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SUSTAINABLE LEGISLATION: GUIDELINES FOR INCORPORATING SUSTAINABILITY CONCEPTS IN THE VITÓRIA/ES BUILDING CODE

124

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ABSTRACT

This article aims to examine the legal aspects of sustainable construction proposing guidelines for incorporating sustainability concepts in the Code of public works and construction of the Vitória-ES. In the global context, sustainability is evident, reinforcing the concern about the impact generated by man to the environment, directly affecting the economy, society and the planet's future, so the importance of environmental preservation and the efficient use of natural resources (water, air, energy, materials etc.). In this sense the role of legislation is important, since the goal of the building code in the municipalities is to ensure minimum conditions of environmental comfort in the deployment of any building to be built in the city. The hypothesis is that the legislation needs to be revised and the goal is to adjust it by inserting sustainability concepts. The methodology is based on literature search applied to the subject. We conclude that the Government should contribute more effectively to the reconstruction of the cities scene, playing their role through legal instruments, in a more effective and active way for both construction of new buildings, the renovation and adaptation of existing ones.

KEYWORDS

Building code. Environmental comfort. Sustainability. Vitória (Espírito Santo).

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SOSTENIBLES LEGISLACIÓN:
DIRECTRICES PARA
INCORPORAR LOS CONCEPTOS
DE SOSTENIBILIDAD EN EL
CÓDIGO DE EDIFICIOS EN
VITÓRIA / ES

LEGISLAÇÃO SUSTENTÁVEL:
DIRETRIZES PARA
INCORPORAÇÃO DE CONCEITOS
DE SUSTENTABILIDADE NO
CÓDIGO DE EDIFICAÇÕES DE
VITÓRIA/ES

RESUMEN

Este artículo tiene como objetivo examinar los aspectos jurídicos de las directrices de construcción proponentes sostenibles para la incorporación de los conceptos de sostenibilidad en el Código de las obras públicas y la construcción de la Vitória-ES. En el contexto global, la sostenibilidad es evidente, lo que refuerza la preocupación por el impacto generado por el hombre al medio ambiente que afectan directamente a la economía, la sociedad y el futuro del planeta, por lo que la importancia de la preservación del medio ambiente y el uso eficiente de los recursos naturales (agua, el aire, la energía, los materiales etc.). En este sentido, el papel de la legislación es importante, ya que el objetivo del código funciona en los municipios es garantizar condiciones mínimas de confort ambiental en el despliegue de cualquier edificio que se construirá en la ciudad. La hipótesis es que la legislación debe ser revisada y el objetivo es ajustar mediante la inserción de los conceptos de sostenibilidad. La metodología se basa en la búsqueda en la literatura aplicada a la materia. Llegamos a la conclusión de que el Gobierno debería contribuir más eficazmente a la reconstrucción de la escena ciudades, jugando su papel a través de instrumentos legales, de manera más eficaz y activo tanto para la construcción de nuevos edificios, la renovación y la adaptación de los ya existentes.

PALABRAS CLAVE

Obras de código y edificios. Confort ambiental. Sostenibilidad. Vitória (Espírito Santo)

RESUMO

Este artigo pretende examinar os aspectos legais da construção sustentável propondo diretrizes para incorporação de conceitos de sustentabilidade no Código de obras e edificações do município de Vitória-ES. No contexto mundial, a sustentabilidade está em evidência, reforçando a preocupação com o impacto gerado pelo homem ao meio ambiente afetando diretamente a economia, a sociedade e o futuro do planeta, por isso a importância da preservação ambiental e o uso eficiente dos recursos naturais (água, ar, energia, materiais etc.). Nesse sentido o papel da legislação é relevante, pois o objetivo do Código de obras dos municípios é garantir condições mínimas de conforto ambiental na implantação de qualquer edificação a ser construída na cidade. A hipótese é que a legislação precisa ser revisada e o objetivo é adequá-la, inserindo conceitos de sustentabilidade. A metodologia baseia-se em pesquisa bibliográfica aplicada ao tema. Conclui-se que o Poder Público deve contribuir mais efetivamente no cenário de reconstrução das cidades, exercendo seu papel através dos instrumentos legais, de forma mais eficaz e atuante, tanto para construção de novas edificações, quanto na reforma e adaptação das já existentes.

PALAVRAS-CHAVE

Código de obras e edificações. Conforto ambiental. Sustentabilidade. Vitória (Espírito Santo).

I. INTRODUCTION

The architecture, as a product of the transformation of the natural environment in space built, also ensues by a concern for the issues of sustainability. But after all, what is sustainability? According to Venancio (2010) Sustainable word comes from the Latin *sustinere* which means “staying alive” or defend themselves. It is known that the topic is broad, comprehensive and subject to various interpretations as it involves both socioeconomic and environmental matters.

The first definition of sustainable development was compiled in 1987 by the UN environment Commission, under the leadership of Gro Harlem Brundtland. “The Brundtland Commission defined sustainable development as that which meets the needs of the present without compromising the ability of future generations to meet their own needs.” (EDWARDS, 2008 p20)

Increasingly, the sustainability subject gets relevant. The serious problems of climate change and depletion of natural resources require the architecture to adapt to changing times. The construction industry accounts for a large environmental impact, both in the consumption of raw materials as the production of waste, therefore, architects and engineers need to design in a more versatile, properly and efficiently way.

In the United States, buildings account for 48% of total energy consumption and 73.1% of electricity consumption. They account for 30% of emissions of greenhouse gases and consume 30% of the raw materials. Furthermore, the construction industry absorbs 12% of the country's drinking water. It is clear that buildings are responsible for a huge environmental liability. The movement of sustainable construction has responded to this degradation. (KEELER BURKE, 2010 p.51)

According to Norman Foster & Partners, sustainable architecture is defined as “the creation of efficient buildings from the energy standpoint, healthy, comfortable, flexible use and designed to have a long life” (EDWARDS, 2008, p.21). Thus, not only the modern technological resources, but also the traditional architecture can help in the understanding of sustainable building design.

The vernacular architecture uses locally available materials, local sources of energy, mostly renewable, and adopts constructive methods that encourage recycling and respect for nature. These characteristics can be observed in rural households, as well as in urban buildings (...). By vernacular architecture, one can learn about important aspects of the buildings individually, and urban planning, as well as relations between the different human settlements and natural resources. (EDWARDS, 2008, p. 67)

Social, economic and environmental aspects lay the foundation of systems thinking, the famous sustainability triple bottom line. According to Keeler and Burke (2010) an integrated building is a sustainable building. The integrated project requires understanding of the interrelationships of each of the materials, systems and spatial elements. It requires all face the project holistically, rather than concentrate solely on an individual part.

According Roaf *et al.* (2009) the quality of life of future societies in and around the buildings, depends largely on the decisions we make about the location and construction technology, the shape and design of the built environment and the lifestyles we adopt among them.

Excessive CO2 emissions and the greenhouse effect are causing serious climate change the planet, thus resulting in heat waves, cold, windstorms, droughts, fires, floods, flooding, landslides, sea level rising etc., all this has worsened considerably over the years. The earth's temperature is rising, it is recognized by all climatologists, disasters arising from it and tendency to worsen in the future underlies the importance of rethinking today's architecture.

The buildings in which we will live in 20 or 50 years will be mostly those which we occupy or are being built today and, therefore, our choices today must be based on these descriptions of a probable future, because they are the best chance we have to plan buildings that are, in some way, at least appropriate to the world in rapid transformation. (ROAF et al., 2009, p. 84)

In this overall context, the role of public policies and legislation are highlighted by ensuring best buildings in the future. In general, the laws governing the construction in Brazil are the responsibility of municipalities through the Master Plans (for urban issues) and the Building Codes (for building issues).

The review of the legislation has an important role because the laws relating to construction in Brazil, as done in several countries, must accompany global concern, where the sustainability theme is inserted. Sustainable construction is based on the creation and management of healthy buildings, from socially just solutions, economically viable and environmentally friendly in the efficient use of resources, which meets the objectives of the codes that is to ensure comfortable, safe and healthy buildings.

Public policies alone are not able to generate necessary changes, but can contribute to break paradigms. Thus, the main objective of this paper is to propose the improvement of the built environment from the review and revision of local legislation, with the specific objectives set criteria and build effective guidelines for sustainable concepts such as bioclimatism, energy efficiency, water reuse and others, applied to the object of study: the Vitória Building Code. The assumption is therefore that the legislation needs to be revised and the goal is to adjust it by inserting sustainability concepts. The work methodology is based on bibliographic research applied to the subject, in books, magazines, scientific works, sites, Vitória legislation, other Brazilian cities and even other countries.

The article is divided into four sections: the first deals with the origin and history of the laws concerning the construction, especially the Vitoria building code. The second provides an overview of sustainable legislation, addressing what is already being produced in the world, national and local context. The third deals with the bioclimatic concepts and environmental comfort eligible for inclusion. And the fourth and final section presents proposals and guidelines for incorporating sustainable concepts in Vitória building code.

2. URBAN AND BUILDING LEGISLATION

Historically, the adoption of urban and building planning laws is ancient. The Code of Hammurabi, one of the oldest sets of written laws found (2200 AC), already had rules clearly establishing the relationship between the manufacturer and the customer, as well as the obligations of the manufacturer in relation to the building security guarantee.

In ancient Rome (450 BC), there were obligations of setbacks of the buildings in relation to neighbors and height limits due to landslides (27 BC). In Rome after Nero (To 54 to 68 AD) there were height limits of buildings limited to the width of the tracks, and requirements relating to openings for lighting and sewer system.

In Brazil, the Building Codes were being established and improved to suit the urban environment to the needs brought about by the evolution of society. In the colonial period it even regulated the citizen conduct, called Postures Codes. Currently, the Building Code is the instrument that allows the municipal administration to exercise control and supervision of the built space and its surroundings, ensuring the safety and wholesomeness of the buildings.

Sanitary and municipal codes have two main objectives: first, to provide a healthy and decent environment, with dignified conditions for the population that yearns for a quality space; second, to prevent the other part of the population who do not care about the aspects of the community, will constitute a threat to community rights. (FERNANDES, 2009, p.81)

. Although there building laws in Federal, State and Municipal governments, according to Article 30 of the Constitution "it is the responsibility of the municipalities: I - legislate on matters of local interest; (...); VIII - promote, where applicable, adequate land use planning by planning and control of use, apportionment and occupation of urban land." Therefore, it is municipal competence the planning of its territory and buildings through appropriate laws to local interests of the municipality.

The municipal building code is based therefore on administrative police power inherent in the government. According to Meirelles (2006): "Police power is the power available to the public administration to condition and restrict the use and enjoyment of goods, activities and individual rights for the benefit of the community or the state itself." In other words, the State must restrict the particular law (in this case the right to construction) seeking to prevent future damage caused to the collective interest in the face of individual misconduct.

In general the building codes use safety standards, nationally accepted materials and tests; they are designed to protect users and set acceptable minimum standards for all types of buildings, and construction techniques and acceptable building installations. (KEELER BURKE, 2010 p. 54)

The municipal law 4,821/98 of Vitória-ES municipality brings in Art. 1 to following definition: "This law establishes the Building Code in the Municipality of Vitória in order to ensure the minimum conditions of safety,

comfort, hygiene and healthiness of buildings and construction in general.”. The Art. 2 states:““The building code determines the administrative procedures and rules, general and specific, to be followed in the planning, licensing, execution, maintenance and use of the works, buildings and equipment, without prejudice to relevant local, state and Federal legislation”“.

The right to build is therefore open to any owner of real estate citizen, but abuse in the exercise of this right may cause inconvenience to the neighborhood and the community, therefore, it is incumbent upon the Government to advance consent to construction, since the project respects Local planning legislation and the neighborhood right.

According to Fernandes (2009) Brazilian law was strongly influenced by the Sanitary Codes, which under a hygienic spaces point of view, they intent to guaranteed health cities and buildings, following international urban discussions in late 19th century. As of 20th century; influence of modern architecture and the Athens Charter has also been incorporated into the Brazilian urbanism and consequently the legislation.

Buson analyzed the COE-DF and points out that the indices used in it were copied from other Brazilian cities and raises the hypothesis that this vicious cycle can be taken repeated elsewhere, resulting in inadequate criteria to the local climatic situation. Toledo reports that the Lawgiver and Municipal Public Administration of the State of Minas Gerais in 1956 and the Building Code of São Paulo 1975 Manual can be considered as potential influencers of texts on natural ventilation present in the national models and in some building codes buildings and other Brazilian cities. (FERNANDES, 2009, p. 83)

In Vitória, the current Building Code has its origins in Law 351/54, former “Construction, postures and tax code, ”“which, following the concerns of society at the time, encompassed in the same law, rules for different aspects of local interest. Following the urban and social evolution of the city, the various codes were being organized separately, for better control by the municipality, resulting thus in different codes: the Buildings, Postures, Health, Public Cleaning, Environment, Urban Master Plan (PDU) Codes, etc.

PDU is the basic tool of development policy and urban expansion, which according to the Federal Law 10.257/01 (Cities Constitution), it is mandatory for cities with more than 20,000 inhabitants, to be revised every ten years, following the local urban evolution. The latest revision of the Vitória PDU was in 2006, resulting in the current Law 6,705/06.

With regard to the Building Codes, there is no legal obligation to review, at the discretion of each municipality the term and upgrade needs. The current Law 4821/98 establishing the Vitória Building Code is therefore lagged in the face of technical developments, regulatory and technological changes in current construction, which cover aspects of sustainability, both worldwide and national, having been inserted in codes of cities around the world.

3. OVERVIEW OF SUSTAINABLE LEGISLATION: GLOBAL, NATIONAL AND LOCAL CONTEXT

In European countries and the United States, since the 80's, there is concern about issues such as bioclimatism and energy efficiency, even for economic reasons. According to Fernandes (2009) legislative updates is one way to ensure the quality of the building in relation to bioclimatic concepts, especially thermal comfort and energy efficiency, thus contributing to sustainability.

From the 80s, countries such as Canada, Hong Kong, France, Jamaica, Japan, Kuwait, New Zealand, Pakistan, Philippines, Singapore, Sweden, UK, Argentina, Italy, Germany, Portugal and the United States have established their thermal and energy performance regulations. The main objective in most countries is to create tools for the rationalization of energy consumption in buildings together with the improvement of environmental comfort conditions. (FERNANDES, 2009, p.19)

Legal issues related to the "right to the sun", natural light, wind and noise pollution are becoming increasingly important. "Protection laws for the right to the sun are being adopted in cities across the world, an example is the Solar Law of Colorado in the US, which ensures that buildings cannot steal the natural light from adjacent buildings." (ROAF *et al.*, 2009, p. 272)

The importance of sun establishes the advantages of natural light: it makes the most economic construction, to reduce energy consumption; reduces the thermal loads from the fixtures; it produces stimulant effects to the inhabitants; and produces levels of illumination higher than artificial lighting. Moreover, the sunlight helps the human body to produce serotonin, vitamin D and a number of substances that make our body healthy and happy (VENÂNCIO, 2010, p. 145)

The creation of various methods of sustainability analysis for buildings, so-called environmental certification seals or "green certificates" such with LEED, AQUA, BREEAM, and others, came to add the global context of sustainability, however, the seals themselves does not ensure that sustainable concepts are deployed due optional character. According to Keeler and Burke (2010) sustainable building policies, license applications and building codes are ways to get the sustainable design out of the voluntary initiatives field and take them to the mandatory public policy.

Coupling project approval to obtain green certificates or tax incentives is part of the current requirements in many cities in the United States and Canada (see Figure 1). One example, according to Keeler and Burke (2010), is the city of San Francisco in the US, since 2008, through the Law 180/08, requires all commercial buildings of more than 465m² and all reforms or large adaptations in buildings with 2.323m², to obtain a basic LEED certification. Gradually the level of certification required will be higher (Gold) by 2012. This policy will also apply to all types and sizes of housing construction, except small ones.

San Francisco may have been the first US city to go that far, but certainly will not be the only one. Local governments across the country are adopting policies and sustainable construction legislations, developing plans to obtain licenses, pledging to reduce carbon emissions and striving to reduce waste production. (KEELER BURKE, 2010, 55 p.)

It is studied also in the state of California, a law that will require all new residential buildings to achieve zero energy consumption by 2020 and all commercial buildings by 2030. It would be the first step toward carbon neutrality known as building with zero power consumption (KEELER BURKE, 2010, 62 p.).

Following the same thinking, the City of Merton, Greater London, requires a “sustainability assessment” in proposals for construction of buildings with more than 1,000m², describing how the building was designed to reduce environmental impact throughout the life cycle. (ROAF *et al.*, 2009, p. 274)

While in the United States and Europe the legislation progresses rapidly following concerns about sustainable construction (air quality, water

consumption, energy efficiency, reducing waste and environmental impact), in Brazil, the process is still fledgling. Due to the complexity of legislative changes, many municipalities have been opting to create additional laws or decrees, rather than revise the basic building legislation in order to adopt sustainability principles. It is a start, but we need to move.

The municipality of São Paulo, according to Pereira, requires all new houses with four or more bathrooms (including toilets) to rely on solar water heating system. Houses and apartments with three bathrooms are also provided for in Law 14 459/07: the property hand over is subject to the construction of infrastructure for future installation of equipment (hot water piping and space in the coverage for the kit).

COMPARISON OF NATIONAL LEGISLATIONS OF SUSTAINABLE BUILDING
COMMERCIAL AND HOUSING REQUIREMENTS (partial list)

CITY	COMMERCIAL BUILDINGS	HOUSING BUILDINGS	CHANGES
San Francisco	YES, 2.323 m ² *	YES, ALL**	YES
Austin	NO Encouragement to the implementations	NO	NO
Boston	YES, 4.646 m ² LEED Certificate 2007	NO	NO
Chicago	NO	NO	NO
New York	NO Tax encouragement	NO	NO
Pasadena	YES, 2.323 m ² Without LEED certificate	YES, 4 pavements or more without LEED certificate	NO
Pleasanton	YES, 1.858 m ² Without LEED certificate	YES, 185 m ² or more Lane County	NO
Portland	NO State tax credits	NO	NO
Seattle	NO Zoning bonus	NO	NO
Washington DC	YES, 4.646 m ² LEED Certificate 2012	NO	NO

All cities of this list require a LEED certification within the city.
The information reflects the standards and requirements for commercial and private housing buildings.

*Gradual LEED requirement: Certificate from 2008 to 2012 (Gold)
**Gradual Green Points Rating Score: from 25 in 2009 to 75 in 2012

Figure 1: Summary of trade and housing requirements of various US cities, June 2007. Source: Keeler and Burke (2010)

Only homeowners who prove technical incapacity (via a report) due to low incidence of sun are exempt. Across the state, fifteen cities have created similar laws. There are those who disagree, due to lack of technical knowledge about the system.

Solar panels technology is ready, but lacks a complete solution for the heating system as a whole, criticizes the civil engineer Roberto Lamberts, Energy Efficiency in Buildings Laboratory researcher at the Federal University of Santa Catarina (UFSC). For Lamberts, solar heating is an important item for energy efficiency in construction, but it is necessary to better understand its functioning and inform users about its peculiarities, so installation and operation errors are avoided. (CIÊNCIA E SAÚDE, <<http://cienciaesaude.uol.com.br/ultnot/2008/02/03/ult4477u312.jhtm>>. Accessed on: June 07, 2012)

In Vitória, isolated specific initiatives were observed, such as: the Law 4,857/99 (which provides for the obligation of individual metering of water consumption in multi-family residential buildings); Law 6,259/04 (which provides for the reuse of non-potable water from the sewage treatment plants, by the municipality itself, for street cleaning, parks, gardens irrigation etc.); Law 7,668/09 (authorizing the government to install solar power supply system in their own buildings); Law 7,989/10 (which provides for the mandatory use by own municipal public agencies, water reduction control devices); and the bill 7831/09 (establishing new destination for rain water and served in residential and commercial buildings with four or more floors) not implemented yet because of lack of regulation.

It can be seen an initial effort, it is essential to conduct more scientific studies that make possible proposals for inclusion of sustainable concepts in municipal legislation, particularly in the Building Codes. One way would be the partnership between government, universities and the construction industry, as provided for in Procel-Edifica Plan of Eletrobrás, which has as one of its goals, the revision of codes according to energy efficiency. “The Brazilian Chamber of Construction Industry (CBIC) seeks to promote coordination between entities to promote the revision of building codes, seeking innovation, and evaluation of buildings from the performance” (FERNANDES, 2009, p. 87)

4. BIOCLIMATIC CONCEPTS AND ENVIRONMENTAL COMFORT

To produce a sustainable building, or a building that is economically and environmentally correct, it is assumed to be environmentally comfortable. Thermal comfort and energetic efficiency, in turn, depend on a bioclimatic good performance, which is intrinsically related to the urban environment, the implementation, and the morphology and volume of the construction. “The application of the concept of comfort is essential to creating healthy human environments. Human beings need to feel comfortable. Healthy environments often rely on lighting, ventilation and natural materials” (EDWARDS, 2008, p. 145)

The quality of the internal environment of a building requires the integration of many functions, that is, depends on an integrated design where the built environment relationship with nature is paramount. “Humans need to connect with the external environment. In addition to being nice, the proximity to green, the visual contact with the sky and outside air sensation on the skin are naturally comforting” (KEELER BURKE, 2010, 102 p.)

According to Venancio (2010) the use of bioclimatism principles can be grouped into “7 Echoes”: eco-efficiency of design, water, energy, natural resources, materials, accessibility and waste. Generally, the higher initial financial cost hinders the implementation of some of these concepts in the elaboration of a project, but the results over the building lifespan generate benefits and investment returns, ranging from real estate appreciation, through low maintenance, plus quality of life and the primordial matter of preserving the environment and natural resources.

Starting from the bioclimatic chart of a city, it is possible to know the behavior of temperature and relative humidity at each location throughout the year, identifying the most likely periods of discomfort and the percentage of strategies suited to the buildings. Using Climaticus_4_2 comfort Software of the FAUUSP/Labaut it was possible to obtain a climate diagnosis to Vitória, where in the summary of the design strategies, it appears that 54.5% of the thermal comfort of the buildings for Vitória can be solved through natural ventilation and 43,8% by artificial conditioning (see Figure 2).

It is clear, therefore, that it is possible to obtain a good project prioritizing: natural ventilation, the orientation of windows, shading, quality of “skin of the building (envelope) and selection of appropriate building materials. However, the data shown are general and are not to be interpreted separately. There is the issue of urban microclimates determined by several factors,

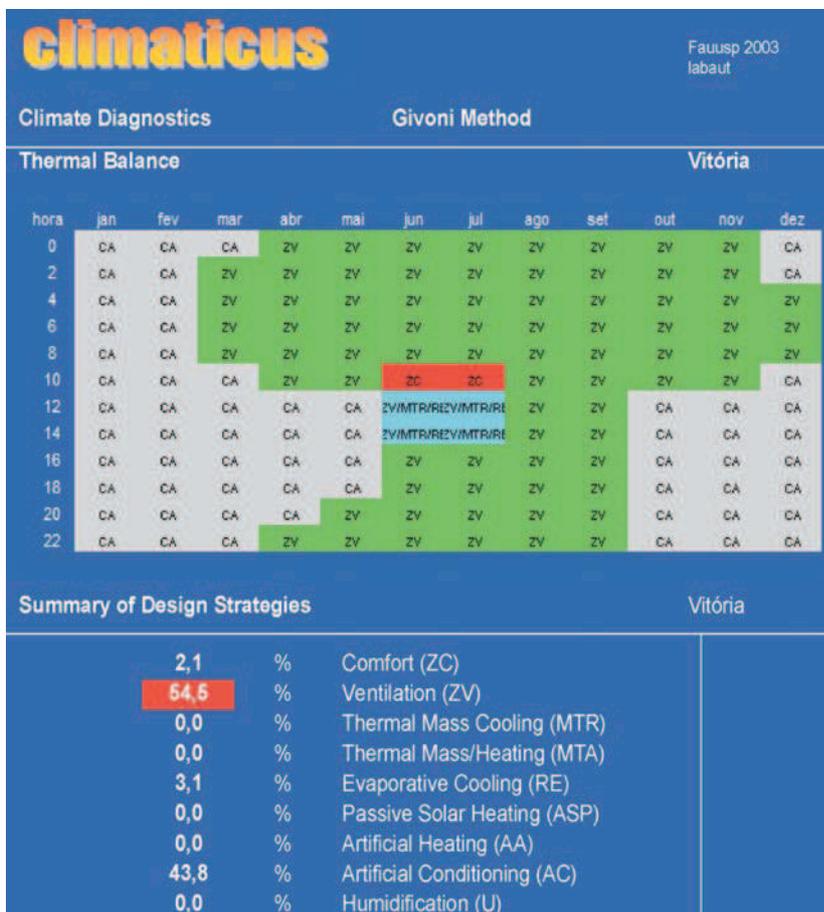


Figure 2 - Design Strategies Climaticus Software
 Source: LABAUT <<http://www.usp.br/fau/pesquisa/laboratorios/labaut/conforto/index.html>>. Accessed on June 07, 2012

such as sunlight, wind, topography, land cover, vegetation, amount of paved areas, natural or artificial obstacles that alter access to sunlight and natural ventilation.

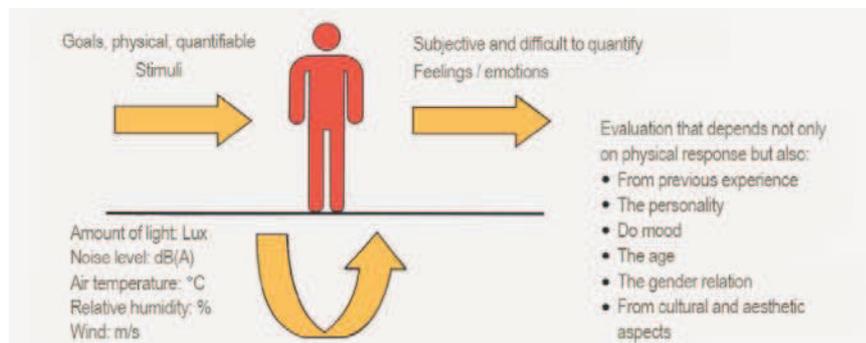
The land use in a city is mainly characterized by a high density built and asphalt paving. These elements, by themselves, can lead to a rise in temperature of a few centigrade degrees. This effect, coupled with pollution, reduction of green spaces and the anthropogenic heat released by the industry, vehicles, equipment and human activities, contributes to the establishment of a higher field temperatures, called "urban heat island" (ROMERO, 2011, p. 73)

Because of urban microclimates, studying general characteristics of a city climate is not enough, it is necessary to understand and interpret the specific environmental conditions of the site where the building will be inserted so that more effective design strategies are adopted.

Another relevant issue is the concept related to the notion of comfort. According to Romero (2001) "The concept of thermal comfort is associated with a good deal of psychological and physiological factors, which vary from person to person, and may lead to different sensations of thermal comfort, given the same conditions of thermal environment" (see Figure 3). Therefore, being an individual and subjective sensation, it is very difficult to satisfy all occupants of a room, unless you give each one of them, the possibility of controlling the microenvironment that surrounds them. "The building of the user also needs flexible and effective tools to further enhance their environment - that is, calibrate it - and controlling at least the temperature, humidity, ventilation and lighting." (KEELER BURKE, 2010, p. 94). The use of environmental control mechanisms (also known as personal or individual control) is also essential to the success of a good design.

The technical standards that address aspects of environmental comfort therefore provide quantitative criteria for the vast majority (at least 80%) of the occupants feel at satisfactory standard of comfort, and that all healthy people are in healthy conditions. Brazil has some regulations related to environmental comfort, among which: NBR 15220, which deals with the thermal performance of buildings; NBR 15215, on Natural lighting; NBR 5413 fixing minimum luminance values according to environmental activity; 6401 NBR environmental conditioning; the NBR-12179, NBR-10152 and other

Figure 3 - Comfort concept: subjective feelings and emotions
Source: < <http://www.vitrineadc.com.br/index.php/corpus-arquiteticos/582-iluminacao-e-arquitetura-conforto-luminoso>>. Accessed on June 09, 2012



standards, on acoustic and NBR 15575, on performance of residential buildings up to five floors, with requirements for lighting, thermal and acoustic comfort.

As for energy efficiency assessment systems standards in Europe and the United States, the aid of computational tools, software simulation for evaluating environmental performance, are already established usages. According to Keeler and Burke (2010) in the state of California in the US, compliance with energy standards is required prior to issuance of the building permit since the 70s through the "Code of regulations and energy standards for state buildings of California" whose indexes are updated periodically and made available on the Internet.

In Portugal, for example, buildings must follow the regulation of thermal-energetic performance, they are evaluated in specific software, which ensure compliance with the requirements and try to speed up and facilitate the process of labeling and approval for both designers, and agencies responsible for reviews. (FERNANDES, 2009, p. 20)

In Brazil, only in March 2009 the Technical Regulation of Quality for Commercial, Service and Public Buildings Efficiency, (RTQ-C) was approved, released by Inmetro/Eletróbrás. A significant step forward towards building more environmental comfort and energy efficiency, primarily evaluating the envelope, lighting and air conditioning of buildings.

The RTQ-C established new methodology for energy assessment of buildings within the Brazilian Labeling Program (PBE), with technical requirements for classification of buildings according to the guidelines for each of the Brazilian Bioclimatic zones, defined in the standard of Thermal Performance (NBR 15.5520-3), 2003, which deals with specific bioclimatic guidelines for the country. (FERNANDES, 2009, p. 20)

In November 2010, it was also released the Regulations for Residential Buildings (RTQ-R). Currently, such regulations are voluntary, but are expected to be required in a few years, which will have great impact on the Brazilian construction market.

5. PROPOSALS AND GUIDELINES FOR COE-VITÓRIA

Vitória is the capital of the state of Espírito Santo, is geographically located in an island at 20°19'09" south latitude and 40°20'50 west longitude, in southeastern Brazil. Mainly tropical climate and northeast winds. As mentioned, sustainable architecture is based on bioclimatic principles, which in turn, relate to the implementation, shape, orientation, function, closures, openings for lighting and ventilation, environments geometry etc. Most of these elements is provided in Building codes, however:

Much of the current built environment comes from projects in which the rules were minimal; that is, most building projects follow the minimum standards allowed by the building code applicable for getting the necessary permits and receive an occupancy permit. (...) The sustainable building codes represent a fundamental paradigm shift, away from the minimum acceptable design

standards and construction standards to the lowest common denominator.
(KEELER BURKE, 2010, 54 p.)

In Vitória, the Building Code (Law 4.821/98) is divided into ten chapters: General Provisions; Rights and responsibilities; Administrative procedures; Inspection procedures; Compartments: sorting, sizing, lighting and ventilation; Furniture and bumps; Circulation and safety; Sidewalks, access, circulation and parking of vehicles; Sanitary facilities; and additional specific requirements. Starting from the sustainable legislation and bioclimatic aspects discussed in previous chapters, follows (Table 1) proposed guidelines for inclusion in the COE-Vitória, from four main themes: design, energy, water and waste.

As already successfully adopted in other countries, it would initially be appropriate to adopt to encourage sustainable building policies, which tax and/or building benefits are established for both new construction and for rehabilitation of existing buildings. Those interested in building sustainable buildings or adapt the built buildings could have tax incentives, such as exemption or discount ITBI, ISS and property taxes during construction and in completed building.

The City of Rio de Janeiro presented a proposal in this sense: the “Qualiverde” Seal (In: <http://www2.rio.rj.gov.br/smu/compur/pdf/proposta_

Table 1: Proposed guidelines for incorporating sustainable concepts in COE-Vitória

THEMES	PROPOSED GUIDELINES
PROJECT Alignment and integration of the project with surroundings	<ul style="list-style-type: none"> · Encourage adaptation to local topography (little change in the land morphology and maintenance of existing vegetation); · Encourage the adoption of permeable areas larger than the minimum required in the PDU and encouraging the landscaping of these areas; · Prohibit use of reflective glass that cause glare in neighboring buildings.
ENERGY Environmental comfort and energy efficiency	<ul style="list-style-type: none"> · Encourage the use of solar energy for water heating; · Force installation of solar energy for large enterprises (buildings over three bathrooms); · Encourage the use of natural lighting and ventilation as well as the installation of energy saving mechanisms; · Encourage adoption of alternative energy sources (wind, solar, biomass etc.) · Compelling presentation of Procel Edifica Seal (long-term proposal).
WATER Water management and saving	<ul style="list-style-type: none"> · Compel individual metering of water in commercial buildings; · Encourage the installation of water saving devices; · Encourage use of rainwater and/or reuse of waste water; · Require the use of rainwater and/or reuse of waste water in large projects (buildings over four floors).
WASTE Waste management	<ul style="list-style-type: none"> · Compelling presentation of Waste Management Plan (Federal Law 10,305/10); · Encourage the use of recycled material or certified origin; · Encourage the use of local building materials and local labor; · Encourage retrofit of old buildings with the use of sustainable technologies; · Encourage selective collection and adoption of environmental education plans.

qualiverde.pdf>. Accessed on: June 23, 2012), however, binding the approval of the project to the achievement of seals can create market mechanisms, raising a false image, it is called *Greenwashing* or “green varnish (makeup)”. According to John (2010), without public and sector policies, the seals do not promote sustainability. Some of them are even explicitly bad faith by passing a false image of sustainable industries and corporations.

To incorporate sustainability criteria in local legislation is believed to be the most appropriate way. And this requires detailed studies based on technical standards that often do not yet exist for the Brazilian context. Research is needed to create standards and local assessment systems with the aid of computational tools, as already adopted in many countries for the approval of projects in the municipality is in addition to more efficient, faster and more effective, favoring construction and the local economy, concepts which are also part of sustainability.

6. CONCLUSION

The society is mostly installed in cities. The environmental issues have and will have an increasingly important role in determining public policy in the urban environment. This is to ensure decent conditions of urban life for all citizens, seeking a social and environmental balance of the planet. There is need for democratization in the priority choices, basing the actions and government programs, namely public policy. The government action has the partnerships between the public sector and the private sector that should assist in the sustainable management process of the built environment.

The environmental comfort can be obtained by various means. The air conditioning is necessary to *capixaba* climate, however, whenever possible, natural systems and technologies are preferable to mechanical systems. Lack of adequate comfort conditions favor the development of diseases, thus, sustainable architecture must seek a balance between energy efficiency and human health. The comfort should promote healthy environments.

The lack of suitable technical standards to the Brazilian context, combined with poor work infrastructure in the prefectures are still barriers to be overcome. As already deployed in many countries, in Brazil most of the municipalities do not have software assessment of project performance, this complicates the legislative changes, as there is a fear of increased bureaucracy, which in turn would cause delays in the analysis and approval of projects. The use of technology is essential to ensure that efficiency.

Other issues are also relevant. Laws do not get “out of paper” alone. It is up to the public power to monitor not only the adoption of sustainable building design, but also its implementation, inspecting both for issuing the “Occupancy Permit”, and over the lifespan of the building, including for ensuring the permanence of tax breaks.

The success of the environmental performance of the building is not only guaranteed in the project. Even if the simulation studies of environmental conditions are very detailed, management of building systems, along with

compliance with the settlement patterns and user behavior is what answers the final performance of the building. Architectural+complementary project relationship, executive+work and work+post-occupation projects are therefore fundamental aspects to be observed in sustainable architecture.

It is also up to society, to break paradigms. Informal civil construction ignores the urban and building laws. In Brazil, most of the buildings do not even have legalized deed, or project or monitoring work by a qualified professional.

The formal market also contributes negatively. The various pressures, especially the real estate market, propel the deployment of increasingly smaller, unhealthy and uncomfortable dwellings. The bathrooms of the current real estate in Vitória, without any openings, ventilated solely by mechanical exhaust ducts, exemplify this issue.

The civil construction industry seeks increased production, but most of them do not invest in good projects and skilled and well-paid labor. Compared to other industries, the process is still handmade, linking productivity to quantitative issues, thereby suppressing qualitative issues of project, such as environmental comfort, hygiene, health and safety. It is up to builders, architects and other designers the observance of bioclimatic concepts and technical standards and to apply them in their projects and convincing customers that compliance with environmental standards and building laws are essential for building a good architecture.

Sustainability is not a “fad is needed and especially urgent. The proposals presented in this article are intended to contribute to improvement of the built environment from the review of the legislation. We conclude that the Government can and should contribute more effectively, exercising its role through legal instruments, in a more active way, both for construction of new buildings, and the reform and adaptation of existing ones. It is not easy to fight market forces, but “we should start to dream of a world where ethics of sustainable development becomes culture, and then political and economic action” (BUTERA, 2009, p. 309), in favor the future of our cities and every one of us.

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