco).
5. If you need to pass the dishes with water before getting into the machine, use cold water.
6. Good maintenance improves energy behaviour: frequently clean the filter
7. Keep full deposits of salt and rinse aid, they reduce the energy consumption in washing and drying, respectively.
8. Always go for periods of empty washing up, if you have dual tariff contracted.

1.1.3. Washing machine

Most of the energy that a washing machine consumes between 40% and 90% (depending on washing temperature) is used to heat the water, so it is advisable to use low temperature programs. All washing machines with a rated capacity of 3 kg, placed on the market since December 2011, should be in class A washing performance.

In order to achieve lower costs, there are a number of practical advices that will reduce by more than 50% power consumption and consequently reduce energy bills and emissions of greenhouse gas (GHG) emissions. The following list summarizes the advice that should be followed:

1. Buy washing machines with energy label class A^{+++}, to save energy and money
2. Make the most of the capacity of your machine and put it into operation when fully charged
3. There are machines on the market with half-load programs, which substantially reduces power consumption
4. Choose a detergent that allows to obtain good results at low temperatures
5. If you need to pass the dishes with water before getting into the machine, use cold water
6. To avoid, wherever possible, to pre-wash cycle

7. Separate the fabric for clothing, colour and degree of soiling and select the appropriate program for the type of clothing that will wash
8. Use descaling products to remove fouling resistance and clean impurities regularly the filter of the machine. Thus improve performance, saving energy
9. If you have contracted the bi-hourly rate, try to do the washing and use most of the appliances at night

1.1.4. Clothes dryer

It is a major energy consumer, due to the high powers which features and long periods of operation required for a drying cycle. Thus, it is recommended that its use is restricted to situations where weather conditions do not permit the drying of the laundry in the sun. In any case, it is necessary to spin the clothes before using the dryer.

In order to achieve lower costs, there are a number of practical advices that will reduce by more than 50% power consumption and consequently reduce energy bills and emissions of greenhouse gas (GHG) emissions. The following list summarizes the advice that should be followed:

1. Make the most of the load capacity and put it into operation only when it is complete
2. Before each use, spin the clothes in the washing machine
3. Do not dry cotton clothing and heavy clothing in the same drying load
4. Periodically clean the filter machine and inspect the vent to ensure if it is not blocked
5. Use the moisture sensor to prevent your clothes dry excessively
6. If available, use the program "iron", which does not dry clothes completely
7. The use of this appliance should be reserved for winter, in case of extreme weather conditions or emergency situations that do not allow clothes drying outdoors
8. Use this appliance preferably in peak hours, if there is bi-hourly rate contracted

1.1.5. Ovens

There are two types of ovens: a gas and electric, of which the former are more energy efficient. The electric ovens have energy labels that allow us to know what the most efficient appliances. The energy label distinguishes between three types of size, according to the working volume of the oven: small, medium and large. A G-class oven consumes more than twice the energy of a class oven A.

In order to achieve lower costs, there are a number of practical advices that will reduce the power consumption and consequently reduce energy bills and emissions of greenhouse gas (GHG) emissions. The following list summarizes the advice that should be followed:

1. Prefer a class oven A
2. Do not open the oven unnecessarily. Each time someone do it is lost at least 20% of the energy accumulated inside
3. Turn off the oven just before end of cooking: the residual heat will be enough to end the process

4. Ovens with internal ventilation favour the uniform distribution of heat, save time and therefore use less energy
5. The ceramic or glass containers retain heat better, reducing the furnace temperature and reducing energy consumption. Buy appropriate utensils

1.1.6. Lighting

It is one of the key elements in any home or property, and for this reason is one of the most important energy needs, accounting for about 14% of the electricity that is consumed in a house. For accommodation this will be proportionally higher depending on your size and needs.

To achieve good lighting, it is necessary to analyse the light needs of each hostel areas, since not all areas require the same luminosity, or during the same time or with the same intensity. There are different types of lamps:

1. **Incandescent bulbs**: Light is produced by passing electric current through a metal filament with high strength. They are those with the highest power consumption, cheaper and shorter duration (1,000 hours). Its sale was banned in the market, and were gradually discontinued by the end of 2015;

2. **Halogen bulbs**: They have the same principle of the above, but are characterized by a longer duration and the special quality of its light. There are halogen lamps that require a transformer. The electronic type decreases energy losses as compared with traditional, and the final consumption of electricity may be up to 30% lower than conventional lamps;

3. **Tubular fluorescent lamps**: They are based on the light emission that some gases such as fluoride emits when subjected to an electric current. The luminous efficacy is so much greater than in the case of incandescent lamps, since this process produces less heat and electricity intended in greater proportion, to obtain the proper light. They are more expensive than incandescent bulbs, but consume up to 80% less electricity than those for the same light emission and have a duration of between 8 to 10 times higher;

4. **Compact Fluorescent Bulbs (CFLs)**: They are small fluorescent tubes which have been gradually adapted to various sizes, shapes and supports the lamps that are normally used. For this reason, the energy-saving lamps are also known as compact. They are more expensive than traditional, though their electricity savings amortize allows greater investment long before finishing his lifetime (between 8,000 and 10,000 hours). They last eight times longer than traditional bulbs and provide the same light, saving about 80% energy compared to incandescent. Therefore, its use is recommended.

5. **LED bulbs**: A LED (Light Emitting Diode) consists of several layers of semiconductor material. Usually are applied for decorative lighting, but there are already available LED lamps for direct replacement of incandescent lamps, halogen and fluorescent, in various sizes and supports. They achieve savings up to 90% energy in replacing incandescent lamps, and although more expensive than energy-saving lamps, can ensure more than 30.000h of operation, 100% immediate light when connecting and a high number

of cycles switch on/off. LED technology does not use toxic components in their composition and are mercury-free.

So, regarding bulbs LED are the best owns in terms of efficiency achieving savings up to 90% comparing to incandescent lamps, although lighting subject is not so simply like that. They are a lot of considerations that every hostel, every touristic accommodation should study and after understand which solutions are better. Nevertheless, LED bulbs are today the best energetic option and should be implemented the sooner the better.

In order to achieve lower costs, there are a number of practical advices that will reduce the power consumption and consequently reduce energy bills and emissions of greenhouse gas (GHG) emissions. The following list summarizes the advice that should be followed:

1. Whenever possible, use natural light
2. Prefer bright colours on the walls and ceilings. best take advantage of the natural lighting and can reduce artificial
3. Do not leave lights on in rooms that are not being used. Use movement sensors or timers
4. Minimise ornamental lighting in outdoor areas (gardens, etc.)
5. Keep clean the lamps and respective protections or ornaments. The luminosity will be increased, without increasing the power
6. Replace incandescent bulbs for compact fluorescent bulbs. To the same level of lighting, saving up to 80% energy and last 8 times longer. In replacement, give priority to those that gives more use
7. Adjust the lighting to your needs and give preference to those who are localized. In addition to saving the environment will be more comfortable
8. Place regulators electronic light intensity
9. Use tubular fluorescent lamp which requires light for many hours, such as in the kitchen
10. In the halls, garages and common areas, placing detectors presence so that the lights come on and go off automatically.

1.2. Air heating systems

As an example, about 22% of energy consumption in a Portuguese family home is intended for room heating. The climate zone, the type of use that is given to the building and the cost of different systems and equipment are factors that must be considered in our choices.

The following lines are going to focus on the different kinds of heating systems, water and air heating systems, available in the market, for all kinds of needs and functions.

1.2.1. Central heating system

System intended for heating rooms, which can also produce hot water for domestic use central heating. The most common systems are composed of the following elements:

- Heat generator: usually a boiler, in which water is heated to a temperature of 90°C.
- Units of regulation and control: they serve to adapt the system's response to heating needs, seeking to be reached, but not beyond the pre-set comfort temperature.
- Distribution system and heat emission is composed of pipes, pumps and radiators, within which water circulates delivering heat.

1.2.2. Radiators

The radiators are devices which is performed the heat exchange between the heated water and the space we want to heat. They are made of sheet metal, aluminium or steel. The best placement of the radiators, for reasons of comfort, should be below the windows by matching the length of the radiator with the window, so as to promote the correct diffusion of hot air heated by the division.

1.2.3. Radiant stepping system

The hot water radiators may be replaced by a flexible tube serpentine in which circulates hot water, built into the ground of the divisions. Thus, the soil is converted into heat emitter. The temperature that has to heat the water is much lower (usually between 35°C and 45°C) compared to a traditional heating system.

1.2.4. Heat pump system

Being independent equipment in general, they are more recommendable centralized systems, where the heat transferred by the heat pump is distributed by a network of conduits and air diffusers (the most common) or by passing air through hot water pipes (fan coils). The advantage of the system is its high efficiency: per kWh of electricity consumed heat is transferred between 2 and 4 kWh heat. In addition, the heat pump permits not only heat the housing, but also to cool it.

1.2.5. Boilers

For boilers and using liquid or gaseous fuels, there is a catalogued system with stars that compares the energy yields, and it is defined in a four-star scale. Greater the boiler size, the greater will be its efficiency. That’s why it is so important to choose carefully, according to the needs, which boiler is more adequate.
Given the type of combustion, boilers can be:

- **Atmospheric**: when combustion takes place in contact with the air from the room in which it is placed;
- **Watertight**: when the intake air and gas extraction takes place in a closed chamber without any contact with air from the room where it is installed. They have better yield than atmospheric boilers.

Noteworthy are also the boilers with **automatic modelling of the flame**. This system minimizes starts and stops boiler, saving energy to continually adjust the heat produced to real

needs, by controlling the produced thermal power (power of the flame). In addition to the normal boilers exist in the market another type of boilers with higher yields:

- **Variable temperature boilers**
- **Condensing boilers**

Although they are more expensive than conventional (up to twice the price), can produce energy savings of over 25%, recovering this way your additional investment.

1.2.6. The Heat Adjustment, Comfort Temperature in winter and other advices

The tourist accommodations heating needs are inconstant, both throughout the year, as throughout the day, as there are daily temperature fluctuations is not necessary the same in every room of a house. In divisions used during the day (day zone), the temperature should be higher than in the rooms (night zone), for example. There are also spaces like the kitchen, which have their own sources of heat and require less heating. So it is very important to have a heating control system that adapts the temperature of the room to our needs.

One of the best ways to avoid waste energy and unnecessary costs is to understand the building and the people's needs. For sure, anywhere we go the comfort temperatures are different from people to people, but they are more a less the same if people come from the same climate zones. Above all, the winter comfort temperature is one of the factors that can help us to achieve better performances and avoid wastes, because the temperature programmed for heating determines the system own energy consumption. Each degree of temperature increase implies an increase in energy consumption by approximately 7%. Although sensation of comfort is subjective, as a rule a temperature between 19ºC and 21ºC is sufficient for most people. Also, at night, in the rooms just have a temperature of 15ºC to 17ºC to feel comfortable.

Another way to save energy to bet on regular maintenance of heating appliances, because there may be efficiency declines up to 15% when they are degraded.

Last but not least, is the aeration of divisions for air renewal. To achieve optimum renovation levels is only necessary to open the windows between 10 to 15 minutes. The heating system should only be turn on after the aeration of the areas.

1.3. Insulation

It is important to know the amount of heat that is needed to maintain the building, and each division with a comfortable temperature. This depends to a large extent, your level of thermal insulation. A poorly insulated building, needs more energy. In winter cools more rapidly and can provide condensation on the inside. In the summer heats up and in less time.

It is through the exterior cover of a building that loses or gains heat, if it is not properly isolated. For this reason, the upper areas, like attics, are usually coldest in winter and hottest in summer. In any case, a good insulation of walls, including separating adjacent buildings, as well as reducing noise, prevents heat losses. However, heat can dissipate by many other places, particularly the windows and glass surfaces, frames of doors and windows, shutters boxes for

rolling without insulation, pipes and ducts, chimneys, etc. It is therefore desirable to have a heating control system that adapts the building temperatures for our needs.

1.3.1. Windows

About 25% to 30% of the heating demand are due to heat losses that arise in the windows. Thermal insulation of a window depends on the quality of the glass and its frame. Double glass systems or double window reduce by almost half the heat losses, compared to normal glass, in addition to reducing the air currents, condensation and ice formation. The type of frame is also determinative. Some materials such as iron and aluminium are characterized by their high thermal conductivity and therefore allow passage of cold or heat with easiness. It is worth highlighting the window frames called with “thermal cut”, containing insulating material between the inner and outer.

1.4. Air conditioning

Air conditioning is also one of the most purchased equipment in recent years, and cooling requirements can represent up to 2% of electricity consumption in a regular house in Portugal.

Contrary to what happens in the case of heating systems, it is unusual in our country to build buildings with air conditioning centralised systems. This means that most facilities are composed of independent elements. They are so, rare the centralized or collective facilities, although they are much more efficient and avoid the need to install equipment on the facades of buildings.

1.4.1. Type air conditioning equipment

Currently there are 4 types of air conditioning equipment, each one with different characteristics that should be analysed and adapted to the needs. The following lines explain their differences:

- **Conventional unit** (window installation) composed by a single unit, usually with smaller dimensions than the other types of apparatus, which can impair the efficiency. This kind of equipment consume more energy than the split type;
- **Conventional Portable unit**, similar to the conventional but portable. Are models of small dimensions, which makes them less effective;
- **Split**, the most common models are composed of two units: one to put on the inside and another outside the building. There are designs that allow only cooling air or additionally, heat it, when equipped with the heat pump;
- **Multi-split**: composed by a unit to be placed on the outside and several on the inside of the building, which allows us to have air conditioning in many rooms as we want.

For touristic accommodations, if the intention is to use air conditioning, the best option is the pre-installation of a centralised system, because not only will avoid the need to install equipment on the interior and exterior facades (that needs much more care), but also are much

more efficient. In case the building is old, already built or in the beginning there was no need of this installation, the centralised system might not be the best solution. A multi-split system perhaps will be better. Here is very important to understand the real needs to not over dimension the equipment.

1.4.2. Advices and other tools

It is important to be advised by a qualified professional about the type of equipment and power that best fits your needs of cold and/or heat. Depending on the features of the building to be conditioned, if the building is very sunny, we should increase the refrigeration capacity. On the other hand, the construction materials, the orientation of the building and its design, largely influence the cooling needs.

It is possible to achieve savings of over 30%, if there is an installation of the awning in the windows more exposed to the sun, and also adequately insulate walls and ceilings.

The following table provides information which serves as a guide for choosing the air conditioning system cooling power, taking into account the surface area to cool. These amounts are not applied to buildings or tourist accommodations, but can be a guide when choosing the equipment. However, these values are adapted to the Portuguese climate by Adene Agency, which is already an orientation quite right.

Table 43: Air conditioning surface according to the cooling power needed (ADENE, 2011)

Surface (m^2)	**9-15**	**15-20**	**20-25**	**25-30**	**30-35**	**35-40**	**40-50**	**50-60**
Cooling power (Kw)	1.5	1.8	2.1	2.4	2.7	3.0	3.6	4.2

The following list is also a compilation of actions that could save relevant amounts of energy:

1. Air conditioning with adjustable intensity by the customer in the rooms, and automated system in the common spaces.
2. Equipment efficiency Class-B or higher
3. When turning on the air conditioner, do not set the temperature to a lower value than normal: it does not cool the divisions more quickly and can be excessive cooling and, therefore, result in unnecessary expense
4. Install awnings, close the shutters and close the curtains are effective measures to maintain the temperature of spaces
5. A fan, particularly in the ceiling, can be sufficient to maintain an adequate level of comfort
6. It is important to put air conditioners in places that are not reached by the sun or where there is good air circulation. In the case of condensing units meet placed on the roof, we recommend creating a shading system
7. The light colours in ceilings and outer walls reflect solar radiation thus preventing the heating of indoor spaces

1.5. Good practices in action

When a study at the Hotel Nikko of 17 floors in Hong Kong, found that a third of guests did not turn off the main switch of electricity to come out of their rooms, the hotel has installed automatic operation controlled by key card. The hotel estimates the key card system saves $ 0.30 per room per day. With an initial cost of $ 21 per key, the amortization period is 70 days. This solution can be implemented in hostels considered large (more than 150 beds) according to Hostelsworld website, where lighting control is more difficult to do effectively.

The Seattle Westin Hotel achieved a reduction of 66% in wattage and an annual savings of $ 400,000 in exchange for incandescent bulbs with compact fluorescent lamps that save energy and improving control mechanisms. This action is one of the easiest things to do in touristic accommodation and shows immediate results in energy bills. Also reduces significantly the hazardous waste cause by the lamps due to its extraordinary duration comparing to incandescent bulbs.

The Taj Group of Hotels which uses solar heating to cover 50 to 100 percent of the hot water needs of all their hotels, found that investments in solar power pay for themselves in just two years. Maybe this action cannot be applied in all hostels, especially in Lisbon where many hostels facilities don't have access to the roof of the building where they are located. But anyway, is one excellent action for large and medium hostels with terraces or roofs.

2. Efficient use of water

In many parts of the world, the demand for water exceeds supply and seriously overloads the available water resources. Some of the most deprived areas of water, such as the Mediterranean, are also home to some of the biggest international destinations.

The guest demand for water usually far exceeds the locals. In addition to the water required for each hostel room and general activities of the hostel administration, such as kitchens and laundries, other elements such as swimming pools and lawns, can significantly increase the total use. Excessive water use can degrade or destroy local water resources, threatening the availability of water to meet local needs. The problems could get worse in areas where high tourist season corresponds with periods of low rainfall.

Adopting water saving solutions will reduce in the total water consumption and can lead to a reduction in costs; especially during periods of drought, use restrictions or under government regulations increasingly stringent regarding the use of water. Also, will help conserving and protect the local water resources which the hostel depends and the local community. The preservation of the quality of local water resources is also can eliminate the need for costly treatment processes of drinking water.

In conclusion, water saving actions not only reduce impacts on natural environments and costs, but is a very interesting policy for enhance reputation among guests and others concerned with the reduction of water consumption and protecting local resources.

2.6. Hot water

2.6.1. Snapshots systems

Snapshots systems heat water when activated. It is the case of gas water heaters, electric or wall mounted boilers. Its disadvantage is that, until it reaches the desired temperature, wastes a considerable amount of water and energy, the greater as the distance between the heating system and the point of consumption. Another important disadvantage is that whenever you need hot water, the machine starts operating and the "stop-start" system greatly increases the consumption and deteriorates equipment. On the other hand, also have very limited benefit in supplying two points consumption simultaneously. Despite this, the instant systems are still the most common in the hot water production.

2.6.2. Accumulation systems

The accumulation systems may be subdivided into two types:

- Equipment which heats the water (for example, a boiler or a heat pump) and water heater;
- Heaters of electrical resistance.

The boiler systems with integrated battery are the most commonly used among the centralized production of hot water systems. The water, once heated, is stored for later use in an insulated accumulator tank. These systems have several advantages:

- Avoid permanent "stop-start", starting to work continuously and therefore more efficient;
- The accumulated hot water allows simultaneous use while maintaining the comfort levels.

Another amazing way of reducing the electricity costs is to implement solar panels in roofs and terraces in order to provide heating to the boilers. This system is regularly used in countries with lots of sunshine hours, like in Portugal and Spain, and could be a valuable source of energy in several hostels and touristic accommodations.

On the other hand, the electric resistance water heaters are not a recommended system from the energetic and financial point of view. When the temperature of the water contained lows until a certain level, it starts operating an auxiliary resistance. This electric resistance spends additional energy, and it is therefore important that the water heater, as well as being well insulated, is used only when it is really needed by a programmer clock. Within the electric heating variants, the most appropriate systems are heat pump and accumulation with bi-hourly rate.

2.7. Waterless toilet systems

A waterless toilet provides a pratical and clean alternative to a regular flush toilet, being 100% waterless system. This systems don’t require water or a connection to a sewer or septic tank, being usually easy to install. Some systems are absolutely odorless thanks to

an active vent system included and no need of chemicals, and work without any electric device. Others can use solar panels to charge their batteries. They are also called composting toilets.

The technology uses a predominantly aerobic processing system to treat human excreta, by composting or managed earobic decomposition. The solid waste is collected in a small discrete compost chamber directly beneath the toilet pedestal. A low powered 12 volt or alternatively 240 volt electric fan continually circulates air through the chamber speeding the composting process and eliminating odours. Liquids are separated from solids and evaporated by the fan. Any excess liquid is dispersed into a small bath tub sized trench.

So, these toilets can be seen as na hygienic method of recycling human waste, by managing to separate waste and wastewater (i.e., greywater), avoiding the need to waste and pollute potable water.

They have found use in situations where no suitable water supply or sewer system and sewage treatment plant is available to capture the nutrientes in human excreta. So, they are more suitable to be used in hostels closely connected with their green and permeable áreas, mainly rurals, to immediately connect the toilets with a composting bin or any other structure adequate to composting.

Some brands like Ecoflo ande z-Loo have different types of manufactured composting toilets, but all systems are a greywater treatment system to provide a full on-site wastewater management solution.

2.8. Advices and other tools

The following list is also a compilation of actions that could save relevant amounts of energy:

1. For hot water production are advisable accumulation systems
2. It is very important that the accumulators and hot water supply pipes are well insulated. Good insulation is the basis of savings
3. Provide only the shower option in the bathrooms. A shower can consume about 4x less water than a bath
4. Put reducing water flow in all taps. The low-flow fittings in showers can reduce the water flow by 50% without affecting the customer's comfort level
5. The temperature regulators with thermostat, especially in the shower, can save between 4% to 6% of energy
6. The double button or partial discharge systems for the flushing saves a large amount of water
7. Regularly monitor the water consumption for each hostel area (kitchen, laundry, bedrooms, bathrooms, etc.) Daily or weekly monitoring helps to identify leaks and to quantify water savings when efficient equipment is installed or the implementation of a good practice

8. Encourage guests to use their towels or linens for more than one day. In Portugal, it is required by law that the sheets are changed 2x in the space of five days, or whenever a guest out obviously
9. Work with employees to identify practices for saving water, such as not leaving the water running, or operating washing machines and dishwashers only when full
10. Use drip type irrigation systems and select species of native plants, drought-resistant, for landscaping
11. Reutilisation of inferior water quality (rainwater or from own WWTP) to irrigation, washes and discharges

A concrete example of the last advisable action is the Apple Farm Inn and Restaurant, a luxury hotel in California, USA, with only seven rooms used the water discharged by washing machines to flush toilets, saving 15.900 litres of water per day and approximately $ 5,000 per year. For a hostel with capacity for 75 people minimum or more, can be achieved very significant savings in water and costs.

3. Waste management and energy recycling

The waste is a potential source of energy and raw materials that can be harnessed in production cycles, by appropriate treatments. About 70% of recyclable waste will end up in the dustbin, so only a small part is recovered. Currently, there are ways to not produce as much waste and to recover raw materials and resources contained in waste. To improve this situation, we all, as citizens, managers and owners, must take our responsibility and act, acquiring new buying habits, reducing waste, making selective separation of waste, as well as request the authorities and companies corrective measures (ADENE, 2011).

Tourist accommodations generate large amounts of solid waste from packaging and food waste, to cleaning and maintenance products, some of which are toxic. In many cases, waste is accumulated in badly designed waste dumps, discarded directly into the sea or rivers, or simply dumped in areas out of sight of customers. In addition to visually degrading a destination, improper waste disposal can lead to contamination of water and soil pollution through leaching of contaminants from waste piles. Poorly designed waste dumps can result in fires, odours, flies and ineffective containment of wastes.

Uncontrolled disposal of toxic items such as paint cans, batteries, lamps, oils, stoppers and others can severely contaminate water, air, and soil, threatening the environment and human health.

3.6. The rule of 3 R's

Whether in the domestic context or in tourism, minimizing the problems caused by waste depends largely on consumers. The responsible consumer must choose products that do not create waste and are recyclable in the domestic context. Another important action is the separation of waste, thus facilitating its further processing, which should also be practiced on the

road. The key to a systematic approach to waste is based on the famous 3 R's: Reduce, Reuse, and Recycle.

3.6.1. Reduce the waste

The family packs are preferable to individual packages. In general, we should be more careful when buying disposable products, such as paper napkins or plastic dishes. It is preferable to choose objects that can be used more than once.

3.6.2. Reuse Products

It consists of harness the potential that these products can offer us, or if this is not possible, return them to the commercial circuit where they were purchased. There are some types of beverages which still retain a commercial distribution based on reusable glass bottles, which after being washed back to the circuit. The use of rechargeable batteries and recipients in devices that allow, is another great way to reuse products.

3.6.3. Recycle

This process consists in allocate recyclables in their Eco points for that after appropriate treatment can be re-entered the market. Thus, it is possible not only to avoid the deterioration of the environment, promoting a significant savings of raw materials and energy.

Materials with larger recycling rate is paper, glass and metals. For example, the tires can be used for sound reducing materials on the roads, or can also be availed of an energy point of view, to replace fossil fuels in cement kilns. Currently, the cooking oil is used in the production of biodiesel. In addition to known containers for packaging recycling, organic waste and paper, there are also containers and specific services for collection:

- Batteries;
- Appliances and other electronic equipment;
- Toners and ink cartridges;
- Fluorescent lamps;
- Corks.

A good example how important is recycling is to compare new paper and recycled paper. To make a ton of paper are required between 12 and 16 medium sized tree, about 50,000 litres of water and more than 300 kg of oil. On average, the recycled paper requires 74% less energy and less than 50% water that the paper obtained from virgin wood.

3.7. Advices and other tools

Since 70% of the total produced waste can be recycled, and knowing the degradation duration of paper, plastics, metal and glass, is extremely important the implementation of the 3 R’s rule, and assure that guests and staff understand its importance.

No less important are the organic waste, which is also possible to recycle. Whenever possible, compost bins should be provided in kitchen work areas and gardens. In hostels can be a bit difficult this implementation because the kitchen is mainly used by guests, as it appeals to the sensitivity of people, however the fact that there is already halfway to success.

This measure might not be applied to all hostels, but for those who are located in sensitive areas, or nearby natural areas, it is important to provide trash containers in strategic areas, particularly in access to beaches, green areas and along trails.

In such a complex sector as tourism, reaching so many different styles of travellers, nationalities and habits, is important that sustainability is present. If the hostel invests in a consistent policy for waste management, guests will feel the need of do the same, guest will see it as an example.

4. Renewable energies in touristic accommodations

If there is the possibility of build a hostel, capacity of decision in its construction, or easy access to the surrounding natural resources, that can be the opportunity for taking advantage of that resources in the hostel's benefit. There are a few types of renewable energies that can, and should, be harnessed by hostels and other touristic facilities. Thermal solar, photovoltaic solar and biomass energy are the types of renewable energy often use and adapted to touristic accommodations, and easy to implement in the hostel's market.

4.1. Thermal solar energy

Its main application is the production of domestic hot water. However, it may be an interesting supplement to the heating support, particularly for systems using water at less than 60°C, as with the radiant stepping heating systems. In all cases, the solar thermal systems require conventional support systems for producing hot water (gas boiler, diesel boiler, etc.). Solar thermal energy is integrated in new buildings as an additional facility that can ensure an important part of the sanitary hot water needs, heating and cooling.

The correct sizing of the system, and proper maintenance, guarantee high production and a significant durability that can overcome twenty years, always with a good performance. A solar thermal system, like any other installation in a building, should have a proper maintenance performed by certified technicians. Although is needed a correct sizing of the system, a solar system should never respond to 100% of the requirements since it is convenient to install a system capable of meeting the needs in times of increased consumption, remaining excess collectors unused, in times of lower consumption.

Refrigeration with solar energy is one of the applications with more future since the times of increased solar radiation coincide with the period of greatest need for cooling.

This type of renewable energy is one of the most implemented in touristic accommodations, not only in rural areas but also urban. Like mentioned in section 3.1.6, thermal solar energy system is an investment but the reduction of energetic costs pays for it. So the

investment is made, the building obtains its own energy for heating systems, and there is no need of buying energy from the network, guaranteeing the use of a clean energy.

4.2. Photovoltaic solar energy

The discovery of the photovoltaic effect allowed convert the energy released by the sun, in the form of solar radiation directly into electricity. The first significant investments were made in isolated houses and pumping systems. However, the sector's development took place with the facilities connected to the network, which allowed the exponential growth of production capacity and the installed power worldwide.

The uses of photovoltaic solar energy are growing and increasingly diverse. May settle two major groups:

- **Facilities isolated from the power grid**: stand up rural electrification and agricultural applications (water pumps, irrigation systems, lighting, supply electric milking system, cooling and conditioning of water).
- **Installations connected to the grid**: can be photovoltaic (of any power) or integrated facilities or overlapping in buildings (facades and roofs). In these installations, the investment is recovered through the sale of energy produced at a regulated tariff.

4.3. Biomass energy

Biomass is organic matter of animal or plant origin, which include organic, susceptible waste energy recovery. Biomass is a renewable source of fuel to produce energy because the waste residues will always exist – in terms of scrap wood, mill residuals and forest resources; and properly managed forests will always have more trees, and we will always have crops and the residual biological matter from those crops. With a constant supply of waste – from construction and demolition activities, to wood not used in papermaking, to municipal solid waste – green energy production can continue indefinitely.

It is a renewable energy source not only because the energy in it comes from the sun, but also because biomass can re-grow over a relatively short period of time compared with the hundreds of millions of years that it took for fossil fuels to form. Through the process of photosynthesis, chlorophyll in plants captures the sun's energy by converting carbon dioxide from the air and water from the ground into carbohydrates—complex compounds composed of carbon, hydrogen, and oxygen. When these carbohydrates are burned, they turn back into carbon dioxide and water and release the energy they captured from the sun (Union of Concerned Scientists, 2015).

Fossil fuels such as coal, oil and gas are also derived from biological material, however material that absorbed CO_2 from the atmosphere many millions of years ago. The vital difference between biomass and fossil fuels is one of time scale. Biomass takes carbon out of the atmosphere while it is growing, and returns it as it is burned. If it is managed on a sustainable basis, biomass is harvested as part of a constantly replenished crop. This is either during woodland or arboriculture management or coppicing or as part of a continuous programme of

replanting with the new growth taking up CO_2 from the atmosphere at the same time as it is released by combustion of the previous harvest. This maintains a closed carbon cycle with no net increase in atmospheric CO_2 levels (Biomass Power Association, 2016).

Although the most familiar forms of renewable energy are the wind and the sun, biomass is the oldest source of renewable energy, used since our ancestors learned the secret of fire. It is also 2 times more effective in reducing GHG emissions that any other type of renewable energy.

Among the main solid biofuels, we can highlight the olive pits, nut shells (almond, pine nuts) and of course, forest residues and their industries.

4.3.1. Types of biomass:

1. Forest residues: are produced during forestry activities or to their defence and improvement, or to obtain raw materials for the forestry sector (wood, resins, etc.);
2. Herbaceous and wood agricultural waste: are obtained during the harvest of some crops, including grain or corn, and the olive harvest, vines and fruit trees;
3. Waste from forestry and agricultural industries: are composed of the shells and splinters of wood industries and the stones, shells and other waste from the food processing industry;
4. Energy crops: crops are plant species specifically designed for the production of biomass for energy use;
5. Other types of biomass: can also be used for energy uses other materials such as organic matter from domestic waste or recycled by-products of the wood or plant and animal materials.

Independently of the type of biomass, this renewable energy is the less used in Portugal, not because it has less potential but the conditions to do it are more linked with rural areas. The majority of the touristic accommodation, in the study area, are located in the urban centres, in the case of Lisbon, where the density of cultural and historical attractions is, or along the shore, in case of Cascais, to take advantage of the landscape, the fresh air and the beach itself. In Sintra, due to its natural surroundings, biomass energy is more suitable. Nevertheless, one way to contribute is to do the separation between undifferentiated waste and organic, and deliver the last to the selective collection of organic residues services of the Intermunicipal Services of Water and Residues (SIMAR) from Loures and Odivelas, in partnership with Valorsul. This service collects organic waste to recovery in 600 establishments in the 2 municipalities.

5. Bioclimatic architecture

In each location all over the world every day buildings are erected, as there is always a need to have a structure, in one way or another. Among all types of buildings, from industrial, commercial, educational, institutional, etc., one of the most dominant is the tourist accommodation building. In addition to being dominant, it is a type of building which increasingly needs to be adapted to its surroundings, to the available natural resources and local problems, in order to contribute to a gradually more sustainable sector. For any building to be effective and serve its occupants the most adequate way, there are a number of basic amenities that should be present as electricity, pipe borne water, cooling and heating systems, as well as others that make the user's life more comfortable possible.

Buildings consume many natural resources, as was seen in the previous sections, due to various utilities and accessories used in the construction system, operation and maintenance. With inefficient management, the environment is polluted with waste produced by these processes. According to Edem, the energy used determines the amount of waste generated (Edem, 2010). Applying sustainability in architecture promotes the proper use of the ecosystem in favour of the building, without causing damage. It is therefore imperative to be able to combine the projects of buildings in harmony with the local environment and the microclimate which are constructed by adopting the approach bioclimatic design.

The meaning of bioclimatic is easy to understand, that does not mean that the bioclimatic energy is too. Bioclimatic results from the combination of two words, "bio" means the natural form of living "things" and "climate" the regular pattern of the weather conditions in a particular location (Hornby, 2000). The bioclimatic energy is the comprehension of the weather conditions, in order to use them for energy in the building to be constructed or in operation. According to Proharam referend in Olatunde, Philip, Stephen and Amina, bioclimatic architecture is an optimization of the interactions between the building and its surrounding environment (Olatunde, Philip, Stephen, & Amina, 2013). Thus, there is a significant reduction in heating and cooling requirements, while also improving the comfort who enjoys the building. Since the weather is constantly changing depending on where we are, it can be said that bioclimatic architecture is an architecture of "place" in which the resources (energy and materials) are free to be used to reduce environmental impacts and consumption other types of energy (Martinez, 2012; Olatunde et al., 2013). As such, the buildings have to be in tune with the local climate of the region where they are being projected, being able to incorporate the environment into its design. The aim is to integrate the building in its natural environment and adapt it considering the weather conditions, and not the opposite. The surrounding is the limiting factor; it is what will define the design.

Bioclimatic buildings make efficient use of solar radiation and less use of materials such as aluminium and concrete, which are produced to require a lot of energy, favouring the use of materials such as stone, earth and wood (Olatunde et al., 2013). Nevertheless, the essence of any bioclimatic design is to be able to implement a degree of thermal comfort within each structure. ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) is a global society advancing human well-being through sustainable technology for the built

environment, founded in 1894. The goal of ASHRAE is to build systems, energy efficiency, indoor air quality, refrigeration and sustainability within the industry being a reference for built environment today (ASHRAE, 2016). Thermal comfort according to ASHRAE is a cognitive state that determines user satisfaction with the thermal environment. It is a parameter measured by the individual (ASHRAE A., 2013). It is then an important aspect of any design since it determines the efficiency of buildings by the occupants. The term "thermal comfort" is therefore determined by each individual's state of mind is he or she hot, cold or just comfortable in your environment (HSE, 2012).

Today, a still considerable number of buildings use HVAC systems (Heating Ventilation Air Conditioning) to keep check their thermal environment. However, there are more energy efficient methods and environmental friendly that are used to heat/cool buildings. The natural ventilation reduces and eliminates the amount of mechanical systems that are needed for cooling a building if designed properly. Depending on the season, the temperature can either be increased to very high as well as very low. Therefore, the following factors must be considered when designing, to achieve a good thermal comfort (Omer, 2008).

- Building orientation;
- Cross ventilation;
- Construction materials;
- Roof, walls and floor insulation;
- Window sizes and location;
- Additional cooling required during heat periods.

The purpose of a building is to protect its occupants and indoor space from extreme weather conditions such as excessive sun, rain and wind. When the building is not equipped to withstand the climatic conditions, the occupants of the buildings begin to feel thermally uncomfortable. This discomfort can be avoided if adopted designs based on climate. Certainly in Portugal, there will be a significant percentage of buildings constructed without a bioclimatic project. Part of the reason may be the lack of sensitivity to this practice, or geographical differences between regions leading to the requirement to adopt a particular design for each region. These problems can be even greater if a country accommodate different climate zones in its territory.

Bioclimatic buildings can be achieved considering the entire life of the building from its design to construction. The materials and methods used are important aspects of sustainability of the building, while the orientation, sun shading devices and size of openings must also be considered during the design process. According to Martinez, building materials and passive design systems are examples of environmentally friendly systems. The principle of bioclimatic design addresses both interior looks like outside the building (Martinez, 2012). This is achieved using the essential aspect of the bioclimatic design to ensure that the landscape, building materials and microclimate of a place are actively integrated into the existing environment. The measures of bioclimatic design are centred mainly on the climate of a region. They are then:

- **Building envelope and orientation**: The building needs to be protected against the heat gain into the structure, especially during the hot periods. This phenomenon can be reduced with the orientation of the building and materials used in construction (Martinez, 2012).
- **Energy source**: Solar energy should be an alternative source of energy and also to illuminate the buildings throughout the year. The orientation of the building facing south and the convenient location of the openings is also something to take into account (Cres, 2012). Photovoltaic energy is also a very viable option for production of energy for lighting.
- **Sun shading devices**: The heat gain into the building during periods of high temperatures may also be reduced by using sun shading devices, and materials and paints that do not allow such a high penetration of solar radiation.
- **Passive design**: The accumulation of heat during the day can also be avoided or naturally balanced by the night time through the use of large windows which will allow natural ventilation and appropriate choosing the type of windows.
- **Indoor air quality**: Through the use of green/living walls, the indoor air quality can be improved because these solutions will capture airborne particles as provide oxygen to liven up spaces. Air locks can also be installed in the doors as it reduces the effect of heat in the building envelope (Moon, 2007)
- **Heating air quality**: Ensures that materials used in glazing allow the minimization of solar radiation (glare) and adequate light in interior spaces.
- **Landscape**: Planting trees and incorporate artificial water bodies can also improve the micro climate of the environment.

5.1. Examples of construction materials and solutions

5.1.1. Insulation materials

Insulation provides resistance to heat flow. The more heat flow resistance the insulation provides, the lower heating and cooling costs. They run the gamut from bulky fibre materials such as fiberglass, rock and slag wool, cellulose, and natural fibres to rigid foam boards to sleek foils. Bulky materials resist conductive and -- to a lesser degree -- convective heat flow in a building cavity. Rigid foam boards trap air or another gas to resist conductive heat flow. Highly reflective foils in radiant barriers and reflective insulation systems reflect radiant heat away from living spaces, making them particularly useful in cooling climates. Other less common materials such as cementitious and phenolic foams and vermiculite and perlite are also available.

When insulating a building, there are many types of insulation that can be chosen. To choose the best type of insulation, should be determine the following:

- Where we want or need to install/add insulation.
- The recommended R-values (Thermal resistance values) for areas we want to insulate.

The table 42, in Annex III, provides an overview of most available insulation materials, how they are installed, where they're typically installed, and their advantages.

5.1.2. Living Green Walls

One might think that the concept of living green walls is something new, however in truth, the concept dates back to the 1930′s. The idea for living green walls was first patented by Stanley Hart White in 1938, however it is Patrick Blanc's name that resounds through the industry. After creating one of the most famous green walls at the Musee du Quai Branly in Paris, he was designated the godfather of the 'vegetal wall', sparking a revolution in sustainable architecture (Sean Heffernan, 2013).

Living green walls are panels of plants, grown vertically using hydroponics, on structures that can be either free-standing or attached to walls. Living green walls are also referred to as vertical gardens, green walls, living walls or ecowalls.

Now known as green facades, living green walls are the next generation, differing from climbing plants like ivy, as they are intricately planned collections of plants held in a structure away from the building.

These structures can bring nature back into urban environments. As the concrete expands and pollution rises, the application of living green walls stands to reverse this trend. Incorporating carefully chosen selections of plants into cutting edge design, living green walls have been devised to help restore the natural balance, as it is a perfect solution for improving the air quality, capturing airborne particles while providing oxygen.

Figure 37: Examples of buildings with green walls, Milan, Vancouver and Seoul, respectively.

5.1.3. Benefits to Air Quality

Since the first years of school, we learn that plants naturally remove carbon dioxide and produce oxygen rich air. Ever since the industrial revolution, modern advancements have increased air pollution. In built-up areas, polluting gases and particulate matter are turning our air toxic, but is possible to utilize nature to reverse the damage caused. This natural effect of plants is multiplied by the sheer number of plants in living green walls.

According to an article for Environmental Science & Technology, living green walls can be one of the solutions for the improvement of air quality in urban areas due to the high level deposition of pollutants in vegetation. It is well known that street-level concentrations of nitrogen

dioxide (NO_2) and particulate matter (PM) exceed public health standards in many cities, causing increased mortality and morbidity. There are a few regular measures for decrease these concentrations like controlling emissions, increasing dispersion, or increasing deposition rates, but little attention has been paid to the latter as a pollution control method. Both NO_2 and PM are deposited onto surfaces at rates that vary according to the nature of the surface; deposition rates to vegetation are much higher than those too hard, built surfaces (Pugh, Mackenzie, Whyatt, & Hewitt, 2012). Previously, city-scale studies have suggested that deposition to vegetation can make a very modest improvement (<5%) to urban air quality. However, few studies take full account of the interplay between urban form and vegetation, specifically the enhanced residence time of air in street canyons. The study of Pugh, MacKenzie, Whyatt and Hewitt shows that increasing deposition by the planting of vegetation in street canyons can reduce street-level concentrations in those canyons by as much as 40% for NO_2 and 60% for PM (Pugh et al., 2012). According to Green Over Grey, the carbon that is sequestered (i.e. absorbed and stored) from, say, a 20m^2 wall is about the same as a medium sized tree, of course with the right density.

The same can be applied in interior spaces taking into account its less well-known ability of filter the air around them by absorbing and cleaning pollutants. A green wall can absorb particulate levels and reduce in 20% respiratory irritations (Sean Heffernan, 2013).

5.1.4. Benefits to Energy costs

The build-up of urban environments has caused a worrying side effect. Termed the urban heat island effect, research has found that metropolitan areas are considerably warmer that rural areas. The annual mean air temperature of a city with 1 million people or more can be 1-3ºC warmer than its surroundings. In the evening, the difference can be as high as 12ºC. Heat islands have a negative impact on the environment and can affect communities by increasing summertime peak energy demand, air pollution and greenhouse gas emissions, heat related illness and mortality, and water quality (US Environmental Protection Agency, 2016).

One solution can be living green walls. Living green walls help to offset this problem by providing shade from the effects of direct sunlight. Also, unlike brick or concrete, plant surfaces don't store up solar energy, but reflect it. Both interior and exterior walls help to actively cool the air in summer by a process called evapotranspiration, reducing the need to cool the building (Sean Heffernan, 2013). But the advantages of green walls don't end with summer. The panels insulate the building and reduce energy costs for heating the building in winter as well.

Nevertheless, these features act to reduce the carbon footprint of a building.

5.1.5. Benefits to Noise Reduction

Plants are sometimes used outdoor in buildings for providing acoustic benefits, because vegetation naturally blocks high frequency sounds while the supporting structure can help to diminish low-frequency noise. In Germany a green concert hall was constructed which incorporated many plants. The high density resulted in such a good acoustic quality that the

German Broadcasting Station relocated to use the room for news casting (Green over Grey, 2013).

As the use of green walls increase, this could significantly change in urban environments. They insulate against noise, vibrations and reduce sound penetration. In addition, they help to absorb the echo bouncing and dampen then noise pollution of modern cities, eradicating the din of the hustle and bustle we've had to adapt to(Sean Heffernan, 2013).

5.1.6. Benefits to Thermal Protection

Buildings are adversely affected by changing temperatures that cause materials to expand and contract, which over time leads to deterioration, cracks and fissures. Exterior living walls give buildings protection, not just from temperature fluctuations but also by diverting water away from walls during heavy rain and providing protection from UV radiation.

However, green walls cannot be selected randomly. Plants for the exterior are chosen based on climate zone as it's important to use the correct plants in the correct zones. Although, the plants should be chose according to their survival in a zone higher than the location's climate. Which means, for example, if we are in Lisbon we'd pick plants that could survive in a more northern climate. Therefore, the further south we go the more species of plants that will grow and so a wider choice of plants is available for use, says Matt Hills, Architect I with Ambius, the largest company and provider of interior landscaping, design installation and maintenance services in North America. In addition to using a wide range of native and locally adapted vegetation on outdoor walls, beneficial organisms, such as birds, butterflies, bees and other insects are attracted to these green spaces, and can be viewed as mini ecosystems.

5.1.7. Benefits to Water Resources

The presence of green walls or vertical gardens help absorb and filter storm water, while the excess water can be collected and used to irrigate them. Although most green walls are designed with a drip-irrigation system, which maximizes the use of water and is set up using an automated system that times the irrigation to minimize water waste.

Recirculation systems are the most efficient. They reuse the water repeatedly, pumping the water from the bottom to the top, until there's no water left. The tank is then refilled. Alternatively, direct irrigation is an option for spaces that don't have room for tanks.

5.2. Conclusions

The purpose of this section of the chapter is not to find solutions to some of the thermal discomfort problems that can be felt in buildings of hostels in study, but to present the concept of bioclimatic architecture and in what areas or measures the design centres. A more detailed study would be needed to give answers, which may be done in the future. However, some considerations can be made about the possible buildings in the study area. Most of the buildings where they are located hostels in the Lisbon area are in the older areas, where buildings have easily 100 years or more. The oldest areas of Lisbon are the most historical and cultural interest,

and where most of the day and night leisure areas are. It is so here this area where most of the hostels are located. As such, the structure of buildings, the materials and orientation cannot be changed even if inappropriate to weather conditions. However, non-structural aspects of bioclimatic design can still be adopted as energy sources, sun shading devices, indoor air quality, and heating and cooling. The implementation of solar and/or photovoltaic energy, appropriate materials in insulation in indoor areas and when possible in exterior refurbishment/rehabilitations, proper disposition and dimension of windows for helping naturally in the balance of heat and natural lighting, and green living walls, are some possible solutions in pre-existing buildings, later hostels facilities.

Nevertheless, for hostels built from scratch will be possible to make use of structural references in the field of bioclimatic architecture. Furthermore, there is also the possibility to take advantage of the many abandoned buildings, or with no function.

According to the magazine Visão, there are nearly 5,000 vacant buildings, in poor condition or crumble in Lisbon. If we choose a historic area as Baixa, Rossio, Chiado, Mouraria or Alfama, there are at least a partial building or totally deserted and degraded in a 300m radius from this location or just in 100m. In the area of Marques de Pombal, Saldanha, Campo de Ourique and Belém are counted more than 50, according to a survey of Lisbon City Hall (CML), dating from 2009. This is an opportunity to take advantage of the existence of these buildings, being more rational use them both in overcoming its abandonment, as well as is more sustainable at this point take advantage of the structures that are already made, instead of resorting to new construction. Later the best solution would be to adopt and remodel them as best as possible to their functions and climatic context (Visão Magazine, 2013).

6. Associated LiderA Criteria to be improved

Table 44: Possible sustainable solutions able to improve specific LiderA criteria.

Types of solutions	Category	Area	Criteria
Household appliances	Resources	Energy	C9 Carbon intensity
	Environmental Loads	Atmospheric emissions	C18 Atmospheric emissions
Lighting	Environmental Comfort	Lighting & Acoustic	C26 Lighting Levels
Air heating systems	Resources	Energy	C9 Carbon intensity
	Environmental Loads	Atmospheric emissions	C18 Atmospheric emissions
	Environmental Comfort	Thermal Comfort	C35 Thermal Comfort
Insulation	Environmental Comfort	Thermal Comfort	C35 Thermal Comfort
Air conditioning	Resources	Energy	C9 Carbon intensity
	Environmental Loads	Atmospheric emissions	C18 Atmospheric emissions
Hot water	Resources	Energy	C9 Carbon intensity
	Environmental Loads	Atmospheric emissions	C18 Atmospheric emissions
	Sustainable Use	Innovation	C43 Environmental Solutions
Waste Management	Environmental Loads	Waste	C19 Waste control
			C21 Waste Valorisation
Renewable Energies	Resources	Energy	C9 Carbon Intensity
	Environmental Loads	Atmospheric emissions	C18 Atmospheric Emissions
	Sustainable Use	Innovation	C43 Environmental solutions
Bioclimatic Architecture	Local Integration	Soil	C2 Environmental Employment Valorisation
		Natural Ecosystems	C3 Ecological valorisation
			C4 Habitats Connection
		Landscape & heritage	C5 Landscape Integration
	Resources	Energy	C8 Passive Design Performance
		Water	C11 Local Water Consumption
	Environmental Comfort	Air quality	C24 Air Quality Levels
		Thermal Comfort	C25 Thermal Comfort
		Lighting & Acoustic	C26 Lighting Levels

III - Insulation materials

Table 45: List of insulating materials, their applications and advantages.

Type	Insulation Materials	Where Applicable	Advantages
Blanket: batts and rolls	• Fibreglass • Mineral (rock or slag) wool • Plastic fibres • Natural fibres	• Unfinished walls, including foundations walls • Floors and ceilings	• Do-it-yourself • Suited for standard stud and joist spacing that is relatively free from obstructions. Relatively inexpensive.
Concrete block insulation	Foam board, to be placed on outside of wall (usually new construction) or inside of wall (existing buildings): Some manufactures incorporate foam beads or air into the concrete to increase R-value	• Unfinished walls, including foundations walls, for new construction or major renovations • Walls (insulating concrete blocks)	• Insulating cores increases wall R-value. • Insulating outside of concrete block wall places mass inside conditioned space, which can moderate indoor temperatures. • Autoclaved aerated concrete and autoclaved cellular concrete masonry units have 10 times the insulating value of conventional concrete
Foam board or rigid foam	• Polystyrene • Polyisocyanurate • Polyurethane	• Unfinished walls, including foundation walls • Floors and ceilings • Unvented low-slope roofs	• High insulating value for relatively little thickness. • Can block thermal short circuits when installed continuously over frames or joists.
Insulating concrete forms (ICFs)	Foam boards or foam blocks	Unfinished walls, including foundation walls for new construction	Insulation is literally built into the home's walls, creating high thermal resistance.
Loose-fill and blown-in	Cellulose Fibreglass Mineral (rock or slag) wool	• Enclosed existing wall or open new wall cavities • Unfinished attic floors • Other hard-to-reach places	Good for adding insulation to existing finished areas, irregularly shaped areas, and around obstructions.
Reflective system	Foil-faced kraft paper, plastic film, polyethylene bubbles, or cardboard	Unfinished walls, ceilings, and floors	• Do-it-yourself. • Suitable for framing at standard spacing. • Bubble-form suitable if framing is irregular or if obstructions are present. • Most effective at preventing downward heat flow, effectiveness depends on spacing.

Table 46: List of insulating materials, their applications and advantages (continuation).

Rigid fibrous or fibre insulation	• Fibreglass Mineral (rock or slag) wool	• Ducts in unconditioned spaces Other places requiring insulation that can withstand high temperatures	Can withstand high temperatures.
Sprayed foam and foamed-in-place	• Cementitious • Phenolic • Polyisocyanurate Polyurethane	• Enclosed existing wall • Open new wall cavities Unfinished attic floors	Good for adding insulation to existing finished areas, irregularly shaped areas, and around obstructions
Structural insulated panels (SIPs)	• Foam board or liquid foam insulation core Straw core insulation	Unfinished walls, ceilings, floors, and roofs for new construction	SIP-built houses provide superior and uniform insulation compared to more traditional construction methods; they also take less time to build

IV - LiderA – Sustainability Assessment System tables

Table 47: LiderA Assessment of Golden Tram 242 Hostel, Lisbon.

CATEGORY	AREA	Wi	PREREQ.	CRITERIA	C nr	Assessment
LOCAL INTEGRATION	SOIL	7%	Y	Territorial valorisation	C1	A
				Environmental deployment optimization	C2	F
	NATURAL ECOSSYSTEMS	5%	Y	Ecological valorisation	C3	E
				Habitats connection	C4	F
6 Criteria	LANDSCAPE AND HERITAGE	2%	Y	Landscape integration	C5	A++
14%				Heritage protection and enhancement	C6	A+
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
RESOURCES	ENERGY	17%	Y	Energy efficiency - certification	C7	E
				Passive design performance	C8	B
				Carbon intensity (equipment efficiency)	C9	A+
	WATER	8%	Y	Domestic water consumption	C10	E
				Local water consumption/management	C11	F
	MATERIALS	5%	Y	Durability	C12	A
				Local materials	C13	A+
9 Criteria				Low impact materials	C14	E
32%	FOOD PRODUCTION	2%	Y	Local food production	C15	E
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
ENVIRONMENTAL LOADS	WASTEWATER	3%	Y	Wastewater treatment	C16	F
				Wastewater use	C17	E
	ATMOSPHERIC EMISSIONS	2%	Y	Atmospheric emissions control	C18	A+
	WASTE	3%	Y	Waste control	C19	A++
				Hazardous waste management	C20	A++
				Waste valorisation	C21	B
8 Criteria	NOISE EMISSIONS	3%	Y	Noise emissions control	C22	A
12%	THERMAL AND LIGHT EMISSIONS	1%	Y	Thermal and light pollution	C23	C

Table 48: LiderA Assessment of Golden Tram 242 Hostel, Lisbon (continuation).

CATEGORY	AREA	Wi	PREREQ.	CRITERIA	C nr	Assessment
ENVIRONMENTAL COMFORT	AIR QUALITY	5%	Y	Air quality levels	C24	A
	THERMAL COMFORT	5%	Y	Thermal comfort	C25	A
4 Criteria	LIGHTING AND ACOUSTIC	5%	Y	Lighting levels	C26	A+
15%			Y	Acoustic and insulation/Noise levels	C27	B
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
SOCIOECONOMIC EXPERIENCES	ACCESS FOR ALL	5%	Y	Public transports access	C28	A+
				Low impact mobility	C29	E
				Inclusive design	C30	A
	ECONOMIC DIVERSITY	4%	Y	Flexibility	C31	A
				Local economic dynamics	C32	B
				Local work	C33	A+
	AMENITIES AND SOCIAL INTERACTION	4%	Y	Local amenities	C34	A
				Community interaction	C35	A
	CONTROL AND PARTICIPATION	4%	Y	Controllability	C36	A
				Participation and governance conditions	C37	B
				Natural risks - safety	C38	E
13 Criteria				Human threats - security	C39	A++
19%	LIFE CYCLE COSTS	2%	Y	Life cycle costs	C40	A++
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
SUSTAINABLE USE	ENVIRONMENTAL MANAGEMENT	6%	Y	Environmental information	C41	D
3 Criteria				Environmental management	C42	E
8%	INNOVATION	2%	Y	Innovative solutions	C43	D
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
	Assessment level obtained:					**A-23.4%**
LiderA - Sustainability Assessment System® - Base Criteria V 2.0b						

Table 49: LiderA Assessment of HUB New Lisbon Hostel, Lisbon.

CATEGORY	AREA	Wi	PREREQ.	CRITERIA	C nr	Assessment
LOCAL INTEGRATION	SOIL	7%	Y	Territorial valorisation	C1	A
				Environmental deployment optimization	C2	F
	NATURAL ECOSSYSTEMS	5%	Y	Ecological valorisation	C3	E
				Habitats connection	C4	F
6 Criteria	LANDSCAPE AND HERITAGE	2%	Y	Landscape integration	C5	A++
14%				Heritage protection and enhancement	C6	A+
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
RESOURCES	ENERGY	17%	Y	Energy efficiency - certification	C7	E
				Passive design performance	C8	B
				Carbon intensity (equipment efficiency)	C9	A+
	WATER	8%	Y	Domestic water consumption	C10	E
				Local water consumption/management	C11	F
	MATERIALS	5%	Y	Durability	C12	A
				Local materials	C13	C
9 Criteria				Low impact materials	C14	E
32%	FOOD PRODUCTION	2%	Y	Local food production	C15	E
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
ENVIRONMENTAL LOADS	WASTEWATER	3%	Y	Wastewater treatment	C16	F
				Wastewater use	C17	E
	ATMOSPHERIC EMISSIONS	2%	Y	Atmospheric emissions control	C18	A+
	WASTE	3%	Y	Waste control	C19	A+
				Hazardous waste management	C20	A+
				Waste valorisation	C21	A+
8 Criteria	NOISE EMISSIONS	3%	Y	Noise emissions control	C22	A+
12%	THERMAL AND LIGHT EMISSIONS	1%	Y	Thermal and light pollution	C23	B
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
ENVIRONMENTAL COMFORT	AIR QUALITY	5%	Y	Air quality levels	C24	B
	THERMAL COMFORT	5%	Y	Thermal comfort	C25	B
4 Criteria	LIGHTING AND ACOUSTIC	5%	Y	Lighting levels	C26	A+
15%			Y	Acoustic and insulation/Noise levels	C27	B

Table 50: LiderA Assessment of HUB New Lisbon Hostel, Lisbon (continuation).

CATEGORY	AREA	Wi	PREREQ.	CRITERIA	C nr	Assessment
SOCIOECONOMIC EXPERIENCES	ACCESS FOR ALL	5%	Y	Public transports access	C28	A
				Low impact mobility	C29	C
				Inclusive design	C30	D
	ECONOMIC DIVERSITY	4%	Y	Flexibility	C31	A
				Local economic dynamics	C32	B
				Local work	C33	A+
	AMENITIES AND SOCIAL INTERACTION	4%	Y	Local amenities	C34	A++
				Community interaction	C35	A+
	CONTROL AND PARTICIPATION	4%	Y	Controllability	C36	B
				Participation and governance conditions	C37	B
				Natural risks - safety	C38	E
13 Criteria				Human threats - security	C39	A+
19%	LIFE CYCLE COSTS	2%	Y	Life cycle costs	C40	A++
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
SUSTAINABLE USE	ENVIRONMENTAL MANAGEMENT	6%	Y	Environmental information	C41	D
3 Criteria				Environmental management	C42	E
8%	INNOVATION	2%	Y	Innovative solutions	C43	D
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
	Assessment level obtained:					**A-23.2%**
LiderA - Sustainability Assessment System® - Base Criteria V 2.0b						

Table 51: LiderA Assessment of Jardim de Santos Hostel, Lisbon.

CATEGORY	AREA	Wi	PREREQ.	CRITERIA	C nr	Assessment
LOCAL INTEGRATION	SOIL	7%	Y	Territorial valorisation	C1	A
				Environmental deployment optimization	C2	F
	NATURAL ECOSSYSTEMS	5%	Y	Ecological valorisation	C3	E
				Habitats connection	C4	F
6 Criteria	LANDSCAPE AND HERITAGE	2%	Y	Landscape integration	C5	A++
14%				Heritage protection and enhancement	C6	A+
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
RESOURCES	ENERGY	17%	Y	Energy efficiency - certification	C7	E
				Passive design performance	C8	A
				Carbon intensity (equipment efficiency)	C9	C
	WATER	8%	Y	Domestic water consumption	C10	E
				Local water consumption/management	C11	F
	MATERIALS	5%	Y	Durability	C12	A
				Local materials	C13	A+
9 Criteria				Low impact materials	C14	E
32%	FOOD PRODUCTION	2%	Y	Local food production	C15	E
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
ENVIRONMENTAL LOADS	WASTEWATER	3%	Y	Wastewater treatment	C16	F
				Wastewater use	C17	E
	ATMOSPHERIC EMISSIONS	2%	Y	Atmospheric emissions control	C18	A+
	WASTE	3%	Y	Waste control	C19	A++
				Hazardous waste management	C20	B
				Waste valorisation	C21	A
8 Criteria	NOISE EMISSIONS	3%	Y	Noise emissions control	C22	A
12%	THERMAL AND LIGHT EMISSIONS	1%	Y	Thermal and light pollution	C23	B
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
ENVIRONMENTAL COMFORT	AIR QUALITY	5%	Y	Air quality levels	C24	A
	THERMAL COMFORT	5%	Y	Thermal comfort	C25	C
4 Criteria	LIGHTING AND ACOUSTIC	5%	Y	Lighting levels	C26	A+
15%			Y	Acoustic and insulation/Noise levels	C27	B

Table 52: LiderA Assessment of Jardim de Santos Hostel, Lisbon (continuation).

CATEGORY	AREA	Wi	PREREQ.	CRITERIA	C nr	Assessment
SOCIOECONOMIC EXPERIENCES	ACCESS FOR ALL	5%	Y	Public transports access	C28	A++
				Low impact mobility	C29	B
				Inclusive design	C30	C
	ECONOMIC DIVERSITY	4%	Y	Flexibility	C31	A+
				Local economic dynamics	C32	B
				Local work	C33	A+
	AMENITIES AND SOCIAL INTERACTION	4%	Y	Local amenities	C34	A++
				Community interaction	C35	A
	CONTROL AND PARTICIPATION	4%	Y	Controllability	C36	B
				Participation and governance conditions	C37	D
				Natural risks - safety	C38	E
13 Criteria				Human threats - security	C39	B
19%	LIFE CYCLE COSTS	2%	Y	Life cycle costs	C40	B
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
SUSTAINABLE USE	ENVIRONMENTAL MANAGEMENT	6%	Y	Environmental information	C41	D
3 Criteria				Environmental management	C42	E
8%	INNOVATION	2%	Y	Innovative solutions	C43	E
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
	Assessment level obtained:					**A-21.3%**
LiderA - Sustainability Assessment System® - Base Criteria V 2.0b						

Table 53: LiderA Assessment of Lisb'on Hostel, Lisbon.

CATEGORY	AREA	Wi	PREREQ.	CRITERIA	C nr	Assessment
LOCAL INTEGRATION	SOIL	7%	Y	Territorial valorisation	C1	A
				Environmental deployment optimization	C2	D
	NATURAL ECOSSYSTEMS	5%	Y	Ecological valorisation	C3	D
				Habitats connection	C4	C
6 Criteria	LANDSCAPE AND HERITAGE	2%	Y	Landscape integration	C5	A++
14%				Heritage protection and enhancement	C6	A+
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
RESOURCES	ENERGY	17%	Y	Energy efficiency - certification	C7	E
				Passive design performance	C8	A+
				Carbon intensity (equipment efficiency)	C9	A
	WATER	8%	Y	Domestic water consumption	C10	A
				Local water consumption/management	C11	D
	MATERIALS	5%	Y	Durability	C12	A+
				Local materials	C13	D
9 Criteria				Low impact materials	C14	E
32%	FOOD PRODUCTION	2%	Y	Local food production	C15	E
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
ENVIRONMENTAL LOADS	WASTEWATER	3%	Y	Wastewater treatment	C16	F
				Wastewater use	C17	E
	ATMOSPHERIC EMISSIONS	2%	Y	Atmospheric emissions control	C18	A
	WASTE	3%	Y	Waste control	C19	A+
				Hazardous waste management	C20	A++
				Waste valorisation	C21	A
8 Criteria	NOISE EMISSIONS	3%	Y	Noise emissions control	C22	A
12%	THERMAL AND LIGHT EMISSIONS	1%	Y	Thermal and light pollution	C23	A
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
ENVIRONMENTAL COMFORT	AIR QUALITY	5%	Y	Air quality levels	C24	A+
	THERMAL COMFORT	5%	Y	Thermal comfort	C25	B
4 Criteria	LIGHTING AND ACOUSTIC	5%	Y	Lighting levels	C26	A+
15%			Y	Acoustic and insulation/Noise levels	C27	B

Table 54: LiderA Assessment of Lisb'on Hostel, Lisbon (continuation).

CATEGORY	AREA	Wi	PREREQ.	CRITERIA	C nr	Assessment
SOCIOECONOMIC EXPERIENCES	ACCESS FOR ALL	5%	Y	Public transports access	C28	A++
				Low impact mobility	C29	E
				Inclusive design	C30	B
	ECONOMIC DIVERSITY	4%	Y	Flexibility	C31	A+
				Local economic dynamics	C32	A
				Local work	C33	A+
	AMENITIES AND SOCIAL INTERACTION	4%	Y	Local amenities	C34	A++
				Community interaction	C35	A
	CONTROL AND PARTICIPATION	4%	Y	Controllability	C36	A
				Participation and governance conditions	C37	D
				Natural risks - safety	C38	E
13 Criteria				Human threats - security	C39	A
19%	LIFE CYCLE COSTS	2%	Y	Life cycle costs	C40	A
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
SUSTAINABLE USE	ENVIRONMENTAL MANAGEMENT	6%	Y	Environmental information	C41	B
3 Criteria				Environmental management	C42	E
8%	INNOVATION	2%	Y	Innovative solutions	C43	D
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
	Assessment level obtained:					**A-24.7%**
LiderA - Sustainability Assessment System® - Base Criteria V 2.0b						

Table 55: LiderA Assessment of Locals Hostel & Suites, Lisbon.

CATEGORY	AREA	Wi	PREREQ.	CRITERIA	C nr	Assessment
LOCAL INTEGRATION	SOIL	7%	Y	Territorial valorisation	C1	A
				Environmental deployment optimization	C2	F
	NATURAL ECOSSYSTEMS	5%	Y	Ecological valorisation	C3	F
				Habitats connection	C4	F
6 Criteria	LANDSCAPE AND HERITAGE	2%	Y	Landscape integration	C5	A++
14%				Heritage protection and enhancement	C6	A
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
RESOURCES	ENERGY	17%	Y	Energy efficiency - certification	C7	E
				Passive design performance	C8	B
				Carbon intensity (equipment efficiency)	C9	E
	WATER	8%	Y	Domestic water consumption	C10	D
				Local water consumption/management	C11	F
	MATERIALS	5%	Y	Durability	C12	A
				Local materials	C13	A+
9 Criteria				Low impact materials	C14	D
32%	FOOD PRODUCTION	2%	Y	Local food production	C15	E
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
ENVIRONMENTAL LOADS	WASTEWATER	3%	Y	Wastewater treatment	C16	F
				Wastewater use	C17	E
	ATMOSPHERIC EMISSIONS	2%	Y	Atmospheric emissions control	C18	A++
	WASTE	3%	Y	Waste control	C19	A
				Hazardous waste management	C20	A+
				Waste valorisation	C21	B
8 Criteria	NOISE EMISSIONS	3%	Y	Noise emissions control	C22	A
12%	THERMAL AND LIGHT EMISSIONS	1%	Y	Thermal and light pollution	C23	B
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
ENVIRONMENTAL COMFORT	AIR QUALITY	5%	Y	Air quality levels	C24	A
	THERMAL COMFORT	5%	Y	Thermal comfort	C25	A
4 Criteria	LIGHTING AND ACOUSTIC	5%	Y	Lighting levels	C26	A++
15%			Y	Acoustic and insulation/Noise levels	C27	B

Table 56: LiderA Assessment of Locals Hostel & Suites, Lisbon (continuation).

CATEGORY	AREA	Wi	PREREQ.	CRITERIA	C nr	Assessment
SOCIOECONOMIC EXPERIENCES	ACCESS FOR ALL	5%	Y	Public transports access	C28	A+
				Low impact mobility	C29	D
				Inclusive design	C30	E
	ECONOMIC DIVERSITY	4%	Y	Flexibility	C31	A
				Local economic dynamics	C32	A
				Local work	C33	A+
	AMENITIES AND SOCIAL INTERACTION	4%	Y	Local amenities	C34	A++
				Community interaction	C35	A
	CONTROL AND PARTICIPATION	4%	Y	Controllability	C36	B
				Participation and governance conditions	C37	D
				Natural risks - safety	C38	E
13 Criteria				Human threats - security	C39	A+
19%	LIFE CYCLE COSTS	2%	Y	Life cycle costs	C40	A+
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
SUSTAINABLE USE	ENVIRONMENTAL MANAGEMENT	6%	Y	Environmental information	C41	E
3 Critérios				Environmental management	C42	E
8%	INNOVATION	2%	Y	Innovative solutions	C43	E
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
	Assessment level obtained:					**A-22.5%**
LiderA - Sustainability Assessment System® - Base Criteria V 2.0b						

Table 57: LiderA Assessment of Music Hall Lisbon Hostel, Lisbon.

CATEGORY	AREA	Wi	PREREQ.	CRITERIA	C nr	Assessment
LOCAL INTEGRATION	SOIL	7%	Y	Territorial valorisation	C1	A
				Environmental deployment optimization	C2	E
	NATURAL ECOSSYSTEMS	5%	Y	Ecological valorisation	C3	E
				Habitats connection	C4	F
6 Criteria	LANDSCAPE AND HERITAGE	2%	Y	Landscape integration	C5	A++
14%				Heritage protection and enhancement	C6	A
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
RESOURCES	ENERGY	17%	Y	Energy efficiency - certification	C7	E
				Passive design performance	C8	A+
				Carbon intensity (equipment efficiency)	C9	C
	WATER	8%	Y	Domestic water consumption	C10	C
				Local water consumption/management	C11	E
	MATERIALS	5%	Y	Durability	C12	A
				Local materials	C13	A+
9 Criteria				Low impact materials	C14	A
32%	FOOD PRODUCTION	2%	Y	Local food production	C15	E
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
ENVIRONMENTAL LOADS	WASTEWATER	3%	Y	Wastewater treatment	C16	F
				Wastewater use	C17	E
	ATMOSPHERIC EMISSIONS	2%	Y	Atmospheric emissions control	C18	A
	WASTE	3%	Y	Waste control	C19	A+
				Hazardous waste management	C20	A++
				Waste valorisation	C21	A
8 Criteria	NOISE EMISSIONS	3%	Y	Noise emissions control	C22	A
12%	THERMAL AND LIGHT EMISSIONS	1%	Y	Thermal and light pollution	C23	A
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
ENVIRONMENTAL COMFORT	AIR QUALITY	5%	Y	Air quality levels	C24	A
	THERMAL COMFORT	5%	Y	Thermal comfort	C25	A
4 Criteria	LIGHTING AND ACOUSTIC	5%	Y	Lighting levels	C26	A++
15%			Y	Acoustic and insulation/Noise levels	C27	B

Table 58: LiderA Assessment of Music Hall Lisbon Hostel, Lisbon.

CATEGORY	AREA	Wi	PREREQ.	CRITERIA	C nr	Assessment
SOCIOECONOMIC EXPERIENCES	ACCESS FOR ALL	5%	Y	Public transports access	C28	A++
				Low impact mobility	C29	D
				Inclusive design	C30	A
	ECONOMIC DIVERSITY	4%	Y	Flexibility	C31	A
				Local economic dynamics	C32	A
				Local work	C33	A+
	AMENITIES AND SOCIAL INTERACTION	4%	Y	Local amenities	C34	A++
				Community interaction	C35	A+
	CONTROL AND PARTICIPATION	4%	Y	Controllability	C36	A
				Participation and governance conditions	C37	D
				Natural risks - safety	C38	E
13 Criteria				Human threats - security	C39	A
19%	LIFE CYCLE COSTS	2%	Y	Life cycle costs	C40	A+
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
SUSTAINABLE USE	ENVIRONMENTAL MANAGEMENT	6%	Y	Environmental information	C41	B
3 Criteria				Environmental management	C42	E
8%	INNOVATION	2%	Y	Innovative solutions	C43	E
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
	Assessment level obtained:					**A-26.2%**
LiderA - Sustainability Assessment System® - Base Criteria V 2.0b						

Table 59: LiderA Assessment of Nest House Lisbon Hostel, Lisbon.

CATEGORY	AREA	Wi	PREREQ.	CRITERIA	C nr	Assessment
LOCAL INTEGRATION	SOIL	7%	Y	Territorial valorisation	C1	A
				Environmental deployment optimization	C2	F
	NATURAL ECOSSYSTEMS	5%	Y	Ecological valorisation	C3	E
				Habitats connection	C4	F
6 Criteria	LANDSCAPE AND HERITAGE	2%	Y	Landscape integration	C5	A++
14%				Heritage protection and enhancement	C6	A
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
RESOURCES	ENERGY	17%	Y	Energy efficiency - certification	C7	E
				Passive design performance	C8	A
				Carbon intensity (equipment efficiency)	C9	A+
	WATER	8%	Y	Domestic water consumption	C10	D
				Local water consumption/management	C11	E
	MATERIALS	5%	Y	Durability	C12	A+
				Local materials	C13	B
9 Criteria				Low impact materials	C14	E
32%	FOOD PRODUCTION	2%	Y	Local food production	C15	E
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
ENVIRONMENTAL LOADS	WASTEWATER	3%	Y	Wastewater treatment	C16	F
				Wastewater use	C17	E
	ATMOSPHERIC EMISSIONS	2%	Y	Atmospheric emissions control	C18	A+
	WASTE	3%	Y	Waste control	C19	A++
				Hazardous waste management	C20	A+
				Waste valorisation	C21	B
8 Criteria	NOISE EMISSIONS	3%	Y	Noise emissions control	C22	A
12%	THERMAL AND LIGHT EMISSIONS	1%	Y	Thermal and light pollution	C23	D
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
ENVIRONMENTAL COMFORT	AIR QUALITY	5%	Y	Air quality levels	C24	A
	THERMAL COMFORT	5%	Y	Thermal comfort	C25	B
4 Criteria	LIGHTING AND ACOUSTIC	5%	Y	Lighting levels	C26	A++
15%			Y	Acoustic and insulation/Noise levels	C27	C

Table 60: LiderA Assessment of Nest House Lisbon Hostel, Lisbon (continuation).

CATEGORY	AREA	Wi	PREREQ.	CRITERIA	C nr	Assessment
SOCIOECONOMIC EXPERIENCES	ACCESS FOR ALL	5%	Y	Public transports access	C28	A++
				Low impact mobility	C29	A
				Inclusive design	C30	D
	ECONOMIC DIVERSITY	4%	Y	Flexibility	C31	A
				Local economic dynamics	C32	C
				Local work	C33	A+
	AMENITIES AND SOCIAL INTERACTION	4%	Y	Local amenities	C34	A+
				Community interaction	C35	A
	CONTROL AND PARTICIPATION	4%	Y	Controllability	C36	B
				Participation and governance conditions	C37	D
				Natural risks - safety	C38	E
13 Criteria				Human threats - security	C39	A++
19%	LIFE CYCLE COSTS	2%	Y	Life cycle costs	C40	A
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
SUSTAINABLE USE	ENVIRONMENTAL MANAGEMENT	6%	Y	Environmental information	C41	C
3 Criteria				Environmental management	C42	E
8%	INNOVATION	2%	Y	Innovative solutions	C43	E
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
	Assessment level obtained:					**A-23.8%**
LiderA - Sustainability Assessment System® - Base Criteria V 2.0b						

Table 61: LiderA Assessment of Oasis Backpackers Mansion Lisboa, Lisbon.

CATEGORY	AREA	Wi	PREREQ.	CRITERIA	C nr	Assessment
LOCAL INTEGRATION	SOIL	7%	Y	Territorial valorisation	C1	A
				Environmental deployment optimization	C2	E
	NATURAL ECOSSYSTEMS	5%	Y	Ecological valorisation	C3	D
				Habitats connection	C4	E
6 Criteria	LANDSCAPE AND HERITAGE	2%	Y	Landscape integration	C5	A++
14%				Heritage protection and enhancement	C6	A
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
RESOURCES	ENERGY	17%	Y	Energy efficiency - certification	C7	E
				Passive design performance	C8	A+
				Carbon intensity (equipment efficiency)	C9	C
	WATER	8%	Y	Domestic water consumption	C10	D
				Local water consumption/management	C11	F
	MATERIALS	5%	Y	Durability	C12	B
				Local materials	C13	B
9 Criteria				Low impact materials	C14	B
32%	FOOD PRODUCTION	2%	Y	Local food production	C15	E
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
ENVIRONMENTAL LOADS	WASTEWATER	3%	Y	Wastewater treatment	C16	F
				Wastewater use	C17	E
	ATMOSPHERIC EMISSIONS	2%	Y	Atmospheric emissions control	C18	B
	WASTE	3%	Y	Waste control	C19	A++
				Hazardous waste management	C20	A++
				Waste valorisation	C21	A
8 Criteria	NOISE EMISSIONS	3%	Y	Noise emissions control	C22	A
12%	THERMAL AND LIGHT EMISSIONS	1%	Y	Thermal and light pollution	C23	A
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
ENVIRONMENTAL COMFORT	AIR QUALITY	5%	Y	Air quality levels	C24	A+
	THERMAL COMFORT	5%	Y	Thermal comfort	C25	A
4 Criteria	LIGHTING AND ACOUSTIC	5%	Y	Lighting levels	C26	A++
15%			Y	Acoustic and insulation/Noise levels	C27	B

Table 62: LiderA Assessment of Oasis Backpackers Mansion Lisboa, Lisbon (continuation).

CATEGORY	AREA	Wi	PREREQ.	CRITERIA	C nr	Assessment
SOCIOECONOMIC EXPERIENCES	ACCESS FOR ALL	5%	Y	Public transports access	C28	A+
				Low impact mobility	C29	D
				Inclusive design	C30	A+
	ECONOMIC DIVERSITY	4%	Y	Flexibility	C31	A
				Local economic dynamics	C32	B
				Local work	C33	A++
	AMENITIES AND SOCIAL INTERACTION	4%	Y	Local amenities	C34	A++
				Community interaction	C35	A+
	CONTROL AND PARTICIPATION	4%	Y	Controllability	C36	A
				Participation and governance conditions	C37	D
				Natural risks - safety	C38	E
13 Criteria				Human threats - security	C39	A+
19%	LIFE CYCLE COSTS	2%	Y	Life cycle costs	C40	A
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
SUSTAINABLE USE	ENVIRONMENTAL MANAGEMENT	6%	Y	Environmental information	C41	B
3 Criteria				Environmental management	C42	E
8%	INNOVATION	2%	Y	Innovative solutions	C43	E
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
	Assessment level obtained:					**A-26%**
LiderA - Sustainability Assessment System® - Base Criteria V 2.0b						

Table 63: LiderA Assessment of PH in Chiado, Lisbon.

CATEGORY	AREA	Wi	PREREQ.	CRITERIA	C nr	Assessment
LOCAL INTEGRATION	SOIL	7%	Y	Territorial valorisation	C1	A
				Environmental deployment optimization	C2	F
	NATURAL ECOSSYSTEMS	5%	Y	Ecological valorisation	C3	E
				Habitats connection	C4	F
6 Criteria	LANDSCAPE AND HERITAGE	2%	Y	Landscape integration	C5	A++
14%				Heritage protection and enhancement	C6	A
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
RESOURCES	ENERGY	17%	Y	Energy efficiency - certification	C7	E
				Passive design performance	C8	B
				Carbon intensity (equipment efficiency)	C9	A
	WATER	8%	Y	Domestic water consumption	C10	C
				Local water consumption/management	C11	F
	MATERIALS	5%	Y	Durability	C12	A
				Local materials	C13	B
9 Criteria				Low impact materials	C14	D
32%	FOOD PRODUCTION	2%	Y	Local food production	C15	E
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
ENVIRONMENTAL LOADS	WASTEWATER	3%	Y	Wastewater treatment	C16	C
				Wastewater use	C17	C
	ATMOSPHERIC EMISSIONS	2%	Y	Atmospheric emissions control	C18	A+
	WASTE	3%	Y	Waste control	C19	A++
				Hazardous waste management	C20	A+
				Waste valorisation	C21	B
8 Criteria	NOISE EMISSIONS	3%	Y	Noise emissions control	C22	A
12%	THERMAL AND LIGHT EMISSIONS	1%	Y	Thermal and light pollution	C23	B
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
ENVIRONMENTAL COMFORT	AIR QUALITY	5%	Y	Air quality levels	C24	A
	THERMAL COMFORT	5%	Y	Thermal comfort	C25	A
4 Criteria	LIGHTING AND ACOUSTIC	5%	Y	Lighting levels	C26	A++
15%			Y	Acoustic and insulation/Noise levels	C27	B

Table 64: LiderA Assessment of PH in Chiado, Lisbon (continuation).

CATEGORY	AREA	Wi	PREREQ.	CRITERIA	C nr	Assessment
SOCIOECONOMIC EXPERIENCES	ACCESS FOR ALL	5%	Y	Public transports access	C28	A++
				Low impact mobility	C29	E
				Inclusive design	C30	B
	ECONOMIC DIVERSITY	4%	Y	Flexibility	C31	A
				Local economic dynamics	C32	A
				Local work	C33	A+
	AMENITIES AND SOCIAL INTERACTION	4%	Y	Local amenities	C34	A+
				Community interaction	C35	A
	CONTROL AND PARTICIPATION	4%	Y	Controllability	C36	A
				Participation and governance conditions	C37	D
				Natural risks - safety	C38	E
13 Critérios				Human threats - security	C39	A
19%	LIFE CYCLE COSTS	2%	Y	Life cycle costs	C40	B
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
SUSTAINABLE USE	ENVIRONMENTAL MANAGEMENT	6%	Y	Environmental information	C41	B
3 Criteria				Environmental management	C42	E
8%	INNOVATION	2%	Y	Innovative solutions	C43	E
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
	Assessment level obtained:					**A-21.9%**
LiderA - Sustainability Assessment System® - Base Criteria V 2.0b						

Table 65: LiderA Assessment of Sunset Destination Hostel, Lisbon.

CATEGORY	AREA	Wi	PREREQ.	CRITERIA	C nr	Assessment
LOCAL INTEGRATION	SOIL	7%	Y	Territorial valorisation	C1	A
				Environmental deployment optimization	C2	E
	NATURAL ECOSSYSTEMS	5%	Y	Ecological valorisation	C3	E
				Habitats connection	C4	D
6 Criteria	LANDSCAPE AND HERITAGE	2%	Y	Landscape integration	C5	A++
14%				Heritage protection and enhancement	C6	A
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
RESOURCES	ENERGY	17%	Y	Energy efficiency - certification	C7	E
				Passive design performance	C8	A+
				Carbon intensity (equipment efficiency)	C9	A+
	WATER	8%	Y	Domestic water consumption	C10	A
				Local water consumption/management	C11	F
	MATERIALS	5%	Y	Durability	C12	E
				Local materials	C13	B
9 Criteria				Low impact materials	C14	B
32%	FOOD PRODUCTION	2%	Y	Local food production	C15	B
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
ENVIRONMENTAL LOADS	WASTEWATER	3%	Y	Wastewater treatment	C16	F
				Wastewater use	C17	E
	ATMOSPHERIC EMISSIONS	2%	Y	Atmospheric emissions control	C18	A+
	WASTE	3%	Y	Waste control	C19	A++
				Hazardous waste management	C20	A+
				Waste valorisation	C21	A+
8 Criteria	NOISE EMISSIONS	3%	Y	Noise emissions control	C22	A
12%	THERMAL AND LIGHT EMISSIONS	1%	Y	Thermal and light pollution	C23	A+
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
ENVIRONMENTAL COMFORT	AIR QUALITY	5%	Y	Air quality levels	C24	A+
	THERMAL COMFORT	5%	Y	Thermal comfort	C25	A
4 Criteria	LIGHTING AND ACOUSTIC	5%	Y	Lighting levels	C26	A++
15%			Y	Acoustic and insulation/Noise levels	C27	C

Table 66: LiderA Assessment of Sunset Destination Hostel, Lisbon (continuation).

CATEGORY	AREA	Wi	PREREQ.	CRITERIA	C nr	Assessment
SOCIOECONOMIC EXPERIENCES	ACCESS FOR ALL	5%	Y	Public transports access	C28	A++
				Low impact mobility	C29	D
				Inclusive design	C30	C
	ECONOMIC DIVERSITY	4%	Y	Flexibility	C31	A+
				Local economic dynamics	C32	A
				Local work	C33	A++
	AMENITIES AND SOCIAL INTERACTION	4%	Y	Local amenities	C34	A+
				Community interaction	C35	A+
	CONTROL AND PARTICIPATION	4%	Y	Controllability	C36	A+
				Participation and governance conditions	C37	D
				Natural risks - safety	C38	E
13 Criteria				Human threats - security	C39	A
19%	LIFE CYCLE COSTS	2%	Y	Life cycle costs	C40	A
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
SUSTAINABLE USE	ENVIRONMENTAL MANAGEMENT	6%	Y	Environmental information	C41	B
3 Criteria				Environmental management	C42	E
8%	INNOVATION	2%	Y	Innovative solutions	C43	D
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
	Assessment level obtained:					**A-27.8%**
LiderA - Sustainability Assessment System® - Base Criteria V 2.0b						

Table 67: LiderA Assessment of Almáa Sintra Hostel, Sintra.

CATEGORY	AREA	Wi	PREREQ.	CRITERIA	C nr	Assessment
LOCAL INTEGRATION	SOIL	7%	Y	Territorial valorisation	C1	A+
				Environmental deployment optimization	C2	A
	NATURAL ECOSSYSTEMS	5%	Y	Ecological valorisation	C3	A++
				Habitats connection	C4	A
6 Criteria	LANDSCAPE AND HERITAGE	2%	Y	Landscape integration	C5	A++
14%				Heritage protection and enhancement	C6	A
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
RESOURCES	ENERGY	17%	Y	Energy efficiency - certification	C7	E
				Passive design performance	C8	A
				Carbon intensity (equipment efficiency)	C9	C
	WATER	8%	Y	Domestic water consumption	C10	A+
				Local water consumption/management	C11	A++
	MATERIALS	5%	Y	Durability	C12	A
				Local materials	C13	A++
9 Criteria				Low impact materials	C14	A+
32%	FOOD PRODUCTION	2%	Y	Local food production	C15	B
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
ENVIRONMENTAL LOADS	WASTEWATER	3%	Y	Wastewater treatment	C16	E
				Wastewater use	C17	E
	ATMOSPHERIC EMISSIONS	2%	Y	Atmospheric emissions control	C18	A+
	WASTE	3%	Y	Waste control	C19	A++
				Hazardous waste management	C20	A++
				Waste valorisation	C21	A
8 Criteria	NOISE EMISSIONS	3%	Y	Noise emissions control	C22	B
12%	THERMAL AND LIGHT EMISSIONS	1%	Y	Thermal and light pollution	C23	A
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
ENVIRONMENTAL COMFORT	AIR QUALITY	5%	Y	Air quality levels	C24	A+
	THERMAL COMFORT	5%	Y	Thermal comfort	C25	A
4 Criteria	LIGHTING AND ACOUSTIC	5%	Y	Lighting levels	C26	A++
15%			Y	Acoustic and insulation/Noise levels	C27	C

Table 68: LiderA Assessment of Almáa Sintra Hostel, Sintra (continuation).

CATEGORY	AREA	Wi	PREREQ.	CRITERIA	C nr	Assessment
SOCIOECONOMIC EXPERIENCES	ACCESS FOR ALL	5%	Y	Public transports access	C28	C
				Low impact mobility	C29	B
				Inclusive design	C30	B
	ECONOMIC DIVERSITY	4%	Y	Flexibility	C31	A
				Local economic dynamics	C32	A
				Local work	C33	A+
	AMENITIES AND SOCIAL INTERACTION	4%	Y	Local amenities	C34	B
				Community interaction	C35	B
	CONTROL AND PARTICIPATION	4%	Y	Controllability	C36	A
				Participation and governance conditions	C37	D
				Natural risks - safety	C38	E
13 Criteria				Human threats - security	C39	B
19%	LIFE CYCLE COSTS	2%	Y	Life cycle costs	C40	A++
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
SUSTAINABLE USE	ENVIRONMENTAL MANAGEMENT	6%	Y	Environmental information	C41	B
3 Criteria				Environmental management	C42	E
8%	INNOVATION	2%	Y	Innovative solutions	C43	A+
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
	Assessment level obtained:					**A+ - 33.8%**
LiderA - Sustainability Assessment System® - Base Criteria V 2.0b						

Table 69: LiderA Assessment of Fundação, O Século, Estoril.

CATEGORY	AREA	Wi	PREREQ.	CRITERIA	C nr	Assessment
LOCAL INTEGRATION	SOIL	7%	Y	Territorial valorisation	C1	A
				Environmental deployment optimization	C2	D
	NATURAL ECOSSYSTEMS	5%	Y	Ecological valorisation	C3	A
				Habitats connection	C4	A
6 Criteria	LANDSCAPE AND HERITAGE	2%	Y	Landscape integration	C5	A++
14%				Heritage protection and enhancement	C6	B
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
RESOURCES	ENERGY	17%	Y	Energy efficiency - certification	C7	E
				Passive design performance	C8	A+
				Carbon intensity (equipment efficiency)	C9	B
	WATER	8%	Y	Domestic water consumption	C10	D
				Local water consumption/management	C11	E
	MATERIALS	5%	Y	Durability	C12	B
				Local materials	C13	C
9 Criteria				Low impact materials	C14	E
32%	FOOD PRODUCTION	2%	Y	Local food production	C15	A
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
ENVIRONMENTAL LOADS	WASTEWATER	3%	Y	Wastewater treatment	C16	F
				Wastewater use	C17	E
	ATMOSPHERIC EMISSIONS	2%	Y	Atmospheric emissions control	C18	B
	WASTE	3%	Y	Waste control	C19	A++
				Hazardous waste management	C20	A+
				Waste valorisation	C21	B
8 Criteria	NOISE EMISSIONS	3%	Y	Noise emissions control	C22	B
12%	THERMAL AND LIGHT EMISSIONS	1%	Y	Thermal and light pollution	C23	A
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
ENVIRONMENTAL COMFORT	AIR QUALITY	5%	Y	Air quality levels	C24	A
	THERMAL COMFORT	5%	Y	Thermal comfort	C25	A
4 Criteria	LIGHTING AND ACOUSTIC	5%	Y	Lighting levels	C26	A++
15%			Y	Acoustic and insulation/Noise levels	C27	C

Table 70: LiderA Assessment of Fundação, O Século, Estoril (continuation).

CATEGORY	AREA	Wi	PREREQ.	CRITERIA	C nr	Assessment
SOCIOECONOMIC EXPERIENCES	ACCESS FOR ALL	5%	Y	Public transports access	C28	C
				Low impact mobility	C29	B
				Inclusive design	C30	A+
	ECONOMIC DIVERSITY	4%	Y	Flexibility	C31	A+
				Local economic dynamics	C32	A
				Local work	C33	A
	AMENITIES AND SOCIAL INTERACTION	4%	Y	Local amenities	C34	A
				Community interaction	C35	A
	CONTROL AND PARTICIPATION	4%	Y	Controllability	C36	B
				Participation and governance conditions	C37	A++
				Natural risks - safety	C38	E
13 Criteria				Human threats - security	C39	A+
19%	LIFE CYCLE COSTS	2%	Y	Life cycle costs	C40	A
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
SUSTAINABLE USE	ENVIRONMENTAL MANAGEMENT	6%	Y	Environmental information	C41	D
3 Criteria				Environmental management	C42	E
8%	INNOVATION	2%	Y	Innovative solutions	C43	D
CATEGORY	**AREA**	**Wi**	**PREREQ.**	**CRITERIA**	**C nr**	**Assessment**
	Assessment level obtained:					**A-22.5%**
LiderA - Sustainability Assessment System® - Base Criteria V 2.0b						