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# Vernacular urbanism, unearthing lessons through urban analysis to increase urban sustainability in the Middle East : an analysis of Al Ula Old Town

Omar Abou Nader

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# VERNACULAR URBANISM

unearthing lessons through urban analysis to  
increase urban sustainability in the Middle East

an analysis of

## Al Ula Old Town



by  
**Omar Abou Nader**

# **VERNACULAR URBANISM**

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increase urban sustainability in the Middle East  
- an analysis of Al Ula Old Town -

by

**Omar Abou Nader**

**Master in Urban Planning and Development**

concentration in

**Transformative Urban Studies (TRUST)**

Thesis Report

**Université Grenoble Alpes, Institute of**

**Urbanism and Alpine Geography**

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Omar is the author behind Vernacular Urbanism. He is an architect, urban designer and planner. His passion to explore the world and investigate architecture & urbanism has taken him from his home country Lebanon to Dubai where he spent nearly a decade studying and practicing architecture and urban design, before moving to France in 2021.

During his B.Arch, Omar undertook an internship with Sou Fujimoto Architects in Tokyo, an experience that marked him deeply and changed his outlook on socio-spatial design. Inspired by this, his award-winning undergraduate thesis project explored new frontiers in urban intervention to influence Dubai's evolving social and urban fabric.

After graduating in 2017, Omar worked on a broad range of urban and architectural projects across the Middle East and Asia alongside renowned design firms, Woods Bagot and CallisonRTKL. As a young professional, Omar is proud to have witnessed several of his projects come to life, most notably the Red Sea Coastal Village.

Dedicated to assisting communities, Omar has co-led a mission to support the UN-Habitat in efforts to Build Back Better Beirut's public spaces after the port blast in 2020. This sentimental experience has led Omar to move to France in 2021 in pursuit of complementary skills to better contribute to an ever-changing (urban) world.

In his other life, he is a cave explorer and expedition leader.

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## **Abstract**

At a time of heightened urban challenges, there is a growing voice urging us to look back at how our ancestors built cities. This thesis examines if vernacular knowledge in the Middle East is first needed by architects and urban designers, and if so, what are some of the lessons that we can deduce in order to increase some aspects of urban sustainability.

Incorporating evidence collected from 30 respondents, this study demonstrates that architects and urban designers in the Middle East believe that vernacular knowledge could be the key to building cities that are climate responsive, human-centric, and reflect local architectural and urban identity. The study then proceeds in building a methodology for VERnacular urBan Analysis (VERBA), which is subsequently used to analyse the urban characteristics of the archeological site of Al Ula Old Town in Saudi Arabia. The results reveal interesting patterns between the Old Town's spatial characteristics and socio-environmental aspects such as user behaviour in navigating the meandering streets, and thermal comfort within the various public spaces, indicating that vernacular sites indeed do hold precious knowledge.

Keywords: Vernacular urbanism, urban sustainability, Al Ula Old Town, spatial analysis, VERBA.

## **Abbreviations**

CAD Computer Aided Drawing

CFD Computational Fluid Dynamics

EQ Environmental quality

FAR Floor area ratio

GCC Gulf Cooperation Council

GFA Gross Floor Area

HCC Heritage Conservation Consulting

KPIs Key Performance Indicators

MBS Mohammed bin Salman Al Saud

ME Middle East

MENA Middle East and North Africa

PIF Public Investment Fund

QL Quality of life

RCU the Royal Commission for AIUla

SD Sustainable development

TRUST (Master's in) Transformative Urban Studies

UTCI Universal Thermal Climate Index

VGA Visibility Graph Analysis

## **i. PROLOGUE**

Defining what vernacular architecture exactly is, is a challenge by itself, let alone translating this vernacular into meaningful and functional design. This thesis is a personal exploration to unearth a little more on the vernacular.

### **A professional necessity**

I moved to Dubai in the summer of 2012 and left to the day, 9 years after. Throughout almost a decade of studying, teaching and working in the architecture and urban field I always faced a multifaceted dilemma when it came to vernacular architecture. I often questioned, like many others, how can we leverage vernacular architecture in what we do? How do we leverage vernacular architecture in our response to increasing contemporary urban challenges such as climate change, identity loss, and lack of human centricity?

This feeling heightened during my professional career where vernacular research sometimes felt like ticking a box rather than helping solve a challenge. If vernacular architecture did indeed hold valuable knowledge, then why are we not capturing that in our designs beyond aesthetics? And if vernacular architecture does not help solve contemporary challenges, then why are we adamant on exerting resources to study it and then burying that knowledge in the drawers?

Despite a lot of efforts put into research on some projects, the vernacular essence sometimes felt lost in translation. At times, it felt that it was either done for aesthetics, for branding, or to give false validation to the end product. On other projects certain vernacular characteristics morphed well within the project brief, client intentions, and internal design efforts. Besides a few successful attempts, albeit sometimes unintentional, understanding vernacular and then translating it remains a challenge.

Therefore, I always believed that comprehensive investigations were a necessity. I stress here on the plural form to underline that I do not believe in a one rule fit all nor a generalisation to assert or debunk vernacular usefulness.

Over the years, many colleagues shared my outlook on problematics revolving around the use of vernacular architecture in the Middle East, and especially in the Gulf



countries where rapid urbanisation is in full effect. Endless discussions over lunch breaks, late nights, and gatherings where non-architects wished they never joined the outing, always somehow ended in a consensus: vernacular is good, but how do we take it forward?

While preparing my topic, professional network posts (such as LinkedIn) affirmed that these sentiments and opinions are not confined to my circle but are rather widespread across the urban planning and design industry. These public posts proved primordial to my research, leading me to exchange with various planning experts on the topic in order to better inform myself and my study.

Therefore, this thesis does not only respond to a knowledge gap, but to pertinent questions shared across the design industry which encompasses architects, urban planners, and their clients whether it is private developers or governmental entities.

### **An ancestral duty**

But, why vernacular, besides the obvious?

Hailing from Dhour El Choueir, a small village tucked in the rugged terrain of the Lebanese mountains, I believe that I did not choose architecture as a career but rather as an ancestral vocation. Those same ancestors, master builders and artisans, were renowned across the Levant with evidence of constructed habitats stretching as far as the north of Saudi Arabia (Chebl Baaklini, 2020).



Figure 1. Picture of Dhour Choueir dating back to the 19th Century. (The Fouad Debbas Collection, n.d.)

What made Choueiri (derived from the name of the town) builders stand out was their unparalleled craftsmanship in masonry and their signature triptych arches, an icon in traditional Lebanese houses (Chebl Baaklini, 2020). Their architectural sensitivity resulted in a typology that the local inhabitants regard as habitats that respond to their needs, respect local terrain, and are in harmony with nature. Unfortunately, industrialisation, wars, and conflicts slowly forced stone into concrete and with time, the know-how dissipated with the departure of the last mason.

### **A fated convergence**

Between pragmatism and romanticism, modernity and tradition, vernacular architecture forever populated my design intentions albeit unconscious at most times. A fanatic of user behaviour and experience, I naturally gravitated towards environmental psychology while - admittedly - putting vernacular learning on the back burner. It was not until I came across Philippe Garnier, David Gandreau and the rest of the CRAterre team that I realised that the two fields are not exclusive and that my interest lies in both.

My first interaction with CRAterre was during a one-week intensive course as part of the TRUST master's in early 2022, where through a series of lectures and manual workshops I learnt heaps about Earth Architecture. Through subsequent interactions with Philippe and David, I learnt more about CRAterre's multidisciplinary international team, their pioneering work across the globe, and most importantly their ongoing projects in my former playground: the Arabian Peninsula.

After learning more about these projects, my first reflection was: "Finally! someone going beyond the pastiche, now how can we take that to the drawing board and tell every designer?". However, the juncture was hearing about CRAterre's work in Al Ula Old Town, a vernacular settlement in North-West Saudi Arabia that forever bedazzled me and realising there is much to collaborate on. The instantaneous match led to a cross-disciplinary collaboration between urban design, architecture, and archeology, which brainchild is this thesis.

## **01 INTRODUCTION**

## 1.1 Problem statement

Rapid urbanisation in the Arab countries has been labelled a curse and criticised for accelerating urban challenges (Elgendy & Abaza, 2020) as well as creating homogenous, out-of-context communities (Bin & Sinclair, 2017, p. 1-2; Salama, 2015, p. 32-36). This is attributed to designs that overlook local climate conditions (Benslimane & Biara, 2019, p. 1248-1251), local architectural identity (Bin & Sinclair, 2017, p. 1), and human-centricity (Alonso, 2017). In response, some scholars believe that knowledge of vernacular architecture and urbanism is key to achieving sustainability within contemporary architecture (Correia et al., 2015, p. 17). While significant research has been done to study vernacular architecture, there has been little work exploring vernacular urbanism in the Middle East and even less so in archeological sites.

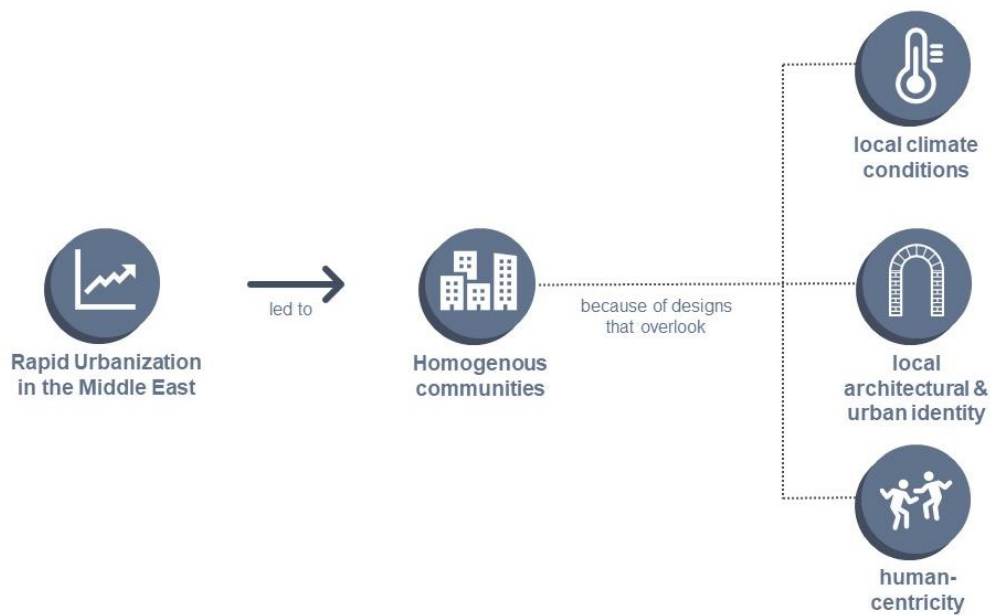


Figure 2. Research problem. (Diagram by author, 2022).

Beyond literature, primary data collected from architecture and urban design professionals working in the Middle East revealed a desire to further investigate vernacular architecture in the region. What started out as an assumption following personal experience and opinions on professional networks, was later confirmed through a series of interviews and survey responses. Subsequently, it became evident that what design and urban professionals in the Middle East lack is not curiosity, but rather data, interrogation, and in-depth exploration.

Consequently, to gain a fuller understanding on vernacular urbanism and how we can utilise it to alleviate the aforementioned urban challenges in the prologue, in-depth quantitative research is required. Focusing on archeological sites can help understand certain vernacular design tendencies and principles away from the preconceived notions of city planning and regulations. By leveraging urban analytics, this study hopes to unearth ancient knowledge that will not only fill in a scholarly gap, but will potentially inform urban designers and planners.

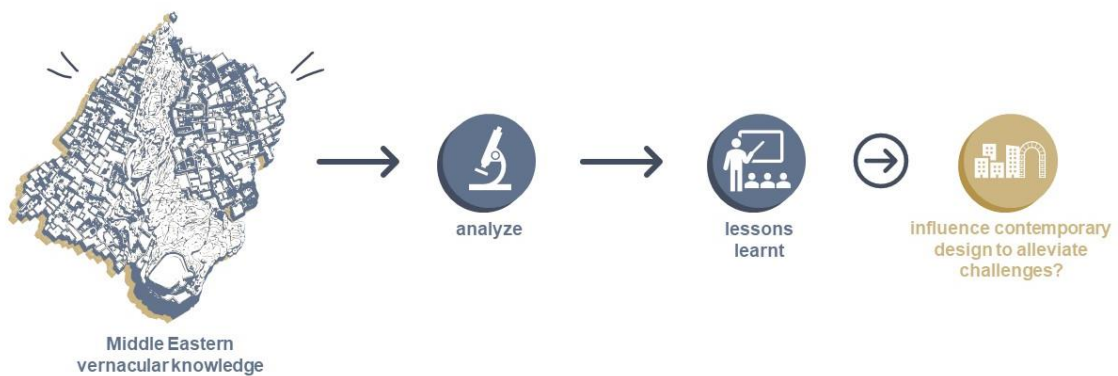


Figure 3. Hypothesised response to the research problem. (Diagram by author, 2022).

## 1.2 Research objectives

- This research will first solicit architecture and urban planning professionals in the Middle East to understand whether or not vernacular knowledge is sought after in designing new developments in the region and whether or not these design professionals see vernacular knowledge as a valuable way to solve contemporary challenges related to climate, identity and human-centricity.
- The study will contribute in decreasing the knowledge gap that exists on three levels:
  - the gap in vernacular architecture and urbanism research within the Middle East,
  - the gap in the information and depth of urban analysis in Al Ula Old Town,

- the general lack of environmental performance analysis and urban network analysis using Space Syntax methodology and techniques within archeological sites in a consolidated urban analysis framework.
- Determine if there are lessons to be learnt from vernacular urbanism that can be adapted in the designs of contemporary developments beyond mere aesthetics, and if that's the case, develop a catalogue of what these lessons are.
- Establish an urban analysis toolkit/framework for future research on vernacular urbanism.
- Encourage architects, planners and decision makers to invest more in learning from vernacular and leveraging this knowledge in current and future designs to overcome and avoid the identified challenges.

### 1.3 Methodology overview

The methodology of this research is two-parts: Part A is a research validation exercise, while Part B is the urban analysis methodology.

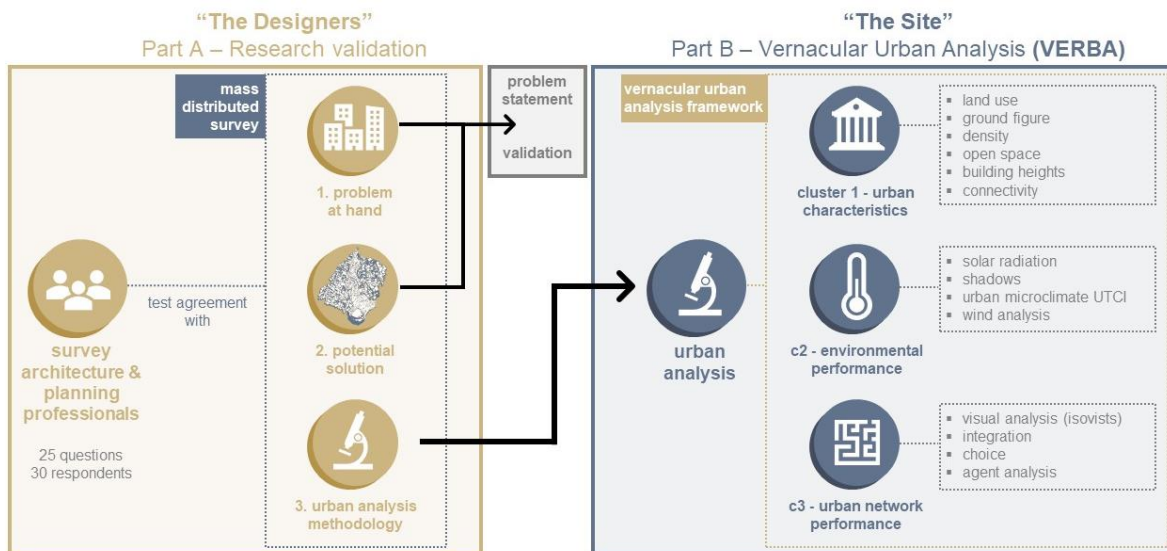


Figure 4. Methodology visually represented, additional details are available in chapter 4. (Diagram by author, 2022).

The first part (A) stems out of a desire to not only close a knowledge gap but to also make this research relatable to designers and ultimately translatable in (urban) design.

To do so, it was important to capture experts' insights and accordingly fine-tune the proposed research questions and problem statement, expand on the literature review, and tailor the urban analysis methodology in Part B. The approach used is a mix of secondary source and primary source data collected from LinkedIn posts (professional network) and a survey distributed over the same platform.

The second part (B) is the central methodological approach used to respond to the main research questions. As a first step, various archeological sites were screened and then Al Ula Old Town was chosen as the case study. The second step was to construct a set of urban analysis methods and tools categorised in three groups, ranging from 'conventional' observation methods covering urban basics such as land-use and open space to data-driven computational methods covering environmental analysis and urban network analysis. While the data collection is predominantly quantitative primary source data, in certain instances secondary source data was consulted and cross-checked.

For the urban analysis (Part B), I first drew a CAD (computer aided drawing) drawing based on a PDF plan sourced from CRAterre's database. I then used the CAD drawing to create the 3D model, supplemented by information such as building heights from other field surveys done by CRAterre or partners. The basic analysis (cluster 1) was done using conventional drawing and graphics software with data found in books and CRAterre's database. I carried out most of the environmental analysis and network analysis (clusters 2 and 3) in a 3D modelling software using readily available open-source code definitions.

#### **1.4 Innovation and significance**

This graduate thesis bridges the fields of archeology, architecture, and urbanism and proposes a more holistic urban analysis methodology to study vernacular architecture. This cross pollination between archeology and urbanism can be partly seen in the works of Katherine A. Crawford, notably in her research titled *Rethinking Approaches for the Study of Urban Movement at Ostia* (2019), in which the author uncovers



insightful learnings on pedestrian movement in an ancient settlement through the use of computational methods.

Furthermore, despite the various efforts to research urban characteristics and attributes of archeological sites in order to respond to contemporary urban challenges, little research has been done in the Middle East, and even less so in the Arabian Peninsula. Moreover, the selected site, Al Ula Old Town, presents an even greater opportunity to widen the available literature since there is little information published on this settlement. While professor Hisham Mortada made significant effort in his book *Al-Ula Unearthed* (2020) to give an urban overview of Al Ula Old Town, there is still much to analyse, investigate and delve into.

Finally, what makes this thesis more significant is the fact that it stems out of the architecture and urban planning/design industry's desire to learn more about and leverage vernacular knowledge in upcoming developments. If proven true, the findings within this thesis can potentially inform design decisions and find its way into the drawing board. Therefore, I would like to consider this thesis, similarly to vernacular architecture, of the people, by the people and for the people. Finally, while I am aware of the limitations of this study (discussed in sub-chapter 1.5), I am optimistic that this study will be the first of many to come, especially with the growing interest in this field and with the ongoing efforts to further open Saudi Arabia's hidden gems to the world.

## 1.5 Limitations

Inevitably, the research presented challenges and limitations:

- **Data:** Al Ula Old Town is an ongoing project involving several consultants and institutions. In addition, it is an archeological site and thus some information is based on assumptions, unfinished surveys and initial observations. Consequently, confidentiality agreements and/or lack of data have either hindered certain types of analysis such as building heights and density, or resulted in analysis which accuracy is to be determined in the future as more fieldwork is carried out.

- **Expertise and software:** Certain analysis types such as wind analysis CFD (Computational Fluid Dynamics) using Rhino+Grasshopper software proved to be very difficult and beyond my set of skills, alternative software were expensive to purchase. Additionally, certain analysis types such as the urban microclimate analysis were extremely demanding in terms of computational power requiring long hours of runtime. Consequently, I could not compute the overall area and was obliged to restrict the analysis to selected zones (a roughly 10% zone took around 6 hours of computation).
- **Archeology:** The depth of my observation and analysis were limited since my knowledge of archeology is also limited.
- **Methodology:** The notion that urban analysis is almost unlimited is not far fetched. To study one aspect, a plethora of tools and methods can exist. For instance, solar exposure can be studied in multiple ways and from various perspectives using different available tools and techniques. My profile is polyvalent and generalist, consequently I constrained my analysis with the tools and techniques I knew, well knowing that more thorough, comprehensive and accurate analysis can be done by a specialist in a certain topic or analysis type.
- **Time:** Public enemy number 1, time has forced me to adjust the scope several times along the timeline and consequently having to prioritise from an extensive urban analysis methodology that would have helped me reach better research outcomes. As a result, some urban analysis types appear in chapter 4 (methodology) but not in chapter 6 (urban analysis data collection and analysis). I hope that future research(ers) would take the full methodology in consideration and hopefully fill in the gaps.

## **02 LITERATURE REVIEW**

## 2.1 An introduction to today's urban and architectural challenges

According to Aisa Kirabo Kacyira, the UN-Habitat Deputy Director and Assistant Secretary-General, urban zones have steadily grown over the last two decades into the main habitat of humankind due to demographic growth and socio-economic convenience (Kirabo Kacyira, 2012, p. 58-59). While Kirabo Kaycira acknowledges the socio-economic benefits of cities, the Deputy Director urgently stresses the need to protect the environment and thus people from the detrimental impacts of urbanisation (Kirabo Kacyira, 2012, p. 58). Part 2 of the report titled *The future of cities: Opportunities, challenges and the way forward* (2019) by the European Commission revolves around 7 urban challenges such as mobility, affordable housing and urban health, showcasing the multifacets of urban challenges.

With yearly urban summits, awareness campaigns, high research expenditure, new policies and far more, urban challenges and issues are no longer the elephant in the room. However, urban challenges and issues unfortunately spread across different sectors, fields and aspects. Therefore, in a bid to situate this thesis, three urban and architectural challenges will take centre stage: climate, local architectural and urban identity, and human-centricity.

## Climate



*Figure 5. A flooded residential area after heavy monsoon rains in Pakistan on August 29, 2022. (Fida Hussain via Getty Images as cited in Lu, 2022).*

Probably the best-known and most-felt challenge is climate change, currently spreading devastation across the world through floods, droughts, wildfires, and unprecedented storms (Kirabo Kacyira, 2012, p. 58). At the time of writing this thesis, Pakistan is facing one of the worst floods in its history with a death toll of over 1,000, France is facing challenging wildfires amidst drought, and Italy continues to investigate the unexpected avalanche on the Punta Rocca glacier. These unfortunate incidents and disasters spearhead the news, however, there are much more facets to climate change that impact urban zones and everyday life.

According to the European Commission (2019), cities are responsible for generating about 70% of global GHG (Greenhouse Gas) emissions and in turn, cities are the most vulnerable to the impacts of climate change (European Commission, 2019, p. 83). Due to global warming, the European Commission suspects that “city residents and the critical infrastructure on which they depend will face more frequent flooding, drought,

heatwaves and intense rain events along with other climate related hazards” (European Commission, 2019, p. 84). These side-effects of climate change will consequently lead to higher health problems, an increase in energy use, and a higher strain on local and global resources (European Commission, 2019, p. 84).

Consequently, organisations such as the European Commission (2019) and the UN-Habitat (2019b) who are at the forefront of urban climate resilience strongly urge decision makers and planners to decarbonise cities, improve resiliency (European Commission, 2019, p. 84), and built “climate friendly” cities (Kirabo Kacyira, 2012, p. 59).

### Architectural and urban identity



Figure 6. Homogenous architectural identity from different regions, circa 2014. (Horton, 2014).

Architectural and urban identity might not be echoed through research and media as much as climate change, but it nevertheless remains an important challenge within the architecture and urban fields (Adam, 2012, p. 176). To start with, the Oxford dictionary defines identity as “the characteristics, feelings or beliefs that make people different

from others”. In architecture this translates into the architectural characteristics and similarities that have developed over time in a certain region, crafting a unique architectural language to the same place (Leon Martens, 2020).

In other words, identity is a socio-cultural concept that is shaped by social, cultural, economic, political, and technological factors, and which is manifested by tangible facets such as architectural and urban styles. To illustrate, Mayan architecture reflects the architectural style that was specific to modern day Mesoamerica, while Māru-Gurjara architecture reflects the architectural style that was specific to modern day India. Both styles existed around the same time but were distinct and reflected a unique local architectural style.

Yaldiz et al. (2014) report that architectural and urban identity play an important role in social dynamics as spatial characteristics shape the way people meet and interact. In addition, scholars such as Kevin Lynch and Aldo Rossi assert that architecture and urban space are integral parts of people’s identity, memories and belonging (Yaldız et al., 2014, p. 222-223). In the chapter titled *Identity and identification: The role of architectural identity in a globalised world* (2012), Robert Adam underscores architectural identity as a way to reinforce community values and support vulnerable communities. Kevin Lynch’s collective memory, the notion of ‘genius loci’, Paul Oliver’s vernacular, and more literature on 20th and 21st century architectural movements will be discussed in subchapter 2.2 adding more details to this overview. However, the highlight is drawn to the importance of preserving and highlighting local architectural and urban identity.

With the rise of globalisation, however, architectural and urban identity in the spatial characteristics sense of the term has been greatly threatened and widely altered (Adam, 2012, p. 179). Hoshiar Nooraddin (2012) asserted that architectural identity in several places around the world has shifted from mirroring the local context in its various tangible features such as colours, materials, shapes, and culture to a “scene of crowded architectural identities” (Hoshiar, 2012, p. 83). Adam (2019) simply labels this phenomena as a product of the “homogenising” force of globalisation. While architectural and urban identity will be further discussed in the next subchapter, it is

important to end by stressing on the importance of including architectural and urban identity as a key challenge.

## Human-centricity



*Figure 7. This photo showing a diner's table squeezed between two cars has become a symbolic picture to represent (the lack of) human-centric and liveable urban spaces. (Horton, 2014).*

“Take good care of the people, and the precious life between the buildings”

Jan Gehl (2010)

“Human-centricity” is a term that has been gaining traction over the past decade across several fields such as governance, information technology, and urban planning (Mcbride et al., 2022, p. 4). In planning, human-centric entails a design or approach that responds to people’s needs and wellbeing (Mcbride et al., 2022, p. 3). In other words, it is about “humanising” urban space in order to make cities more inclusive, safe, resilient, and sustainable (UNESCO 2016, 205 as cited in Almahmood et al., 2018, p. 1). Professor Tim Stonor, Space Syntax Managing Director and spatial design expert, drew attention to human centric design as a way forward to increase livability in urban zones amidst growing issues such as overcrowding and dependency on the automobile (KONE, 2021).



Several urban designers and scholars such as Jan Gehl (2010) and Jane Jacobs (1961) have dedicated their lives to the study of human-centric design, way before the term was even coined. For instance, Gehl managed through rich references to sociology and psychology to build a rich literature work most notably *Life between buildings* (1971) and *Cities for people* (2010). In the first book, Gehl establishes pioneering work on how and why people use public space by studying the human body and senses; while in *Cities for people*, Gehl builds on the foundational work he did in his first book to underscore the importance of human scale and walkability in creating successful urban spaces (Potter, 2011).

In the first chapter of *Cities for people* (2010), Gehl's contempt with how the human scale has been overlooked in planning is evident (Gehl, 2010, p. 3). Similarly to other scholars, Gehl attributes some of these failures to modernism (which will be discussed in subchapter 2.2) and in the final chapter of the book calls rapidly urbanising cities to embrace human-centricity (Gehl, 2010, p. 227-229).

In admiration of Gehl's notions, Stonor believes that human-centric principles such as walkable streets and a reasonable distance between residence, work and amenities, which existed in the pre-industrial city need to be readopted if we want to build sustainable cities (Potter, 2011).

To sum, a human-centred urban space is defined as "being accessible, walkable, safe, comfortable, liveable, inclusive, and sociable" where people can rest, play and meet (Almahmood et al., 2018, p. 2). Human-centricity is therefore an important pillar to consider in urban challenges and will be the third urban challenge this thesis will focus on.

## **2.2 Learning from vernacular, a trend or a way-forward?**

### **What is vernacular architecture?**

In Latin, *vernaculus* means native, indigenous, or domestic (Mahoney, n.d.), and in certain instances, this definition can and has been interpreted in a derogatory manner

(primitive, archaic, unsophisticated, etc.) by Western scholars (Blier, 2006, p. 230) (Rudofsky, 1964, p. 3). Subsequently, as with many ‘technical’ terms across a multitude of fields, several definitions exist. Thanks to scholars such as Bernard Rudofsky (1964) who pioneered in investigating the “vernacular”, today we can find a widely used terminology that is not one-sided, elitist, or pejorative. Rudofsky paved the way for several other scholars such as Suzanne Preston Blier (2006) and Paul Oliver (2007) who have more recent work covering vernacular.

Delving into the definition, vernacular architecture encompasses structures that are built by a given group of people with respect to their own environment and socio-cultural beliefs while using locally sourced materials and locally developed building techniques (Blier, 2006, p. 230-231). Vernacular architecture is therefore unique to different places and cultures in the world, built to adhere to specific geographies, climate, needs, values, resources, and lifestyle. The use of the term ‘vernacular architecture’ can refer to a type of local or regional construction in synonymy with the architectural identity of a region or place (Ghisleni, 2020).



Figure 8. Distinct architectural identity from different regions, circa 1914. (Horton, 2014).

Since this thesis investigates the urban scale, then the term ‘vernacular urbanism’ stemming out of ‘vernacular architecture’ will also be used throughout this research. The term vernacular urbanism is used to refer to the urban planning aspect of vernacular construction that focuses on the larger-scale fabric allowing a better understanding of urban spatial characteristics rather than just the building-level (Blier, 2006, p. 243-244).

### **Architecture without architects**

To better understand vernacular architecture and urbanism, we ought to start with the works of Bernard Rudofsky whose work is indispensable to understanding the protagonists of vernacular architecture and subsequently build on this throughout the literature review. In his book, *Architecture Without Architects: A Short Introduction to Non-Pedigreed Architecture* (1964), the author writes:

*“There is much to learn from architecture before it became an expert’s art. The untutored builders in space and time - the protagonists of this show - demonstrate an admirable talent for fitting their buildings into the natural surroundings. Instead of trying to “conquer” nature, as we do, they welcome the vagaries of climate and the challenge of topography. Whereas we find flat, featureless country most to our liking (any flaws in the terrain are easily erased by the application of a bulldozer), more sophisticated people are attracted by rugged country. In fact, they do not hesitate to seek out the most complicated configurations in the landscape. The most sanguine of them have been known to choose veritable eyries for their building sites-Machu Picchu, Monte Alban, the raggy bastions of the monks republic on Mount Athos, to mention only some familiar ones.”*

Rudofsky’s influential book is a reaction to neo-classical and modernist architectural styles, in which the author attempts to shed light on 50 centuries of construction that was “skipped” in architectural history in the Western world (Rudofsky, 1964, p. 1). From the above passage we can already identify two protagonists: a “non-expert” exponent and an “elite” exponent. The former which seems to have mastered building

in harmony with nature despite its challenging complexities, and the latter which seems to seek “flawless” and effortless design approaches. I tend to disagree with Rudofsky’s over-simplistic analogy purely due to the author’s choice of words, since humankind has managed over the past decades to overcome some of the most complex design and engineering challenges (i.e. the construction of Burj Khalifa on very challenging soil). Nevertheless, I see eye to eye with the core of his argument, which is that we seem to have forgotten how to build in response to climate conditions, people’s needs, geographical constraints, and socio-cultural sensitivities.

The emergence of these two protagonists in Rudofsky’s work is metaphorical in today’s design and construction field.

Vernacular in many instances was romanticised, merely aesthetic, and replicated in parts within a larger set of orthogonal, formal rules derived from the classical city model. While I understand why (high-influx of foreign architects and a reliance on western expertise), it does not change the fact that it is superimposing on the way our ancestors built settlements. Subsequently, this form of elitism extends beyond western literature as highlighted by Rudofsky and seeps into practice. To go even further, I would argue that elitism is inherent within the architecture and urban design field itself.

Furthermore, Rudofsky argues through a series of analogies that vernacular architecture is an instinctual approach to solving problems that respond to its users’ needs through iterative design processes (Rudofsky, 1964, p. 3-4). The author underlines the functional and spontaneous aspects of vernacular architecture through the writings of Darwin and Brehm who on different occasions highlighted events where fauna and animals sheltered themselves from the elements (Rudofsky, 1964, p. 2-3). Rudofsky wrote: “Brehm noted that one of his baboons “used to protect itself from the heat of the sun by throwing a straw-mat over his head”” and then Rudofsky developed further with his infamous quote: “suburban man falling asleep near his lawn mower, pulling a section of his Sunday paper over his head”, asserting “thus re-enacts the birth of architecture” (Rudofsky, 1964, p. 2-3). In simpler words, Rudofsky is trying to explain that the vernacular is the architecture of the people, by the people and for the people.



Figure 9. Makeshift rain hat from a newspaper. (Wisdom, n.d.)

Rudofsky's analogy and consequent remarks throughout his book provoke - for me - the saying: "necessity is the mother of invention", underscoring the intelligence and thoughtfulness that went into crafting these structures.

To end this subsection, Rudofsky's disdain of modern architecture echoed throughout his work. Perhaps the pinnacle of this rejection is his opposition to Le Corbusier's "a house is a machine for living in" that can be summed up in his following response: "the house has to become again what it was in the past: an instrument for living rather than a machine for living" (Pohl & Nájera, 2009).

Following Rudofsky's footsteps, several like-minded architects, planners and scholars have subsequently spent years advocating vernacular architecture in response to modern day challenges. For instance, Correia et al. (2015) reported in their publication titled *VERSUS: Heritage for tomorrow* that "vernacular heritage represents a great resource that has significant potential to define principles for sustainable design and contemporary architecture" (Correia et al., 2015, p. 17). This research is rooted within the same belief and tries to uncover vernacular knowledge in the Middle East to

mediate between sustainability, vernacular and contemporary architecture and urbanism.

### **Vernacular architecture and urbanism between heritage and modernity**

The debate within architecture and urbanism between tradition and modernity dates back at least to the Romans and has been a repeating dichotomy ever since (Brown & Maudlin, 2012, p. 347). Concerning the architectural or urban design, the point of contention remains whether to renew the previous architectural style through nuances or abstraction or whether to completely discard it in favour of the new architectural style (Brown & Maudlin, 2012, p. 347).

In recent history, this debate takes place notably between the vernacular and its antithetical: the Modernist movement. According to the Oxford dictionary, modernism is “a style and movement in art, architecture and literature popular in the early 20th century in which modern ideas, methods and materials were used rather than traditional ones”.

Within the field of architecture and urbanism, modernism is seen as the physical response to the environmental and social inefficiencies of the 19th century city, championing the use of technology to provide a better quality of life for city dwellers (Calmon de Carvalho Braga, 2013). This high-tech, efficiency-driven city evokes Le Corbusier’s vision of the machine for living, albeit here on the urban scale. In addition, modernism was responsible for the large-scale post-war reconstruction as well as creating and promoting the use of a universal architectural language and aesthetic across all regions and geographies in line with globalisation (Calmon de Carvalho Braga, 2013).

The opposition to Modernist architecture and urbanism did not take too long to manifest. In her book *The Death and Life of Great American Cities* (1961), influential urban theorist and activist Jane Jacobs fiercely defied this movement and its principles. Building from her first-hand experiences as an urban dweller, Jacobs challenged many Modernist urban characteristics such as the prioritisation of transportation infrastructure and hence the vehicle over more pedestrian-centric

approaches; the segregation of land-use and functions that limits diversification and increases homogeneity in the urban fabric (Kidder, 2008, pp. 256-259); and the use of long self-isolating streets that constrict social exchange and limits economic opportunity (Jacobs, 1961, pp. 178-180).

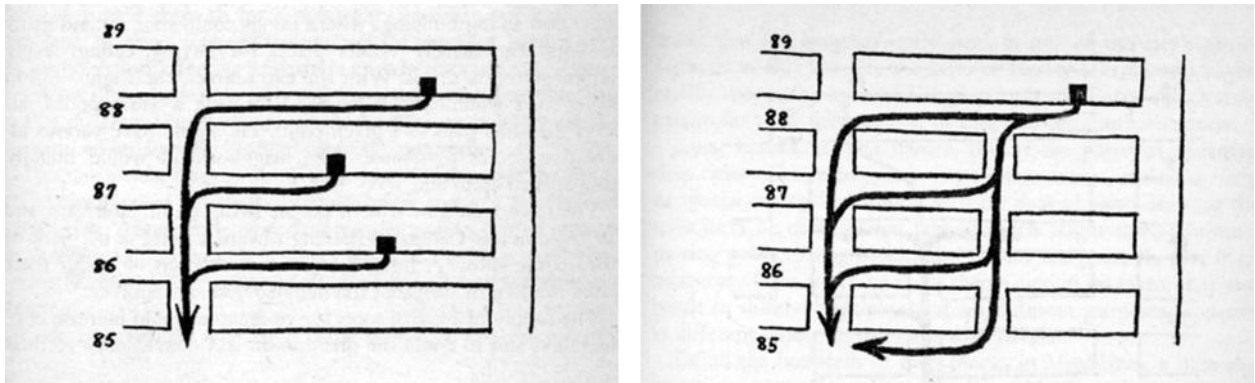


Figure 10. Illustrations extracted from *The death and life of great American cities* by Jane Jacobs, showing existing block conditions and ideal block conditions (Jacobs, 1961, pp. 179-181)

For instance, in the above illustration Jacobs demonstrates how Manhattan's current urban configuration (left side) restricts pedestrian movement and provides less choice, whereas shorter urban blocks (right side) would have enabled more freedom of movement and additional commercial frontage with various socio-economic advantages (Jacobs, 1961, pp. 178-180).

Jacobs' ideals soon latched on to urban planners, setting course to a fundamental shift in urban planning which ultimately led to the creation of the New Urbanism (Kunstler, 2022). New Urbanism is a movement that promotes human-centric and environmentally friendly design principles to create diverse, walkable, vibrant, and mixed-use communities (New urbanism, n.d.). As per the movement's official website, the movement aims to raise the quality of life by reviving the lost art of designing cities, "the way they have been built for centuries around the world" (New urbanism, n.d.). In other words, New Urbanism celebrates vernacular knowledge as an approach to create better communities and raise the standards of life for its users as opposed to the Modernist movement that abandoned the vernacular.

However, New Urbanism has also been criticised for being neo-traditionalist (Brown & Maudlin, 2012, p. 351). The Britannica dictionary defines neo-traditionalism as "the

deliberate revival and revamping of old cultures, practices, and institutions for use in new political contexts and strategies”, in this case the revival of old architectural styles. For instance, Kenneth Frampton argued that “superficial historicism can only result in consumerist iconography masquerading as culture” (Frampton, 1980, p. 377). Consequently, the general criticism of New Urbanism lies on the argument that it recycles vernacular architecture aesthetics, thus producing “pastiche” architecture rather than employing the logic and functionality behind vernacular architecture.

Therefore, architects and urbanists have a responsibility to go beyond mere replication when it comes to vernacular, or as Rudofsky elegantly paints the idea:

“The philosophy and know-how of the anonymous builders presents the largest untapped source of architectural inspiration for industrial man. The wisdom to be derived goes beyond economic and esthetic considerations, for it touches the far tougher and increasingly troublesome problem of how to live and let live”. (Rudofsky, 1964, p. 5)

Very much like Rudofsky’s refute to Le Corbusier’s machine for living on the architectural scale, Jacobs refuted the machine for living on the urban scale. However, her theories and writings faced criticism due to the lack of empirical investigation which was later tested as research on spatial analysis progressed notably with the introduction of Space Syntax which will be introduced later in this chapter (Rocco, 2018, p. 41).

In contrast to Jacobs, urban planner and author Kevin Lynch approached the subject from a more objective, apolitical point of view. In his book *The Image of the City* (1964), Lynch argues that the historical (aka the vernacular) city’s success lies in its ability to create a “vivid and sharp image”, which becomes part of the collective memory of urban dwellers and thus creating a strong social tie (Lynch, 1964, p. 5). In addition, Lynch reported that inhabitants processed the built environment in consistent and predictable ways, creating mental maps with five elements (Kepczynska-Walczak & Walczak, 2015, p. 3):

1. **paths**: routes along which people move within the urban environment;
2. **edges**: boundaries and breaks in continuity;



3. **districts:** areas characterised by common characteristics;
4. **nodes:** strategic focus points for orientation like squares and junctions; and
5. **landmarks:** external points of orientation, usually an easily identifiable physical object in the urban landscape (Lynch, 1964, p. 41-42).

Besides contributing to subsequent empirical studies and theories in urbanism, Lynch's theory highly contributed to the field of environmental psychology as well as urban philosophy, notably the contribution to the "*Genius Loci*". With roots in classical Roman religion, the term *Genius Loci* meaning evolved from "protective spirit of a place" to the contemporary definition "sense of place", first introduced to the field of landscape design by Alexander Pope in the 18th-century (Kepczynska-Walczak & Walczak, 2015, p. 2). Christian Norberg-Schulz later expanded on the concept and asserted that a physical space possesses socio-cultural significance and an identity of its own (Kepczynska-Walczak & Walczak, 2015, p. 2-3).

While *Genius Loci* is intangible from a psychological standpoint since it stems out of users' sensory experience (Bash, 2021), it is considered crucial in urbanism since it is linked with quality of life (Kepczynska-Walczak & Walczak, 2015, p. 3). For instance, the sense of place can evoke feelings of security and satisfaction for the inhabitants and consequently reflecting positively on the quality of life (Kepczynska-Walczak & Walczak, 2015, p. 3). Once again, the argument circles back to the vernacular, the *Genius Loci*, that needs to be imperatively embedded within any new or future project due to demonstrated benefits.

Whether one agrees with Rudofsky's admiration of the simplicity, functionality, and circumstantiality of vernacular architecture or not, the question of whether or not we should learn from the vernacular beyond pastiche has been settled. The question that remains is: what can we learn from the vernacular to help address the increasing urban challenges?

## 2.3 Sustainability and VerSus wheel as a vernacular-specific framework

### Sustainable architecture and urbanism

In 1987, the United Nations Brundtland Commission defined sustainability as “meeting the needs of the present without compromising the ability of future generations to meet their own needs” (United Nations, 2020).

Likewise, sustainable architecture/urbanism is characterised by a concern for the environment while trying to meet users’ current needs without compromising the needs of future users (Alho, 2017, p. 454). It is a dynamic and multidimensional concept that tries to balance conflicting requirements of simultaneously sustaining nature on one hand and the flows of production on the other hand (Alho, 2017, p. 454).

Although sustainability today has become a mainstream concept in the field of architecture and urbanism, we can trace its beginnings back to the early 1970s (Alho, 2017, p. 453) coinciding with Rudofsky’s *Architecture without Architects*. Moreover, Bennetts et al. (2003) assert that sustainable architecture is a response to various contemporary challenges triggered by human activity (Bennetts et al., 2003, p. 1). In the same spirit, this research turns to Middle Eastern vernacular knowledge in order to help alleviate some of the contemporary challenges evoked in the region.

Furthermore, in the chapter written by Vegas et al. in the publication *VERSUS: Heritage for tomorrow* (2015), the authors showcase multiple terminological variations that stemmed out of “sustainability” such as “low-tech”, “bioclimatic”, and “passive ecological” (Correia et al., 2015, p. 35). Despite nuances between the terminologies, they remain the same at the core: seek to utilise a conscious approach to optimise energy consumption, minimise environmental impact, and enhance well-being (Alho, 2017, p. 453-454).

Vegas et al. (2015) argue that “architecture has been sustainable from birth and that (...) it has satisfied many of the needs that today are no longer met” (Correia et al., 2015, p. 35). The authors add that vernacular architecture represents a natural response to both environmental and climatic constraints in addition to the socio-

cultural and economic aspects of a society (Correia et al., 2015, p. 17). Therefore, the vernacular approach was inherently conscious, optimising energy<sup>1</sup> consumption (i.e., due to careful positioning of the settlement), minimising environmental impact (i.e., since inhabitants depended on nature as a source of livelihood), and enhancing well-being (i.e., since materiality and construction techniques evolved to respond to people's needs). Consequently, this validates the choice of using vernacular as an approach to help offset some of the aforementioned contemporary challenges.

According to Bennetts et al. (2003), a paradigm shift took place in the architectural field wherein the notion of "good architecture" is no longer an architecture that shelters its users from the environment, but rather an architecture that protects the environment from pollution and other forms of degradation caused by human activity (Bennetts et al., 2003, p. 1). In contrast, vernacular architecture never differentiated between providing a shelter and caring for the environment prevailing once more as a potent approach.

Moreover, sustainability is often characterised with the "triple bottom approach" (aka 3Ps) which is composed of the environmental subsystem (Planet), sociocultural subsystem (People), and the economic subsystem (Profit) (Bennetts et al., 2003, p. 4). This triptych framework is used to assess the validity and success of designs (Bennetts et al., 2003, p. 4) and is described by the authors as a three-legged stool in which sustainability cannot be achieved if one leg fails (Bennetts et al., 2003, p. 84). The triple bottom approach will be further discussed in the VerSus framework subchapter.

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<sup>1</sup> The term energy here is used to refer to the strength that is required to sustain physical activity.



Figure 11. Triple Bottom Line concept based on the 3Ps: People, Planet, Profit. (Champions of the Planet, n.d.)

Moving forward, the sustainable spill over from architecture to urbanism shortly followed since some of the challenges needed to be tackled on the urban scale rather than on the individual building-level (Alho, 2017, p. 453). This was marked by the creation of various international frameworks and organisations following several key assemblies such as Habitat II in Istanbul and the ECO92 in Rio (Alho, 2017, p. 453).

As defined by Carlos Alho (2017), “Urban Sustainability (then) refers to the amount of environmental quality which is achieved at a particular level of quality of life in relation to a development planning process”. Environmental quality (EQ) is the physical characteristics of an urban environment whereas quality of life (QL) represents the wellbeing of people. EQ is gradually enhanced when there is a decrease in the negative effects of human activities on the urban environment (Alho, 2017, p. 454).

The main factors to be considered in the above relationship between EQ and QL are listed below in decreasing level of importance for EQ and inversely, an increasing level of importance for QL:

- Population of all species, Amount of resources,
- Dimension, Spatial density,
- Transportation and Mobility,
- Availability of Energy and nonrenewable resources,
- Biodiversity, Pollution and waste,

- Comfort, security and Level of Noise,
- Scientific knowledge and Educational services,
- Built heritage and Technological progress,
- Media and Communication between actors,
- Social cohesion (such as no crime) and Accessibility to social services,
- Economical structure and Resources use efficiency (such as employment),
- Architectonic style, Visual appeal of buildings,
- Democracy and participation in decision making,
- Solidarity and Equity,
- Community value (sharing vision).

(Alho, 2017, p. 454-455)

Consequently, a delicate balance between EQ and QL is required to achieve SD (sustainable development). Some of the above factors will partially resurface throughout the research, notably the spatial qualitative aspects such as spatial density, comfort, and architectonic style.

In conclusion, Alho (2017) invokes an important point which is that despite the fundamental aspects listed to achieve Sustainable Development, this approach is not yet universally adopted and instead of creating a trendy label, Sustainable Architecture and/or Urbanism should be a basic consideration in the design process (Alho, 2017, p. 455). To this end, organisations such as the UN continue to evolve sustainability frameworks within the fields of architecture and urbanism to increase sustainable development.

### **2030 Agenda for Sustainable Development**

Since coining the definition of sustainability in 1987, the United Nations along with its Member States have continuously worked into building sustainability frameworks, culminating in the creation of the 2030 Agenda for Sustainable Development (United Nations, 2020). Today, the 2030 Agenda is widely used amongst governmental and non-governmental agencies across fields (United Nations, 2020) and hence why it is essential to showcase it and explain its limitations for this research in order to adopt a more adequate framework tailored towards the vernacular.

The 2030 Agenda englobes 17 Sustainable Development Goals (SDGs) repatriated on several thematic issues such as climate, urbanisation, and transport (United Nations, 2020). Furthermore, urbanisation is tackled under SDG 11 titled “sustainable cities and communities” with an official mission to “make cities inclusive, safe, resilient and sustainable” (United Nations, n.d.). SDG 11 hopes to achieve this through 10 targets of which 7 are called “outcome targets”, and which are:

*11.1 – “Adequate, safe, and affordable housing and basic services and upgrade slums”*

*11.2 – “Safe, affordable, accessible, and sustainable transport systems”*

*11.3 – “Enhance inclusive and sustainable urbanisation and capacity for participatory, integrated and sustainable human settlement planning and management in all countries”*

*11.4 – “Strengthen efforts to protect and safeguard the world’s cultural and natural heritage”*

*11.5 – “Reduce the number of deaths and the number of people affected by disasters and decrease the direct economic losses relative to global gross domestic product caused by disasters”*

*11.6 – “Reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management”*

*11.7 – “Provide universal access to safe, inclusive and accessible, green and public spaces”*

Target 11.4 stands out in this research evidently due to the focus on preserving cultural (and natural) heritage since this has been linked to vernacular architecture and urbanism. The Target has one indicator: “Total per capita expenditure on the preservation, protection and conservation of all cultural and natural heritage, by the source of funding (public, private), type of heritage (cultural, natural) and level of government (national, regional, and local/municipal)” (United Nations, n.d.).

The above indicator for Target 11.4 evaluates cultural and natural preservation from a financial perspective (per capita expenditure) in order to contribute to urban sustainability. While this target directly impacts cultural heritage, it fails to tap into this

vast resource of knowledge in order to increase sustainability as highlighted in the works of Rudofsky and more recent scholars. Preservation remains an important factor in cultural heritage, but from a sustainability point of view, this sub-target of SDG 11 falls short of achieving its full potential. Similarly, Targets 11.6 and 11.7 seem to also relate to this research's objectives, but a closer look at the indicators shows that these two targets cannot be fully leveraged in this study either.

While the 2030 Agenda in general and SDG 11 in specific are undoubtedly beneficial in increasing sustainability on a high-level and in general cases, they remain largely vague and unsuitable for use in some specific cases such as this study. To this end, Bennetts et al. (2003) stressed on the necessity to impose suitable assessment frameworks that include adequate criterion for specific cases. After all, the UN Deputy Secretary-General, Ms. Amina Mohammed advocated that "addressing the mega trend of urbanisation so that it promotes sustainable development will require a whole-of-system approach, and joined up action at all levels of engagement" (UN-Habitat, 2019b). Consequently, this study will turn to the vernacular-specific pioneering work of the VerSus framework.

### **VerSus framework**

The VerSus project stems out of the intersection between *Vernacular* and *Sustainability*, responding to one key question: "*which are the lessons embedded in vernacular heritage that can contribute to sustainable architecture today?*" (Correia et al., 2015, p. 15). The project considers itself a relay from Paul Oliver's *Encyclopaedia of Vernacular Architecture of the World* (1997) (Correia et al., 2015, p. 13) and is naturally a continuation from literature work into academic research. This study builds on those two pillars and hopes to open doors to the professional practice within the field of architecture and urbanism.

Furthermore, VerSus builds on literature review of more than a thousand articles treating the subject of vernacular heritage (Correia et al., 2015, p. 17). The result is a systematised set of 15 principles encompassing several strategies and divided over 3 categories following the triple bottom approach:

1. Environmental sustainability

2. Socio-cultural sustainability
  3. Socio-economic sustainability
- (Correia et al., 2015, p. 17)

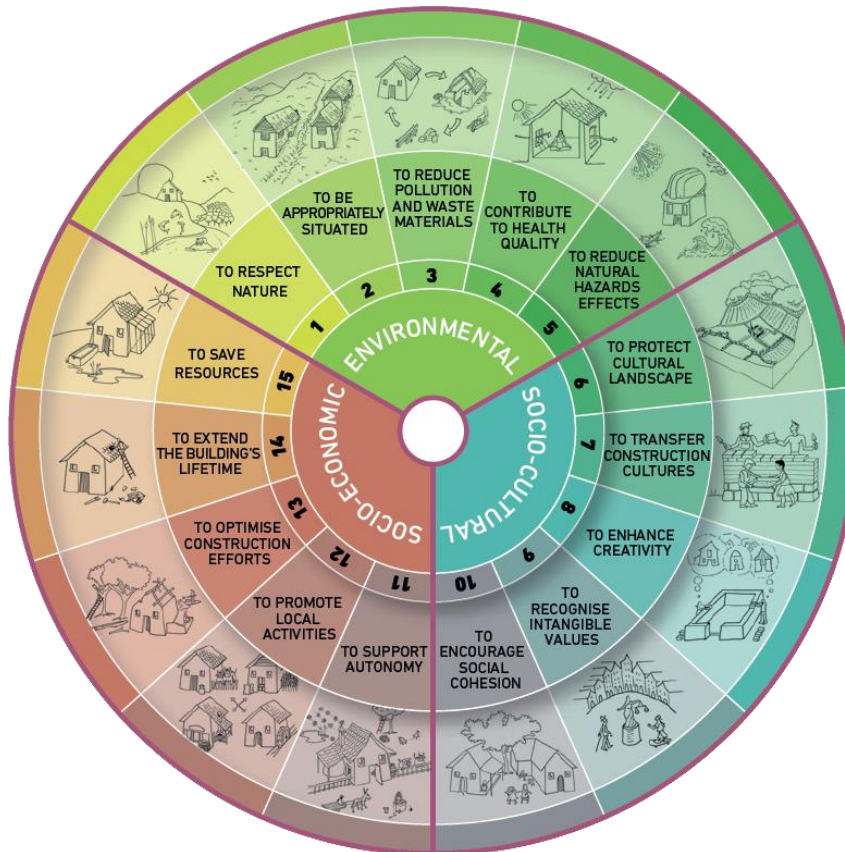


Figure 12. VerSus wheel framework. (Correia et al., 2015, p. 29)

The first category, Environmental, addresses the ability of people to limit the negative impacts on nature and the ability to compensate for any negative consequences on the biosphere (Correia et al., 2015, p. 26). It relates back to Environmental Quality (EQ) previously discussed with the work of Alho (2017).

The second category, Socio-cultural, englobes more intangible aspects such as human relations, identity and sense of belonging (Correia et al., 2015, p. 26). It is often correlated with the process or the after-effect of the product rather than the product itself (Correia et al., 2015, p. 26). This scope relates back to Quality of Life (QL) previously discussed with the work of Alho (2017).



The third category, Socio-economic, is the most quantitative aspect of the three and encompasses monetary value as its basic indicator (Correia et al., 2015, p. 26).

In summary, VerSus is a framework born out of vernacular heritage to improve sustainability within contemporary projects. As such, VerSus is the ideal framework that is woven within the DNA of this study and should be utilised in vernacular studies. However, as it stands, VerSus needs to be refined to address additional sustainability pillars such as governance which can be found for instance in the SDGs (e.g. targets 11.3 & 11.4).

## 2.4 Tailoring a geographical delimitation of the Middle East

In order to geographically situate and focus the research and subsequently the case study, a geographical stratification from the regional to the local context is a must. But first, a geographical definition of the term “Middle East” respective to this study is imperative.

The term “Middle East” is often used synonymously with “Arab States” or “Middle East and North Africa” (MENA), and can cause ambiguity since the countries included in these geopolitical terms can vary from one source to another.

In a report prepared by Katja Schäfer from the UN Habitat Regional Office for Arab States (ROAS) titled *Urbanization and Urban Risks in the Arab Region*, the Arab countries are grouped in the following sub-groups:

- **Mashreq:** Egypt, Iraq, Jordan, Lebanon, Palestine, Syria
- **Gulf Cooperation Council (GCC):** Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates
- **Maghreb:** Algeria, Libya, Morocco, Tunisia, Mauretania
- **Southern Tier countries:** Comoros, Djibouti, Somalia, Sudan, Yemen (Schäfer, 2013, p. 4).

The above categorisation is driven by more or less a cultural and socio-economic grouping between the countries. Interestingly, a similar delineation can be observed in the literature work of Paul Oliver in the field of vernacular heritage. In Oliver’s book:

*Built to meet needs: Cultural issues in vernacular architecture* (2007), the author explains how geopolitical borders can limit the study of vernacular and why it was necessary, albeit simplistic, to create a map (fig. 13) based on similar cultures for the study of vernacular heritage (Oliver, 2007, p. 31-33).

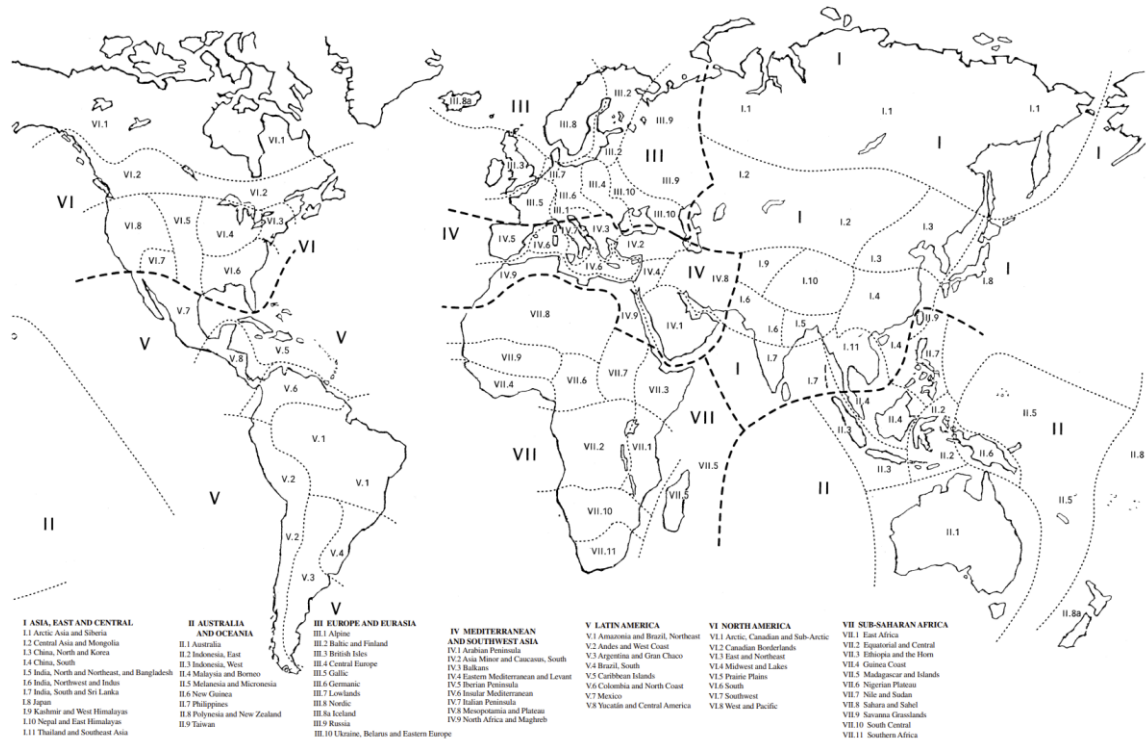


Figure 13. A map of the global culture regions and areas, as defined and drawn by Paul Oliver. (Oliver, 1997 as cited in Oliver, 2007)

This study will focus on regions IV.1 and IV.4 as defined by Oliver (2007). Thus, the term “Middle East” used throughout this research includes the following:

- Mashreq (aka Levantine) countries: Iraq, Jordan, Lebanon, Palestine, and Syria;
- Gulf Cooperation Council (GCC) countries: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates.

## 2.5 Urbanisation in the Middle East

### Urbanisation in numbers

It is no secret that the global urban population seems to have hit a perpetual rapid growth in the past 70 years, rising from just 746 million in 1950 to 4.2 billion in 2018, and is projected to hit 6.7 billion in 2050 (United Nations, 2018a, p. 2). Consequently, the number of cities<sup>2</sup> and megacities<sup>3</sup> have been naturally increasing. For instance, an increase from 33 megacities in 2018 to 43 megacities by 2030 is expected, while an increase from 548 cities in 2018 to 706 cities by 2030 is expected (United Nations, 2018a, p. 2). While urban areas occupy globally less than 3 percent of terrestrial areas (Elgendy & Abaza, 2020), they host 55% of the world's population as of 2018 (United Nations, 2018a, p. 0).

Shifting the focus to the Middle East, this area is no stranger to urbanisation with 18 Middle Eastern<sup>4</sup> cities listed today as having more than 1 million inhabitants (United Nations, 2018a, p. 21-22). Moreover, Riyadh and Baghdad have already crossed the 6 million inhabitants mark and are expected to hover just below the 10 million mark in 2030 making them quasi-megacities (United Nations, 2018, p. 21-22). In fact, the Middle East has the second highest urbanisation rate (Fahmy & Dhillon, 2008) with an average annual urban growth rate of more than 5% in the past two decades (United Nations, 2018b).

These upward trends show that cities have become the concentration of human development and population growth (Elgendy & Abaza, 2020). Furthermore, cities are particularly attractive due to their ability to provide large-scale urban services, economic benefits, and networking opportunities (Elgendy & Abaza, 2020). Therefore, there is an underlying belief that cities are supposed to provide certain economic, social and environmental benefits (NSDS Hub, 2019, p. 3).

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<sup>2</sup> more than 1 million inhabitants

<sup>3</sup> more than 10 million inhabitants

<sup>4</sup> Cities that lie within the chosen Middle Eastern countries in subchapter 2.4

## The Great Middle Eastern Divide

To help paint a qualitative picture, the edited collection titled *The Evolving Arab City* by Yasser Elsheshtawy provides an insightful overview of urbanisation in the Arab countries in general and of the urbanisation imbalance between these countries. The introductory chapter classifies eight Arab cities in two camps: *Struggling Cities* and *Emerging Cities*, underlining the multifaceted contrast in urban development within the Arab world. Although modernity and tradition take a central stage in the book's arguments, the main takeaway for this literature review is the disproportionate urban development between the Arab countries and the shift in regional and global significance.

On one hand, the authors of the different chapters assert that cities like Beirut (Lebanon) and Amman (Jordan) are struggling amongst other things to maintain their regional influence and redefine their identity amidst modernity (Elsheshtawy, 2008, p. 11); while cities in the Arabian Gulf region are emerging as global nodes and educational, cultural, and financial centres. Relational indicators such as urban population data coupled with regional geopolitical tensions and economic strains can confirm this division (Elgendy & Abaza, 2020). Case in point, between the years 2000-2018, Beirut has had an urban population growth (2.6%) well under the average Arab rate (3.4%)<sup>5</sup>, this growth is expected to hit the negative value between 2018-2030 when the average Arab rate is expected to be 2.1% (United Nations, 2018a, p. 21-22). On the other hand, Abu Dhabi's urban population growth between 2000 and 2018 was 5.7% and is expected to be 1.7% between 2018 and 2030 (United Nations, 2018a, p. 21-22).

Consequently, we can deduce a rough geographical delineation from this edited collection that would help in defining the scope of this thesis: the division between *Struggling* and *Emerging* seems to fall between the Levantine countries and the Gulf countries, respectively. Historically, Levantine cities (especially coastal) experienced growth in the course of the nineteenth century and achieved the height of rapid

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<sup>5</sup> this average is based on the 18 cities presented in the UN Habitat World Cities Data Booklet (2018a)

urbanisation after World War II (Ibrahim, 1975, p. 33), with the exception of a few like Amman that experienced growth spikes following regional conflicts (Elgendy & Abaza, 2020). Generally speaking, Levantine cities achieved growth through rural-urban migration, organic population growth, and foreign migration (Ibrahim, 1975, p. 34-35). In contrast, Elgendy and Abaza describe the Gulf coastal cities as being 'born urban'. This is due to the harsh climate that negatively impacted the growth of rural areas, as well as the oil boom that sparked the rapid urbanisation of these cities (Elgendy & Abaza, 2020). In a report by Katja Schäfer from the UN Habitat Regional Office for Arab States (ROAS) titled *Urbanization and Urban Risks in the Arab Region*, the author reports that the Gulf countries are today among the most urbanised in the world with an urban population of more than 80% (Schäfer, 2013, p. 8).

### **Disparate but indisputable urban challenges**

However, this contrast does not establish the superiority of one zone over the other since each city, whether 'struggling' or 'emerging' in Elsheshtawy's terms, has its own set of challenges. To illustrate, Elsheshtawy describes Abu Dhabi's newly found desire to establish itself as an international cultural destination by building several renowned museum projects such as the Louvre and the Guggenheim (Elsheshtawy, 2008, p. 288-294). The author proceeds to raise concerns over the social sustainability aspect of this approach, asserting the negative impact of capital in creating spaces of exclusion (Elsheshtawy, 2008, p. 277). In the conclusion of his chapter, Elsheshtawy raises questions of tradition and identity that were somewhat overshadowed by globalism, starchitecture, and 'disneyfication' (Elsheshtawy, 2008, p. 297). Therefore, labelling the Levantine cities as 'struggling' and the Gulf cities as 'emerging' does not negate the fact that the latter have significant urban challenges.

In addition to concerns over social sustainability within Arab cities, other pillars such as environmental and economic sustainability are also in question. Many urban experts have expressed concerns over the quality of urbanism amidst the Arab world's rapid urbanisation. Some like Elgendy and Abaza, have even raised concern that Arab cities have managed to accumulate the negative aspects of cities (congestion, densification, exclusion, etc.), without reaping the benefits of urbanisation (social inclusion, economic vitality, etc.). To pinpoint this phenomena, sociologist Saad Eddin

Ibrahim coined the term “Urbanisation without Urbanism” (Elgendy & Abaza, 2020). Scholar and consultant Karim Elgendy regularly echoes this phenomena within his publications to criticise new urban developments in the MENA region that overlook basic considerations for urban sustainability.

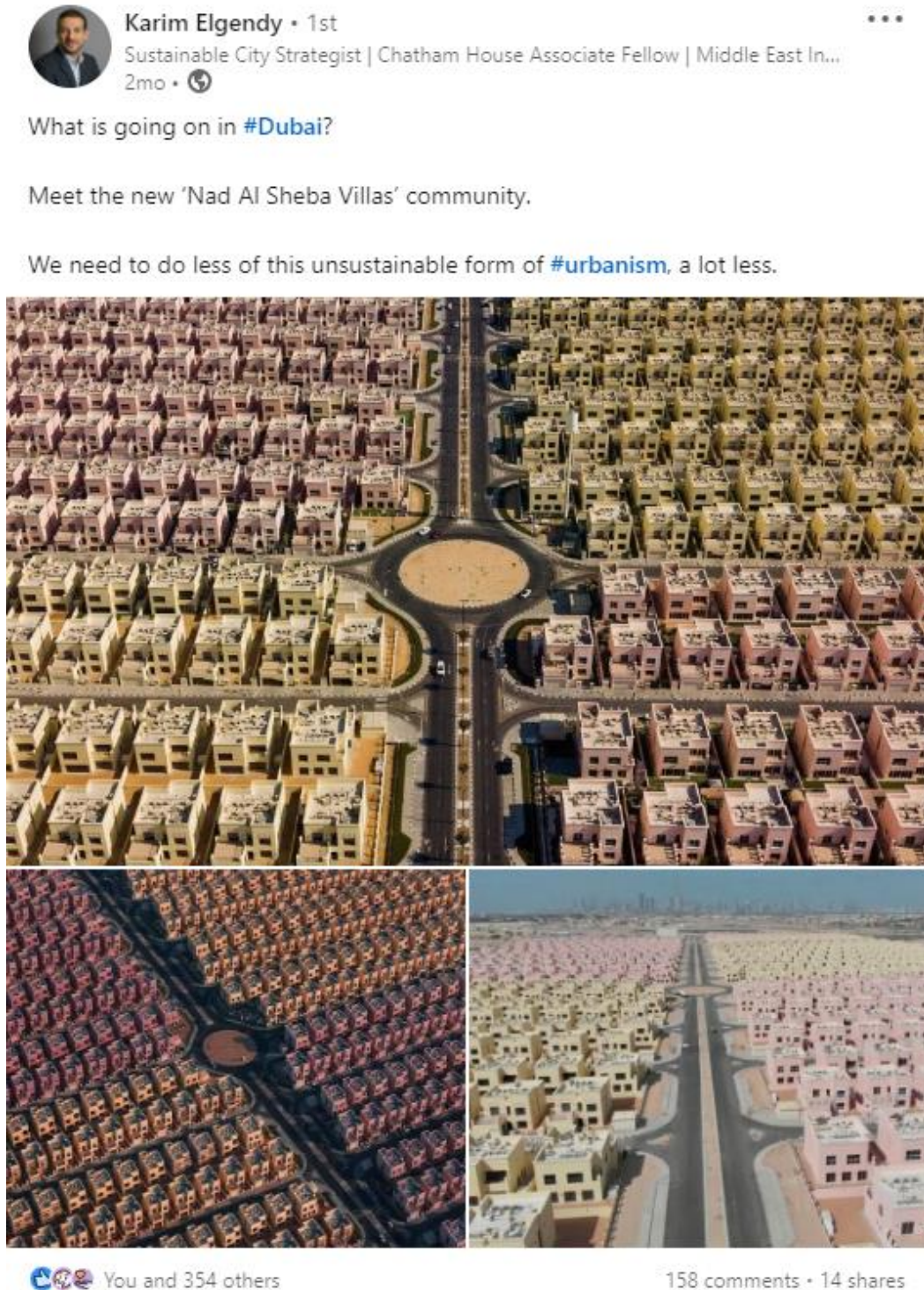


Figure 14. Screenshot by the author of Karim Elgendy's LinkedIn post.

Moving forward, most of the urban growth in the selected Middle Eastern countries is in steady decline today (United Nations, 2018a, p. 21-22). However, a few countries continue to witness fast paced urbanisation. Spearheading this growth is Saudi Arabia that hopes to transform its economy from an oil-dependency to a tourism and commerce economy by building several multi-billion ‘megaprojects’ as part of its Vision 2030 (Saudi Vision 2030, n.d.). In order to fulfil this objective, the Kingdom will be creating new urban zones such as NEOM and will drive urban growth and expansion throughout the country.

Finally, amidst urban critiques of Arab cities, there seems to be a strong current demanding radical change across the urban field (Elgendy & Abaza, 2020; Elsheshtawy, 2008; Fahmy & Dhillon, 2008). On one hand, following these authors, correctional measures should be taken to help alleviate the current social, economic, and environmental challenges in both ‘struggling’ and ‘emerging’ cities. And on the other hand, sustainable design strategies should be implemented when designing and executing new developments to avoid further challenges.

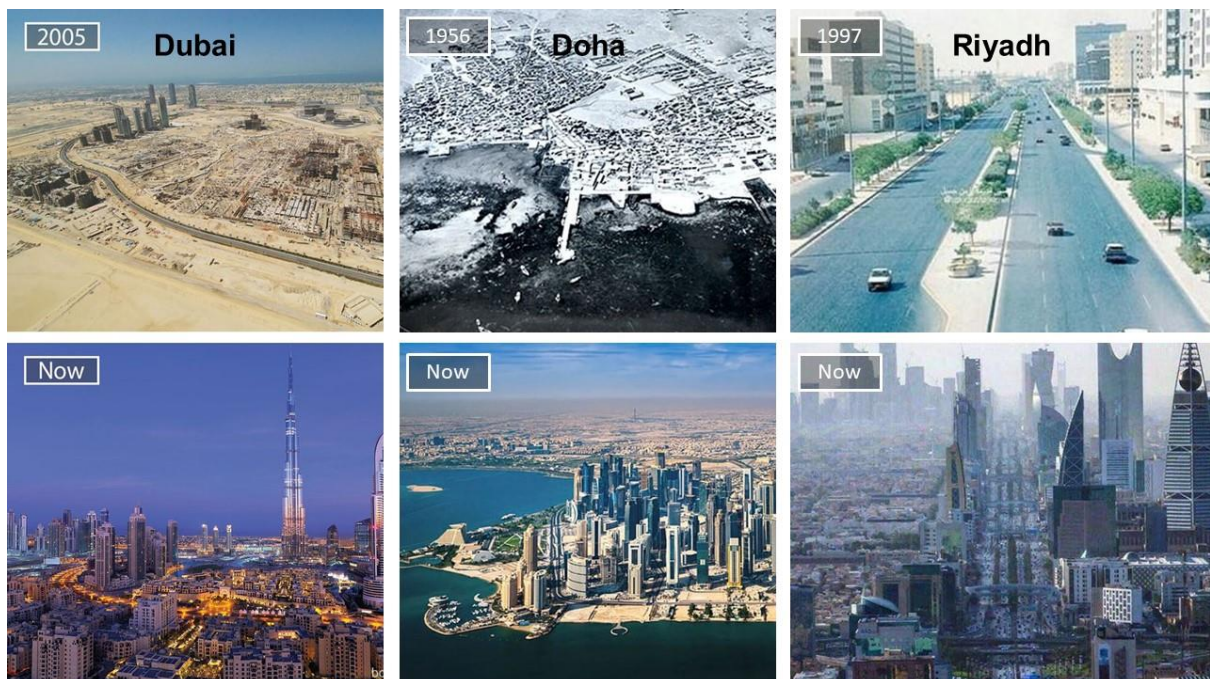


Figure 15. Urbanisation in the Middle East, a comparison spanning over only a few decades. (K.A., 2016).

To conclude, urbanisation in the Middle East has generally been on the positive side of the charts, ranking amongst the highest globally and earning itself the 'rapid urbanisation' label. Quantitatively and qualitatively this urbanisation is distinct in shape, rate, and intensity between the Middle Eastern countries. Consequently, two major sides can be identified: cities that are 'struggling', mainly the Levantine cities, and cities that are 'emerging', mainly the Gulf cities. However, each has distinct challenges and setbacks to be addressed. The Gulf cities have been distinguished by large-scale urban developments to accommodate for the growing urban population as well as to earn themselves a global position, which equally has attracted several criticisms amongst architects, planners and authors.

### **A brief overview of vernacular architecture and urbanism in the Middle East**

For more than five decades, Danish urban designer and author Jan Gehl has helped transform cityscapes thanks to his influential research into how inhabitants actually use the urban environment through the five senses (Alonso, 2017). In an interview originally published in the Spanish magazine *City Manager*, Gehl echoed the importance of learning from the vernacular city stating that:

"In the old metropolis, everything was made to a suitable size for a person, but after the introduction of modernism and the automobile, the importance of this scale was forgotten. We went from having architecture suited to the travel speed of 5 kilometres per hour, to entire cities of 60 kilometres per hour, which meant wider streets, bigger advertisements, higher buildings, where we weren't able to see anything in detail as we moved so fast" (Middle East Architect, 2018).

Here, Gehl approached the vernacular theme from the human scale aspect, and then proceeded to compare Dubai and Venice, with the former defying human-centric urban principles according to the author (Middle East Architect, 2018). Gehl's disdain of modern megacities and suburbs on one hand, and appreciation of vernacular urbanism on the other hand follows Jacobs' footsteps (Alonso, 2017). While his critique of Dubai's modernist approach towards urbanism is recent, other Arab architects such as Hassan Fathy have long before tested with Middle Eastern vernacular architecture and urbanism.



Hassan Fathy is an Egyptian architect and urbanist who is most known for his contextual approach in design and his strong opposition to imported Western architectural models in the Arab region (Bertini, 2020). His works attempt to establish an architectural language that best reflects an Egyptian and Arab accent and identity, inspired by Nubian vernacular architecture found in archeological sites across Egypt (Bertini, 2020). While his use of locally found vernacular materials and interpretation of vernacular knowledge was evident since his early works, Fathy's design language really consolidated in his most famous project, the New Gournia Village designed and built between 1946 and 1952 (Bertini, 2020).



*Figure 16. New Gournia Village designed by Hassan Fathy. (Taw, 2011).*

The New Gournia Village was commissioned to Fathy by the Egyptian Department of Antiquities, who saw it necessary to move the original village and its inhabitants from within the archaeological area of the Valleys of the Kings and Queens (Bertini, 2020). The architect seized the opportunity to create a local narrative inspired by the land, the people, the history, and the socio-cultural practices (Bertini, 2020). The inhabitants resisted the rehousing initiative and in protest, purposefully flooded the new village, leaving an incomplete project and a disappointed architect (Bertini, 2020).

In a critical response to postmodern contextual and vernacular approaches (aka regionalism), Egyptian author and urban planner Nezar Alsayyad called out such projects due to the fact that “they ignored the reality that the Western model continued to shape their cities through inherited institutions and regulations” (Alsayyad, 1995, p. 19). Furthermore, Alsayyad expressed his inquietude over architects and planners who approach regionalism through an “imagined history and an invented tradition” (Alsayyad, 1995, p. 19). To elaborate, Alsayyad uses Fathy’s New Gournia as a “failed” example, illustrating poor interpretation of what Al Gournia inhabitants considered as alien or inappropriate (i.e., Fathy’s use of Islamic forms that were uncommon in the region as well as vaults and domes that were associated with the tombs and shrines of the dead in El Gournia), as well as a project driven purely by form without having a “real economic base and no social services” (Alsayyad, 1995, p. 19).

While New Gournia stands as Fathy’s jewel, the architect’s crusade to build postmodern vernacular architecture inspired by local identity continued well beyond this project (Bertini, 2020). In the article written by Bertini (2020), the author states that Fathy’s later work became more popular amongst the upper classes despite his lifelong efforts to create an architecture language that responds to and represents the “Poor”. In response, Bertini (2020) reports Fathy as saying: “what defence can the feeble peasant culture put up against the clamorous attack of Western industry?”, arguing that the greater public beheld Western models synonymously with modernity and progress and overlooked the cultural value of local approaches (Bertini, 2020).

Despite Alsayyad’s firm opposition to “Fathy-like” architecture, the author did acknowledge the positive influence it had on the architectural community especially in invoking the issue of representing people’s identity in design (Alsayyad, 1995, p. 20).

Consequently, a balanced and holistic design approach where inhabitants (non-experts) and institutions (experts) collaborate could be the missing piece to create a successful contextual language.

To conclude, modernism's grip did not spare Middle Eastern cities where in certain places like Dubai, urban models and architectural styles seem to have been made for cars and giants rather than people. On the other hand, postmodern reactions and experiments to establish a local architectural language in the Middle East such as demonstrated by Hassan Fathy did not always succeed in its intention, however it remains integral in treating questions of identity. In order to deepen the dialogue and find an adequate case study to investigate Middle Eastern vernacular urban characteristics, this thesis turns to Saudi Arabia which is currently experiencing a remarkable urban boom.

## 2.6 Urbanisation in Saudi Arabia

### Why Saudi?

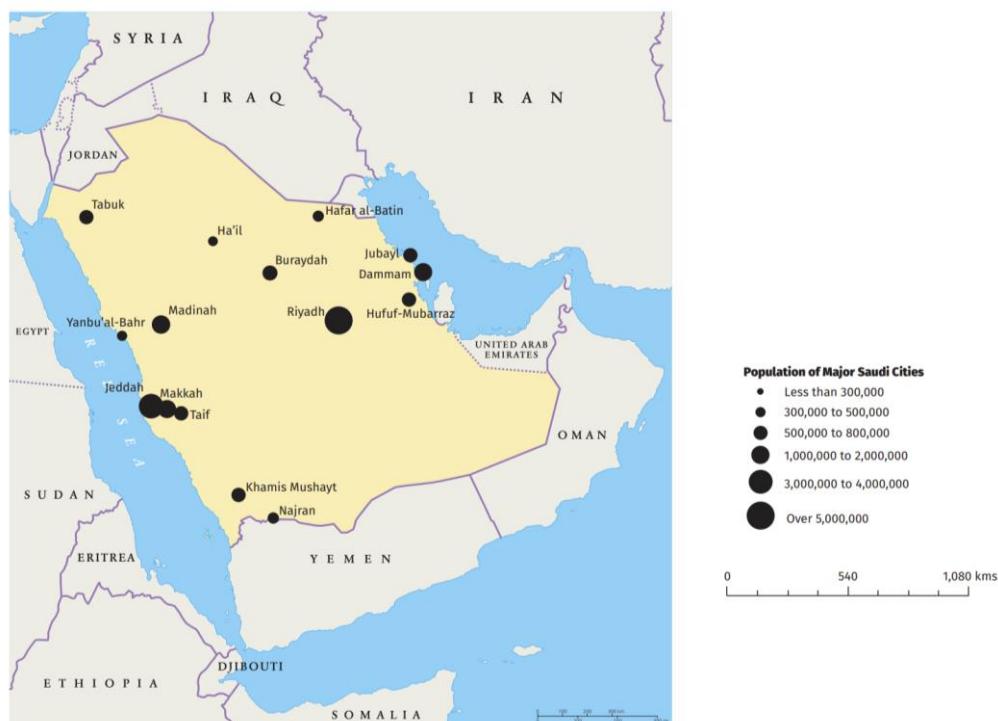


Figure 17. Saudi Arabia major urban agglomerations, 2017. (Grand & Wolff, 2020).

According to the 2019 Saudi Cities Report, 8 out of every 10 people in the Kingdom live in an urban area, making the country one of the most urbanised (UN-Habitat, 2019a, p. 5). Seven major urban centres (fig. x) account for over half the population of Saudi Arabia, with Riyadh nearing the megacity status (Abubakar & Aina, 2018, p. 239).

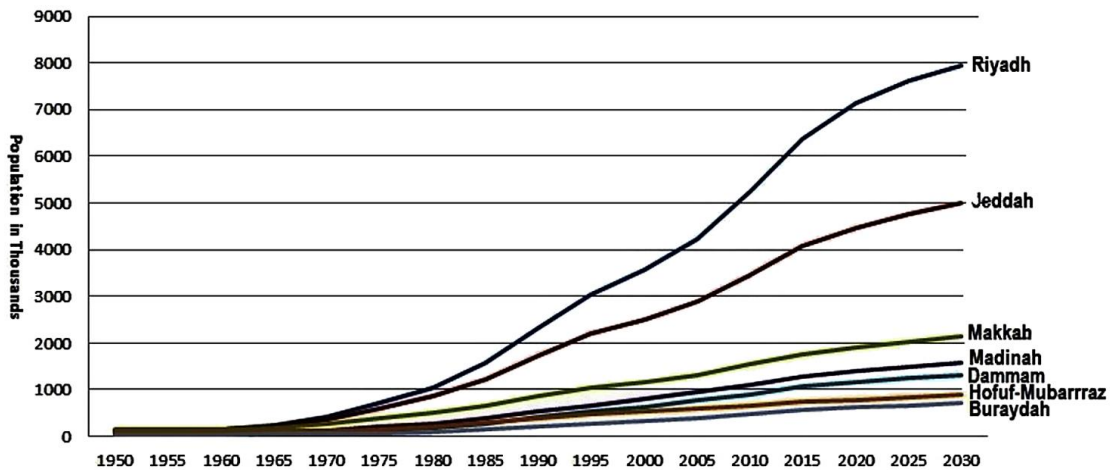
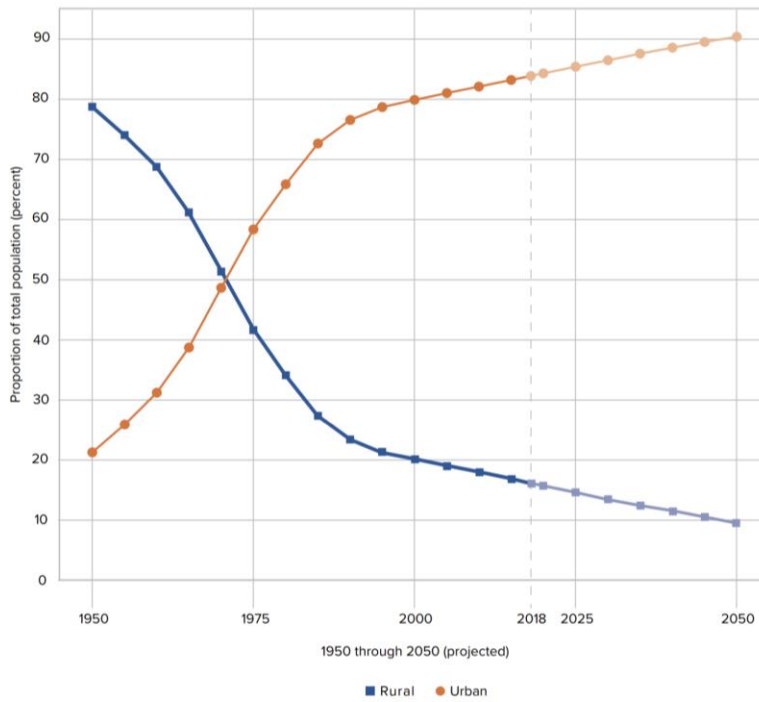


Figure 18. Population growth of Saudi cities with 500,000 inhabitants or more, 1850-2030. (Abubakar & Aina, 2018, p. 240).

The kingdom's urbanisation and urban growth are in major part due to the oil-boom in the second half of the 20th century, in the exception of Makkah and Jeddah that are the religious and coastal commerce hubs of the Kingdom (Abubakar & Aina, 2018, p. 238).



Source: "World Urbanization Prospects: The 2018 Revision, Online Edition," United Nations, Department of Economic and Social Affairs, Population Division, File 21, 2018, accessed February 24, 2020, <https://population.un.org/wup/Country-Profiles/>.

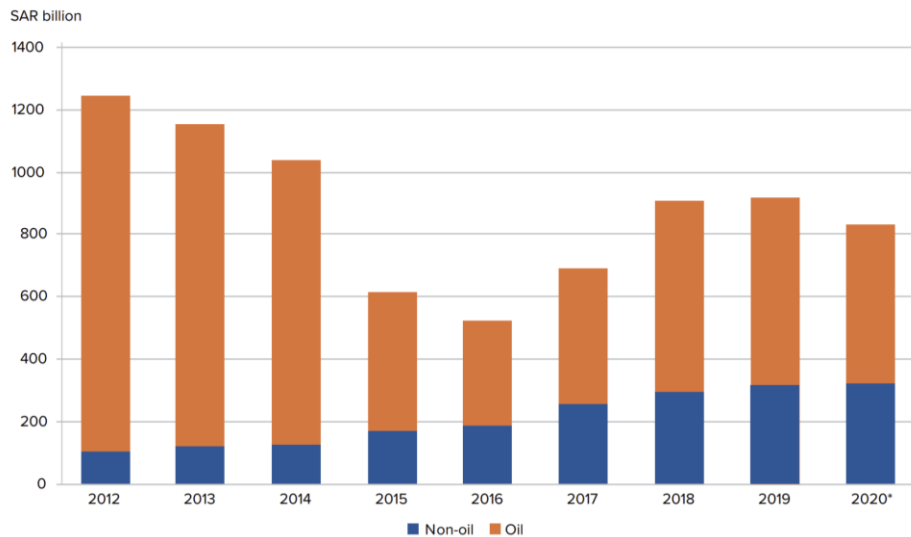
Figure 19. Percentage of Saudi population in urban and rural areas. (Grand & Wolff, 2020).

Since the beginning of the 21st century, political and economic forces continue to shape Saudi Arabia's rapidly-transforming urban landscape (Abubakar & Aina, 2018, p. 240-241). Two noteworthy factors that impact Saudi's urban development are urban development policies that have resulted in large-scale public urban development projects, and politically-backed private real estate companies (Abubakar & Aina, 2018, p. 241).

Furthermore, the unprecedented urban growth and fame of Dubai has sparked a regional contest amongst neighbouring cities, with the latter competing to imitate Dubai in hopes to attain a similar global status (Alraouf, 2006, p. 25). Perhaps the most prominent gesture of this contest, often referred to as "Dubalization", is the competition for building the world's tallest tower between Dubai and Jeddah (Springer, 2019). Beyond the surface, this race is triggered by a slowing oil economy and the need for economic diversification in the oil-dependent Gulf states (Alqahtany & Aravindakshan, 2021, p. 1).

## Saudi Vision 2030

The global oil crash in the summer of 2014 led to major financial strains in Saudi Arabia, consequently resulting in the development of a social and economic reform framework: Saudi Vision 2030 (Grand & Wolff, 2020, p. 2). The ambitious plan championed by the crown prince Mohammed bin Salman Al Saud (aka MBS) is cross-sectoral (Grand & Wolff, 2020, p. 12), with urban development being inherently at the core of this transformation. In hopes to create economic diversification, increase global competitiveness, and attract foreign capital, the Kingdom heavily relies on government spending through new entities it created such as the Public Investment Fund (PIF) (Grand & Wolff, 2020, p. 2-3).



\*Projected in the 2020 budget, released in December 2019. Experts have already indicated that revenues are expected to decline drastically in 2020.

Sources: "2020 Saudi Fiscal Budget," Jadwa Investment, December 10, 2019, <http://www.jadwa.com/en/researchsection/research/economic-research/budget-reports>. "Budget Statement: Fiscal Year 2020," Ministry of Finance (Saudi Arabia), December 2019, <https://www.mof.gov.sa/en/financialreport/budget2020/Documents/Bud-Eng2020.pdf>.

Figure 20. Saudi government revenues. (Grand & Wolff, 2020).

Saudi Vision 2030 is broken down into 3 themes, 6 overarching objectives, 27 branch objectives, 96 strategic objectives, and 13 Vision Realisation Programs (VRPs) (Saudi Vision 2030, n.d.). On a side note, VRPs are entities created to help implement Vision 2030, of which the Public Investment Fund (PIF) is one (Grand & Wolff, 2020, p. 17).

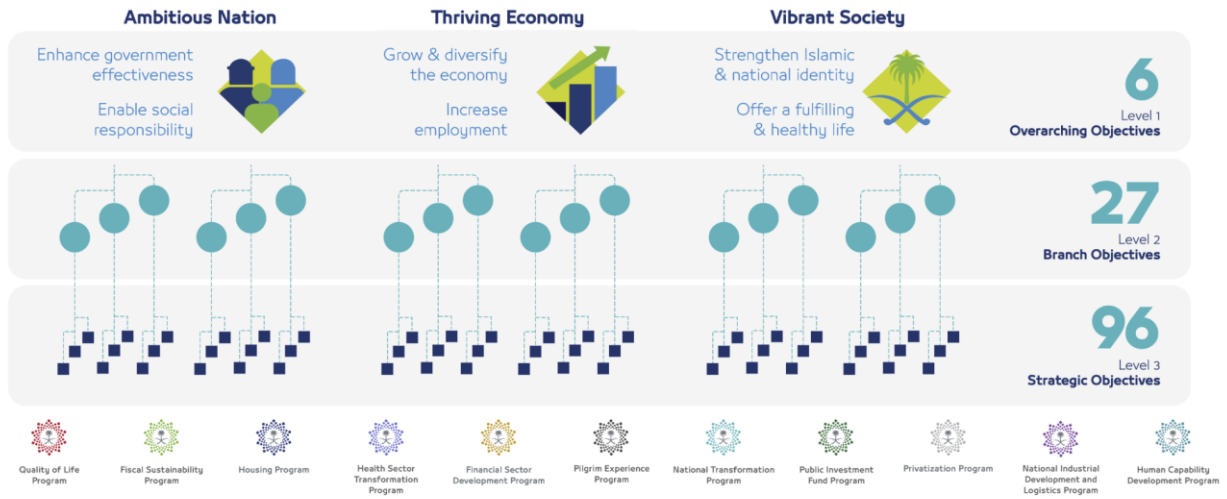


Figure 21. Saudi Vision 2030 guiding themes and objectives. Screenshot by the author from (Saudi Vision 2030, n.d.).

As shown in the above figure, the three themes are the following:

- A Vibrant Society: tackles social reforms by underlining existing social values and enhancing the quality of life,
- A Thriving Economy: tackles economic reform by promoting economic growth, diversification, and employment,
- An Ambitious Nation: tackles governmental reform by increasing social responsibility and government effectiveness (Saudi Vision 2030, n.d.).

Delving into some of the Key Performance Indicators (KPIs) it is evident how much urban development is entwined with Vision 2030. To illustrate, one of the KPIs is “to have three Saudi cities be recognized in the top ranked 100 cities in the world” (Kingdom of Saudi Arabia, 2016, p. 25), another objective is to rehabilitate economic cities and “create special zones in exceptional competitive locations” (Kingdom of Saudi Arabia, 2016, p. 50-51). The 5-year update report for Vision 2030 released in 2022 showcases the major achievements to date, amongst which are PIFs’ ongoing urban megaprojects notably NEOM, The Red Sea Project, and Qiddiya (Kingdom of Saudi Arabia, 2022, p. 58).

To clarify, the title ‘megaproject’ is earned due to the projects’ sheer size and investment value: for example, NEOM spans over 26,500 km<sup>2</sup> of land (x2.5 the size of Lebanon) located in the northwest of the Kingdom and will cost over 500\$ billion

(Pearson, 2022). NEOM's official website (<https://www.neom.com/en-us/about>) includes an overview of the ambitious project namely its flagship feature "The Line", a 170km linear city of one million residents. Like many other projects in the Kingdom, NEOM consists of building entirely new communities and urban developments within the country, leading to even higher urbanisation and urban population growth rates.

In the 2020 review of the Vision by Grand & Wolff, the authors discouraged the top-down approach through the financing and creation of megaprojects and instead encouraged a more inclusive and participatory approach (Grand & Wolff, 2020, p. 3). However, since the creation of new developments and communities in the Kingdom is in full throttle (NEOM, Red Sea, Qiddiya, Riyadh expansion, etc.), this thesis hopes to equip designers who work on such large-scale projects with crucial vernacular knowledge to offset some of the urban challenges.

## **Urban impacts and challenges**

While Saudi Arabia tries vigorously to implement Vision 2030, pre-existing and new challenges loom over the Kingdom's efforts (Abubakar & Aina, 2018, p. 243). Several scholarly articles, books, reports, and researches have raised concern over the country's urban sustainability. The following overview lists some of these challenges following the holistic theoretical framework of sustainability.

### **Environmental**

An important feature of Saudi urbanisation is the concept of 'urban primacy', which means that most of the urban population is concentrated in the capital (UN-Habitat, 2019a, p. 12). In the case of Saudi, urban primacy led to rapid and sometimes unplanned urban expansion leading to large-scale urban sprawl and low-density developments (Abubakar & Aina, 2018, p. 243). In Riyadh this phenomenon has negatively impacted the ecological footprint of the capital, which grew from just 1 km<sup>2</sup> to 3000 km<sup>2</sup> in less than a century (Abubakar & Aina, 2018, p. 243). Certain secondary cities such as Jeddah and Dammam have also experienced similar urban sprawl and face the same challenges (UN-Habitat, 2019a, p. 12, 161).



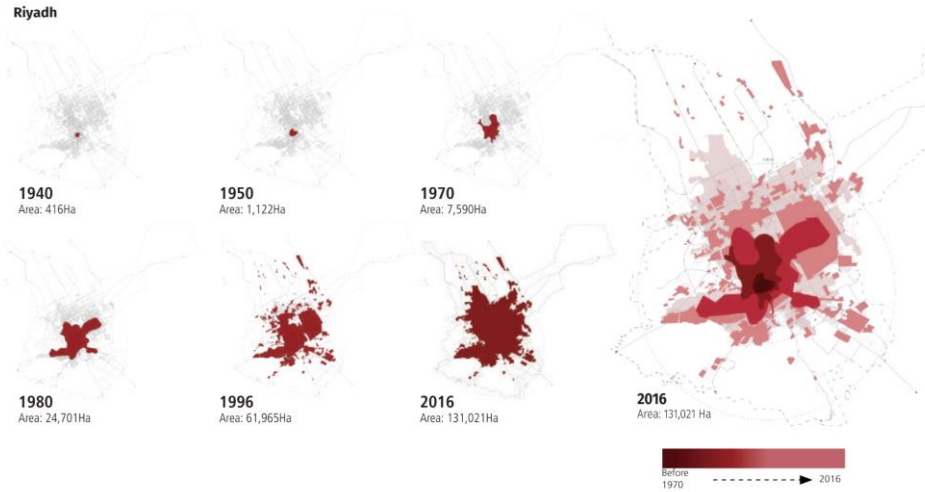


Figure 22. The urban growth of Riyadh. 1940-2016 (UN-Habitat, 2019a).

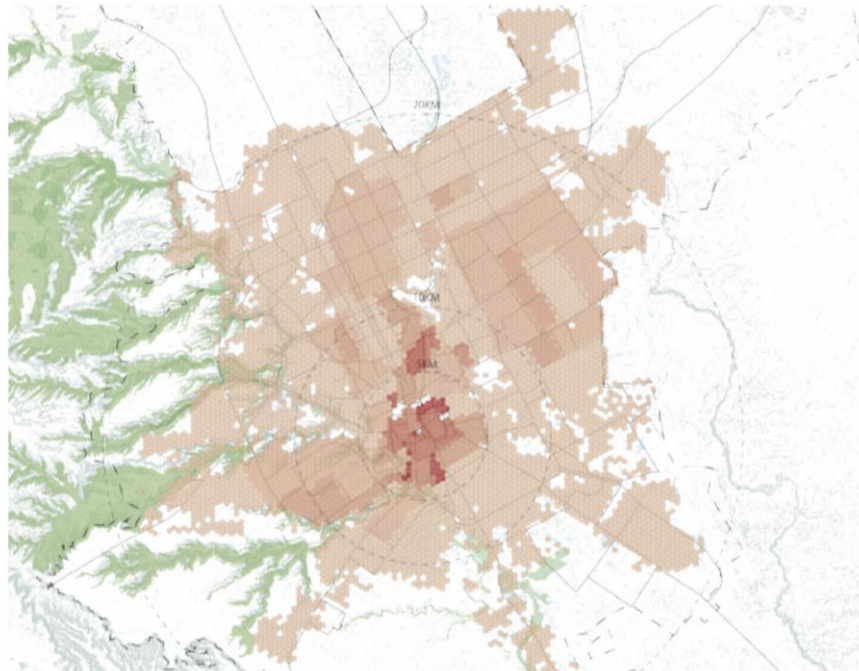
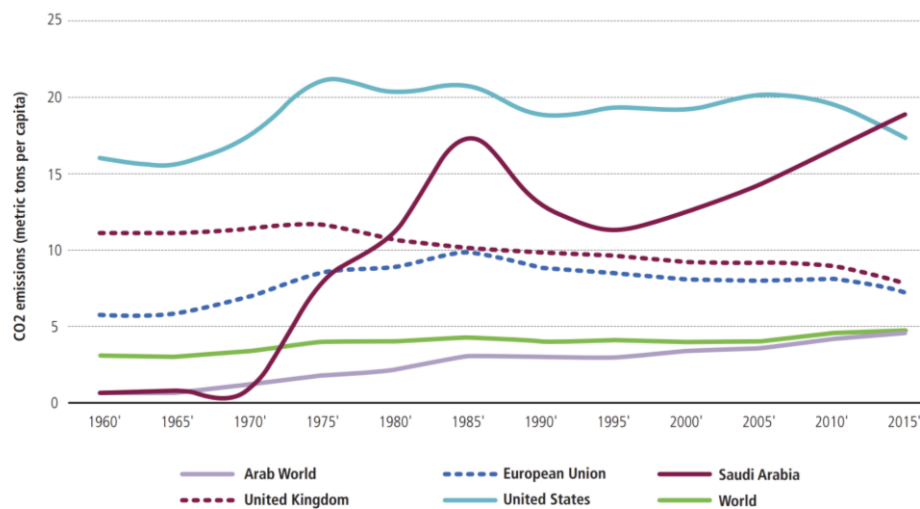


Figure 23. The density of Riyadh circa 2015. (UN-Habitat, 2019a).

Besides the unsustainable demand in urban services and resources required to support low-density urban sprawl, transportation infrastructure and vehicle-dependency remains a big burden on the Saudi environmental bill (UN-Habitat, 2019a, p. 23-26). Below chart showcases the alarming rate at which

greenhouse gas emissions in Saudi Arabia have been increasing per capita in comparison to other regions in the world between 1960 and 2015. To illustrate, the Kingdom's greenhouse emissions surpassed that of the world's average CO<sub>2</sub> consumption in the early 1970s, and in a little over 5 decades it dwarfed that of the United States. This increase of 2,786% between 1960 and 2015 is associated with increasing levels of income, energy production and consumption, private car ownership, and rapid urbanisation (UN-Habitat, 2019a, p. 25).



Source: World Bank, 2017a [Compiled from <http://databank.worldbank.org/data/source/world-development-indicators>]

Figure 24. Comparison of per capita CO<sub>2</sub> emissions in Saudi Arabia and other countries. (UN-Habitat, 2019a).

Furthermore, Saudi cities' low levels of green open space and dense urban areas result in higher thermal discomfort levels, decrease in walkability, decrease in livability and finally an increasing threat to urban health (UN-Habitat, 2019a, p. 77). If not properly addressed, poor urban planning regulations coupled with climate change will only increase the urban challenges and risks especially with the continuous increase in dust storms, changes in rainfall patterns, and increase of severe floods (UN-Habitat, 2019a, p. 78).

The UN-Habitat 2019 Saudi Cities report (2019a) urges swift correctional measures to be implemented within the Saudi urban planning regulations in order to limit low-density urban sprawl that has evident colossal environmental

impacts and improve other areas such as green and blue infrastructure to mitigate climate change risks.

## Economic

Sprawling has direct and indirect impacts on sustainability. One of the most important direct impacts of Saudi urban sprawl on economic sustainability is the centralisation of economic opportunity, imbalance between regions and more importantly imbalance between urban and rural areas (UN-Habitat, 2019a, p. 16). The strong significance of the Dammam-Riyadh-Jeddah urban corridor has further strengthened this imbalance (UN-Habitat, 2019a, p. 102-104), leading to detrimental impacts such as the decline of agricultural area per capita (0.18km<sup>2</sup> in 1965 to 0.063 km<sup>2</sup> in 2010) and a reduction in the production of food commodities per capita (UN-Habitat, 2019a, p. 17). The decreasing role of rural economy in favour of urban economy continues to widen the development gap between these regions leading to several socioeconomic risks (UN-Habitat, 2019a, p. 17).

When it comes to the indirect economic impacts, urban growth can heavily impact the health bill as it increases diseases due to congestion and poor air quality (Abubakar & Aina, 2018, p. 245-246). Moreover, poor air quality can also impact worker productivity and life expectancy, increasing healthcare expenditure and decreasing time spent working (UN-Habitat, 2019a, p. 75).

## Social

Abubakar & Aina (2018) report that Saudi urban sprawl is responsible for generating income-based inequalities and spatial disparity in cities leading to segregation and marginalisation (Abubakar & Aina, 2018, p. 245-246). This is especially true in the case of private developers who prioritise single family housing types and development locations in peripheral zones (UN-Habitat, 2019a, p. 26). In turn, this contributes to Saudi's decades of affordable housing shortage since it does not align with the socio-economic expectations of its citizens, nor does it attain recommended density marks (e.g. Dammam currently has a density of 70 people/ha, while the UN recommended density is 150 people/ha) (UN-Habitat, 2019a, p. 26).

## Governance

As previously mentioned, there is a high level of centralisation in Saudi Arabia, and this is no different when it comes to urban planning and management (UN-Habitat, 2019a, p. 28). Beyond limited responsibility and lack of autonomy given to local governmental actors, there is little to no participatory frameworks adopted by the central government towards local non-state actors (UN-Habitat, 2019a, p. 28). Moreover, the UN-Habitat 2019 Saudi Cities report states that policy development and implementation should be more transparent otherwise it can lead to high volatility, decrease in citizen approval, and an increase in socioeconomic disparity (UN-Habitat, 2019a, p. 127).

Vision 2030 acknowledges governance as a challenge and hopes to increase collaboration between the government agencies on one hand, and the private sector and citizens on the other (UN-Habitat, 2019a, p. 28). As discussed however, Grand & Wolff (2020) strongly recommended to steer away from the top-down approach that the government is currently undertaking to fulfil Vision 2030.

## Cultural

Despite screening several literature works it was difficult to find significant work on cultural sustainability in Saudi Arabia. However, the following two aspects can be brought forward to light:

- Urban growth and urbanisation has led in many instances to the dilapidation of cultural heritage, which Saudi Vision 2030 hopes to enhance and promote by putting in place several initiatives and programs such as Al Ula project (Alqahtany & Aravindakshan, 2021, p. 2).
- The UN-Habitat 2019 Saudi cities report mentions that cultural restrictions on women “have impeded the development of the (public) transport system” (UN-Habitat, 2019a, p. 169).

As discussed, one of Vision 2030's objectives is to enhance sustainability and to re-establish regional balance in the Kingdom. As pointed out by the Saudi Vision 2030 assessment report, the Saudi government seems to have "emphasised glitzy megaprojects" in order to fulfil Vision 2030 (Grand & Wolff, 2020, p. 59). In contrast, Alraouf has criticised Dubai's iconography development approach in his work titled *The emergence of a new urban brand "Dubaization"* (2006) due to its alien imposition on local identities and divergence from local sustainability characteristics. In light of this, a question poses itself: what could be an alternative to icon-led approaches while designing new developments?

## 2.7 Urban analysis approach

The final subchapter of the literature review will be looking at urban analysis methods and techniques in order to be able to construct a meaningful methodology, capable of achieving the objectives of this thesis.

The Cambridge dictionary defines analysis as "the act of examining a substance, especially by separating it into its parts, in order to discover what it is or contains". In this case it is about understanding what a certain urban space is and what it contains by dismantling the space to its individual parts, studying these parts individually as well as how these distinct parts work together (Schwalbach, 2017, p. 38). Moreover, urban analysis describes or analyses elements that could fall within aesthetic, spatial, social or economic factors, in whole cities or within smaller defined areas (Schwalbach, 2017, p. 10). In his book *Basics Urban Analysis* (2017), Gerrit Schwalbach identifies three approaches within urban analysis:

1. Aesthetic observation: the visible city
2. Scientific observation: the invisible city
3. Integrative observation: the logical city

(Schwalbach, 2017, p. 13-22)

In the first category, the author explains that perception is an integral part of observing urban characteristics and classifying elements such as identifying a building from a street, prompting users to constantly and unconsciously process information (Schwalbach, 2017, p. 13-14). This type of observation consequently leads observers

to create patterns that are subjective to one's knowledge, culture and personal views (Schwalbach, 2017, p. 14-15), very similarly to Lynch's notion of collective memory that differs from a loci to another and from a perspective to another. Schwalbach uses the simpler example of observing and identifying a human face to explain this Gestaltist category: rather than noticing the distinct elements of a face we collate the overall impression made by all the facial elements (Schwalbach, 2017, p. 14).

In contrast, the second category delves into the intangible individual factors that are often invisible to the human senses such as demographics that constitute a given loci without it being distinctly perceptible to the human eye (Schwalbach, 2017, p. 16). Therefore, scientific urban analysis interprets defined values that can be compared across location and time.

However, the third category could be considered as a mix of the first two categories, presenting several subcategories such as urban morphology. The latter is a cause-and-effect analysis that describes the urban spatial characteristics while explaining what caused them (i.e. topography, socio-political decision, etc.) (Schwalbach, 2017, p. 17). Urban morphology is studied through plans following selected factors such as the hierarchy of streets, buildings and open spaces, density, proportions, public amenities, etc. (Schwalbach, 2017, p. 17-18).

Therefore, urban analysis is not a set-in-stone toolkit but rather a varying set of analysis that depends on the objective of the study (Schwalbach, 2017, p. 23). Hence why it is important to first set the problematic and the objectives of the study and then accordingly tailor an adequate urban analysis.

Chapter 4 will delve deeper into the selected individual analysis, drawing a more comprehensive picture. However, we will first look at the general categories that will constitute the urban analysis of this study.

Schwalbach began the *Methods of Analysis* chapter with a disclaimer stating that urban analysis is not standardised and consequently there is an unlimited way to study a certain aspect (Schwalbach, 2017, p. 38). In light of this, the author included analysis types that are most commonly used in urban planning and design such as land use

analysis, open space analysis, and connectivity analysis. I have consequently decided to collate these urban analysis types under “**cluster 1: urban characteristics**”.

However, in order to offer a more holistic analysis, other types should be considered such as environmental performance. Taleb & Abu-Hijleh’s research titled *Urban heat islands: Potential effect of organic and structured urban configurations on temperature variations in Dubai, UAE* (2013) offers a perfect example on how and why environmental analysis types should be included within this urban analysis. By analysing solar exposure and wind behaviour in the vernacular neighbourhood of Bastakiya, the authors deduce that organic urban forms possess a better environmental performance than structured urban forms (Taleb & Abu-Hijleh, 2013, p. 761). Consequently, the second urban analysis types will fall under “**cluster 2: environmental performance**”.

Finally, to draw a more comprehensive urban analysis we will look at Space Syntax, which was introduced in the 1970’s by Bill Hillier and colleagues at the Bartlett, University College London. Space Syntax stems out of a gap in spatial analysis to understand the mathematical relationships between physical objects in the built environment and consequently comprehend the socio-spatial relationships within a given space (Nes & Yamu, 2021, pp. 2, 20). Space Syntax falls under the urban network school of analysis and focuses on spatial configurations and street structures as opposed to other types of analysis (Nes & Yamu, 2021, p. 20). To sum, Space Syntax encompasses a set of techniques for the analysis of spatial layouts and user patterns; it investigates “where people are, how they move, how they adapt, how they develop and how they talk about it” (Space Syntax, 2022). As a result, the third urban analysis techniques will fall under “**cluster 3: urban network performance**”.

**03 AL ULA OLD TOWN**



"A sandy territory between two high mountains, followed by a gorge, a valley with lush vegetation, water springs and the city of Al Ula. In the middle of the valley, there are many palm trees and dates. The city is modest in size and has a small fort at the top of a rocky peak; freshwater springs irrigate the crops. An emir heads the fort and pilgrims can leave their belongings there."

*Ibrahim ibn Shuja' ad-Dimashqi*

"أرض رملية بين جبلين مرتفعين ، يليها مضيق ، ووادئ به نباتات مورقة ، وينابيع مياه ، ومدينة العلاء. يوجد في وسط الوادي العديد من أشجار النخيل والتمر. المدينة متواضعة الحجم وفيها حصن صغير على قمة قمة صخرية. ينابيع المياه العذبة تروي المحاصيل. أمير يرأس القلعة ويمكن للحجاج ترك متعلقاتهم هناك."

ابراهيم بن شجاع الدمشقي



### 3.1 Selection criteria

The Endangered Archaeology in the Middle East and North Africa (EAMENA) project database contains more than 338,000 records in the MENA region ("EAMENA Project Database," n.d.), while the UNESCO world heritage list contains 80 cultural sites in the same geographical area. Today, estimates show that more than 20,000 archeological sites exist across the MENA region, with many covering large areas and constituting small towns and cities ("EAMENA Project Database," n.d.). In 1976, a survey carried out in Saudi Arabia managed to document about 4,000 archeological sites in the Kingdom alone (al-Rashid, 2005, p. 207). Subsequently, a set of criteria is therefore important to be able to shortlist a suitable site as a case study due to the abundance in archeological sites in the country.

The main parameter is the site area and its built density. The site needs to cover a large area (in thousands of square metres) with a significant density in order to be able to produce substantial analysis and draw meaningful insights. This parameter significantly reduced the extensive list to a few sites. The second paradoxical parameter is the importance of finding a site with basic data and literature on which to build on, yet is still unpublished and remains considered to have a gap in the literature. Other parameters were functional and logistical such as requiring at a minimum a plan to work from.

Finally, after screening several sites according to the established selection criteria, Al Ula was selected as the case study.

### 3.2 Location



Figure 25. Al Ula location within Saudi Arabia. (Johnston, n.d.)

Al Ula Old Town (aka Al-Dira) is located in Al Ula County which spans over 23,301 km<sup>2</sup> and is located in the north-west of Saudi Arabia, falling geographically between the cities of Medina and Tabuk (Mortada, 2020, p. 11; Heritage Conservation Consulting, n.d.). The Old Town falls within the narrowest part of Wadi Al-Qura (Valley of Villages), which is now called Al Ula Valley and is built on a slightly higher elevation than the rest of the fertile wadi plateau (Heritage Conservation Consulting, n.d.). In addition, it is bordered by mountains from the East and from the West that run from the North-West to the South-East, making the town historically strategic along the pilgrimage and trade routes (Mortada, 2020, p. 11). Additionally, the Old Town is in close proximity to Hegra (aka Mada'in Saleh), a UNESCO World Heritage Site (Heritage Conservation Consulting, n.d.).



Figure 26. Aerial photo of Al Ula Old Town.  
(Heritage Conservation Consulting, n.d.).

**Al Ula Old Town**  
[site plan]



Figure 27. Site plan illustration of Al Ula Old Town by the author, 2022.

### 3.3 History

Despite it being tucked in the creases of Saudi's rich natural landscape, Al Ula County upheld an important role throughout much of its rich history. With the rise of early civilisations and the establishment of trade routes, Al Ula became a prominent trade hub as early as the 6th century BC, becoming an integral part of four subsequent kingdoms: the Kingdom of Dedan, the Kingdom of Lihyan, the Kingdom of Ma'in, and the Kingdom of Nabataeans (Mortada, 2020, p. 36).

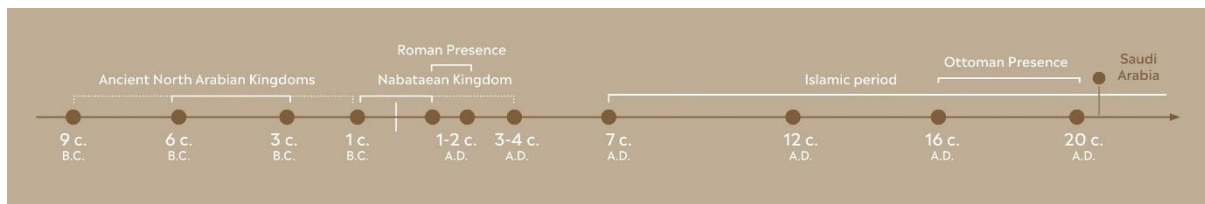


Figure 28. Al Ula chronological timeline. ("ALULA region," 2019).

With the emergence of Islam in the 7th century AD, the influence of pre-Islamic kingdoms diminished but Al Ula continued to be a strategic location and is said to have been visited by Prophet Mohamed on his way to the city of Tabuk (Mortada, 2020, p. 66). Historians believe that the Old Town as we know it today was established by the Umayyad general and governor Mussa bin Nussair, who was buried under the central hill that runs across the Old Town from East to West (Mortada, 2020, p. 66). On that same hill, a castle was constructed in the 6th century BC overlooking the valley (Mortada, 2020, p. 66). Al Ula witnessed several historical events, most notably the wars over the Islamic Caliphate between the Umayyads and Ibn Al Zubair since the valley was considered a middle point between Damascus and Mecca, the headquarters of each of the two armies (Mortada, 2020, p. 66). In peaceful times, Al Ula provided respite for pilgrims travelling to Mecca and Medina (Mortada, 2020, p. 72).

The expansion of the Ottoman Empire during the 18th century led to the development of the Hejaz Railway connecting Medina and Damascus with a train station located in Al Ula (Mortada, 2020, p. 68).



*Figure 29. Five local men crossing the Hijaz railway track in the Oasis of Al Ula, 1907. (École Biblique et Archéologique Française as cited in The Living Museum, n.d.).*

With the fall of the Ottoman Empire and rise of Al Saud dynasty which led to the unification of the different regions under the Kingdom of Saudi Arabia, Al Ula pledged allegiance to the Kingdom in 1926 (Mortada, 2020, p. 68). It is worth noting that Al Ula has been favourably mentioned by travellers, archeologists and explorers such as the infamous Ibn Battuta as well as the German orientalist Julius Euting (AD 1839-1913) and British explorer Charles Doughty (AD 1843-1926) whose maps and writings provided today's researchers with much-needed insights (Mortada, 2020, p. 82-85).

Today, Al Ula remains an important archeological, cultural and agricultural hub in Saudi Arabia (Heritage Conservation Consulting, n.d.). The push to achieve Vision 2030 goals led to the creation of the Royal Commission for AlUla (RCU) in 2017, whose mission is to preserve, develop and leverage Al Ula's natural, historical, and cultural significance (Heritage Conservation Consulting, n.d.).

# Al Ula Old Town [connectivity and direct proximity]



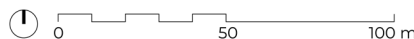
Al Ula New Town

Summer Farms

Al Ula Old Town

- Al Ula Old Town boundary
- Al Ula New Town boundary
- Summer Farms boundary

- Historical pilgrimage & trade route
- Musa bin Nusair Street (built circa 1950s)
- King Fahd Road - Highway 375 (built circa 1990s)



The town's boundary (dashed line) is the delineation used by HCC - Heritage Conservation Consulting Inc., adopted and modified by the author.





Figure 30. Photo collage of Al Ula Old Town. (Various sources: TourMag, n.d.; Experience AlUla, n.d.; Heritage Conservation Consulting, n.d.; Ali Al-Suhaimi as cited in Al-Thaqafi, 2021; Expedia, n.d.; Srivastava, 2022).

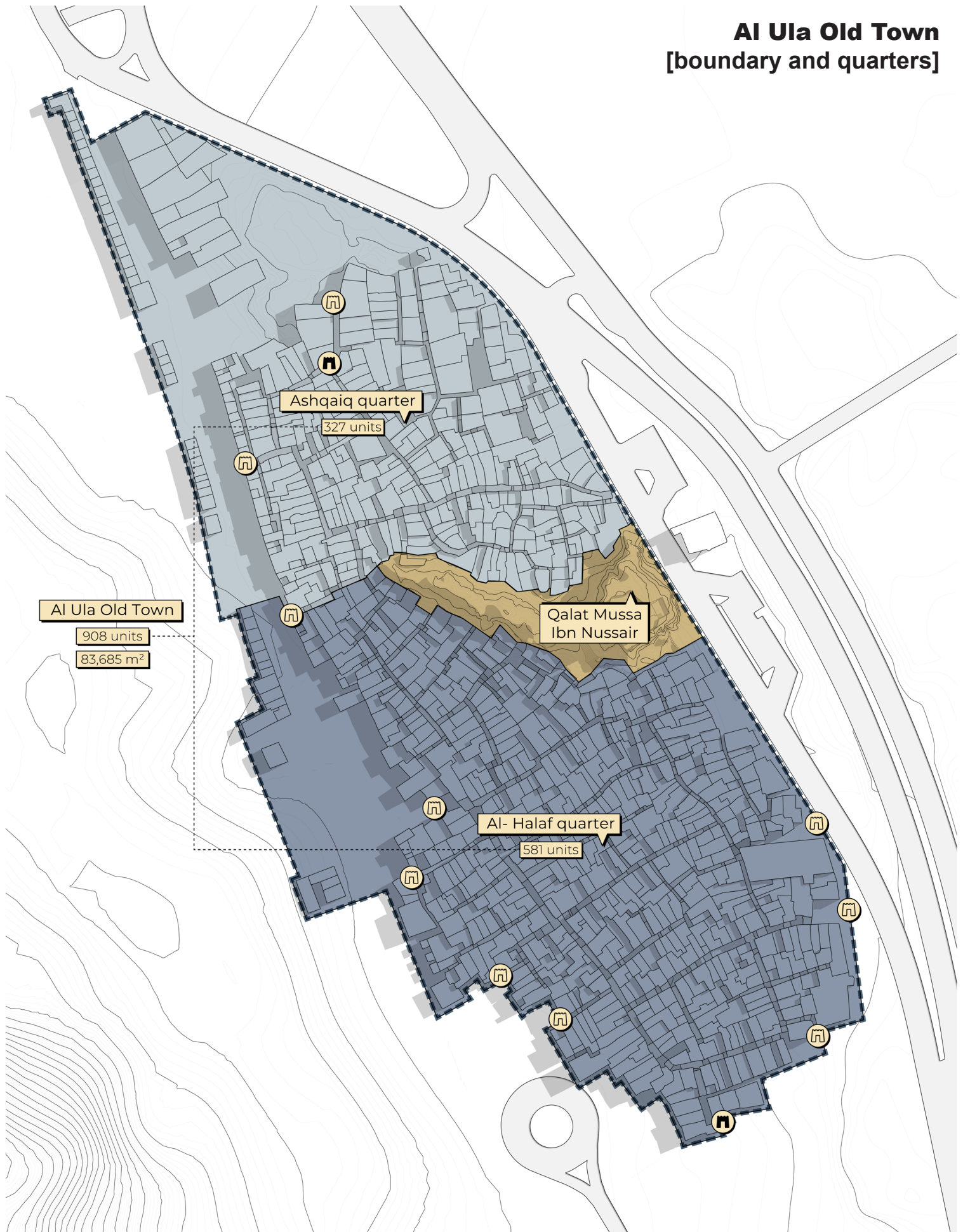
The fertile valley enabled a strong agricultural presence in Al Ula which was mostly spread along the flat land, East of the old town. These lands were known as the summer farms and it was customary in Al Ula for inhabitants to move out from the Old Town during the hot summer months and spend time in simple mud and wood structures sheltered under palm trees, orchards, and jasmines (Mortada, 2020, p. 33).



*Figure 31. The fertile farms of Al Ula. (DR as cited in Georges, 2022).*

With the demographic growth and urbanisation across the country during the 20th century, the new town of Al Ula was established just north of the old town, and an expansion to the south later followed (Heritage Conservation Consulting, n.d.). The urban growth, rather transformation to concrete housing and more orthogonal planning was also accompanied by several road developments and expansions notably Mussa bin Nussair street (built circa 1950s) and the King Fahd highway (built circa 1990s) which created a strong separation between the Old Town and the summer farms.

# Al Ula Old Town [boundary and quarters]



--- Al Ula Old Town Boundary

■ Ashqaiq quarter

■ Al-Halaf quarter

■ Qalat Mussa Ibn Nussair

Ⓜ Main gate

Ⓜ Secondary gate

0 50 100 m

The town's boundary (dashed line) is the delineation used by HCC - Heritage Conservation Consulting Inc., adopted and slightly modified by the author. Al Ula Old Town has 908 units, the breakdown between the quarters may vary as fieldwork has not yet been concluded.

Fieldwork done by HCC and CRAterre documented 906 tightly packed units, which is thought to be for defensive reasons (Heritage Conservation Consulting, n.d.). The 14 city gates controlled access to the Old Town's meandering and narrow alleyways which span for more than 3,000 linear metres and run between houses and under *Tayaras* (Heritage Conservation Consulting, n.d.). A *Tayara* or *Skifa* are first floor extensions that run above the alleys, creating well-needed shade (Heritage Conservation Consulting, n.d.).



Figure 32. An alleyway in Al Ula Old Town covered by a series of 'Tayaras'. (Expedia, n.d.).

Furthermore, the Old Town is split by the rock formation that hosts Mussa bin Nussair's castle into two neighbourhoods: Al-Halaf quarter to the south and the Ashqaiq quarter to the north (Heritage Conservation Consulting, n.d.).

### 3.4 Society and demographics

Al Ula is historically formed by several tribes, each headed by a chief who is entrusted by the community to overview the organisation of social life, administration and agriculture (Nehmé & Alsuhaibani, 2019, p. 112-113). The inhabitants of the oasis usually elected one judge who oversaw juridical matters (Nehmé & Alsuhaibani, 2019, p. 113).



During the Ottoman rule, Al Ula enjoyed relative independence and continued to self-govern with the supervision of the tribal chiefs and the appointed judge (Nehmé & Alsuhaibani, 2019, p. 112). However, this changed when Al Ula joined the Kingdom of Saudi Arabia in 1926 and the governance shifted to a board of directors of 7 members elected every 4 years by the local inhabitants (Nehmé & Alsuhaibani, 2019, p. 113).

*Figure 33. A festivity in Al Ula Old Town to celebrate the start of the planting season. (Zaki, 2020).*

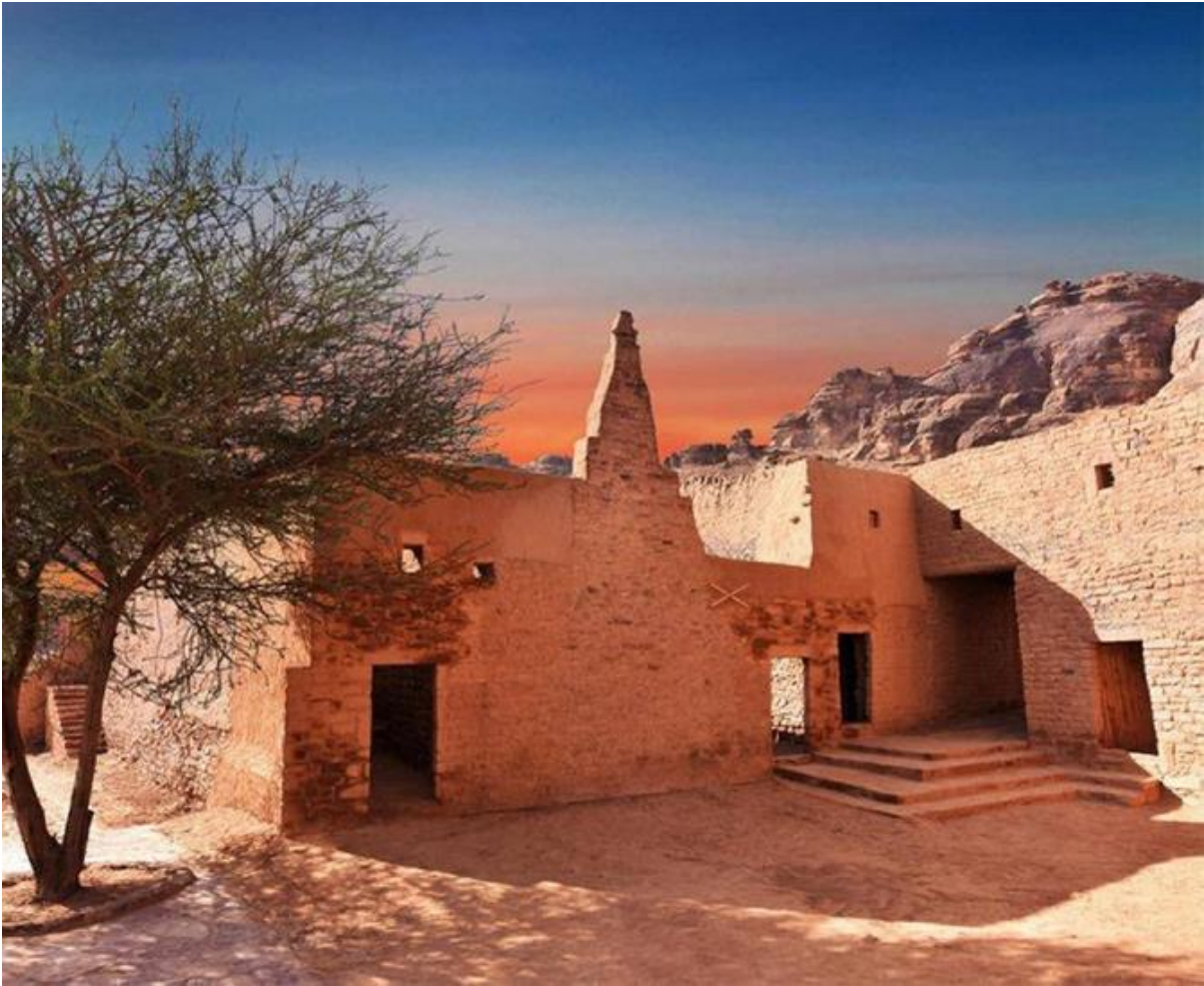
Under the new rule, agriculture thrived under reformed regulations that enabled infrastructure development such as the restoration of old canals (Nehmé & Alsuhaibani, 2019, p. 113). Besides agriculture, locals also thrived on trade especially due to the town's location along the pilgrimage and trade routes (Nehmé & Alsuhaibani, 2019, p. 113).

Throughout its establishment, Al Ula attracted settlers from across the Middle East and beyond (Nehmé & Alsuhaibani, 2019, p. 112-113). It was customary for newcomers to approach one of the tribes in an attempt to join it in which case the tribe leader would gather the tribe elders and leaders to review the request to settle in the oasis (Mortada, 2020, p. 33). If granted a place, a record would be drafted detailing

the incomer's lineage and personal details (Mortada, 2020, p. 33). This practice stands behind a well detailed database of all the inhabitants of Al Ula (Mortada, 2020, p. 33).

As mentioned earlier, inhabitants would leave their houses in al-Dira district in the second half of June in favour of the cooler location amidst the plantations. While al-Dira resembled a ghost town during this period, the farms bustled with life, night gatherings, singing and local games (Nehmé & Alsuhaibani, 2019, p. 114). Souks were a usual sight and were populated with food stalls and trading carts (Nehmé & Alsuhaibani, 2019, p. 114). Weddings are said to last a week in Al Ula, while religious holidays such as Eid were given the utmost importance coupled with prayers as well as chanting, singing and drumming (Nehmé & Alsuhaibani, 2019, p. 114-115).

Al Ula's public spaces were an integral part of social life and leisure activities, offering spaces of meeting and exchange such as the *dikak*, which are stone and clay benches found in front of houses and stores where people would meet to chat or play (Nehmé & Alsuhaibani, 2019, p. 116). Furthermore, one of the squares located southeast of the Old Town features a unique landmark called *Tantoora*, a pyramidal shaped structure on top of one of the houses overlooking the squares that is used as a sundial to organise irrigation and define the agricultural seasons (Mortada, 2020, p. 96).



*Figure 34. The 'Tantoora' sundial in Al Ula Old Town. (Ali Al-Suhaimi as cited in Al-Thaqafi, 2021).*

Al Ula is one of seven governorates in the Medina Region which spans over an area of 151,990km<sup>2</sup> and had a population of 1,777,973 inhabitants in 2010 of which 55,010 lived in Al Ula in 2015 (Mortada, 2020, p. 13). The ethnic makeup of Al Ula changed with migration patterns and urban growth but the non-Saudi population remained at 19% in 2008, which is well under the national average of 31% at the time (Mortada, 2020, p. 13).

### 3.5 Nature and climate

Al Ula presents a diverse natural landscape making the governorate stand out in the accounts of those who visited it along the centuries. Al Ula has several mountains that stand between 1100m and 1600m above sea level, dominating the horizon with their varying rock compositions and colours (Mortada, 2020, p. 15). Scattered sedimentary plateaus facilitated movement into the valley, which vary in width and are known to be floodplains and highly fertile (Mortada, 2020, p. 23-25). Lava fields known locally as *Harrat* also dot the northwest/southeast side of Al Ula (Mortada, 2020, p.24).



Figure 35. The diverse landscape of Al Ula County. (Johnston, n.d.).

Unlike the central regions of Saudi Arabia, Al Ula enjoys extended periods of mild climate per year, making it a more enjoyable place to live (Mortada, 2020, p. 29). Summers are known to be hot and arid with an average temperature of 32°C, while winters to be cool and dry with an average temperature of 15°C (Mortada, 2020, p. 29). The year-round average temperature is known to be around 25°C (Mortada, 2020, p. 29). Precipitation is inconsistent during the colder months, usually starting from October and lasting until April (Mortada, 2020, p. 30). Humidity in Al Ula usually sits



below 27%, while the prevailing winds are mostly from the West for about 8 months of the year and from the North for about the rest of the year (Mortada, 2020, p. 31).

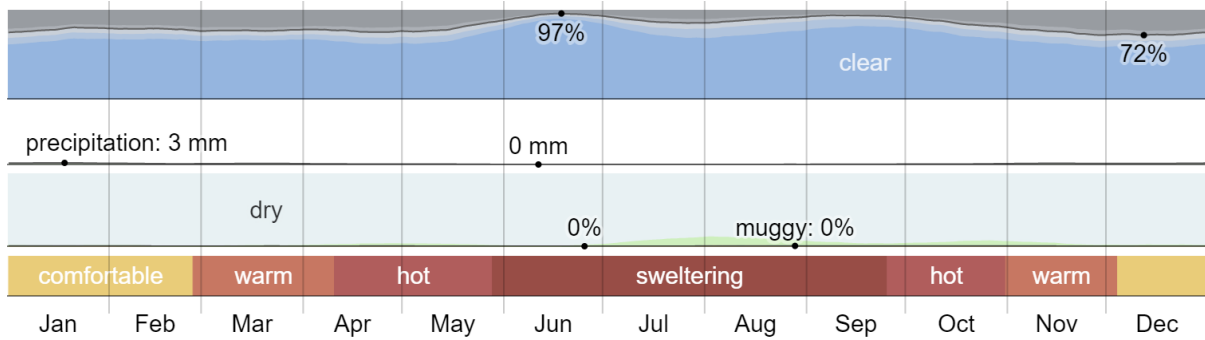


Figure 36. Climate in Al Ula County. (Adapted from Weather Spark, n.d.).

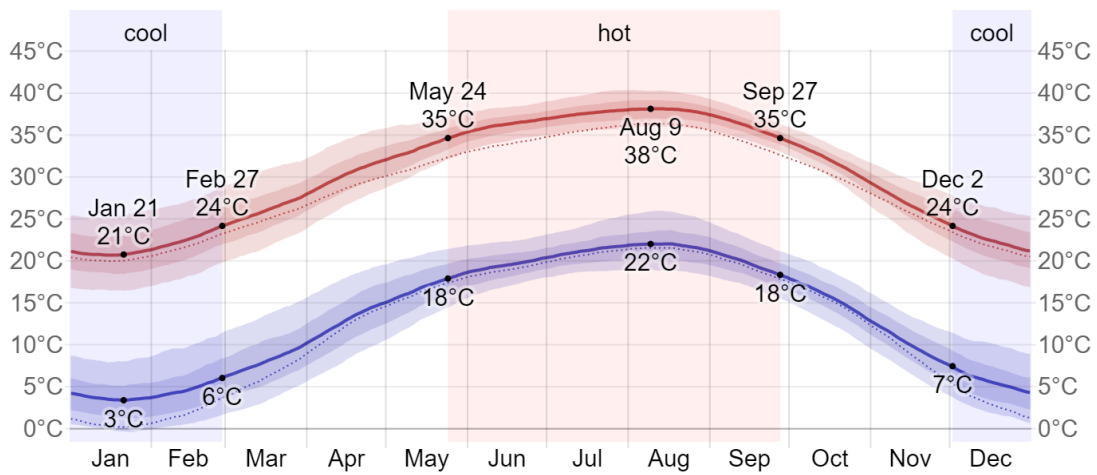


Figure 37. Average high and low temperature in Al Ula County. (Adapted from Weather Spark, n.d.).

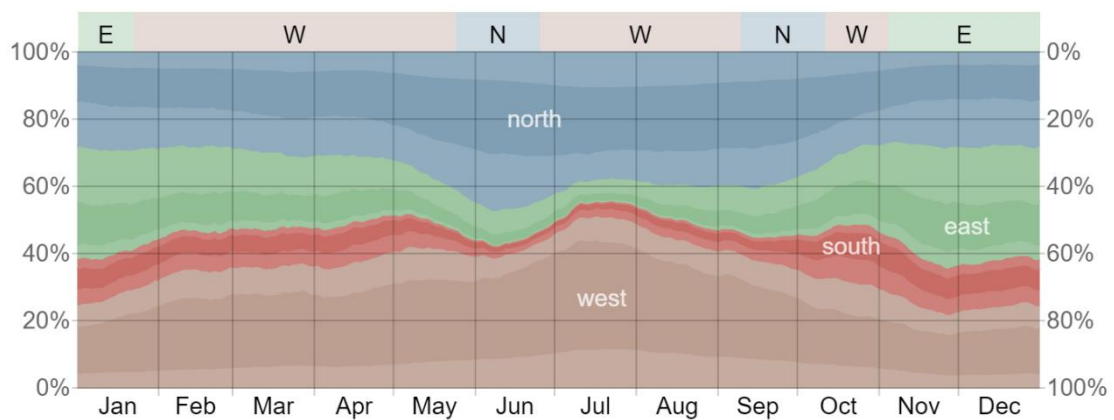


Figure 38. Wind direction in Al Ula County. (Weather Spark, n.d.).

## **04 METHODOLOGY**

## 4.1 Part A - The designers

### The questionnaire design

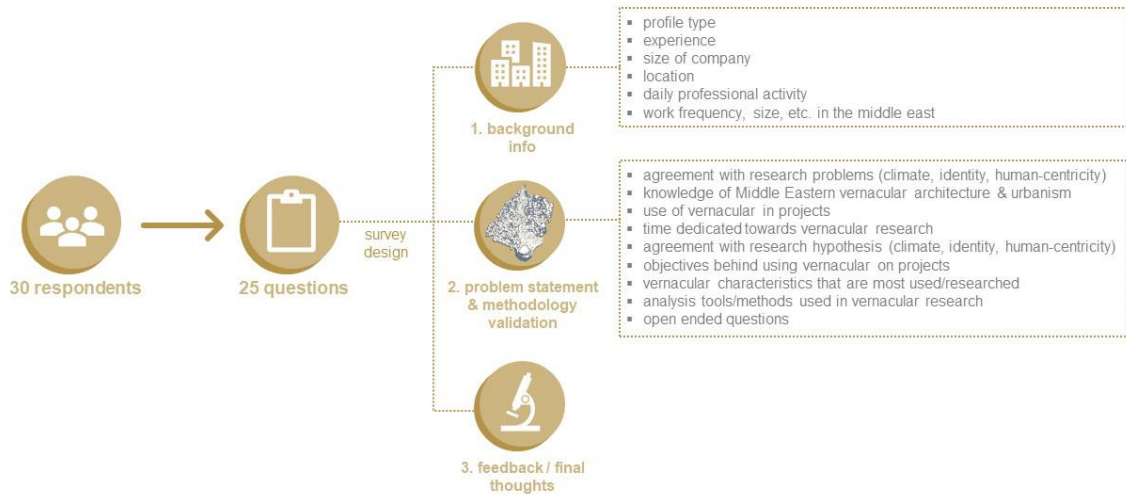


Figure 39. Part A: questionnaire & survey overview. (Diagram by author, 2022).

Built out of a desire to test the problem statement and draw deeper insights, the questionnaire is made out of 25 mixed-format questions (annexed), of which the majority are quantitative. The quantitative questions are repatriated as either multiple choice questions or likert scale questions, while the qualitative questions are open ended.

The 25 questions are organised in 3 sections:

1. Section 1 has eleven questions and aims to gather some background information about the respondents such as industry specialisation (architecture, urban design, research, etc.), years of experience, daily professional tasks, and geographical location. The last 3 questions of section 1 test respondents' agreement with three statements that constitute the basis of the research problem. These statements ask respondents whether they feel that there are recently built developments in the Middle East that overlook:
  - a. local climate conditions,
  - b. local architectural identity,
  - c. human-centricity.

Assessing whether architecture and urban professionals agree or disagree with the above three aspects will validate whether the proposed research problems are commonly perceived as problems within the architecture and urban planning industry in the Middle East.

2. Section 2 has eleven questions and besides attempting to validate the problem statement it also delves into the respondents' Middle Eastern vernacular knowledge, research frequency and applicability on projects, and the urban analysis methods used.

In questions 4 through 6 of section 2, the respondents are again asked to rate their agreement with three statements. These statements ask respondents whether they feel that vernacular architecture can help in creating developments in the Middle East that:

- a. respond to local climate conditions,
- b. are in line with local architectural identity,
- c. are human-centric.

Assessing whether architecture and urban professionals agree or disagree with the above three aspects will validate whether the proposed hypothesis is a common belief within the architecture and urban planning industry in the Middle East.

The rest of the questions in this section will influence the subsequent urban analysis methodology to be constructed within this study by revealing research patterns and tendencies within the design process. One of the questions tries to understand design professionals' motivation for using vernacular knowledge in projects, followed by two other questions that try to understand what vernacular characteristics are mostly used on projects as well as the methods and tools used to analyse these characteristics. Responses will determine what urban characteristics and methods this research should focus on.

3. Section 3 has three open-ended questions collecting final thoughts to close the survey.

## **Diffusion and target audience**

Google forms was used to host the survey due to the platform's simplicity, range of tool options, friendly user interface, and adequate visual representation of answers. LinkedIn posts and peer-to-peer messages were the main method of diffusion. The target audience were architecture and urban professionals who have experience working in the Middle East.

## **4.2 Part B - The site**

### **Constructing the urban analysis methodology**

After collecting insights from design professionals through the survey and carrying out desk research on Al Ula Old Town, supported by David Gandreau and the fieldwork of the CRAterre team, I was able to construct a diverse methodology that assesses several urban characteristics. The resulting methodological framework is organised into three different clusters, each cluster combining a different set of analysis methods to test distinct urban aspects.

#### **Cluster 1: urban characteristics**

The first cluster covers "conventional" analysis methods and aspects that are essential to comprehend the urban morphology. This will be done using maps, pictures, available survey data and some basic calculations and visual representation tools, in addition to building a 3D model that will help with the subsequent clusters.

The following components will be studied in this cluster:

1. **Land use:** using different colours, this analysis will help understand the function of each building, the different amenities that were available at the time for the inhabitants' and visitors' alike as well as the different activity centres within the

site (American Planning Association et al., 2006, p. 7, 267; Schwalbach, 2009, p. 41-42).

2. **Ground figure:** by visually highlighting the built mass, this analysis will help understand the urban fabric and other components such as compactness, open spaces, pathways, connectivity, etc. This will equally highlight the different building typologies, the relationship between these buildings, as well as the interface between the buildings and the open spaces (American Planning Association et al., 2006, p. 266; Dempsey et al., 2008, p. 25).
3. **Density:** one way to measure density is by calculating the total Floor Area Ratio (FAR) which by definition is the ratio of the buildings total floor areas to the size of the site (American Planning Association et al., 2006, p. 272). Density could have several indications such as low or high accessibility to amenities (Dempsey et al., 2008, p. 25), implications on the user experience, and quality of space (American Planning Association et al., 2006, p. 272-273).
4. **Open space:** one of the ways this can be quantified is by calculating the Open Space Ratio (OSR) which is the amount of undeveloped space on a given site as a percentage of the FAR. This gives an idea of how much open space is available for users' whether it is for recreation, commerce, transportation, or other sub-uses (Yang et al., 2019, p. 1). Open space is attributed with many social, political, and wellbeing benefits (Stanley et al., 2012, p. 1090). Open space could be landscape (green, parks, etc.) or hardscape (plaza, square, etc.).
5. **Building heights:** coupled with density, building heights reveal important indications on the spatial quality. Street aspect ratio could also be determined with this information, which is another good indicator on whether or not the built environment is human-scale and as well as other environmental performance indicators (this will be covered in cluster 2).

## **Cluster 2: environmental performance**

The second cluster delves into the environmental performance aspects, mainly analysing solar and wind exposure. To perform these studies, a 3D model is imperative, as well as weather data and more advanced analysis tools. This cluster is

important to understand whether or not the built environment facilitated a comfortable spatial experience to the users.

The following components will be studied in this cluster:

1. **Solar radiation:** or simply sunlight has a direct implication on the way people use outdoor spaces, especially in hot arid climates where direct sun exposure can be detrimental to users' outdoor experience. There are several ways to quantify this, and one way is by measuring the amount of sunlight falling on the horizontal plane at different times of the day and of the year. In simpler terms, it is tracking the sun that hits the public realm at selected times. Solar radiation has a direct impact on the heat island effect and is also one of the environmental aspects that are considered when measuring outdoor thermal comfort. Consequently, there are many advantages to calculating an urban zone's solar radiation.
2. **Shadows:** another important aspect of outdoor thermal comfort is shadows. In hot arid climates, shading is crucial to ensure a sensible outdoor experience for pedestrians. Certain compact urban fabric in hot arid climates have proved highly efficient due to the self-shading aspect, which not only resulted in a better outdoor experience but also resulted in cooler temperatures within buildings (Taleb & Abu-Hijleh, 2013, p. 761). Therefore, a shadow study is highly beneficial to understand whether or not the studied urban fabric facilitates a better outdoor thermal comfort.
3. **Urban microclimate - UTCI (Universal Thermal Climate Index):**  
UTCI measures the human physiological comfort level within its surroundings and is represented in an equivalent temperature (°C). More technically, UTCI takes into consideration the air temperature, sun exposure, humidity, wind and the actual clothing worn in that context in order to calculate the link between outdoor environment and human well-being (Climate-ADAPT, n.d.),
4. **Wind analysis:** equally to sunlight and shadow, wind is another important component of outdoor thermal comfort that can highly impact users' outdoor experience (Stathopoulos, 2009, p. K 67). One way to quantify this is by running a Computational Fluid Dynamics (CFD) test that simulates wind at the ground-level (Stathopoulos, 2009, p. K 78). A CFD simulation coupled with a basic

overlay of street orientation onto the local wind rose, will reveal whether or not the urban morphology promotes better wind circulation in order to improve the outdoor thermal comfort.

### **Cluster 3: urban network analysis**

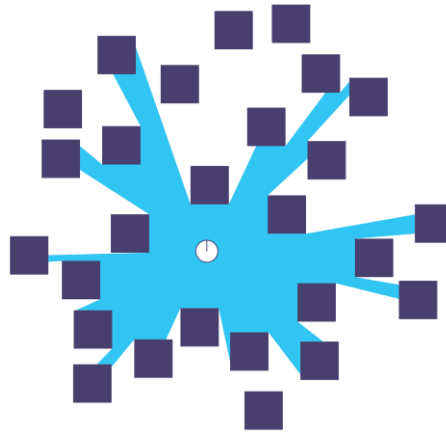
The third cluster focuses on analysing the urban network through the theory of Space Syntax in order to draw meaningful insights on the spatial layout and human activity pattern within Al Ula Old Town (please refer to subchapter 2.7 for an overview). Space Syntax theory firmly believes that spatial elements are relationally interconnected, meaning activity that happens in one spatial element such as an open space, is influenced by other spatial elements that are connected to it such as a street or another open space (Space Syntax, 2022). Moreover, the analyses are not only indicative of spatial relationships but also indicative of social effects such as commercial footfall, accessibility, crime, and traffic (Space Syntax, 2022).

Techniques used in Space Syntax are derived from mathematical relationships and can be computed using an open-source software called depthmapX (courtesy of the depthmapX development team, 2017), which will be used in this cluster (Space Syntax, 2022). To sum up, depthmapX will map spatial relationships within the urban fabric in order to help us understand how accessible a space is to people and inversely how people navigate space.

The following are a selection of the analysis that will be produced following Space Syntax methodology:

1. **Visual analysis:** the basic element of visual analysis is an “Isovist” which is a representation of all the spatial objects that can be directly seen from any given vantage point (Space Syntax, 2022) such as shown in figure 17 (Doherty, 2011). In real time, isovists constantly change as people move in space. Thus, the accumulation of these isovists represents a continuous overlapping reel of isovists.





*Figure 40. Representation of an isovist: the circle represents the vantage point, the dark blue represents the spatial objects, whereas the light blue represents all the objects that can be perceived from the circle. (Doherty, 2011)*

Several visual analyses can be produced following the Space Syntax methodology depending on the purpose, for this study a Visibility Graph Analysis (VGA) will be performed which shows all the mutually visible locations in the public realm (Space Syntax, 2022). To perform the visual graph analysis, the software will flood the open space of Al Ula with isovists and will calculate the mean average of these isovists to produce the final map Space Syntax (2022).

From an urban standpoint, this will allow drawing important insights such as the location of hotspots, safe points, the visibility of public squares and consequently help paint a picture of how people used the space in the Old Town.

2. **Integration** (aka closeness): measures how close each segment (i.e., street) is to all others (Space Syntax, 2022). In other words, Integration is used to measure how many street-to-street transitions are needed to go from point A to point B, using the shortest paths. Therefore, integration helps us understand how well each street is integrated within the wider network following user-defined distances (i.e., 200m, 400m, 800m, etc.) to determine proximity and accessibility within the urban network (Space Syntax, 2022).
3. **Choice** (aka betweenness): measures how much flow is likely to take place on each segment (i.e., street) on trips between all the network's segments (Space Syntax, 2022). In other words, Choice is used to assess the likelihood of a

pedestrian passing through one segment each time they traverse the segments (i.e., footfall on each segment within the network). Choice can for instance be used to assess what land use best fits a certain area depending on the footfall on that street.

4. **Agent analysis:** by releasing bots called “agents” in the virtual open space, depthmapX can simulate a range of pedestrian behaviours that allows us to understand how the built environment is used by the agents (UCL, 2020). In more elaborate cases, we can establish scenarios where we have certain attractors such as an open space, an amenity, or a destination so that we comprehend how pedestrians react to a given destination within the urban network. Due to time limitation, a general simulation will be run to see what are the preferred routes of agents to move across the town.

**05 SURVEY**

## The People Demand

In the following section I return to the personal experience and relation with the vernacular that sparked this thesis, away from the literature work of renowned authors and scholars. I return to colleagues, connections, and regional professionals who are helping shape the cities of tomorrow.

First and foremost, I start with Karim Elgendy's one-of-many posts regarding newly-built communities vis-a-vis sustainability:

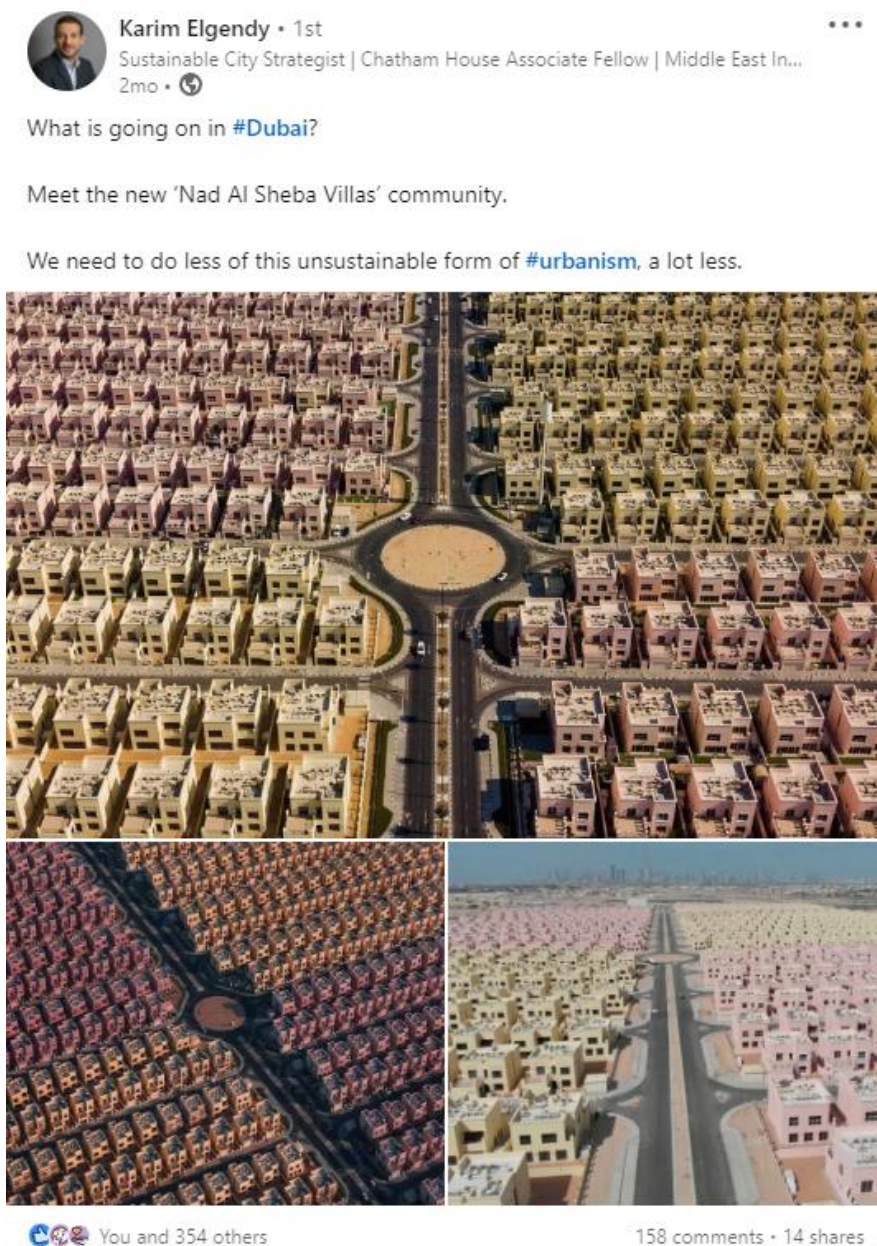


Figure 41. Screenshot by the author of Karim Elgendy's LinkedIn post.

With 355 reactions, 158 comments, and 14 shares to date, this post represents but a small part of the conversation industry-wide. The following selection of comments can summarise the majority of the 158 comments.

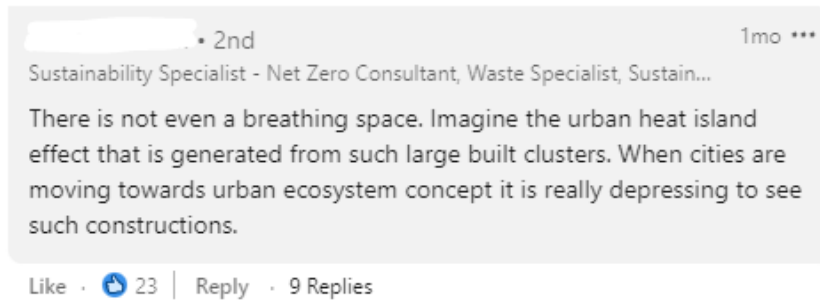


Figure 42. Screenshot by the author of a comment on Karim Elgendy's LinkedIn post.

The author of the above comment draws our attention to the urban heat island effect, which has one of the biggest impacts on climate change and environmental sustainability.

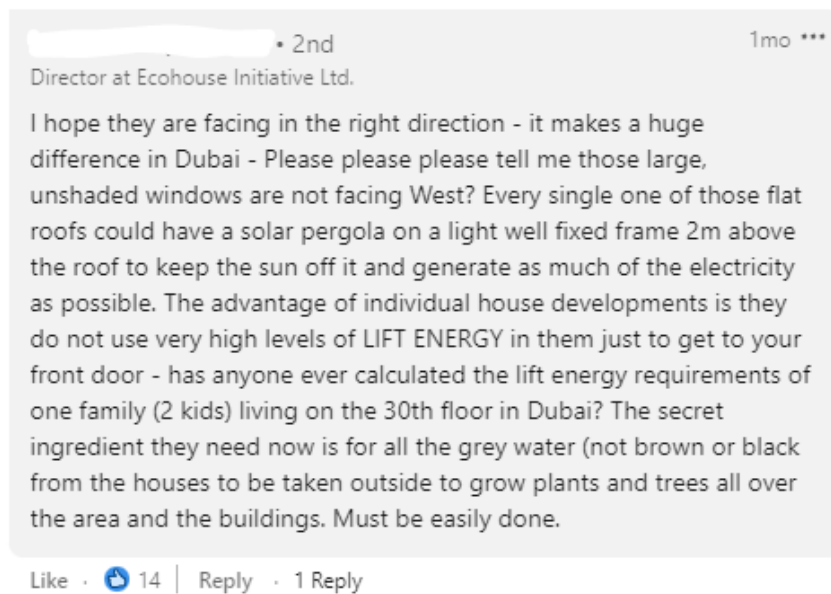


Figure 43. Screenshot by the author of a comment on Karim Elgendy's LinkedIn post.

Another point provoked through the above comment is the importance of using passive and active design strategies to adhere to the local climate. In this case using adequate unit orientation, shading devices, and PV panels were suggested as sustainable design principles by the author of this comment.

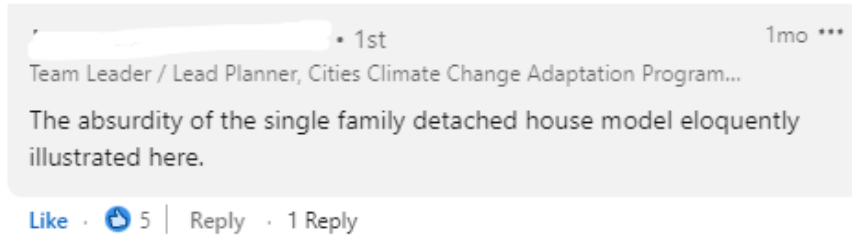


Figure 44. Screenshot by the author of a comment on Karim Elgendy's LinkedIn post.

This commenter inferred that unit typology is equally responsible for unsustainable designs.

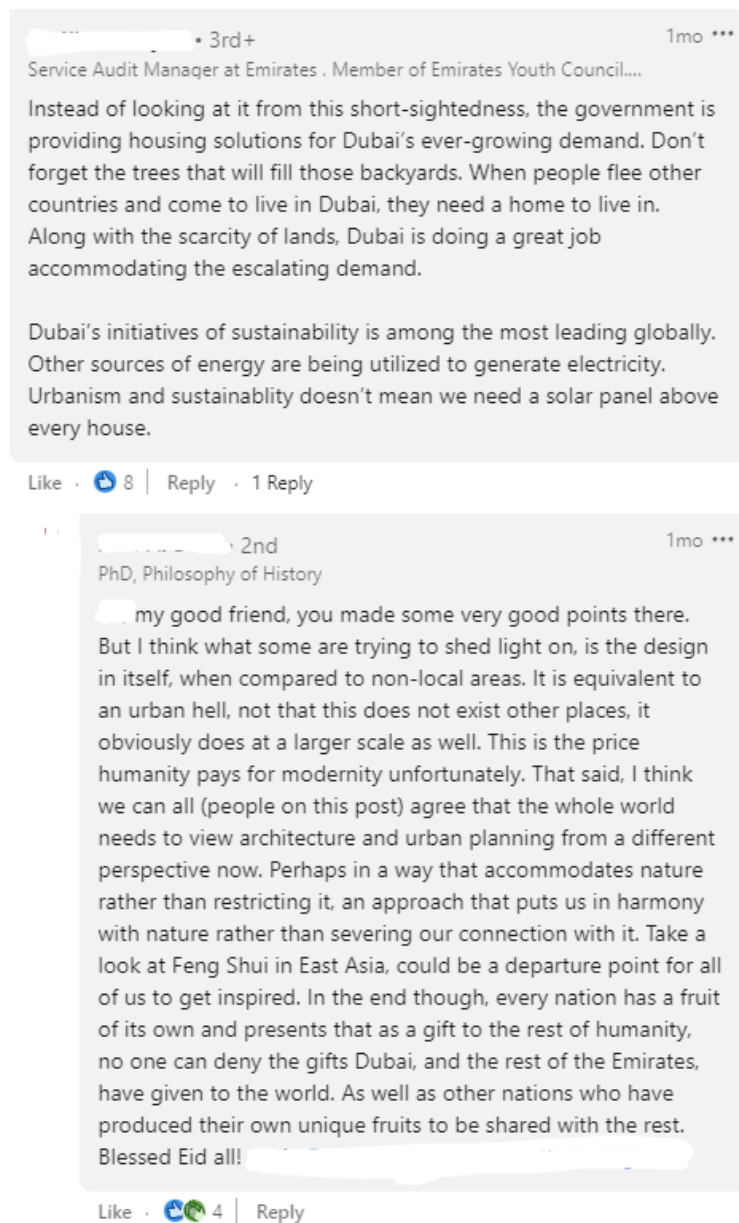


Figure 45. Screenshot by the author of two comments on Karim Elgendy's LinkedIn post.

However, what is especially important for me to take out of this conversation is the belief that “the whole world needs to view architecture and urban planning from a different perspective now”. The *nowness* for me reflects the urgency at which we need to respond to the undeniable sustainable challenges of our day. I return to Rudofsky’s wisdom and perhaps the “different perspective” at which we need to look at architecture and urban planning from lies in the vernacular.

A month after the above post, Elgendy proceeded to publish the below post on his LinkedIn page, harvesting 302 likes, 16 comments, and 16 shares. In rather a simplistic way, the author asserts the need to learn from the principles of vernacular urbanism while stating 4 “facts”.

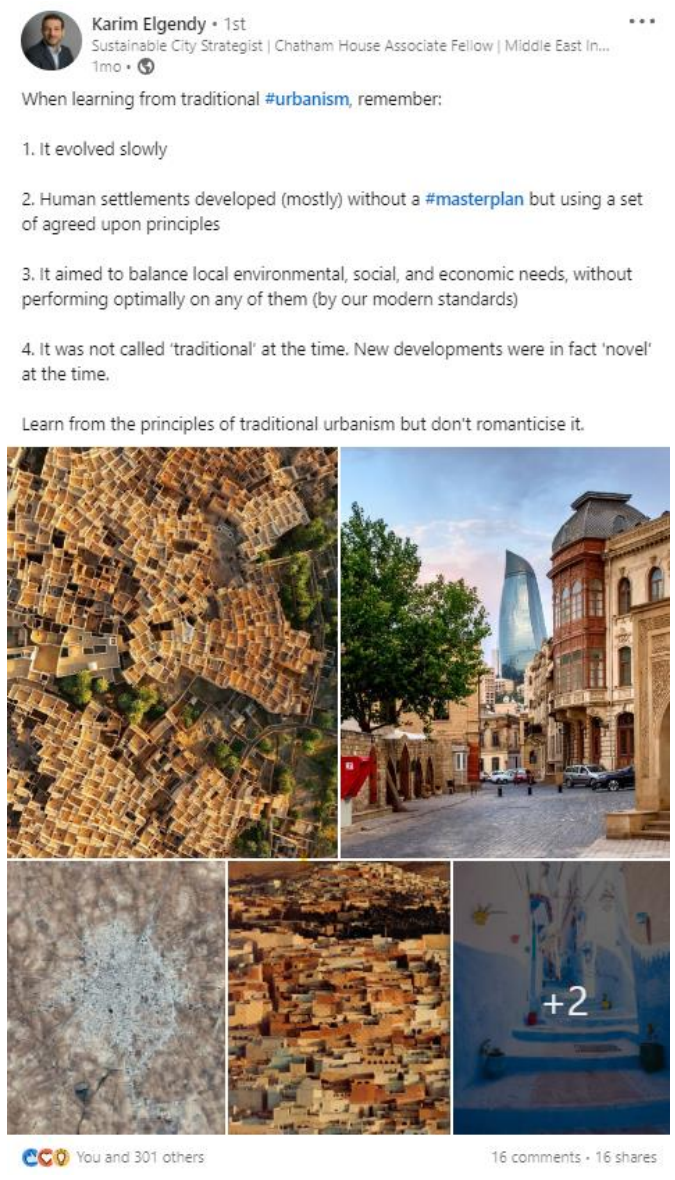


Figure 46. Screenshot by the author of another of Karim Elgendy’s LinkedIn posts.

In the following comments, we could see some concepts, ideas and thoughts not only echoing what scholars like Rudofsky (1964), Oliver (2007) and Blier (2006) reported, but also reiterating the need to “go back to our roots”.

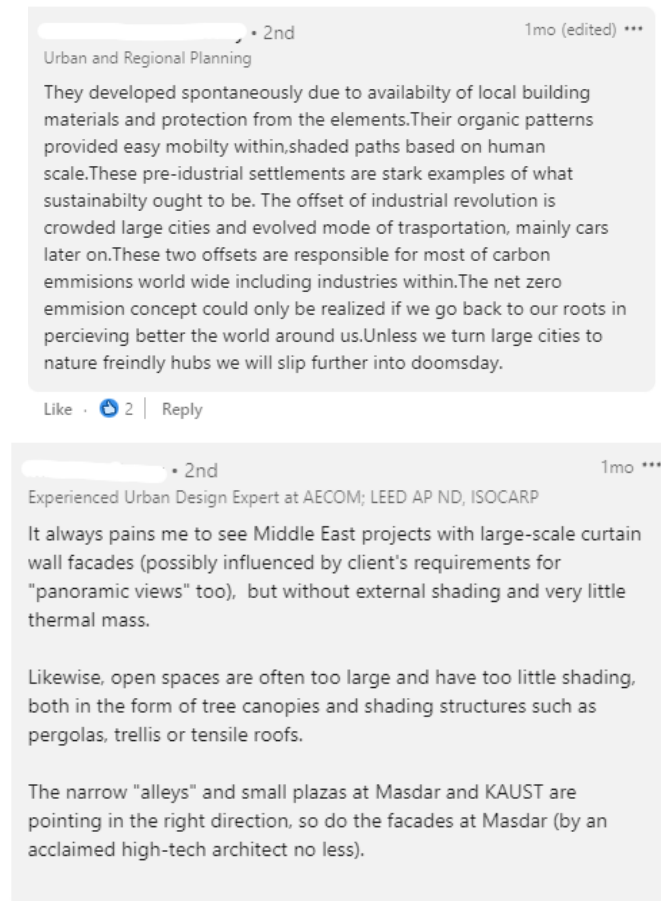


Figure 47. Screenshot by the author of two comments on Karim Elgendy's LinkedIn post.

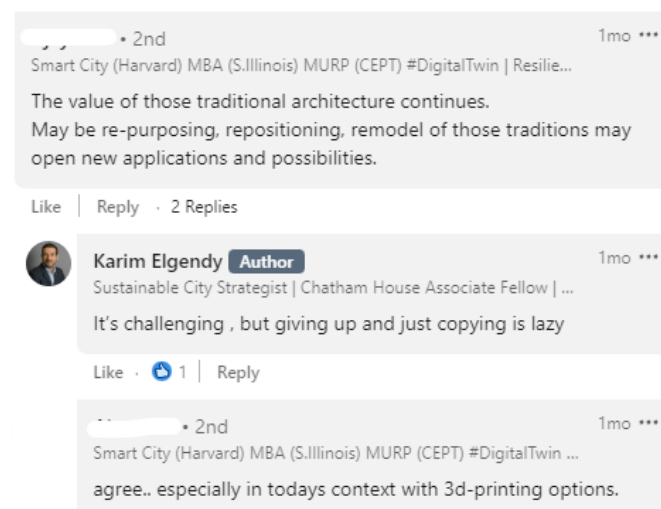


Figure 48. Screenshot by the author of comments on Karim Elgendy's LinkedIn post.



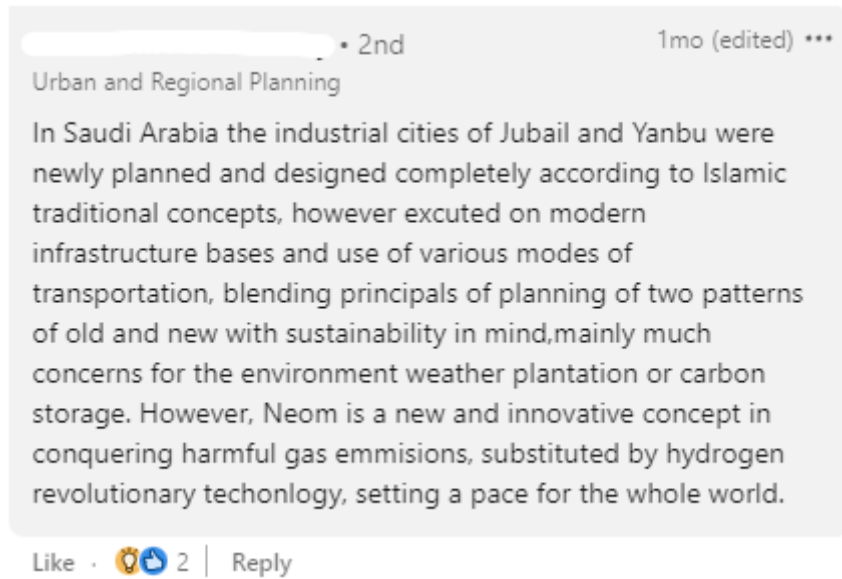


Figure 49. Screenshot by the author of a comment on Karim Elgendy's LinkedIn post.

In the concluding chapter, I will return to the above comment regarding modern infrastructure demands, which out of experience believe that while they are fundamental, they tend to get in the way of "innovation".

In an aim to validate or debunk the above recurrent opinions while clearing any bias, the survey responses came back with interesting insights.

#### a. Respondents background

First and foremost, the survey I diffused had 30 respondents, 13 of which are urban designers and 14 are architects, meaning that 90% of the respondents work at the forefront of design.

30 responses

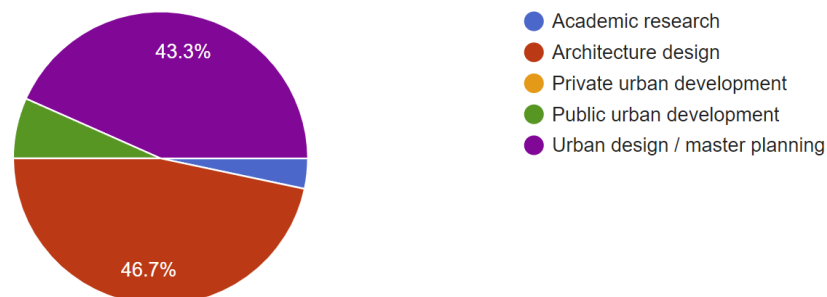


Figure 50. Question 1 of the survey by the author.

This result is very satisfactory for (part of) the objectives of this thesis, since the intention is to relate the outcomes of this investigation to the drawing board, and to do so it was important to listen to professionals on the delivery side of the industry. This is further validated through responses to question 5 regarding daily professional activities, where 90% of the respondents indicated that on a daily basis they take care of design and task delivery.

30 responses

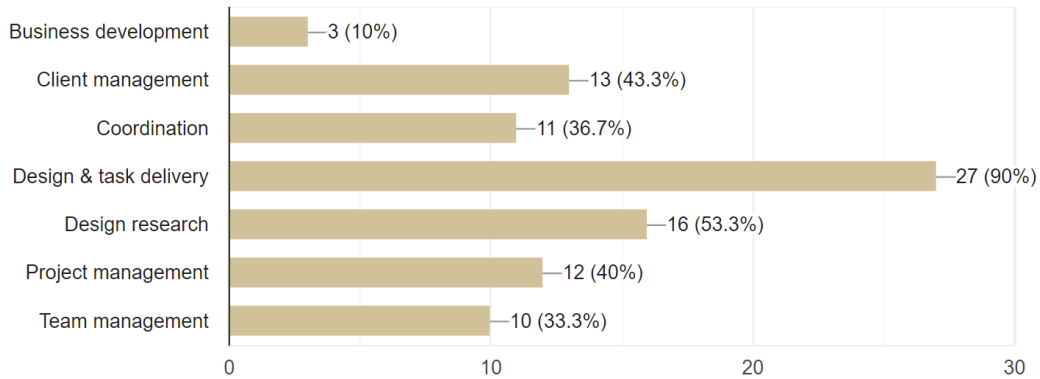


Figure 51. Question 5 of the survey by the author.

Furthermore, out of the total, 22 are based in the United Arab Emirates (73%), while 19 work on projects within Saudi Arabia (63%).

Which country is your office based in?

30 responses

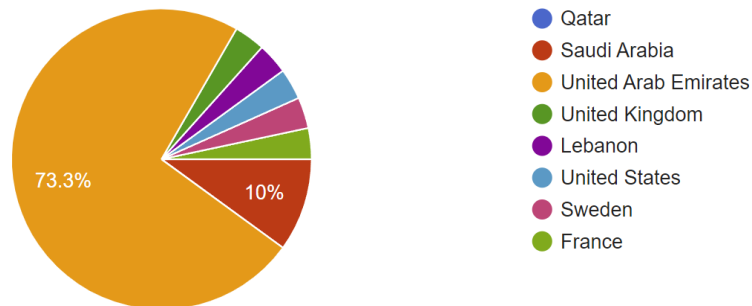


Figure 52. Question 4 of the survey by the author.

Which of the following Middle Eastern countries are most of your projects located in?

30 responses

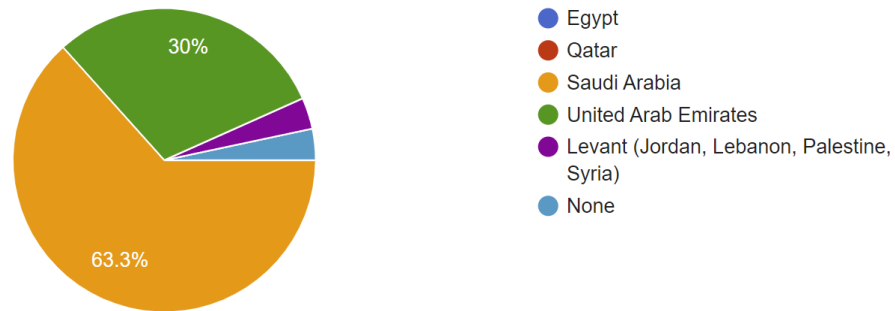


Figure 53. Question 7 of the survey by the author.

This cross-analysis between these two questions stands witness to the various socio-economic dynamics at play in the Gulf region, in specific between the UAE and Saudi Arabia. To stay on topic, what this thesis is interested in highlighting is the expertise exportation from the UAE to the Kingdom as well as the remarkable regional tipping point in urban growth and development. On one hand, the fact that 73% of the respondents live in the UAE is not surprising since the country managed over the past few decades to attract design professionals to meet its unprecedented urban development demands. On the other hand, with Dubai and Abu Dhabi reaching a more stable urban growth and with the launch of Saudi Vision 2030, the market has been witnessing an influx of urban projects from the Kingdom. Case in point is the 19 respondents stating that the majority of their projects are now originating from the Kingdom. This further validates the literature review indicating a rapid urbanisation is in full effect in Saudi Arabia and subsequently my choice to investigate a case study within this Middle Eastern country.

What is the area in hectares of a typical project that you deliver in the Middle East?

30 responses

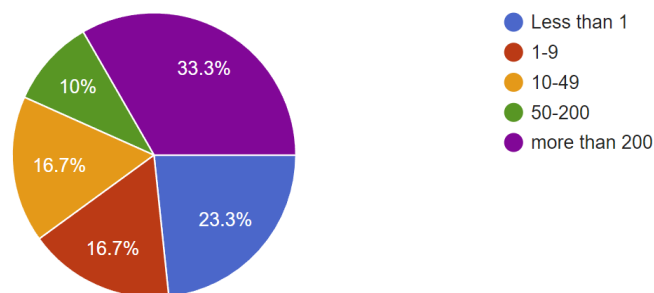


Figure 54. Question 8 of the survey by the author.

An additional factor that was assessed through the above question is the typical scale of a project that these professionals work on. A third stated that a typical project size is more than 200 hectares, showcasing just the sheer scale and grandeur of these commissioned projects. From personal exchange, I confirm that several of the respondents work or have worked on Saudi megaprojects.

Moreover, the responses are quasi-equally distributed in terms of years of industry experience with a slightly higher number of junior-level (33.3%) and principal-level (26.7%) professionals as compared to entry-level (10%), mid-level (13.3%), and senior-level (16.7%).

How many years of industry experience do you have?

30 responses

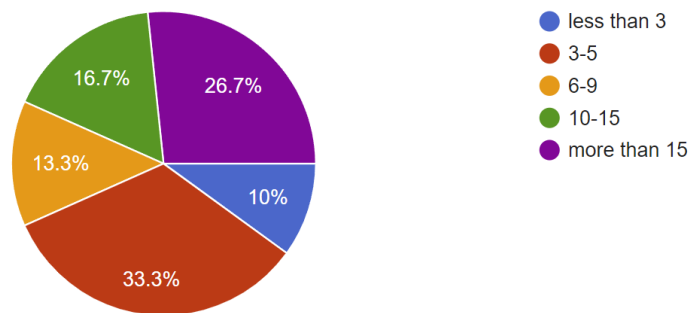


Figure 55. Question 2 of the survey by the author.

The participation of principal-level and senior-level reflects a maturity in the responses provided since these professionals will have an overview of the design process, financial restraints, and client obligations; whereas the participation of entry-level to mid-level usually reflects less restraints in the responses since these professionals focus more on design problematics and less on budgetary constraints and client expectations. Therefore, this balance in the profiles of the respondents is appreciated.

#### b. Problem statement validation

The next step after the background information is assessing the problem statement in likert-scale questions 9 through 11.

Question 9 asked respondents whether or not they agree that “there are some developments built since the 1990s in the Middle East that overlook local climate conditions”. An anticipated two-thirds strongly agreed while no respondent disagreed.

There are some developments built since the 1990s in the Middle East that overlook local climate conditions.

30 responses

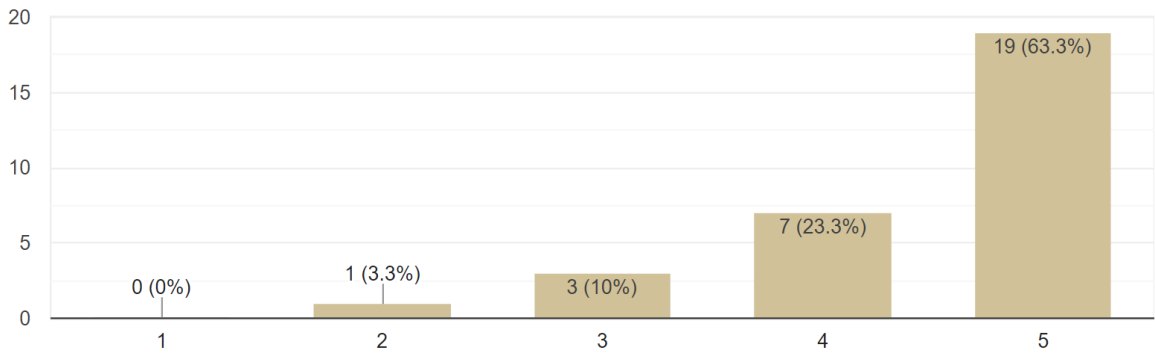


Figure 56. Question 9 of the survey by the author.

Following the same format, question 10 tested whether or not there are developments that overlook local architectural identity.

There are some developments built since the 1990s in the Middle East that overlook local architectural identity.

30 responses

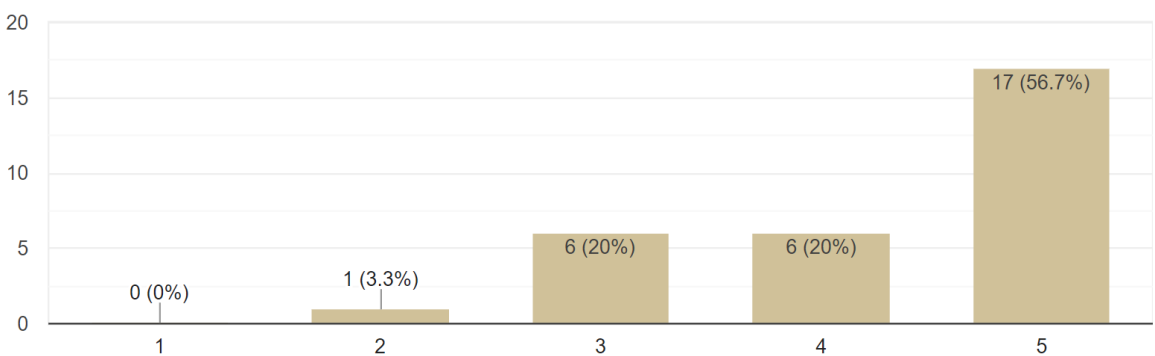


Figure 57. Question 10 of the survey by the author.

We can notice that there is a slight decrease in agreement to this statement. This could be explained through the works of Rudofsky, Oliver and Blier who individually argued that vernacular architecture (often synonymous with local architectural identity) is hard to define. The statement itself is also open for interpretation since “local architectural

identity” can mean different things to different people: are we talking about aesthetics, functions, principles? In the same spirit, I can argue following Alsayyad’s lens (1995) that architects and developers have put more effort into mimicking local architectural features and aesthetics rather than principles and functions, giving a deceitful image that architectural identity is in fact celebrated through developments built since the 1990s. In any case the level of agreement remains satisfactory and validates a part of the problem statement relating to local architectural identity.

Similarly, to the previous 2 questions, question 11 tests for human-centricity.

There are some developments built since the 1990s in the Middle East that are not human-centric.

30 responses

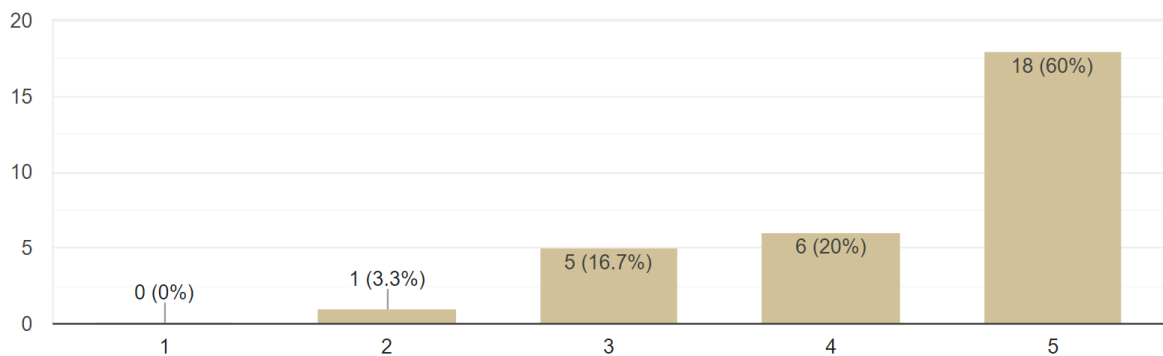


Figure 58. Question 11 of the survey by the author.

Here we see similar responses to question 9, which is not shocking since a lot of developments in the Gulf countries especially in UAE, Qatar and Saudi have been criticised for being car-centric and disregarding human-scale. For instance, Jan Gehl described Dubai as a “city for dinosaurs, not for human beings” when asked about the importance of human-scale planning (Middle East Architect, 2018).

With high agreement levels on the above three statements, it is safe to conclude that the research problems are valid and current in both literature review and amongst industry professionals alike. The second step is then to determine whether the industry believes or not that vernacular architecture can help create more adequate developments.

Mirroring the format and coherence of questions 9 through 11, the following 3 questions asked respondents whether or not they agree with the following three statements:

1. Knowledge from vernacular architecture and urbanism can help create developments that respond to the local climate conditions.
2. Knowledge from vernacular architecture and urbanism can help create developments with a local and contextual architectural identity.
3. Knowledge from vernacular architecture and urbanism can help create human-centric developments.

Knowledge from vernacular architecture and urbanism can help create developments that respond to the local climate conditions.

30 responses

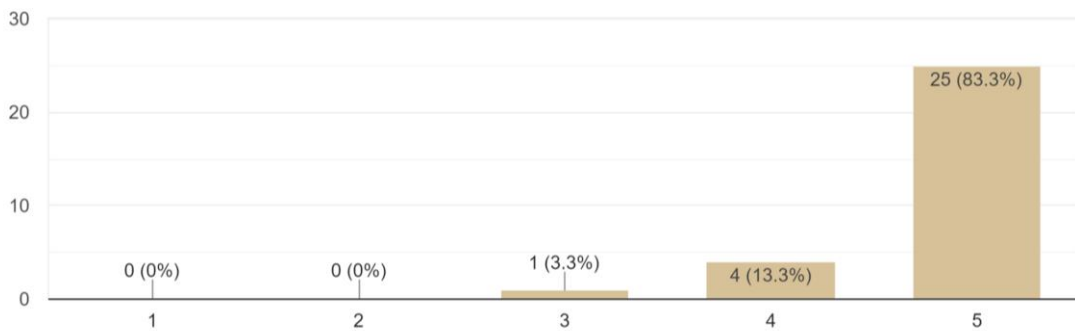


Figure 59. Question 15 of the survey by the author.

Knowledge from vernacular architecture and urbanism can help create developments with a local and contextual architectural identity.

30 responses

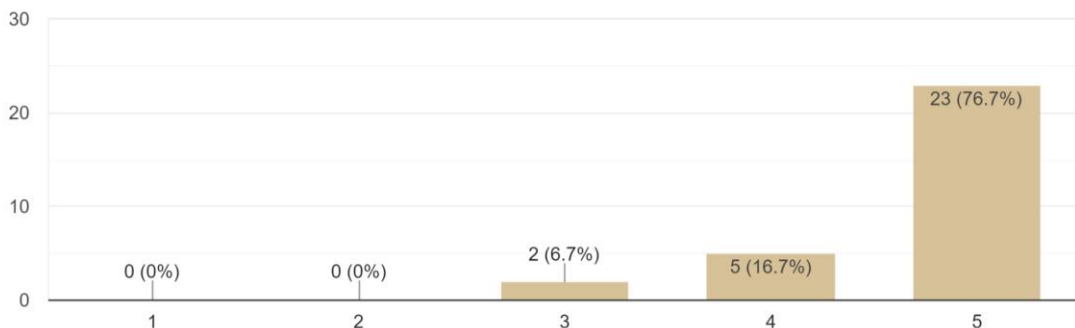


Figure 60. Question 16 of the survey by the author.

Knowledge from vernacular architecture and urbanism can help create human-centric developments.

30 responses

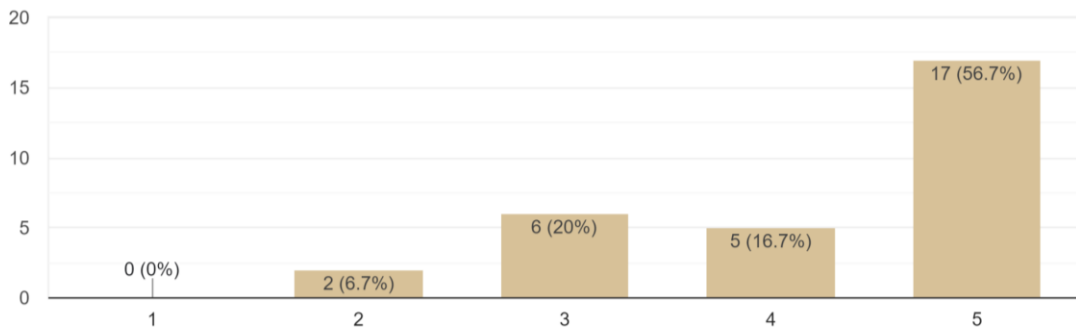


Figure 61. Question 17 of the survey by the author.

No respondents reported strong disagreement with any of the statements (i.e., score of 1 out of 5), with the majority strongly agreeing (i.e. score of 5) the first two statements (83.3% and 76.7% respectively), and 56.7% strongly agreeing with the third statement. This shows a strong belief amongst professionals that vernacular can indeed help respond to challenges linked with climate responsiveness, local architectural identity, and human-centricity. However, to validate this analysis, an open-ended question accompanied these three questions, the below selected responses justify some of the above answers:

#### Response 1

*The vernacular, in my opinion, has, primarily, nothing to do with (whether it is) human centric or not. For me it has to do with the response to some circumstances and technologies of the time. It is human centric (in most of the cases) because life and tech was human centric, but it wasn't on their agenda. It happen(ed) by chance, due (to) some specific contextual circumstances.*

#### Response 2

*I don't disagree but I can say that human centric design and climate responsive design is not necessarily informed by local vernacular. Local vernacular can be one of the approaches but there are many other modern and contemporary design solutions that can deliver similar results. How alienated or integrated the*



*solution is with regards to its context is subjective though and different people will likely have disparate perspectives.*

#### Response 3

*Human-centricity might not have been imperative in all vernacular approaches. I don't see it (as) synonyms with vernacularism.*

#### Response 4

*Just a thought, what if we built more vernacular architecture now but the current inhabitants of a city would not feel connected to these new vernacular developments as they are more comfortable with the current architecture connotations whether good or bad because they got so used to them (would it be not human-centric in their perspective? would vernacular architecture be timeless then?)*

#### Response 5

*We have to be careful to understand that the conditions & lifestyle expectations that led to vernacular urbanism are drastically different. Camels are not the predominant form of mobility and only 20-30% of the current population use mosques. We need to use vernacular urbanism models judiciously.*

The common argument between the answers gravitates towards the time and age at which the vernacular was built, arguing that the technology, conditions, circumstances, and lifestyles were different. While this is factual, vernacular adapted through time with people's need until industrialisation and globalisation facilitated the creation and exchange (importation & exportation) of new building methods, techniques, and styles which consequently resulted in the creation of homogenous styles that are far removed from the local context. Consequently, I am a firm believer that vernacular elements should not be copied but rather understood and studied to respond to challenges.

Going back to the three statements, the responses validate the problem statement: learning from the vernacular can help us design and build communities that are better suited with local climate, people's needs, and contextual identity.

### c. Establishing vernacular knowledge and industry trends baseline

After validating the problem statement, the following section assesses respondents' knowledge of vernacular architecture and urbanism in the Middle East in a first time, and in a second time assesses industry trends of vernacular research and application.

In terms of Middle Eastern vernacular knowledge, two-thirds of respondents were either knowledgeable (score of 4 out 5) or very knowledgeable (score of 5 out 5), increasing the research confidence in the responses they provide.

How knowledgeable are you of Middle Eastern vernacular architecture and urbanism?

30 responses

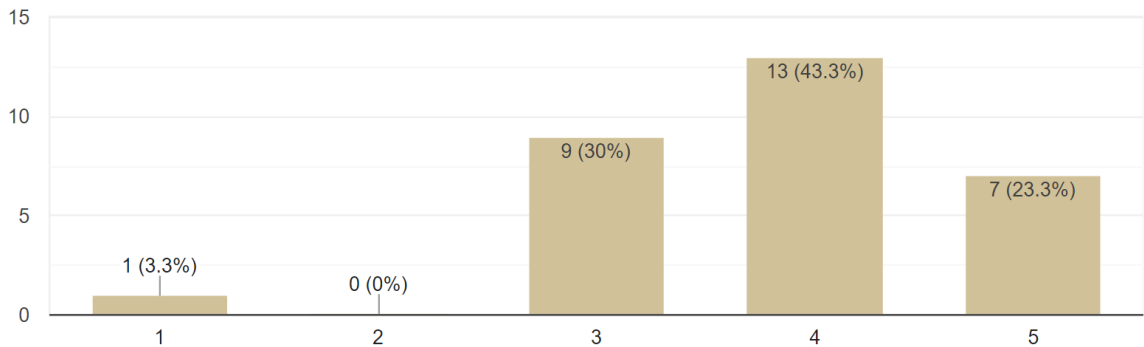


Figure 62. Question 12 of the survey by the author.

Similarly, most of the respondents stated that they often use vernacular research on their design projects, with the majority dedicating 2 to 3 days on average for research in a 6-week project.

How often do you use vernacular research on projects?

30 responses

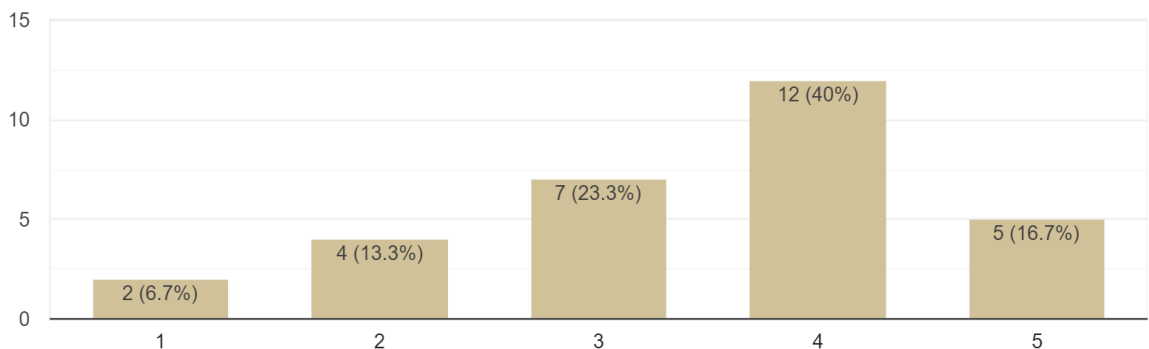


Figure 63. Question 13 of the survey by the author.

How many days do you dedicate per project for vernacular research? (Assume a 6-weeks competition timeline and no prior in-house research exists)

30 responses

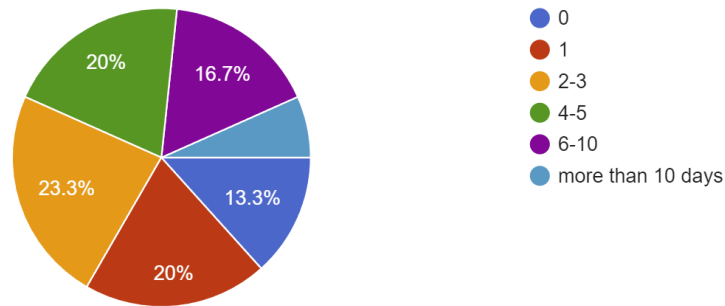


Figure 64. Question 14 of the survey by the author.

Subsequent questions reveal more in-depth insights regarding the usage of vernacular architecture on projects.

For instance, when asked why do they incorporate vernacular knowledge into their projects, 26 respondents answered that it is to promote local architectural identity, 20 answered that it is to tackle environmental sustainability challenges, while 19 answered that it is to promote human-centric and human-scale designs. Other answers included “to fulfil contractual or regulatory obligations”, and “a more embraceable solution for local society and users especially for small, remote, non-globalised locations”.

Furthermore, when asked about what vernacular characteristics do they use the most on projects, the answers where the following:

1. 23 chose: urban morphology (i.e., compactness, typologies, open space ratio, etc.)
2. 21 chose: passive sustainability elements (i.e., self-shading, courtyards, etc.)
3. 21 chose: materiality and palette
4. 20 chose: walkability, connectivity & amenity distribution
5. 16 chose: proportions (i.e. streets aspect ratio, facade proportions, etc.)

Other answers included “only when part of client brief”, and “none of the above, it really depends (...)”

When asked about what analysis tools and methods they usually use, respondents said:

1. 27 chose: urban analysis type 1: land use, mobility, points of interest, open space ratio, density, access, etc.
2. 23 chose: background information: history, demography, economy, etc.
3. 11 chose: urban analysis type 2: solar radiation, shadow studies, microclimate, wind analysis (CFD), etc.
4. 8 chose: urban analysis type 3: street network analysis (integration, choice, depth distance), isovists, walkability metrics, etc.

The above two questions allowed me to tweak the methodology (Part B) accordingly, showing what needs to be further investigated. For instance, the fact that less people chose urban analysis type 2 and 3 is not surprising since these studies generally require more time and specific expertise. This is evident for instance in professor Mortada's book on Al Ula, which excluded these types of studies and presented the general mass with background information and high-level urban analysis type 1. What is surprising however is that 20 respondents said that they incorporate vernacular "walkability, connectivity & amenity distribution" within their projects. This illogical disparity between the two relational choices shows that this specific vernacular characteristic is being (mis)interpreted and used on projects without proper corresponding analysis. Therefore, I believe more focus should be put into analysis type 2 and 3 in this study and subsequent ones.

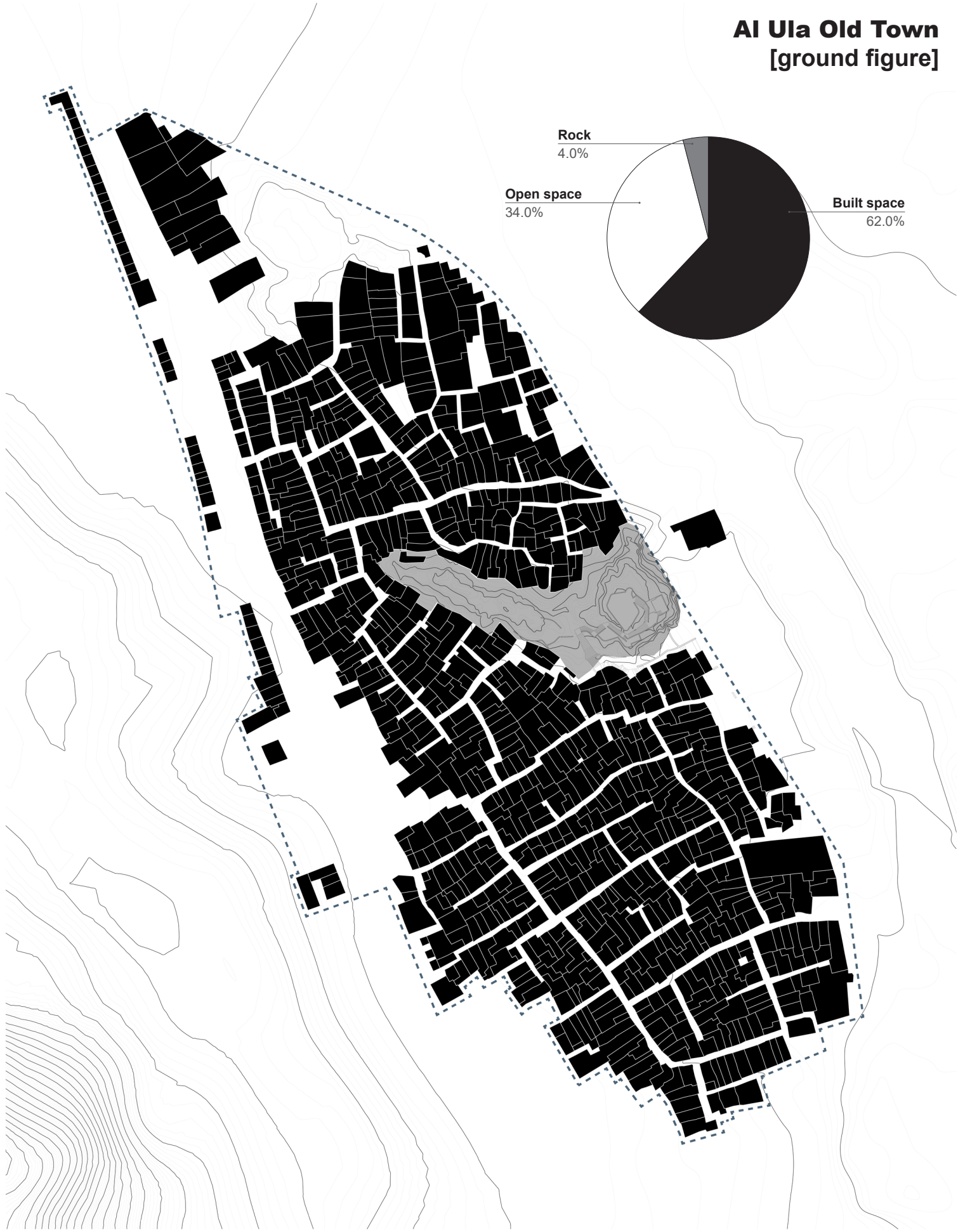
To conclude, 30 respondents with various industry experience managed to confirm the urbanisation trends and dynamics existing in the Kingdom as well as validate the research problem statement. Further analysis of the answers revealed a tendency amongst respondents to interpret and use vernacular elements without proper analysis despite a high knowledge of the vernacular amongst the participants. The key takeaway though is that there is an encouraging and conducive environment of professionals who are eager to learn and apply vernacular principles, and more importantly believe that the vernacular can help create better developments.

**06 AL ULA OLD TOWN  
URBAN CHARACTERISTICS**

## **6.1 The Old Town's urban form - Cluster 1 analysis**

The following chapter presents the urban analysis of Al Ula Old Town. Due to time constraints, several studies that are mentioned in the methodology were not carried out and thus will not appear in this chapter. In addition, some of the analysis might be presented in a different order than how it appears in the methodology chapter. Furthermore, this chapter builds on the analysis work done by professor Hisham Mortada (2020) and consequently will try not to repeat information except where deemed necessary.

# Al Ula Old Town [ground figure]



■ Building footprint    ■ Steep topography

0 50 100 m

## Ground figure

Starting with the ground figure will allow us to understand certain patterns in the urban morphology. At first glance, Al Ula shares several similarities with the Islamic city model, usually distinguished by narrow meandering streets, compact and dense built space and cul-de-sacs.

The mass which is highlighted in black forms several “blocks”, which is indicative of the social ties and relations where a family or tribe would usually occupy the same block, forming a neighbourhood. Blocks appear to be more or less consistent in size and orientation, revealing a proportional growth system within the urban planning practices rather than arbitrary and random growth. Additionally, we can identify a pattern for the urban fabric growth which took place diagonally along the northwest and southeast axis, growing outward from the central rock formation.

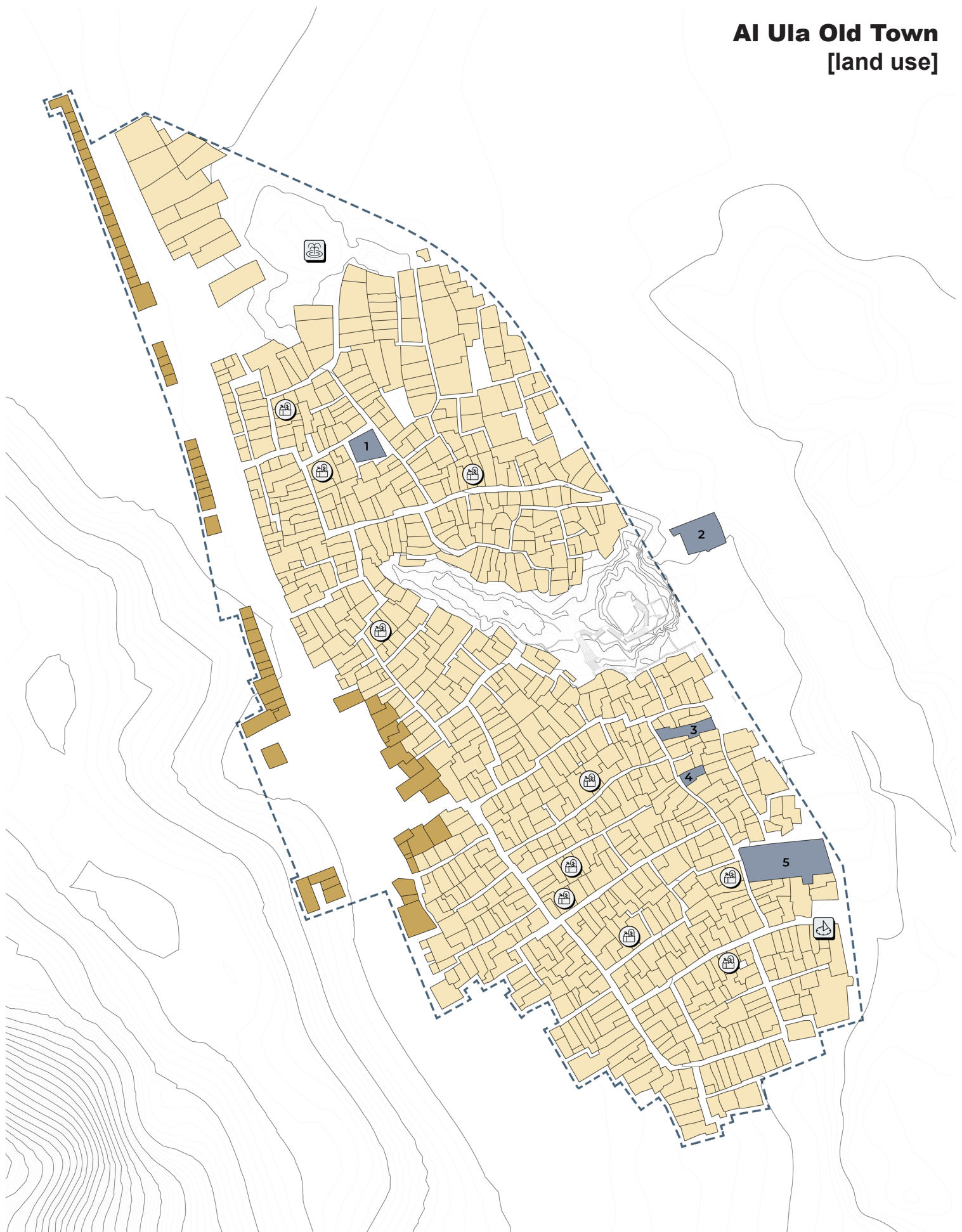
Mortada (2020) and other records of the town mention several times the defensive characteristic of the town, which explains the density, the limited access points (gates), and the continuous solid wall formed by the peripheral units. However, later analysis will test whether or not other elements such as climate has anything to do with the density and compactness and not only defence.

Zooming in on the units, they appear to have similar proportions and sizes, except a few which are about 4 times larger than a typical unit. Similarly, to the built mass, the open space follows an interesting pattern on a northwest-southeast and eastsouth-westnorth diagonal grid. The open space is made up of a varying hierarchy of interconnected streets leading to entry points or public squares. Public squares are spaces in between the built mass that are proportionately rectangular and typically larger than the residential units. We can spot several in the northern quarter as well as a few dispersed in the southern quarter.

Finally, a distinct and large linear open space dominates the western edge of the town, and it is delineated on its eastern side by the compact urban fabric and on its western side by linearly aligned units. As we’ve seen in chapter 03, this used to be the old caravan route that traversed next to the town as well as the large public souk of the town.



# Al Ula Old Town [land use]



--- Al Ula Old Town Boundary

Residential

Commercial

Shops

Tantora sundial

Water spring

Religious

1. Al-Dahra Mosque

2. Al-Sakhra Mosque (Masjib Masab)

3. Hamad Ibn Yunus Mosque

4. Al Zawya Mosque

5. Al-Jumua Mosque (Masjid al-Izam)

0 50 100 m

*The above land use data is largely based on the works of professor Hisham Mortada (2020) with other features reported by CRAterre and partners.*

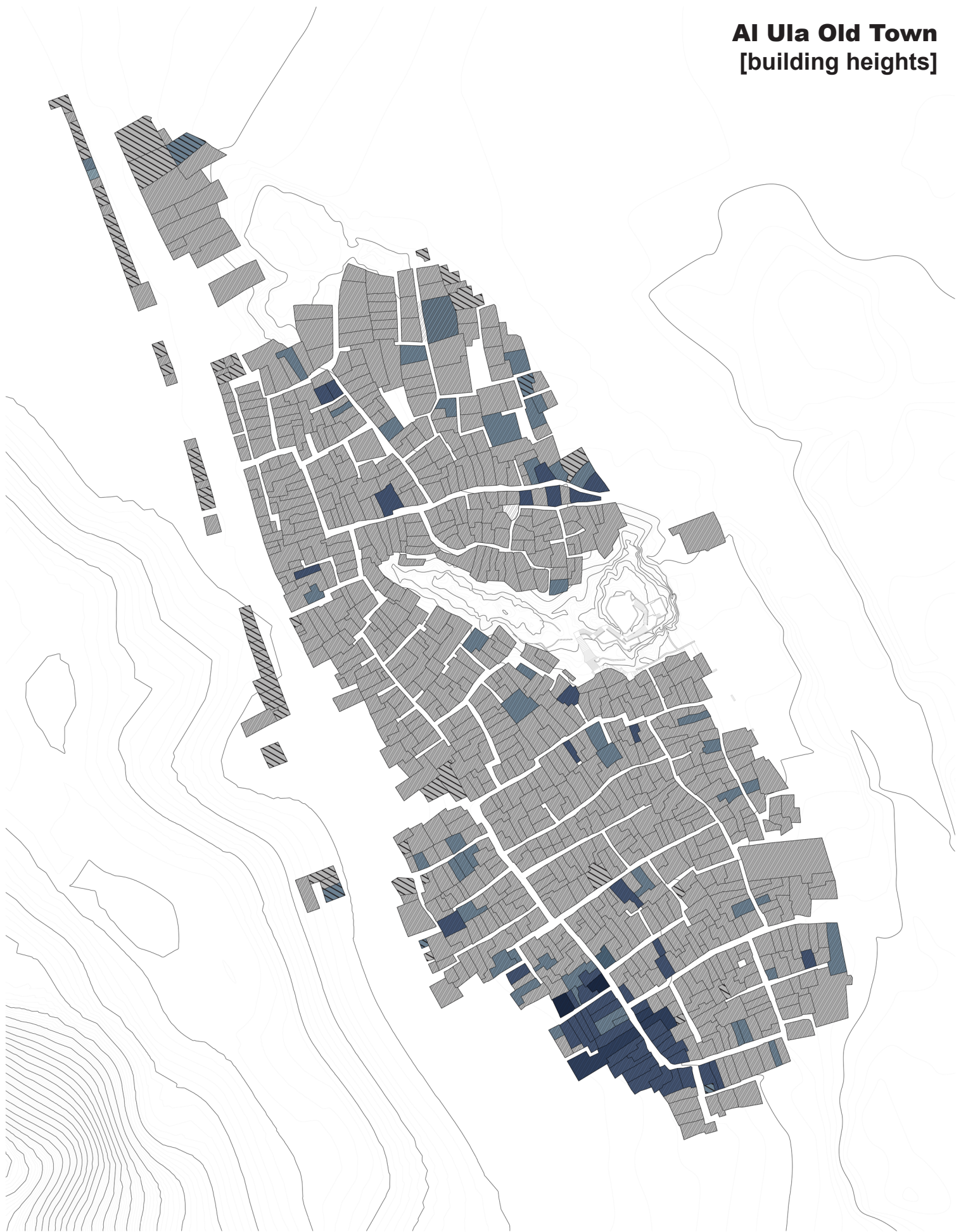
## **Land use**

The land use plan of Al Ula Old Town affirms the town's predominant use as a residential city which is shown in yellow in the above plan. Commercial use, shown in orange, is the dominant use of the unit-strip on the western edge of the town, delineating the major souk. However, smaller shops (groceries) are dispersed within the town and are nestled within residential units, covering the shopping needs of the different residential blocks.

Religious land use (mosques) is dispersed within the town but is predominant in the eastern edge of the southern quarter. The concentration along the eastern edge could be to retain the mosques in close proximity to the summer farms which lie further to the east. As to why the mosques are located on the periphery could be explained by the proximity to the gates and possibly to provide easy access to pilgrims and outsiders while keeping access to the village controlled.

Finally, the Tantora sundial is located in close proximity to one of the mosques since residents would usually distribute the water after the midday prayer (Mortada, 2020, p. 117). The Tantora would cast its shadow on the square located north to it, where markings on the ground are used for scheduling (Mortada, 2020, p. 117).

# Al Ula Old Town [building heights]



9.00m 8.40m 7.40m 6.80m 5.65m 4.05m No data

Single floor building

Two-floors building

0 50 100 m

## Building heights

Building heights data is courtesy of the fieldwork done by CRAterre and partners, however as shown above, the available data covers very few units in comparison to the overall town. Therefore, in order to build the 3D model, I had to study the heights pattern, and then couple it with images and HiRes satellite imagery in order to assign a height to each unit. Therefore, studies such as density and all studies that are in cluster 2 that are dependent on building heights should be reevaluated in the future when accurate building heights data is available.

Besides a few buildings, all buildings in the old town consisted of two floors, ranging between 5 and 9 metres. *Tayarar* span across the street at the first-floor level (considering a ground floor + first floor terminology). Data at this point is insufficient to produce meaningful analysis and draw insights. However, it gives a preliminary idea on the building heights in the Old Town.

## Density

Building on the building heights analysis, the density will be calculated according to the FAR formula which is:

Floor Area Ratio (FAR) = Gross Floor Area (GFA) of the buildings / town's area

As a start, we need to calculate the total GFA value of all the units in the town. As previously mentioned, this study is based on assumptions and will be an estimate only. Using a code source to calculate the GFA within the 3D model, the GFA output yields **138,931.58 sqm** in GFA.

The town's area is: **83,685 sqm =>**

FAR = 138,931.58 / 83,685 sqm

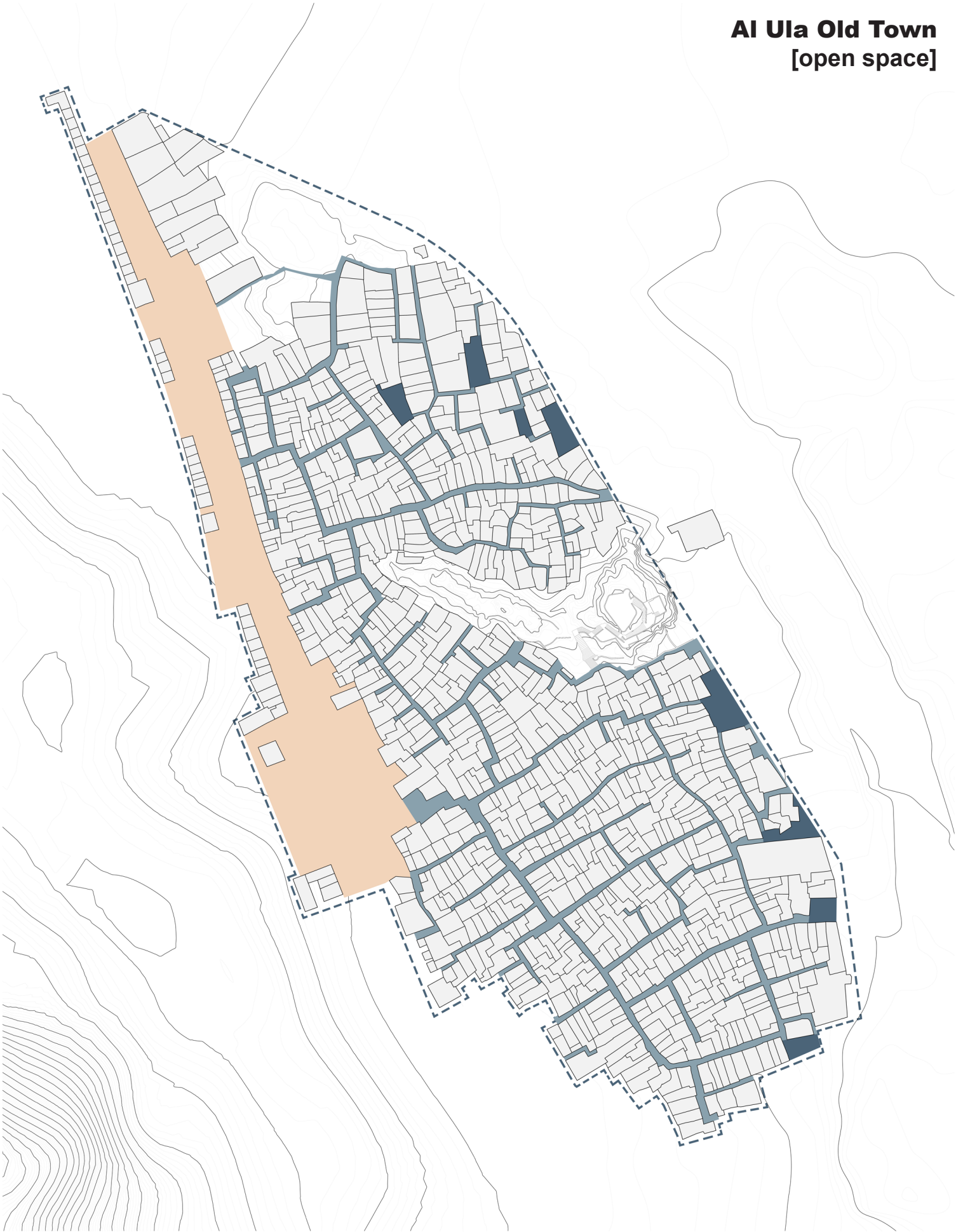
**Al Ula Old Town's FAR = 1.66**

The table below shows different FAR for city-centres across the world. The old town's FAR falls in the range of that of Mumbai, Chennai, Delhi and Amsterdam's average city-centre FAR. This is evidence of the relatively high density of Al Ula's Old Town, knowing that the rock formation occupies around 4% of the terrain and is unbuildable.

<i>City</i>	FAR
Sao Paulo	1
Mumbai	1.33
Chennai	1.5
Delhi	1.2–3.5
Amsterdam	1.9
Venice	2.4
Paris	3
Shanghai	8
Vancouver	9
San Francisco	9
Chicago	12
Hong Kong	12
Los Angeles	13
New York	15
Denver	17
Tokyo	20
Singapore	12–25

Figure 65. Table showing FAR values in different city centres. (Brueckner & Sridhar, 2012, p. 15).

# Al Ula Old Town [open space]



Public square Pathways Souk



## **Open space**

As previously explained in the ground figure analysis, the Old Town's open spaces are diverse and despite falling more or less on a distinguishable grid, they remain somewhat organic.

# Al Ula Old Town [street hierarchy]





## Street hierarchy

To produce the above analysis, it was first important to define the street-width parameter. To do so, I used Neufert's dimensional basics which stipulates that two people standing side-by-side will need a space of ~1.2m, or 60cm per person.

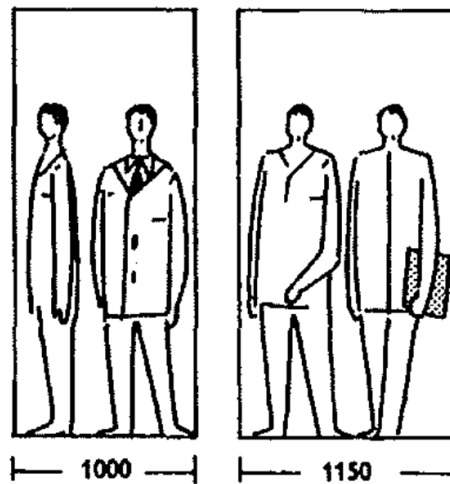


Figure 66. Extract from Neufert showing the standard dimensions of two people standing next to each other. (Neufert, 2019)

From this understanding, I defined the streets as follow:

- Narrow: less than or equal to 1.2m
- Regular: 1.2-1.8m
- Large: 1.8-2.5m
- Wide: 2.4-4m
- Transitory space:  $\geq 4$ m

Based on the set parameters to define the street width and hierarchy, we notice that an important axis traverses the old town from north to south parallel to the western boundary. In addition, three important axes that cross the town from east to west, one in the northern quarter and two in the southern quarter.

Additionally, a secondary layer of hierarchy (large/regular streets) forms some sort of a loop around the blocks in the southern quarter, facilitating the movement of people

and carts, as well as predominantly from and to squares and gates. Whereas narrow streets are reserved for cul-de-sacs and more private connections to the residential units.

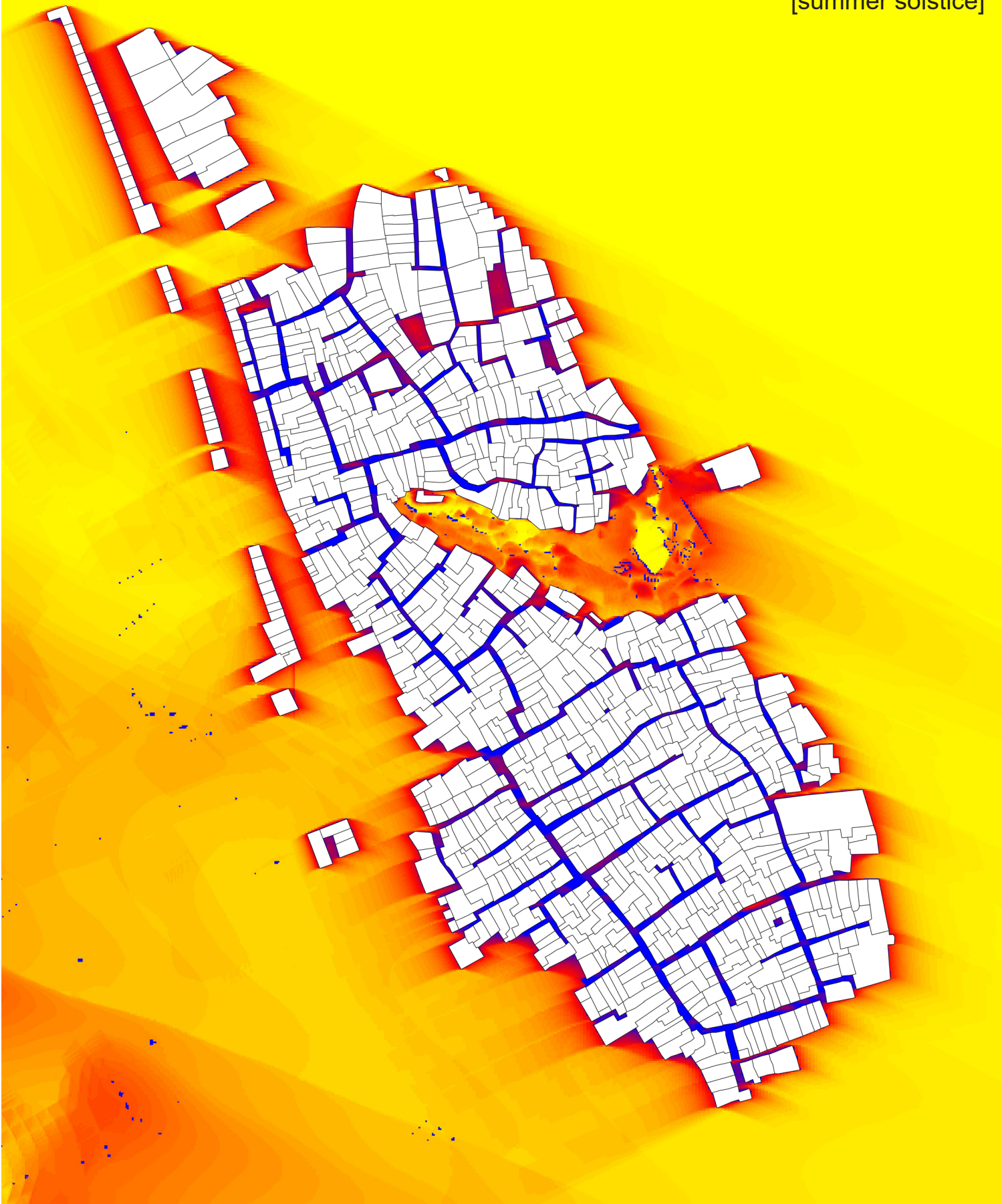
## **6.2 The Old Town's environmental performance - Cluster 2 analysis**

The following environmental analyses were performed on the 3D model using weather data collected in the nearby Prince Abdulmajeed Bin Abdulaziz Airport between 2007 and 2021. Consequently, this study ignores historical differences in weather data as well as vegetation and trees which would affect the results. Additionally, the topography was modelled using open-source data and might be erroneous. These studies are therefore indicative.

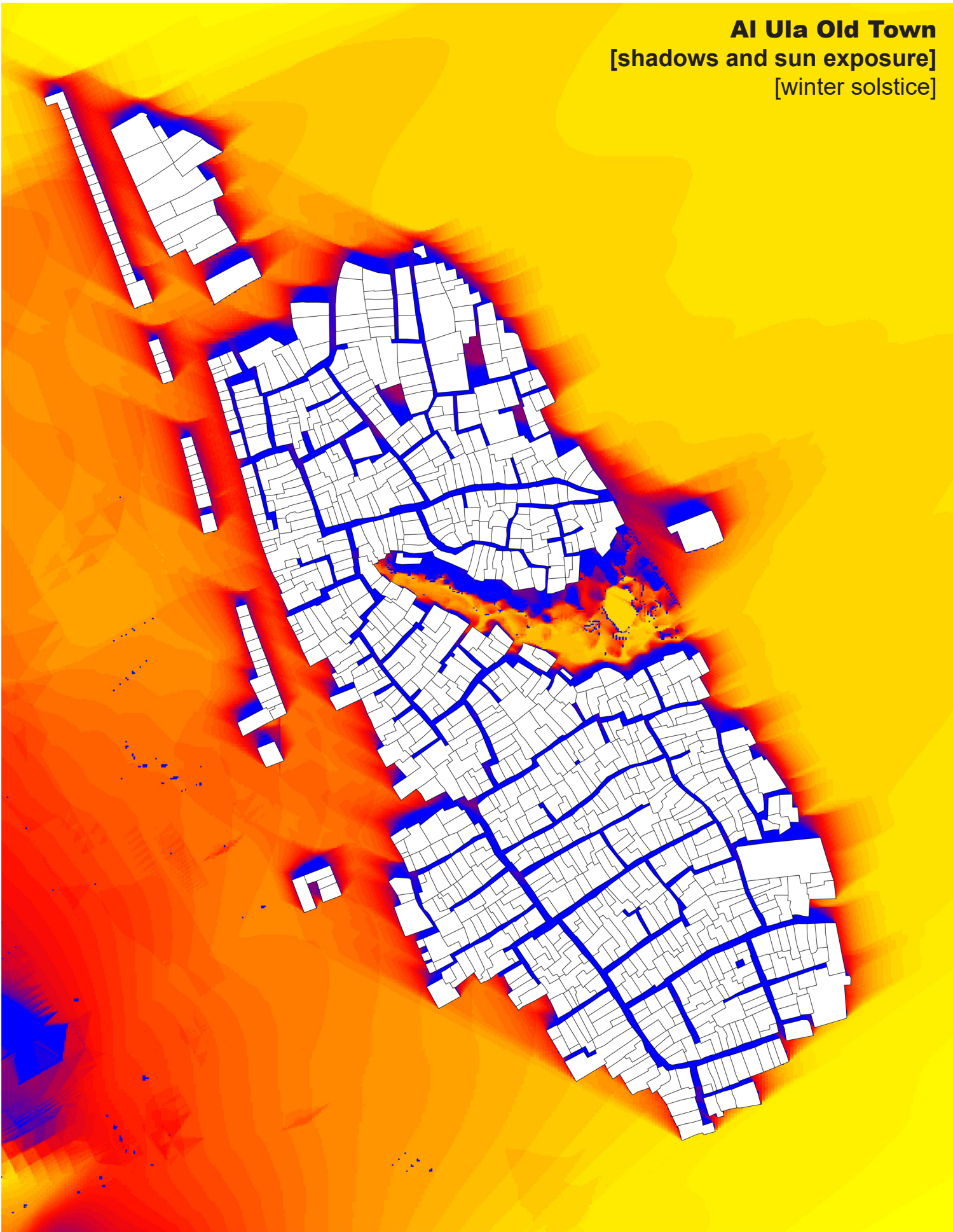
### **Shadows and sun exposure**

Three shadow analyses were done: summer solstice, winter solstice, and for the entire year. It is measured by hours where blue represents 0 hours of sun exposure, and yellow represents more than 14 hours of exposure in the case of summer solstice, and more than 12 hours in the case of winter and year-round.

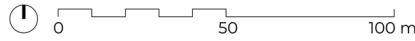
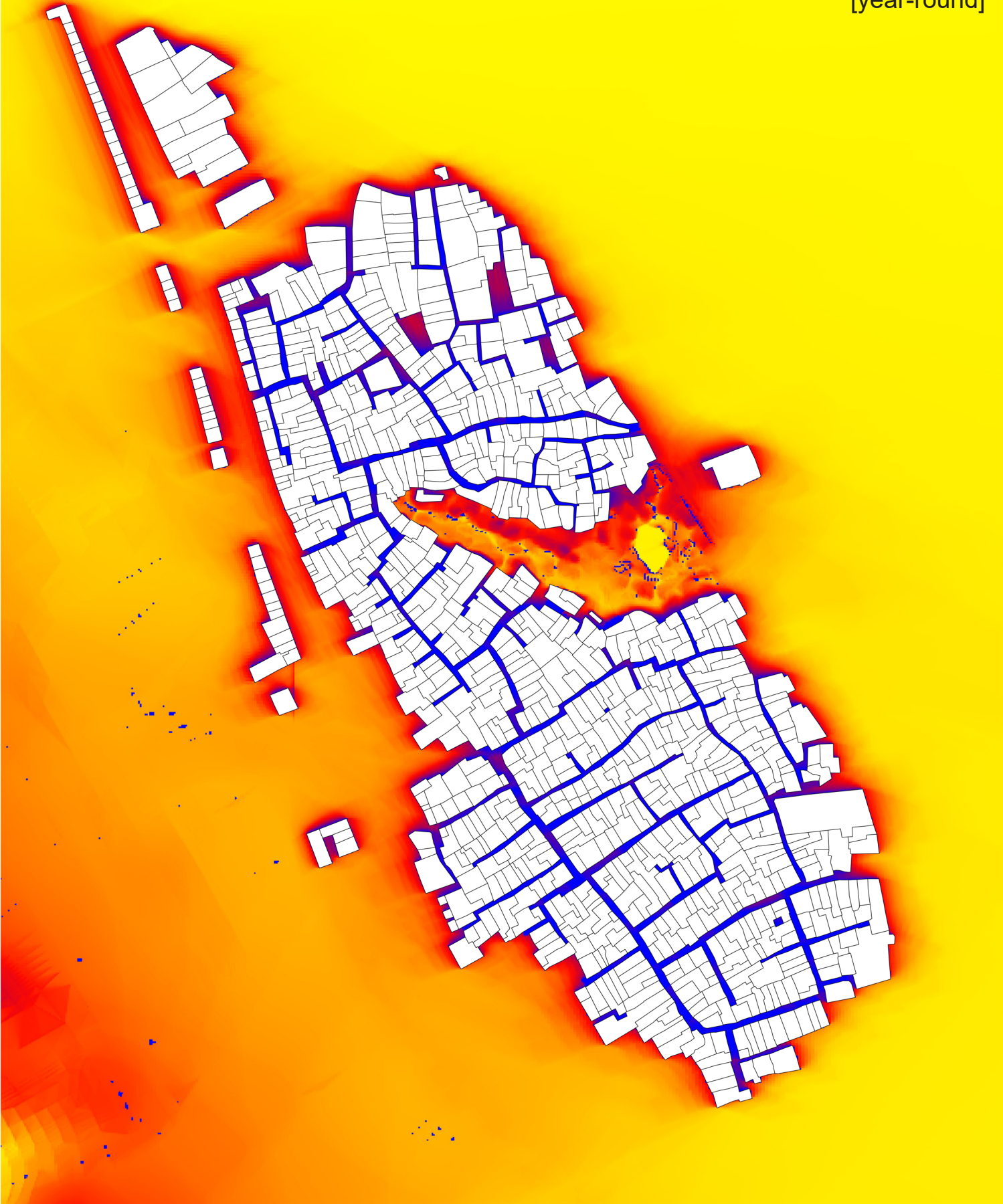
**Al Ula Old Town**  
[shadows and sun exposure]  
[summer solstice]



**Al Ula Old Town**  
[shadows and sun exposure]  
[winter solstice]



**Al Ula Old Town**  
[shadows and sun exposure]  
[year-round]



The three maps reveal that despite high levels of exposure in the surrounding plateau, the streets within the town remain well protected from the sun. We can notice a nuance in the blue within the street network which is caused by the tayyaras that are accounted for in this study but are not represented graphically.

Thermal comfort and implications on users and urban morphology will be discussed in the following analysis.

### **Urban microclimate** - Universal Thermal Climate Index (UTCI)

The following analysis required heavy computation, consequently I focused the analysis to three zones. Each scenario took the computer about 6 hours to run (i.e., 12 hours per zone excluding iterations).

To get as many insights as possible, I diversified the spatial characteristics of the selected zones:

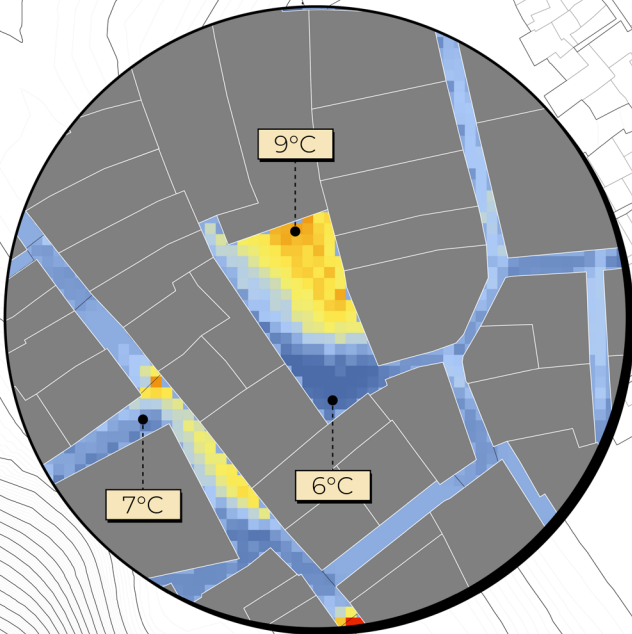
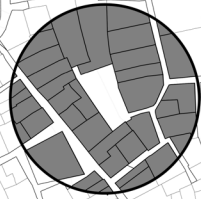
1. Zone 1 presents a closed square at the heart of the town, surrounded by streets that are partially covered by tayyaras.
2. Zone 2 lies on the western edge of the town and presents a soft transitional space between the open plateau and the inner streets.
3. Zone 3 lies on the western edge of the town and has no transition between the open plateau and the streets.

Unlike the shadow study which considers the longest and shortest days of the year, the UTCI calculation considers the coldest and hottest weeks of the year. This is identified by the software following the weather data provided. In addition, the shadow studies give out results for the entire day, whereas I had to fix the UTCI analysis to 12 noon on the coldest/hottest week, again due to the long computation. The legend for the UTCI maps is read as the following:

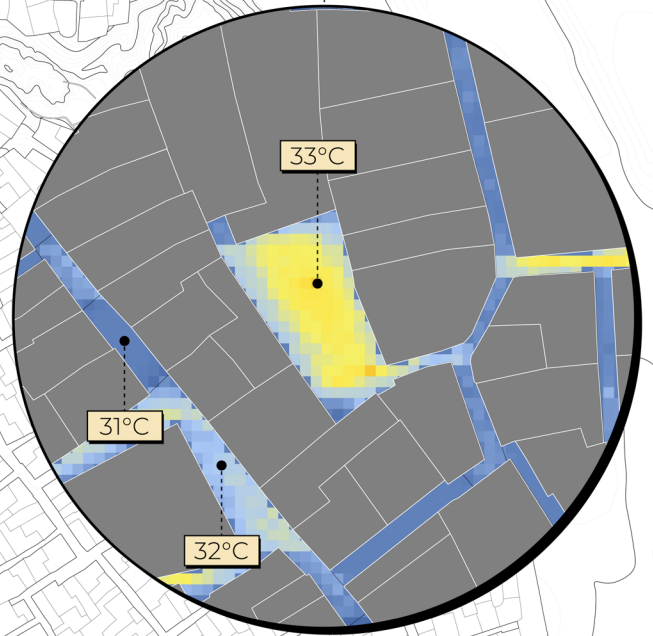
- Coldest week: Blue is the lowest at 6°C and red is more than 10°C;
- Hottest week: Blue is the lowest at 31°C and red is more than 34°C.

# Al Ula Old Town [UTCI] [zone 1]

Analysis Zone 1



Coldest week  
results @noon



Hottest week  
results @noon

Coldest week (08-14 January)



Hottest week (01-07 July)



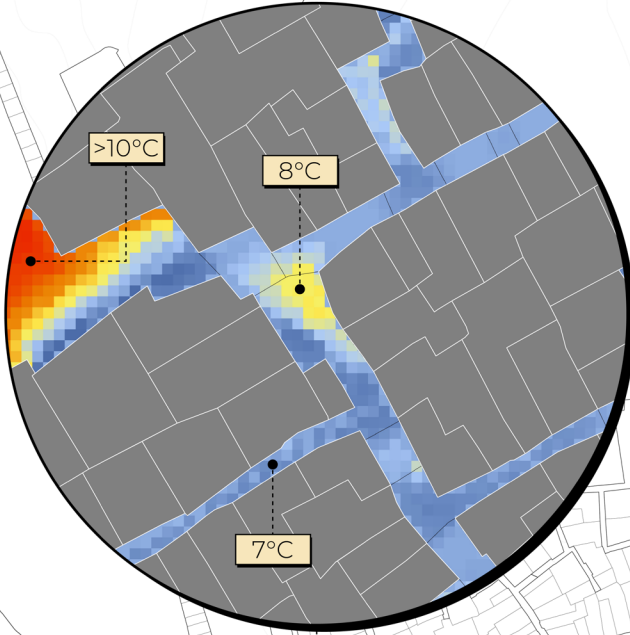
In a contained public square, the UTCI shows 3 degrees variation within the same space, consistently showing that the narrow streets, under the tayyara were the coolest (31°C / hottest week), followed by the uncovered narrow streets (32°C / hottest week), and finally by the uncovered square (33°C / hottest week).

This indicates that the narrow street coupled with the tayyaras indeed protects from the heat in the summer. Interestingly, the same results were detected during winter where I had expected an inverse result where the narrower streets would protect from the wind and consequently be warmer under the tayyaras rather than the open square. This could be explained through professor Mortada's account on the tayyaras, which are apparently great capchens and conductors of wind, from the higher levels to the lower levels (Mortada, 2020, p.115-116).

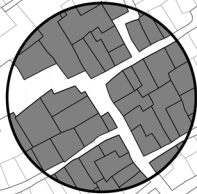
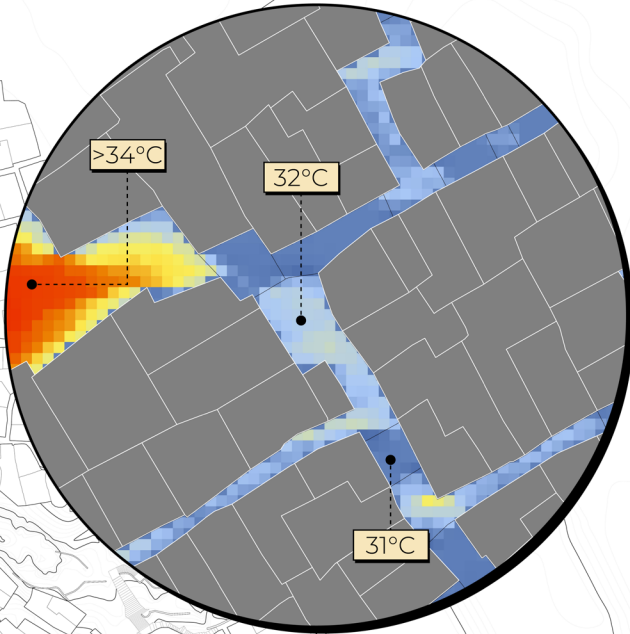


# Al Ula Old Town [UTCI] [zone 2]

Coldest week  
results @noon



Hottest week  
results @noon



Analysis Zone 2

Coldest week (08-14 January)



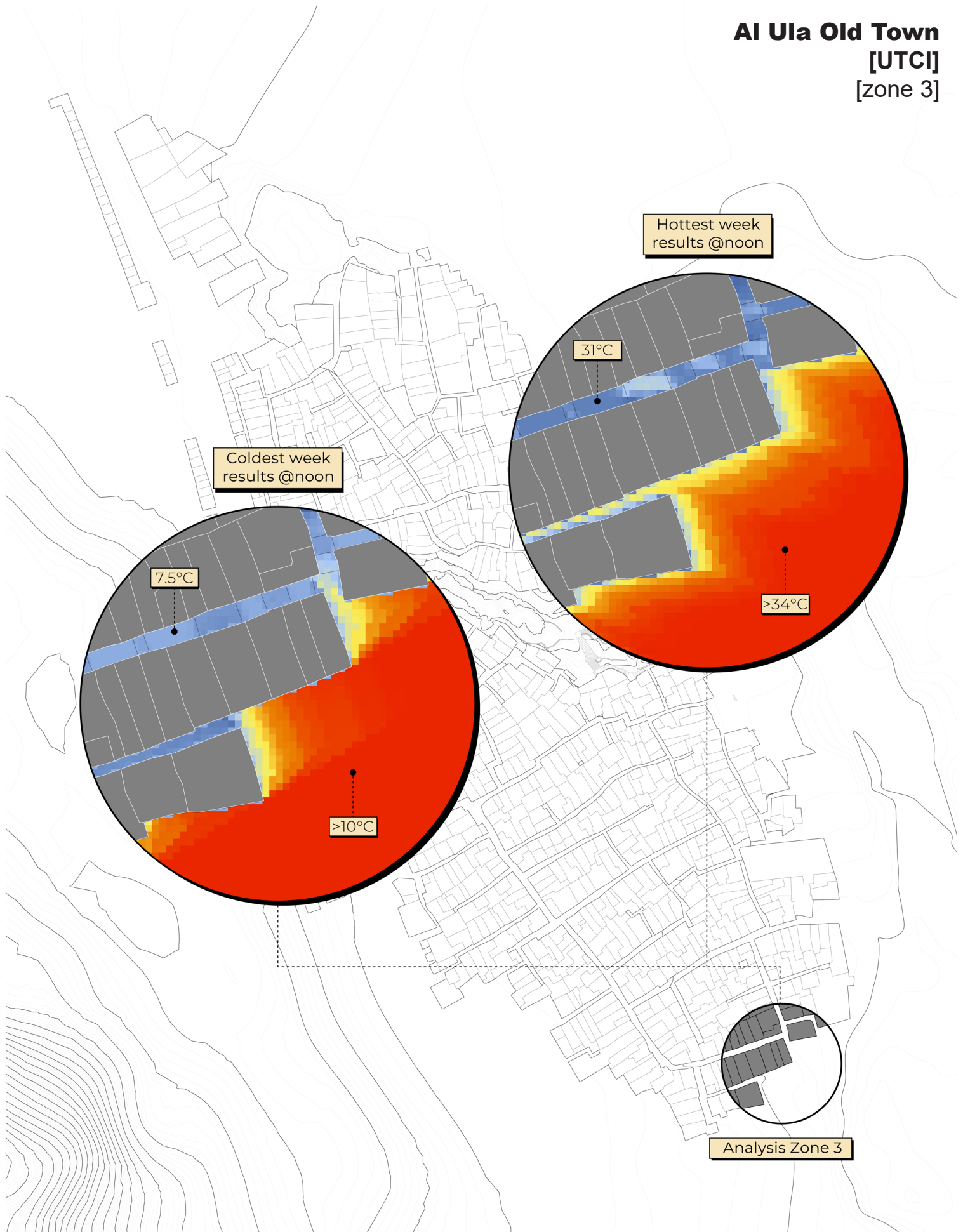
Hottest week (01-07 July)



In zone 2, the open area to the west presents substantially higher temperatures represented in red in the above map and gradually decreases to the lowest degree under the tayyaras in both the coldest week and hottest week. This showcases the interface between the outer open space (plateau) and the inner streets that are separated by a contained larger space that acts as a transitional space.

Whereas in zone 3 below, we can notice that the lack of transitional space results in an abrupt change in temperatures between the plateau (covered in red) and the inner streets (covered in blue). Nonetheless in both scenarios we can deduce the same conclusion of zone 1: narrow streets offer greater thermal comfort levels in the summer than open space, making the dense and compact nature of Al Ula Old Town not only defensive but also climate responsive.

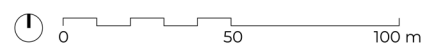
# Al Ula Old Town [UTCI] [zone 3]



Coldest week (08-14 January)



Hottest week (01-07 July)



## Wind analysis

Despite not being able to perform a full CFD analysis, I managed to generate a simple wind rose using the weather data file that I overlaid on top of Al Ula Old Town's plan in the figure below.

Reading the wind rose is intuitive and follows a circular shape just like a compass with bearings. The different colored bars growing from the centre of the compass represent the wind and its direction. The longer the bar is, the stronger and more frequent the wind is from that direction during the year. The colours represent wind speeds. And if you look closely, you will notice that the same colour in different bars can have a different size/length. This indicates different frequencies measured in hours for each wind speed where each ring (circular step) in the compass equals 50 hours. So, for instance the bar oriented to the North has the colour yellow measuring a bit more than half of a circular step, this means that the total wind with a speed of 7m/s coming from the North every year is about 30 hours per year.

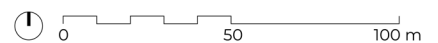
Next, I overlaid the wind rose on top of the Old Town's plan and interestingly we can see that the prevailing wind coming from WSW, aligns almost perfectly with the streets that connect the eastern edge of the town with its western edge. Similarly, the second strongest wind that comes from NNNW, also aligns with the strong axes that run from NNW to SSE although with a small degree of variance.

While a CFD analysis would be ideal to verify the following, it is impressive how the streets orientation align almost perfectly with the prevailing wind, revealing that our ancestors did indeed build with nature and in response to climate conditions.

# Al Ula Old Town [wind and orientation]



0.10      2.88      5.66      8.44      11.22      > 14  
m/s



Calm for 8.31% of the time = 728 hours.  
Each circular step represents a frequency of 0.6% = 50 hours.

### **6.3 The Old Town's urban network analysis - Cluster 3 analysis**

The following network analyses were performed using the CAD drawing inputted in depthmapX software (depthmapX development team, 2017). Due to time constraints, the analyses are not exhaustive and are generic but still provide compelling results.

#### **Agent analysis**

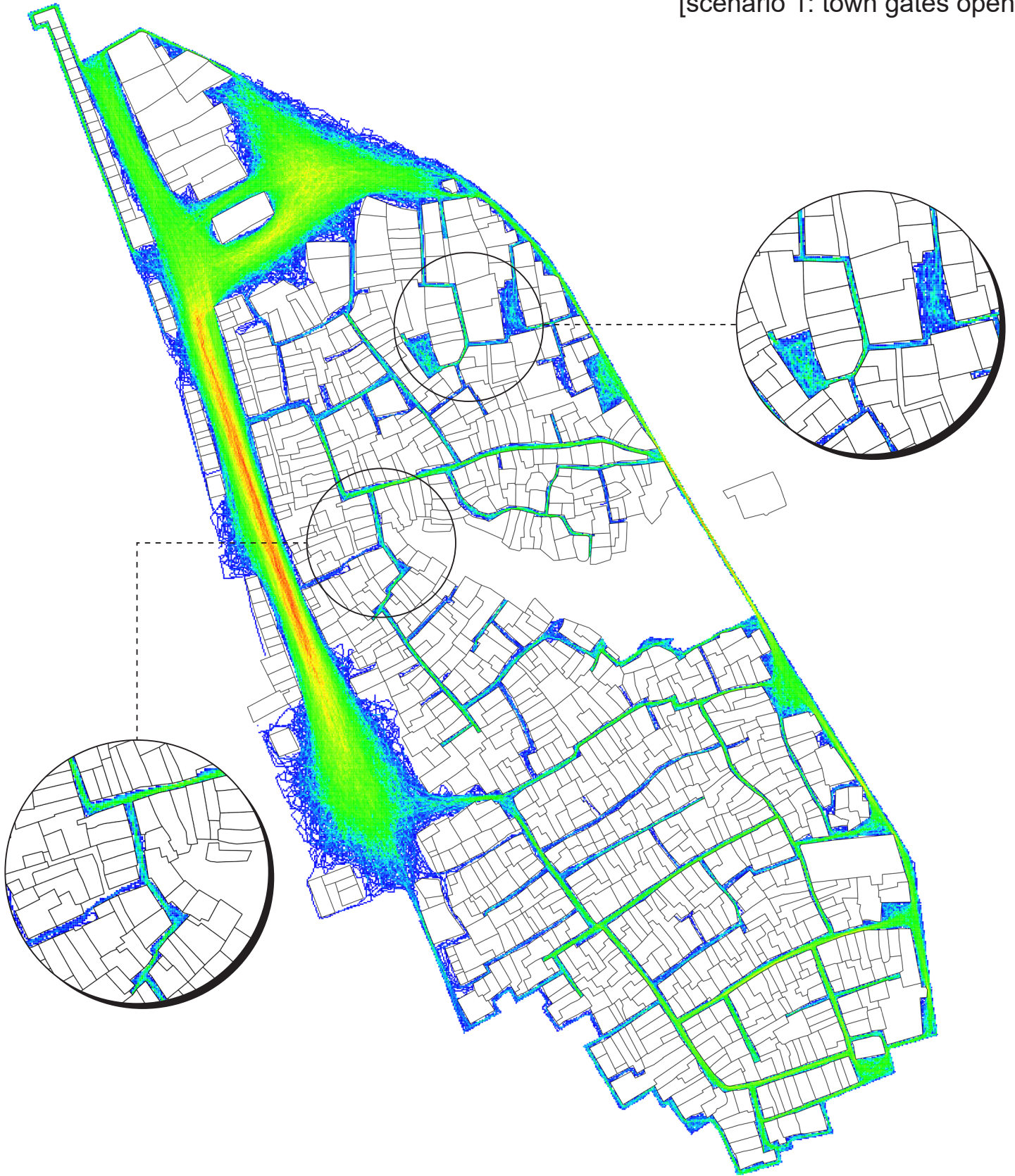
The following two maps simulate pedestrian movement within Al Ula Old Town developed with two scenarios in mind:

- Scenario 1: Town gates are all open; pedestrian movement is unrestricted across the plateau and the town.
- Scenario 2: Town gates are shut; pedestrian movement is restricted to the inner streets of the town.

The maps are similar to heatmaps and to read them, a graphical legend is provided where blue shows the least passage and red the most passage at a given point.

In scenario 1 (first map in this analysis) we can clearly see that the outer open spaces such as the souk, the area next to the spring (north) and the squares to east have the highest footfall since they are naturally the first points of accessibility. Interestingly, the agent simulation corresponds closely to the street hierarchy map and validates the results, affirming that the wider streets are indeed the preferred option for pedestrians. The first map also validates the three strong axes that traverse the site from east to west, the loop in the southern quarter, but showcases a very low footfall on the street that connects the northern quarter to the southern quarter. Instead, agents preferred using the souk to do the connection. This is highly indicative of human behaviour and preference which indicates that larger spaces are preferred over the narrower spaces. However, since Space Syntax does not take into consideration thermal comfort, the souk might in fact be less preferred in real conditions.

**Al Ula Old Town**  
**[agent analysis]**  
[scenario 1: town gates open]



low  
footfall

high  
footfall



**Al Ula Old Town**  
**[agent analysis]**  
[scenario 2: town gates shut]



low footfall  high footfall

0 50 100 m



In the second map, the connecting street between the two quarters shows a higher passage than in the previous map, reiterating the observation. Similarly, the internal public squares also show a higher pedestrian movement. If we observe the two northmost public squares we can see that the square in the centre of the northern quarter has a significantly higher flow than the square directly to its right. The key difference between the two is the spatial configuration of both: the square on the left is enclosed and has one access point whereas the square on the right has three access points. Consequently, this shows that pedestrians prefer contained public squares over public spaces that are transitory in nature.

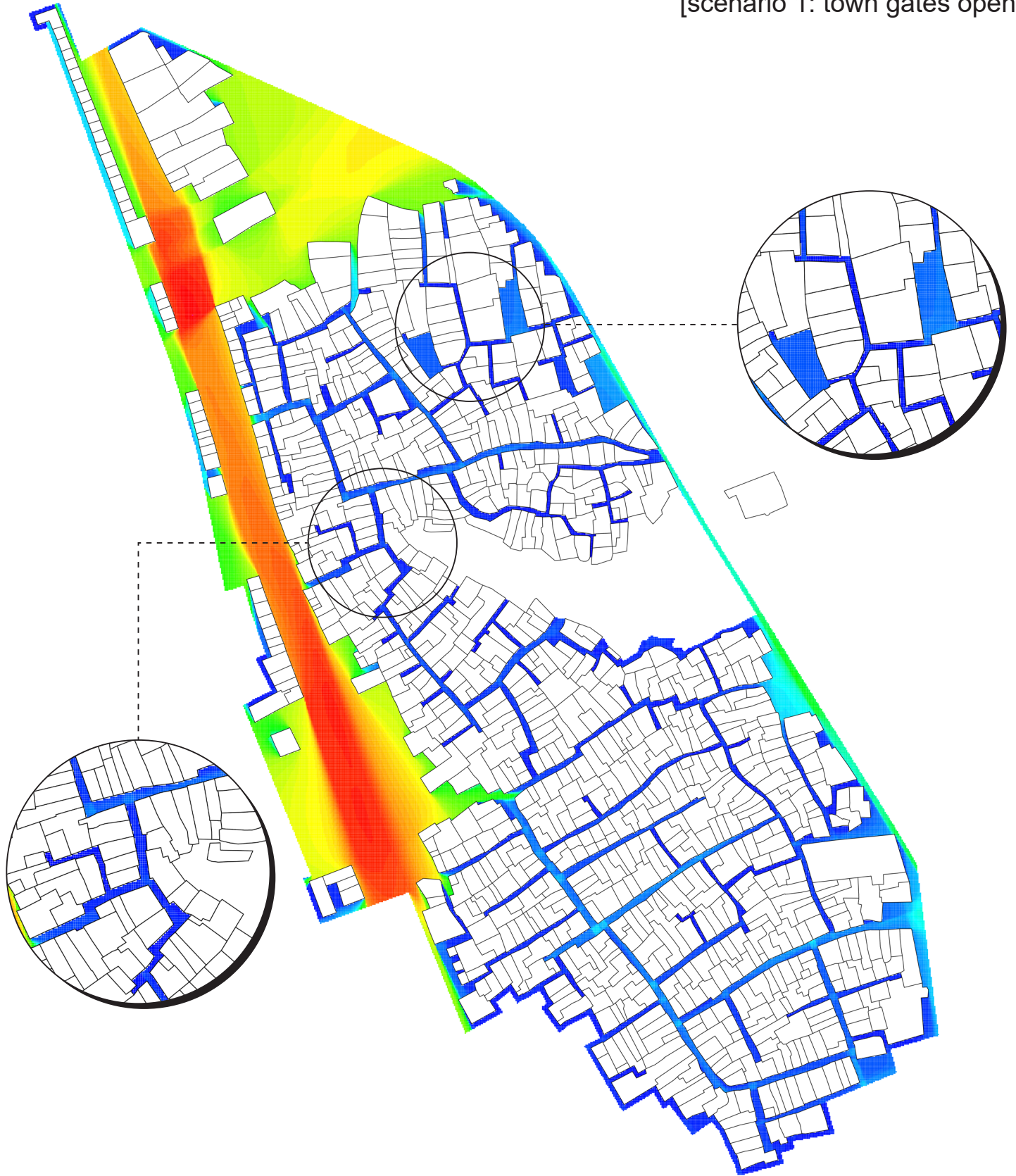
Moreover, this map further validates the street hierarchy mapping and logic. In light of this, the street dimensions and proportions of the Old Town vis-a-vis pedestrian behaviour is definitely an aspect to learn from.

### **Visibility Graph Analysis**

The VGA analysis in the following two maps follows similar patterns to the agents' behaviour in the previous two maps. We can see that the hotspots when the town's gates are open lie on the periphery and mainly in the souk. Whereas when the gates are shut, we can see less blue within the inner streets. If we compare the inner VGA to the inner agent simulation and the streets hierarchy diagram, it is evident that the preferred street and space typologies are those that are linear, have intersections and are overlooked by other spaces. Consequently, these types of nodes (e.g., red hotspots) are safest, most likely to have higher times of lingering and social exchange, and can be ideal places for non-residential land uses and function.

Finally, additional studies need to be performed to complete the above analyses as per the methodology as well as complementary analyses such as amenity distribution in comparison to the residential units. However, through the above network analyses, coupled with the environmental performance studies and cluster 1, it is safe to deduce that vernacular characteristics hold many lessons that await further uncovering.

**Al Ula Old Town**  
[visibility graph analysis]  
[scenario 1: town gates open]

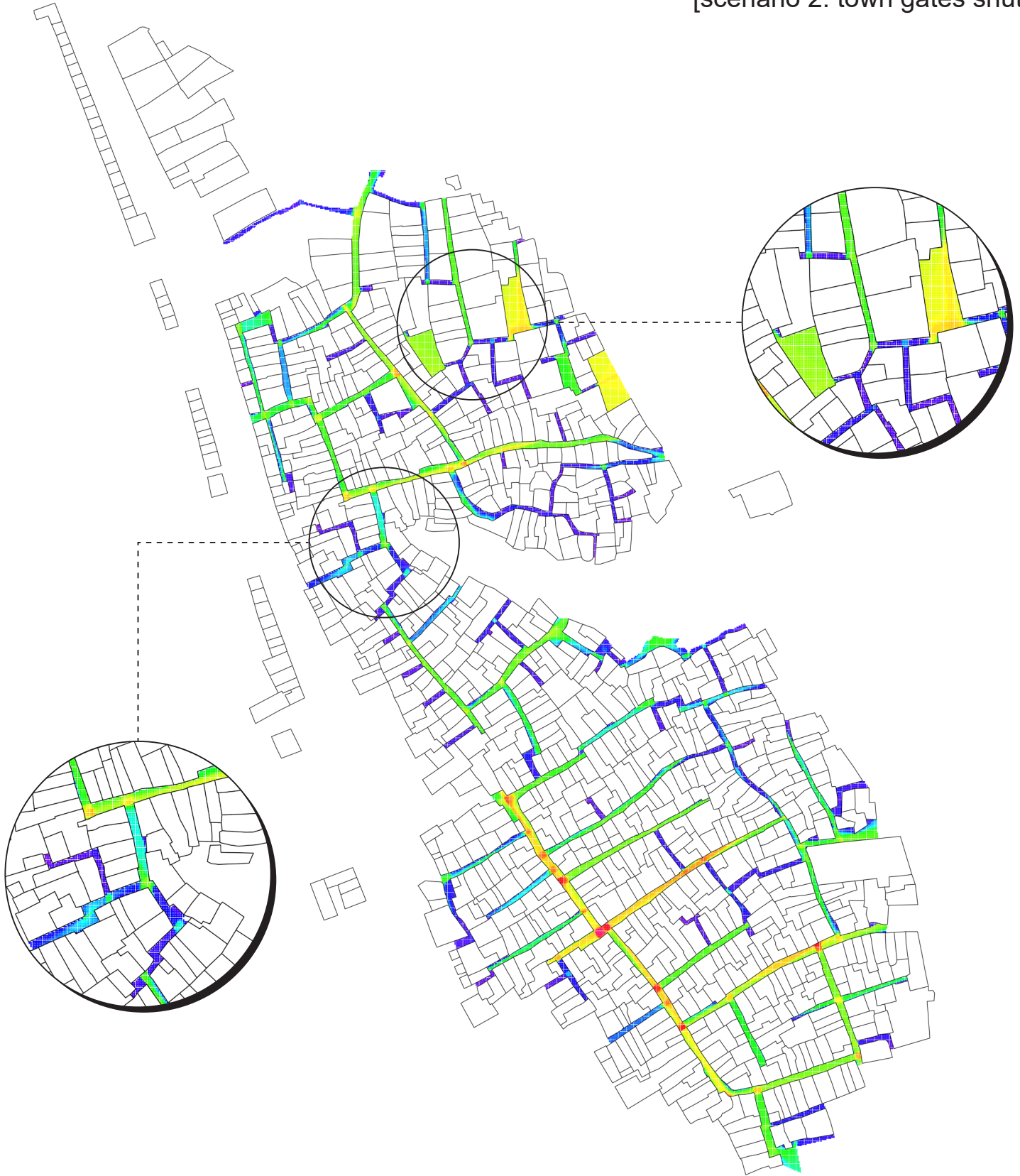


least visible

most visible



**Al Ula Old Town**  
[visibility graph analysis]  
[scenario 2: town gates shut]



least visible

most visible



**07 LESSONS LEARNT**

## 7.1 What do we know so far?

This study set out to identify possible lessons from the vernacular urban planning of Al Ula Old Town while leveraging three aspects: climate, architectural and urban identity, and human-centricity.

The research commenced with a literature review in chapter 2 that covers several key areas, answering three main questions:

### 1. What are the current challenges in the world, and why turn to vernacular knowledge for solutions?

- Subchapter 2.1 gives a brief introduction of the three contemporary challenges that are pertinent in the architectural and urban planning field;
- Subchapter 2.2 gives an overview of vernacular architecture and the current discussion in academia;
- Subchapter 2.3 gives an overview of architectural and urban sustainability, the widely spread framework of the United Nations, and the introduction of VerSus, a vernacular-specific sustainability framework.

### 2. What are the impacts of urbanisation in the Middle East and why should Saudi Arabia take centre stage when it comes to studying challenges and vernacular?

- Subchapter 2.4 introduces what countries will be included when referring to the term “Middle East” within this study;
- Subchapter 2.5 subsequently looks at urbanisation across these countries, the contrast between Gulf cities and Levantine cities, the reasoning to choose a rapidly urbanising country for the case study, and finally a brief overview of vernacular architecture and urbanism in the Middle East;
- Subchapter 2.6 then zooms into the Kingdom of Saudi Arabia, firstly explaining why it was the selected choice for a case study, then proceeds to detail its state of urbanisation, current issues, challenges and ongoing effort championed by the Saudi Vision 2030;

### **3. How can we study the vernacular urban fabric?**

- Finally, subchapter 2.7 gives an overview of what urban analysis is and what are some of the types and techniques, laying the foundation for the methodology in chapter 4.

## **7.2 The designers told me**

Reaching the conclusion that vernacular architecture and urbanism might indeed be helpful in solving some of the aforementioned challenges, it was practically impossible to find any data on if and how architecture and urban design consultancies (or clients for that matter) in the Middle East actually leverage vernacular knowledge in contemporary designs.

Consequently, the idea for the survey emerged after a couple of informal dialogues with former colleagues. The idea behind the survey was two-fold: validate the problem statement and inform the urban analysis methodology through responses provided by design professionals in the Middle East.

While not surprised by the answers, I was impressed that the majority of respondents believed in the potential of using vernacular knowledge in new designs. More interestingly, most believed that the vernacular can be indeed used in newly built projects to better respond to the local climate, promote local architectural and urban identity, and create more human-centric urban spaces. This marks a relatively new trend in the Gulf cities where modernism is considered to be the most dominant of styles.

Moreover, while most of the respondents do in-house vernacular urban analysis, the majority dedicate only about 10 to 15% of their time for this type of research. The more interesting insight I found, is when I cross-analysed questions 20 and 21, revealing a gap between the characteristics that the design professionals look for in a vernacular project and the actual analyses technique they use in their research. For instance, two-thirds of the respondents indicated that walkability and connectivity in vernacular sites are two characteristics that they use regularly in a project. However, when asked

for what tools they use to analyse these characteristics, less than one-third chose network analysis. This reveals that while the intent to utilise vernacular knowledge is there, sometimes the time or the expertise gets in the way.

To conclude, the responses submitted by (in a majority) architects and urban designers validated the problem statement and informed the urban analysis methodology of Part B. Additionally, the survey analysis also uncovered a gap in the field: an opportunity exists to develop a holistic, user-friendly, fast and efficient vernacular urban analysis methodology. In addition to frameworks like the VerSus wheel, such analysis methodology can be complementary and will greatly facilitate knowledge transfer between existing vernacular sites and the drawing board.

### 7.3 The process taught me

Despite a consequent setback due to time constraints, the urban analysis chapter was nonetheless informative. Perhaps the most valuable lesson that I can share is related to the process rather than the results.

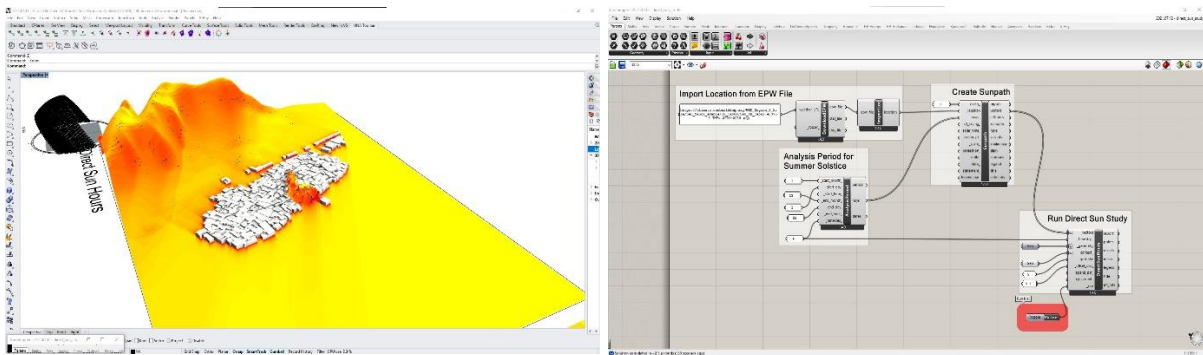


Figure 67. Screenshot of one of the analysis processes between the 3D model and the visual coding.

For years I wondered in my design job why don't we further research the vernacular. The answer took me a thesis to understand: time, expertise, and more importantly existing research.

- **Time:** will always be limiting, and in high-pressure professional environments, time = money.

- **Expertise:** related to urban analysis vary largely between individuals, and to a big part, remains exclusive due to the specialisation it requires (e.g. Space Syntax).
- **Existing research:** is hence pivotal in overcoming time and expertise-induced limitations.

Consequently, I regard the results far less important than the process, making me truly value the gap in knowledge that exists, which is not only related to the end-lessons about the vernacular, but rather how to study it. I have therefore decided to name the Vernacular Urban Analysis methodology set forth in Part B of chapter 4 as “**VERBA**”. Finally, the methodology should be considered as a first iteration that needs to be refined with time.

#### **7.4 And the site showed me**

Finally, Al Ula Old Town, a perfect example of an Islamic city with its compact dense fabric and meandering narrow alleyways, provided us with several insights that I will summarise below.

- Organic growth in the old town did not mean chaotic and unplanned.
  - ◆ Learning point: prioritise proportional and utilitarian growth that is based on demand and is supported by adequately-sized amenities and provisions.
- Despite a small variety of land use functions in the pre-industrial city, the inhabitants of the Old Town managed nonetheless to distribute the functions across the town.
  - ◆ Learning point: although more studies need to be carried out using Space Syntax to determine amenity distribution and accessibility, a mixed-use approach should be adopted in order to ensure autonomy for each neighbourhood and equitable amenity distribution.



- Sizing open spaces in the old town was not arbitrary, but rather followed a hierarchy and reasoning.
  - ◆ Learning point: develop hierarchy of open spaces and adequate spatial arrangements in order to:
    - diversify the offering for activities (i.e., large festive spaces such as the souk, small intimate spaces, socio-culturally significant spaces such as the Tantora public square, etc.) for different user groups (tourists, residents, workers),
    - provide privacy for residents (e.g., narrower streets that are tucked away are less preferred by outsiders for instance),
    - provide a safe urban environment (as shown by the VGA analysis: avoid single streets branching out as well as visually obstructing objects).
  
- Urban fabric density and compactness in the old town was not solely a defence strategy, but also a climatic one.
  - ◆ Learning point 1: adequate urban and architectural orientation that follow the sun and wind orientation can maximise thermal comfort within the public realm, making walkability and outdoor activities a much more pleasant experience in hot and arid climates.
  - ◆ Learning point 2: tayyaras (i.e., protruding masses, balconies, louvres, etc.) are excellent design elements that create shade and redirect wind.
  - ◆ Learning point 3: Adequately sized public squares can be more pleasant than oversized ones when it comes to thermal comfort.
  - ◆ Learning point 4: transitory spaces between large open spaces and narrow streets can help increase thermal comfort.

The above learning points are observations stemming from the analysis in chapter 6, and have the potential to branch out to more technical details and exhaustive guidelines. Therefore, I highly urge future research to build on the above knowledge and hopefully build an exhaustive database of lessons that will help create urban spaces in the Middle East that are climate responsive, have a strong local identity, and are human-centric.

**08 CONCLUSION**

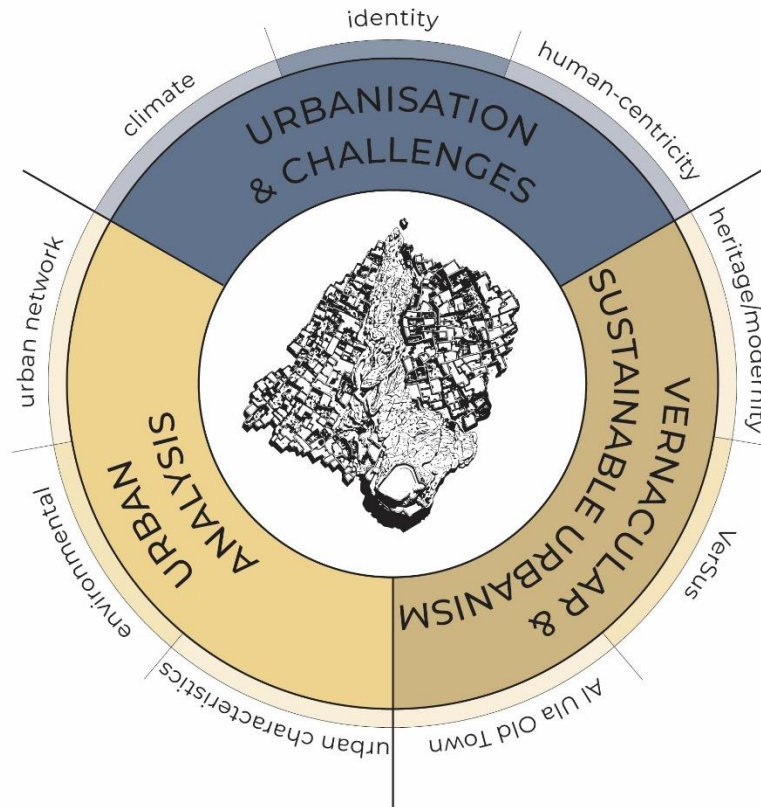


Figure 68. Challenge focus. (Diagram by author, 2022).

Set out to investigate vernacular urbanism in the Middle East in order to increase urban sustainability under three main target areas (climate, identity, and human-centricity), this study managed to tick off several objectives.

Firstly, the survey demonstrated that architecture and urban planning professionals in the Middle East believe that vernacular applications can be pivotal in the way we design our cities. Additionally, respondents showed a high level of interest in the topic and high agreement with the problem statement, ticking the first objective.

Secondly, the thesis managed to sew the knowledge gap by providing new insights on vernacular urbanism in the Middle East in general and on Al Ula Old Town in specific. Moreover, the thesis worked towards creating a vernacular urban analysis methodology to facilitate future research work, whether in academia or amongst architects and urban designers.

As a result, **VERBA** covers several aspects and techniques in urban analysis. However, the methodology still needs rigorous testing, development and refinement, in hopes that one day a single platform-solution combining all analysis would exist instead of scrounging across multiple platforms and softwares to perform the different analysis types. Furthermore, I believe that VERBA can be powerful when coupled with VerSus and strongly advise using the two together.

Thirdly, while I thought the lessons would be purely technical when I first started drafting the research questions, the reality could not be much different. The primary lesson, stippled with many technical challenges, came from the urban analysis process. Therefore, I cannot stress enough on the necessity to make the analysis tools and softwares accessible to all if we really want to push the knowledge ceiling and leverage vernacular knowledge in contemporary designs. Moreover, the problem statement-specific lessons fall under two main categories: those stemming from the survey and those stemming from the analysis of the Old Town.

Moving forward, I would like to highlight several elements that surfaced in the literature review but never in the data collection or the analysis. The first item in order is the duality between Rudofsky's protagonist: the expert and the non-expert. In today's world, the non-expert remains an integral part of design since in most cases they are the end-users. I consequently urge that user-participation is taken into consideration in further studies and design initiatives. The second point is the non-technical approaches that are less often spoken about such as governance, which need to be integrated within the VerSus framework as well as any subsequent studies.

In conclusion, vernacular can be a rich learning opportunity, providing many answers to contemporary challenges. However, it cannot be approached with a tunnel vision and should always be considered as a whole if we are to embrace the ancestral wisdom that lies within. Afterall, vernacular is the zeitgeist of its era; therefore, mimicking it would be futile, and entirely discarding it would be unwise.

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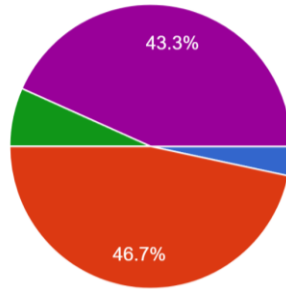
# Annex

## Survey questions and answers

### Question 1

Which type of work do you specialise in?

30 responses

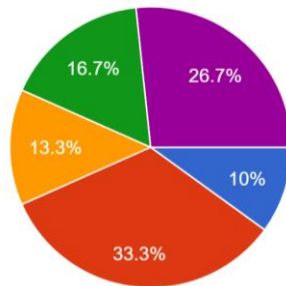


- Academic research
- Architecture design
- Private urban development
- Public urban development
- Urban design / master planning

### Question 2

How many years of industry experience do you have?

30 responses

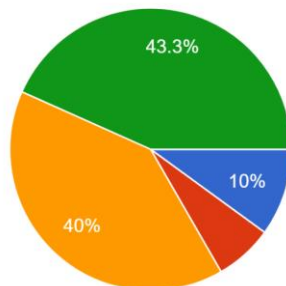


- less than 3
- 3-5
- 6-9
- 10-15
- more than 15

### Question 3

How many employees does your company have?

30 responses



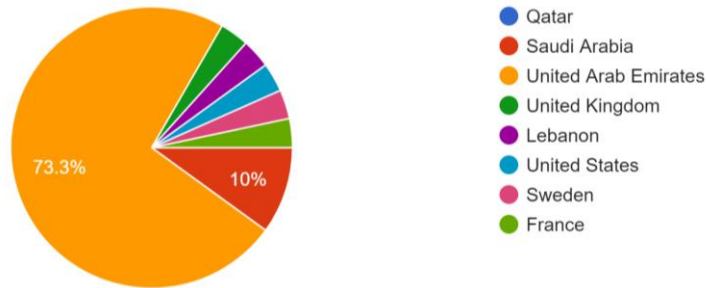
- less than 10
- 10-49
- 50-249
- more than 250



### Question 4

Which country is your office based in?

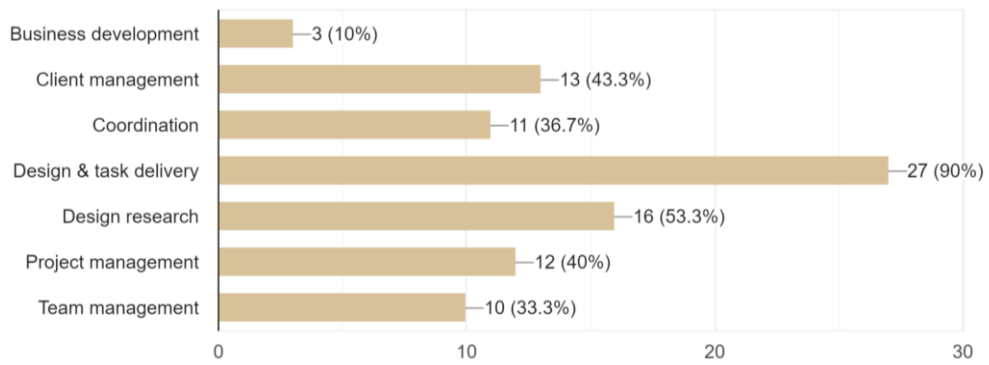
30 responses



### Question 5

Which professional activities do you mostly do on a daily basis?

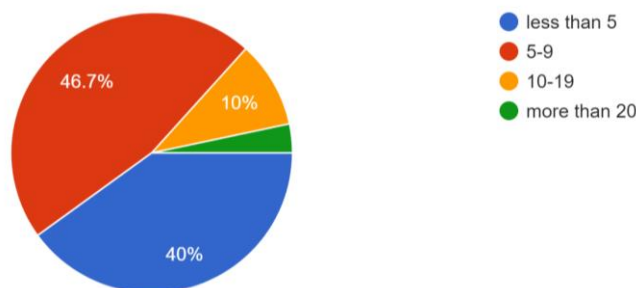
30 responses



### Question 6

How many projects do you deliver per year in the Middle East?

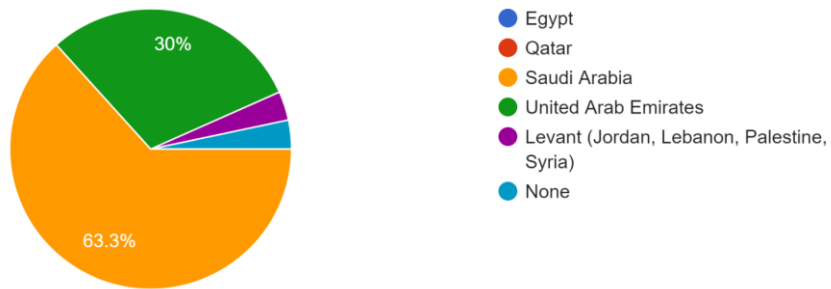
30 responses



### Question 7

Which of the following Middle Eastern countries are most of your projects located in?

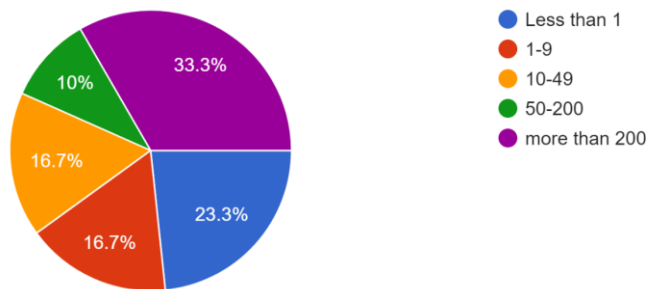
30 responses



### Question 8

What is the area in hectares of a typical project that you deliver in the Middle East?

30 responses

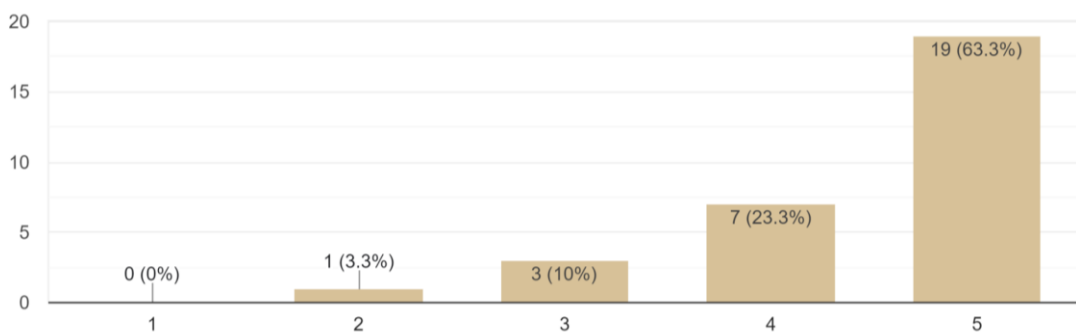


For the following three questions (9, 10 & 11), please rate your level of agreement with the written statement.

### Question 9

There are some developments built since the 1990s in the Middle East that overlook local climate conditions.

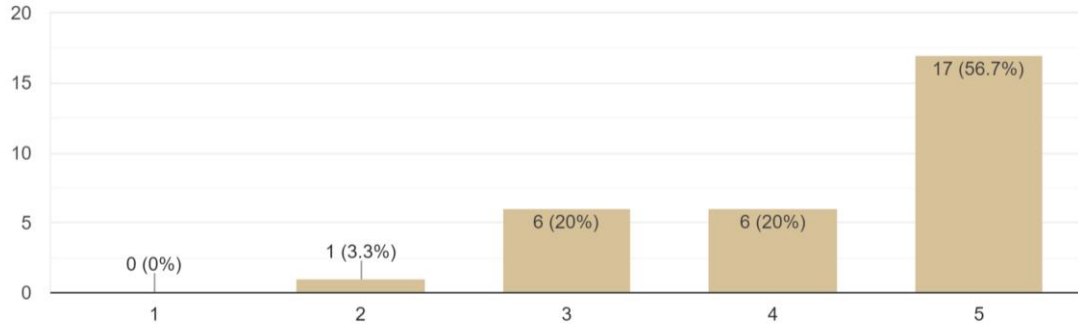
30 responses



### Question 10

There are some developments built since the 1990s in the Middle East that overlook local architectural identity.

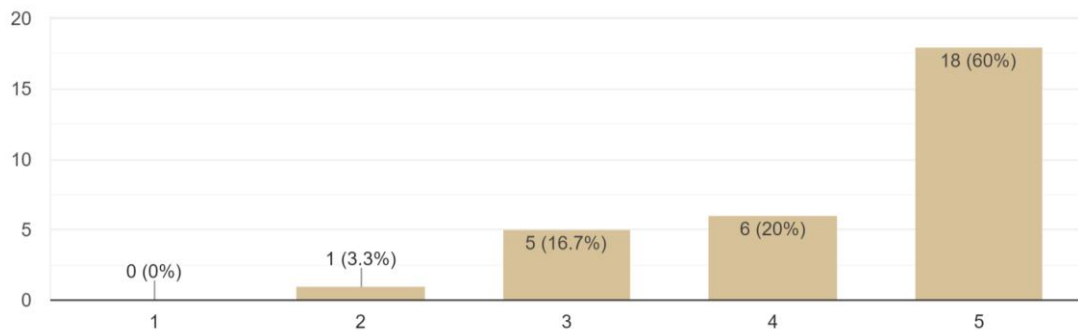
30 responses



### Question 11

There are some developments built since the 1990s in the Middle East that are not human-centric.

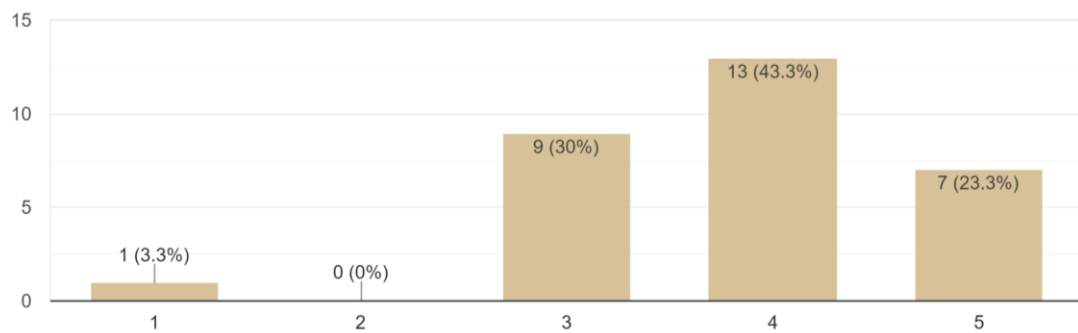
30 responses



### Question 12

How knowledgeable are you of Middle Eastern vernacular architecture and urbanism?

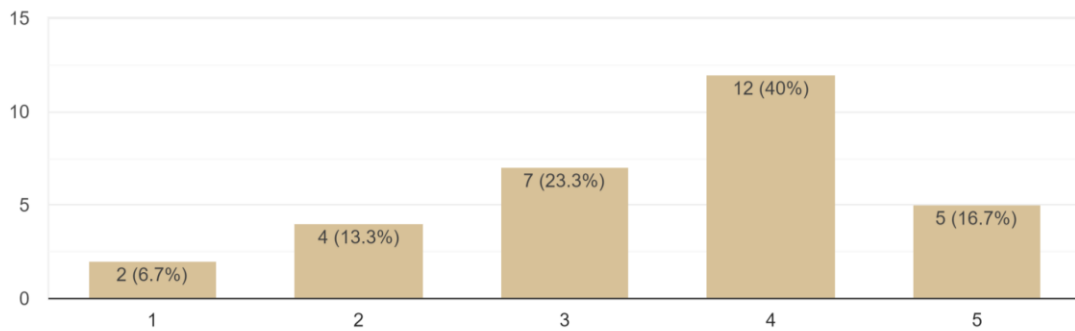
30 responses



### Question 13

How often do you use vernacular research on projects?

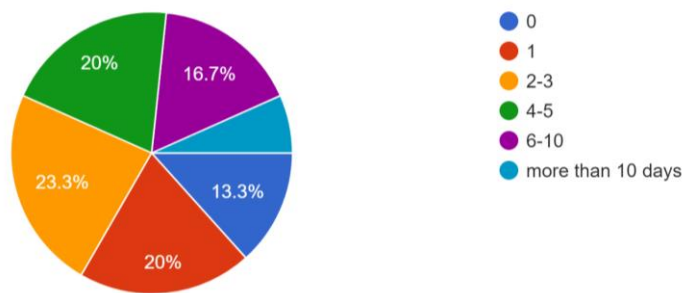
30 responses



### Question 14

How many days do you dedicate per project for vernacular research? (Assume a 6-weeks competition timeline and no prior in-house research exists)

30 responses

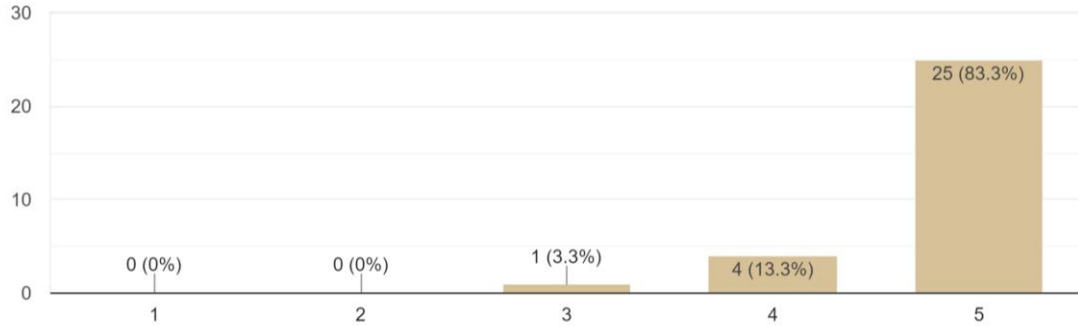


For the following three questions (16, 16 & 17), please rate your level of agreement with the written statement.

### Question 15

Knowledge from vernacular architecture and urbanism can help create developments that respond to the local climate conditions.

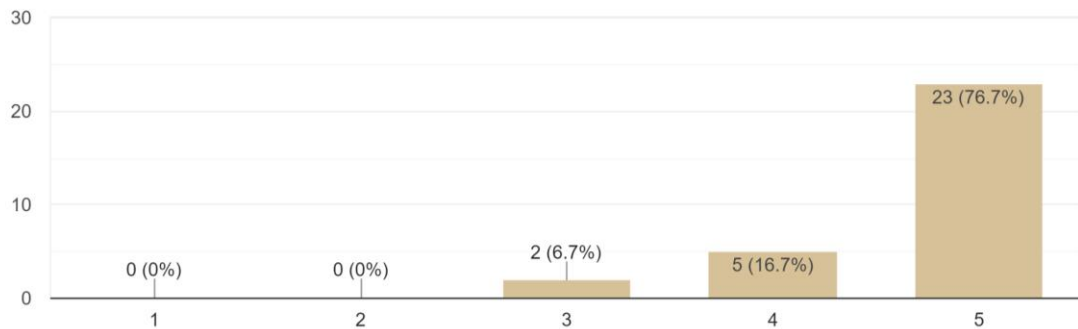
30 responses



### Question 16

Knowledge from vernacular architecture and urbanism can help create developments with a local and contextual architectural identity.

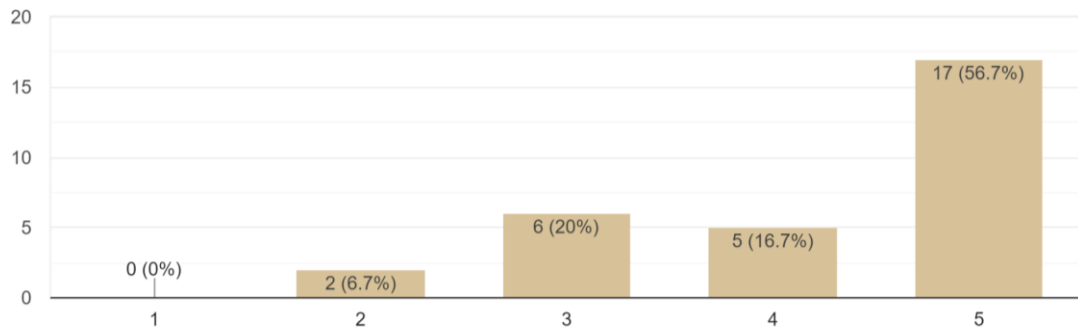
30 responses



### Question 17

Knowledge from vernacular architecture and urbanism can help create human-centric developments.

30 responses

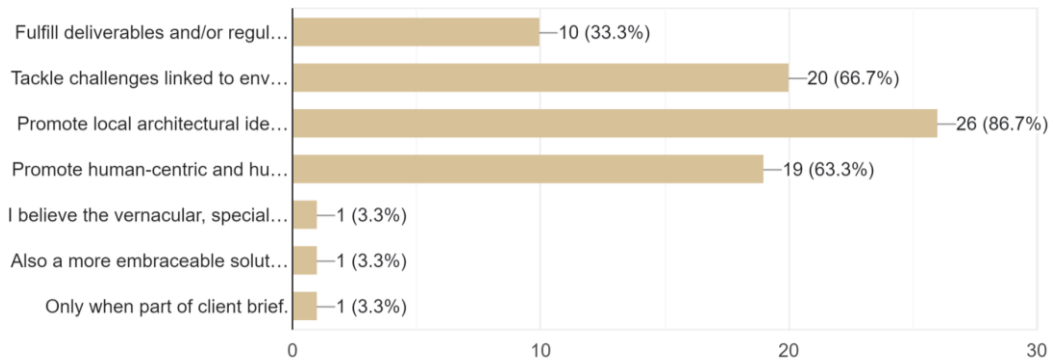


Question 18: If you disagree with any of the previous 3 statements, can you elaborate why in a few sentences?

### Question 19

Why do you incorporate vernacular knowledge into your projects?

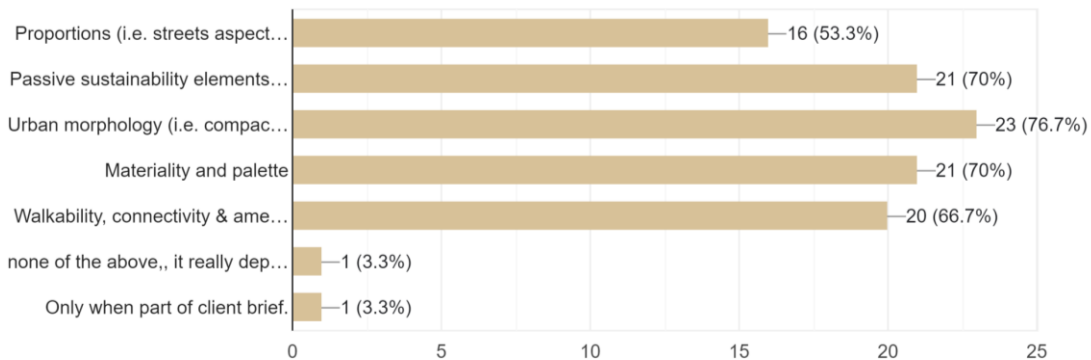
30 responses



### Question 20

What vernacular characteristics do you use the most on projects?

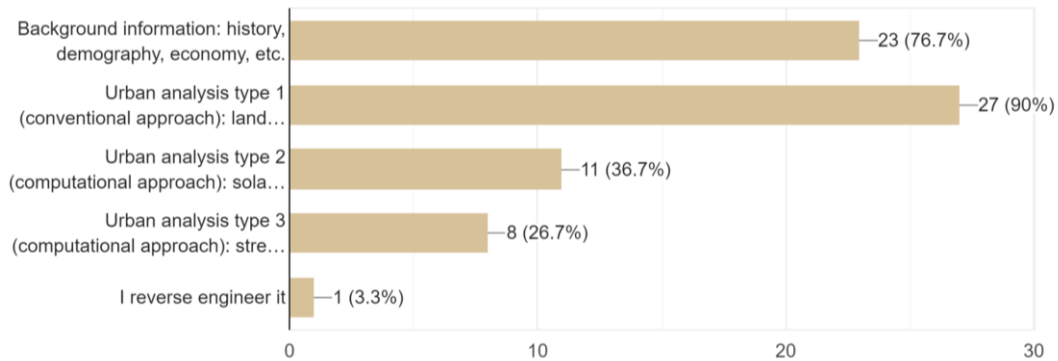
30 responses



## Question 21

What analysis tools and methods do you usually use?

30 responses



Question 22: Is there any vernacular characteristics you wish to learn more about but do not have the needed resources (time, data, knowledge, etc.) to do so? If yes, could you please specify.

Question 23: Do you have any final comments, suggestions or feedback?

Question 24: Do you have any suggestions for bibliography, research, or modern projects that fall within the theme of vernacular architecture in the Middle East?

Question 25: If you authorise the author to contact you in case there's a need for complementary information, please provide your name and email. (Reminder that the survey is anonymous, so unless you write your email/name, your identity will not show to the author).