



# LEED ND as A Tool for Evaluating the Quality of Life in Egyptian Cities

## Case Study: Bilqas City, Dakahlia

Sarah A. Ibrahim\*, Esraa M.Elazab, Nanees A. Esayad and Mohammed Mekkawy

### KEYWORDS:

*Bilqas city, LEED-ND, Quality of life, Sustainability, Urban Development in Egypt*

*Abstract—Egyptian urban communities in the old cities suffer many urban issues. These issues affect the quality of the natural and built environment in which people live, work and have leisure. Promoting community quality and human satisfaction is the main focus of urban development. The notion of QOL as a result of urban communities' development came into synchronization in the 60th. In 2007, the USGBC conducted the LEED-ND rating system to create more sustainable neighborhoods and raise the QOL for residents. This study focuses on the importance of QOL studies in the urban planning field and the coherence between the LEED-ND system and the indicators of QOL. It addresses this topic relative to the urban communities in Egyptian old inhabited cities, precisely Bilqas city in Dakahliya province. This proposal represents a new approach to comprehending urban development methodologies and their application in Egyptian urban communities. Challenges and opportunities in the proposed case study visualize the research conclusion*

### I. INTRODUCTION

EGYPTIAN urban communities in old existing suffer a lot of urban problems. Despite the beautiful nature that one day was a great legacy, the change in the built environment form, unfortunately, harmed the beauty of the environment.

Researchers identified the problems resulting from inappropriate urban design patterns to be related to population increase rate and overcrowding, the insufficient level of services in certain urban areas, the degraded sense of place, the diminished air quality inside the cities, the encroachments on agricultural land, and the spread of slum areas. These issues

negatively affect the quality of life and human satisfaction in Egypt. [Serag Eldin, 2012]. Man hurt the environment by using ill-considered strategies and principles for the built environment, which degraded the living environment's level of satisfaction and negatively affected individual satisfaction [Das, 2007]. So, reducing the pressure upon the burdened urban communities concerned the planners and policymakers to demonstrate efficient urban development strategies.

The notion of quality of life (QOL) has attracted the attention of researchers, scientists, policymakers, and planners since the sixtieth [Marrans, 2011]. It is considered one of the most critical dimensions for sustainability and green urban development. Improving the QOL for residents in the built

Received: (06 July, 2022) - Revised: (19 September, 2022) - Accepted: (27 September, 2022)

\* **Corresponding Author:** Sarah A. Ibrahim, researcher at Architectural Engineering, Engineering Faculty, Mansoura University, Egypt (email: [arch.masr@gmail.com](mailto:arch.masr@gmail.com))

Esraa M. Elazab Assistant professor, Architectural Engineering, Engineering Faculty, Mansoura University, Egypt (email: [esraelazab@mans.edu.eg](mailto:esraelazab@mans.edu.eg))

Nanees A. Esayad, A Professor, Architectural Engineering, Engineering Faculty, Mansoura University, Egypt (email: [nanees\\_elsayyad@mans.edu.eg](mailto:nanees_elsayyad@mans.edu.eg))

Mohammed Mekkawy, Professor, Architectural Engineering, Engineering Faculty, Mansoura University, Egypt (email: [redjewel\\_82@yahoo.com](mailto:redjewel_82@yahoo.com))

environment is the main focus of attention for planners to promote human well-being.

As an application for green sustainable development, the United States green building council (USGBC) created the LEED-ND rating system, the most crucial rating system for green development and QOL improvement.

This research aims to study the QOL improvement ways and the contribution of LEED-ND to this issue worldwide and discuss its mission to repair what was messed up by the improper applications of the built environment, which negatively affected the environment.

The study also addresses the conflicts around the urban communities in the existing Egyptian cities, their current situation, and the related challenges. This approach comes through evaluating the QOL of Bilqas city as an example for Egyptian urban communities using LEED-ND as a tool for the evaluation.

And the research question is: *“how can a global rating system such as LEED-ND be used to improve QOL in Egyptian old existing urban communities?”*

## II. QUALITY OF LIFE

The QOL is a broad term with no precise definition. It is a notion that concerns different academic disciplines and attracts the attention of researchers, planners, politicians, scientists, and policymakers. There are social, psychological, biological, physical, and economic needs for human life. The enhancement between all human-needs pictures the whole figure of life quality of residents. In other words, QOL is a concept that deals with an individual's sense of satisfaction, happiness, freedom to fulfill the needs and priorities, health, education, quality of services provided by public institutes, quality of housing, and the built environment. All of this goes along with the natural environment [Marrans and Stimson, 2011]. So, it is likely to state that the QOL is affected by natural and built or urban environment quality.

There are two reliable definitions to summarize the definition and the idea of QOL in urban communities:

*“The quality of life is the outcome of the interaction between the social, economic, constructional, and environmental cases which affect man”* [Mostafa, 2012].

*“The state of the day living enhanced by good food, clean air, and water, enjoyment of open spaces, conservation of land and wildlife, safety and peace of mind”* [Serag El-Din et al, 2012].

### A: QOL Dimensions:

According to researchers, there is a general agreement on the dimensions linked to the QOL in urban communities. Researchers estimated that there are two main dimensions for the QOL concept, the first is psychological, and the second is environmental. The psychological dimension is the dimension that is concerned with the life satisfaction of each individual. Moreover, it is referred to as the “subjective” dimension. The environmental dimension concerns the quality of the place or environment where the people live. Moreover, it is referred to as the “objective” dimension [Marrans, 2012].

The integration between the two dimensions, subjective and objective, provides a complete picture of QOL for residents and the environment in which they live. *“A person's quality of life is dependent on the exogenous (objective) facts of his or her life, and the endogenous (subjective) perceptions he or she has of these factors and of himself or herself,”* said Dissart and Deller in 2000 [Massam, 2002].

### B: QOL Indicators:

The two dimensions of QOL consist of indicators or factors essential for measuring the overall quality. The QOL in urban communities' investigation comes through a set of components that measure the material aspects of the built environment, natural environment, economy, and social aspects. It is also called the characteristics of the community. This set of components forms the first indicator type, the *“objective indicator.”* The second type consists of a set of components that configures the human's sense of satisfaction and well-being and determines the people's evaluations and points of view of their community. This indicator is called the *“subjective indicator.”* Another important indicator is the behavioral indicator which defines the people's behavior and usage of their community [Marans & Stimson, 2011] [Masaam, 2002].

#### 1. Subjective Indicators:

A review of the quality of life studies; concluded that objective circumstances do not significantly influence the subjective QOL [McCrea, 2006]. People's personalities differ according to certain private events, so their subjective indicators cannot be that accurate. Studies assume that the influence of personality traits weakens the relationship between objective and subjective indicators, making it tough to measure QOL.

However, the improvements in objective measures established in any community, such as improvements in infrastructure, the number of open spaces, health services and facilities, public transportation characteristics, number of recreational facilities, and cultural resources, mediate the subjective evaluations of the residents and positively affect their satisfaction with their urban surrounding. The subjective evaluation of QOL focuses on feelings, opinions of individuals and groups, and their pleasant and unpleasant experiences with their community [Marans & Stimson, 2011].

The following table represents some leading subjective indicators:

TABLE (I)  
SETOF SUBJECTIVE QOL INDICATORS [MARANS & STIMSON, 2011]  
SUBJECTIVE INDICATORS

Satisfaction with housing
Satisfaction with health care services
Satisfaction with neighborhood
Satisfaction with jobs
Perceptions of school quality
Perceptions of crime
Feelings about neighbors
Feelings about government
Public transit use
Amount of walking and bicycling
Participation in community gatherings and events
Visits to parks and civic centers
Overall happiness

## 2: Objective Indicators:

Specialists propose a set of objective indicators to assess the QOL in specific communities regarding; economy, community, and environment. In the following table, there are sets of indicators agreed upon by researchers that are discussed in determining QOL objective indicators in urban communities.

TABLE (II)  
SET OF OBJECTIVE INDICATORS [Feneri et al., 2013] [Massam, 2002]

Objective indicators
<b>Economic</b>
Employment status
Personal income
Number of households /flats
Household income
Number of households living in owned dwellings
Number of motor vehicles per household
Percentage of population with a university degree
Percentage of population with no formal qualifications
Number of students continuing their education
Number of schools and universities
<b>Community</b>
Population density
Housing conditions; home ownership- the cost of living- household composition- buildings qualities and services
Government services provision – expenditure on community
Access to facilities; schools, libraries, supermarkets, historical places
Public transit and distance walked to transit stops.
<b>Environmental</b>
Renewable sources of energy
Pollution; Air, Noise, Garbage
Pollution load of greenhouse gas emissions
Green spaces accessibility
Greenery and area of parks
The Natural environment and Ecological life quality

The objective indicators in any urban environment deal with satisfaction with certain life domains such as housing, recreational activities, transportation, government services (education, health), and residential areas (streets, parks, buildings), which are defined as the place attributes [Marans, 2012]. The satisfaction with these life domains meditates the overall satisfaction with the urban community [Mccrea, 2006]. Briefly, objective indicators for QOL in urban communities can meditate the subjective perceptions and supports overall QOL improvement.

### III. LEED-ND RATING SYSTEM

The movement toward the city's development determines the distribution of jobs, housing, and community activities which determines how far people travel to meet their daily needs and transportation options. These travel decisions affect the percentage of air pollutants, greenhouse gas emissions, and physical activity levels. So, we can say that the city development patterns can affect everyone; children, the elderly, people with disabilities, and people of lower socioeconomic status. Moreover, the changes in community design could help provide a range of transportation solutions, improve air quality, support human health, and mitigate greenhouse gas emissions,

promoting livability in communities and improving life quality [EPA, 2013].

In 2007, the US Green Building Council (USGBC), the Congress of New Urbanism (CNU), and the Natural Resources Defense Council collaborated to develop a rating system for neighborhood planning and development based on the combined principles of smart growth, New Urbanism, and green infrastructure and building. This partnership aims to establish a national leadership standard for assessing and rewarding environmentally superior green neighborhood development practices within the LEED Green Building Rating System [USGBC, 2009].

According to the USGBC, there are ten main issues facing the urban communities that need to be solved to reach sustainability and quality of life:

- 1- Planning for environmental risk: anticipate future issues.
- 2- Culture and Heritage: Promote communities' social, cultural, and historical life.
- 3- Well-being: Enhance health and happiness for residents.
- 4- Sustainable transport: Reconcile mobility with wellbeing.
- 5- Land & Ecology: Develop in harmony with the natural system.
- 6- Self-sufficiency: Promote local jobs and prosperity.
- 7- Energy efficiency: Reduce energy use and carbon emissions.
- 8- Materials and waste: Wise material usage with little waste as possible.
- 9- Water efficiency: Treat water as a precious resource.
- 10- Sustainable performance: Monitor and measure performance.

The LEED-ND certificate addresses standards for sustainable development and proposes solutions for the previously stated issues; it has five categories that express the whole development process.

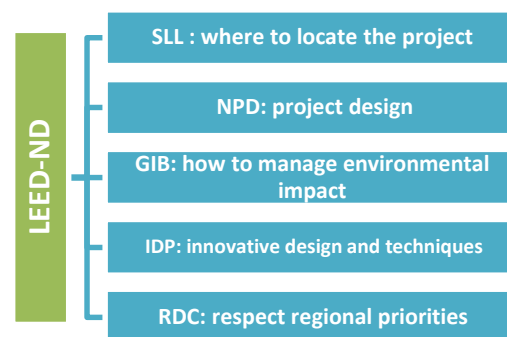


Fig.1. LEED-ND categories

### IV. LEED-ND RELATION WITH QOL

The LEED-ND rating system addresses the areas of sustainability and livability in urban communities, promoting the QOL.

The relation between the QOL indicators and the LEED-ND aspects of the three main categories, SLL, NPD, and GIB, can be illustrated in the following figure.

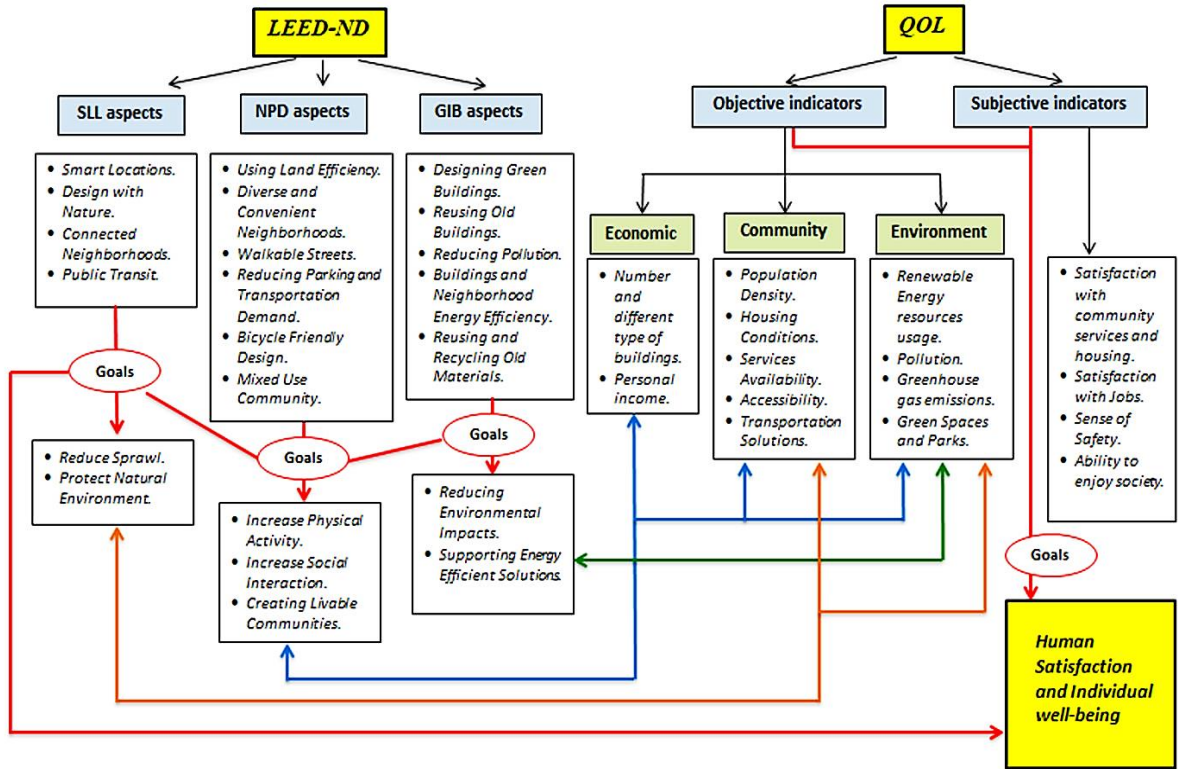


Fig. 2. LEED-ND relation with QOL objective indicators

As mentioned, the subjective indicators are individual perceptions and feelings resulting from satisfaction with the life domains. Moreover, the objective indicators are considered the material aspects that mediate the feelings of satisfaction toward the community. So, the study deals with the materialistic criteria of QOL objective indicators as a factor that can be assessed relative to the LEED-ND system.

*A: SLL Relative to QOL Objective Indicators:*

SLL category reflects the vision of where to build. Siting urban developments in brownfield or infill sites connected to exiting transit facilities reduce the dependence on private vehicles [Benson & Bereitschaft, 2020]. Building in these locations uses land efficiently and preserves open space, ecological areas, and agricultural land around cities.

Also, the SLL category addresses the sensitivity toward the natural environment and protects its quality by prohibiting and strictly limiting the development of habitat areas, wetlands and water bodies, prime agricultural land, and floodplains [USGBC, 2009].

The following matrix presented in figure (3) shows the relation between the components of the SLL category in the LEED-ND system and the QOL objective indicators. Each red dot represents a relation for each criterion.

		Smart Location and Linkage (SLL)													
		P1: Smart Location	P2: Impaired Species and Ecological Communities Conservation	P3: Wetland and Water Body Conservation	P4: Agricultural Land Conservation	P5: Floodplain Avoidance	C1: Preferred Locations	C2: Brown fields Redevelopment	C3: Locations With Reduced Automobile Dependence	C4: Bicycle Network and Storage	C5: Housing and Jobs Proximity	C6: Steep Slope Protection	C7: Site Design for Habitat or Wetland and Water Body Conservation	C8: Restoration of Habitat or Wetlands and Water Bodies	C9: Long Term Conservation Management of Habitat for Wetlands and Water Bodies
QOL Objective Indicators	Economic	Not Available according to the proposed indicators in this study													
	Community														
	Population density														
	Housing conditions														
	Government services														
	Access to facilities														
	Public transit														
	Walking distances														
	Environment														
	Renewable energy resources														
	Pollution: Air, Noise, Garbage														
	Pollution due to greenhouse gas emissions														
	Green spaces accessibility														
	Greenery and parks area														
	Natural environment and ecological life quality														

Fig.3. SLL category and QOL objective indicators relationship

*B. NPD relative to QOL objective indicators:*

The basic target for the NPD category is explaining what to build in a given location. Compact development as a design

pattern represents a neighborhood design in which destinations like schools, shops, and parks can be closer together, making walking and cycling more efficient. And based on this, even when people tend to drive, they drive less. These blended neighborhoods aim to use the land efficiently [Welch, 2010]. This can be acknowledged through the USGBC statement in 2012: “the character of a neighborhood, including its streets, homes, workplaces, shops and Public spaces, affects the quality of life” [Boeing et al., 2014].

The matrix represented in figure (4) illustrates the relationship between the NPD category and QOL objective indicators.

		Neighborhood Pattern and Design (NPD)																	
		P1: Walkable Streets	P2: Compact Development	P3: Connected and Open Community	C1: Walkable Streets	C2: Compact Development	C3: Mixed-Use Neighborhood Centers	C4: Mixed-Income Diverse Communities	C5: Reduced Parking Footprint	C6: Street Network	C7: Transit Facilities	C8: Transportation Demand Management	C9: Access to Civic and Public Space	C10: Access to Recreation Facilities	C11: Visit ability and Universal Design	C12: Community Outreach and Involvement	C13: Local Food Production	C14: Tree-Lined and Shaded Streets	C15: Neighborhood Schools
QOL Objective Indicators	Economic																		
	Community																		
	Housing conditions		●																
	Government services		●		●						●				●				
	Environment																		
	Renewable energy resources		●																
	Pollution: Air, Noise, Garbage		●		●														●
	Pollution due to greenhouse gas emissions		●		●														●
	Green spaces accessibility		●		●														●
	Greenery and parks area			●															●
	Natural Environment and Ecological life Quality																		●

Fig.4. NPD category and QOL objective indicators relationship

C. GIB relative to QOL objective indicators:

The GIB category targets to reduce the environmental impact of the construction and operation of buildings and infrastructures (Pedro et al., 2018). It illustrates strategies to utilize green building practices such as; certified green buildings within the development area, proposing energy efficiency strategies, district heating and cooling systems, using on-site renewable energy, reusing existing buildings and previously used materials, and encouraging strategies for reducing urban heat islands, preserving existing vegetation, proposing water efficiency strategies and the ability to reuse the wastewater [USGBC, 2009] [Pedro et al., 2018]. Furthermore, the quality of infrastructure greatly impacts the standard of living and the resilience of cities to several environmental, social, and health-related risks [Diaz-Sarachaga et al., 2018].

The matrix represented in figure (5) illustrates the relationship between the GIB category and the QOL objective indicators.

		Green Infrastructure and Buildings (GIB)																					
		P1: Certified Green Building	P2: Minimum Building Energy Efficiency	P3: Minimum Building Water Efficiency	P4: Construction Activity Pollution Prevention	C1: Certified Green Buildings	C2: Building Energy Efficiency	C3: Building Water Efficiency	C4: Water-Efficient Landscaping	C5: Existing Building Reuse	C6: Historic Resource Preservation and Adaptive Use	C7: Minimized Site Disturbance in Design and Construction	C8: Stormwater Management	C9: Heat Island Reduction	C10: Solar Orientation	C11: On-Site Renewable Energy Sources	C12: District Heating and Cooling	C13: Infrastructure Energy Efficiency	C14: Wastewater Management	C15: Recycled Content in Infrastructure	C16: Solid Waste Management Infrastructure	C17: Light Pollution Reduction	
QOL Objective Indicators	Economic	Not Available according to the proposed indicators in this study																					
	Community																						
	Housing conditions		●				●																●
	Government services												●		●				●		●		●
	Environment																						
	Renewable energy resources		●					●									●						
	Pollution: Air, Noise, Garbage		●				●										●			●		●	●
	Pollution due to greenhouse gas emissions		●				●										●			●		●	●
	Greenery and parks area																						
	Natural Environment and Ecological life Quality																						●

Fig.5. GIB category and QOL objective indicators

The QOL is considered as the benefits derived from breathing clean air; having access to transportation choices, jobs, housing, education, open space, and healthy food; increased physical activity; living in a pleasant, safe, and cohesive community; having a sense of social belonging; and having adequate opportunities for recreation and leisure time [Vanzerr & Seskin, 2011]. And according to the USGBC, the LEED-ND fulfills this vision.

In the coming section, a study of the urban communities in the old inhabited Egyptian cities is to be discussed. The study addresses the topics of the QOL in existing Egyptian cities and the assessment of LEED-ND for its improvement.

V. EGYPTIAN BUILT ENVIRONMENT OVERVIEW

There has been a remarkable increase in population in Egypt; according to CAMPAS, the population in 1996 was 59313000, and by 2019 it rose to 98101011, and the number is still growing. The population increase rate burdens the urban communities in the old inhabited cities, which is the main focus of this study. Also, the characteristics of the built environment in these cities were affected by the size of the population increase, which in turn affected the quality of life within the urban communities in old Egyptian cities [El-Kholei,2020].

A. The Urban Features in Egypt:

A plan was initiated in the 1970s to create new cities in the desert areas to attract population, de-concentrate urban areas in

the delta, and encourage economic activities and investments in these new cities [Hegazy, 2021]. Throughout the previous proposal, The Egyptian urban communities can be classified into two sections; the old inhabited existing cities with their affiliated villages and the 38 new cities through its four generations [Ibrahim & Masoumi, 2016] [NUCA, 2022]. Despite the presence and the implementation of the strategic plan of the new cities to attract residents, the overcrowding in the old inhabited cities is still noticeably present.

**B. Urban Problems in The Existing Egyptian Cities:**

The urban communities in the old inhabited cities in the delta and Nile valley suffer many problems due to the high demand for urban areas to keep up with the increasing population rate. The available lands within these areas are scarce. Therefore, the only option for urban expansion is the infill sites within the urban fabric. This caused violations and subdividing of the agricultural land surrounding the urban agglomerations to transform it into urban land for more settlements and more profit for the landowners [Soliman, 2015].

Generally, the development of existing cities occurred based upon two hypotheses:

- The previously planned areas follow the governmental authorities’ regulations and laws.
- The spontaneously planned areas by people following no rules.

There is a conflict between the planning strategy in these cities and the built environment implemented haphazardly by the people. That phenomenon reshaped the built environments in the existing cities and towns and produced urban communities with a high-density level. These problems can be generally defined in certain points as follows:

- Unhealthy residential spaces due to lack of proper lighting and ventilation.
- Overcrowding in housing, employment, and mobility due to population rate growth.
- Certain areas, which are frequently informal settlements within the cities, suffer an insufficient level of services.
- Diminished air quality and environmental issues.
- Traffic problems.
- Infringements on the agricultural land that outskirt these cities.
- Spread of deteriorated areas with social groups with poor living conditions leads to unethical behaviors [Alshater, 2012] [Hammad,2019].

These problems adversely impact the quality of life for residents and the environment. The research sheds light on Bilqas city in Dakahliya province as a case study for Egyptian cities.

**VI. BILQAS CITY OVERVIEW**

Bilqas city is located in Bilqas urban center "Markaz," which occupies the northern borders of Dakahliya governorate.

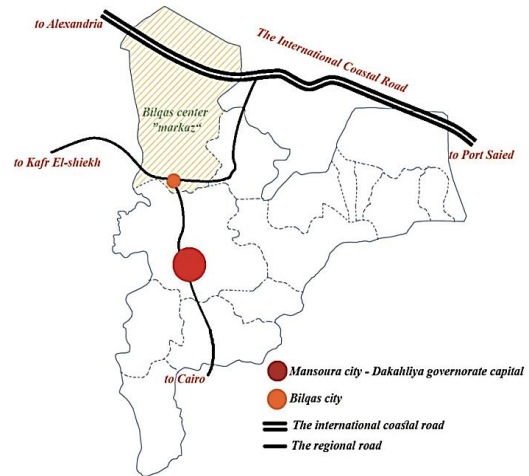


Fig.6. Regional location of Bilqas city relative to the urban center, Dakahliya province, and its’ capital

Bilqas is considered a city with a rural background despite the urban features it gained, and the reason behind that is that most of the urban centers in the Egyptian delta had administrative and service missions for the following rural. Accordingly, the rural manifestations in human attitudes seized the urban life in the city. It is important to say that the rural background doesn’t configure whether the city is developed or underdeveloped but rather describes the people and their basics, attitudes, interests, and needs [Aboukorin, 2011].

**A: Bilqas City Urban Development Process:**

Bilqas city is surrounded by agricultural land. As the population grows within the city, the need for land to cope with that growth increases. This resulted in the extension of the built-up slots over the agricultural land. The extension process in Bilqas city went through four main phases from 1945 until the present day.

**1- Phase (1):**

The location of the old city of Bilqas, or the city core, was the initial stage of urbanization. It is located in the center of the city’s layout and is directly connected to the other city parts. The urbanization is bounded between the railway road and the water canal. The surface of this area occupies 120 acres [GOPP, 2017].

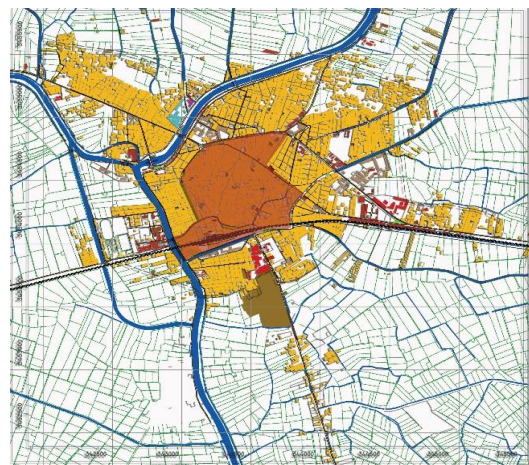


Fig.7. phase 1 of Bilqas city layout

The urban fabric characteristics of phase 1 can be stated as follows:

- This area is the densest area on the city plan according to the strategic plan report of Bilqas city, and the average density of this area is 220person/acre [GOPP, 2017].
- The dominant land use is residential. There is a lack of different uses in this area, such as retail and open spaces.
- Narrow internal streets with widths ranging from 6 meters to 10 meters maximum make them more suitable for walking and more complex for vehicles to pass through.
- The street network design patterns are curvilinear loop and cul-du-sac patterns.
- The internal streets are well connected to the main roads.
- The main feature of the building blocks is “Adjacent buildings.”
- There is a significant lack of vegetation in the area.



Fig. 8. Elgomhoria street, one of the main streets in the city, taken by researchers



Fig.9. Internal streets from Elgomhoria street, taken by researchers

## 2- Phase (2):

The city's second phase of urban expansion took place in the areas around the city center (phase 1) in all directions at the expense of agricultural land. It took place in the interval between 1945 and 1986.

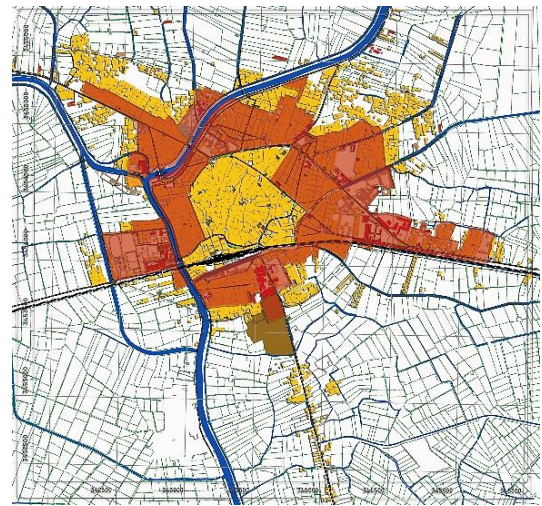


Fig.10. phase 2 in Bilqas city layout

The expansion was mainly in the northern and eastern directions due to the medical and educational services that were established. The city's area then became 557 acres [GOPP, 2017].

The urban fabric characteristics of the phase 2 area can be stated as follows:

- The density in this phase is less than the density of the urban area of the old city. The average density was about 100-150 person/acre in the urban areas neighboring the city core and in the areas near the medical and educational services in the Northeast and Northwest. Some areas in the southern areas are less dense than the others, about 35-100 person/acre [GOPP, 2017].
- The mixed land use appeared at that point in the urban development. The city was fueled by medical, commercial, educational, governmental, and other services located within the stated phase.
- Social services were established during this phase, such as the Bilqas city sporting club, Elsaqa open space, the youth club, and the Bilqas city open garden.
- The street network design pattern is closer to the fragmented parallel pattern. The widths of the inner streets in the residential blocks range from 6m to 10m maximum.
- Adjacent buildings are the main feature, the same as the first development phase.
- The lack of vegetation is still a significant feature.



Fig.11. Almahkama and Elthawra streets the two wide main roads, Taken by researchers



Fig.12. Internal street from Elmahkma street, Taken by researchers

### 3- Phase (3) and phase (4):

Phases 3 and 4 were structured starting from 1986 until the present day. In these two phases, the infringements on the agricultural lands increased, and the built-up areas went beyond the zoned area border. The surface area of Bilqas city in phase 3 reached 792.5 acres and continued to enlarge.

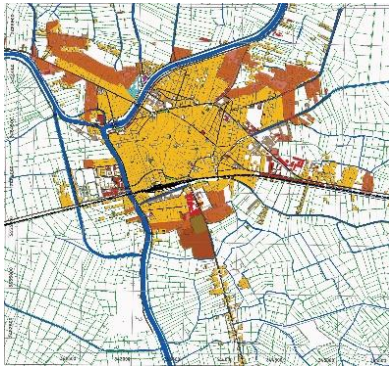


Fig.14. phase 3 of Bilqas city

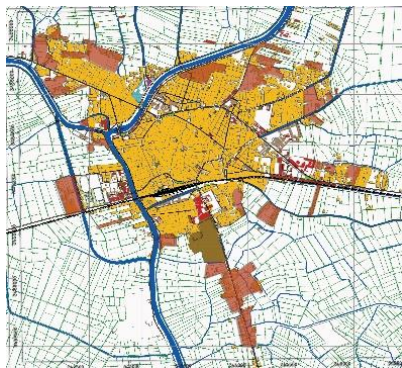


Fig.15. phase 4 of Bilqas city

These areas are considered the most deteriorated areas in the city and suffer from insufficient services and infrastructure. The urban fabric characteristics of phase 3 and phase 4 are pretty much similar; it can be stated as follows:

- The average density in some areas, especially the northern and eastern, are about 100-150 person/acre, and it decreases in the other areas to become 35-100 person/acre at that phase, same as phase 2 [GOPP, 2017].
- The dominant land use is residential.

- The street pattern design is a fragmented parallel pattern.
- The street widths range from 6m to 10m.
- The buildings are adjacent.
- The lack of vegetation still is a feature.



Fig.16. Informal areas at the city borders in the north east



Fig.17. Internal street at Ezbst Gad in winter.

## VII. BILQAS PLAN ASSESSMENT BASED ON QOL OBJECTIVE INDICATORS AND LEED-ND PRINCIPLES

USGBC suggests that the LEED-ND system addresses design principles that enhance sustainable development and promote QOL within urban communities. Although the system regulates the certification process in a specified schedule for any applied project, the main concepts and principles proposed by LEED-ND can benefit the comprehensive vision of sustainable development and QOL improvement. So, the study adopts the idea that the LEED-ND design principles can be considered a tool for assessing urban communities. In this context, the study assesses the QOL in Bilqas city plan according to the relationship between the LEED-ND system and QOL objective indicators.

The similarity in the city plan features and characteristics through the different phases of its development is evident. The street design, land use, and buildings all give us an image of the development logic in the city, including the challenges and opportunities.

The whole image of how can the sustainability focus is represented in the LEED-ND system helps indicate the QOL of the city. The matrices represented in this study that combines the LEED-ND categories and the QOL indicators are the assessment tool to examine the city's overall QOL and human well-being.

### A: SLL Category Relative to QOL Indicators in Bilqas City:

The first matrix deals with the QOL indicators regarding the SLL category in the LEED-ND system. The high density in the urban communities within the city through the development phases was due to the city's location and the migration of



residents from the surrounding rural villages to the city. Also, the walking distances can be considered balanced in each city sector. And the residents tend to walk to their jobs and facilities, reducing automobile dependence.

The big issue here is the harmful effect on the natural environment due to the absence of strategies for protecting the environment from pollution. Most of the added sectors in the fourth phase release the sewage of the buildings in the water canals surrounding the built-up areas and enter the agricultural land that is supposed to enrich the soil.

Furthermore, the lack of public transit in the city leads to a high level of air pollution and noise due to the use of alternative means of transport such as “toktok.”

housing units are noticeable features. Furthermore, the services and civic facilities are accessible to all residents.

The applicability of these criteria is considered a privilege for city development and influences QOL within the city.

Despite the presence of some of the NPD criteria considering well-connected streets, and in spite of the fact that residents tend to use these streets for walking to their daily needs, the streets cannot be considered walkable streets for the lack of the proper urban street design. There are no safe sidewalks for pedestrians, which might cause injuries and threaten public health. Also, there are neither bicycle lanes nor tree-lined or shaded streets.

Also, public open spaces are scarce. A small area civic garden in the east serves all the residents, which makes it very chaotic and crowded most of the time. It cannot fulfill the needs of the residents or accomplish its purpose for the community and the environment.

The lack of vegetation, the non-appealing street design, the scarcity of open public spaces, and the absence of transit facilities negatively impact the urban and natural environment which suffers from unsafe and unhealthy streets and open areas as well as air, noise, and garbage pollution.

		Smart Location and Linkage (SLL)				
QOL Objective Indicators	Economic	Not Available according to the proposed indicators in this study				
	Community	Not Available according to the proposed indicators in this study				
	Population density	●	●		●	
	Housing conditions	●	●		●	
	Government services	●	●		●	
	Access to facilities	●	●		●	
	Public transit				●	
	Walking distances	●	●		●	●
	Environment	Not Available according to the proposed indicators in this study				
	Renewable energy resources		●			
Pollution: Air, Noise, Garbage	●	●	●	●	●	
Pollution due to greenhouse gas emissions	●	●	●	●	●	
Natural environment and ecological life quality	●			●		

Fig.20. SLL criteria and QOL corresponding indicator matrix

**B: NPD Category Relative to QOL Indicators in Bilqas City:**

The second matrix deals with the QOL indicators regarding the NPD category in the LEED-ND system.

The urban communities in the different areas in the city plan or each sector have well-connected internal streets and are well connected to the community at large. This feature promotes daily physical activity.

Also, the compactness and diversity where most of the services and amenities are within walking distance from

		Neighborhood Pattern and Design (NPD)				
QOL Objective Indicators	Economic	Not Available according to the proposed indicators in this study				
	Community	Not Available according to the proposed indicators in this study				
	Population density	●	●	●	●	
	Housing conditions			●		
	Government services			●		
	Access to facilities	●	●	●	●	●
	Walking distances	●	●	●	●	●
	Environment	Not Available according to the proposed indicators in this study				
	Pollution: Air, Noise, Garbage	●	●	●	●	
	Pollution due to greenhouse gas emissions	●	●	●	●	
Green spaces accessibility				●	●	
Greenery and parks area				●		

Fig.21. NPD criteria and QOL corresponding indicator matrix

**C. GIB Category Relative to QOL Indicators in Bilqas City:**

The development of the city plan occurred with a lack of awareness of the methodology of green design and sustainability. There are no applied strategies based on the

fundamentals of GIB categories. So, the category of GIB does not apply to our case study.

### VIII. QOL REVIEW IN BILQAS CITY

From the previous analysis, it is clear that the QOL indicators are affected by the applicability of LEED-ND principles and vice versa. For example, the absence of vegetation and greenery within the city directly affects the air quality, the climate condition, and the chance of having appealing walkable streets. This issue affects the indicators related to community quality and environmental quality. Also, the absence of public transit affects the quality of the urban community because of the use of alternative means of transport and private vehicles, which consume more fuel producing more air pollution, further to noise pollution and overcrowded streets.

### IX. CONCLUSION

According to this study and the observations of the development process of Bilqas city, the city consists of plenty of opportunities that can be useful in promoting the QOL for residents. These opportunities can be stated as follows:

- Diversity and compactness are features in the city design which are appreciated in sustainable urban development-related systems.
- Well-connected internal streets which promote walkability and physical activities
- Sufficient level of governmental, educational, and medical facilities.
- Main routes connecting the city's different sectors to each other and other cities can help transportation.
- Efforts from the authorities for the city's development are taking place to control the urban sprawl and protect agricultural land.

In addition to the opportunities, some challenges need re-correction. The challenges can be stated in the following points:

- The streets do not support walkability because of their non-appealing street design; there are no sidewalks, bicycle lanes, or shaded streets.
- The scarcity of public open spaces makes it harder for residents to enjoy their time or have safe gatherings.
- Lack of vegetation is a common feature in every community within the city plan, which negatively affects the air quality and human comfort.
- The total absence of transit facilities within the city is a huge problem.
- High levels of air and noise pollution due to the use of private vehicles for transportation and non-authorized vehicles with big numbers.
- Environmental pollution and arable land damage are caused by releasing the sewage of buildings in the water canals in the unplanned sectors at the city's borders.

- Lack of awareness about the fundamentals of green development and sustainability and its importance in improving livability and QOL between the residents and the local authorities.

### X. RECOMMENDATIONS

Improving QOL in Bilqas city can be enhanced by applying strategies considering the following recommendations. It may be helpful for urbanists, policymakers, and who are concerned with improving life quality in Egyptian urban communities to consider the following points:

1. There is no agreement on the QOL definition, which differs according to each perspective. So, it is essential to consider the different human opinions and aspects while conducting a design or development plan.
2. Unfortunately, the basics of sustainable and green development are not being applied yet to the Egyptian old inhabited urban communities. So, there has to be a plan for educating the local authorities, whose mission is urban development.
3. Also, there must be community outreach gatherings to spread awareness about sustainability and how it affects the QOL for residents and the community.
4. Studying of the LEED and equivalent rating systems in Egypt and other countries is essential for development and QOL improvement.
5. Protecting the natural environment is a must, as well as re-correction of the bad habits in the built environment. So, a strategy for vegetating within the Egyptian cities is very important for facing climate issues and improving human mental and physical well-being in addition to avoiding pollution crises.
6. Considering the unplanned areas that need to be developed and contained in the urban growth boundary.
7. The economic, community and environmental aspects give a comprehensive image of life quality. So, they have to be studied in an integrated manner.
8. Considering the best locations for projects around the city border that will attract development in the future, to ease population burdens on the city.
9. It is important to create open spaces to enhance daily activities.
10. Public transit plan must be established in the city to avoid reaching a high level of pollution due to large amount of vehicle exhaust.
11. Redesigning the streets to create secured walking and cycling paths to promote residents' physical activity and avoid reaching high level of pollution.
12. LEED-ND reference guide suggests that some principles can avoid causing pollution or lowers the level of pollution such as smart location, agricultural land conservation and bicycling network. So, applying those criteria can help lower or avoid pollution.
13. there are squares and a park located in the city plan with walking distances  $\frac{1}{4}$  mile from its surrounding residential

units. These areas can benefit the future development plan for the city for more community quality improvements.

The relationship between LEED-ND and QOL improvement studies can benefit further future research for urban community development.

### ACKNOWLEDGMENT

My deepest gratitude to my supervisors for their support and encouragement in this research process.

### AUTHORS CONTRIBUTION

- **Eng. Sarah A. Ibrahim:** contributed in the Conception or design of the work, proposed the methodology, carried out problem data collection, analysis and interpreted the results. Finally drafting the article and prepared for publication
- **Dr. Esraa M. Elazab:** contributed in discussing revise and approves the article for publication.
- **Prof. Dr. Nanees A. Esayad:** contributed in the Conception or design of the work, supervised the work, contributed in discussing, revising and approving the article for publication.
- **Prof. Mohammed Mekkawy:** proposed the problem to be investigated and supervised the work

### FUNDING STATEMENT:

The author did not receive any financial support of the research authorship and publication of this article.

### DECLARATION OF CONFLICTING INTERESTS STATEMENT:

The author declared that there are no potential conflicts of interest with respect to the research authorship or publication of this article.

### REFERENCES

- [1.] H.S.Serag el Din, A. Shalapy, H.E.Farouh and S. Alarine (2012, November). Principles of urban quality of life for a neighborhood. Housing and Building National Research Center (HBRC). Vol.9. Pages: 86-92.
- [2.] R.W.Marans and R.J.Stimson (2011). "An Overview of Quality of Urban Life" in Investigating Quality of Urban Life. Vol. 45. A. C. MICHALOS. Canada.
- [3.] D.Das. (2007, September). Urban quality of life: A case study of Guwahati. Social Indicators Research. Vol: 88. Pages: 297-310.
- [4.] R.W.Marans and R.J.Stimson (2011). "Objective Measurement of Quality of Life Using Secondary Data Analysis" in Investigating Quality of Urban Life. Vol. 45. A. C. MICHALOS. Canada.
- [5.] A.M.Mostafa (2012, July). Quality of Life indicators in value urban areas: Kase Elnile Street in Cairo. Procedia – Social and Behavioral Sciences. Vol. 50. Pages. 254-270.
- [6.] B.H.Massam (2002, October). Quality of Life: Public planning and private living. Progress in planning. Vol. 58. Pages. 141- 227.
- [7.] R. McCrea, T. Shyy and R. Stimson. (2006, March) What is the Strength of the Link between Objective and Subjective Indicators of Urban Quality of Life? Applied Research in Quality of Life. Vol.1. Pages. 79-96.
- [8.] R.W.Marans (2012). Quality of Urban Life Studies: An Overview and Implications for Environment-Behaviour Research. Procedia – Social and Behavioral Sciences. Vol 35. Pages. 9-22.
- [9.] A.M. Feneri, D. Vagiona, and N. Karanikolas. (2013, September) Measuring Quality of Life (QOL) in Urban Environment: An integrated approach. Presented at 13<sup>th</sup> Conference on Environment science and Technology (CEST).  
Available:[https://www.researchgate.net/publication/260124117\\_MEASURING\\_QUALITY\\_OF\\_LIFE\\_QOL\\_IN\\_URBAN\\_ENVIRONMENT\\_AN\\_INTEGRATED\\_APPROACH](https://www.researchgate.net/publication/260124117_MEASURING_QUALITY_OF_LIFE_QOL_IN_URBAN_ENVIRONMENT_AN_INTEGRATED_APPROACH)
- [10.] US Environmental Protection Agency report. (2013, June). Our Built and Natural Environments: A Technical Review of the Interactions among Land Use, Transportation, and Environmental Quality. 2<sup>nd</sup> edition. Available: [www.epa.gov/smartgrowth](http://www.epa.gov/smartgrowth)
- [11.] US Green Building Council (USGBC) (2009). LEED Reference Guide for Neighborhood Development. Vol. 2009 edition. U.S. Green Building Council. Washington. USA.
- [12.] G. Boeing, D. Church, H. Hubbard, J. Mickens, & L. Rudis (2014). LEED-ND and Livability Revisited. Berkeley Planning Journal. Vol. 27(1). Available: <http://dx.doi.org/10.5070/BP327124500>
- [13.] J.Pedro, C. Silva& M.D. Pinheiro (2018, August). Scaling up LEED-ND sustainability assessment from the neighborhood towards the city scale with the support of GIS modeling: Lisbon case study. Sustainable Cities and Society. Vol. 41. Pages: 929-939.
- [14.] J. M. Diaz-Sarachaga, D. Jato-Espino and D. Castro-Fresno (2018, February). Evaluation of LEED for Neighborhood Development and Envision Rating Frameworks for Their Implementation in Poorer Countries. Sustainability. Vol. 10. Pages: 492- 508
- [15.] M. Vanzerr and S. Seskin (2011, May). Recommendations Memo #2 Livability and Quality of Life Indicators. Corp., CH2M HILL. USA.
- [16.] Central Agency for Public Mobilization and Statistics (CAPMAS) (2018, May). Annual Bulletin of Lands Reclamation 2016/2017. Ref. No. 71-22128-2017. Available: <https://censusinfo.capmas.gov.eg/Metadata-en-v4.2/index.php/catalog/291>
- [17.] A. Elkholei (2020, June). Does Urban Planning in Egypt Address Environmental Issues and Social Justice?. Article on: ALTERNATIVE POLICY SOLUTIONS. Available: <https://aps.ucegypt.edu/en/articles/455/does-urban-planning-in-egypt-address-environmental-issues-and-social-justice>
- [18.] I.R.Hegazy (2021, June). The quality of life between theory and implementation in Egypt: The case of Al-Rehab City, Egypt. Ain Shams Engineering Journal. Vol. 12. Pages: 2285-2296.
- [19.] M. R. Ibrahim & H. E. Masoumi (2016, December). Will Distance to the Capital City Matter When Supplying New Cities in Egypt?. Geoscape. Vol. 10. Pages: 35-52.
- [20.] New Urban Communities Authority (NUCA). (2022). Official website. Available: [http://www.newcities.gov.eg/know\\_cities/default.aspx](http://www.newcities.gov.eg/know_cities/default.aspx)
- [21.] A. M. Soliman (2015): Collective planning process: a driving seat for formalizing urban informality in Egypt. International Journal of Urban Sustainable Development. Vol. 8. Pages: 25-48.
- [22.] A. Elshater (2012, November). New Urbanism Principles versus Urban Design Dimensions towards Behavior Performance Efficiency in Egyptian Neighborhood Unit. Procedia – Social and Behavioral Sciences. Vol. 68. Pages. 826-843
- [23.] A.Hammad (2019, September). The Future of Urban Growth in Egypt Assessment of Current Trends and Forging New Approches for Sustainable development. JES, Journal of Engineering science, College of Engineering, University of Assiout. Vol. 47. Pages. 752-764.
- [24.] A. AbouKorin (2011, June). Urban Concentration: a Characterising Feature of Urban Change in Egypt. 5<sup>th</sup> Int'l Conference and Workshop on Built Environment in Developing Countries ICBEDC '11, At Universiti Sains Malaysia, Malaysia.
- [25.] General Organization for Physical planning (GOPP) (2017). Strategic Plan for Urban Development of the Delta Territory. GOPP official web page. Egypt. Available: <http://gopp.gov.eg>
- [26.] General Organization for Physical planning (GOPP) (2017). Strategic General and Detailed plan for Bilqas city. GOPP Electronic Library. Egypt. Available: <http://library.gopp.gov.eg/ElectronicBooks>

ويستمتعون بها. إن تعزيز الجودة في المجتمع وراحة الإنسان هو المحور الرئيسي للتنمية الحضرية. ظهر مفهوم جودة الحياة كنتاج لمبادئ تطوير المجتمعات العمرانية في الستينيات. وفي عام ٢٠٠٧ قامت منظمة USGBC بابتكار نظام تقييم LEED-ND و ذلك لخلق مجتمعات أكثر استدامة ورفع QOL للسكان. تركز هذه الدراسة على أهمية دراسات QOL في مجال التخطيط العمراني والعلاقة بين نظام LEED-ND ومؤشرات QOL. ويتم تناول هذا الطرح عن طريق دراسته نسبة الى المجتمعات العمرانية في المدن المصرية القديمة المأهولة ، وبالتحديد مدينة بلقاس بمحافظة الدقهلية. يمثل هذا الاقتراح نهجاً جديداً لفهم منهجيات التنمية الحضرية وتطبيقها في المجتمعات العمرانية المصرية. تصور نتيجة البحث التحديات والفرص في دراسة الحالة المقترحة.

### *Arabic Title*

LEED-ND كأداة لتقييم جودة الحياة في المدن المصرية  
دراسة حالة: مدينة بلقاس ، الدقهلية

### *Arabic Abstract*

تعاين المجتمعات العمرانية المصرية في المدن القديمة من مشاكل عمرانية كثيرة. تؤثر هذه القضايا على جودة البيئة الطبيعية والعمرانية التي يعيش فيها الناس ويعملون