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RETHINKING HERITAGE AND IDENTITY

Pancawati Dewi, Dhini Dewiyanti

Heba Jahin, Ayman el- Zamarani, Rania Rasla

Khalid S.M. Al-Hagla, Manar Talaleldin Mohammed, Lara A. Awad

Susane Havelka, Hans-Peter Mønsted

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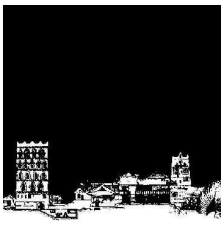
Volume Editors:
Mark Gillem
Hesham Issa
Adnya Sarasmita

207 East 5th Avenue
Eugene, OR 97401

tel: 541 712 7832
e: coordinator@iaste.org; www.iaste.org



TRADITIONAL DWELLINGS AND SETTLEMENTS WORKING PAPER SERIES

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Traditional Dwellings and Settlements
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HEARTH IS ONE OF THE DNAS OF THE NUSANTARA DWELLINGS

Pancawati Dewi, Dhini Dewiyanti

HEARTH IS ONE OF THE DNAS OF THE NUSANTARA DWELLINGS

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Architecture has material and energy dimension. The hearth, as one of the basic elements, becomes a source of energy for the architecture. In Nusantara architecture, the hearth is an important element that cannot be ignored, from initially playing a multifunctional role to slowly changing into an elemental one, from an element that can be felt physically to becoming abstract and symbolic. The richness of the diversity of hearths in Nusantara houses can provide a pluralistic color to domestic architecture in cosmopolitan cities in Indonesia. The hearth as the DNAs of Nusantara architecture remains a memory that does not want to be erased. The hearth as energy is the DNA that becomes the "soul" of architecture.

"Thus, globalization doesn't impose European architecture adapted to Indonesia. Instead, it refines and elevates Nusantara style to share with the world"

(Josef Prijotomo)

1. INTRODUCTION

Indonesia is not yet fully considered a cosmopolitan country, but some of its major cities, such as Jakarta, Surabaya, and Bali, have characteristics that approach those of cosmopolitan cities. Cosmopolitanism is usually marked by cultural diversity, openness to the international world, and extensive economic, social, and political interactions with various countries. Indonesia is the 14th largest country and the largest archipelago in the world, with a land area of 1,904,569 km². It is also the sixth country with the most islands in the world, with 17,504 islands, and has 1,340 ethnic groups and sub-ethnic groups in Indonesia. Each of these ethnic groups has cultural diversity that ultimately also influences the diversity of its architecture. Indonesia is also known by the term "Nusantara," referring to its vast archipelago.

However, history shows that Indonesia has long been familiar with cosmopolitanism. For example, Banten, a port city in Indonesia from the 15th to the 17th century, demonstrated cosmopolitan life through the Nusantara spice route. Port cities like Banten became sites of interaction, communication, and knowledge exchange, not only in trade but also in culture, tradition, religion, language, and technology. According to Ariwibowo, Banten not only became an open trading city visited by various merchants from various countries in Nusantara and Asia, but also from the 16th to the 17th century became a center of Islamic education and teaching that was quite influential in the western region of Nusantara. Additionally, it was a place for the flourishing of various Islamic teachings and philosophies that originated from the Middle East, Central Asia, to South Asia.[1]

Cosmopolitanism in Indonesia is not a recent phenomenon. Now, cosmopolitanism influences people's lifestyles, not only among the global elite who have access to various cultures around the world but also the

lives of ordinary people through their daily experiences. How, then, does Indonesia navigate the era of globalization and the inevitable rise of cosmopolitanism? Indonesia's complexity lies in the meeting of different ethnic groups within the same space, often leading to tensions due to differences in ideology and lifestyle, resulting in confusion over identity. On the other hand, urban Indonesian communities also face globalization, namely the influence of foreign cultures and technological advancements that cannot be avoided.

Babba (in Beynon et al., 2023) asserts that cosmopolitanism arises from a complex "glocal" identity, supported by technology, infrastructure, and a sense of home, "in mature communities with an adequate foundation when their 'I am' matures into a satisfying truth." Furthermore, Beynon et al., stated how the development of places, such as in Springvale, can be seen as an expression of local agency in a built environment, and its meeting with largely informal adaptations influenced by culture, which is a worldwide phenomenon. This represents the "glocal" as it offers distinct "local" particularity within a shared built environment, not only in cultural terms but also in relation to economic and socioeconomic development, which is interconnected between locality and (in this case, largely from Southeast Asia) global influences.[2]

Various definitions and phenomenon of cosmopolitan cities show that cosmopolitan cities in Indonesia did not just emerge today. The traces of acculturation in buildings that still stand today are evidence that Indonesia, an archipelago country, especially in port cities, has long been familiar with other ethnic groups in the Nusantara region and has known foreign cultures for a long time. The richness of architecture and culture in the Nusantara region has shaped cosmopolitan cities in Indonesia from the past to the present. To understand all of this, a search for architectural DNA is needed. As one of the basic elements that shape architecture, the hearth plays a crucial role in Nusantara houses. Furthermore, a study of the origin of architecture and the evolution of architecture (specifically for hearths) is expected to provide answers to all of this.

Origin of architecture

According to Vitruvius, the discovery of fire originally gave rise to the coming together of men, to the deliberative assembly, and to social intercourse. And so, as they kept coming together in greater numbers into one place and they began in that first assembly to construct shelters.[3] While Semper stated:

> "In ancient and modern times, the store of architectural forms has often been portrayed as mainly conditioned by and arising from the material. Architecture, like its great teacher, nature, should choose and apply its material according to the laws conditioned by nature. If the most suitable material is selected for their embodiment, the ideal expression of a building will of course gain in beauty and meaning by the material's appearance as a natural symbol. It is the first and most important, the moral clement of architecture. Around it were grouped

> the three others the roof, the enclosure and the mound, the protecting negations or defenders of the hearth's flame against the three hostile elements of nature."
>
> Semper, G., Mallgrave & Herrmann[4]

The opinions of Vitruvius and Semper above explain each other about the elements that form architecture. Semper looks more at the physical elements that form architecture, while Unwin looks at the human side that requires architecture. Semper's explanation of how the materials from the roof, enclosure, and mound protect the fire from the hearth emphasizes how architecture was first created by humans to protect the fire from the hearth. The important role of fire at that time can be understood. Fire, which initially came from natural phenomena, easily went out due to rainwater and wind gusts. Humans, who felt the benefits of fire, then tried to create fire. Initially, making and creating fire was not an easy task. Humans had to work hard for hundreds, even thousands, of years to achieve it. Fire was an important discovery that changed the foundations of human life, including its civilization traditions. That's why humans needed protection to safeguard the flame, and that's how humans began to architect.

Furthermore, Galiano's opinion also further clarifies the connection between materials and the hearth in architecture. In his book Fire and Memory, Galiano explains that the thermal space of the campfire is no less architectural than the visual space of the hut. The hut and the fire, construction and combustion, are closely linked in the history of dwellings, a unique combination of built order and flammable disorder. Energy brings architecture into the world of process and life. However, energy also endows architecture with consumption, transience, and irreversible time. Architecture unites fire and hut, chaos and organization.[5] As explained in the book Fireplace:

> "Fire production is the great productive revolution in humanity. Throughout human history, fire has been decisive for its technological and cultural development, therefore, in symbolic and religious matters it has also acquired a relevant role. Intentionally made combustion structures might be considered the first architectural elements in human history."
>
> Koolhaas Rem[6]

Unwin also explains how a fireplace was used to identify a place that would subsequently become the center of their activities. Other activities would then develop around the fireplace. From their choice of the site onwards they have begun the evolution of the house; they have begun to organize the world around them into places which they use for a variety of purposes. They have begun to do architecture.[7] This was also confirmed by Galiano, anthropologists associate the domestication of fire with the separation of paleoanthropoids from their biological predecessors and consider evidence of combustion the surest signs of human habitation.[8]

The above opinions affirm the role of fire in triggering the emergence of architecture for the first time. Starting from the discovery of fire, humans began to architect. Fire is not only a marker of place, but with all its energy, it functions not only physically but also symbolically and has a connection to religion.

Evolution of Hearth

To understand the evolution that occurred in one of the basic elements of architectural formation, namely the hearth, we need to know the developments that have taken place so far. According to Koolhaas, the function of fireplaces began to shift in the 19th century, as they were gradually supplanted by non-architectural, individual technologies. The hearth evolved from a basic existential and architectural feature into a complex thermal comfort system.[9] Galiano asserts that the relationship between architecture and fire has undergone significant transformations throughout history. Fire, once a central element, has undergone processes of reproduction, specialization, and expansion, both in terms of number and size. However, as its quantity increased, there was a gradual, yet inevitable, decline in its quality. The fire lost its ritual and mystical significance and was ultimately displaced from the central role it once held in architectural space. Even in the earliest urban cultures, particularly those that emerged in more temperate climates, the symbolic role of fire within the home often outweighed its functional purpose. The continuity of fire rituals was considered more important than its capacity for heating.[10] Meanwhile, Unwin provides a detailed account of the hearth's development over time, beginning with the simple campfire surrounded by stones. These stones served to protect the fire from excessive wind and retained some of its heat. Over time, this evolved into a more structured form, with two parallel stone walls that channeled drafts and provided a platform for cooking. Further advancements saw the introduction of a tripod for hanging cooking utensils, followed by more sophisticated constructions such as elevated hearths incorporated into seats or tables, enhancing both functionality and convenience, and eventually leading to the creation of small, dedicated buildings to house the hearth.[11]

The explanation above shows that the evolution of a hearth occurs starting from the change in function of the hearth due to being partially replaced by modern technology. The fire in a hearth, which was once multifunctional, shifts to being mono-functional or elemental. In fact, fire also loses its ritual and mystical content, causing it to be removed from its central place.

Will the role of fire from the hearth eventually be fully replaced by technology? Can humans eliminate the role of the hearth, especially in their dwellings? What is the actual function and role of a hearth in the history of architectural evolution? This writing will attempt to answer those questions. Through the case of Nusantara Architecture, it is hoped that the DNA of architecture can be found, so that Indonesia will be able to face cosmopolitanism without hesitation.

2. METHODOLOGY

This study employs an Interpretive-Historical research method, as outlined by Groat and Wang (2002). The Interpretive-Historical approach is suitable for framing narratives that explain past events and phenomena. It involves the collection of historical data, its evaluation, and organization into a coherent narrative that provides an in-depth understanding of past occurrences. The core of this method is interpretation, which aims to derive objective meaning from subjective data, particularly within specific community contexts.

Data collection was conducted through direct field exploration of various ethnic architectures across Nusantara. Given the region's architectural diversity, this research method necessitates a typological approach. This approach allows for identifying "general similarities" or "convergences" within the diverse data, thereby enabling effective categorization. Once categorized, the data was organized according to historical timelines, cross-referenced with theoretical perspectives on the evolution of the hearth, as discussed by Unwin.

To ensure comprehensive and reliable empirical data, the study employed a longitudinal research design. Repeated field visits were conducted at multiple locations across different time periods to track changes in the use of hearths within the same residential or settlement areas. The data collected from these visits, including direct observations, historical photographs, and interviews with homeowners, was then organized based on time periods. This temporal grouping provided the foundation for historical interpretation.

The gathered historical data was analyzed through the lens of Unwin's hearth evolution theory, with a focus on technological advancements and their influence on the hearth's design over time. Additionally, the theory of space segmentation was integrated to examine how the spatial arrangement of the hearth within Nusantara houses evolved. By constructing a genealogy of the Nusantara hearth, the study aims to uncover the architectural "DNA" of Nusantara houses, which forms the basis for the analysis of contemporary cosmopolitan cities in Indonesia.

The research then extends its analysis to three cities—Jakarta, Surabaya, and Bali—which were selected for their cosmopolitan characteristics. Jakarta and Surabaya were chosen due to their diverse populations, resulting from the gathering of communities from different regions. Bali was selected for its significant influence from foreign tourism. These cities serve as case studies to explore the impact of cosmopolitan dynamics on local architectural practices. Furthermore, interviews with young architects in Indonesia will offer insights into future trends in architectural design, especially as they relate to the ongoing influence of cosmopolitanism.

Finally, the research will build a narrative based on a thorough examination of reliable, holistic data, which will be critically evaluated and interpreted through theoretical discussions. This approach ensures that the findings of the research provide objective interpretations of how historical, cultural, and technological factors have shaped the architecture of cosmopolitan cities in Indonesia.

3. FINDINGS

As stated by Galiano, architecture has a visible material dimension and an invisible energetic dimension, and that both cannot be separated. Fire warms the body and transforms food, but it also symbolizes the soul of the home and the city, making it a fundamental element in the foundation rituals of urban and domestic spaces.[12] This research will see the hearth not only physically as an interior element. The hearth with all its functions and roles will be studied holistically so that the DNA of this architecture can be found.

Hearth as an energy source

The hearth, serving as a vessel for containing and managing fire, plays a crucial role in maintaining the flame and regulating its use according to specific needs. In Nusantara, the hearth within a dwelling initially functioned through several interconnected elements. These included the combustion element for burning during the cooking process, the heat element for warming both individuals and spaces, the light element for illumination, the flame element for ceremonial rituals, and the smoke element, which served both to preserve organic building materials and to facilitate ritual activities (Fig. 1). Hearths with such multifunctional roles can still be found in many regions of Nusantara, particularly in homes that retain a single, unified hearth. However, over time, many hearths have undergone a transformation from multifunctional to mono-functional uses, leading to an increase in the number of hearths within homes to accommodate various specific needs. [13]

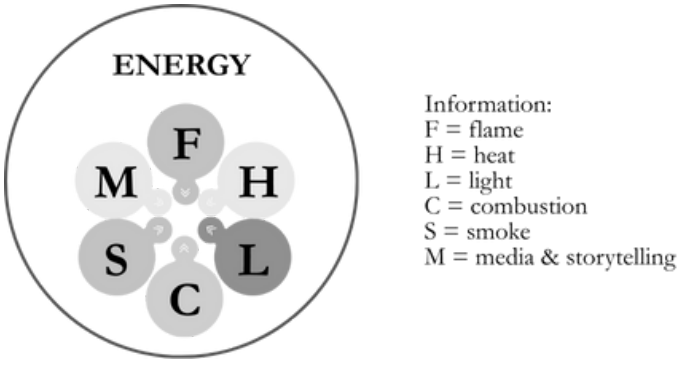

Fig. 1: Hearth as a source of energy

Continuing the discussion on the role of the hearth, it can be understood that a hearth plays a role due to the function of fire within it. Fire as a source of energy can be further distinguished as: energy as a transformer (lighting, heating, cooking, and transforming materials); energy for gathering people; and energy for safety, life, kinship, prosperity, and other aspects related to religion or rituals. This reaffirms Galiano's statement that architecture, especially in Nusantara, has not only a material dimension but also an energy dimension. Like fire, which has physical functions, it also has abstract functions (related to domestic rituals).

Genealogy of Hearth in Nusantara

Genealogy is a discipline commonly employed in anthropology, particularly in the study of familial structures and the tracing of lineages and histories. It can also refer to a detailed account of the origins and historical development of a particular subject or entity. "The diversity of ethnic groups in Indonesia reflects the diversity of its architecture, including the diversity of hearths in Nusantara community dwellings. Through the evolution of hearths in Nusantara, it shows that there are 5 (five) types of hearths that exist to this day, namely: 1) The First Generation: a permanent, multifunctional wood hearth placed on the ground in the center of the room; 2) The Second Generation: a row of stones surrounding the fire, permanent, multifunctional, and placed in one of the rooms in the house (kitchen); 3) The Third Generation: a hearth shaped like a table, permanent, multifunctional, and placed in one of the rooms in the house (kitchen); 4) The Fourth Generation: a varied hearth shape, permanent, multifunctional or mono-functional, and placed in a special room or outside the house; 5) The Fifth Generation: a varied hearth shape, movable, mono-functional, and placed in a special room or outside the house.[14] The diversity of Nusantara hearths can be seen in Figure 2.

The typology of the diversity of hearths in Nusantara above is compiled based on the theory of evolution influenced by technology and the use of fire functions that are increasingly elementary. This typology represents Nusantara houses scattered mainly in small towns or rural areas. However, it does not yet represent houses in big cities or cosmopolitan cities in Indonesia. The changing lifestyle of urban communities in facing cosmopolitanism and the role of "hearth as the heart of home" as mentioned by Unwin, or as done by Architect Frank Lloyd Wright in his design of Fallingwater, which considers a focal fireplace as "the psychological center of home"[15], becomes an interesting discussion to understand the further role of a hearth in urban dwellings.

Fig. 2: Genealogy of Hearth in Nusantara Dwellings

Cosmopolitanism vs Localism

A different phenomenon is shown in cases of urban dwellings, especially in large cities that are becoming cosmopolitan cities, such as Jakarta, Surabaya, and Bali. Most people in Indonesia who live in big cities come from various regions. As newcomers, most of them will live in planned housing (real estate) designed for all groups without considering specific ethnic. The consideration for real estate is based on the economic ability of potential buyers. This forces newcomers to adapt to new housing that does not accommodate all their needs, especially their needs as social beings who are part of a specific culture. It's no wonder that the current generation living in big cities often no longer knows their origins. They have become modern people whose ethnic identities can no longer be distinguished.

Concerns about the condition of modernization in Indonesia began to emerge in the 1970s, with the emergence of "Tropical Architecture" and "Vernacular Architecture" as a form of resistance against uniform modern architecture. In the 1980s, the concept of vernacular architecture was strengthened as a concept that uplifts local cultural values and natural materials. At that time, the concept of "Nusantara Architecture" was also introduced theoretically in academic seminars. Furthermore, research on traditional houses, traditional architecture, and local materials began to be used as thesis and dissertation materials in various universities. In the 1990s, the course "Nusantara Architecture" began to be integrated into the curriculum of architectural education in Indonesia, although not all universities implemented this. In the 2000s until now, Nusantara architecture is often used as a national identity, where the new Indonesian capital city is also named Nusantara Capital City. The emergence of Law Number 28 of 2002 regarding Building which requires every region to consider "local cultural values" in building administration, also reaffirms the government's commitment to paying attention to national identity. In one of the articles, it is stated that architectural planning for buildings must consider the cultural values of the nation and the social and cultural conditions of the local community.[16]

Facing unavoidable globalization, several major cities in Indonesia are responding in various ways. Bali, as one of the world's tourist destinations (the largest in Indonesia), cannot avoid the influence of foreign cultures. The strength of Balinese culture, which is one of the main attractions, is fully realized by the government and the people of Bali. Traditional settlements are maintained in their original form, and the daily life of the indigenous people has become a fascinating spectacle. Adaptation is also made in their daily lives. The layout and shape of Balinese houses tend to be maintained in their original form, and customs and daily life patterns remain unchanged. However, the people of Bali cannot avoid the influx of technology. The presence of traditional hearths in their houses is still maintained, but they are usually only used for ritual ceremonies, while in their daily lives they have switched to using modern technology or gas stoves (Fig. 3 - left).

Fig. 3: The role of the hearth in modern houses (left - house in Bali; right - house in Bromo Tengger)

The influence of globalization is not only hitting major cities in Indonesia but also starting to affect more remote areas. As seen in Figure 3 (right), a house located in Ngadisari village in Bromo Mountain area, which is also a tourist destination for foreign visitors. This house has several hearths, including a moveable hearth (a traditional hearth that can be easily moved) and a hearth shaped like those found in European or American countries. This combination of hearths is quite interesting, where the family wants to be global but is unable to leave behind their local identity as Tengger people.

The phenomenon occurring in cosmopolitan cities in Indonesia today places local identity as an important aspect. Many new buildings are now showcasing the past or highlighting Indonesian culture as a tourist attraction or design theme. Providing memories of the past as photo booths is also becoming popular among the current generation. This, of course, serves as a good introduction for the generation that has started to lose touch with their cultural heritage (the identity of each ethnic group).

Hearth as a memory

Fire is no longer a reality for science. According to Bachelard, fire is not just a physical phenomenon, but a symbol rich in meaning and closely related to human imagination. Fire has been able to evoke human imagination since ancient times, becoming a symbol of myth, ritual, and spirituality. Humans have an intimate and emotional relationship with fire, which transcends scientific understanding. Fire and heat provide modes

of explanation in the most varied domains, because they have been for us the occasion for unforgettable memories. Fire is the ultra-living element. it is intimate and it is universal.[17] Meanwhile, Galiano argues that fire and house complement each other in children's minds. Children draw and create poetry, and even under the subconscious, they always associate between cave and bonfire. the fireplace and the house.[18] Both opinions show how the experience of fire (hearth) has been ingrained since childhood and becomes an 'unforgettable memory'.

Fig. 4: Hearth as memory and symbol in houses in cosmopolitan cities (case tudy : Surabaya)

How do houses in cosmopolitan cities in Indonesia recall memories of their occupants' childhood? Various ways are shown through various phenomena, ranging from domestic houses to public facilities. One example is a house located in Surabaya. Various ways of remembering traditional hearths and fire are shown, starting from the use of gas stoves in the kitchen designed with a depiction of a wood-fired stove; the reuse of unused gas tanks as tables in the garden and the use of artificial lighting in the garden that takes the shape of a torch. Fire and hearth, with all their benefits, are presented as memories of the homeowner's childhood (Fig. 4).

Memories of the hearth do not only occur in domestic houses but can also be seen in public facilities. In Figure 5 (left), it is shown how the lobby of an apartment in Jakarta welcomes the Christmas celebration. A Western-style hearth (European and American) with a burning fire becomes a symbol of Christmas in that place. On the other hand, Figure 5 (right) explains how a restaurant serving Javanese cuisine tries to evoke memories of the past by presenting a traditional hearth. The hearth is equipped with traditional cooking utensils and a mortar for pounding rice, which are not only presented as atmosphere enhancers but also function as a photo booth. This is done to add attractiveness to customers while providing memories or even new experiences for customers who have never known Javanese culture in the past.

Fig. 5: Hearth as memory and symbol in public facilities (case tudy : Jakarta)

Andy Rahman, an architect in Indonesia, tries to capture the energy of a hearth in some of his designs. The energy that can gather people is made as a community focus for all building occupants. In 'boarding house' buildings or office buildings with more than one floor, the 'hearth room' or kitchen is placed as a dining area and gathering area (Fig. 6). According to the architect's explanation, he tried to evoke the concept of a Javanese House by using the hearth room (kitchen and dining area) as a quite important space for gathering or unifying space for all building occupants.

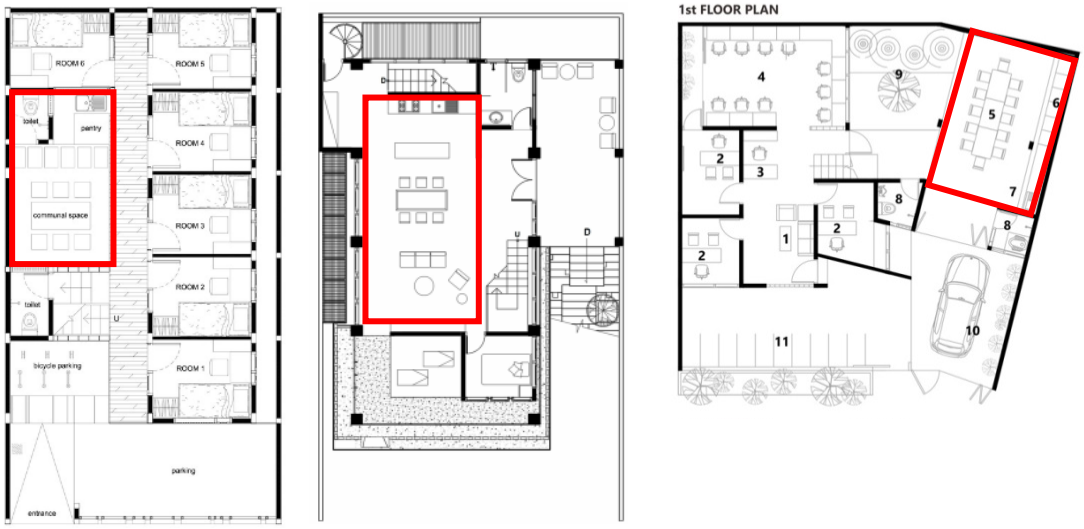

Fig. 6: Energy from Hearth (dining room) as a community focal point

Hearth (=energy) as an DNA of architecture

Architectural DNA can be studied through various approaches. Embden *et al.* employ Evolutionary Computation (EC) to enhance and modify structural forms based on microscopic biological structures. Their method utilizes ParaGen as a design tool to explore parameterized solutions, which are defined by a combination of visual and performance criteria. In this context, the ParaGen tool proves valuable in the decision-making process, especially when addressing design complexities, such as intricate geometries produced by computational tools. [19]

Indah Kartika Sari, on the other hand, applies the concepts of genotype and phenotype to uncover the values and meanings embedded in the spatial layout principles of the Malay traditional house in West Kalimantan. This study examines gender classification and environmental cleanliness/pollution as genetically inherited traits. By using space configuration techniques developed by Hillier and Hanson, the research explores how the original genotype and phenotype inform architectural identity, with a particular focus on the function of space. The findings of this study highlight the generational transmission of spatial layout principles, specifically in relation to gender and zoning regularity. [20]

Meanwhile, Adiyanto uses a synchronic-diachronic approach to conduct an in-depth study of the 'origin' of the community that inhabits Nusantara. This research shows that human migration brings the ability to inhabit and leaves its mark in Nusantara. The ability to architecturally inhabit then merges with human adaptation abilities and produces new residential architectural works. This new ability then also merges with other abilities brought by newcomers in the next wave of migration. There are layers of architectural traces that can be explored. Nusantara architecture is diverse, due to its hybridity and adaptability to its environment. Nusantara architecture is not singular, but plural, so it's natural to understand Nusantara architecture from various perspectives.[21]

In this study, the DNA of Nusantara architecture is attempted to be seen from one of the elements that form its architecture, namely the hearth element. Hearth in Nusantara is considered one of the elements that can give identity to its architecture. Through the evolution of architecture and typological approaches, the genealogy of Nusantara hearths, especially those in rural areas, is known to have developed rapidly. The diversity of Nusantara architecture shows that until now, ranging from the first type (primitive) to the fifth type (the table-shape stove), can still be seen throughout Nusantara. The hearth develops into many and is elementary and moveable, while the next development in cosmopolitan cities can be explained through Figure.7.

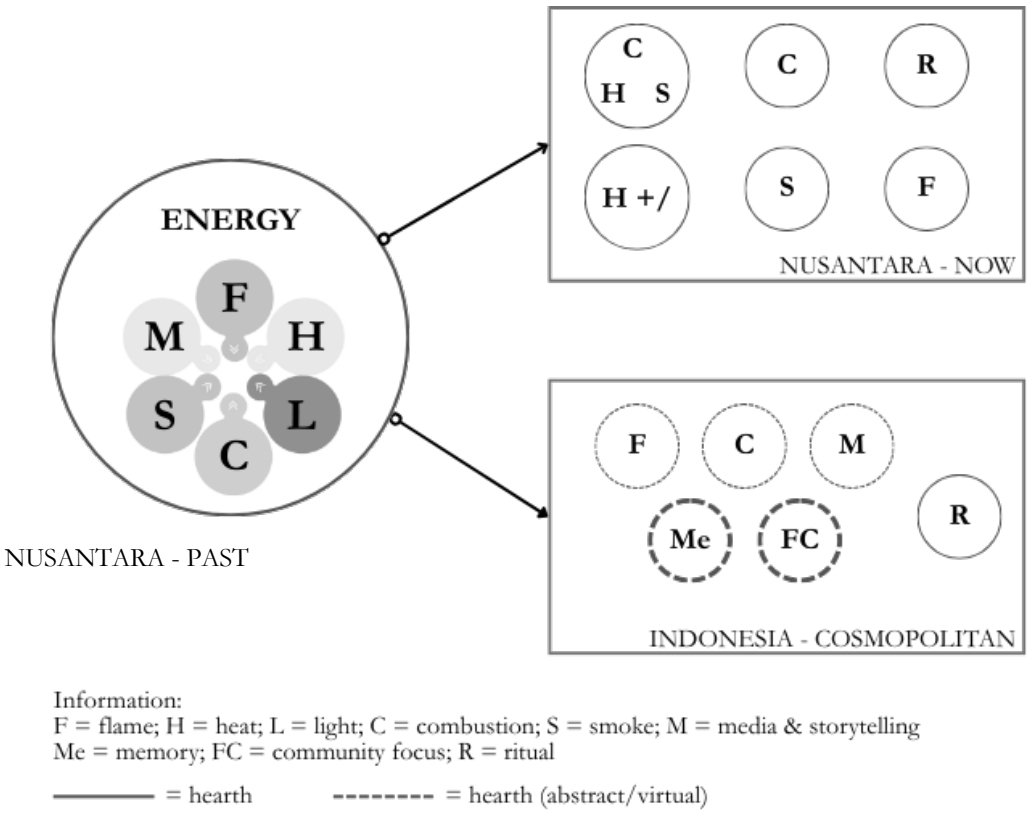

Fig. 7: The energy of the Hearth as the DNA of architecture

Figure 7 shows that fire as an energy source has several abilities (multi-functions) that have slowly begun to be replaced by technology. Modern technology is able to separate the energy in fire and provide it according to what is needed. For example, only specifically for lighting, heating, or cooking. In Nusantara or some Indonesian communities living in rural areas, most still maintain traditional hearths, but with different functions, so it's no wonder that the number of hearths in a house increases rather than decreases or disappears. There are traditional hearths specifically used for cooking or warming the body, especially in mountainous areas; and there are those that are specifically symbolic to show ethnic identity. In communities that still hold traditions or certain beliefs, traditional hearths are still believed to be one of the places where ancestral spirits or gods and goddesses related to life reside. That's why traditional hearths are still maintained and used only during ritual ceremonies.

The phenomenon of using hearths in cosmopolitan cities in Indonesia is currently done in various ways. In cities that still uphold traditions and customs well, such as in Bali, it shows that the Balinese people cannot leave their old traditions behind, by still maintaining the existence of traditional hearths. This is done not only to maintain tradition, but hearths are considered to have a connection with their religion that cannot be simply abandoned. However, adaptation to modern technology cannot be ignored either. The changing function and

role of traditional hearths are decreasing, in some places showing the role of traditional hearths as an energy source that was initially multifunctional, now the energy used is only as a connector to their ancestors or gods, which is the belief of the Balinese people.

In other cosmopolitan cities, such as Jakarta and Surabaya, there is a more pluralistic character, marked by the gathering of diverse ethnic communities within Indonesia. Modernization has a dominant influence on the lives of people in these cities. The role of the traditional hearth has been almost entirely replaced by technology; however, the concept of the hearth as the "heart of the home" remains relevant to this day, albeit in a more symbolic form. In modern homes, the kitchen is sometimes regarded as the center of the house, serving a similar function as a space for people to gather and interact. The hearth has become increasingly abstract, with only its energy still felt. As previously mentioned, the energy of fire, as a magnet for bringing people together, continues to be an energy that is frequently utilized, even though the triggers may differ (modern stoves, televisions, Wi-Fi, etc.). The memory of the traditional hearth is evoked as a symbolic value, offering a reminder of the past or serving as an identity marker for human beings as social creatures.

4. CONCLUSION

In cosmopolitan cities like Jakarta and Surabaya, the urban environment is characterized by a high degree of pluralism, with diverse ethnic communities coexisting. Modernization plays a dominant role in shaping the lifestyles of people in these cities. While traditional hearths have been largely replaced by technological advancements, the symbolic significance of the hearth as the "heart of the home" endures. In contemporary homes, the kitchen has often taken on a similar role as a central gathering space, where people interact and form connections.

Though the traditional hearth itself is no longer physically central, its symbolic function persists. In modern contexts, the energy of the hearth—once embodied by the physical fire—has been abstracted. Today, this "energy" is manifested in various forms, such as the warmth of a modern stove, the glow of a television, or the connectivity provided by Wi-Fi. These modern substitutes still act as gathering points, fostering social interaction in a manner akin to the traditional hearth.

Ultimately, the memory of the hearth lives on as a powerful symbol. It serves not only as a reminder of the past but also as a cultural marker, representing human identity as social beings. The hearth, in both its traditional and modern forms, remains a symbol of unity, continuity, and community in the face of rapid modernization.

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BLUEPRINTING THE VISUAL URBAN IDENTITY OF HISTORIC EGYPTIAN METROPOLISES: A DOCUMENTATION- BASED PROCESS FOR ARCHITECTURAL ANALYSIS IN DAMANHUR CITY, EL-BEHIRA, EGYPT

Heba Jahin, Ayman el- Zamarani, Rania Raslan

BLUEPRINTING THE VISUAL URBAN IDENTITY OF HISTORIC EGYPTIAN METROPOLISES: A DOCUMENTATION – BASED PROCESS FOR ARCHITECTURAL ANALYSIS IN DAMANHUR CITY, EL-BEHIRA, EGYPT

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Historic Egyptian cities reflect the complex interplay of the cultural, historical, and architectural layers that shape their urban identity. However, rapid urbanization and modernization threaten these identities, necessitating systematic documentation and analysis for preservation. This study employs a documentation-based process to explore the architectural essence of Damanhur, a historic city in El-Beheira, Egypt by integrating historical research, architectural and urban observations, and digital coding techniques. The study establishes a methodological framework for assessing visual urban identity. The findings emphasize the importance of spatial continuity, landmark structures, and cultural narratives in maintaining urban areas character. This research enhances our understanding of visual urban identity in historical cities and provides valuable insights for sustainable urban planning in historical contexts through a qualitative data analysis (QDA) process.

1. INTRODUCTION

Historic cities are a product of layered historical, architectural, and sociocultural influences. Egyptian cities exhibit architectural richness shaped by successive civilizations, including the Pharaonic, Roman, Coptic, and Islamic periods. However, the pressure of modern development often results in the loss of architectural heritage, disrupting historical continuity and cultural memory (Lynch, 1960). The urban identity of historic cities is a complex tapestry woven from the threads of cultural heritage, historical significance, and architectural character (Lynch, 1960; Cullen, 1961). In Egypt, cities like Damanhur, with their rich histories and architectural legacies, are facing unprecedented threats from rapid urbanization and modernization (Abu-Lughod, 1971; Raymond, 2000). As these cities transform, their unique urban identities are at risk of being erased, compromising the cultural and historical narratives that define them (Gehl, 1971; Whyte, 1980).

In recent years, the importance of preserving urban identity in historic cities has gained significant attention from scholars, policymakers, and practitioners (Al-Hathloul, 1996; Taylor, 2009). However, the process of documenting, analyzing, and preserving urban identity remains a daunting task, particularly in cities with complex cultural and historical layers (Lefaivre & Tzonis, 2003; Vellinga, 2006).

By integrating historical research, architectural and urban observations, and digital coding techniques, this study aims to explore the architectural essence of Damanhur and establish a methodological framework for assessing visual urban identity. This research contributes to the growing body of literature on urban identity, cultural heritage, and sustainable urban planning, providing valuable insights for preserving the unique

character of historic cities in the face of rapid urbanization and modernization.

This study focuses on Damanhur City, a historically significant city in El-Beheira, Egypt, as a case study to develop a documentation-based approach using the qualitative data analysis with the help of QDA Miner Lite coding program to analyze urban identity as a consequence of blueprinting the city's visual identity. This study explored how architectural elements, spatial organization, and cultural narratives contribute to a city's visual identity. Utilizing architectural analysis as a primary methodology, the study investigates the levels of historical progression and cultural impact that have molded Damanhur's unique visual identity.

2. VISUAL URBAN IDENTITY

The concept of urban identity is central to the study of historical cities. Lynch's (1960) theory of imageability highlights the role of key urban elements —paths, edges, districts, nodes, and landmarks—in shaping a city's legibility. Similarly, Kavaratzis (2005) emphasized the significance of place branding in reinforcing urban identity through architectural and cultural continuity. Other scholars, including Proshansky et al. (1983), have discussed place identity as an interplay between the physical environment and collective memory, further reinforcing the need for systematic documentation. The advent of digital documentation techniques such as photogrammetry and Geographic Information Systems (GIS) has revolutionized urban heritage studies (Fan Zhang, 2024). These cutting-edge technologies provide a platform for in-depth spatial analysis and visualization, thereby empowering stakeholders with informed insights to effectively guide preservation endeavors.

The integration of artificial intelligence (AI) in urban heritage studies presents a new realm of possibilities for analyzing and documenting urban identity. AI technologies can enhance the efficiency and accuracy of data collection, processing, and analysis in urban environments.

By combining the latest digital technologies with traditional documentation practices, stakeholders can work towards sustainable urban development that respects the past while embracing the future.

3. DAMANHUR AS HISTORIC EGYPTIAN METROPOLISES

As a metropolitan city, Damanhur can be defined as a region encompassing a densely populated urban core and its surrounding territories that are often economically and socially interconnected. When considering different levels of a city, city-level identity, as outlined by Lynch (1960) and Kavaratzis (2005), pertains to how a city is perceived based on its history, culture, architecture, and public images. This perception is shaped by a combination of tangible and intangible factors as follows:

1. Urban design and architecture, such as iconic buildings and landmarks.
2. Cultural elements that represent local traditions and heritage.
3. Economic and social aspects encompassing industries, innovation, and lifestyles.
4. Public perceptions reflect how both residents and visitors view a city.

At various levels within a city, these factors play different roles in shaping identity. The city level encompasses all the aforementioned factors as follows:

- The district level reflects a combination of these factors.
- Street level is influenced by urban design and public perception.
- Building levels are particularly influenced by urban design and public perceptions.

By exploring and understanding these components, deeper insight into Damanhur's rich historical features and modern-day significance can be gained, unveiling the city's identity in the broader context of urban development and cultural heritage.

The maps in Fig. (1), illustrate the evolution of Damanhur's urban structure over time, reflecting its spatial expansion and planning transformations. This analysis examines key changes in a city's morphology, infrastructure, and land-use patterns.

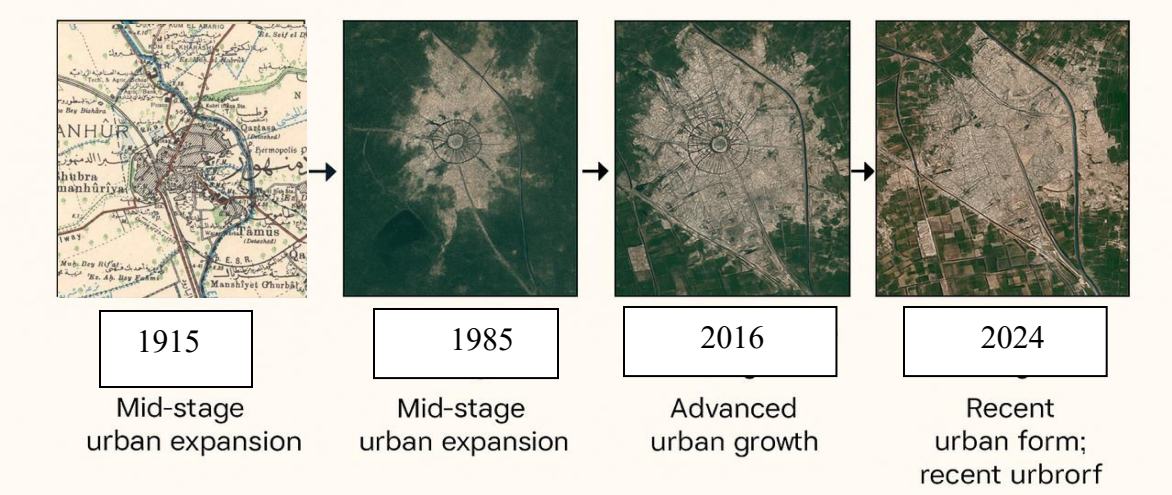


Fig. 1: Cartographic analysis of development for Damanhur city shows changes in planning structure over time.

By analyzing the maps over the years, the following can be observed:

1. Historical Context and Early Urban Form (1915)
   • The earliest map presents Damanhur as a compact urban settlement with a well-defined core.
   • The city structure appears radial-concentric, with main roads converging towards the central area.
   • The Nile and its canals played a critical role in shaping the city's early development.

- The built environment is relatively small and surrounded by vast agricultural land.

2. Mid-Stage Urban Expansion (1985)
   - The city started expanding outward, incorporating more built-up areas, maintaining the radial pattern.
   - Main roads and railways play a crucial role in guiding the expansion of key regional connections.
   - Peripheral settlements and industrial zones emerge at the edges.
   - Agricultural land has been increasingly converted to urban use.

3. Advanced Urban Growth and Density Increase (2016)
   - Urban sprawl intensified, and the city boundary became less distinct.
   - Expansion followed a linear growth pattern along major roads and transportation routes.
   - The urban core became denser, indicating vertical expansion and infill development.
   - Increased urbanization pressure led to fragmentation of agricultural areas.

4. Recent Urban Form (2024)
   - The city exhibits a fully developed, complex urban structure with interconnected roads, mixed-use areas, and a higher density.
   - A more grid-like pattern emerged, particularly in newer urban extensions.
   - The periphery is urbanizing rapidly, with rural zones absorbed into the metropolitan fabric.
   - Green spaces shrink because of continuous land conversion.

To conclude the city growth observations and analysis, the city has expansion trends, initially radial, shifting towards linear and grid-like extensions. Roads and railways dictate urban growth patterns. Gradual loss of agricultural land to urban functions by land-use transition. The core remains the densest part, whereas newer areas expand horizontally. Damanhur's urban development reflects a progressive transformation from a compact, radial city to a more dispersed, grid-integrated urban system. Infrastructure, population growth, and economic factors play critical roles in shaping its contemporary form. Future planning strategies should focus on sustainable expansion, the preservation of green spaces, and improved transportation networks to balance urban growth with environmental conservation.

4. RESEARCH CONTEXT

The scarcity of information on urban identity in Damanhur's central city area poses a significant challenge for residents and visitors, influencing their perceptions and overall experience. The lack of clear guidance hinders exploration, engagement, and meaningful interaction with the urban environment. To address this issue, a

comprehensive documentation-based process, incorporating accessible guidance tools, is essential for informing future developments in historic cities.

By providing readily available information on a city's urban identity, municipalities can enhance connectivity, memorial experiences, and overall visitor satisfaction. Moreover, engaging stakeholders, local authorities, and urban planners in the development of an effective documentation and information system can foster a more inclusive, visitor-friendly environment in Damanhur's central city area. This collaborative approach can ultimately contribute to the preservation and celebration of the city's unique urban identity.

5. RESEARCH METHODOLOGY

This study employs a documentation-based approach as a stage of blueprinting the urban identity of the city that combines historical facade analysis, field observations, and digital coding and analysis techniques. The methodology consists of the following sequential steps as shown in Fig.2:

Fig. 1: Analytical diagram for visual urban identity framework as a main process for urban and architectural documentation process.

1. Field Observations: Conducting on-site documentation of significant architectural and urban elements such as building facades, streetscapes, and public spaces.
2. Comparative Analysis: Utilizing AI engines to compare Damanhur's urban elements to identify its distinctive traits.
3. Qualitative data analysis: Leveraging the QDA Miner Lite coding program as a supportive tool for architectural documentation and analysis. This method involves an integrated retrospective and compositional analysis of urban structure.

A Documentation-Based Process for Architectural blueprinting of Visual Urban Identity presents a structured methodological framework for analyzing architectural and urban elements to establish a coherent visual identity. The process in Fig. 3 is divided into three major sections: corpus construction, thematic analysis, and corpus establishment.

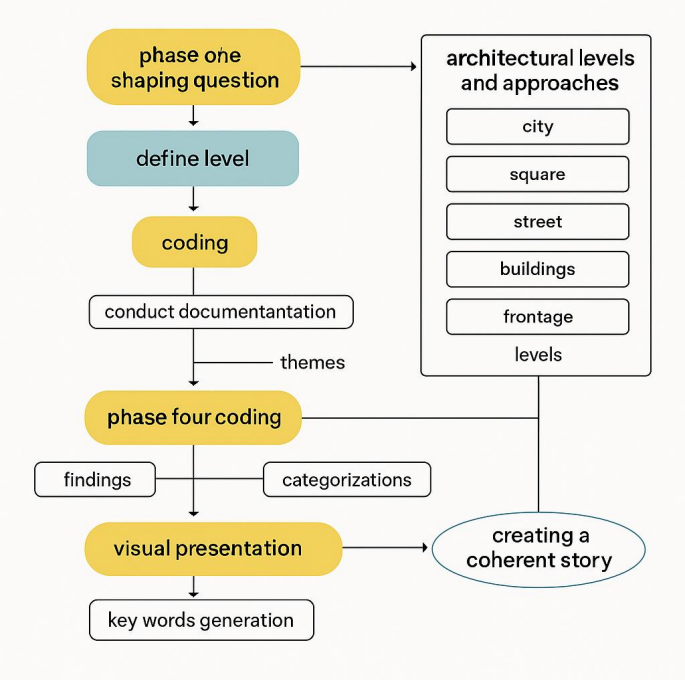


Fig. 2: General analytical diagram for workflow of research methodology

6. BLUEPRINTING URBAN IDENTITY; A FRAMEWORK FOR DOCUMENTATION AND PRESERVATION

Blueprinting is a crucial aspect of architectural documentation, involving the creation of detailed technical drawings and specifications for building construction (Ching, 2014). In the context of urban identity, blueprinting plays a vital role in capturing the essence and character of a city or urban environment through

detailed architectural plans and designs (Lynch, 1960). Urban identity blueprinting involves the documentation of key architectural features, historical landmarks, urban layouts, cultural assets, and spatial organization within a city (Kavaratzis, 2005).

Through the process of creating urban identity blueprints, stakeholders can develop a shared understanding of a city's identity and vision for future development (Relph, 1976). These blueprints serve as a visual representation of the city's character, guiding decision-making processes related to urban planning, preservation, and revitalization efforts (Gehl, 1971). Furthermore, urban identity documentation through blueprinting fosters community engagement and awareness of the built environment (Altman & Low, 1992). By documenting and showcasing the unique architectural styles, urban forms, and cultural heritage of a city, these blueprints enhance the public's appreciation and connection to their surroundings.

The Blueprinting Visual Urban Identity (VUI) framework presents a structured methodology for defining, developing, and refining the visual identity of urban environments, particularly historical metropolises (Fig. 4). This framework is divided into four main stages:

a. Research and Analysis: This stage involves gathering data on the city's architectural, historical, and cultural context.
b. Concept Development: During this stage, stakeholders develop a shared understanding of the city's identity and vision for future development facilitated by QDA Miner software.
c. Implementation: This stage involves the creation of detailed architectural plans and designs that reflect the city's unique identity.
d. Evaluation or Refinement: The final stage involves evaluating the effectiveness of the blueprinting process and refining the urban identity documentation as needed**.** This process results in refined visual identity scenarios, which can be implemented in urban planning and policymaking.

The proposed framework provides a systematic roadmap and prioritization approach, ensuring that critical urban components are meticulously analyzed and integrated into the visual identity formation process. This structured methodology enables stakeholders to navigate the complexities of urban identity development, fostering a cohesive and inclusive urban environment.

Ultimately, this comprehensive framework leverages the synergies of urban theory, artificial intelligence (AI) technologies, and quality assessment methodologies to establish a robust, adaptive, and responsive blueprint for urban identity development. This approach is particularly pertinent for historical cities, where the preservation of cultural heritage and urban character is paramount.

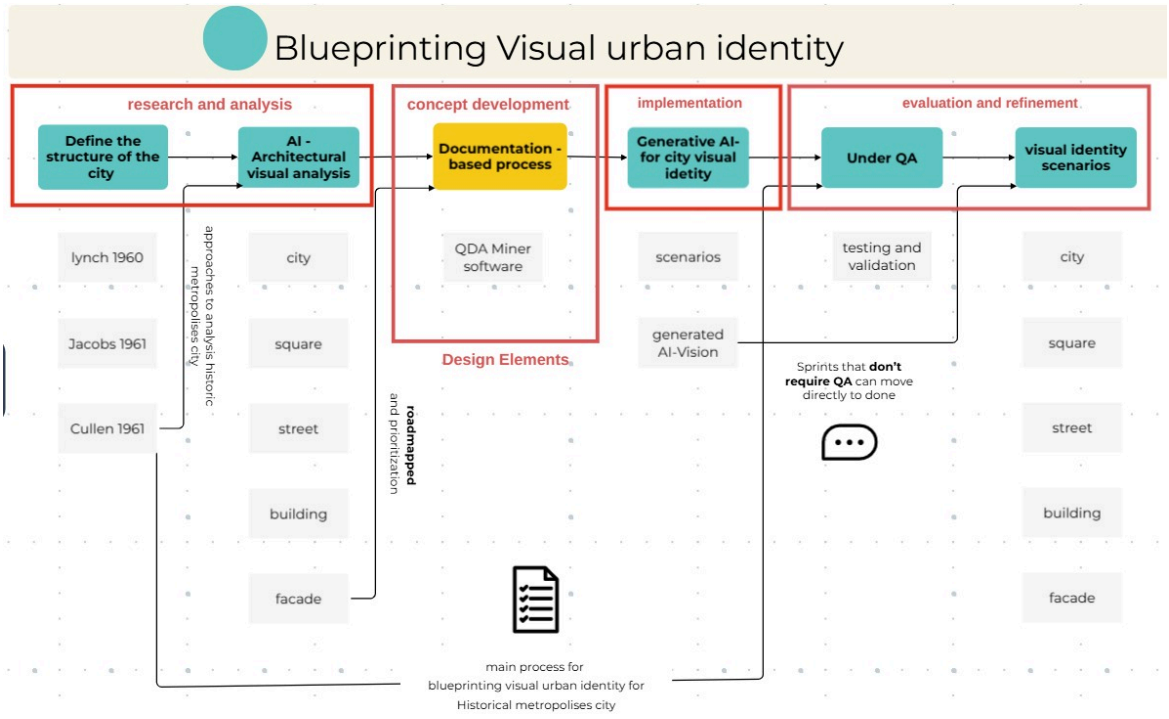


Fig. 3: A chart illustrates the Blueprinting process for visual urban identity.

6.1. Documentation Process

In architectural analysis, the documentation-based process plays a vital role in understanding, preserving, and appreciating the architectural heritage of a structure or city (Lynch, 1960; Ching, 2014). Through the documentation process, as shown in Fig. 5, architects, historians, urban planners, and preservationists can capture detailed information regarding the design, materials, construction techniques, and historical significance of a building or urban area (Gehl, 1971; Whyte, 1980).

One key aspect of documentation in architectural analysis is the creation of measured drawings, such as floor plans, elevations, sections, and details (Bertolucci, 2005). These drawings provide a precise visual representation of the building's layout and architectural features, aiding the analysis of its design principles and functionality (Ching, 2014). Photographic documentation is another essential component of architectural analysis. High-quality photographs capture the aesthetic qualities, spatial relationships, and materiality of a building under various lighting conditions and perspectives (Kavaratzis, 2005). These images help document

the building's original condition, evolution over time, and details that may be overlooked during on-site inspections.

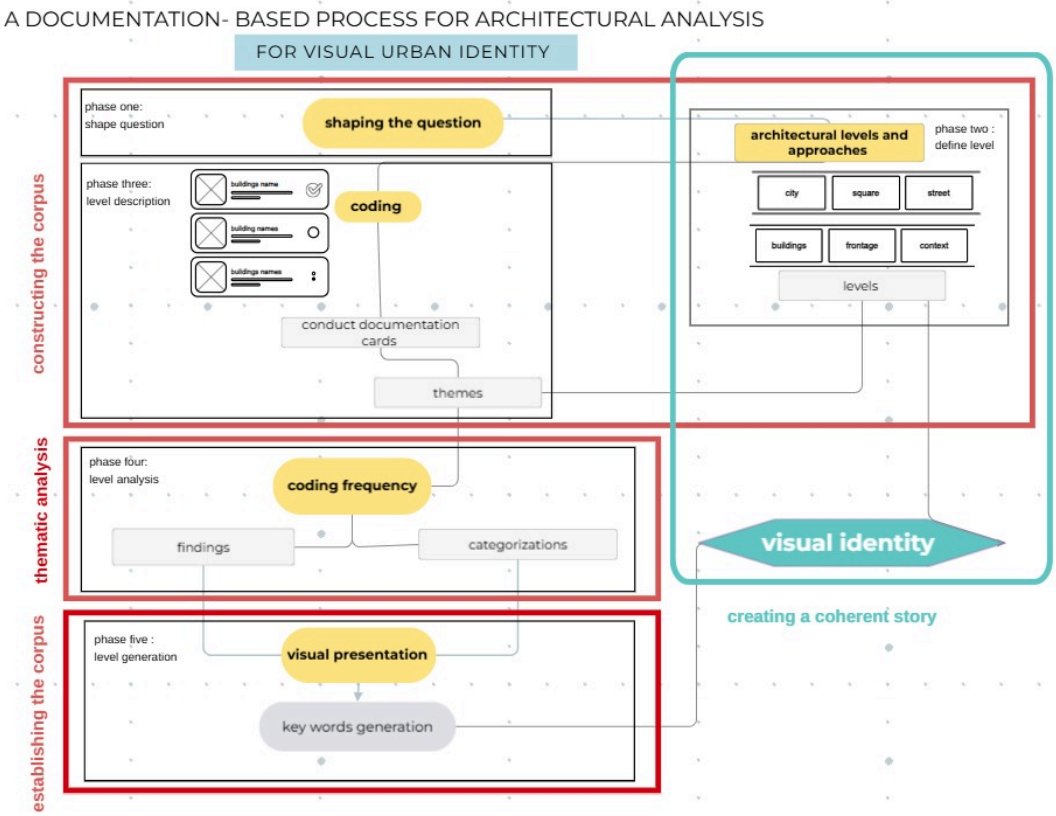


Fig. 4: Documentation based-process flowchart for visual urban identity

6.2. Analysis Process

A Documentation-Based Process for Architectural Analysis for Visual Urban Identity presents a structured methodological framework for analyzing architectural and urban elements to establish a coherent visual identity. The process as shown in Fig.6, is divided into three main sections: constructing the corpus, thematic analysis, and establishing the corpus.

A. Constructing the Corpus

This stage focuses on defining the research framework and gathering data:

- Phase One – Shaping the Question: This involves formulating the research question that guides the analysis.
- Phase Two – Defining the Level: Architectural elements are categorized into city, square, street, buildings, frontage, and context, ensuring a multi-scale analysis of the urban fabric.
- Phase Three – Level Description and Coding: The documentation process involves collecting and coding architectural elements using documentation cards and assigning thematic categories.

B. Thematic Analysis

At this stage, the coded data were analyzed as follows:

- Phase Four – Coding Frequency: By analyzing the frequency of specific elements, patterns emerge, leading to findings and categorizations that contribute to understanding architectural trends and visual identity formation.

C. Establishing the Corpus

The final stage involved synthesizing the findings in a communicable format.

- Phase Five – Visual Presentation: The research outputs are translated into visual representations through keyword generation, ensuring clarity in defining.

This systematic approach ensures coherent architectural analysis that integrates documentation, coding, and visual representation. This framework facilitates a comprehensive and data-driven understanding of urban visual identity by structuring the process across multiple architectural levels and utilizing thematic analysis the framework facilitates a comprehensive and data-driven understanding of urban visual identity.

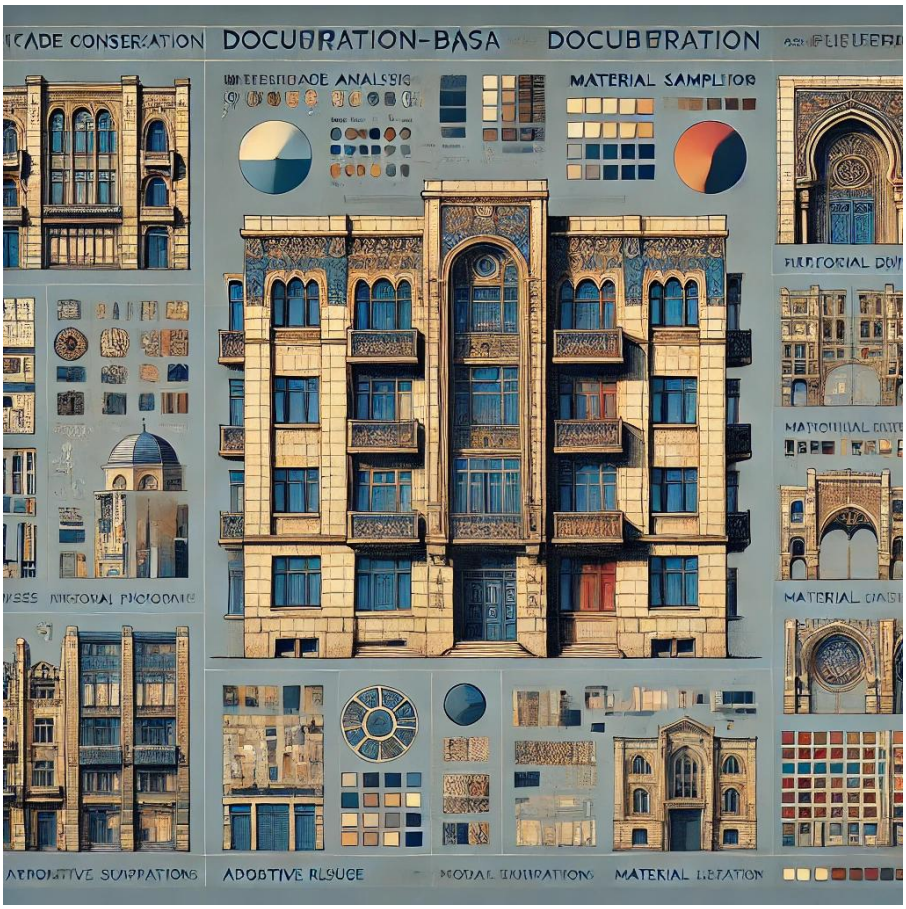


Fig. 6: A thematic analysis framework that facilitates a comprehensive and data-driven of urban visual identity.

7. CASE STUDY: ARCHITECTURAL COMPARISON IN THE URBAN CONTEXT OF DAMANHUR

7.1. Analytical Stage

Damanhur, a historically significant city, exhibits a diverse architectural landscape shaped by cultural, historical, and functional factors. This case study analyzes the architectural features, materiality, environmental integration, and urban role of various structures in Damanhur's central area as shown in Fig.7. The study draws insights from the provided comparison document, emphasizing the impact of building design on urban identity, heritage conservation, and user experience through analytical stage follows.

7.2. Design Elements and Materiality

1. Colors and Material Composition

The buildings in Damanhur's central area display a dominant earthy color palette, including:

- Beige, brown, and reddish hues – typical of natural stone and aged plaster.
- Green shutters – providing contrast in some facades, adding a traditional aesthetic.
- Yellowish stone and weathered tones – indicating age and historical evolution.

Materials used in construction include:

- Stone and brick, often covered with plaster.
- Wooden elements for shutters and balconies, enhancing traditional aesthetics.
- Concrete, either with brick detailing or as a primary construction material

2. Texture and Architectural Style

The buildings feature varied textures, shaped by material aging and historical influences:

- Weathered surfaces with peeling paint, adding historical character.
- Smooth surfaces with decorative moldings, typically seen in institutional or religious buildings.
- Textured stone with engravings or carvings, showcasing Islamic or Gothic influences.

Architectural styles vary across the city:

- Neo-Classical and Eclectic European influences, evident in late 19th–early 20th-century structures.
- Art Deco elements, found in buildings inspired by French designs.
- Islamic architectural motifs, including arches, engravings, and geometric patterns.
- Gothic Revival features, present in religious buildings such as churches.
- Vernacular and colonial influences, blending local and Western styles.

3. Openings and Vertical Hierarchy

The placement of windows and openings reflects both function and aesthetic priorities:

- Tall, arched windows with wooden shutters – characteristic of traditional and religious architecture.
- Rectangular, evenly spaced windows – seen in modernist adaptations.
- Arched entrances with geometric patterns – emphasizing Islamic and historic styles.

Building heights vary depending on use:

- Multi-story buildings, often used for mixed residential and commercial purposes.
- Grand institutional buildings, marked by larger scales and monumental proportions.
- Two-story religious structures, designed with open courtyards and gathering spaces.

7.3. Environmental Context and Urban Integration

1. Urban Setting and Landscape

The central area of Damanhur includes a mix of commercial, religious, and residential buildings:

- Dense commercial streets – featuring signage, small businesses, and active pedestrian movement.
- Religious complexes with open courtyards, allowing community engagement.
- Older historic districts, where buildings show visible signs of aging and urban modifications.

Greenery and landscaping are minimal in commercial zones but more evident in:

- Institutional buildings with well-maintained green areas.
- Religious sites with courtyards, fences, and organized pathways.

2. Proportion, Scale, and Façade Treatment

Buildings maintain a proportional balance relative to their function:

- Vertical emphasis in religious and monumental buildings, using towers, domes, or minarets.
- Horizontal and vertical balance in residential and commercial buildings through window alignment and balcony arrangements.
- Grand proportions in institutional buildings to create a sense of authority and permanence.

Façades show diverse surface treatments:

- Smooth, modern finishes in contemporary buildings.
- Engraved details with religious or cultural inscriptions in historic structures.
- Brickwork with ornamental features, contributing to textural depth.
- Worn-down surfaces, indicative of aging without restoration efforts.

Repetitive design elements contribute to the rhythm of facades:

- Consistent window placements and balconies enhance continuity in commercial buildings.
- Irregular or asymmetrical patterns in modified or expanded structures.

- Strong vertical alignments in religious and monumental buildings.

3. Urban Identity and Building Integration

Buildings in Damanhur's central area demonstrate varying levels of street engagement:

- Commercial structures interact directly with street, often modified ground floors for retail.
- Religious buildings maintain set-back entrances, creating semi-public gathering areas.
- Institutional and landmark buildings integrate controlled access.

A key challenge in preserving urban identity is the modern signage disruption in historic buildings:

- Commercial signage sometimes overwhelms heritage architecture, covering decorative elements.
- Some buildings incorporate signage within original design elements, blending modern needs with historical integrity.
- Religious buildings use subtle plaques or inscriptions, maintaining traditional aesthetics.

Logo placements and sign designs significantly influence urban perception:

- Institutional signage is often placed subtly, respecting original architecture.
- Modern commercial signs dominate certain facades, affecting the visual coherence of heritage streetscapes.
- Traditional Arabic inscriptions are preserved in some buildings, maintaining historical character.

Damanhur's built environment tells a story of cultural evolution and adaptation. While commercial activity and modern interventions have altered the cityscape, proper urban documentation and guided development strategies can ensure a balance between growth and heritage conservation. By prioritizing inclusive urban planning, engaging local stakeholders, and enforcing heritage-sensitive policies, the city can enhance its urban identity while fostering a dynamic and visitor-friendly environment.

A holistic understanding of a city's urban identity is compromised by the presence of architectural and urban structures, leading to diminished visual unity in the city. A detailed examination of the architectural historic core of Damanhur reveals a range of contemporary issues, such as the disparity in architectural design between newly erected buildings and established historical edifices, which results in a discordant aesthetic that interrupts the overall visual coherence of the region.

These challenges underscore the need for a comprehensive urban design strategy that prioritizes the preservation of cultural heritage, promotes sustainable development, and enhances the overall quality of life in Damanhur's historical center. That leads to the understanding of visual codes of the city's image is defined as perception 'Perception depends on coding the world into iconic signs that can represent it within our minds. The study selected 11 landmark buildings in the city as a case study (Fig. 7), where Building Facades play a vital role. Building façade elements and color solutions provide special characteristics for the historical

part of Damanhur. This forms a single street front and contributes to a holistic perception of the urban environment.

Fig.7: The selected buildings for analysis at the first stage of the case study

By developing proposals for the formation of the design code of the urban environment, it is necessary to consider the characteristic elements of historical buildings, such as brick and wooden decorative designs of building facades, carved décor elements, wrought iron fences, and gate elements. The design code should be developed considering the characteristic elements of the urban environment for application to the territories of the central part of the city, individual residential development, as well as to the territories adjacent to public tasks.

DESIGN ELEMENTS			
Texture	Materials	colours	
Smooth, decorative elements around windows	concrete or stone, with decorative plaster or carved details.	beige with darker accents on windows and the minaret.	CASE 1 (RELIGIOUS)
Highly ornamented with intricate geometric and floral carvings; smooth domes	limestone or sandstone, with carved stone detailing.	beige and cream	CASE 2 (RELIGIOUS)
Rough brick surfaces combined with smooth carved stone for decorative elements.	Exposed brick masonry with some stone detailing.	warm earthy tones, with red brick, contrasted by dark window frames and decorative elements	CASE 3 (RELIGIOUS)
Smooth surfaces with carved decorative motifs and relief sculptures.	stone or concrete, with decorative plasterwork and ornamental elements.	light beige or off-white, with darker accents (brown and red)	CASE 4 (GOVERNMENTAL)
The rough texture of the brick contrasts with the smooth stone elements,	rick and stone, with decorative cornices and sculptural elements. modern commercial materials like metal, plastic, and glass for	striking red brick and beige stone combination.	CASE 5 (RESIDENTIAL)
Combination of smooth plaster and rough brick patterns	Concrete structure with exposed red brick detailing and plastered sections.	Warm beige and reddish tones, with decorative brickwork adding contrast.	CASE 6 (RESIDENTIAL)
weathered surfaces, peeling paint, and possible structural wear.	stone or brick, covered with plaster. The wooden shutters and metal railings	earthy tones—beige and brown green shutters contrast with the muted façade	CASE 7 (RESIDENTIAL)
Smooth façade with subtle decorative elements.	concrete or stone, covered with plaster.	Light beige or sandstone-coloured façade, with dark green wooden shutters	CASE 8 (RESIDENTIAL)
smooth surfaces	stone or concrete, with plaster finishes. wooden shutters.	Light beige with some darker brown accents around windows and balconies.	CASE 9 (RESIDENTIAL)
rough and weathered,	Brick and plaster with wooden shutters.	Earthy tones—mainly yellowish-brown with aged patina.	CASE 10 (RESIDENTIAL)
Aged façade with noticeable wear, cracks, and peeling paint.	tone or concrete with plastered surfaces; wooden shutters on windows.	Beige and light brown tones	CASE 11 (RESIDENTIAL)

Table 1 show design elements related to the 11 case studies of Damanhur buildings

ARCHITESTURE STYLE			
level	opening	style	
Single-story prayer hall	Arched windows with geometric and floral patterns,	Islamic architecture with modern influences.	CASE 1 (RELIGIOUS)
Single-story structure with a grand scale,	Arched doorways and windows, adorned with decorative grilles and geometric carvings.	Islamic architecture with Mamluk influences, characterized by domes, a towering minaret, and arabesque detailing.	CASE 2 (RELIGIOUS)
The church has a central nave with a raised façade, and an attached bell tower, adding vertical emphasis.	A series of rounded arched windows, with some featuring stained glass or decorative mouldings.	Neo-Romanesque characterized by arched windows, buttresses, and symmetrical façade composition.	CASE 3 (RELIGIOUS)
Tall, arched windows with intricate framing, 2 levels buildings	Tall, arched windows with intricate framing, enhancing the verticality of the structure.	A blend of Neo-Classical and Islamic architectural influences, characterized by arched windows, decorative cornices, and elaborate detailing.	CASE 4 (GOVERNMENTAL)
multi-story (4levels) ,	rectangular and arched windows, with decorative stone framing. Balconies feature intricate iron railing	Art Nouveau or Eclectic European styles. The twin cylindrical corner towers are a distinctive feature, adding a sense of	CASE 5 (RESIDENTIAL)
Four-story residential building with commercial spaces on the ground level.	Rectangular windows with wooden shutters; arched detailing above the vertical brick elements.	Art Deco-inspired design with strong geometric elements and vertical emphasis.	CASE 6 (RESIDENTIAL)
multi-story (3 levels) structure suggests a mixed-use function	tall, arched windows with wooden shutters	late 19th–early 20th-century European-influenced architecture, possibly Neo-Classical or Eclectic styles.	CASE 7 (RESIDENTIAL)
Multi-story structure (3 levels), and residential (upper floors) functions.	Rectangular windows with green shutters.	Early to mid-20th-century modernist or European.	CASE 8 (RESIDENTIAL)
Multi-story structure, (5 levels) i	Rectangular windows, some with wooden shutters. Balconies have railings, providing outdoor space.	Mid-20th century modernist architecture with subtle European influences.	CASE 9 (RESIDENTIAL)
Two-story structure—commercial use on the ground floor, likely residential on the upper floor.	Wooden-shuttered windows on the upper floor, large glass-panelled doors for the café.	Early 20th-century vernacular architecture, with simple ornamentation.	CASE 10 (RESIDENTIAL)
Four stories, indicating a multi-residential or mixed-use function.	Rectangular windows with wooden shutters, symmetrically arranged.	Early 20th-century urban residential architecture with simple ornamentation.	CASE 11 (RESIDENTIAL)

Table 2 shows the architectural style related to the 11 case studies of Damanhur buildings

ENVIROMENTAL CONTEXT		
landscape	urban setting	
Minimal greenery but an enclosed fence providing separation from the street.	Located in a dense city area with cars and pedestrians around, suggesting it serves a busy community.	CASE 1 (RELIGIOUS)
Small trees and greenery in the courtyard, contributing to a serene and inviting atmosphere.	The mosque is integrated into a dense urban area, surrounded by modern buildings. The open entrance court provides a transition between the street and the sacred space.	CASE 2 (RELIGIOUS)
Limited greenery, but the open entrance space provides a small buffer between the building and the street.	Located in a dense urban fabric, surrounded by both modern and older buildings.	CASE 3 (RELIGIOUS)
Manicured gardens with trimmed shrubs and trees, contributing to a formal and prestigious setting.	Likely located in a prominent area, with well-maintained landscaping	CASE 4 (GOVERNMENTAL)
indicating an urban-centric development pattern	structure is part of a commercially active street, surrounding buildings suggest a historical district in Damanhur, possibly from the early 20th century.	CASE 5 (RESIDENTIAL)
Limited greenery with palm trees nearby; street lighting and urban furniture present.	Located in a dense commercial and residential area, with signage indicating business activity.	CASE 6 (RESIDENTIAL)
typical of historic urban areas where pedestrian and commercial activity dominate	dense commercial area with shops at street level, likely in a historic part of Damanhour.of signage and small businesses suggests a bustling economic role	CASE 7 (RESIDENTIAL)
Minimal greenery, characteristic of dense urban environments. The street below appears to be active with	Located in a dense commercial area with visible signage and shopfronts at street level, suggesting economic activity.	CASE 8 (RESIDENTIAL)
Minimal landscaping: street trees provide some greenery but the focus is on commercial activity.	Located in a dense commercial area, surrounded by other multi-story buildings. Presence of shops, advertisements, and pedestrians indicates a bustling urban	CASE 9 (RESIDENTIAL)
Minimal greenery: the focus is on urban integration.	Located in a bustling neighbourhood with an active street life.	CASE 10 (RESIDENTIAL)
Minimal greenery: the focus is on urban integration.	Located in a dense commercial area with active pedestrian and vehicular traffic.	CASE 11 (RESIDENTIAL)

Table 3 shows the environmental context related to the 11 case studies of Damanhur buildings

DESIGN THEORIES						
horizontal to vertical	frontage	rhythm	surface	scale	proportion	
The structure is primarily horizontal, but the tall minaret provides a strong vertical counterpoint.	Direct engagement with the street, allowing easy access for worshippers.	Mostly flat but enriched with subtle detailing around openings and cornices.	The repeated window patterns and decorative friezes create a structured rhythm.	The mosque's size and height are appropriate for an urban religious building,	The minaret provides a strong vertical element, balancing the horizontal mass of the prayer hall.	CASE 1 (RELIGIOUS)
Strong vertical elements (minaret and domes) counterbalanced by horizontal bands of arches and base	A welcoming entrance with an open gate, visually connecting the mosque to the surrounding community.	Repetition of arches, geometric patterns, and domes establishes a strong visual order.	Elaborately decorated with carved stone elements, showcasing a rich architectural heritage.	The mosque is monumental compared to surrounding structures, asserting its	The minaret and domes create a vertical emphasis, balanced by the wide base of the mosque.	CASE 2 (RELIGIOUS)
The bell tower and vertical window arrangements contrast with the horizontal lines of the roof and base.	the entrance is slightly set back, with steps leading up to the doorway, creating a transition between public space and sacred space.	Repetition of arched openings and vertical elements in the façade provides harmony.	the brick texture adds historical character, and the detailing around the windows and statues enhances the visual appeal.	Larger than surrounding commercial buildings, emphasizing its religious	The façade is well-balanced, with the central entrance and upper-level statues creating a focal point.	CASE 3 (RELIGIOUS)
Strong verticality emphasized by tall columns, windows, balanced by	Set back slightly from the street, with an inviting entrance and open landscaping.	Repetitive arches, windows, and ornamental details create a structured and	Clean and well-preserved, with decorative elements that enhance its historical or governmental importance.	Grand scale,	Well-balanced vertical and horizontal elements, with strong symmetry in window placement.	CASE 4 (GOVERNMENTAL)
The twin towers emphasize verticality, balanced by horizontal bands	The ground floor is highly modified with modern shopfronts, contrasting with the upper historic	repetitive visual flow. The central axis is emphasized, leading the eye upwards.	The brick and stone combination give the facade a rich depth. The weathered look suggests age and	The building is larger than its immediate surroundings,	symmetry of the facade, with central vertical	CASE 5 (RESIDENTIAL)
Strong verticality through brick	Active street-level interaction with shops and	Repeating balconies and window placements	Aged façade with visible material wear; peeling	Proportionate to surrounding	Balanced height-to-width ratio, with corner verticality adding prominence.	CASE 6 (RESIDENTIAL)
Strong verticality	Direct street interaction.	Repeating window and	aged facade and visible	taller than	balanced width-to-height	CASE 7
Strong horizontal emphasis through balconies, balanced	Direct street interaction, with commercial activity at the lower level.	Repetition of balconies and windows creates a cohesive architectural	The façade shows signs of aging, with peeling plaster and visible wear.	Consistent with neighboring	Balanced width-to-height ratio. The horizontal balcony lines contrast	CASE 8 (RESIDENTIAL)
Vertical emphasis from windows and balconies, but	Direct street interaction, with commercial activity at the lower level.	Repeated balconies and windows create visual order.	indicating age but maintains structural integrity.	Consistent with neighboring	Balanced width-to-height ratio, ensuring harmony	CASE 9 (RESIDENTIAL)
Primarily horizontal due to its low height, but the upper floor	Direct interaction with the street, with the café utilizing the sidewalk for	Aged façade with peeling paint and visible wear contributing to a	Windows and doors create an irregular but functional rhythm.	Modest in scale compared to	The building maintains a simple and balanced height-to-width ratio.	CASE 10 (RESIDENTIAL)

Table 4 shows design theories related to the 11 case studies of Damanhur buildings

BUILDING INTEGRATION		
Signage	logo placement	
Minimal signage, maintaining the mosque's historical and spiritual ambiance.	Not applicable, as this is a religious structure.	CASE 1 (RELIGIOUS)
Minimal signage, maintaining the mosque's historical and spiritual ambiance.	Not applicable, as this is a religious structure.	CASE 2 (RELIGIOUS)
Minimal, maintaining the solemn and historic nature of the structure.	Not applicable; religious symbolism is integrated into the façade rather than commercial signage.	CASE 3 (RELIGIOUS)
Minimal, maintaining the solemn and historic nature of the structure.	Likely minimal or placed discreetly, as the building itself serves as a symbol of authority.	CASE 4 (GOVERNMENTAL)
Shopfronts use bright colors and modern materials, contrasting with the classical elegance above.	The modern commercial signage at street level disrupts the original design. Some signs block architectural details, affecting visual harmony.	CASE 5 (RESIDENTIAL)
Moderate signage presence, primarily for commercial functions, without overwhelming the façade.	Commercial signage placed at street level, partially blending with the architecture.	CASE 6 (RESIDENTIAL)
Some signs are visually overwhelming, covering part of the historic facade.	Modern commercial signage is prominent and somewhat intrusive, disrupting the original aesthetic.	CASE 7 (RESIDENTIAL)
Some shop signs appear visually intrusive, covering part of the façade and reducing historical	Minimal, with a single hanging sign on the street pole.	CASE 8 (RESIDENTIAL)
The ground floor has been adapted for modern commercial use, while the upper floor retains its	Prominent commercial signage on the ground floor, disrupting the building' s original aesthetic.	CASE 9 (RESIDENTIAL)
The ground floor has been adapted for modern commercial use, while the upper floor retains its residential nature.	Minimal, with a single hanging sign on the street pole.	CASE 10 (RESIDENTIAL)
The ground floor has been adapted for modern commercial use, while the upper floor retains its residential nature	Minimal, with a single hanging sign on the street pole.	CASE 11 (RESIDENTIAL)

Table 5 shows the building integration related to the 11 case studies of Damanhur buildings

8. DAMANHUR DOCUMENTATION – BASED PROPOSAL FOR VISUAL IDENTITY (FAÇADE SCALE)

Data documentation is a critical component of the grouping and architecture analysis. The case study used QDA-Miner 2024 as a coding program to document and analyze Damanhur architecture features; the approach can be described as follows:

8.1. Constructing the Corpus

8.1.1. Shaping the Question

This step focuses on developing the research question that will lead the analysis. To design the key parts of the city's visual identity, use qualitative research methods that emphasize the interpretation of urban elements and their impact on observers. Those questions were introduced into QDA-Miner 2024 by integrating the description of the 11 case studies Damanhur (3 religious buildings, 1 opera building, 8 residential buildings) into the query editor under (the case part). The research question two main approaches, outlined below:

- Can architecture analysis bring the main and common aspects that can identify the keywords to shape further visual identity?

- What is the most significant aspect of Damanhur's buildings (building design – building integration)?

8.1.2. Defining the Level

This step involves identifying and integrating architectural elements and variables into the two research questions (RQ1-RQ2), encompassing buildings, frontage, and context. This multi-scale examination enables a comprehensive analysis of the relationships between buildings, frontage, and urban context. Specifically, this step focuses on recognizing and coding architectural elements, such as building facades, storefronts, and surrounding urban features, to facilitate a nuanced understanding of the research questions shown in Fig.9.

The analysis is based on 11 case studies, Ih are Integrated Into the code section and supplemented with transcripts related to each research question.

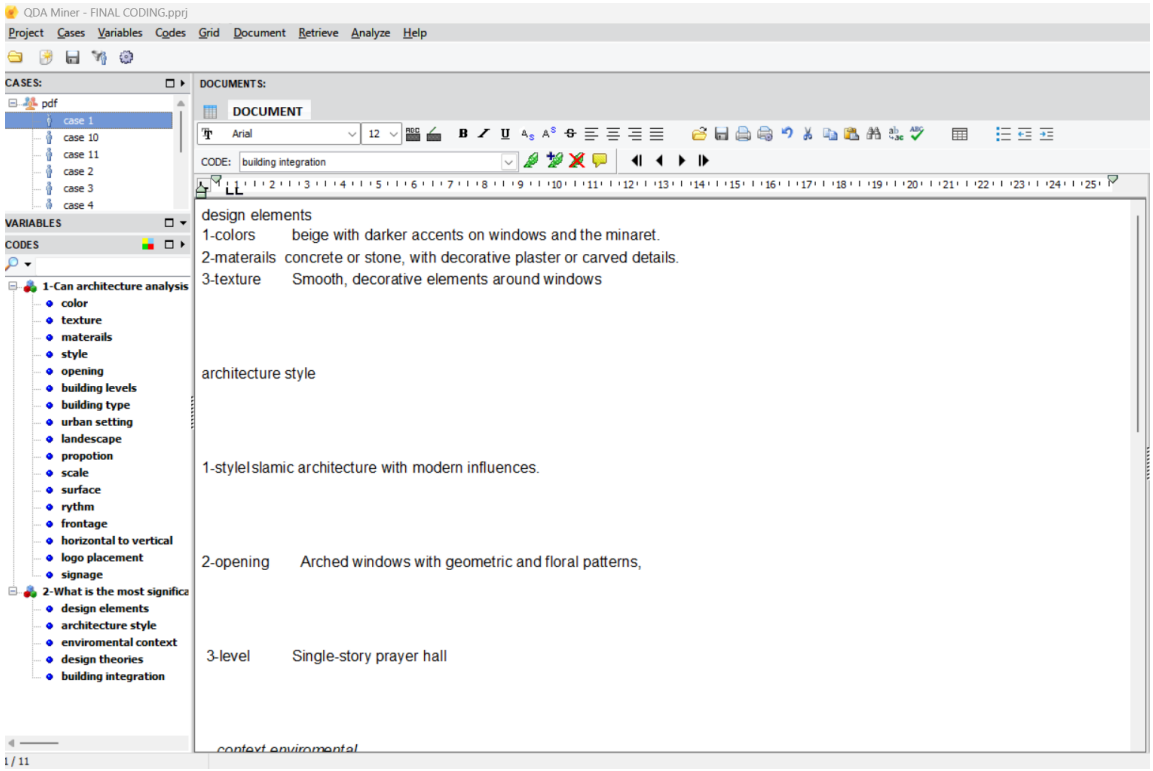


Figure 8: A screenshot of the QDA coding program for the analysis process.

- Can architecture analysis bring the main and common aspects that can identify the keywords to shape further visual identity?
- The defined codes are color – materials- texture - style – opening – levels - urban setting – landscape- proportion- scale – surface – rhythm – frontage – horizontal to vertical- logo placement- signage
- What is the most significant aspect of Damanhur's buildings (building design – building integration)?

The main defined codes -Design element - Architecture style -Environmental context -Design theories - Building integration (logo placement- signage)

8.1.3. Level Description and Coding:

This step focuses on coding the architectural elements of the 11 case studies Damanhur (3 religious buildings, 1 opera building, 8 residential buildings) inserted into (the document part).and coding transcript based on the two research questions (RQ1-RQ2), as shown in Fig. 9 , as the color (in codes part) indicate to the research question related to each transcript (color related to (RQ1), blue related (RQ2)).

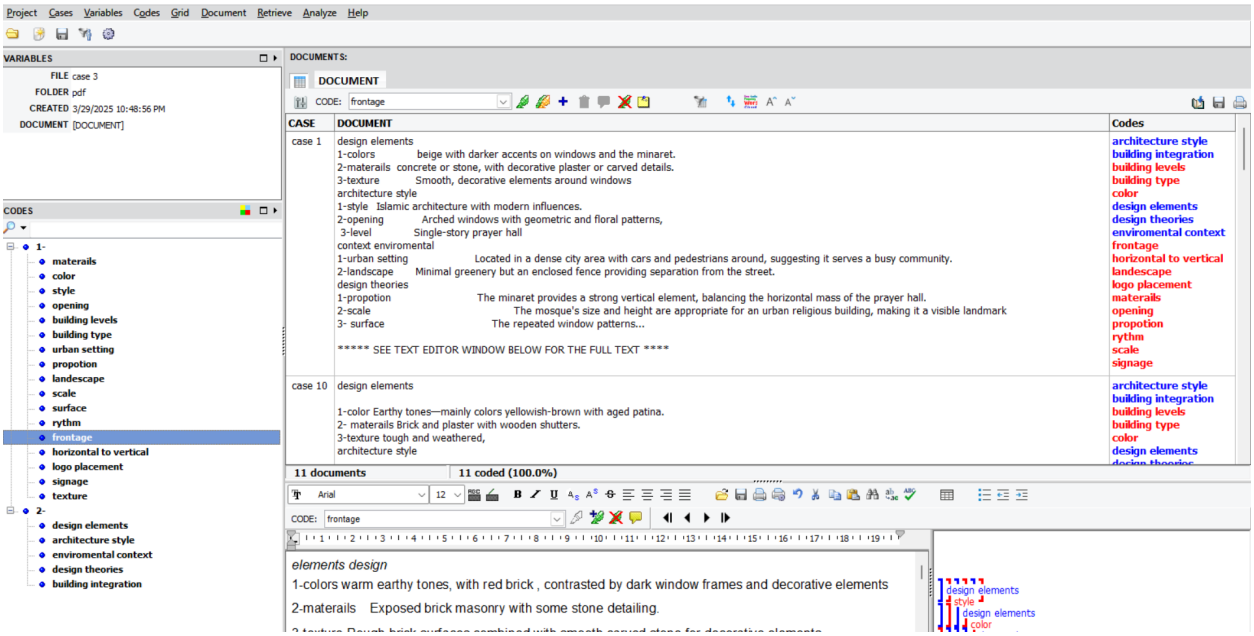


Fig. 9: A screenshot for the coding transcript at QDA coding program

8.2. Thematic Analysis

8.2.1. Coding Frequency:

This step analyzing the frequency of each code and its count and appearance in the 11 case studies related to (RQ1-RQ2), as shown in figure, leading to findings and categorizing the transcript and codes into themes that contribute to understanding architectural trends and visual identity formation.

As the codes in (RQ1: Can architecture analysis bring the main and common aspects that can identify the keywords presented in table (6) bellow to shape further visual identity? were established, four themes were created, as indicated in the table, each with its unique set of codes describing the theme.

THEME 1 DESIGN ELEMENTS	THEME 2 ARCHITECTURE STYLE	THEME 3 ENVIRONMENTAL CONTEXT	THEME 4 DESIGN THEORIES
COLOR	Style	Urban setting	Proportion
MATERIALS	Opening	Landscape	Scale
TEXTURE	Horizontal to vertical	Logo placement	Surface
LEVELS	Building type	Signage	rhythm
		frontage	

Table 6 shows themes related to RQ1

As the codes in (RQ2: What is the most significant aspect of Damanhur's buildings (building design – building integration)?) were established, two themes were created, as indicated in the table, each with its unique set of codes describing the theme.

Theme 1 (building design)	Theme 2 (environmental integration)
Design element	Environmental context
Architecture style	Building integration
Design theories	

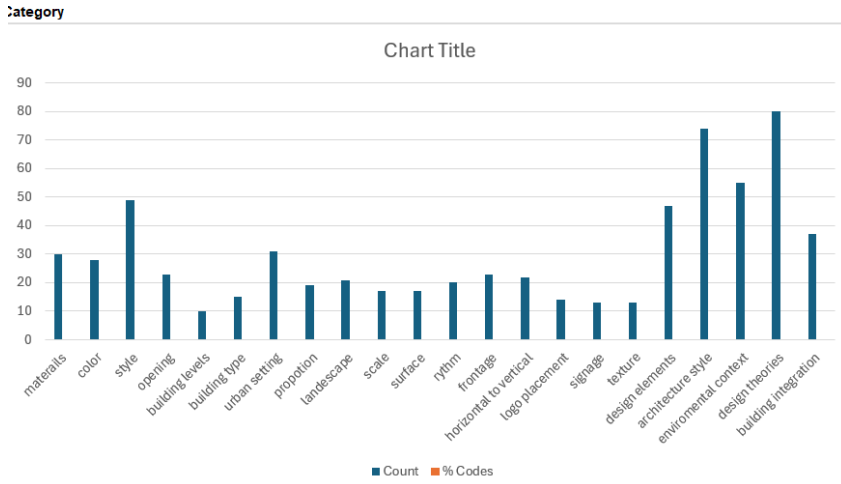
Table 7 shows the main themes related to RQ2

Following that, in (the code part), codes were combined based on the previous table to change the eleven building codes of RQ1 into four main themes, and the five building codes of RQ1 into two main themes for QR2.

8.3. Establishing the Corpus

8.3.1. Visual Presentation:

The final stage entailed presenting the findings in a comprehensible format. The research findings are converted into visual representations using keyword generation, assuring clarity in definition. As a counting and proportion of the appearance of codes and themes in the eleven case studies, as shown in Fig. 10.



Code	Count	% Codes
materails	30	4.60%
color	28	4.30%
style	49	7.40%
opening	23	3.50%
building levels	10	1.50%
building type	15	2.30%
urban setting	31	4.70%
propotion	19	2.90%
landescape	21	3.20%
scale	17	2.60%
surface	17	2.60%
rythm	20	3.00%
frontage	23	3.50%
horizontal to vertical	22	3.30%
logo placement	14	2.10%
signage	13	2.00%
texture	13	2.00%
design elements	47	7.10%
architecture style	74	11.20%
enviromental context	55	8.40%
design theories	80	12.20%
building integration	37	5.60%

Fig.10: A chart shows the keywords generation

The data consists of the following columns: Code: Represents different architectural and design elements and themes., Count: The number of times the code appears., % Codes: The percentage of the total codes that each code represents., Cases: Indicates the number of cases associated with each code., % Cases: The percentage of total cases that each code represents., The total number of codes is 100, and all cases are consistently represented by a total of 11 cases, with some codes appearing in 10 cases

The code represents that the highest code (design theories 12.20%, architecture style 11.20%, environmental context 8.40%, design element 7.10%, style 7.10%), and the lowest code (building level 1.50%, signage 2.0 %, texture 2.0%, logo placement 2.10%, building type 2.30%)

CODE	DESCRIPTION	COUNT	% CODES	CASES	% CASES
ARCHITECTURE STYLE (THEME 2)	style - opening - horizontal to vertical - building type	109	16.60%	11	100.00%
DESIGN ELEMENTS (THEME 1)	Color - materials - texture - level	81	12.30%	11	100.00%
DESIGN THEORIES (THEME 4)	proportion - scale - surface - rhythm	73	11.10%	11	100.00%
ENVIRONMENTAL CONTEXT (THEME 3)	urban element- landscape - logo - signage	102	15.50%	11	100.00%
BUILDING DESIGN (THEME 1)	architecture style - design element - design theories	201	30.50%	11	100.00%
ENVIRONMENTAL INTEGRATION (THEME 2)	building integration - environmental context	92	14.00%	11	100.00%

Table 8 The description and frequency of codes in coding themes

The data theme is then represented in a pie chart below (Fig.11) to demonstrate that the architecture style theme most represents RQ1, and the building design theme most represents RQ2.

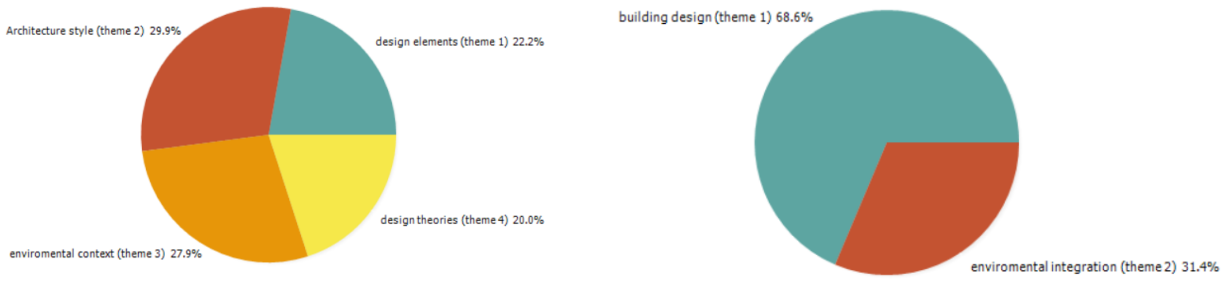


Figure 11: The result presented in pie charts for the architectural style most represented

9. EVALUATION

This systematic approach, Documentation-based Proposal for Visual Identity (Façade Scale), ensures coherent architectural analysis that integrates documentation, coding, and visual representation. This framework facilitates a comprehensive and data-driven understanding of urban visual identity by structuring the process across multiple architectural levels and utilizing thematic analysis.

The following finding, based on coding retrieval from QDA Miner 2024, each entry includes a code, a text description, the number of words in that description, and the percentage of the total words that the description represents.

9.1. Finding Based Code Count

1. Dominant Codes: The codes "design theories" (12.20%), "architecture style" (11.20%), and "environmental context" (8.40%) are the most significant in terms of word count percentage. This suggests that these areas are likely prioritized in the data set, indicating a focus on theoretical frameworks, styles, and contextual considerations in architectural design.

2. Mid-Range Codes: Codes such as "design elements" (7.10%) and "style" (7.40%) also hold considerable weight, indicating that the aesthetic and functional aspects of design are frequently discussed.

3. Lower Frequency Codes: Codes like "building levels" (1.50%) and "logo placement" (2.10%) are at the lower end of the spectrum. This could indicate less emphasis on these aspects in the analyzed cases, or they may be considered less critical in the overall architectural strategy.

9.2. Finding of Analysis of Damanhur Architecture style

Analysis of Damanhur Architecture style	
Words entries	211
Percentage words attributed	0.40 % - 8.50%
Most significant	Mixed-use building
Top entries and percentage	Mixed-use building 8.50% Active street-life 5.40% Dense – city, pedestrian around 5.60% Flat façade – detailing around opening 5>60%
Common themes	Urban integration , Mixed-use spaces , Historical preservation
Repetitive elements	Minimal signage , Maintain historical ambiance , Subtle detailing Detailing around the opening , Decorative frieze , Windows pattern
Trends and patterns	Modern adaptation of traditional structure Balance between contemporary needs and historical integrity Focus on style in architectural identity
Notable observation	The mention of minimal greenery in several entries
Top Keywords by Word Count	"Commercial use" (18 words, 8.50%) Structure—commercial use on the ground floor" (15 words, 6.70%) "Bustling urban setting neighborhood" (12 words, 5.40%) "Dense city area" (11 words, 5.60%) "Flat but enriched with subtle detailing" (11 words, 5.60%)

Table 9 Shows the findings of analysis Damanhur architecture style

9.3. Finding Based themes, RQ1, and RQ2

The entries can be categorized into several prominent themes based on the frequency and word count percentage. Below are the most significant aspects identified:

1. Location and Context: ("Located in a dense city area with cars and pedestrians around": 11 words (5.60%), "dense city area": 3 words (1.50%), "dense city area with cars and pedestrians around": 8 words (4.10%) , "busy community": 2 words (1.00%), "Direct engagement with the street": 5 words (2.50%))

2. Architectural Features:("Smooth, decorative elements around windows": 5 words (2.50%), "Arched windows": 2 words (1.00%)"Islamic architecture": 2 words (1.00%), "geometric and floral patterns": 4 words (2.00%) , "decorative plaster": 2 words (1.00%)) ": 4 words (1.90%), "tall minaret provides a strong vertical counterpoint": 7 words (3.60%))

3. Environmental Integration:("Minimal greenery": 2 words (1.00%), "Minimal signage, maintaining the mosque's historical and spiritual ambiance": 10 words (5.10%), "open entrance court provides a transition between the street and the sacred space": 13 words (5.50%))

4. Building Characteristics:("size and height are appropriate for an urban religious building": 10 words (5.10%) , "making it a visible landmark": 5 words (2.50%), "well-balanced between height and proportion width": 7 words (3.30%), "horizontal bands emphasizing stability.

	RQ1 theme 2	RQ2 theme 1
Total Entries	100	179
Total Words	2124 word	1570 word
Most Frequent Word Count	approximately 50% of entries have between 6 to 10 words.	8.77 average
High frequency theme	Active street life Density Mixed use	Color (beige – dark accent for windows - cream) Materials (concrete, stones-plaster)
Architecture features	Minimalist design elements Strong vertical elements (opening) Horizontal masses Design balance modest in scale "Appropriate height-to-width ratio."	Arched windows Decorative elements Floral pattern Geometric horizontal structure, vertical emphasis, well-balanced proportions
Cultural and historical context	Strong cultural significance with architectural style Early 20th-century vernacular style Islamic architecture	Dense area with cars and pedestrians (5.60%) Islamic architecture busy community, minimal greenery direct engagement with the street historical ambiance, modern influences, spiritual significance
Suggested visual identity	Mixed use \urban integration Minimal signage Historical ambience Strong vertical elements	Earthy tones color direct engagement with the street Open entrance court

Table 10 shows the main finding related to RQ1 THEME 2– RQ2 THEME 1

10. CONCLUSION

This study has investigated the visual urban identity of historic Egyptian metropolises, with a specific focus on Damanhur City, El-Bahira, Egypt. Utilizing a documentation-based process for architectural analysis, facilitated by QDA Miner 2024 coding software, this research provides a structured framework for analyzing architectural elements and their role in shaping urban identity.

The findings highlight the complex interrelationships among architectural elements, cultural identity, and urban integration, demonstrating how Damanhur's built environment navigates the balance between modern utility and historical preservation. This study contributes to the discourse on Damanhur's visual identity by identifying key themes and analytical methodologies, including design theories, materiality, ornamentation, and spatial organization.

Moreover, this research underscores the importance of data analysis and coding techniques in handling qualitative information on Egyptian cities, enabling a more systematic and objective architectural analysis. The documentation-based paradigm presented in this study should inform policy decisions aimed at preserving architectural identity while addressing contemporary urban challenges.

To preserve their historic heritage while fostering urban resilience and modernity, cities like Damanhur can implement policies such as historical conservation guidelines, visual documentation projects, signage regulations, and sustainable restoration procedures. Ultimately, this research contributes to the broader discussion on urban identity formation in historic Egyptian cities, providing a foundation for future studies on the role of architecture in shaping collective memory, city branding, and cultural sustainability in evolving urban landscapes.

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Traditional Dwellings and Settlements

Working Paper Series

DECODING HISTORICAL JEDDAH: PATTERNS AND PRINCIPLES FOR INTERPRETATION

Khalid S.M. Al-Hagla, Manar Talaleldin Mohammed, Lara A. Awad

DECODING HISTORICAL JEDDAH: PATTERNS AND PRINCIPLES FOR INTERPRETATION

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This paper employs Christopher Alexander's "A Pattern Language" to systematically analyze the architectural and urban fabric of Historical Jeddah (Al-Balad), recognized as a UNESCO World Heritage Site. It explores the methodologies of induction and deduction to decode the Landscape Cultural Genes (LCG) that underpin the historical area's urban patterns. These genes not only illuminate the socio-cultural and environmental adaptations of the region but also act as a pivotal link between historical conservation efforts and contemporary urban development. By translating these genes into a comprehensive pattern language, the paper articulates how these enduring design principles can inform both heritage conservation and new developments. A key focus of the study is on "The Jeddah Central Project," a new mega-development in Jeddah, which serves as a practical example to validate the paper's approach. The project demonstrates how integrating heritage cultural genes into modern urban planning can enhance the cultural coherence and historical continuity of new developments. This approach ensures that even as Jeddah expands and modernizes, it retains a connection to its rich historical identity. The paper argues that leveraging a pattern language derived from the city's landscape cultural genes is crucial in maintaining this link, showcasing a model where urban growth and heritage conservation coexist synergistically. Through this analytical lens, the research highlights the broader applicability of pattern languages in marrying the past with the present, offering valuable insights for urban planners and architects involved in similar contexts globally.

1. INTRODUCTION

Christopher Alexander's Pattern Language theory establishes a foundational framework in architecture and urban design, emphasizing human-centered, context-sensitive solutions to recurring environmental challenges. Introduced in A Pattern Language: Towns, Buildings, Construction (1977), co-authored with Sara Ishikawa and Murray Silverstein, the theory comprises 253 interrelated patterns that cover a broad spectrum from regional planning to the nuances of interior design [1]. Alexander's methodology provides a systematic framework for analyzing existing urban fabrics and developing new architectural strategies. Each pattern identifies a specific urban challenge and offers versatile, adaptable solutions tailored to varied contexts[2].

This methodologically robust approach to urban analysis ensures that new developments are deeply informed by existing environmental, cultural, and social contexts, integrating historical continuity into modern urban planning and architectural practices. This approach champions a sustainable urban development paradigm that respects and preserves historical legacies while incorporating contemporary solutions to modern challenges [3]. Concurrently, the concept of "landscape cultural genes" provides a framework for understanding how cultural elements are embedded within and transmitted through landscapes, emphasizing the preservation of traditional architectural styles, spatial configurations, and land-use patterns. These elements are vital for defining a place's unique identity and are increasingly significant in safeguarding cultural heritage amidst rapid urbanization [4].

Historical Jeddah, or Al-Balad, a UNESCO World Heritage site, exemplifies these landscape cultural genes, showcasing the rich cultural heritage of Saudi Arabia through its unique architectural styles, urban layouts, and social practices[5] . By applying Alexander's Pattern Language, this study translates these cultural genes into design patterns that inform both conservation efforts and contemporary urban planning, ensuring that Al-Balad's cultural essence is preserved while integrating traditional wisdom into modern developments.

This research employs a qualitative approach based on Alexander's Urban Pattern methodology to develop a pattern language that guides the conservation of existing structures and informs new developments in Al-Balad in a culturally and contextually sensitive manner. The methodology benefits from the author's expertise gained from the "Heritage Documentation of Historical Jeddah (Al-Balad)" project, enriched by comprehensive field surveys and detailed analyses of Al-Balad's architectural and spatial characteristics. Data collection involved documenting key architectural features and mapping urban patterns, complemented by semi-structured interviews and ethnographic observations with local stakeholders, providing deep insights into the socio-cultural dynamics of Al-Balad [6] [7] .

This paper presents a structured examination of three primary areas: Pattern Identification and Extraction, Pattern Language Development, and an analytical study of "The Jeddah Central Project." This framework is designed to systematically capture, analyze, and synthesize the embedded landscape cultural genes within Al-Balad’s urban fabric. By applying a rigorous methodology, the study discerns and articulates culturally and historically significant design and planning motifs, translating them into a comprehensive pattern language that informs and guides the developmental processes of the Jeddah Central Project, ensuring that new constructions resonate with Jeddah's historical and cultural essence while addressing contemporary urban challenges.

To enhance the reliability of the findings, the study utilized multiple data sources and methodologies, including field observations, interviews, and literature reviews. Triangulation was employed to ensure a comprehensive pattern analysis and to minimize potential biases from single data source reliance. Reflexive strategies like peer debriefing and maintaining an audit trail were implemented to uphold research objectivity, especially considering the potential biases from the author’s prior project involvement. While the study provides an exhaustive analysis of Al-Balad, its findings' applicability may be limited due to the unique cultural and historical characteristics of the area. However, the methodology demonstrated significant adaptability, potentially applicable to other historical urban contexts, suggesting a broader utility for integrating landscape cultural genes into contemporary urban design frameworks[4]. This adaptability underscores the potential for broader application, supporting urban transformations that respect and perpetuate historical and cultural legacies in other regions.

2. PATTERN LANGUAGE BETWEEN INDUCTION AND DEDUCTION

Alexander's Pattern Language theory is rooted in an inductive process whereby extensive empirical analyses of diverse built environments have enabled the identification of recurring design solutions that profoundly impact human experiences. By examining environments from villages to urban areas, Alexander and his colleagues created a rich database from which to extrapolate common design elements that significantly enhance human interaction and satisfaction [1]. These patterns, each addressing specific environmental challenges and proposing context-sensitive solutions, were formulated through the meticulous identification of successful design attributes across varied settings [2] .

The application of these patterns, however, is predominantly deductive. Architects and designers employ these established patterns as foundational principles, using them to derive specific solutions tailored to new design challenges. This deductive reasoning allows designers to apply general solutions to particular situations, ensuring that the designs are both appropriate and effective for their intended contexts [8].

The iterative relationship between inductive observation and deductive application in Alexander's theory fosters a dynamic evolution of the Pattern Language. As new environments are designed using these patterns, they provide fresh empirical data that feed back into the inductive process, refining and expanding the pattern lexicon over time [9]. This cyclical process not only facilitates continual improvement and relevance of the patterns but also mirrors the scientific method, where hypotheses are tested and refined through ongoing observation and experimentation [10] .

In the context of heritage conservation, Alexander's Pattern Language offers a potent framework for the sensitive integration of preservation and modernization efforts within historically significant areas. Planners and architects can inductively analyze heritage sites to identify essential design elements—such as pedestrian-friendly street layouts or communal spaces that promote social interaction—which are then distilled into patterns that capture the essence of these areas [11]. These patterns can then guide both the conservation of existing structures and the integration of new developments, ensuring interventions respect historical integrity while meeting contemporary needs [12].

Moreover, involving local communities in identifying these patterns helps capture intangible cultural values, making the planning process more inclusive and grounded in local heritage[13]. This participatory approach ensures that interventions are culturally resonant and widely accepted, enhancing the sustainability and functionality of heritage sites. The deductive application of these patterns allows for adaptability, recognizing that heritage sites are living entities that evolve over time[14]. By maintaining this balance, Pattern Language

facilitates a structured yet flexible approach to managing change in heritage sites, advocating for development that is both respectful of the past and responsive to present needs[15] .

Ultimately, Alexander's Pattern Language, with its blend of inductive analysis and deductive application, provides a comprehensive, adaptable framework that aligns with best practices in heritage conservation. It offers a methodological basis for integrating sustainable historical patterns into contemporary urban development, supporting the preservation of cultural identity while fostering necessary evolution and adaptation[16] .

3. LANDSCAPE CULTURAL GENES (LCG) AS THE SOURCE OF URBAN PATTERNS IN HERITAGE AREA

The concept of cultural transmission through physical landscapes, building upon foundational ideas in cultural geography and landscape ecology, suggests that human activities imprint cultural values onto the physical environment, as posited by Carl Sauer in his notion of the "cultural landscape" [17]. Extending this, the "landscape cultural genes" (LCG) concept likens cultural elements within landscapes to biological genes, suggesting they carry essential cultural information across generations, akin to Richard Dawkins' concept of memes, which represent units of cultural transmission focused on ideas and behaviors, rather than physical attributes[18] .

LCGs encapsulate a culture's interactions with its environment, serving as a repository of cultural wisdom and influencing landscape perception, utilization, and transformation[19]. Viewed through Alexander's framework, these genes are patterns—solutions to specific environmental and cultural problems that capture successful design practices adaptable across various contexts[1]. LCGs enrich Alexander's Pattern Language by integrating unique cultural identities into urban design, enhancing both cultural relevance and sustainability by rooting design solutions in local traditions and environmental knowledge [20] .

The integration of LCGs into urban planning respects the dynamic nature of landscapes as entities shaped by ongoing interactions among people, their environment, and culture, thus reinforcing ecological sustainability and social cohesion [21] . The inductive approach to identifying these patterns involves observing and abstracting successful cultural practices, capturing place-based knowledge embedded in vernacular design, and land-use practices that are inherently sustainable [22] [23].

Conversely, the deductive application of these patterns in new urban settings, especially in conservation, allows for the preservation of both the physical and symbolic meanings of culturally significant sites [24] . This

approach ensures that conservation efforts maintain a community's cultural and social identity, providing continuity and a sense of belonging [25] .

In cultural landscape conservation, the deductive methodology helps preserve not only the material aspects of environments but also the intangible cultural and historical values they embody [26] . For example, maintaining and adapting traditional patterns such as terracing or communal water usage in Mediterranean landscapes allows these practices to continue serving contemporary needs while preserving cultural heritage[27].

Furthermore, the deductive approach facilitates adaptive reuse in conservation, where culturally significant structures or landscapes are repurposed for modern uses without sacrificing their historical essence, thereby balancing heritage preservation with functional modernity[28]. This strategy enhances sustainability in urban development by minimizing new construction and maximizing the use of existing resources.

4. "LANDSCAPE CULTURAL GENES" IN HISTORICAL JEDDAH (AL-BALAD)

The concept of "landscape cultural genes" (LCG) provides an insightful framework for examining the complex interplay between culture and landscape in localized contexts. In Historical Jeddah (Al-Balad), LCGs are instrumental in understanding the evolution of cultural practices, environmental adaptations, and urban developments that have collectively shaped the city's unique urban fabric. This section synthesizes pivotal studies addressing the urban morphology, vernacular architecture, and socio-cultural dynamics that define Al-Balad's landscape, elucidating the critical role these elements play as carriers of the city's landscape cultural genes.

Historically, Jeddah's urban morphology has been shaped by its strategic role as a port city along the Red Sea, facilitating trade and pilgrimage routes. The city's spatial arrangement—characterized by narrow, intertwining streets and densely packed buildings—reflects adaptations to both social interactions and climatic conditions. Urban morphologists highlight that such spatial configurations are not merely functional but are deeply embedded in the cultural identity of Al-Balad, serving as key components of its LCGs[29] . For instance, the harat (narrow alleys) optimize airflow and minimize heat in response to the harsh desert climate, while the prevalent use of coral limestone as a building material underscores both environmental adaptation and cultural specificity[6].

The vernacular architecture of Al-Balad also prominently reflects its landscape cultural genes. The quintessential rawashin (wooden latticed windows) of traditional homes exemplify how architectural features meet environmental challenges while simultaneously embodying the social and religious values of the community[5 7]. These elements demonstrate how vernacular architecture in Al-Balad is a manifestation of

cultural identity, sustained through specific material choices and construction techniques that resonate with the local socio-ecological milieu.

Moreover, the socio-cultural dynamics of Historical Jeddah, shaped by its historical significance in the Hajj pilgrimage and as a commercial hub, have fostered a multicultural urban tapestry. This diversity is intricately woven into the architectural styles, urban layout, and communal spaces of Al-Balad, which have evolved to support a heterogeneous populace[30] . The theoretical lens of Relph's (1976)[25] concepts of place and placelessness is particularly relevant here, illustrating how Al-Balad's communal gathering spaces and religious sites not only contribute to the physical landscape but also reinforce a collective sense of belonging and identity continuity. These communal elements are pivotal in maintaining social cohesion and cultural continuity amidst modernization pressures[31].

Al-Balad's ability to assimilate external influences while preserving its intrinsic cultural identity highlights the resilience of its landscape cultural genes, ensuring the ongoing preservation of its unique heritage. The integration of LCGs into urban planning and conservation strategies is essential for maintaining the authenticity and vibrancy of heritage areas like Al-Balad, where the built environment and community life are inextricably linked[7].

5. TRANSFORMING THE LANDSCAPE CULTURAL GENES OF HISTORICAL JEDDAH INTO PATTERNS

The integration of "landscape cultural genes" (LCGs) into urban development strategies provides a crucial link between historical continuity and modern urban planning. In the context of Historical Jeddah (Al-Balad), this concept becomes particularly salient, offering a framework to explore how deeply embedded cultural and environmental practices can be harmoniously integrated into contemporary architectural projects. The table below presents a comprehensive analysis of specific "Patterns" derived from Al-Balad's LCGs, detailing their characteristics and evaluating their potential applicability in new urban developments. This assessment aims to highlight the adaptability of these patterns within the existing urban fabric, facilitating sustainable development that respects historical landscapes while addressing modern needs. This approach aligns with the growing scholarly discourse on the necessity of incorporating cultural sustainability in urban planning to enhance social cohesion and environmental adaptability[13 26].

Traditional Architecture and Local Materials

One of Al-Balad's most distinctive cultural genes is its traditional architecture, characterized by the use of coral limestone and intricate wooden lattices called Roshan[5]. These materials are not only locally sourced but also suited to the region's climate, providing natural cooling and ventilation.

- Translating this into Alexander's pattern "Local Materials" (Pattern 174), the use of indigenous materials fosters a sense of place and continuity with the past[1]. It supports local economies and reduces environmental impact by minimizing transportation and promoting sustainability.
- Critics might argue that modern construction demands materials with higher durability and lower maintenance costs. Relying on traditional materials could limit architectural innovation and fail to meet
- A hybrid approach can merge traditional materials with modern technology, enhancing performance while preserving cultural identity. For instance, treating coral limestone with modern sealants can improve durability without sacrificing authenticity.

Climate-Responsive Design

Al-Balad's buildings employ climate-responsive features like thick walls and internal courtyards to mitigate heat [32]

- This reflects Alexander's pattern "Courtyards Which Live" (Pattern 115), promoting designs that enhance natural ventilation and create comfortable microclimates[1]. Such features reduce energy consumption and support environmental sustainability.
- Modern air conditioning systems offer immediate comfort, potentially diminishing the perceived need for traditional climate adaptations. There may be a preference for maximizing indoor space over allocating areas for courtyards.
- Combining traditional passive cooling techniques with modern systems can optimize energy efficiency and occupant comfort. Courtyards provide social and aesthetic benefits, enhancing property value and occupant well-being

Human Scale and Proportion

Buildings and spaces in Al-Balad are designed to human scale, making the environment more relatable and comfortable[5]

- This aligns with Alexander's pattern "Human Scale" (Pattern 206), which emphasizes the importance of designing environments that cater to human proportions and senses[1]. It enhances accessibility and psychological comfort.
- The demands of urban density and economic efficiency may necessitate larger structures that exceed traditional human-scale proportions.

Innovative architectural designs can achieve high density while maintaining human scale at street level. Podium-tower configurations and stepped building profiles are examples of balancing scale with urban needs [33]

Urban Layout and Shaded Pathways

Al-Balad's narrow alleys and interconnected streets are designed to provide shade and facilitate pedestrian movement, addressing both climatic challenges and social needs [32]

- This corresponds with Alexander's patterns "Pedestrian Street" (Pattern 100) and "Arcades" (Pattern 119), which emphasize human-scaled, pedestrian-friendly environments[1]. Such designs encourage walking, reduce vehicular dependency, and promote community interaction.
- Modern urbanization often prioritizes vehicular access and wider roads for traffic flow and emergency services, potentially conflicting with the preservation of narrow, pedestrian-focused streets.
- Integrating pedestrian zones within modern cities is feasible and beneficial. Cities like Copenhagen have successfully prioritized pedestrian and cycling infrastructure without compromising urban functionality[33]. Applying similar strategies can maintain Al-Balad's cultural patterns while accommodating modern needs.

Labyrinthine Street Networks

The maze-like streets of Al-Balad create a unique urban experience, encouraging exploration and providing social security through natural surveillance [32]

- Reflecting Alexander's pattern "Network of Paths and Cars" (Pattern 52), such street designs enhance pedestrian experiences and foster community interactions [1]
- Complex street networks can be inefficient for navigation and logistics. Emergency services and delivery systems may face challenges in areas with non-linear layouts.
- Technological advancements like GPS navigation mitigate these issues. Moreover, designing neighborhoods with both navigational efficiency and experiential richness is possible by combining grid layouts with pedestrian pathways.

Social Interaction and Community Nodes

Public squares and communal spaces in Al-Balad encourage social cohesion and cultural expression[5].

- Corresponding with Alexander's patterns "Small Public Squares" (Pattern 61) and "Promenade" (Pattern 31), these spaces facilitate community events and daily interactions[1]. They are essential for a vibrant urban life.
- In high-density urban areas, dedicating space to public squares may conflict with economic pressures to maximize built-up areas for commercial or residential use.

Well-designed public spaces enhance the livability of a city, which can, in turn, attract businesses and residents, ultimately benefiting the economy. Examples from cities like Barcelona demonstrate how investing in public spaces contributes to urban regeneration and economic vitality [34]

Marketplaces and Communal Spaces

Traditional markets, or souks, are integral to Al-Balad's social and economic life. They serve as hubs for commerce and community interaction.

- Aligning with Alexander's pattern "Market of Many Shops" (Pattern 46), preserving and revitalizing these markets supports local businesses and maintains cultural practices[1]. They offer authentic experiences that attract tourism and enrich community life.
- The rise of modern shopping centers and e-commerce challenges the viability of traditional markets. Developers may prefer large-scale retail projects that promise higher profits.
- - Traditional markets can coexist with modern retail by adapting to contemporary consumer needs. Enhancements in infrastructure, hygiene, and services can make souks competitive while retaining their cultural significance [35].

Intricate Facades and Privacy Screens		
Roshan not only adds aesthetic value but also serves cultural functions by providing privacy while allowing residents to observe street activities[5]. • Reflecting Alexander's pattern "Balconies and Windows Overlooking Life" (Pattern 167), such features enhance social engagement and connect private spaces with the public realm [1]. They contribute to a lively streetscape and foster a sense of community. • The cost and craftsmanship required for intricate wooden lattices may be prohibitive in modern construction. Additionally, contemporary architectural trends favor minimalistic designs with large glass surfaces. • Modern materials and fabrication techniques can replicate traditional designs more efficiently. Incorporating culturally significant elements adds unique character to buildings and can be a marketable feature in real estate development.		

Table 1: comprehensive analysis of specific "Patterns" derived from Al-Balad's LCGs, detailing their characteristics and evaluating their potential applicability in new urban developments

6. INDUCTING THE PATTERNS REPRESENTING HISTORICAL JEDDAH'S "LANDSCAPE CULTURAL GENES"

The approach demonstrates practicality on two fronts: firstly, in the preservation of existing heritage; and secondly, in ensuring the continuity of "landscape cultural genes" within new developments through the inductive application of heritage patterns.

6.1. The conservation of the Historical Jeddah (Al-Balad)

The conservation of Historical Jeddah has become a focal point for heritage preservation in Saudi Arabia, particularly following its inscription as a UNESCO World Heritage Site in 2014. This recognition underscores the global importance of Al-Balad's unique cultural landscape and the urgent need to protect it from the pressures of modernization and urban development[32]. The conservation efforts aim to safeguard the physical integrity of historical structures, revive traditional urban patterns, and preserve the intangible cultural heritage embodied in the social fabric and daily life of the community[36].

Conservation initiatives involve a multidisciplinary approach that includes restoring dilapidated buildings using traditional materials and techniques, rehabilitating public spaces to encourage social interaction, and implementing policies that balance heritage preservation with contemporary urban needs[37]. The Saudi government's commitment, in collaboration with local stakeholders and international organizations, reflects

an understanding of the intrinsic value of Al-Balad's landscape cultural genes—those fundamental cultural elements that define the city's identity and continuity[38] .

Despite the challenges posed by rapid urbanization, economic considerations, and the need for modern infrastructure, the conservation of Historical Jeddah strives to maintain the authenticity and integrity of the site. Efforts are guided by international conservation charters and frameworks, such as the UNESCO Recommendation on the Historic Urban Landscape, which advocates sustainable management of urban heritage that integrates conservation with social and economic development[39]. Through these endeavors, Al-Balad serves not only as a living museum of the past but also as a vibrant part of Jeddah's present and future, embodying a harmonious blend of tradition and modernity.

The application of inductive methodologies in the conservation of Historical Jeddah (Al-Balad) exemplifies the effective preservation of the city's landscape cultural genes, particularly through the restoration efforts at the Nasif House *Fig 1*. This iconic structure, celebrated for its traditional Hijazi architecture, serves as a pivotal case study in understanding how cultural and historical values are embedded within architectural forms. The restoration process involved a detailed analysis of the original design elements of the Nasif House, including the use of coral limestone, the iconic Roshan wooden screens, and its unique internal spatial organization. These elements were meticulously studied to extract and redefine patterns that were instrumental in guiding an authentic restoration process[40]. By employing a pattern-based approach, conservators were able to inductively understand and preserve the inherent design principles of the building, thereby ensuring that its restoration maintained the cultural and historical integrity of the structure for future generations. This process not only highlighted the practical applications of landscape cultural genes but also underscored the importance of such genes in maintaining the continuity of traditional architectural practices in a modern context.

The rehabilitation of Souk Al-Alawi *Fig 2*, a central market in Historical Jeddah (Al-Balad), underscores the nuanced approach needed in heritage conservation that accommodates both cultural significance and contemporary function[41]. Drawing from in-depth analyses and documentation of traditional patterns within the marketplace, such as shop layouts, pedestrian dynamics, and social interactions, conservation efforts have been able to encapsulate the essence of this vibrant market's role within the community[33]. The methodical application of these inductively derived patterns has facilitated a restoration that not only revives the souk's economic vitality but also preserves its authentic architectural and cultural elements. This strategy ensured that the historical integrity of the narrow alleyways, shaded corridors, and rhythmic alignment of shopfronts was maintained, thereby conserving both the tangible and intangible aspects of the marketplace, which are crucial for sustaining the social fabric and cultural practices inherent to Al-Balad.

Fig 1: Nasif House (historical Jeddah (AlBalad)

Fig 2: Souk Al-Alawi (historical Jeddah (AlBalad)

Additionally, the Jeddah Historical Preservation Society initiated training programs for local artisans and craftsmen based on patterns identified in traditional building techniques[35]. By studying existing structures, they extracted patterns related to masonry, woodwork, and decorative arts. These programs ensured that the skills necessary to maintain and restore historical buildings were passed down, embodying the landscape cultural genes in both the physical environment and the community's knowledge base.

These examples demonstrate how inductively working with patterns derived from careful observation and analysis of existing cultural elements can effectively preserve the landscape cultural genes of Historical Jeddah. By grounding conservation efforts in the tangible and intangible patterns inherent in the city's heritage, practitioners ensure that interventions are authentic, contextually appropriate, and culturally resonant. This approach not only protects the architectural and urban legacy of Al-Balad but also revitalizes its role as a living, evolving community that honors its past while engaging with the present.

6.2. New Urban Developments in Jeddah: The Jeddah Central Project

Fig 3: The Jeddah Central Project aerial view

The Jeddah Central Project is an ambitious urban redevelopment initiative launched by Saudi Arabia's Public Investment Fund (PIF) in December 2021, aiming to transform a significant portion of Jeddah's waterfront into a modern, mixed-use district that honors the city's rich cultural heritage[42]. Covering an area of approximately 5.7 million square meters along the Red Sea coastline, the project plans to develop residential neighborhoods, commercial spaces, cultural venues, and recreational areas, all designed with an emphasis on sustainability and the incorporation of traditional Hijazi architectural elements[43]. By integrating patterns that reflect Jeddah's "landscape cultural genes," the project seeks to preserve and celebrate the historical identity of the city while fostering economic growth and enhancing the quality of life for residents and visitors alike[44] .

An analytical evaluation of The Jeddah Central Project redevelopment plan, using the patterns that reflect Historical Jeddah's landscape cultural genes, reveals a conscientious effort to integrate traditional urban elements into modern development. The project demonstrates a sophisticated hybrid approach in urban development by integrating traditional materials such as coral limestone and Roshan lattices with modern

technology. This strategic fusion not only enhances the durability and functionality of these traditional elements but also preserves the aesthetic integrity of Jeddah's architectural heritage. By applying modern sealants and reinforcing techniques, the development ensures sustainability and adapts traditional materials to modern building requirements without sacrificing historical significance, thereby setting a precedent for sustainable urban growth in heritage-rich cities worldwide[45] [46].

Strategically designed to harmonize pedestrian mobility with climatic adaptability, the project incorporates extensive pedestrian pathways shaded by strategically placed native vegetation and architectural features. This design reduces reliance on vehicular transportation and enhances community interactions, encouraging walking and reducing heat islands. The focus on shade provision and social interaction facilitation aligns with sustainable urban development practices, emphasizing the enhancement of urban livability and the reduction of carbon footprints [43] [47].

The sophisticated application of hybrid architectural techniques merges traditional materials with modern fabrication methods to enhance building performance while reinforcing cultural identity. The iconic Roshan privacy screens, crafted with advanced materials, maintain aesthetic appeal and functional benefits, thereby improving their durability and environmental adaptability. Such integration not only enhances the unique character of the buildings within the Jeddah Central Project but also serves as a significant marketable feature in real estate development, addressing climatic challenges and facilitating social interaction[42] [43].

By blending the traditional souk experience with the sophistication of modern retail, the project catalyzes economic activity and fosters a vibrant community hub. The integration of shaded walkways and open communal spaces invites social interaction and accommodates the region's climatic needs. This architectural layout promotes pedestrian movement and encourages visitors to traverse seamlessly between traditional markets and modern outlets, symbolizing a new paradigm in urban development where heritage and modernity coexist harmoniously [43].

The climate-responsive design strategy of the project merges traditional passive cooling techniques with advanced environmental technology, optimizing energy efficiency and occupant comfort. Courtyards designed to maximize natural ventilation and cooling enhance both the property value and occupant well-being. The strategic placement of vegetation and water features contributes to microclimatic control, making the environment more comfortable for residents and visitors alike, thus standing as a model for future developments in arid regions.

The project exemplifies urban design that fosters social interaction and community cohesion through well-conceived public spaces. These areas not only enhance city livability but also attract businesses and residents,

boosting economic growth. The integration of traditional elements with modern functionality creates vibrant nodes that facilitate community gatherings and social activities, stimulating local economies and enhancing the social fabric of urban settings[43] [44].

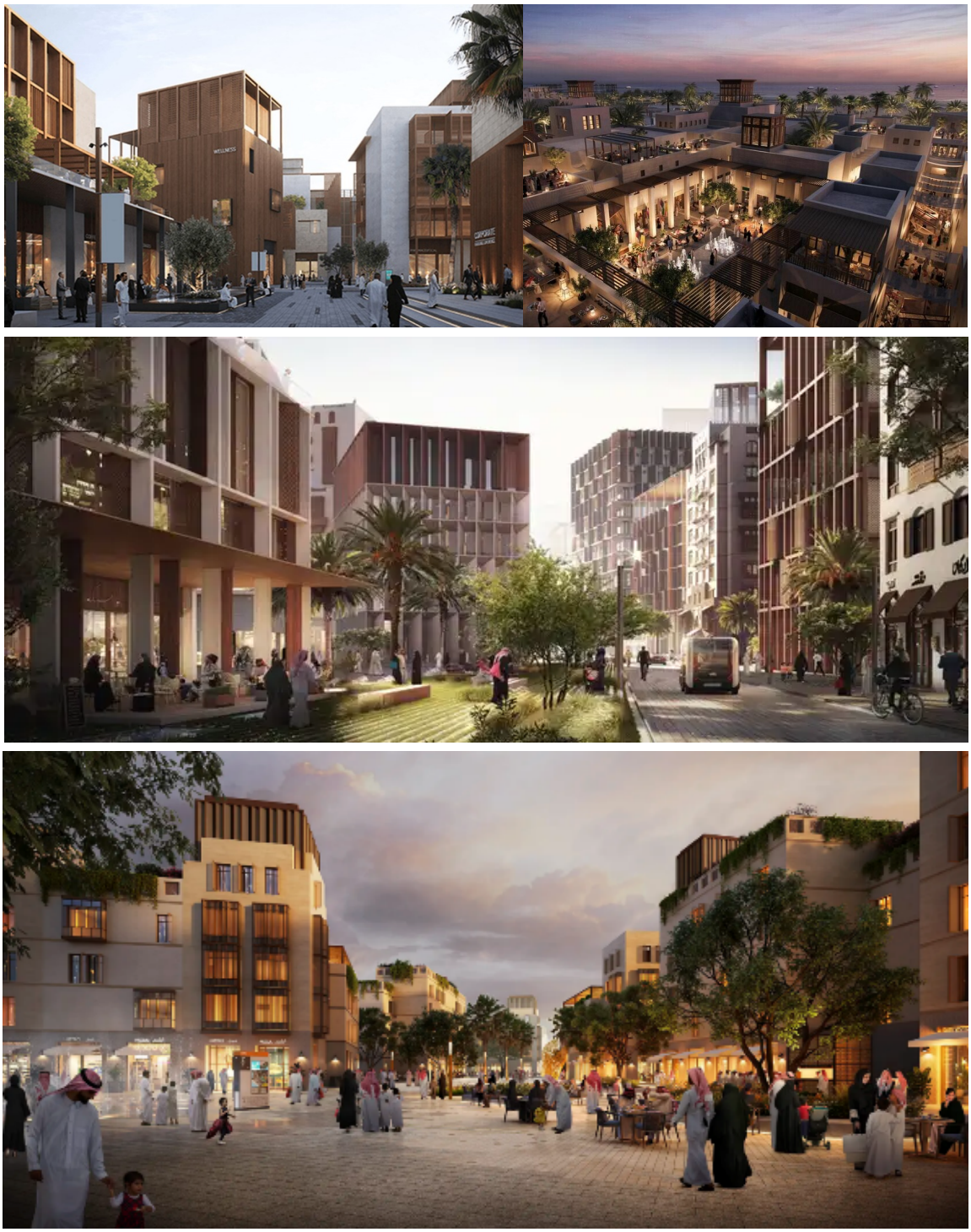

Fig 4: The Jeddah Central Project: Development Aspects

Incorporating labyrinthine street networks that blend navigational efficiency with experiential richness, the Jeddah Central Project supports efficient movement through the city while enriching the pedestrian experience. This design promotes vibrant social spaces and enhances the city's livability, facilitating easy access to various districts and offering scenic routes that connect different community nodes, setting a benchmark for future urban developmen[43 44]

Innovative architectural strategies in the project balance high-density urban design with human-scale proportions to create an inviting and functional urban space. This integration of labyrinthine street networks and comprehensive pedestrian pathways enhances navigational efficiency and enriches the experiential quality of the urban environment. Narrow, winding streets flanked by high-density buildings maintain a human scale, fostering comfortable and engaging pedestrian experiences that encourage walking and social interaction [43 44].

These design strategies ensure that the Jeddah Central Project does not exist in isolation as a modern development but rather as an extension of the city's rich historical narrative. By weaving the architectural and urban planning traditions of old Jeddah into the fabric of this new development, the project demonstrates a comprehensive understanding of how contemporary urban planning can enhance and extend the historical and cultural identity of a place. This synthesis of old and new serves to strengthen the social and cultural fabric of Jeddah, ensuring that the development is not only a place of economic activity but also a continuation of the city's historical legacy and cultural vibrancy [43 44].

7. CONCLUSION

This research has systematically applied Christopher Alexander's "A Pattern Language" to elucidate the urban and architectural fabric of Historical Jeddah (Al-Balad), demonstrating the pivotal role of Landscape Cultural Genes (LCG) in guiding both the conservation of historical elements and the infusion of these elements into contemporary urban development. Through a methodological blend of induction and deduction, this study has highlighted how deep-rooted cultural patterns can be preserved and adapted to modern contexts, particularly through the lens of the "Jeddah Central Project."

The conservation efforts in Al-Balad, particularly exemplified by the meticulous restoration of the Nasif House and the vibrant rejuvenation of Souk Al-Alawi, illustrate the practical application of inductively derived patterns. These efforts have not only preserved the architectural integrity and historical essence of these landmarks but have also revitalized them to support economic and social vitality. Such initiatives underscore the importance of integrating deeply embedded cultural patterns into contemporary conservation practices, ensuring that these efforts are sensitive to both the historical significance and the living heritage of the community.

Simultaneously, the Jeddah Central Project serves as a pioneering model for integrating historical cultural insights into new urban developments. This project creatively incorporates traditional Hijazi elements into a modern urban setting, demonstrating how new developments can respect and reflect historical identities while providing for contemporary needs and aspirations. The project's design strategically blends traditional materials and urban layouts with modern technologies and infrastructure, presenting a sustainable and harmonious approach to urban expansion.

In synthesis, the findings from "Decoding Historical Jeddah: Patterns and Principles for Interpretation" advocate for a holistic framework where heritage conservation and urban development coexist synergistically. The adaptability of the pattern language framework, as applied in Jeddah, provides a globally relevant blueprint for sustainable urban development. This approach not only preserves cultural integrity but also enhances urban livability, offering a pathway that respects historical legacies while fostering economic growth and social cohesion.

The successful integration of landscape cultural genes into both conservation efforts and new developments in Jeddah underscores the broader applicability of this methodological approach. It invites urban planners, architects, and policymakers worldwide to consider cultural heritage as a dynamic component of urban development, capable of enriching not only the aesthetic and historical landscape but also the socio-economic framework of urban environments. This study thus contributes a significant scholarly and practical insight into the sustainable integration of historical preservation within contemporary urban development strategies.

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A PASSION FOR BUILDING BY-LAWS: CHARACTERISTICS AND OPPORTUNITIES OF COSMOPOLITAN SELF-BUILT SPACE AS A SUSTAINABLE TRADITION

Susane Havelka, Hans-Peter Mønsted

A PASSION FOR BUILDING BY-LAWS: CHARACTERISTICS AND OPPORTUNITIES OF COSMOPOLITAN SELF-BUILT SPACE AS A SUSTAINABLE TRADITION

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Rising housing costs have made home ownership increasingly inaccessible in circumpolar communities. While large-scale multiplexes are common, late 20th-century self-building initiatives—providing materials for individuals to construct their own homes—offer a sustainable, empowering alternative. Fieldwork in Greenland and Canada's Northwest Territories revealed lasting benefits: builders reported pride, autonomy, and improved well-being. Many of these homes, over 40 years old, remain well-crafted and well-maintained. However, rigid building codes often hinder such approaches. To support this time-tested model, regulatory frameworks must adapt—embracing flexibility and cultural relevance to empower individuals and strengthen remote communities through self-directed, sustainable housing.

1. INTRODUCTION

In the pursuit of comprehensive housing solutions and the empowerment of communities, the discourse often overlooks the significant impact of self-build housing projects on well-being. This paper aims to address this gap by examining the symbiotic relationship between self-building and well-being through case studies from Canada and Greenland. Over the span of four decades, we delve into the self-build housing experiences of two distinct communities in these countries. Notably, while the self-building program in Canada's Northwest Territories ceased in 1991, its Greenlandic counterpart persists, providing valuable insights into long-term sustainability and efficacy.

Through in-depth interviews, we uncovered the nuanced benefits of self-building initiatives, including the cultivation of self-esteem, identity, and a sense of belonging, as well as the acquisition of invaluable construction knowledge. Participants consistently reported heightened agency and self-efficacy, leading to tangible improvements in overall well-being. Their narratives not only shed light on the successes of past programs but also prompt critical reflections on their discontinuation and the potential for revival.

By analyzing these case studies, we aim to elucidate the intricate dynamics between self-building and well-being, providing actionable insights for policymakers, practitioners, and communities alike.

1.1. Introduction to Case Study 1: Uummannaq, Greenland

Nestled in the heart of Avannaata Kommunia, Greenland, the town of Uummannaq stands as a testament to the delicate balance between natural surroundings and human habitation. This small northern enclave, with a population of 1407 as of 2020, is strategically located on a compact island within a vast fjord. The

surrounding mountains act as formidable sentinels, sheltering the town from precipitation and ocean currents, thereby creating a temperate climate that is conducive to the flourishing of hunting and fishing activities. The bountiful waters teem with whales and fish, offering sustenance to the local hunters and fishermen, known as piniartut, who ply their trade from boats during late summer and autumn, while winter and spring see them skillfully fishing on the ice.

Fig. 1: Figure-Map of Municipalities Greenland. 2015 using satellite imagery on GIS January 17, 2023. (Source: Hijmans, Robert J., University of California, Berkeley. Museum of Vertebrate Zoology. First-level Administrative Divisions, Author: Morgane Dackiw. (2023). https://geodata.lib.utexas.edu/catalog/stanford-fs835tc1851

Part of the broader Avannaata Kommunia, alongside Qaanaaq, Upernavik, and Ilulissat—with the latter serving as the municipal capital—Uummannaq's history is intricately woven into the fabric of Greenlandic municipal evolution. The amalgamation of individual municipalities into the unified Avannaata Kommunia in 2009 was driven by a centralization effort aimed at reducing costs. As of 2017, Uummannaq housed 1255 individuals, constituting 12% of the total population of the municipality. Noteworthy is the population's decline by 14% since 2000, a trend that prompts exploration into its underlying factors.

Delving into the architectural landscape of Uummannaq, the year 2010 witnessed the presence of 576 homes, with governmental ownership accounting for a modest 7%. The housing composition reflected a prevailing inclination towards single-family residences (79%), complemented by semi-detached houses (13%) and residential multi-storey buildings (8%). A nuanced scrutiny reveals a notable increase in single-family homes, contrasting with the stability in the numbers of semi-detached and multi-storey structures during the same period.

Moreover, the social fabric of Uummannaq is reflected in its communal living spaces, such as town dormitories accommodating seven residents and a retirement home catering to 42 individuals in 2010. Fast forward to 2017, and the town's landscape comprised 467 households, with an average household size of 2.7 persons, marking a shift in the town's residential dynamics.

In recent years, residential expansion in Uummannaq has primarily gravitated towards the west, notably in Spraglebugten, with projections indicating a continuation of this trend. The town's zoning plan, outlined on the Avannata Kommunia planning website, emphasizes the harmonious integration of detached single-family houses around the base of Uummannaq mountain. Compliance with the topography and existing structures is encouraged in new developments, while urban expansion is restricted to the west due to a designated zone around the lake, safeguarding the extraction of drinking water.

The municipal planning website further advocates for the renewal of dilapidated structures and the demolition of uninhabited houses in poor condition. It posits do-it-yourself houses as a potential avenue for replenishing the building stock, ensuring accommodation for newcomers, young families, and senior citizens alike.

1.2. Introduction to Case Study 2: Fort Good Hope

Situated on the banks of the McKenzie River, the Dene Nation of Fort Good Hope, also recognized as the Charter Community of K'asho Got'ine, stands as the oldest among the 11 Dene Charter communities in the Sahtu Region, Northwest Territories. Representing the Sahtu region with a population of 516 (2021), Fort

Good Hope, or Radeyilikoe in its traditional Dene name, meaning "where the rapids are," has been an integral part of the region since the 1930s. Nestled approximately 805 km northwest of Yellowknife, this community traces its roots back to its establishment as a fur trading post in 1805. Today, it remains home to around 800 residents, engaging in time-honored family hunting and trapping practices, complemented by numerous trails for berry picking and trapping.

Fig. 2: Figure-Administrative Boundaries Canada, Fort Good Hope. 2011 Census. Statistics Canada Catalogue no. 92-160-X. Author: Morgane Dackiw. (2023).

Fort Good Hope has endured several relocations in the early 1800s due to river flooding, marking its resilience. Noteworthy landmarks include the Catholic Church, Our Lady of Fort Good Hope, built during this period. Despite the closure of the outpost in 1918, the community persisted. Accessible only by plane

from Inuvik, Norman Wells, and Colville Lake, and linked by land, Fort Good Hope maintains its vitality. The town faces logistical challenges, with the nearest hospital and international airport located in Yellowknife.

The Housing Department oversees numerous housing units, including xx Canada Mortgage and Housing Corporation (CMHC) units and xx Band-owned rental units. These accommodations range from single-family homes to apartments in multi-unit complexes, encompassing detached, semi-detached, duplex apartments, and row houses.

For the Fort Good Hope community, the imperative to continue developing culturally appropriate housing demands attention from all levels of government and those responsible for housing design and construction. In 2021, a stark statistic revealed that over one in six Indigenous people (17.1%) inhabited crowded housing considered unsuitable for the number of occupants (Statistics Canada – Catalogue no. 98-200-X, issue 2021007). This paper seeks to delve into the pressing issue of housing development in Fort Good Hope and advocate for comprehensive solutions that address the unique needs of its residents.

1.3. Northern Housing Programs in Greenland: The Emblematic Role of Self-Built Houses

The distinctive self-built houses in Greenland, characterized by their type units, have evolved into symbols of rural life in the country. Adorned in vibrant colors and equipped with ample outdoor storage for hunting and fishing gear, these houses not only signify successful self-build endeavors but also continue to serve as hubs for traditional daily activities. Facilitated by a housing program that bore the financial burden, the average citizen was empowered to construct and own a home, thereby fostering individual autonomy. Consequently, the houses themselves, through their design and the economic mechanisms underpinning their creation, transform end users into both self-builders and homeowners.

The Greenlandic community holds a favorable view of the self-building program, particularly as it catered well to the needs of the local average family, especially those engaged in hunting and fishing. The houses, crafted with functionality in mind, feature cold porches and, being single units, offer ample exterior space for storing equipment such as snowmobiles and dogsleds. Conversations with self-builders reveal a sense of pride in their accomplishments, evident in the meticulous maintenance of houses that have weathered more than three decades. Beyond being mere structures, these homes stand as testaments to the achievements of their builders, further accentuating their commitment to upkeep.

Fig. 3: Figure-of Uummannaq, Municipality of Greenland. June 2022 Photo of Type house by author Susane Havelka

1.4. Second Case Study: HAP Houses of Fort Good Hope, NWT

However, discussions about contemporary self-building within the community underscore bureaucratic challenges. Increasing demands for professional involvement to comply with building codes have escalated construction costs. Formerly covered by the government, the responsibility for financing building materials has shifted to the local municipality. While government funding once incentivized self-building by injecting funds and creating jobs at the local level, the current scenario views it as an added expense for municipalities. Consequently, fewer self-build projects are approved, signaling a shift in the dynamics of housing initiatives.

1.5. Northern Housing Program in NWT

Reexamining the Self-building housing initiative under the Homeownership Assistance Program (HAP) in Fort Good Hope, Northwest Territories

In March 1990, William Rees and David Hulchanski authored a comprehensive report titled "Housing as Northern Community Development: A Case Study of the Homeownership Assistance Program (HAP) in Fort Good Hope, Northwest Territories." This report stands out as the most extensive exploration of a

northern housing program to date, providing valuable insights into housing delivery in the NWT before the nineties. Administered by the Northwest Territories Housing Corporation in collaboration with the Canada Mortgage and Housing Corporation, the Homeownership Assistance Program (HAP) operated from 1982 to 1988. This initiative empowered prospective homeowners by allowing them to actively participate in the construction of their homes through "sweat equity," thereby becoming clients of the program.

The program catered to individuals possessing sufficient funds for utility bills and repairs but lacking the financial means to purchase a home outright. Potential homeowners engaged in the building process with the assistance of Program Officers and Project Officers, who provided guidance throughout construction. Eligibility criteria included residing in the territory for at least five years, being 19 years old or older, and maintaining an income below the Northwest Territories Housing Corporation's core need income threshold (CNIT). Despite the specific conditions for participation, being a client in the program offered distinct advantages.

The process commenced with selecting a suitable lot for construction, either through leasing from the Hamlet or obtaining a band council resolution for lot use. The lot's size and location played a crucial role in helping clients determine the appropriate house type and design based on their needs and location. Upon program acceptance, clients completed the HAP Order Form (refer to Appendix 2) to specify their chosen options, such as foundation type, wall and roofing systems, as well as interior and exterior colors.

The ordered materials were delivered in crates by truck or sealift and barge directly to the Housing Corporation. Subsequently, the district office provided instructional videotapes on building the selected house type. Clients assumed full responsibility for the construction process or sought assistance as needed. Site preparation involved tasks such as preparing the land with a gravel pad for cribbing, strip footings, or opting for pile foundations.

Upon the arrival of material packages, construction activities included erecting walls and roof framing, sheathing, installing vapor barriers, windows, and doors, insulating (if using a timber frame), coordinating with electrical contractors, and undertaking plumbing and other necessary mechanical work. The subsequent steps encompassed finishing work, including drywalling, taping, filling, painting, floor finishes, cabinets, trim, and hardware installation.

Despite limited selections, the program offered nine different HAP house types, a log house option, four types of siding, three cabinet hues, vinyl flooring, and three countertop colors. Clients even had the choice between a truss roof or a cathedral roof.

In summary, the Dene Nation perceived HAP housing as a positive force for local social and economic development, making significant contributions to the well-being of vulnerable population groups.

Fig. 4: Photo of HAP Log House in Fort Good Hope, North West Territories, Canada, Photo by David Hulchanski, August 1988-

1.6. Methods and Data Sources

This study, spanned two years and adhered to Indigenous Research Methodology (IRM) principles, integrates the Capabilities Approach with Community-Based Participatory Research (CBPR). The aim was to ensure that indigenous values, ethics, and experiences play a guiding role in the research process. The chosen locations for the study were two geographically isolated small settlements with successful owner-built home assistance programs. These programs empowered homeowners to train and construct their own houses.

Employing collaborative approaches, the Housing Associations in these settlements served as active partners, involving community members in every aspect of the project— from data collection and analysis to the dissemination of research results. The project aligned with the Tri-Council Policy Statement for Ethical Conduct for Research Involving Indigenous People and recognized the community's expertise in Self-build housing conditions.

Our research now extends beyond these settlements to encompass documents from Northwest Territories and Greenland, including materials from the federal Department of Indigenous and Northern Affairs Canada (INAC) and local government agencies. We focused on documents reflecting program and policy changes in housing delivery, with a special emphasis on the Homeownership Assistance Program (HAP) and Denmark's introduction of easily constructible single-family houses in Greenlandic.

Primary data collection involved in-person interviews. Although a Qualtrics survey was developed for online deployment in case of an extended COVID-19 lockdown, we opted for in-person fieldwork when the lockdown lifted in both northern communities. Subsequently, fieldwork was organized in Greenland during late spring and early summer 2022, followed by Northwest Territories in July 2022.

Interviews, lasted approximately one hour each, took place in the main living spaces of self-built houses in Uummannaq, Greenland, and Fort Good Hope, Northwest Territories. The bilingual nature of interviews, conducted in English with some Greenlandic, necessitated translation, either through digital recording or meticulous note-taking following participants' informed oral consent.

The interview format involved participants introducing themselves, followed by a comprehensive explanation of the study's significance for their community and presentation of the consent form. A set of guiding questions, focused on well-being, housing experiences, and the influence of housing conditions on individuals and communities, facilitated open discussions. Participants shared insights on culturally appropriate housing design and community-led planning fostering relationships with family and beyond.

Tea or coffee was offered during interviews, and participants were compensated with an equivalent of $50 for their time. Hans Peter Mønsted transcribed all interviews verbatim, with Greenlandic interviews translated into English by the same researcher. Subsequent independent data analysis and coding by both researchers identified and organized emerging themes. Regular collaboration and discussion between the researchers ensured a comprehensive classification and organization of these themes.

1.7. Recruitment and Characteristics of Participants

This study involved in-depth interviews with twelve owner-builders and four housing officers. The researchers deliberately selected participants through a targeted recruitment approach, employing posters in local venues, social media outreach, and direct contact via telephone or in-person meetings. All participants willingly agreed to be part of the project and provided verbal consent.

The participant pool was diverse, encompassing various segments of the population, and exclusively comprised self-builders, including Elders, Leaders, men, and women. Notably, participants represented a range of professional backgrounds, having worked for the band council, public or private sectors, or falling into categories such as unemployed, casual/seasonal workers, or retired individuals. The majority of participants had resided in their self-built homes for a significant portion of their adult lives.

2. RESULTS AND THEMES

In the post-World War II era, both Arctic Canada and Greenland witnessed the implementation of various government initiatives aimed at fostering northern housing development and community self-sufficiency. These endeavors sought to diminish reliance on external sources for goods, services, and expertise, gradually empowering local communities to cultivate the capacity to fulfill their own needs. Among the myriad initiatives and funding schemes, the noteworthy HAP program in the Northwest Territories (NWT) and Denmark's introduction of easy-to-build, self-constructible single-family houses in Greenland played pivotal roles in enabling remote communities to build durable dwellings. The HAP program utilized locally sourced logs in conjunction with a kit of parts, while Greenland's approach involved providing materials for assembling various house models rooted in Scandinavian architecture.

Following the establishment of these self-building schemes, the Fort Good Hope Housing Society in the NWT and the Uumaannaq Housing Agency in Greenland emerged as exemplars of successful programs guided by parallel ideals. Primarily, these initiatives championed the notion of homeownership as an empowering tool for inhabitants in remote indigenous communities. Secondly, they introduced the concept of self-building as a means of wresting control from bureaucratic top-down models of development, thereby granting individuals the freedom of choice. The NWT Housing Corporation, in particular, embraced the management and control of their "experimental block sum" funding, envisioning a replicable model for other communities in the Mackenzie Valley region. This paradigm of self-building and self-management aimed to not only redefine domestic space production but also to capitalize on human potential, fostering empowerment.

In Greenland, a parallel narrative unfolds.

To deepen our comprehension of these two self-building models, and subsequent to an evaluation of the relationship between self-building and well-being, we have identified five overarching themes contributing to the well-being of individuals in their self-constructed environments:

- ***Self-building fosters self-esteem and agency***: The act of self-building instills a sense of self-efficacy and empowerment.

- ***Locally sourced materials foster identity and belonging:*** Utilizing materials indigenous to the region cultivates a sense of identity, shared cultural values, and belonging within a community.
- ***Building makes sense***: Comfort stems from interacting with the familiar, providing a sense of security and continuity.
- ***Building within one's skill level***: Authentic experiences and satisfaction arise from hands-on interaction with the construction process, aligning with one's abilities.
- ***Building a house as an accomplishment***: The act of constructing a home not only fulfills a practical need but also establishes an emotional attachment to the place.

These themes, though presented individually, exhibit significant overlap and interconnectedness, collectively shaping the multifaceted relationship between self-building and well-being.

2.1. Challenges that Stretch without Overmatching Skills

Csikszentmihalyi posits that engaging challenges must appropriately demand from individuals; challenges that are too daunting evoke anxiety, while those too trivial lead to boredom. In this psychological framework, the emphasis is on the perceived challenge rather than the inherent difficulty of the goal itself. In line with this theory, we categorize self-building into three phases akin to theme 1: planning (choosing design), building (actual construction), and maintaining (upkeep).

2.1.1. Planning

Examining housing programs in Fort Good Hope and Uummannaq reveals user-friendly approaches, where catalogues with illustrations of various self-built house types and kits for material orders are provided. This pre-organized presentation of information alleviates the perception of self-building as an insurmountable challenge, reducing potential anxiety or disinterest. This approach, in essence, acts as a natural filter, allowing only those genuinely intrigued and undeterred by the task to embark on the self-building journey.

2.1.2. Building

During the construction phase, the self-builder literally shapes their surroundings. Achieving smaller milestones, such as completing a wall, provides tangible, immediate feedback and reinforces motivation. As the physical structure takes shape, the builder is surrounded by evidence of successful mastery, influencing their perception of their capabilities in relation to similar challenges.

2.1.3. Maintaining

Having constructed their environment, the self-builder not only surrounds themselves with tangible achievements but also gains in-depth knowledge about their physical surroundings. This familiarity equips them with enhanced abilities to maintain their environment or, at the very least, instills an appreciation motivating its upkeep.

2.2. The Significance of House Building as an Achievement and Catalyst for Place Attachment

In flourishing communities, the amalgamation of material and psychological elements played a pivotal role in augmenting well-being. Central to this is the degree of social identification individuals forge with their local community, as highlighted by Maricchiolo et al. (2021). The social bonds formed within one's place of residence hold the potential to significantly enhance happiness and well-being.

Building upon this premise, Larson et al. (2018) revealed that a heightened "place attachment" leads to increased "community involvement" and a stronger commitment to "place protective behaviors" among residents. This underscores the idea that individuals deeply attached to their homes experience a heightened sense of well-being, evidenced by greater community engagement and a proactive stance in safeguarding their built environment. This body of literature underscores the intricate connection between place attachment and social well-being, necessitating a closer examination of the impact of self-building on a specific form of well-being.

Houses transcend their physical structure, serving as repositories of cultural values and reflections of individual identity. In essence, they narrate stories about the people who build them and the values they hold dear. This paper delves into the profound impact of constructing one's dwelling, positing that the act of building a house serves as an accomplishment with far-reaching implications.

Success in building a house not only yields a tangible dwelling but instills a profound sense of personal achievement. This sense of accomplishment extends beyond the realm of house construction, potentially motivating individuals to embrace new challenges in various facets of their lives. The self-esteem cultivated during the building process is not confined to the specific skills associated with construction; rather, it may permeate other realms, contributing to an overall sense of well-being.

Remarkably, the historical perspective reveals a shift in our understanding of housing construction. Prior to World War II, limited knowledge existed about the prevalent construction practices in North American towns and cities. However, insights derived from property assessment records shed light on the prevalence of self-building. For instance, in Toronto between 1901 and 1913, a substantial one-third of all constructions were

self-built (Harris, 1991). This era, characterized by owner builders, witnessed approximately 25% of new single-family homes in the US being owner-built. While conclusive data on the widespread presence of self-building remains elusive, Harris's estimation method, utilizing building permits and property tax assessments, provides valuable insights.

The significance of self-building extends beyond the act itself. District offices, such as those in the NWT, actively facilitated self-building by providing information, instructional video tapes, and workshops to impart necessary skills. Engaging in a build not only cultivated a profound sense of attachment to a specific place but also motivated individuals to assume responsibility for it. This territorial identity, coupled with ensuing attachments, contributes to the construction of meaningful and sustainable remote communities.

3. CONCLUSION

In conclusion, the evidence presented highlights the vital role of governments in incentivizing and supporting self-building initiatives within remote communities. Through thoughtful planning and the provision of essential resources—such as land parcels, town plans, and standardized building kits—authorities can empower individuals to construct their own homes. This empowerment not only addresses housing shortages but also fosters psychological well-being, autonomy, and community resilience. The cases of Fort Good Hope and Uummannaq exemplify how such programs can contribute to both physical infrastructure and social cohesion.

At the psychological level, incorporating Csikszentmihalyi's flow theory—which emphasizes the benefits of engaging in purposeful, goal-oriented tasks—offers further insight into the transformative impact of self-building. When paired with strategies that respect and strengthen territorial attachments, self-building initiatives such as the HAP program and Illorput demonstrate the potential for deep, lasting change in remote communities. These examples offer valuable lessons for policymakers and practitioners seeking sustainable, culturally grounded housing solutions.

However, for self-building to remain a viable and scalable approach, its limitations must be acknowledged and addressed. Lower-density development can challenge service efficiency, while the significant time and effort required may be unrealistic for individuals with limited availability. In many cases, a lack of formal building skills further complicates implementation. Moreover, the strong culture of mutual aid and institutional support that underpinned earlier programs has weakened over time, reducing the social infrastructure that once enabled widespread participation.

Moving forward, continued research and innovation are essential to adapting self-building to contemporary realities. Programs must integrate training, flexible regulatory frameworks, and inclusive support mechanisms. By building on the lessons of pioneering efforts and promoting democratized, community-led development, we can chart new pathways for holistic, sustainable housing in remote and underserved regions around the world.

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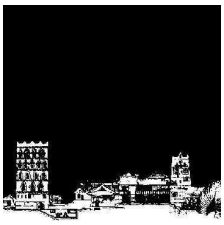

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Contributors

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Pancawati Dewi [1], Dhini Dewiyanti [2]
[1] Universitas Gunadarma, Indonesia; dhehas@gmail.com
[2] Universitas Komputer Indonesia, Indonesia; dhini.dewiyanti@email.unikom.ac.id

Heba Jahin [1], Ayman el- Zamarani [2], Rania Rasla [3]
Alexandria University, Egypt
[1] h-jahin@alexu.edu.eg; [2] aymanelzemrany@yahoo.com; [3] rania.raslan@alexu.edu.eg

Khalid S.M. Al-Hagla [1], Manar Talaleldin Mohammed [2], Lara A. Awad [3]
[1] Imam Abdel Rahman Bin Faisal, Saudi Arabia/Alexandria University, Egypt; kealhagla@iau.edu.sa
[2] Alexandria University, Egypt; manartalal@alexu.edu.eg
[3] Alexandria University, Egypt; laraayman@alexu.edu.eg

Susane Havelka [1], Hans-Peter Mønsted [2]
[1] Queens University, Canada; susane.havelka@mail.mcgill.ca
[2] ATT Department for survivors of Traum and Torture, Denmark; hans.peter.monsted@rsyd.dk