Conciencia Digital

ISSN: 2600-5859
Vol. 7 No. 1, pp. 120 – 144, January - March 2024

www.concienciadigital.org

Selección sostenible de sitios residenciales: desarrollo de una matriz de indicadores integrando LEED, Jan Gehl, Hernández y Velásquez

Sustainable selection of residential sites: development of a matrix of indicators integrating LEED, Jan Gehl, Hernández & Velásquez

[1] Karina Elizabeth Cajamarca Data https://orcid.org/0009-0009-3465-302X
Master in Architecture and Sustainability, National University of Chimborazo, Riobamba, Ecuador.
karina.cajamarca@unach.edu.ec

[2] Maikol Josueé González Espinosa https://orcid.org/0009-0007-8619-836X
Faculty of Engineering, National University of Chimborazo, Riobamba, Ecuador.
maikol.gonzalez@unach.edu.ec

[3] Janeth Alexandra Morales Gonzalez https://orcid.org/0000-0001-9380-4865
Master in engineering specializing in landscape architecture, National University of Chimborazo, Riobamba, Ecuador.
janeth.morales@unach.edu.ec

[4] Erick Fabricio Nieto Paez https://orcid.org/0009-0005-6708-037X
Master's Degree in International Building and Construction Management. International Construction Management MBA, National University of Chimborazo, Riobamba, Ecuador.
erick.nieto@unach.edu.ec

Scientific and Technological Research Article
Sent: 06/11/2023
Revised: 12/18/2023
Accepted: 01/26/2024
Published: 23/02/2024
DOI: **https://doi.org/10.33262/concienciadigital.v7i1.2907**

Please quote:

Cajamarca Dacto, KE, González Espinosa, MJ, Morales González, JA, & Nieto Páez, EF (2024). Sustainable residential site selection: development of an indicator matrix integrating LEED, Jan Gehl, Hernández and Velásquez. ConcienciaDigital, 7(1), 120-144.https://doi.org/10.33262/concienciadigital.v7i1.2907

DIGITAL CONSCIOUSNESS,andIt is a multidisciplinary, quarterly journal, which will be published electronically. Its mission is to contribute to the training of competent professionals with a humanistic and critical vision who are capable of presenting their research and scientific results to the same extent that their intervention promotes positive changes in society.https://concienciadigital.org
The journal is published by Editorial Ciencia Digital (a prestigious publisher registered with the Ecuadorian Book Chamber with membership number 663).www.celibro.org.ec

Conciencia Digital

ISSN: 2600-5859
Vol. 7 No. 1, pp. 120 – 144, January - March 2024

www.concienciadigital.org

Palabras claves:
Urbano, indicadores, sostenibilidad, calidad de vida

Resumen

Introducción: La calidad de vida es un concepto multifacético que está vinculada con nociones como el nivel de vida, la felicidad y el bienestar. Surgió en el siglo XVII en Inglaterra, previo a la revolución industrial, y desde entonces ha sido objeto de diversas definiciones. Abarca aspectos subjetivos y espaciales, relacionándose con la excelencia en la provisión de bienes y servicios para satisfacer necesidades humanas. Sin embargo, en entornos urbanos, surgen desafíos como la falta de accesibilidad y viviendas insostenibles. **Objetivo:** Implementar métodos adaptados al contexto para recopilar y analizar datos sobre calidad de vida urbana y arquitectónica, con herramientas interdisciplinarias y criterios de sostenibilidad, buscando desarrollar una matriz de indicadores. **Metodología:** La metodología cualitativa combina revisión bibliográfica exhaustiva para identificar indicadores urbanísticos y de sostenibilidad. Se emplea un enfoque descriptivo y correlacional, con una matriz sintético-deductiva, basada en los lineamientos de Gehl y Hernández, para seleccionar sitios de vivienda que mejoren la calidad de vida. **Resultados:** El análisis de indicadores de calidad de vida propuestos por LEED, Gehl, Hernández & Velásquez guía la creación de una matriz para elegir sitios residenciales sostenibles. Considerando aspectos como habitabilidad, seguridad y sostenibilidad urbana, se desarrollarán indicadores para evaluar calidad de vida urbana, complementaria y arquitectónica. Basándose en estas bases, el estudio se dirige hacia la consideración de los siguientes elementos: a) calidad de vida urbana; b) calidad de vida complementaria; y c) calidad de vida arquitectónica relacionados con la arquitectura. **Conclusión:** La investigación destaca la importancia de un enfoque interdisciplinario para evaluar la calidad de vida urbana. Desarrollar una matriz de indicadores para la selección sostenible de sitios residenciales promueve entornos habitables y sostenibles, con potencial para influir en políticas urbanas y académicas. **Área de estudio general:** Arquitectura **Área de estudio específica:** Urbanismo

Keywords:
urban, indicators,

Abstract

Introduction: Quality of life is a multifaceted concept that is linked to notions such as standards of living, happiness, and well-

sustainability, quality of life

being. It emerged in the seventeenth century in England, prior to the industrial revolution, and has since been the subject of various definitions. It encompasses subjective and spatial aspects, relating to excellence in the provision of goods and services to satisfy human needs. However, in urban environments, challenges such as lack of accessibility and unsustainable housing arise. Objective: To implement methods adapted to the context to collect and analyze data on urban and architectural quality of life, with interdisciplinary tools and sustainability criteria, seeking to develop a matrix of indicators. Methodology: The qualitative methodology combines a comprehensive literature review to identify urban and sustainability indicators. A descriptive and correlational approach is used, with a synthetic-deductive matrix, based on the guidelines of Gehl and Hernandez, to select housing sites that improve the quality of life. Results: The analysis of quality-of-life indicators proposed by LEED, Gehl, Hernandez and Velasquez guide the creation of a matrix choosing for sustainable residential sites. Considering aspects such as livability, safety and urban sustainability, indicators will be developed to evaluate urban, complementary, and architectural quality of life. Based on these bases, the study is directed towards the consideration of the following elements: a) urban quality of life; b) complementary quality of life; and c) architectural quality of life related to architecture. Conclusion: The research highlights the importance of an interdisciplinary approach to assess urban quality of life. Developing a matrix of indicators for sustainable residential site selection promotes livable and sustainable environments, with potential to influence urban and academic policies. General area of study: Architecture. Specific area of study: Urbanism

Introduction

In the literature, multiple definitions of the concept of quality of life have been offered, and there is no unanimous agreement on its precise meaning. However, when referring to this concept, it is inevitable to relate it to other terms such as standard of living, happiness and well-being.

The term originates in the 17th century in England with Sir William Petty in the peak of preparation for the industrial revolution (Perren & Lamfre, 2018). However, until today, in the course of a vast account to find the most appropriate definition, several categories are established regarding it.

That is to say,Quality of life, from a subjective point of view, refers to an individual's happiness and satisfaction with life and the environment. It includes needs, desires, lifestyle preferences, and other tangible and intangible factors that determine well-being (Cutter, 1985 cited in Romero, 2016).

Thus also in the spatial aspect, the term quality of life is agreed upon as"The optimal conditions that govern the behavior of the habitable space in terms of comfort associated with the ecological, biological, economic, productive, sociocultural, typological, technological and aesthetic in its spatial dimensions. In this way, urban environmental quality is, by extension, the product of the interaction of these variables for the formation of a healthy, comfortable habitat, capable of satisfying the basic requirements of sustainability of individual human life and social interaction within the urban environment" (Luego, 2002).

In addition, in the social aspect the term refers to thedegree of excellence that a given society, precisely located in a time and geographic space, offers in the provision of goods and services intended to satisfy a certain range of human needs for all its members, and the consequent level of individual and group contentment or discontent according to the perception of that offer, accessibility and use, by the population involved (Abaleron, 1999).

Considering that the degreeof satisfaction of the demand for needs and/or aspirations by individuals who occupy an urban space, obtained through organizing strategies that act directly on the physical spatial component of the area considered, and indirectly on the social, economic, political and cultural components; establishing quality relationships between them (Benavidez, 1998).

The term “quality of life” therefore focuses on meeting the basic needs and well-being of citizens, ensuring access to fundamental resources for individuals, groups and communities. This concept is widely discussed in various disciplines due to its relevance to contemporary economic, social, environmental and territorial problems. In urban environments, where resources and population are concentrated, challenges arise such as lack of accessibility, deterioration of the built environment, problems in social relations, poverty, social insecurity and saturation of services.

Since architecture and construction have allowed the growth of cities. Therefore, it can be deduced that, in the last 10 years, 32% of the inhabitants of developing countries

worldwide live in informal areas or slums, which generate problems in living conditions such as: security, infrastructure, green areas, etc. Habitat III (UN-Habitat) (United Nations, 2017). Which leads to most cities having unsustainable housing and, therefore, no quality of life. Thus, the UN (United Nations) mentions that 54% of the current world population resides in urban areas and it is expected that by 2050 it will reach 66%. (United Nations, 2024). In all of Latin America, 89% of people live in urban areas, while Habitat III (UN-Habitat) (United Nations, 2017) indicates that 113.4 million people in Latin America live in marginal settlements. In conclusion, 1 in 4 people who live in urban areas are settled in these places. In addition to this, the housing problem expands to energy inefficiency, which is why (Hernández, 2012, p. 2) comments that: The residential sector is responsible for excessive energy consumption, stating that in 2004 it represents 23%, in 2007 with 26%, in 2008 with 25%, resulting in together 40% of final energy consumption and 36% of CO2 emissions. Globally, homes account for around 10% of direct CO2 emissions, however, when taking into account emissions from electricity use, this rises to a proportion of 30%. Despite these figures and the great impact that the construction area has on the environment, people's health and the economy of the project, little has been done to improve or reduce these amounts. It can be deduced then, that one of the problems of this origin starts from the selection of the site where urban housing is located, where the guidelines parameters are scarce in a sustainable way and therefore the term of result of quality of life in a home is insufficient or in most cases ends up being null.

In Ecuador, 2.8 million inhabitants are living in informal settlements (Noriega, 2022). These settlements have generated the growth of cities with a greater number of inefficient and unsustainable housing, turning them into buildings with problems of spatial functionality, architectural quality, and quality of life. Thus, turning them into inefficient and unsustainable constructions.

In short, the absence of mechanisms for evaluating and monitoring the product through which the housing deficit is addressed means that the quality obtained in the application of policies in this area is unknown, especially in urban, architectural and social terms (Ceballos, 2006). Executing design strategies without functionality, operability, privacy, meaning without comfort and relationship with the context. However, the problem becomes even more latent and visible when the sum of these generates focal points in cities and generates urban conflicts such as overcrowding, insecurity, non-vital cities, unsustainable, unhealthy and unsafe cities.

Therefore, it can be deduced that the individual who occupies this home requires optimal conditions that combine and determine feelings of comfort in the biological and psychosocial aspects within the space where man lives and acts. These conditions, in the

city, are closely linked to a certain degree of satisfaction with services and to the perception of the habitable space as healthy, safe and visually pleasing" (Pérez, 1999).

As previously mentioned, the definitions of quality of life can be concluded that it responds to the need to satisfy two different perspectives, the objective and the subjective, where the first is directly related to the physical-spatial dimension, while the second emphasizes the psychosocial part (Landáruzi & Mercado, 2004).

In the same way, when we talk about quality of life we are talking about habitability, that is, improving habitability means increasing the quality of life of users not only in the physical field but also in the psychosocial field (Zulaica & Celemín, 2008).

Therefore, given the wide range of influencing factors, it is necessary to implement methods to collect and analyze this information, adapted to the diverse and complex context of the object of study. This is crucial due to the multiple definitions of the term "quality of life." Only through effective systems of comprehensive knowledge about this term, rational, efficient, fair and coherent decisions can be made to identify the best place to live. From the evaluation of guidelines proposed by the authors to the individual contributions of several authors; the interdisciplinary perspective has contemplated the use of tools in the environmental, social and economic fields to promote sustainability in housing and in cities. The case of the importance matrix and the Leadership in Energy and Environmental Design (LEED) guidelines (Leed, 2015; Gehl, 2010; Hernández & Velásquez, 2014), constitute an innovative approach in this context. By establishing a framework for evaluating the most suitable locations based on carefully developed value criteria, this matrix makes it possible to detect potential imbalances and ensure that the effects of various actions are examined and taken into account during the planning phase of residential projects.

With these references, the research is oriented towards addressing the following components: a) Basic urban quality of life guidelines; b) Complementary urban quality of life guidelines; and c) Architectural quality of life guidelines. The construction of assessment indicators is projected on the three of them.

Therefore, the general objective of this study is to develop a matrix of indicators and criteria based on the analysis of*Leadership in Energy and Environmental Design (LEED)*(Leed, 2015; Gehl, 2010; Hernández & Velásquez, 2014), in order to identify the optimal location for a residential home that promotes the sustainable improvement of the quality of life.

Methodology

*Research design***:**The methodology proposed for this research is based on a qualitative approach of an interpretive nature. A meticulous review and analysis of specialized

bibliography will be carried out, highlighting the contributions of authors such as Gehl (2010) and Hernández & Velásquez (2014), with the purpose of identifying the main urban and sustainability indicators. Additionally, a critical analysis of the evaluation criteria used for the Leadership in Energy and Environmental Design (LEED) certification (LEED, 2015) will be carried out; in order to extract and adapt those relevant indicators that allow the future sustainable evaluation of residential sites. This process will include the systematization of the information collected that supports the evaluation of sustainability in residential contexts, thus promoting more responsible and environmentally friendly urban development practices.

*Type of research:*Document obtained through an exhaustive review of specialized literature, including books, research projects, journal publications and scientific articles relevant to the topic. On a second level, indicators are identified and defined for three fundamental components: the basic criteria that determine the quality of urban life, the complementary aspects that enrich this quality of urban life and the principles of quality of life from an architectural perspective.

*Research level:*The study adopts a descriptive and correlational level to explore the interaction of human beings with the urban environment, based on the analysis of the variables identified in the works of Gehl (2010) and Hernández & Velásquez (2014). These studies address the coexistence between people and urban space, complemented by a detailed analysis of the environmental sustainability criteria defined by the Leadership in Energy and Environmental Design (LEED) certification (LEED, 2015); which evaluates the impact of buildings on the environment throughout their entire life cycle. In parallel, through a correlational approach, a comparative study will be carried out that will facilitate the extraction of essential guidelines for the definition of relevant indicators.

*Research modality:*Basic, because it focuses on unraveling the essential hypotheses proposed by the aforementioned authors, in order to develop indicators that support future applied research and the analysis of sustainable housing, thus integrating the daily development of individuals in their environment.

*Method:*This study uses a synthetic-deductive methodological approach to create a matrix of indicators that categorizes urban aspects, facilitating the comprehensive evaluation of urban environments through an exhaustive bibliographic review.

*Research procedures and techniques***:**bibliographic research technique to gather information about the guidelines that the authors of the analysis consider to allow generating a matrix to select a suitable site for a home that contributes to improving the quality of life of the individual.

Results

Conciencia Digital
ISSN: 2600-5859
Vol. 7 No. 1, pp. 120 – 144, January - March 2024
www.concienciadigital.org

Following the suggested methodology, the analysis of quality of life indicators is carried out.proposals by*Leadership in Energy and Environmental Design (LEED*) (Leed, 2015; Gehl, 2010; Hernández & Velásquez, 2014), with the aim of establishing as a result a matrix that covers indicators of sustainable selection of residential sites on the subject referred to.

Analysis of quality indicators; Hernandez & Velasquez

This study addresses the lack of information on the quality of life of residents of housing in Mexico, focusing on validating the living conditions. Through a comparative study between two types of housing, field visits, surveys of residents and analysis of results were carried out to assess their satisfaction and the differences between the prototypes. Thus, it provides a measurement of the quality deficit of social and economic housing, considering indicators of habitability and the psychosocial analysis of users.

Specifically, this research stipulates that architectural spaces are characterized by satisfying both the objective and subjective needs of people. This involves analyzing two types of factors: the objective ones, which are tangible or quantifiable indicators directly related to the perception of the residential environment, including the home, the neighborhood and the city; and the subjective ones, which refer to the psychological interactions arising from the relationships between the individual and his or her residential environment, as well as with the neighborhood and the city, influenced by the personal interpretation of each individual. These concepts are represented in Figure 1.

Figure 1

Conceptual diagram of psycho-social dimension and physical-spatial dimension; Hernández & Velásquez

Conciencia Digital
ISSN: 2600-5859
Vol. 7 No. 1, pp. 120 – 144, January - March 2024
www.concienciadigital.org

The study focuses on the evaluation of systemic levels, defining an objective primary systemic level based on the relationship of the individual with the interior of his or her home, divided into four aspects: space, form, overcrowding and dimensions. On the other hand, in the subjective aspect of this level, the psychological interactions of the individual with his or her habitat are analyzed, focusing on six aspects: pleasure, activation, significance, functionality, operability and privacy. At the objective secondary systemic level, the interaction between the home and the neighborhood constitutes an analysis factor in the aspects of infrastructure and services, such as the availability of drinking water and drainage networks. At the objective tertiary level, the interaction between the home and the neighborhood constitutes an analysis factor in the aspects of infrastructure and services, such as the availability of drinking water and drainage networks.The relationship between housing and the city is measured through the parameters of equipment and transportation. While in the subjective secondary and tertiary sphere, the psychological transactions that individuals have with their housing, and which are related to the neighborhood and city, are analyzed through the parameters of structure, sequence, character, interval and meaning. All of the above is shown in Table 1:

Table 1

Quality of life indicators according to Hernández & Velásquez

Primary Systemic Level					
Aim			Subjective		
Variable	Parameter	Indicator	Variable	Parameter	Indicator
Housing-Habitat	Space	Number of rooms	Individual	Pleasure	Human well-being
		Living area			Personal growth

Conciencia Digital
ISSN: 2600-5859
Vol. 7 No. 1, pp. 120 – 144, January - March 2024
www.concienciadigital.org

Table 1

Quality of life indicators according to Hernández & Velásquez (continued)

		Number of Bathrooms		Sense of affiliation
		Garage space		Sense of belonging
	Shape	Land surface		Comfort
		Number of floors		Aesthetic delight
	Overcrowding	Number of inhabitants per number of rooms		Order
	Coefficients	COH	Activation	Tranquillity
		COS		Silence
		CUS		Temperature
				Light
				Color/contrast
			Significance	Identity
				Belonging
				Rootedness
				Status
			Functionality	Spatial arrangement
				Communicability
				Practicality
				Effectiveness
			Operability	Comfort
				Amplitude
				Dynamism
				Adaptability
				Displacement
			Privacy	Security
				Opening
				Privacy
				Isolation
				Interaction
				Modulation

Conciencia Digital
ISSN: 2600-5859
Vol. 7 No. 1, pp. 120 – 144, January - March 2024
www.concienciadigital.org

Table 1

Quality of life indicators according to Hernández & Velásquez (continued)

Secondary Systemic Level					
Aim			Subjective		
Variable	Parameter	Indicator	Variable	Parameter	Indicator
Housing-Neighborhood	Infrastructure	Roads	Housing-Neighborhood-City	Structure	Hierarchy
		Drainage			Continuity
		Drinking water			Unit
		Lighting			Clarity
		Phone			Diversity
		Nomenclature			Accessibility
	Services	Surveillance		Sequence	Identity
		Waste collection			Sense
Tertiary Systemic Level					Control
Aim					Scope
Variable	Parameter	Indicator			Contrast
Housing - City	Equipment	Schools		Character	Identity
		Markets			Plasticity
		Parks			Scale
		Squares			Individuality
		Churches		Interval	Continuity
	Urban Transport	Distance			Visibility
		Frequency			Change of scenery
	Suburban Transport	Distance			Change of function
		Frequency		Meaning	Sensory stimulus
					Focal points
					Significant objects
					Location value
					Adaptability
					Displacement

Analysis of quality of life indicators; Jan Gehl

In the book "Cities for People" (Gehl, 2010), emphasis is placed on the importance of designing cities that improve the quality of life of their inhabitants from an objective-physical approach. He argues that a well-designed city must take into account fundamental human needs, such as safety, accessibility, health and emotional well-being. He proposes that cities should be places where people can easily move around on foot or by bicycle, where they have access to green spaces and where they can participate in

social and cultural activities. In short, the author advocates a people-centred approach to urban design from the perspective of creating vital, safe, sustainable and healthy cities that adapt to human needs, encourage community participation and promote a healthy and sustainable lifestyle. Analysis in which 3 main parameters are deduced: Vital City, Safe City and Sustainable and Healthy City.

As regards the parameter of "vital city" to a city that is designed to foster social life and interaction between people, he maintains that a vital city is one in which citizens can move freely on foot or by bicycle, where public spaces are accessible and welcoming, and where diversity and inclusion are promoted. In a vital city, streets are designed to encourage encounters and communication between its inhabitants, green spaces and recreational areas are an integral part of the urban environment. In short, it is one that is designed with the needs and desires of the people who inhabit it in mind, and that promotes a sense of community and well-being for all its residents.

"Safe city" refers to a city where residents feel protected and free from risk in their urban environment. The importance of designing spaces that are safe and inclusive for all people is highlighted. This involves having well-lit streets, clearly defined pedestrian areas and open spaces that encourage natural surveillance by residents. Emphasis is placed on the need to address problems such as crime and vandalism through strategies that promote social cohesion and community participation. In short, a safe city is defined as one that is designed to minimize risks and create an environment where all residents feel protected and confident in their daily lives.

"Sustainable and healthy city" establishes the need to create urban environments that promote the health and well-being of its residents, minimizing environmental impact and promoting long-term sustainability. In which active mobility, such as walking and cycling, is prioritized over motorized transport, which contributes to reducing air and noise pollution, as well as improving the cardiovascular and mental health of the population. The importance of providing equitable access to green and recreational spaces is emphasized. Designed to promote active and healthy lifestyles, while protecting and preserving the environment for future generations. The above is shown in table 2:

Conciencia Digital
ISSN: 2600-5859
Vol. 7 No. 1, pp. 120 – 144, January - March 2024
www.concienciadigital.org

Table 2

Quality of life indicators according to Jan Gehl

Aim		
Variable	Parameter	Indicator
City	Vital city	Tours that promote walking
		Perception of the immediate environment
		Ground floor treatment
		Attractive and varied spaces
		Meeting places
		Cultural and permanent activities
		Quality street furniture
	Safe city	Reduce hard edges, closed plants, and high walls
		The presence of the people
		Windows and balconies
		Active and attractive streets or roads
		Buildings of various uses
		Permeable and open facades
		Road safety that prioritizes pedestrians
		Wide sidewalks
	Sustainable and healthy city	Alternative mobility
		Good public transport system
		Cycle paths and green routes
		Paved or well maintained streets
		Inclusive and social spaces
		Good cityscape
		Opportunity to access public space
		Pedestrian paths
		Trees for shade
		Reduce obstacles and improve pedestrian crossings

Analysis of quality of life indicators; Leed

Certification*Leadership in Energy and Environmental Design (LEED)*(LEED, 2015), is an internationally recognized sustainable rating system for sustainable constructions. While there is no specific category called "quality of life" within LEED, several aspects of the system are designed to improve the quality of life of the occupants of certified projects. The analysis determines that it is managed objectively, considering external

habitability, in which it analyzes parameters such as location and transportation and sustainable plots.

"Location and Transportation" considers aspects such as site location, accessibility to public transportation, bicycle and pedestrian facilities, reduction of greenhouse gas emissions, and efficient parking management as part of its sustainability assessment in relation to the location and transportation of materials for a project.

"Sustainable Plots" sets out guidelines for the planning and design of the site where the project will be built. This category addresses how the plot of land on which the project will be built is used and managed, with a focus on conservation and efficient use of natural resources, as well as minimizing environmental impact.

"Water Efficiency" highlights the importance of efficient water use through the implementation of technologies and practices that reduce consumption and promote the conservation of this vital resource.

"Energy and Atmosphere" focuses on promoting practices that improve energy efficiency, reduce greenhouse gas emissions and encourage the use of renewable energy in buildings, thereby contributing to the mitigation of climate change and the protection of the environment.

"Materials and Resources" promotes the selection and use of sustainable building materials, as well as practices that reduce waste and encourage the reuse of resources, as part of its focus on building more sustainable and environmentally friendly buildings.

"Indoor Environmental Quality" focuses on creating healthy and comfortable indoor environments for project occupants, addressing aspects such as air quality, lighting, thermal comfort and acoustics, as part of its approach to building sustainable and environmentally friendly buildings. As shown in Table 3.

Table 3

Quality of life indicators according to LEED

		Aim	
Variable	Dimension	Parameter	Indicator
CITY	PHYSICS	Location and transportation	Avoid sensitive soils (high quality agricultural soils, green areas, flood plains, habitats, wetlands, water bodies)

Conciencia Digital
ISSN: 2600-5859
Vol. 7 No. 1, pp. 120 – 144, January - March 2024
www.concienciadigital.org

Table 3

LEED Quality of Life Indicators (continued)

Aim			
Variable	Dimension	Parameter	Indicator
			Location in sites with 75% of the land developed.
			Location relative to an open public space at 800m
			Locate the project connected to streets and sidewalks
			Bicycle parking
			Compact design
			Multifunctional buildings within 800m range
			Project 400m from a public transport stop
		Sustainable plots	Pollution prevention in construction activities
			Introducing local plants into gardening
			Reducing heat islands
			Trees or other elements that generate shade
			Non-absorbent, light-colored materials with solar reflectance
			Green roofs
			Use of open paving stones
			Rainwater management
			Rainwater infiltration or collection
Variable	Dimension	Parameter	Indicator
DWELLING	PHYSICS	Water efficiency	High efficiency appliances
			Efficient gardening (local plants)
			Water reuse strategies (rainwater or treated on site)
		Energy and Atmosphere	Minimize energy consumption
			Preparing for active solar design
			Housing size (compact)
			Building orientation for a passive solar system
			Air Infiltration
			Thermal insulation
			Windows 15% in relation to the built area
			Reduction of artificial lighting
			Use of renewable energy

Table 3

LEED Quality of Life Indicators (continued)

	Materials and resources	Highly durable materials
		Local products within a maximum distance of (160km)
		Recycled or regenerated products
		Correct structural sizing, modulation
	Indoor environmental quality	Natural ventilation in humid areas
		Fireplaces and wood stoves must have closing doors
		Air filtration
		Control of pollutants
		Low emission products

Continuing with the proposed methodology, after the analysis of the Quality of Life indicators managed by Leadership in Energy and Environmental Design (LEED) (Leed, 2015; Gehl, 2010; Hernández & Velásquez, 2014), a compilation matrix of the indicators necessary to better choose a sustainable site for a future residential project is proposed.

Matrix of quality of life indicators; integrating LEED, Jan Gehl, Hernández & Velásquez

The proposed matrix presents theapproach to the following components: a) Basic urban quality of life guidelines; b) Complementary urban quality of life guidelines; and, c) Architectural quality of life guidelines. To which a rating system is assigned according to the compliance and status of the parameter on site, the highest satisfactory value being Good (1); Average (0.5); Bad (0); and the least satisfactory value Null (0). As shown in table 4.

Basic urban quality of life guidelines

As a result of this analysis, a compilation of measurable guidelines for site selection at the level of urban quality of life is developed. With a predominance towards the objective factor, physical dimension and external habitability, since it is related to the city in which the analysis site is located. The basic parameters for evaluating the sites are:

Infrastructure:plays a crucial role in choosing a site for sustainable housing, as it provides access to essential services such as drinking water, electricity, adequate roads, telecommunications networks, waste management, safe places with continuous surveillance. In other words, by choosing a site with adequate and already established infrastructure, it is guaranteed that residents have access to these services in a reliable, sustainable and, above all, economical way, since it generates lower costs for public

management. It also prevents cities from continuing to expand and creates more compact cities on land that has these characteristics.

Facilities: In order to select a suitable site, it is important to ensure that it is close to facilities that contribute significantly to the sustainability of a home by improving access to essential services (supermarkets, health centres, schools, parks and recreational spaces, etc.); as well as those that promote active and healthy lifestyles (walking paths, green areas and those that allow outdoor exercise and participation in activities that strengthen the local community). It is suggested that the site have a maximum walking distance of 500 metres to these facilities (LEED, 2015).

Public transport: In order to select the appropriate site, it is suggested that three mobility indicators be analysed first (inter-cantonal transport, alternative transport and cycle paths or green corridors), ensuring that these systems allow adequate accessibility, facilitate social and commercial relations, with pedestrian routes that allow for a reduction in car use, promoting a more active lifestyle. In addition, it should be close to the site, that is, the chosen site should be located a maximum of 0.8 km from a bus stop (LEED, 2015).

Sustainability: This criterion is essential to consider when choosing a site,since it influences the environmental impact. In this regard, it is suggested to favor a site that is in harmony with the natural environment, with a low environmental footprint. That does not require deforestation of natural areas or destruction of habitats and that is not located in protected areas. Also, ensure that the site has availability of infrastructure resources and services already established, as well as availability of good accessibility on roads and sidewalks, and transportation systems and equipment, stipulated in the previous section.

Table 4

Basic urban quality of life indicators

Aim						
Variable	Parameter	Indicator	Assessment			
			Good (1)	Regular (0.5)	Bad (0)	Null (0)
City	Infrastructure	Roads and sidewalks (State)				
		Sewerage				
		Drinking water				

Conciencia Digital
ISSN: 2600-5859
Vol. 7 No. 1, pp. 120 – 144, January - March 2024
www.concienciadigital.org

Table 4

Basic urban quality of life indicators (continued)

Aim						
Variable	Parameter	Indicator	Assessment			
			Good (1)	Regular (0.5)	Bad (0)	Null (0)
		Street lighting				
		Telecommunications network				
		Security and surveillance				
		Waste collection				
		Street Furniture				
	Equipments	Education				
		Trade				
		Passive and active recreation				
		Religion				
		Health				
	Public transport	Inter-cantonal				
		Alternative				
		cycle paths, green corridors				
	Sustainability	Type of soil	Buildable or others (1)		Sensitive (0)	
		Percentage of urbanized land	25% (0.5)	50% (0.5)	75% (1)	100% (1)
		Proximity to a facility	150m(2)	450m (1)	750m (0.5)	1050m (0)
		Proximity to main and secondary roads	Immediate (2)		Through paths (0)	
		Proximity to public transport stops	150m(2)	450m (1)	750m (0.5)	1050m (0)
		Mixed-use buildings nearby	YES (1)	NO (0)		
		Pollution	Air, water, soil, noise (0)	3 types (0)	2 types (0.5)	1st least (1)
		Green areas	Good (1)	Regular (0.5)	Bad (0)	Null (0)

Source: Own elaboration

Complementary urban quality of life guidelines

These guidelines show a predominance towards the subjective factor, psychosocial-sensory dimension and external habitability, since it is related to the city in which the analysis site is located. As shown in Table 5. The basic parameters for evaluating the sites are:

Organization of public space: This is essential when choosing a site for a home. It is suggested to give priority to sites that are close to landscapes or green areas in good condition, and those that have good accessibility to the different points of interest in the city.

Routes: Promote sites with short connections to public spaces in the city and that in their pedestrian routes present points of interest and visual connection that strengthen the cultural growth and identity of the residents.

Sector qualities: Promote sites that present sustainable urban planning and design, which favors an implementation that allows generating social cohesion and energy and economic efficiency in the project.

Likewise, choosing areas that present a mixture of land uses allows for the promotion of more compact communities and more active and attractive streets or roads; and therefore allows for the promotion of activity and economic strengthening in the sector and in housing.

Intervals of change: This indicator suggests choosing sites close to areas that allow or carry out cultural or permanent activities to promote social cohesion with the community. Favor sites that allow permeability and are pedestrianized in the urban environment, avoiding physical barriers and favoring accessibility to public spaces.

Appropriation of the place: Favoring sites that allow for the development of local identity and promote community cohesion by encouraging joint work and a sense of belonging. This improves the quality of life of residents by creating support networks, increases the sense of security and promotes greater interaction between neighbors.

Table 5

Complementary urban quality of life indicators

Psychosocial-Sensory						
Variable	Parameter	Indicator	Assessment			
			Good (1)	Regular (0.5)	Bad (0)	Null (0)
City	Organization of Public Space	Space Attractive and varied				
		Urban Landscape				
		Possibility of access to public spaces	Yes (1)	No (0)		
		Direct Sections				
		Pedestrian Crossings				
	Tours	Circuit with Points of Interest				
		Relationship with Nature and Visuals				

	Pedestrian Density	High (1)	Average (0.5)	Low (0)	

Table 5

Complementary urban quality of life indicators (continued)

Psychosocial-Sensory						
Variable	Parameter	Indicator	Assessment			
			Good (1)	Regular (0.5)	Bad (0)	Null (0)
	Qualities of the Sector	Windows and balconies				
		Active and attractive streets or roads				
	Change Intervals	Cultural Activities or Permanence				
		Relationship with the immediate environment	Open or Commercial Floor Plan, Low Walls (2)		Closed Plant, High Walls (0)	
		Facades	Permeable or Open (1)		Closed (0)	
		Trees or Other Shade Elements				
		Pedestrian Plots				
	Appropriation of Place	Inclusive and Social Spaces				
		Meeting Places				

Architectural quality of life guidelines

When choosing a site for a dwelling, it is necessary to consider that this land must be able to meet architectural requirements of a physical nature that improve the quality of life of the individual. Therefore, these parameters are suggested, which have a predominance towards the objective factor, physical dimension and internal habitability. As shown in table 6.

Space: It is suggested to verify that the space available for the future home complies with the requirements of the sustainability regulations in your area, and returning green areas as payment for the percentage of the construction cost occupied on the surface of the land.

Shape:The chosen site must provide that the architectural spaces can be executed in a sustainable manner with a holistic approach, flexible and adaptable to changes according to the needs of users. As well as the adaptation of the architectural form to the topography of the site, producing the least possible environmental impact.

Overcrowding: It is suggested that housing construction be planned sustainably, especially by prioritizing high-density buildings in central urban areas, close to services and employment, to avoid the growth of urban sprawl. It is also suggested that investment

be made in the rehabilitation and renovation of existing housing in densely populated urban areas instead of demolishing and rebuilding. And that the design of mixed-use, high-density housing should be promoted.

Water efficiency: It is suggested that when selecting a site, it should allow for the creation of green areas and the use of rainwater for maintenance, as well as taking advantage of the existing topography of the land to improve water collection and flow.

Energy and Atmosphere: It is suggested to verify that the chosen site allows for maximum use of passive and active bioclimatic architecture systems. As well as verifying the shadows produced by surrounding buildings in accordance with the climatic requirements that are present on the site.

Materials and resources: Prefer land with manufacturing or production areas close to the study site, to generate the least possible environmental impact from the transportation of materials. Determine if there are elements on site that can be used for recycling materials in the project.

Indoor environmental quality: Conduct an environmental quality analysis on site, checking for any contaminants present in soil, air, and water that need to be treated.

Table 6

Architectural quality of life indicators

		Aim
Variable	Parameter	Indicator
Housing- Habitat	Space	Number of rooms
		Living area
		Number of Bathrooms
		Garage space
	Shape	Land surface
		Number of floors
	Overcrowding	Number of inhabitants per number of rooms
	Water efficiency	Efficient gardening (local plants)
		Water reuse strategies (rainwater or treated on site)
	Energy and Atmosphere	Minimize energy consumption
		Building orientation for a passive solar system
		Air Infiltration
		Thermal insulation Windows 15% in relation to the built area
		Reduction of artificial lighting
		Use of renewable energy

ISSN: 2600-5859
Vol. 7 No. 1, pp. 120 – 144, January - March 2024

Table 6

Architectural quality of life indicators (continued)

Aim		
Variable	Parameter	Indicator
	Materials and resources	Highly durable materials
		Local products within a maximum distance of (160km)
		Recycled or regenerated products
		Correct structural sizing, modulation
	Indoor environmental quality	Natural ventilation in humid areas
		Fireplaces and wood stoves must have closing doors
		Air filtration
		Control of pollutants
		Low emission products

Conclusions

- The development of an indicator matrix for the sustainable selection of residential sites represents a significant advance in urban and architectural planning. This tool allows for a comprehensive assessment of potential residential sites, ensuring that environmental, social and economic sustainability criteria are met, resulting in projects that improve the quality of life of their inhabitants.
- The research emphasizes sustainability as an essential criterion in the choice of residential sites. Consideration of factors such as energy efficiency, water resource management and minimizing environmental impact not only responds to global challenges such as climate change and environmental degradation, but also promotes healthier and more comfortable living environments.
- The research emphasizes sustainability as an essential criterion in the choice of residential sites. Consideration of factors such as energy efficiency, water resource management and minimizing environmental impact not only responds to global challenges such as climate change and environmental degradation, but also promotes healthier and more comfortable living environments.

Conflict of interest

Authors must declare whether or not there is a conflict of interest in relation to the submitted article.

Bibliographic References

Abaleron, C. (1999). Agenda for reflection in architecture, design and urban planning. AREA. Editorial LatBook.Towards the standardization of data from the different agencies of the city's infrastructure services (uba.ar)

Benavidez I. (1998). Quality of life as a tool for urban design, [Presentation at the IV Latin American Seminar on Urban Quality of Life, 1998]. IV Latin American Seminar on Urban Quality of Lifehttps://acervoapi.paulofreire.org/server/api/core/bitstreams/3efa644e-3876-4dd4-8d1c-538387b8b13b/content

Ceballos, OL (2006). Housing policy and housing quality. Reflections on low-cost habitability in Bogotá. Bitácora Urbano Territorial Magazine, 10(l1): 148-157.https://www.redalyc.org/pdf/748/74801013.pdf

Gehl, J. (2010). Cities for the people. IslandPress Publishing.https://umranica.wikido.xyz/repo/7/75/Cities_For_People_-_Jan_Gehl.pdf

Hernández Sánchez, JM (2012). Energy consumption and associated emissions of the residential sector [Departament de Projectes d'Enginyeria. Polytechnic University of Catalonia]. Polytechnic University of Catalonia, Barcelona.

Hernández, G. & Velásquez S. (2014). Housing and quality of life. Measuring social habitat in western Mexico. Urban Territorial Logbook Journal. National University of Colombia, 1(24): 1-36. ,https://www.colef.mx/posgrado/wp-content/uploads/2016/12/TESIS-Romero-Ch%C3%A1vez-Christian-Rodrigo.pdf

Landáruzi, M. & J. Mercado (2004). Some physical and psychological factors related to the internal habitability of housing. Environment and Human Behavior, Vol. 5. Pp5.https://dialnet.unirioja.es/servlet/articulo?codigo=1332328

Then, G. (2002). Urban environmental quality as a theoretical-methodological instrument. Study of the impact on historical-urban values. Venezuelan Journal of Sociology and Anthropology, 33(12): 126-141.https://www.redalyc.org/pdf/705/70511244009.pdf

United Nations. (2017). The new urban agenda [New Urban Agenda]. United Nations Conference on Housing and Sustainable Development (Habitat III), Quito, Ecuador. https://habitat3.org/wp-content/uploads/NUA-Spanish.pdf

United Nations. (2024, January 18). Department of Economic and Social Affairs.https://habitat3.org/wp-content/uploads/NUA-Spanish.pdf

Noriega, V. (2022). Housing and informal habitat: Determinants of human settlements in the city of Riobamba [Thesis prior to obtaining the Master's degree in local development with a mention in planning, development and organization from the National University of Chimborazo].https://lc.cx/Ha3w14

Pérez, A. (1999). The construction of Bio-Ecological indicators to measure the quality of the urban natural environment. DOCPLAYER.https://docplayer.es/15445317-La-construccion-de-indicadores-bio-ecologicos-para-medir-la-calidad-del-ambiente-natural-urbano.html

Perren, J. & Lamfre, L. (2018). Quality of life under debate. Derivation, definition and operationalization of a suggestive category for historical studies. Journal of the History Area of the María Saleme de Burnichón Research Center, Faculty of Philosophy and Humanities, 18(2017): 9 - 31.https://ri.conicet.gov.ar/bitstream/handle/11336/89729/CONICET_Digital_Nro.58db1d6d-0165-4a73-80ed-9fc899939f48_A.pdf?sequence=2&isAllowed=y

Romero, C. (2016). Public spaces and urban quality of life. Case study in Tijuana, Baja California [Thesis for obtaining a master's degree in public action and social development, El Colegio de la Frontera Norte].https://www.colef.mx/posgrado/wp-content/uploads/2016/12/TESIS-Romero-Ch%C3%A1vez-Christian-Rodrigo.pdf

Spain Green Building Council. (2014). LEED v4 for building design and construction [PDF]. Translated by Pilar Martínez Pérez. Spain Green Building Council® and USGBC.https://www.usgbc.org/leed

Zulaica, L. & Celemín, JP (2008). Territorial analysis of the living conditions in the peri-urban area of the city of Mar de Plata (Argentina), based on the construction of an index and the application of spatial association methods. Revista de Geografía Norte Grande, 41: 129-146. https://www.scielo.cl/pdf/rgeong/n41/art07.pdf

ISSN: 2600-5859
Vol. 7 No. 1, pp. 120 – 144, January - March 2024