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Integrating Multi-Scalar Attributes in Assessing Urban Sustainability for the Built Environment in Heritage Sites: The SHAI Model

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1 ABSTRACT

Sustainable development approaches are a widely used term, which has been increasingly essential in the Middle East, in general and, in Egypt in specific, for the purpose of planning and urban policies formulation specifically in heritage sites. The research was inspired by the significance of assets of historical areas which motivated the researchers to study and define their values, and find appropriate processes and mechanisms to measure, and evaluate their qualities.

A proposed model, for re-structuring planning processes and assessing information in regards of relative materials on sustainable, urban indicators is discoursed in order to develop a distinctive representation that integrates approaches of urban sustainability in the built environment, in terms of socio-culture and socio-economic aspects, environmental, and spatial dimensions, furthermore, various factors such as time, activities, space, interests, and quality of life.

This paper aims to reduce the complexity of multi-attribute criteria of sustainability, by adopting analytical representation for selected case study, based on a integral model to assess urban sustainability in the built environment for Heritage Sites. This approach investigates indicators of urban qualities relying on the integration of a BEQUEST framework implementing effective qualitative scales (quantifiable cities) and concludes with recommendations to develop an integrative, multi-scalar assessment method.

The paper present details for the proposed framework; Sustainable Historical Area Index (SHAI); model as an integrated tool used to evaluate the capacity of the multi-scaler attributes to assess the urban sustainability in the built environment for Heritage Sites. Results should provide assessment methods to be used in developing the model and provides sustainable evaluations for enhancing urban aspects.

Finally, the paper applies its findings on a case study assessment of the urban setting in El Fustat, Cairo, Egypt. The application comes to show the validity of the conceptual application of the proposed multi-scalar attributes of the Sustainable Historical Area Index upon evaluating values and principles within an existing Heritage Sites towards more sustainable built environment. This paper investigates the optimal corresponding values to be applied in evaluating the sustainability of urban development based on the analytical techniques of the empirical study.

Keywords: fustat old Cairo, assessment models, heritage sites, urban planning, sustainable design

2 INTRODUCTION

Over the past few decades, historical and heritage sites have gained a great priority, reflecting the new urban agenda goals. From this perspective, employing urban sustainability assessment frameworks for the built environment in historical and heritage sites, as key mechanisms for assessing the sustainability variables have become crucial instruments to follow sustainable urban development (UWH, 2015). Particularly during the last decade, sustainability assessment through indicators and indexing models has gained recognition. These assessment approaches based on reliable variables are highly considered as logical approaches in determining urban sustainability measurable values (Singh R. et al, 2009).

Although various urban sustainability assessment methodologies, models, and tools have been developed so far(Kalman H. , 2014), only a few have focused on the historical and heritage sites with a multi-scalar integral approach that takes into account all of the urban sustainability domains; environmental, economic, and social, ecological, and urban.

The importance of the Sustainable Historical Area Index (SHAI) Model as a variable-based urban sustainability assessment model is the quantifiability of the urban sustainability variable and parameters. In addition itaims to reduce the complexity of multi-attribute criteria of sustainability by simplifying, quantifying, and analysing complex and complicated information (A.Nayer, & Fattah, D. A., 2015).

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3 HISTORICAL AND HERITAGE SITES

The interpetation of the term "heritage" is quite broad and encompasses various aspects. Part of the heritage are the historic buildings that not only refer to an inheritance from the past, but also carry a definite connotation of value or importance or frame: architectural, aesthetic, economic, and even political and symbolic values. (Nasreldin, R. 2019).

3.1 Defining Heritage sites

The term heritage has different meanings in different contexts. The World Heritage Convention classifies heritage into two categories: Cultural heritage: a monument, group of buildings or site of historical, aesthetic, archaeological, scientific, ethnological or anthropological value. Natural heritage: includes outstandingphysical, biological, and geographical features, different kind of plants or animals species and areas with significant scientific or aesthetic value; those could be best for conservation (UNESCO, 2002).

The Budapest Declaration on World Heritage Convention (UNESCO, 2002) made reference to“ensure an appropriate and equitable balance between conservation, sustainability and development, so that World Heritage properties can be protected through appropriate activities contributing to the social and economic development and the quality of life of our communities”. Historical and Heritage are invaluable resources for cities and regions; they contribute to economic development, social cohesion, and citizens“ sense of place.

In addition, to these arguments there might be other perspectives to approach historical and heritage values.Adding the word "sites" to the term "heritage" will reveal multiple dimensions of identity and emotional symbol of characteristics continuity in the sense that it has a physical existence (Embaby. M. ,2014).

Historical and Heritage sites, whatever their size and scale, are an essential resource to build identity and a sense of belonging and can serve social cohesion, pride and integration. As a diverse resource, it ranges from tangible valuesof buildings, landscapes, etc. to intangible values, such as traditions, language, knowledge, etc. An important characteristic of the built heritage is its presence in time and space(UWH, 2015). Great attention has been devoted to Historical and Heritage sites considered as request to save local identity(Singh R. et al, 2009). The idea of sustaining Historical and Heritage sites from the urban perspective can help to visualise the diversity of urban form and to explore the cultural, political and historical character of the urban areas, for more suatainable approaches (Singh R. et al, 2009).

3.2 Urban Sustainability for Historical and Heritage sites

The World Commission on Environment and Development (WCED) in 1987 proposed a definition of sustainability as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." The definition considered the balance across three interconnected domains: economic, environmental, and social dimensions(Guzmán PC, ,2017).

Urban sustainability for historical and heritage sites tackles the conservation of the urban context and heritage from deterioration.From this approach, heritage, which has long been absent from the platform of urban sustainability is nowadays recognised to have great potential in contributing to social, economic, and environmental development. Urban sustainability for historical and heritage sites can significantly maintain social capital and generate economic resources and can strengthen the sense of living place and sense of belonging. The new urban agenda also acknowledges historical and heritage sites as a crucial component of urban sustainable development (10,11), particularly in the sub-goal 11.4 that aims to “strengthen efforts to protect and safeguard the world’s cultural and natural heritage” (Fletcher, R., 2007).

4 ASSESSMENT TOOLS: MULTI-SCALAR ATTRIBUTE

In recent years, various tools and methodologies have been developed, both at a strategic and operative level, for Assessing Urban Sustainability For the Built Environment in Heritage Sites (Murtiyoso, A., 2018). The research is adopting the multi-scalar approach as a tool for assessment. The multi-scalar approach works on the concept of variable and parameters that enables the exploration of the urban sustainability dynamics of interrelated key processes in the Historical and Heritage Sites.

4.1 Quantitative assessment method

The Multi- scalar attribute represents a family of methods that describes and models integral evaluations with respect to different interests, subsystems of the cases, or disciplinary perspectives. This method is a mean to analysing situations and creating an evaluation process. As a case evaluation method,the multi- scalar attribute tackles both the conceptual/qualitative and numerical/quantitative approaches. The objective of the multi- scalar attribute is to attain a conjoint measure of the urban sustainability variables in correspondence to the urban sustainability main domain (Guilherme C. et al., 2013).

4.2 Sustainable Historical Area Index (SHAI)

The literature highlights the shortcomings of the current evaluation models and the urgent need for more efficient assessment methods and tools as sustainable urban development demands rise rapidly (Vincenzo B., et al., 2002). Accordingly, the current study demonstratesthe multi- scalar attribute as an assessment tool. It discussses a proposed model for re-structuring planning processes and assessing information regarding sustainable, urban variables. The purpose is to develop a distinctive representation that integrates approaches of urban sustainability into the built environment, in terms of socio-cultural and socio-economic aspects, environmental, and spatial dimensions. Furthermore, it incorporates various factors such as time, activities, space, interests, and quality of life. This index is based on the bequest framework(Mark D. et al., 2014) and the quantifiable city theories (Rose, C., 1995), in addition to local community psychological aspects, and taking into consideration the decision making process among key actors representing governmental institutions, local communities and NGOs (A.Nayer, & Fattah, D. A., 2015). The model aims to provide a more effective sustainability assessment by taking all of the major aspects affecting sustainability into account.

5 RESEARCH METHODOLOGY: SHAI MODEL FOR ASSESSMENT

The paper is presenting a structured methodology to provide a coherent assessment of heritage beneficial implementation of sustainable development approaches. Based on the literature review and the qualitative and quantitative content analysis, with the integrated community involvement, the methodology is running accordingly:

Step 1: Building up the model: Integration between different approaches, based on the literature review, backgrounds and definitions.

Step 2: Discussion: Case study analysis (on site documentation for existing conditions, including investigations through observations and semi-structured interviews with multiple stakeholders (local-residents and visitors – NGOs – Local government and institutions)

Step 3: Model implementation and variable assessment (measurable verification), case study as an application.

Step 4: Demonstration of proposed solutions as part of more extended development strategic plan, findings, conclusions, and recommendations.

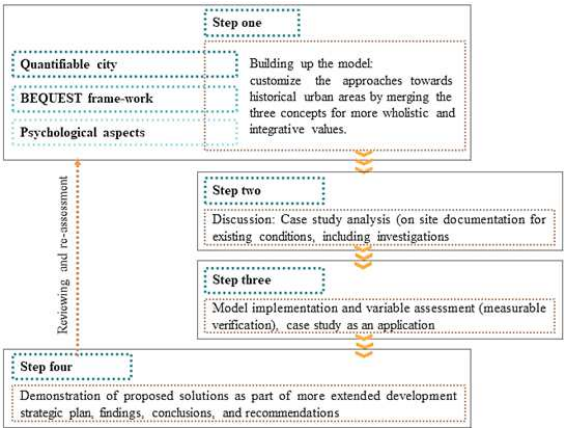

Figure 1: Structured Methodology, by Authors.

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STEP 1: BUILDING UP THE MODEL: The integration of multiple approaches, each representing certain concept. The model introduces wholistic vision that accommodates various layers of informations, and tackles deep interpretation for the historical and heritage sites.

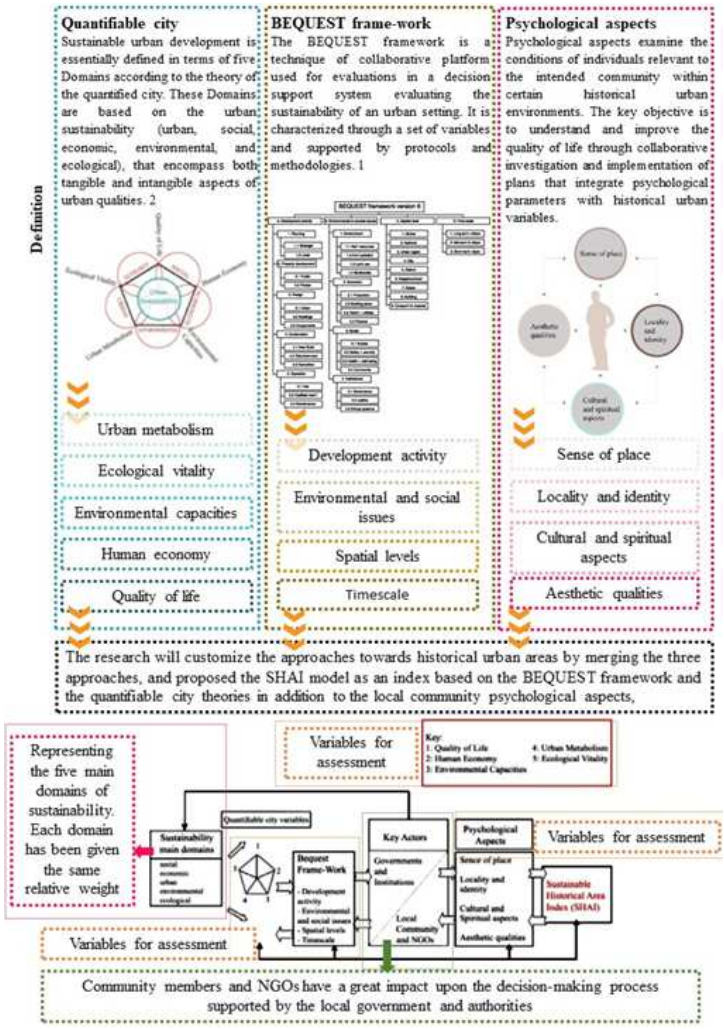

Figure 2: Sustainable historical areas index (SHAI) Diagram, by Authors.

Theories and approaches	Variables	Discussion
Quantifiable city	Quality of life	Giving a value and standards to the living environment.
	Urban metabolism	Reflects the deep relation between the urban physical features of street width, building heights, and theirrelationship with the environment, in terms of shades and shadow, air circulation, and landscaping.
	Ecological vitality	Analysing the impact of the environment and studying the interactions withinthe local community
	Environmental capacities	It is a process that involves, shifting societal attitudes, to pursue environmental development, strengthening individuals“ capabilities.
	Human economy	The ability of the local community to be a part of the financial process of the sustainable urban development in the historical areas
BEQUEST frame-work	Development activity	Projects and strategies, in the approach to conservation and preservation, property development public and private interests.
	Environmental and social issues	It explains how the local community is capable of preserving its surrounding environment and re-using the resources of the local materials.
	Spatial levels	Various spatial levels ranging from the scale of the whole urban setting down to that of the individual historical building and its construction systems and material components.
	Timescale	Represents the normal scale used in economic and strategic planning, as time-scale phases of evaluation and re-assessment.
Psychological aspects	Sense of place	It is a place made up of a web of various buildings and streets, from different periods along history, which creates various cultural and urban strata.
	Locality and identity	The feeling of belonging to a certain urban context, as part of the self-conception and self-perception to local community within its urban settings.
	Cultural and spiritual aspects	Aspects represent the psychological values of the local communities related to their urban setting, and culture.
	Aesthetic qualities	The theory of beauty, providing luxury for human demands, feeling comfortable, safe and secure.

Table 1: Sustainable historical areas index (SHAI), by Authors.

The sustainability historical areas index (SHAI) Model is developed as an advanced variable-based urban sustainability indexing model.It is presented through thirteen variables, which will be evaluated based on statistical methodology according to their relative weights, depending on case study approach, applying data gathering based on observation,and semi-structured interview for the actual physical context for the designated site (A.Nayer, & Fattah, D. A., 2015). The idea of the direct weighting means that the evaluator is asked to simply specify the weights numerically. This is, of course, possible for only a small number of attributes. The weight can be specified in percentage (with all weights summing to 100%) (Vincenzo B., et al. , 2002).Appropriate values are expected to be assigned, each variable (X1,X2… Xn) gives a value to each domain of the (SHAI) = YN, (social, urban… etc.,) Scale as: Inconvenient: 0-5%, Moderate: 6-10%, Good: 11-15%, Convenient: 16-20%.

The five domains originally driven from the "Quantifiable city" approach are representing a pentagon with equal values, translated within the SHAI Model as 20% value for each domain. In addition, for more accurate calculations, and more reliable numerical values, the formula had to have one variable to be measured (the thirteen variables) while the other conditions on a constant state. Accordingly the five domains kept an equal relative weight to facilitate assessing the variables, and validate the idea of applying the model upon various historical sites (which might not by necessary have a domain with a privilege upon the others), dealing with all the domains on an equal distance approach.

Sustainability Historical Areas Index Variables / Urban Sustainability main Domain	Sustainability historical areas index variables													Total
	Human economy	Urban metabolism	Ecological vitalities	Quality of life	Environmental capacities	Development activities	Environmental and social issues	Spatial levels	Timescale	Sense of place	Locality and identity	Cultural and spiritual aspects	Aesthetic qualities	
Social20%														
Economic20%														
Ecology20%														
Environmental20%														
Urban20%														
Total100%														

Table 2: Assessment methodology sustainability historical areas index (SHAI), by Authors.

The paper methodology indicates the application on the SHAI Model by analysing a case study of a historical setting. The evaluation process followed the hierarchy of the site introduction, the documentation of the existing conditions, the observation and finally the application of the assessment tool.

6 STEP 2: DISCUSSION: CASE STUDY ANALYSIS ASSESSING URBAN SUSTAINABILITY IN HERITAGE SITES; FUSTAT, CAIRO EGYPT

6.1 Defining the Context of Fustat

Fustat's historical significance is rooted in the days of the Arab conquest in 21 AH/641 AD during the Byzantine era. Caliph „Umar ibn al-Khattab" gave his orders to establish a new capital for Egypt. Fustat was founded by "Amr Ibn al-Aas" becoming Egypt's first Islamic capital. The new capital, with its unique location in proximity to the Nile and the Fortress of Babylon, had quite distinguished values. Later, it became part of the Fatimid capital. References mention that the area was named Fustat, derived from the Arabic word for "tent", named after the camp set up by the army of "Amr ibn al-As" because its initial inhabitants lived in the army"s tents before they built the original Amr Ibn Al-Aas Mosque in the same location as the new one (which is also known as al-"Atiq" the Old Mosque). Fustat remained the capital of Egypt for around 500 years, on and off, until 1168(Feilden, B., 2007).

Today, Fustat is a part of the Old Cairo District, one of the historically significant spots in Cairo, famous for its important archaeological sites, such as the Mosque of „Amr ibn al-As", the seven old churches, the excavated ruins of the old city, the Nilometer, al-Manesterley palace, and Mohammad Ali Palace in al-Manyalm (Karim K., 2016). Fustat is considered one of the unique cultural heritage sites in the world, where

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the integrated area of Fustat along with the area of Islamic Cairo and Khedivian Cairo is a world heritage site, in figure 3, (Wladyslaw B., 2016). Great dedication was attributed to site preservation and development, and projects have been implemented, tackling various aspects and domains (Aghakhan, 2001). The development project suggested a framework of integrated development policies, based on having the greatest variety of archaeological sites on a global scale. It aims to integrate historical and modern areas in order to ensure continuity and vitality while balancing the economic development of the site with environmental and aesthetic heritage as well as tourism potential (Feilden, B., 2007).

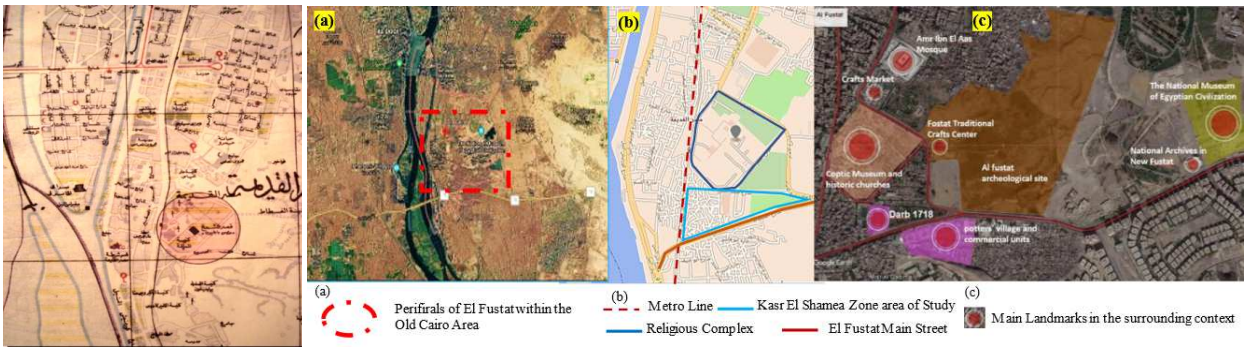

Figure 3: Fustat contextual map, Wladyslaw B. 2016. Figure 4: Case study Localisation: Old Cairo zone highlighting the study area of “Kasr El Shamea” in the core of “El Fustat” ,by Authors.

The selected localisation represents the three main aspects of architectural heritage, comprising the following integrated properties which promote the importance of urban sustainablility:

Firstly the integration of monuments: this refers to all the buildings and structures of conspicuous historical, archaeological, artistic, scientifc, social, or technical interest, including their fixtures and fitting presented in the existance of the “Religious Complex”as indicated in Figure 4.

Secondly the surrounding context containsa group of heritage buildings in addition to residential neighbourhouds at various densities which require interventions to assure the sustainable developmentof the area showcasing its historical, archaeological, artistic, scientifc, social, and technical interest.

Thirdly, the selected site of Kasr Elshamea incorporates combined contributions ofhumankind and nature.Some activities based on local products such as leather workshops and stone carving are supporting the tourism and visitors interest in the area. Their settingsare distinctive within the topography and, together with the inherited historical background rooted in cultural settings of the inhabitantsthey are built upon.

6.2 Landmarks in the surrounding context

Several Projects have adopted the idea of restoring the existing historical buildings in Fustat, in particular the Religious Complex in “Babylon Fort” (Figure 5).

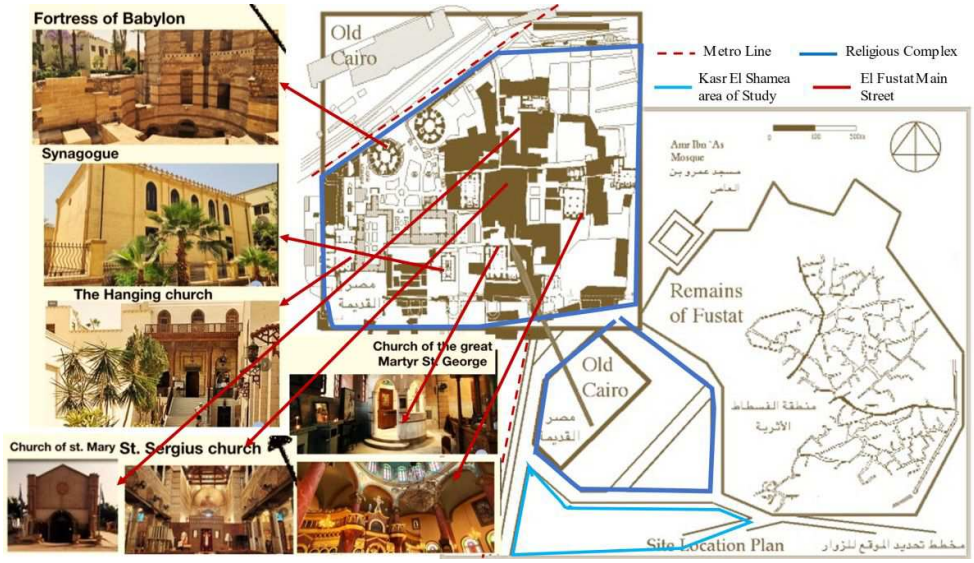

Figure 5: The Main Landmarks in the surrounding Context of “Kasr El Shamea”, by Authors.

6.3 Defining the studying site

Figure 6 shows existing values to be assessed by the research team in the urban context of Kasr El Shamea regarding architectural features. Explain the architecture in terms of heritage building, and discuss their relevance in terms of heritage values related to the built environment add ref. to the cond. And regulations for future additions and renovations. This highlights the importance of elaborating urban management processes to support sustainable development of future city expansions and public spaces (Matero F., 2000). Urban heritage streets have some common characteristics that define their style and history. They can create a more liveable community by providing a setting for activities which are attractive for all people, including walkability to enhance the pedestrian experience (H. Elshimy& R. Ragheb, 2017).

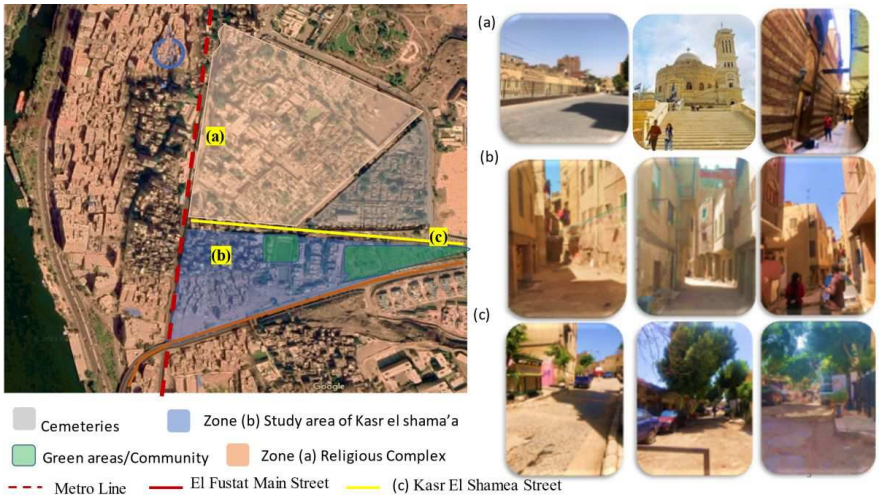

Figure 6: Existing values to be assessed in the urban context in terms of architectural features, by Authors.

6.4 Discussion: Assessing Urban Sustainability Domains

Assessing urban sustainability domains plays a key role in defining sustainable measures of development in heritage-related sites (De la Torre M, 2002). Studies are provided continuously by local authorities and researchers with a set of demonstrations as their main target, that supports the recognition and expression of the values latent in the work asbeing of special importance in the conservation of architectural heritage (20). Analysing the urban context and the settings of activities of the inhabitants activity brings more value to the decision-making on treatment and intervention in such settings (Sama Badawi, A.Nayer, 2017).Nevertheless, the selected site shows a wide concentration of heritage buildings, sites, structures, and landscapes, as well as the consistency in visual elements throughout the district, including scale or built form, all give the impression of a distinct time period, and define the uniqueness of an area (A. Nayer, Samaa Badawi, 2016).

This section discusses the detailed aspects influencing the conservation policies in the Fustat area in an integrative approach while being inspired and aspiring local community anddecision makers like the case of Jameel Community in 2022, highlighting the role of participatory approches in sustainable urban development initiatives.

6.4.1 Demographic and Social Domain

A thorough investigation is done to define the social demographics of inhabitants of the study zone,to emphasis on the local residence capacities and potentials, (H.Rashed, 2013). The results in Figure 6 shows that the majority of inhabitants are elderly persons and families of 4 to 6 persons residing in the units allocated to the south of the Kasr El Shamea Street. Educational facilities do not exist on site. Nevertheless it comprises a medical complex and community centre including sport court.

The majority of the residents are middle sized families of 4 to 6 persons and children are mostly attending schooling in the younger age while trying to find small jobs to support their parents. Most of the residents tend to learn the local crafts related to leather making or pottery enherited from elderly generations. It is recognised that number of females is up to 65% of the total population and they do participate in sustaining the local cgftsmenship by selling the products to small shops or for lower daily wages.

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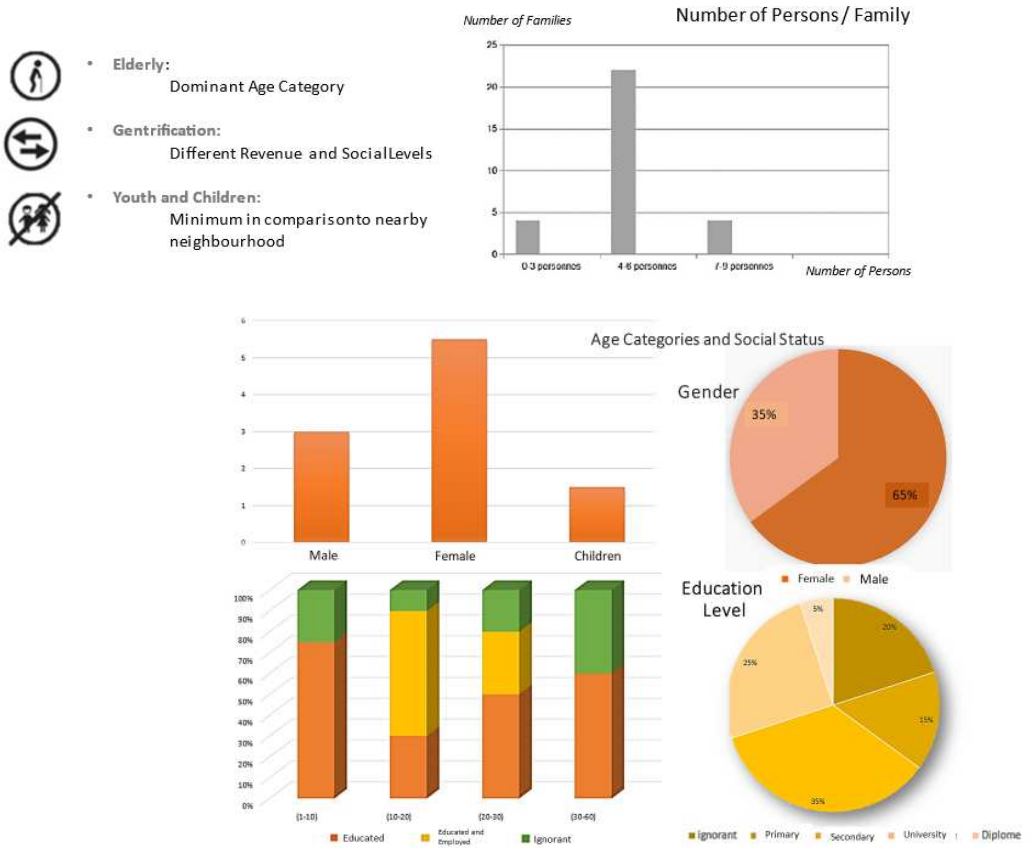

Figure 7: Demographic pattern for Kasr El Shamea residents, by Authors.

6.4.2 Economic Domain

The most relevant economic activities are supporting the tourism potential of the nearby existing heritage sites (Figure 7). The existence of local small shops for leather works and gifts are locatedon the ground level of the residential units, inhabited mostely by low-income families. Some local food stalls and cafes are more frequently active in the evenings and during weekends. The commercial activities on site have the purpose of preserving the historical and cultural built environment (Shaheen, P. 2010).

Figure 7: Exiting activities supporting the sustainable development in the area, by Authors.

6.4.3 Ecological Domain

Ecological values are driven by the role of the environment and the interactions among the local community. Fustat has a unique ecological footprint, and direct access to the Nile banks, in addition to the Ein-ElSira lake. There has been a large change in the surface water masses of the area where some have dried out while others have extended. since Ain al-Sira lies on lower land, sewage water runs down to the lake, creating both ecological and environmental damages (UNESCO, 2012).On the other hand, the natural topographical settings in the nearby area are due to archeological sites going back to the Greco Romain eras. The existence of natural stones also encouraged the settings of local human activities for artifacts and touristic products, as well as locally built units for workshops or residential units in an informal setting.

6.4.4 Environmental Domain

The natural environment supports and sustains human life in many different ways. It plays a critical role in delivering social, cultural, economic, and environmental outcomes for the local community. The Site is currently in the heart of the potential for developing Old Cairo, It provides opportunities to diversify and strengthen the economy in sectors like tourism and local art-crafts, yet the environmental conditions impose adaptation to the environmental settings of the capital with related densities and infrastructure demands, (URHC, 2012). As mentioned, The site suffers deeply from sewage complicationsand need for more support regarding waste management and garbage collection, in addition to lacking vegetation and air quality.

6.4.5 Urban Domain

The site has faced layers of development and showcases the typical sprawl impact on the existing urban fabric (Figure 8) showing densities and quality of the urban fabricof three different zones.

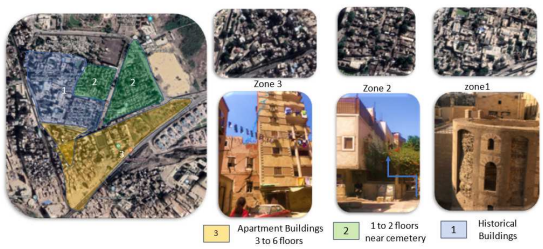

Figure 8: Existing densities and varity of urban fabric, by Authors. Figure 9: Demolished units on Fustat main street, by Authors.

The site has a unique organic urban fabric with layers of accumulated history and spirtual values. Due it its significance many project redevelopments have been proposed for the area (UNESCO, 2015). Of the most recent ones, thedevelopment project for informal areas in the heart of Cairo has resulted in the demolition of a number of residential buildings with deteriorated status (Figure 9 a) resulting in vacant land (Figure 9 b) where further solutions for sustainable development are proposed by the research project, in alignment with policies as well as considering local potentials resulting from the assessment of related values on the site.

Considerations for the displaced inhabitants forming less than 10% for actual residents of the site are alocated to new housing settelements at Al-Asmarat , the process is focusing on the upgrading of the economic conditions of existing site by ensuring the available infrastructure and the actual potentials of craftsmanship in the study area. Further studies by Saleh E., 2022, highlights the advantages and drawbacks of the upgrading project comprehensively of informal settlements in Cairo region.

Considerations for decision making regarding further develepment plans discusses the impact on the local art and craft activities which gain income from integrating the community and enhancing touristic values of the site.

6.5 Step 3: Model implementation and variable assessment

Sustainable Historical Area Index (shai):Model Assessment

Based on the documentation of the existing conditions, and the studies of the sustainability domains, the SHAI model proposes to analyse, measure, and assess the implemented sustainable development for the Fustat area. The model represents five domains: social, economic, ecology, environmental and urban, in addition to thirteen variables defining the sustainability historical area index. Each domain has a weight of 20% with a total of five domains of 100% total. Each cell represents a value of the variable in reference to the domain with a weight out of 20, with a final row with a total percentage of each variable, in addition to the vertical column indicating the percentage of each domain.

The assessment methodology of the Sustainability Historical Areas Index for the Fustat site presented in Table 3 indicates a set of measurable values and weights for each domain and variable. The values were attributed by the evaluators (Fattah, D. A., 2017), representing multiple categories. The community as the local residences, in addition to the historical sites“ visitors, whether national or foreigners. As for the NGOs, number of non-governmental institutions offered support through cooperative representative from the local residences accommodated guided tour around the site, and facilitated group meetings with the families, women, and children. Those NGOs, one supported by Amr Ibn Alas Mosque, the other represented the Christian community, and finally the workmanship representing the craftsmen and the local art. Regarding

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the local authorities, they acted as enabler, they supported the idea of community involvement and provided validation documents to allow the researcher to collect data, applying observation, taking photos, and produce visual maps.

Sustainability Historical Areas Index Variables / Urban Sustainability main Domains	Human economy	Urban metabolism	Ecological vitalities	Quality of life	Environmental capacities	Development activities	Environmental and social issues	Spatial levels	Timescale	Sense of place	Locality and identity	Cultural and spiritual aspects	Aesthetic qualities	Total	Percentage
V1,V2,V3……..Vn	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13		
Social 20%	13	17	15	15	13	18	13	18	16	17	19	19	17	210	**80%**
Economic 20%	12	14	13	13	13	17	13	15	16	17	17	17	17	194	75%
Ecology 20%	16	17	13	14	14	18	14	15	15	18	18	18	17	207	79%
Environmental 20%	14	14	13	13	11	18	14	16	16	18	18	18	18	201	77%
Urban 20%	16	14	12	13	12	19	14	18	18	18	18	20	18	210	**80%**
Total 100%	71 %	76 %	66 %	**68 %**	**63 %**	**90 %**	68 %	82 %	81 %	88 %	**90 %**	**92 %**	87 %	Total percentages	

Table 3: Assessment methodology sustainability historical areas index (SHAI), by Authors.

The numerical values were extracted and translated by the researcher from huge amount of date collected through the semi-structed interview, and focus groups. The idea of the numerical assessment was to validate the qualitative data into quantitative values. From the table above, the relatively high values of three variables are noted (V6: Development activities – V11: Locality and identity – and V12: Cultural and spiritual aspects) scoring approximately 90 - 92%, affecting the values of both the social and urban domain, scoring an accumulative figure of approximately 80% from the thirteen variables. The emphasis of V6 (Development activities) represents all the previous projects, and the current ones, targeting sustainable developments. The values of V11, and V12 (Locality and identity, Cultural and spiritual aspects) are expressing the high sense of locality and place attachment of the local community, and the significant cultural and spiritual values within the Fustat sites. The readings are representing the sensitivity of the current status, with high values of the variables related to the development and local identity, while, on the other hand, the Environmental capacities (V5), and Quality of life (V4) show very low values. The results indicate that, despite the historical and heritage values of the Fustat site, and its significant character with all the proposed and implemented sustainable development projects, still suffers from lacking services, facilities, and environmental and ecological treatments. Measures are indicating a poor quality of life, which urges a more holistic vision that would tackleall the variables in a parallel pattern.

Step 4: Demonstration of proposed solutions

The SHAI model is offering the interrelation of the integrated variables in a graphical visualization as per the framework shown in figure 10. The arrows represent the flow of information and how the model works, how the variables are connected and affecting each other as an endless loop of enhancements and developments. Annotated on the model the values of the variables with a highlight on the highest (green) and lowest (red) values. Noted that both Environmental capacities and environmental and social issues scoring the lowest values 63% and 68% respectively. These numbers indicate the poor environmental quality, and its direct harmful impact on the historical site. It acquires an instant urban solution. Although, development projects are introduced, but the aim of the SHAI model is to highlight, focus and define the deficiencies.

The implemented projects had focused on the urban development, in terns of building restoration and street networks, however, lacking the environmental approach with disregards to its importance and damageable effect. On the other hand, the SHAI model flourishes the variables with the highest scores as: locality and identity, and cultural and spiritual aspects, 90% and 92% respectively.

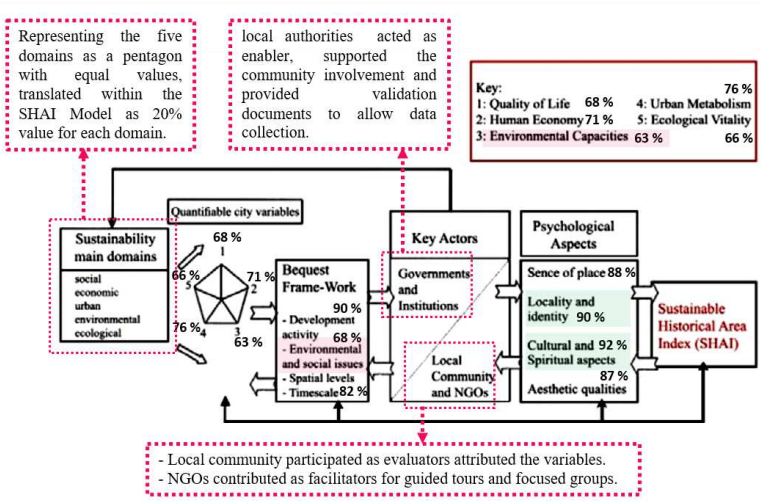

Figure 10: Framework demonstration of proposed solutions integration, by Authors.

The site is quite rich with sense of locality, that creates a strong identity and community solidity. These vibes were shown throughout the focus groups. The idea of having a strong identity and community connections, facilitating the residences participation and involvement. This promotes a stable platform of a motivated community to support the development projects and act together to enhance their local urban setting.

7 CONCLUSION

The paper applies its findings to show the validity of the conceptual application of the proposed multi-scalar attributes of the Sustainable Historical Area Index upon evaluating values and principles within existing Heritage Sites towards a more sustainable built environment.

The paper presented details of the proposed framework; the Sustainable Historical Area Index (SHAI); model as an integrated tool used to evaluate the capacity of the multi-scalar attributes to assess the urban sustainability of the built environment for heritage sites. The model has been applied to a case study based on a research project for assessing the urban sustainability of the Fustat site, focusing on Kasr El Shamea Street. Assessment results indicates promising results in the social and urban domains (as mentioned in the discussion) scoring relatively high values on the SHAI Model. The numerical values provide reliable readings, conveying valid figures with a clear vision of the site's existing conditions. Investigations, surveys and the analysis of gathered data demonstrate that detected points need specific remedies that should be mended in terms of spatial solutions and community involvement. Parallel investigations of people's responses, as well as physical surveys provide a complete image of howpublic involvement would work best to enhance the visitors' experience. Despite all the dedicated efforts and proposed projects, the site is still lacking essential needs, with major deficiencies of environmental issues such as waste management, freshwater supply, ecology of water level and sewage leaking into the lake water, and finally the economy, with poor communities and low-incomes.

Further suggestions are made towards resolving major points to urban enhancements. They include: encouraging safe pedestrian accessibility while preserving the built environment in the historical area of Kasr El Shamea; encouraging public services and enhancing the quality of spatial features and establishing connecting points with the adjacent heritage sites by including commercial purposes and while preserving the historical and cultural built environment.

Accordingly it can be concluded that there is a need for a regulatory model assessing the values of sustainable developemnet factors existing in the heritage sites to support the presence and conservation of development of today's societies taking in consideration the the architectural heritage. The research emphasises on the main purpose of attracting visitors, both local residents and tourists, sustaining the unique sources of income and improving the quality of life of the district's surrounding neighbourhoods while integrating existing community in the process of assessment and potential developement.

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8 LIMITATIONS

Limitations of the study is due to the continuous alterations performed on the extentions of infrastructure development plans in the periferals of El Fustat zone. Instead, reflection on site potentials should consider more sustainable and effective developments for both residents' and visitors' interests in the zone of Kasr El Shamea.

9 SUGGESTIONS FOR FURTHER STUDIES

The main goal of the "SHAI Model" research project is to assess sustainable values for sites under study by means of weighted analysis to provide quantifiable measures towards setting priorities for planimplementation. Thus, other potential areas of study can be suggested to apply the model while adjusting the value settings according to related analytical investigations with the aimto simulate a heuristic responsive set of recommendations and guidelines for future sites under study.

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