GIS APPLICATION FOR DOCUMENTATION OF HISTORICAL JEDDAH MONUMENTS

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ABSTRACT:

Jeddah had a history rooted more than 3000 years ago. It is the entrance to the two holy cities Makkah and Medina at Saudi Arabia with its core significance as a tourism, trading and service center area. As a result of the booming development that Jeddah witnessed the last three decades a mess in the architectural styles took place and its original heritage was harmed. From the sixties of the 20th century a numerous studies were done in the field of studying the Historical Jeddah. Recently the Municipality of Jeddah has created a special department for monitoring the development works within the Historical Jeddah distract. In collaboration with the abovementioned department, the Faculty of Environmental Design at King Abdul Aziz University has developed a relational database and a Geographical Information System for the documentation, protection and preservation of the buildings of the Historical Jeddah. The final product can be used by the Municipality of Jeddah, and researchers who are interested in such historical areas. It can be considered as a pilot system to help in management and developing of the cultural resources of the historical centres within surrounded urban environment.

KEY WORDS: Jeddah, Historical Buildings, Ggeographical Information Systems, documentation, preservation, built environment.

1. INTRODUCTION

The city of Jeddah had a history rooted more than 3000 years ago. It is considered as the western entrance to the two holy cities of Islam Mekkah al-Mukaramah and Al-Medina Al-Munawarah at Kingdom of Saudi Arabia with its core significance as a tourism, trading and service center area. As a result of the booming development that Jeddah witnessed the last three decades a mess in the architectural styles took place and its original heritage was harmed. From the sixties of the 20th century a numerous studies were done in the field of studying the Historical Jeddah. Recently the Municipality of Jeddah has created a special department for monitoring the development works within the Historical Jeddah distract. In collaboration with the above mentioned department, the Faculty of Environmental Design at King Abdul Aziz University has developed a Geographical Information System for the documentation of the urban information of the buildings at the Historical Jeddah district.

The generated information system includes all urban information of the building within the historical Jeddah besides the historical information of the cultural heritage contents. This system aims to help the municipality of Jeddah in the process of conservation of the cultural heritage of historical Jeddah.

Architecture is a substantial part of our cultural heritage. But whereas other elements of our cultural heritage may be protected by putting them behind a glass in a museum, architectural monuments are widely used and endangered by long term influences like traffic or air pollution or destructive events causing heavy damage like earthquakes, fire or war etc. But by all means when monuments are seriously damaged, or completely destroyed, the amount and quality of any surviving documentation becomes highly important (Duran and Toz 2001).

1.1 . Study Objectives

The desired GIS application will be used by the Municipality of Jeddah city to help decision making process and monitoring the urban development works within the Historical Jeddah district and its urban surrounded areas. It is also can be used by individual researchers who are interested of researching on Historical Jeddah and it

can be considered as a pilot information system for the management and urban developing of such cultural resources of the historical centers within surrounded urban environment.

1.2 . Study Methodology

In this study Esri ArcGIS application has been chosen for the documentation of the urban data of the historical Jeddah district. The study was done by a group of 18 student of different academic level at department of architecture at the faculty of Environmental Design at King Abdul-Aziz University. A digital orthographic satellite image of Historical Jeddah has converted into drawing with the help of AutoCAD software. The concluded drawing has used as a base map contains the spatial data that required for the information system.

The urban information and photographs of the urban contents of the study area has collected by the students organised in groups and entered into a relational database by using Microsoft Access software. Both base map drawing and relational database has been used with the help of Esri ArcGIS Software to create the desired Geographical Information System to documenting the urban information of the Historical Jeddah district. Jeddah municipality later on will be able to retrieve the urban information and modify it as the modifications get required.

1.3 . Historical Jeddah district

The old city covers an area of 1.5 km^2; it is delimited to the west by the cornice and to the north, east and south by the King Abdul Aziz ring road. Most of the structures which make up the dense city fabric are less than 200 years old. They essentially consist of two, three and four-story houses, some 19th century merchants' mansions, caravansaries and mosques. (Figure 1)

Because of the expansion of the city and the spread of new buildings outside the wall, the wall was demolished in 1947 A.D. (Daghistani, 1993). Recently the historical Jeddah district is a part of the central area with a total area of 1.5 km^2 and it was located within the old Jeddah inside its ancient wall. The Historical Jeddah consists of 3 main parts:

Part A- the costal part found between Ba ashan st. to the west and Al zahab st. to the east, Al Bayah Square to the north and a part of King Abdul Aziz to the south.

Part B- is the area located between Al zahab st. to the west and King Faysal to the east.

Part C- is the area located east of King Faysal st. known as The Historical Jeddah district; it is a living inhabited area with a full rang of service and trading activities.

Figure (1): Arial View of Jeddah in 1952

2. PREVIOUS STUDIES

Numerous studies were done for the City of Jeddah development including the Historical Jeddah district. The most important studies were as follows:

- 1963 AD, 1383 H: Jeddah Master Plan Study, Consultant Dr. Abdul Rahman

Makhloof. This study is one of the first investigations done in the area of urban planning for Al balad area. It is the base for all studies done later.

- 1978 AD -1398 H: Jeddah Executive Plan study, Consultants: Sirt Jackson and Saudi Consultants.

- 1979 AD -1399 H: Jeddah Historical area study, Robert Mathew and Partners, the study covers an area of 1.5 km^2 and is divided to 4 integrated parts as shown in next figures, these four area are as follows:
    1. Costal area
    2. Central work area
    3. Historical area
    3a. Eastern area

  The study concentrates on the historical area; it suggests preserving the area through integrated resolutions for land use and urban planning design.

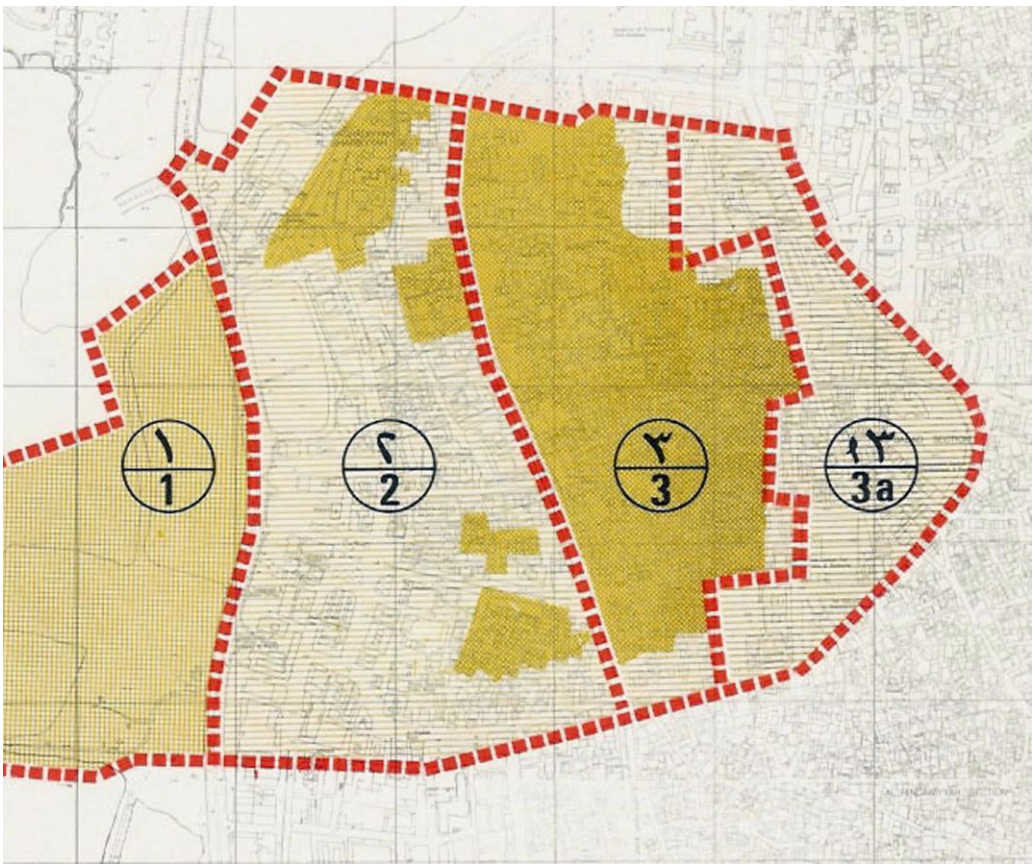

Figure (2): Jeddah divided to 4 integrated parts in Robert Mathew study.

- 1399 AD -1404 H: Historical Jeddah, Office of the United Consultants for Engineering Consultations. The study comprehended a detailed report about historical Jeddah and methods to preserve it with a concentration on a number of goals:
    - Present condition of the historical area
    - Allocating the reasons led to such situation.
    - How to preserve the historical area?.

- 1986 AD - 1406 H: The Urban Area Growth for Jeddah City, Al Sommet for Engineering consultations.

- 1987 AD - 1407 H: The Development of Jeddah Master Plan, Al Sommet for Engineering consultations.

- 2000 AD - 1419 H: Urban Development for the New Trading Center in North and West Of The Central Area of Jeddah, Dr. Ziyad Zida'an, The International Center for Designing and Engineering Consultations.

- 2005 AD - 1425 H: Renovation for Jeddah Master Plan Guidance, Al Bea'a – Planners, Architects and Engineers. The study recommended in general the sustainable development for the central area and to preserve its historical area as well. A detailed study was done for the western part of the area known as Bahr al teen – Mud sea- which represent a futuristic importance for the central area.

Some other studies were done, as instance: a study to develop the Al Arb'een lagoon by Zoher Fayez and Partners, an other study for the Historical Jeddah carried out by Dr. Sami Angawi. Some other studies were for the area between the Al Arb'een lagoon and Al Amana lagoon.

3. DATA COLLECTION

A considerable amount of data in map, image and tabular formats were collected, complied, and integrated. These data were further processed and structured into an IG. Database is strictly defined as one or more structured sets of persistent data, managed

and stored as a unit and generally associated with software to update and query the data (Navathe and Elmasri, 2002).

Data collected in this study has been gathered from private records, published professional literature, reports from engineering firms, maps and open file reports from municipality of Jeddah, documents from recording offices, and information through the Internet. One large set of data, including databases and documents, is from government agencies.

The updating site information was surveyed by a team work divided into groups to collect the recently information from all over the study area that divided into twenty two zones as shown in figure (3).

Figure (3): Historical Jeddah divided into Twenty Two zones.

4. DATABASE DESIGN

GIS techniques allow us to handle large amounts of complex data in new ways. The insights offered to archaeological research by GIS analysis have been increasingly acknowledged through the confirmation of spatial relationships, incorporation of temporal aspects, inclusion of uncertainty and a greater emphasis on cognitive aspects of space. In addition, GIS has been increasingly used to develop theory and to test alternative interpretations of spatial activity in earlier cultures (van Leusen, 1998).

A geodatabase in GIS includes data about the spatial locations and shapes of geographic features recorded as points, lines, areas, pixels, grid cells, or TINs, as well as their attributes. A geodatabase is a collection of geographic data sets for use by ArcGIS (ESRI, 2004a).

The ESRI ArcGIS® desktop environment was selected for creating the desired database. The relational database was designed to work individually or in consistency with the Geographical Information System, in such a way as to meet all the needs of the employees of the Municipality's Historical Jeddah Department.

The first step in the construction of Historical Jeddah database is implementing a geodatabase design scheme. Such a scheme will contain different types of information. In the present case the collected information are grouped into five main datasets:

a- Building coding numbers and heritage class according to Robert Mathew classification. (Robert Matthew, 1979)
b- Building characteristics (such as Building Height, building conditions, building materials, and occupation status, number of units and building types).
c- Availability of building services and infrastructure networking.
d- Ownership and main building uses.
e- Building photographs

Information about the streets and the construction works and interventions within the limits of the Historical Jeddah distract is also included. A geodatabase was created to hold all these primary information and creating relationships inside the geodatabase (Figure 4).

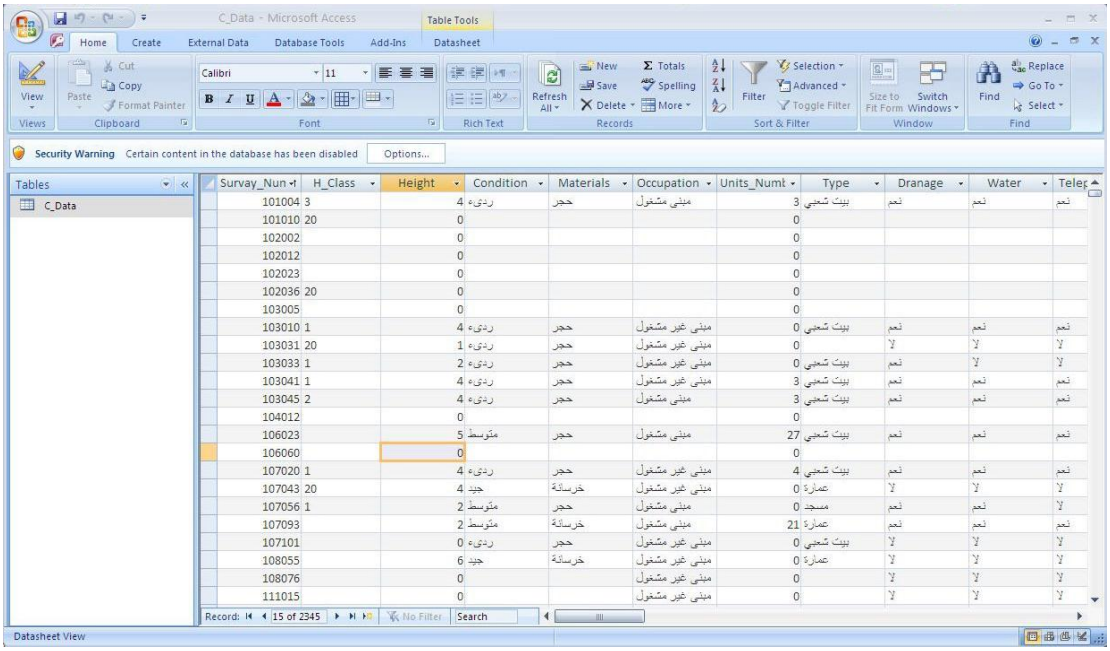

Figure (4): Geodatabase View of the Geographical information system of Historical Jeddah

5. GIOGRAPHICAL INFORMATION SYSTEM (GIS)

Much of the criticism was based on extreme data-led GIS applications, which developed into a pre-occupation with analyzing spatial patterns in a social and theoretical vacuum. Since then, predictive and spatial modeling using GIS have become increasingly attractive to archaeology as one of the more flexible and comprehensible analytical tools available to the archaeologist. (Ashmore,W., Knapp, B. (Eds.)1999).

A geographic information system (GIS) is a system for the management, analysis, and display of geographic information. Geographic information is represented by a series of geographic datasets that model geography using simple, generic data structures. GIS includes a set of comprehensive tools for working with the geographic data. The power of a GIS comes from the ability to relate different information in a spatial context and to reach a conclusion about this relationship.

Satellite image data that have been interpreted by a computer to produce a land use map can be "read into" the GIS in raster format. Raster data files consist of rows of uniform cells coded according to data values. GIS software can be used to convert a satellite image map to a vector structure by generating lines around all cells with the same classification, while determining the spatial relationships of the cell, such as adjacency or inclusion (figure 5).

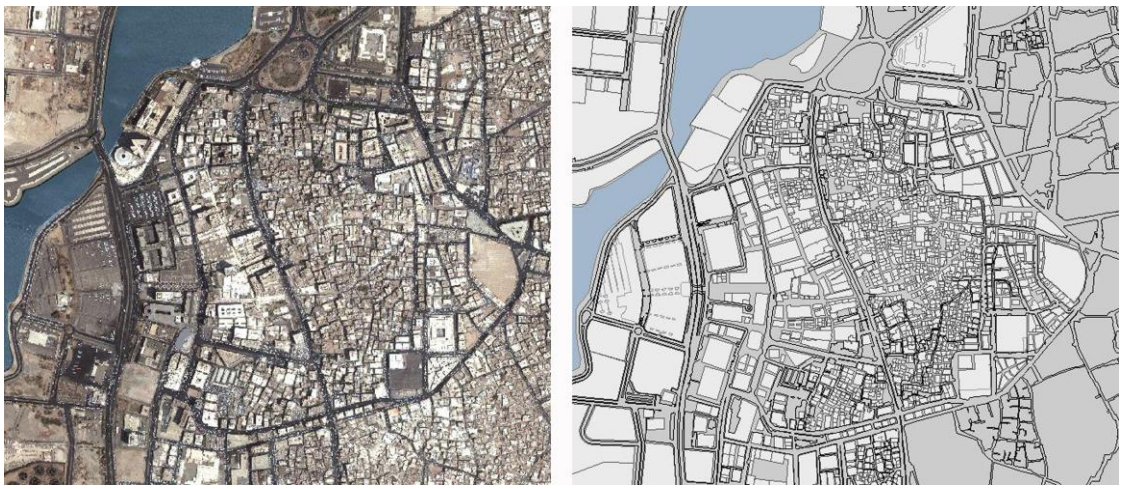

Figure (5): Historical Jeddah shown as a satellite image map and as a vector structure map.

The software of ArcMap offers two types of map views: a geographic data view and a page layout view. The geographic data view, used to work with geographic layers to symbolize, analyze, and compile GIS datasets. A table of contents interface helps in organizing and controling the drawing properties of the GIS data layers in the data frame. Figure (6) shows the geographic data view of the Geographical information System of Historical Jeddah.

In the layout view, the work will be with map pages that contain geographic data views as well as other map elements, such as scale bars, legends, North arrows, title, and reference maps. ArcMap able to compose maps on the pages for printing and publishing in different digital format as required for the municipality of Jeddah uses. Figure (7) shows a layout view as a sample output of the GIS application of Historical Jeddah.

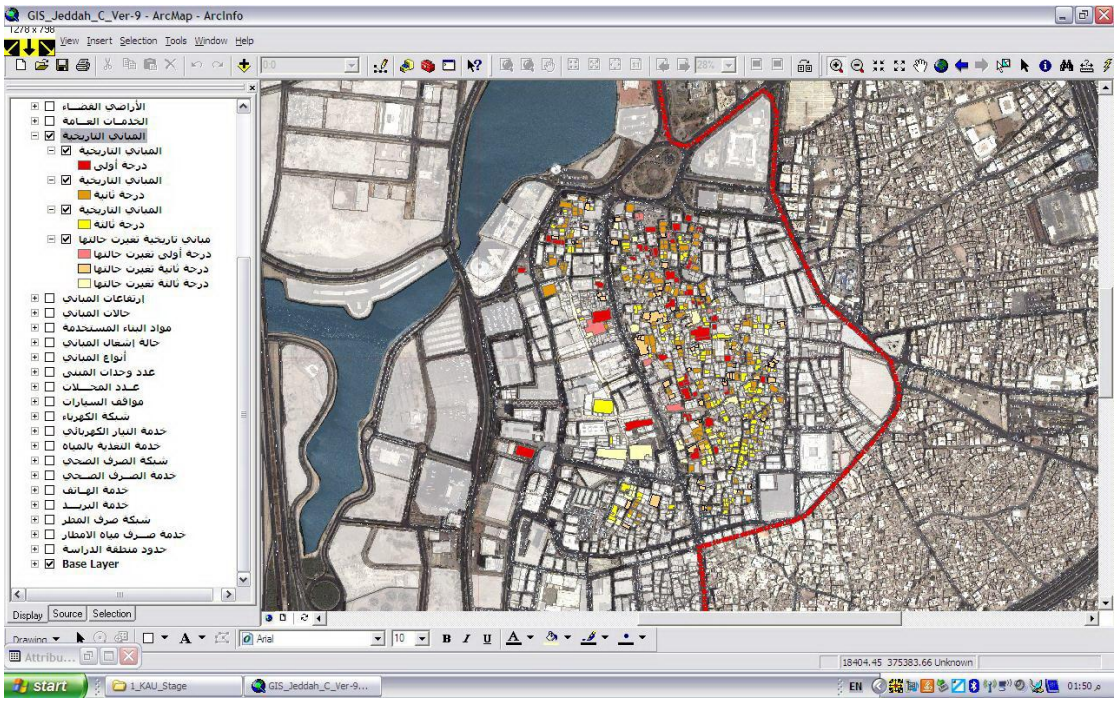

Figure (6): Geographic Data View of the Geographical information system of Historical Jeddah.

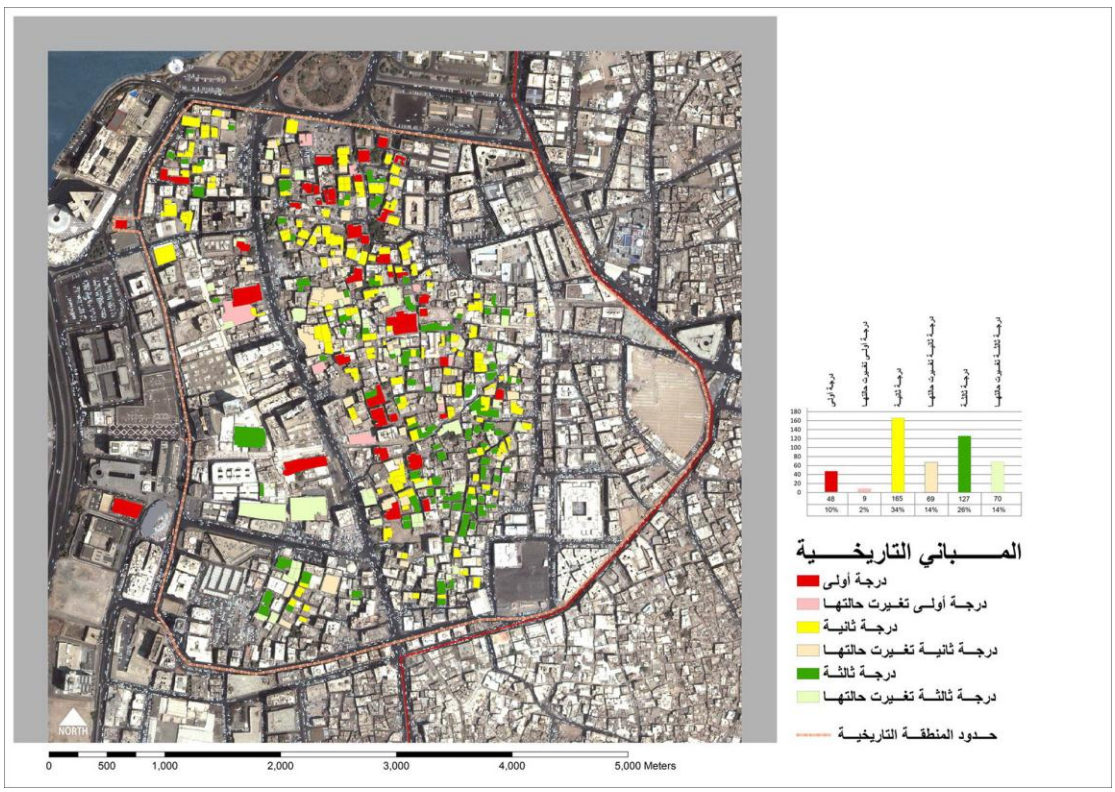

Figure (7): Layout View shows a sample output of the GIS application of Historical Jeddah.

6. CONCLUSIONS

The paper is dealing with a demonstration project designed for the documentation of historical Jeddah that can be used by the Municipality of Jeddah, and individual researchers and it can be considered as a pilot system for the management and developing of the cultural resources of such historical centers within surrounded urban context. The proposed information system has tried to introduce a digital way of documenting the database, which includes information related to the present day settings of historical monuments and buildings of Historical Jeddah district. The concluded GIS system will help the municipality of Jeddah in the decision making process related to urban development and preservation of high architecture value monuments within historical Jeddah.

The final GIS system can be used in different ways. The Municipality can use it to protect the monuments and monitor the construction interventions within the limits of the Historical Jeddah and to provide an interactive map with the sights of the town for tourists. Individual researchers can use it as a tool to locate architectural information for the Historical Jeddah monuments. The system can be easily applied to other small or large Historical districts aiming to management of the historical monuments within the urban environment. For the future, the proposed system can be designed and installed in user-friendly interface in the internet, serving the geographically referenced information through a Web-GIS platform of Historical Jeddah.

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تطبيقات نظم المعلومات الجغرافية في توثيق المحتوى العمراني التراثي لجدة التاريخية

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الملخص:
يعود تاريخ جدة الى أكثر من 3000 سنة. جدة تعد اهم المداخل إلى المدينتين المقدّستين مكة المكرمة والمدينه المنورة في المملكة العربية السعودية، كما انها تحظى بأهميه رئيسية كمنطقة سياحة وتجارية ومركز خدمات للمنطقة. كنتيجة للتطوير والازدهار الذي شهدته جدة خلال العقود الثلاثة الأخيرة وما واكبه من الفوضى في أنماط الفن المعماري، توارى تراثها العمراني الأصلي. منذ الستينات من القرن العشرون جرت دراسات عديدة إهتمت بدراسة جدة التاريخية. مؤخرا قامت أمانة جدة بانشاء قسم خاص لمراقبة أعمال التطوير العمراني لمنطقة جدة التاريخية. بالتعاون مع هذا القسم، قام فريق من كلية تصاميم البيئة في جامعة الملك عبد العزيزبتطوير نظام معلومات جغرافي يضم قاعدة بيانات عمرانية للتوثيق المعلومات التي تساعد في إتخاذ القرارات المتعلقة بحماية والحفاظ على عمران جدة التاريخية. المنتج النهائي من هذه الدراسة تستفيد منه امانة جدة وكذلك الباحثون المهتمين بعمران جدة التاريخي. أيضا هذا المنتج يمكن إعتبارة نظام تجريبي للمساعدة في إدارة وتطوير المراكز التاريخية للمدن حتى تصبح فاعلة ضمن البيئة الحضرية المحيطة.

الكلمات الدالة:
جدة، المباني التاريخية، نظم المعلومات المكانية، توثيق، حفاظ، البيئة المبنية.