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TRADITIONAL DWELLINGS AND SETTLEMENTS WORKING PAPER SERIES

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Traditional Dwellings and Settlements

Working Paper Series

FROM BALLOONS TO MACHINE LEARNING: GEOSPATIAL TECHNOLOGY AND THE SHAPING OF GULF CITIES

Yousef Awaad Hussein

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This paper explores the transformative impact of geospatial technologies, specifically aerial and satellite imagery, on the fields of urban planning and development in the Arabian Gulf. It walks the readers through a chronological series of events from the early use of pigeons and military reconnaissance in the 1900s to the deployment of satellites during the Space Race era, and from analog photographic surveys to the development of machine learning algorithms for processing data today. The author traces the evolution of these moments and their revolutionary impact on Gulf states, shedding light on the way their cities were understood, visualized, and formed.

1. INTRODUCTION

The urban landscape of the Arabian Gulf has undergone a remarkable transformation over the past century. This transformation is the result of a dynamic interplay between historical events and technological advancements, leaving an indelible mark on its urban and architectural fabric. From the earliest settlements to modern metropolises, this essay delves into the intricate narrative of the region's evolution through five distinct eras. Each era is characterized by a unique set of factors that have altered planning methods, urban growth, and technological integration in Gulf cities.

The journey begins with the Early Era, characterized by the confluence of military reconnaissance, exploration, and technological innovations when Gulf settlements were shaped by geographical and cultural influences. Subsequently, the Founding Era heralded the inception of aerial imaging companies and centralized, top-down planning motivated by geopolitical changes during the rise of oil economies, fundamentally changing how cities were formed. With the foundation for urbanization laid, the Media Era marked the democratization of aerial perspectives, driven by advancements in satellite technology and its integration into civilian life. The Growth Era ushered in a period of unprecedented urban expansion, characterized by the fusion of information systems and geographic science, transforming planning into a datadriven, analytical endeavor. As Gulf cities continue to evolve, an imminent Next Era beckons, promising advancements driven by the synthesis of technology, data analytics, and urban innovation through the transformative role of machine learning. This chronological exploration of these eras not only delves into the past but also provides insights into the future of urban planning in the Arabian Gulf region.

The transformation of urban perception and its profound impact on planning are the central arguments in this exploration. Before the advent of aerial imagery, cities were primarily informed by observations from the ground. However, the introduction of cameras and balloons as tools of observation revolutionized our understanding of urban landscapes. The shift from "figure-ground" city representations to aerial perspectives fundamentally altered how we conceptualized urban spaces. The newfound ability to observe cities from the skies allowed for the composition of a city's various parts in a way that was previously impossible. This paradigm shift coincided with the emergence of the modern conception of the city, moving urban planning away from incremental development towards a sanitized tabula rasa approach.

The gradual emergence of aerial perspectives saw its peak influence on the urban realm around 1990 and has since gradually transitioned to a supporting role. Today, contemporary advancements in artificial intelligence and technology enable us to reconcile the transformation with traditional city planning, recapturing essential aspects of pre-flight urban structures.

As such, this narrative highlights the pivotal roles of geospatial technology, policy, and planning in the metamorphosis of Gulf cities into the urban forms they are today. It specifically illuminates Kuwait City, Dubai, Abu Dhabi, Doha, and Riyadh as case studies of the region's urban landscape and identity (Table 1).

Chapter	Era	Approx. Timeline	Case Study	Motivation	Technology
2	Early Era	1900-1940	-	Photography	Balloon +
3	Founding Era	1940-1970	Kuwait City, Dubai	Survey	Airplane
4	Media Era	1960-1990	Gulf War	Space	Satellite
5	Growth Era	1970-2000	Abu Dhabi, Doha	Policy	GIS
6	Next Era	2000-2030	Riyadh	Smart City	Machine Learning

Table 1. Essay Framework. (Source: Yousef Awaad Hussein).

2. EARLY ERA (1900-1940)

Historically, one could only imagine what it was like to look down at the world. Capturing it from above was a privilege held by a select few, such as those with the means to charter large aircraft, fervent enthusiasts, or military personnel. Yet, humanity's undying fascination with aerial perspectives remains consistent, irrespective of the changing tides of time or technological advancements. The legacy of aerial photography spans centuries, with its inception rooted deeply in humanity's pursuit of documenting Earth's vastness. From capturing the haunting beauty of natural terrains and laying bare the raw devastation left in the wake of calamities to its strategic utility in warfare, reconnaissance, and tactical operations shaping the course of battles and wars. Remarkably, the trajectory of aerial photography is almost a mirror reflection of the major events and transitions of the past century of human history.¹

The innovation of commercial photography in the nineteenth century heralded a new age. Soon after its invention, intrepid enthusiasts began launching cameras skyward, harnessing the buoyant powers of balloons, the unpredictable drift of kites, and the sheer force of rockets.² A monumental milestone in this realm was achieved by Gaspard-Felix Tournachon. In 1858, while hovering 262 feet above Petit-Clamart, he successfully photographed the first aerial view from a hot air balloon.³ Though time has erased the remnants of his original work, the legacy remains. A testament to this is James Wallace Black's 1860 aerial capture from the "Queen of the Air" balloon that soared 2,000 feet above Boston, which stands today as the oldest preserved aerial photograph (Fig. 1).⁴



Fig. 1. "Boston, as the Eagle and the Wild Goose See It," by James Wallace Black, 1860. (Source: Metropolitan Museum of Art).

By the turn of the century, innovation in aerial photography saw significant strides. George Lawrence, a visionary in this domain, pioneered a technique to capture panoramic views. He utilized kites fitted with large-format cameras and curved film plates.⁵ A memorable representation of his work illustrates the catastrophic aftermath of the 1906 San Francisco earthquake. To achieve this, Lawrence employed a staggering 17 kites, elevating the camera to a height of 2,000 feet. His method involved electrical currents transmitted via insulated steel cables. Once the image was captured, a parachute signaled the retrieval of the camera.⁶ These groundbreaking images, perhaps the earliest examples of media aerial reporting, found their way into newspapers across the nation, underlining their historical and journalistic importance (Fig. 2).⁷

Concurrently, global pioneers of aerial photography were charting their own courses. It was in the year 1903 when engineer Alfred Maul unveiled an innovative approach. He propelled a camera skyward via a gunpowder rocket, reaching an elevation of 2,600 feet in mere seconds. As it gently descended, the camera, suspended by a parachute, meticulously captured images of the German landscape.⁸ During that same year, Julius Neubronner embarked on his own experiment. Aiming to trace the routes of his prescription-carrying pigeons, he fitted them with cameras. In 1909, following the approval of his patent, he showcased postcards of aerial photographs captured by his pigeons and presented his "System Dr. Neubronner" at the Dresden International Photography Exhibition.⁹



Fig. 2. *Left*, German landscape by Alfred Maul Camera Rocket, 1904; *above right*, "San Francisco in Ruins," by George Lawrence, 1906; *below right*, Schlosshotel Kronber by Julius Neubronner, 1907. (Sources: Smithsonian's National Air and Space Museum; Library of Congress; and Rofhof/Stiftung Deutsches Technikmuseum Berlin).

The annals of history mark 1903 as the year the Wright Brothers achieved their maiden flight at Kitty Hawk. Shortly after this aviation breakthrough, aerial photography transitioned to motor-powered aircraft as L.P. Bonvillain captured Le Mans, France, in 1908 from an airplane.¹⁰

With the onset of World War I, the world was plunged into chaos. Military strategists soon recognized the unparalleled advantages of up-to-date aerial visuals. Aircraft of varied designs were quickly fitted with cameras, marking the inception of aerial reconnaissance.¹¹ This union of aviation and photography enabled extended missions, yielding invaluable images that provided intel on enemy activities and facilitated strategic operations (Fig. 3).



Fig. 3. *Left,* "Pin-pointing"; *right,* "Mosiac Mapping" US School of Aerial Photography, Langley Field, Virginia, 1918. Reproduced from Aerial Photography: The Story of Aerial Mapping and Reconnaissance. (Source: McMaster University Library, courtesy of the US Air Force).

Beyond the immediate context of warfare, the ascendancy of powered flight in the twentieth century altered the global vantage point. As aviation technologies evolved, so did the visionaries who sought to harness them. Professionals from architecture, landscape design, and urban planning began to see a world of possibilities from the skies.¹² The aerial view offered a new perspective, allowing design professionals to visualize cities, landscapes, and infrastructures in their entirety, understanding their inter-relations and their place within a broader context.¹³ The association of altitude with power became embedded in the human psyche.

The act of flight, a triumphant defiance of gravity, signaled a conquest of the vertical domain. Yet, an inherent tension exists in this conquest. This oscillation between skyward aspirations and terrestrial obligations posed a unique challenge for design professionals.¹⁴ How does one reconcile the expansive opportunities provided by aerial vision with the concrete constraints of the terrestrial realm? In 1925,

sponsored by an aircraft builder, Le Corbusier developed Plan Voisin, offering his modern conception: wholesale removal of these constraints and the top-down introduction of new developments.

The 1920s marked the integration of aerial perspectives into design and planning. Noting the rise of commercial air transport in 1928, landscape architect John Nolen foresaw employment opportunities that aviation provided for architects. The possibilities were vast, from designing aerial views for the burgeoning industry of air tourism to reimagining cities from a skyward vantage point. Structures, traditionally designed to be admired from the ground, would now need to inspire when viewed from above.

Early adopters of this aerial viewpoint recognized its transformative potential. In 1929, László Moholy-Nagy proclaimed the airplane's aerial perspective as a "new vision," an uninterrupted space that meandered seamlessly from the interiors of homes to the vast expanse of the cityscape, hinting at a design that was infinite and holistic. His seminal work, "The New Vision," leveraged aerial photographs to drive home this point, demonstrating that aerial views offered not just a new angle but an entirely new contextual understanding of the landscape. By the 1930s, the aerial view had become a cornerstone of architectural and urban planning discourse.

Beyond its influence on design representation, it served as a validation tool. Designers began to appreciate the aerial view not just as a means of objective analysis but as a tapestry of experience, imagination, context, and detail. This multifaceted nature of the aerial view encapsulated the dualities of modernity, balancing the abstract with the tangible. This perspective made widely accessible through World War II's extensive use of aerial imagery, revolutionized planning, imagining spaces that catered not only to the terrestrial observer but to the aerial one as well.

During the Early Era, Arabian Gulf towns exhibited a distinct urban structure that mirrored their historical, cultural, and economic contexts. These settlements were characterized by traditional architecture and spatial layouts rooted in their cultural heritage. Planned from the ground, their urban structure reflected the close-knit social fabric of Gulf societies, with neighborhoods organized around family and community connections. These towns were compact and pedestrian-oriented, emphasizing human interaction and localized trade (Fig. 4). As these developments laid the foundation for their future growth, this urban structure represented a harmony between human needs, culture, and environment, shaping the distinctive character of Gulf towns and soon-to-be cities.



Fig. 4. *Above left*, Aerial view of Dubai 1951; *above right*, Abu Dhabi 1954; *below left*, Kuwait 1940s; *below right*, Doha 1947. (Sources: Ronald Codrai/Max van Berchem Foundation; BP Archives; KOC Archive; Ministry of Municipality & Urban Planning).

The dawn of powered flight at the start of the twentieth century not only reshaped our physical world but profoundly altered how we perceive it. Viewing from above fundamentally restructured the principles of planning. Once an elusive frontier, the Gulf landscape became a canvas that architects and planners could paint. Suddenly, they could visualize the burgeoning urban centers of Kuwait, the UAE, and Qatar during their modernization debut. The challenge? To bridge the gap between sky and earth, merging the limitless vistas of the aerial view with the grounded realities of human existence.

3. FOUNDING ERA (1940-1970)

The nexus between military endeavors and exploration is unmistakable. From its inception, the aerial imaging company Hunting Aerosurveys Ltd. melded architecture, planning, and military insight. Its co-founder, Francis Wills, was trained as an architect but honed his skills in photographic surveillance during World War L¹⁵ After being demobilized in 1919, he drew inspiration from his wartime role as an aerial photographer. Rather than reverting to his initial profession in architecture, he cofounded Aerofilms Ltd. with Claude Grahame-White and Herbert William Matthews, establishing the premier commercial enterprise for aerial photography.¹⁶ By 1938, Wills sought to enhance the company's capabilities and secured a Wild Heerbrugg

A5 stereoautograph, progressing from oblique to vertical photography and later to photogrammetry.¹⁷ However, the company's expert staff and specialist equipment became the nucleus of the Central Interpretation Unit as the machine's potential was swiftly recognized during World War II, assisting in pinpointing missile launch sites with precision. In 1944, Wills linked with Huntings, and the company was renamed Hunting Aerosurveys Ltd. and pivoted to an air survey organization.¹⁸ In the post-war period, aligned with the oil boom, the company was commissioned by oil corporations to produce detailed aerials of the Arabian Gulf, creating maps with aerial surveys for exploration in regions like Kuwait. Over time, Hunting extended its operations to the UAE, including Dubai, Sharjah, Ras Al Khaimah, and Abu Dhabi.¹⁹

In the early 1950s, Hunting secured its inaugural comission to map Kuwait's settlements. The acquired imagery played a pivotal role in formulating the state's first comprehensive master plan, leading to a planning system that subsequently dictated the demolition of the pre-existing town. During this time, Kuwait underwent transformational changes, reshaping not only its societal dynamics but also its urban landscape. Prosperity from the pearling trade, the oil boom, and an influx of foreign labor and civil services enabled rapid urbanization. As industries evolved, Abdullah Al Salem's rise to power initiated a state-backed modernization movement.²⁰ Guided by his British Advisor, William Hasted, Al Salem enlisted British urban planners Minoprio, Spencely, and MacFarlane (MSM) to envision Kuwait's future.²¹

The Hunting commission triggered modernist planning as MSM utilized their aerial survey as the state's baseline in the inception of the first master plan. This approach, based on aerial observation, unlocked urban development around the Gulf.²² The utilization of this view significantly impacted Kuwait, as initiatives within the town were conceived with consideration for their visibility from above, specifically, the wholesale removal of the pre-existing town.²³ The unprecedented insights into the state signaled the commencement of top-down planning. Once stakeholders had visual documentation in a tangible form, they could wholly reframe the state's planning approach. At present, this centralized approach, guided by the government's dual roles as the provider and developer of land, continues to play a significant role in shaping relevant land policies.²⁴

The aerial perspective was more than a tool; it was an agent of change, legitimizing and motivating urban modernization. The state, when viewed from the skies, unraveled its deepest intricacies.²⁵ In *The Kuwait Urbanization*, Saba George Shiber likened this to storytelling etched into the land. These aerial "narratives" offered insights into not only the urban fabric but also the socioeconomic underpinnings of the town, capturing the essence of its inhabitants and their multifaceted lives. For Kuwait, the flattening of the urban fabric in two dimensions ultimately led to the flattening of the pre-existing town (Fig. 5).²⁶



Fig. 5. Aerial survey of Kuwait City with new developments of the first master plan and the demolition of the old town, circa 1960. (Source: Kuwait Oil Company Archive).

Further down the Gulf, Dubai embarked on its first town plan in 1960, fueled by an aspiration to transform the emirate from a traditional trading port into a modern metropolis. The driving force behind this change was the leadership of the ruler of Dubai, Sheikh Rashid bin Saeed Al Maktoum. Seeking to capitalize on the region's strategic location and vast oil reserves, Sheikh Rashid envisioned a city that would facilitate economic diversification, urban growth, and improved infrastructure to accommodate the growing population. The master plan was entrusted to the British architecture and planning firm John Harris and Partners.²⁷

The mapping of Dubai was an exercise in abstraction. Hunting technicians used mathematics to guide machinery without physically viewing the city, creating an almost divine aerial perspective.²⁸ This dominion over Dubai's depiction was exerted during a period when aerial photography relied heavily on terrestrial triangulation.²⁹ This modern endeavor involved planting a grid of pipes deep into the dunes to assist the aerial capture. As brought to light in Todd Reisz's dispatch *Wild Machines with Views over Dubai*, their motivation was a bold intent to command the world through "geodetic control."³⁰

The aerial survey intended to present Dubai with unparalleled accuracy. The landscape was documented across all scales, from the Creek to every household and palm tree, using specialized cameras. The imagery, procured from dizzying altitudes, underwent photogrammetry at the remote Hunting Surveys base.³¹ This surveying feat provided an incredibly detailed foundation, establishing the baseline on which Dubai was defined.

The rapid metamorphosis witnessed in the Gulf states is unparalleled. Without their newfound affluence and coinciding advances in aviation, extensive urbanization in the same manner might have been inconceivable.³² Once unveiled, the newfound perspective shifted the natural evolution of these cities. Incremental development was sidelined. Ironically, aerial photographs vividly encapsulate this shift, merging varying transitions into a singular frame. Hunting Surveys was frequently contracted to take new photographs of the Gulf region, simultaneously expanding and strengthening its triangulated network globally (Fig. 6).³³



Fig. 6. Geodetic control in the Arabian Peninsula. (Source: John Leatherdale and Roy Kennedy, 1975, "Mapping Arabia," *The Geographical Journal* 141).

4. MEDIA ERA (1960-1990)

The practice of revisiting for documentation of the region's ongoing development is no longer necessary. This responsibility has now shifted to the multitude of Earth-orbiting satellites, equipped to instantaneously capture moments in time.³⁴ Although the transformation of images still relies on equations established decades ago, contemporary computing technology enables the near-instantaneous completion of this process. The question arises: how did we reach this point?

By the mid-century, using aerial imagery was no longer primarily a military prerogative. Wartime photos made their way to newspapers and cinemas, bringing the realities of distant battlefields to home fronts. Aerial images began to permeate civilian life. These photos, previously reserved for strategic military planning, became symbols of perspective, beauty, and artistry. They adorned magazines and galleries and were woven into the fabric of pop culture. The once-exclusive bird's-eye view became democratized, accessible, and sought after.

Globally, as countries were rebuilding and redefining relationships, the United States and the Soviet Union found themselves embroiled in an intense ideological confrontation—the Cold War. This covert conflict spanned half a century and saw not only proxy combat but also technological advances and diplomatic maneuvers. By 1960, the battleground shifted upwards.³⁵ The vastness of space became a new arena for competition, offering not just atmospheric control but a strategic vantage point. Both superpowers perceived space as the ultimate platform to broadcast their prowess globally. The Space Race went beyond rockets and astronauts—it was an ideological duel manifested in celestial achievements.³⁶ The rivalry between the Soviet Union and the United States to surpass each other's achievements in aerospace directly spurred the advancement of satellite imagery, representing the pinnacle of unmanned aerial photography.³⁷

In 1972, NASA launched the Earth Resources Technology Satellite, an eye in the sky meant to document Earth's every nook and cranny. This was the genesis of the Landsat Program, a collaborative initiative between NASA and the US Geological Survey. The program's debut was so revolutionary that it paved the way for a series of successor satellites. As noted by James Irons, director emeritus at NASA's Goddard Space Flight Center, the early Landsats transformed global observation methodologies.³⁸

Over its five-decade journey, Landsat has grown to eight satellites, three of which are still operational. Each satellite iteration showcased technological evolution. For instance, while the first Landsats could differentiate specific light wavelengths, aiding in vegetation and terrain distinction, the manner of data storage and interpretation was relatively rudimentary. Images were stored on hefty magnetic tapes, which later transformed into printed photographs. These photos then underwent a unique coloring process to categorize

land types—a hands-on, color-coding procedure.³⁹ Landsat's legacy today encompasses over 10 million images, capturing the ever-changing facade of our planet—urban sprawls, coastlines, and more. Over the years, these images have been indispensable to a diverse audience, from geologists mapping surficial deposits to farmers assessing crop vitality. A pivotal moment in the program's history came when USGS offered the entire Landsat dataset to the public free of charge.⁴⁰ In essence, the journey of Landsat, set against the backdrop of the Cold War's Space Race, encapsulates humanity's ceaseless quest for knowledge and a deeper understanding of our planet's surface. It's a narrative of technological triumphs and a seemingly unwavering commitment to global observation.

Dubai, in particular, has often been portrayed through satellite imagery showcasing its vast urban development. These visuals were frequently used in promotional materials, travel brochures, and real estate marketing to emphasize the city's growth and transformation. Financial and business publications covered the economic success and development of Gulf cities. These articles often used aerial and satellite imagery to illustrate the investment opportunities in the region, contributing to a narrative of prosperity emerging amid arid surroundings. This narrative, often described as "rising from the desert," has been perpetuated by the media for decades. An example is "The Miracle in the Desert" by the Daily Mail, which employs satellite images to market the "emergence" of a development from salt marshes.⁴¹

It is important to understand that these media chronicles overshadow the nuanced geopolitical influences, urban realities, and societal dynamics at play by undermining their roles in favor of a sensationalized alternative. An assessment of the visual rhetoric embedded in these strategies unravels layers of multifaceted realities that underpin urban development in this context, extending beyond the visual spectacle. When left unchecked, such reportage has influenced global perceptions and policy formulations.

In 1991, the world witnessed the catastrophic environmental repercussions of the Gulf War. Retreating Iraqi forces ignited over 650 oil wells in Kuwait, leaving a trail of destruction with crude oil contaminating the desert and the Arabian Gulf. Kuwait suddenly emerged at the forefront of global attention. These flames raged for almost ten months. In an extensive international response, firefighting teams from ten countries rallied to combat the inferno. They employed both conventional and innovative technologies, finally extinguishing the last fire in November that year. The shortwave infrared band of Landsat-5 detected the searing heat of the flames and was pivotal in studying the lasting impacts of and observing changes to the residual oil pools. Kuwait was scarred with approximately 300 oil lakes and a hardened mix of oil, soot, sand, and gravel covering 5% of its landscape (Fig. 7).⁴² Satellites played an indispensable role during this crisis, reshaping global perceptions of the region and shaping Kuwait's geographical narrative.



Fig. 7. Left to right, Landsat TM band 4 image of Burgan oil field in 1987, 1991, 1993, and 1995. (Source: Andy Yaw Kwarteng and Dhari Al-Ajmi, Remote Sensing Group, Kuwait Institute for Scientific Research).

Just as early promotional brochures in the region showcased the onset of modernization, Kuwait's national landscape was again transformed into a space dominated by aerial technology. During the Gulf War, news outlets primarily focused on showcasing aerial views of the battles, making Kuwait a central figure in global news narratives (Fig. 8). This war was unique as it was the first to be aired live from the combat zones, capturing the gaze of viewers from around the world. The vantage points offered by satellites and planes gave a penetrating understanding that traditional reporting couldn't achieve.⁴³



Fig. 8. *Left*, An aerial image of the Al-Qaim facility in Iraq captured by a US military observer highlighting an airstrike during Operation Desert Storm; *right*, The "Highway of Death" after subsequent airstrikes by US aircraft on retreating Iraqi military units. (Source: The US National Archives).

The war left lasting repercussions on the nation that would be felt for years. Striking photographs of the world veiled in smoke began to represent Kuwait in the global eye. These potent visuals shifted Kuwait's international image significantly and played a central role in reshaping the narrative surrounding its foundational ideals (Fig. 9).⁴⁴



Fig. 9. In a wide-angle view from June 1991, a pall of smoke hovers in the distance over the Arabian Peninsula. (Source: NASA STS040-75-D).

5. GROWTH ERA (1970-2000)

Historically, foreign consultancies birthed the region's foundational master plans, but the baton soon passed to local municipalities such as Abu Dhabi's Urban Planning Council, emphasizing localized expertise and vision. Gradually, the urban nuclei they managed expanded, reached out, and enveloped neighboring zones. Originally residential and industrial quarters, these areas merged into extensive urban clusters. Taking Doha as an example, apart from its core population, the urban sprawl encompassed regions like Al Rayyan and the Industrial Area. Such expansions often saw cities amalgamating. Another example is Saudi Arabia's Greater Dammam area, which has been under one governance since the 1980s and has been a collective of cities like Dammam, Dharan, and Al Khobar. Similarly, over the past decades, Dubai merged with Sharjah and Ajman, forming an urban continuum housing millions in population.⁴⁵

How was this managed? Alongside the progress in satellite technology and the advent of unmanned aerial observation, the field of Geographic Information Systems (GIS) was launched, and the initial ideas of computational and quantitative geography began to take shape during the 1960s.⁴⁶ The National Center for Geographic Information and Analysis assumed a central role in propelling research in essential domains of geographic information science. These initiatives triggered a quantitative revolution in the realm of

geographic science and provided the groundwork for the establishment of urban planning as a legitimate scientific field.⁴⁷ The development of GIS brought a new level of sophistication to geospatial technology, allowing planners to analyze and interpret data in new ways, providing a more holistic understanding of urban environments.⁴⁸ Spatial data points served as the means to establish new communities and enhance the quality of life. In parallel, geographic information science empowered spatial thinking to convert this data into practical solutions and insights.⁴⁹ It offered the ability to capture and analyze data on land use, population density, and other vital factors, allowing planners and policymakers to contextualize decisions by better understanding existing conditions.

As populations expanded and dispersed, the pivotal function of GIS was its capacity to consolidate the extensive datasets required to reconcile conflicting priorities and address intricate challenges. These challenges encompassed tasks like optimizing the location of new welfare housing or assessing the capacity of road networks. Such tools empowered local planners to comprehend the requirements of both established, densely populated regions and to scrutinize and assess smaller towns and informal settlements. The capability to perform diverse queries and analytical tasks on GIS data enabled experts to assess how new development would integrate with existing infrastructure and align with regulatory and political requirements.⁵⁰

In this context, Abu Dhabi's tale stands out. As a city that marries traditional ethos with global urbanism, it is a testament to the influence of architectural diversity, political ambition, and technological advances. From the 1970s through the 1980s, it experienced a metamorphosis fueled by global ambitions. This evolution coincided with the birth of the United Arab Emirates in 1971, following the confederation of the seven emirates, with Abu Dhabi crowned as the capital.⁵¹

After the revolutionary changes of the late 1960s, Abu Dhabi underwent further developmental phases, with the city's boundaries stretching southwards to the mainland.⁵² The period between 1971 and 1985 was instrumental. With the occurrence of strategic suburban development, roads were expanded, and pivotal infrastructural undertakings like governmental institutions, power plants, and desalination facilities emerged. From 1974 to 1979, the city expanded horizontally. The old structures, which once whispered tales of the past, made way for modern establishments, addressing the growing demands of a nascent expatriate community. This period marked a boom in construction—offices for corporations, oil magnates, and local administrations—reflecting the city's economic and administrative growth.⁵³

Statistics from 1970 showcase Abu Dhabi's rapid urban growth, with its inhabited lands extending from 3.5 to 40 square kilometers, and a residential population expanding from 62,000 to 120,000 people by 1975.⁵⁴ The 1980s saw another urban evolution when its first master plan was commissioned. This plan, set out in 1990 and implemented across two decades, aimed to manage growth, optimize land use, establish community

planning norms, and ensure adequate housing provisions for Emiratis and expatriates alike. Nevertheless, it posed challenges, particularly as suburban sprawl threatened the city's ecological balance and sustainability by encroaching on sensitive ecosystems (Fig. 10).⁵⁵



Fig. 10. *Above*, Urban development and horizontal growth of Abu Dhabi; *below*, Urban development and horizontal growth of Doha. (Source: Yousef Awaad Hussein, adapted from Fayez Elessawy, 2021, and Agatino Rizzo, 2014).

Shifting the focus towards Qatar, the transition period of the 1950s and 1960s witnessed a gradual replacement of traditional structures with a somewhat disorganized modernization process. Although there was an initial public administration in place when the first municipality was established in 1963, it wasn't until Qatar declared its independence as a state in 1971 and, arguably of greater importance, when Sheikh Khalifa Bin Hamad Al Thani assumed leadership in 1972, that an effective central administration was established.⁵⁶ Within this administrative framework, multiple government ministries were responsible for overseeing Qatar's urban development. The Ministry of Municipal Affairs and Agriculture (MMAA) played a crucial role in this structure by establishing its town planning division in 1974. Subsequently, ministries dedicated to infrastructure development, like the Ministry of Public Works, were also founded.⁵⁷ This centralization of information facilitated the efficient allocation of funds to urbanization efforts, resulting in a swift expansion of urban areas during the 1970s and 1980s, coinciding with record-high oil prices.

In 1974, the newly established town planning authority, operating under the MMAA, enlisted the services of British consultant Llewelyn Davis to formulate the inaugural master plan for Doha. This initial urban framework introduced a radial structure that laid the groundwork for the establishment of a ring-road system, guided land allocation, and spurred the expansion of suburban areas surrounding the city. As this zoning plan evolved and new land policies were implemented, a new urban center took form, marked by the inclusion of commercial, public services, and multi-story residential developments.⁵⁸ These changes led to a substantial population increase in the greater Doha metropolitan area, with the number of residents growing five-fold between 1970 and 1997. Simultaneously, the combination of land policies and real estate speculation fueled a remarkable expansion in the overall urban area, which expanded fifty-fold between the mid-twentieth century and 1995.⁵⁹ However, this rapid urban sprawl resulted in a low-density urban landscape, primarily due to suburban development patterns and a significant amount of undeveloped land resulting from speculative market activities.⁶⁰

In essence, the journey of Gulf cities, epitomized by Abu Dhabi and Doha, is a testament to the use of GIS by planning professionals advancing spatial policies, offering lessons and inspirations for what has now become global urbanism. These examples illustrate how technology has led to urban planners' understanding of data. It enabled the tracking of changes over time, the assessment of the viability of proposed projects, and the presentation of alterations to assist stakeholders in making informed decisions. The software demonstrated this capability to collect and analyze current environmental data for a given area, allowing planners to compare it with the expected outcomes of proposed development plans.

Moreover, the integration of GIS has empowered organizations to craft their unique digital map layers to tackle specific localized issues and has evolved into a tool for data sharing and cooperative initiatives.⁶¹ This transformation has ignited a vision that is rapidly coming to fruition: a continuous, interconnected, and interoperable database for each city, encompassing virtually all aspects of urban life. As it shifts towards webbased and cloud computing and integrates real-time data from the Internet of Things, GIS has evolved into a versatile platform applicable to nearly all human endeavors, effectively functioning as the global central nervous system.⁶² As urban centers grapple with growing populations and challenges like environmental degradation and pollution, geographic information systems persist in demonstrating their crucial role in our comprehension and resolution of these issues.

6. NEXT ERA (2000-2030)

Geospatial technology has seamlessly woven itself into the realm of urbanism. Conventionally, GIS served as a tool for visualizing geographically referenced data related to urban environments, while satellite systems like those from Landsat, with their extensive coverage, provided unprecedented insights into land dynamics.⁶³ The real challenge in a data-centric planning approach lies in harnessing this data to generate insights that can inform urban planning, restructuring, or expansions.⁶⁴

Recent advancements in Machine Learning (ML) are dramatically transforming the analysis of satellite imagery and the field of remote sensing. Methods, such as pixel-based image classification, have been employed to infer urban land usage, leading to the rapid and precise processing of extensive datasets, which, in turn, enhances map creation, pattern recognition, and urban attribute categorization.⁶⁵ However, the spatial and spectral resolution of satellite images dictates the extent of detailed information that can be extracted from urban structures.⁶⁶

With rising populations, climate change implications, and socioeconomic disparities, cities are pressured to foster sustainable and inclusive growth.⁶⁷ As urban centers in the Gulf continue to grow, the intricacies of their expansion call for advanced methodologies in urban planning to address these challenges. ML, situated at the nexus of informatics and statistics, emerges as a beacon in these dynamic scenarios.

In recent years, the global academic and practical landscape has witnessed an uptick in machine learning applications, especially within the context of "smart city" paradigms.⁶⁸ Gulf cities, replete with both tangible facets like land use and intangible elements such as social disparities, stand to gain significantly from ML-driven urban dynamics. Notably, the integration of geospatial data with machine learning tools can revolutionize the region's urban planning spectrum. Traditional urban modeling techniques, though foundational, have certain limitations when faced with intricate contextual urban challenges. ML presents a fresh lens, facilitating a nuanced analysis of urban factors such as land use, energy efficiency, and spatiotemporal shifts.

The path to integrating machine learning into the region's urban planning isn't without challenges due to the lack of high-resolution satellite imagery, archiving of records, or siloed management of existing data. Despite its potential, comprehensive studies tailored to Gulf cities' unique urban idiosyncrasies are scarce. Bridging the gap between ML research and urban science necessitates harnessing big data and evidence-driven strategies. Creating cohesive analytical frameworks and common protocols may enable synergistic solutions to Gulf cities' urban challenges, fostering reproducibility and practical applicability.⁶⁹ Presently, varying low resolutions of publicly available satellite imagery and land-cover data are the cornerstone of urban growth simulations and the evaluation of ecosystems in the region. In developing zones, datasets are seldom available due to the absence of local expertise and dynamic urban growth, often outpacing periodic updates to existing plans, rendering them obsolete.⁷⁰

With its rapid infrastructural developments and evolving urban fabric, Saudi Arabia represents a perfect canvas for ML applications. By analyzing vast troves of data, machine learning offers predictive insights into urban evolution, helping urban planners anticipate trends and potential crises and allocate resources for long-term, sustainable growth. In a region keen on diversifying its economy and bolstering its tech-savvy vision, ML's ability to address challenges related to sustainability is invaluable.

Tackling these demands requires utilizing public datasets and satellite visuals to differentiate between patterns representing human endeavors and land cover that symbolizes the physical land. Open-source data, when analyzed, mirrors the intricate rhythm of urban functions and captures the spatiotemporal patterns of human activity. While one can deduce land use from land cover, they aren't synonymous. Layering machine learning outputs creates a bridge between everyday human experiences and the formal realm of GIS. Sources such as the Landsat 8 Operational Land Imager support points-of-interest data and open map networks, culminating in comprehensive classifications. Such methodology, piloted in Beijing, yielded an impressive 81% accuracy for primary classification and 70% for secondary levels, unearthing intricate urban patterns.⁷¹

Saudi Arabia's recent urbanization trajectory, encompassing millions of residents, serves as a case study. Assessing this phenomenon and its repercussions becomes paramount for formulating robust future urban strategies. Consider the scenario of Riyadh—with northern expansion, potential threats to desert ecologies occur, leading to issues like increased stormwater runoff. A comprehensive territorial analysis can be undertaken by revising traditional urban methodologies and leveraging remote sensing imagery coupled with artificial intelligence (AI) technologies.⁷² Riyadh can employ AI to pinpoint natural-based solutions, proposing holistic models for improved management. For instance, remote sensing tools can be crucial in identifying areas susceptible to flooding, necessitating protective measures.⁷³ By optimizing these ML-based approaches, decision-making processes can be enriched, paving the way for solutions that consider both the natural environment and socioeconomic implications.

Recent studies in the city trialed by Perkins&Will have employed supervised and unsupervised ML to identify dormant urban spaces and informal tree coverage (Fig. 11). Clusters with shared attributes were discovered using neural networks.⁷⁴ This integration of AI for Riyadh acts as a bridge from data collection methodologies to urban analysis and, ultimately, planning. As Saudi Arabia advances toward its Vision 2030, the incorporation of machine learning in urban planning stands as a promising and inevitable trajectory. The nation can chart a sustainable urban future through informed decision-making and predictive analytics.



Fig. 11. Neighborhood tree classification through machine learning process in lieu of missing datasets. (Source: Perkins&Will, 2023).

Ultimately, the solution lies in the skies, with over 700 Earth observation satellites. Machine learning transforms this vast unstructured satellite data into actionable insights, enhancing our understanding of ecological coverage, land utilization, and population dynamics.⁷⁵ Harnessing the synergy of satellite imagery and machine learning can potentially revolutionize our approach to global issues by gauging socioeconomic and environmental situations in regions where archival data is inconsistent or incomplete. Tackling challenges, whether urban demographic shifts or economic progression, demands comprehensive observations.⁷⁶ The fusion of urban planning, architectural design, and smart city technology offers this new dimension to urbanism. It's imperative to strike a harmony between these sectors in data management and the humane mission of designing urban spaces.

7. CONCLUSION

The evolution of Gulf cities encapsulates a journey through time, technology, and vision, where each era has played a crucial role in shaping the urban landscapes we witness today. From the Early Era, where the foundations of aerial vision and urbanization were laid, to the technologically driven Next Era, transforming urban planning with artificial intelligence integration, this essay has navigated through a rich tapestry of history, innovation, and progress. Throughout these eras, the development and integration of geospatial technology into urban planning emerged as a driving force.

The Founding Era witnessed architects and planners interested in structured aesthetics bestow upon the region's settlements their first top-down imposed master plans, a divergence from the preceding incremental

development. Whether it was the radial plans observed in Kuwait and Doha or the orthogonal sketches of Al Khobar and Abu Dhabi, each adopted an expansion framework.

The Media Era democratized aerial perspectives, making satellite imagery accessible to the masses and *n*presenting these cities to a global audience as aerial photography evidenced their existence. The Growth Era brought geospatial science to the forefront, enabling planners to analyze, interpret, and plan with greater precision. It witnessed the development of comprehensive spatial databases, empowering planners to tackle complex urban challenges through data-driven decisions. From addressing housing needs to optimizing infrastructure, GIS played a pivotal role in orchestrating the growth of Gulf cities.

With burgeoning populations and environmental concerns, the stage was set for the Next Era, characterized by the synergy of machine learning and urban planning. This ability to analyze vast datasets and predict urban forms offers a glimpse into a future where complete datasets and urban models are paramount for the Gulf in building resilient cities.

As the region grapples with urban complexities, the seamless fusion of geospatial technology, cultural heritage, and planning emerges as a solution that transcends eras. Kuwait, Dubai, Abu Dhabi, Doha, and Riyadh stand as living testaments to how urban evolution is a confluence of historical narratives and innovative responses. As we cast our gaze toward the horizon, the lessons drawn from these cities' evolution reverberate beyond regional boundaries. Their narratives resonate on a global scale, inviting one to revisit the relationships between innovation and tradition for human-centric urban transformation.

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Traditional Dwellings and Settlements

Working Paper Series

IMAGINARIES OF SURF AND TATTOOS: THE POLITICAL ECOLOGY OF ART IN COSTA RICA

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IMAGINARIES OF SURF AND TATTOOS: THE POLITICAL ECOLOGY OF ART IN COSTA RICA

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Art is an intriguing tool that can be utilized to transform our perception of nature and our interaction with the environment. The climate change conundrum can be approached through art that portrays nature and which provides a springboard for using natural resources or their alternatives to produce visual art and artifacts which document the environmental risks and impacts of climate change. Art in Costa Rica is positioned as both a portrayal of nature and as a means of using nature's resources to produce visual art. Preserving nature and wildlife through artistic projects creates powerful meaning, assigns value to artwork and connects us to our environment and its escalating problems.

1. INTRODUCTION: ART IN THE COSTA RICAN IMAGINARY

In the age of the Anthropocene, art can become a vehicle to address the climate emergency, to call for a more interactive role in the environment and to show "ardent concern for the living, breathing subject of the Earth and all fellow terrestrials caught up in this fast-moving climate drama."¹

The eminence of art in the Costa Rican realm is evidently manifested in the vibrant colors and exuberant drawings and paintings in shops, galleries, hotels, restaurants, and touristic sites. Artwork and handicrafts disclose the geographic and environmental settings and the sociocultural context in Costa Rica. As an integral part of the culture, the hues of nature and scenic landscapes are recreated in the artistic views, paintings, architecture, furniture, and interior designs. The intimate relation between the form and visualization of art and the environment is documented in literature as pinpointed by Elly Kent's² research on Indonesian art. Likewise, artists in Costa Rica use the aesthetics of nature, wildlife, and marine life in myriad artifacts, drawings, sculptures, and artwork. Moreover, art is part of people's bodies; on streets, at seashores, in restaurants and shops, adorned arms and body parts with tattoos are observed everywhere, especially on beaches where surfers are in constant search for waves. The collective cultural imaginary situates art within the settings of painted, walled, and embodied art. Further, this essay sheds light on the use of wood as a raw material in art paintings and interior design, as an inherent part of the art trajectory and aesthetics of artwork in Costa Rica.

During my visit to Costa Rica, I was intrigued by the multitude of artistic depictions of wildlife, marine life, the mountains, forests, and the ocean. I question the relationship between art and the environment. In that sense, art in Costa Rica is positioned as both a portrayal of nature and as a means of using nature's resources to produce visual art. It is controversial though how art is contextualized within the notion of commodifying

nature and wildlife for the purpose of satisfying tourists' appeal for souvenirs and artifacts, and ultimately for profitmaking and financial growth.

The core of this research paper emphasizes the use of art as a vehicle for environmental activism to conserve nature's resources, rainforests, and wildlife. It also brings to the fore the art illustrating nature, wildlife, surfing and tattoos. Art is a precursor to express and embrace new means of ecological conservation, and it can be used as a tool to educate individuals about climate change in creative and transformative ways.



Fig. 1. Paintings in an art gallery in La Fortuna, Costa Rica



Fig. 2. Woodwork in a souvenir shop in Tamarindo, Costa Rica

2. CONTEXTUALIZING ART WITHIN POLITICAL ECOLOGY

In a fast-paced world that prioritizes economic growth at the expense of resource exhaustion, oftentimes art is used in producing illustrations of nature that target consumers' expectations and satisfaction while overlooking the repercussions on the environment. Research has affirmed that the predicament of climate change results from anthropocentric activities under the overarching neoliberal principles which prioritize economic growth, deplete natural resources, and consequently wreak havoc with the planet's climate^{3, 4, 5}. Alarmingly, human reaction to climate change is sluggish, inadequate, and ineffectual. An accelerated action is deemed urgent to induce significant alteration on a global level. Upon integrating art within the context of political ecology, we can recognize how "environmental communication transmitted through artmaking may speak to the problem of inaction in a way that employs soft persuasion and affective poetics." ⁶. Intertwining art with activism can relay an intense and versatile message aimed at engaging the public with the natural environmental dilemmas, and second, to use materials that contribute to conservation of nature

and reduction of waste. Both policy changes and behavioral changes can be induced by people's understanding of the dire effects of their everyday actions on the environment. While art in Costa Rica is used as a channel for exhibiting the landscapes, the flora and fauna, we find that ecological concepts are dissociated from artistic productions. Since art is an essential part of the culture that depends wholesomely on nature, then, nature must be conserved in order to sustain this flow of art. Depletion of natural resources such as forests, which are cut for woodwork, is detrimental to the environment.

Alternatively, art can be repurposed to utilize recycled waste in creating sculptures, installations, or canvas, in an attempt to showcase the ill effects of our waste on the environment and to highlight the role of environmentalist art². Indonesian art has had an eminent role in environmental activism throughout its history, as chronicled by Kent². "Indonesian artists continued to explore and experiment with the form and function of the artwork in ways that led, seemingly inevitably, to the use of post-consumer waste as an artistic medium."²

Parallel patterns for Costa Rican artists were not documented in research articles. Further ethnographic research may shed light on similar artistic practices.

3. TATTOOS, ART AND SURFING IN A CHANGING CLIMATE

In her thesis on tattoos, the author, Stacie Slattery⁷, recognizes that her tattoos manifest her internal spiritual transformation, and how her body becomes reclaimed space for showing personal unique identity and character. She explains that inscribing a tattoo is a type of commending possession of her own body and a means of empowering her through images that remind her of who she had been and now have become. It is not just the images on the body parts, I contend, but the act of drawing a tattoo and all the connotations around tattoos in a society is what makes it a special act that deserves self-praise. Not all people have tattoos on their bodies, and therefore, acquiring one becomes a unique expression of oneself that depicts freedom and other human feelings of contentment. For women, it can be a healing activity, that is why my focus is on women's tattooing their bodies. I attempt to establish a relationship through the art of tattoos, as an analogy of the art depicted on the surface of earth, tattooing mother earth. However, the art used to depict nature incessantly exhausts its resources and does not conserve the nature that it is reflected in paintings. As mentioned previously is this paper, paying reverence to nature is paramount in acknowledging its importance as an inspirational source of art. The visual imagery of nature must be continuously restored for art to promulgate.

The author's explication of tattoos can be applied to art's depiction of nature; she describes tattoos as calling for realignment of the self with the sacredness of the body⁷. Art can beckon and guide us, humans, to realign with the earth, to love, cherish and conserve the planet.

3.1. Women and Tattooed Bodies

Observing artwork in Costa Rica's shops and outlets was quite intriguing; art exposed multiple characteristics of the Costa Rican imaginary. My fieldwork research investigated how women viewed the embodied art and the embellished skin. In Tamarindo, I met a shop assistant who explained how her tattoo gives her a sense of freedom that helps her blend into the community in Costa Rica. Another shop assistant elaborated on her tattoo had been challenging when she worked as a schoolteacher; she explained that there are religious reasons behind people rejecting tattoos, such as the sacred nature and wholesomeness of the body and the prohibition of changing its color or texture. Working as a shop assistant now has given her the freedom to adorn her body with tattoos and to show her character and true self. While listening to my interlocuter, an American lady entered the shop who had tattoos on her arm, one of which was the Ancient Egyptian Key of Life symbol. I noticed the ancient drawing and commented on it, and the American lady, who was also a retired veteran, told her story of visiting Egypt and going through the path of healing and searching for her purpose, a pilgrimage of loving oneself and overflowing with kindness to others, I contend. She came to Costa Rica to continue her path of love and rehabilitation by connecting to nature.

Earlier in Playa Guiones, at an Apothecary, I met Yana, a young Nigerian lady from the USA who was visiting Costa Rica on a yoga retreat. Yana is a healer, and we talked about art as a method of recuperation and alignment with nature and its inhabitants. We agreed that people who show up in our lives, those we meet, are not a coincidence. In our trip to Santa Teresa's Zwart Café, I met Margarite the Canadian painter, who has lived in Costa Rica for seventeen years; her passion is for art, surfing, and freedom. She deconstructed all concepts on education or climate change and asserted that the world order is devoid of love and compassion. Blatantly, she affirmed that race and color are engendered by governments to force people into vicious circles of hatred and bigotry. Her call for love and oneness among humanity was manifest through her art which she painted on wooden pieces from the beach using vivid colors and paints. The aforementioned conversations situate insightful views on art in everyday lives in Costa Rica and exhibit the human knowledge of the body's wholesomeness, its ability to heal as well as its innate yearning for knowledge; these aspects comprise the catalyst for inducing change. We turn to nature to heal our bodies, and we exercise freedom to heal our planet. The level of consciousness I encountered in those brief narratives was impressive. Arguably, organizing meaningful and artistic pathways of activism can be inspiring to a lot of women and can culminate in significant climate action. The separation between sociopolitical and

environmental issues is sparse; accordingly, art can be utilized as a means for communicating the intensity of the climate crisis in a subtle yet effective manner⁶.

3.2. Surfing in Red Tides

Surfing is the most popular sport in Costa Rica, where surfers come from different parts of the globe to enjoy lucrative wave breaks. The large number of tourists, especially surfers, are a major economic resource for the country. Upon looking at the Costa Rican art, one finds that surfing, the ocean and the waves are situated in the cultural imaginary and are depicted in numerous paintings, which recognize surfing and its surrounding environment as part of the cultural repository. Unfortunately, environmental degradation has affected the quality of marine waters, resulting in red tides, a phenomenon where toxic algae is produced due to water pollution, and which has detrimental health effects on the respiratory system⁸. It is worth noting that "global climate changes associated with warmer seawater temperatures and increased nutrients favor phytoplankton that can produce toxins in marine environments."⁸.

In general, sustaining the sport of surfing and marine life relies on reducing pollution, which can be unattainable with the incessant drive for development and economic growth.

4. CONCLUSION

The attempt hence is to look through the lens of political ecology and analyze the art within the environmental, social, and cultural realms. According to research on how art and the environment interact, artists produce creations that visualize inconvenient truths that are encountered as a result of environmental degradation⁹. Art can build closer ties between humans and nature, a relationship that has withered due to excessive urbanization, mass production and consumption⁶. It is suggested that "artmaking and arts-based environmental communication may be extremely useful" in reconnecting us with nature⁶. The diverse artistic work can serve as an engaging medium where our worldview changes to feel the environmental impact on endangered animal or plant species for instance⁶.

Further exhaustive research on art in the sociopolitical sphere is recommended to investigate Costa Rican artists' speculations and their views on the role of art in spurring environmental action, as well as the common perception of art among citizens of Costa Rica and its relation to climate change. The aim is to initiate the conception of environmental discourse that dually acclaims the role of nature in sustaining our life on the planet, and the role of human stewardship in revering nature.¹⁰

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Traditional Dwellings and Settlements

Working Paper Series

INVESTIGATING THE "ALTERA FORMA URBIS", THE SECRET STRUCTURAL URBAN FORM OF ANCIENT ROME, BY APPLYING A SUSTAINABLE INNOVATIVE ARCHITECTURAL DESIGN METHODOLOGY FOR THE CHALLENGES OF THE CONTEMPORARY BUILT ENVIRONMENT

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INVESTIGATING THE "ALTERA FORMA URBIS", THE SECRET STRUCTURAL URBAN FORM OF ANCIENT ROME, BY APPLYING A SUSTAINABLE INNOVATIVE ARCHITECTURAL DESIGN METHODOLOGY FOR THE CHALLENGES OF THE CONTEMPORARY BUILT ENVIRONMENT

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The enquiry is based on work by Italian archaeologist Giuseppe Lugli, architect Pier Maria Lugli and Professor Gianfranco Moneta about the "Altera Forma Urbis" of Rome as a hidden, "secret" structural urban form in the shape of a star, to reveal the interconnections with its contemporary form. Through a case study, the paper argues that applying Moneta's Analysis-Design Interaction methodology (ADI), an historical-morphological process-based analysis to the "Altera Forma Urbis" can be an effective framework to correctly inform the sustainable evolution of the built environment, and consequently, a tool to design architecture which respects the identity of place.

1. INTRODUCTION

The enquiry is based on the work of Italian archaeologist Giuseppe Lugli and architect Pier Maria Lugli about the "Altera Forma Urbis" of Rome, which investigates the hidden, "secret" structural urban form of Rome in the shape of a star. Analyzing the nodes, axes, and vertices of the star it is possible to recognise that all main buildings (including the Coliseum, Baths and temples) and all consular roads of ancient Rome have not been randomly placed; instead, they are located in the crucial points of the star which are defining its shape. The work was further extended in the 1990s by Professor Gianfranco Moneta at University La Sapienza (Rome), revealing a correspondence of Rome's contemporary structure, main buildings, and roads, with an extended version of the star reaching the seven-mile radius of the city. This was an important confirmation of the close interrelation between the morphology of the place, the roads and settlement typology and their evolution for two millennia.

This study is focused on the application of the principles of the "Altera Forma Urbis" on the contemporary built environment of Rome to test Moneta's methodologies using an international architectural competition in the Tuscolana district as case study. The final goal was to challenge current urban and architectural design practice with alternative, sustainable approaches which utilises the role of memory and heritage, emphasizing the interaction of architectural composition with history. The article is aimed at answering the following research questions: Can the "Altera Forma Urbis" be an effective framework to correctly inform the sustainable evolution of the built environment? Can the application of Analysis-Design Interaction methodology (ADI), an historical-morphological process-based analysis, support the design of sustainable architecture which respect the identity of place?

The article reviews the current practice of urban and architectural design and the authors' professional work and research about the application of Moneta's Analysis-Design Interaction methodology (ADI), an historical-morphological process-based analysis developed since 2005 by the authors with Archabout, a research collective based in Rome, Italy. A case study related to a recent international architectural competition for a development in the Tuscolana district of Rome has been the opportunity to test the methods and to compare the research outcome with other design proposals.

Using the support of "Altera Forma Urbis" framework and ADI method, the research was aimed at evidencing how urban and architectural design could be summoned as an action of use and re-use of the place and its components: those present at the time of the activity, and those hidden, no longer visible but which still condition the present state of the place. The research team developed an alternative design proposal for the competition aimed at enhancing the relationship with history and the Genius Loci (the character of the place). All finalist design proposals, instead, ignored the relationship with the context, proposing architectures that are detached from the historical context and heritage: the winning proposal is unaware of and indifferent to the physical, social, and historical differences that characterize Tuscolana's area of intervention.

2. THE ALTERA FORMA URBIS ROMAE

At its zenith, Rome stood as the capital of the mightiest among ancient empires, boasting an estimated population of one million individuals from approximately 100 BCE to 200 CE. During this era, it claimed the distinction of being the largest city ever witnessed in the annals of human history. Comprehending the evolution of this sprawling metropolis, as well as the factors contributing to its immense growth, the mechanisms by which it sustained itself, and the daily lives of its inhabitants amidst significant historical developments, remains a matter of paramount importance for historians and archaeologists. A pivotal source of invaluable insights for addressing these inquiries is the Severan marble plan of Rome, commonly known as the Forma Urbis Romae. This colossal cartographic masterpiece, measuring roughly 18 by 13 meters (approximately 60 by 43 feet), was meticulously crafted between the years 203 and 211 CE. It was etched onto 150 marble slabs meticulously placed on a wall within the aula of the Templum Pacis.¹ Remarkably, this monumental map offered an intricately detailed representation of the city's topography, delineating the ground plan of every architectural element within the ancient urban landscape. These ranged from temple complexes and entertainment venues to the intricate network of aqueducts, warehouses, residences of the elite, shops, modest chambers, and even the internal staircases that wove through this remarkable ancient city.

Altera Forma Urbis, the "secret" form of ancient Rome which was reconstructed by decoding the description of the Pomerium (the sacred boundary around the city of Rome)², that Plinius Major made in his Naturalis Historia in 73 CE. Plinius tells about the measurement of Rome's perimeter at the distance of the first mile from the centre of Rome. Plinius states that in his time, Rome was encompassed within a perimeter of 13,200 passus³, a measurement larger than the circumference of the first mile (11,000 *passus*) and even of the Aurelian Walls built two centuries later. This non-correspondence of distances resulted quite unusual, being ancient romans well-known for their precision. This historical puzzle was then inherited by Lugli's son in the 90s.⁴

Plinius also provides a series of data regarding the distances of the 37 gates of the city, measured in a straight line from the "Miliarium"⁵ in the Roman Forum, for a total of 20,765 passus, i.e. 30,705 metres. However, Plinius points out that 12 of these 37 gates need to be counted only once, implying that they were external gates compared to other more ancient ones, probably the gates of the Servian Walls which by his time were now incorporated by the expansion of the city. The interpretation proposed by Lugli suggests the existence of 17 external toll gates and 20 gates belonging to the Servian Walls set back from the new city limits. There were in fact 17 accesses leading to Rome from the outside, just as there will be 17 gates of the Aurelian Walls built two centuries later and still almost entirely existing today.

Based on Plinius description and cryptic clues that allowed the identification of significant measurements, gates positions, and dates in the calendar and history of Rome, P. M. Lugli proposed that the perimeter Plinius was talking about was not a circumference but a polygonal shape in the form of a star symbolising the *sun*, formed by three triangle with the same centre in the Forum Pacis and differently oriented.⁶ Lines linking the polygon's vertices and inflections were oriented to astronomical, astrological and geographic points , that were important in the oldest history of Rome. The vertices and inflections were marked by the 17 accesses to Rome from the outside. Lugli was then able to graphically re-create the hypothetical *secret* form of Rome in the shape of a 8-point star as direct reference to the symbol of the Sun: the image of the brightest star reflected in the Eternal City. Supporting this hypothesis is also the fact that Nero had represented himself in the guise of the sun god Phoebus crowned with rays in the "Colossus", a colossal bronze statue inside his Domus Aurea, a statue then moved in front of the Flavian amphitheater -the *Colosseum*- whose construction began with the first of the emperors of Flavian family, Vespasian. Lugli suggests that the *star/sun* symbolic form could have been outlined by emperor Nero as an ideogrammatic model of his Urban Plan for the reconstruction of Rome after the famous fire in 65 CE.

The 8-point star has its vertical axis aligned with ancient towns of Vejo (North) and Tellena (South), has a perimeter of 13,200 *passus* (19,518 m) and is inscribed in a circumference that reaches the first mile of the Consular Roads.⁷ The star could have been generated by an initial esoteric triangle oriented towards Vejo,

with a possible evolution in the Augustan era (1 BCE) adding another triangle in the opposite direction, which resulted in a six-point star that eventually evolved again into the Altera Forma Urbis of the eight-point star as described by Plinius Major in 73 CE (Fig. 1). The three triangles were all centred on the Forum Pacis and, specifically, exactly in the place where the Forma Urbis Romae was positioned. Other aspects are confirming the hypothesis: all vertices of the star are oriented on settlements or astronomical points relevant for the history of Rome. To name a few: "Mons Albanus", "Praeneste", sunrise and sunset of 21st April (Rome's foundation anniversary), sunrise and sunset of summer and winter solstices (Fig. 2).



Augustan era hypothesis, adding another triangle in the opposite direction



The Star as described by Plinius Major in Naturalis Historia, 73 CE



Fig. 1: The hypothesis of the evolution of the Star from the Republican to the Augustan era (Source: M. R. Leante, L'interazione analisi progetto. Area studio: Roma. Progetto di un centro servizi per la produzione cinematografica, 2006 (Available at: <u>https://xoomer.virgilio.it/maleante/tesi.html</u>)



Fig. 2: The Star's astronomical and territorial alignments (Source: M. R. Leante, 2006)

Furthermore, Lugli noticed that all main monuments of ancient Rome were aligned on the generating axis of the star and that extending the star to its fifth mile some correspondence could be found with Renaissance and Baroque era's topographical alignment and to some modern and contemporary alignments too. This fascinating research was further developed by Gianfranco Moneta's architectural research at University La Sapienza, where he hypothesized the permanence of this ideal form of Rome in the historical evolution of the urban grid extended to the seventh mile, which includes the GRA (Rome's ring road) and its current urban configuration. Bringing the eight-pointed stellar structure of the ancient perimeter to the current urban scale, was key to identify Rome's polycentric structure, composed of nodes and relationships able to provide hints and guidelines for possible urban interventions, both on the consolidated city, and in the areas of new expansion (Fig. 3). Research was developed through several architectural design projects with the module of Architectural Design at the University La Sapienza, testing the hypothesis of the connection with the Altera

Forma Urbis, utilising Moneta's Analysis-Design Interaction methodology to read and acknowledge the *star of Rome* during the design process. Some of the images used in this paper are part of Moneta's research and they had been developed by architect Mario Rosario Leante for his thesis during the master's in architectural design, which was supervised by prof. Gianfranco Moneta and prof. Andrea Moneta.



Fig. 3: The *Star of Rome* in its first mile (area in yellow) and its extension to the seventh mile (area in red), with evidenced Tuscolana area of study (red box) and its landmarks aligned on astronomical axis of the December 21 sunrise and June 21 sunset (Source: G. Moneta research mentioned in M. R. Leante, 2006)

3. ANALISY-DESIGN INTERACTION METHODOLOGY

The Analysis-Design Interaction methodology (ADI) was conceived and developed by Professor Gianfranco Moneta's research between 1980s and 2000s within CIRTER (inter-university research centre about territory studies) and his module of Architectural Design at the Faculty of Architecture of University of Rome "La Sapienza". ADI was conceived as a tool to read and interpret the natural and anthropic elements of territory, their process of use, reuse, and transformation, with the final goal to use these elements for sustainable urban and architectural design. This methodology is rooted in the longstanding research of Italian architect Saverio Muratori who put the basis, between the 50s and 60s in Italy, for a morphological school of urban design and studies on anthropology of the territory that are becoming relevant today in the quest for sustainability.8 ADI is rooted in Muratori's urban morphology approach, and further research of his disciples G. Cataldi and G. Caniggia in Italy, and M. R. G. Conzen in UK on typo-morphological analysis.⁹ ADI in fact, considers the form of territory and settlements as a temporary phase in a never-ending process of transformation, where the environment acts as a stable heritage of the civilisation. ADI is aimed at reading and understanding the historical structure of territory and settlements as integral part of the character of the place (Genius Loci) through a diachronic and synchronic analysis. These two analyses, combined together, could then be used to interpret and design a territory, an urban settlement, an urban space. ADI methodology is able to go beyond the present chaotic picture through a morphological analysis which follows the evolution of the territory and settlement; thus, identifying new sequences of meaning, new material and immaterial spatial configurations which are truly sustainable and respectful of places because conceived in a critical relationship with history and memory. The design activity in ADI is directly connected with the analysis and it is here considered as an action of use or re-use of the place/territory and its components; some components are present at the moment of the activity, others are no longer visible, but they are still conditioning the actual state of the place/settlement/territory. Analysing and revealing models of use/re-use of the territory, ADI identifies the form of transformations, a crucial aspect that can inform -at different scales- both urban design and architectural design. ADI methodology phases are: 1) The territory considered as a global architecture: the aim is to 'read' the territory through an historical-morphological analysis of both territorial and urban areas' transformations during the years; 2) Transformations and re-use: Morphological analysis the territory and landscape to identify invariant historical structures as a series of systems interacting with their continuous process of transformations, i.e. territorial grids, boundaries, settlements and *pathways*: ridge paths, half-ridge paths, valley paths; 3) Systems and sub-systems: Overlay of historical periods to understand the relationship between physical environment and anthropic systems, historically; 4) The structure of the element: To utilize diachronic and synchronic reading of models of use of places/territory to identify elements as particular form of transformation; This crucial phase is aimed at identifying the relation between systems and elements, to recognise models as structures of historical use of the territory that are still present, in whole or in part, in it; then, in the design project, to prefigure a reconfirmation, a reinforcement and reuse with new functions of these forms that thus constitute the basic material for the design process. 5) Between memory and future: To apply models of use and processual re-use of places in urban and architectural design re-utilizing historical territorial support and, at

the same time, re-constructing a structure of interdependences.

4. CASE STUDY: TUSCOLANA PROJECT

Archabout is a multidisciplinary research collective founded in 2008 by architects and scenographers from Rome, Italy with a common ground of being collaborators of prof. Gianfranco Moneta at the University of Rome "La Sapienza". They co-founded the Cultural Association Archabout as a laboratory of studies and production to continue thirty years of architectural design theory and practice of prof. Moneta at the Faculty of Architecture, towards the challenges of our contemporary world.¹⁰ Archabout's manifesto considers architecture as a critic methodology that -redefining the notion of transformation process - recovers the relationship between site, memory and design, with a focus on the Analysis-Design interaction, to explore and apply new technologies and the relation with historical models. Currently, Archabout members are architect Maurizio Crocco (CEO) and architect Andrea Moneta, of whom are active researchers and academics in the field of architecture, urban planning, and site-specific performance. In December 2019, Rome's City Council released a call for the regeneration of the Tuscolana railway area for the "Reinventing Cities" competition, which is part of C40 global network of the world's leading cities that are united in action to confront the climate crisis.¹¹ The competition unfolded in two phases between 2020 and 2021. In the first phase, Archabout participated in partnership with SCUP social cultural association, which had a direct connection with the Tuscolana district and inhabitants since many years, and their workspaces located within the competition area. Archabout and SCUP initiated a participatory design workshop to generate a design project for the aforementioned competition. Even though our team was not shortlisted for the second phase, we decided to continue the grassroots participatory design experience. This decision was aimed at addressing the apparent lack of attention to the crucial aspect of participation, which was initially intended to be a defining element of the competition's design process. The main issue which the team identified in the competition guidelines as imperative was the need for an inclusive and comprehensive community participation in the architectural design and urban regeneration of the site. We identified a lack of attention to the diverse needs and requirements of the residents in the Tuscolana railway station area as the common problem of all other top-down regeneration design proposals and similar competitions. These competitions, in fact, often overlooked essential aspects, such as services, socio-cultural spaces, and affordability. We embarked on this participatory journey because we consider co-governance as the key to strengthening local democracy and involving more individuals in co-creating sustainable urban environments. This process empowers citizens to influence policy creation, fostering trust and transparency in local government. Additionally, designs created with the involvement of local communities address a broader spectrum of pertinent issues, resulting in more diversity and enhanced cultural sustainability. Both Archabout and SCUP hold critical views concerning the cultural approach of C40 and the Reinventing Cities initiative. These programs seek innovative solutions and

formulas for sustainable zero-impact buildings that are essentially replicable anywhere to address climate issues. We do not believe that sustainable design can rely solely on the application of technical engineering solutions, such as Natural Light Orientation, Energy Maximization, and specific materials. All the projects submitted to C40 competitions in different cities worldwide display a substantial homogeneity, characterized by exposed structural frames made of concrete or wood, extensive glazing, and the presence of trees on rooftops and in loggias. We question the feasibility of promoting this green-washed version of the international style which is unaware and indifferent to the physical, social, and historical character that distinguish different locations. It is essential to question how such architectural approaches can genuinely be considered sustainable. The issue with such standardized solutions is that they do not work uniformly across different contexts. As explained by the ADI methodology in the previous chapter, the architectural intervention becomes sustainable when it acknowledges the fundamental elements derived from both diachronic (historical) and synchronic (contemporary) readings of the local context. We firmly believe that it is crucial to transform the narrative of the design approach to the built environment. We advocate for a more modern vision of territory-one that is not merely consumed but lived in, maintained, and respected, rooted in its histories and contributing to the well-being of its residents. Participatory design should always encompass the use and reuse of both visible and hidden elements within a Place.

The work for the competition involved an initial analysis to recognize the historical, functional, and physical aspects that shaped the area of intervention using ADI, the longstanding research on the morphology of Rome developed within the module of Architectural Design of prof. Gianfranco Moneta at University of Rome La Sapienza. ADI methodology focuses on *elements* as self-contained territorial entities interconnected through *pathways*. These *pathways* should be acknowledged and strengthened to facilitate genuine urban regeneration. To comprehend the dynamics of transformations in the project area, it was imperative to conduct both diachronic historical analysis and synchronic studies. This helped us grasp the typical natural and anthropic elements and their permanence throughout the processes of use, reuse, and transformation. These elements should serve as indispensable foundational materials for the design project, thereby transcending an outdated cultural approach that segregates functional and physical domains.¹² In this vision, locations need to be interpreted as landscapes, in line with the principles of Landscape Ecology, which defines a location as a system of interrelated ecosystems in a given environment.¹³ To understand the scope of the design intervention, it was necessary to begin with an analysis of a larger context; in this case, the considered context is the city of Rome. The close connection between the structure of places and urban morphology generates a typical resulting *form*. From the outset, a hierarchy of *pathways* is established: those on the ridges, exclusively pertinent to local areas, and those in the valleys, also with local relevance. When paired with ridge pathways, they form the dual-entry roads to the settled area and have territorial relevance as interchange structures between various populations surrounding Rome, including the Etruscans, Latins, and Sabines. This structure progressively solidified from the republican era (509 - 27 BCE) to the imperial period (31 BCE – 380 CE). The historical layout of the city, up to the present day, is predominantly the one established by the late-Imperial city use model. Although the form remains almost unaltered, its functionality has partially declined.¹⁴

From its origins until the Imperial era, radial routes of the consular roads tended to progressively merge into a broad coordinated system. Particularly, the eastern radial routes (Salaria, Nomentana, Tiburtina, Prenestina) converged into a network forming a fan-shaped road network. Its edges are primarily formed by the Via Salaria, dating back to the Republican period, and later by the Flaminia-Cassia and Labicana-Campana (Casilina) roads to the North, and to the East.¹⁵ To the West, it was strengthened the system consisting of Etruscan pathways leading to the Tiber ford and then merging into the final stretch of the Via Aurelia, and the pathway of Latin populations, the Via Latina first and the via Appia later. However, this system was also connecting other pathways to link the city with the sea (Portuense, Magliana, Ostiense, Ardeatina). The two primary systems, eastern and western, pertain to the vast area. These are road systems composed of pathways that reach the borders of the Empire: Cassia, Flaminia/Casilina, and Aurelia/Appia. They enclose the Forum structures, creating a *dual hyperbolic form* that typifies the city (Fig. 4). This form establishes an effective relationship between the territorial road system and the urban system in the central areas, known as the 'open' Forum system, emphasizing the city's territorial dimension. This identified form declined during the medieval age; however, the urban road structure, despite being used differently, has essentially retained its original layout to the present day. The concept of a double hyperbolic form and structure for Rome was a brilliant insight by Gianfranco Moneta.



Fig. 4: The dual "hyperbolic" form (Eastern in blue, Western in green) within the *Star* of Rome at the first mile (left) and its extension at the seventh mile (right) (Source: authors' elaboration of M. R. Leante, 2006)

The linear layouts of the "Altera Forma Urbis" were examined for the area of the competition, specifically the astronomical axis of the winter solstice, which partially aligns with the Tuscolana route, pointing toward the volcano of Mons Albanus, which is a significant place in Rome's origins from both geological and anthropological perspectives. The identification of the *element* is characterized by the presence of two fundamental systems of relations crucial for Rome's form and transformations. Immediately North of the intervention area is Via Casilina, a part of the primary road system of the Eastern Hyperbole. To the immediate South is Via Tuscolana, which, together with Via Latina, is one of the oldest ridge routes that generated the city of Rome—the *Latin ridge* (Fig. 5, 6, and 7). Through a diachronic analysis based on historical cartography and a synchronic overlay mapping operation, was possible to comprehend the *form of transformations* of this specific *element*.



Fig. 5: The area of the competition (centre-right, highlighted in pink) falls within the Aurelian Walls, the Tuscolana/Appia Nuova and Casilina (Labicana) roads, and the Via dei Canneti (highlighted in green), alongside the railway axis. The Via dei Canneti represents a typical element of Rome's urban morphology, serving as a connecting road between two adjacent consular roads, primarily following a valley path (Source: elaboration by M. Crocco on 1876 cartography by Istituto Geografico Militare, Roma, F.150 della Carta d'Italia, IV.S.O.)



Fig. 6: Casilina axis (in red, top), part of the Eastern Hyperbole, exiting from Porta Maggiore; Tuscolana road (in red, bottom) exiting from Porta San Giovanni to Porta Furba; in blue, the Felice Sistino aqueduct; in green, Via dei Canneti; in brown, the scattered built-up areas of villas and mills with pathways system. (Source: elaboration by M. Crocco on map of Papal States and Tuscany, 1841–1843 [B VII a 384-11] (Available at https://maps.arcanum.com)



Fig. 7: Overlay of the 1841 map on actual map of Rome (Source: elaboration by M. Crocco on Papal States and Tuscany, 1841–1843 [B VII a 384-11])

The principles of ADI were consistently applied to the Tuscolana project within a participatory approach. Through a series of meetings and activities, the local community evaluated different vital aspects of the area completing a questionnaire. They provided insights and proposals that align with the discussions held during the participatory laboratories (Fig. 8).



Fig. 8: Participatory process with Tuscolana inhabitants (Source: personal archive, 2022)

The project programmatically rejects intensive and speculative building developments that have already characterized the area over the past century. Instead, the project aligns with the strong morphological values inherited from a long history of transformations. The primary objective of the project was to reconstruct the interrupted historical route of Via dei Canneti with a pedestrian and cycling bridge over the railway ditch to reconnect paths and parts of the city divided by the railway trench. The Project proposed a compact city settlement model characterized by functional diversity and pedestrian-friendliness. It included paved and green public pedestrian spaces, semi-public and public inner courtyards, public services, social housing, small-scale commerce and craftsmanship spaces, and innovative hubs.¹

Specifically, the architectural project of the competition area was conceived as a project for urban spaces, not just buildings, which should instead contribute to creating the system of *urban voids*. The project envisions an organic system of pathways, squares, and strictly public green areas that generate an urban place promoting and facilitating encounters and socialization. This system occupies 40,000 square meters of the total 50,000 square meters of the area and is intended to become a new neighborhood and urban center.

¹ Project Area: 50,000 square meters; Built Area: 35,000 square meters. Average Building Height: 10 meters, 2 levels.

The Casilina road, which structurally defines our project area, constitutes one of the arms of the previously described Eastern Hyperbolic structure. The intervention area is strongly morphologically related to the Casilina road system, even though it is currently physically separated from the railway track. The assembly of six maps from the Gregorian Cadastre provided valuable indications for reconstructing the form of the Tuscolano part before its urbanization in the 20th century: the ancient connection route between Via Tuscolana and Casilina (Via dei Canneti), the scattered built-up areas, the inter-farm pathways, the form and texture of the land plots – all of which serve as fundamental material for the architectural project. From a morphological perspective, the project constitutes an urban polarity morphologically linked to the Casilina road, creating greater definition and strengthening the figure of the Eastern Hyperbole (Casilina-Cassia/Flaminia), a primary system at the territorial scale and connecting with the Tuscolana System. Overlooking the "valley" of the Acqua Mariana ditch, in an elevated position (acroterius), the Tuscolana road is primarily a ridge path from the Tusculum Sanctuary, a sacred place for Latin peoples, to the ford on the Tiber River, and to the Tiber Island. It partly coincides with the astronomical alignment of the December 21 sunset and June 21 sunrise of the Altera Forma Urbis. This positioning has its reference in the oldest memories of the settlements at the origin of Rome. The project thus envisages the construction of a rich and diversified functional mix, capable of promoting processes of interaction and exchange among the involved actors/residents. This aspect is particularly translated into the identification of a diverse functional mix with no predominant functions, guaranteeing a social framework which ensures generational, typological, and functional diversity; temporary settlements alongside permanent ones; new forms of cohabitation, coworking, and shared services in an open and transversal manner. This is done to avoid the so-called sum of functions and to prioritize interaction among the functions themselves.

Another central aspect in this regard concerns the concept of a "Borgo" (neighborhood) that the project aims to create. The Project's Master Plan envisions an urban texture consisting of solid and void spaces, where the quality and design of public spaces encourage interaction among the parts and give rise to new forms of relationships, including the use of public spaces. The presence of services accessible to the adjacent neighborhood and the project's focus on pedestrian-friendly design ensure a dimension of proximity and accessibility that aligns with the idea of a 15-Minute City. The project thus establishes a clear distinction between the structures for urban mobility: a bike path, a railway axis, and its green ring connecting areas without structuring new morphologies, and the systems, subsystems, and elements derived from historical-morphological analysis that, on the other hand, form the foundational materials for the formal genesis of the project itself (Fig. 9, 10)

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Fig. 9: Masterplan of Archabout proposal for Tuscolana competition. (Source: personal archive, 2022).

From a construction perspective, the proposed building typology relies on materials and technologies rooted in the Roman tradition. Bio-eco-compatible materials and technologies that were successfully adopted in Rome over a century ago in the construction of public housing complexes, still demonstrate their durability, cost-effectiveness, and environmental and social sustainability. These are materials and techniques that, once again today, in significant examples like the new residential complex in *Le Plessis Robinson* in Île-de-France (Paris), showcase the feasibility, cost-effectiveness, and environmental sustainability of such projects.



Fig. 10: Archabout's project proposal. Legend: 1. Train Station square with Italian Garden. 2. Innovation Hub: coworking and Fab lab spaces.¹⁶ 3. Fab lab co-working for social use. 4. Recreational-cultural spaces 5. Shops and artisan workshops, Housing for Seniors/Senior Living.¹⁷ 6. Shops and artisan workshops, Youth hostel.¹⁸ 7. Local health district (ASL). 8. Cultural services: rehearsal rooms for artistic production spaces; public theater; amphitheater. 9. Headquarters of the cultural associations (Source: authors' elaboration)

5. CONCLUSION

The two-thousand-year nature of Rome in the form of a *Star*, which interact with its *double hyperbole* urban structure, presents a challenging methodological dilemma for urban and architectural design, if not known or considered. The *Star* of Rome is still pretty much unknown to urban planners and architects, even for those that are involved in longstanding urban morphology studies; this situation partly explains Rome's chaotic urban development since the 50s, a metropolis that is locked in the hands of building companies' interests.¹⁹ Rather than attempting to unravel the complexities directly from Rome's current urban landscape, our ADI morphological analysis has undertaken a different approach by tracing the historical evolution of the city's layout revealing and acknowledging the interconnections with the Altera Forma Urbis in the design process. This approach allowed us a clearer understanding of how Rome's urban plan has evolved over time with a multitude of functional influences within the overarching framework of morphological periods. It is essential to note that this accumulation of changes in the city plan is not a simple case of layering one element on top of another. Instead, the morphological frames have been observed to have varying degrees of continuity from one period to another and in different geographical areas, leading to their persistence in contemporary Rome structure.

On one hand, straightforward, additions to the urban structure, such as most of the recent and less recent residential developments, can be easily identified and categorized as *self-referential* urban design, detached from the historical and morphological context. On the other hand, ADI method allowed a deeper understanding of the historical-morphological processes as a valuable tool to discern the multifaceted features of the competition's place as an integral part of the *design process*. This research underscored the importance of comprehending the historical context and morphological evolution of Rome's urban environment to inform future urban and architectural design decisions. By recognizing the city's intricate and dynamic history, we can better navigate the complexities of urban planning and ensure the sustainable and harmonious growth of our cities in the future.

The case study of Tuscolana was the perfect occasion to demonstrate ADI methodology as a valid sustainable alternative to traditional urban and architectural design, avoiding the narrow-minded *trends* and self-referentiality of mainstream contemporary urban and architectural design. Archabout project proposal for Tuscolana competition is different from all other competition's submissions because of its approach to history, and to site and inhabitants' needs. ADI methodology allowed Archabout designers to read the character of a place through a diachronic and synchronic analysis; to interpret and design Tuscolana history and urban space through its connection with the *star* of Rome. Through a participatory process, Archabout

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designers strived to translate the identities and desires of Tuscolana district's inhabitants in architectural

spaces to foster placemaking, social cohesion, and wellbeing.

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⁴ For more information about the star of Rome see Archabout's YouTube Channel:

https://www.youtube.com/@romeuncovered

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¹² See: G. Cataldi, Per una Scienza del Territorio. (Firenze: Studi e Note, 1976)

¹³ R.T.T. Forman and M. Godron, *Landscape Ecology*. (New York: John Wiley & Sons, 1986).

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¹⁵ G. Moneta, "Roma: la struttura e la forma." In G. Moneta, *Lineamenti del corso di composizione III*, (Dispensa n.6 DAAC Università La Sapienza, Rome, 1985), pp 20-24.

¹⁶ 2-3-4. A Gross Leasable Area (GLA) of 15% will be allocated to co-working spaces and innovative fab labs, following the innovation hub concept, which promotes dialogue and collaboration among the involved stakeholders, in addition to approximately 5% of GLA for related services. The presence of co-working spaces will ensure the involvement of young people to maintain the right generational mix in the project area. The remaining GLA of 10% will be dedicated to other services, including sports facilities (including a gym with a pool), recreational, and cultural activities, with a preference for revenue-generating activities that could offer special discounts and benefits to residents in the neighborhood.

¹⁷ Senior Living offers its residents the opportunity to remain independent in the comfort of their own homes for as long as possible, without giving up access to services that may become necessary as they age, ranging from simple daily assistance to personalized care services.

¹⁸ These budget accommodations that combine aspects of socialization and meeting among young people. It represents an economical solution, without sacrificing the creativity of the spaces and modern comforts, for youth visiting the city of Rome.

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Traditional Dwellings and Settlements

Working Paper Series

TRANSFORMATION OF A HISTORICAL TOWN AND THE DYNAMICS OF TRADITIONAL IDENTITY: THE CASE OF ALGIERS, ALGERIA

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TRANSFORMATION OF A HISTORICAL TOWN AND THE DYNAMICS OF TRADITIONAL IDENTITY: THE CASE OF ALGIERS, ALGERIA

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To address growing issues in the transformation and growth of historical settlements such as apprehensions of identity crises and the emergence of ghost towns and dual cities, understanding the underpinning dynamics of traditional identity becomes necessary. In this context, this research aims to study the role of traditional identity in the process of urban transformation, question the perceptions associated with it and scrutinize the key issues. It takes a case study-based approach and studies these questions by critically analyzing the chronological transformation of Algiers in Algeria. Building on the discourse of perception, it derives why the idea of traditional identity needs to be conceived holistically extending beyond morphological dimensions; how it makes sense only in a particular context and how it is variable in both place and time. It, accordingly, suggests that the measure of 'authenticity' in the context of traditional identity should be restructured and aimed at achieving the best contextual response through (the principles of) traditional architecture.

1. INTRODUCTION

'Identity' has been defined as 'the characteristics, feelings or beliefs that distinguish place or people from others'; in other words, identity is 'what someone or something is'¹. Accordingly, traditional identity can be seen in the spirit of how places and communities are identified traditionally. It symbolizes one's perceived location in the social [and physical] world and is generally conceived as a communal [and not individual] identity. As it is founded on the concept of 'tradition'², it is associated with continuity and constancy³. In the context of the built environment, traditional identity provides a sense of rootedness and a sense of belonging to its inhabitants⁴. It also helps in achieving cohesion as well as comprehensibility among the built forms⁵. However, in the process of built environment transformation, the idea of traditional identity works in a complex and dynamic manner. It takes many connotations and triggers various trends of practices, many of which are proving to be damaging.

For instance, an uncontrolled pace of urban growth seen across the globe has led to apprehension of 'identity crises'; while the efforts of preserving traditional identity in its response, have produced theme parks, ghost towns and dual cities. Similarly, the interpretation of traditional identity as a representation of a nation's identity and pride has led to damage, demolition and reconstruction of a number of settlements in the current and historical timelines. Thus, although the importance of traditional identity cannot be undervalued, it is equally true that the pressure of traditional identity has often triggered inapt approaches of urban transformation. It is, therefore, necessary to understand the dynamics of traditional identity in urban transformations, question the perceptions that lead them, and explore alternative directions of urban growth based on the developed understanding. This is the aim of this research.

It takes a case study-based approach and studies these questions through the historical settlement of Algiers in Algeria. It analyzes Algiers' chronological phases of transformation starting from its original vernacular architecture to imperialism, colonialism and post-colonial period, and examines their underpinning reasons through the following primary research questions: How was the morphology of Algiers transformed over time? And what was the role of identity in this process?

It is important to note that the discussion on the role of traditional identity in urban transformation is broadly found in two disciplines: the field of architecture approaches it as a morphological study, and focuses on subjects like changes in built forms, effects of changes in the milieu on living patterns, etc. (for example, Conzen, 1960; Hakim, 1991; Levy, 1999; Butina and Bently, 2007; Perkins and Thorns, 2012)⁶. Whereas, the field of anthropology studies it under the framework of human relationships and explores power equations, socio-cultural-economic changes, and other similar areas (for example, Synder, 1954; MacKenzie, 1995; Ricceur, 2004; James, 2012; Kyle et al., 2013)⁷. The notion of identity or the relation between identity and morphology, however, has been rarely questioned.

In the discourse on colonial and post-colonial changes, too, a common presumption of morphology being an expression of a particular culture, and hence a representative of a cultural identity is observed. The 'forms of dominance' are explored as the imposition of the coloniser's morphology over the colonised by Metcalf (1989)⁸ and Alsayyed (1992)⁹; while concepts such as 'hybridity' or identity amalgamation are studied as the influence of one culture on the other, and one morphology on the other by Bhabha (1990, 1994)¹⁰. The rationale behind the morphological identity, somehow, remained untouched. Said (1985)¹¹, nevertheless, asserts that such relationships between the coloniser and colonised are rooted in the notions of identity of 'self' and 'the other', and his argument has remained highly influential in all the succeeding works in this field, too (see Celik (1997), MacKenzie (1995))¹². However, his argument also doesn't go into the detail of how these notions are formed and how identity is perceived in the first place.

This, indeed, is a gap in the literature. The formation of the identity of a settlement and the consequences of various perceptions associated with it have not been studied from the lenses of perception theories; which is, in fact, the key to understanding all aspects of traditional identity in the realm of built environment. It is the basis not only to understand the relation between morphology and identity but also to reflect upon urban development and conservation issues such as gentrification, social segregation, high land prices, low sanitary levels and non-integration. This research aims to contribute towards bridging this gap by examining the following sub-questions for the case of Algiers:

- How does the perception of traditional identity get formed?
- What is the relation between a settlement's morphology and its traditional identity?

• What role do the notions of identity play in morphological transformations, and what are its consequences?

Herein, the case-specific data, including drawings, maps and images, being chiefly historical, is collected from a wide range of secondary sources and is cross-examined thoroughly. The research methodology, further, is structured on analysing this chronological data based on theoretical arguments that are derived from subjectspecific theoretical sources.

Regarding the case study, it is noteworthy that Algiers is a part of the Berber Maghreb region comprised of Morocco, Algeria and Tunisia, each sharing similar historical, political, economic, cultural, climatic and morphological settings¹³. Accordingly, the political and economic territory of Algiers extends up to not only Algeria but the entire Maghreb region; and events that occurred on the macro scale hold complete relevance for the micro-scale. Hence, following King's (1990)¹⁴ suggestion, certain historical events have been cross-referred from the macro scale in this research. Likewise, following Moudon's (1997)¹⁵ approach, the settlement morphology is studied in reference to its overall socio-cultural and geographic context to understand it holistically.

The analysis of the formation of identity and various notions associated with traditional identity is carried out based on perception theories such as Gestalt psychology, Bohm and Nichol (1998), Piaget and Inhelder (1967), Kepes (1944), Arnheim (1969), Heidegger (2002) and Ricoeur (2004)¹⁶. This theoretical base helps in formulating not only the analysis criteria but also the central arguments of the research in a wider context.

Thus, although the study here is case-specific, the arguments presented here can be applied to any historical settlement undergone/undergoing 'identity-led' urban transformation. For such transformations, the research not only discusses the causes of underlying issues but also opens up possibilities to find alternative approaches. By discussing some crucial questions, it offers a new perspective to understanding the transformation and growth of the built environment. In this manner, the research holds high significance in the discourse on the future of historical settlements.

2. THE REGION, THE SETTLEMENT AND ITS VERNACULAR MORPHOLOGY

The Maghreb region is located at a strategic location- in between the Atlas Mountains, the Mediterranean Sea and the Sahara Desert. Owing to this, it has developed long commercial and cultural associations with the Mediterranean countries more than the inlands of Africa, an evident influence of which is seen in the culture of Maghreb¹⁷. On the other hand, the expedited communication and migration across the Mediterranean Sea has also brought sovereignty of numerous empires in the region, namely, Numidians, Phoenicians, Carthegians, Romans, Vendals, Byzentines, Umayyads, Abbasids, Idrisid, Aghlabid, Rustamid, Fatimids, Zirid, Hammadids, Almoravids, Almohads, Ottomans and the French. The present-day settlements, however, are largely considered to have an Arab Islamic origin of the late 14th-early 15th century; which were further reigned by the Ottomans in the 16th century and the French in the 19th century¹⁸.

These historical settlements of the Pre-Ottoman and Ottoman periods are referred to as 'Islamic cities. Their morphology typically represented the Arabic vernacular models derived from the belief system of Islam and demonstrated characteristics such as a typical complex geometry, compactness and interiority, convoluted shaded streets, dead-end alleys and irregular neighborhoods. The core of such traditional Islamic settlements is known as 'Medina'; and a fortified medina is known as 'Kasbah'¹⁹.



Fig. 1: Characteristics of a typical Islamic settlement (Source: Nourissier, G. (e.d.), Oliver, P. (1997), Celik, Z. (1997)).

In Algiers, a typical Kasbah of the 15th century was observed in the form of a communal cluster consisting of dwelling groups and public squares. The 'communal living', here, is the key concept of Islam guiding the morphology²⁰; nonetheless, the cluster also reflected some striking contrasts on a simultaneous level, which suggests the influence of some additional parameters in the formation of morphology. For instance, the concept of communal living was manifested in the streets that served as gathering places; however, these streets were further faced with blind walls of the dwellings²¹. The terraces, contrarily, are again treated as open

social spaces (Fig.1). An interrogation in various literary sources explains these contradictions and reveals the following parameters to be the key influencers, along with religion, in shaping the morphology of the Kasbah:

a) Geographical parameters:

The settlements were sited in a way that they easily camouflage with the natural surroundings- by following the gradient of the ground, color of the surroundings, or even by being partially underground. This was a strategy adopted under the defensive concerns, following which, settlements were also built in close-knit groups, entirely or partially enclosed by fort walls (Fig. 2). In some cases, the dwellings themselves were also designed as defensive elements, such as tower houses²².



Fig. 2: Development of morphology under geographical and socio-cultural parameters (Source: Nourissier, G. (e.d.), Oliver, P. (1997), conceptdraw.com/a1132c3/preview/640).

Simultaneously, the Mediterranean climate played a particularly important role and shaped the built forms to facilitate climate-dependent living patterns. The open spaces, accordingly, were as important as the indoors for the Maghrebis. The streets were developed as an extension to dwellings for social exchanges, domestic activities, and, often, economic activities like small shops. To facilitate these activities better, they were often shaded (Fig. 2) diluting the stark difference in light and providing a comfortable microclimate²³. Another important element for the microclimate was the open-to-sky courtyard around which the dwellings were designed. It socially served as the core of the house²⁴, while the open terraces

were exposed to the sun offering places for drying in the noon, gathering in the evening and sleeping at night during summers²⁵. The shared wall system helped additionally in reducing the heat as well as providing seismic resistance²⁶.

Interestingly, the topography of Algiers had divided the kasbah into two: the upper city called al-Gabal or 'the mountain', and the lower city, called al-Wata or 'the plains'²⁷. The upper comprised of around fifty small neighborhoods, while the lower formed the administrative, military and commercial centers (Fig. 3). Both together were governed by a citadel located on the hilltop, and were enclosed by a fort wall from all sides²⁸ confirming the defensive strategy. The fort wall had shielded the seafront, while the terraces had taken an exceptionally extrovert form by positioning on top of each other, and 'conquering the view of the sea and the sun' as noted by Le Corbusier²⁹.





View of Algiers from the sea (19th century)

Fig. 3: Siting of Algiers (Source: Celik, 1997).

Plan of Algiers showing the upper and the lower Kasbah

b) Socio-cultural parameters:

Religion was undoubtedly the most important parameter in shaping the settlements. In fact, it is the Islamic planning system which brought uniformity in the morphology of Islamic settlements throughout the region. It provided both: a typical formal articulation and a specific organizational order. Nevertheless, the Islamic law of power, termed as 'Wilaya', simultaneously allowed the freedom to modify individual dwellings. Wilaya chiefly operated on two umbrella power structures: public authority and private authority, and keeping a balance between freedom and control, allowed individuality to evolve in a uniform morphology³⁰. In Algiers, however, Wilaya operated on three power spheres, with an additional intermediate body of the collective power sector. This gave rise to a rich and dynamic morphology that could harmoniously integrate any alterations and transformations appearing on the local level (Fig. 4).

On the social front, a strong emphasis on women's seclusion engendered two separate domains of space usage: the house as the women's domain, and the outside as the men's. Consequently, the blind walls around the street, dead-end alleys, separation between floors, and alike, are the strategies for creating concealed spaces. The terraces, in contrast, were the only extrovert spaces of the house, which served as a feminine communal space-network³¹. The dead-end alleys formed the smallest scale of the street hierarchy of Algiers. Since they were women's domain, the walls facing these alleys had some small windows, notably, placed above the eye-level. Moreover, the entry of the dwellings was designed in a manner that would restrict direct access to the central court, instead, leading to the separated frontmost room allocated as the guest space³².



Courtyard as the women's domain

Terrace as a social space for women

Fig. 4: Elements of vernacular Morphological shaped by socio-cultural parameters, local resources and the structure of Wilaya (Source: Nourissier, n.d., Celik, 1997; conceptdraw.com/a1132c3/preview/640; BenHamouche, 2003).

On the other hand, political expressions, or depiction of power was through monumentality, on account of which, religious and imperial structures added a language of monumentality in the settlements. The religious structures, furthermore, appeared in the hierarchy of scale, form and structural details adding a variety in the even grain of the settlement tissue. The expression of power was also seen in the dwellings of higher income groups, who used to decorate the dwellings with elaborate ornamental elements³³. Materials and basic details of construction, nonetheless, remained common here. The homogeneity of materials in the entire settlement could be a result of local availability. The materials, however, changed in the 'Bidonville' or 'squatter settlement' of Algiers occupied by immigrants. It represented fairly similar urban grain³⁴, but a drastic variation in materials owing to economic differences.

c) Construction process and Resources:

The local builders here were the guilds of local craftsmen, trained by their predecessors in working with local materials and local details. Therefore, all construction work was executed in a particular manner, with specific materials, with typical details (Fig. 4), and by a specific group of local builders. The common building materials of Maghrebi settlements were locally available resources like earth, dried mud bricks, stone, lime and, occasionally, vegetal materials³⁵.

Hadjiri (1997) describes that the act of building was considered a social event in this region, where all members of the community were involved in the process of construction. BenHamouche (2003)³⁶, further, mentions that the guilds were headed by master builders nominated for their expertise and trustworthiness. They were given the authority to lead construction and design new details if required; the freedom of design was, however, restricted by the Islamic planning system, which set the rules for the morphology. Alterations in the typical built form, thus, came in response to contextual or functional requirements³⁷, which were equally applicable in the entire settlement. As a consequence, any innovation eventually turned to standardization for the specific settlement and was passed down from generation to generation. Consequently, on the settlement scale, the morphology constantly presented a uniform expression.

The traditional settlement of Algiers, thus, emerged in response to its contextual settings. a typical Algiers dwelling, in Rene Lespes' words, can be described as a form achieved in harmony with 'lifestyle and customs [and climate]'³⁸. It expresses a harmonious architectural language, works coherently and responds perfectly to the living patterns, beliefs, resources and needs of the inhabitants.

3. TRANSFORMATION OF THE SETTLEMENT

The process of transformation is defined as change taking place over time (OED). Accordingly, the transformation of 14th-15th century Islamic settlements of Maghreb is studied under two major chronological phases in literature: the colonial era and the post-colonial era. However, an additional force of transformation,

though comparatively minor, was also observed between the rules of the Arab- Berbers (14th -15th century) and the French colonizers (19th -20th century). This force was imposed by the Ottoman Empire to execute its imperial policies, based on the same religion with a slightly different set of beliefs³⁹. Thus, Imperialism under the Ottoman Empire is considered as the first phase of transformation in this research.

1) Imperialism (1529-1830):

Imperialism is, in fact, described as 'the practice, theory, and attitude of establishing a dominant metropolitan center with which to rule distant territories' by Said (1985). Following this, the Ottoman Empire brought two foremost changes in the Maghrebi settlements: primarily, the settlements were readapted by their new settlers as per the orders received from Turkey; and successively, they were significantly expanded by either shifting the fort wall or adding a ring-like zone outside it.

In Algiers, imperialism was an Ottoman project of 'dissecting the living body' of the existing settlement 'only to reconstitute it' in the words of Tawadros (1988). The existing citadel and fort wall were demolished and replaced with a new fort wall; while, disregarding the existing mosques, Turkish mosques were built in the lower as well as upper Kasbah⁴⁰. The lower Kasbah was occupied by Turkish immigrants, however, their neighborhoods presented similar characteristics to the Maghrebi ones. Thus, apart from these utilitarian reasons, certain changes in the built forms were made to assert a different rule, a different line of belief in Islam. Nevertheless, as the changes were not major, this phase is rarely studied in the literature compared to colonization.

2) Colonization (1830-1962):

Colonization represented many approaches of transformation; most of which employed architecture as a medium of oppression supporting the claim made by Cairns (2001)⁴¹. An interesting example of this was seen in Rabat, Morocco, where the governor's residence was strategically located on the main axis connecting straight to the medina and was symbolically placed on height to denote the opposite power. Similarly, in Tlemcen, Algeria, the majority of the Islamic neighborhoods and monuments were deliberately demolished and replaced by French urban settings; while, in some settlements, such French interventions were further covered with Islamic facades to merge with the local identity⁴².

The oppression was rooted in the notion of what Said (1985) termed as 'us' and 'others'. The colonizers considered the colonized as a culturally primitive society, which was not only different but also inferior to their own society. As a result, the majority of morphology that emerged during this period was an expression of not 'colonialism', but plain 'dominance' in Alsayyad (1992)⁴³'s words. Nevertheless, some

built forms, although very few, emerged through cultural exchanges and local adaptations as exceptions to this claim. The French house type with a patio or courtyard can be considered an example of this. Such examples of 'hybrid' architecture, however, are very rare and are even rarely studied. In contrast, a more common form of amalgamation was observed in the 'association policy', originally implemented in Casablanca, Morocco (Fig. 5) by Governor General Hubert Lyautey⁴⁴. He had divided the city into two parts: one part, the medina, preserved untouched; while the other, transformed under strictly 'ordered' French urbanization; nonetheless, the motive here was to preserve the picturesque Islamic city for tourism.

The colonial transformation of Algiers, too, followed this association policy, under which, the upper Kasbah was preserved intact, while the lower was 'ordered' following the French policy. The first phase of interventions appeared as the replacement of the existing 'chaotic' organizational pattern with the typical block-boulevard pattern dominated by French military engineering (Fig. 5). Subsequently, as the French residents began to inhabit the lower Kasbah, it was altered with 'regularized' street networks and commercial places depicting the Parisian urban character⁴⁵. The existing fortification was further replaced by a new one covering a larger area; whereas the Islamic markets were replaced by the Western covered markets. Eventually, displacing the locals, the sea face was replaced with luxurious French villas decorated by eye-catching structures to represent a French image of the city from the seaside⁴⁶.



New blocks in Rabat portraying French architectural expressions



'Re-clothing' of French Barracks with Islamic facades in Rabat





Chronological "ordering" of the French part in Casablanca



Morphological transformation of Tunis under the association policy



Morphological transformation of Casablanca under the association policy

Thus, as noted by Algerian sociologist Djaffar Lesbet (1997), the lower Kasbah, which was later renamed as 'the marine quarter', developed as 'the counterpart' of the upper Kasbah over a period, obliterating any probabilities of unification. Furthermore, the boulevard dividing the two was widened to symbolize the capture of the Kasbah as opined by Lamprakos (1992)⁴⁷. His argument, however, lacks any literary evidence. On the contrary, the capture of the upper Kasbah was indeed represented by the intervention of an open space for military use, 'place du gouvernement', by demolishing some of the existing built fabric. This intervention was successively followed by additional construction causing a divide in the upper Kasbah (Fig.6). Nevertheless, the pressure of tourism prevented any more changes in the Islamic morphology; and instead, prompted the efforts to make the Kasbah more picturesque. Conservation and restoration, hence, became a priority for the government. Strict regulations were imposed on the inhabitants of the Kasbah, which triggered serious housing issues with massive demographic growth⁴⁸. As a result, the Kasbah started bulging with pockets of bidonville (slums), majorly adulterating its quaint image.



Transformation of Algiers under the association policy



Fig. 6: Transformation of Algiers under the association policy. (Source: Celik, 1997)

In parallel, the conservation efforts also led to practices like the deconstruction-reconstruction initiative by architect Laprade. He analyzed the morphology of the Islamic settlements, extracted the typical elements, and recomposed them with new order in Casablanca. Condemning Laprade's approach as a mere formal exercise, Ecochard proposed an alternative plan based on human needs following the Charter of Athens principles⁴⁹. Nonetheless, his plan also failed completely owing to the consideration of human needs on a universal basis, a common belief of the era of modernization. Notably, the movement of modernism attempted to create an entirely new expression of built forms that was based on a consideration of universal needs and universal solutions, deliberately overruling historical as well as contextual parameters. In this era, the colonies served as 'laboratories' for the colonizers, where various possibilities offered by industrialization such as broad boulevards, mass housing, prefabricated constructions, new infrastructure and alike, were experimented (Cohen, 2006).

In Algier's case, attempts to develop it as the capital city of French Africa, and planning it as a model approach of modernization were made in this phase. A number of urban plans were proposed to epitomize a model French city; among which, the most critiqued one was Plan Obus by Le Corbusier in 1932. It proposed new modern housing with 'terraces, suspended gardens and grand bays opening to the landscape'. This housing was proposed for the surplus population in order to eliminate the bidonville and restrict the density of the Kasbah to maintain its beauty. Corbusier's design plan, according to him, was derived from the aesthetic qualities of the Kasbah⁵⁰; nevertheless, his understanding seemed to have been constrained merely up to the built form, while its relationship with the socio-cultural practices is entirely disregarded. For instance, the plan proposed integration of the Kasbah and the marine quarter, but through a lifted boulevard that could serve as a zone for interaction, which would have actually enhanced the equation of difference and dominance following a French green belt gesture⁵¹.

On the other hand, an alternative plan was proposed by Rene Danger, Henri Prost and Mourice Rotival, arguably, the 'true urbanists' of the era, which recommended demolition of the entire lower Kasbah, preserving only two 'untouchable monuments', the mosques. Nevertheless, the 'asymmetric relationship' between the two, was also proposed to be amended. This plan, although highly criticized by historians, was implemented in 1931. Thereupon, the morphology transformed dramatically with projects like high-rise structures at the edge of the marine quarter by Gerard Hanning, modern housing by Charles de Gaulle, schools, clinics and commercial centers executed with the widening of narrow streets by the government, and alike (Fig. 7). This sequence of changes came to rest only with the beginning of the Algerian war in 1954, where the Kasbah was utterly marked with the symbols of war and defence⁵².



Development of the sea-front, Algiers

Fig. 7: Development of the 'marine quarter'. (Source: Lamprakos, 1992)

3) Post-colonial changes (1962 onwards):

The transformation observed during colonialism reflected two kinds of exchanges between the colonizer and the colonized: 'self-seeking and beneficial', as argued by Alsayyad (n.d.). The transformation caused by modernization was seen as a 'beneficial exchange' in the post-independence period, owing to the colonized community's self-image of being 'less advanced'. A number of policies and decisions of the colonizers were, therefore, carried forward by the settlements themselves⁵³. This aspirational trend was further fostered by local designers who had graduated from the French education system; nonetheless, the goal of transformation had certainly shifted in this period towards the economic and social development of the locals and addressing their issues like housing scarcity⁵⁴.

On the contrary, the force of nationalism intensified the need for a national identity, an identity that could symbolize the refutation of French dominance and the revival of idiosyncrasy. This led the Maghrebi settlements to the traditional and even fundamental values; as a result of which, the pre-colonial morphologies were perceived as the original national identities⁵⁵. Correspondingly, any surviving Islamic fabric was conserved and proscribed from any major changes. Likewise, new schools of architecture and urban design started focusing on heritage and traditional identity. The idea of tradition, however, was of an unchanging tradition. As a result, with the increasing pressure of tourism, the Islamic morphologies turned into museum cities portraying a static image of the city.

In the Kasbah of Algiers, additional symbolic initiatives such as renaming the streets and squares were also observed. Remarkably, a new approach was adopted here for the built interventions, which recommended taking interviews of the residents to consider their needs and aspirations. This was a commendable approach which rose above a fixed idea of traditional architecture; however, disappointingly, the aesthetic concerns eventually overpowered this intention. Thus, any new post-colonial interventions were observed as a direct response to the colonial trend, either in support or in opposition.

As a ray of hope, an alternative route had started developing through new architectural schools that were trying to focus on local as well as universal aspects of the Maghreb. Nevertheless, the slow evolution of a new academic structure could not match pace with issues like the rate of immigration causing intense pressure on housing needs. Immigration, in Algiers as in the majority of the Maghrebi settlements, was led by the wave of development and globalization. Hence, where one fragment of the settlements remained frozen under conservation policies, the other kept on adopting rapid changes under the pressure of development. The trend of development, notably, has brought a major shift in economic, social, administrative and occupational aspects; which has not only affected the space usage but also space construction and its resources. With the availability of a range of materials, technologies, building parts and standardized methods of construction, the factor of 'local' holds no bearing in the profession of built environment. A passive role of the designer contributes additionally to the lack of integrity in the emerging morphology⁵⁶.

Thus, with the pressures of population growth and migration, Algiers saw a rapid increase in shantytowns and uncontrolled urban sprawl. The government's response to this was provision of infrastructure along

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the coast, construction of built forms with prefabricated parts, and a continuous skyward growth of the morphology. In contrast, the Kasbah was still conserved with its 'poetic morphology', and continued to serve as a symbolic image of the city, remarkably, still for political and tourism purposes. This led to a high rate of gentrification, with the Kasbah eventually turning into an economical shelter with low facilities for rural immigrants⁵⁷. In this manner, this polarity has led to the formation of a 'dual city' in Algiers (Fig. 8). This polarity, with time, has not only grown stronger, but has also percolated into the social and economic structure of the settlement. Besides, this specific situation is not only seen in Algiers, but is considerably common in the Maghreb. The dual city of Tunis and Fez; the 'pieces of city Tizi Ouzou near the village' of Kabylia, the ghost town of Ait bin Haddu, and the tourist village of Matmata are a few examples of the same.



Fig. 8: Post-colonial view of Algiers illustrating two distinct morphologies of the Kasbah and the French development. (Source: Celik, 1997)

4. THE DYNAMICS OF TRADITIONAL IDENTITY

A comparative analysis of all the trends of transformation suggests that the majority of changes are led by certain notions of traditional identity, whether it is the identity of the Maghrebis, the French, the Ottoman Empire, or the national identity of Algiers. As an example, it can be observed that a conscious attempt has been made in all phases to retain the Kasbah intact, and the decision of its conservation has been predominantly driven by a specific perceived image of the traditional identity of the settlement. Even if we consider the tourism economy to be a key motivation, this tourism has also been led by this perceived image. This image of the Kasbah is further closely associated with the traditional identity of Algiers and its people. Quite similarly, the Turkish and the French traditional identities have also been associated with particular morphologies; which were employed as an instrument for dominance in the colonies as the study noted.

Let us understand these equations more in detail:

In the first phase of Imperialism, although both were Islamic empires, the Ottoman Empire demolished the existing mosques and replaced them with Turkish mosques. On the contrary, the neighborhoods demonstrated changes that were minor. Here, one can observe that certain religious beliefs and certain cultural beliefs are represented through symbols. These symbols, with time, become an identity of that specific belief system and of that group which holds that belief system. Consequently, although the basic religion is the same, the identity is now judged based on these specific symbols, and through these symbols, it is used as a tool for oppression.

Equally, in the colonial period, the majority of the changes were based on a perceived identity of 'self' and of 'the other' as mentioned earlier. The other, in the colonial equations, is commonly marked lower than self. Accordingly, all forms of imposition of the traditional identity of self over the traditional identity of the other, such as demolishing the existing settlements and constructing new ones following the colonizer's identity, were considered a representation of power.

Moreover, the perceptions of both, the identity of self and the other were built on certain portrayals or popular images of specific morphological symbolism, which could be significantly different from the identity perceived by the natives. In Hamadeh's (1991)⁵⁸ words, 'the reality' was often different than the reality. Therefore, without understanding the morphology of Maghrebi settlements, the French perceived it to be 'chaotic', and imposed an 'ordered' Parisian morphology to organize the settlements. Similarly, the French colonies were built following the French traditional architecture, even when it could not respond to the local climate. Re-clothing of some French buildings with Islamic facades, and protecting the Kasbah with no changes allowed to maintain 'the aesthetics of traditional Islamic settlement', too, represent a similar perception of the 'fascinating' image of the other-beyond the known world (term given by Gordon, 1999)⁵⁹.

The change in perception, however, was observed during modernization and development, where the perceived image was that of 'the modern' and 'the developed'- both bearing a Western influence. Modernism attempted to produce a morphology that entirely rejected the traditional identity and adopted a [perceived] 'universal identity' of universal solutions for universal needs regardless of historical or cultural contexts. It is therefore that the apprehension of losing the cultural identity of places and peoples developed. The post-colonial movement of going back to historical architecture and traditional identity under the perception of 'national identity' was a result of this identity crises. It was also the only alternative found as the language of rebellion against the expressions of colonial identity. The symbolic construction of history and local traditions helped establish, reinforce and promote the identity of the local community.

The notion of development, nonetheless, again came as the opposite of traditional. The identity issues play here on a different level. The colonizer's perception of less-advanced societies became the self-image of the colonized, which is why the new morphology emerged as 'not-traditional' architecture. In Gidden's (1990)⁶⁰ opinion, the sense of 'other' is erased in globalization, which could be a probable cause for the range of influences and exchanges reflected on the morphology of these settlements without any cultural references. However, these exchanges are conspicuously led by a slightly different sense of the 'other' in the form of 'developed' and 'developing' countries. As a result, leaving the Kasbah aside, the rest of the town kept growing with significantly different expressions and eventually resulted in a dual city. Furthermore, with the Kasbah turning more into a museum catering to tourists and immigrants who opt to stay in poor living conditions, the dual city gave rise to social segregation under the equation of 'us' and 'others-among-us'.

Thus, even though it is extremely valuable for built environments, the traditional morphological identity can also become problematic when it is relied upon as a static image for expression, pride, power and dominance. It is, therefore important to understand how traditional identity is perceived and what is the relation between traditional identity and morphology.

5. WHAT IS TRADITIONAL IDENTITY AND HOW IS IT FORMED?

In the first part, it was studied how the key influencing parameters had shaped the vernacular morphology of Algiers with a peculiar character; a character that was quite different from any other settlement of Africa, but was common throughout Algiers. This commonality or sameness is called 'idem' in Latin, from which stems the word 'identity' (OED). The relationship between identity and similarity is thoroughly studied in the field of psychology, which asserts that human perception is primarily built on 'similarity' and 'difference'⁶¹. While forming any new perception, as per the pioneering Gestalt principles of psychology, the brain compares all similarities and identifies them as a group, separating them from the differences. This set of similar symbols forms a perception of a cohesive entity. The overall image of any composition is then constructed through

the relationship between this entity formed by similarities and the differences appearing in them.⁶² Accordingly, a settlement with all similar built forms is perceived as one coherent group with some variations appearing in it.

Furthermore, if this identified group remains stable in terms of its perceived image for a longer time, it leads to the perceptual formation of 'identity'⁶³. Thus, it can be derived that the perceived identity of Islamic settlements was an outcome of their stable and uniform morphology for a significantly longer time span. In Anderson's (1983)⁶⁴ term, it is owing to the stability of this morphology for a very long time span, that the 'constructed' identity started to be perceived as the 'rooted' identity, whereas, such a notion did not exist in the realm of identity formation. Herein, since the group of similarities was significantly bigger, small changes made in the built forms didn't change the overall perception. Therefore, changes made at the neighborhood level during Ottoman rule did not change the identity perception of the whole neighborhood. However, if changes are big in such a context, they can certainly alter the identity perception⁶⁵.

Thus, theoretically, if a majority of the built forms change in a similar manner, producing all new similar forms, a new image perception and a new identity would be formed. In simpler words, the perception of identity changes as the morphological symbols in the milieu change. Consequently, as per the perception theories, in a span of time, there can be two different identities of the same settlement called an 'old traditional identity' and a 'new traditional identity'. Hence, the concept of a fixed or unchanged traditional identity would be misleading in reference to morphology. However, as argued by Ricoeur (2004)⁶⁶, it is the psychological bearing of culture, media, memory etc., which causes a resistance against acceptance of a new identity, and, instead, contributes to the reification of a fixed image of traditional identity.

Now, approaching this argument from the anthropological lens, it has been widely established that the concept of 'tradition' is associated with process; which means that tradition is dependent on the factors of time and continuity. It develops over time accommodating small changes that are necessary. Therefore, tradition should not be perceived as a static concept. Correspondingly, the concept of traditional identity, too, makes sense only in the temporal dimension and is a concept variable in time.

Furthermore, the analysis of transformational trends suggests that traditional identity is perceived here only based on morphology; whereas, there are several other dimensions attached to traditional identity such as values, meanings, associations, memories, sense of place etc. There are various ways in which inhabitants associate themselves with a place and draw their identity; many of them can be categorized as 'unselfconsciously' produced characteristics of a group as per the discourse of Sachlichkeit. The amalgamation of all these associated dimensions gives a complete sense of traditional identity; therefore, the conception of traditional identity remains incomplete if it is seen plainly as morphological identity. In fact, a

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transformation carried out without considering the traditional identity holistically can cause serious issues in the settlement.

To understand this point in the context of Algiers, let us take the example of 'place identity'- the manner in which people associate with a place. As discussed earlier, the vernacular Islamic settlement was a derivative of socio-cultural behaviors to a great extent. Moreover, the community itself was actively involved in the process of building; hence, the morphology completely corresponded to their associational values and place identity. However, when the morphological identity changed under the imposition of French rule, the correlation between morphology and place identity was lost. The French morphological symbols carried no meaning or association for the locals. Therefore, the morphology functioned merely as an object that was completely detached from its local context. Moreover, the French solutions were neither affordable nor climatically efficient for the locals. The morphology, thus, failed in supporting, containing or guiding their behavior pattern (The term behavior is used here as inclusive of perceptions, cognitions, affect, preferences, social interactions, roles, meanings and all-encompassing dimensions as defined by Rapoport (1986)).

Parallely, in all attempts of strict conservation of the Kasbah, the morphological identity was considered to be frozen in time and no changes were allowed in the built forms. Herein, initially, the morphology closely responded to the place identity. However, changes in time and demographics changed the requirements, aspirations and lifestyle of the locals majorly altering their associations with the place and making the morphological symbols irrelevant. Thereafter, an effort to conserve the morphological identity (with no consideration of place identity) could only result in theme parks, gentrification, poor living conditions, land scarcity, deteriorated sanitation levels and shanty towns.

In both examples, the cross-section of 'system of activities' and 'system of settings in which they occurred' did not match in Rapoport's (1997)⁶⁷ terms, which created major issues on front of the living conditions. By not considering the associational identity of the settlement, the mentioned transformations caused a major gap between the urban form and the socio-cultural-economic structure of the settlement. The notion of traditional identity, thus, needs to be understood holistically, particularly, in reference to its application in built environment. It should be comprehended not only through its formal attributes but as a system closely associated with the socio-cultural-geographical fabric of a place.

Furthermore, all these dimensions associated with identity are flexible in time. With significant changes in values, meanings, associations, cultural behaviors and built forms, related identities also change. On the other hand, there is a factor of subjectivity involved in the perception of identity of any kind. Accordingly, it is possible that multiple symbols and multiple perceptions of identity exist in a common domain, where each perception finds its own morphological expression contesting the notion of a singular authentic identity. It is,

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however, the factor of time, collective memory and collective associations that eventually lead to a common perception of a group. Nonetheless, such common perceptions, too, are variable based on the polysemic nature of symbols. The term 'authentic traditional identity', therefore, must be employed with great caution, as it leads to the notion of an unchanged identity. This research has demonstrated a number of such instances of how a morphology produced under such notions of a fixed identity has failed to respond to contextual parameters and contextual changes.

Looking at such failures of urban transformations, Stuart Hall (1991) notably explains that morphology 'can only hope to symbolize national [or settlement] identity as observed by a single individual or groups of individuals at a specific point of time.' Traditional identity in reference to any built environment cannot be seen as a 'permanent' or 'fixed' image. Contrariwise, it makes sense only in a particular context. The term context, here, includes all parameters dependent on both place and time. Accordingly, a tradition developed in response to one context completely loses its relevance if imported to a different place or in a different time. To remain relevant, it should develop parallelly with the context adopting the necessary changes to appropriately respond to the changing contextual parameters. The concept of tradition in reference to the built environment, thus, can be construed as a concept in flux, but a concept that is always most appropriately responsive to its context. Correspondingly, traditional identity, too, can be seen in this light, as an identity of tradition that develops in response to context. This suggests the need to re-interpret the parameters of 'authenticity' for the application of traditional identity in the built environment, and to measure it based on how well it responds to the context developing the traditional line of thought.

6. CONCLUSION

In summary, the research intended to understand the dynamics of traditional identity in the process of urban transformation, which was examined through the chronological transformation of Algiers in the Maghreb region. A study of various approaches of transformation, compared to how the morphology was originally formed, suggests various notions related to traditional identity to be the underpinning reasons. Interestingly, it is observed that the perception of traditional identity is first formed based on the morphology, and is later employed to demolish and reconstruct new morphologies. Further scrutiny in the field of perception reveals how the perception of traditional identity is constructed based on a stable image, and how this image varies with the variation in symbols. It further explains the polysemic nature of symbols, and discards the notion of a fixed or unchanged traditional identity.

Building on the case study and the theoretical inputs, three key derivations are made in reference to the application of traditional identity in urban transformation: (1) Traditional identity is variable in time. (2) The concept of traditional identity is not only associated with morphology but is based on an amalgamation of

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many dimensions such as associations, values, meanings, memories, sense of place etc. Hence, to get a complete idea of traditional identity, it should be seen holistically. (3) Traditional identity makes sense only in specific context. Accordingly, the research suggests that the measure of authenticity can be restructured, and can be focused on achieving the most appropriate response to a context, developing traditional approaches.

Thus, by proposing a more dynamic and holistic outlook towards traditional identity, the research opens up possibilities to explore avenues of development of traditional morphology. Furthermore, deviating from a mere form-based approach, it recommends understanding traditional identity as a system closely related to socio-cultural-economic-climatic context. While timeless identity-led morphological transformations are becoming a common phenomenon across the globe, this research brings to light some underlying issues and charts the path for alternate urban transformation and urban growth approaches that can allow flexibility, integrity and continuity with the historical morphologies.

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TRADITIONAL DWELLINGS AND SETTLEMENTS WORKING PAPER SERIES

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