



Architecture and Sustainability: Case Studies from Cairo's Downtown and Nubia-Aswan towards Achieving the UN Sustainable Development Goals

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Keywords

Sustainability; Built
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Abstract: As the global community strives to address the pressing challenges of environmental degradation and social inequality, the role of architecture in promoting sustainable development has gained unprecedented significance. This paper explores the intrinsic connection between architecture and sustainable development, focusing on Egypt as a case study. The research follows theoretical and practical application methodology, where case studies and solutions are applied. Egypt, with its rich historical heritage and rapidly urbanizing cities, presents a unique context to investigate how the built environment can contribute to achieving the Sustainable Development Goals (SDGs) outlined by the United Nations. This study adopts a multidisciplinary approach, integrating architectural analysis, urban planning principles, environmental science, and social studies to examine the various ways in which architecture influences and interacts with sustainability goals. Case Studies include two locations in Egypt as future concepts to solve problems: Downtown Cairo and Nubia-Aswan, where ideas were introduced towards a better quality of life. The findings of this research underscore the importance of collaboration between various stakeholders, such as government bodies, non-governmental organizations, architects, and the public, to create a holistic approach to sustainable architectural design and urban planning towards resilient communities. The paper also emphasizes the need for education and awareness campaigns to foster a culture of sustainability within the architectural and construction sectors. Proposed projects were introduced in the International Union of Architects (UIA) World Congress of Architects in Copenhagen 2023 and published in UIA Guidebook 2030.

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1. Introduction

The built environment stands as a pivotal force, shaping our world in multifaceted ways. However, its impact extends beyond aesthetics; it influences energy consumption, resource utilization, community well-being, and societal equity [1]. As urbanization accelerates, the role of Architecture becomes increasingly vital in driving Sustainable Development. This study explores Architecture's potential to support the 17 Sustainable Development Goals (SDGs) of the UN, highlighting the revolutionary role architects play in promoting Sustainable Cities and Communities [2]. In an era marked by unprecedented global challenges, decreasing biodiversity, and population growth; the concept of Sustainability has emerged as a central theme, driving discussions across various disciplines and industries [3]. At the forefront of this discourse lies the built environment, encompassing Architecture, Urban Planning, and Design, which not only shapes the physical landscapes but also influences the socio-economic and environmental fabric of societies [4]. As nations strive to address pressing issues such as climate change, resource depletion, and social inequality, endeavor to tackle persistent matters such as social inequality, climate change and resource depletion, the built environment's role in achieving Sustainable Development Goals (SDGs) has gained paramount significance [5], Fig. (1).



Fig. 1: Sustainable Development Goals [6].

Environmental Architecture today gathers a wide and heterogeneous series of principles and draws on concepts from a variety of disciplines [7]. Energy Sustainability is a challenge for

a developed and sustainable world [8]. This paper embarks on a journey to explore the relationship between Architecture and Sustainable Development, focusing on the unique context of Egypt. Situated at the crossroads of history and rapid urbanization, Egypt presents a compelling case study to examine how architecture can contribute to the pursuit of SDGs [9]. This study aims to untangle the various avenues through which architecture can promote Sustainable practices. By analyzing existing literature and real-world case studies, to uncover key areas where Architectural interventions can yield positive outcomes. These areas include energy-efficient design, water management strategies, waste reduction practices, inclusive and accessible design, affordable housing solutions, and the preservation of cultural heritage.

Architects have the responsibility and opportunity to guide humanity toward a Sustainable future where the negative impacts of climate change are reduced, as buildings have more of an environmental impact than any other human activity [10]. To contextualize our research, we consider prominent policy frameworks, regulations, and initiatives that have been enacted in Egypt to propel sustainable architectural practices forward. Recognizing that the implementation of sustainable design principles often encounters challenges, investigate into the hurdles faced by architects, urban planners, policymakers, and local communities [11]. Through this research, aspire to illuminate the pivotal role of architecture in shaping Egypt's sustainable development goals, while also contributing to the broader discourse on sustainable built environments. By highlighting both challenges and opportunities, to inspire meaningful shifts in architectural practices, urban planning strategies, and policy frameworks, not only within Egypt but also worldwide. As Architecture stands at the crossroads of innovation and tradition, it presents a pathway to a more sustainable and harmonious future [12].

1.1. Aim of research

The research aims to tackle built works related to Sustainable Development Goals in all categories, through the following:

- Investigate and analyze the role of Architecture and the built environment in contributing to the achievement of Sustainable Development Goals (SDGs) in Egypt.
- Spotlight the indispensable role architects play in steering our trajectory towards sustainable cities and communities. By investigating innovative Architectural solutions and strategies, seek to uncover how Architecture can serve as a catalyst for achieving the SDGs.
- Envision the future by proposing Architectural structures that address pressing challenges while aligning with the global Sustainable Development Agenda.

1.2. Methodology

This research employs a qualitative methodology, to explore and analyze the architectural visions for sustainable futures in two distinct locations in Egypt: Downtown Cairo and Nubia-Aswan through theoretical practical methodology (Fig. 2). The Theoretical Methodology include literature review about sustainability in Architecture, the practical application includes analysis of case studies in two selected locations in Egypt. The proposed projects for each location will be grounded in sustainable design, addressing specific SDGs, such as affordable housing (Goal 11), clean energy (Goal 7), Zero hunger (Goal 2). Through envisioning these future concepts, the research aims to offer tangible solutions that contribute to improving the quality of life for local inhabitants while harmonizing with global Sustainability objectives. Followed by analyzing the collected data and case studies, and a comparative study of the proposed solutions to identify key themes and patterns related to Sustainable Architectural interventions, their impact on achieving Sustainability concept, and the challenges faced in implementing such projects.

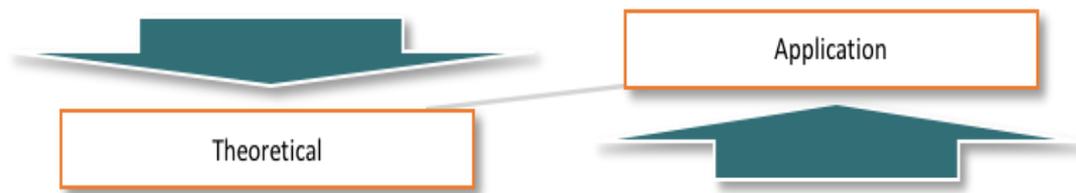


Fig. 2: Research Methodology

Furthermore, the proposed Architectural solutions were presented in Copenhagen 2023, during the World Congress of Architects organized by the International Union of Architects (UIA). This platform offers a unique opportunity to showcase Egypt's commitment to Sustainable Architecture on the global stage. The research outcomes documented in the UIA Guidebook 2030 solidify the research's impact and dissemination [13].

2. Architecture and Sustainability

Architecture and Sustainability are closely intertwined concepts that aim to minimize the negative impact buildings and urban environments have on the environment [14], Fig. 3. Sustainable Architecture focuses on creating structures that are energy-efficient, environmentally friendly, and socially responsible [15]. Architecture can be stimulating in its experiences as well as influencing and contributing to efforts of 17 SDG and evolution of 2030 Agenda. The future is aiming towards better quality of life through sustainable cities and communities, responsible consumption, climate change and anti-hunger [16].

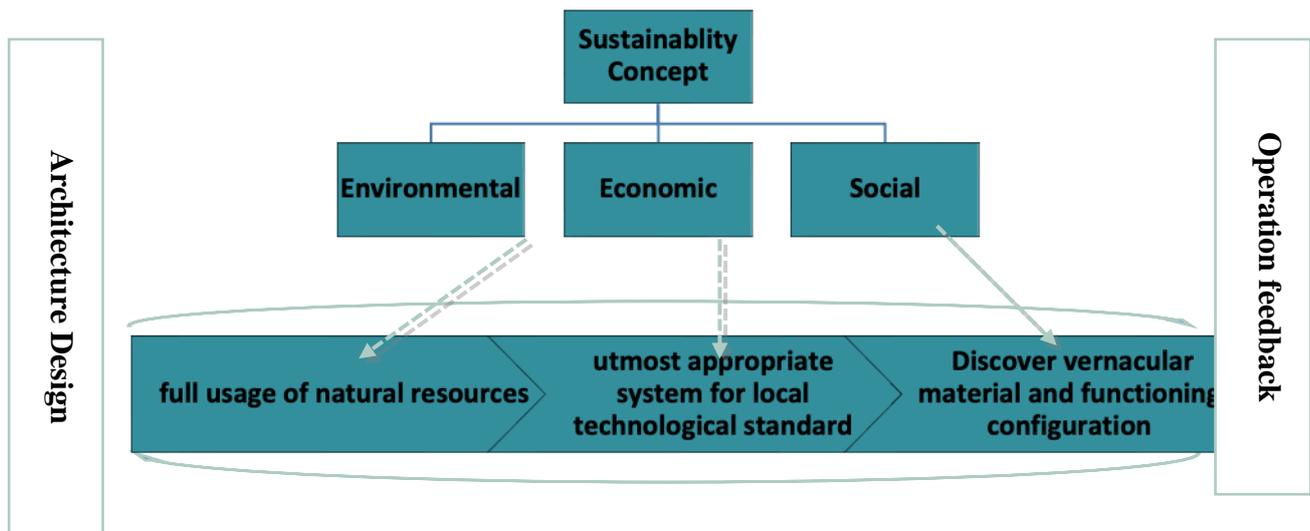


Fig. 3: Environmental, Economic and Social Sustainability [17].

One key aspect of Sustainable Architecture is energy efficiency. Buildings are designed to reduce energy consumption through improved insulation, natural ventilation, and the use of renewable energy sources like solar panels or geothermal heat pumps. By reducing energy use, sustainable architecture helps to reduce greenhouse gas emissions and combat climate change [18]. "Design for Climate Adaptation" comprises both high- and low-tech environmental design solutions with the objective of making buildings more intelligent and environmentally self-sustaining. It additionally incorporates protection techniques [3]. The use of environmentally friendly materials and construction methods are an important key aspect in Sustainable Architecture. Where the priority to materials that are non-toxic, locally sourced, recyclable, and have a low embodied energy [19]. Also, aim to reduce waste during construction and demolition processes.

Sustainable Architecture refers to the application of design techniques that minimize adverse effects on the environment. The three key tenets of Sustainable design are life cycle design, quality of life design, and resource management. When the concept of resource management is examined, it can be understood as the efficient and sustainable use of materials, building spaces, water, energy, and other resources. [20]. Furthermore, Sustainable Architecture promotes the creation of healthy and livable spaces [21]. This includes designing buildings that maximize natural light and views, as well as providing access to green spaces. The integration of vegetation and green roofs in buildings helps to improve air quality, reduce urban heat island effect, and provide habitats for wildlife [22].

In addition to these physical aspects, Sustainable Architecture also considers the social and cultural context of a project [23]. It considers the needs and preferences of the local community and aims to create buildings and urban areas that are inclusive, accessible, and

promote social interaction [24]. The goal of sustainable architecture is to create a built environment that satisfies current demands without jeopardizing the capacity of future generations to satisfy their own needs. To create built environments that are resilient, sustainable, and harmonious, it incorporates energy efficiency, social responsibility, and environmental stewardship[25].

3. Towards a Sustainable Future

Sustainable development is a process of advancement that guarantees the use of resources to meet human needs while protecting the environment; these needs can only be satisfied for the time being and for future generations [26]. Our buildings need to be created with the notions of elaboration in mind, as they will encouragingly influence people's quality of life and the environmental health of society. The idea of sustainability forces architects to think wisely about and consider the long-term consequences of their choices on the world's lessening resources [27]. In the past, communities thrived within well-defined boundaries, where face-to-face interactions were the norm, fostering strong social bonds rooted in shared experiences and proximity. However, the advent of digital technology has dissolved these time and place barriers, enabled instantaneous global connections but sometimes led to reduced face-to-face interaction and a sense of detachment from physical communities. To bridge this gap, the main idea of the proposals is to create a communal space where barriers are dissolved/ all people can engage in common activity.

3.1. Case Study

In this part, two different locations were chosen in Egypt and concepts for future ideas and prospects to contribute to Sustainable Development Goals, Fig. (4). Vision of the suggested solution of the space Influencing and contributing to efforts of SDGs and evolution of 2030 Agenda. The main target is to afford Sustainable Cities and Communities, responsible consumption and hunger and climate change.

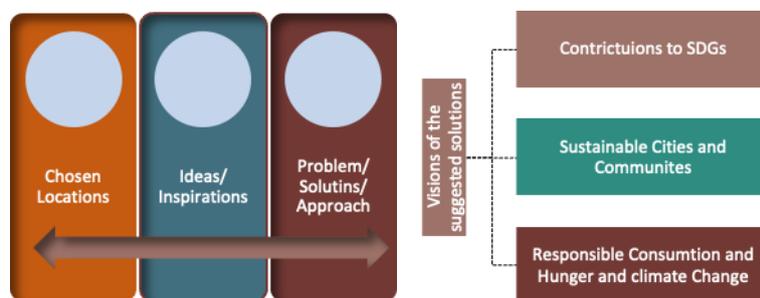


Fig. 4: Strategy of application on two locations in Egypt (Authors)

3.1.1. Background and reasons of choice of locations:

The two locations selected compromise two distinct places in Egypt. The first location showcases Cairo's rapidly evolving urban fabric and congested, overwhelming spaces, while the second location illustrates Egypt's rich history. Downtown Cairo is a famous big city, resolutions proposed address issues like establishing public common spaces, combating pollution, facilitating quick city mobility, and fostering shared interests among its diverse population. On the other hand, the other suggestion addressing traditional area in South of Egypt; Nubia. The idea is to create spaces and maintain the preservation of the big history and tourist attractions as well as vernacular architecture that stands witnessing part of vernacular sustainable Architecture of Egypt. In South of Egypt in Nubia, where the vernacular, and environmental aspects, inhabitants preserve their customs and traditions, and vernacular architecture formation has rich features to learn from sustainable concepts. It shows how a building's design evolved over many years of experimenting with different building materials and how the community responded cooperatively with ideas and religious convictions. Vernacular architecture utilizes the arrangement of spaces and urban patterns to demonstrate the expressions of culture [28].

3.1.2. Inspirations for the future: Ideas and concepts for future projects: proposal 1

3.1.2.1. Challenges and background:

Downtown Cairo is significant historically and culturally, but it also faces urbanization issues like population growth, traffic, and a shortage of green space. The location is in Attaba/ Moskey, Downtown-Cairo, Egypt, Geographic Coordinates: 30.0494682 N, 31.2490398 E. This chosen location in a dense urban place, challenges include overlapping land use, street vendors, lake of social places, high rates of pollution and noise, Fig. (5).



Fig. 5: Challenges in Downtown in Egypt (Authors)

The proposed concept is to suggest solutions towards Enhancing the high-density places between edges of buildings to create community participation, social activities and relations dissolving the time and place barrier, using recyclable materials, vertical farming, self-sufficient of some crops/ zero hunger (eat or sell), improve the quality of life (good health and well-being), (Table 1). The concept of green farms on building facades emerges as a contribution. These vertical farms not only enhance the physical environment but also encourage community members to come together for shared activities like tending to the greenery [29]. The idea based on a Flexible Approach – Adaptability of space, moving parts of shadings [30], interactive design, smart materials and applications using clean energy, self-cleaning. An interactive wall to change according to user’s preferences or environmental change, energy exchanging materials, biological concrete filter the air from CO2 [31].

Green wall technologies present a surplus of options. It can provide adaptability that is aesthetically pleasing, restore indoor and outdoor air quality, reduce the effects of urban heat islands, improve energy efficiency, keep the structural integrity of buildings, and lower noise levels [32].

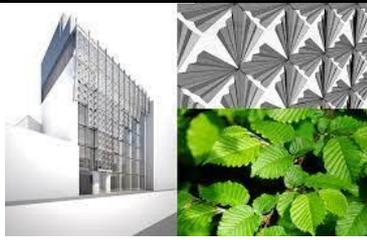
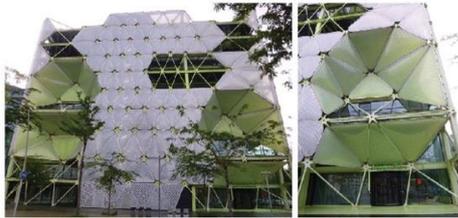
3.1.2.2. *Main Idea:*

Boundaries (Edges of buildings)

Approach:

- man, long time ago lives in communities, set his own boundary.
- digital technology dissolves time and place barrier, nevertheless let the gap increase between people (social interaction, face-to-face ...)

Table 1: Architectural Visions for Sustainable Future in Downtown- Cairo

Architecture as a unifying goal		
Idea: creating a space where barriers are dissolved/ time, and place / all people can engage in common activity inspirations	Design Concept	
	<ul style="list-style-type: none"> • Choosing the triangle by which its 3 vertices suggest the 3 pillars of sustainability concept: Social, Environmental and Economic 	
		
Architecture mimics Nature [33]. Natural systems and the geometric rules.	Cloud 9's Inflatable Bubble Building, Barcelona [34].	Biomimetic Architecture [35].
Fig. 6: Inspirations of the project		

Bubble/ cells		Rose of Jericho	
Interactive wall			
Change according to users' preferences or environmental change	Energy exchanging materials	Biological concrete	Filter the air from CO2
Inspiration and Form generation			
<p>Fig. 9: steps of inspiration, design concept and form generation. The golden ration found in nature, fractals geometry and spiral [37].</p>			
Time and place: High density Area Attaba/ Moskey, Cairo Egypt, Between residential buildings for example			
Problem <ul style="list-style-type: none"> • Overlapping land use • Street vendors • Lake of social places • High rates of pollution and noise 		Suggested solutions (Towards Enhancing the high-density places) <ul style="list-style-type: none"> • Social activities (relations) • Community participation • Sustainability (using local /recyclable materials) (sustainable cities and communities) • Self-sufficient of some crops / zero hunger (eat or sell) /rain. • Improve the quality of life (good health and well-being) 	
<p>Fig. 10: Proposed design (Authors)</p>			

Communal space-Creating a green lung into the city in downtown Cairo; dense area					
Scenario	Materials				
<ul style="list-style-type: none"> • building bridges to create a dialogue. • targeting equity (equal opportunity) • mingling different cultures/traditions 	<ul style="list-style-type: none"> • interactive/ smart/generating energy. • clean energy • self-cleaning 				
					
					
<p>Fig. 11: Sustainable farming part of building system- The design idea of vertical farming to rebuild species diversity in downtown Cairo; dense area (Authors)</p>					
<p>Solutions:</p> <table border="1"> <tr> <td>Flexible Approach -adaptability of space</td> <td>Movable parts -shadings</td> <td>Interactive Design -smart materials and applications</td> </tr> </table>			Flexible Approach -adaptability of space	Movable parts -shadings	Interactive Design -smart materials and applications
Flexible Approach -adaptability of space	Movable parts -shadings	Interactive Design -smart materials and applications			
<p>Aiming to:</p> <ul style="list-style-type: none"> Social relations Community participation Sustainable (using recycled materials) Self-sufficiency of some crops (eat or sell)/ help community (Zero Hunger) Improve quality of life Designing with Nature and equity Shed: dimensions of the environment (triple bottom line) 					
<p>This revitalizes face-to-face interactions, re-establishing a sense of connection in urban environments while embracing the advantages of modern technology. These green farms symbolize a harmonious blend of traditional community values and the possibilities of the digital age, bringing people together in both physical and virtual spaces.</p>					
<p>SDG Targeted in the suggested solution: Goal 2, 3 and 11</p>					

3.1.3. Inspirations for the future: Ideas and concepts for future projects: Proposal 2

3.1.3.1. Challenges and Background:

The location is in Nubia, South of Aswan, Egypt, and Geographic Coordinates: 24.0808449 N, 32.8940075 E. Nubia has been called the land of gold for thousands of years. It is

distinguished by the expressive beauty of its homes and the preservation of social customs. The ancient Egyptians called Nubia the land of bows, in reference to the skill of its people in archery. The only route to Nubia is via the Nile. Sailboats and Nile ships are used by Nubians to travel between villages [39].

3.1.3.2. Nubian Architecture

Nubian Architecture is an environmentally- Friendly Architecture, distinguished by its notable features, whether in building materials or in building design and its division, which depends on wind directions and natural lighting. The way the Nubian house was designed and its internal and distribution, determined by the genius of choosing its openings. Treatment of climatic conditions: environmental materials were used in the construction which overcome the hot climate of Southern Aswan [40]. The vernacular Nubian Architecture and urban fabric was greatly influenced by its climate, where the compact layout of Nubian residential clusters provides shade, hinders wind in the winter, and increases air velocity in the summer. The road's narrowness contributes to the cold air's prolonged preservation. At the level of the urban fabric, all these concepts achieve the highest level of climate compatibility [41]. Residents of Nubia understand the value of protecting their Nubian heritage, distinguishing them from various areas where many tourists visit these places. When building new buildings, they incorporate the fundamentals features that define the Nubian architecture and urbanization [42].

3.1.3.3. Building materials in Nubia:

Clay: Clay consists of rock deposits of mineral materials, and when adding water, attractive forces are generated between the contents of this matter which gives it cohesion and plasticity so that it is able to be formed, and then it is prevented Permeability of water, and in the case of drought, it is hard with the degree of hardness of stones and it is mixed with sand and silt, and it is used in construction.

Timber: The palm tree has many uses in homes. The trunks of the palm trees, after being cut and shaped, are used as vertical supports.

The interior of the houses and the horizontal supports for the ceilings, as well as the palm fronds by themselves in their use in the ceiling of some non-essential rooms, just as the leaves come after cutting them into small pieces. The mixture from which building blocks are made and the adhesive between the blocks. The unique nature and elements of the fertile environment and their association with the Nile River and the privacy of their society, Nubian art reflects the specificity of the Nubian culture, and includes symbols that reflect their meanings in the murals that decorate the facades of the houses inside [44].

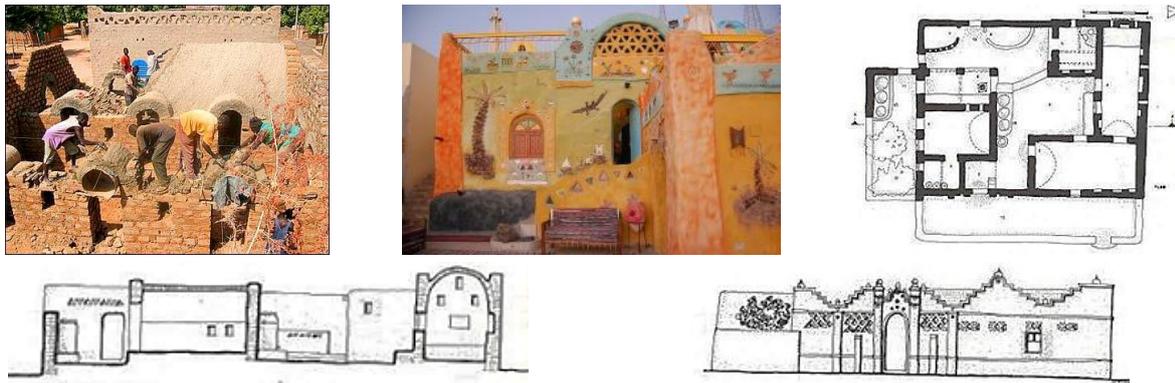


Fig. 12: Vernacular Nubian Architecture [43].

3.1.3.4. Achieving Sustainability in Nubian Architecture

The network of streets and roads is narrow, winding, and non-perpendicular, as the winding of the streets leads to receiving the greatest amount of solar radiation and reducing dust-laden winds. It increases the shadows, which makes the roads, corridors, and open areas characterized by coolness in hot areas. Also, reduces the effect of dust-laden air. The narrowing of the streets in some areas and their widening in other areas, and the roofing of some parts of them, leads to the creation of areas with high pressure from which it moves. Air into areas of low pressure, resulting in good air movement [45].

The facades are characterized by their absence of external openings, with the exception of the small upper openings above the entrance door in the facade, and the upper rectangular and circular openings above the entrance door in the façade, reducing the amount of direct light resulting from the falling sunlight and the passage of cold air into the room in the summer and winter. The proposed idea means to integrate the traditional elements and use of local materials, in addition to integrating green spaces in every context to improve air quality, (Table 2). Being vital components of an ecosystem, green spaces offer a variety of sustainable environments in different sizes and forms, improve quality of life, and provide ecosystem services like biodiversity and climate management. [46].

Table 2: Architectural Visions for a Sustainable Future in Nubia-Aswan

Architecture as a unifying Goal: Creating a space where barriers are dissolved/ all people can engage in social community activities. Revive Heritage and Saving nature (Preserving the environment)	
Idea: to create a space where all children can mingle, engaging kids in social community activities	<p>Design Concept:</p> <ul style="list-style-type: none"> • Choosing the triangle by which its 3 vertices suggest the 3 pillars of sustainability concept: Social, Environmental and Economic • The Nubian Heritage represent part of the Egyptian Identity
Inspirations: inspired by History of Nubian monuments, Vernacular architecture	



Fig. 13: Vernacular Architecture Features of Nubia Houses

Culture, traditions, way of life, Festivals, Art Revival



Fig. 14: Crafts and Art of Nubia

Fig. 15: Trigonometry Art

Nubian Experience, Interactive spaces “culture revival”

Building green	Usage of local materials	Integrating vernacular Architecture features
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Healthy spaces, interactive playing areas, Shadings, Cultural heritage, Communal spaces
 Knowledge transfer, Quality of suggested space, Integrate socio-economic aspirations

Time and place:

- Traditional area
- Chosen area: Nubia, Aswan, Egypt

Problems/ Challenges:

- Climate/ hot weather
- Equity
- Equal opportunities for education and entertainment
- Preserving heritage

Suggested solutions

- (Towards Enhancing and preserving heritage, customs, and traditions)
- Social activities (relations)
 - Community participation (of all ages to serve children)
 - Sustainability (using local), (sustainable cities and communities)
 - Improve the quality of life (natural ventilation, solar power electricity for lighting)



Fig. 16: Proposed design (Authors) Long-term farming towards sustainable farming and self-efficient. women and children engagement, educating others, preserving Nubian Culture and Arts/ local materials

Scenario:

- building bridges to create a dialogue.
- encourage children to use recycled materials and get inspired by heritage and surrounding nature.
- promoting Nubian Art as a source of continuing learning and giving job opportunities
- targeting equity (equal opportunity)
- Considering the interest in Nubian education, and the provision of an appropriate educational environment, the idea of the project came to a center for the interest of Nubian arts and culture for children. The center seeks to emphasize the role of Nubian women and

<p>to exploit women’s skills in works such as sewing, looms, carpets, and handicrafts, to provide job opportunities for women in this center.</p> <ul style="list-style-type: none"> • Dealing with contour lines and distinctive views of the river Nile. • Linking to approach the project through boats. <p>Materials: Local, handmade bricks</p>					
<p>Solutions:</p> <table border="1"> <tr> <td>Local Materials</td> <td>Overlaying shadings to reduce high temperature</td> <td>Playing areas for children. workshops and places for playing and interaction, learning environment</td> </tr> </table> <p>Aiming to: Social relations/Community participation Sustainable (using local materials) Improve quality of life (opportunities for children in education and playing) Equity (role of women)</p>			Local Materials	Overlaying shadings to reduce high temperature	Playing areas for children. workshops and places for playing and interaction, learning environment
Local Materials	Overlaying shadings to reduce high temperature	Playing areas for children. workshops and places for playing and interaction, learning environment			
SDG Targeted in the suggested solution: Goal 4,5 and 11		  			

4. Results

Architectural visions for Sustainable futures and their role in advancing the Sustainable Development Goals was gleaned from the analysis of the two addressed case studies of Nubia-Aswan and Downtown Cairo, (Table 3). The outcomes demonstrate how successful sustainable architectural interventions are in addressing Environmental, Social, and Economic issues while fostering a more inclusive and sustainable future for these areas.

Table 3: Evaluation Matrix of proposals – A Comparative Analysis:

	CAIRO DOWNTOWN	NUBIA-ASWAN
Challenges	<p>The application of sustainable architectural interventions in Downtown Cairo has produced several advantageous results:</p> <ul style="list-style-type: none"> - brought life to urban communities. - The area is more livable, with easier access to amenities and less traffic. - Produced lively, walkable public areas that encourage social interaction while cutting carbon emissions. - The addition of vertical gardens has improved biodiversity and air quality in addition to the area's aesthetic appeal. 	<p>Sustainable architectural solutions have been implemented in Nubia-Aswan to address the region's particular environmental problems:</p> <ul style="list-style-type: none"> -The installation of water management systems has aided in the sustainable management of water resources. - reducing their negative effects on the environment - Eco-friendly housing projects have enhanced local communities' quality of life. -The preservation of cultural heritage by promoting Sustainable tourism and

			preserving the identity of the Nubian people. -Creating a space for children education	
Solutions proposed/SDGs achieved	decreased carbon emissions/ vertical gardening/ corping/ can sell or buy	SDG 2,13	preservation of culture/ giving opportunities of education	SDG 4,5
	Revitalized urban communities.	SDG11	better housing conditions	SDG 6,8,11
	increased livability	SDG 3	sustainable management of water resources	

4.1. Contribution to SDGs:

In the past, communities thrived within well-defined boundaries, where face-to-face interactions were the norm, fostering strong social bonds rooted in shared experiences and proximity. However, the advent of digital technology has dissolved these time and place barriers, enabled instantaneous global connections but sometimes led to reduced face-to-face interaction and a sense of detachment from physical communities.

Preservation of cultural heritage and urban community revitalization have been the main priorities in Downtown Cairo. The area's architectural legacy has been preserved and the urban fabric has been revitalized through the adaptive reuse of historical buildings. Since it encourages the development of inclusive, safe, resilient, and sustainable cities, this strategy is in line with SDG 11: Sustainable Cities and Communities. Additionally, lowering carbon emissions and enhancing air quality and the installation of vertical gardens have aided in the achievement of SDG 13: Climate Action. Nubia-Aswan has environmental problems, especially regarding water management. The installation of water management systems, which is in line with SDG 6: Clean Water and Sanitation. SDG 11 has been aided by eco-friendly materials, which have improved housing conditions for the nearby communities. Additionally, by encouraging sustainable tourism and bolstering local economies, Nubia-Aswan's cultural heritage preservation contributes to SDGs 11 and 8: Decent Work and Economic Growth.

Even though both case studies support SDG 11, they do so in distinct ways. While Nubia-Aswan concentrates on environmentally friendly housing and sustainable water management, Cairo's Downtown is more concerned with urban renewal and cultural preservation. This emphasizes how crucial it is to use context-specific strategies and customize architectural interventions to meet the unique opportunities and problems that each region presents. Fig. 17 illustrates Architectural Visions Framework towards UN SDGs.

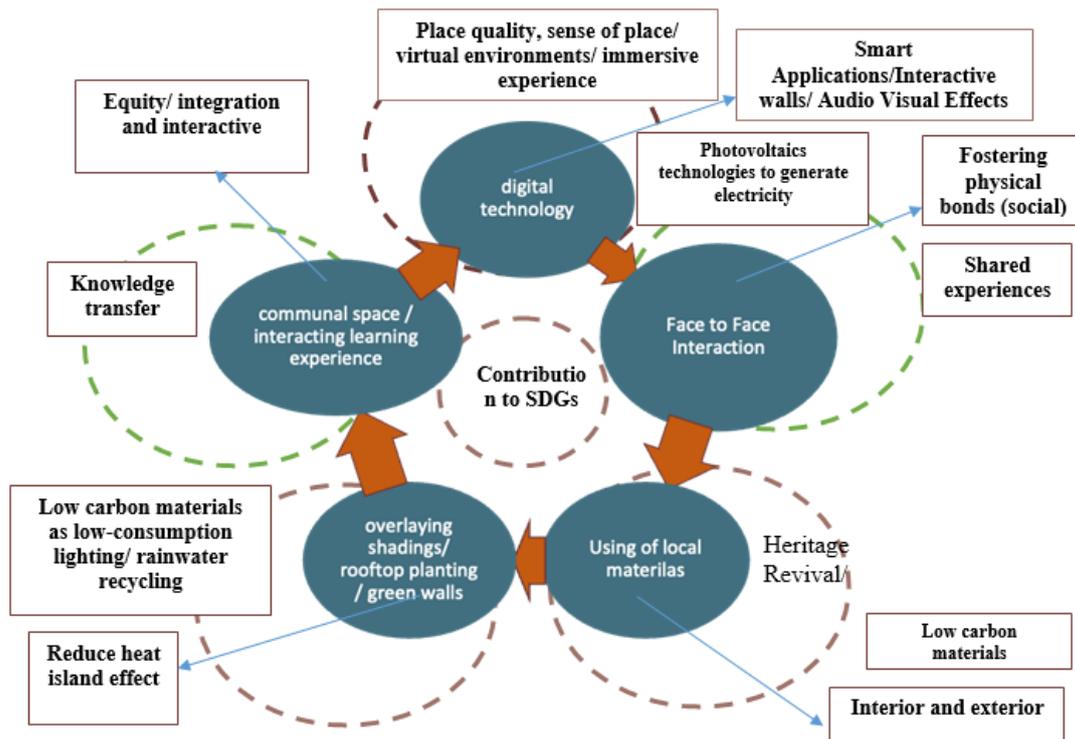


Fig.17: Architectural Visions framework towards UN SDGs

5 Discussions

This section discusses the extent to which architecture can contribute to SDGs. In addition, opportunities for integrating sustainability concept in architecture are identified from the framework and the proposed case studies, (Table 4). Architecture vision for sustainable future includes ideas like Net-Zero Energy Buildings, Biophilic Design, circular economy, resilient communities, community engagement and inclusivity, education, and awareness. Results show Contribution to the SDGs part of the solutions include using local materials, overlying shadings to reduce high temperature with roof top plantings, playing areas for children. Workshops and places for playing, interacting learning environment. Integrating vernacular architecture features through providing healthy spaces, interactive playing areas, culture heritage revival, knowledge transfer, shadings, roof planting and communal spaces.

Table 4: Summarized findings of research and suggestions towards a Sustainable Future in Architecture

Suggestions towards sustainability concept in Architecture	-integrating Nature into urban environments that could improve the quality of life, through green facades and roof planting
	-engage and incorporating the input of communities promotes collaborations and create sustainable future environments.
	-education and awareness about sustainable development to adopt sustainable practices.
	-creating job opportunities for local communities
	-continuous education and preserving traditions and customs
	-embedding the technology and smart materials to upgrade and improve the quality of life
	-green walls and roof planting to help in reducing negative impacts and serve the environment in dense areas
	-creating places where people can engage in common activities and have equal opportunities.

6. Conclusions

This paper aims to investigate how Architecture can contribute to Sustainability and improved quality of life. The Sustainable Development Goals (SDGs) and sustainable futures can be achieved through architectural interventions, as shown by the case studies of Nubia-Aswan and Cairo's Downtown. To build a more sustainable and inclusive future, the research's findings emphasize the significance of incorporating Sustainable design principles and considering the unique opportunities and challenges faced by each location. The proposals suggest prospects where new ideas tackle the needs and function of spaces using the local materials and create new spaces with common interests. Using ideas inspired from nature and an approach to create a common space.

After conducting a comparative analysis, it was determined that even though the two locations are geographically unrelated to one another, they nonetheless apply the project's central concept, which is the concept of "Boundaries"—common space. The goal was to design a space that could be implemented anywhere in Egypt, allowing for the adaptation of inspiration for the future to the specific circumstances while still achieving the Sustainable Development Goals. Keeping in mind the applicable functions, codes, standards, and user preferences with a flexible approach.

The findings of research suggest that SDGs can be significantly impacted on the three levels: socially by making places more livable and inclusive, they promote social equity. On

the Economic Level, these initiatives support Sustainable tourism, job growth, and local development. They benefit the environment by lowering carbon emissions, protecting natural resources, and increasing biodiversity. It is also noteworthy that strong and successful interdisciplinary collaboration is strongly advised for an expedited provision of sustainable solutions to the environmental problems that the modern world faces.

7. Recommendations

- The following fields can be the focus of future research:
- To increase understanding of the importance of protecting the environment.
- Use the resources and materials that are available to study the natural environment and the lessons taught.
- Maintain the customs and cultural heritage of the area.
- In their upcoming projects, architects, urban planners, and legislators ought to give priority to sustainable architectural practices to build a more inclusive and sustainable future.
- Furthermore, long-term effects of sustainable architectural interventions on sustainable development and the accomplishment of the SDGs, applying mechanisms for monitoring and evaluation.

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