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**Research Article**

# The Urban Transformation of Mesopotamian Cities

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**Abstract:**

Architecture and urban design have undergone profound transformations due to various factors, including economic, political, religious, cultural, and environmental influences. These transformations reflect human development and intellectual evolution. Studying these transformations provides a key to understanding the history of civilizations, their development, and their interaction with their surroundings, serving as a mirror that blends rich heritage with contemporary challenges. There is a lack of clarity regarding the transformations in urban design across different historical periods, as well as the reasons and factors influencing these changes. This study aims to establish a mechanism for tracking these transformations over time and identifying the factors that influence them. The research hypothesizes that multiple factors drive urban design to evolve from one form to another over time. The study adopts a combined approach, integrating historical, descriptive, and comparative analytical methods. The research concludes that urban design transformations are not driven by a single factor but by the interaction of multiple elements, primarily environmental, economic, cultural, and political factors. These factors have shaped urban structures throughout history, reflecting societies' ability to grow and adapt. The transformations observed in cities are continuous and progressive, often involving modifications to the overall form, expansions, or additions over time while maintaining the core elements of the city. This pattern has been followed since the city of Ur, except for Seleucia, where the transformation was abrupt due to the adoption of the Hippodamian planning and division system.

## 1. Introduction

### 1.1 Concept of Transformation

#### 1.1.1 Related Concepts

- **Change (Alteration):**
  A shift in **state or appearance**, signifying a transition from one condition to another. It is sometimes associated with concepts such as diversification, modification, variation, and deviation [19].
- **Continuity:**
  The uninterrupted duration or continuation of a process without essential change (https://www.merriam-webster.com/dictionary/continuity).
- **Evolution:**
  A qualitative transformation characterized by a series of consistent changes that always move forward. It is evident in behavioral improvement, skill development, intellectual advancement, emotional enhancement, and social evolution (Fakhir, p. 4).
- **Derivation:**
  The process of extracting something from another while focusing on the relationship between elements.
  - **Transformation** involves a change or transition from one state to another, possibly without a direct connection to its source.
  - **Derivation**, however, emphasizes interdependence and the influence between the source and the derived element.

### 1.2 Scale of Transformation in Urban and Architectural Space

First Scale: Time and Space Time serves as a suitable criterion for determining the nature of transformations. The type of transformation is influenced by both space and time, as partial transformations alter the form and shift it from its original reference. This displacement occurs due to the accumulation of transformations over time, highlighting time as a primary determinant of transformations and their impact on form [13].

According to Rossi, transformation does not occur only through space but also over time.

This emphasizes how the relationship between parts and the whole affects transformation:

- Impact of part transformations on the whole
- Impact of whole transformations on individual parts
- This interaction between the original source and the final outcome over time suggests that architectural transformation occurs on two levels: the whole and the part, demonstrating the comprehensiveness of transformation.

Second Scale: Place Place is divided into two types:

- **Public:** Includes shared spaces.
- **Private:** Surrounds each individual entity separately.

The interaction between place and time influences movement, as time is perceived through movement in space, making it the fourth dimension. Architecture integrates with life, identity, and memory, while the design of spatial environments affects the experience of time, strengthening an individual's connection to their surroundings [26].

***Table 1.*** *The Relationship Between the Concept of Transformation and Other Related Concepts*

| Difference Between Terms | Change | Alteration | Modification | Development | Derivation | Communication |
|---|---|---|---|---|---|---|
| **Definition** | A shift or replacement in a certain state. | A change or replacement in shape or condition. | May be minor or significant, temporary or permanent | It may be gradual and involve improvement. | Stems from roots or origins and involves interconnection. | The transfer of information between individuals. |
| **General Nature** | It may be sudden or gradual. | It may be sudden or gradual. | It can be temporary or permanent | It is mostly gradual and continuous. | It contains interconnection and continuity. | It involves interaction among individuals. |
| **Temporal Scope** | Can occur in the short or long term. | Can be immediate or long-term. | Can be temporary or permanent | Usually long-term and ongoing. | Can be extended over time and history. | Can occur constantly and continuously. |
| **Structural or Fundamental Nature** | Can be minor or major. | Indicates difference in essential aspects. | Can be minor or major but is often conditional | Often involves fundamental changes in elements. | Involves fundamental transformations in elements. | Can influence support, relationships, and connections. |
| **Inclusiveness and Scope** | Can be limited or broad in scope. | May be limited or broad. | Includes various aspects such as shape, state, and function. | Encompasses interconnection between shared elements. | Includes all aspects of interaction between individuals. | |

The relationship between time and place cannot be understood without movement. Economic, social, and psychological variables influence architecture, while place is shaped by environmental and geographical factors. These factors lead to transformations reflected in social and cultural interactions, shaping society's perception of time.

### 1.3 Forms of Transformation

There are multiple forms of transformation, but this research focuses on formal transformation in urban design and planning.

Formal Transformation refers to changes in the shape or appearance of a building or site without altering its core function or use. In other words, it involves modifying the external form of a structure while preserving its fundamental structure and purpose.

(Transformation at the level of external form while maintaining function).

### 1.3.1 Levels of Formal Transformation:

- **Architectural Element Transformation**
  - This form of transformation occurs when changes affect architectural elements, leading to a shift in meaning through modifications in their external appearance.
  - Example: DE constructivist architecture, which alters traditional forms while maintaining functional aspects. [40].
- **Transformation in Spatial Relationships**
  - This type of transformation is reflected through changes in the connections within a system—what is referred to as spatial relationships.
  - Transformations can be observed in different spatial connections, such as:
    - Inside vs. Outside relationships
    - Mass vs. Void (solid structures vs. open spaces)
- **Public vs. Private** spaces [15].

### 1.4 Objectives of Transformation

Transformation serves multiple purposes, as its mechanisms can lead to: Generating new ideas and meanings. Enriching thought by altering connotations without affecting physical form. Completely shifting meanings and interpretations, sometimes leading to a break from the original concept .In some cases, transformation reveals new meanings while preserving the original memory and perception associated with an element. In other cases, transformation results in a complete break from the original meaning, causing the loss of its previous symbolic or semantic impact [19].
According to Luchinger (1992), transformational structures form a fixed system of relationships that allow elements to change without disrupting the integrity of the whole.

- This idea considers architectural form as an outcome of a system of internal relations that generate meaning.
- These relationships manifest through surface variations between architectural models, enabling the interpretation of broad architectural phenomena [27].

## 2. Transformation at the Urban Design Level:

### 2.1 Concept of the City:

According to [43], the city consists of multiple public and individual images that intertwine, influencing people's perception of the city and shaping their mental image. This perception is based on five key elements: Landmarks. Nodes. Districts. Edges (boundaries). Paths. However, Lynch did not address an important aspect of urban planning in his study—the ratio of built mass (solid structures) to open, unbuilt spaces (voids) [43].
On the other hand, Trancik's theory of spatial linkage placed great emphasis on the relationship between mass and void, analyzing their distribution and proportions. This, in turn, clarifies the city's organization and the interaction of human activities with urban spaces. This relationship depends on building locations, movement direction, and building forms [44].

## 3. The Transition from Hunting and Gathering to Agriculture and Settlement Construction

This section examines the period of significant transformations at the end of prehistory and the beginning of early civilizations.

### 3.1 The Transition Period from Hunting and Gathering to Agriculture and Settlement Building:

This section discusses the phase during which significant transformations and qualitative shifts took place at the end of prehistory and the beginning of ancient times. Humanity underwent gradual changes until 3200 BCE, transitioning from hunting and gathering to agriculture, which in turn led to the emergence of the first communities and villages. During this period, the first engineer specializing in dam construction appeared. Settlement in Mesopotamia was preceded by two phases: the first was linked to interaction with

**Paths:**
The main element that enables **movement and transition** within the city and its parts, allowing for **monitoring and organization** of other elements. It includes **alleys, main streets, canals, railways, and transportation lines**.

**Edges:**
Represent **boundaries or separators** between different urban zones. These act as **physical or visual barriers**, playing a role in **urban continuity and interaction**. They can be **natural (e.g., rivers, beaches) or artificial (e.g., walls, railways, and highways**


**Paths:**
The main element that enables **movement and transition** within the city. These elements vary in **hierarchy and arrangement**, influencing circulation and **wayfinding** (e.g., **main roads, side streets, pedestrian walkways, and railway tracks**).

The nodes or convergence points, which serve as the main gathering centers (religious, social, cultural) or intersections of pathways, represent transition points from one structure to another or act as passageways

"They are elements that help individuals determine their location and navigate, as they are prominent and can be seen from multiple and distant locations (historical buildings, statues, gates). A distinctive element in the city that signifies its identity."

***Figure 1.*** *Components of the city by lynch [43], [44].*

nature, while the second relied on social interactions. *(Falijah, p. 184)*

### 3.1.1 The Natural Factor (Climate):

The current climatic conditions differ significantly from those of the Stone Ages, particularly the Pleistocene Ice Age, which was characterized by high humidity and abundant rainfall. These conditions transformed desert regions into green landscapes, allowing humans to inhabit them. [12].
One of the fundamental factors that drove settlement and the establishment of the first communities was climate change, which provided fertile land suitable for agriculture—a stark contrast to the previously arid desert terrain.
In the second half of the seventh millennium BCE, the agricultural lifestyle was adopted, marking a shift to a more stable system that required a permanent place to live. Previously, humans were nomadic, moving in search of hunting or grazing areas, which explains the absence of fixed shelters. Instead, they lived in circular dwellings or reed buildings, which were among the earliest structures inspired by nature, featuring curved shapes similar to the traditional mudhifs of the Mesopotamian marshlands. (Al-Jourani, 2018, p. 14).

The **Halaf settlements** consisted of **small villages** composed of a mix of **large circular buildings (tholoi)** and **rectangular structures**. However, like other early settlements, the **social dynamics** and **religious rituals** associated with **elite residences** or **ceremonial buildings** remain unclear.

In **southern Iraq**, the **hot and arid climate** made **rain-fed agriculture impossible**, leading to the establishment of **settlements along riverbanks**. However, these areas were also prone to **flooding**, which made farming even more challenging. This created a need for **water management systems**, such as **canal construction**, to ensure a reliable water supply for crops. As a result, the first **permanent settlements** in **southern Mesopotamia** emerged during the **Ubaid period**.

As life's demands became more complex over time, along with the advancement of agriculture and the need for social cooperation (the collective effort to accomplish tasks – "Faz'a"), people required proximity to one another, leading to the formation of settlements. This marked the early emergence of communities, though they lacked any form of urban planning, as human thought during this period was primarily focused on providing shelter rather than structured development.

### 3.1.2 Urban Planning: The Transition from Settlements to Cities

During the Early Dynastic Period, the rise of trade and the emergence of various occupations were among the key factors driving urban development. One of the most crucial elements was the economic foundation, particularly production, which played a decisive role in the establishment of cities. Settlements were strategically located to support agriculture, trade, and industry, benefiting from fertile soil, water availability, a suitable climate, and access to raw materials.

Trade facilitated the emergence of cities as centers for gathering and distributing goods, while manufacturing was instrumental in urban expansion, attracting labor from rural areas. This influx of workers led to the growth and expansion of settlements, driven by the availability of job opportunities.

Beyond economic factors, the need for security and personal identity also contributed to urbanization. However, one of the most influential local events was the Great Flood, which played a pivotal role in the formation of early nations, the rise of city-states, and ultimately, the transition to fully developed urban centers.

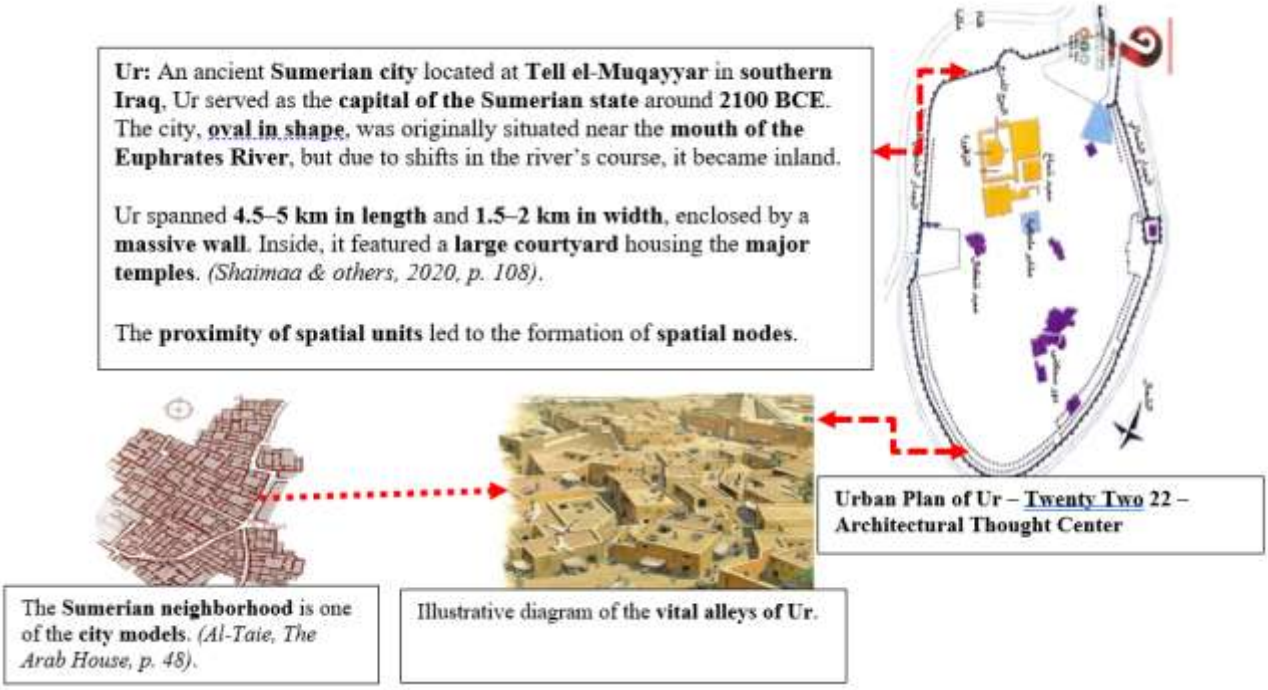
The first recorded instance of urban planning was observed in the city of Ur.

For the first time, we observe the emergence of alleys and linear extensions along their length, representing the earliest form of urban planning. The term "urban" was derived from the Sumerian city of Ur, and later, it became synonymous with civilization. This concept laid the foundation for understanding the city and, subsequently, the city-state.

The key components of the city—the alley, the courtyard, the temple square, and the city wall—became the fundamental elements replicated in other cities. The walls served as a barrier between the inner city (the central core) and the outer world.

While the city as a whole followed a geometrical layout, its residential areas were organically structured, aligning with the alleys. Additionally, a clear separation was maintained between the central core and the residential section.

### 3.1.3 Urban Planning: The Transition from Cities to Empires



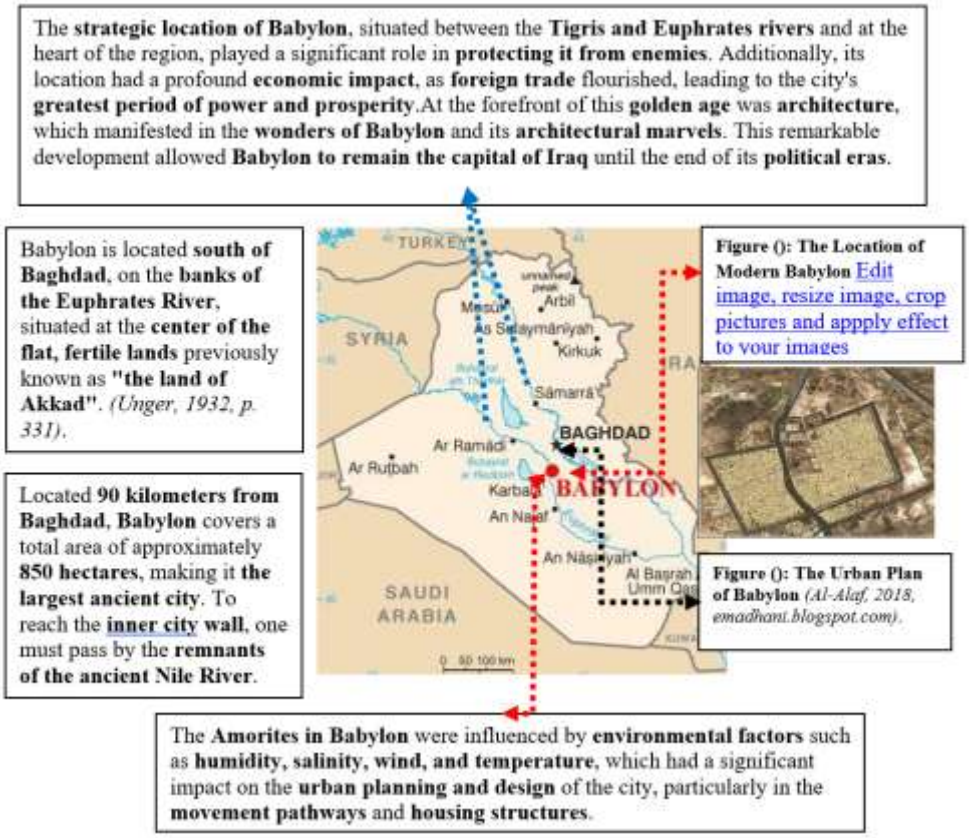



***Figure 2.*** *Urban Plan of Babylon, Rashad Ashraf, 2023 (doctorzeinab.com).*

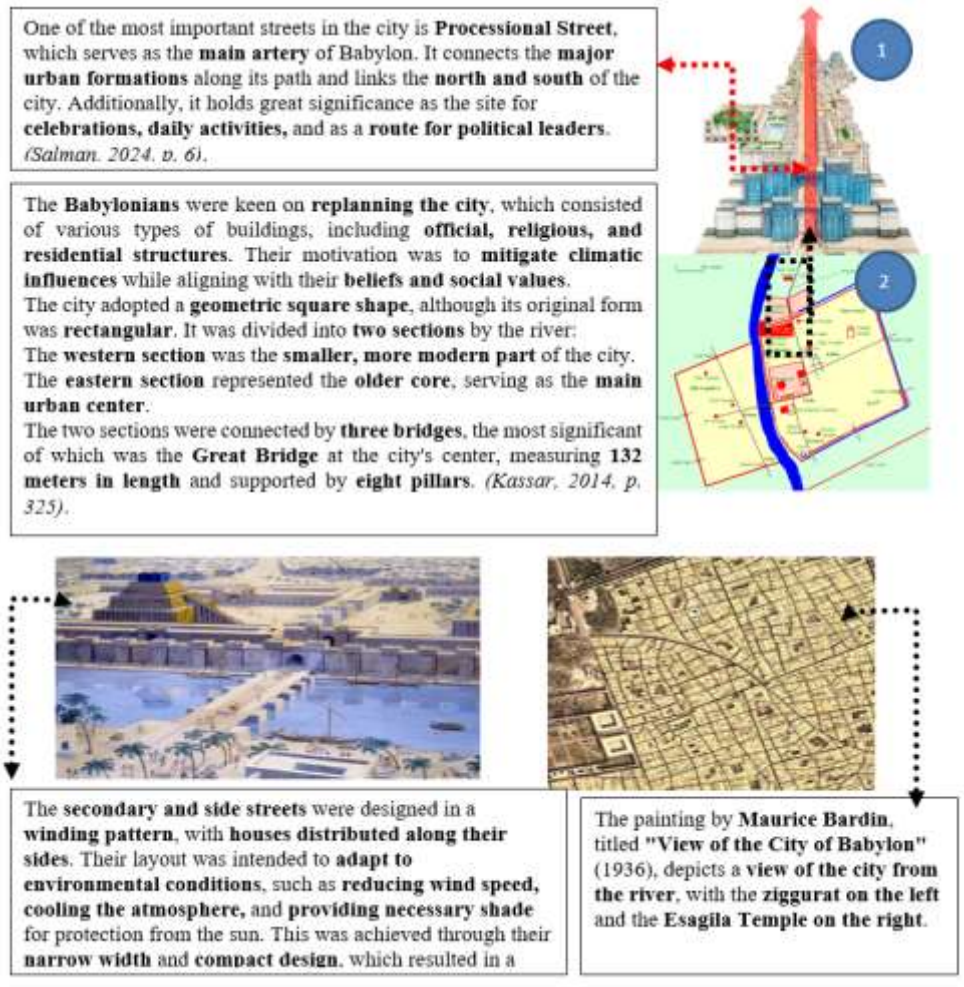



***Figure 3.*** *Processional Street, Masó, 2018 (nationalgeographic.com).*

During this period, the city witnessed the separation of temples and palaces, a division that resulted from the dominance of the king's political authority. The king aimed to maintain a balance between these two institutions while preserving their distinct functional roles.

The city was enclosed by two walls—an inner wall and an outer wall, reaching a height of 30 meters, reflecting an advanced and sophisticated defensive design. These walls were reinforced with towers, and the inner wall contained eight gates, each leading to its own dedicated street and named after the deity associated with the nearby temple.

### 3.2 The Era of Alexander the Great and the Fall of Babylon

The military policies of Philip II had a significant impact, as they encouraged Alexander the Great to launch military campaigns to counter the expansion of the Achaemenid Persian Empire [25]. This served as the catalyst for his well-known project—the conquest of the ancient world, with a particular focus on the capture of Babylon.

In 324 BCE, Alexander established a city and a port at the mouth of the Tigris River, after realizing the strategic importance of the Arabian Peninsula and its potential to connect the Persian Gulf with Egypt. He also founded a harbor for commercial ships.

After liberating Babylon from Achaemenid rule, Alexander successfully expelled the Persians completely, not only from Persepolis and Susa but also from India and China. His conquests were driven by a desire to merge and integrate Greek civilization with the ancient Eastern civilizations [20,39].

Following Alexander's death, the Seleucid era emerged after his empire was divided among his generals. Seleucus I established the Seleucid dynasty, which focused on rebuilding Babylon after much of its population had departed. One of their most notable achievements was the founding of the city of Seleucia in 307 BCE, located north of Babylon on the right bank of the Tigris, which became the capital of the eastern part of the empire.

It is a **design consisting of several large rectangles**, surrounded by **straight streets**. The city covered an area of approximately **550 hectares** and included **districts designated for various functions**, such as **administration, trade, and residential areas**. *(Seleucia - Wikipedia, wikipedia.org)*.

***Figure 4.*** *Illustration of the location and plan of a city [37].*

The city of **Seleucia** was built based on the **Hippodamian grid plan**, which was common among the **Greeks**. *(Al-Salihi, 1985, p. 350)*.

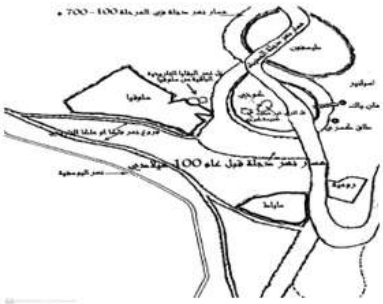


***Figure 5.*** *Dura City Plan and Royce (Salhia currently) [8].*

The city contained temples, political centers, and commercial hubs, forming its urban core. It was designed in the style of the Agora—an evolution of the urban nucleus concept. However, unlike the traditional Mesopotamian urban core, the Agora was not elevated and included previously uncommon activities in the Mesopotamian valley and highlands, most notably commercial activities [8].

Due to Greek influence (Hellenistic influence)—which was especially prominent after Alexander the Great's conquests—a new architectural style appeared in Mesopotamia for the first time: the theater. The theater was introduced to Seleucia, reflecting both the spread of Hellenistic culture and the Seleucid rulers' desire to reinforce Greek heritage in all the cities they founded. As a result, Seleucia became a cultural center, blending local Mesopotamian traditions with Greek influences.

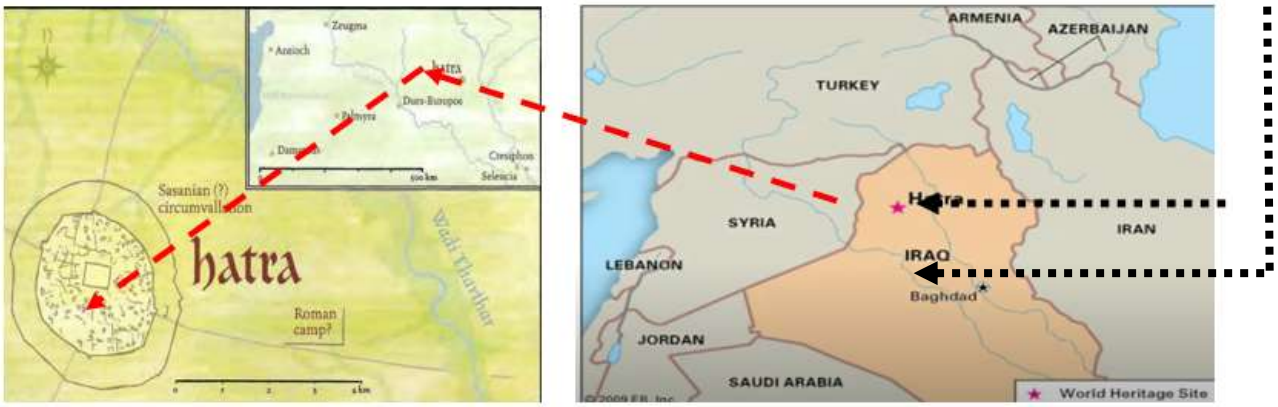
This vast urban space was the result of Seleucus I's ambition to construct a massive city that would rival the great cities of ancient Mesopotamia. He strategically chose its location at the intersection of major trade routes along the Tigris River. The city

was built using Babylonian bricks and was named after him as "Seleucia on the Tigris."
Some theories suggest that Seleucia was built atop the ruins of Babylon, which would explain the use of the Hippodamian grid plan—as it closely resembled Babylon's layout and was more compatible with its urban structure. Furthermore, the city reflected the concept of the "Ideal City."

## 4. Urban Design in Hatra and Al-Hirah:

### 4.1 Hatra:

The city held great significance, as it represented a unique capital that emerged and flourished within the region, particularly after the end of native rule and the successive control of the Achaemenids, Alexander the Great, the Seleucids, and the Parthians. During this period, the Kingdom of Hatra began to rise in the north [21].
According to Ibn Khaldun's perspective, Hatra was an independent entity with self-rule, in addition to having ruling dynasties, which allowed it to acquire the key elements of civilization, namely kingship and sovereignty. Under Parthian rule, this era was known as the "Age of the Client Kings." [8].




#### 4.1.1 Political, Social, and Economic Aspects of Hatra and Al-Hirah

##### 4.1.1.1 Political:

Due to the persecution that Arab tribes faced under the rulers of major empires, they were driven to migrate and establish cities far from these important urban centers and major rivers. As a result, they settled in the desert of northern Mesopotamia [17, 21]. Another key factor behind their migration was the collapse of the Marib Dam. Hatra was strategically located along the Hadrianic buffer zone, which extended southward through Al-Hirah, serving as a neutral frontier between the Persians and the Romans.

##### 4.1.1.2 Social:

The Arab tribes formed the majority population in Hatra due to mass migrations following the fall of Nineveh. This transformation turned Hatra from a small settlement into a unique and highly distinguished city that thrived during the Seleucid era. At the same time, there was a small presence of non-Arabs, including Greeks, Romans, and Arameans, whose beliefs and languages shared a common origin with those of the Arabs (Jinan, 2000, p. 304).

##### 4.1.1.3 Economic:

Hatra's strategic location enabled it to control and oversee trade routes that transported goods from China and India via ships in the Persian Gulf. These goods included silk, precious stones, wood, and spices [21]. Additionally, its position along the land route linking the eastern and western capitals of Seleucia further enhanced its economic significance (Al-Salihi, 1985, p. 223).

### 4.2 Al-Hirah:

The city of Al-Hirah was influenced by the circular urban planning style commonly used by the Assyrians, yet it stood out for its strong defensive capabilities and religious significance. Unlike earlier or contemporary cities, Al-Hirah did not undergo prior urban planning.
These gates are not merely symbols of physical transition from the outside to the inside, but also represent a symbolic passage between the external (worldly) realm and the internal (sacred) space. The city itself serves as a nurturing mother, caring for and protecting its inhabitants, while the walls and

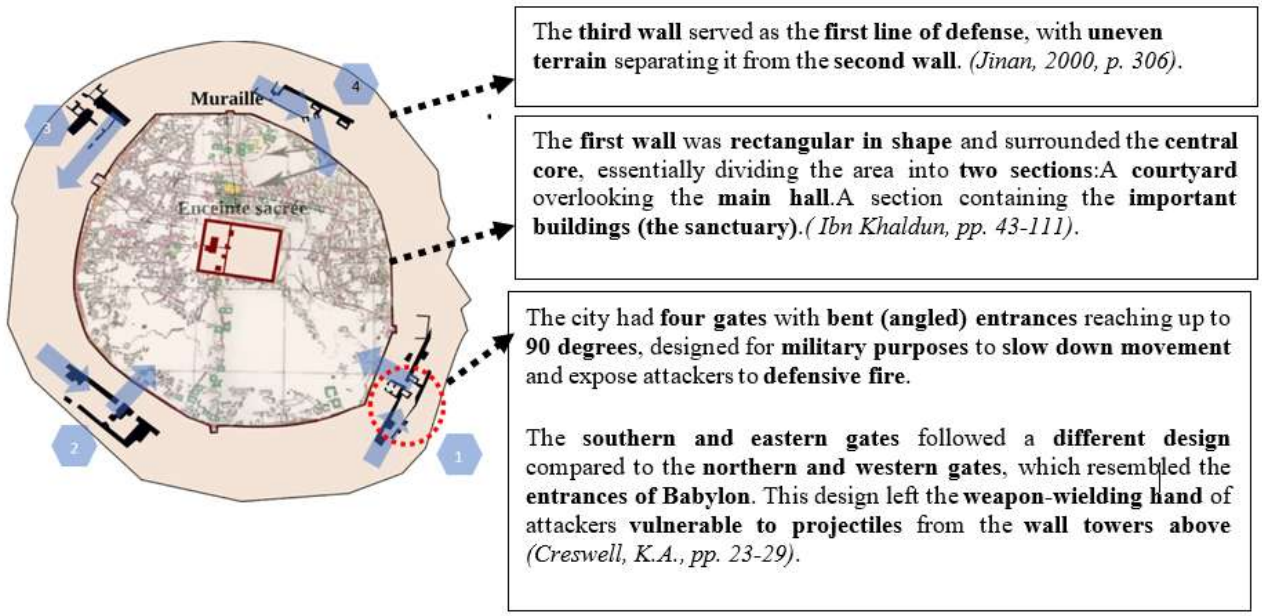



***Figure 6.*** *Chart showing the city of Hatra by the researcher*

defenses stand as symbols of courage and heroism against invasion.

There are several perspectives regarding the original urban layout of Al-Hirah. One account, based on travelers' descriptions, portrays the city as having a simple geometric layout with a central urban core represented by a palace complex or a main palace. Two streets intersected this central area—one primary and the other secondary. The city was divided into four sectors, each containing residential houses that surrounded a public bath, a marketplace, and a camel stable [11].

Another perspective considers Al-Hirah's orthogonal (grid-like) layout as an extension of Mesopotamian urban planning, particularly Babylonian city planning. It closely resembled the design of Babylonian cities, specifically Borsippa, which was built around 1800 BCE. Following this pattern, the early Muslim cities of Kufa and Basra were also established [8, 34]. This layout positioned monasteries outside the city, and as the city expanded, its urban plan adopted a linear and grid-based structure.

A third perspective suggests that Al-Hirah extended along the route connecting Al-Hirah and Najaf, with palaces and buildings concentrated within the city, while some ruins existed beyond its boundaries. Meanwhile, Saleh Ahmed proposed a northward-elongated layout, surrounded by palaces and monasteries. However, due to geographical constraints, this design is considered impractical [32].

What can be observed from this urban layout is the presence of multiple clusters consisting of palaces, monasteries, or both, surrounded by residential areas. These clusters are distributed in an irregular and scattered manner, indicating the absence of a single central core and instead the existence of multiple urban centers.

Additionally, Al-Hirah's proximity to the Sasanian capital facilitated quick military support during times of war or crisis. Its commercial, cultural, and economic significance also made it a gathering point for nomadic Arab tribes.

All these factors may explain the absence of defensive walls around the city. This represents a unique urban shift, where fortifications were not constructed, and there was no clear separation between authority, the people, and religion.

## 5. Urban Planning in the Early Islamic Conquests

As a result of the Islamic conquests in Mesopotamia, aimed at spreading Islam, many regions were liberated, especially after the Battle of al-Qadisiyyah and the fall of the Sasanian capital, Ctesiphon, in 637 CE. This necessitated the establishment of a central location for the Muslim army and their families.

Initially, they settled in Ctesiphon, but due to its climate and other conditions, they sought more suitable locations in terms of geography, climate, and future prospects. As a result, they founded Basra, marking the first planned Islamic city. Following its model, Kufa was established in 638 CE (17 AH) [30].

Between 627 and 628 CE, severe floods caused a shift in the courses of the Tigris and Euphrates rivers, altering the geographical and topographical features of the region. This led to urban displacement and the submersion of lowlands

between Basra and Kufa, an area known as Al-Bata'ih [20].

### 5.1 Basra:

Historians have debated the exact founding date of Basra:

- Al-Baghdadi (1948, p. 93) attributed its establishment to 16 or 17 AH.
- Others dated it to 14 AH, while some claimed it was founded in 13 AH.

However, Basra is considered the first Islamic city established by the Arabs in Iraq.
The primary motivation behind its construction was military—to serve as a base and military camp, reinforcing the Muslim presence in the region [10]. This decision was a response to the liberation movement during the caliphate of Umar ibn Al-Khattab (may Allah be pleased with him) and his desire to establish permanent headquarters.
Basra differs from other garrison cities as it was established from the outset as a military camp, built from a palace. It adopted a linear (semi-rectangular) urban layout, making it similar to Babylon and later Samarra in terms of expansion.
Its geographical location influenced its shape, as it was bordered by: The Hammar Marsh to the north, extending on both sides. Al-Ghata to the west and Shatt al-Arab to the east. The Arabian Gulf to the south.
These factors played a crucial role in shaping the city's urban form (Abi Bakr, 2003, pp. 106-123).
With the emergence of Islam and its call to monotheism, the city witnessed, for the first time, the introduction of a new functional element—the mosque—at its center, serving as both a religious and cultural hub. The mosque was not only a place for prayer but also a center for education and the dissemination of knowledge [10].
This marked a shift in urban planning, where the central core of cities—previously centered around temples, churches, and monasteries—was now replaced by the mosque as the primary nucleus around which the city's components were organized. The mosque became the venue for five daily prayers, as well as a political and consultative institution.

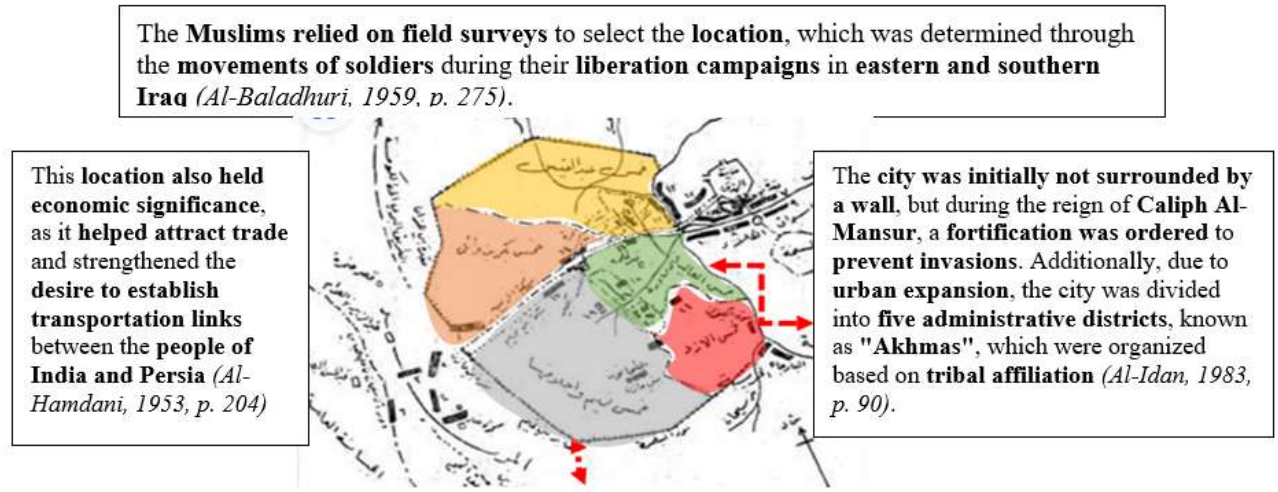
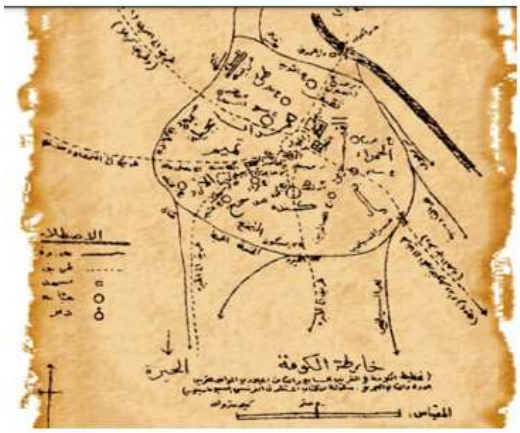



***Figure 8**. An Approximate Map of the City of Basra [28].*

### 5.2 The Second Islamic City in Iraq: Kufa

The city of Kufa was planned during the caliphate of Umar ibn Al-Khattab by the military commander Sa'd ibn Abi Waqqas in 17 AH / 638 CE. The selection of Kufa as its location came after careful examination and testing of other sites in Sawad (southern Iraq).
Initially, Al-Anbar was chosen, but it was quickly abandoned due to flies disturbing the Arab settlers. Sa'd then moved to another site, but it proved unsuitable. Finally, he selected the location of Kufa and established the new city there.
Kufa was strategically positioned on the right bank of the Euphrates River following the Islamic conquest of Iraq, serving as a permanent base for the Arab army. Initially, it functioned as a military camp, but after the construction of its grand mosque, it developed into a flourishing city.



The city has an **almost circular shape** (semi-circular) and is connected to the **central square** through **six main roads**. Additionally, the **Euphrates River** has **three branches** that pass through the city. *(Al-Tamimi, 2022, p. 6)*.

Kufa **spanned a vast area** along the **riverbank** and was home to the **famous Kufa Bridge**, which later became a **major land route for pilgrimage** during the **Abbasid era**.

***Figure 9.*** *Urban Plan of the City of Kufa [41]*

## 6. Urban Planning During the Abbasid Period

### 6.1 The City of Baghdad

Political and Military Aspects: One of the key factors the Abbasids considered when establishing a capital for the caliphate was selecting a central location. This decision was influenced by the geographical separation of Greater Syria (Bilad al-Sham) from the eastern regions due to the desert [9]. Additionally, choosing a location too far north or south could have caused administrative disruptions and complicated state governance. In the event of a rebellion, such locations would have hindered military movement [16].

Military Considerations: After the Abbasids gained control of Al-Hashimiyyah in Kufa, a revolt known as the Rawandiyya Uprising took place. This was one of the main reasons for selecting Baghdad as the new capital. The city's initial design was outlined by Caliph Al-Mansur, who marked its layout by drawing lines with ashes, placing cotton seeds along them, and setting them on fire. The foundations were then dug accordingly [36].

Baghdad's strategic location at the intersection of major trade routes significantly boosted commercial activity and connectivity within the empire. This influence was reflected in its division into four "Tasuj" districts, which were agricultural or administrative units containing villages with a unified irrigation system. This organizational structure helped manage land distribution across provinces and regions.

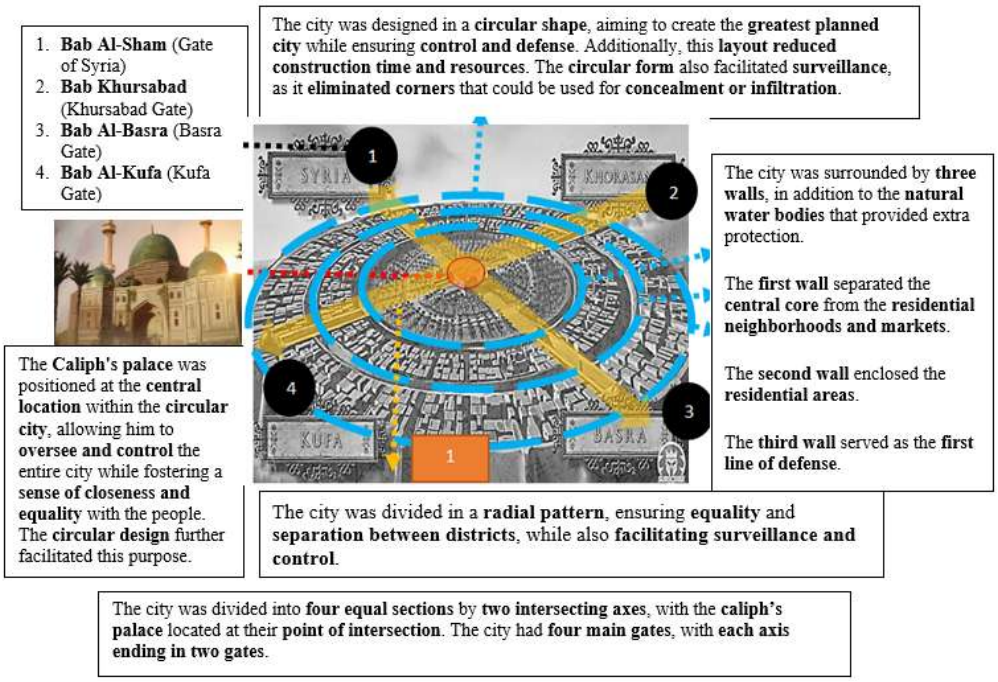



***Figure 10.*** *Map of the City of Baghdad and a Conceptual Illustration (Round City of Baghdad - Alchetron, The Free Social Encyclopedia).*

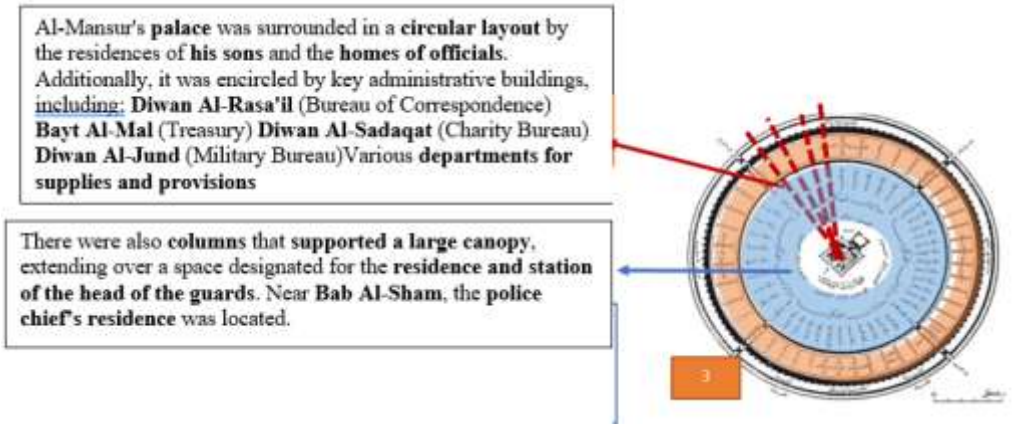



***Figure 11.*** *Conceptual Illustration of the Caliph's Palace (The Green Palace) – Created by the researcher using AI-generated software.*

## 6.2 The City of Samarra

The reason Caliph Al-Mu'tasim chose Samarra as his new capital was due to complaints from the people of Baghdad about the Turkish soldiers' misconduct and their harassment of civilians. Another reason was the lack of allegiance from the Harbiyah faction, who favored Abbas ibn Al-Ma'mun [31].

In response, Al-Mu'tasim ordered the construction of Samarra, sending requests to provincial governors to dispatch specialists in architecture, agriculture, irrigation, and urban planning from across the Islamic state. This vision materialized in palaces surrounded by pools and gardens, along with the construction of a bridge on the western bank of the Tigris River [7].

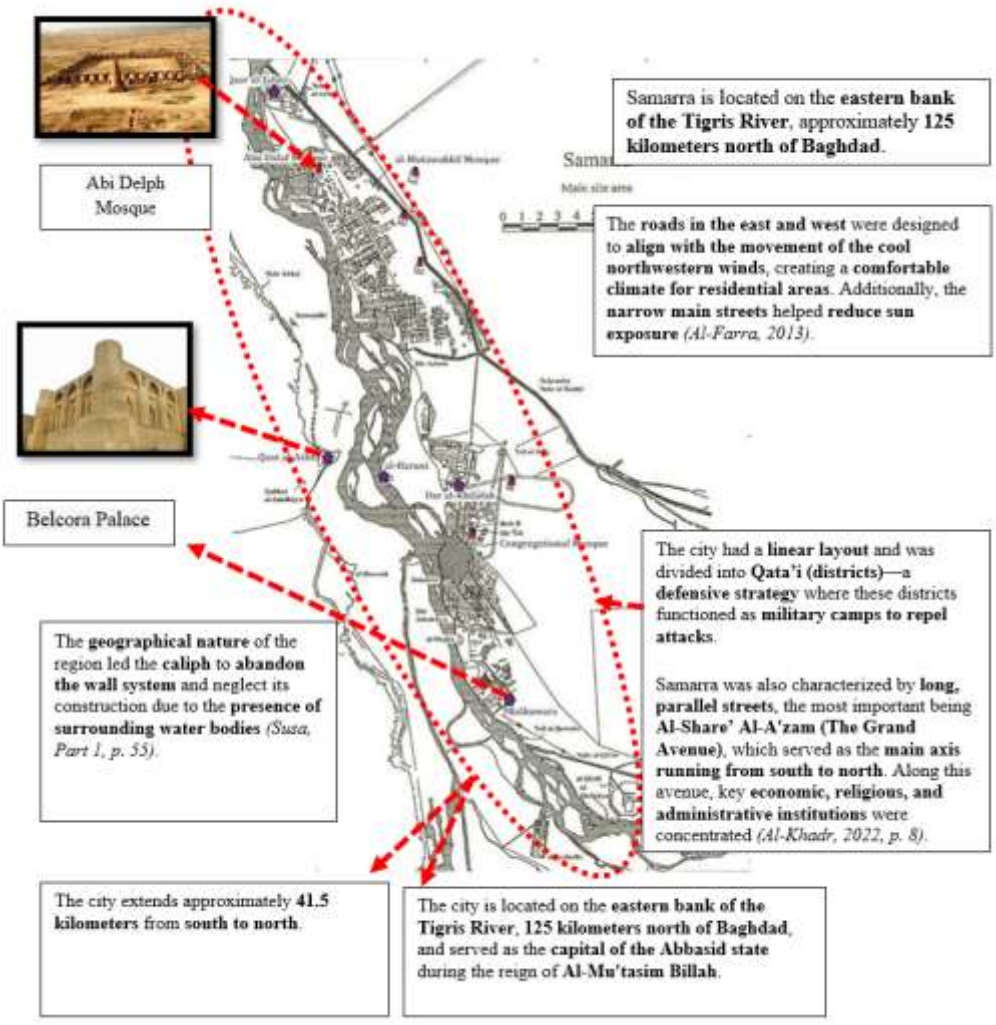
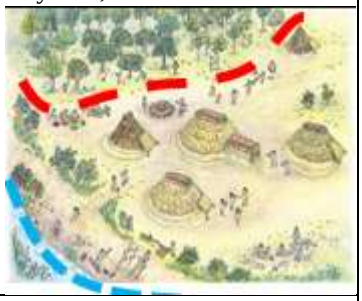
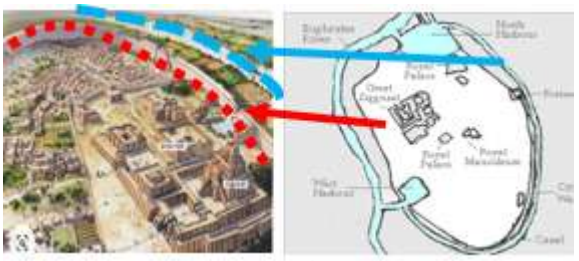
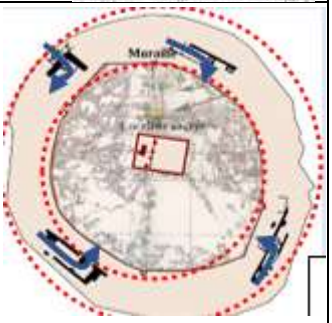
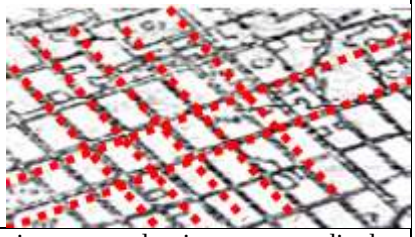
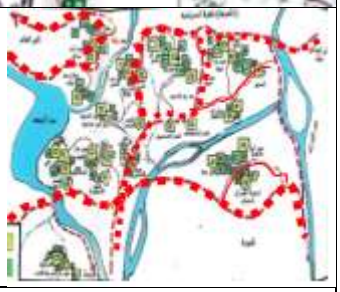
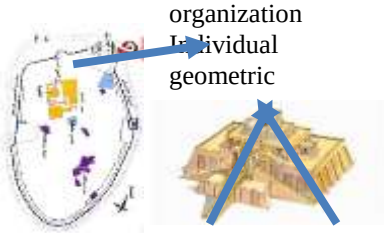
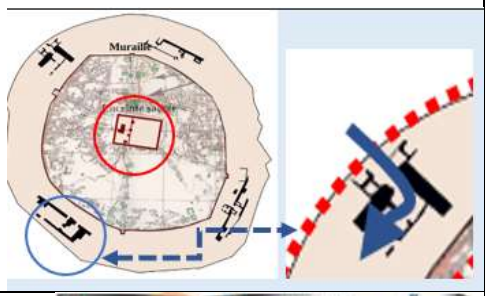
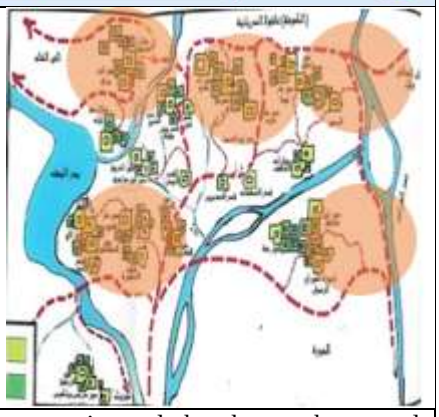


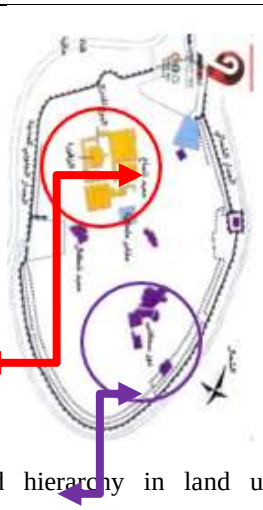

***Figure 12.*** *Samarra city plan Tamimi, 2022, prepared by the researcher [41]*

| Period | | Influencing Factors | Boundaries (General Form) |
|---|---|---|---|
| The First Settlements | | Natural Factors: (Climate, Geography)<br>Economic Factor: The transition from a pastoral economy to an agricultural economy | The transition towards the emergence of the first settlements followed the river's hydraulic system, where rivers and agricultural lands represented the natural boundaries of the settlement. The only separation from neighboring settlements was the absence of a specific organization or knowledge of urban planning.<br>  |
| From Settlements to Cities (Ur) | | Political Factor: The transition of the governing system from a theocratic monarchy (where power was held by priests and deities) to an absolute monarchy (where the king held supreme authority) and his desire to define and establish the boundaries of his state.<br>Natural Factor: Natural disasters, such as floods, which influenced settlement patterns and urban development. | The transition towards the early emergence of urban planning began with Ur, which adopted an organic, oval-shaped layout.<br>For the first time, a surrounding wall appeared, emphasizing an inward-focused approach and isolation from the outside world. This was achieved through solid walls and fortifications, primarily for protection against floods and defining the city's boundaries. However, the hierarchical relationship within the city remained unclear.<br>  |
| From cities to empires | Babylon | Natural Factors: (Geographical location and topography)<br>Political Factor: (Absolute monarchy (power centralized under King Hammurabi), invasions, transition from city-states to an empire). | the city, serving as a dividing line between its two sections<br>The walls evolved from simple structures to double fortifications, primarily for political control rather than just protection from natural disasters.<br>The transition also saw the emergence of connecting bridges.<br>  |
| | Seleucia | Political Factor: (Absolute monarchy (power centralized under King Alexander the Great), transition to independent cities).<br>Natural Factor: (Geographical location).<br>Cultural Factor: (Greek philosophy and ideology). | The transformation adopted the Hipp consisting of multiple rectangles instea layout.<br>A high level of functional zoning was applied to different parts of the city. The walls followed a different approach from the traditional style, adopting the Greek method, which was more fortified and complex.<br>  |
| From empires to kingdoms | Al-Hatra | Natural Factor: Strategic geographical location in the desert.<br>Political Factor: (Transition to kingdoms, invasions, serving as a defensive center, in addition to the inhabitants' expertise in warfare). | The transformation adopted a circular shape instead of the Hippodamian layout, as it facilitated control and administration by eliminating corners. This resulted in a circular planning style, driven by the desire for stronger fortifications, extending the Assyrian model, but without a predefined pattern or structured planning.<br>  <br>The transition also included three surrounding walls instead of a single one, with gates designed for increased fortification, featuring angled entrances for enhanced defense. |

| Period | Influencing Factors | Boundaries (General Form) |
|---|---|---|
| From empires to kingdoms — Al-Hirah | Natural Factors: Strategic location (situated between two empires: the Byzantine and Persian Empires). Political Factor: Political stability (alliances | The transformation involved removing the city's surrounding walls, as fortifications were no longer needed. This also facilitated the delivery of aid during times of danger and boosted trade, leading to the city's expansion over a vast area.  |
| from kingdoms to Islamic cities. | Natural Factor: Geographical location. Political Factor: Invasions. | Both Basra and Samarra adopted a linear strip layout parallel to the river. However, Samarra differed from Basra by lacking city walls. In contrast, Kufa and Baghdad adopted a circular layout for political reasons, aiming to enhance fortifications, as the circular shape eliminated vulnerable corners. However, Kufa was more flexible for expansion, whereas Baghdad was more structured and well-defined. |
| Period | Influencing Factors | Routes (Road Network) |
| The First Settlements | Economic Factor: The transition from a pastoral economy to a traditional agricultural economy. |  Routes characterized by their simplicity, organic form, and harmony with the natural terrain |
| From Settlements to Cities (Ur) | Economic Factor: Traditional economy (agriculture and trade), population growth. Natural Factor: Climate, natural disasters (floods). | The transformation from separated residential units to closely packed arrangements.For the first time, narrow, winding organic alleys (organic urban fabric) appeared in a strip-like pattern, connecting trade routes to the city center. Additionally, these alleys helped regulate the climate by providing proper ventilation and shade.  |
| From cities to empires | Political & Military Factor: Facilitating army movement. Cultural Factor: Festivals, beliefs (dominance over all), religion, and the political-religious nature of city planning. Economic Factor: Socialist and traditional economic system. | The transformation led to the emergence of the main artery, represented by Processional Street. The construction of connecting bridges, most notably the Great Bridge, further enhanced urban connectivity. A shift towards a central axis occurred, around which urban functions were organized. The city's layout became a linear, sequential relationship, clearly reflected in the Processional Street, which structured the interaction between private and public spaces, in addition to river and land trade routes. Regarding the interconnection of urban elements, the city's organization emphasized the dominance of the whole, achieved through an extensive road network, blending organic and grid-like patterns.  |

| Period | | Influencing Factors | Boundaries (General Form) |
|---|---|---|---|
| From cities to empire | Seleucia | Cultural Factor: Influence of Greek Hellenistic thought.<br>Economic Factor: Mixed economic system, economic prosperity.<br>Psychological Factor: Alexander the Great's desire to connect the East and the West. | The transformation adopted a perpendicular and parallel pattern (grid planning) with a precise geometric distribution of neighborhoods. Main roads connected the city's districts with the surrounding external areas, in addition to linking secondary streets within the city.<br>A significant shift occurred with the introduction of river transportation routes and the construction of a port on the Tigris River (Alexandria Port).<br>This marked a complete transition to a structured grid-like urban fabric.<br>  |
| From empiresto kingdoms | (Al-Hadr) | Economic Factor: Economic prosperity.<br>Natural Factor: Geography. | The transformation led to main routes adopting a perpendicular layout, while secondary and branch roads remained organic, aligning with the city's circular shape.<br>Trade was facilitated by relying on internal roads leading to markets and storage areas, creating a dense and grid-like urban fabric.<br>  |
| | Al-Hirah | Natural and Economic Factors:Strategic location (a key link between important regions).<br>Mixed economic system (trade activity and movement between markets). | The road network transformed into an organic shape, characterized by its simplicity and harmony with the relationship between urban elements and the natural environmen t.<br>  |
| The Transition from Kingdoms to Islamic Cities | | Political and Administrative Factor<br>Religious Factor<br>Natural Factor: Geographical Location | In Basra and Samarra, the transformation moved towards a linear longitudinal layout instead of the radial pattern, which was dominant in Kufa, where radial routes emerged as a new urban phenomenon. |
| Period | | Influencing Factors | Nodes and Landmarks |
| The First Settlements | | Cultural Factor: Religion (The shift from belief in myths and magic to the beginning of faith in deities)<br>Social Factor | The transformation led to the first emergence of what is known as the central core, embodied in the temple. |

| Period | | Influencing Factors | Boundaries (General Form) |
|---|---|---|---|
| From Settlements to Cities (Ur) | | Cultural Factor: Religion (Natural phenomena linked to a priestly structure), separation between religion and authority.<br>God → Priests → Temple<br>Beliefs: The descent of gods from the sky.<br>Philosophy: Multiple levels of the universe, separation between power and religion.<br>Technological Advancement: Design techniques used to showcase grandeur | The transformation shifted from the central core being limited to the temple or ziggurat to being divided between the temple, the royal palace, and the royal tombs, taking either a central or slightly offset position.<br>The ziggurat became the dominant structure, characterized by its massive scale and great height, built on a raised platform. Previously, the city lacked a single dominant element, and the ziggurat was positioned on the periphery.<br>The relationship between the urban core components became organic, while the overall organization remained geometric. Individual buildings followed a geometric arrangement, but within the broader urban fabric, the layout remained organic<br>  |
| From Cities to Empires | Babylon | | Cultural Factor: (Religion) – Polytheism and rituals.<br>Technical and Technological Factor: – The development and improvement of irrigation systems. The greatest irrigation system was embodied in the Hanging Gardens. |
| | Seleucia | | Economic Factor: Mixed (Commercial Center).<br>Social Factor: Focus on social participation, psychological (Alexander's desire to prove his legitimacy as the successor to Persian kings), and cultural diversity.<br>Cultural Factor: Greek thought. |
| From Empires to Kingdoms | Hatra | Cultural Factor: Religion (Polytheism and various faiths, including Paganism, Zoroastrianism, and the worship of planets and stars).<br>Political Factor: Invasions, protection, and defense. | The transformation involved making the main core represented by the Temple of Shamash (a religious node) instead of the Agora model.<br>The transformation of gate entrances introduced bends and turns reaching 90 degrees.<br>  |
| | Al-Hirah | Political Factor: Alliances (Political Stability).<br>Cultural Factor: Religion – The shift towards Christianity, the disappearance of beliefs related to gods descending from the sky, and the influence of Persian and Byzantine thought. | The transformation towards multiple cores instead of a single central core.<br>The shift towards the disappearance of the ziggurat and the emergence of monasteries and churches, around which the city's components were organized.<br>  |
| The Transition from Kingdoms to Islamic Cities | | Religious Factor: The emergence of Islam and the call for monotheism.<br>Political-Administrative Factor: The transformation of the governance system from kingship to the Caliphate. | The transformation from monasteries and churches as the central core to the grand mosque.<br>The shift towards the emergence of the governor's residence (Dār al-Imārah) as a replacement for palaces.<br>At the city center, the mosque and the governor's residence became the most significant landmarks. |

| Period | | Influencing Factors | Boundaries (General Form) |
|---|---|---|---|
| The Transition from Kingdoms to Islamic Cities | | Religious Factor: The emergence of Islam and the call for monotheism.<br>Political-Administrative Factor: The transformation of the governance system from kingship to the Caliphate. | The transformation from monasteries and churches as the central core to the grand mosque.<br>The shift towards the emergence of the governor's residence (Dār al-Imārah) as a replacement for palaces.<br>At the city center, the mosque and the governor's residence became the most significant landmarks. |
| Period | | Influencing Factors | Neighborhoods (Districts) |
| The First Settlements | | Economic Factor: Traditional economy (agriculture-based).<br>Cultural Factor: Psychological factor – The need for security and identity.<br>Social Factor: Collective work (Faz'a) and the emergence of social bonds. | The transformation from living in caves to residing in simple clustered dwellings surrounded by agricultural lands.<br>The simplicity of relationships, which were initially limited to interactions between housing units, with openness to the outside due to the absence of boundaries like walls.<br>Land use was primarily residential and religious. |
| From Settlements to Cities (Ur) | | Economic Factor: Growth in trade and industrial activities, leading to the need for markets.<br>Cultural Factor: Religion and the rise of empirical thought, focusing on parts rather than the whole, with a shift from universals to particulars.<br>Natural Factor: Hot and arid climate influencing urban planning and architecture.<br>Social Factor: Strengthening of social cohesion within the community. | The transformation towards city expansion and the emergence of functional zoning, where religious areas were surrounded by residential and commercial districts.<br>The shift towards the dominance of individual parts, where the whole was formed by assembling separate elements—each building functioned as an independent unit.<br>Religious districts became central, while commercial and residential areas were located on the periphery, consisting of adjacent housing units with central courtyards.<br>This led to a clearer division and hierarchy in land use (residential, religious, and commercial).<br>  |
| From Cities to Empires | Babylon | Social Factor:<br>Class differentiation:<br>Aristocratic class (King and priests). Middle class (artisans and merchants). Lower class (workers and farmers engaged in agriculture and daily activities). Opportunities for social interaction through cultural and community activities.<br>Cultural Factor: Shift from empirical thought to rational idealism.<br>Religion remained a central influence in governance and daily life. | Transformation towards considering individual elements as active components within an integrated system, where the city became a primary entity resulting from the interaction of secondary subsystems. Unlike Ur, individual buildings were no longer independent structures but rather influenced the overall urban composition.<br>The emergence of public spaces for celebrations, exemplified by Babylon's Processional Street, which combined both military and religious activities.<br>Increased complexity in urban planning, leading to a clear and structured class-based functional division of neighborhoods.<br>For the first time, the emergence of royal districts, featuring palaces as centers of power.<br>Segmentation of residential areas based on social class:<br>Nobles resided near the city center Commoners lived on the outskirts.<br>Commercial zones were located close to the central area. |
| | Seleucia | Cultural Factor: Psychological aspect: The desire to establish a global empire and to project prestige and power. Religion: A fusion of Greek and local religions. Philosophy and Thought: Strong influence of Greek thought.<br>Social Factor: Social stratification and class distinctions. | Transformation towards zoning neighborhoods based on function, highlighting the Agora as a commercial and political center.<br>Hippodamian planning encouraged visual relationships, achieved by elevating the temple and creating a more open interaction between public and private spaces.<br>Emphasis on open public spaces, enhancing accessibility and social interaction. |

| Period | | Influencing Factors | Boundaries (General Form) |
|---|---|---|---|
| From Empires to Kingdoms Hatra | Hatra | Economic Factor: Commercial center.<br>Cultural Factor: Religion – Worship of the sun god. | The transformation towards clear hierarchical segregation from public to private spaces, achieved through:<br>Separation of the city's core from residential areas. Isolation of residential zones from the outside world using walls and gated entrances, ensuring privacy for each area. |
| | Al-Hirah | Functional Division:<br>Social Factor: Class distinction and social stratification.<br>Religious Factor: Influence of Christianity.<br>Cultural Factor: Ethnic and cultural diversity. | Transition from a walled city to an open layout, allowing for greater fluidity between private and public spaces.<br>The shift towards a more adaptable urban structure, aligning with the region's characteristics and promoting open interactions between interior and exterior spaces. |
| The Transition from Kingdoms to Islamic Cities | | Economic Factor:<br>Social Factor: Emphasis on equality principles.<br>Political and Administrative Factor: Providing protection from invasions | In Basra and Kufa, neighborhoods were divided based on tribal affiliations, reflecting the demographic structure and social belonging.<br>In Baghdad and Samarra, urban planning was more diverse, with a clear separation between administrative/government districts and residential areas for workers.<br>Baghdad's radial layout aimed to achieve equality and ease of surveillance, ensuring central control.<br>Samarra was divided into distinct sections, functioning as military camps for protection and defense. |
| Period | | The Ratio of Mass to Void | |
| First Settlements: | | Natural boundaries and open spaces dominated the landscape, with a high mass-to-void ratio favoring voids.Buildings were small, simple, and few in number, arranged in a scattered layout.The proportion of void (open space) was significantly larger than the built mass | |
| From Settlements to Cities (Ur): | | The mass-to-void ratio increased, with built structures dominating over open spaces. The Ziggurat, characterized by its massive structure and vertical dominance, became the focal point of the urban landscape, occupying a significant area. Public open spaces were limited, with fewer surrounding voids. The residential fabric was dense and cohesive, with minimal gaps between units. Spatial nodes emerged, formed by the adjacent housing units, creating small shared spaces that functioned as voids within the compact urban structure. | |
| From Cities to Empires | Babylon: | Characterized by a massive urban mass, where buildings dominated over open spaces .Limited public spaces, with large-scale structures like the Ishtar Gate and the Hanging Gardens defining the cityscape. High-density urban form, intensified by fortified walls enclosing the city. Increased mass-to-void ratio, favoring built structures over open areas.Movement corridors, such as the Processional Street, occupied a moderate proportion of urban space. | |
| | Seleucia: | Maintained a balance between mass and void, creating a harmonious urban fabric. Hippodamian grid planning resulted in rectangular divisions, ensuring an even distribution of built structures and open spaces.More structured and spacious urban layout compared to Babylon, allowing for greater accessibility and fluid movement. | |
| From Empires to Kingdoms | Hatra .. | Higher mass-to-void ratio, with built structures dominating over open spaces. Minimal voids within the city, as urban density was dictated by its military character. Large open spaces were concentrated outside the city walls, due to the desert environment surrounding the settlement. | |
| | Al-Hirah: | Lower mass-to-void ratio, with voids exceeding built structures, resembling early agricultural settlements. Urban layout featured dispersed clusters, arranged in a non-uniform pattern with multiple cores. Large open spaces within and around the city, supported by agricultural lands, contributed to an increased void ratio. | |
| The Transition from Kingdoms to Islamic Cities | | Basra & Kufa: Higher void-to-mass ratio, with greater flexibility in urban expansion. Open spaces were designed to accommodate tribal settlements and future growth.<br>Baghdad: Higher mass-to-void ratio, due to dense construction and the influence of centralized circular planning. Compact urban fabric with limited open spaces within the walled city.<br>Samarra: Balanced mass-to-void ratio, resulting from administrative planning.Included large green spaces integrated into the urban fabric, creating a harmonious blend of built structures and open areas. | |

## 7. Conclusions

- Major historical transformations reflect changes in collective human consciousness. The transition to agriculture contributed to the organization and stabilization of life, replacing the nomadic lifestyle based on hunting and gathering. This shift led to the development of social and psychological structures and the emergence of community architecture, such as public squares and shared buildings.
- The transition toward city-building represents a desire for cooperation and social organization through division of labor. The city became a center for innovation and cultural exchange, with:
    - Markets facilitating economic and cultural interactions.
    - Temples embodying religious and social values.
    - Walls symbolizing political and administrative authority.
- Urban design transformations were not influenced by a single factor but rather by the interaction of multiple forces—environmental, economic, cultural, political, and religious. These factors shaped urban structures over different periods, reflecting societies' ability to grow and adapt.

### 7.1 Early Settlements and the Emergence of Urban Planning

- Early settlements lacked urban planning, as nomadic humans were not settled, which explains the absence of fixed shelters. The emergence of compact communities was mainly driven by economic factors, particularly the shift from a pastoral economy to traditional agriculture, followed by natural and social factors, such as cooperative labor (mutual aid/faz'ah).
- Ur: The first appearance of urban planning
    - Ur represents the earliest example of structured urban planning, introducing the concept of narrow, linear alleys.
    - This urban form was shaped primarily by economic and environmental factors, such as natural disasters.
    - The religious factor played a secondary role, influencing city organization, with the ziggurat serving as the central core.
    - Social and other factors followed, contributing to the city's development.

### 7.2 Urban Transformations in Key Cities

- Babylon
    - Transition toward geometric urban formation (rectangular layout) at both the city and building levels, characterized by high-mass structures.
    - A dual urban organization emerged:
        - Centralized nucleus, where the core functions radiated outward.
        - Linear axis, where key activities were aligned along a primary movement corridor.
    - The most influential factor was political (monarchical authority, laws, and governance), followed by environmental, cultural (religion, festivals), economic, and social factors.
- Seleucia
    - Transition toward Hippodamian (grid-based) planning, characterized by straight divisions and perpendicular movement paths.
    - The Agora became the central urban node, while traditional Mesopotamian religious structures (e.g., elevated ziggurats) disappeared.
    - The most influential factor was cultural (Greek thought), followed by economic and political influences, then social and other factors.
- Hatra
    - Increased fortifications and adoption of a circular layout.
    - Absence of a predefined urban plan.
    - Transformation of gateways into angled entrances (90-degree turns).
    - A mix of organic and grid-based movement axes.
    - The most influential factor was political (defense and military fortifications), followed by economic (as a trade center), and then social and cultural factors.
- Al-Hira
    - Lack of a clear urban layout or defensive walls.
    - Openness to external influences and emergence of multiple urban cores instead of a single central nucleus.
    - Monasteries and churches replaced traditional temples, serving as new urban focal points.
    - The dominant factor was cultural (Christianity and religious beliefs), followed by political and environmental factors, with economic

and social factors playing a secondary role.

### 7.3 Islamic Urban Planning Transformations

- At the urban level, Islamic city planning adopted either a circular or linear layout, with the Caliph's palace and the Grand Mosque at the center, symbolizing both spiritual and political authority.
- Islamic conquests transformed urban infrastructure, replacing monasteries and churches with mosques as the new central urban nodes.
- In Baghdad, urban design introduced segregation of functions:
    - Residential neighborhoods were separated from commercial markets.
    - Unlike other Islamic cities, where urban life was centered around a compact core, Baghdad's design created a more structured layout.
- Neighborhood divisions were initially tribal and social, emphasizing open expansion before later adopting flexible defensive walls for security and urban organization.
- The most influential factors in Islamic urban transformation were:
    - Political and administrative governance.
    - Religious influence.
    - Economic structures.
    - Social organization.
    - Environmental and other contextual factors.

## Author Statements:

- **Ethical approval:** The conducted research is not related to either human or animal use.
- **Conflict of interest:** The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper
- **Acknowledgement:** The authors declare that they have nobody or no-company to acknowledge.
- **Author contributions:** The authors declare that they have equal right on this paper.
- **Funding information:** The authors declare that there is no funding to be acknowledged.
- **Data availability statement:** The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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