LiderA

VOLUNTARY SYSTEM FOR THE SUSTAINABILITY OF BUILT ENVIRONMENTS

Manuel Duarte Pinheiro

www.lidera.info

2011 [v2.0]

Lead for the environment in search of sustainability

LiderA

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Summary Presentation

This document summarily presents version 2.00c1 – version for the built environments – of the voluntary support system for the search and certification of Sustainable Construction.

Lisbon,
February 2011

Working Version (V2.00c1)

Manuel Duarte Pinheiro

Contributors:
Deolinda Chaves | *Duarte Nunes* | *Manuel Duarte* (IPA)

Contents

Introduction

Nowadays, sustainable construction is still seen as a new concept for the construction industry, mainly when studding the Portuguese case, offering multiple perspectives, according to different approaches. Practical ways to assess and recognize sustainable construction have increasingly become a reality in different countries, especially in those that have promoted sustainable construction through market systems (CIB, 1999; Silva 2004), principally when these systems study the building scale.

Internationally, several systems have been created in order to access, recognize and evaluate sustainable construction (namely in the United Kingdom, United States of America, Australia, Canada, France, and Japan, amongst others). In the Portuguese case, the Civil Engineering and Architecture Department of Instituto Superior Técnico (the most important engineering faculty in Portugal), has been developing the foundations for a new sustainable construction support and assessment system (Pinheiro et. al 2002; Pinheiro, 2004; Pinheiro e Correia, 2005, Pinheiro, 2006).

Therefore, since the beginning of the new millennium, at Civil Engineering and Architecture Department of Instituto Superior Técnico, with the support of IPA – Inovação e Projectos em Ambiente, Lda., the author has been developing researches for sustainable construction's technical support. Amongst these researches, stands out the development of a support and evaluation system for sustainable construction at national level, with particular emphasis on buildings and businesses, known as LiderA - Portuguese acronym of Lead for the environment in search of sustainability construction.

LiderA, as a Sustainable Evaluation System, is a Portuguese registered trademark; that could be use to search solutions and evaluate projects, allowing them be certified or recognised by the system's brand, according to different final purposes.

The first version (V1.02), released in 2005, was mainly intended to evaluate, certify or recognise projects within the building scale and respective surroundings. However, given the number of applications studied, a new version (V2.00) has been developed, extending this possibility, not only to the building scale, but also to the built environment, including the demand for outdoor spaces, blocks, neighbourhoods and sustainable communities.

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. The system is recognized and referenced by many different entities or agents, namely from professionals to municipalities.

The main summary guidelines of LiderA's current version (2.0) will be listed below.

system

LiderA system is presented in this first chapter – what is it and what it is meant for, its structure, categories, areas and criteria; its performance levels, and finally, how the final classification is obtained by weighting the different evaluation areas.

LiderA

LiderA System

LiderA is based on the concept of re-positioning the environment in construction, under a sustainable perspective, assuming itself as a leading system for the environment. It is organized into category's that include areas of intervention and are operated by criteria, which allow the guidance and evaluation of the level of demand for sustainability.

Categories and Areas

LiderA's approach to the demand for sustainability in the built environment is based on six principles, which cover the main aspects considered in six different categories, namely:

- **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.

The six different categories are subdivided into twenty-two areas, namely:

- **Site and Integration**, regarding Soil, Natural Ecosystems, and Landscape and Heritage;
- **Resources**, including Energy, Water, Materials and Food Production;
- **Environmental Loadings**, regarding Wastewater, Atmospheric Emissions, Waste, Noise Emissions, and Thermal and Light Pollution;
- **Environmental Comfort**, including Air Quality, Thermal Comfort, and Lighting and Acoustics;
- **Socioeconomic Experience**, including Access for All, Economic Diversity, Amenities and Social Interaction, Control and Participation, and Life Cycle Costs;
- **Sustainable Use**, including environmental management, and innovation.

Performance Levels

As a support for sustainable development, the system suggests a set of criteria distributed through different areas. The proposed criteria oblige not only that legal requirements are met but also that these are adopted as minimum essential requirements, in all the considered areas, including all the regulation applied to the built environment. In this case, the demand for sustainability will imply a performance that surpasses the minimum essential requirements found in present regulation.

In order to guide and evaluate the project's performance, through its evaluation process, a set of criteria, regarding every aspect taken into consideration in each area, was established. In this version (V 2.00), there are 43 predefined base criteria. These criteria have different levels of performance (from 1 to 10 or higher) and evolve with the evolution of technology, thus providing more environmentally efficient solutions. However, the criteria and guidelines presented are intended to help select, not the best solution available, but the solution that, preferably, improves most significantly the existing performance within an economic view.

For each type of use and for each criterion, performance levels were defined, in order to determine whether the evaluated solution is sustainable or not. The presented parameters for each criterion, listed below follow, either the improvement of existing practices, or the reference to good practices values, as usual in other international systems.

These performance levels are derived from three main reference points. The first is based on technological performance or current building practices and is considered the standard level (Level E). The second refers to the best performance results able to be attained with current and viable building practices (Level C, B or even A). The third point is based on neutral or regenerative solutions, with a high level of sustainability (Level A+ or A++). Furthermore, performance levels are set accordingly to each different use.

These performance levels are adjusted to each use and can be prescriptive (indicating which solution to consider) or performing (defining specific performance values). Thus, there is a framework available for each use, that particularizes the different requirements for each performance level.

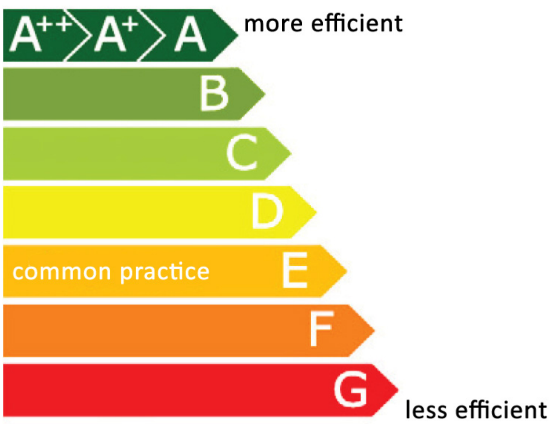

Illustration 1 – Performance Levels

According to LiderA, the sustainability degree is measurable and able to be certified in performance levels (C, B, A, A+ and A + +), that include an improvement of 25% (Level C), when compared to common practices (Level E), an improvement of 50% (Class A), a factor 4 improvement (Class A+) and finally, to factor 10 improvement (Class A + +).

Weighting

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. In this context, the area of greatest importance is energy (with a 17% weight), followed by water (8%) and soil (7%).

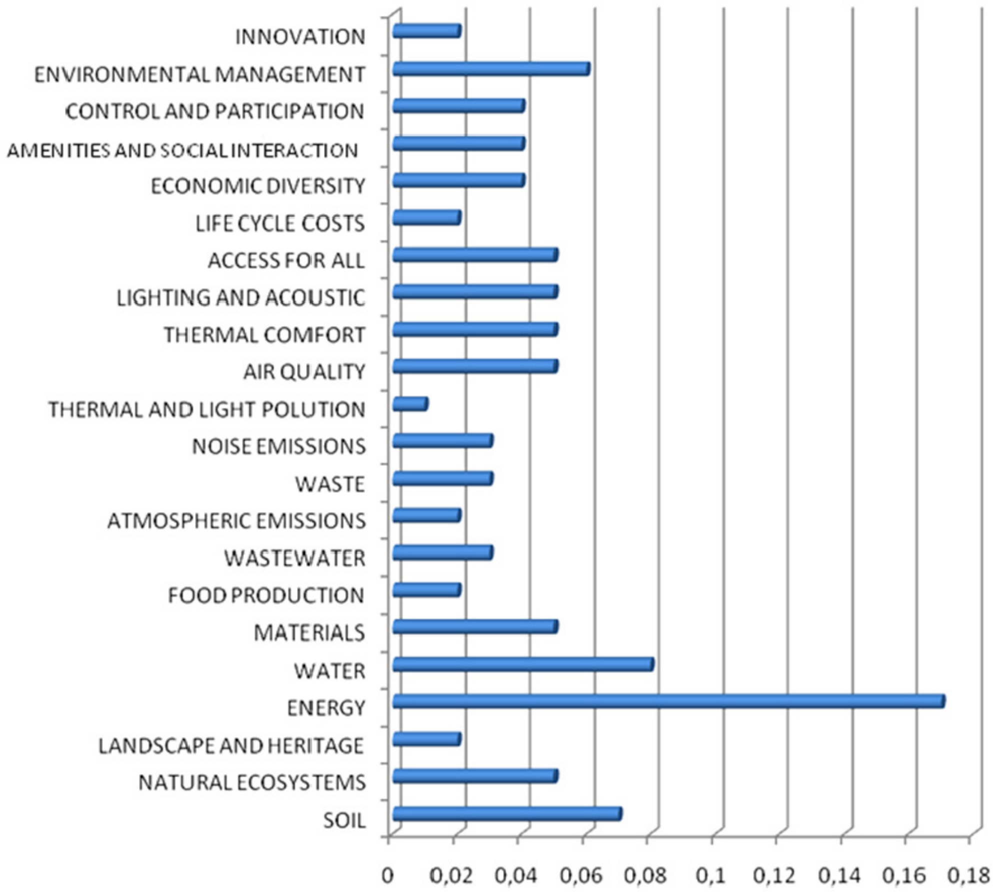

Illustration 2 – Weighting (wi) by Areas (%) - LiderA (V2.00)

When accounting by categories, it becomes clear that the Resources' category is the most relevant one, with 32% of the total weight, followed by the Socioeconomic Experience (19%), Environmental Comfort (15%), Site and integration (14%), Environmental Loadings (12%) and finally Sustainable Use (8%).

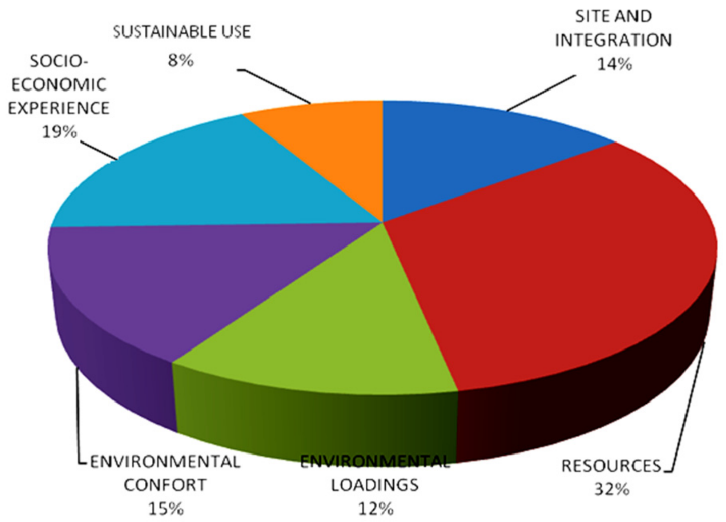

Illustration 3 – Weighting by Categories LiderA (V 2.00)

The performance clustered in the areas of Local Integration, Resources and Environmental Loadings profile a strict environmental performance, which combined with the areas Environmental Comfort, Socioeconomic Experience and Sustainable Use perspective the general performance in the search for sustainability.

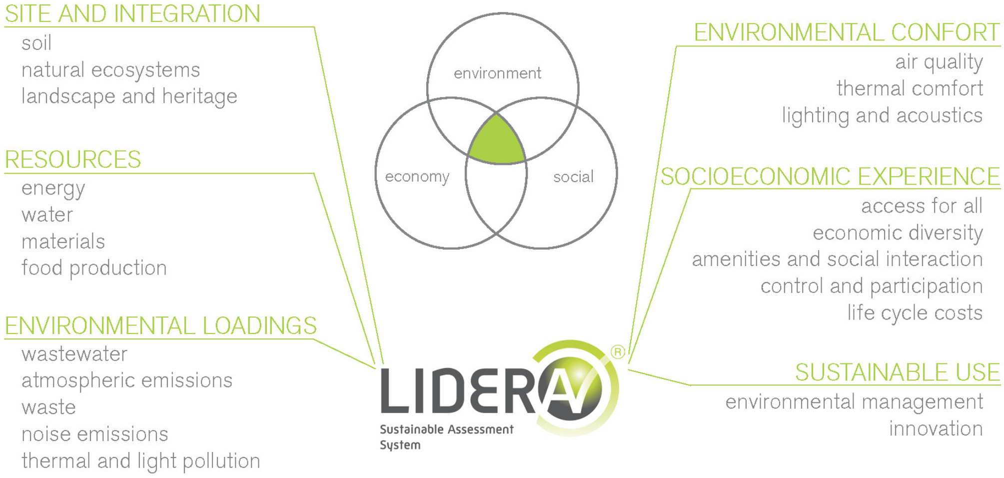

Illustration 4 - LiderA's Categories and Areas scheme

criteria

To operationalize the search for sustainability, in version 2.0 there are 43 predefined criteria. These criteria are numbered from 1 to 43 (a criterion is suggested as C no.). Secondly, various aspects will be addressed in this chapter, considering areas and other features of the LiderA system.

LiderA

Criteria

Category

Site and Integration

Project location is one of the key elements in the building's initial development. Conditionings like soil occupancy, ecological land changes and landscape, the area needs for development, the ecological network and landscape and heritage enhancement are associated with the choice of location and the delimitation of any building or developing area environmental performance.

Table 1 - Site and Integration: considered areas and criteria

CATEGORY	AREA	Wi	Pre-Req.	CRITERIA	C 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 AND HERITAGE	2%	S	Landscape integration	C5
14%				Heritage protection and enhancement	C6

When regarding site and integration, the support criteria focus on the following aspects:

SOIL

Soil is an extremely important resource. The decision on where to build and how to use the site for built interventions is a major aspect of sustainability, because it will structure the project's development. Soil and its occupation is an important factor when selecting appropriate sites for construction, and thus a challenge for sustainability, since there is the need to prevent the increase in occupancy of natural areas, to reduce impermeable and occupied areas. Thus, LiderA highlights the importance of valuing local territory (C1) and environmentally optimize deployment (C2).

- Territorial valorisation (C1) - it is more suitable to build in places that assure low soil impacts and in its uses generate sustainability in the deployment area, and valorise global environmental characteristics such as, for example morphology. The possibility to valorise a degraded place is a relevant aspect to prioritize.

- Environmental deployment optimization (C2) – on one hand the building's footprint must be reduce, without exceeding the height limits (of the surrounding buildings) established for the area, on the other hand, deployment should be adequate to the constructed spaces and building's operation area, in order to ensure its proper implementation, given the environmental space's sensitivities.

NATURAL ECOSYSTEMS

- Ecological valorisation (C3) - the ecological value of places is often diminish by human interventions, however if adequately directed towards the valorisation of ecosystems, namely its fauna and flora, it can increase the existing values. This can occur through the increase of local biodiversity and valorisation of natural zones.

- Habitats connection (C4) - the built environment should integrate and respect existing natural areas, minimizing any unwanted effects, namely by encouraging the protection of major natural habitats and the introduction of continuity zones in between, in order to safeguard these areas. This criterion intends to minimize natural areas and biodiversity depletion, to protect habitats and to prevent ecological fragmentation.

Natural ecosystems cover a multitude of aspects, either in open not humanized spaces, or in humanized spaces, in many cases not covered by the construction area. In ecosystems, the challenges to promote sustainability, highlighted by LiderA, focus on the protection of natural areas, on the mitigation of impacts on biodiversity, on maintaining the existing natural, on the increase and enhancement of ecological dynamics (C3), and on reducing the increased fragmentation of habitats, through habitats' interconnection (C4).

LANDSCAPE AND HERITAGE

- Landscape Integration (C5) - the project should contribute to enhance the built environment and, if possible, it should ensure connections between naturalized landscape and the surrounding built environment, as it contributes to the integration of development and enhancement of natural components. This must be done as a contribution for the integration of natural and urban dynamics.

- Heritage Protection and Enhancement (C6) - the built heritage can have a great influence in the place's identity and characteristics, therefore it should be preserved and developed (rehabilitated or restored). The adoption of conservation practices, as well as the built environment's preservation and enhancement is a major issue that should also be considered in the surrounding areas. These measures can be materialized by designing architectural forms according to the existent surroundings.

Changing local landscape integration capacity of ventures is an important and complex issue to consider, given its partial. In built environments, it is important to highlight the ability that interventions and projects need, to ensure the landscaping integration or the valorisation of the site (C5) according to objective parameters, such as: volume and orientation of the building, urban morphology and relevant views. When addressing heritage, LiderA highlights the possibility to protect and enhance local built heritage (C6).

Category

Resources

Energy, water, material and food resources consumption have a key role in sustainability, in balancing the environment, as its impacts can be very significant and may occur at different stages in the projects life cycle.

The possibility of punctual food production, which, although not affecting directly the operation of buildings and areas, can contribute: to food's timely provision, to an occupation, connected to nature, to reduce transport footprint and integrate food process in urban zones.

Table 2 - Resources: Areas and criteria considered

CATEGORY	AREA	Wi	Pre-Req.	CRITERIA	C 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

When regarding the Resources category, the support criteria focus on the following aspects:

Energy consumption activities has increased, and not always according to an efficient perspective of creating wealth (reflected in the indicators of energy intensity). Energy production and other combustion activities, originate emissions, such as CO_2, one of the green house gases (GHGs). The energetic challenge, according to LiderA, should be based on an effort to reduce any unnecessary consumption, considering the possibility that being connected to energy certification (C7). Whenever possible, it is also important to adopt bioclimatic and passive design solutions (C8), as well as, energy production from renewable sources, which will translate in low-carbon emissions (C9), such as CO_2 or other greenhouse gases.

- **Efficiency in consumption – Energy certification (C7)** - this criterion aims at buildings energy consumption and energy performance certification (Energy and Air Quality National Certification System). The buildings' energy requirements should be analysed in the scope of normal comfort conditions, which transforms into specific measures to reduce energy consumption.

- **Passive Design (C8)** – passive design methods may be the key component to achieve an effective approach for reducing energy consumption needs. In buildings, as well as in public spaces, the adoption of passive strategies (bioclimatic) is essential to reduce energy needs. The adoption of passive design is one of the most important measures due to its influence during the buildings operational phase, and in some cases, a good passive design can avoid the use of mechanical systems (HVACs) in buildings.

- **Carbon Intensity (equipment efficiency) (C9)** – the carbon footprint establishes the balance between the emitted carbon and global energy consumption, either from renewable sources or non-renewable ones. The ideal scenario would be the exclusive use energy use from renewable sources, aided by equipments efficiency.

WATER

- **Potable water consumption (C10)** - sustainable use of water requires a strategy that reduces consumption, which can be achieved through adequate and efficient water use. This can be enhanced through the implementation of water reuse mechanisms or, if possible, through the decrease of potable water use for secondary purposes (such as using grey water in toilet flushing).

- **Local water management (C11)** – it is fundamental to contribute to natural water cycle through the naturalization of water management on site, in particular by increasing surface runoff and possible peak / flood effects mitigation during rainfalls. A naturalized system must be created for storm water management, allowing its infiltration, as well as providing drainage lines and the retention of pollutants in areas with potential contaminants.

The water cycle is essential for life in general, ecosystems, human beings and several other activities. The challenge for water demand in sustainability, according to LiderA, is based on seeking the reduction of potable water consumption (C10) by joining its good quality to more noble and demanding uses and in seeking to manage waters (C11) in the intervened areas.

MATERIALS

- **Durability (C12)** – materials consumption is directly related to their durability, and the build environments' durability, hence the importance of durable materials matters, especially in the building envelope and networks. In a sustainable strategy, the built environments' durability should be increased, in order to minimize materials consumption and maintenance costs, often associated with the renovation and demolition phases of the existing buildings or the construction phase of new ones.

- **Local materials (C13)** – the availability and use of local materials (up to 100 km), can contribute to the mitigation of transport needs, including their energy and emissions, encouraging construction integration and local economy dynamics.

- **Low impact materials (C14)** – it fosters the use of materials with reduced environmental impact, including the use of environmentally certified materials (the eco-label or other recognized certification systems), recycled materials or materials with enhanced environmental performance.

The buildings and associated activities are placed as the largest consumers of materials, that during their lifetime occupy land, consume minerals, fossil fuels, other natural materials, and produce waste. The production and use of building materials have a significant impact on the environment and on project costs. In this sense, in the search for sustainability, it is important to reduce the amount of materials used and seeking, if possible, the use of local, recycled and / or renewable materials, ensuring that they have low environmental impact. In the materials area, according to LiderA, the search for sustainability is based on seeking durability (C12), on promoting the use of local materials (C13), and on a thoughtful demand for materials with low environmental impact (C14).

FOOD PRODUCTION

- **Local food production (C15)** – maximize the adequate local food production possibilities, especially in outdoor spaces and occasionally in the interior of buildings. The local production can begin to create a level, although low initially, of local autonomy, thus contributing to greater sustainability.

Local food production will contribute, in a timely manner, to maximize the chances of adequate food production. This local production could start creating a level, although reduced, of awareness to ecological cycles and local autonomy, thus contributing to greater sustainability.

Category

Environmental Loadings

The impacts of loads generated by the built environment and related activities results in wastewater emissions, air emissions, solid waste, and thermal and light pollution. This strand focuses on buildings and structures, as well as the close relationships established with outside areas.

Table 3 - Environmental Loadings: Areas and criteria considered

CATEGORY	AREA	Wi	Pre-Req.	CRITERIA	C 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
8 Criteria	NOISE EMISSIONS	3%	S	Noise emissions control	C22
12%	THERMAL AND LIGHT POLLUTION	1%	S	Thermal and light pollution	C23

When regarding the Environmental Loadings category, the support criteria focus on the following aspects:

WASTEWATER

Effluents are one of the areas with high impacts on the environment. In the wastewater area, the demand for sustainability, according to LiderA, is based on ensuring an adequate level of wastewater treatment at the site (C16) and on the possibility of reusing wastewater (C17). Thus, the strategy adopted is based on the reduction of effluents, on the separation of sewage types, and on the maximization of water reuse. Finally, the type of treatment should be compatible with the means to discharge wastewater, its sensitivity and possible reuse.

- **Wastewater treatment (C16)** – encourage the use and implementation of local treatment systems, reducing the strain on municipal treatment plants and, whenever possible, using appropriate biological systems and treatment systems with low-intensity in energy and materials. The biological wastewater treatment is a good example of a treatment system that may contribute to later re-usability (see C17).

- **Wastewater use (C17)** – one of the possibilities to reduce water consumption is based on the reuse of wastewater (namely gray water or black waters) for activities that do not require drinkable water, such as toilets discharge, irrigation and outdoor decks washing, green spaces maintenance, car washing, amongst others.

ATMOSPHERIC EMISSIONS

The reduction of air pollution emissions should be the focus of attention, as highlighted by LiderA, by reducing the flow of atmospheric emissions (C18), which applies in particular, to the level of particles and / or potential acidifying substances (SO_2 and NOx).

- **Air emissions control (C18)** – it applies mainly to particles and potentially acidifying substances (SO_2 and NOx). The combustion activities create particle emissions of SO_2 and NOx (amongst others); therefore, reducing these emissions is essential. Furthermore, established legal specifications must be complied, particularly by reducing the sources and loads of atmospheric emissions.

WASTE

- **Waste control (C19)** – the reduction of waste production during the building's various construction/use phases, should be seen as an objective that must be achieved. That reduction can be achieved by technical solutions and reused materials. These measures will only be efficient, if this goal is agreed by all involved parts, and if it is considered during all phases of built environments lifecycle.

- **Waste management (C20)** – promote the selection of materials and respective waste, taking into account the possibility of reduced production of hazardous waste, as well as considering the conditions for storage and appropriate treatment.

- **Waste valorisation (C21)** – the percentage of waste recovered should be increased (whether it is recycled or reused), either in construction, operation or demolition phases. Reused waste presents higher gains, since the reuse process requires less energy than the production of new materials.

Waste management strategies should be based on a reduction logic, notably by ensuring the reduction of waste (C19), by ensuring hazardous waste management (C20). It should also encourage the valorisation of waste (C21), in all phases of the building's lifecycle, increasing the percentage of waste recovered, either in construction, in operation, or in deconstruction.

NOISE EMISSIONS

- **Noise emissions control (C22)** – obtaining acceptable noise levels is crucial either for human life or for animals. This objective can be promoted through noise sources control inside buildings or in open public spaces.

Noise is a major problem and one of the main complaints in the environmental approach. This should, therefore, in accordance with LiderA' demand for sustainability be reduced by the outset of noise sources (C22), with implications on current activities in the venture.

THERMAL AND LIGHT POLLUTION

- **Thermal and light pollution (C23)** – the heat island effect is mainly caused by changes in the site's thermal balance and has a global impact, which is corroborated by the unpleasant environmental conditions verified in some public spaces. The main goal is to reduce thermal changes in the built environment. During night periods, artificial light may appear harmless to natural species, but it constitutes another source of pollution, which, if not contained, can interfere with ecosystems and also with the development of human activities and, therefore, should be mitigated.

In the search for sustainability, according to LiderA, it is important to enlighten thermal pollution (C23), which includes the heat island effect, caused by changes in the site's thermal balance, and the pollution generated by outdoor artificial lighting, that should be minimized to reduce any interference on ecosystems and human activities.

Category

Environmental Comfort

When considering current lifestyles, it is essential to consider that buildings and outdoor environments should not only meet the demands of efficiency but also customer satisfaction, so that any intervention at this scale is prominent and necessary, and should be definitely equated. There are no hard and fast rules or unique solutions, that allow the creation of that respond to human comfort and well-being.

However, there should be quantification methods that can demonstrate the effectiveness and efficiency of the adopted solutions. These solutions must be linked to specific strategies that depend on the occupants, on the activities and on the program itself. The following factors may be useful when considering different scales and answering several questions, therefore facilitating the occupants' ability to modify and interact with interior spaces' air quality, thermal environment, light and sound.

Table 4 - Environmental Comfort: Areas and basic criteria considered

CATEGORY	AREA	Wi	Pre-Req.	CRITERIA	C No.
ENVIRONMENTAL COMFORT	AIR QUALITY	5%	S	Air Quality Levels	C24
	THERMAL COMFORT	5%	S	Thermal Comfort	C25
4 Criteria	LIGHTING AND ACOUSTIC	5%	S	Lighting levels	C26
15%				Acoustic insulation / noise levels	C27

Regarding the indoor environment, without excluding outdoor environment, the basic criteria focus on the following aspects:

AIR QUALITY

The indoor air quality is one of the factors with greatest impact on living beings life cycle. Today it appears a gradual degradation of air quality, has generally occurred in buildings. In the search for sustainability, good levels of air quality (C24) must be ensured.

- **Air Quality Levels (C24)** – it is necessary to evaluate the various elements that can influence such quality, not only indoors (such as the natural ventilation phenomena, VOCs emissions and micro-contamination) but also outdoors (wind conditions and especially the air quality levels). The presence of vegetation can improve the outdoor air quality.

THERMAL COMFORT

- **Thermal Comfort (C25)** - comfort is a fundamental element in buildings, therefore, this criterion is intended to achieve appropriate temperature and humidity levels or wind speeds during the operation phase over a certain period, for most of its occupants. It is also essential to create comfortable conditions, appropriate to outdoor activities.

Thermal comfort (C25) is an important parameter in the welfare of users and sometimes even on energy expenditure.

LIGHTING AND ACOUSTIC

- **Lighting levels (C26)** – the ideal light levels for buildings' outdoor and indoor environments, above all, must take into account not only the activities that are being developed in each of its areas, but also its occupants' characteristics. The possibility of using natural light for these purposes is extremely important.

- **Acoustic insulation / noise levels (C27)** - this criterion aims to enhance the maintenance of acceptable noise levels for activities and to achieve acoustic comfort levels within the built environment, therefore minimizing the disruption resulting from inadequate results, that do not lie within the appropriate boundaries. In this case, various solutions can be adopted, including the protection of activity areas.

Along with lighting, acoustics is a key element for humans. It should be approached in order to ensure good lighting levels (C26), adjusted to present activities, this is, good lighting levels in the building and outer spaces, either natural or artificial illumination. Noise levels (C27) aim to promote the maintenance of acceptable noise levels for activities, and to achieve levels of acoustic comfort in the built environment.

Category

Socioeconomic experience

Socioeconomic experience is a category that relates the society directly with the space or area in which it lives. Social and economic aspects are an integrant part of this interaction, namely: the accessibility and mobility aspects, that cover the type and ease of people's movements; the life cycle costs, that establish a better relationship between price and quality; the available amenities' type and quality, considering which affect the population's quality of life; the type of social interaction that takes place amongst the population; the economic diversity that, covers a greater or lesser variety of spaces with different functions and economic functions; and finally, control and security, that ensures a more or less secure relationship within individuals, and between population, and its surrounds.

It is intended that these aspects are tackled in a way that ensures an ever more versatile and efficient socioeconomic experience and structure, when considering population's life quality.

Table 5 - Socioeconomic Experience: Areas and basic criteria considered

CATEGORY	AREA	Wi	Pre-Req.	CRITERIA	C No.
SOCIOECONOMIC EXPERIENCE	ACCESS FOR ALL	5%	S	Public transportation access	C28
				Low impact mobility	C29
				Accessibility to disabled 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
				Natural Risks - Safety	C38
13 Criteria				Human Threats - Security	C39
19%	LIFE CYCLE COSTS	2%	S	Life cycle costs	C40

With specific regard to socioeconomic experience, the basic criteria focus on the following aspects:

ACCESS FOR ALL

The construction, operation and decommissioning of built structures leads in many cases, to mobility needs of materials, people, goods and services, both as a transport issue, and in terms of access for people with reduced mobility or other needs of inclusiveness. Thus in the area of access for all, the quest for sustainability, according to LiderA, is based on the promotion of access to public transport (C28), on promoting low impact mobility(C29), and inclusive solutions (C30).

- **Public transportation access (C28)** - it is important to create conditions for the use of public transports, preferably the use of those whose character is more ecologic, to enhance the proximity of public transport or the creation of local ecological transport means and to ensure access to transport nodes, or supplement that need.

- **Low impact mobility (C29)** - reduce transport needs, promote the use of low impact transport means, by addressing important mobility aspects such as creating infrastructures (paths, bike lanes) that enable its use and assuring the availability of dedicated parking spaces.

- **Accessibility to disabled people (C30)** – first, it is necessary to remove any barriers that often exist in buildings and outdoor spaces, that prevent or difficult the access of disabled people, contributing to the alienation of society members. The careful planning of buildings and their characteristics, providing the creation of zones, accessible to all users (disabled people or people with special needs) as a way to ensure inclusive solutions, could eliminate this.

ECONOMIC DIVERSITY

- **Flexibility / Adaptability (C31)** – this criterion shall ensure the existence of modular and adjustable zones that can respond to changing needs. This aspect helps to maintain the built environment and all areas tailored to its occupants and users needs, enhancing their ability to adapt to different uses and avoiding obsolete spaces.

- **Local Economic dynamics (C32)** - the existence of services, buildings and areas which have economic activities has become extremely important, including a part of which is monetarily accessible, and not only enables the existence of economic activities but also the access to different users.

- **Local work (C33)** - It is important to have the possibility of offering job opportunities in the local built environment, in order to avoid wasting time on travel, and simultaneously allowing a better quality of life, reducing thereby the pollution caused by occupants' pendulum movements. These measures will also promote a greater state of comfort for those people whose job does not locate near their residence.

Economy is one of the three main components of sustainability. Therefore, economic diversity can contribute, to better living conditions of a building, outer space, development or urban area. According to LiderA the following issues should be considered: flexibility and adaptability of spaces to new uses (C31), encouragement of local economic dynamics (C32) and contribution to the creation of local work (C33).

AMENITIES AND SOCIAL INTERACTION

- **Local amenities (C34)** – users' proximity to these amenities should be seen as an asset for the local environment, and if its enjoyment is rational and meets the capacities of such amenities, it creates a win-win relationship between the different parties. Therefore, the system suggests the enhancement of local amenities, the promotion of their presence, creation, maintenance and access in the proximities, and the preservation of its functions.

- **Community Interaction (C35)** - it should be possible for the whole population or neighbourhood to enjoy the infrastructures and spaces that are created for the building or urban area. Moreover, it may even be promoted activities (for example, sports and cultural) that not only imply the occupants' participation, but also allow their interaction with the surrounding community, promoting proximity relationships between neighbours.

The proximity of users to amenities should be seen as an asset (C34) the built environment, and if their enjoyment is rational and meets the capacities of such amenities, it creates a win-win relationship for the various parties. Thus, an important aspect to take into account is the fact that buildings and respective surroundings, should contribute constructively to the interaction with the community (C35) and potential users.

CONTROL AND PARTICIPATION

The contribute for a good experience is also based on the users' ability to control (C36) their living conditions, especially in terms of comfort and others. Better conditions of participation and governance (C37), give additional importance to users and various stakeholders, to help create and develop the built environment. A good experience is also means to ensure the safety of users of the built environment, control of natural risks (C38), and monitoring human threats (C39).

- **Controllability (C36)** – this is a crucial aspect, as buildings' occupants should be able to control comfort levels, according to their needs (referred to as adaptive comfort). The occupants should be able to control the enterprises' functions, such as ventilation (mechanical and natural) and lighting levels (artificial and natural). The scrutiny of both, will ultimately lead to temperature, humidity, pollutants and noise levels control, amongst others. In the outdoor environment, the aim is to adapt to the existing conditions by creating shadow areas and wind or storm protection.

- **Participation and governance conditions (C37)** – users should be able to suggest and participate actively in decision-making, which may even change their lifestyle and their comfort conditions, fulfilment and experience of the built environment.

- **Natural Risks - Safety (C38)** - the area and space shape condition, in general, for their own fruition. It should be understood that any use, not suitable for these features could jeopardize them, especially when considering natural threats (natural catastrophes, strong winds, earthquakes, floods, etc.). The venture's or space's shapes and materials may also interfere with the user's safety; therefore steps to reduce risks should be taken.

- **Human Threats - Security (39)** - it is important to think carefully about the type of space that is proposed in a venture and its possible future uses in order to reduce the conditions in which any risks may arise from the developed activities, dangerous substances or acts of crime and vandalism, amongst others.

LIFE CYCLE COSTS

Costs are one of the aspects that weigh more on a building's viability, because these are reflected throughout the buildings' lifetime, which must be addressed by the life-cycle costs (C40).

- **Life cycle costs (C40)** – this is an essential and important aspect to be taken into account when considering the building's success and viability, as it is one way of maximizing the building's or built environments' profitability, minimizing their maintenance. It should also be taken into account the various life cycle phases of buildings (design, construction, operation and demolition), nevertheless the most prominent is the operation phase, since it is the longest phase in a building's life cycle.

Category

Sustainable Use

The management of environmental aspects, both by providing information to stakeholders, or by applying a management system, can ensure the consistency and fulfilment of criteria and solutions with impact on environmental performance, a continued improvement and control dynamics of environmental projects and the promotion of innovation.

Amongst the relevant aspects, focused above, are the following: the level of information that facilitates good working conditions and the users' awareness. These factors contribute to spread environmental concerns and ensure that new ventures and areas have the ability to be properly used and that they are adapted or have the ability to adapt, over time, to the needs of their occupants and users.

The adoption of environmental management modes and practical innovations, ensure a good performance by the building, while proving its ability to adapt over time, thus contributing to sustainability issues.

Table 6 – Sustainable Use: Areas and basic criteria considered

CATEGORY	AREA	Wi	Pre-Req.	CRITERIA	C No.
SUSTAINABLE USE		6%		Environmental Information	C41
3 Criteria				Environmental Management System	C42
8%	INNOVATION	2%		Innovative solutions	C43

With specific regard to Sustainable Use, the basic criteria focus on the following aspects:

ENVIRONMENTAL MANAGEMENT

- **Environmental Information (C41)** - it is important that this information is available, including simplified mechanisms and environmental specifications that enable stakeholders (construction workers, tenants, etc) understand and operate the building systems and external areas correctly, ensuring a good sustainable performance.

- **Environmental Management System (C42)** - an environmental management system and environmental management mechanisms should be adopted for the enterprise (formal, certified or not), as systems can contribute to a better management and maintenance of the buildings' and outdoor areas' performance, corroborating the good environmental performance.

The management of environmental issues, either through environmental information, or through the applicability of environmental management systems, can ensure consistency and the implementation of solutions with consequences to the environmental performance, a dynamic control and continuous environmental improvement of the venture, for a proper environmental use (C41). Management mechanisms should also be ensured in order to guarantee proper construction, operation and maintenance of built environments.

INNOVATION

- **Innovative Solutions (C43)** - one of the elements that should be strengthened and encouraged, in implementing solutions that promote sustainability, is the adoption of completely innovative solutions that improve the environmental performance of the previously suggested criteria.

Innovation (C43) can help to create a meaningful change in the quest for sustainability and in the evolution to a good performance towards a more sustainable and efficient set.

application

The following chapter is intended to present an introduction to the application of the LiderA system - how to look for and how to ensure sustainability by LiderA.

LiderA

Application

The proposed system (Pinheiro, 2005), offers different possibilities of implementation: plan, design and life cycle management (construction, operation, rehabilitation, renovation, restoration and end of life); allowing monitoring at different development stages of the project's life cycle.

LiderA's application is aimed to cover different spatial scales, ranging from the urban scale (areas or districts), to the buildings and materials scale. To this end, the enterprise must meet the disposed prerequisites and demonstrate a good performance in the criteria that compose the evaluation system.

Apply to search for Sustainability

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, because of an investigation, developed by various agents involved, in the construction and data collection process on the ground.

This system can be applied at various stages, and in fact, is particularly relevant in the enterprises' design phase, as it can obtain a performance value that can be improved for the construction phase.

Since its early stages, each enterprise must adopt an environmental policy (or demonstrate its implementation), which should be suitable for its development and environmental characteristics, when considering the sustainable principles, referred before.

In the **initial phase** of each project, the Developer, being responsible for commissioning operations and awarding a contract to the winning design bid, defines the characteristics, conditions and solutions that should be implemented in the venture. There must be an environmental policy that is able to provide that the undertaken work is conducted with safety, hygiene and healthy conditions for all the involved stakeholders. The developer shall establish general rules for planning, organizing and coordinating the project during all phases.

The Developer should be aware of the planning conditions needed to execute the proposed work and thus anticipate all the risks inherent to each type of work. In subsequent interventions or necessary adjustments, he must ensure that the technical compilation is updated and that the adopted solutions are flexible and modular, in order to provide the building with a new use, in the future, if needed.

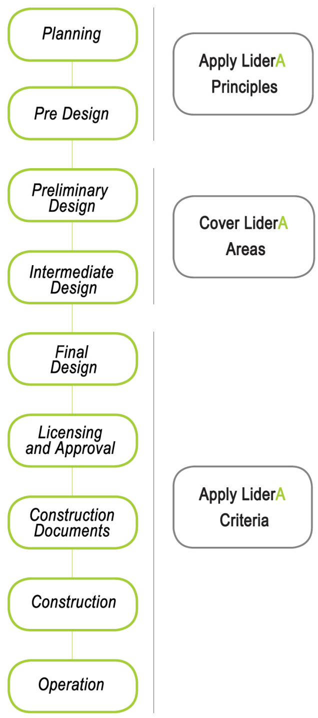

Illustration 5 - Development phases and implementation of the LiderA approach

Planning phase

In terms of the **planning phase**, the approach principles must be disclosed and defined, according to an environmental policy. The Agenda 21 and the Sustainability Guidelines present in the Portuguese General Buildings Regulation were taken into account as criteria for comparison, at this level. This approach consists of the following principles: to promote proper location and environmental integration, to attain efficiency in consumption and flow management, to reduce the impact of environmental stressors, to achieve adequate comfort, to pursue socio-economic adaptability, and to foment a consistent environmental management and a proactive search of innovation.

These principles, established at the ventures' policy level, should be applied at an early design stage and define performance as the commitment, which needs to be met in order to achieve them. This commitment should be formalized, as an ongoing strategy towards the sustainability of enterprises, in which a set of sustainable principles must be assumed.

The **pre-design phase** should include a program that discriminates and delineates the Developer's intentions of seeking a good performance in the search for the venture's sustainability. The initial strategy should be guided by the LiderA principles, which are based on the following components: local integration, resources, environmental loadings, environmental comfort, socioeconomic experience and sustainable use.

This approach should include, in each category, the principles that will regulate the entire project trough the design stages and throughout all stages of approval. These principles are the following:

- **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.

Design phase

The **preliminary design phase** is based on the principles and performance demand levels viable for each specific situation. This is the stage in which solutions and performances must be defined and compared with the benchmarks of sustainability, given the enterprises' performance within the various criteria. As more details are available, from the design phase to the project's implementation, prescriptive measures must evolve in order to be complemented with higher performance levels.

On the **intermediate design phase** the designers must take into account local characteristics (topography, built environment) to enable an optimal orientation, a good integration, and the adoption of exterior permeable surfaces. These considerations will positively influence the environmental comfort and the socioeconomic experiences. When considering the resources, the principles to be followed consist of the balanced management of water and energy, creating a strategy that encompasses passive systems and bioclimatic architecture and enabling the possible use of active systems, the sustainable use of materials, given their life cycle and embodied energy, and the adoption of the concept of local food production. The principles inherent to environmental loadings refer to the requirements defined in the pre-design stage: the existence of a proper place for placing waste, that appeal to their separation and recovery, the treatment of waste water and the possible collection and reuse of rainwater.

The **final design phase** should assess whether proposals (solutions) presented follow the strategies outlined initially and are in accordance with the principles outlined for the areas of LiderA (ensuring an overall coverage and the path to sustainability, which was initially set and analyzed in the pre-design phase). At this stage, it is important to analyze the strategic options and designs previously completed, in order to assess their compatibility with the desired program, both in previewed costs (budget), strategic assessment demand level of sustainability.

The **licensing and approval phase** includes various stages of the project and as a main challenge, it is ambitioned that these stages are also a target for an investigation regarding environmental and social performance, therefore testing sustainable performance.

In this case LiderA has an important role, since it functions as a help tool that will attempt, at every step of the approval process, to evidence the most relevant performance issues to consider in each project.

In this context, LiderA is used as a guide and starting point for analysis, monitoring and evaluating measures applied in the search for sustainability, that need to be submitted to the respective process.

At this stage, documents needed for approval are presented, accompanied by the project's thoughtful approach to sustainability, according to the perspective of the LiderA system. This integrated approach aims to address the possibilities inherent to the search for sustainability of buildings, based on the licensing and approval process (according to Ordinance No. 701-H/2008 of July 29, Annex I - art. 1).

At the **construction documents phase**, details of constructive solutions and proposals originally outlined in previous phases must be checked. At this stage it is important to detail all construction elements as well as procedures and rules that will be applied or followed. Solutions that require the use of renewable energy, water collection, the reduction of energy and water consumption and use of certified materials are aspects that require more detailing, in the resources category.

When considering waste, intervenients should detail sites for waste disposal, such as "Eco-points", as well as spots for composting. In environmental comfort, it is necessary to ensure good levels of lighting and noise insulation, good wall insulation, glazing and roof insulation.

In air quality, detailed solutions that promote natural ventilation should be considered. The use of green roofs and facades are other aspects that could be detailed, since they promote an improvement in air quality and the reduction of atmospheric emissions. Another important aspect is related to adaptability, since the detailing of modular and flexible solutions in a building, allows it to adapt to new uses in the future, if necessary.

Construction phase

In construction, renovation, rehabilitation, restoration, amongst others the implementation of solutions and the definition of materials ought to be considered in order to ensure a good environmental performance, as well as the creation of management mechanisms that structurally reduce environmental impacts.

Operation Phase

In the operation phase, the logic is to support the sustainable use and management, in order to insure to good performance levels, indicated for the specific situation. At this stage, the solutions and their levels of performance can be compared with the sustainability benchmarks found, in order to determine the venture's positioning and possible improvements.

Its application for development may go through an approach involving the following eight steps:

(d1) contact the development team, that should be informed of the type of project in question, and its characteristics, in order to determine the thresholds and the adequate performance levels;

(d2) involve LiderA advisor (list available on site), agreeing the scope and steps to follow;

(d3) online registration, on LiderA's site, available in www.lidera.info;

(d4) advising on sustainability, involving the positioning evaluation;

(d5) proposals for performance level and benchmarking;

(d6) facilitate the search for sustainability to LiderA officer;

(d7) implementation of solutions (in planning, designing, constructing and operating phases);

(d8) periodic assessment of LiderA's positioning, supported the collection of proofs that show it clearly, regarding future certification and improvement suggestions, for example for future management.

Recognition and Certification

When enterprises show good performing solutions, at the design or plan stage, these can be proven through a prescriptive form or through their performance. If they show performance levels of 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.

In order to be recognized or certified, the project must show a good environmental performance, which can be verified by existing evidences (documents), and from thereafter carry out:

(c1) contact the LiderA team in order to certify and agree on evaluation dates;

(c2) register online, on LiderA's site, available in www.lidera.info, on the link "contacts", and complete the available form;

(c3) systematization of evidences of the project or venture that will be certified;

(c4) verification by an independent party of the performance levels found;

(c5) if performance levels top Class C or higher, attribute Certification / recognition by LiderA brand;

(c6) monitoring.

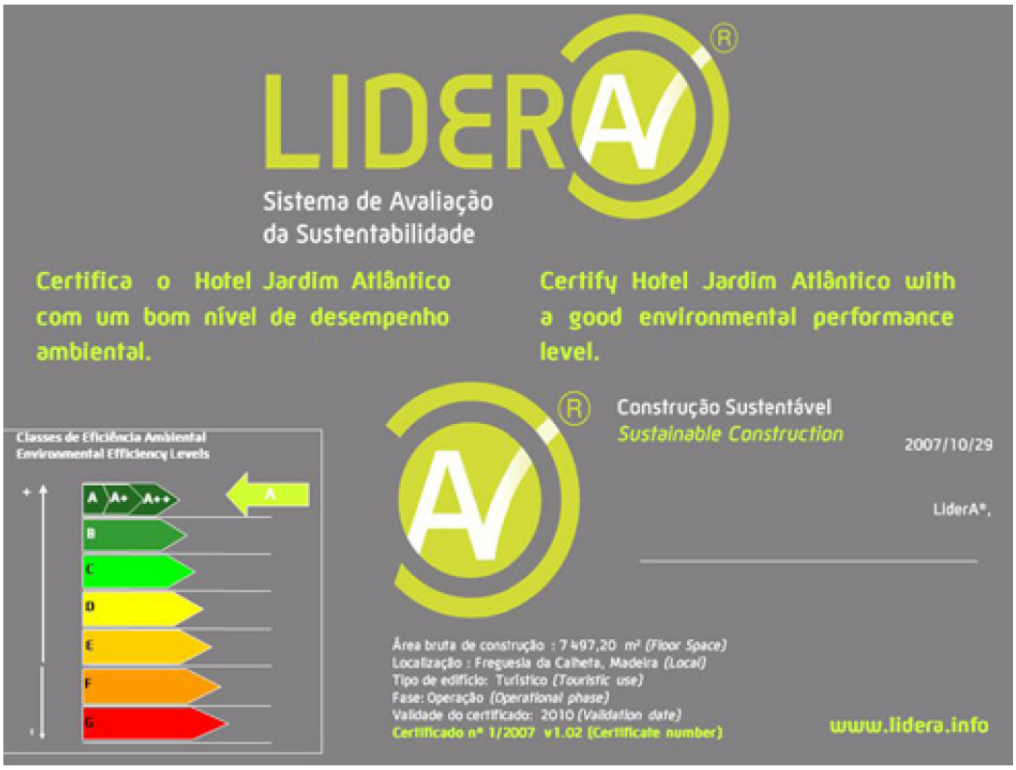

Illustration 6 - LiderA's certificate

info

The following pages are intended to present important information, such as contacts and references.

LiderA

Info

In order to use for development or for certification, the interested identities that wish to use the system, must agree on how to apply it with the LiderA team, so that the corresponding elements can be provided.

To this effect, interested entities should contact project coordinator by e-mail: manuel.pinheiro@lidera.info. To supplement the present summary presentation, more detailed information can be found on the website: http://www.lidera.info.

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annexes

In the following pages guidelines – lines of best practice - are provided, as well as a LiderA synthesis, with criteria, and ways to measure environmental performance.

LiderA

Annexes

Guidelines – lines of best practice

In the following tables, summary indications of the LiderA system are presented, regarding the criteria, good practice lines, measuring modes, and relevance to different life cycle phases.

In general, it is assumed that the applied solutions have periods of low economic return, when compared with the buildings' lifespan that ranges from 50 to 100 years. Therefore, a payback period of around 7 to 10 years, is considered a reasonable economic payback. Solutions with longer payback periods should be envisaged in a specific context, which may exceptionally justify their adoption, though this should not operate as a rule. As a result it is assumed that is better to adopt solutions that are economically viable.

The depth and detail of information required to support and highlight the performance of each criteria should depend on the characteristics of the area to intervene and respective sensitivities, as well as the size and complexity of the project. Thus, for projects of limited size, the performance indications that can be proven expeditiously may be sufficient, while for larger projects, evidence must be quantitative and detailed.

Following the logic of selecting criteria, a number of these are not necessarily disjoint, for example, the reduction energy consumption and equipment efficiency, renewable energy and carbon dioxide (CO_2), recycled materials and renewable low impact materials. This logic suggests the enhancement of sustainability by combining the best environmental conditions. It also provided a set of prerequisites that need to be fulfilled in different areas.

The criteria focus on the possibility of performance, assuming the ability to integrate and enhance landscape and fulfilling architectural quality. The proposed criteria are a base core that can be adjusted, given the type of use of the venture (areas) and the environmental aspects considered.

Table 1 - LiderA System, guidelines and application in each stage of built environments lifecycle (1/2)

LEVEL 1	LIDERA 2.00	LIDERA SUSTAINABILITY BUILDING EVALUATION SYSTEM - CRITERIA FOR SUSTAINABLE CONSTRUCTION				
CATEGORY	**AREA**	**Wi**	**Pre-Req.**	**CRITERION**	**C No.**	**GOOD PRACTICE GUIDELINES**
SITE AND INTEGRATION	SOIL	7%	S	Territorial Valorisation	C1	Building in degraded or abandoned areas (already used), with contaminated soil, which must be decontaminated. Building in infrastructured areas: with sewerage and water networks. Respecting and safeguarding territorial planning conditions as well as sensitive areas (according to territorial planning and management instruments). Using impermeable zones or already constructed areas to the yard's placement, minimizing the impact of construction operations on the ground.
				Environmental Deployment Optimization	C2	Reducing the building's deployment area. For example, buildings could be built on piles as a way to minimize the occupied land area by each one, thus minimizing the sealed area.
	NATURAL ECOSYSTEMS	5%	S	Ecological Valorisation	C3	Development should enhance local ecological value: all local fauna and flora species (particularly endemic) should be preserved, therefore allowing an increase of the area's ecological biodiversity.
				Habitats connection	C4	Promoting a continuous green structure in surrounding areas: green roofs, green facades, trees and green spaces, in order to ease the interconnection of habitats. Avoiding barriers/obstacles between physical habitats or within the same habitat, introducing new structures (burrows, nests, etc.) that encourage species development.
6 Criteria	LANDSCAPE AND HERITAGE	2%	S	Landscape Integration	C5	Fostering integration and landscape recovery through some possible measures of integration in the area's visual surroundings: using a colour palette and materials similar to those typically used on surrounding buildings, promoting the insertion within the visual surroundings (in a mountainous area the building should have a kind of construction according to the region; historic buildings should keep the facade, the type of deployment, etc). Buildings' height should be similar to the local average. (2 floors above or below the average of the block).
14%				Heritage Protection and Enhancement	C6	If there is local heritage, the intervention should preserve it. When intervention is necessary, make it in an appropriate way, in terms of rehabilitation and / or in terms of restoration. The building should have a formal relationship with the surrounding heritage (built or natural) and be suitable for the use and type of environment.
RESOURCES	ENERGY	17%	S	Efficiency in consumption – Energy certification	C7	Compliance with the energy certification law, preferably by obtaining higher level classes, such as level A and A+. Reduce energy consumption – Monitoring energy consumption and verifying energy certification levels. These solutions should be adapted to the local situation and existing buildings.
				Passive Design Performance	C8	Nominal energy decrease by more than 50%, as a result of adopting bioclimatic and passive solar performance practices, during summer and winter. Applicable parameters: building orientation, insulation, form factor, shading, fenestration, etc.
				Carbon Intensity (equipment efficiency)	C9	Reduce CO_2 emission levels through the total amount of energy produced from renewable energy sources. Electricity production from renewable energy sources such as: photovoltaic, wind energy (or urban wind), cogeneration, amongst others. Increase the number of devices (appliances, lamps ...) with good energy efficiency rating and increase the share of energy that is produced in the building. Measures that should be implemented: energy needs for domestic hot water would be supplied by solar collectors and electricity needs would be met by renewable energy sources: solar, wind and others.
	WATER	8%	S	Potable water consumption	C10	Reduce water consumption from the primary distribution network (should be around 80 litres / inhabitants day and secondary water should be around 95 litres / habitants. day, which would mean a reduction of more than 50% when compared to current practices). Type of efficient equipment that should be used: 1. use of taps with reducer, for example mixer taps; use of taps with sensors; double flushing toilet or waterless toilet, 2. use of rainwater for secondary purposes, 3. other monitoring systems, in addition to water meters; 4. limit drinking water distribution according to the building / type of users; reduce water needs in outdoor spaces.
				Local water management	C11	Some possible measures: local groundwater containment and protection plans; low consumption irrigation system; local water management plan; retention, treatment and on site runoff discharge - types of on-site retention and treatment: wetlands, sedimentation lakes, retention ponds, infiltration basins, waterways, drainage, biological filters; taking measures in order to reduce the percentage of annual rainwater runoff in: parking lots, roofs, impermeable surfaces and coverings; minimizing the sewage discharge; usage of vegetation, in landscaped areas, that reduces the need for water and chemicals (avoiding contamination of local waters); and to increase infiltration levels.
	MATERIALS	5%	S	Durability	C12	Designing using durable materials, with longer lifetimes, and fostering materials preservation and maintenance. Measures that should be considered: 1. Building networks - 25 years; 2. Finishes - 5 years; 3. Equipments (elevators, electrical wiring, interior and exterior sensors, solar panel, photovoltaic, effluent treatment, boiler, etc) - 5 to 10 years. It is considered that the weight of the structure and finishes durability is much more important than others, when considering the intervention needs and frequencies.
				Local materials	C13	Use of materials produced within 100 km (more than 50 %).
9 Criteria				Low impact materials	C14	Use of environmentally certified, recycled and / or renewable materials. Dangerous materials such as lead, asbestos, arsenic, cadmium, mercury, sulphate, benzene, chlorinated solvents, PCB, PCT, formaldehyde, chromium, creosote, phenol resins, amongst others, should be avoided.
32%	FOOD PRODUCTION	2%	S	Local food production	C15	Food production of plants and animals in areas belonging to the building's envelope or in the building itself (roof, balconies, etc.). Determine a percentage of land to be assigned for agricultural purposes (terraces, places or areas of the framework). Building's use for agricultural purposes: roofing, balconies, floors, (ex vertical farms).
ENVIRONMENTAL LOADINGS	WASTEWATER	3%	S	Wastewater treatment	C16	Wastewater treatment carried out on site. Building / area not connected to the urban wastewater treatment system. Check whether it is connected to the urban wastewater treatment system, as all wastewater is treated on site (or partially treated, depending the situation), since the obtained level of treatment will always be the minimum required according to its reuse.
				Wastewater use	C17	Use of reused water for green areas maintenance, through automated irrigation systems and the reuse of gray water (50%).
	ATMOSPHERIC EMISSIONS	2%	S	Atmospheric emissions control	C18	Possible measures to reduce SO and Knox emissions: elimination or reduction of fuel operated devices (kerosene heaters, fireplaces, etc), cookers, water heaters, boilers, tobacco smoke, transports, particles brought in the feet and carpets, vehicles parked inside, amongst others.
	WASTE	3%	S	Waste control	C19	Reduction of solid waste production (50%, when compared to the common practices), and the possibility of composting organic waste.
				Waste management	C20	Reduce and manage any generated / used hazardous waste. Possible measures: adequate and safe disposal, management and final disposal; elimination of pesticides and swimming pools' chlorine; facilities for safe storage and proper packaging of cleaning and maintenance products; locations for the disposal of batteries, lamps, cooking oil, or hazardous office (cartridges); disposal of hazardous materials in products used for maintenance and operation; a management and monitoring plan for hazardous waste.
				Waste Valorisation	C21	Increase the amount, of recycled waste in the building, in kilograms or equivalent.
8 Criteria	NOISE EMISSIONS	3%	S	Noise emissions control	C22	Implement solutions in order to reduce abroad noise emissions: silent equipments inside (sound power less than 50dB); silent equipments abroad (sound power less than 50dB), noise reduction equipments; appropriate location for equipments that produce noise; baffles that reduce the sound spread; appropriate placement of insulation in inner and outer walls, surrounding noise emitting equipments.
12%	THERMAL AND LIGHT POLLUTION	1%	S	Thermal and light pollution	C23	Reducing heat island and light pollution effect. Possible measures that should be considered: placement of shadows on the impervious and / or dark areas; the use of light colours on the building's exterior: walls, roofs, sidewalks and pathways; use of vegetation on the roof; minimization of impervious surfaces: pathways, sidewalks and outside parking lots; underground parking lots; use of vegetation in outdoor areas, with water surfaces; quantifying the light intensity on advertising areas or in buildings.

	Possible Interventions					ENTITIES				
	E- Essential	M -Extremely Important	I- Important	R -Reduced Importance	S- Almost Meaningless	E- Essential	M -Extremely Important	I- Important	R -Reduced Importance	S- Almost Meaningless
		APPLICABILITY FOR EACH PHASE				ENTITIES ACTION LEVELS				
MEASURING	C No.	Plan	Project	Construction / Renovation	Operation	Authorities	Promoter	Designer	Contractor	User
Defining the initial state of all areas considered important (or sensitive ecological areas; built / contaminated)) for assessment before the intervention or during it. Checking the constraints of territorial planning and management instruments. Estimating the percentage of local zones valorised by the intervention. Checking which measures should be taken from a strategic point of view (land use, construction site, etc) and what is intended with each of them, mainly with land use measures.	C1	E	E	M	R	E	E	I	R	S
Setting all areas considered important (global area and deployment area) for assessment. Checking the percentage of permeable ground when compared to the lot's total area.	C2	E	E	M	R	E	M	E	R	S
Checking the percentage of green spaces versus the lot's area / block's interior. Collecting the number of local species (plants or animals) or upgraded through the intervention. Determining the percentage of natural vegetation areas and indigenous zones.	C3	E	E	M	I	M	E	E	R	I
Evaluating the percentage of habitats in order to promote the relationships between species. Identifying situations that allow the habitats' interconnection in the block's interior (including the analysis of the form and type of green structure). Verifying if the green structure establishes continuity with the surrounding green corridors (outside the block). Accounting the green perimeter contact with the block's interior boundaries. Checking for barriers / physical barriers between habitats or inside habitats.	C4	E	E	M	I	I	R	E	R	I
Developing the local environment's characterization and listing elements that contribute to the integration and adaptation of the building in its site, including: architectural design, natural features, materials, building's form and aesthetics. Doing a critical analysis to building's volume when compared to local geometries. Checking the kind of materials and colours used in the building's construction, taking into account the ones used locally. Observing the type of local construction, practised in the defined region, by establishing a critical analysis of the proposed intervention.	C5	R	E	M	I	E	I	E	I	R
Evaluating and quantifying the measures that contribute to the conservation and enhancement of the surrounding.	C6	E	E	M	R	E	M	E	M	I
Monitoring energy consumption and verifying compliance with EU Directives for energy certification (SCE - National Certification Energy and Air Quality System, in the Portuguese case) and promoting reduction in energy consumption. Compliance with local norms and values related to energy efficiency certificates.	C7	R	M	I	E	E	M	E	R	S
Estimate energy expenditure (kWh/m2.year) resulting exclusively from bioclimatic and passive solar performance measures. List all measures implemented in this area, while investigating their benefits.	C8	E	E	I	E	R	I	E	E	I
Determining the reduction in CO_2 emissions (and / or other pollutants that contribute to the greenhouse effect) from renewable energy sources and the total amount of energy produced. Set the number of existing devices (appliances, lamps ...), their energy efficiency rating, providing percentages for each level and type of equipment; Photovoltaic, Biomass, Wind, etc.	C9	R	E	M	E	S	M	E	I	R
Define the water consumption in litres / inhabitant.day (or equivalent) by the reading overall water consumption, public net consumption, or the extraction of a water body surface using public accountants, or through computer consumption simulations. Prepare an inventory of the implemented measures designed to control losses and efficiency.	C10	R	M	E	I	S	R	E	M	I
Set the percentage of run-off sites before and after the intervention and draw up a list of measures implemented to reduce runoff and local water management with its effectiveness	C11	R	E	M	E	S	R	E	E	I
Evaluate the increase rate of finishes and common materials durability, used in the building, while measuring their lifetime. List the measures that will reduce materials consumption and / or alternatives over others which would increase their consumption. Establish timing in terms of each material's lifetime.	C12	M	E	I	I	S	R	E	E	R
Estimate or calculate the materials quantity (in kg or equivalent) that were purchased, manufactured or produced at a distance that does not exceed a 100 km radius, centred in the place of operation. Stipulate the proportion of local materials against the total used.	C13	S	M	M	I	S	R	M	E	R
Estimate or calculate the amount (in kg or equivalent) of environmentally certificated, low impact and recycled materials and outdoor renewable energy sources that can be converted. Estimate which materials, from the building itself, need to be converted and stipulate their proportion against the total used. List the hazardous materials that are not included.	C14	R	E	E	I	S	R	M	E	R
Determine the local plant and animal food production. Check the percentage of areas assigned to the enterprise for food production.	C15	R	E	M	E	R	I	E	I	E
Determine the flow of effluents produced in litres / habitant. day (or equivalent) and determine the amount that is treated on site (technical capacity of the treatment system) and the level of treatment for each fraction of effluent, carrying out computer simulations of produced effluents in litres / habitant. day (or equivalent). It can be based on water consumption in litres / habitant. day (or equivalent), or on the overall reading consumption of the public net or of a surface water extraction body, by using own or public accountants.	C16	I	E	M	M	I	R	E	I	R
Determine the total percentage, or equivalent of the reuse flow of treated wastewater (in litres / habitant. day).	C17	I	E	I	E	S	S	E	M	I
Determine SO and Knox emissions (and / or other pollutants that contribute to greenhouse effect) in kg/m2.year (or equivalent) using calculation or simulation methods, or through measures implemented in order to reduce these emissions and their efficiency, or through monitoring.	C18	S	I	I	E	S	S	E	M	E
Determine solid waste production in kg / habitant.year (or equivalent), that could be done by controlling the generated waste containers, and after knowing the amount and density of waste and the amount of occupants, a waste production estimate is made. Carry out sampling on some apartments, using weighing scales, or making estimates according to average production.	C19	R	I	M	E	S	S	I	M	E
Prepare a hazardous wastes list of used materials and products, and propose measures for waste reduction, waste elimination, waste management and adequate and safe final waste disposal. This listing may be the result of the implementation of a questionnaire to residents.	C20	S	I	M	E	S	S	I	E	E
Determine the amount (kg or equivalent) of recycled waste in the building (or enterprise) by carrying out a questionnaire to residents, occupants or employees on its recovery. Placing containers for recyclable waste, weighing it, or presenting documents that certify the amount of waste sent for recycling.	C21	R	M	M	E	S	R	E	M	I
Set outside noise levels that result from the building's inside sources, in dB (A): by using the sound characteristics of equipments, buildings and indoor activities; by measuring sound levels from interior sources; by drawing an opinion survey of the community; or by listing implemented measures, its purpose, efficiency and effectiveness.	C22	R	M	M	E	S	S	E	M	E
Prepare a list with measures implemented in order to reduce heat island effect of and light pollution, its relevance and efficiency.	C23	M	E	R	I	S	R	E	M	S

Table 2 - LiderA System, guidelines and application in each stage of built environments lifecycle (2/2)

LEVEL 1	LIDERA 2.00	LIDERA SUSTAINABILITY BUILDING EVALUATION SYSTEM - CRITERIA FOR SUSTAINABLE CONSTRUCTION				
CATEGORY	**AREA**	**Wi**	**Pre-Req.**	**CRITERION**	**C No.**	**GOOD PRACTICE GUIDELINES**
ENVIRONMENTAL COMFORT	AIR QUALITY	5%	S	Air Quality Levels	C24	Fostering natural ventilation (its type and incidence in each division). Promoting measures to reduce VOCs (in any materials such as carpets, insulation and others that can be sources of VOCs) and to reduce contaminants in indoor air (micro – contamination).
	THERMAL COMFORT	5%	S	Thermal Comfort	C25	In order to attain the established thermal comfort, the following measures should be promoted: humidity (35% to 60%), temperature (18º to 26º; minimum 18º in the Winter and maximum 26º in the Summer; the seasonal variation should correspond to seasonal air temperature variation outside); air velocity (≤ 0.2 m/s in the Winter; ≤ 0.5 m/s in the Summer). Ensuring good comfort conditions in outdoor areas, with shadows and wind protections, for example.
4 Criteria	LIGHTING AND ACOUSTIC	5%	S	Lighting levels	C26	Lighting levels in accordance to those defined by CIBSE for the different areas studied and adapted to local activities (interior lighting between 350 to 400 lux).
15%				Acoustic insulation/noise levels	C27	Setting the noise levels inside the building (dB): through the characterization of equipment's sound characteristics, insulation and windows specifications, taking into account the activities within it.
SOCIOECONOMIC EXPERIENCE	ACCESS FOR ALL	5%	S	Public transportation access	C28	Access to the public transport or the promotion of interface access. In specific cases providing mechanisms for public transport and checking distances between them.
				Low impact mobility	C29	Promoting low impact mobility solutions.
				Accessibility to disabled people	C30	Reducing potential accessibility problems in sites and identifying inclusive solutions that can be adopted for their resolution, either inside or outside local buildings.
	ECONOMIC DIVERSITY	4%	S	Flexibility / Adaptability	C31	Encourage spaces flexibility, including the existence of modular and adaptable buildings, when considering various uses.
				Local Economic dynamics	C32	Enhance and encourage local economic activity. Reduce social inequalities locally, identifying and adapting specific solutions when considering their resolutions. Encourage the establishment of relevant economic activities to the developing area.
				Local Work	C33	Generating new jobs in the built environment and / or fomenting existence of nearby job opportunities (up to 1000 m), which could contribute to the building's occupants social integration. There should be no decrease in local job offer. It should encourage the provision of employment activities within the public space: commercial, cultural, or other local activities. Creating high-skilled jobs that contribute to the region's development.
	AMENITIES AND SOCIAL INTERACTION	4%	S	Local Amenities	C34	The existence of Natural (river, forest) and human (food shops, post offices...) amenities in a 500 m radius. Proximity to five of the following amenities, in a 1000 m radius: post office, bank, pharmacy, school, health centre, leisure centre, community centre and children's garden.
				Community Interaction	C35	Interventions that facilitate the community's integration and accessibility to the enterprise: allow non-residents, of any age group, to enjoy natural outdoor spaces for recreational and / or sportive purposes. The utilization of the building's interior areas, which can be accessed by the community (ex inland areas of restoration associated with public open spaces), should be considered.
	CONTROL AND PARTICIPATION	4%	S	Controllability	C36	It is fundamental to control comfort levels in 5 major areas: Temperature, Humidity, Ventilation, Shading and Lighting. Some solutions must be adopted in order to cover all of these areas and to promote interaction between them, resulting in buildings' upgraded performance and in a greater efficiency to obtain the appropriate comfort levels for users.
				Participation and governance conditions	C37	Promote in the initial phase of the strategic plan an extensive exchange of information between project leaders and potential users. Promote regular meetings in each project phase, where potential users are represented by a diverse population (age, education level, economic status).Define a project team, organized hierarchically, with well defined and set functions for each of its members. Decisions taken by the project's team should always be disclosed to the local population before initiating any intervention in public spaces. Create conditions and implement measures that enable community interaction, allowing it's inhabitants to have an influence in decision-making, when considering the built environment's management and evolution.
				Natural risks - Safety	C38	Matching the intervention with the existing natural risks and avoiding risks inherent to the adopted architectural solutions. Measures that should be implemented: structures protection/resistance to earthquakes, high winds, floods and other natural risks in places with high or medium danger degree to the user. For example, implementation of protection elements outside the building, with a good resistance to extreme weather conditions; incorporation of tempered glass in buildings or furniture that is partially or completely weather exposed, in popular areas or highly frequented; use of trees with medium to deep roots near areas subjected to inclement weather and adequate protection elements in areas with some degree of danger (stairs, sloping areas, etc) or with big flow of people; implementation of measures to reduce cars' speed of along the building's access roads to access, near areas with big flow of people. External solutions adapted to protect these risks.
13 Criteria				Human Threats - Security	C39	Implementation of measures to control and inhibit crime and vandalism on two different but complementary category's: building and adjacent public space, therefore, the measures at public space level are the most prevalent. These measures can be organized in areas related to lighting, surveillance, space permeability and vision fields. Implement measures to: control risks associated with activities that use dangerous substances. Existence of well illuminated, monitored and open-fronted spaces; buildings with main access situated at street level; establishment of opening / closing hours in areas where security/crime is difficult to control, like interior courtyards.
19%	LIFE CYCLE COSTS	2%	S	Life cycle costs	C40	Promote the use of cost-effective and quality materials, equipments, systems and other elements that compose buildings. Possible measures: 1. Equipments choice / efficient and low cost energetically efficient solutions; 2. Costs and maintenance intervals.
SUSTAINABLE USE	ENVIRONMENTAL MANAGEMENT	6%		Environmental Information	C41	Provide environmental information and outer space and buildings' usage methods, in order to facilitate proper use and the enterprise's good performance. Information: user's manual, electric installations, plumbing installations, architectural plans, equipments' use and maintenance information, structure, materials, amongst others. Monitoring and performance information, amongst others.
3 Criteria				Environmental Management System	C42	Implement documented environmental management methods. Boost the demand for management objectives that seek environmental sustainability. If possible, environmental management systems should be implemented and should be certificated by ISO 14001 or EMAS.
8%	INNOVATION	2%		Innovative solutions	C43	Systematize and analyze structural innovations that have a specific and effective contribution to one or more evaluation criteria and contribute effectively to the environmental performance improvement of the building, with the possibility to affect also the incidence area. Verify the existence of innovative elements in at least two of the following measures (Site and Integration, Resources, Environmental Loadings and Socio-economic Experience).

	Possible Interventions					ENTITIES				
	E- Essential	M -Extremely Important	I - Important	R -Reduced Importance	S- Almost Meaningless	E- Essential	M -Extremely Important	I - Important	R -Reduced Importance	S- Almost Meaningless
		APPLICABILITY FOR EACH PHASE				ENTITIES ACTION LEVELS				
MEASURING	C No.	Plan	Project	Construction / Renovation	Operation	Authorities	Promoter	Designer	Contractor	User
Providing the building's indoor ventilation flow or rate, checking for natural ventilation; Checking that the ventilation rate is correct according to different building uses (for example the dwellings cannot be <0.6% and for the service buildings <0.8%); Verifying that all interior spaces are open to the outside or have a renewal air system, through the architectural drawings, written documentation, photos, etc..; Checking for the type of materials, carpets, insulation and / or finishes that can be sources of VOC's and providing a list of measures in order to reduce the VOC's. Conducting a monitoring of actual emissions in the interior space; conducting a monitoring to determine the concentration of various pollutants and micro contaminants in the inside and outside air.	C24	S	E	M	E	I	R	E	I	E
Checking for temperature (ºC or equivalent), humidity (in%) and air velocity (m/s or equivalent) levels, that occur within the building, throughout the year, through: monitoring, control parameters, EMS or simulation; determining occupants' satisfaction when considering indoor thermal comfort, through inquiries; carrying out a survey of all measures taken to ensure good comfort conditions; verifying if the following building elements were well implemented: form factor (relation between surrounding surface and volume), type and quality of glazing and frames, glazing area, thermal inertia, solar orientation, thermal insulation, type of shading, etc.	C25	I	E	R	E	I	R	E	M	E
Determine lighting levels (lux) in the main and secondary areas; checking the type of lighting in the building such as: the organization and spatial distribution of lamps, type of lamps, and the conditions of the illuminated space: size, shape, colour, etc; systematizing the main human activities and checking outside the lighting levels	C26	R	M	R	E	R	S	E	M	E
Checking the noise level (dBA) in each main occupied area. Setting the values for each threshold, depending on the values required in Noise Regulations. Checking the type of insulation, window frames, windows and other constructive solutions applied in the building as well as their performance too; doing a survey to check the occupants' opinions about the noise comfort in the building.	C27	R	E	R	M	R	S	I	I	E
Checking the number of public transports and their distance to the site. Determining which public transports are situated less than 500m and which are situated between 500 and 1000m from the site. Analyzing the transports frequency, verifying if these are operating alone or are integrated in a public transport network (this latter situation is privileged in terms of thresholds).	C28	E	M	I	E	S	E	M	R	I
Check walk paths conditions, ensuring a good accessibility, a correct implementation in the territory, and crossings with other tracks; Measure the distance to the nearest bike paths (a radius of 100 m could be used as a reference value) and check its correct design and operation, identifying support elements (showers, bicycle parking, rental conditions ...) Identify the conditions that favour other types of low impact mobility, such as: carpooling, hybrid cars services; transfers services; parking spaces reserved for clean vehicles; charging stations for electric vehicles.	C29	E	M	I	E	S	I	M	R	E
Identify all the inclusive design solutions adopted and their scope, both within buildings or facilities, or in public outdoor spaces. Check for specific signs that clarify spaces and mechanisms. Identify constructive measures to enable a future integration of accessibility elements (lifts, ramps ...).	C30	M	E	I	E	I	I	E	M	E
Check for different housing types and flexible interior solutions (furniture or walls easily removable). Examine projects' drawings to identify double right foot areas, or high ceilings. Through specialties' drawings / descriptions, verify if networks are concentrated and easy to access, and check pre-existence of mechanical equipment (particularly for air conditioning equipment, energy and electronic).	C32	R	E	R	M	R	I	E	M	E
In the street's front: quantify the percentage of street's front available for businesses and identify the type of trade (permanent or temporary); In the building and other areas of the lot: quantify the ability to maximize returns through rental income from rented space and renewable energy, investigating its diverse types (that can be adapted to the market); verify the conditions of accommodation (focus is the diversity of values for various social classes and ages); analyze the integration of 'social housing' buildings in the urban scenario.	C32	E	R	R	E	I	E	M	R	M
Conjugation between job statistics and the number of interventions. Need to check both conditions at each evaluation level. Quantify the gross floor area for each job. Counting the jobs generated within the building. Check for job offer in the surrounding areas (up to 100 m).	C33	E	I	R	E	I	E	M	R	E
Quantify natural and human amenities in the building nearby areas (radius 1000 m). Determine the distance to each of these amenities, ensuring that they can be easily accessed.	C34	M	I	R	E	S	I	I	R	M
Identify all solutions, equipments, activities and measures taken to ensure accessibility and building interaction with the surrounding community.	C35	E	M	R	E	S	M	I	R	E
Quantify measures that provide users with control ability, their coverage and programmability, at both the indoor and outdoor spaces.	C36	R	E	I	E	S	I	M	R	E
Check the interaction ability between the project's design and construction team and the project's owner with users during the design and construction phases. Verify the existence of participation and governance mechanisms, implemented after the construction phase, to ensure the interaction with users during the building's operation phase.	C37	S	I	I	E	S	E	I	S	E
Quantify the use of materials and architectural solutions that do not present a risk or reduce the effects of natural risks (floods, earthquakes, high winds). Estimate the areas and levels in which the reduction of accidents resulting from natural phenomena, should be given particular attention, during the buildings and outdoor areas' planning and construction.	C38	S	E	E	E	I	M	E	E	I
Check the measures aimed to reduce the crime and vandalism phenomena within the building and surrounding areas. Implementation of measures to control and inhibit crime and vandalism on two different but complementary themes: building and adjacent public space, considering that the measures for public space are the most prevalent. These measures can be organized in areas related to lighting, surveillance, permeability of space and fields of vision in that space.	C39	M	E	R	E	I	E	M	I	I
Check the cost and quality of adopted solutions and equipments. Systematization of construction costs in € / m2, with measures' cost increase percentage. Quantifying maintenance / operation costs, related to the building's materials, ensuring its integrity throughout the building's life cycle. Analyze the costs that may arise from the prescription of planned water and energy networks, through its associated maintenance. Analysing and quantifying which materials have high recovery rate when recycled.	C40	R	M	R	E	R	M	E	M	E
Identify all available information, which was delivered to the occupants and to those responsible for maintaining the enterprise, regarding environmental aspects, equipment's operation, building plans, specifications, maintenance, monitoring, user manuals, facilities, amongst others. It should be considered whether the amount of information available is consistent with the recipients (users / maintenance technicians) and whether it is clear and concise.	C41	S	R	M	E	R	E	M	R	I
Check and list the existence of environmental monitoring, EMS (or other), as well as the existence of environmental certifications, defining its current stage.	C42	E	E	I	E	I	E	M	R	E
List the aspects that have been implemented and carry out its characterization, including its contribution to the building and the area of incidence environmental performance improvement. Accounted innovations should, without fail, have a real contribution to at least one criterion assessed in LiderA, thereby ensuring that these contributions fall within the sustainable construction theme.	C43	M	M	I	E	S	E	E	M	M

How to obtain information?

Manuel Duarte Pinheiro (manuel.pinheiro@lidera.info)
Secretariado IPA - telephone: +351 214 658 450

www.lidera.info