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Assessing Galala City as Infra Habitation: Gaps, Challenges and Opportunities for Sustainable Human Settlements

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Abstract

This study evaluates Galala City as a contemporary example of Infra Habitation, focusing on how its infrastructure supports sustainable and resilient human settlement. Using established assessment tools—including the InVEST Habitat Quality Model, Habitat Suitability Modelling, the Habitat Hectare Method, rapid assessment protocols, and the Disaster Habitation Model—the research develops a tailored Infra Habitation framework for Galala. Findings show that while the city exhibits strong engineered infrastructure, including highways, tunnels, and a desalination-based water system, significant gaps persist in ecological integration, mixed-use development, public transit, and social services. The analysis highlights weaknesses in walkability, housing diversity, vegetation cover, and long-term livability. A preliminary Infra Habitation scorecard identifies priority areas for improvement, particularly in environmental restoration, neighborhood planning, and mobility systems. The study concludes by proposing strategic actions to guide Galala's evolution into a more inclusive, ecologically responsive, and human-centered city aligned with UN-Habitat principles.

Keywords: Infra Habitation, Galala City, habitat assessment, urban infrastructure, sustainable human settlements, desert-coast urbanism, mixed-use neighbourhoods, resilience.

1. Introduction

This paper assesses the state of infra-habitation at Galala City, Egypt, and its ability to support a sustainable human settlement. Because the city was rapidly constructed, it provides a real-world example of a habitat with strong engineered infrastructure but lacking social, environmental, and service-based layers. The paper aims at bridging conceptual theory with applied evaluation via a scorecard methodology. Galala, as a new coastal city built from scratch on a plateau between sea and mountains, represents a large-scale attempt to create a new human habitat. The study stems from personal experience and observations of lack of vitality and population at Galala City due to absence of basic services and amenities. The aim of the city was to develop a new city centered around a large university campus serving 25000 students as a focal point of development. Field observations conducted between 2020–2026 indicate limited permanent occupancy outside university-related activities. The questions posed by this the study are: To what extent does Galala City fulfill Infra Habitation principles? What gaps exist between infrastructure provision and livability outcomes? How can Infra Habitation assessment models support sustainable development evaluation in new Egyptian cities? The results and recommendations will help improve the vitality of the city and support the government efforts to attract investment and development to the city.

2. Background

2.1. Infra Habitation

"Infra Habitation" refers to the infrastructure of human habitats (cities, towns, and settlements), which involves the physical and organizational structures needed to support human life and well-being. This includes aspects like housing, urban planning, public services, and the infrastructure that enables sustainable urbanization, as promoted by organizations like UN-Habitat, that works to promote socially and environmentally sustainable towns and cities worldwide. This includes ensuring the basic right to adequate shelter and reflecting on the future of human habitats. It covers everything from roads and water systems to the design of buildings and the planning of urban spaces. It addresses the challenges of rapid urbanization, such as providing adequate housing, managing resources, and reducing pollution, to create livable and resilient cities for the future.

Figure (1) illustrates the Infra Habitation framework, in which infrastructure, sustainability, and human settlements are treated as interdependent and co-constitutive components rather than isolated domains. Infrastructure provides the enabling physical and organizational systems that shape settlement form and accessibility; human settlements represent

the spatial and social expression of these systems; and sustainability operates as the regulating logic that evaluates resource efficiency, environmental impact, and long-term resilience. Their interaction forms an integrated analytical structure that directly informs the proposed Scorecard later in the paper, where each component is translated into measurable indicators assessing performance across environmental, spatial, and socio-technical dimensions.

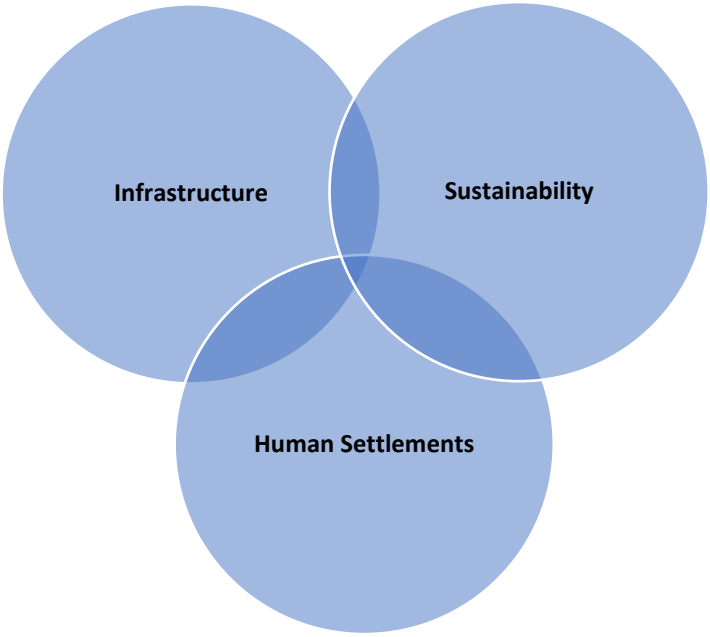


Figure 1. Elements of Infra Habitation (Developed by the Authors).

2.2. Infra Habitation assessment models

Infra Habitation assessment models refer to quantitative tools and methodologies used to evaluate the suitability, quality, or condition of a habitat, often in the context of infrastructure development or environmental changes. These models help assess environmental impact, guide development decisions, and plan future efforts. Common models and approaches include:

2.2.1. InVEST Habitat Quality Model: The Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST) model is a widely used tool that uses land-use data and proximity to human threats (like roads or urban areas) to calculate a habitat quality index. This model is valuable for spatializing natural capital and informing land management decisions, including urban planning. InVEST can be used to assess Galala City for habitat loss due to construction on mountain plateau, impact of new roads and urban footprint on natural areas and biodiversity fragmentation. The outputs can show areas where development pressures degrade natural habitat and ecological corridors need protectionThis reveals the environmental cost of the new city.

2.2.2. Habitat Suitability Modeling (HSM): These are statistical methods used to predict the suitability of an area for a specific species based on environmental factors like elevation, vegetation, and water resources. They often use Geographic Information Systems (GIS) to map areas of potential habitat. This method can be useful for evaluating if native species (mountain goats, desert flora, migratory birds) can survive after urbanization and understanding which zones must remain undeveloped. A GIS-based map could show suitable vs. unsuitable areas for urban growth and critical ecological zones.

2.2.3. Habitat Hectare Method: This is a site-based vegetation assessment method that measures the condition of native vegetation against an established benchmark for specific vegetation type. This method can evaluate vegetation condition before and after development and suggest opportunities for restoration (wadis, coastal green corridors) that would help in setting ecological benchmarks for the city.

2.2.4. Rapid Assessment Protocols: Many agencies use rapid assessment methods, which involve rating various habitat conditions as optimal, suboptimal, marginal, or poor based on criteria described in survey data sheets (e.g., the US EPA's Rapid Bioassessment Protocols Manual). If applied to Galala, it can quickly show water quality around desalination discharges, coastal and mountain habitat conditions and urban public space quality that can be transformed into an Infra Habitation Scorecard.

2.2.5. Disaster Habitation Model (DHM): A specific model developed by the US Army Corps of Engineers (USACE) for quantifying the "habitation" impacts (return to normal daily activities and pre-event conditions) of disaster mitigation projects, combining the impacts of critical internal infrastructure systems within a community. This is relevant to Galala City because it is exposed to flash floods (mountain runoff), harsh winds and water supply risks. It can be used to evaluate resilience of infrastructure and ability of the city to maintain function during extreme events.

The above models typically require various data inputs, which may include:

- Land use and land cover data.
- Threat sources (e.g., roads, railways, urban areas).
- Species-specific requirements (e.g., food, water, cover, space).
- Topographic data (e.g., elevation, slope).
- Hydraulic indicators (for aquatic habitats) like water depth and velocity.

Galala City fits the theme of Infra Habitation because it sits at the intersection of:

- Housing + Infrastructure planning
- Urban systems in a challenging topography
- Sustainability, livability, and resilience
- Human settlements and UN-Habitat principles

2. 3. Context: Galala City development strategy

Galala Plateau is one of the main projects that intend to distribute the economic and population concentration away from the Nile Valley to new desert communities. The region is rich in raw materials and minerals. Galala limestone has been increasingly popular for building and ornamental applications and very famous in the world by many commercial names, Galala White, Galala Golden, Galala Cream and Galala Classic. Galala Mountain was selected due to its strategic location 700 meters above sea level overlooking the Gulf of Suez which allows for the construction of touristic facilities and mountain roads. The project that started as a tourism and leisure project evolved to become a major comprehensive development project due to the natural wealth of the region. The project is supervised by the Armed Forces Engineering Authority, in cooperation of the civil sector.

Figure 2. Galala City Location (Developed by the Authors).

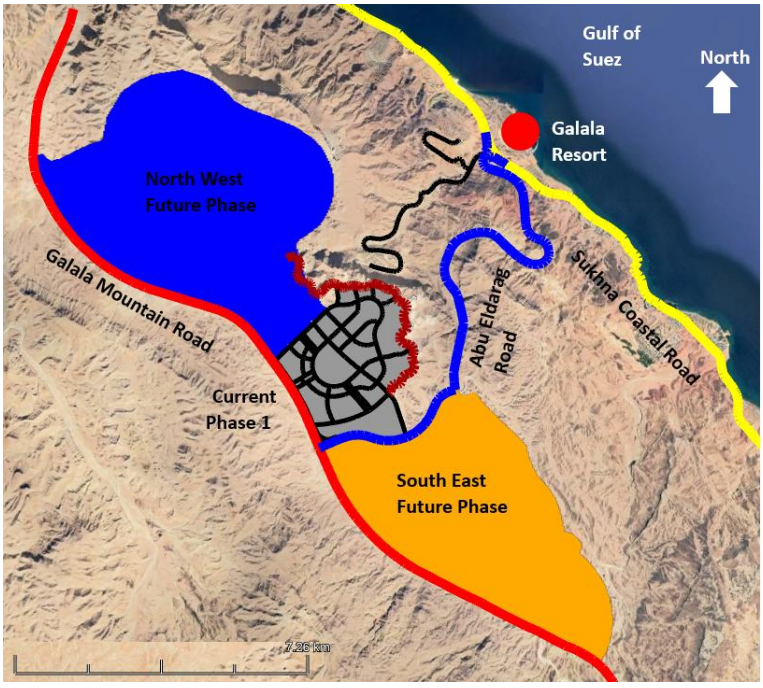
Figure 3. Galala City Leading Roads (Developed by the Authors).

Figure 4. View from Galala Plateau Corniche (Developed by the Authors).

2. 4. Context: Galala City development strategy

Galala City master plan aims to create sustainable, active, mixed-use public transit, new road systems, and public spaces that consider the existing ecological conditions. (Mahgoub, 2022) The first of the three phases of the city comprises a total of 2,372 acres and includes a variety of activities. Residential districts, touristic villages, and commercial, cultural, medical, educational, and religious institutions are all included. These institutions are linked to the project's public arena, which houses the convention downtown as well as the city's largest mosque. The consultant SITES International office was in charge of the infrastructure that comprised irrigation, sewage treatment plants, massive water tanks, and preparations for solar-powered illumination in public spaces. The city's masterpiece is the breathtaking 6-kilometer mountain plateau corniche walkway, with a drop of 200 meters. In addition to affording fascinating perspectives of the neighbouring residential and tourist settlements, the promenade features vantage points of the Galala plateaus, Gulf of Suez and Sinai Peninsula. A cycling track, a mix of cafes, restaurants, pedestrian routes, and covered lounging places are provided.

The mountain city is connected to the seaside Galala Resort by a cable car, while its architectural character reflects the distinctive coastal mountain environment. Building materials sourced from Red Sea quarries and environmentally responsive landscape design contribute to the city's sustainable approach. Indigenous and semi-indigenous plants, trees, and ground cover are integrated with treated water reuse and efficient water-conservation irrigation systems to minimize environmental impact and protect the surrounding ecosystem with minimal alteration. (Mahgoub, 2022)



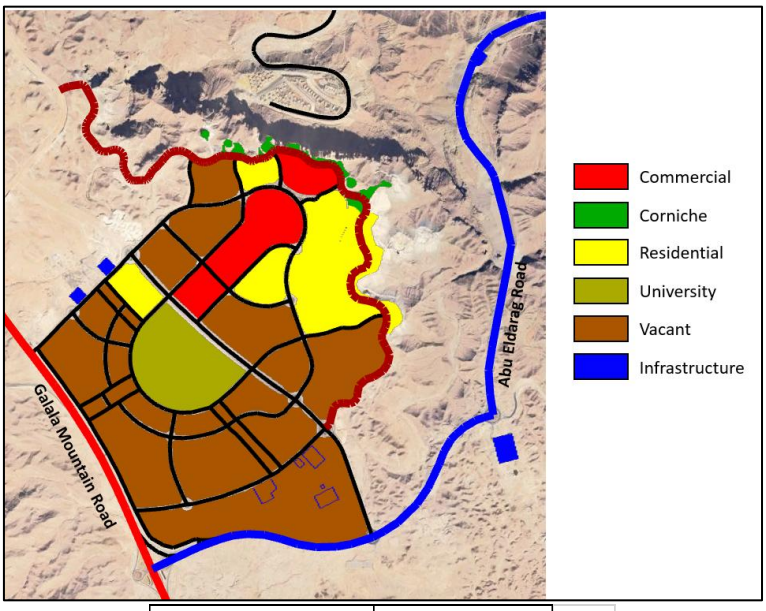
Phase	Area in Acres	
Current Phase	2,372	15%
Future SE Phase	5,800	37%
Future NW Phase	7,634	48%
Total	15,806	

Figure 5. Galala City Master Plan Areas (Developed by the Authors).

2. 5. Spatial Planning of Galala City

Galala City Master Plan is composed of 3 phases. Construction of the first phase, the central part of the master plan, started in 2018. Galala University is the largest, and only operational development so far, and occupies the central part of the first phase. The current first phase of the city comprises a total of 2,372 acres (15% of the total master plan), of which the university occupies an area of 173 acres (7% of phase 1 area). Galala Downtown, a large governmental development composed of several independent buildings connected by underground parking, is located east of Galala University. It is a 130-acre development that includes residential, commercial, and retail spaces. The project is also home to several amenities, including a central park, a dancing fountain and a large mosque. The project is not operating yet and all the fully finished buildings are still vacant. The Galala Plateau Corniche is a planned 19-kilometer-long waterfront promenade. The corniche offers stunning views of the Red Sea and the mountains of the Galala Plateau. It also features several amenities, including restaurants, cafes, shops, and public spaces. The Galala Plateau Corniche is expected to become a major tourist destination in Egypt. Galala City contains several large residential developments that offer a variety of housing options, including apartments, townhouses, and villas inside gated communities. They feature a variety of amenities, including swimming pools, gyms, and security systems. Several fully finished gated communities are not occupied yet. Sky City is a large mixed-use development located in Galala City, Egypt. It is a 247-acre development that includes residential, commercial, and retail space. It provides its residents with a panoramic view of the Red Sea and the mountains of the Galala Plateau.

Figure 6. University (UL), Downtown (UR), Plateau Corniche (LL) and Sky City (LR).
(Developed by the Authors).



Land Use	Area in Acres	%
Corniche	30.18	1%
Galala University	173.00	7%
Commercial	185.50	8%
Housing	327.00	14%
Vacant	905.99	38%
Total no roads	1,621.67	68%
Roads	750.33	32%
Total with roads	**2,372.00**	

Figure 7. Galala City Phase 1 Master Plan. (Developed by the Authors).

2. 6. Development Phases and Socioeconomic Challenges

Key milestones of the construction of Galala City:

- 2014: Decision to establish the city
- 2015: Construction of the city begins.
- 2017: The 82-kilometer-long Al Galala Mountain Road is opened.
- 2020: Galala University accepts its first batch of students.
- 2025: The first phase of the project was expected to be completed.
- 2030: The city was expected to be fully completed.

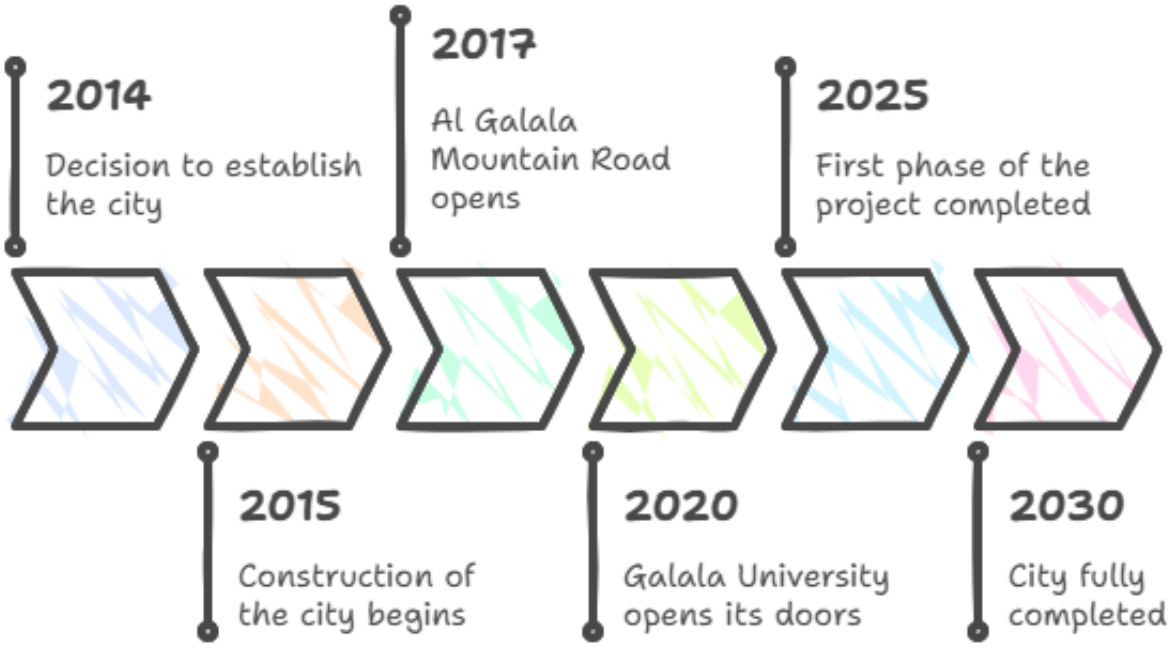


Figure 8. Galala City Timeline. (Developed by the Authors).

There are several vacant lots surrounding Galala University and are ready for development. At the beginning of the project, vacant lots were occupied by temporary construction workers living in informal, temporary buildings and shanty towns. The situation of the construction workers was a complex one. On the one hand, they provided an essential labour force for the construction sites in the city. On the other hand, they were living in substandard conditions and were at risk of eviction anytime. This area was called “Alezba”, by the local community, and was a source of illegal activities and health hazards. It was a clear illustration of the "Inclusivity & Affordability" gap in the planning of the city.
Several factors contributed to that situation. First, the pace of development in Galala City was very rapid, and the construction companies did not provide appropriate housing for the workers. Second, construction workers were often migrants from other governorates who did not have the resources to build or rent formal housing. Third, the land on which they were living was expected to be developed for residential or commercial purposes soon.
It is noticeable that the planning of the city lacks the provision of low-cost housing for workers and lower economic groups. In 2021, the government announced a plan to provide formal housing to 10,000 construction workers in Galala City. However, the plan was not implemented, and it is unclear how many of the workers will benefit from it. The government needs to provide more affordable housing options for the workers so that they can move out of informal settlements.

2. 7. Current Condition of Galala City

The only occupied part of the city is the university campus. The university enrolled approximately 1,500 students in the 2020–2021 academic year, with around 60% concentrated in medical disciplines. This number doubled to roughly 3,000 students in 2021–2022, reflecting a rapid early expansion phase. By 2022–2023, the student body had grown to about 5,000 students distributed across 13 faculties offering 36 academic programs. In the current 2025–2026 academic year, enrollment has further increased to approximately 16,000 students across 66 programs, indicating sustained institutional scaling and diversification of academic offerings. Looking ahead, the total student population is projected to reach around 25,000 by 2030, underscoring the university’s continued trajectory of growth and academic expansion.
Most of the students and faculty members commute daily from Cairo and nearby cities using minibuses or private cars. Some of them live in Ain Sukhna resorts, especially Porto Sukhna Towers on the waterfront. Approximately 1600 students and faculty members lived in the university dorms at 2020. In Spring 2023, the university rented several new rooms in the newly built Sky City project adding 1000 more places for the students, that was increased to 8000 places in Fall 2026. The university investigates all possibilities to increase the number of available accommodation places on campus. With the expected increase during the coming years, the university will need more places to accommodate its increasing population. The problem is that all the city plots are allocated for large size development and specific use while no plots are allocated for private and small development. There are no functioning facilities around the university. (Mahgoub, 2023) This makes the "Weakness" of limited services more concrete.
In summary, Galala City is a visionary development that embraces its natural surroundings and aims to create a distinctive urban identity. The Galala Plateau Corniche showcases a harmonious blend of natural stone and wood, encouraging social interaction and walkability. Positioned 700 meters above sea level, it offers breathtaking views of mountains and the coast, providing a unique experience that combines cultural heritage with scenic beauty. Galala Downtown exhibits a unified architectural style with sloping pitched roofs, vibrant colours, and water features, reflecting a forward-looking approach to building the future. Galala University stands out with its elegant marble and granite cladding, emphasizing a commitment to excellence and innovation. The Residential Compounds boast a European resort-like ambience with modern designs inspired by various international styles. Galala City's Landmarks and Roundabouts feature distinctive shapes and materials, symbolizing a bright future ahead. While the wide streets and roads may discourage walkability, the city's geographical distinctiveness and natural charm remain alluring. The integration of landscape and urban furniture at Galala Plateau Corniche enhances the environment's beauty, with the city striving to meet high international standards in creating new urban communities.

3. Method: Proposed Infra Habitation Assessment Framework for Galala

3.1. Infra Habitation assessment framework for Galala City

The proposed Infra Habitation assessment framework for Galala City includes the following dimensions:
3.1.1. Environmental Infrastructure: Assesses the ecological foundations of Galala including land disturbance, water sustainability, native vegetation preservation, and environmental mitigation efforts.
This dimension aligns with UN-Habitat Urban Environment indicators and SDG 11.6 (Environmental impact reduction).
3.1.2. Urban Infrastructure & Services: Measures the quality and completeness of physical infrastructure (transport, water, energy), social services (health, education), and housing diversity. Linked to SDG 9 (Infrastructure) and UN-Habitat City Prosperity Index – Infrastructure Development.
3.1.3. Urban Form & Built Environment: Evaluates how well the city’s built form supports urban life—density, connectivity, mixed use, walkability, and public spaces. Reflects UN-Habitat Public Space Index and SDG 11.3 (Inclusive urbanization).
3.1.4. Resilience & Risk Management: Covers natural hazard mitigation (floods, heat), energy reliability, stormwater systems, and redundancy of critical infrastructure. Aligned with UNDRR frameworks, SDG 13 (Climate Action), and SDG 11.5 (Disaster resilience).
3.1.5. Livability & Human Experience: Focuses on the human scale: comfort, social life, inclusivity, culture, and everyday experience. Connected to UN-Habitat Livability Index and SDG 11.7 (Safe, inclusive public spaces).

Figure 9. Infra Habitation assessment framework. (Developed by the Authors).

3.2. Galala Infra Habitation Scorecard

An evaluation tool for assessing the suitability, quality, and sustainability of Galala City as a human habitat was developed based on the Rapid Assessment Protocols system. The scoring process was developed through a hybrid evaluative approach combining direct field observations with quantitative benchmarks. Fieldwork provided grounded qualitative insights into the performance of infrastructure, settlement patterns, and sustainability indicators in real contexts, capturing conditions that are often not fully reflected in secondary data. These observations were then systematically translated into measurable criteria and aligned with established quantitative thresholds drawn from relevant planning and sustainability standards. The resulting scorecard ensures a balanced assessment framework that integrates empirical, context-sensitive understanding with comparable, data-driven evaluation metrics. Its rating involved assessing various habitat conditions as optimal (4), suboptimal (3), marginal (2), or poor (1) based on criteria described above. The assessment was as follows:

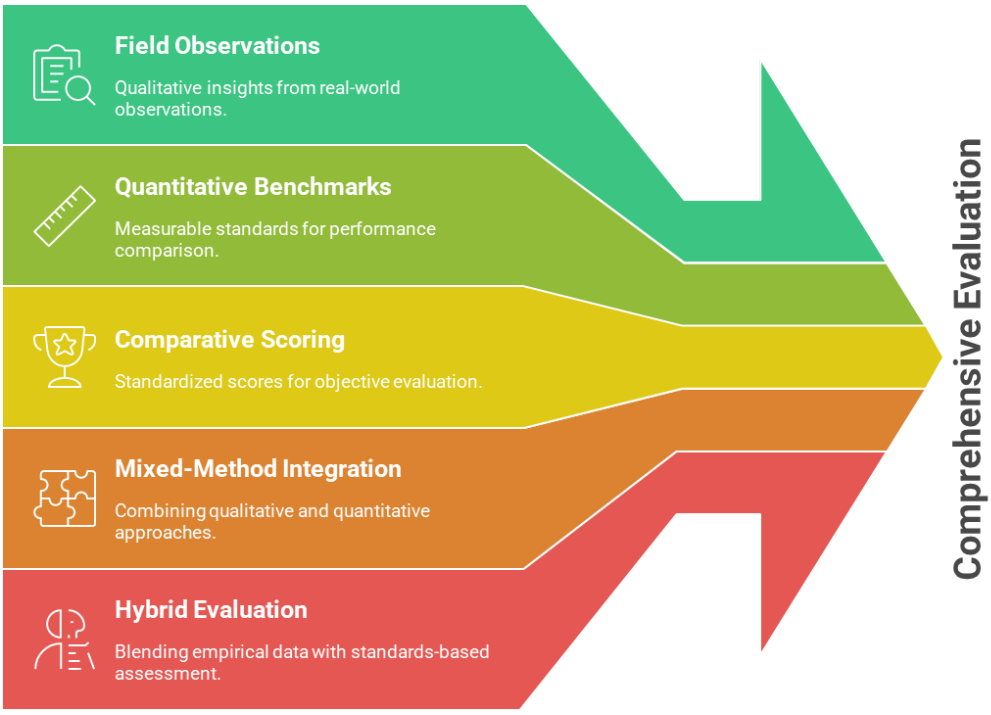


Figure 10. Mehodology. (Developed by the Authors).

3.2.1. Environmental Infrastructure (0–20 points)

Sub-Criterion	Description	Score (0–4)	Notes
Ecological Integrity	Protection of native habitat, biodiversity corridors	**1**	Heavy modification of mountain terrain; limited ecological buffers
Water Sustainability	Water production efficiency, recycling, stormwater management	**2**	Reliance on desalination; limited reuse systems
Green Infrastructure	Vegetation cover, climate-responsive landscape	**1**	Minimal greenery; weak microclimate strategy
Environmental Impact Mitigation	Measures to reduce land degradation	**2**	Some protection zones exist; implementation inconsistent
Total (20)	—	**6/20**	**Low** environmental resilience

3.2.2. Urban Infrastructure & Services (0–20 points)

Sub-Criterion	Description	Score	Notes
Mobility Systems	Public transport, pedestrian networks	**1**	Mainly car-dependent
Connectivity & Accessibility	Internal and external connections	**3**	Excellent highways; weak internal mobility
Housing Diversity	Range of typologies, affordability	**1**	Mostly touristic or investment housing
Public Services Availability	Universities, schools, clinics, municipal services	**2**	Developing but still limited for a "city"
Total (20)	—	**7/20**	**Weak–Developing**

3.2.3. Urban Form & Built Environment (0–20 points)

Sub-Criterion	Description	Score	Notes
Mixed Land Use	Integration of residential, commercial, institutional zones	**2**	Mostly segregated zones
Density & Compactness	Efficient land use, walkability	**1**	Low density; dispersed layout
Urban Continuity	Spatial integration, avoiding fragmentation	**1**	Gaps between zones; disconnected nodes
Public Space Quality	Usable parks, plazas, and social spaces	**2**	Some public spaces exist but lack activation
Total (20)	—	**6/20**	**Fragmented urban structure**

3.2.4. Resilience & Risk Management (0–20 points)

Sub-Criterion	Description	Score	Notes
Disaster Risk Management	Wadi flooding, stormwater, slope stability	**2**	Measures exist but not fully integrated
Energy Reliability	Redundancy, renewables	**2**	High reliability but low renewable adoption
Critical Infrastructure Resilience	Water, power, transport durability	**3**	Strong engineering base
Climate Adaptation	Heat mitigation, environmental buffers	**1**	Limited shading/green cover
Total (20)	—	**8/20**	**Moderate** resilience but not optimized

3.2.5. Livability & Human Experience (0–20 points)

Sub-Criterion	Description	Score	Notes
Social Vibrancy	Daily life, population presence, community activity	**1**	Very low permanent population

Sub-Criterion	Description	Score	Notes
Comfort & Microclimate	Shade, walkability, thermal comfort	**1**	Harsh microclimate; minimal shading
Inclusivity & Affordability	Accessibility to different income groups	**2**	Mostly mid/high-income housing
Cultural & Recreational Quality	Public events, cultural identity	**2**	Some university activities but not continuous
Total (20)	—	**6/20**	**Low–Developing** livability

3.2.6. Summary of Scores

Dimension	Score	Interpretation
Environmental	**6/20**	Low resilience & ecological integration
Urban Infrastructure	**7/20**	Developing but still weak
Urban Form	**6/20**	Fragmented, car-dependent
Resilience	**8/20**	Good engineering, weak adaptation
Livability	**6/20**	Limited social life & comfort
Final Score	**33/100**	

This places Galala City at category: Developing Habitat (Infra Habitation Level 3 of 5). Meaning that Galala has strong engineered foundations but lacks the ecological, social, and urban layers needed to become a fully functional, sustainable, and livable human habitat.

3.2.6. Key Takeaways from the assessment

- Excellent primary infrastructure, but weak urban experience.
- High engineering investment but low environmental performance.
- Fragmented urban form preventing the development of a real community life.
- Requires major improvements in mobility, greenery, microclimate, and social services.

4. Findings: Environmental & Urban gaps

Analysis of strength, weaknesses, opportunities and challenges of Galala City produced the following:

Figure 11. SWOC Analysis assessment. (Developed by the Authors).

5. Conclusions

This study evaluated Galala City as a contemporary example of Infra Habitation, examining the relationship between engineered infrastructure, urban form, environmental sustainability, and human livability. The assessment revealed that although the city possesses strong primary infrastructure, including highways, tunnels, desalination systems, tourism facilities, and institutional investments, it still lacks several critical components necessary for a fully functioning and sustainable human settlement.

The findings indicate that Galala City currently operates more as a resort and institutional cluster than a socially integrated urban environment. The absence of permanent residents, limited economic activities, weak social infrastructure, and fragmented land-use planning have reduced urban vitality and community cohesion. The predominance of gated developments and low-density spatial organization has further reinforced automobile dependency and limited walkability.

Environmental challenges were also identified, including ecological disruption caused by large-scale terrain modification, limited vegetation cover, dependence on energy-intensive desalination, and insufficient integration between the built environment and the surrounding mountain and coastal ecosystems. In addition, the study highlighted the need for improved governance mechanisms, affordable housing, social inclusion, disaster preparedness, and economic diversification.

Despite these challenges, Galala City possesses significant development potential due to its strategic location, university population, completed infrastructure, and opportunities for tourism, research, and renewable energy investment. With appropriate planning interventions and long-term governance strategies, the city can evolve into a more resilient, inclusive, and sustainable urban settlement.

6. Recommendations

To improve the vitality, sustainability, and livability of Galala City, the following recommendations are proposed:

6.1. Urban and Social Development

- Create mixed-use neighborhoods instead of isolated gated communities to encourage social interaction and urban vitality.
- Introduce a variety of development scales, including large, medium, and small projects, to diversify housing opportunities and attract different economic groups.
- Develop permanent housing and community facilities, including schools, healthcare centers, entertainment venues, and public services.
- Address the needs of informal and migrant workers through affordable housing and inclusive planning strategies.
- Promote social cohesion through inclusive urban policies accommodating different income levels and demographic groups.

6.2. Economic Development

- Diversify the city's economic base beyond tourism and higher education to improve long-term economic stability.
- Encourage private investment and entrepreneurship through incentives supporting different business sectors and scales.
- Activate vacant economic and commercial facilities to stimulate urban life and employment opportunities.
- Strengthen partnerships between the university, nearby industries, resorts, and businesses to support innovation and knowledge-based development.

6.3. Environmental Sustainability

- Restore wadi ecosystems and establish ecological corridors linking the mountain, plateau, and coastal zones.
- Expand native drought-resistant landscaping and green infrastructure to improve environmental performance and microclimatic comfort.
- Improve water conservation systems, wastewater reuse, recycling, and waste management practices.
- Integrate renewable energy systems and microgrids to reduce dependence on conventional energy sources.

6.4. Mobility and Urban Form

- Improve walkability through shaded pedestrian networks, bicycle routes, and human-scaled public spaces.
- Introduce electric shuttle buses and transit nodes connecting the university, residential districts, resorts, and commercial areas.
- Encourage compact urban development and mixed-use planning appropriate for hot arid climates.
- Reduce automobile dependency by prioritizing sustainable transportation systems and complete streets.

6.5. Governance and Resilience

- Establish effective governance structures and monitoring systems for long-term urban management.
- Strengthen disaster preparedness and climate adaptation strategies related to flooding, heat, and infrastructure resilience.
- Encourage stakeholder participation in spatial planning processes, including universities, residents, businesses, and tourism operators.
- Sequence infrastructure and service implementation to accelerate the transition from construction phase to fully operational city life.

7. Lessons for Egyptian New Cities

The Galala City case study offers important lessons for the planning and development of new cities in Egypt and other developing countries. The study demonstrates that providing large-scale engineered infrastructure alone is insufficient to create successful human settlements. Urban livability depends equally on social integration, economic diversity, governance capacity, environmental sustainability, and everyday human experience.

One key lesson is the importance of establishing governance structures early in the development process to coordinate growth, manage services, and support long-term urban resilience. New cities must also provide diversified housing options accommodating different economic groups, including workers and low-income residents, to avoid social exclusion and fragmented urban communities.

The case further highlights the necessity of balancing land-use separation with mixed-use urban environments that encourage walkability, social interaction, and local economic activity. In hot arid regions such as Galala, compact urban form, shaded pedestrian systems, and sustainable mobility networks are essential for improving comfort and reducing automobile dependency.

Another critical lesson is the need to align construction sequencing with operational functionality. Large completed facilities without active economic and social use may result in resource underutilization and urban stagnation. Attracting permanent residents requires parallel investment in jobs, services, healthcare, education, recreation, and cultural activities. Finally, the study emphasizes the importance of integrating environmental sustainability into all stages of planning and development. Protecting natural ecosystems, enhancing green infrastructure, improving resource efficiency, and strengthening climate resilience are fundamental requirements for future Egyptian cities seeking long-term sustainability and resilience.

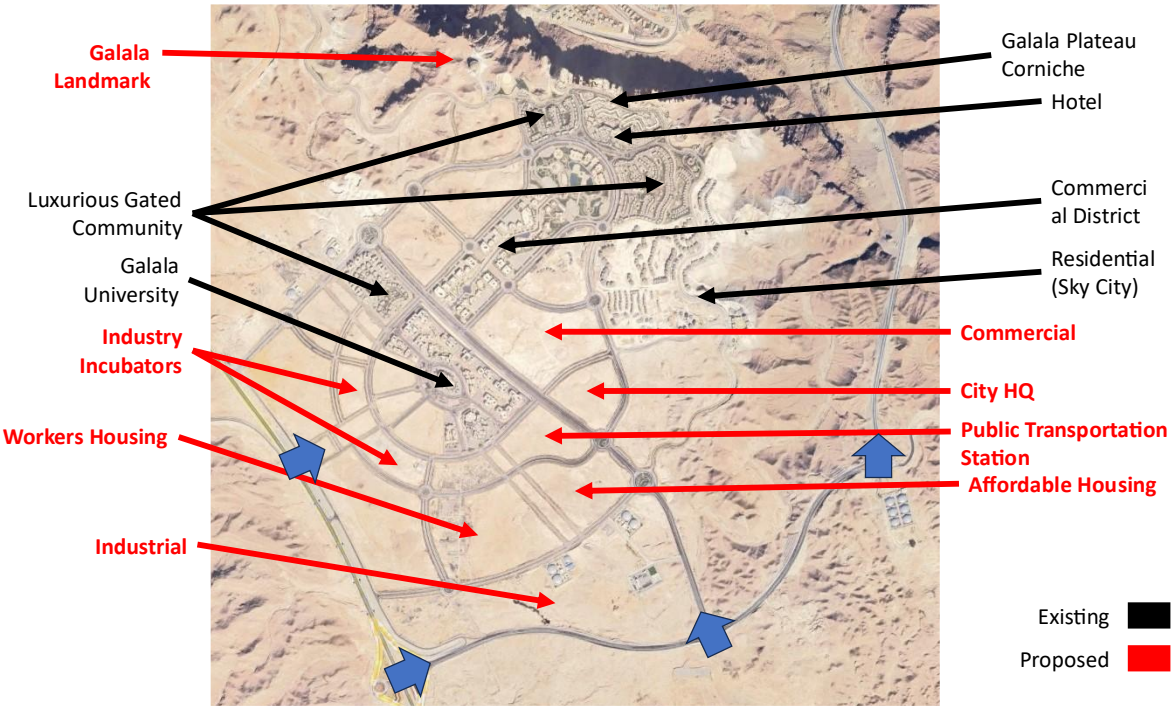


Figure 12. Galala City Development Proposal. (Developed by the Authors).

By implementing these recommendations, Galala City can enhance its development, foster economic diversity, improve the landscape, prioritize walkability, optimize land use, and ensure stakeholder engagement. This will contribute to creating a well-rounded and sustainable city that promotes a high quality of life.

Galala City stands out with its distinctive features and specific challenges. The strengths of the city include its university population, which brings a vibrant intellectual and cultural atmosphere. Additionally, Galala City hosts ample completed facilities, providing potential for economic and leisure activities. However, there are notable weaknesses that need to be addressed. The lack of residents, apart from the university population, is a significant limitation that hampers social diversity and community dynamics. Furthermore, the absence of economic activities and non-occupied economic facilities indicate an underutilization of resources. Galala City presents several opportunities for growth and development. Initiating economic and leisure activities can activate unused economic facilities and attract residents and businesses to the area. Diversifying the population by attracting families, retirees, and other demographic groups can help create a more balanced social structure. Leveraging the presence of the university population, Galala City can foster innovation, research collaborations, and knowledge-based industries. Partnerships with businesses and organizations can further promote economic development and investment in the city.

However, Galala City also faces challenges and potential threats. The delay in operating economic facilities may impede progress and financial viability. Completed facilities without use can lead to resource waste and contribute to a stagnant environment. Attracting a diverse residential population may be difficult due to the limited demographic profile and absence of certain age groups. Balancing the needs of temporary workers with the long-term development goals of the city presents an ongoing challenge. Galala City possesses unique strengths, such as its university population and completed facilities. However, there are weaknesses related to the lack of residents and non-occupied economic

facilities. With appropriate measures, Galala City can capitalize on opportunities for economic growth and social development. Nonetheless, challenges remain, including facility delays and the need to attract a diverse population. By addressing these factors, Galala City can work towards its full potential and create a thriving and inclusive urban environment.

Lessons from the Galala City case study can be applicable in other new cities in Egypt and beyond. The repeatability of the Responsible Cities concept allows for the creation of a network of sustainable and well-designed cities, each tailored to their local needs but guided by shared principles. This can result in a more widespread implementation of sustainable urbanism and architecture, leading to improved living conditions, reduced environmental impact, and increased resilience in the face of future challenges. Mutisya and Yarime argue that "Governance remains a critically important dimension of urban sustainability, especially when discussing urbanization in developing countries, given rapid population movements and imbalances in socio-economic development. For urban sustainability in developing countries, more emphasis should be placed on the governance dimension, because this is where the biggest challenge exists, with increasing needs for immediate management of rapid urbanization." (Mutisya & Yarime, 2013)

The case of Galala City offers valuable insights applicable to both 4th generation cities and new urban developments worldwide. Establishing effective governance structures and institutions is a pivotal initial step in the evolution of new cities. Ensuring a diversified range of housing options becomes imperative to cater to various economic strata, thereby fostering inclusivity. Furthermore, it is crucial to address the residential, commercial, and recreational needs of low-skilled labourers during and post-construction phases. Prioritizing job creation and business prospects emerges as a foundational principle for attracting and retaining permanent inhabitants. Strengthening essential amenities such as healthcare, education, and leisure facilities is vital for enhancing residents' overall quality of life. Sequencing the construction of distinct infrastructure components becomes indispensable to expedite the city's functional commencement. The active involvement of current and potential stakeholders, integrated from the outset of design and execution, plays an instrumental role in the success of the city. Engaging stakeholders through consultations, workshops, and feedback mechanisms ensures their perspectives are incorporated, fostering a more inclusive and well-informed decision-making process. In regions characterized by hot and arid climates, such as Galala City, adopting a mixed-use and compact design approach emerges as prudent. Minimizing reliance on automobiles and prioritizing pedestrian-friendly and sustainable transportation modes contributes to a more environmentally conscious urban fabric.

8. Limitations and Future Research

This study was subject to several limitations related to data availability, the evolving condition of Galala City, and the partly observational nature of the assessment process. Although the proposed Infra Habitation scorecard combines field observations with established assessment frameworks, some evaluation criteria relied on qualitative judgment due to the limited availability of comprehensive demographic, environmental, and operational datasets. In addition, Galala City is still under development, and current urban, social, and economic conditions are expected to change as future phases are completed and population levels increase. Therefore, the assessment presented in this paper should be considered a preliminary evaluative framework rather than a final measurement of long-term urban performance. Future research could strengthen the proposed framework through the integration of Geographic Information Systems (GIS) analysis, occupancy and population distribution modeling, mobility and transportation simulations, and ecological performance metrics capable of quantitatively evaluating environmental resilience, land-use efficiency, biodiversity impacts, and long-term sustainability performance. Comparative studies involving other Egyptian new cities may also contribute to developing more comprehensive planning and governance approaches for sustainable desert urbanism.

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