Sustainable urban housing.
Strategies for implementation in Bogotá

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Abstract

Urban housing component of the built environment, establishes guidelines for the consolidation of human settlements and the creation of infrastructures that support a comprehensive urban development. It includes activities of building industry, public housing programs, design and provision of social services.

While the policy of friendly, inclusive, and sustainable cities considered compact housing as urban factor, questions arise about what the sustainable resource are saving strategies and guidelines which enable its implementation in certain environments with sustainable technological principles.

To establish strategies for the development of living spaces from concepts of sustainable housing in their environmental, technological and social dimensions, with evaluation indicators to be applied in housing solutions of Bogotá, theoretical and practical references are obtained related with environmental, technological, social and legal aspects of urban housing policy in the context of Sustainable Construction.

Keywords: Housing, Sustainability, Environment, City, Building, Habitat.

Background and diagnosis

This work is generated from the study developed in the document “Guidelines for Sustainable Construction in Colombia” (2008) in which theoretical patterns from technology, management and the environment, should contribute to the generation of a determined Sustainable Construction in Colombia.

Although housing has been perceived as the most critical path to achieve sustainable construction, most interventions have not considered their socioeconomic and biophysical conditions. Also, to combine sustainability with policies or guidelines of housing, this constitutes one of the most important actions for sustainable construction in developing countries. Large infrastructure projects to provide are not motivated by a sustainability policy, but by the need to improve economic indicators in the generation of employment with construction activities and solve the guidelines generated by political purposes.

In Colombia there is a policy to attract friendly, inclusive, compact and sustainable cities (DPN, 2005), but to consider home as a housing solution and determinant of urban

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development, questions arise that challenge sustainable strategies for saving water and energy, possible guidelines adopted to consider the environmental conditions of the land -as topography and climate- that allow deployed in the housing, and how materialize the principles of technological sustainability, namely, recovery, renewal, and recycling of structures and building materials. So what is the riddle of sustainable strategies to implement housing policy to address the premise of building friendly, inclusive and sustainable cities are.

**Principles of sustainability in construction and components of Habitat Build**

Construction is sustainable when applied the principles of sustainable development lifecycle of construction, from extraction and processing of raw materials to its deconstruction and waste management by planning, design and construction of buildings and infrastructure. It is a “holistic process” that seeks to harmonize and restore the natural milieu and the built environment, while forging settlements that ensure human dignity and economic balance. The understanding of sustainable construction goes beyond a biophysical impact on the built environment and its concept transcends environmental sustainability, to include economic and social sustainability and emphasize the added value of the quality of life of individuals and communities.

Housing is as Bollnow (1969), a place (experiential space), where sensations are fused, the individual needs and family or social relationships, which does the job to protect, to serve as shelter, covert. The construction of housing as the highest expression of built environment is a dynamic system, because as a system, is itself a service mechanism that responds to the satisfaction of existential needs of the individual. And as a function, it is an organism in which are combined the place, materials and financial resources to achieve product character, namely, use value and exchange.

The Urban Housing can be classified as formal and informal, in a context of massive housing solutions for people of higher or lower (better or worse) resources. In environmental and technological livability, sustainable urban housing construction falls under low initial costs, productive life cycles, good quality, recognized financial value, alternative production methods, and organized community efforts for the planning, management and conservation environment.

To develop a program of building homes with a focus on sustainability, an indicator development is needed for the evaluation of projects with sustainable criteria and, in this regard, here are six aspects with which housing impacts on the environment mentioned: the water consumption, energy supply, the fate of solid and liquid waste, the use of building materials and bio-climatic adaptability (Albalat, 2005).

Housing is more than shelter and stands as one of the components of a human settlement. Usually, it is seen as a product that is manufactured and delivery, rather than an elaborate process and associated. To make housing sustainable, programs that it promotes should integrate urban and ecological infrastructure with adequate social services.

Sustainability of built environment generates a manifest challenge to the demand for resources and experiences. The demand for "possible housing" should be more than a
production capacity and reserves, and become a neuralgic opportunity for the construction industry to achieve adequate levels of sustainability with regard to the impacts and opportunities in the formal sector, adapting models and processes based on knowledge of the informal communities that are characterized by their low cost and joint work.

The development of technologies, systems and innovative and competitive construction processes, ensures higher standards of quality and safety in the building, and improve the overall competitiveness of the construction sector through its modernization and automation. Industrialization streamlines the construction process to reduce execution times, workplace hazards, environmental impacts and economic resources.

New technological possibilities allow, and social needs so require, contemplate the fact constructive in its full cycle, from conception to its deconstruction, considering it as a process of integration of passive and active, permanent and temporary systems, provided by agents involved in each stage of the cycle, exceeding the targeting maintained until now in partial aspects of the construction process.

To create a sustainable built habitat, and in the property is implicit, we must begin to mimic natural processes that will identify new forms of heating, ventilation and waste management, by exploring all levels from manufacturing to materials, to planning and management of cities, with emphasis on the use of energy and renewable resources, recycling and imminent scientific revolution in biotechnology.

**Dimensions of built environment**

The degree of development necessary to achieve a sustainable habitat, it must consider four areas: environmental sustainability, economic growth, social equity and technological development. Consistent with this, this study addresses the issue of the environmental aspect related with the place and understood as: geographical, natural and artificial; in the technological aspect is the action to the mechanization of the satisfaction of needs to live, especially construction technologies, that can be classified by systems (processes) and materials (technical); finally, the social field, is related to individual and collective interactions, economic development, indicators of quality of life, and forms of production.

In what has to do with the constructive aspects, from the environmental dimension, is necessary to seek the efficient use of resources, management of urban biodiversity, and planning and use more efficient of land with declining consumption of soil. From the social dimension, should allow for increased social participation and increased life expectancy. This is achieved if, in economic size, productivity growth is reached, the increase in income and wealth, and improving infrastructure. In the technological dimension, interactions that the individual and society and made with the environment are manifested, they get to this economic developments and possible habitats built for shelter and enjoyment of various social groups as a solution of basic needs, spiritual, individual and collective. All this is possible if there is an improvement in the regulation and governance from the political dimension.

**Environmental Dimension.** The environment is the set of physical, biological and chemical variables of a geographical space where activities are carried out with physiological and
psychological sensations. The city is an ecosystem surrounded by others that are subsystems of the biosphere; besides generate waste and transformed quantities of matter, energy and information. The atmosphere has three main functions in the economic activity of man: supply resources -water, energy and materials-; assimilation of the waste generated by the use, transformation and consumption of resources and generation of other environmental services, such as physical and biological autoregulation of the environment, or the satisfaction of other, cognitive, aesthetic, spiritual and recreational needs.

Sociocultural Dimension. Cities are the most efficient human organization to create, transmit, accumulate and evolve cultural information. The main social actors generate flows of information related to the representation that each actor makes the environment, their relationship with its, and the relationship to others and to himself. The economic system aims to meet human needs and wealth generation, combining the public good and the particular. Consumption habits are formed from these requirements and their interaction with physical and social factors of accessibility, income levels and cultural model of each population group within the city.

Technological Dimension. So-called "technology standards" do not prevail for use in any scenario and appropriation of foreign technologies, which usually are commercially imposed by producing new sources of fictional resources, cause usually conflicts between the territory and society supposed to serve. Here, Santos (2000) argued with some justification, that technology can become a destructuring component socio-economic, political, cultural, spatial, etc., effects which result in a reorganization of territories.

Indicators for sustainability and proposed strategies

Generating indicators that empower the valuation of buildings with sustainable criteria and suitable for development and contribution to the rationalization of the construction and management processes for satisfactory enjoyment, enabling consensus decision making, is essential. At present, the demand for social sustainability becomes a requirement to techniques and products that focus on improving quality standards and for this, there are different methods for assessing the sustainability of buildings, called indicators, which allow trends to be the evolution of their specific parameters.

Then the proposed strategies for design, construction and operation of sustainable housing are presented. It aims to encourage and enable the acceptance and implementation of sustainable practices in urban housing from the creation and implementation parameters and verifiable criteria.

The four dimensions described, transversely relate to each other, and they focused activities to fulfill specific needs in the field of urban housing. Chosen were key factors inherent in sustainability, accessibility and quality of life in urban housing in Bogotá, namely sustainability of the place, efficient management of financial resources, conservation of water resources, energy efficiency, use of appropriate technologies to the environment, selection of materials and resources, environmental quality in interiors and well-being of the user.

The evaluation parameters, focus on sustainable site development and respect for the environment, climatic conditions, the efficient management of economic and financial
resources, the proper use of water resources, efficiency in the use of clean energy sources, innovation in construction and significant advance over conventional methods, integration of innovation in materials and construction products, taking care of non-renewable materials and respect for raw materials and protected areas, innovative concepts in design, structure, enclosure and construction services, and patterns of behavior that govern sustainable community.

1. **Environmental and Technological Dimension**

a. Area: Sustainability place.
Parameter: Sustainable development of the site and respect for the environment.
Indicators:
- Site selection and ecological value. Building footprint and impact on the environment.
- Construction of suitable housing. Inappropriate land use.
- High level of architectural quality and aesthetic impact on their cultural and physical context.
- Mobility, accessibility and relationship with the urban context. Public transport.
- Recovery of central areas of the city. Reuse of buildings.
- Maintenance of the urban ecosystem, landscaping and project equipment. Vegetation used and ratio of soft and hard areas.

b. Area: Conservation of water resources and energy efficiency.
Parameter: Use of water resources and efficiency in use of clean energy sources.
Indicators:
- Management of water resources. Efficient water treatment discharges and wastewater reuse.
- Use of natural light and energy consumption in building operation.

c. Area: Use of appropriate technologies to the medium.
Parameter: Innovation in construction and significant advance over conventional methods.
Indicators:
- Innovations in technology construction processes, operation and maintenance. Energy used in the process of construction of the building.
- Effectiveness of the construction process. Compliance with current regulations.
- Prevention of emergency evacuation. Emission standards and climate change.

d. Area: Selection of materials and resources.
Parameter: Innovation in integration of materials and construction products.
Indicators:
- Management of construction waste. Recycling: storage and collection
- Responsible use of natural resources, including operation and maintenance.
- Energy used in the production of construction materials
- Materials selected for their environmental impacts and human health.

e. Area: Environmental quality in interior spaces.
Parameter: Innovative concepts in design, integration of materials, structure, and construction services.

Indicators:
- Control systems and comfort: acoustic, visual, hydrothermal, olfactory, health.
- Flexibility against future changes of users, ownership and regulations.
- Thermal mass of the building. Ventilation and temperature occupied housing.
- Acoustic design of housing. Luminance Control. Indoor air quality.

Environmental and Economic Dimension

a. Area: Management means.

Parameter: Efficiency of economic and financial resources.

Indicators:
- Economic performance and compatibility. Operational control and maintenance.
- Total cost of lifecycle housing. Spatiality of housing as needed.
- Adherence to ethical standards in all project phases. Eco-efficiency and environmental quality.

Environmental and Sociocultural Dimension

a. Area: Social Aspects.

Parameter: environmentally sustainable behavior patterns that govern the community.

Indicators:
- Involvement of stakeholders. Housing spatiality from the social inclusiveness.
- Level of maintenance of the building.
- Design spaces and enclosures, selection of materials, bioclimatic architecture.
- Sustainable behaviors (recycling, low energy consumption and resources).
- Prevention and adaptation to climate change. Ethical standards and social equity.

The relationship between housing and the environment, affecting both the ecosystem and the “urbsystem”, and require the adoption of updated assessment guidelines that take into account the life cycle of buildings, as well as systems, elements and components of the construction activity for a harmonious development of the city and support the achievement of healthy environments and housing spaces.

Conclusions

From the environmental and technical dimensions, are tending towards more efficient use of energy resources and the integration of urban biodiversity.
From the social dimension, seek the increased quality of life; this is accomplished if the economic dimension of productivity growth and improving infrastructure is reached.
All this is possible if there is greater participation in decisions and an improvement in the application of the rule from the political dimension.
Table 1. Indicators for sustainable urban housing

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<tr>
<th>Sustainability of the site</th>
<th>Sustainable development instead of a place and respect for the environment</th>
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<tr>
<td>Effective management of financial resources</td>
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<td>Water conservation and energy efficiency</td>
<td>Proper use of water resources and efficient use of clean energy sources</td>
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<td>Using appropriate technologies to the medium</td>
<td>Innovation in sustainable construction and significant advance over conventional methods</td>
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<td>Selection of materials and resources</td>
<td>Innovative integration of materials and construction products</td>
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<tr>
<td>Environmental quality in interior spaces</td>
<td>Innovative design, integration of materials and products, structure, premises and construction services concepts</td>
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<td>Social aspects</td>
<td>Environmentally sustainable behavior patterns that govern the community</td>
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References


