

The Portuguese LiderA System – From Assessment to Sustainable Management?

Pinheiro, Manuel Duarte

DECivil, SHRHA, Instituto Superior Técnico, TULisbon, Portugal

ABSTRACT: LiderA is a voluntary Portuguese system that intends to assess the sustainable buildings. It is been in development since 2003 and this year it certified the first five Portuguese buildings. Besides a brief explanation of LiderA approach and certification cases, this paper presents other possible applications of this assessment system, in order to lead environmental management in building to sustainable management.

1 LIDERA – PORTUGUESE ENVIRONMENTAL BUILDING ASSESSMENT SYSTEM

Sustainable development, sustainable construction or buildings can have a broad perspective, from triple bottom to strong sustainability. In all them, the environment must have an important role with minor or major perspective from economics, social or other components (Kibert 1994; Kibert 2003).

LiderA (in Portuguese the acronym for environmental leadership to sustainable construction) is a voluntary system to assess the sustainable Portuguese buildings that is been in development since 2003 (Pinheiro and Correia, 2005), and is mainly based in environmental dimensions.

The LiderA sustainable assessment have its core in environmental components, like soil and integration, resources (energy, water and materials) and environmental loads, complemented with social aspects like comfort, accessibility, and technical components like durability, environmental management and innovation.

The system have a top-down approach with 6 categories, divided in areas (21) and subsequently in criteria (50) in order to allow in those, the nesting of different levels of detail and analysis. The global set of criteria can be applied to different uses with different thresholds to define levels of sustainable performance. Levels range from G to A++, in which A level means 50 % of improvement towards practice (usual E level) and A+ and A++ an improvement Factor 4 and Factor 10.

To be certified, LiderA system must verify that it complies with legislation and have a performance that achieve at least a C level. The first five certificated buildings appeared in 2007 and are (name, data of use, use type, built area):

- Hotel Jardim Atlantico (Calheta), 1993, tourist complex, 7 497,20 m², 97 apartments;
- Torre Verde (Lisbon), 1998, one residential building, 7 200 m², 41 apartments;
- Casa Oásis, (Faro), 2002, one tourist house, 240 m²;
- Ponte da Pedra, phase 2 (Matosinhos), 2006, two residential buildings, 14 852 m², 101 apartments;
- Parque Oriente (Lisbon), design phase approved, 13 buildings, 41 441 m², including a residential area (27 912 m²) with 185 apartments and different types of commercial use in other areas.

The assessment and certifications involve 72 230 m² in residential (70 %), tourist (11%) and commercial use (19%), from a house to several buildings, in design and operation phases, showing that it is possible to have multi-application to different types of buildings.

In the certification cases range from energy performance, thermal comfort and other areas and different levels between apartments, once they have different orientations and conditions, what point out to the need of adjust in project, in order to assure similar levels. This emphasises the possibility of scale and adjust.

2 FROM ASSESSMENT TO MANAGEMENT

Nevertheless, the environmental performance of the buildings depends not only of the design but also of the type of use and management as Ratti (*et al.*, 2005) point out to the case of energy in offices. In an analysis of near 100 office buildings the authors show that energy consumption could have a variation of 1 to 20, where a factor of 2 results from the users of the offices (2,5 factor from design, 2 factor from the system and 2 factor from urban context). In other areas like water, solid wastes, energy consumption in transports, the users could have a larger influence.

So, in order to walk to sustainable buildings, it is need to achieve a higher environmental performance at buildings, that include good environmental design, and tools to assess and certify, but also the support by the user and management with environmental management knowledge and capabilities, like an environmental management system to support the use phase and complementarily in the construction phase (new, renovation or demolition).

The most used international environmental management system (EMS) is ISO 14001 (Block, 2006:8; Peglau 2002; Kein *et al.*, 1999:449) and it can be an important tool to the construction sector (Ball, 2002) and to buildings (Hill e Bowen, 1997).

The application of ISO 14001 can contribute to achieve a better environmental performance and perhaps to contribute to sustainable buildings. That challenges the ISO 14001 in several dimensions:

1. ISO 14001 is a base to improve organization and can be neutral, since it is not focused in a specific level of environmental performance, and so the practical results are not necessarily a more sustainable organization or building. In order to assure that environmental performance is achieved, assessment tools will be need;
2. ISO 14001 is design to command and control and in cases of buildings environmental management, the users can be informed and influenced but command is not necessarily a good approach, so the logic must be to adjust in order to inform and influence several stakeholders;
3. ISO 14001 can be applied to different phases, from the idea, to construction, operation and demolition or deconstruction, but usually it is applied to a specific phase, in most of the cases in construction and partially in operational phase, and do not interlink information and management between phases, which constitutes an important step;
4. ISO 14001 requires specific formal procedures which must be adjust depending of the phases, uses types, for example the applications in construction phase can demand for the need of simpler formal approach and in the operation of a hotel can call for further formal strategies.

The environmental performance focus is the base to drive from environmental management to sustainable management. As Hill and Bowen (1997) indicated, integrated environmental assessment tools with environmental management can be a base to search and implement sustainability.

Since the performance of the buildings result from several aspects and in most of the cases is important to create conditions to improve and manage, the assessment can give a structural input to that approach.

LiderA assessment can be done in the several phases, and it can assess for example in operation phase, measuring the standard use (in average behaviour from the users and maintenance) of the building with the LiderA thresholds level; so when compared with the real performance, that gives a margin to the users, management, and maintenance to further improvement.

In that context, one of the possible applications of results is to interlink with a potential environmental management system (ISO 14001) with specific requires deriving from the assessment

component and expanded it to complementary aspects, from social and economics areas. This approach in which the assessment component supports the future use and management of the buildings can lead to new performance and continuous improvement.

3 CAN LIDERA SUPPORT SUSTAINABLE MANAGEMENT?

Usually (Cole, 1998) the assessment system are developed in specific phases (to assess design or operation), types (residential, offices, or others), context (most of them area bottom up), and so applications in broader context can be difficult.

Theoretically, LiderA approach with a hierarchical level, and a structural approach, allows other applications and since it is focused at environmental performance it can be used to support EMS (like ISO 14001) to sustainable management. What happens in practice?

When we analyse the five LiderA certifications, four of them have components from environmental management, like environmental information and monitoring and Hotel Jardim Atlântico have a full ISO 14001 certification.

Hotel Jardim Atlântico (four stars hotel), it is located in Portugal, Madeira Island, in a place called Calheta. Since it was built in 1993, the focus of the approach and services is based on the idea of Nature, aiming to be integrated in the landscape and defending the environment (HJA, 2007). The Hotel has an implantation area of 19.808 m² with a garden area of 25.000 m².

The building design was careful about the landscape, use of bioclimatic principles and also solutions allowing reducing the consumption of resources, like energy and water, and reducing, treat and reuse environmental loads, like effluent discharge or solid waste.

Nevertheless, the environmental performance depends not only of the design but also of the type of use and management. They adopted an ISO 14001 System as a component to define its policy, environmental program and practical measures that involve the workers and the users. They implemented an environmental program (including measures and management actions) in the following areas:

- Landscape impact - e.g.: The hotel was efficiently planned and built in order to integrate the buildings in the landscape; they have built an own typical footpath near the hotel in the middle of unspoilt nature. The hotel installed clotheslines on the balconies to prevent the guests drying their towels over it.
- Energy efficiency – e.g.: Key switches in the guest rooms; use of energy efficient light bulbs; most apparatus and machines are equipped with low consumption and recovery energy equipment; good isolations in every part in order to avoid losing energy; The laundry uses digital measuring apparatus and exact computerized programs to obtain an exact capacity and lower consumption of water and energy; they have checklists, where they check every day, weekly or monthly, all the maintenance of the house to have a control and a prevention policy.
- Management of fresh water resources - e.g.: They have installed water savers in all taps; apply to the guests to save water, for the well being of our nature; provide instructions on how to use the toilet flush, depending on the necessity of everyone, in order to reduce again 50% of water. At the same time they reduce the water capacity of the reservoir to a minimum, saving 40% at each flush; in the laundry, for the steam iron, they use the recycled water from the dehumidifying machine.
- Waste water treatment - e.g.: They have a biological cesspool (sewage) and they use the treated water for the irrigation of the garden in order to save the fresh water; the irrigation water from the cesspool is rich in manure, so they don't need fertilizer or other ecological harmful products; they kept a planed cleansing of the small water courses "levadas", watercourses, siphon, etc... for a better drain in case of rain, as prevention;
- Air quality and noise control - e.g.: All rooms have natural ventilation and no air conditioning; periodically they check and clean the chillers and air conditionings (public areas);
- Employees, guests and public entity's - e.g.: They have trained the employees through initiatives about their environmental policy; they inform the guests about the environmental programs and activities. 90% of guests participate and give new sug-

gestions/ideas. Some of them have already been implemented; the municipality and other public entities cooperate.



Figure 1 – Hotel Jardim Atlantico – Example of environmental measures

The environmental management system and its performance is periodically monitored and annually revised with a general balance and assessment of objectives and goals. The results show progressive advances (e.g. between 2005 and 2006 the package reduction approach lead to a reduction of 18 % in waste), improvement opportunities and aspects that are worst. Deriving

from that annual balance usually it is designed the next year action program, in order to have a better performance.

Nevertheless this assessment is relative and does not allow a full view of the situation and the building's environmental performance level. The HJA LiderA assessment (Pinheiro, 2007) show the Hotel with a position of good environmental performance (Figure 2) in areas like energy and water, effluents, solid, indoor air quality, or thermal comfort.







Local and integration											
									3	Landscape	
									C5	Local integration (C LiderA level)	
									4	Amenities	
									C7	Valorisation (B)	
Resources											
									6	Energy	
									C11	Electricity consumption (B)	
									C15	Equipment efficiency (A)	
									7	Water	
									C16	Domestic water use (B)	
									C19	Rainwater collection and use (C)	
									C20	Storm water management (B)	
Environmental Loadings											
									9	Effluents	
									C25	Wastewater production (B)	
									C26	Wastewater treatment (A)	
									C27	Wastewater recycling (A)	
									10	Solid Waste	
									C31	Waste production (C)	
									C32	Toxic waste (C)	
									C33	Waste recycling (A)	
									13	Thermal Effects	
									C35	Heat Island (C)	
Interior Environment											
									14	Indoor environmental air quality	
									C36	Natural ventilation (C)	
									C38	Micro contaminant prevention (B)	
									15	Thermal comfort	
									C39	Adaptative comfort (A)	
Durability and Accessibility											
									20	Accessibility	
									C47	Relations with the community (C)	
Environmental Management and Innovation											
									21	Environmental Management	
									C48	Environmental Information (A)	
									C49	Recognize Environmental Management System	

Figure 2 – Hotel Jardim LiderA Profile Assessment Level (Pinheiro, 2007)

LiderA assessment shows that HJA have a better environmental performance when compared with other same level of services hotels. For example, in 2006 (HJA, 2007b) when compared with an average of 4 star Hotels in Madeira, the average shows a:

- 67% reduction in consumption of electricity by night and by user;
- 22% reduction in propane gas by night and by user;
- 55 % reduction in water consumption by night and by user.

The LiderA does not give only an indication of improvement face to the average practice, but once the limit of improvement is not A (50 %), but factor 4 or 10 (respectively A+ and A++) it point out structural areas of improvement. For example, they have a system to collect the rain water that can be use to supply swimming pool and to other uses, reducing the needs of potable water to level 75 % compared with practice, or to include solar panel to heating the waters. These will imply small construction works. Other aspects, like reducing toxic waste will imply further supplier involvement and personal training, in order to reduce to 75 %.

The role of LiderA assessment can be used as a global view, making a contribution to identify new environmental aspects and give new performance goals in short, medium and long term in the way to sustainability.

From other perspective, the role of environmental management in HJA could lead to a better environmental performance and to a continuous dynamic, which can also support a higher sustainable building performance.

In others cases, like Torre Verde, Casa Oasis, Ponte da Pedra or Parque Oriente the situation is that they do not have a full EMS, but they have or will have at least an user's manual, a maintenance manual and ways to inform (internal web site, newsletter, reports, meetings or others) the building management and the users of the environmental level, allowing them to make better decisions and improve global or individual actions.

	<ol style="list-style-type: none"> 1 A FUNÇÃO DO MANUAL DE UTILIZAÇÃO 2 NASCIMENTO DA EXPO URBE 3 BREVE HISTÓRIA DO EMPREENDIMENTO <ol style="list-style-type: none"> 3.1 INFRA-ESTRUTURAS E EQUIPAMENTOS 3.2 ESPAÇOS VERDES CIRCUNDANTES 4 SIMPATIA PELO AMBIENTE <ol style="list-style-type: none"> 4.1 URBANISMO SUSTENTÁVEL 4.2 ARQUITECTURA BIOLIMÁTICA 4.3 PRODUÇÃO E SEPARAÇÃO DE LIXOS 5 CONFORTO TÉRMICO <ol style="list-style-type: none"> 5.1 VENTILAÇÃO NATURAL 5.2 SISTEMAS DE SOMBREAMENTO EXTERIORES 5.3 PAREDES TROMBE 5.4 AQUECIMENTO DAS ÁGUAS DOMÉSTICAS 6 O EDIFÍCIO <ol style="list-style-type: none"> 6.1 ESPAÇOS COMUNS EXTERIORES 6.2 ESPAÇOS COMUNS INTERIORES 7 AS COMPONENTES DO EDIFÍCIO – MANUTENÇÃO QUE FAZER EM CASO DE... <ol style="list-style-type: none"> 7.1 COBERTURA 7.2 PAREDES – INTERIORES E EXTERIORES 7.3 JANELAS 7.4 PORTAS – INTERIORES E EXTERIORES 7.5 MADEIRAS 7.6 PAVIMENTOS 7.7 TECTOS 7.8 OBRAS EM SUA CASA? 8 SEGURANÇA <ol style="list-style-type: none"> 8.1 SISTEMA DE DETECÇÃO DE INCÊNDIO 8.2 REDE DE EXTINTORES PORTÁTEIS E CARRETÊIS 8.3 REDE DE INCÊNDIOS ARMADA 9 ENTIDADES ENVOLVIDAS NO EMPREENDIMENTO 10 ALÇADOS DO EDIFÍCIO E PLANTAS DO SEU APARTAMENTO
-----------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------



Manual de utilização

Figure 3 – Torre Verde Environmental building manual (Tirone Nunes, 2005)

4 ENVIRONMENTAL BUILDING ASSESSMENT AND ENVIRONMENTAL MANAGEMENT

The main question is to know that if it exist a positive relation between these two approaches. The HJA show that complementary it can exist and it has a positive relation leading to a better environmental performance, but it also shows the existence of some critical points. There is different focus and application in different phases.

Traditionally, to each area it is applied a specific context, and in specific phases this can be a fragmenting trap, so assessment and management must be defined since, as LiderA pointed out, the earlier phases of the project and support all the life cycle phases like construction, operation and demolition or deconstruction.

Another important aspect is that most of the important decisions are taken in earlier moments and in phases where the environmental information is reduced and it is difficult to have an integral performance assessment. So a possible prescriptive orientation and assessment is essential in preliminary phases, as presented in LiderA system to that specific phase.

As Cole (*et al.* 2005), point out several possibilities can be postulated regarding the possible ways that assessment methods may evolve in the longer future including: assessment methods will need to be cast within a broader array of initiatives for creating necessary change, will have to be recast under the umbrella of sustainability – environmental, social and economic.

In most of the cases in assessment methods, economic or cost analysis are implicit (or absence) but not explicit and are partial. An exception is GB Tool, which included that approach (Larson, 1999) and that is a reason why LiderA component recommend a life cost cycle analysis.

The environmental management system includes mainly the workers and suppliers. In order to go towards sustainable management the system must be enlarged and must include the users and other stakeholders, even in an influential context.

LiderA system provides an assessment of environmental performance, not only related with the improvement of practice but to further structural improvement that can give, as showed, a broader view from environmental performance to sustainable level. LiderA have also specific criteria to environmental management information and environmental management system.

Nevertheless it is important and needed to include new degrees of action and management in the buildings in order to allow a dynamic management in different moments and with different users. So, as LiderA points out, there is a need to consider environmental management aspects in the design phase.

LiderA can be the base to interlink an environmental building assessment with an environmental management system (like ISO 14001, that must be adjusted), focusing in environmental performance and applied at different phases, creating, in theory and practice, a win-win relations between these two approaches.

5 CONCLUSIONS

LiderA is a voluntary Portuguese system to assess the sustainable buildings that begins to be in the market in an experimental phase, but certified in 2007 the first five buildings, involving 72 230 m² in residential (70 %), tourist (11%) and commercial uses (19%), from a house to several buildings, in design and operation phases.

These five certifications show that it is possible to have a multi-application to different types of buildings and to several life phases, resulting from the top down structure with different levels of detail and thresholds linking design, construction, use and final end life.

Besides the usual assessment system, the hotel Jardim Atlantico case point out that it is possible and needed a potential positive relation between environmental management system and LiderA system.

Since the final performance depend from several components, including design and users, the two approach can be complementary and can create a win-win relation if they use the environmental assessment system as a base to implement a full strategy to ensure environmental and sustainable performance with broader view, environmental performance focus, and adjust from environmental management system.

In conclusion, another new frontier to sustainable environmental assessment is a holistic approach that links the sustainable assessment component to the environmental management system (mainly users) in order to achieve higher sustainable performance.

As Cole (*et al.* 2005) explains market-based assessment methods will have to reinvent themselves to maintain potency. To that field, LiderA system could provides new perspectives, experimental applications, creating new opportunities and challenges.

6 REFERENCES

- Ball, Jonathan (2002). Can ISO 14000 and eco-labelling turn the construction industry green? *Building and Environment*, Volume 37, Issue 4, April 2002, Pages 421-428
- Block, Marilyn (1999). *Identifying Environmental Aspects and Impacts*. ASQ Quality Press, 145 p.
- Cole, Raymond J. (1998). Emerging trends in building environmental assessment methods. *Building Research & Information*, Volume 26, Number 1 / January 1, 1998, 3 - 16 p.
- Cole, Raymond J; Howard, Nigel; Ikaga, Toshiharu; Nibel, Sylviane, (2004), *Environmental Assessment Tools: Current and Future Roles*, SB 05, Issue Paper 4 & 5, Tokyo, Japan.
- Hill, Richard C.; Bowen, Paul A. (1997). Sustainable construction: principles and a framework for attainment. *Construction Management & Economics*, Volume 15, Number 3 / May 1, 1997, Pages: 223 – 239.
- HJA - HOTEL JARDIM ATLÂNTICO (2007a). *Main Characteristics*. Calheta, Madeira, Portugal, <http://www.jardimatlantico.com/ingles/localizacao.html>
- HJA - HOTEL JARDIM ATLÂNTICO (2007b) *Environmental Management System Report Status 2006*. Calheta, Madeira, Portugal, 32 p.
- Kein, Alan; Ofori, George; Briffett, Clive (1999). ISO 14000: Its relevance to the construction industry of Singapore and its potential as the next industry milestone. *Construction Management & Economics*, Volume 17, Number 4 / July 1, 1999, 449 - 461 p.
- Kibert, C. J. (1994). *Establishing Principles and a Model for Sustainable Construction*. Proceedings of the First International Conference on Sustainable Construction, November 6-9, 1-10, Tampa, Florida.
- Kibert, Charles (2003). *Sustainable Construction at the Start of the 21st Century*, International e-Journal Construction, Special Issue - The Future of Sustainable Construction 2003, <http://www.bcn.ufl.edu/iejc/pindex/si/10/>
- Larsson, Nils K. (1999). Development of a building performance rating and labelling system in Canada. *Building Research & Information*, Volume 27, Number 4-5 / July 1, 1999, 332 - 341 p.
- Peglau, Reinhard (2002). Applauding the success of ISO 14001 should not deafen us to the challenges. *ISO Management Systems – January-February 2002*, 15:16
- Pinheiro, M. D.; Correia, F. N. (2005). LiderA - Portuguese voluntary sustainable assessment building system (main lines). *The 2005 Sustainable Building Conference in Tokyo 27-29 September (SB05 Tokyo)*, 2005, Tokyo, Japan.
- Pinheiro, M. D. (2007). *LiderA - Portuguese voluntary sustainable assessment building system certification cases*. http://www.lidera.info/Casos_ingles.html
- Ratti, C.; Baker, N.; Steemers, K. (2005). Energy consumption and urban texture. *Energy and Buildings*, Volume 37, Issue 7, 1 762-776.
- Tirone Nunes (2005). *Manual de Utilização da Torre Verde*, 37 p. Tirone e Nunes, Lisboa