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البلدية و القروية
Ministry of Municipal & Rural Affairs

MADINAH City Profile



مستقبل المدن السعودية
FUTURE SAUDI CITIES



UNO HABITAT
FOR A BETTER URBAN FUTURE

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MADINAH

المدينة المنورة



FUTURE SAUDI CITIES PROGRAMME

CITY PROFILE



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1 INTRODUCTION



1.1 About the Future Saudi Cities Programme

The Future Saudi Cities Programme is a joint programme developed by the Saudi Ministry of Municipal and Rural Affairs (MoMRA) and UN-Habitat, implemented in close cooperation with the municipalities of 17 major Saudi cities. The cities have been selected based on their different population sizes, geographic distribution, and a range of criteria based on capacities and economic potential to create a more balanced regional development among the cities of Saudi Arabia. The chosen cities include Riyadh, Makkah, Jeddah, Taif, Madinah, Tabuk, Dammam, Qatif, Al-Ahsa, Abha, Najran, Jazan, Hael, Arar, Al Baha, Buraidah, and Skaka.

After undertaking city-level reviews in the 17 cities, five cities were chosen as a representative cross-section, for in-depth analysis. The city-level reviews considered the linkages between urban and territorial planning by examining the city within the relational context of its sub-region and exploring specific issues at the neighbourhood level. These reviews, when referenced with City Prosperity Index (CPI) reports and validation processes in the Rapid Planning Studio workshops, were used to extrapolate strong, evidence-based conclusions that relate to the planning system as a whole.

Applied research, with a strong focus on action-oriented conclusions, was used to collect evidence to diagnose the strengths and weaknesses of the planning system and local planning practices in each city. The methodology utilised design tests and demonstration projects as avenues to apply and analyse potential solutions, before concluding on policy recommendations.

UN-Habitat's three-pronged approach considers spatial planning in relation to legal and institutional frameworks, in addition to financial mechanisms. In this way, success criteria for the sustainable implementation of a spatial plan should include flexible but enforceable rules and regulations, in addition to a financing strategy and projections.

As a pragmatic explication of this approach, three local demonstration projects, representing essential elements of a strengthened and improved planning system, have been developed. These were elaborated to include schematic designs and feasibility studies, that can later be transformed into implementation plans. Such implementation plans are projected to be undertaken by MoMRA, in collaboration with other partners in the Kingdom.

In order to facilitate this process, a joint "FSCP Urban Lab" was created as a vehicle to strengthen endogenous capacities and to develop tailored tools, and instruments. The Lab, composed of international expertise from the planning, legal and economy branches of UN-Habitat Nairobi office, has been working with Saudi-based staff in the UN-Habitat Riyadh office (selected by MoMRA), to enhance knowledge exchange and to apply a learning-by-doing method to the programme.

As such, all 17 cities have been simultaneously engaged in a capacity-building strategy that included foundational learning, and 'on the job' training, culminating in Saudi-specific advanced training. This training was based on the planning-system conclusions and recommendations, that the FSCP produced. Thus, the Urban Lab functions as a tool to generate evidence whilst additionally strengthening capacities through a process of learning-by-doing.

1.2 Saudi Initiatives for Sustainable Urban Development

The Saudi Government, along with the respective Ministries, and in line with a larger country-wide transformation process, has made several efforts aimed at the sustainable development of its growing cities. These contributions vary from plans at the national level, like the National Spatial Strategy (NSS), to strategies and plans at the regional level, cutting across various sectors towards realising Vision 2030. The FSCP recognises these efforts as positive, supporting Vision 2030 goals to realise a sustainable urban environment for the Kingdom of Saudi Arabia. The FSCP acknowledges and builds upon the current tools, plans, and strategies as part of a comprehensive assessment and suggests variations and improvements where appropriate.

1.3 Objectives of the City Profile Report

1.3.1 Scope of the city profile

The city-profile combines MoMRA's new strategy, with a review of existing studies, plans, and strategic documents, such as the review of the Kingdom of Saudi Arabia National Spatial Strategy (NSS) to identify and address the root causes of problematic conditions outlined in the preliminary findings. The report acknowledged low uptake of the NSS by regions, utilities and ministries, as a key weakness. The issue of horizontal (sectors) and vertical (scales) integration is thus a key challenge that the FSCP aims to address going forward.

Policy recommendations for improving urban planning frameworks and practice shall be structured through a multi-scalar lens, considering the city as a continuum in the urban fabric, that should grow from the neighbourhood to the wider city-region, whilst influenced by dynamics and regulations at the national and supranational levels. This ensures that policy recommendations for these cities do not operate in isolation from the city's envisioned role in the administrative region and the national system of cities.

1.3.2 Objectives of the city profile

The City Profile Report brings together diagnostic urban analysis and aligns that analysis with the UN-Habitat sustainable development framework and the Saudi Vision



Sayed Al Shuhada Mosque near the Uhud Mountain

© FSCP

2030. It performs as a thinking tool that constitutes together an assessment tool and guidance for the current and future planning of the city, whilst defining a clear strategy for sustainable development.

The definition of an ad-hoc strategy is rooted in an evidence-based approach to the issues, building upon both primary and secondary data collection and analysis. The profile, as well as the Program as a whole, uses the data collected by the City Prosperity Initiative (CPI), to identify significant trends and challenges at the city level. This evidence is then combined with reviews of existing planning documents, and cross-referenced with multi-scalar GIS spatial analysis, to define the above-mentioned ad-hoc strategy.

1.4 City Profile Methodology

1.4.1 Evidence-based input approach

The evidence-based planning approach creates a deeper understanding of the spatial dynamics of the urban area, by combining and comparing urban datasets such as demographics, density, land use, natural features, and accessibility analysis.

The evidence (data) is reflected in the form of indicators that can be compared with best practice standards and benchmarks

for sustainable urban development. Not only does this provide a clear perspective on the main developmental issues, but it also quantifies the projected effect of future development proposals on the indicators applied in the analysis.

The programme recognises that the methodology, on which policy recommendations guiding improvements and adjustments in the planning system are based, needs to be evidence-based. For this purpose, different methods were integrated to first provide the necessary body of evidence on which to build an understanding, and full assessment of issues before making recommendations for the respective cities.

The elements constituting the evidence-based approach are primarily constituted of the following:

- Reviews of existing policy documents and plans;
- CPI;
- GIS spatial analysis.

All of these elements are utilised in a cross-scalar diagnostic methodology that incorporates quantitative and qualitative evidence. The method used to generate evidence-based policy recommendations, which develops capacities and engages stakeholders in all 17 cities, provides conclusions derived from both top-down and bottom-up approaches, cross-cutting all scales of planning.



The Al-Baqi Cemetery is an important space within Madinah urban structure

By analysing how the structures of spatial, socio-environmental and economic issues interact at different scales of influence, the diagnostic methodology moves from the national to the neighbourhood scale, tracking the interdependencies within the city's physical development patterns, and seeking to decrypt the reasons behind them.

1.4.2 The reviews

Several reviews of existing policy documents and plans were undertaken with the purpose of a) extracting information useful to the understanding of the context, and the city itself, and b) assessing their contents based on three criteria: content relevance, process integration, and effectiveness. The reviews focused on assessing the:

- National Spatial Strategy;
- Al Madinah Regional Plan;
- Comprehensive Plan of The Madinah Metropolitan Area;
- Madinah Local Plan.

1.4.3 The City Prosperity Index assessment report

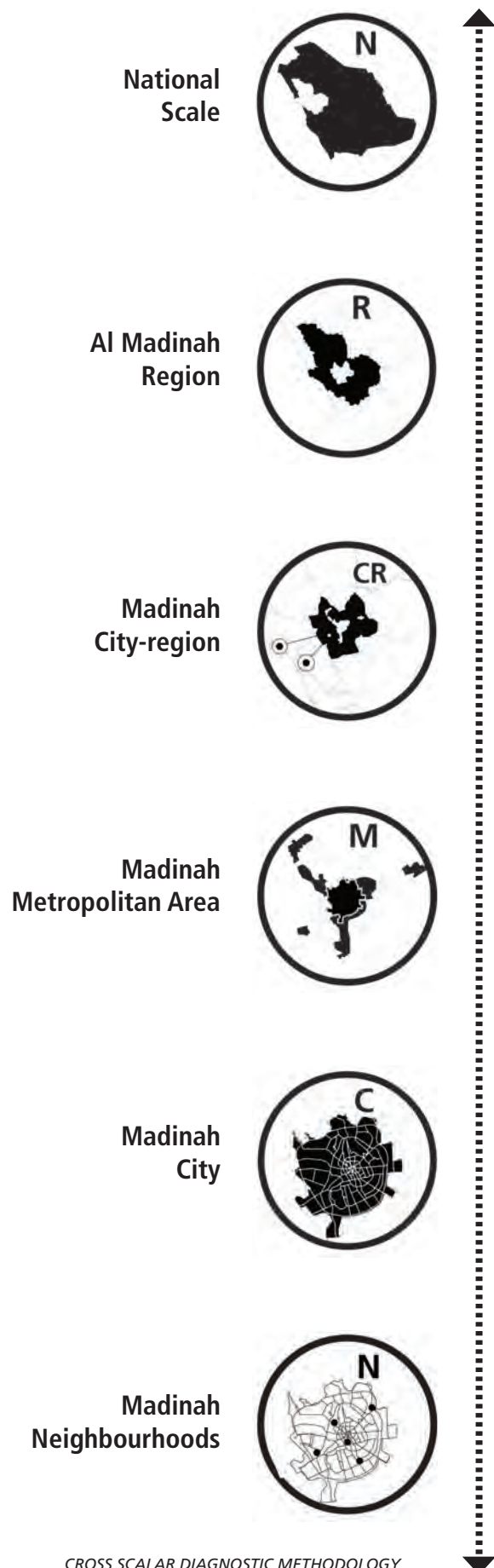
The City Prosperity Index is made up of six dimensions that serve to define targets and goals that can support the formulation of evidence-based policies. These include the definition of city-visions and long-term plans that are both ambitious and measurable. The six dimensions are:

- Productivity;
- Infrastructure;
- Quality of life;
- Equity and inclusion;
- Environmental sustainability;
- Governance and legislation.

These dimensions have been assumed as guiding principles in the spatial assessment of Madinah. There are ten detailed spatial indicators at the FSCP city profile level that link into the 72 flexible indicators of the CPI assessment.

1.4.4 The GIS spatial analysis

The spatial reflection of the above indicators highlights detailed patterns of development and the interactions and dynamics associated with movement, densities, and land use within the urban system. This process enables a dynamic understanding of the physical expressions of weaknesses and strengths in the urban system and the main issues to be addressed. The effect of proposals for future development can also be assessed by use of the same indicators.



NATIONAL AND REGIONAL SPATIAL CONTEXT

2





2.1 The Region’s Role in the KSA

2.1.1 Historical background

Madinah is an ancient, holy city, with a history that goes back to the time of the Prophet Abraham and his descendants. Medinah is the second holy city of Islam, after Makkah, the city custodian of the Kaaba. Its importance as a religious site derives from the presence of the Masjid al Nabawi, the Mosque of the Prophet Muhammad, which was built on the site of his home and where he was laid to rest. The first mosque of Islam is also located in Medinah and is known as Masjid Al Quba, the Quba Mosque.

The City of Madinah was traditionally compact, centring around the Prophet’s Mosque, and grew at a gradual pace throughout its history. However, during the past three decades, urban growth has occurred at a more substantial rate. This is because the overall nation’s development has been experiencing significant urbanisation, translated in rapid increase in urban population in the entire Kingdom of Saudi Arabia.¹

2.1.2 Geography and location

Al-Madinah Al-Munawwarah is the capital city of the Al Madinah Region, located in The Eastern part of the Al Hijaz area, in the Northwestern part of the Kingdom of Saudi Arabia, approximately 250 kilometres to the East of the Red Sea. A number of mountains surround the city, Al-Hujaj to the West,

Salaa to the Northwest, and Al-E’er to the North. Al-Madinah Al-Munawwarah lies on a flat mountain plateau, at the junction of the three valleys of Al-Aql, Al-Aqiq, and Al-Himdh, standing 620 metres above sea level, and covering an area of about 700 square kilometres. A hot, continental climate characterises the area. The temperature ranges between 36-46 degrees celsius during the summer and between 15-20 degrees celsius during winter, while the average temperature is 30C° in summer and 15C° in winter. Rains mainly fall between November and January, but overall, the area receives little rainfall, with an average of 94mm.

2.1.3 Demographic background

According to estimates from the Saudi Central Department of Statistics and Information, the total population in the Al Madinah Region in 2014 was 2.01 million, representing 6.54% of the total population of the Kingdom, which was 30.8 million people in the same year. The number of Saudi population in Madinah is estimated to be 1.39 million, in addition to 616.000 non-Saudis. The Madinah Governorate holds the largest portion of the population in the region, hitting 66.6%, followed by the Yanbu Governorate with 16.8%, Al Ula with 3.6%, Badr with 3.5%, Al-Mahd with 3.5%, Al-Hanakiya with 3.3%, and finally Khaibar with 2.7%.

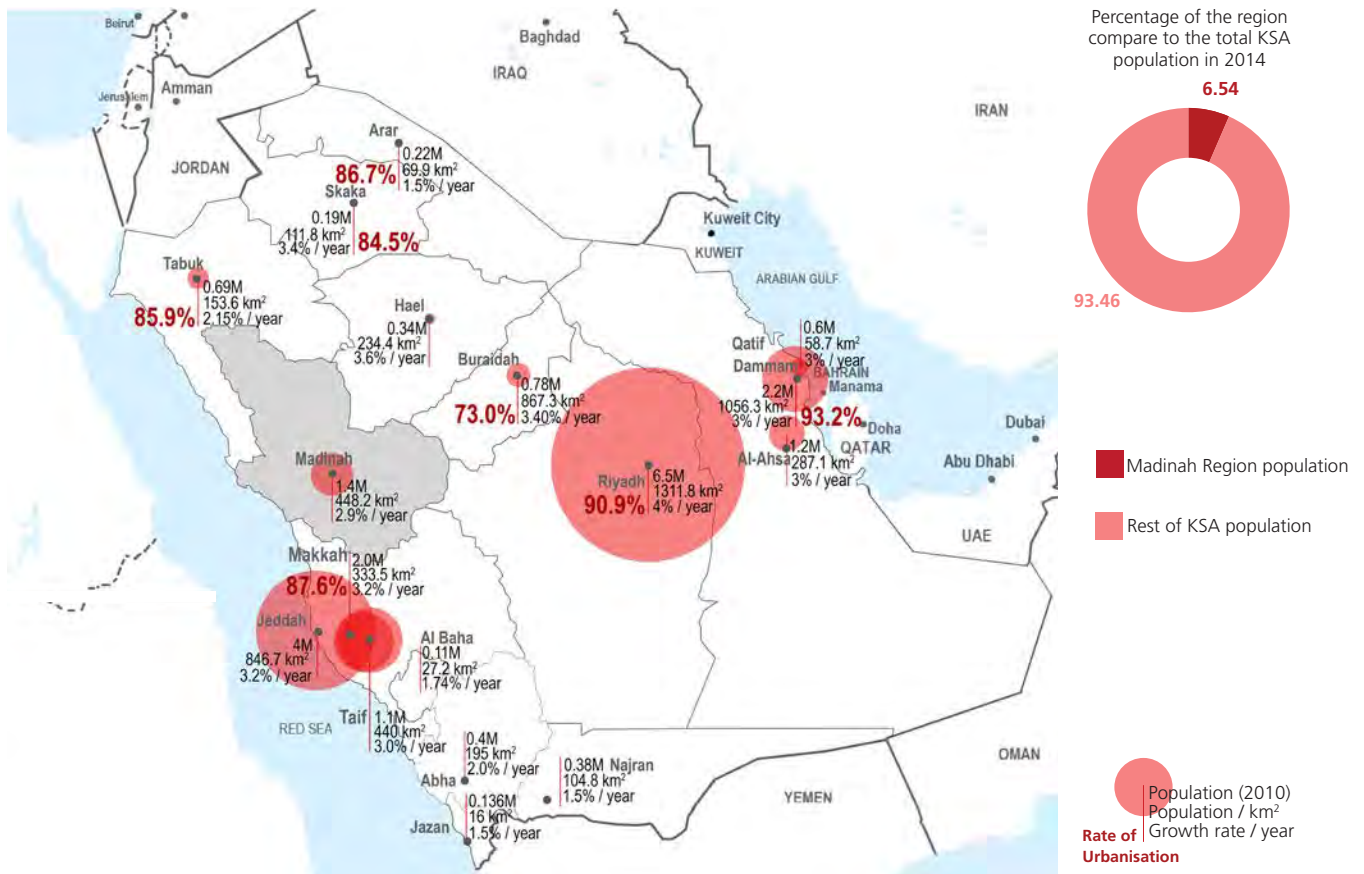


Fig. 1. Population distribution, growth rate and urban areas within the Kingdom of Saudi Arabia

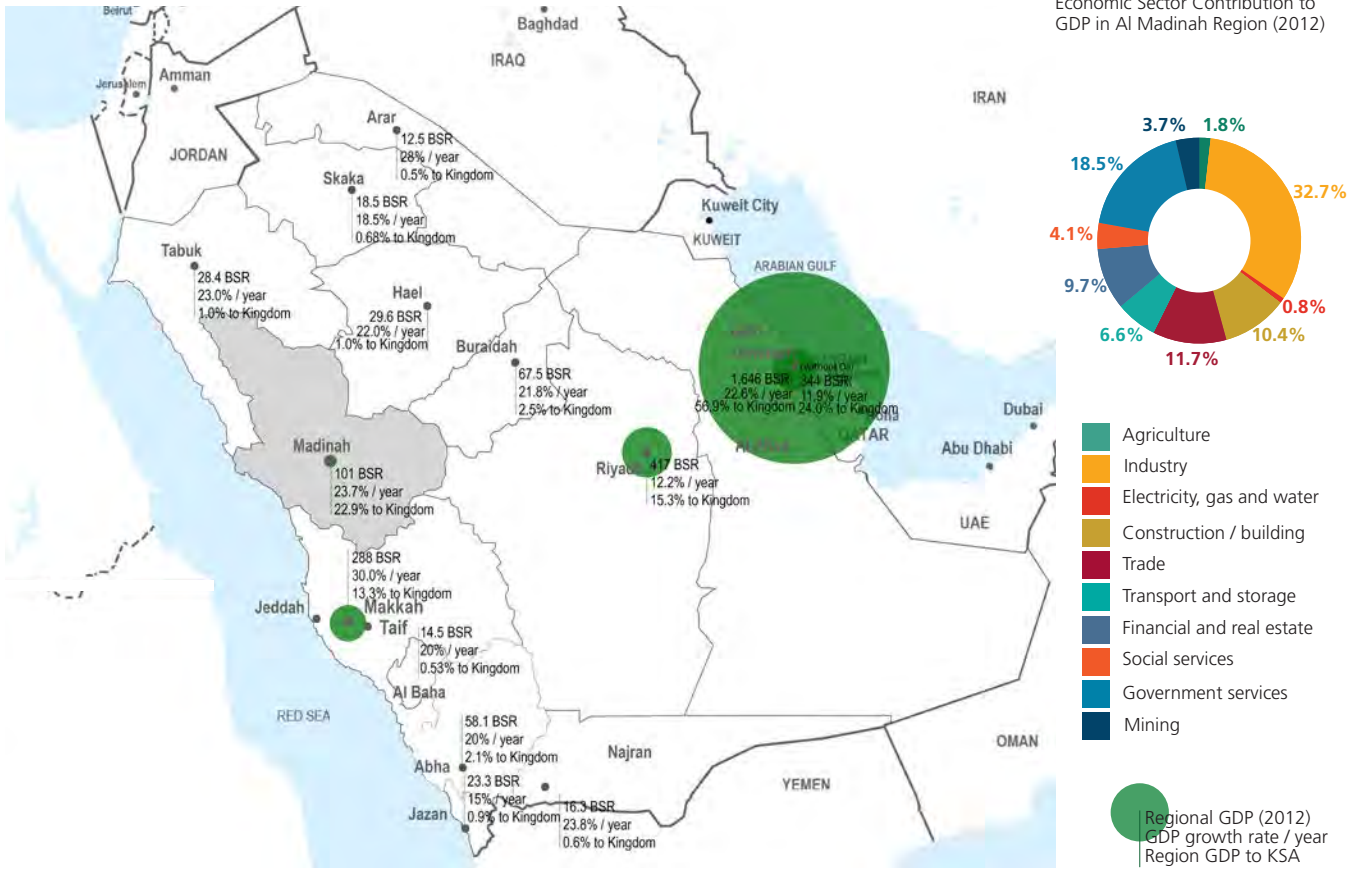


Fig. 2. Regional Gross Domestic Product and economic sector contribution

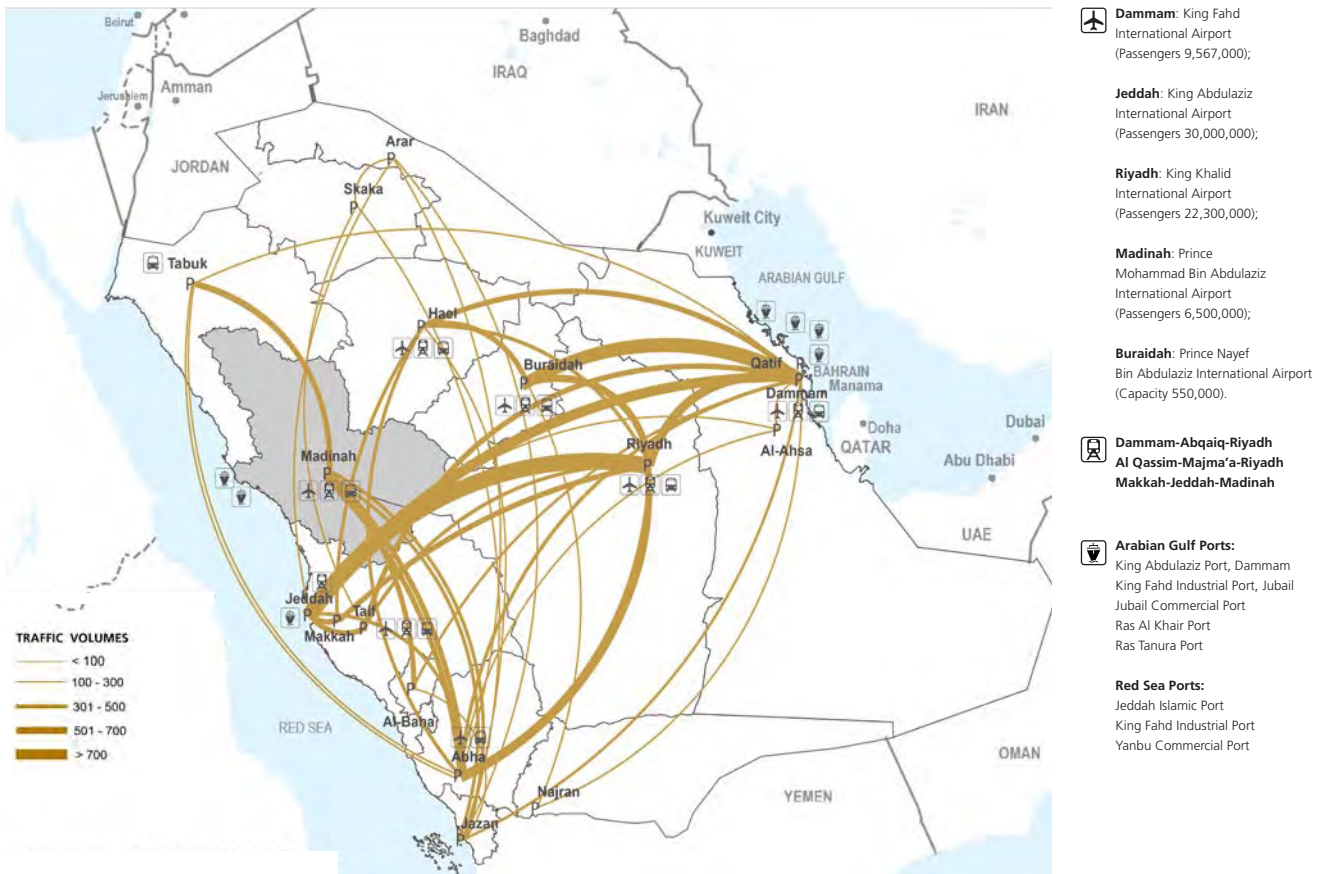


Fig. 3. Transport connectivity between Saudi cities



2.1.4 Socio-economic background

The city of Al-Madinah Al-Munawwarah holds major historical, religious, and economic importance for its unique location and presence of the Holy Prophet's Mosque. The Prophet's Mosque and his sacred tomb attract millions of pilgrims to the city every year, making Madinah a key city for the tourism industry in the Kingdom. The Al Madinah Region has an industrial city, which feeds a relatively prosperous industrial economy. The number of factory workers in the Al Madinah Region recorded at the end of 2013 was 32,500 in total, this represents 3.9% of the total industrial workforce in the Kingdom, which was 828,000 workers in the same year.²

The Al Madinah Region has a good network of roads and bridges connecting its major cities, as well as its industrial and commercial facilities, and also links the region to the neighbouring areas. Trade is one of the key sectors in Al-Madinah Al-Munawwarah because of the various vital economic and productive activities present in the city and spreading throughout the region. Another key aspect influencing the city's economy is the large volume of consumer markets due to the large numbers of visitors to the Holy Prophet Mosque.

The mining and quarrying sectors significantly contribute to the exploitation of natural resources in the region and serve the needs of the construction and industrial sectors with raw materials. The agricultural sector has major importance in the

region, thanks to the fertile soil around Madinah. In 2011, the total crop area amounted to 27,500 hectares, representing 3.5% of the total crop area in the Kingdom, which was 788,000 hectares in the same year.

Gross Domestic Product

The Gross Domestic Product (GDP) of the Madinah Region was about 101 billion riyals in 2012, representing 3.7% of the GDP of the Kingdom, and 7.1% of the GDP of the Kingdom, without crude oil and gas. During the period 2009 to 2012, the average annual growth rate of the region's GDP was 23.7%. The main contributions came from the industrial sector, ranking first in terms of contribution to the overall GDP of the region with 35.7% of the total. The trade sector follows with 11.7%, the construction and building sector at 10.4%, the financial and real estate services sector with 9.7%, transport and communications sector at 6.6%, social and personal services sector with 4.1%, and mining sector with 3.7%.³

2.1.5 National Connectivity

Air transport

Unlike most of the other regions, the Al Madinah Region hosts two airports: an international airport, which is located in the city of Al-Madinah Al-Munawwarah; and a regional airport⁴, the Prince Abdul Muhsin Bin Abdulaziz Airport (PMBAA), located in the city of Yanbu. The PMBAA currently accommodates 19% of all



New development in the outskirts of the city

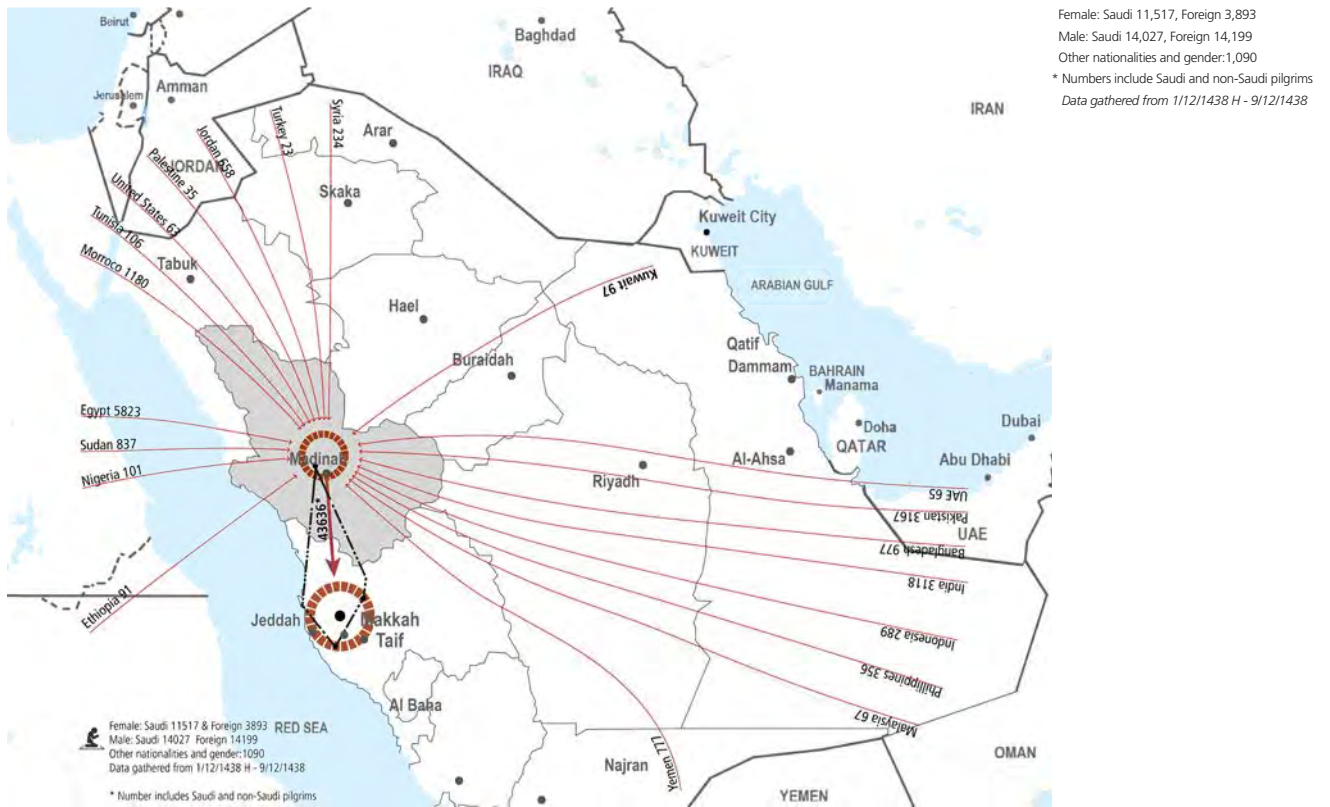


Fig. 4. International pilgrimage flow map in 2017 (1438H)

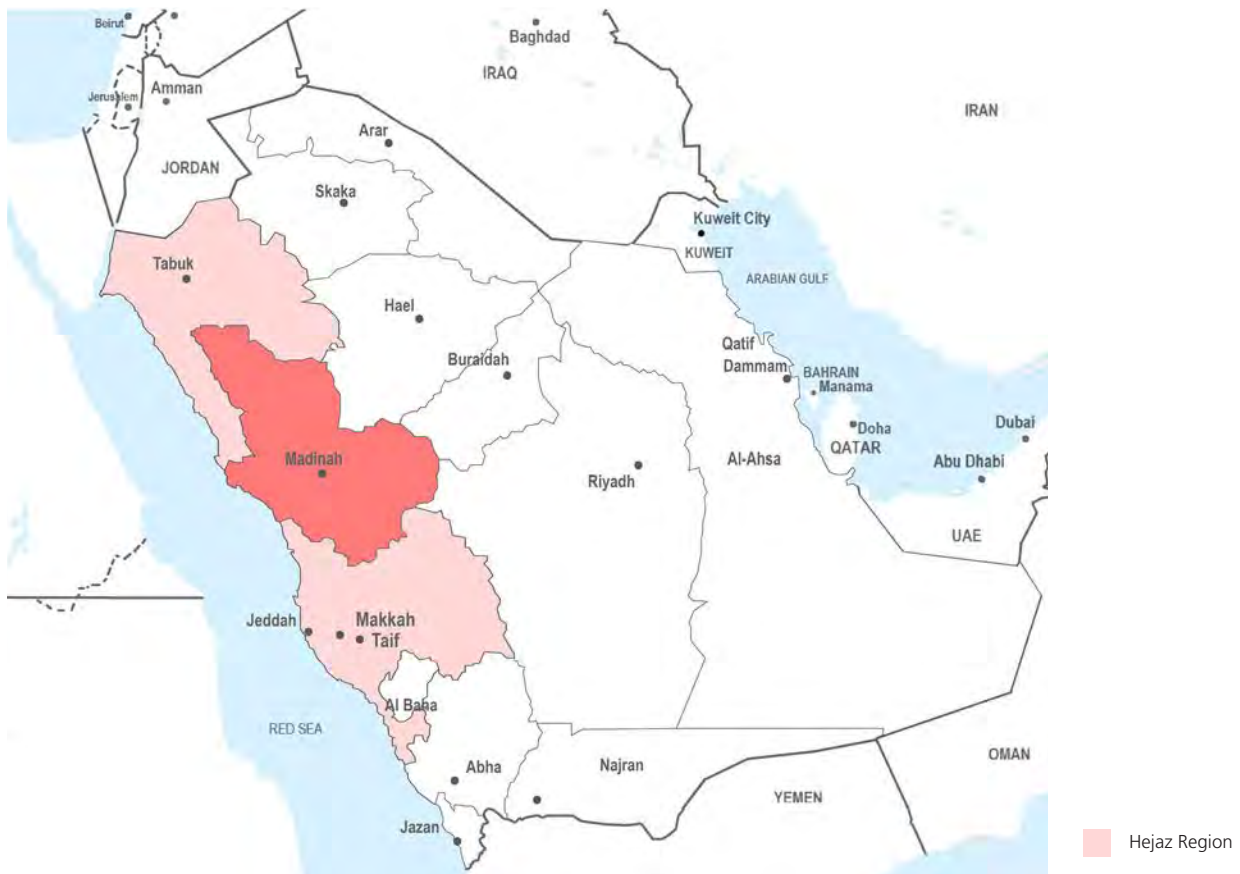


Fig. 5. Madinah Region



international air traffic arriving into the Kingdom of Saudi Arabia, 9% of all domestic passenger traffic, and 11% of all domestic cargo traffic across the country. The total number of passengers using the airports in the Al Madinah Region was 2.46 and 2.94 million passengers in 2011 and 2012 respectively. This represented an increase of about 20% and as an estimated percentage was 7.3% and 7.7% of the total air traffic of passengers in the Kingdom, which recorded 33.6 million and 38.5 million passengers in the same years. The air traffic in Madinah is one of the fundamental and important pillars on which the present and future economic development projects in the region can rely.

Sea transport

According to the Saudi Port Authority (SPA), the West Coast accounts for 70% of cargo coming in and out of the country and hosts six of the Kingdom's ten principal ports: KAP, JIP, Dhiba, Jizan, Yanbu Commercial Port, and Yanbu's King Fahad Industrial Port. In the Al Madinah Region, there are two ports on the Red Sea: King Fahd Port in Yanbu Industrial City and Yanbu Commercial Port. The ports of the region contribute a large proportion of the total shipping movement in the Kingdom. The quantities of goods handled at the ports of the region (loaded and unloaded) were 43 million tonnes in 2013, representing 22% of the total goods handled at the Kingdom's ports, which amounted to 195 million tonnes in the same year. The number of passengers in 2013 (arrivals and departures), was approximately 50,000 passengers, representing about 3.7% of the total number of passengers by maritime transport in the Kingdom, which was 1.35 million passengers in 2013.⁵

2.2 Regional Development Patterns and Dynamics

2.2.1 Regional organisation

Administrative Boundaries

The Al Madinah Region is currently distributed over nine administrative units representing the economic sectors of the region, namely Madinah, and its directly related centres, forming the Madinah City-region: Yanbu, Ola, Mahd, Badr, Khaybar, Hanakiyah, Ais, and Wadi Al-Fari. The Madinah City-region can host a diverse set of functions. Madinah and Yanbu are considered to be development centres at the national level, with mixed-use functions and primary services related to industry, trade, commerce, agriculture, and culture. Madinah and its city-region, as an economic sector, are ranked at the top regarding population size, with almost 63% of the total population in the region.

As previously mentioned, the city of Madinah has reached the stage of self-growth, being the fourth urban centre in the Kingdom and including proposed satellite developments within the Regional Plan. At the city-region level, Yanbu and Badr have strong links with Madinah regarding water provision, trade, and transport, and overall the area has a high agricultural potential both within the city and in the surrounding settlements of Al Henakiyah, Al Mindassah, Shajwa, and Abu Rubayq.

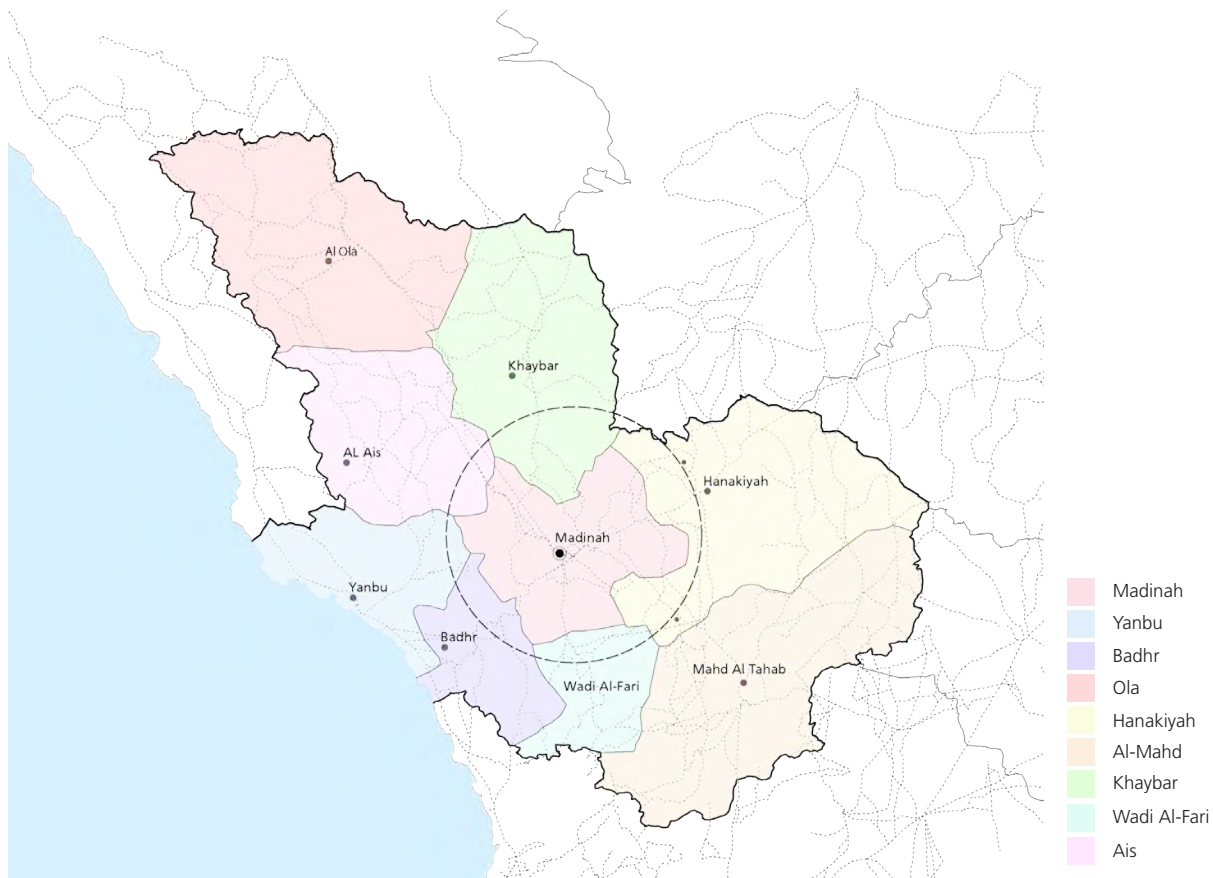


Fig. 6. Administrative boundaries



The Prophet's Mosque

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Linkages to National Spatial Strategy

The National Spatial Strategy (NSS) designates the city of Madinah as a National Growth Centre, one of the three in the Al Madinah Region. The City of Madinah ranks fourth in terms of urban agglomeration in the Kingdom, after Riyadh, Jeddah and Makkah. Madinah is anticipated to grow significantly over the next 30 years, reaching a projected permanent residential population of 2.06 million, and approximately 12 million visitors annually by 1462H (2040).

The city of Madinah is considered to be a development centre at the national level, together with the capital of the Yanbu Governorate. However, Madinah has reached the so-called stage of self-growth, being the fourth urban centre in the Kingdom due to its population size.

Madinah is also one the first eight urban centres that the NSS supports as a top priority for the overall national development. This is due to the relative advantage of Madinah City in impacting the Al Madinah Region development, and of the region in spreading regional development to the national level. This aspect positively affects the regional spatial balance in terms of distribution of services and central government functions provided by Madinah, such as universities, research organisations, and specialist medical services, among others. Balanced regional development is key in ensuring efficient utilisation of infrastructure and public services already in place, as well as directing support to the overall growth of small and medium cities around it.

With a resident population of almost 1.4 million and a floating population of about nine million every year, Madinah is significantly important within the national urban landscape, compared to many other cities in the Kingdom. As mentioned, the city of Madinah qualifies as a centre of national development because of the many resources present, such as agriculture, industry, and other important income-generating activities, such as religious tourism, and the strategic importance of the Al Madinah Region. The NSS confirmed this through the goals it set for the region:

- Achieving balanced regional urban development in the long term;
- Expansion and enhancement of economic growth;
- Strengthening of selected growth centres in the cities of the region; and
- Making the most of basic equipment existing in the current major urban centres (mainly represented by the city of Madinah).

Being a cultural/religious centre with rich agricultural resources, the city of Madinah has an important role and a strategic location in the region, linking and impacting three valuable functional axes: the agricultural belt, the heritage axis along the Hejaz Region, and the mining / industry activities shaping the axis stretching through Yanbu to Riyadh.

Al-Madinah Al-Munawwarah is the largest and most important urban centre in the Al Madinah Region. Its religious significance

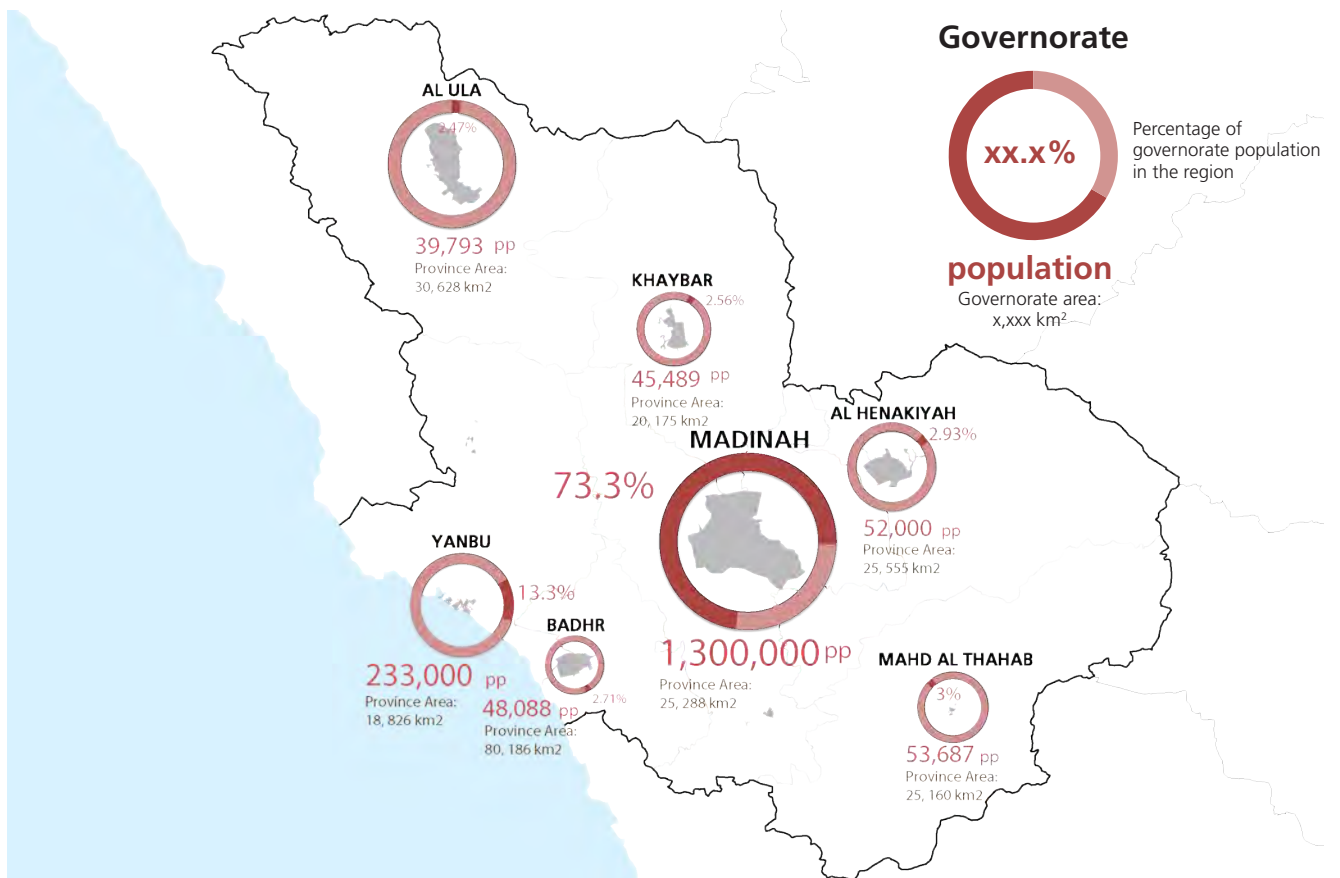


Fig. 7. Population distribution in the governorates according to 2010 census



makes it one of the most visited places in the Islamic world, and it receives over nine million Muslim pilgrims each year during the Hajj and Umrah seasons. The city has been expanding rapidly since the 1970s. Due to rapid growth, the government invested heavily in physical infrastructure, which attracted labour from all over the Kingdom and other countries leading to further growth of the city.

The sudden population growth exerted pressure on the city's boundaries, creating more demand for land, and leading to an explosion in land subdivisions. Land subdivision is considered the main process by which rural land is converted into urban land. In Madinah, the land has been subdivided with diminutive reference to the rate of development or occupancy, which has resulted in an enormous proportion of the subdivided plots remaining vacant.⁶

2.2.2 Regional Structure and Resources

Movement Infrastructure

As earlier highlighted, the region's main and minor transit arteries create a good network of connections throughout the Al Madinah Region, with the highest concentration being at the region's capital, the city of Madinah. The total length of the paved roads belonging to municipalities, and distributed across the cities and villages of the Al Madinah Region, amounts to 6,227 linear kilometres, accounting for 6.8% of the total roads managed by the Ministry of Municipal and Rural Affairs in the Kingdom for the year 2012, the total length of which was over 91,000 kilometres

in the same year. In comparison with other regions in the Southwestern side of the Kingdom, the Al Madinah Region has a good network of roads and bridges connecting its major cities as well as its industrial and commercial facilities, and the region is also well connected to the neighbouring areas. Notwithstanding this well-developed regional road network, it is important to note that public transport does not benefit from it, especially at the urban level. In fact, within Saudi Arabia, public transport is primarily focused on intercity routes as opposed to intra-city public transport systems. Nonetheless, within the city of Madinah, the Saudi Arabian Public Transport Company (SAPTCO) operates a very modest public transport network (bus service) with very low ridership. The service is relatively infrequent and only attracts 700 to 2,000 passengers per day.⁷

Madinah City, as well as its city-region, is the epicentre of a radial network of national and regional roads and highways, like the Al Hijra, Yanbu, and Tabuk Roads, and the Al Qassim Road. The city also has an important connection with Jeddah and Makkah through the Al-Haramain High-speed Railway. It is also worth noting that overall, the Madinah's road network functions at a satisfactory level. Although the automobile is still the preferred means of transportation within both the Al Madinah Region and the Madinah City-region, it has presented both the city and the region with some mobility challenges.

As such, the Regional Plan for Madinah 1420H (1999) foresaw the creation of three new suburban areas as well as three satellite cities within a 60-kilometre radius from the Haram

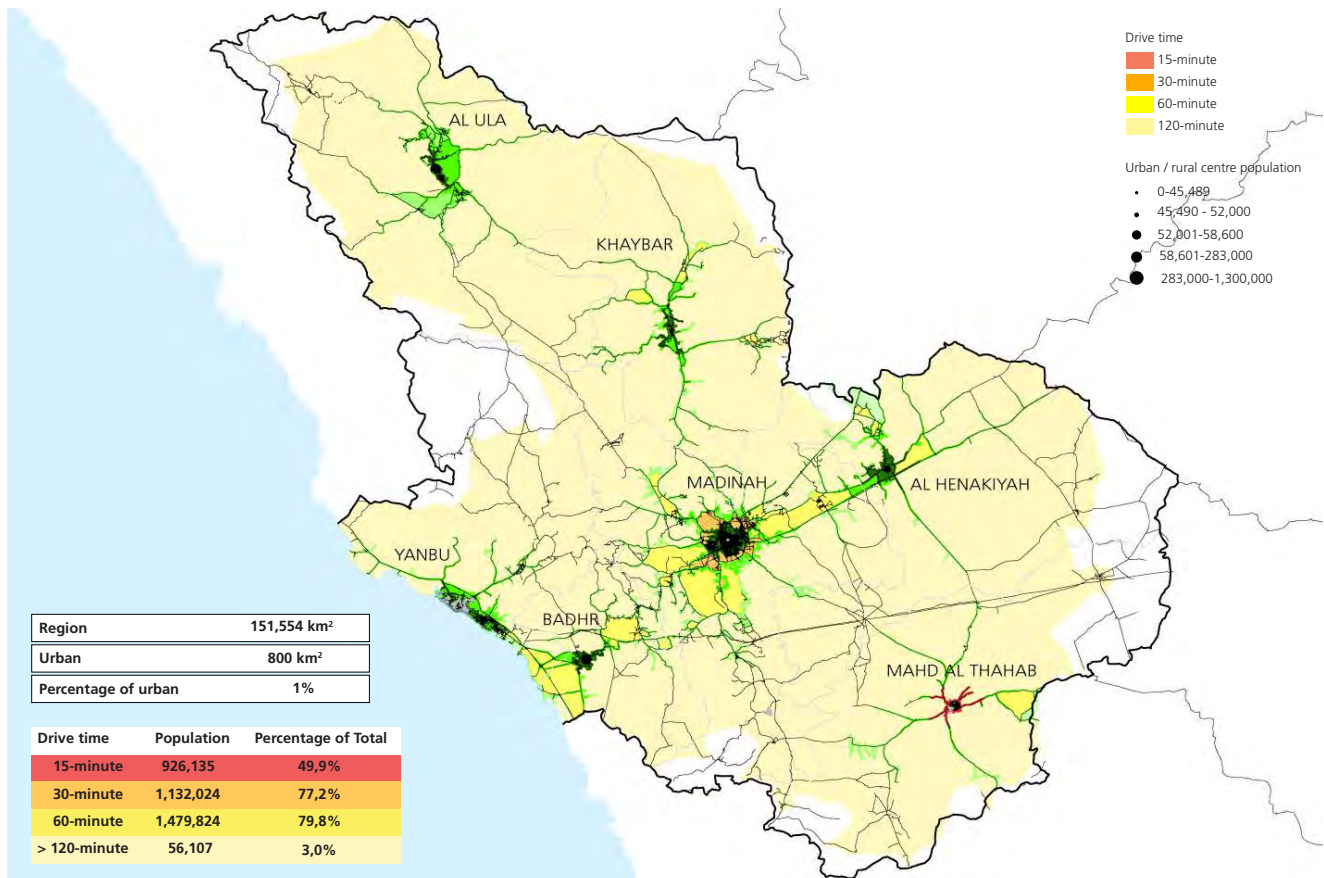


Fig. 8. Accessibility in the Al Madinah Region



Area, which are intended to be linked to the Madinah City through a hierarchical road network and, in some cases, a regional rail network. This proposal, still valid although not fully implemented yet, was meant to manage the increase in traffic as the region develops further.

Environmental and topographic elements

The Kingdom of Saudi Arabia represents 80% of the Arabian Peninsula, and it is mainly formed by large sandy and rocky deserts with considerable mountainous areas, also presenting 2,410 kilometres of marine coast, 2.7 million hectares of forest land, over 171 million hectares of rangelands, 35 square kilometres of mangroves, and 1,480 square kilometres of coral reefs.⁸ These ecosystems have an incalculable value, not only do they structure the territory but they are also key elements for the national economy, and the welfare of the population.

Saudi Arabia has a mid to high rate of population growth, one of the few in the world, standing at 1.45%. If not well managed, this growth can impact and deteriorate the natural systems, affecting biodiversity and ecosystems' dynamics. In the case of the Al Madinah Region, and of Madinah in particular, different drivers of environmental degradation have been identified. On the one hand, unsustainable growth patterns, and inadequate infrastructure are challenging future economic development and compromising existing natural resources. On the other hand, the burden on the environment is exacerbated by climate change, which is currently driving the already severe climate towards more extreme conditions. The Al Madinah

Region, like most of the country, has a semiarid to hyper-arid climate, characterised by high temperatures, very low rainfall, and extremely high evapotranspiration. In Madinah, summers are extremely hot, at 36-45°C, and winters are mild, ranging between 15-20°C. Prevailing winds influence these temperatures, from the Northwest with cooling air coming from the mountains and hot, dry wind from the South. It is important to notice that, according to recent studies, the air temperature has increased by 1.7°C between 1959 and 2011 due to climate change.

The city of Madinah, located 350 kilometres North of Makkah and approximately 250 kilometres inland from the Red Sea coast, is situated in close proximity to mountainous landforms, which create a picturesque backdrop for the city. Geologically speaking, Madinah is situated on the structural province of the Arabian Shield, which is an ancient land mass that covers approximately one-third of the country's surface area, influencing both precipitation rates and distribution of sand deserts across the country. The city's climatic conditions are highly influenced by its unique physiography, characterised by the mountains, large desert lands, and volcanic fields.

To the North, West and South, Madinah is enclosed by the Hejaz Regions' arid hills. Other prominent mountains include Jabal Jamuah and Jabal Ghorabah to the Southwest, Jabal Sala' to the Northwest, and Jabal Ayr to the South. The dislocation of the rock strata in the West of Arabia has led to the upwelling of much lava, which has solidified into vast barren expanses,

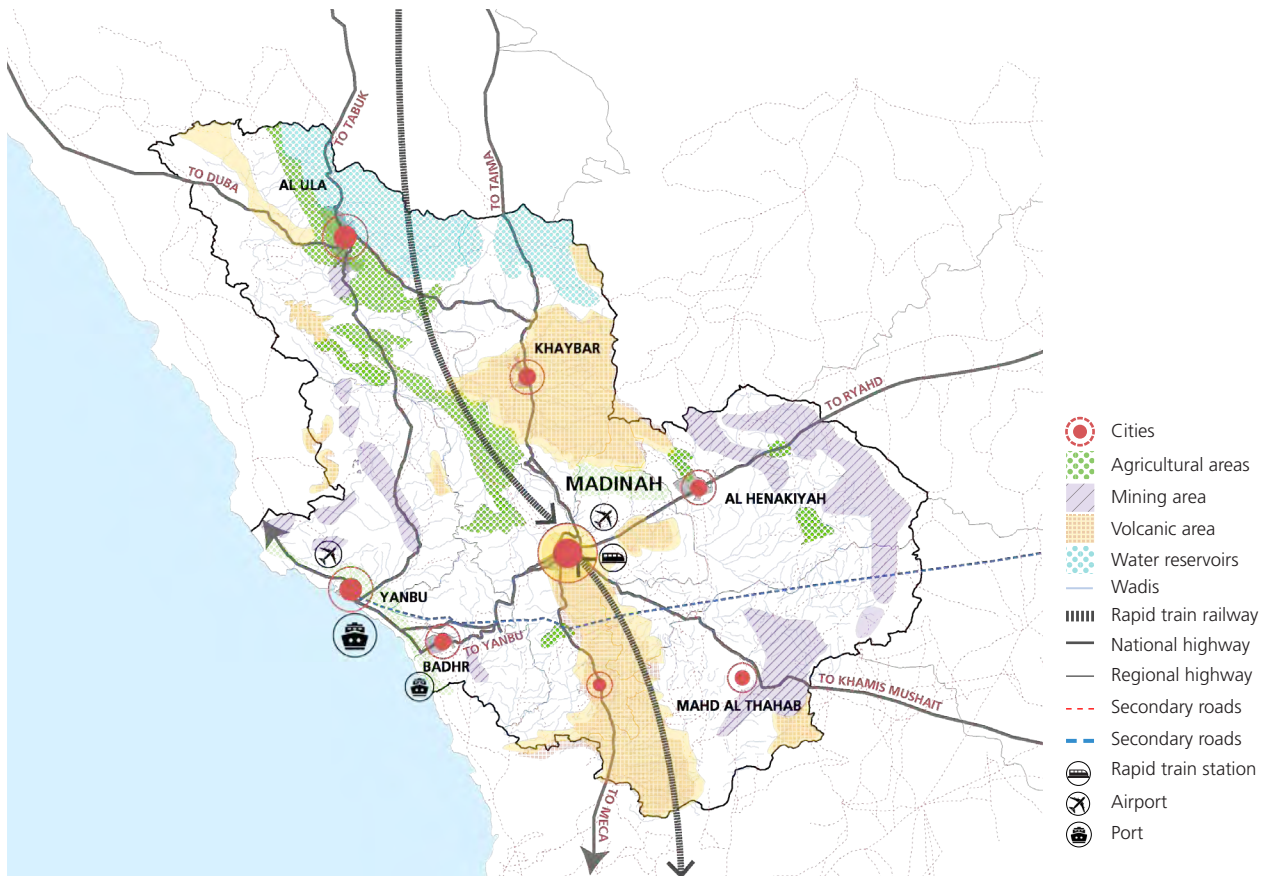


Fig. 9. Natural resources



View of Southern Al Ula from the top of the mountains

known as the Harrat Rahat lava fields, which borders the East side and West side of the city. Around Madinah, especially in the Southeast, there are over 400 vents and craters, and more than 2,000 scoria cones along its Harrat. Studies define the hazard imposed by this volcanic environment as uncertain, given that no eruption has happened in historical times. In addition, Madinah is within a seismically active area where significant earthquakes have occurred throughout its history. Currently, there are two local seismic networks used to monitor seismic activity around both Madinah and Makkah.

Regarding rainfall, the mean annual value is 47mm. In spite of this low level, the area has relatively abundant water as the city is settled on a flat mountain plateau, at the junction of three wadis: Wadi Al Aqiq, Wadi Al Hemd, and Wadi Al Aql. Saudi Arabia is known as the largest country in the world without perennial rivers or lakes; therefore, wadis are not permanent waterways. The wadis are dry all-year-round except for the periods of intense rainfall. Still, they maintain a fairly high-water table that feeds the many wells and springs that have been a historic water supply for the city. These wadis have gradually been dammed, starting with a dam built in the 1940's Northeast of the city, and a dam built in 1966 across the upper course of Wadi Butan, which used to flood the city frequently.

The topographical and hydrological conditions described above, have historically enabled Madinah to have an important agricultural hinterland. The valleys provide water

for irrigation, and the soil is highly fertile. Indeed, the existing natural drainage patterns, and the agriculture they support are integral parts of Madinah's heritage. While agriculture accounts for 8% of the city, green areas are only 1%. These limited open spaces (e.g., parks, plazas, and medians along roads), lack connectivity, are poorly distributed, and compete with one another for usage. Still, in 2010, Madinah was the most vegetated area in comparison to the region, showcasing its potential as an oasis in an arid region.

Economic resources

Industry

The industry is de facto the largest and most important economic sector in the Al Madinah Region, where there are two industrial cities: the first is the Industrial City of Yanbu, the second largest industrial city in the Kingdom; and the second is the Industrial City of Madinah, which is built on an area of ten million square metres. In the city of Yanbu, there is also the Yanbu Refinery, which in 2012, produced 25.5% of the total petroleum-refinery products in the Kingdom. The total number of productive factories in the region is 188, representing 3% of the total number of productive factories in the Kingdom, which totaled 6,364 at the end of 2013. In the same year, the total industrial investments in the region were 88.9 billion riyals, representing 10.2% of the total finance of productive plants in the Kingdom, which was 873.2 billion riyals in total. Additionally, by the end of 2013, the number of recorded factory workers in Madinah was 32,500, representing 3.9% of the total industrial manpower in the Kingdom, which totaled 828,000 workers.⁹

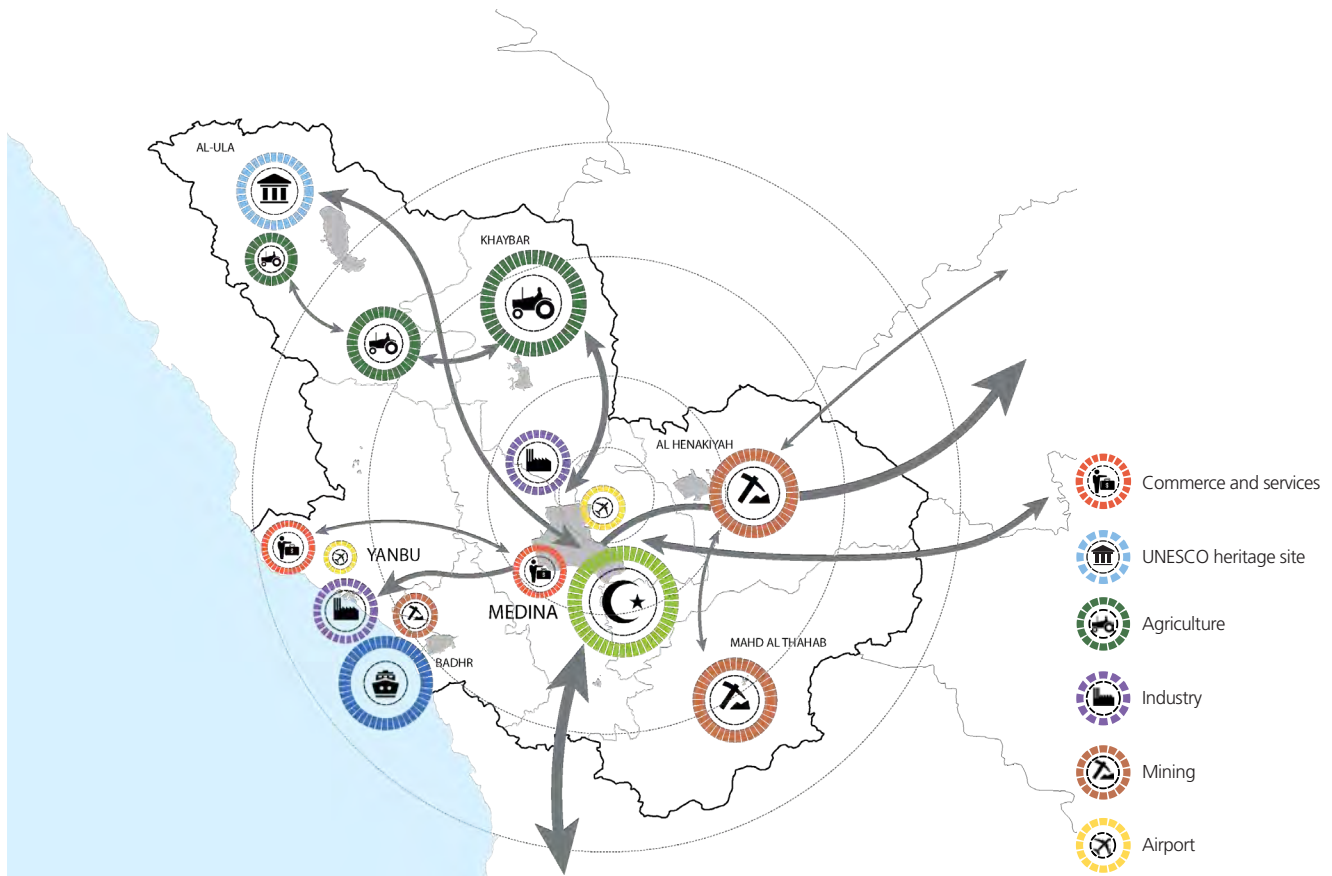


Fig. 10. Economic nodes and network



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The view on the Holy City of Madinah



Agriculture

The agricultural sector is still one of the most important economic sectors in the region, where in 2011 the total crop area was 27.5 thousand hectares, representing about 3.5% of the total crop area in the Kingdom, which totaled 788,000 hectares in the same year. Khaybar and Al Ula, producing mostly dates and wheat, are the main agricultural centres, and are directly linked to the Agricultural Corridor of the Kingdom formed by Al-Qassim, Hail, Tabuk, and Madinah. It is important to note that during the period from 2007 to 2011, there was a production increase in all agricultural products of the region, with an annual increase in the total regional production of 0.9% for vegetables, 4.3% for dates, and 1.5% for fruits. During the same time, there was a rise in the number of livestock, with 16.7% increase for camels, 4.6% for sheep, and 4.7% for poultry, while the number of goats and cows decreased, with an annual average of 10.5% and 14.7% respectively. The region also had a considerable honey production in 2011, which amounted to 119 tonnes.¹⁰

Mining and Quarrying

The mining and quarrying sector in Madinah is one of the key activities which can contribute to the utilisation of the natural resources in the region, also covering the needs for raw materials by the construction and industrial sectors. Some companies and establishments are operating on site to extract raw materials, such as limestone and gypsum. These are used in manufacturing gypsum products, cement (sand), ceramic (clay and kaolin), glass (silica sand), and together with other natural mineral resources such as copper, zinc, and lead constitute a substantial regional resource. The main mining areas in the region are located in Al-Henakiyah and Yanbu, providing mainly gold, copper, tantalum ores and manganese. Overall, more than 136 mining locations have been discovered in the region, based on geological studies. Also in Madinah, there is a major mine that extracts the most precious metal of the Kingdom, the ore. The Mahad Al-Dahab mine, owned by the Saudi Arabian mining company Maaden, is where the ore is extracted from and then treated for the ultimate production of gold. The annual production of the Mahad Al-Dahab mine is estimated to be of over 1,500 kg of gold and 3,300 kg of silver, 900 tonnes of copper and 600 tonnes of zinc per year.¹¹

2.3 City-region Structure and Dynamics

Madinah and its directly related centres of Yanbu, Ola, Mahd, Badr, Khaybar, Hanakiyah, Ais, and Wadi Al-Fari, form the Madinah City-region. The city-region can be identified by following the main corridors that functionally link these set of cities within the Al Madinah Region together, specifically by the heritage, religious, industrial, and agricultural corridors, as highlighted in the corridors map.

Two main implied thoroughfares structure what forms the main transportation corridors in the city-region. Route 60, that runs Southwest from Badr and Northeast of the region, and Route 15, that runs Northwest through Khaybar and Southeast through Al Akhal of the region as well.

A strong heritage corridor departing from the centre of the city-region, in Madinah, and following the Hejaz rail-line to the North of the region towards Al-Ula and Tabuk, and to the South towards Jeddah characterises the area. This is an important asset to the city-region, as it hosts the historical Hejaz railway, which is part of UNESCO's heritage sites list, and marked for preservation. If appropriately upgraded and serviced, the Hejaz railway could act as an attractor for cultural tourism, producing revenues for the city-region.

Apart from the central core of Madinah as the religious, industrial, and commercial centre, other major economic sectors like trade, industries, and maritime activities are located in Yanbu, on the Western part of the city-region, while agriculture is concentrated in Al-Hernakiyah, and services in Badr. The city of Madinah and its consequent city-region take advantage of the water desalination plant in Yanbu, and equally important is the port connection to Ar Rayis in Badr, making the functional connections across the city-region stronger.

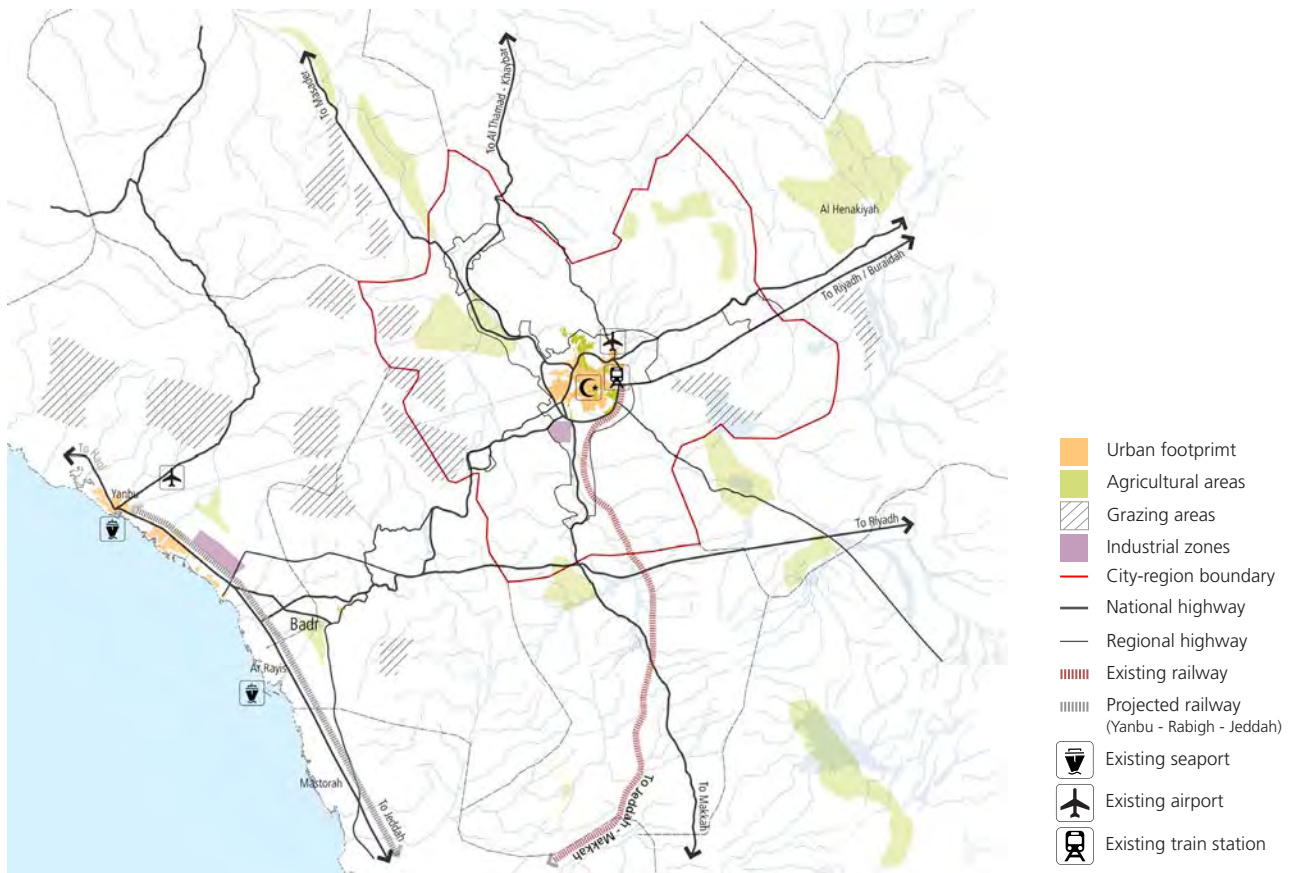


Fig. 11. Structural elements

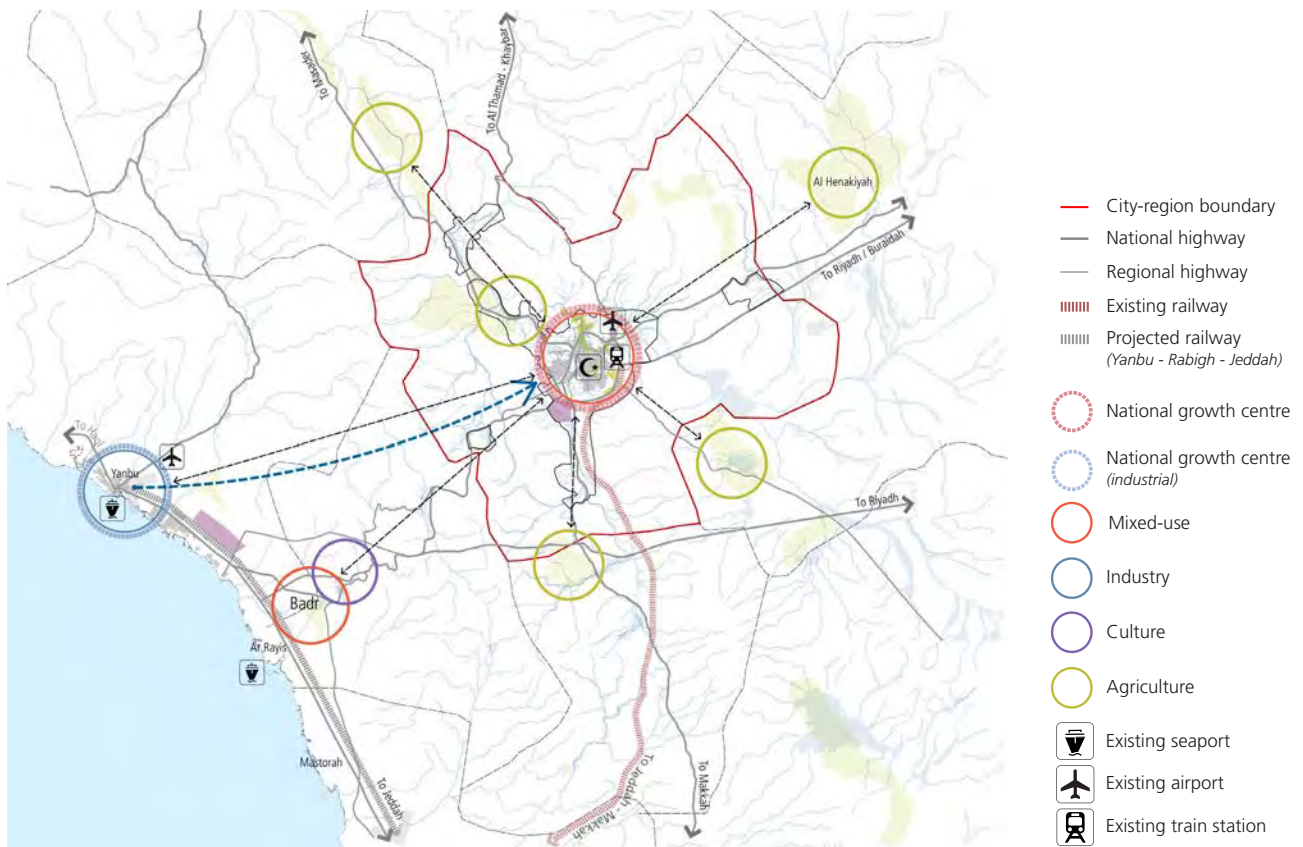
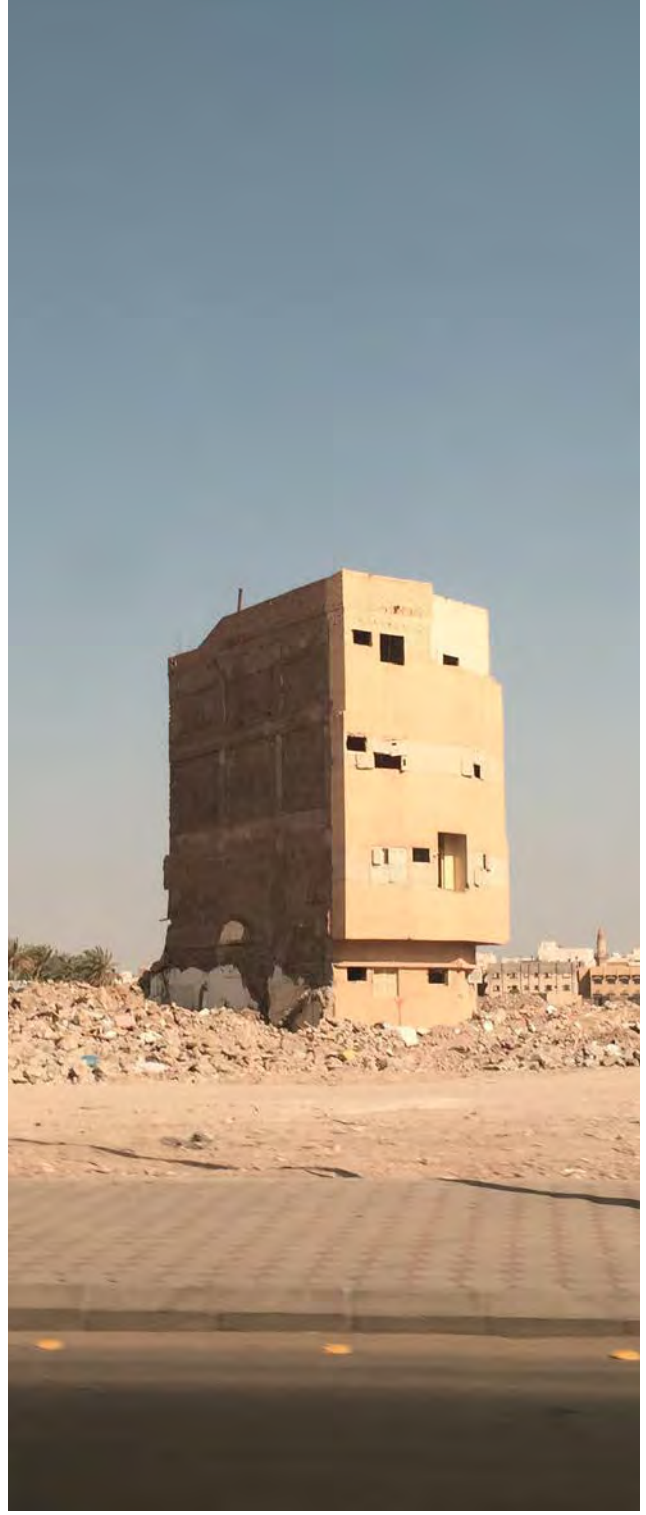


Fig. 12. Functional connectivity

3

GOVERNANCE AND FINANCIAL FRAMEWORK



3.1 Legal and Institutional Context

The planning legal framework of Madinah is shaped by the Kingdom's legislative environment, which is based on Islamic Sharia Law. The law-making authority is vested in four entities; the King, the Shura Council, the Council of Ministers and the Ministerial departments. Consequently, there are five legislative instruments (Royal Order, Royal Decree, Supreme Order, Council of Ministers Resolution, and Ministerial Decree) that function in a hierarchical order, underpinning their authority and validity.

Given this non-centralised law-making process, the city of Madinah is guided by over 500 existing urban planning related instruments with most of these having been promulgated at the lowest administrative level (Circulars),¹² that lack authoritative legal force. Moreover, the recent enactment of the Urban Boundary Law and its Executive Regulations No 60001 is causing pressure to preserve agricultural land inside the urban boundary for cities including Madinah and causing a significant economic loss for the city and other cities famous for their agricultural economic base.

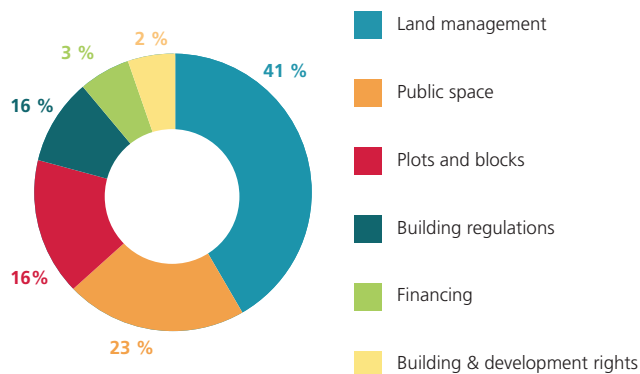


Fig. 13. Number of urban laws in KSA based on the Main Themes of Urban Planning Legislation (UN-HABITAT)

The Ministry of Municipal and Rural Affairs (MoMRA) plays a significant role in Madinah's growth and development patterns because it is legally entrusted with the task of conducting urban planning of the Kingdom's cities, including the permitting of all types of construction activity. Consequently, the Municipality of Madinah (Amanah), as the local level actor for Madinah, merely acts as an implementing arm for MoMRA. The institutional budgetary system is also centralised, meaning that Madinah's development intervention is reliant on funds allocation from MoMRA through an annual line item budgeting, which is the sole fiscal means available.

The Kingdom's planning system, which follows a hierarchy of spatial level and is predominantly top-down, influences the spatial system of Madinah. The National Spatial Strategy (NSS) of 2001 is the guiding plan for the Kingdom. The Madinah

Regional Plan 2000 highlights the pivotal role that Madinah, as the regional capital, can play as the economic engine of the Madinah Region. The Madinah Local Plan applies urban controls to urban land use and building regulations within the municipal boundary, while the three phases of the Urban Growth Boundary (2014, 2019, and 2030) aim to prevent urban sprawl on the outskirts of cities without adequate urban infrastructure. The Land Subdivision Plans are the basic building blocks that guide Madinah's development.

Apart from NSS, these planning instruments are defined by procedural manuals within MoMRA, rather than by Law, and thus they lack legitimacy. By their nature, these instruments cannot construct a system of legal accountability and transparency of the relevant actors. Moreover, land use and building control regulations have facilitated urban sprawl within Madinah. This had led to unbalanced growth and development as well as social, economic, and environmental unsustainability.

In terms of reform, Madinah would benefit from both fiscal and jurisdictional decentralisation to facilitate independent and innovative solutions to urban social problems at the Amanah level. This should entail:

- The transfer of local planning power, authority and function from MoMRA to the Amanah with provision for independent action without recourse to effectively address community needs. This is supported by the New Urban Agenda, which specifies that territorial urban design and planning processes should be led by sub-national and local governments, but their implementation will require coordination with all spheres of governments as well as participation of the civil society, the public sector and other relevant stakeholders.
- Fiscal decentralisation, which gives autonomy to the Amanah to source funds to finance development activities. Revenue generation activities in cities may also include taxes and levies. Urban areas should be allowed to collect some form of property taxes to fund development activities. The recent White Lands Act that imposes fees on undeveloped plots in urban areas to tackle land speculation, housing shortage and indiscriminate land development shows that regulatory mechanisms can be leveraged to generate revenue while fostering an efficient development framework.
- Opening of avenues for actors, including the private and voluntary sector and the general community, to participate in decisions regarding projects that affect them.

The city of Madinah needs a functionally effective by-law that preserves rural open space and agricultural land through clear terms and conditions for land use change with a clear and transparent decision-making process.



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Clock Tower in the central part of Madinah

. The legal framework also needs to enshrine an acceptable mode of public participation in public decision making to foster equality and inclusion. The consolidation of the urban legislation would also give legitimacy to the plans that Madinah relies on.

Revising the Urban Growth Boundary (UGB) Law to include clear criteria on how it is set would enhance technical and vertical accountability. The law also needs to place more emphasis on establishing the Development Protection Boundary as a no-development zone to prevent not only haphazard development but also avert private interests from taking advantage of the laxity in the legal text. These initiatives will strengthen policy formulation designed to make the city more sustainable, compact and dense. Primarily, post-legislative scrutiny of the UGB Law should be done to assess if it has met its policy objectives. This could, in turn, inform the legal reform process as well as the planning policy options.

3.2 Planning Instruments and Procedures

3.2.1 Hierarchy of plans - Madinah

The planning system of Madinah is derived from the de facto planning hierarchy of the Kingdom. In this framework, there are four different levels of spatial plans: national, regional, local and district. Figure 14 highlights the planning instruments in force in Madinah.

3.2.2 The Al Madinah Regional Plan

Regional planning represents the second-tier of spatial planning in the KSA, which aims to address the natural, urban, social and economic regional development aspects. The Madinah Regional Plan was prepared and approved in 2000 by the Regional Council in collaboration with the Amanah including sectoral plans at the regional level. It aims to adopt a 20-year comprehensive vision for economic, social, and spatial development based on studies that were undertaken as part of the project. The plan demands multilevel arrangements for governance (horizontal and vertical) that includes all government sectors, private businesses, and NGOs. However, the Regional Council has no authority over the governmental or semi-governmental sectors to ensure that the plan is implemented in the manner approved. Each authority follows its lead Ministry's directives, objectives, strategy, and budget. There is no formal mechanism or requirement to follow the Regional Plan.

3.2.3 The Madinah Plan

The Madinah Plan¹³ is a planning tool constituted by a strategic component, namely the Comprehensive Plan of Al Madinah Metropolitan Area, and of a regulatory document, the Local Plan. The scope of these plans includes:

- Long-term strategy for the city;
- Identification of relevant development areas;
- Identification of urban/not urban land;
- Main mobility system;

- Environment protection;
- Infrastructure provision;
- Detailed land use;
- Urban regulations; and
- Detailed proposals for selected areas.

The Comprehensive Plan of Madinah Metropolitan Area

A report published in 2011¹⁴, indicates that the Madinah Development Authority (MDA) established a 20 year Comprehensive Plan to guide development across the Madinah Governorate. This plan addresses and provides policy guidelines on a broad range of thematic areas such as land use, urban design, transportation, environment, and infrastructure and utilities' needs. The Plan, (prepared in 2013 by the MDA in cooperation with the consultant company, MMM Group Limited and Moriyama & Teshima Architects) was approved by the MDA¹⁵, but it was rejected by the Amanah on the basis that it was in breach of the planning standards set by MoMRA¹⁶. The following is a list of previous plans that were reviewed as part of the comprehensive planning process:

- Eighth Five-Year Development Plan by the Ministry of Economy & Planning (2005 – 2009)
- The Ninth Five-Year Development Plan by the Ministry of Economy & Planning (2010-2014)
- NSS for the Kingdom of Saudi Arabia by the Ministry of Municipal & Rural Affairs (2001)
- Regional Plan of Al Madinah (2000 - 2028) by Ahmad Farid Mostafa (AFM) Consultants (2000)
- Madinah Urban Plan by Robert Matthew, Johnson Marshall Consultants (1973)
- Madinah Master Plan by Mousalli, Mandili & Co. (1977)
- Al-Madinah Al-Munawarah Directive Plan (1989) by Dar Al Handasah Consultants
- Al-Madinah Al-Munawarah Updated Directive (2000-2028) by Ahmad Farid Mostafa (AFM) Consultants (2006)
- Central Al Madinah Development Action Plan (2001)

The Plan also consists of both a Development and Growth Strategy and a Structural Plan. The Development and Growth Strategy establishes the vision statement and the planning principles that serve as the foundation for the Comprehensive Plan and its supplementary sectoral reports. The vision statement aims to direct future growth for Madinah to achieve a balance between a) the natural and built environment, b) private investments vis-a-vis public welfare, and c) the needs of residents compared to visitors to Madinah.

The Structural Plan augments the Development and Growth Strategy with more detailed aspects that articulate the desired future development pattern in Madinah. It is built upon a series of studies to respond to diverse and pertinent urban challenges based on the vision of the city's administration. The main objectives are to provide social and public facilities, better spatial design and concentrate development in nine (9) special plan areas, which include:¹⁷

- New Central Area, inclusive of the Civic Centre and Old

- Hejazi Railway Station Focal Area;
- Knowledge Economic City (KEC) Node;
- Quba Mosque Node and Sunnah Path;
- Miqat Mosque Node;
- Universities Node;
- Seven Mosques and Al Qiblatain Mosque Focal Areas and corridor;
- Uhud Path and Focal Area;
- Key Wadis, including the open channelization of portions of Wadi Bathan; and
- Informal Areas.

In terms of land use, this plan identifies strategic land uses and infrastructure networks within the metropolitan area of the 2030/1450 Urban Growth Boundary (UGB). For instance, 13% of land is allocated for residential development.

Local Plan

The Local Plan represents the third level of the urban planning system in KSA and is largely focused on those areas of a municipality, which are contained within the UGB with a special focus on housing. The Local Plan contains the Urban Atlas which details the allowed land uses for every part of the city. It is complemented by a report of regulations which contains specifications on the permissible development rights such as floor area ratio, street dynamics, building heights, areas of special building regulations, etc.

The aim of the Local Plan is to a) apply urban controls to urban land use and building regulations; b) to provide public services and

infrastructure in a cost-effective and integrated manner; c) set basic requirements for proposed road networks; and d) help facilitate the development of public and private sector housing.

There is no legal framework to direct the preparation and implementation of local plans. Rather, it is prepared by various consultants following the "Booklet of the Terms of Reference for the Preparation of the Local Plan," which is formulated by MoMRA. This Booklet was updated in 2015, and one key technical change is the requirement that the lifespan of new plans should be 14 years (2015-2029).

The development of the Local Plan is complicated by the fact that there are parallel structures set up by MoMRA and the Ministry of the Interior. While the legal mandate for planning lies in the Municipalities (under MoMRA), there are jurisdictional overlaps with the Regional Development Authority. In other words, while MoMRA is the central spatial planning institution but there is no clear coordination mechanism. This frequently leads to decision-making impasse which affects the delivery of technical standards within municipalities such as Madinah.

The Local Plan was approved in 2014 by MoMRA. The Zoning Regulations Document, approved in 2015, details the suitable land uses and building heights, floor area ratio and geographical extent of the built-up area. The following are the Plan's implementation challenges:

- Other government Ministries influence the plan in relation



Public spaces are important for the social and religious life of the city

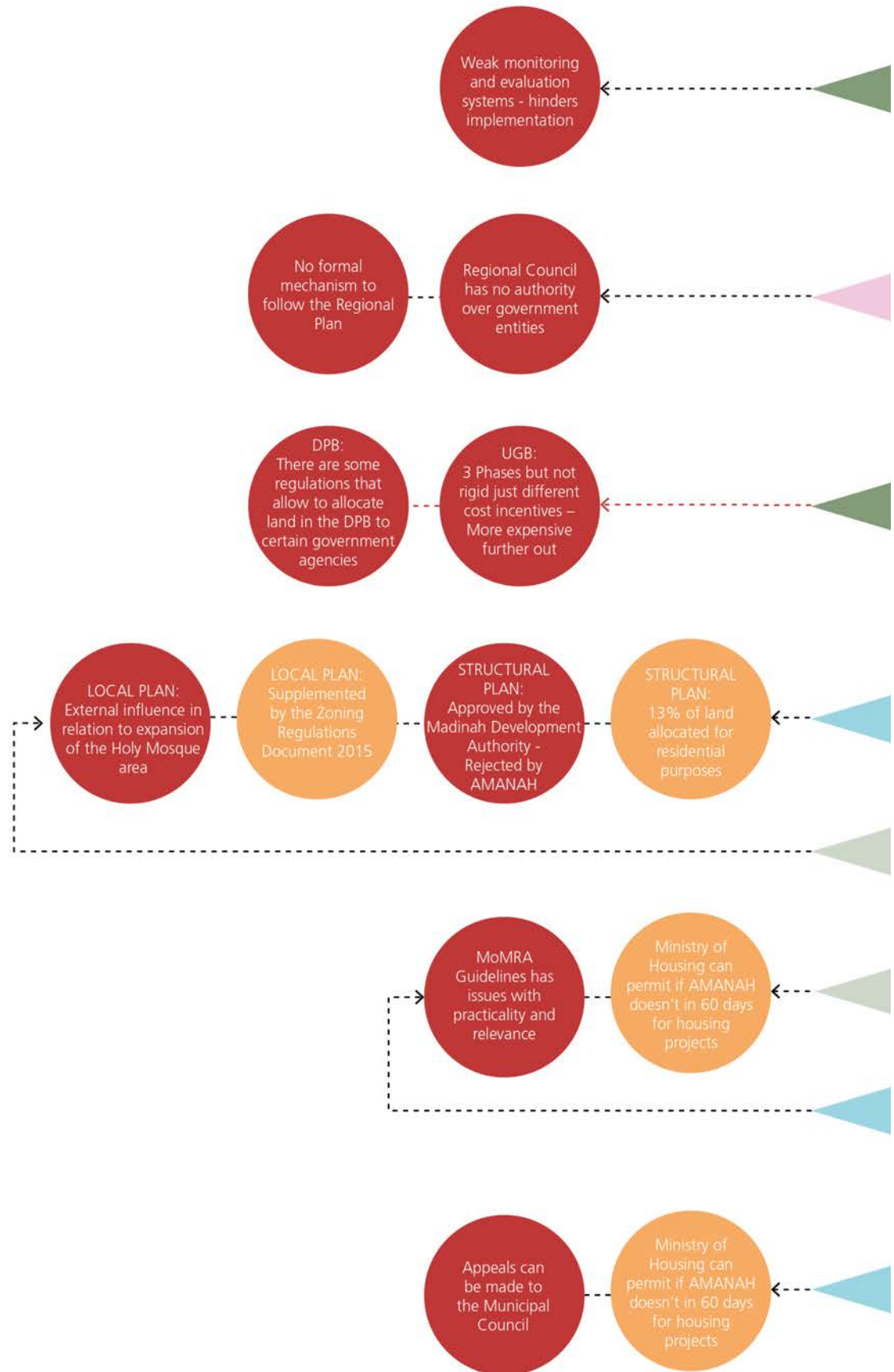
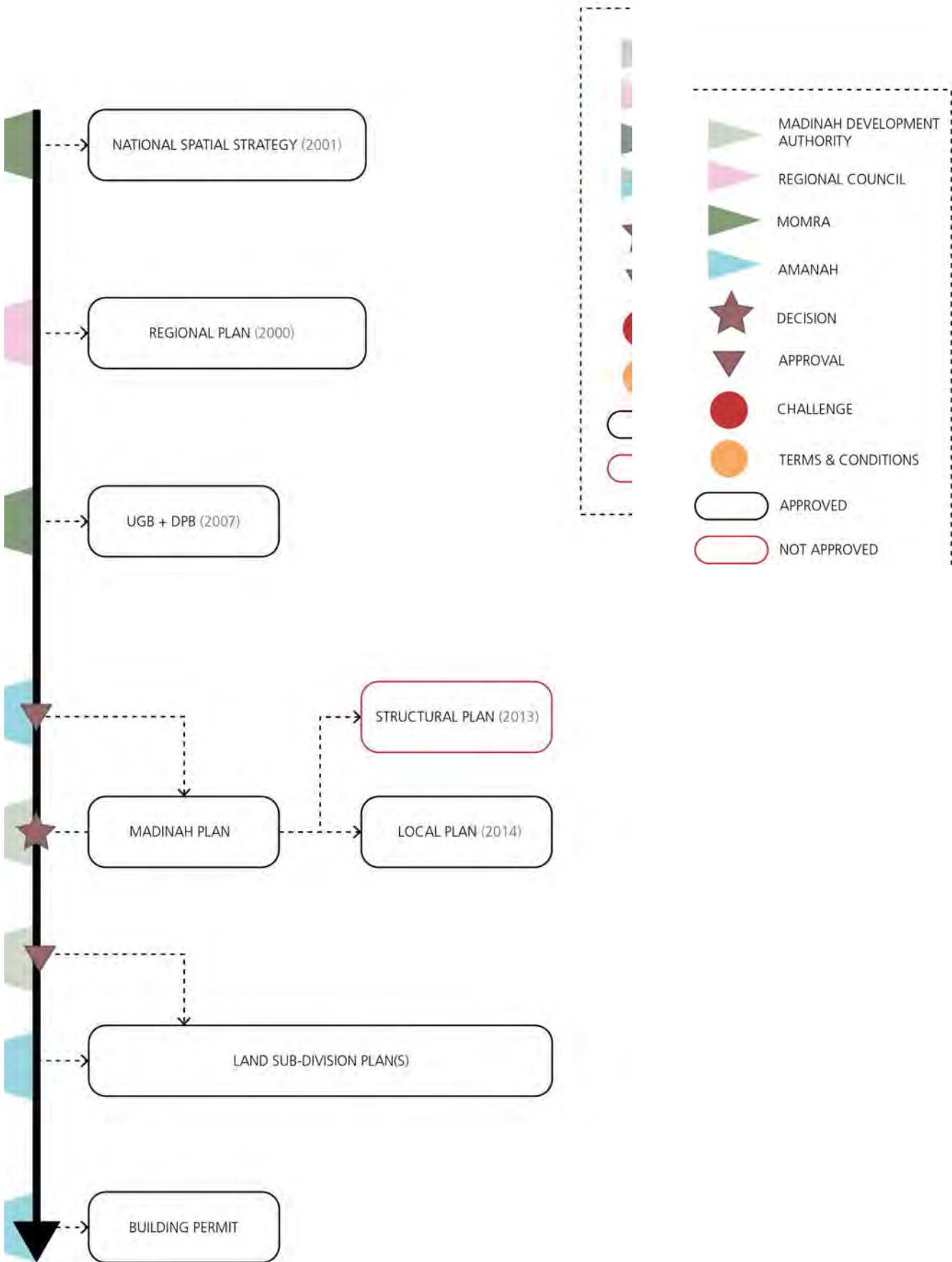


Fig. 14. FSCP simplified representation of hierarchy of plans and the planning instruments for the city of Madinah



- to the expansion of the area of the Holy Mosque
- The Amanah misunderstands the contents and differences between the Directive/Master Plan and similar plans such as local and Structural plan.
- The comprehensive plan is technically non-binding since the Amanah rescinded MDA's approval, based on non-conformity to the planning standards set by MoMRA.

3.2.4 The Madinah Urban Growth and Development Protection Boundaries

Legal Framework

In 2008, the Prime Minister issued decree No. 157, which sets the overall regulations for both the Urban Growth Boundary (until 2030) and the Development Protection Boundary. The executive regulations were issued in 2010 by the MoMRA Ministerial Decree No. 11769 followed by the current revision (MoMRA Ministerial Decree No. 66000) which was enacted in 2014. The growth boundary is intended to control urban expansion and prevent sprawl in the outskirts of cities without adequate urban infrastructure, whereas the DPB sets a long-term plan for future development of cities beyond the 2030 UGB.

The 2014 Decree stipulates several general development principles including:

- Strategic development projects that are part of the spatial strategies, including major road and railway networks passing through private lands, should be prioritised over any other development projects;

- Development projects outside of the boundary are only permitted with the approval of MoMRA; and
- Large-scale development projects should follow specified detailed standards.

The Law also defines development standards that a developer is obliged to comply with based on strategic categories of national, regional, and local centres and the size of the lot. Madinah is categorised as a National Growth Centre (See Figure 15).

Legally, the area between the Development Protection Boundary and the 1450 (2030) Urban Growth Boundary is protected and not earmarked for development, but the law also outlines mechanisms for building mega or national-regional economic projects therein.

Moreover, given the law, certain agencies have rights to land situated in such areas, where approval of development projects is routinely controlled by set of regulations in this regard. Additionally, given the legal flexibility around the definition of "mega" or "strategic" projects, private residential developments exist outside the 1450 (2030) Urban Growth Boundary. These factors have undermined the functional effectiveness of the regulations, the rule of law, as well as compact development of urban areas, such as Madinah.

Setting the Boundary

The Urban Growth Boundary for Madinah was set simultaneously, along with other cities, by MoMRA, through a



First validation workshop

Committee under the Unit of Coordination and Projects. The composition of the committee is not yet clear, for instance, it did not involve the municipality of Madinah Governorate, which is responsible for planning at the city level. There is an understanding that the calculations were based on selective factors, such as historical growth and expected population growth in the city; however, there is no accurate published criteria on how the size of the boundary was calculated. Spatially, there are areas located within the urban boundary in the East of Madinah that cannot be used because they are covered by basaltic rocks (Harat).

Challenges

There are unplanned settlements outside the urban boundary as well as the disparity between the size of the boundary and the demographic dynamics of Madinah based on the Committee’s calculations which undermine densification. In other words, based on current population growth projections, the 2030 density will be 20.3 p/ha, which is well below any recommended target, including the UN-Habitat recommendation of 150 p/ha.

Permitting

Development within the urban growth boundary is closely linked to permitting and development control. The process is as follows:

- A developer submits a land subdivision plan, including detailed implementation plans for the instalment of the requisite infrastructure to the Amanah of the Madinah

Region;

- The Amanah will then assess the application in accordance with the provisions of the Law on the Urban Growth Boundary; except those cases defined by MoMRA Ministerial Decree No 17777. This Decree delegates certain roles to the mayors in regards to approving land subdivision, solely in relation to the size of residential projects. The Mayor of Madinah is an approval authority under this Law;
- The application is then sent to MoMRA for review in accordance with development standards and applicable building codes, and building permits are either refused or granted by MoMRA;
- A developer whose permit has been refused has two options of appeal: a) recourse to the Amanah and MoMRA calling a re-study of the application; or b) file the case in the relevant jurisdictional administrative court;
- The decision in the above appeal processes is final and binding to all the parties.

3.2.5 White Lands Act

The percentage of undeveloped land (“white lands”), in Madinah, is 18% of the land inside the current urban boundary area (1440H) / 2019. The existence of “white lands” has been a major contributor to a growing housing shortage particularly for the youth and the growing population as owners choose to hoard property to maximise value rather than develop it. The government recently issued the White Lands Tax Law that

URBAN BOUNDARY CLASSIFICATION OF LAND SUBDIVISION APPROVALS AND THE URBAN BOUNDARY PHASES		
EXECUTIVE REGULATION ISSUED BY THE MINISTERIAL DECREE NO 66,000 IN 20/12/2014		
1 ST PHASE (2014-2018)	2 ND PHASE (2019-2024)	3 RD PHASE (2025-2030)
NATIONAL GROWTH CENTRES (MAKKAH, RIYADH, MADINAH, JEDDAH AND DAMMAM)		
MORE THAN 500,000 SQM		
- Tarmacking of internal roads - Water, sanitation and electricity - Median light poles - Storm water infrastructure	- Tarmacking of internal roads - Water, sanitation and electricity - Median light poles - Storm water infrastructure - Connect to closest main road - Percentage of residential area completed not less than 50% - Provide land for social services (schools, kindergartens, hospitals, etc.)	- Tarmacking of internal roads - Water, sanitation and electricity - Median light poles - Storm water infrastructure - Connect to closest main road - Percentage of residential area completed not less than 50% - Provide land for social services (schools, kindergartens, hospitals, etc.)
- Tarmacking of internal roads - Sanitation and electricity - Provide land for social services (schools, kindergartens, hospitals)	-	-

Fig. 15. Matrix showing the development options within the phases of the urban boundary in the National Growth Centres (Including Madinah)

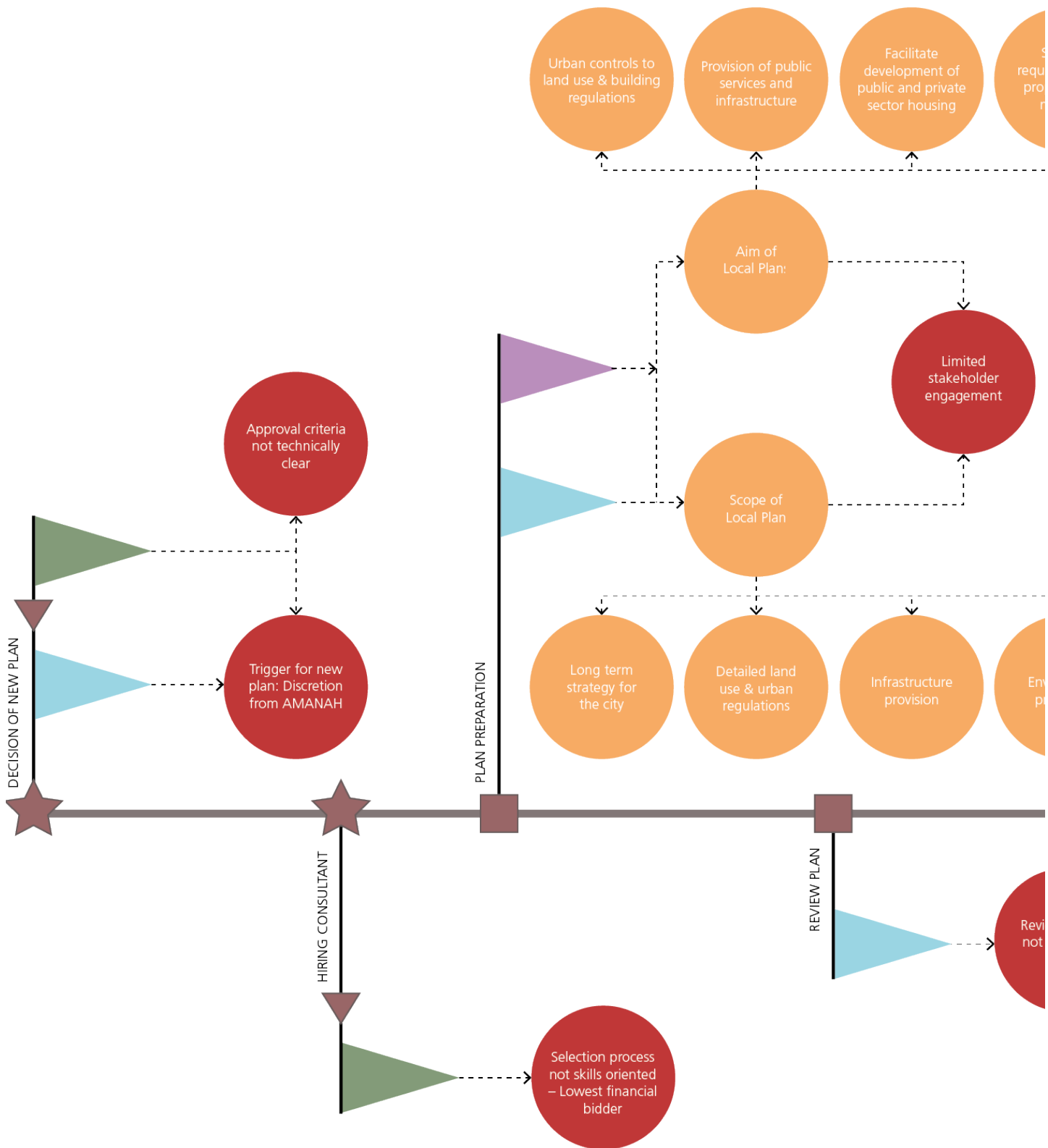
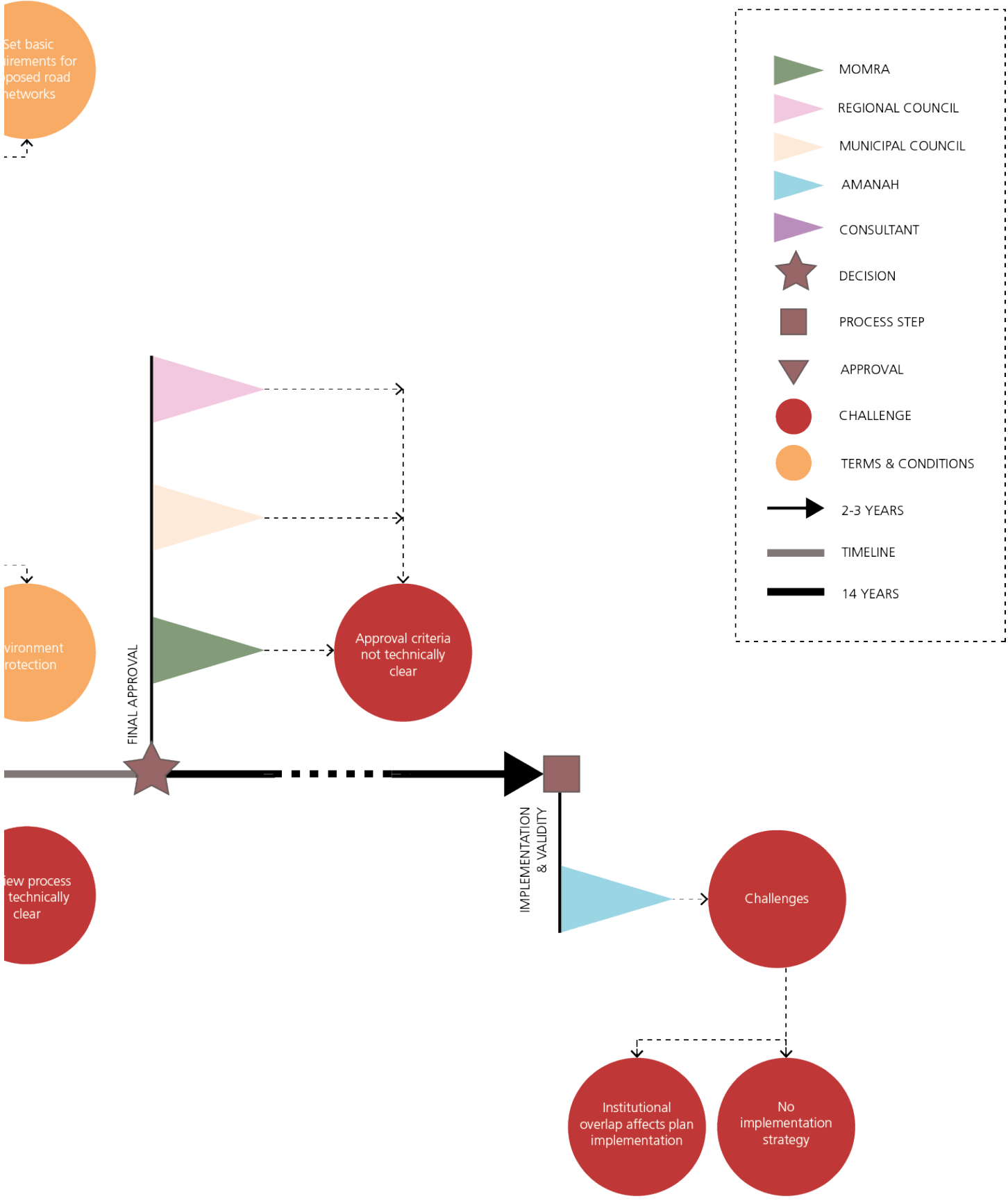


Fig. 16. FSCP simplified representation of Planning Process and Actors involved in the preparation of the Madinah Local Plan



imposes an annual land tax of 2.5% of its value on “white land,” which is defined as vacant land located in ‘populated areas’; zoned for residential or for dual residential and commercial use. This Law aims to: a) increase the supply of developed land to better address housing shortages; b) make residential land available at reasonable prices, and c) combat monopolistic practices. The Ministry of Housing, which is the implementing authority, will enforce the Law in phases. At the moment, the Act is operational only in Makkah, Riyadh, Dammam and Jeddah (see figure 17).

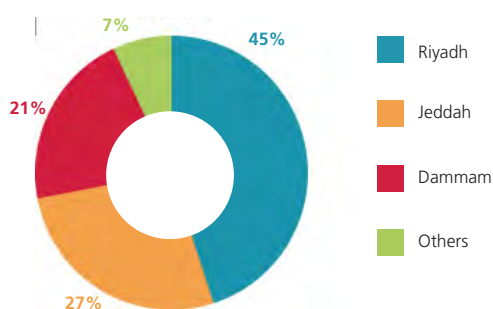


Fig. 17. Percentage of white lands – First phase of implementation of the White Lands Law

3.2.6 Land Subdivision Plans

The land subdivision plans are the basic building blocks for the KSA cities’ growth and development. The Mayor of the Madinah Amanah has the power to approve the land subdivision in accordance with the following criteria (Ministerial Decree No. 17777 of 2010):

- The land must be within the approved urban boundaries;
- The land-use specified for the land is consistent with the instructions and regulations governing it;
- The subdivision will not result in cancellation or modification of an approved regulation, planning or authorised land use; and
- All necessary planning procedures have been completed and the Deputy Ministry for Town Planning (DMTP) has been issued with a certified copy of the plan after its approval.

The Ministry of Housing can approve land subdivision for housing projects if the Amanah fails to respond within 60 days. The Amanah has approved 36 land subdivisions between January-December 2017.¹⁸

3.3 The Institutional Context

3.3.1 Urban institutions in KSA

Madinah’s growth and development pattern is impacted by the centralised planning institutional framework of the KSA, under the Ministry of Municipal and Rural Affairs (MoMRA). MoMRA

is entrusted with the task of conducting urban planning of the Kingdom’s cities, including providing the necessary roads and fixtures, maintenance and cleanliness of the environment, as well as of licensing all types of construction activity.¹⁹

The Deputy Ministry of Town Planning under MoMRA and its departments, such as Local Planning, Studies & Research, Projects Coordination and Urban Planning & Design, is mandated to coordinate with “concerned bodies” in charge of planning, to achieve comprehensive urban development.²⁰ In practice, there is little coordination between these departments and the Amanah, and this affects service delivery and project implementation.

3.3.2 Regional context

According to the Ministry of Interior administrative classification, the Al Madinah Region is divided into nine governorates (5 are class A while 4 are class B), and 101 centres (45 are class A while 56 are class B).

Madinah, being the regional capital, is not included in this classification but is instead governed through a “municipality” (Amanah), and headed by a Mayor. This delineation is provided for by MoMRA with Madinah’s actual status being a 1st class Amanah. Given this structure, the Amanah is allocated funds by MoMRA for development action and municipal services through an annual line-item budgeting, which is the sole fiscal means available to Madinah

There are additional institutions in the Madinah Region that manage and regulate the development process. The newly established Madinah Region Development Authority (MRDA) and the Amarah of the region, headed by the Regional Prince who, pursuant to the Regional Law,²¹ reports to the Ministry of Interior.

The Regional Council is based in the Amarah and is required to:

- Identify the needs of the region and propose their inclusion in the National Development Plan;
- Identify beneficial projects for the region and submit these as activities requiring funding. These requests are vetted, and viable projects selected for funding. Funding is provided as part of the National Development Plans and annual budget of the country, which is the sole means available to municipalities
- Study the organisational arrangement of the regional administrative centres, follow up implementation of any modifications; and
- Implement the provisions of the development and budget plan, and carry out the needed coordination.

The Municipal Council, also located in the Amanah, with two-thirds of its members elected by citizen’s votes while MoMRA appoints the rest, supervises the activities of the Amanah

and municipalities to make sure that they conform to the Local Plan, as well as meet the current needs of the region. It approves:

- The municipal budget sourced from the cash allocation from the national government. This is constantly subject to revision as it is based on the agreed priorities between the Council and the Mayor;
- Examines the residential plans focusing on whether any procedural violation occurred;
- The scope of municipal services; and
- Expropriation projects based on the priorities of the Mayor.

3.3.3 Local context – Madinah

The Al Madinah Region is composed of several cities including Al-Madinah Al-Munawarah, which is the capital and largest city. The city has two agencies that manage and plan the city a) the Amanah and b) the Madinah Development Authority (MDA). The Amanah is headed by a Mayor who is appointed by the Minister of MoMRA, and the rest of the Amanah's executive members are appointed by the Civil Service Bureau based on their professional qualifications.

The Department of Construction and Development (DOCD), within the Amanah, is responsible for planning and implementing in-force urban legislation. The DOCD²² ensures compliance with MoMRA's outline for the Kingdom's cities, rural areas, streets, and construction designs. The DOCD consists of five main departments a) the General Department of Urban Planning; b) the Strategic Development Department; c) the Department of Construction Licenses; d) the Survey and Land Department; and e) the GIS Department.

However, it is difficult to ascertain the manner that these units link with other authorities since the internal structure constantly changes with no technical accountability. The Amanah established a Local Urban Observatory, which is monitored by the National Urban Observatory (MoMRA Ministerial Decree No. 1280 of 2007). This observatory supports DOCD by measuring, every three years, the progress of:

- Achieving Vision 2030;
- Achieving Goal 11 of the SDGs; and
- City Prosperity Index indicators and other contextualised urban indicators.

The Amanah has approximately 22 urban planners, which is inadequate to manage its planning functions. The MDA's General Directorate of Planning is also responsible for the spatial organization of the city.

The Authority is presided over by the Prince of the Region. The Minister of Hajj (Religious Affairs), the Minister of Finance and

the Mayor are members of the Authority. The MDA is affiliated to the Region Council which reports to the Ministry of Interior. It has approximately 10 urban planners.

In 2010, the Development Commission of Al-Madinah Al-Munawarah (DCOM) was established by the Prime Minister Decree number 717 on 20/6/1974 and the latest decree for reorganisation and scope of duties was issued by Royal Decree number (3/A) on 28/12/2009 to direct planning in a unified and coordinated manner based on an integrated vision for future.

From 2012, DCOM is recognised as the Madinah Development Authority, which was initially responsible for the expansion project of the Holy Mosque of the Prophet, (Al-Masjed Al-Nabawi). Recently the scope and name of the agency changed, becoming the Madinah Region Development Authority.

Finally, the Local Planning Department under MoMRA is responsible for the implementation of two initiatives related to the National Transformation Programme: a) the preparation of the Local Plan; b) technical support to the drafting process of the Planning Act; and c) undertaking studies on roads and parking spaces. Some institutional challenges include:

- Limited coordination and communication between MDA and the Amanah of Madinah in the development of the Comprehensive Plan which leads to decision-making impasse;
- The recruitment and selection process is bureaucratic and time-consuming. This is one of the procurement challenges that most government agencies are currently facing especially due to the dynamics of the country to meet the targets of the NTP, and the vision 2030;
- The Amanah has limited competency to draft and implement by-laws;
- Madinah Development Authority is not utilising the data of the observatory indicators due to lack of coordination mechanisms, laws and regulations, and lack of direct regular mechanisms for sharing and utilisation of the outcomes of the regular updates of the indicators.
- External pressure on the Amanah and MDA, from the Ministry of Finance, (which is involved in certain planning projects) which prompts the revision of both the Local Plan and the Comprehensive Plan.

3.3.4 Legal and institutional implications for Madinah

Most of the technical decisions and approvals in the local governance system (Amanah), including planning decisions, are made on a discretionary basis based on the priorities set for the city. Therefore, the system lacks technical accountability, predictability, and practical clarity.

3.4 Financial Context

3.4.1 Financial system

Efficient public finance and sound fiscal management are fundamental for establishing a solid financial base, strengthening the public sector, and, hence, supporting local development. This chapter examines the financial system in Saudi Arabia and in particular, Madinah.

The financial system for Madinah mirrors the degree of centralisation observed in the overall governance system of the Kingdom of Saudi Arabia (KSA). The Ministry of Municipal and Rural Affairs (MoMRA), via the Amanahs, is responsible for financing municipal service activities such as city planning, building licensing, and road maintenance.

In addition to MoMRA, a number of other specialised agencies, (e.g., the emirs, and national ministries) fund and implement projects at the local level. For instance, the Ministry of Education funds city schools directly, instead of funding them through the Amanahs.

3.4.2 Municipal revenue

Currently, the Amanahs has few sources of revenue and limited authority to collect fees. MoMRA has recently introduced municipal fees, which expanded their own-source revenue base; however, local revenues continue to be insufficient. Consequently, the Amanahs continue to rely on support from the central budget.

The central government finances most of the public services and infrastructure at the local level. Baladiyahs elaborate and submit project proposals to municipal governments so that they can be submitted for funding. Municipalities send these proposals to MoMRA and the MoF (see Figure 18).²³ The MoF allocates funds to ministries and government agencies, (e.g., emirs, and national ministries) and these are allocated based on various factors, such as population. Municipalities spend the amount received on the activities included in the line-item budget proposal.

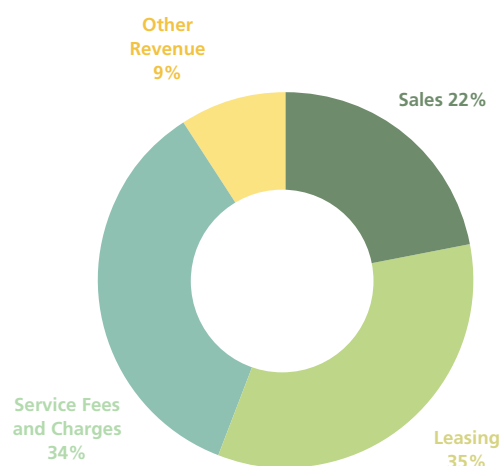
MoMRA introduced new fees to increase municipality's own sources of revenue. In the financial year 2017, Madinah generated 23% of its budget with own-source revenue. Land sales, advertising sign fees, fees on shop signage, land rental and rental of commercial buildings are the main contributors to own-source revenue (figure 19). In particular, land sales, land rental and rental of commercial buildings represent 54% of Amanah's local income, as 18%, 12%, and 23% respectively.

The gap between own-source revenue and the municipal budget is usually filled by intergovernmental transfers, resulting in municipal governments heavily relying on financial resources from the central government.

Although between 2013 and 2016, own-source revenue increased from SAR 240 million to SAR 325 million in the Madinah Amanah, they remain below the NTP goal of 40%. To help bolster the own-source income, UN-Habitat recommends introducing new tax tools and financing strategies.

Key Accounts	SAR (thousands)
Sales	70,000
Service fees and charges	110,000
Leasing	115,000
Other Revenue	30,100
Total	325,100

Source: Madinah Amanah, Kingdom of Saudi Arabia

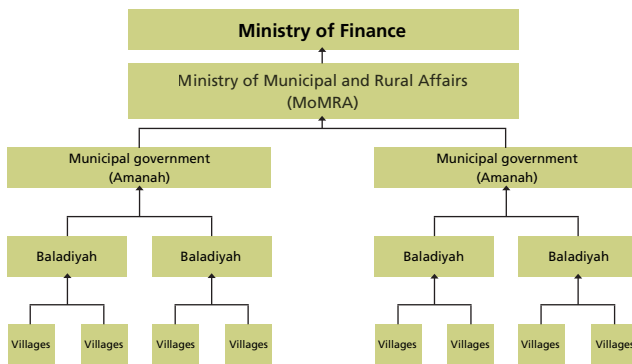


Source: Madinah Amanah, Kingdom of Saudi Arabia (2017)

Fig. 18. Madinah Amanah own-source of revenue, 2017

Every year the MoF solicits each ministry for budget proposals. Thus, ministries are responsible for drafting budgets that are compliant with budgetary guidelines. Even though the final decision is usually a top-down process, within MoMRA, the procedure tends to be bottom-up, which means that lower levels of government submit projects for the next budgetary cycle.

For example, Amanahs gather project proposals from Baladiyahs, which are then submitted to MoMRA. Following budget evaluations and revisions, the approved projects are included for review by the MoF. After review and approval, the MoF allocates funding accordingly.



Source: Ministry of Finance, Kingdom of Saudi Arabia

Fig. 19. Municipal budget process

3.4.3 Financing municipal operating costs

Despite minor setbacks between 2013 and 2017, own-source revenue increased from SAR 240 million in 2013 to SAR 325 million in 2015, a total of 35%. Madinah remains dependent on intergovernmental transfers and other financial resources provided by the central government, and in 2017, only 23% of Madinah's budget was funded by own-source revenue.

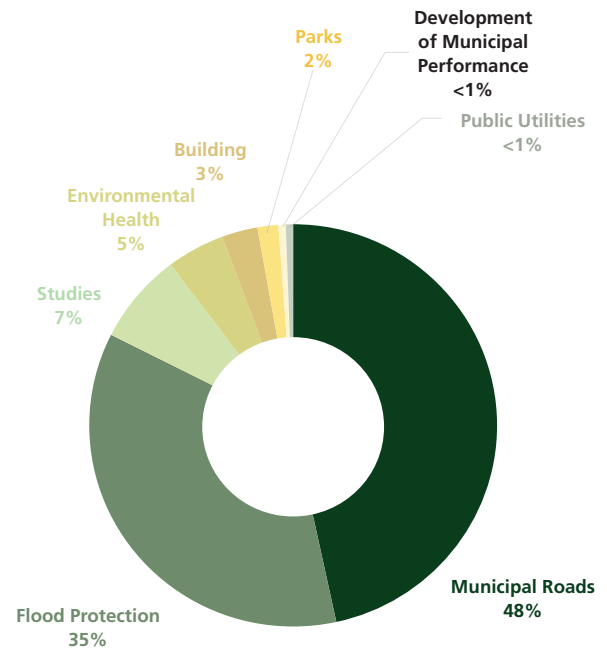
Figure 21 shows a breakdown of Madinah's 2017 budget by expenditure category. Operation, maintenance, and programmes constitute the largest share of Madinah's budget, followed by salaries and operation expenses. Project expenditures during the fiscal year 2017 were primarily focused on public infrastructure, such as municipal roads and flood protection, accounting for 48% and 35% of Madinah's municipal budget, respectively.

While municipal own-source revenue has increased over the last several years, its share of total municipal revenue has lagged. If the national government urges a 40% of own-source revenue target, as proposed in the National Transformation Programme, (NTP), without supportive policy incentives and intermediate goals, municipalities may be pressed to promote sub-optimal land use and development projects, which would create negative externalities.²⁴

Budget Category	SAR (thousands)
Salaries	323,096
Operation Expenses	34,152
Operation and Maintenance Programmes and Contracts	580,250
Projects	461,672
Own-source Revenue	325,100
Total	1,399,170

Source: Ministry of Finance, Saudi Arabia (2016)

Fig. 20. Madinah Amanah budget, 2016



Source: Madinah Amanah, Kingdom of Saudi Arabia (2017)

Fig. 21. Project budget categories, 2017

3.4.4 Capital financing for municipal development

The demand for capital to finance local infrastructure in emerging countries is becoming a priority, especially in cities like Madinah. To fulfill the financial requirements and address these new development challenges, financing options available to countries such as Saudi Arabia has been rapidly expanding. Recent reforms are aiming to improve the Saudi capital market through increased market capitalisation. For example, the Capital Market Law, the Securities and Exchange Commission, and a privately owned Stock Exchange were recently launched in Saudi Arabia, with the goal of improving the domestic capital market.

Between 2011 and 2016, Saudi equities increased in value from just over 50% to almost 70% of GDP (Gross Domestic Product). Today, Tadawul is the sole Saudi stock exchange market and the largest equities exchange market in the Arab world.²⁵ In addition to Tadawul, Saudi Arabia introduced Nomu, an equity market with fewer listing requirements for small and medium-sized enterprises (SMEs). Nomu is a good option for SMEs that are interested in going public. In addition to providing traditional banking services, Saudi Arabia's domestic banks went through a series of mergers and acquisitions, changed their assets structure, and began to offer both conventional and Islamic financial products to

a diversified investor base.²⁶ The Saudi Arabian market is becoming an example of efficient capital allocation driven by strategic reforms and increased market capitalisation.²⁷

Regarding Saudi Arabia's debt market, the government began issuing bonds for debt financing in 1988. In the last 15 years, the debt market underwent a series of reforms, which changed the process for issuing bonds, pricing bonds, and setting bond maturity terms. One of the major buyers of government bonds is the group Investors in Government Development Bonds (GDBs), which consists of domestic financial institutions, banks, and foreign investors.²⁸ GDBs are Zakat deductible for domestic investors, and exempt from withholding tax on income for foreign investors. Saudi Arabia's approach to creating the competitive and attractive conditions for capital and equity investors is expected to have a wide-ranging impact on the local economies of cities like Madinah in the future, thus increasing the availability of capital to fund urban development.

Housing Finance

The Saudi Arabian real estate market is ten times larger than any real estate market in the Gulf Region. Nevertheless, it remains underdeveloped with approximately 30% of Saudi's citizens owning their own home. Home ownership is currently legally confined to Saudi nationals only, although foreigners can buy leasehold property in designated developments. The demand in the KSA is primarily generated by local buyers rather than foreign investors and is driven by the total population growth (3.1%), and the overall Saudi national population growth (2.2%).

Prior to the mortgage law and mortgage financing, either the Real Estate Development Fund or commercial banks financed the housing credit market. The Real Estate Development Fund is one of the main sources for soft loans to Saudi nationals to finance home building. Commercial banks, in general, provide mortgages to those who can provide large down payments. In order to fill the resulting financing gap in the housing market, a series of finance laws were approved consisting of (1) the Enforcement Law, (2) the Real Estate Finance Law, (3) the Registered Real Estate Mortgage Law, (4) the Finance Lease Law, and (5) the Finance Companies Control Law.²⁹ Initially, the loan-to-value rate for mortgages was fixed at a rate of 70%. Compared to other countries, such as the United Kingdom and India, where the rate is 90-95% and 80% respectively, the loan-to-value ratio offered in Saudi Arabia was considerably lower. Recently, Saudi Arabia's central bank lifted the maximum loan-to-value rate on mortgages from 85% to 90% in an effort to stimulate the supply of mortgage loans.³⁰ Thanks to the recent legislation, international finance companies are now able to extend credit lines in housing.

Financing Utilities

In 2016, the Ministry of Environment, Water and Agriculture,

and the Ministry of Energy, Industry and Mineral Resources managed national utilities. The Electricity and Cogeneration Regulatory Authority (ECRA) was established in 2001, and it is responsible for licensing all entities operating in either the electricity or water desalination spheres, in addition to regulating providers. ECRA ensures that the Saudi Arabia's supply of electricity and water is in pace with demand, that quality standards are met, and that water and electricity are priced fairly.

The largest electricity provider is the Saudi Electricity Company (SEC). In 2015, the SEC was solely responsible for distributing electricity to consumers, with the exception of two areas (Jubail and Yanbu), which were operated by Marafiq, the country's first private integrated power and water utility company. Residential customers held the largest share of the SEC client base (6.7 million) in 2015 and consumed 48.4% of its energy output. The second largest consumer group was commercial users (1.5 million consumers, 16.3% of energy sales), followed by government (261,111 consumers, 13% of energy sales) and industry (10,044 consumers, 18.1% energy sales).³¹

The primary water provider is the Saline Water Conversion Corporation (SWCC), and it is responsible for approximately 60% of the Kingdom's production of desalinated water. In 2015, 54% of all desalination plant units were owned and operated by the SWCC, with the largest of the SWCC's plants located in Jubail. In 2016, Jubail's production reached 358 million cubic metres, equivalent to 26% of SWCC's total annual production. SWCC also has desalination plants located in Khobar, Jeddah, and Shuaibah. SWCC is also responsible for the transportation of desalinated water from the production plants to the country's main potable water reservoirs.

The National Water Company (NWC) manages Saudi Arabia's freshwater reservoirs, which is responsible for the water distribution. The NWC oversees water supply and sanitation in the largest cities, Riyadh, Jeddah, Makkah, and Taif. Outside of these metropolitan areas, the Ministry of Environment Water and Agriculture, and the Ministry of Energy Industry and Mineral Resources manage water supply and sanitation through regional directorates and branches, (i.e., the General Directorate of Water in the Madinah Region). Although the SEC and the SWCC are largely government-run agencies, Saudi Arabia is exploring restructuring options that will allow private sector participation.

Financing Health and Social Services

In accordance with the Saudi constitution, the government provides all citizens and expatriates working within the public sector with full and free access to all public healthcare services.³² The Ministry of Health is the primary government



© Osama Bhutta

The Green Dome of The Prophet's Mosque and the surrounding city

provider of healthcare services in Saudi Arabia, with a total of 249 hospitals and 2,094 primary health care facilities. Government healthcare comprises 60% of all health services in Saudi Arabia.³³ The private sector also contributes to the delivery of healthcare services, especially in more populated cities and towns. There are 125 private hospitals (11,833 beds) and 2,218 private dispensaries and clinics, comprising 21% of hospital services in the region.³⁴

The Ministry of Health supervises 20 regional directorates of healthcare affairs in various parts of the country, (e.g., Health Affairs General Directorate of Madinah). The role of the 20 directorates includes (1) implementing healthcare policies, plans and programmes, (2) managing and supporting the Ministry of Health's healthcare services, (3) supervising and organising private sector healthcare services, (4) coordinating with other government agencies and (5) coordinating with partner institutions.

In Madinah there are 20 Ministries of Health hospitals (47 in Riyadh and 14 in Jeddah) holding 2,818 beds. In order to meet the increasing demand for healthcare services, the Ministry of Health has given regional directorates wider autonomy in terms of planning, recruitment, power to establish agreements with healthcare service providers and financial discretion in budgetary and expenditure matters. Nevertheless, for most activities, regional directorates must receive authorisation from the Ministry of Health and, therefore, have limited autonomy.³⁵

3.4.5 Financial sustainability

Under the current system, the central government funds the majority of infrastructure and public services while municipal governments play a minor role. Despite the concerted effort to improve fiscal health envisioned in NTP, fiscal self-sustainability at the municipal level remains a challenge in the context of rising urban populations and unplanned urban growth.

Land-based Finance

Land is widely recognised as one of the most effective revenue generating instruments for subnational governments. Land-based finance provides both a stable revenue source and incentives that support local economic and urban development. In the Madinah Amanah, land is already a major contributor to municipal own-source revenue. In 2017, 30% of the municipal revenue derived from land sales and rental.³⁶

The introduction of 2.5% White Lands Tax (WLT) is further proof that the Kingdom's recognition of land-based finance as a powerful revenue source. In Madinah, where approximately 41% of land is vacant,³⁷ the WLT is expected

to provide a significant source of revenue for the Ministry of Housing, curb land speculation, and protect agricultural land. However, neither of these is a silver bullet to own-source revenue diversification in the KSA. A wide spectrum of land-based financing instruments exists beyond its current focus on leasing and WLT. In the age of decreasing oil income, Madinah will require greater revenue stability and self-sustainability to meet its ever-growing expenditure needs. To this end, Madinah must explore a variety of financing instruments and improve the capacity of the existing land management system.

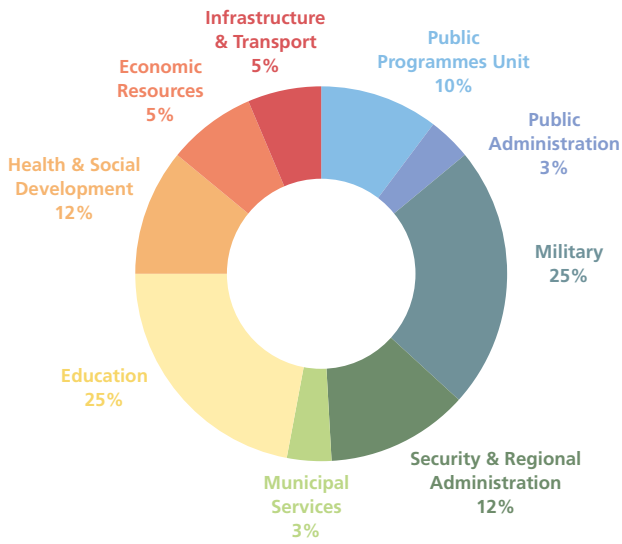
Urban Value Generation

Public finance and sound fiscal management support local development by establishing a solid financial base and strengthening the public sector's role. While these principles are echoed in the National Development Plan guiding both national and subnational public finance, in practice, Madinah operates under a highly centralised system of public finance and continues to be heavily dependent on intergovernmental transfers to fund local development activities and projects. In 2017, the central government allocated 5% of the total budget to municipal services, which also covered projects and programmes managed by the Ministry of Municipal and Rural Affairs (MoMRA), (see figure 22 and figure 23).

To reduce reliance on intergovernmental transfers and increase the performance of municipal services and activities, the government is exploring alternative means to generate revenue.

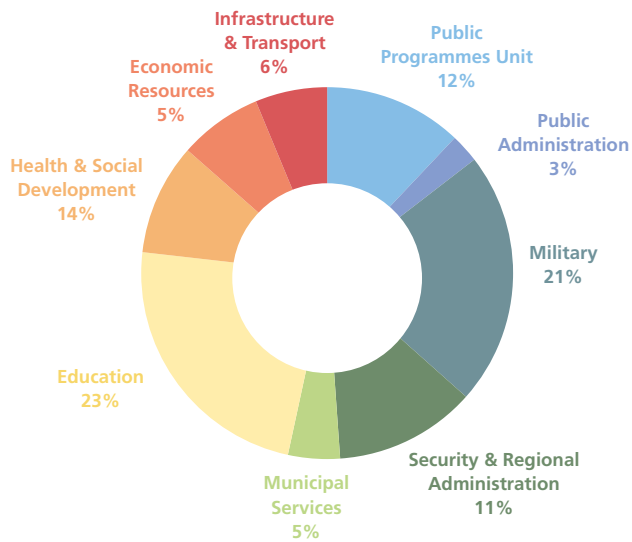
Madinah's economic growth and urban development trajectory are strongly correlated to planning and design, municipal finance, and governance. Land management and urban planning can support the transformation of municipal finance by improving local ability to generate revenue. For example, Madinah could explore a number of revenue generating instruments, such as partnering with the private sector through Public-Private Partnerships (PPPs) in the operation and maintenance of public transportation infrastructure, tax administration and collection, waste management services, and municipal property management.

In order for this to work, the foundational principles of sustainable urbanisation mentioned above must be either present or actively pursued by governments. Consequently, local governance structures that adopt a three-pronged comprehensive approach will be better positioned to maximise urban value.



Source: Bhatia, R. (2017). Saudi Arabia Budget 2017. The Gulf's International Bank.

Fig. 22. Saudi Arabia national expenditure by sector, 2016



Source: Bhatia, R. (2017). Saudi Arabia Budget 2017. The Gulf's International Bank.

Fig. 23. Saudi Arabia national expenditure by sector, 2017

4

THE CURRENT CITY





4.1 Urbanisation Patterns

4.1.1 The city's development patterns

The holy city of Al-Madinah Al-Munawwarah is the administrative capital of the Al Madinah Region, 340 kilometres North of Makkah. It is Islam's second holiest city, which welcomes worshipers from the greater region during Ramadan and a significant number of international visitors who come either before or after Hajj, (the annual Islamic pilgrimage) to accomplish their pilgrimage to Makkah. The city's official name is Al-Madinah Al-Munawwarah, which means the "enlightened" or "radiant" city. Madinah is home to the Tomb of Muhammad (grave of the Prophet Muhammad), and the Prophet's Mosque (Al-Masjid An-Nabawi), which is the heart of the city.

Madinah has a unique administrative structure. The city is a capital of the Al Madinah Region and includes seven major municipalities. The central municipality, Al Haram, is located within the 1st Ring Road, in the heart of the city, close to the Prophet's Mosque and the surrounding services. Besides this particular municipal subdivision, Madinah also has a unique administrative structure within the Kingdom of Saudi Arabia. The city of Madinah hosts the city government, under the control of the Mayor of the city, as well as the Development Commission of Makkah Al-Mukarama, Al-Madinah Al-Munawwarah and Al-Mashaer Al-Muqaddasa (DCOMMM). The DCOMMM was formed in 2004 (1425H), through Royal Order number A/204, with the specific task of coordinating planning efforts among three areas; Makkah, Madinah, and Al-Mashaer. In 2010, the DCOMMM was transformed into two separate commissions: the Development Commission of Makkah Al-Mukarama and Al-Mashaer Al-Muqaddasa (DCOMM) and the Development Commission of Al-Madinah Al-Munawara (DCOM), which is recognised as the Madinah Development Authority (MDA). The Council of DCOM is chaired by His Royal Highness the Governor of Madinah Province, and the other members of the Council are His Highness the Minister of Finance, His Highness the Minister of Hajj, and His Excellency the Mayor of Al-Madinah Al-Munawwarah. The primary role of the DCOM is to direct the planning process in an integrated manner, linking it to the future vision for the city and considering the city's growth, and increasing fluctuating population over the Hajj and Umrah periods. The DCOM operates in cooperation with MoMRA and other government departments. In addition, the Ministry of Hajj and Umrah is a key planning actor regarding the observance of pilgrimage dynamics, influencing the work of the DCOM. The Ministry of Hajj and Umrah is responsible for the management of pilgrims, ensuring the services provided during the visits are sufficient, and controlling and documenting the religious dynamics within the region.

The city is 620 metres above sea level, and is a part of the Peninsula's Hejaz Region, characterised by a longitudinal high escarpment along the Eastern coast parallel to the Red Sea.

POPULATION

 **1,385,192 + Floating population**

FLOATING POPULATION PER YEAR (religious tourism)

 **3,249,000 Hajj**
5,757,000 Umrah

9,006,000 Total

POPULATION DENSITY on built-up area

 **30.9 p/ha**

AGE PROFILE

 **72.8% < 34**

POPULATION GROWTH RATE

 **2.9 %**

2,064,000 Expected population by 2030

MADINAH CITY COMPARED TO MILAN



Population: 1,365,000
Area: 18,167 ha
Density: 75.13 p/ha

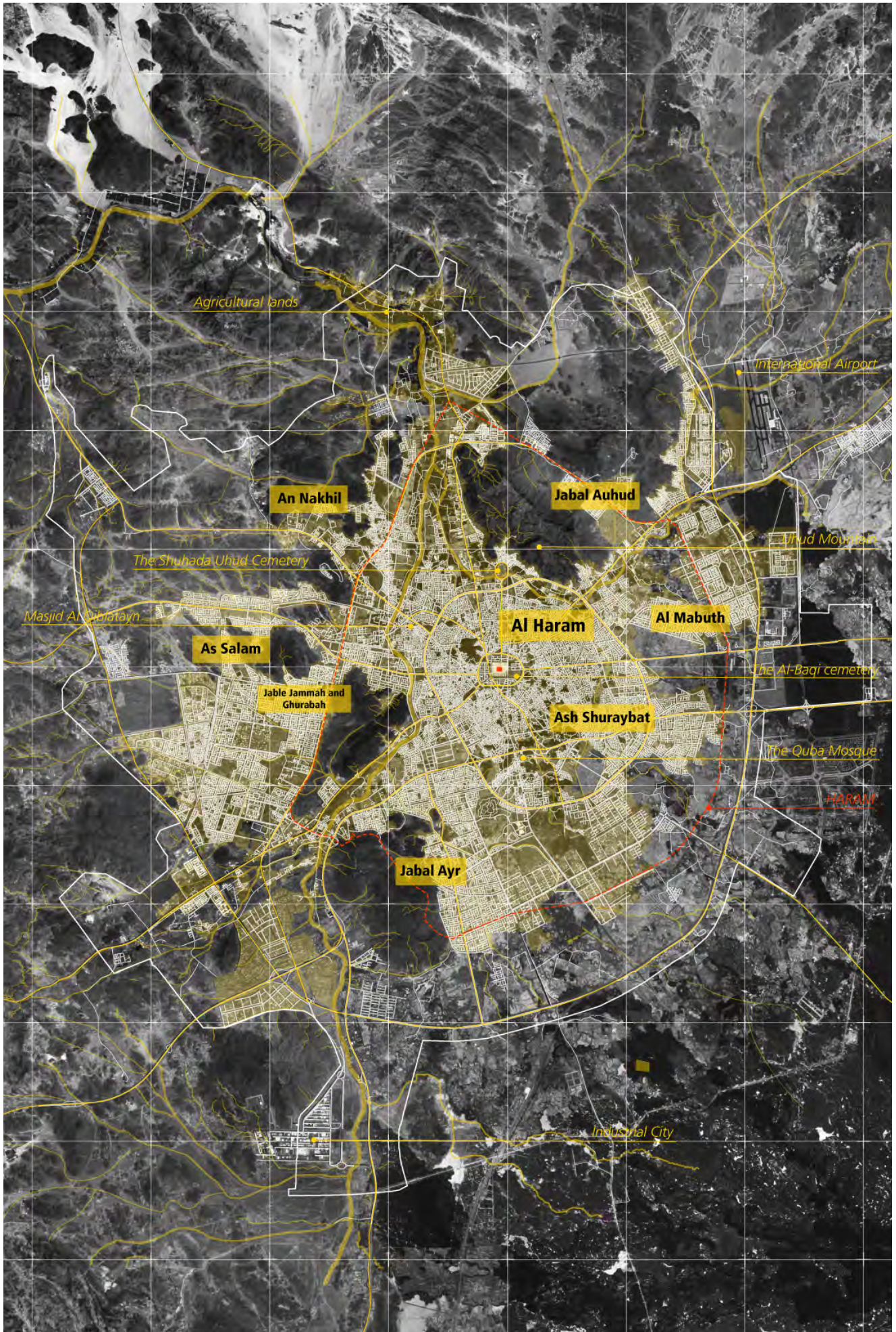


Fig. 24. Boundaries, neighbourhoods and key infrastructure



1928

Area: 837,8 ha
Population: 82,547

The city, located on a plateau at the junctions of the three valleys of Al-Aql, Al-Aqiq, and Al-Himdh, is surrounded by deserts, volcanic fields, and mountains, which form the conditions for an oasis. Due to this unique topography, Madinah has vast green areas and fertile lands suitable for agriculture. The mountains, together with valleys and wadis are the fundamental structural elements, which define the city growth and identity with its numerous historic sites within The Haram boundary. The boundary defines the area that is off-limits for non-muslims, similarly to the one established in Makkah.

The city has a radial structure, extending from the central Prophet's Mosque to the surrounding valleys. The concentric Ring Roads form essential structural elements in shaping the urban form of Madinah, starting with the 1st Ring Road enclosing the holy area surrounding the Prophet's Mosque. According to the last Saudi census that was undertaken in 2010 (1429H), the city of Madinah hosts a permanent population of 1,385,192 people, spread over a built-up area covering 44,800 hectares, with an average population density of 30.9 p/ha. In comparison to similar cities, which have followed a radial development pattern from the city centre (e.g., Milan in Italy), the built-up area of Madinah is more than twice as large, while the density is consistently lower, even though the population is almost the same as in Milan.

The age-related pattern of demographic distribution in Madinah shows a high percentage of young residents, as nearly 73% of the population is below 34 years old. The growth rate of the city is 2.9% per year, which means that by 2030, Madinah's population is expected to reach 2,064,000 people. However, as the estimation only accounts for regular residents, pilgrims who illegally stay on after their Umrah and Hajj visa expires, for work purposes, could further contribute to an increase in the total number.



1965

Area: 9, 977 ha
Population: 188,759

In addition, and similar to Makkah, Madinah is subjected to peculiar religious dynamics, causing a significant fluctuation in the number of residents every year. Religious visitors, both local, and international make up the highest portion of total visitors, and this is directly linked to the pilgrimage trends in Makkah. Around 90% of Umrah and Hajj performers visit Madinah after their journey to Makkah. According to the Visitor Demand Projections for Hajj and Umrah Seasons, by 2019 Madinah will receive 3,249,000 visitors during Hajj and 5,757,000 over Umrah.³⁸ Both estimations include both foreign and in-country Hajj and Umrah performances, as well as authorised and unauthorised Hajj. According to the KSA Ninth Development Plan produced in 2004 (1425H), the number of unauthorised Hajj³⁹ visitors is estimated to be approximately 18% of the total number of authorised Hajj pilgrims.

Urban growth patterns

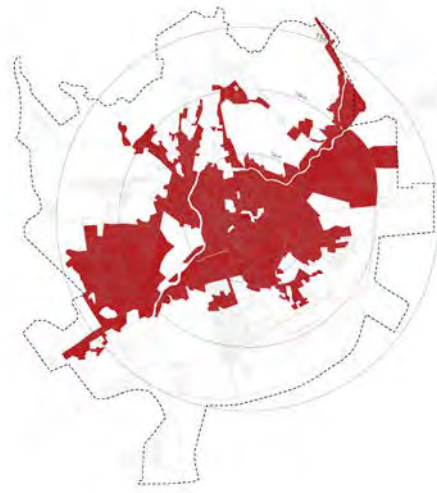
Madinah's location and topography have fundamentally been impacting both the identity of the city and its expansion trends. Madinah's original features are linked to it being a desert oasis, and the consistent presence of farms in some older parts of the city demonstrate this. Traditionally, Madinah was developed as a radial structure, with the Haram area expanding from the central Prophet's Mosque in the centre to the surrounding cities. While the mountains have historically constrained Madinah's growth, the city has recently been expanding along the valleys to the North, South, and East.

Prior to the year 1928, urban development in Madinah was mostly concentrated around the Prophet's Mosque, within the 1st and 2nd Ring Road, where a significant part of the unplanned areas is currently concentrated. Between 1965 and 1989, the city expanded further to the West and Southeast, beyond the current 3rd Ring Road (King Abdullah Road), avoiding the mountainous areas and developing towards the valleys. In these areas, a series of new districts were formed, showcasing a rigid urban organisation that are very different



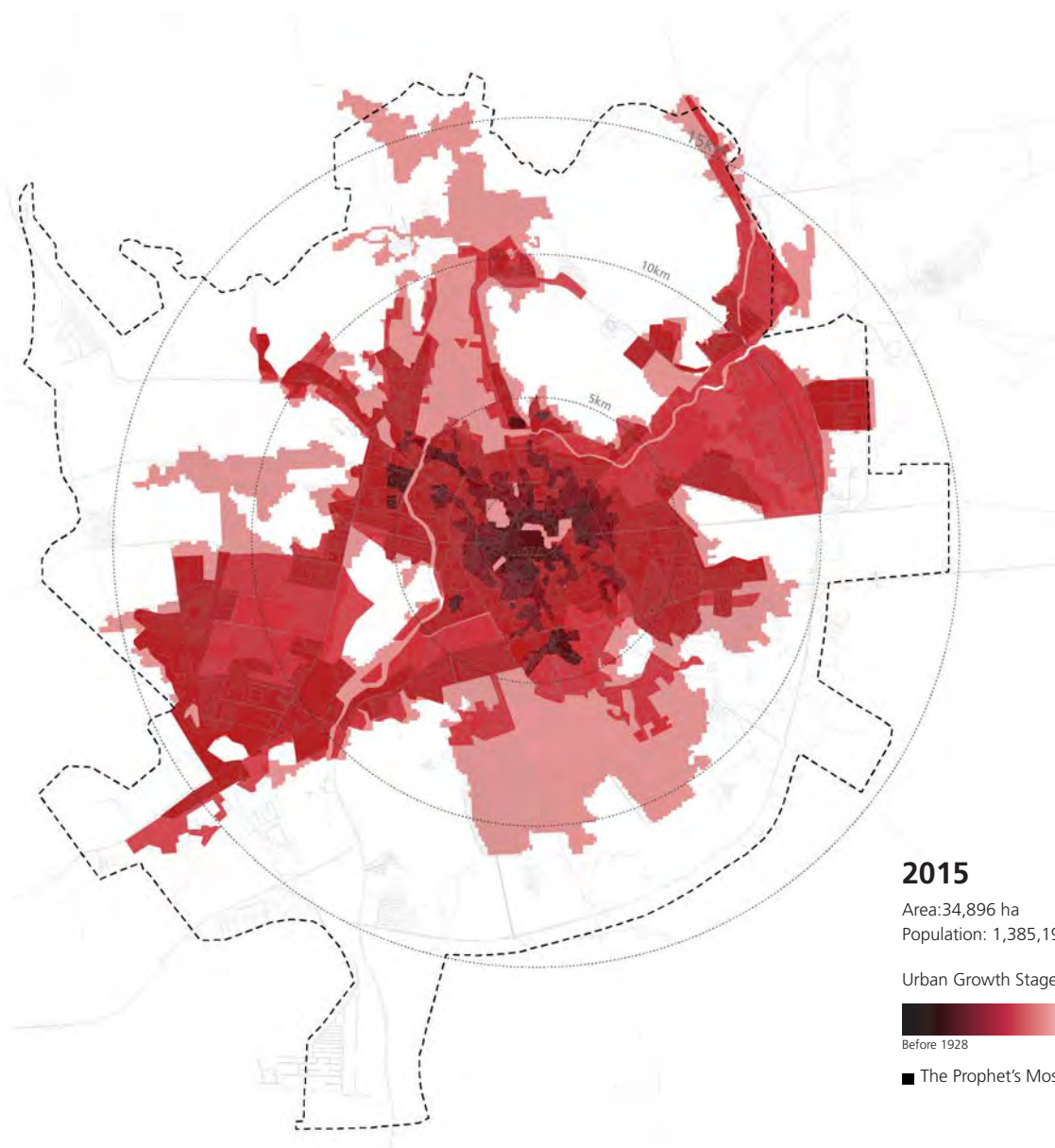
1989

Area: 11,559 ha
Population: 500,043



2002

Area: 19,419 ha
Population: 1,027,943



2015

Area: 34,896 ha
Population: 1,385,192

Urban Growth Stages



■ The Prophet's Mosque

Fig. 25. Urban growth pattern



from the traditional urban fabric. In 1988, another expansion trend emerged and has persisted till today. Over this period considerable extensions to the Northeast characterised development expansions, including the construction of the airport in 2012. The appearance of new nodes along this expansion axis facilitated the urban development to the East, along one of the major transport axes to Riyadh.

Along with consistent urban growth, the characters of more traditional development patterns and housing typologies changed substantially. Due to the city's increasing demand in accommodating both resident and floating populations, the construction of a series of high-rise buildings within the 1st Ring Road began, shifting Madinah's skyline and changing its urban patterns.

The current urban growth pattern is characterised by expansion along the main transportation axis irradiating from the central area towards the valleys. New structural elements as the Prince Mohammed Bin Abdulaziz International Airport, the Al-Haramain train station, as well as other services such as new educational facilities, act as additional nodes, catalysing and supporting the city's expansion and densification along to the Northeast, and bringing new development in Madinah's Eastern municipalities. One of the main projects currently being implemented is the Knowledge Economic City (KEC), which follows the current expansion patterns. Once completed, without any provision of public

transportation, the KEC will add an increasing commuting pressure on the current infrastructure.

On the whole, Madinah is facing the emergence of leapfrog development, with the rise of scattered urbanisation pockets, detached from the main urban fabric. These development islands are spread beyond the 1450 boundary, mostly to the Northeast of the city, beyond the airport, and to the South along the wadi. These satellite developments are quite distant from the city, thus increasing sprawl and lacking appropriate services and facilities.

Since 1928, the Madinah area increased by almost 42 times, while its population has grown only 17 fold over the same period. The number of pilgrims coming to Madinah has been increasing over the years, and it will keep rising in alignment with Vision 2030, bringing new challenges to the city to accommodate the pilgrims and to provide them with sufficient services and infrastructure. The graph below shows that the number of pilgrims still expect to follow increased trends after 2018. According to the Al Madinah Tourism Development Plan, 1425H (2004), the forecasted total number of pilgrims arriving in Madinah will be 14,792,000 by 2040. This also means that Madinah still has a substantial need to increase the capacity of the Prophet's Mosque to host the expected number of worshippers, as well as considering scenarios for the future expansion of the Mosque, in addition to the Haram Plaza.

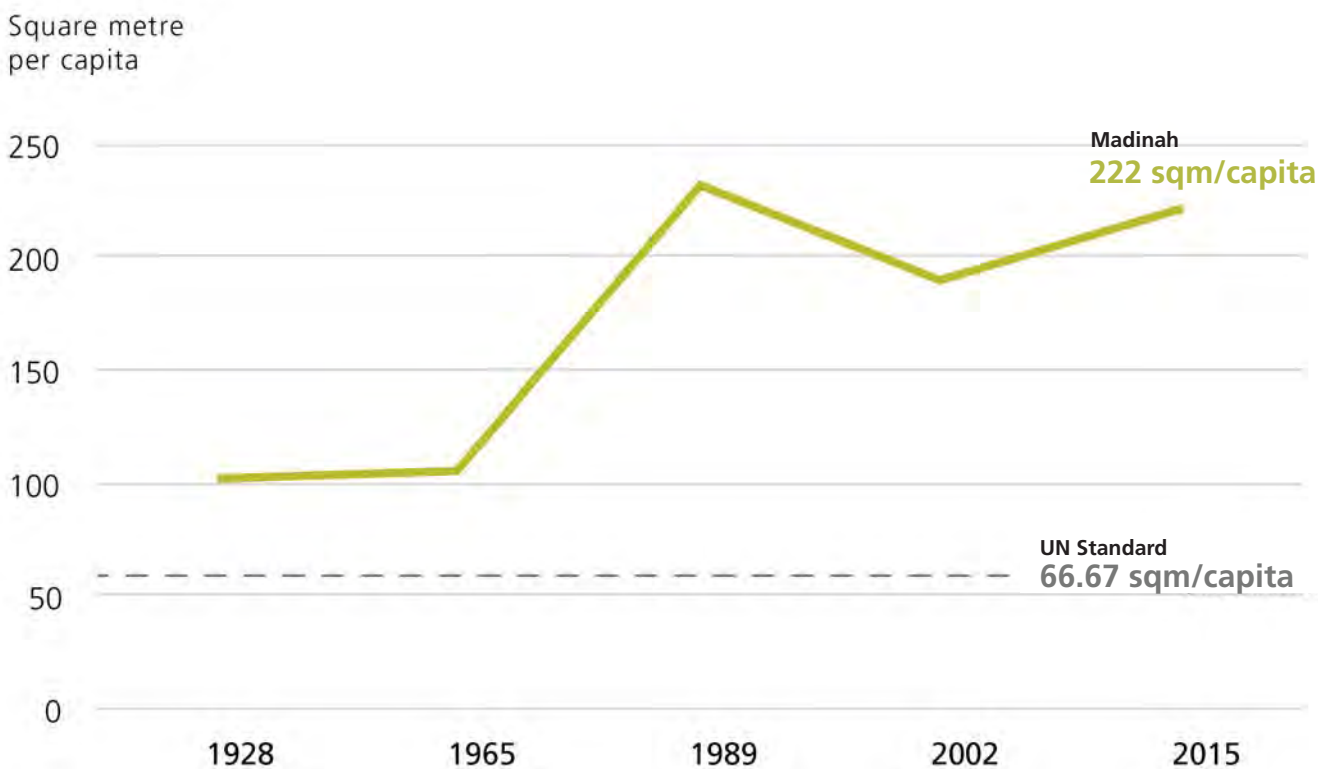


Fig. 26. Land allocated per capita



© FSCP

The Haram Plaza near The Prophet's Mosque is the most important public space in the city



4.1.2 Administrative boundaries

To address the issue of urban sprawl and improve the efficiency of urban management, in 1406H (1986), the Kingdom of Saudi Arabia established Urban Growth Boundaries for all cities. Following the decree, Madinah has three existing Urban Boundaries:

- Urban Growth Boundary established to contain the development up to the 1435H
- Urban Growth Boundary established to contain the development up to the 1450H
- The Development Protection Boundary, which works to limit city expansions, and also defines the limit of the Amanah jurisdiction over the neighbouring rural areas and satellite developments.

Additionally, within the 1450H boundary, the city has set a Haram Boundary, similar to the one established in Makkah. This area occupies the central part of the city between the mountains and cannot be accessed by non-Muslims.

In Madinah, the 1450 UGB total area is 682.27 square kilometres, exceeding the current urban footprint by 234 square kilometres. In order to fill-up the available area between the urban footprint and the 1450 UGB at the UN-Habitat recommended density of 150 p/ha, and considering the current growth rate, it would take more than 75 years to develop it. Whereas the 1435 UGB has an area of 673 square

kilometres and, following the same rationale, it will take more than 70 years to fill it at the recommended UN-Habitat densities.

Finally, the total area delimited by the DPB is 1,890 square kilometres. Again, to fill-up this area at the UN-Habitat recommended density of 150 p/ha with the current growth rate, would take more than 100 years to develop.

Interestingly, the potentially developable land within the 1450 UGB, which function should be to limit the city expansion up to the year 2030 (1450H), amounts to 213 square kilometres. This means that by applying the same principles to the available vacant land within the 1450 UGB, this would have the capacity to accommodate 862,900 people, covering the growing needs for the next 35 years, as calculated at the current growth rate and in reference to the UN-Habitat recommended density.



Spatial frictions between the new residential areas and the existing green spaces in the city

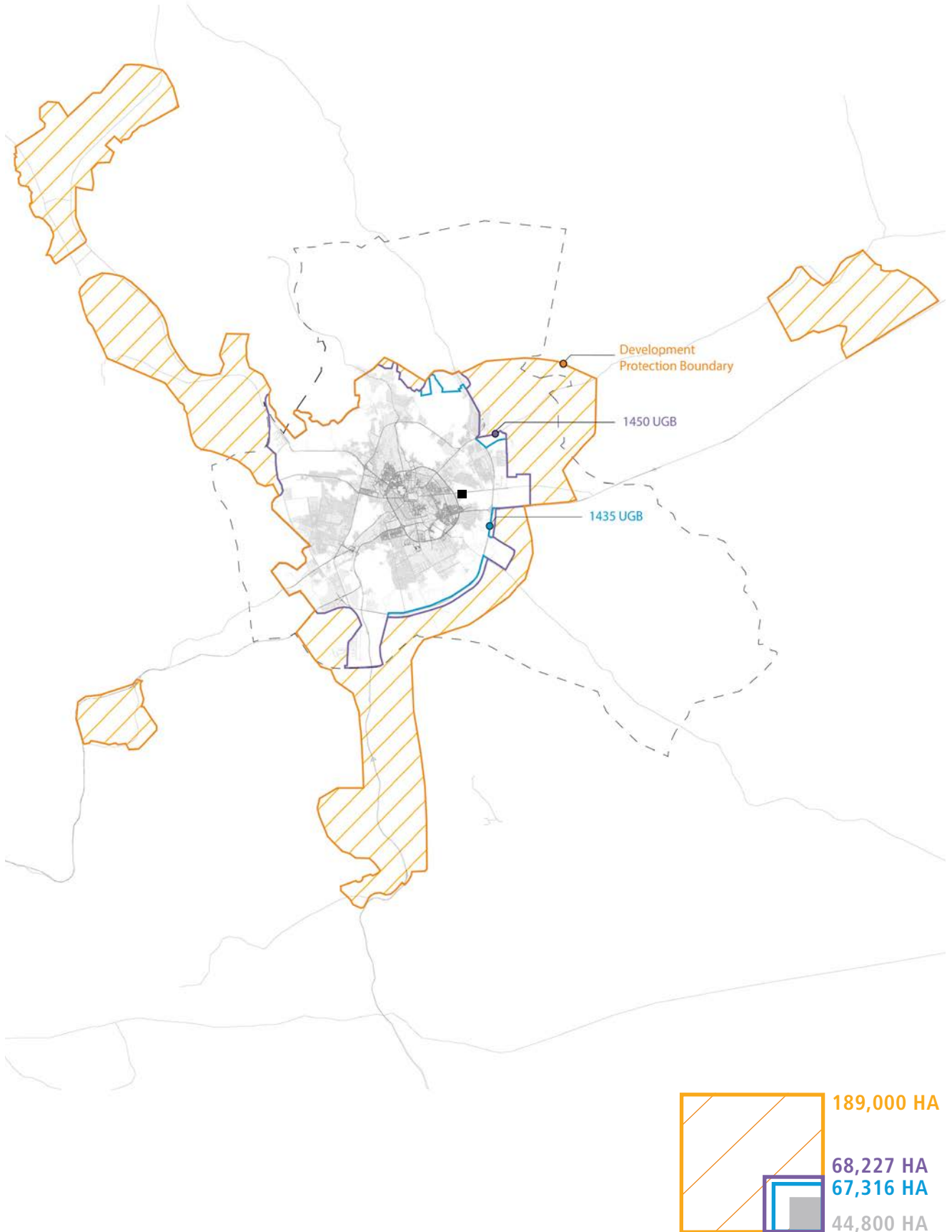


Fig. 27. Administrative boundaries



4.1.3 Urban density

According to the last census in 2011, Madinah's population was 1,385,192, with a growth rate of 2.9%. The floating population (pilgrims/visitors) in the same year was 9,006,000, adding a significant contribution to the total population number.

Inhabitants are mainly concentrated within the 3rd Ring Road, approximately five kilometre radius distance from the Prophet's Mosque. This area used to be a traditional urban core, with an old and rich Islamic fabric. The central area was densely populated, but with new development trends and the increasing demand to accommodate pilgrims has caused radical changes in the traditional urban pattern, especially within the 1st Ring Road. Most of the vernacular urban pattern was demolished in order to increase the city's hosting capacity by constructing high and medium rise hotels, and other accommodations. This operation radically transformed both the spatial and use patterns in the city centre, moving away from the traditionally mixed-use, human-scaled fabric, and threatening the historical way of life and vibrant spirit of the area.

As mentioned earlier, the floating population in Madinah is directly related to the visitors who perform Hajj and Umrah in Makkah, as most of the pilgrims continue their holy journey from Makkah to Madinah to visit the Prophet's Mosque. Visitor Demand Projections during Hajj and Umrah Seasons for Madinah predicts 12,346,000 visitors by 2040 (1462H), which will add additional pressure on the current central infrastructure. The current typologies of visitor accommodation can be divided into two categories:

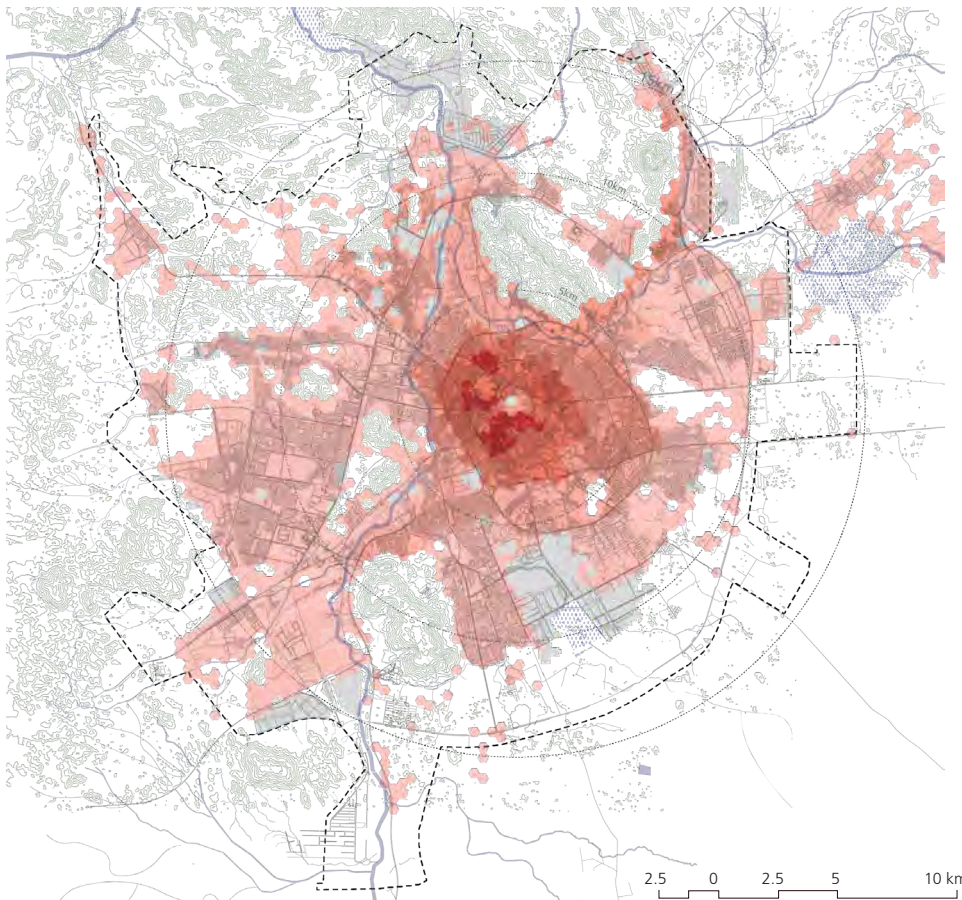
- Hotel Accommodation – available for Umrah performers and Hajj pilgrim accommodation;
- Licensed Seasonal Residential Rooms – provided for Umrah performers and Hajj pilgrims through pre-registration.

Hotels are a major component of the land use pattern within the 1st Ring Road. The hotel area occupancy rate is 100% on the land that is not occupied by the Prophet's Mosque. Nearly half of Madinah's hotel rooms are located within the 1st Ring Road, or in very close proximity to it. Hotel accommodation is also prevalent along major corridors with direct access to the Haram. The rest of the hotel rooms are distributed between the 1st Ring Road and the 3rd Ring Road.

As is shown in the figure 29 the central area within the 2nd Ring Road is also the most populated with an average density more than 250 p/ha, the density of the adjacent areas within the 3rd Ring Road varies from 150 to 240 p/ha. The density analysis shows that these central areas with the densities above 150 p/ha which fit the UN-Habitat recommendations occupy just 5% of the total built-up area but accommodates 39% of the total population. Unbalanced distribution of services for visitors has generated socio-spatial polarisation and inequality in the distribution of services and facilities between the urban core and the periphery, as the majority of the visitors stay in the central area within the 1st Ring Road, which is the area that is best served.



Lively pedestrian street leading towards The Prophet's Mosque



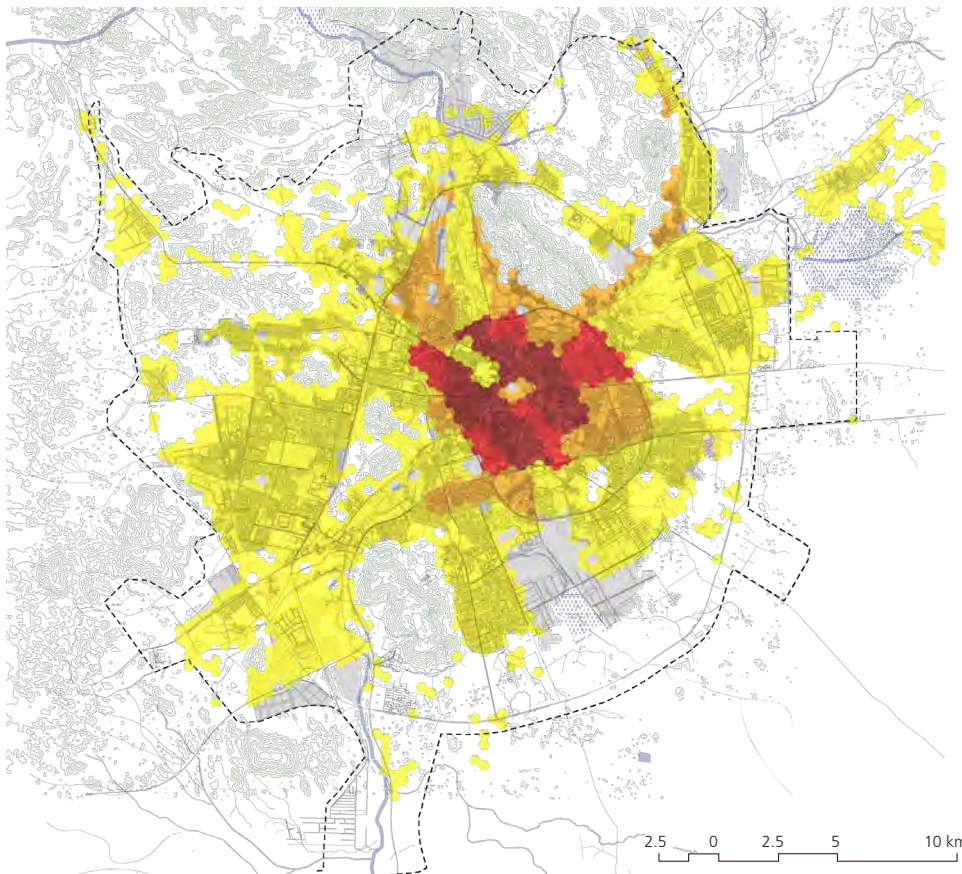
Residents:
1,385,192

Residents + Visitors:
13,640,192

Average population density:
30.9 p/ha

- 1 - 20 p/ha
- 21 - 60 p/ha
- 61 - 100 p/ha
- 101 - 140 p/ha
- 141 - 251 p/ha
- 252 - 350 p/ha
- 351 - 424 p/ha

Fig. 28. Current distribution of population density



Average density UN-Habitat recommendation:

150 p/ha

- 1 - 39 p/ha
- 40 - 89 p/ha
- 90 - 149 p/ha
- 150 - 240 p/ha
- + 250 p/ha

Fig. 29. Distribution of population density recommended by UN-Habitat



4.2 Structuring Elements

4.2.1 Natural and topographic elements

The city of Madinah has the three key natural elements influencing its structure and urbanisation patterns: a mountainous topography, the wadi system, and the agricultural landscapes. These natural elements should be preserved and enhanced, and considered one of the priorities for the future vision, as they are critical assets for the city's sustainable development.

Topography

The topographic structure of Madinah is one of an oasis surrounded by stony mountains, ranging from 800 to 1500 metres in elevation, with the Al-Waira mountain being the highest, followed by the Uhud mountain at 1087 metres above sea level. The area slopes from East to West till the Al-aqiq valley, sloping from South to North. In the Western and Southwestern direction, the surfaces are mostly composed of volcanic rocks. The city itself covers an area about 448 square kilometres and is situated on the flat plateau at the junction of the three valleys Al-Aqoul, Al-Aqiq, and Al-Himdh, at 620 metres above the sea level. Due to this unique geographical location and topographical conditions, Madinah has a particular microclimate, which is suitable for agricultural activities.

The wadi system

Another significant element contributing to shape the city's

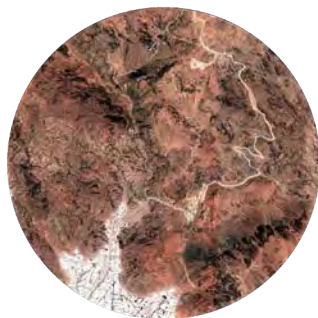
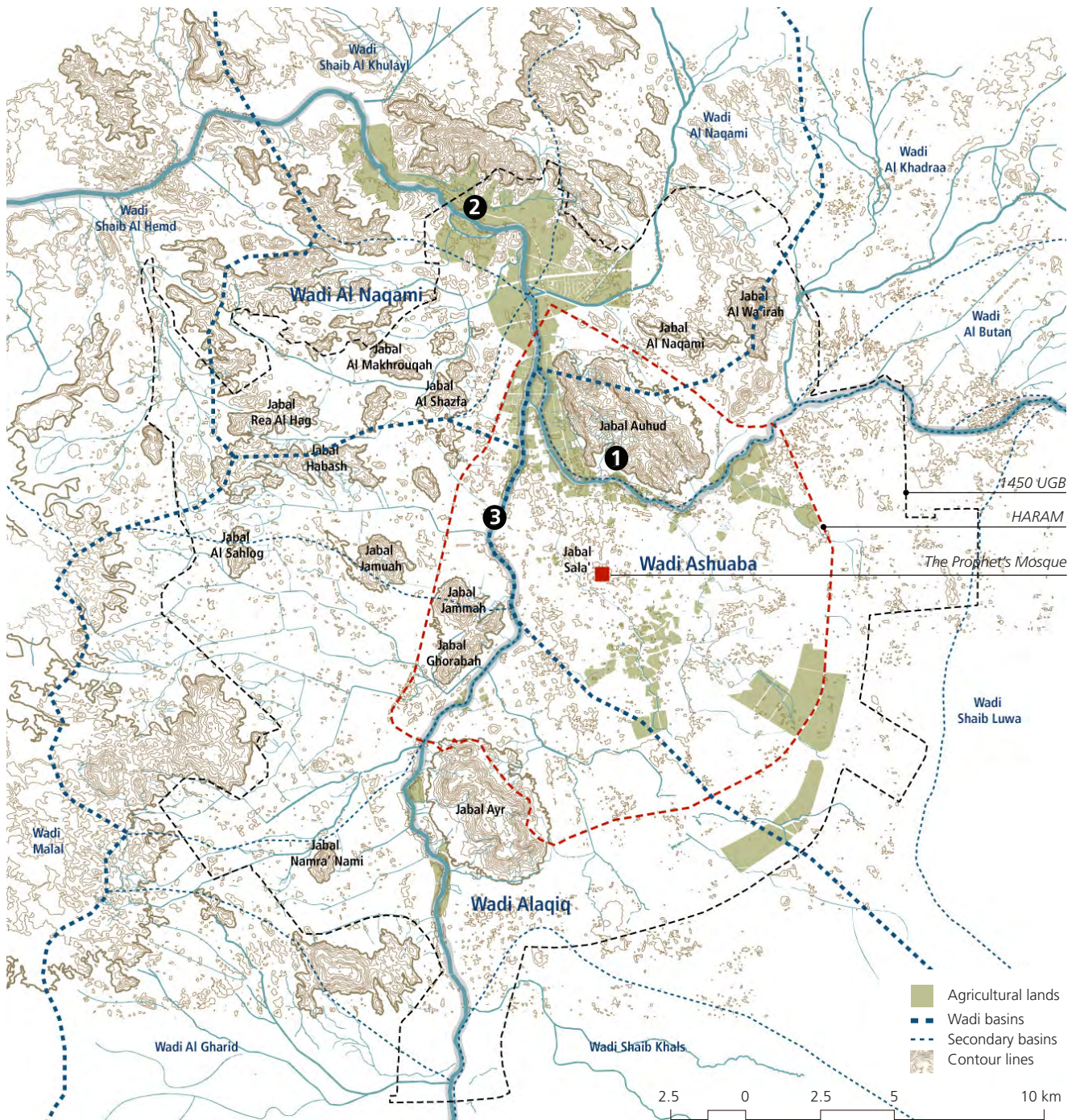
identity as well as the city's traditional economic activities, is the network of wadis and their watersheds, or blue network. Five wadi cross through Madinah: Wadi Al-Aqiq, Wadi Al-Aqoul (also known as Wadi Qanat or Wadi Sayedna Hamzah), Wadi Bathan, Wadi Manzoor, and Wadi Ranounaa. Madinah's wadis vary in forms and depth, but they are all almost dry year-round, except during the period of intense rainfall, which often causes flash-floods because of the sporadic and intense precipitation and the low absorption rates.

Agricultural landscapes

Due to the unique topography of the area, Madinah has a significant number of agricultural land, equal to about 23.3 % of its total area. Both the Wadi system and the agricultural land are part of Madinah's heritage, as the city originally developed as a strategic agricultural centre, where the caravans were stopping along the trade route between Yemen and Damascus to rest and replenish their food reserves. Though, the agricultural lands are the elements of historical significance, during the last few decades Madinah has been increasingly subjected to rapid loss of agricultural land, especially within the consolidated city. This underlines the need for immediate actions for the preservation of these elements and their better integration with the urban structure and functions.



There is still agriculture activity in Madinah city's outskirts



1.

Unique topography



2.

Vernacular agricultural patterns



3.

The system of wadis

Fig. 30. Natural and topographic elements



4.2.2 *The Prophet's Mosque and the associated tourist dynamics*

According to historical data, the area was constituted by scattered settlements surrounded by groves of date-palms and cultivated fields.

The original mosque was an open-air building, on a site originally adjacent to the Prophet's house, which, with its courtyard, served as the first social and religious centre of the early Muslim community, and as a religious school. After the foundation of the Kingdom of Saudi Arabia in 1932, the Mosque underwent several major modifications, being expanded several times, and passing through different stages of transformation. However, the last century characterised the transformation of the Mosque with significant, rapid, and systematic expansions, due to the continuously growing amount of visitors and pilgrims, completing their religious journey with the visit of the Holy Mosque.

The modern Prophet's Mosque, surrounded by the Haram Plaza, although demolished and rebuilt many times, is still situated on the original site, besides the Prophet's house, but in order to accommodate the increasing number of visitors, and provide sufficient prayer spaces, the Mosque was expanded horizontally. The numerous expansions of the Mosque can be resumed in seven stages, covering the period from 1910 to 2011, (1328H–1432H). The largest transformations were held in 1990 (1411H) when the Aghawat district was demolished. In the year from 2010–to 2011 (1431H–1432H) even a larger area was "cleared" and redeveloped as a hotel district, serving the Prophet's Mosque. The new district overwhelmingly supersedes the surrounding areas and screens the Mosque's architectural characteristics to large parts of the city.

The new hotel district occupies most of the area within the 1st Ring Road, and it is characterised by transportation issues, although the pedestrian domain in the central area is overall good, The central area includes sidewalks, covered pedestrian walkways, and some pedestrian-only areas. Nevertheless, the pedestrian infrastructure can be extremely busy, particularly, during peak seasons. Some of the recommendations part

of the Comprehensive Plan for Makkah, Madinah, and Al Mashaer propose further crowd management measures by creating greater pedestrian accessibility and defining civic spaces connected to the spiritual precinct, in order to ensure safety and security of pilgrims, even in the most crowded periods. According to the Comprehensive Plan for Makkah, Madinah, and Al Mashaer, elaborated by the MMM Group together with Moriyama & Teshima Architects and Planners, the total worshipper capacity for the Prophet's Mosque and the Haram Plaza currently stands at 1 million worshippers, which is nearly a 3rd of the total resident population.

The city of Madinah has a unique and very strong centrality, being the Prophet's Mosque, and its surrounding area, influencing the whole city's structure and functionality. However, the spatial centrality is paradoxically more oriented in responding to visitors dynamics than to fulfill the socio-spatial needs of the resident population. Responding to this increasingly important issue becomes therefore key for the future of Madinah.



Umbrellas of the Haram Plaza, The Prophet's Mosque in the Holy City of Madinah



4.2.3 Major movement infrastructure

Madinah's structural organisation is around a radial road network, starting from the central area, where the Prophet's Mosque is located, The Grand Haram, and defined by the 1st Ring Road, creates a central focus that attracts extremely high pedestrian flows. The radial organisation, starting in the centre and followed by concentric Ring Roads defining different areas of the city, remains the main structural feature. In addition to the Ring Roads structure, there are several minor and major arterials, functioning as radial linkages across the city and the different Ring Roads, in an attempt to minimise traffic disruption due to the high tourism rate. The main roads defining the major street hierarchy and urban structure are:

- The 1st Ring Road, King Faisal Bin Abdulaziz Road, circling around the Haram area and the heart of the city, which is 5 kilometres long;
- The 2nd Ring Road, Prince Abdulmajeed Road, which defines an area characterised by a traditional urban pattern and dense population;
- The 3rd Ring Road, Amir Abdullah Road, about 27 kilometres long, which defines a densely populated urban area, where density is overall higher than in any other areas of the city.
- The 4th Ring Road, King Khalid Road, situated at a further distance from the city centre, of about 10-15 kilometres;
- Omar Ibn Al Khattab Road, a main radial road extending to the Southwest, serving largely the traffic flows to/from Makkah and Jeddah.

The total amount of roads within the 1450 UGB is 5834 kilometres, and the amount of road surface per capita is 4.2 metres, indicating a sufficient ratio of road infrastructure in reference to international standards. Overall, the citywide road network functions well and has a well-defined hierarchy of highways, major and minor arterial roads, and collector roads. Nevertheless, because of both the centralised road network structure and the massive numbers of religious visitors and their associated dynamics, Madinah faces a challenging transportation issue, manifesting in the continuous conflict between pedestrians and vehicular traffic within the central area, and particularly within the 1st Ring Road. Another essential aspect affecting Madinah's overall movement structure is the limited accessibility to the historical sites, currently openly accessible by private cars and syndicate busses. The most congested streets (figure 32), especially during the peak seasons, are the arterial roads leading to the main entrances of the city: Omar Ibn Alkhattab Road, also known as the old Jeddah-Madinah Road, the Airport Road, also leading to Riyadh and Al Qassim, and the King Abdulaziz Road. Since the Haram Plaza has recently increased its hosting capacity, these movement issues are predicted to become more substantial without the appropriate development of an efficient public transport system, and an increased pedestrian-only area with sufficient public space provision. Besides the radial road structure, it is worth mentioning that the Al Haramain High-speed Rail, which will connect the cities of Makkah, Jeddah, and Madinah efficiently,⁴⁰ will become a significant structural component of the overall city's mobility infrastructure.



Pedestrian streets allow a better connectivity between the important landmarks in the city

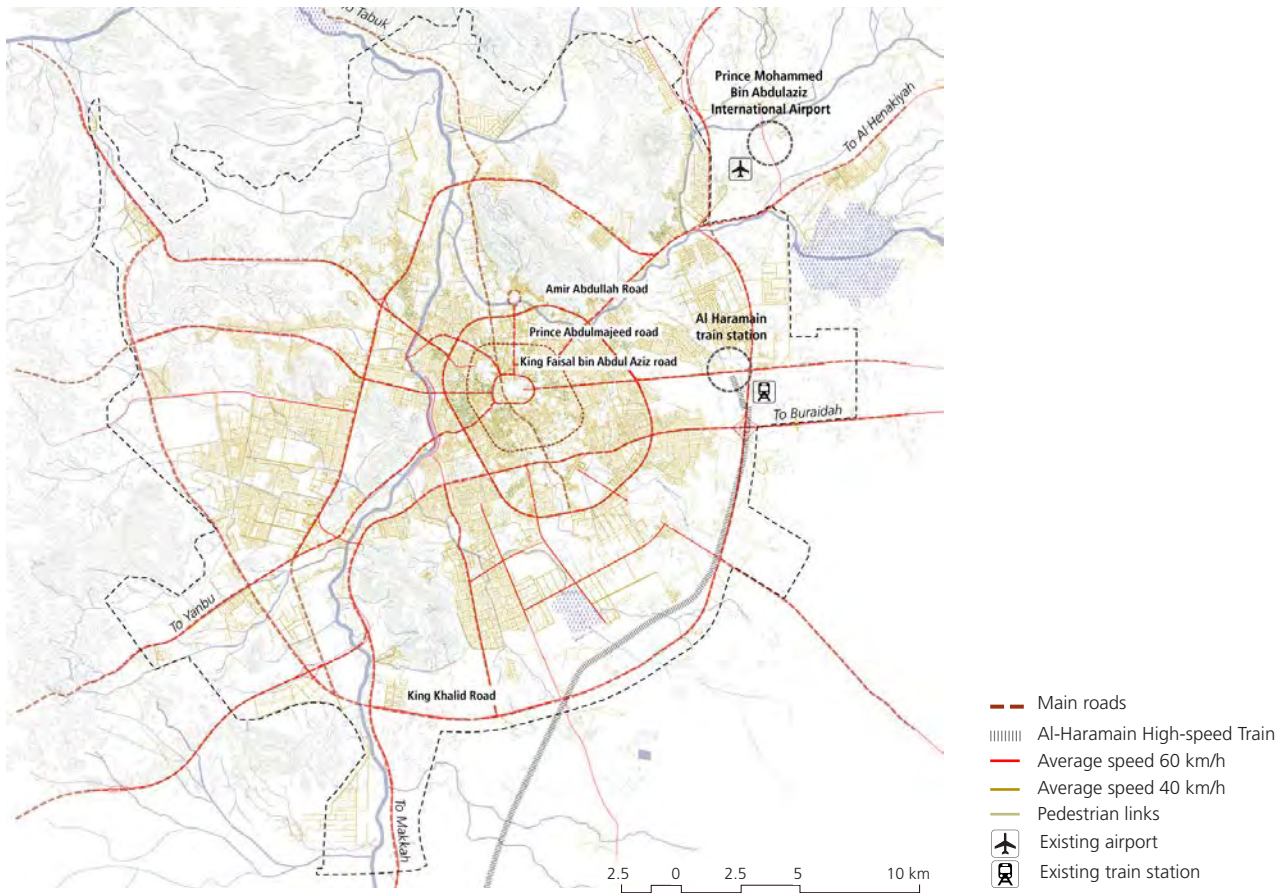


Fig. 31. Major movement infrastructure

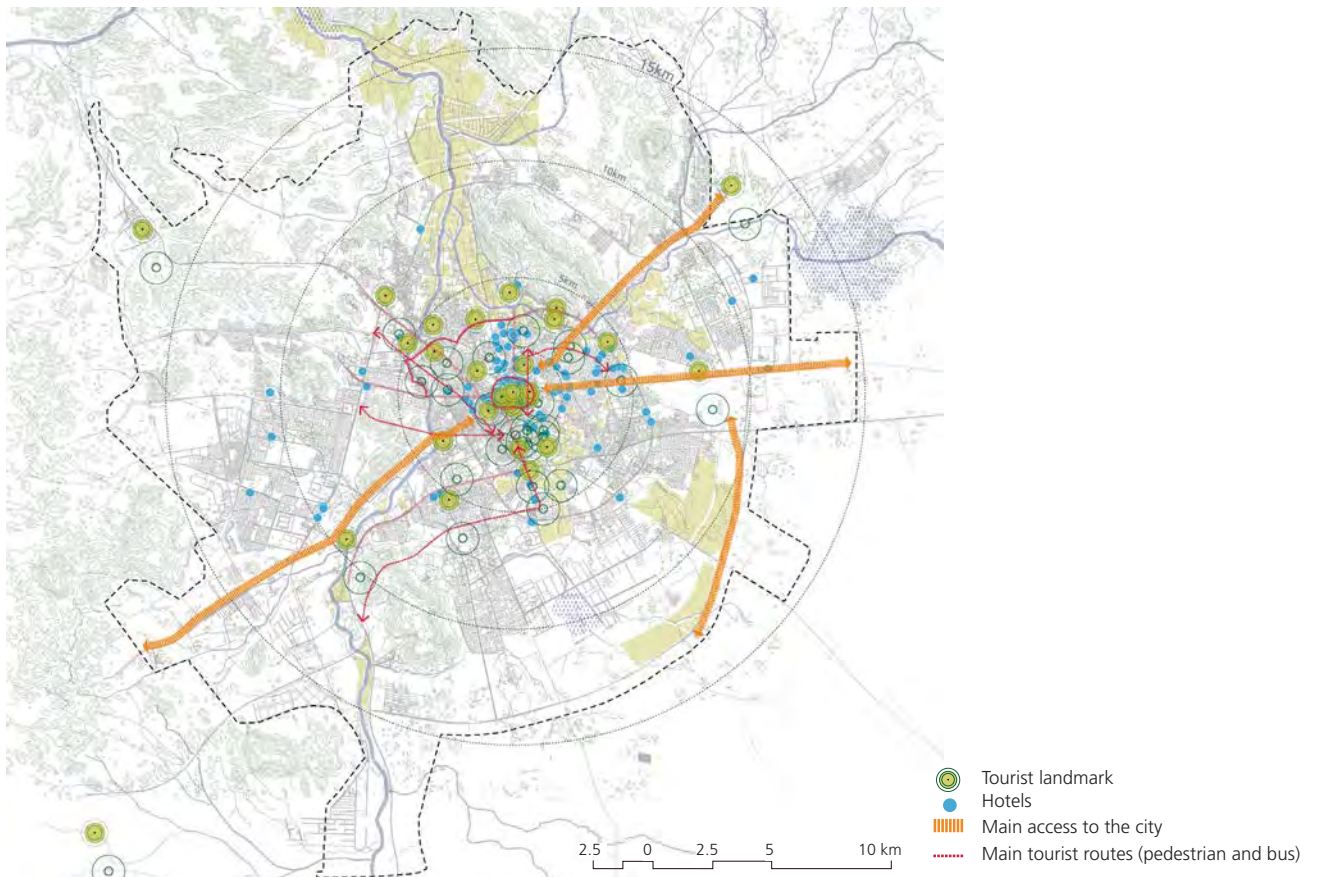


Fig. 32. Tourist dynamics and main entrances to the city



4.2.4 Existing and proposed land use patterns

Madinah's spatial organisation is rooted in its history and role as one of the Holy Cities of Islam. The central areas of the city are dedicated to pilgrims, filled with hotels and commercial functions, distancing itself from the needs of the resident population. This means that Madinah faces an increasing risk of its residents losing a spatial connection to the city centre.

Referring to the current land use organisation, the city showcases several monofunctional areas, segregated from each other. The mixed land use areas only amount to 5.2% of the total land use within the 1450 UGB, where the area delimited by the 1st Ring Road significantly contributes to this percentage. The rest of the city is predominantly monofunctional, consisting mostly of residential new developments, which form an urban fabric that is very different from the traditional vernacular pattern. The subsequent progressive restructuring of the urban form, pushed by this kind of development made of purely residential condominiums, is one of the reasons for the spatial monotonousness of the most recent expansions in Madinah.

Thanks to its topographic and climatic conditions, historically, Madinah has always been able to rely on its fertile land for agricultural uses. Although losses have occurred over the years, the agricultural land still constitutes 23% of the total land use, equal to half of the overall area dedicated to residential land use, which is significant for a city of this size and denotes Madinah's glorious past as a major agricultural oasis. Agricultural green axis along the wadi forms a strong structuring

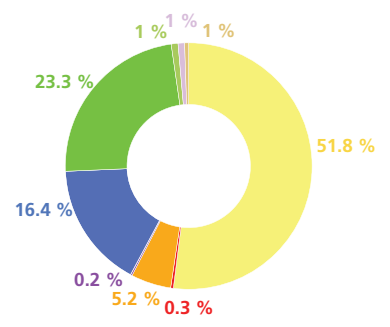
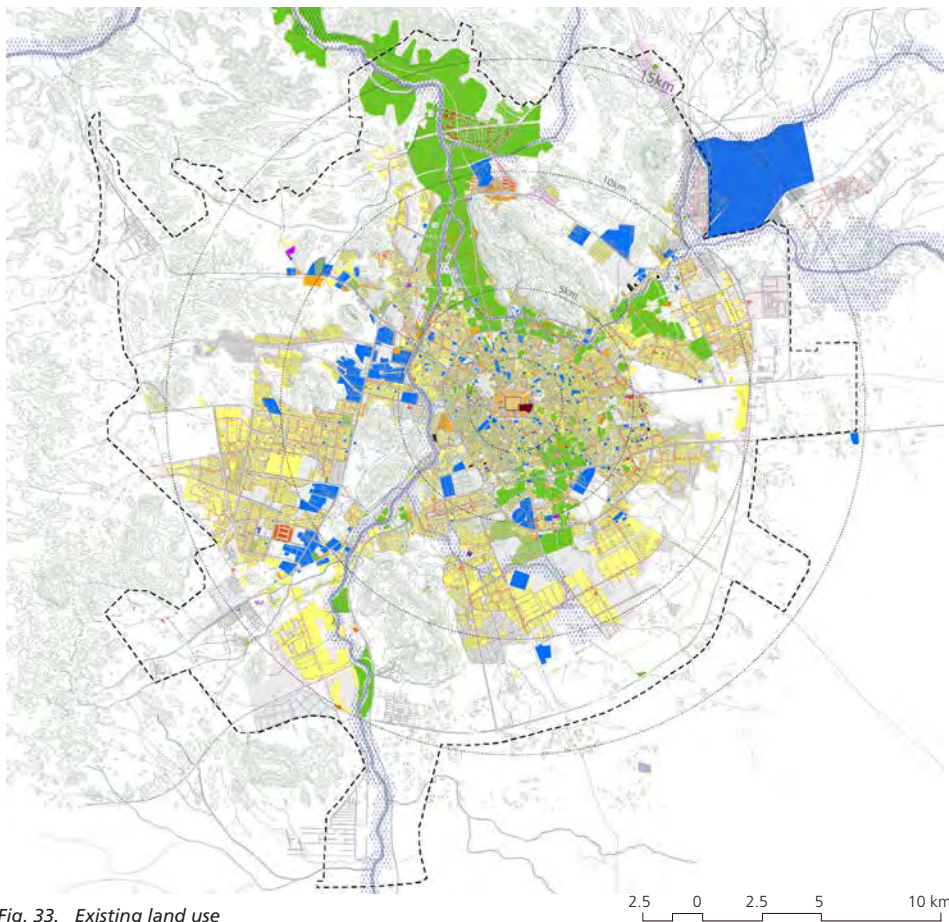
element for the city, although showing signs of deterioration, and the need for revitalisation. Despite the presence of a strong, green, agricultural backbone, the city is lacking public space and recreational areas as parks, public gardens, play areas, squares etc. The increase in the percentage of these kinds of elements was set as one of the priorities for the future vision by the Madinah Plan, but not yet implemented. The vacant land analysis indicates the availability of 12% of the overall developable land lies within the built-up area, which gives many opportunities for creating a network of public and green spaces.

New commercial centres are coming up along the 3rd Ring Road (King Abdullah Road), following the trend of allocating retail clusters along the main highways. This will further increase car dependency, negatively impacting small businesses and the local economy. Social and public facilities, like the Islamic University of Madinah, Taibah University, and some major medical and governmental services, are mostly concentrated within the 3rd Ring Road and along the Prince Naif Bin Abdulaziz Road. However, all the new city extensions beyond the 3rd Ring Road substantially lack services, which is evidence of socio-economic imbalance when accessing public facilities and services. In addition, hospitals and schools located within the 2nd Ring Road are working at over-capacity, while 35% of the population is more than 20-minute drive away from main public services, while the central area of the city remains the main economic core.



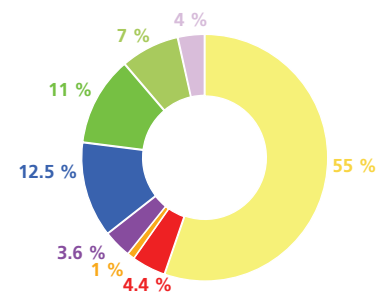
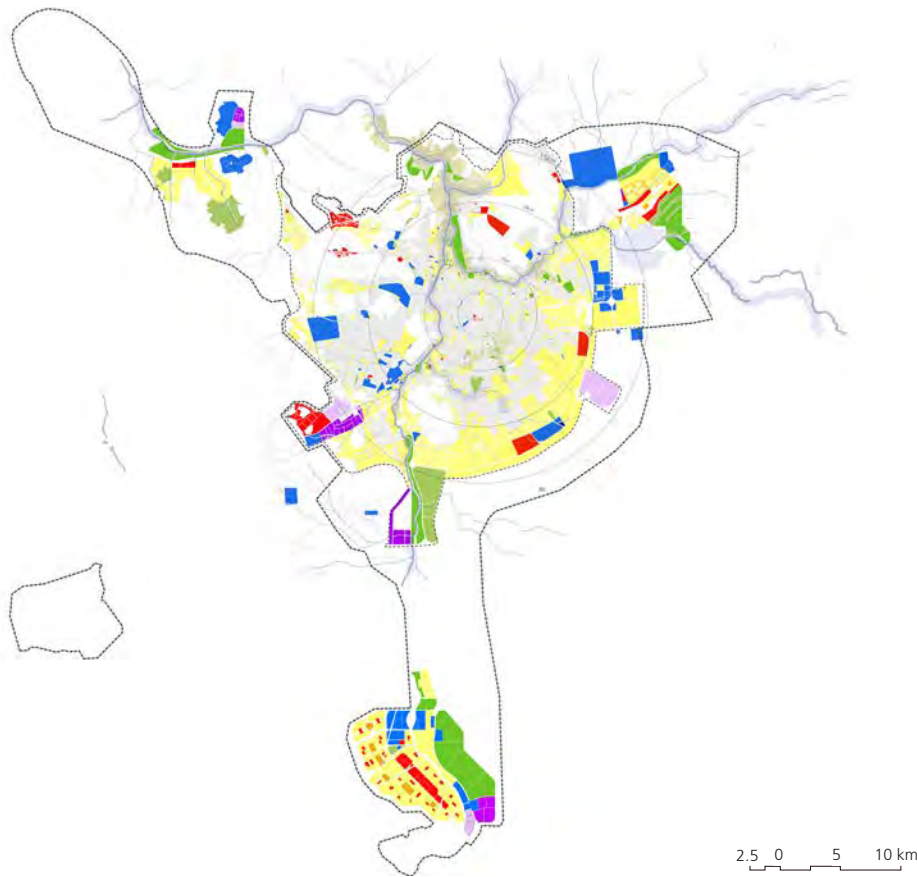
© Omar A.

Temporary markets represent an important economic activity for the city



- Residential
- Commercial
- Mixed-use
- Industrial
- Agriculture
- Public facilities
- Warehouses
- Parking area
- Open spaces
- Religious
- Cemeteries

Fig. 33. Existing land use



- Residential
- Commercial
- Industrial
- Warehouses
- Agriculture
- Open space
- Mixed-use
- Religious
- Cemeteries
- Public facilities

Fig. 34. Proposed land use according to the Madinah Plan by Amanah



The Future Land Use Plan, and part of the normative components of the Madinah Plan, indicates the development of new residential areas to the South, along the 1450 UGB, in an area free from topographic constraints, as well as a series of satellite developments beyond the 1450 UGB and within the development protection boundary, extending to the West, East and South. The proposed new Eastern development and the Southern satellite development along the wadi are currently under construction. Although provisions for these new development areas include secondary recreational and commercial services, they are distant from the urban core (30-40 kilometres away from the city centre), encouraging urban sprawl and putting additional pressure on the Madinah municipality in order to provide sufficient service infrastructure for these distant developments.

4.2.5 Vacant land

As previously highlighted, the current amount of vacant land within the 1450 UGB is 213 square kilometres, which is nearly 31% of the total area delimited by the same boundary. This considerable amount of vacant land is free from any constraints and suitable for development, which is both an opportunity for accommodating the city's population growth and, without appropriate policies, a dangerous situation possibly facilitating sprawled development. According to the Madinah Plan, the vacant land is already mostly planned for residential land use, represented by monofunctional clusters of condominiums and low-density suburbs. These types of development rapidly configure urban sprawl and polarisation of the urban form, making it difficult to provide good access to services and facilities, as well as to job opportunities, thus, increasing the car dependency of eventual residents.

UN-Habitat's 5 Principles for Sustainable Urban Development⁴¹ state that compact cities should aim at developing the recommended density of 150 p/ha. According to this parameter, if UN-Habitat's recommended density is applied to the present conditions of available urban space, the current amount of vacant land within Madinah could inhabit upto 3,195,000 people.

By 2030, Madinah is planning to develop an additional 731 square kilometres of the built-up area within the Development Protection Boundary, in order to accommodate an expected population of 2,064,000 people. Considering these numbers, the emerging average density on the total built-up area of the city would, at this point, be 28.2 p/ha, which is even lower than the current average density of 30.9 p/ha. The vacant land analysis shows that by applying the UN-Habitat recommended density of 150 p/ha, only one-fifth of the proposed amount of built-up area would be needed to accommodate the future population. The analysis also shows that the available vacant land within the 1450 UGB has all the capabilities to accommodate the expected future growth, while the land within the DPB should be preserved from any development, with the exception of agricultural uses.

In addition, the city of Madinah showcases nearly 12% of the total UGB available vacant land as residual land, located within its urban footprint, which is equal to 23.5 square kilometres. This land could be developed as mixed-use, public space, services and infrastructure for a better performance of the city, and to prevent and counteract the unsustainable sprawling trend and of forming monofunctional suburbs and satellite developments.

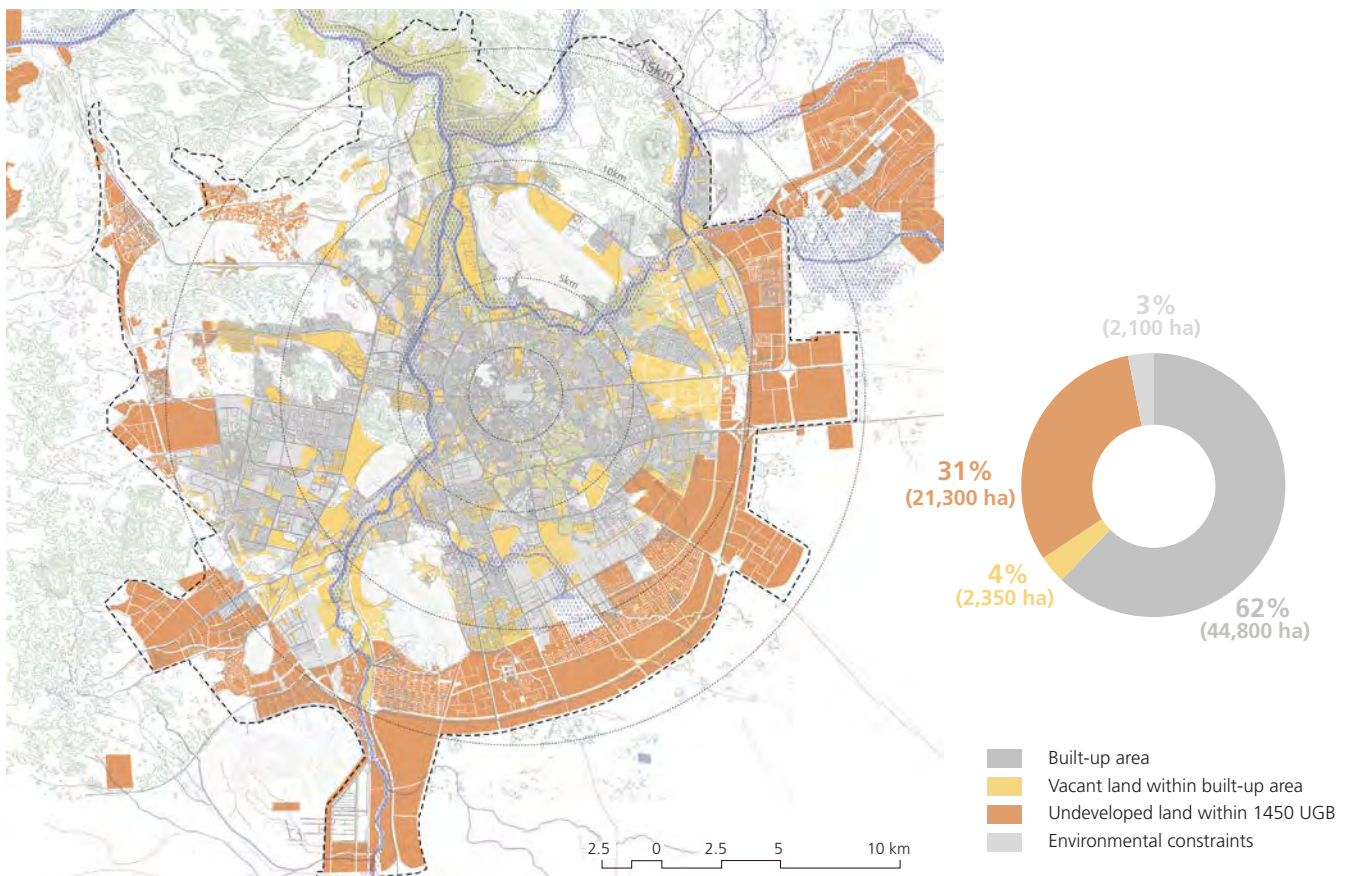


Fig. 35. Vacant land and undeveloped area



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New mixed use developments under construction



4.2.6 Unplanned settlements

Unplanned areas have been a significant concern for Madinah over the past decades. The majority of these areas are located within the 1450 UGB. The higher concentration of unplanned settlements is located within the 2nd Ring Road, around the Prophet's Mosque. Although they represent only 4% of the total urban footprint, they accommodate 17% of the total population. These areas are more densely populated than other parts of the city, showcasing an average density that exceeds 250 p/ha, overperforming even the UN-Habitat recommended density of 150 p/ha.

The largest percentage of the demographic is made of foreign workers, who mainly occupy units located within the 2nd Ring Road. As per 2010 (1431H) there was an estimate of 7 million foreign workers in Saudi Arabia (Arab News, 2010), and, per 2004 (1425H) census data, approximately 230,000 non-Saudi residents in Madinah, comprising 24% of the total urban population.⁴²

According to the recent Housing Plan study and part of the Comprehensive Plan for Al-Madinah Al-Munawwarah (2011), unplanned areas have inadequate municipal services, and weak public space and transportation systems, which affect the standards of living for its residents. The analysis of the community facilities available to residents, published by the UN-Habitat Urban Observatory in 2010 (1431H), indicates that that access to open space and community services significantly reduces within the 2nd Ring Road. Districts within these areas have less than 6 m²/p of open space available within 500 metres of distance. The study

concludes that the lack of necessary maintenance programmes dedicated to the upgrading of these parts of the city, together with poor buildings conditions, resulted in a rapid deterioration of the urban environment.

However, the urban morphology of the unplanned areas located within the central part of the city showcase different physical characteristics, presenting irregular and dense maze-like street networks, and parcels of different dimensions that are typical of the traditional Islamic urban pattern. Figure 37 indicates that these central areas, formed at the early stage of the city' development, have major historical value and tourism potential. Currently, though the term unplanned settlements in Madinah has been utilised to define both historical vernacular neighbourhoods in the central areas and the underdeveloped, overcrowded and unsafe neighbourhoods on the outskirts of the city. This current approach has caused, or cleared the way, for massive demolitions, making room for new hotels in historical, and/or vernacular areas of the city, since these neighbourhoods are not technically inscribed in any conservation plans.

Ultimately, the need for additional services for pilgrims and the continuous new developments of hotels and high-rise residential buildings are deeply changing the city, causing the disappearance of the vernacular and historical urban fabric in the central areas, and this is indeed a threat to Madinah's historical identity.

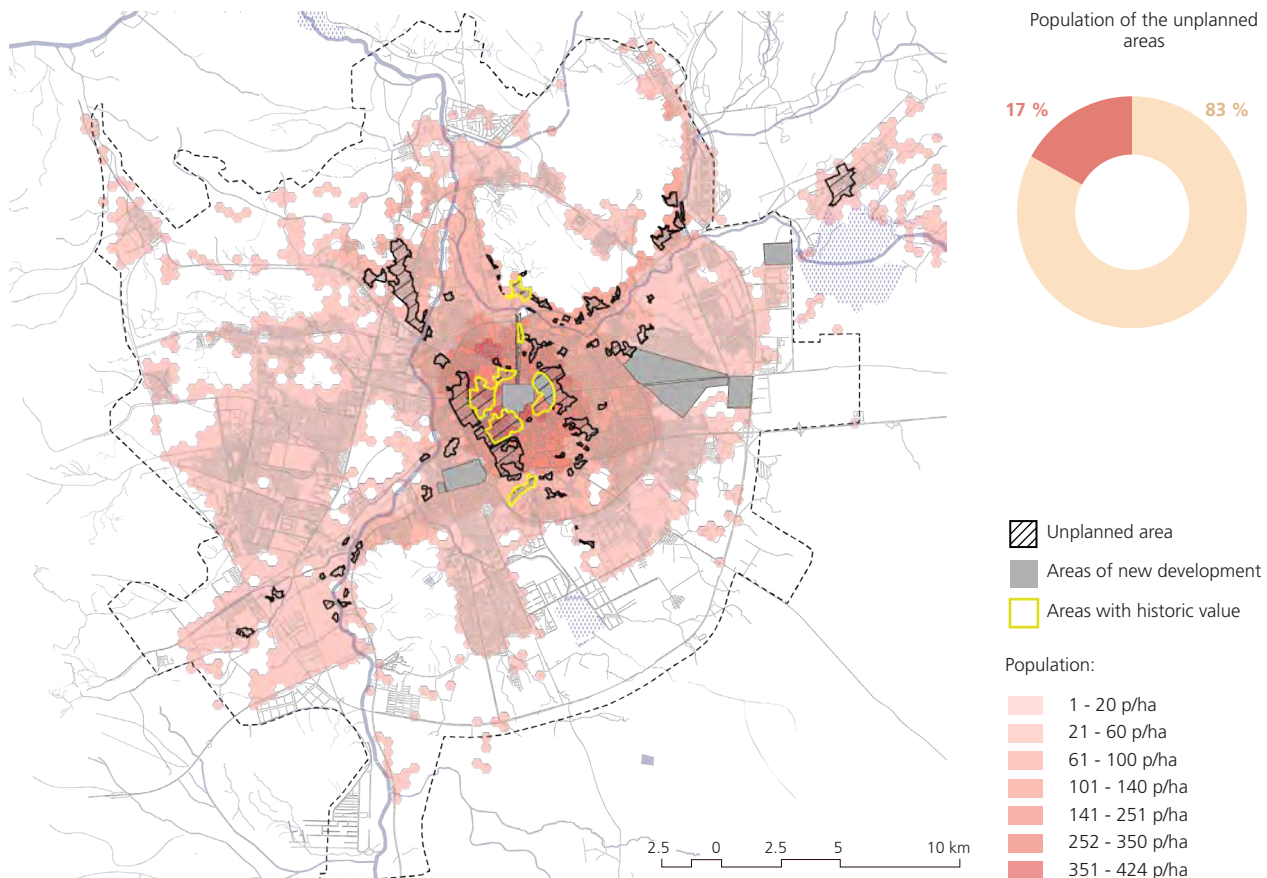


Fig. 36. Distribution of the unplanned settlements and their respective population density distribution

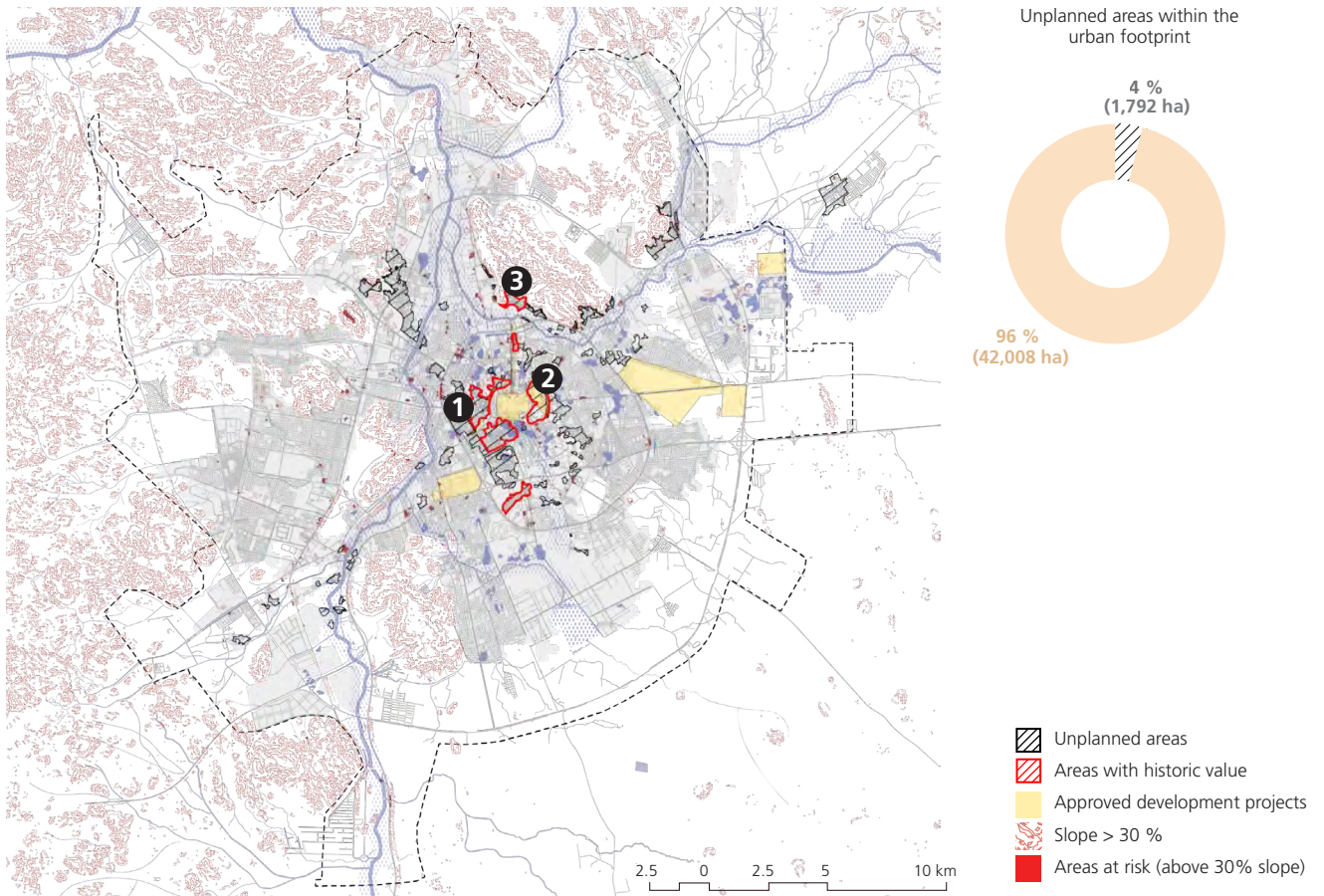


Fig. 37. Unplanned settlements with heritage potential and areas exposed to land-slope risk



1.

Heritage area with traditional historical urban fabrics



2.

Endangered historic vernacular urban pattern



3.

Unplanned area at risk of landslope



4.2.7 Accessibility to urban cores and facilities

Drivability

Madinah is similar to Makkah in terms of urban organisation. Both cities expanded radially from a centre representing the respective Holy site. The road network structure is formed by a set of three ring roads and series of radial arteries crossings them, to distribute the access to the different neighbourhoods of the city.

In order to test the overall accessibility by car to the city core, a study of the movement dynamics was performed, assessing the percentage of population within a 15-minute and 30-minute driving distance. The central area around the Prophet's Mosque was identified as the main attraction point to measure the accessibility to the core of Madinah.

The result of the accessibility study by private cars shows that 1,096,327 people have access to the city centre within a 30 minutes drive, which is nearly 79.1% of the total population, while 959,617 people have access to the central area within the 15-minute drive, which is the 69.3 % respectively. The analysis indicates that Madinah has very good access, as more than half of population resides at a 15-minute driving distance from the centre, and nearly the whole city is under 30-minute drive. This indicates that the city has an adequate provision of road infrastructure, with a well-defined hierarchy, that also indicates great potential for the development of an

efficient public transport system. However, the current public transport system is insufficient, especially when considering the significant expected population growth and the increase in the number of expected pilgrims by 2030.

The existing public transport system mainly consists of a limited urban bus service (SAPTCO), and it leaves large room for private taxis, whose market is not properly regulated. The registered taxi companies in Madinah are few, yet there is an informal taxi service (also called jitney) provided by private vehicles and accounts for nearly 20% of the total daily passenger/vehicle traffic. Amongst its recommendations, the Comprehensive Plan suggests to reform and regulate the taxi services, which would better serve the low-density areas beyond the 3rd Ring Road, currently lacking public transport connectivity and relying entirely on taxi services.

Unlike in Makkah, visitors influxes to Madinah are frequent throughout the year, with peak times being Ramadan and the days before and after Hajj, but more or less constant over the rest of the year. As such, Madinah needs more sustainable, long-term solutions to service the estimated total population, (resident and floating).

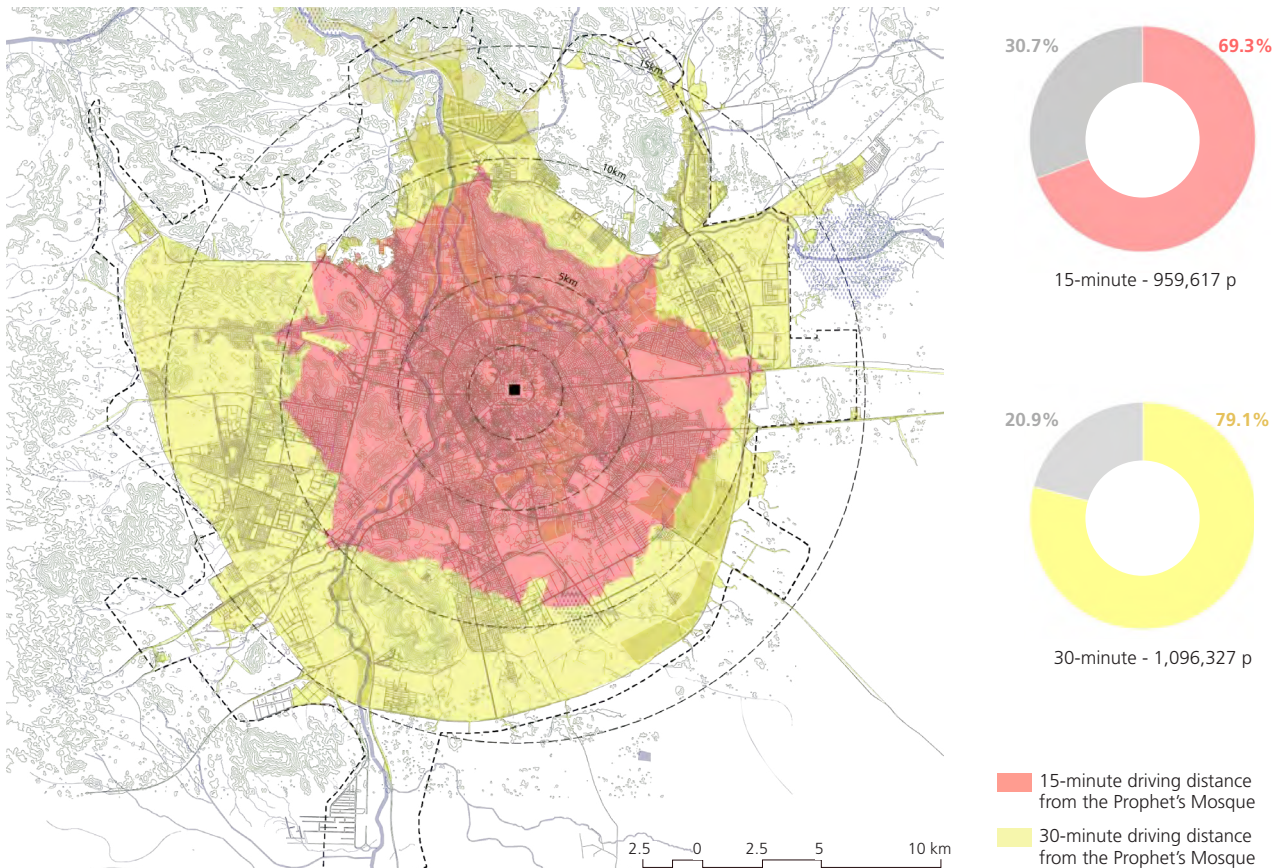


Fig. 38. Driving accessibility to the Prophet's Mosque



© Shutterstock

King Fahd Road to the Prophet's Mosque (Al-Masjid An-Nabawi)



Walkability

Though the hierarchy of roads in Madinah is well-defined, the pedestrian connections remain insufficient. To evaluate the dynamics of accessibility to the city cores by walking distance, three main urban cores were identified based on the concentration of facilities and services:

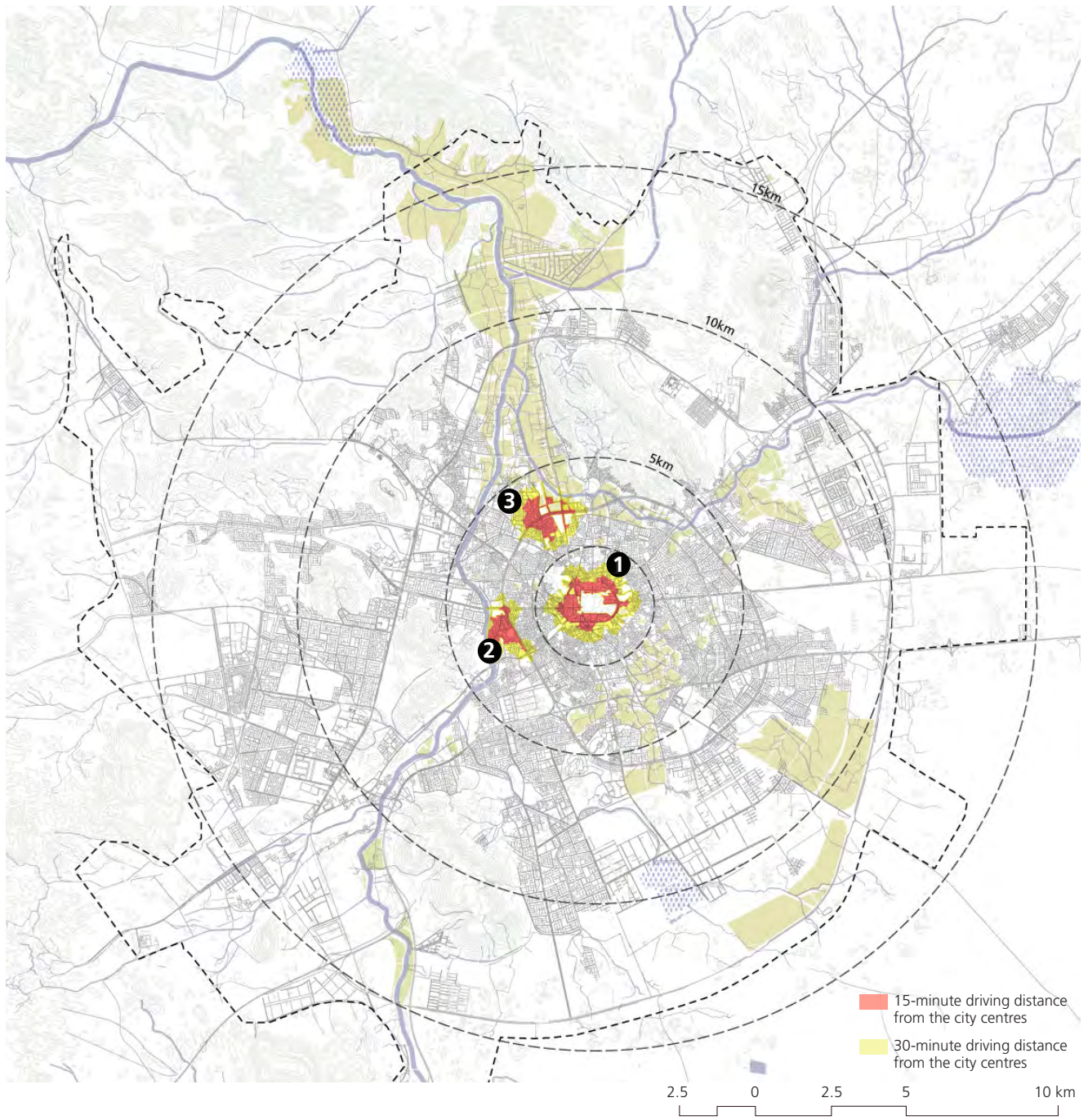
- The central area within the 1st Ring Road around the Prophet's Mosque, where the high rise hotels and various commercial functions are located. The accessibility analysis was carried out by considering the main concentration of the commercial and mixed-use functions, assuming that the actual city centre is a purely religious location. The analysis shows that 49,729 people have access to this area within a 5-minute walking distance, which is equal to 3.6% of the total population, while the same areas is accessible to 109,600 people within a 10-minute walking, equal to 7.8% of the population.
- The concentration of commercial functions along King Abdullah, the 3rd Ring Road Road, to the West of the Prophet's Mosque. This area consists of several markets, shopping malls, and small stores. The analysis shows that 19,181 people have access to this area within a 5-minute walking distance, equal to 1.4% of the total population, and that 45,086 people can access the same area within a 10-minute walking distance, equal to 3.3%.

- The area located along the 3rd Ring Road, King Abdullah Road, to the North of the Prophet's Mosque, showcasing a concentration of commercial areas with several shopping malls. The analysis shows that 22,783 people have access to this area within a 5-minute walking distance, equal to 1.6% of the total population, while 40,203 people can access it within a 10-minute walking distance, equal to 2.9% of the population.

Overall, the analysis highlights how the pedestrian domain is more developed within the central area of Madinah, because of the well-defined and better-structured system of pedestrian connections, while other urban cores should be more integrated with the rest of the city, and be more accessible for its citizens.



Pedestrian dynamics at The Haram Plaza next to The Prophet's Mosque



1.

The central area within the 1st Ring Road



2.

Area along King Abdullah, the 3rd Ring Road road, to the West of the Prophet's Mosque



3.

The area located along the 3rd Ring Road, King Abdullah Road, to the North of the Prophet's Mosque

Fig. 39. Driving accessibility to the commercial city centres



4.3 Assessment of Future Plans

4.3.1 *The Comprehensive Plan of Al Madinah Metropolitan Area*

In 2008, the Development Commission of Al-Madinah Al-Munawwarah, now known as the Madinah Development Authority, appointed a team formed by the MMM Group Limited and Moriyama and Teshima Architects to prepare a 30 year Comprehensive Plan for Madinah.

In addition to an overall future vision for the future development of Madinah, the plan provides key recommendations for different technical aspects, combined into detailed sector-based reports:

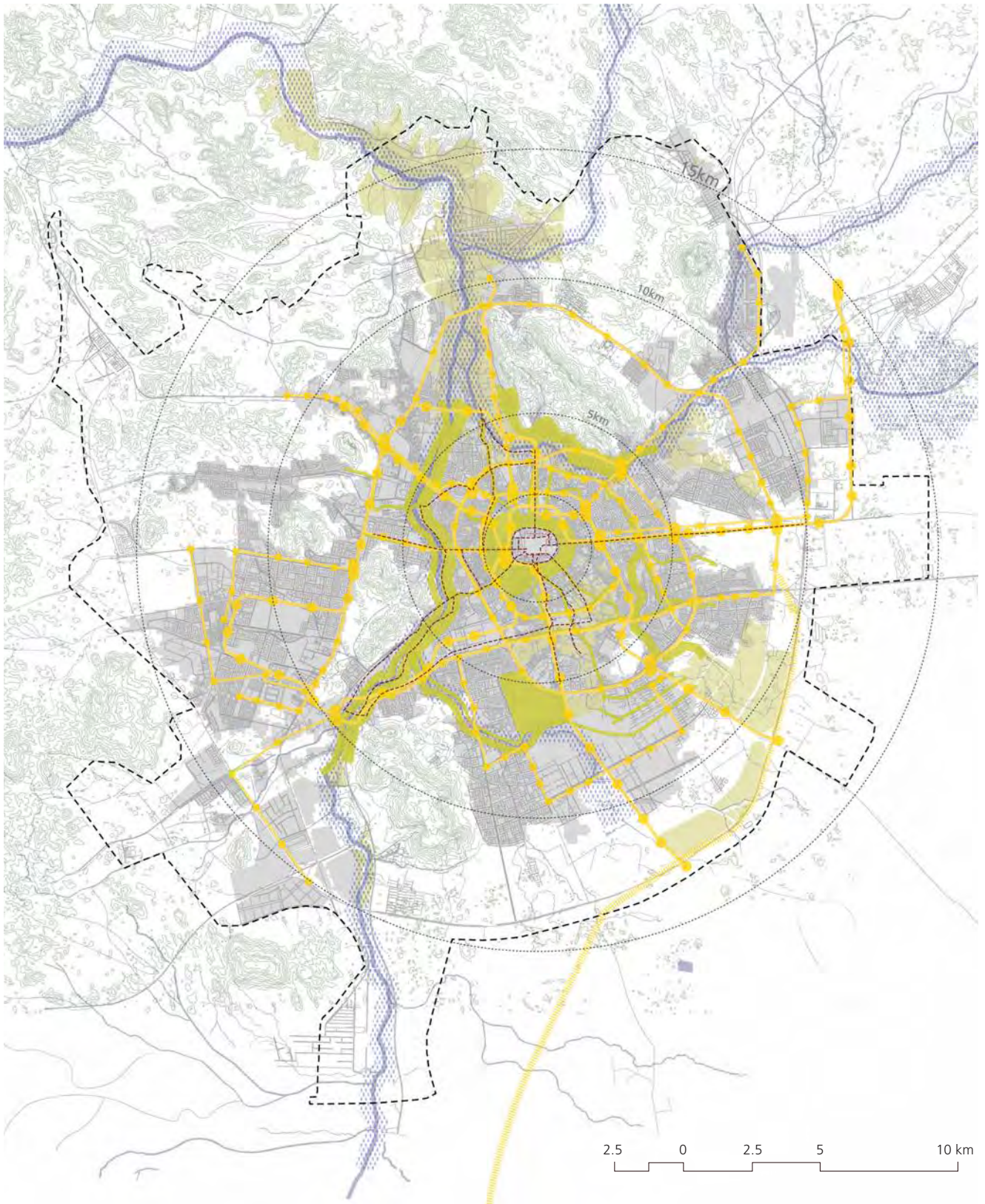
- Economic Development and Investment;
- Environment;
- Expansion of the Holy Mosques;
- Land Use;
- Approved and Proposed Development Projects (Megaprojects);
- Housing Plan;
- Community Facilities Plan;
- Transportation Plan;
- Infrastructure Plan;
- Urban Development Regulations; and
- Urban Design and Architectural Guidelines.

Amongst the main innovations, there is the introduction of the concept of Nodes and Corridors, aimed to rebalance density distribution and to provide opportunities for a targeted investment intended to trigger economic development. The proposal was supported and integrated by a public transit system, to improve the overall connectivity and accessibility. The plan also focuses on the revitalisation of unplanned areas, establishing green and pedestrian infrastructure, integrated with the others city's environmental features. Overall the plan is well-structured, and developed around three main characteristics:

- Broad in extent – the plan covers the entirety of an urban area, from the rural fringes through to the central area;
- Broad in scope – the plan encapsulates all aspects that structure the urban form, from the geology of the landscape to the water infrastructure servicing the various neighbourhoods;
- Broad in timeline – the plan provides direction for a long-term temporal horizon covering 30 years; and
- This means that while the plan is well-structured and detailed, it still maintains a certain degree of flexibility that can help in its incremental implementation.



Iconic view on *The Uhud Mountain*

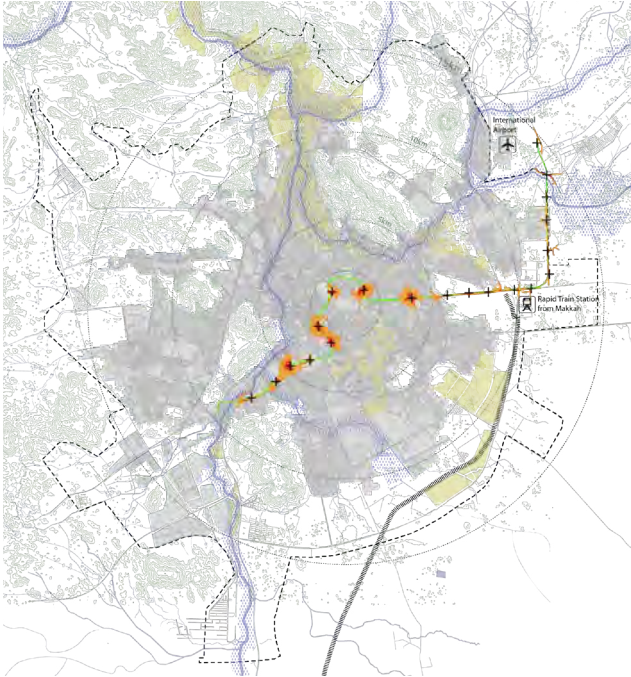


- Proposed green network
- Proposed pedestrian pathways
- Proposed public transport network

Fig. 40. Comprehensive Plan for the Madinah Metropolitan Area with the proposed public transport and green network



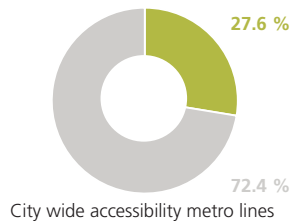
Metro Line Phase I: 34 km and 20 stops



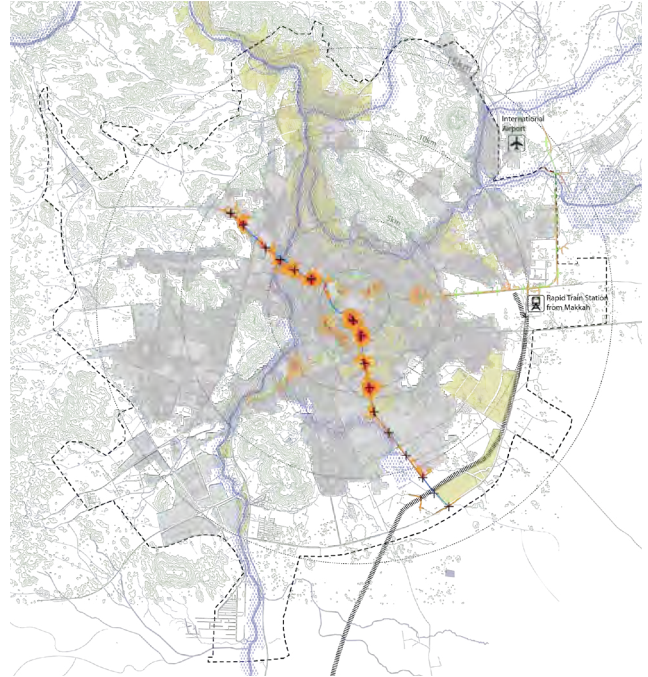
PEOPLE SERVED BY PHASE I

5-minute walking distance
184,231 - 13.3 %

10-minute walking distance
382,313 - 27.6 %



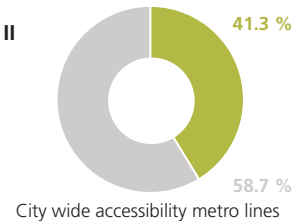
Metro Line Phase II: 22 km and 19 stops



PEOPLE SERVED BY PHASE II

5-minute walking distance
155,142 - 11.2 %

10-minute walking distance
299,201 - 21.6 %



4.3.2 Public Transport Accessibility Analysis

According to the above-mentioned Comprehensive Plan, the city of Madinah is planning to build an intermodal Smart Mass Transport System by the year 2020. The intermodal proposal includes three Metro lines, two Bus Rapid Transit (BRT) lines, four Express Bus Routes, and seven Feeder Bus Routes.

The proposed Smart Transport System would have a significant impact on the city's mobility patterns, facilitating economic development in intermodal nodes, ensuring better access to education, jobs, and public services, reducing energy consumption and environmental impact related to mobility. In November 2013 the Saudi Government approved the project of the metro which, following the plan, will be built in eight years. The proposed metro system is a high capacity urban transport infrastructure that aims to form the backbone around which the rest of the public transport network will be organised. This new metro system is a part of an ambitious plan initiated over the past few years by Saudi Arabia to utilise 100% of public funding to develop and modernise its transport infrastructure. The project committee was led by the same Governor of Madinah, Prince Faisal Bin Salman.

The new Metro System, expected to be opening in 2020, will be implemented in two phases, covering a total path of 95 kilometres in length, of which 25 kilometres is underground and 48 kilometres over the surface, through a Green, a Blue, and a Red line:

- Green Line (Line I): Will be running over 34 kilometres, from

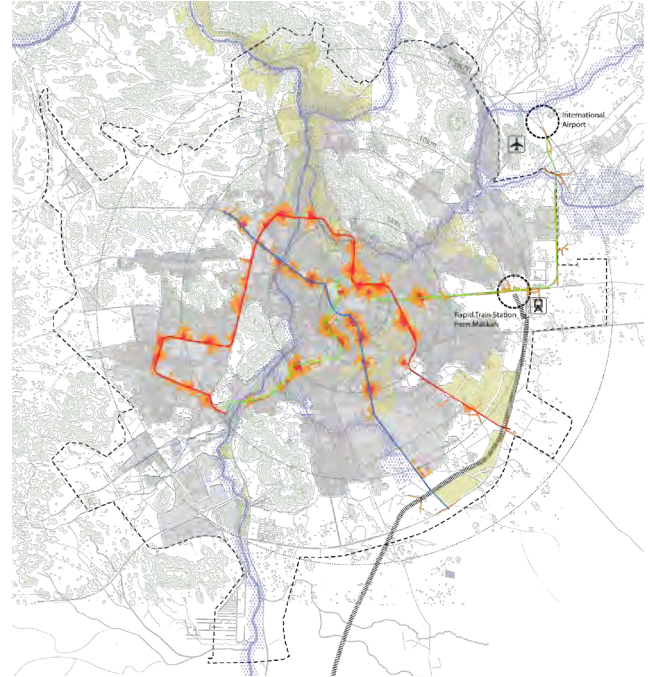
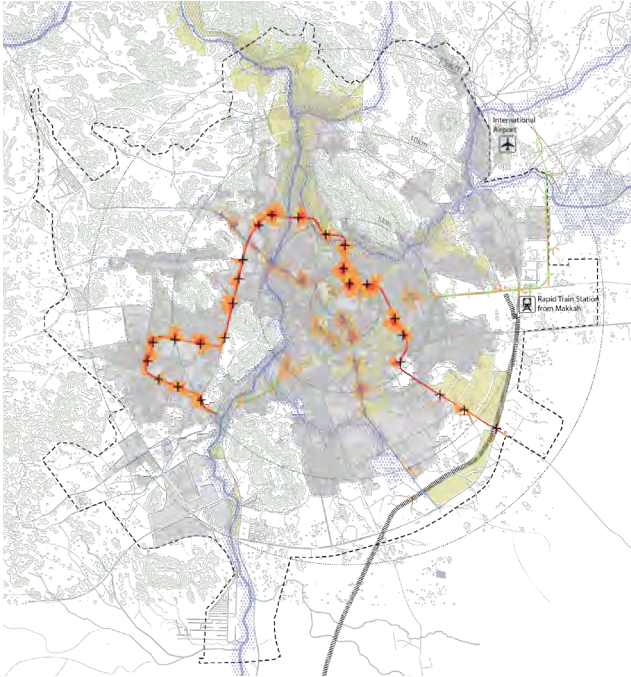
the North to the West of the city, connecting the airport and the Al-Haramain train station, and crossing the central part of the city to the North of the Prophet's Mosque. Following our analysis, this line will serve 27.6% of the existing population within a catchment area considered over a 10-minute walking distance.

- Blue Line (Line II): Will be running for 22 kilometre, from the North to the new development areas in the South, passing through the central area to the West of the Prophet's Mosque. Following our analysis, this line will serve 21.6% of the existing population within a catchment area considered over a 10-minute walking distance.
- Red Line (Line III): Will be running for 40 kilometre, from the Western area where several new developments are located to the Eastern side of the city, crossing the central area to the East of the Prophet's Mosque. Following our analysis, this line will serve 23.5% of the existing population within a catchment area considered over a 10-minute walking distance.

Overall, about half of the total current population would gain access to public transport thanks to the implementation of the foreseen metro system, without even considering the BRT lines, the Express Bus, and the Feeder Bus routes.



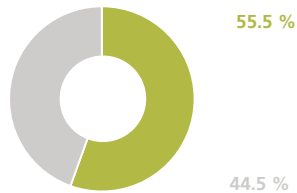
Metro Line Phase III: 40 km and 31 stops



PEOPLE SERVED BY PHASE II

5-minute walking distance
178,690 - 12.9 %

10-minute walking distance
325,520 - 23.5 %



City wide accessibility metro lines

- Al-Haramain railway (Madinah-Jeddah-Makkah)
- Proposed metro lines
- 5-minute walking distance metro stop from metro stop
- 10-minute walking distance metro stop from metro stop
- Regional transportation hubs



© FSCP

Vehicle and pedestrian routes leading to the heart of Madinah - The Prophet's Mosque



4.3.3 Urban density scenario

Crosscutting the diagnosis of the current urban conditions and the approved/submitted projects proposals, FSCP operated a scenario-analysis for increased urban density, according to various choices. The scenarios depict three conditions: the current situation, the situation developed in line with the approved planning instruments, and a situation where density distribution is allocated following the City Profile's recommendations, and based on the UN-Habitat recommendations.

The UN-Habitat scenario is based on the Five Principles for Sustainable Neighbourhood Planning, which are as follows:

- Adequate space for streets and an efficient street network: The street network should occupy at least 30% of the land and at least 18 kilometres of street length per square kilometre,
- High density: At least 15,000 p/km², that is 150 p/ha or 61 p/acre,
- Mixed land use: At least 40% of floor space should be allocated for economic use in any neighbourhood,
- Social mix: The availability of houses in different price ranges and tenures in any given neighbourhood to accommodate different incomes; 20% to 50% of the residential floor area should be for low-cost housing, and each tenure type should be not more than 50% of the total,
- Limited land use specialisation: This is to limit single function blocks or neighbourhoods; single function blocks should cover less than 10% of any neighbourhood.

Current Condition

The current population in Madinah is 1,385,192 people, occupying a built-up area of 44,800 hectares. This generates a population density of 30.9 p/ha, which is considerably low when compared to the UN-Habitat recommended density of 150 p/ha.

Scenario 1: The Madinah Plan

According to the trends documented by the Comprehensive Plan and the Madinah Plan provided by the Amanah, the planned built-up area is supposed to increase to 73,128 hectares, hosting a population of 2,064,000 people by the year 2030. Even with the substantial increase of population, the overdimensioned expansion area will substantially bring down the urban density, which, only considering the built-up area, will be reaching 28.2 p/ha, demonstrating how this plan promote sprawled, low-density development.

Scenario 2: UN-Habitat Recommendations

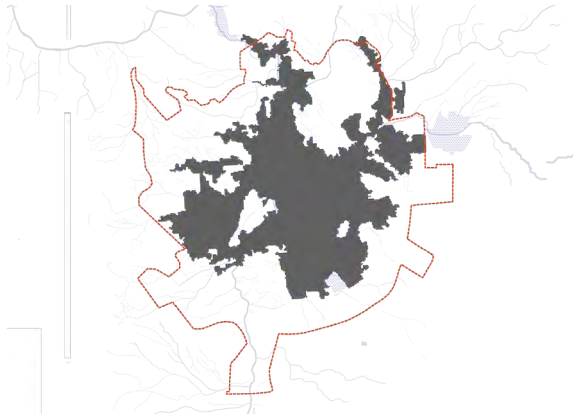
The UN-Habitat scenario supports sustainable neighbourhood planning for the Holy City, starting from promoting an increased density, in line with the average UN-Habitat recommended density of 150 p/ha. Considering the current growth rate, and a consequently increased population of 2,064,000 by 2030, the additional built-up area needed to fulfill the city's future growth would only be 13,760 hectares, which is only one-fifth of the proposed built-up area considered in Scenario 1.





A small market place next to Sayed Al Shuhada Mosque




CURRENT CONDITION

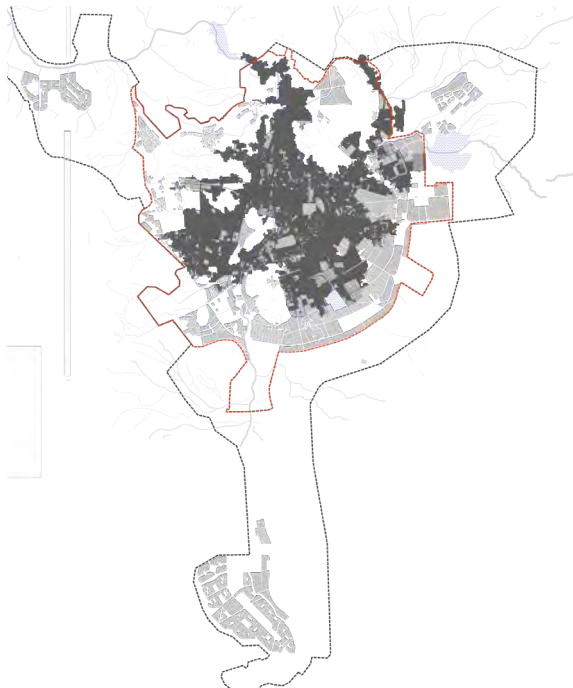


population  **1,385,192**

built-up area  **44,800 ha**

average density on built-up area  **30.9 p/ha**

SCENARIO 1: THE MADINAH PLAN




population  **2,064,000**


planned built-up area  **73,128 ha**


average density on planned built-up area  **28.2 p/ha**


SCENARIO 2: UN-HABITAT RECOMMENDATIONS



population  **2,064,000**

built-up area needed according to UN-Habitat recommendations  **13,760 ha***

vacant land needed to accommodate population growth  **4,525 ha**

average UN-Habitat recommended density  **150 p/ha**

* 1/5 of the built up area proposed by the Madinah Plan



4.4 Environmental and Climate Change Risk Implications

4.4.1 Encroachment on natural topography

Madinah City is located in a very prominent landscape surrounded by mountains, wadis, and agricultural fields, but is also characterised by the presence of volcanic cones, fault-lines, and craters. All these significant natural elements need to be protected and considered as important constraints for the existing urban area and its future growth, by demarcating suitable areas for development that does not encroach on them and influence construction standards in their proximity.

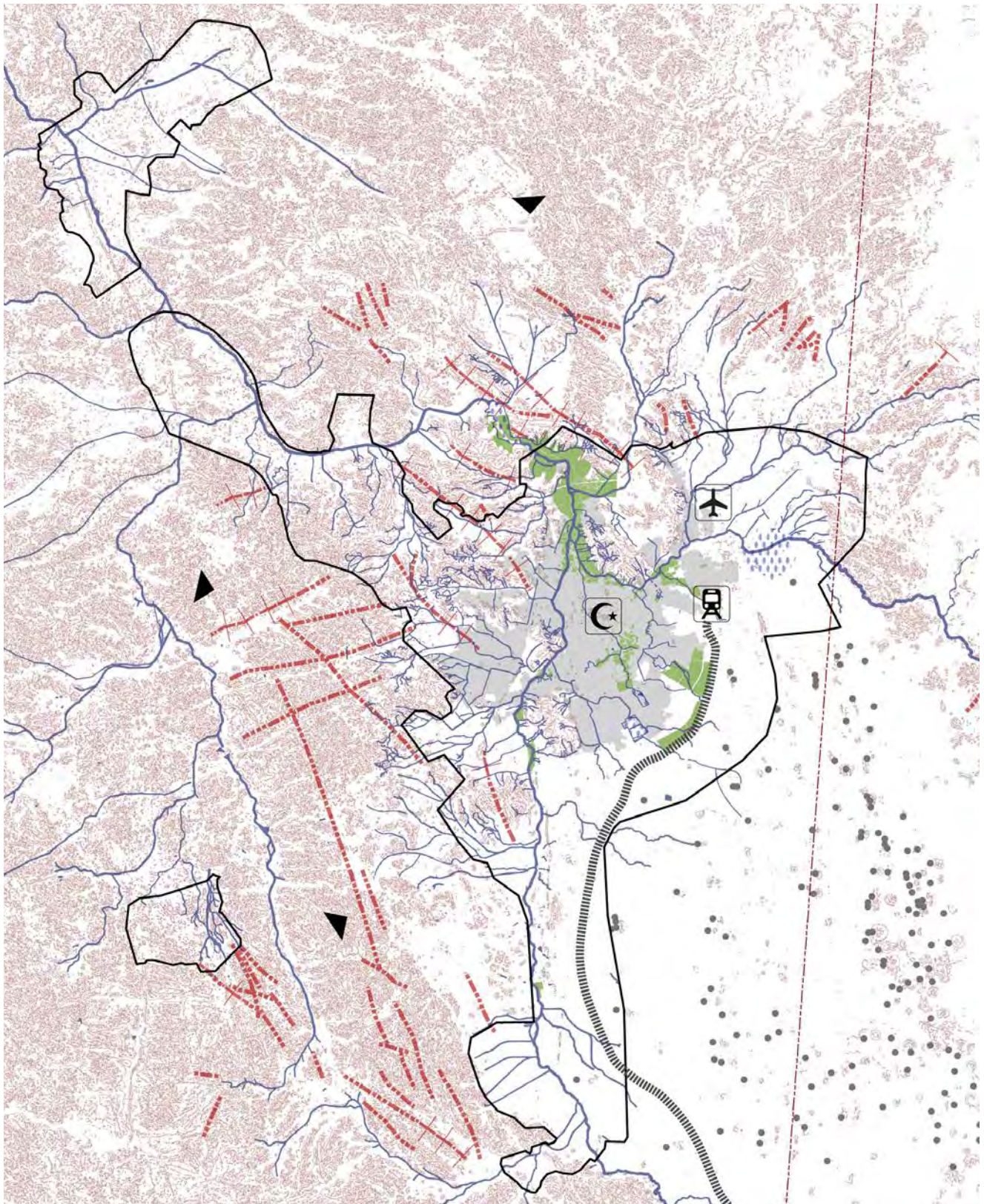
Because of the articulated topography, the whole area presents steep slopes. In order to protect the mountainous surfaces, preventing construction on possibly prone-risk surfaces, and to maintain the overall landscape's characters, appropriate development criteria should be set in place in relation to the topography. As such, areas with slopes lower than 20-30% could allow development to take place, whereas on areas reaching 30% slope a series of restrictions should be detailed, and on areas with slope higher than 30-40% development should not be allowed. In order to spatially identify the different constraints, slopes higher than 30% have been mapped along with volcanic cones and fault lines in figure 42, including the 600 kilometres long Arabian Shield uplift going from Makkah to Nafud, and known as the MMN Line.

The map showcases how the city DPB is limiting expansion towards the Southeast, where the MMN line and the volcanic area are, as well as towards steep slopes, also avoiding proximity to the existing faults. This is important as it prevents possible risks related to seismic and volcanic activities. The map of the built-up area also shows how the city is nestled between the foothills of the surrounding mountains, which occupy 28% of the land in the city, and that development has in many cases encroached these foothills. The spatial implication of this encroachment is the intensification of the natural flow of stormwater flowing down into the city, increasing the risk of flash floods. Additionally, many residential areas have been built alongside and within the waterbed of some traditional natural waterways, which is shown by the fact that in Madinah, many of the streets lie over ancient wadis and minor natural waterways.

This exemplifies how the city has lacked adequate regulatory development in relation to its natural environment. The inappropriate urbanisation of these natural elements hinders their ecological functions, contributing to the pollution of soil and water resources, and affecting biodiversity. It also triggers risks towards the population in various ways, from flooding to general health. Taking into account the increasing population growth in Madinah, regularising development on hillsides and along wadis through buffer zones and integrative ecological planning will help to protect natural resources and the environment in general, but will also improve aspects related to safety and quality of life for the residents.



Desert landscapes are part of the environmental system of the city



- | | | | |
|--------------------|--------------------------|--|------------------------|
| Agricultural areas | Wadis to be protected | Volcanic line
<i>Makkah-Madinah-Nafud</i> | The Prophet's Mosque |
| Built-up area | High-speed train railway | Volcanic cones | Existing airport |
| Slope > 30 % | Fault lines | Prevailing wind | Existing train station |

Fig. 41. Environmental elements and topographic constraints



4.4.2 Loss of agricultural land

Due to the natural topography, rainfall tends to move directly towards the centre of Madinah flowing along the wadis crossing the city. As described in the previous sections, these wadis provide high-water table levels and highly fertile soil that allow the development of agricultural land, which accounts for 8% of the land within the consolidated city. However, several plans, including the Regional Plan, have proposed the conversion of agricultural land to residential, and other land uses⁴³. Fertile and productive cropland in the Kingdom is rare, and the loss of this resource is irreversible. The Normalized Difference Vegetation Index (NDVI) study, part of the Comprehensive Plan and based on a comparison of vegetated areas (agricultural fields and green spaces) between 1985 and 2010, highlighted that Madinah has lost approximately 8.553 hectares of vegetated areas and gained 1367 hectares of newly vegetated areas, with a final net-loss of 7.186 hectares (287ha/year).

In order to understand these dynamics, the wadis, the agricultural land, and the net-loss of vegetated land have been mapped. Figure 43 illustrates how the agriculture development is traditionally located along the wadis, contributing to the linkage of the blue-green networks which, in turn, enhance the landscape productivity of Madinah. The map also shows how the majority of the net-loss of vegetated areas is related to existing agricultural land. It is paramount for the future development of the city that the importance of protecting and enhancing both the blue and green natural infrastructure is understood, not only because of increased productivity but also as a natural protection measure against risks such as flash-floods or droughts. Development should be managed with the goal of preserving and restoring these natural features, as to maximise the benefit of such a rich and fertile environment in an otherwise arid region. Reinforcing these natural systems

by protecting the wadis and the agricultural land wherever it is possible, and integrating, both spatially and functionally, these elements with the urban fabric will help re-establishing a better balance and a positive interaction between the built and the natural environment.

Such interactions can be restored starting with prohibiting development on land that is suitable for agriculture and in parallel promoting more sustainable ways of irrigation, like drip irrigation systems, which are highly efficient in arid climates with high evapotranspiration factor. In comparison to surface irrigation⁴² systems, which are the common practice, up to one-fourth of the water used to irrigate the same crops can be saved by using drip irrigation. Another way of promoting and reinstating these linkages is through a strategy envisaging the implementation of a system of multifunctional public space along the wadis. Not only would this approach improve the quality of life but also help to reduce the increasing temperatures due to climate change and concrete development while providing a substantial increase in public space in the city. Currently, only 1% of the city's land is devoted to public space, which is way below the recommended standard of 9m²/person. Ultimately, promoting such interventions could improve the overall walkability in the city, creating continuous, walkable, and green elements crossing the city and connecting the different neighbourhoods, reducing car-dependency, decreasing pollution, and promoting a healthier urban environment. This is quite an important, given the fact that the government's General Environmental Law and Rules for Implementation recognise fuel combustion, along with industrial zones and widespread small industries in urban areas, as a major source of emissions, which are almost 66% of carbon monoxide and 50% of hydrocarbons and nitrogen oxides.⁴⁴



1.

Agricultural land and current urban pattern



2.

Agricultural land and emerging new development



3.

Unplanned area at risk of flooding

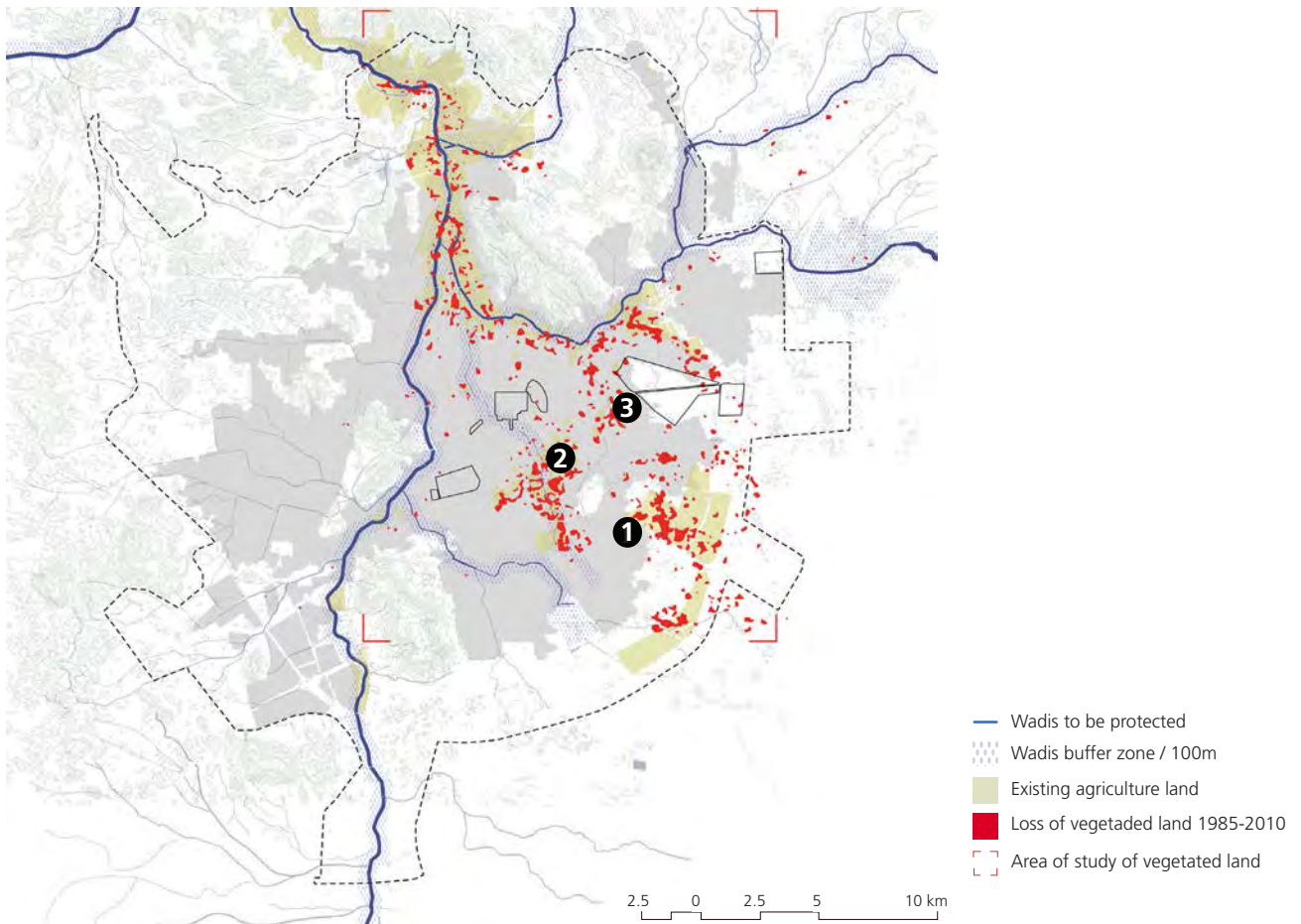


Fig. 42. Loss of vegetated land from 1985 to 2010

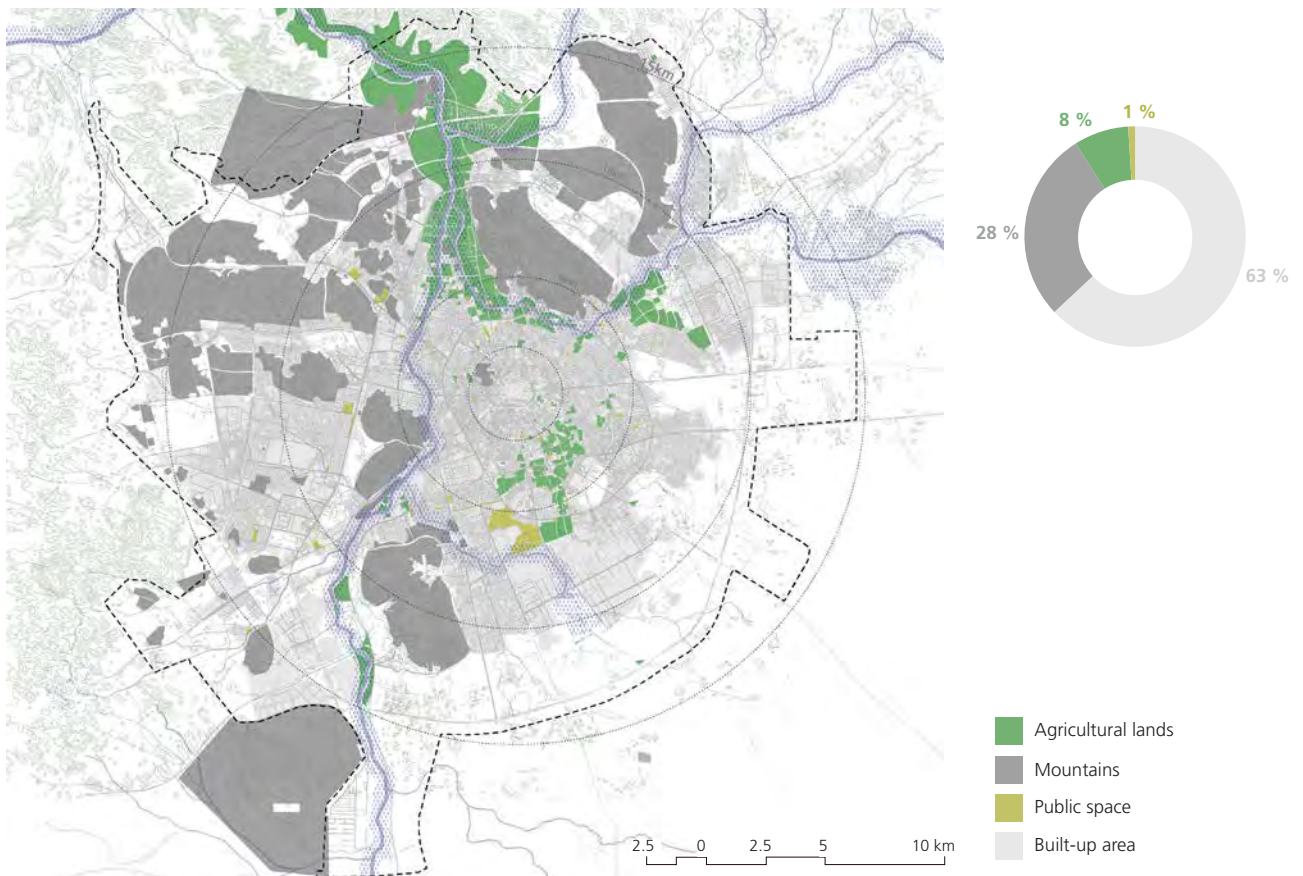


Fig. 43. Topography and green spaces



4.4.3 Loss of freshwater

The climatic conditions in Saudi Arabia result in water scarcity, with an availability of less than 1,000 cubic metres of water per person per year, and reduced green cover. The environmental features previously described coupled with the unsustainable urbanisation and inadequate infrastructure are putting pressure on the already limited water resources. Due to this constraint, a big percentage of water consumption comes from desalination plants. However, it is important to notice that in Saudi Arabia more than 80% of greenhouse emissions come from the energy sector, out of which desalination processes represent 12% of CO₂ emissions.⁴⁵ Shifting current growth trends and consumption patterns in order to incorporate natural water features and ecosystems dynamics is fundamental to make better use of existing resources and prevent pollution.

Also in Madinah, the freshwater supply comes from two sources:

- Desalination plants located on the Red Sea coast, and
- Groundwater wells from shallow aquifers, contributing with 14% of the total water supply.

Groundwater sources have been used at unsustainable rates, which means that aquifers are being depleted faster than they can be recharged. The current use-patterns are affecting the overall renewable water resources per capita, which are dropping at an annual rate of 2%,⁴⁶ due to both unsustainable consumption and increasing population growth. Water demand is outpacing supply, and with local aquifers being depleted by development. Madinah will increasingly be required to fully rely upon costly desalinated water imported from the Red Sea.

In figure 45 water infrastructure, including the stormwater system of the city along with the existing dams, has been mapped. The map shows that the city centre is equipped with underground drainage, whereas the rest of Madinah has open canalizations. Still, a large part of the urban area is not yet covered with stormwater drainage. Through mapping the water network, it appears clear that the high number of wadis that have been canalised because of urbanisation. Not only does this reduce the possibility of recharging water tables or reusing water for irrigation of public spaces and agriculture, but it also increases flood-risk, if not well planned. In spite of the little rain in Madinah, storms are becoming stronger due to climate change, increasingly generating flash-flood episodes. During these events, wadis that remain dry most of the year are rapidly filled beyond their capacities. This, coupled with the encroachment and impermeabilisation of the natural

waterways, which limits their infiltration and bearing capacity, has resulted in increasing floods in the city. Assuming an average impervious surface ratio of 40% for the entire city, approximately 3.5 million cubic metres of rain falls on Madinah every year that is not captured or stored for use.⁴⁷

The existing stormwater drainage system has proven to be inadequate for dealing with the increased inflows of water due to deficient design and lack of maintenance. This is having large impacts on the vulnerability level of the population. An estimation of affected areas and infrastructure has been performed and mapped, based on a buffer zone of 100m to the wadis, (a more detailed study is required). As per the analysis, the figures that are indicating flood-risk areas are as follows:

- 32% of existing road infrastructure,
- 10% of the built-up area,
- 30% of the proposed development, and
- 70% of the unplanned areas.
- This implies a big threat to the city's socio-economic resilience.

Another challenge for the city regarding water management, concerns drinking and waste-water systems, which present a significant water loss and severe water leakage rates, and is estimated to be between 27-30%,⁴⁸ with the efficiency of the current water network estimated to be around 59%. This not only implies the pollution of soil and groundwater resources but also generates an increasing problem in Madinah, the Shallow Water Table Rise (SWTR). The central area is especially affected by this phenomenon, and the social, environmental, and structural risks that result from SWTR are a major concern. This phenomenon is also increased by the large underground parkings that were built in the last expansion of the Mosque. The underground barriers most likely blocked water flow in the area which contributed to its uprising.⁴⁹

Ultimately, all the features presented above highlight the urgency for a better water management approach, based both on improved infrastructure and on the promotion of a different development approach, aimed at better incorporating the natural system of wadis and minor water flows within the city. It is clear that natural dynamics play a key role in our built environment, and strongly impacts the city and its inhabitants. Therefore, they ought to be integrated into decision-making processes in order to increase infiltration, facilitate water recharge, promote green areas, make efficient use of resources, reduce flood risk, and increase resilience.

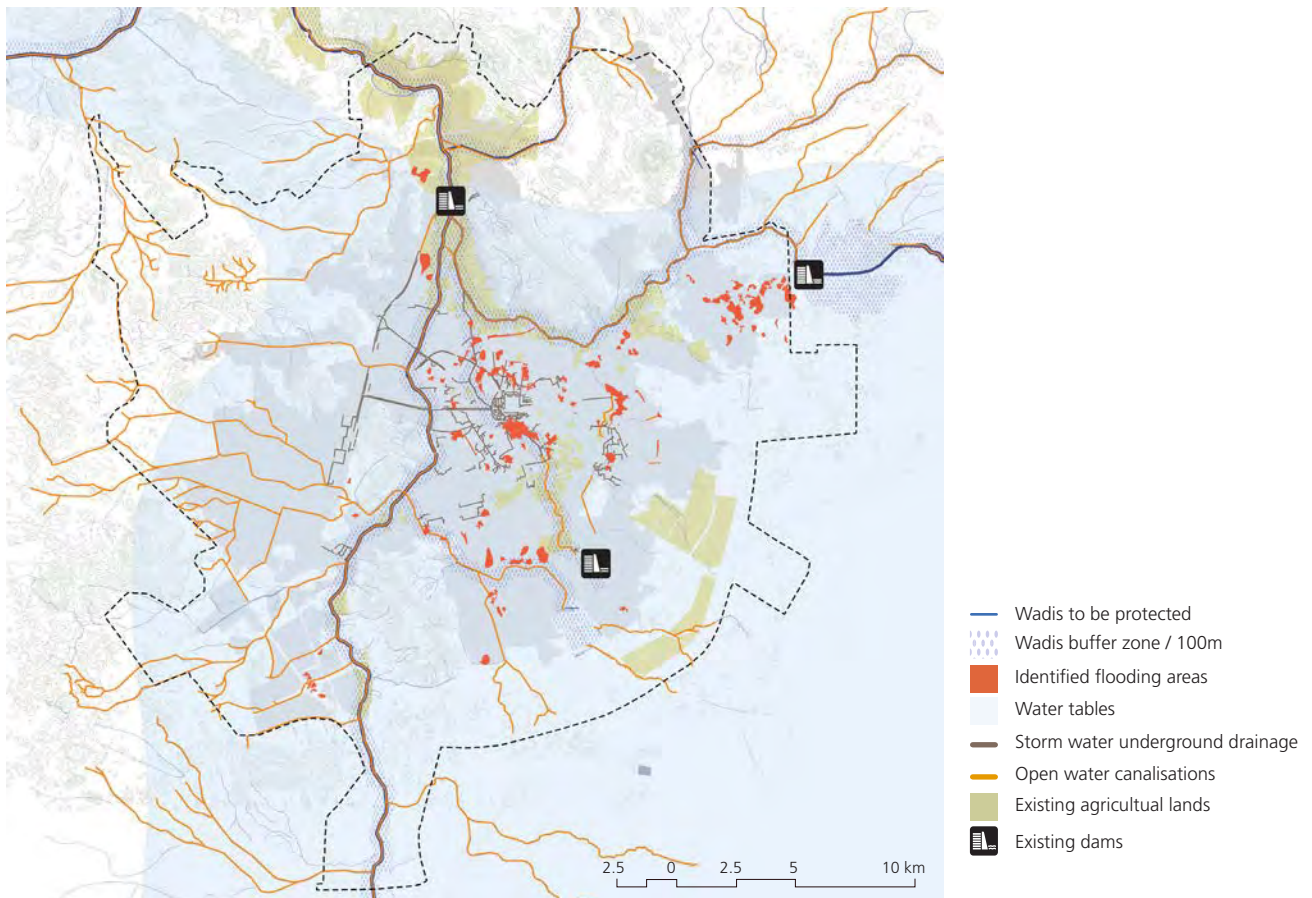


Fig. 44. Water infrastructure with identified flooding areas

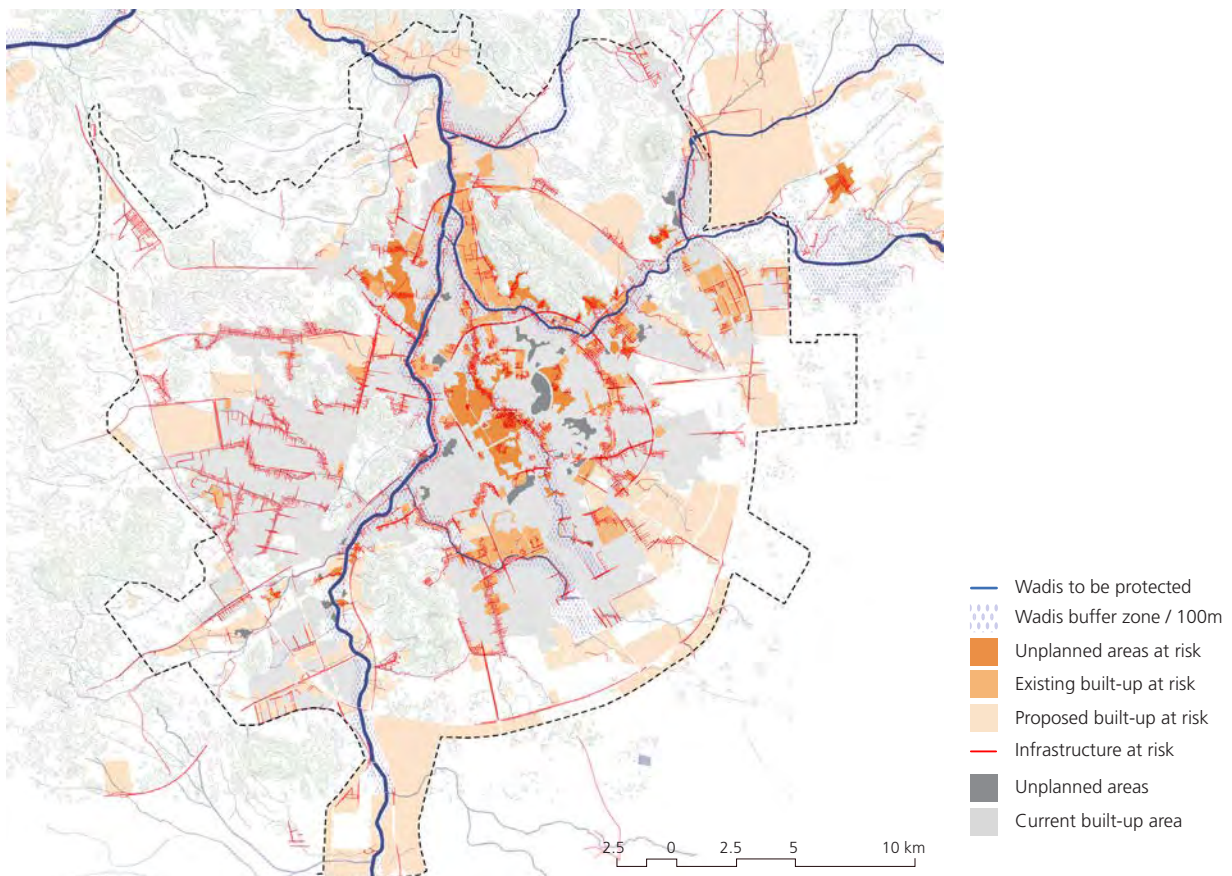


Fig. 45. Existing and proposed areas at flood risk

5

STRATEGIC DIAGNOSIS



5.1 Identifying and Defining Main Strategic Issues

The in-depth, evidence-based analysis brought to light four main strategic, interrelated issues highlighting Madinah’s performance in relation to the principles of sustainable urban development. These issues represent the strategic framing of a complex diagnosis, synthesised through four conceptual lenses. The lenses, once defined in their conceptual nature, were then contextualised by examining how they manifest spatially in Madinah, at different scales. They are synthesised as follows:

5.1.1 Unbalanced growth and development patterns

Spatial patterns are defined by structural elements, fabric morphology, and density distribution, and are highly influenced by land use policy. Inherently, a coherent land use policy influences spatial patterns by determining the appropriate amount of land needed to accommodate future growth and by distributing urban functions and densities accordingly. The combination of these attributes can either generate urban quality or create and increase urban issues such as sprawl. This often happens when a city grows rapidly, presenting an extended sprawl phenomenon, and inharmoniously manifesting unbalanced developments across its territorial extension. Dysfunctionalities emerge in appropriate urban management and citizens experience. In this scenario, the city showcases low density and does not perform effectively, its services and facilities are not well balanced in distribution and accessibility, and therefore citizens do not equally benefit from the advantages of urban life. Additionally, it is costly and difficult for the municipality to provide and maintain basic services or efficient and sustainable infrastructure, such as public transport. This is an inherent issue in conditions of sprawl and low density as water, sewage, electricity and transport infrastructures require extension over longer distances to reach relatively fewer people. As such, the significant amounts of land per capita that urban sprawl tends to consume, requires larger capital investments for infrastructure installation and increasing maintenance costs. The current development trends in Madinah tend to reproduce disperse patterns of low-density and monofunctional land use, with scarce provisions for social activities and both empty interstitial spaces and large areas of vacant land between existing portions of the consolidated city. The tendency toward sprawl in requires urgent address in order to halt progression of the condition, which is heavily affecting the city’s functionality by reproducing unsustainable development patterns of unbalanced growth at low-densities.

5.1.2 Dual City: Conflictual pilgrims and residents dynamics

This issue is unique to cities around the world experiencing religious tourism. Cities such as Makkah and Madinah, over the years, have experienced sudden spikes in population density due to the dynamics of religious tourism connected to the Islamic calendar (referring to Hajj and Umrah). Consequently, the rise in property values in the areas proximate to holy sites, the increased requirements for high-performing infrastructures during peak influx periods, and the prevalent focus of investments in religious-related facilities, creates two time-dependent and contrasting urban realities. This dual condition within the same urban environment, creates an invisible but perceptible barrier, on one side of which, permanent residents feel neglected, and on the other, pilgrims do not experience interaction with residents and the more permanent condition of the city. For cities such as these, it becomes critical to create ways to turn this divisive duality into opportunities for peaceful coexistence, intercultural dialogue, and mutual benefits amongst residents and different city users.



1 UNBALANCE GROWTH AND DEVELOPMENT PATTERN
[SPRAWL]



2 DUAL CITY: CONFLICTUAL PILGRIMS AND RESIDENTS DYNAMICS
[SPATIAL INEQUALITY]

5.1.3 *Endangered historic vernacular urban pattern*

Planning regulation systems in Saudi Arabian cities are currently under development within a unified framework. One of the challenges that will need to be addressed concerns the need for a comprehensive set of criteria that distinguish historical vernacular urban patterns from informal, unplanned settlements. In the absence of such a regulatory framework, historical neighbourhoods in Saudi cities are being erased to make space for new developments. Not only does this endanger heritage and disrupt the sense of identity tied to a historically stratified urban environment, but these new developments additionally disrupt the connectivity to the surrounding urban fabric, whilst alienating themselves to the neighbouring building typologies and established patterns. The introduction of appropriate heritage protection rules for articulated portions of the urban patterns, extended to streetscapes and fabric layout, will reduce risk to traditional urban layouts. These traditional layouts are characterised by narrow alleyways, that excel climatically in terms of passive energy performances and function as vibrant public spaces that generate social value.

5.1.4 *Socio-ecological and economic imbalance*

Each city is formed by complex social, economic and ecological systems. In a sustainable city, the balance between these three interrelated systems is maintained and enhanced over time. If any one system is given continued preference over the others, over time, a structural imbalance will emerge that alters the sustainable trajectory of the city's growth and development. A socio-ecological and economic imbalance is also created when planning decisions for the city fail to consider preservation and management of existing natural resources, or the functional value of natural assets and their territorial continuity. Planning processes and spatial development practices that incorporate, for instance, integrated water-resource management, natural cycles, and more broadly, functional ecosystem services, are often undervalued by local municipalities all over the world. Socio-ecologically unbalanced urban systems result in a number of threats to the environment, to overall urban quality, and to the health of citizens. Unsustainable consumption patterns, pollution, loss of biodiversity and of agricultural soil, pressure on ecosystems, as well as increased subjection to natural and manmade disasters, are examples of these. All of these conditions additionally carries heavy effect on the economic performances of a city, that can become increasingly clear over long-term observation.



3 **ENDANGERED HISTORIC
VERNACULAR URBAN PATTEN**
[HERITAGE LOSS]



4 **SOCIO-ECOLOGICAL AND
ECONOMIC IMBALANCE**
[LACK OF RESILIENCE]



5.2 Analysing Madinah Four Issues in Depth

5.2.1 Madinah's unbalanced growth and development patterns

Overall, the city of Madinah can meet the needs of the growing residents and visitor population over the next 30 years, according to the forecast projections documented by the Comprehensive Plan, as well as our study of the available vacant land within the 1450 UGB. However, land grants and previous investment in the development of suburban areas have resulted in scattered and sprawled development patterns and incomplete and unserviced neighbourhoods. Currently, additional new satellite developments are under construction beyond the 1450 UGB, located around 34-40 kilometres from the city centre. These emerging satellite developments are therefore distant from the urban core and the majority of public and social facilities.

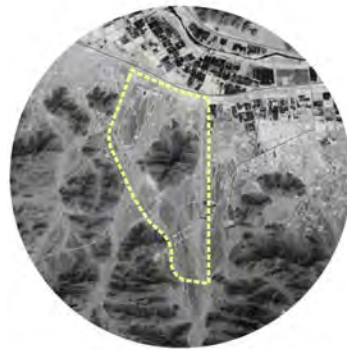
This kind of growth is characterised as leapfrog developments and uncontrolled sprawl, becoming an obstacle for the efficient use of land, and affecting delivery-capacity for infrastructure and transportation services. These areas, being away from the city centre, will place strong economic pressure on the Municipality to provide and maintain the necessary infrastructure to support these future developments. In addition, being located beyond the 1450 UGB, they encroach over the area defined by the Development Protection Boundary of Madinah, which is to be preserved from any development, with the exception of agricultural uses. This sprawling dynamic is also present within the 1450 UGB, where fragmented and monofunctional low-density residential clusters are scattered beyond the 3rd Ring Road (King Abdullah Road), generating a monotonous and rigid urban layout, mostly formed by low-rise condominiums.

Overall, these sprawling patterns increase the cost of providing public services and, especially water. The demand-trends for water supply are expected to grow substantially in the near future. Such urban growth patterns can seriously hinder the sustainability of the city's resources, negatively impacting the agricultural assets, a large percentage of which have already been lost over the years as a result of the extensive subdivision of land, development pressure, and diminishing water. Moreover, incomplete and inappropriate servicing can lead to public health issues and environmental degradation. Without proper control of sprawl, this could lead to significant degradation of the city's environmental settings.

Madinah would need to counteract this sprawling and unbalanced growth pattern, by strategically densifying within the existing footprint and the 1450 UGB. Currently, the population density of the built-up area is 30.9 p/ha, which is significantly lower than the recommended density of 150 p/ha, where this level of density is one of the critical elements for enacting the UN-Habitat sustainable neighbourhood planning and design principles.⁵⁰ The amount of developable vacant land within the 1450 UGB is around 41% of the total area, while the overall built-up area represents 59%.

Therefore, there is considerable potential for infill densification strategies, rather than promoting new developments in the outskirts

of the city and satellite developments beyond the 1450 UGB. As indicated in the urban density analysis, the only parts of Madinah currently presenting a density equal or above above 150 p/ha, are the central areas, which, while only representing 5% of the total built-up area, accommodates 39% of the overall population, denoting the high efficiency of these areas in concentrating people and services.



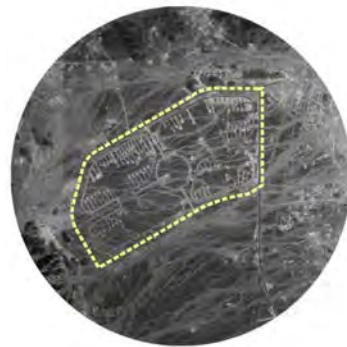
1.

Development to the West from Madinah in the basin of Wadi Shaib Al Hemd



2.

Development beyond Prince Mohammed Bin Abdulaziz International Airport



3.

Development to the South from Madinah in the basin of Wadi Al Aqiq



Fig. 46. Madina's unbalanced growth and development patterns



5.2.2 Dual City: Conflictual pilgrims and residents dynamics in Madinah

Visitors are coming to Madinah all the year round, therefore, unlike Makkah, Madinah is not particularly associated with one significant seasonal peak. However, the number of visitors is somehow influenced by Makkah's pilgrimage dynamics, as most people performing the holy pilgrimage to Makkah are likely to continue to Madinah and visit the Prophet's Mosque. The floating population of Madinah total to 9,006,000 people per year with an estimated 3,249,000 over the Hajj period, and 5,757,000 during Umrah. The overall floating population exceeds the permanent one by nearly 6.5 times.⁵¹

The majority of the accommodation for pilgrims is concentrated in the central area of the city as seen in figure 48. The central area has changed over time to meet the pressure of the growing demand for accommodation, linked to an increase in pilgrims, and is constantly changing. The Comprehensive Plan for Madinah estimates the total maximum capacity for all hotels to be 59,550 visitors / beds, operating at 71.4% of capacity. A further potential expansion of the mosque plaza will affect the existing hotel area; thus the overall accommodation provision, increasing the pressure for providing more visitors/beds. Apart from the implication of pilgrimage dynamics on the lack of housing for residents in the central areas, residents also lament a lack of services, entertainment, and facilities in areas that are not of interest to the heavy pilgrims' influx. The "Dual City" phenomenon can also be associated with land use patterns, highlighted by the domination of commercial and mixed-use functions within the central area, mainly dedicated to accommodating the visitor's needs.

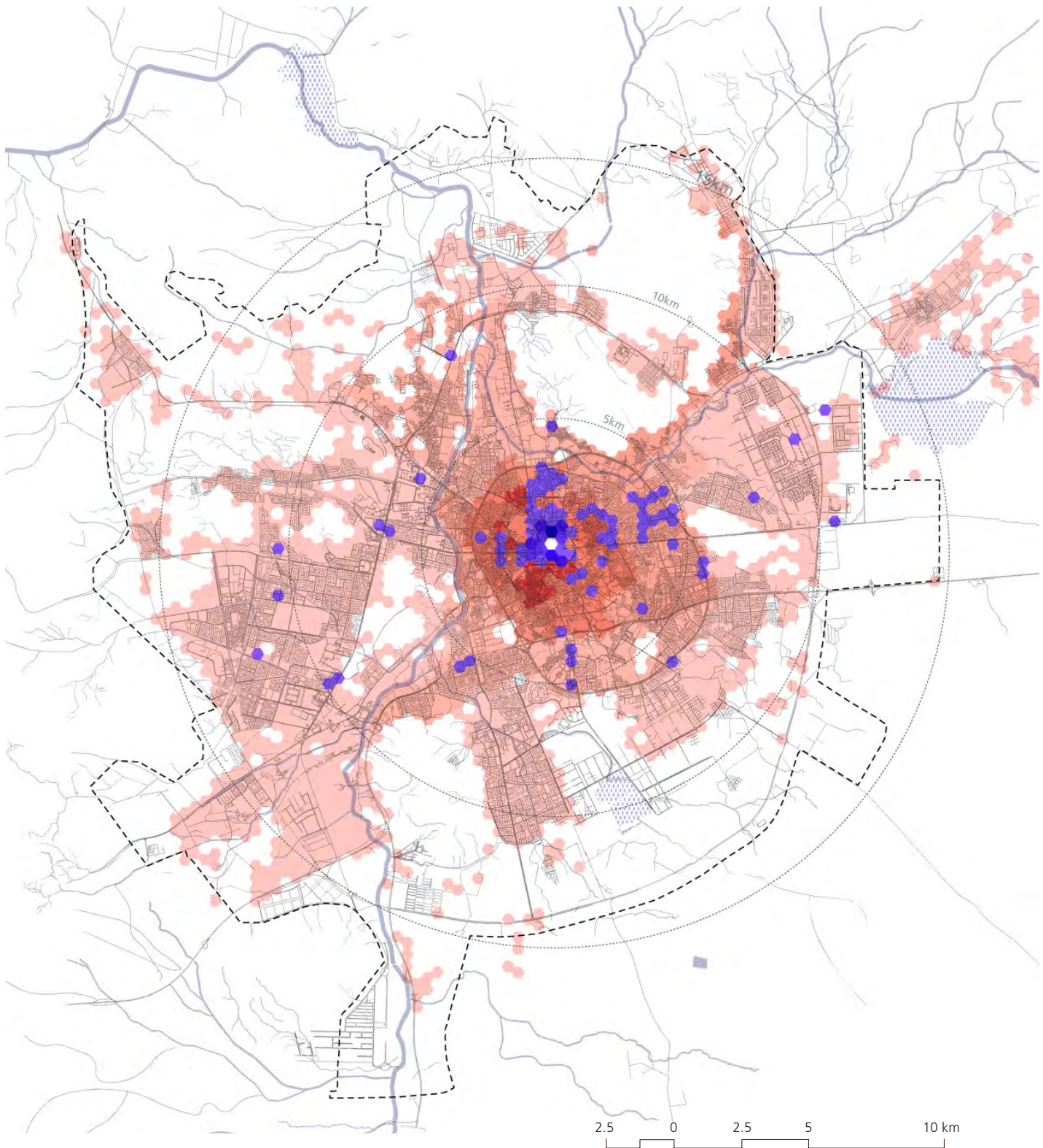
The fact that the highest concentration of pilgrims and visitors are located in the central area negatively impacts road traffic congestion. The more congested directions for the visitor flow leading to the central area is on the radial roads intersecting the 1st Ring Road and within it, increasing traffic loads on the road network and creating conflict between vehicular traffic and pedestrian domain. Some physical barriers and constraints derived from the urban design settings, make movement within the central area more complicated. In the attempt to address these congestion issues, the Madinah Development Authority (MDA) has recently announced that four new pedestrian tunnels will be built in nearby neighbourhoods, in order to facilitate access to the Prophet's Mosque. The four tunnels should be 125 metres long and include elevators, and 12 escalators to help pedestrians reach the Prophet's Mosque without having to cross the road.⁵²

However, without an appropriate rebalancing policy for redistributing pilgrims accommodations and services over the larger city, and better integrating them with and within residential neighbourhoods, the pressure on the central area will keep increasing, further affecting transportation services, urban infrastructure (sewage, water supply), and the socio-spatial structure and dynamics of Madinah. Balancing and integrating residents and visitor needs is, therefore, a critical aspect for the future development of Madinah.



© Wikimedia

Most of the hotels for pilgrims are located within the 1st Ring Road



Hotels:

- 1 - 5 hotels/ha
- 6 - 10 hotels/ha
- 11 - 15 hotels/ha
- 16 - 20 hotels/ha
- 21 - 25 hotels/ha
- 26 - 29 hotels/ha

Population:

- 1 - 20 p/ha
- 21 - 60 p/ha
- 61 - 100 p/ha
- 101 - 140 p/ha
- 141 - 251 p/ha
- 252 - 350 p/ha
- 351 - 424 p/ha

Fig. 47. Dual City: Conflictual pilgrims and residents dynamics

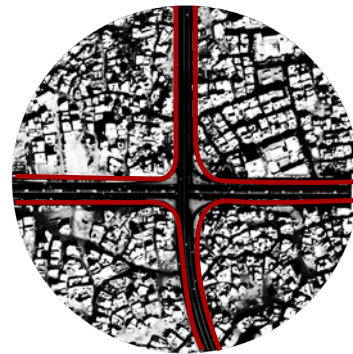


5.2.3 Madinah's endangered historic and vernacular patterns

The issue of endangered vernacular pattern is quickly becoming typical for Saudi cities with rich historical and spiritual context, and increasing visitor/pilgrimage dynamics. Madinah, as Makkah, significantly changed its traditional urban model because of the recent development dedicated to accommodate the increasing number of visitors. In the case of Madinah, the changes can be seen within the Haram boundary, especially within the central area around the Prophet's Mosque. That trend can seriously damage the city's identity and transform the oldest Islamic city where the first Muslim community was established into a place with no local spirit and culture, and no environmental assets.

In Madinah, the horizontal expansion of the area dedicated to accommodating the pilgrims' needs has occurred at the expense of the oldest parts of the city, where Islamic historical sites were located, and which have been substituted by new uses Today, under Vision 2030, which asks for economic diversification and strengthening of economies related to tourism and culture, this might change.

A morphological analysis over three typologies of developments and their relationship with the surrounding fabric was carried on and is shown in Figure 49. These areas were identified according to the criteria of visualising how different kind of developments (residential, infrastructure, and large facilities) are built on top or at the expense of historical and vernacular areas, showcasing a lack of integration that manifests in profound borderlines between the unplanned historical neighbourhoods and the newly developed areas. The first neighbourhood shot highlights the contrast between the vernacular urban pattern and the recently built service areas made of hotels and commercial buildings. The second neighbourhood shot points out the differences in fabric typologies between the vernacular neighbourhood and the new residential regular patterns, usually disconnected from the surrounding fabrics and existing streets. The third neighbourhood shot points out the issue of new, overdimensioned infrastructures, specifically highways, crossing the city centre and disrupting the connectivity of the secondary road networks and the overall urban fabric. Not only does traditional urban patterns help to preserve local culture and the city's historical identity and characters, but they also perform better in terms of climatic conditions. The destruction of these unique patterns can lead to the disappearance of a substantial part of Madinah's characteristics, causing a loss for the city and the whole country.



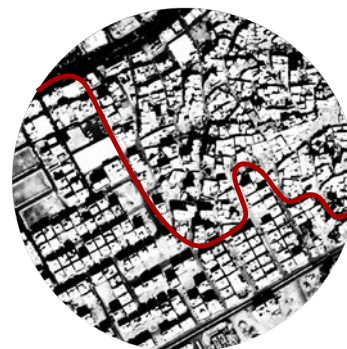
1.

Vernacular pattern and emerging new infrastructure



2.

Vernacular urban pattern and new services



3.

Vernacular urban pattern and emerging new development

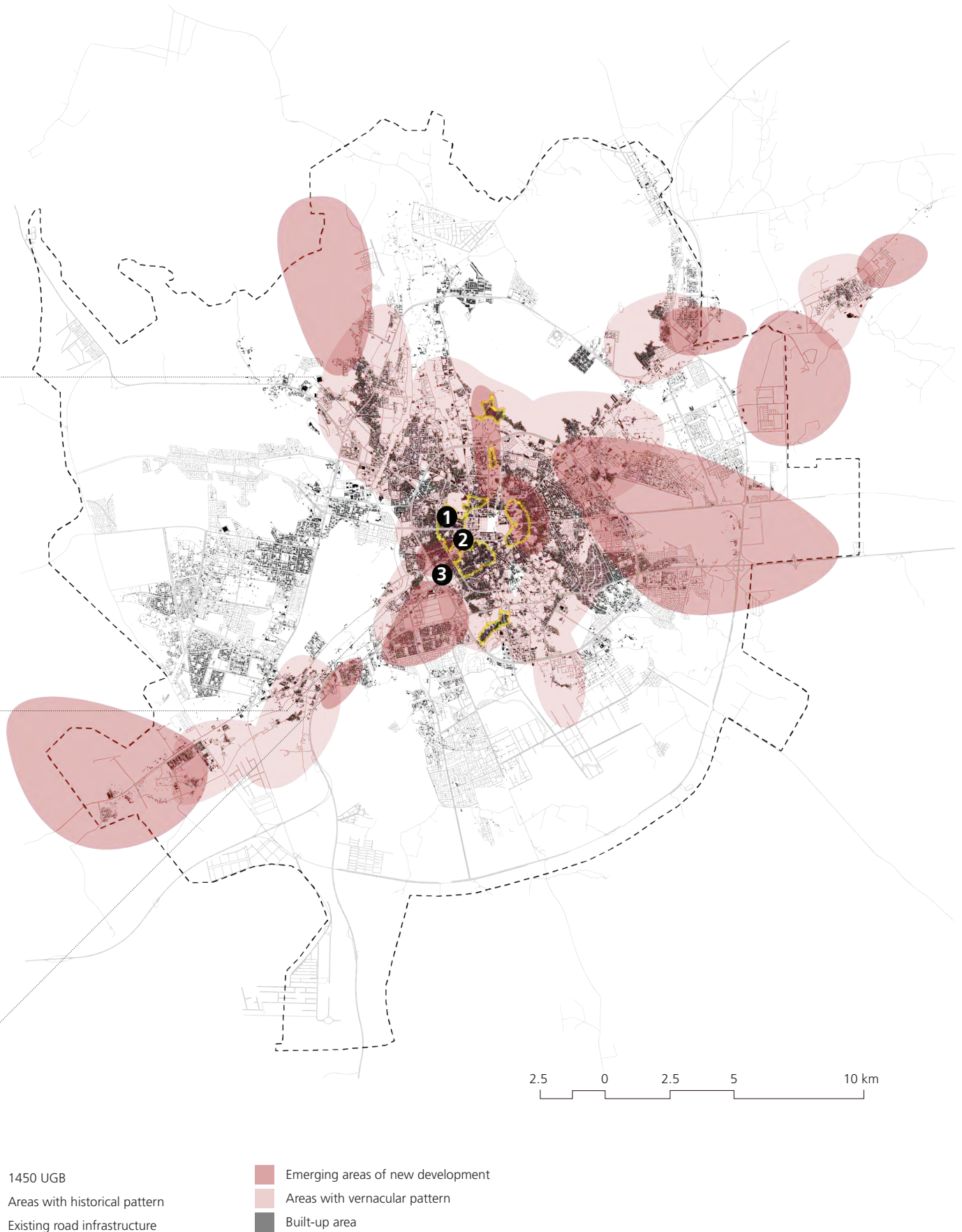


Fig. 48. Endangered historical and vernacular urban patterns and emerging areas of new development



5.2.4 Socio-ecological and economic imbalance in Madinah

Madinah is different from the majority of the cities in Saudi Arabia, as its topographical and hydrological conditions enabled the city to have a specific microclimate and fertile land for agricultural development. Overall, the city's environmental conditions and development patterns have been historically influenced by its unique physiography and climate. As described in Chapter 4, the most recent urban development has also influenced the environment, negatively impacting on urban sustainability factors, such as loss of freshwater, loss of agriculture land, and the overall health, linkage, and continuity of green and blue networks within the city. For instance, sprawling urbanisation and a general increase in water demand is raising the alarm toward the lack of freshwater, and with the local aquifers being depleted beyond sustainable means, Madinah will have to increasingly rely upon costly desalinated water imported from the Red Sea.

Madinah has a unique characteristic in terms of natural elements structuring the city, which is represented by the longitudinal axis of wadis and agricultural land crossing the city, including traditional farms. This is a considerable asset for the improvement of both environmental conditions, and the maintenance and strengthening of the city's historical identity as an oasis. Although the agricultural land consists of 23% of the total land use, which is equal to half of the residential land use, the city presents an overall under-dimensioned, as well as discontinuous and fragmented green network, that is lacking green public spaces such as parks, public gardens, and other types of open public areas that could complement the agricultural-urban landscape. Unfortunately, because of the lack of appropriate regulations, some parts of the existing green system are being transformed into areas for new development, especially in the areas closest to the Prophet's Mosque and the Southern part of the city. If this is not addressed soon, unprotected agricultural land may rapidly succumb to development pressure, as this land is usually located on a relatively flat terrain, which is easier and faster to develop.

Any urbanisation into fringe areas, such as hillsides, agricultural lands, and valleys of the wadis can fragment natural spaces and threaten Madinah's ecosystems. However, analysing the urban patterns in relation to the natural topography, it can be seen that development encroachment on the hillsides is not one of the trends causing major preoccupation, as even unplanned areas built on slopes only represent less than 1% of the total unplanned areas. However, protecting the hillsides as important city's natural elements also needs to be considered a priority, as they define the characters of the natural valley where the city is located, and play a vital role of protecting the urban environment from winds, and providing relief from floods by guiding the stormwater towards the wadis through natural topographic lines.



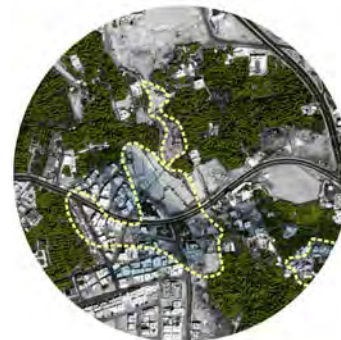
1.

Wadis encroachment



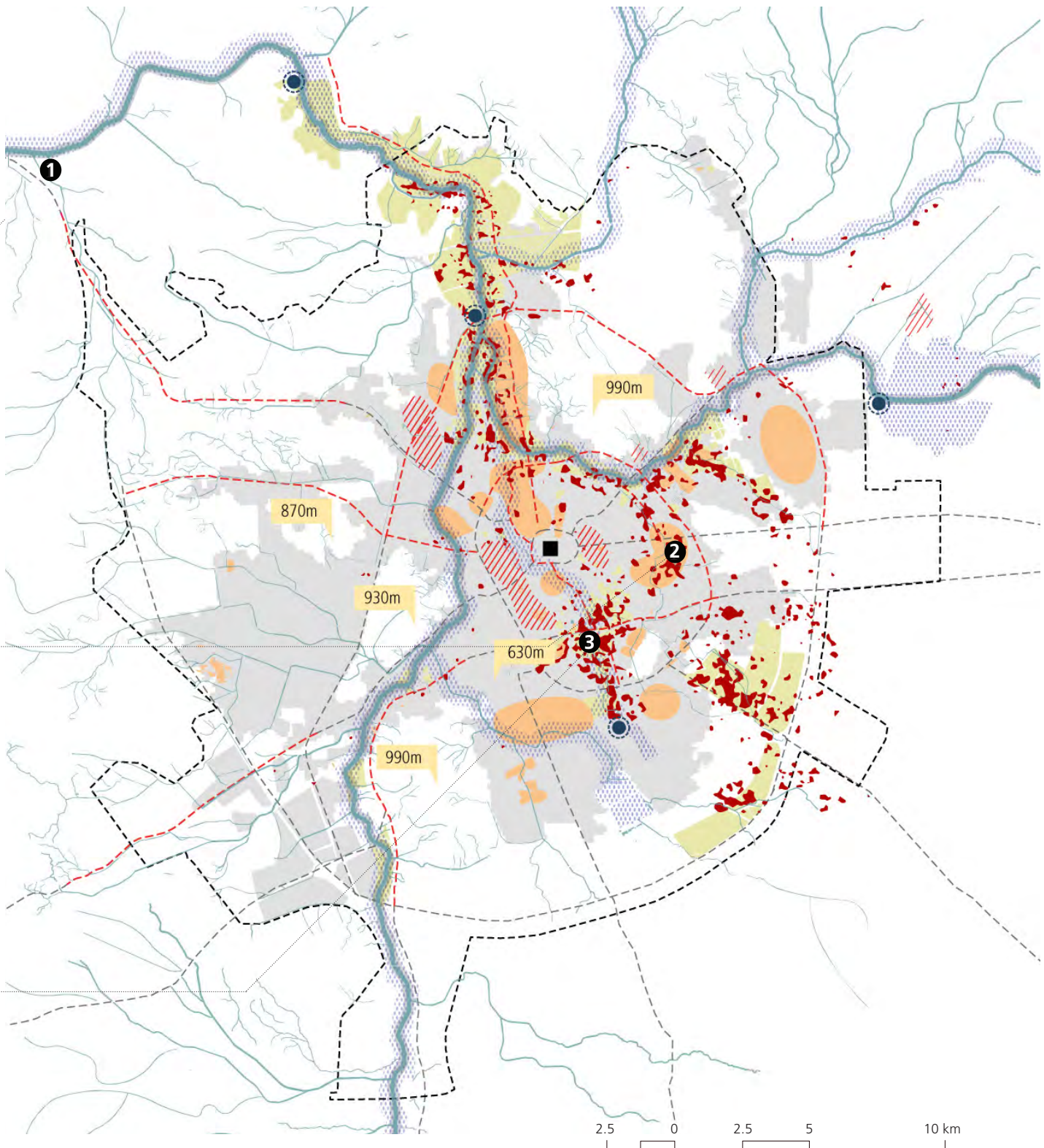
2.

Inadequate infrastructure



3.

Wadis encroachment by emerging new satellite development














- | | | |
|---|---|--|
|  Wadis buffer zone / 100m |  Built-up area at risk |  Secondary wadis to be protected |
|  Built-up area |  Unplanned settlements at flood risk |  Roads infrastructure |
|  Primary wadis to be protected |  Loss of agricultural land |  Roads infrastructure at flood risk |
|  Wadis buffer zone / 100m | |  Dams / traditional water management system |

Fig. 49. Areas at flood risk and loss of agricultural lands

6

THE FUTURE CITY



6.1 Strategic Responses

After performing a strategic diagnosis, and identifying four main issues affecting the urban development of Madinah, four strategic recommendations were identified in response. Akin to the four strategic issues, the above-mentioned four strategic recommendations define the conceptual framing for a systemic and strategic level of solutions. Once defined in their conceptual nature, they are developed into a more detailed description, spatially interpreted and contextualised in Madinah, at the various scales. This is followed by a roadmap to implementation, in the form of an articulated Action Plan.

6.1.1 The Compact City

According to the UN-Habitat principles, cities need to encourage spatial development strategies that take into account, as appropriate, the need to guide urban extension, prioritising renewal by planning for the provision of accessible and well-connected infrastructure and services, sustainable population densities, and compact design. They must consider integration of new neighbourhoods into the urban fabric, in order to prevent urban sprawl and marginalisation. UN-Habitat principles emphasise the relationship between urban form and sustainability, asserting that the shape and density of cities have implications for the sustainable use of resources into the future, and quality of life for citizens. Strong arguments have emerged to promote the Compact City as the most sustainable urban form. A Compact City is envisioned as a high-density urban settlement, characterised by mixed-use development, recognisable, dense, and revitalised central areas, with well-distributed services and facilities (hospitals, parks, schools, leisure, and entertainment). Establishing spatial and legal mechanisms, to consolidate a Compact City, should increase accessibility and walkability, therefore increasing use of public transport and public space, reducing congestion, boosting the local economy and increasing interactions across society. Policies to promote urban compaction involve the promotion of urban regeneration, the revitalisation of town centres, restraint on development in rural and peripheral areas, promotion of higher densities and mixed-use development, promotion of public transport, and the concentration of urban development at public transport nodes. In this scenario, a vibrant street life encourages people to walk or cycle more, and the high-density and mixed-land use developments will, in a sensible way, encourage a social mix who will enjoy close proximities to work, home, and services. Walkability helps to reduce automobile reliance, thus alleviating congestion, air pollution, and unnecessary use of available natural and financial resources. In addition, compact urban development aims to preserve land resources and natural assets, while increasing the efficiency of public infrastructure and transportation services. A compact built form, supported by an efficient public transport backbone, offers opportunities to increase densities, protect environmental resources, and enhance accessibility to the central area for all residents.

6.1.2 The Integrated City

An Integrated City is developed as a whole, presenting a well-distributed level of urban services, ensuring all its parts contribute to its function. An equitable distribution of services and functions should ensure that people of varying social classes and age are brought together, and equally benefit from a high-quality urban environment. However, integration also means that all policies, projects, and proposals are considered in relation to one another. In this regard, the synergies between different urban elements should be such that the city as a whole achieves more than the sum of the individual parts. In response to the diverse fragments and complex relational webs of the contemporary city, UN-Habitat proposes the development of context-sensitive interventions that address the multidimensional aspects of socio-spatial integration in urban policies and practices. The lack of socio-spatial integration in Madinah is multi-layered, but its most visible and impactful aspect relate to the city's spatial dualism between permanent residents and pilgrims. Mechanisms for integration between different city users that bring people together experiences in a shared urban environment, is one of the strategic solutions proposed for Madinah.



1

THE COMPACT CITY

[CONSOLIDATE]



2

THE INTEGRATED CITY

[INTEGRATE]

6.1.3 The Historic City

A Historic City is defined as an active human settlement, strongly conditioned by a physical structure that originates from its past, and recognisable as representing the evolution of its people.⁵³ Following this definition, it is fundamental for historic areas to be inhabited and form a live cultural nucleus, with a strong urban identity. Over the last few decades, inner-cities and their historic districts all over the world have been deteriorating. Saudi cities are facing high-pressure from development, and often, in historic cities, architectural heritage has been allowed to deteriorate or eradicated to make space for new development, in place of conservation in historic areas. Madinah, in particular, suffers from this pressure and it is losing most of its historic areas and their long-term residents, due to radical redevelopments aimed at accommodating pilgrims, led by a speculative real-estate approach. Responding to this scenario requires firstly the establishment of categorisation of these areas, followed by precise regulatory systems for their preservation, restoration, rehabilitation, and revitalisation, aiming not only at protecting the heritage buildings but the entire historic urban fabric, inclusive of all its elements, from streetscapes to residents.

6.1.4 The Resilient City

A Resilient City takes into consideration appropriate built form and physical infrastructure to increase resilience to the physical, social, and economic challenges that arise from depleting carbon-based fuels and climate change. As such, a Resilient City can be defined as a *sustainable network of physical systems and communities*,⁵⁴ in which physical systems consist of both the constructed and environmental components of the city. They include roads, buildings, physical infrastructure, communication facilities, soils, topography, physical features, geology, waterways, population density, etc. In sum, the physical systems act as the body of the city, its bones, arteries, and muscles. Resilient cities as explained by Godschalk (2003)⁵⁵ are cities which are capable of withstanding severe shock and stress without either immediate chaos/damage or permanent deformation or rupture. These cities are designed in advance to anticipate and recover from the impacts of natural or technological hazards. According to the New Urban Agenda (NUA), cities need to ensure environmental sustainability by promoting clean energy and sustainable use of land and resources, protecting ecosystems and biodiversity, promoting sustainable consumption and production patterns, reducing disaster risks, as well as mitigating and adapting to climate change. These elements amount to resilience. The NUA states that cities need to invest in the generation and use of renewable and affordable energy, and sustainable and efficient transport infrastructure and services. This will provide benefits of connectivity and reduce the financial, environmental, and public health cost of inefficient mobility, congestion, air pollution, noise and urban heat island effects. Alongside this, a Resilient City also supports and is mutually supported by its territorial ecosystems, activating positive urban metabolism mechanisms, ensuring a reliable resource supply and balanced value chains.



3 THE HISTORIC CITY

[PRESERVE]



4 THE RESILIENT CITY

[PROTECT & IMPROVE]



6.2 Appropriate Models for Madinah Urban Development

6.2.1 The Compact City: Consolidating development and densifying centres in Madinah

The current development trends of Madinah need to be addressed in order to revert the current tendency towards unbalanced growth and development patterns. Considering the high degree of pressure exercised by religious dynamics on the central areas due to the presence of the Prophet's Mosque, the Structural Plan for Madinah submitted in 2011, proposes a development approach based on densification along Nodes and Corridors to relieve some of the pressure from the city core and the overall transportation system. This approach allows distribution of density across the city and to provide opportunities for targeted investment for economic development.

The approach, supported by public transit, also aims to improve accessibility rather than encouraging migration to areas outside of Madinah to accommodate future growth. This would incrementally create polycentrism, transforming the city from a radial monocentric into a distributed polycentric model. According to this approach and our density analysis, new areas of development should be located within the 1450 UGB, as Madinah has sufficient land to adequately accommodate future population growth without adding new sprawling suburbs and distant, leapfrogging satellite developments, limiting urban sprawl, and promoting compactness and strategic densification. As such, the envisaged nodes, linked to intermodal public transport and located within the 1450 UGB, would become new development clusters, acting as destinations distributed across the city and areas for redevelopment within the urban footprint, and become new centralities. Accordingly, the land between the 1450 UGB and the Development Protection Boundary should be protected from any development, except agricultural.

Future development should be limited to the densification boundary identified in figure 50, between the 3rd Ring Road, (King Abdullah Road) and the King Khalid Highway (4th Ring Road).

The amount of vacant land, together with land considered as redevelopment areas within this boundary, is 3727 hectares (1597 hectares of vacant land + 689 hectares for approved development, including the Knowledge Economic City and Pilgrim City + 2127 hectares for redevelopment areas), which would have the capacity to accommodate 1,119,977 people at a density ranging between 150-200 p/ha. This means that the total amount of land considered for strategic densification could accommodate nearly twice the amount of population projected following the Vision 2030, and, therefore, no expansion would be required in Madinah for the foreseeable future.

Figure 50 illustrates the proposed spatial principles for incremental strategic densification of Madinah, starting with the identification of four categories of vacant land, three of

which have the potential to densify and intensify uses, and one labeled for preservation:

- Vacant land within the 2nd Ring Road, with a proposed density of 150 p/ha and prevailing mixed-use functions. This area is equal to 138 hectares and could accommodate 70,637 people, according to the UN-Habitat recommended density.
- Vacant land within the 3rd Ring Road to be prioritised to be within a 10-minute walking distance from the foreseen metro stops, and be developed with the proposed density of 200 p/ha. This area is equal to 953 hectares and could accommodate 416,193 people.
- The secondary vacant land beyond the 3rd Ring Road with the proposed density of 200 p/ha. This area is equal to 429 hectares and could accommodate 205,434 people.
- Vacant land within the 2nd Ring Road should be reserved for open, public, and green spaces.



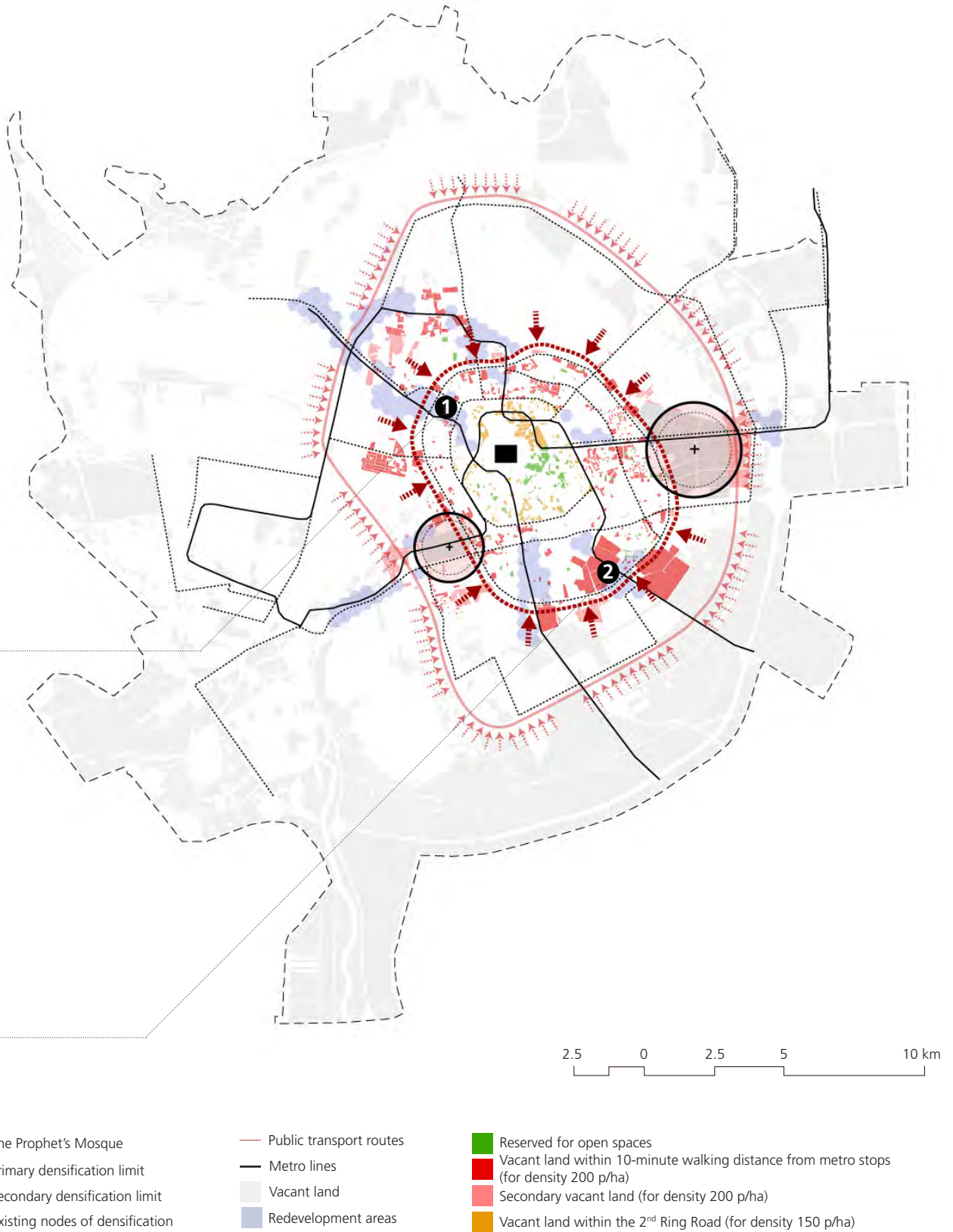
1.

Vacant land within the 3rd Ring Road within a 10-minute walking distance from the foreseen metro stops to be prioritised for densification



2.

Areas for redevelopment within the urban footprint, suitable for densification and increasing public and green spaces



- The Prophet's Mosque
- ⋯ Primary densification limit
- Secondary densification limit
- ⊕ Existing nodes of densification
- Public transport routes
- Metro lines
- Vacant land
- Redevelopment areas
- Reserved for open spaces
- Vacant land within 10-minute walking distance from metro stops (for density 200 p/ha)
- Secondary vacant land (for density 200 p/ha)
- Vacant land within the 2nd Ring Road (for density 150 p/ha)

Fig. 50. The Compact City: Consolidating development by creating and densifying new centres in Madinah



6.2.2 The Integrated City: Bridging the Madinah and bringing residents and pilgrims together

In order to achieve extensive socio-spatial integration in the city, and to dismantle Madinah's spatial dualism, a comprehensive series of policies and interventions need to be set in place. As a first step, a strong emphasis needs to be placed on implementing the proposed public transportation system, which can act as a backbone for integration, by allowing movement, exchanges, and encounters, therefore fostering socio-spatial integration across the city. Overall, the proposed public transportation system will play a key role in fostering integration and connectivity amongst different parts of the city, facilitating interaction between residents and pilgrims, enhancing the pedestrian domain and help to reduce pedestrian/vehicular conflicts within the 1st Ring Road.

In order to strategically redistribute services, facilities, and job opportunities, building on the possibilities offered by public transport, the Integrated City strategy supports the polycentric model envisaged for Madinah by the Comprehensive Plan. Thanks to the implementation of the proposed metro system, the city will be able to host higher densities, by intensifying new mixed-use centres around transportation nodes. The development of new centralities within the urban footprint supported by the proposed public transport backbone will dilute the concentration of pilgrims in the central areas, offering the opportunity for integrating new hosting facilities within other neighbourhoods. This will contribute not only to a more varied distribution of residential densities and mixed-use areas but, by redistributing pilgrims' destinations across these new centres, highly connected by the new public transport, it will also favour social integration and cohesion, and the mixing of residents and pilgrims across the city.

The development of the public transport system should be introduced both locally and as a means to strengthen connectivity amongst Madinah and the two other cities receiving the highest numbers of pilgrims, Jeddah and Makkah. This way, the new Al-Haramain train, and its Madinah's station, will not only work as a strong economic node and new centrality for the residents, but also as an essential linkage between the Madinah, Jeddah, and Makkah becoming a critical component for managing the pilgrim flows across the three cities in a more sustainable manner.

While strongly supporting the central area, the new centralities will become newly distributed secondary city centres, building a multi-polar system that embeds services and activities for both visitors and residents. These newly developed areas will have to be diversified in identity and character, and be developed as a complementary element of an integrated, and polycentric system, so as to support the diversification of local economies and bring new functions to the city. Figure 51 represents selected areas and respective strategic criteria for the definition of multifunctional mixed-use nodes with good walkability and a wide range of services and accommodation for pilgrims. These areas, marked for redevelopment, will be high amongst them connected by the system of public and green spaces encouraging pedestrian movement and relieving pressure from the

actual centre. Implementing the decentralisation model allows for the distribution of the hosting facilities for visitors in a balanced manner, minimising the phenomena of the dual city. In the strategic proposal for the Integrated City, the new centralities are identified as:

- Mixed-use nodes (with prevailing mixed-use and services-concentration functions);
- Commercial nodes (with prevailing commercial functions); and
- Ecological nodes (intersection of nodes with agricultural land and traditional farms).



1.

Al-Haramain High-speed Railway Station



2.

The Prophet's Mosque



3.

Residual vacant land within the existing footprint



- | | | | | | |
|--|-----------------------------------|--|--------------------------|--|---|
| | Mixed-use nodes | | Public transport loop | | Vacant land within 10-minute walking distance from metro stops (for density 200 p/ha) |
| | Commercial nodes | | Express lines | | Secondary vacant land (for density 200 p/ha) |
| | Ecological nodes | | BRT lines | | Vacant land within the 2 nd Ring Road (for density 150 p/ha) |
| | Public transport intermodal nodes | | Feeder lines | | Reserved for open spaces |
| | | | Metro lines | | Agricultural lands |
| | | | Areas of new development | | |

Fig. 51. The Integrated City: Bridging the Madinah and bringing residents and pilgrims together



6.2.3 The Historic City: Preserving and enhancing Madinah's identity

Madinah has lost most of its historic and vernacular built form under the voracious pressure of speculative development, especially in the areas surrounding the Prophet's Mosque, which are also amongst the oldest. In order to preserve the historic identity of the city, a new regulatory system should be set in place and actively adopted to protect historic and vernacular neighbourhoods. These are the areas where the streetscape and the urban patterns, as well as the building typologies and the associated social structures, reflect the history of the city, its people, and both a past and present way of life. Building on the strategy for Madinah Integrated City, the vision for Madinah Historic City proposes a preservation and revitalisation strategy leveraging on the city historical role as a hospitable, vibrant and green religious destination.

Historically, and similarly to Makkah, Madinah residents used to host pilgrims in their houses. In the past 20 years, with the substantial increase in hotels and condominiums, a radical change in the urban layout and the hospitality tradition occurred. Retrieving this old custom would present the possibility of complementing the hospitality offered by creating small-scale accommodation options, such as "boutique hotels" or similar, spread across historical and vernacular neighbourhoods. Not only would this reduce the physical and social distance between pilgrims and residents, but would also constitute an opportunity for additional income generation options in low and middle-class households, favouring an incremental economic revitalisation of historic and vernacular areas. However, differences across diverse types of settlements need to be acknowledged, and as such, a diversified approach to preservation, upgrading, and revitalisation needs to be set in place following their systematic categorisation.

Most of the areas in need of conservation and upgrading are concentrated within the 2nd Ring Road and are considered unplanned settlements. These parts of the city characterised by a vernacular urban pattern, perform better in terms of sustainability parameters such as land efficiency, urban density, and contribution to decreasing the urban heat island effect in the city centre. Currently, these central parts of the city with traditional urban structure are facing inadequate service provision and lack of integration with the rest of the city. Once appropriately upgraded and re-connected to a comprehensive system of public spaces and heritage sites, these areas could become sustainable and vibrant neighbourhoods, with a rich identity and bringing an economic contribution to the city's overall economy.

As such, the strategy proposes to reconsider and appropriately classify the majority of what is currently labeled as unplanned settlements, in order to minimise the risk of losing historically significant and socio-economically valuable assets. The proposed classification of unplanned settlements, illustrated in figure 52, defines two types of neighbourhoods which should be preserved:

- Unplanned areas within the 3rd Ring Road, which accommodate around 22% of the permanent population and have substantial historical potential, as identified in reference to the urban growth patterns and dated back to 1929. These areas need a more in-depth study, especially referring to the neighbourhoods surrounding the 1st Ring Road as they include the oldest parts of the city, formed around the original nucleus of Holy Mosque and incrementally expanding to the surroundings over time.
- Areas with traditional urban patterns are located in close proximity or within the green network, which includes traditional farmlands. These areas should be actively protected and integrated into a new and extended urban green network, promoting local culture and traditions related to agricultural activities, as well as preserving and enhancing the city's historical identity as an oasis.



1.
Unplanned and vernacular neighbourhoods



2.
Wells and archaeological sites with the traditional farmlands

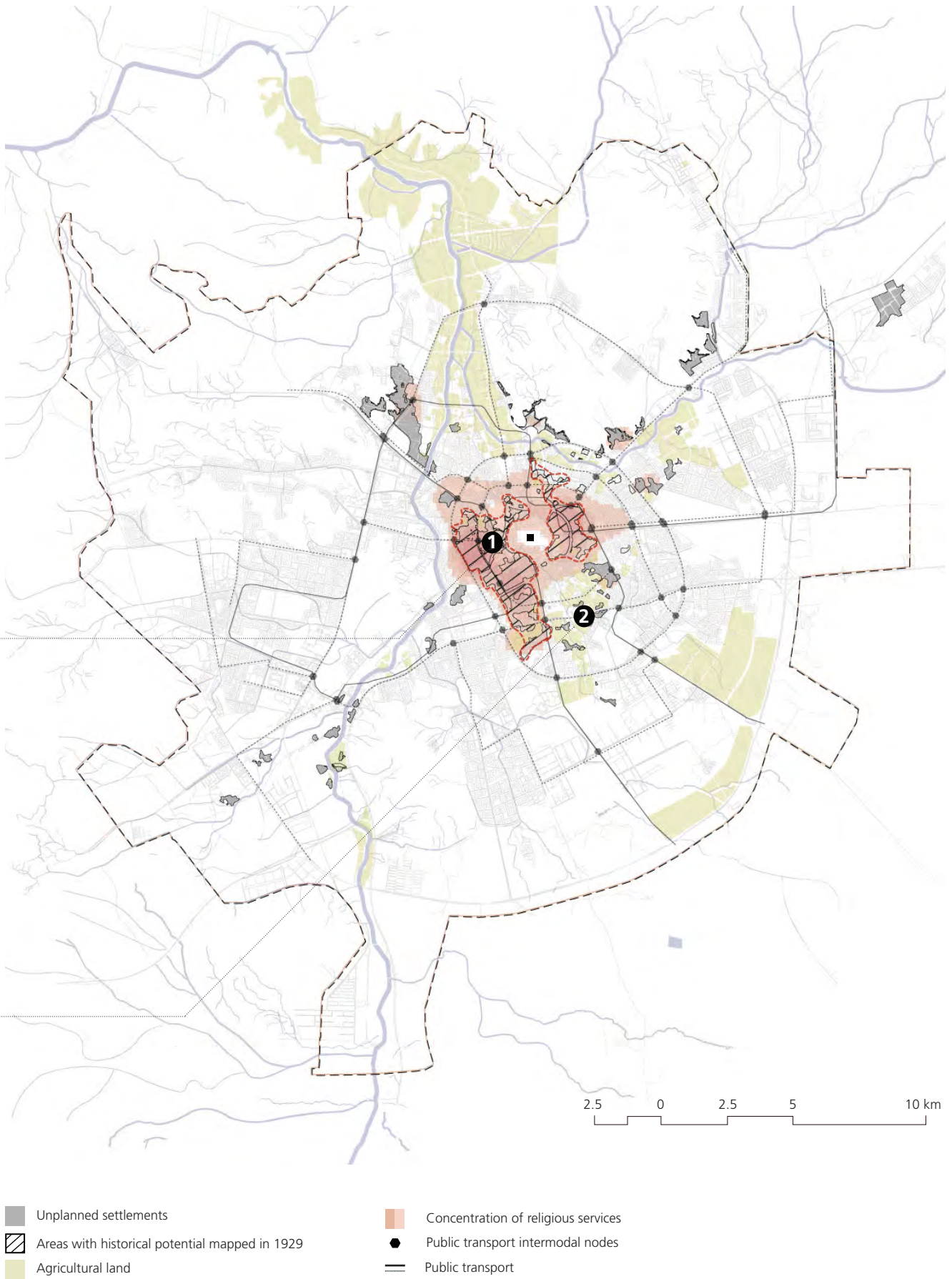


Fig. 52. The Historic City: Preserving and enhancing Madinah's identity



6.2.4 The Resilient City: Rebalancing Madinah's socio-ecological and economic systems

The fourth strategy aims to promote the development of urban spatial frameworks that support the sustainable use and management of natural resources and land, supporting the appropriate compactness and density, polycentrism, and mixed-use from previously illustrated strategies. The strategy, aiming to rebalance how the city functions together with its natural features, intends to strengthen urban resilience, enhance resource efficiency, and environmental sustainability, while triggering economies of scale and agglomeration by fostering risk reduction, food, and water security.

Although Madinah has a well-structured blue and green network, formed by the capillary wadis system, farms, and agricultural land, and a few public gardens and existing parks. This becomes less consistent and more scattered when moving from the territorial/metropolitan to the urban scale and especially in the central areas of the city. In these areas, the green public spaces available are currently scarce in quantity and fairly disconnected from each other, as well as from the blue network of wadis crossing the city. As such, the lack of green spaces in the central areas, together with the previously mentioned loss of agricultural land and freshwater, need to be urgently addressed. This will reduce the disconnection and imbalance amongst the social, ecological, and economic dimensions of Madinah, thus, making the city more resilient. Accordingly, the city needs to rebuild and strengthen its inconsistent green network in the city centre, by converting vacant land into public spaces, especially within the second Ring Road. An articulated and well-linked system of smaller public spaces will need to be set in place, targeting the areas surrounding the Prophet's Mosque, and accompanying the development of the new high-density centralities. Agricultural land within the city, crossing it from North to South, should be preserved and linked to the new system of open, green public spaces.

Primary wadis, which carry the main water flow toward the city and have the capacity to replenish underground water tables, will have to be protected from development encroachment, reopened, and re-naturalised where possible (together with their subsidiary channels network). This will provide opportunities for the establishment of new linear parks across the city, and for the development of a comprehensive pedestrian system, integrated with the blue and green networks. The strategy also aims to reduce flood risk and facilitate water-recharge mechanisms for the city, by distributing compact retention ponds along and in connection to the wadi system. This approach, together with the preservation and promotion of green areas along the wadis, and while gradually re-establishing underground water-recharge mechanisms, will also offer opportunities to promote urban and peri-urban agriculture, strengthening food security and increase the resilience of the city to floods.

The map in figure 53 showcases three types of interventions supporting the Resilient City strategy:

- Primary wadi system to be protected, re-naturalised, and integrated with the city's fabric;
- A system of small and distributed retention ponds along the wadis;
- Agricultural land to be preserved and linked to new and existing green public spaces; and
- Potential areas for the development of green public space at the intersection of a green network and one of the proposed new high-density and mix-use centralities.



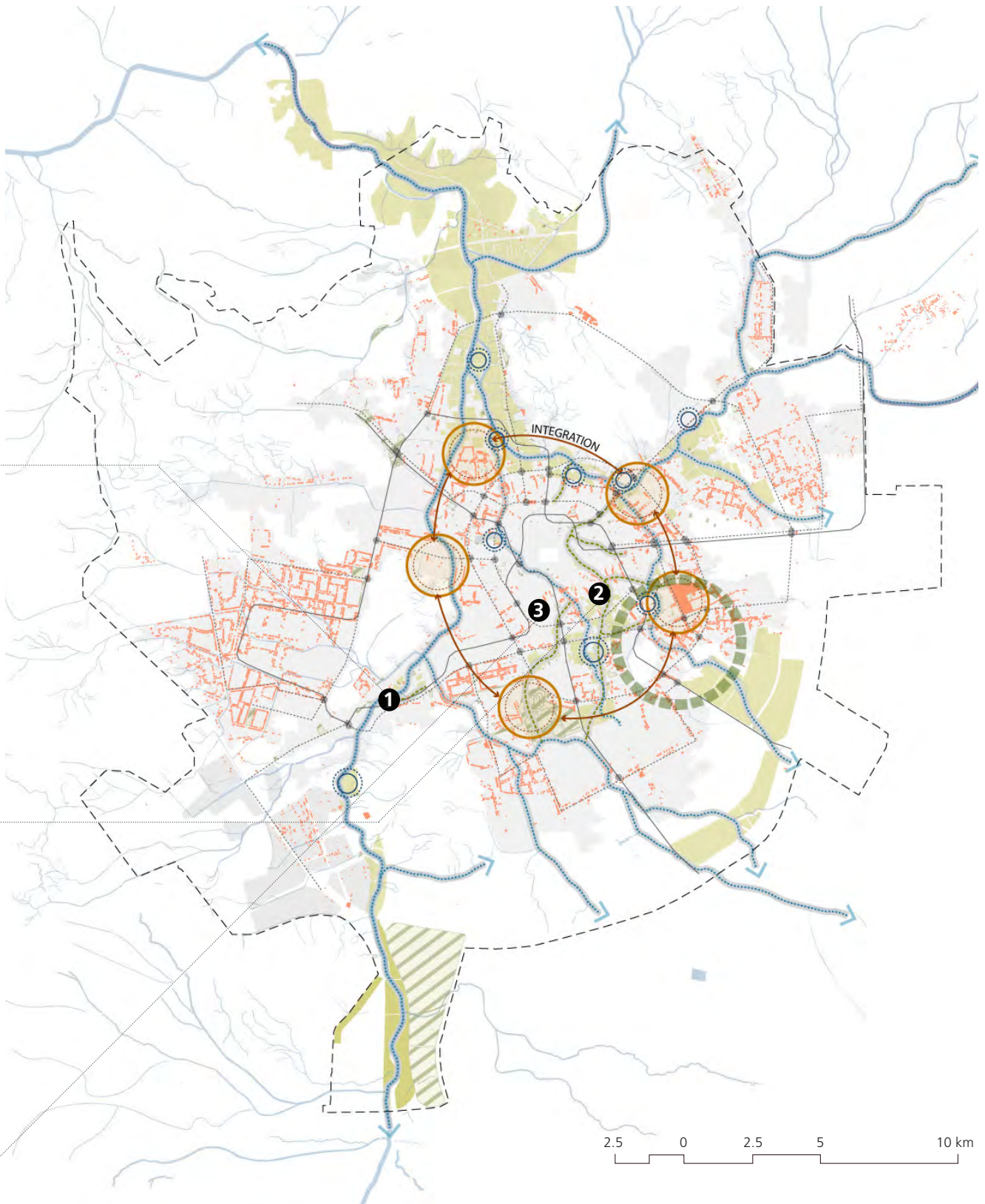
1.
Wadi Al Aqiq



2.
Insufficient green public spaces within the city



3.
Built-up area



- | | | |
|----------------|-------------------|--|
| Blue network | Parks | Public transport intermodal nodes |
| Green network | Agricultural land | The intersection of green and mixed-use areas / Potential places for the development of public space network |
| Built-up area | Mixed-use areas | Ecological node |
| Retention pond | Public transport | |

Fig. 53. The Resilient City: Rebalancing Madinah's socio-ecological and economic systems

6.3 Vision for a Sustainable Madinah

The four strategies proposed for Madinah are aligned with the visions and goals of the New Urban Agenda and based on the three dimensions of sustainability. As such, the overall vision that emerges from the combination of the four strategic recommendations aims at structurally changing Madinah's urban form in order to achieve the following three aspects of sustainability:

- Securing social equity in the distribution of wealth and social services (social sustainability);
- Keeping a stable economic growth while restructuring the productive system, in order to save resources and energy (economic sustainability); and
- Maintaining safe and comfortable living environments through lower emissions and opting for ecological restoration and complex socio-ecological infrastructure, that can devise basic services innovatively, (environmental sustainability).

To enact this vision, which aims to trigger an incremental but radical urban transformation process, it is necessary to translate the four conceptual recommendations into a logical and scaffolded system of actions that sets clear priorities and builds on endogenous potential and competitive advantages.

Overall, Madinah has the opportunity to set itself on the right track towards a more sustainable urban development model, as some of the presented issues also embed opportunities for their solutions. Implementing all of this, requires a strong political will, coupled with a pragmatic approach to the city's socio-economic and spatial restructuring, capitalising on the strengths and opportunities to enhance and rebalance the ecological, the social, and the economic dimensions, while preserving Madinah's unique socio-spatial and historical identity.



Haram Plaza as an inclusive and vibrant public space

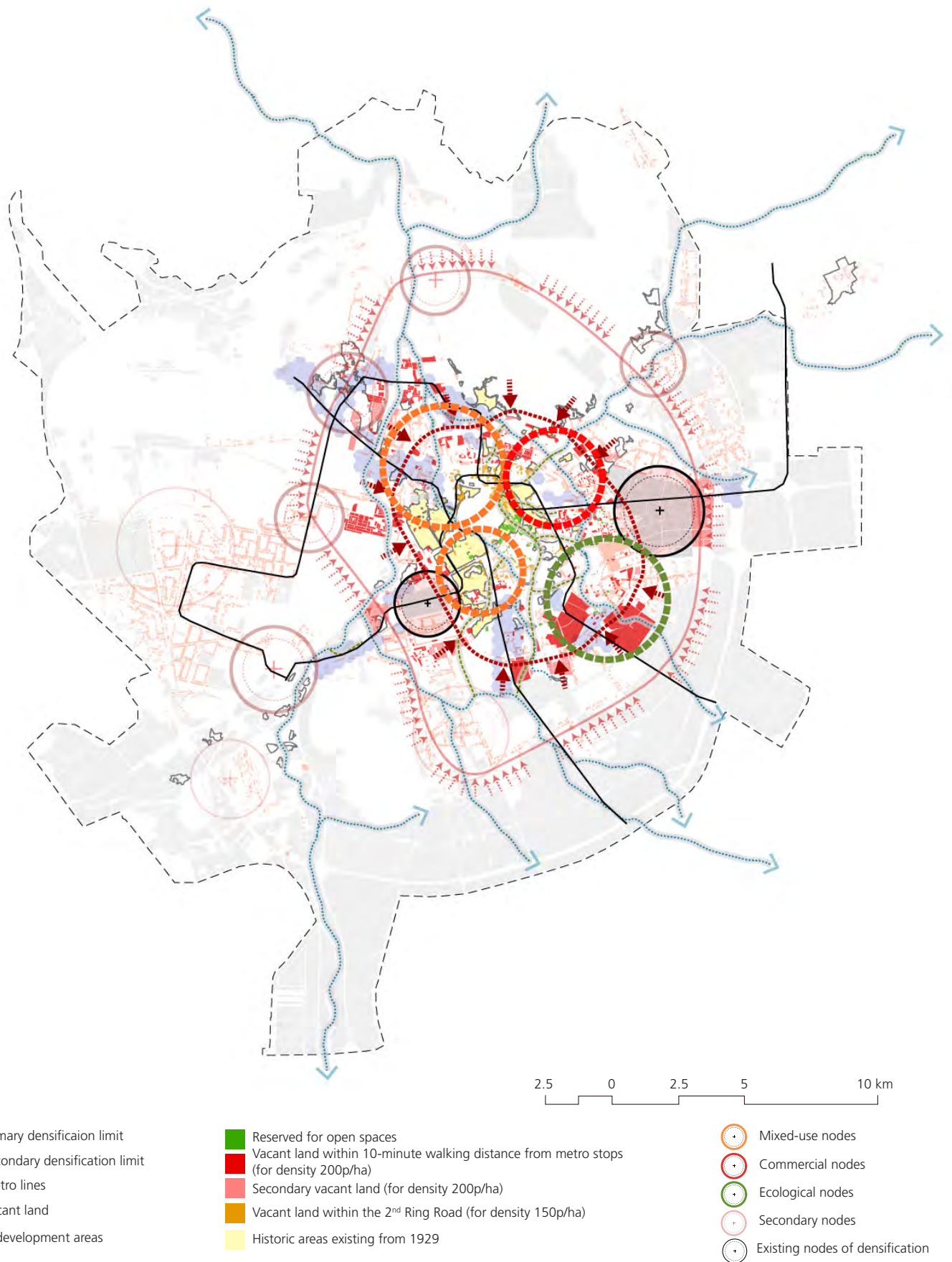


Fig. 54. Vision for sustainable Madinah

6.4 Strategic Impact of the Vision on Urban Patterns

The vision laid out for Madinah in the preceding text has direct and tangible impacts on the spatial organisation of the city. The outcome of the strategic recommendations based on transit-oriented development principles can be assessed using the same methodology that was used to analyse the current conditions. The text and maps discussed in the sections below illustrate the impact of this vision on the density, land use, productivity, and accessibility of Madinah.

Land Use

The spatial patterns of a city are defined by structural elements, fabric morphology, and density distribution. This means that spatial planning and land use are linked to the way a city performs by defining the social, economic, and environmental fabric of

our cities. In turn, spatial patterns determine the amount of land supply that the city would need to accommodate future growth, according to a coherent land use policy.

In the case of Madinah, the identified priority is to infill the interstitial spaces and vacant land existing within the current built-up area and the 1450 UGB. The densification strategy for Madinah prioritises the increase of density along the main axis of the proposed public transport system based on the Transit Oriented Development principles, (TOD). In addition, a general densification strategy foresees and proposes to incrementally densify around two new emerging urban cores within the 3rd Ring Road, forming a system of new centralities.

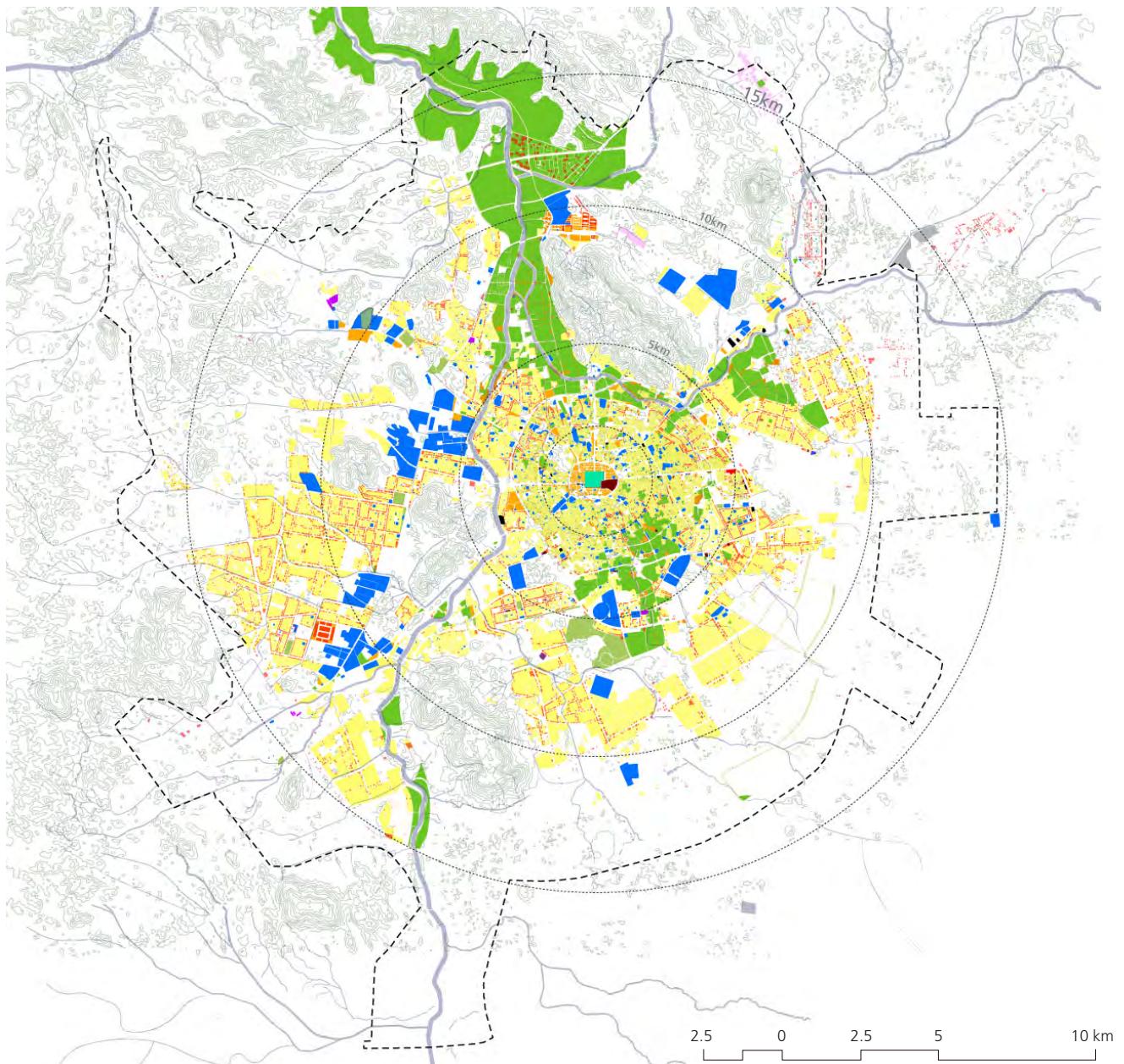


Fig. 55. Existing land use

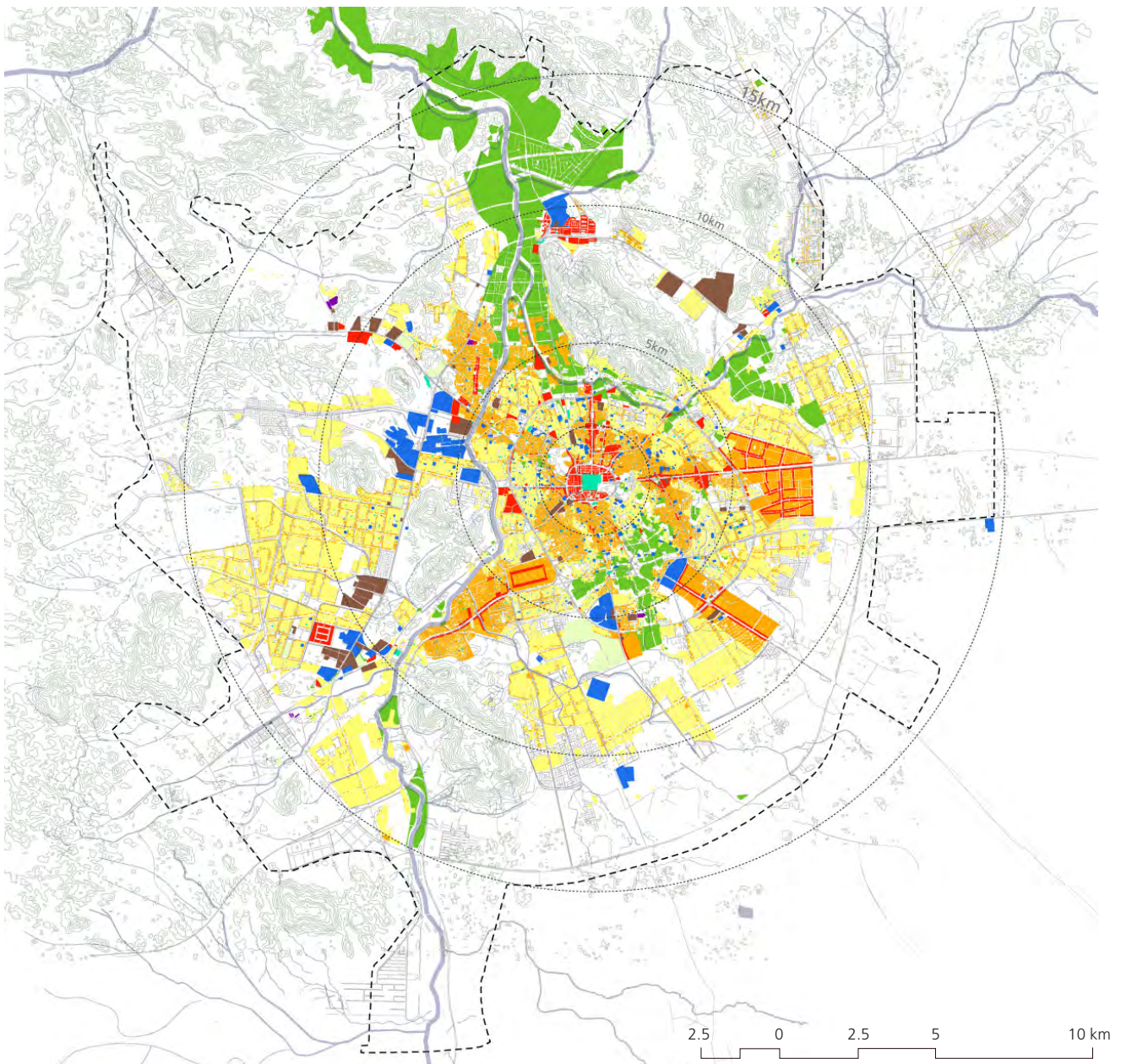
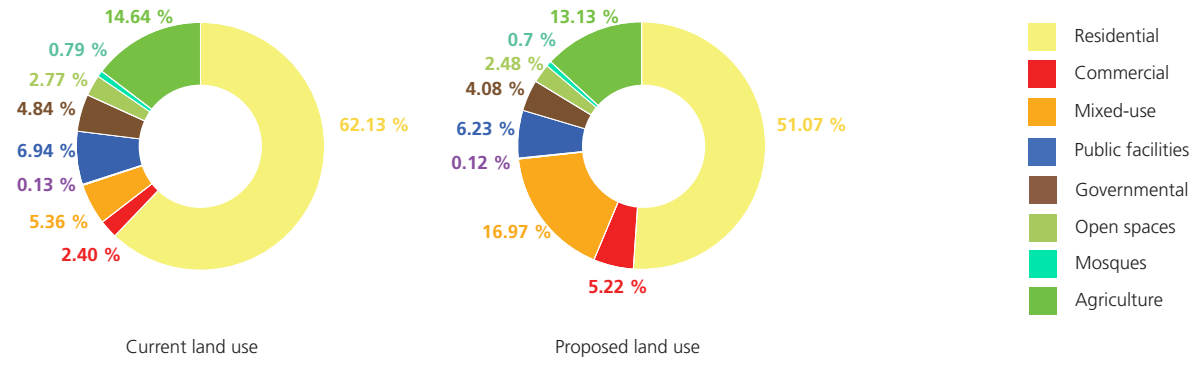


Fig. 56. Proposed land use plan by Amanah

Accordingly, the proposed vision for Madinah rebalances residential and mixed-use functions, counteracting the monofunctional and sprawling development trend. The vision establishes an increase in mixed-use areas up to 12.9%, which is twice as large as the current number. The increase of mixed-use areas will happen through the transformation of residential uses into mixed-use. Drawing from studies and guidelines on good urbanism, the breakdown of the land use assigned to this new, dense corridor is 60% mixed-use, 20% commercial, and 20% residential.

Density

The proposed strategic densification follows the guiding principles of rebalancing residential uses along the main public transport axis up to an area of over a 10-minute walking distance from public transport nodes, and of prioritising developable parcels of vacant land adjacent to the main streets. The proposed residential areas are 65.2% which are in line with the vision, allows Madinah

to accommodate a future growth of up to 2,505,169 people including redevelopment areas and the Knowledge Economic City. This means an increase of 1,119,977 people, with a capacity that exceeds the forecasted number of 2,064,000 inhabitants by 2030.

Implementing this strategic densification and intensification process would enable Madinah to achieve both a well-distributed density increase and widespread accessibility to social infrastructure and services (e.g., shops, restaurants, hospitals, schools), as well as to business opportunities, for a much larger portion of the population. Creating intensification in certain areas would help to reshape Madinah into a better-functioning and balanced polycentric system, fostering socio-spatial integration and connectivity amongst different parts of the city, and facilitating interaction between residents and pilgrims.

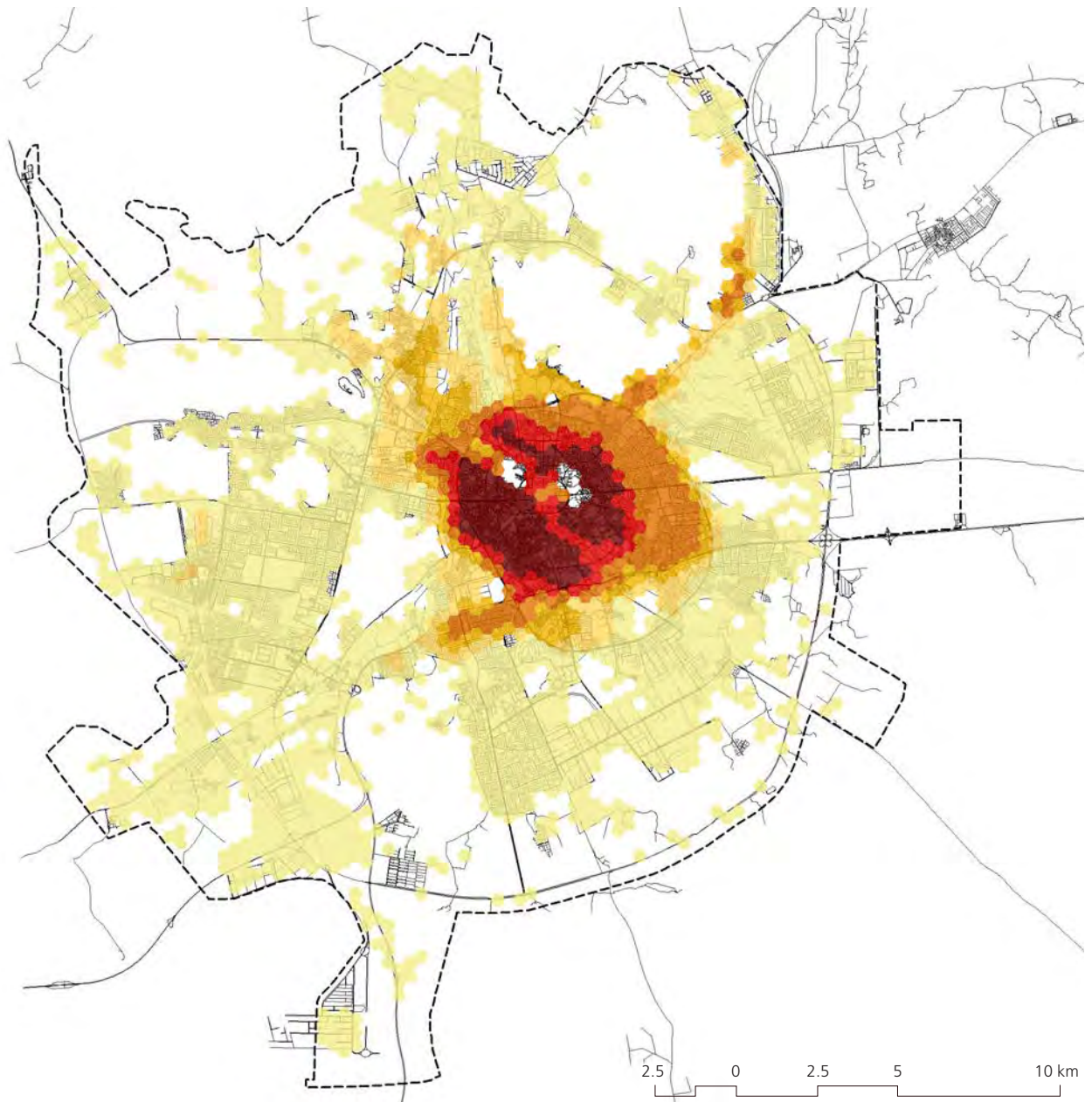


Fig. 57. Current population density

Productivity

Access to jobs is a pivotal factor in the future growth and economic development of a city. The current land use allotment and the population distribution across the city of Madinah can help estimate the number of jobs, which is a critical indicator of the spatial representation of economic opportunities. With greater access to jobs within close distances, the productivity of residents increases, as they spend less time on daily commutes and more time in productive work. Economic opportunities attract businesses and talent, which contribute to the competitive advantage of the city.

The productivity analysis is based on a few assumptions which assign a certain number of jobs per square metre of the built-up area for each land use. While this assumption is broad and an approximation, it helps to understand the trends of job distribution in the city and reveals the inequities and gaps in their spatial

distribution and access. The total jobs in the city at present is at 43 jobs per 100 residents. This number increases to 60 jobs per 100 residents in the proposed scenario by simply densifying land use and building heights within a 10-minute walk corridor along the two metro lines. Thus, for a 200% increase in total population in Madinah, the estimated increase in total jobs in the city is 300%.

Average current **POPULATION DENSITY** on built-up area

 30.9 p/ha

Average proposed **POPULATION DENSITY** on built-up area

 57.8 p/ha

Average **POPULATION DENSITY** in transit corridor

 114.5 p/ha

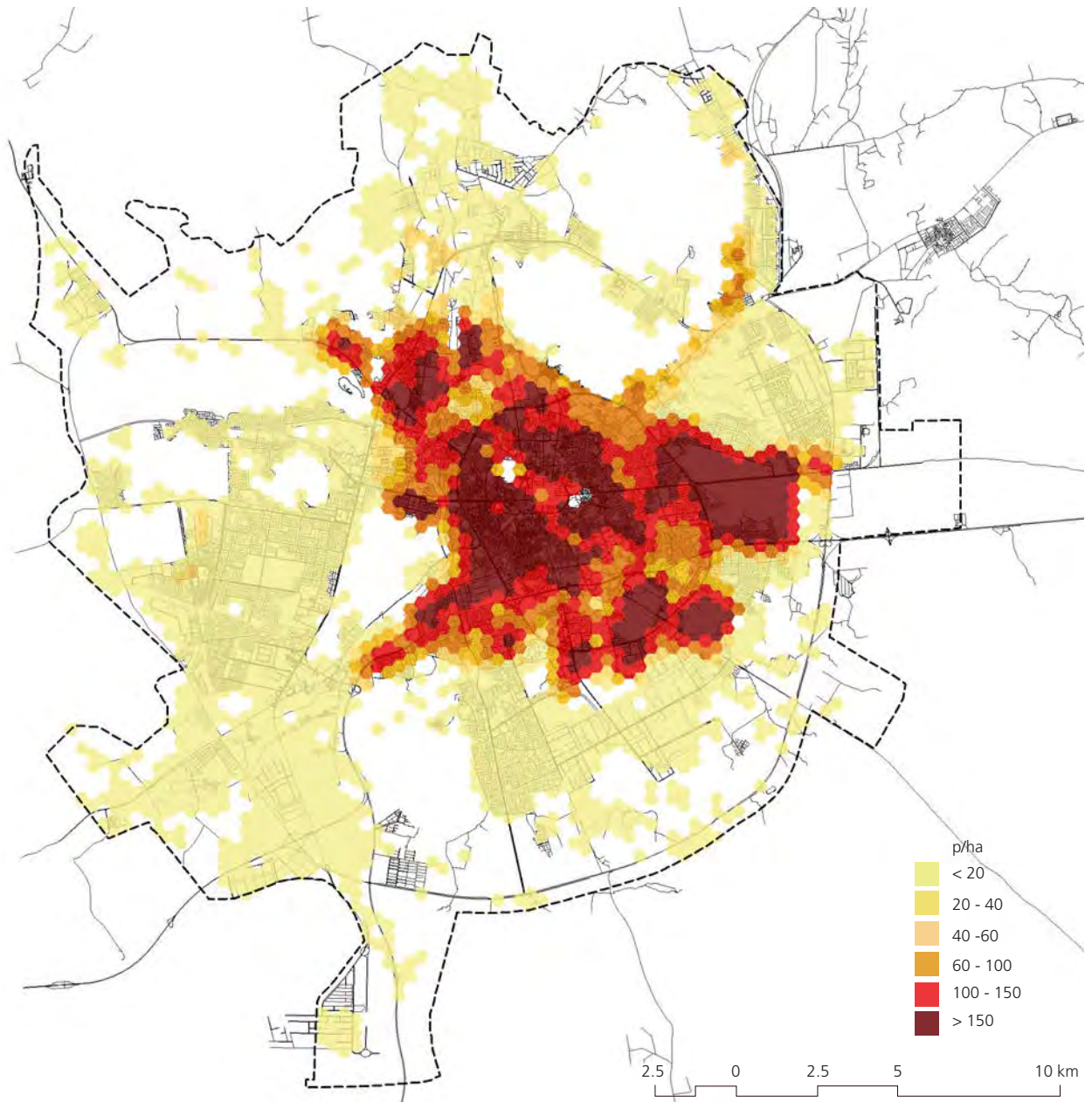


Fig. 58. Proposed population density

Jobs accessed by walking

While the total number of jobs in the city increase at a rate higher than the population growth rate, the spatial distribution of these jobs is a critical factor in planning for future growth of the city. The map in figure 59 represents the number of jobs accessible within a 10-minute walk from different city-regions. More jobs are concentrated in certain parts of the city, which reveals and corroborates a trend discussed in the land use section, with no distinct city centre but a cluster of dense mixed-use centres within and outside the Ring Road. As expected, the farther extents of the city, which are majorly residential, have a low job density and hence lower access to jobs. There are large sections of the city devoid of development, and hence show up as voids in the current scenario

The proposed land use scenario for Madinah will significantly increase the number of jobs accessed within a 10-minute walk from different city-regions. In the new scenario, each person can access 4,500 more jobs on an average within a 10-minute walk. Focusing on creating opportunities within the built-up footprint by filling in the gaps and densifying existing developments within the geographic core and Ring Road will increase access to jobs four times over (400%), (see figure 60). Redistributing land use by ensuring a balance of commercial, mixed, and residential land use, will improve the spatial distribution and access to jobs across the city.

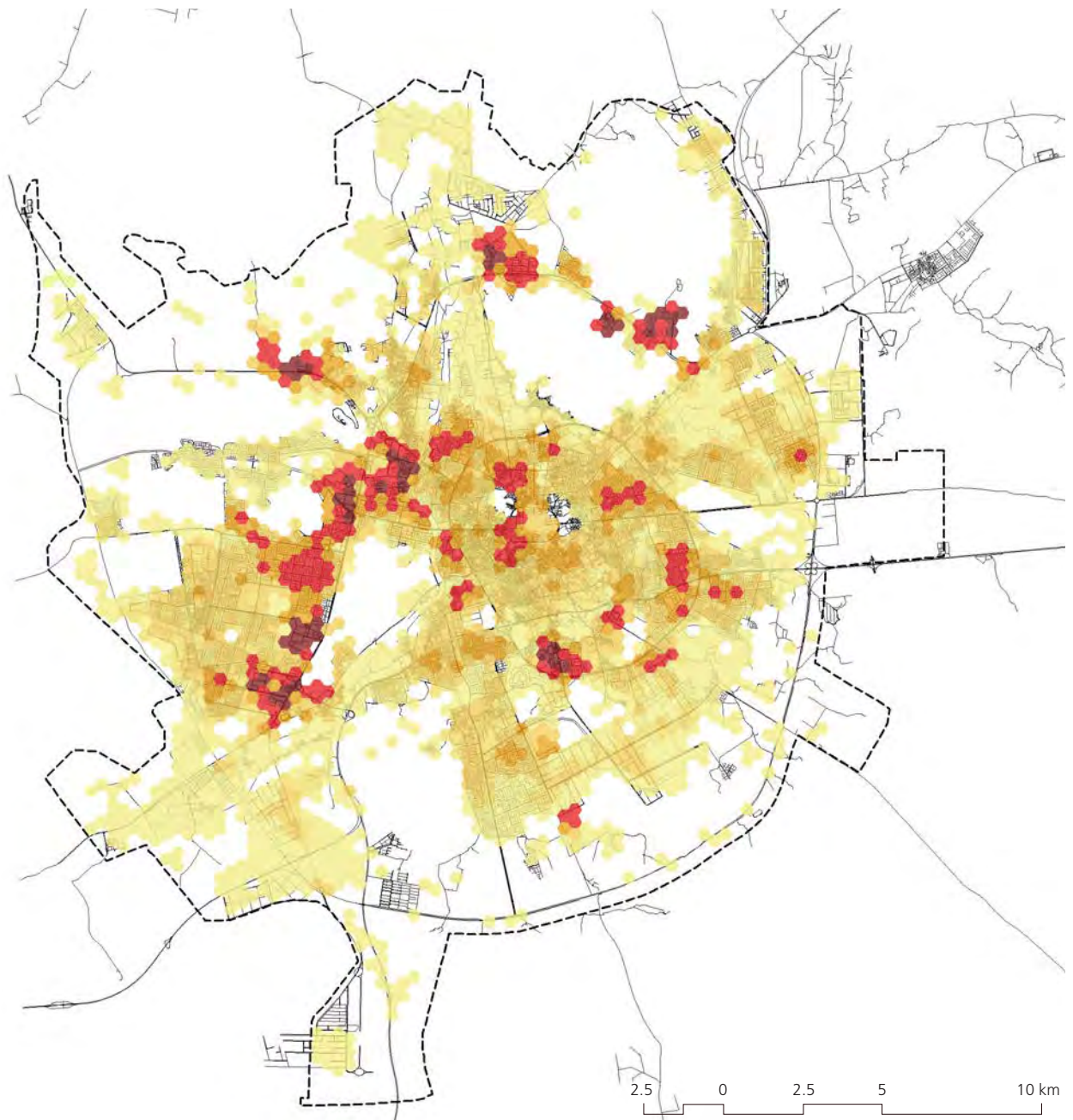


Fig. 59. Current job accessibility within the 10-minute walking distance

Jobs accessible within a 10-minute walk per person:

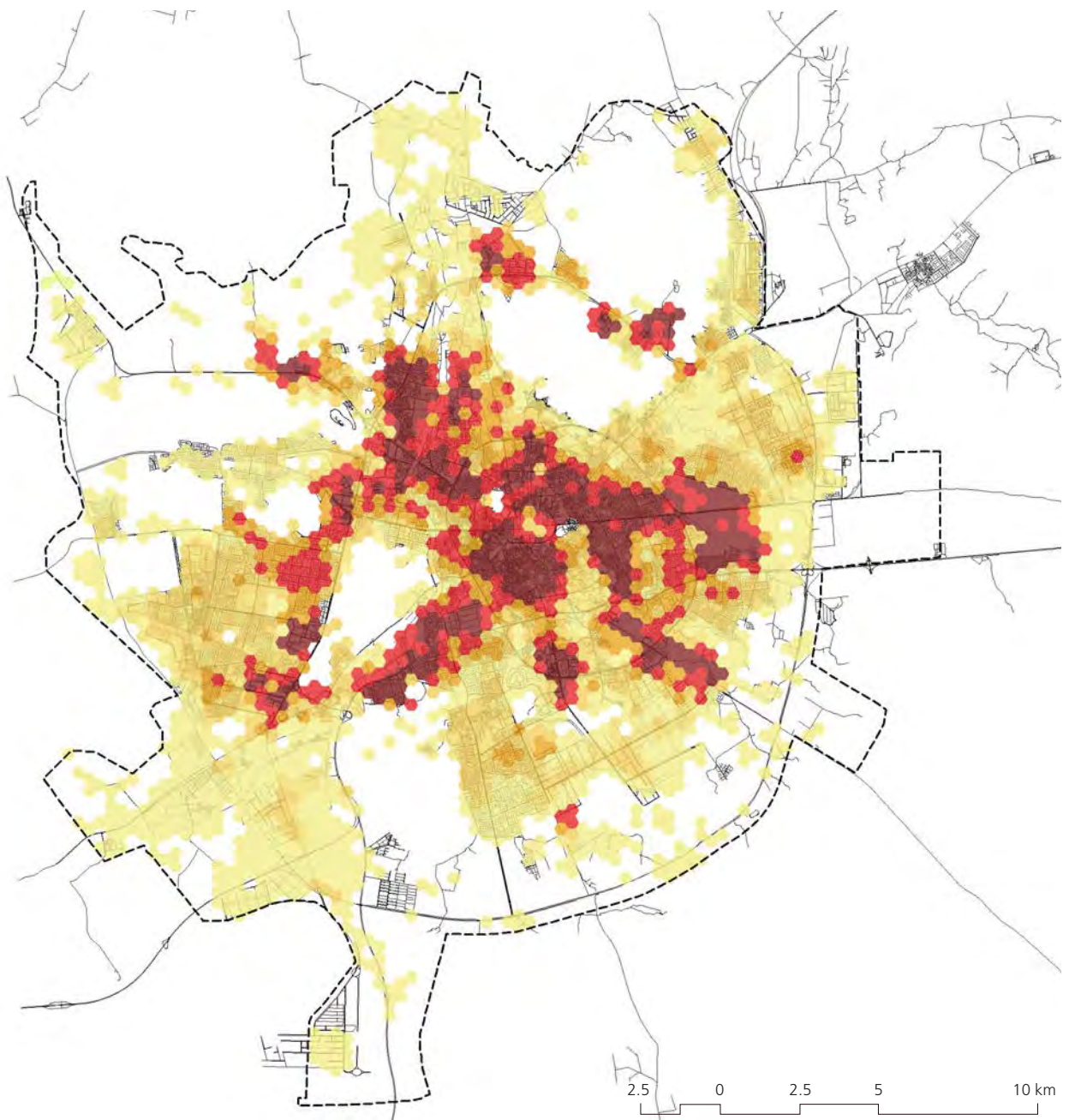
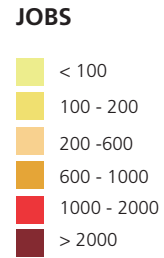
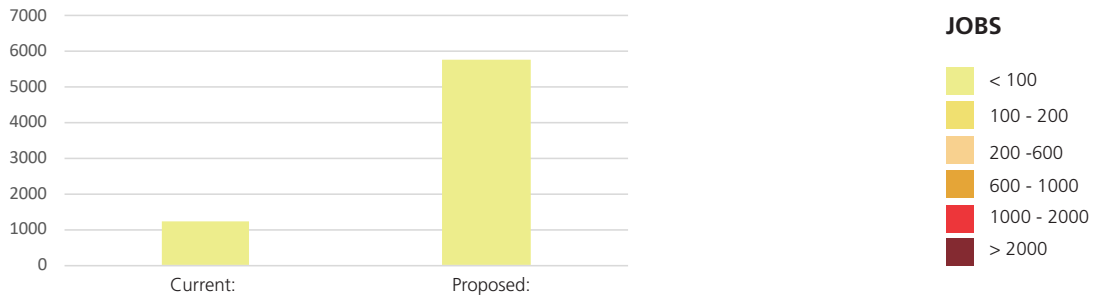


Fig. 60. Proposed job accessibility within the 10-minute walking distance

Jobs accessed by metro

The proposed metro lines, with the current land use pattern and distribution, give access to 33% of all jobs in the city to people residing and working within a 10-minute walk buffer and assuming a 20-minute metro ride. With the current density and distribution of land use, the public transportation system will not be as successful as it would struggle to serve a large percentage of the population.

Densifying and changing land use along the 10-minute walk catchment area from the metro stations, doubles the number of jobs accessed, increasing access to 63% of all jobs within the city. The exact proportion of jobs added along these corridors will vary based on the density and distribution of land use during implementation. However, developing along

the guidelines mentioned in this document will ensure that the city benefits from the economic advantages of bringing people together and connecting them via public transport.

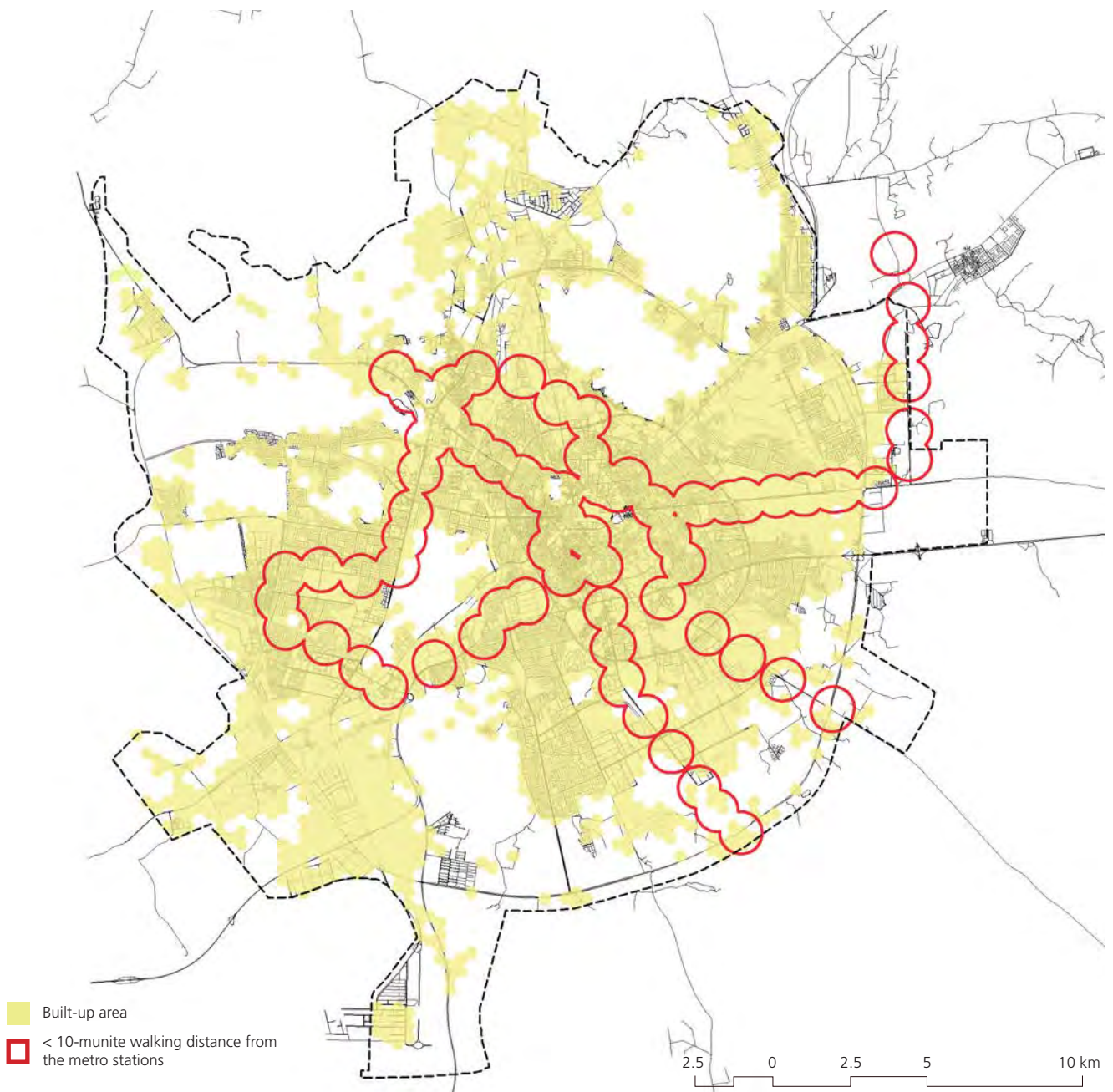
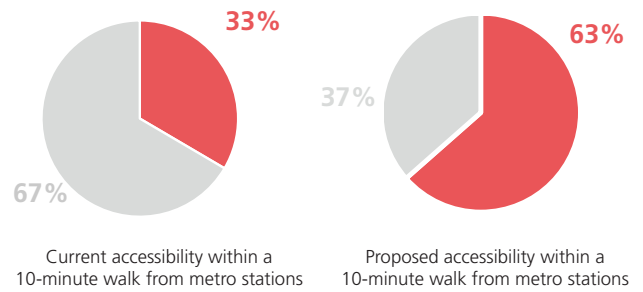


Fig. 61. Current and proposed job accessibility by metro



© Ikhlasil Amal

The pedestrian route with vegetation towards the Prophet's Mosque

Jobs accessed by driving

Job distribution is calculated by estimating a certain number of jobs per square metre of the built-up area for each land use. As shown in figure 62, about 69% of all current jobs in the city can be accessed within a 20-minute drive. This analysis is dependent on the even distribution of land use and the road network itself. This means that the more central locations have a greater reach to jobs within the city.

As the population increases and with a denser distribution in the city centre, the access to jobs by road should increase. However, with an increase in the number of people on the current road network, the travel speeds would reduce due

to congestion. This is a fair assumption, as trends worldwide indicate that growing cities witness increased congestion and an overall reduction in travel speeds. Hence, the number of jobs accessed by car within a 20-minute in the proposed scenario will reduce to 45%, (figure 63). This statistic endorses the need to supplement this reduction in the number of jobs accessible by car by putting a public transportation system in place as the city grows. The public transportation system will increase the total number of jobs accessed when all modes of transport are considered together.

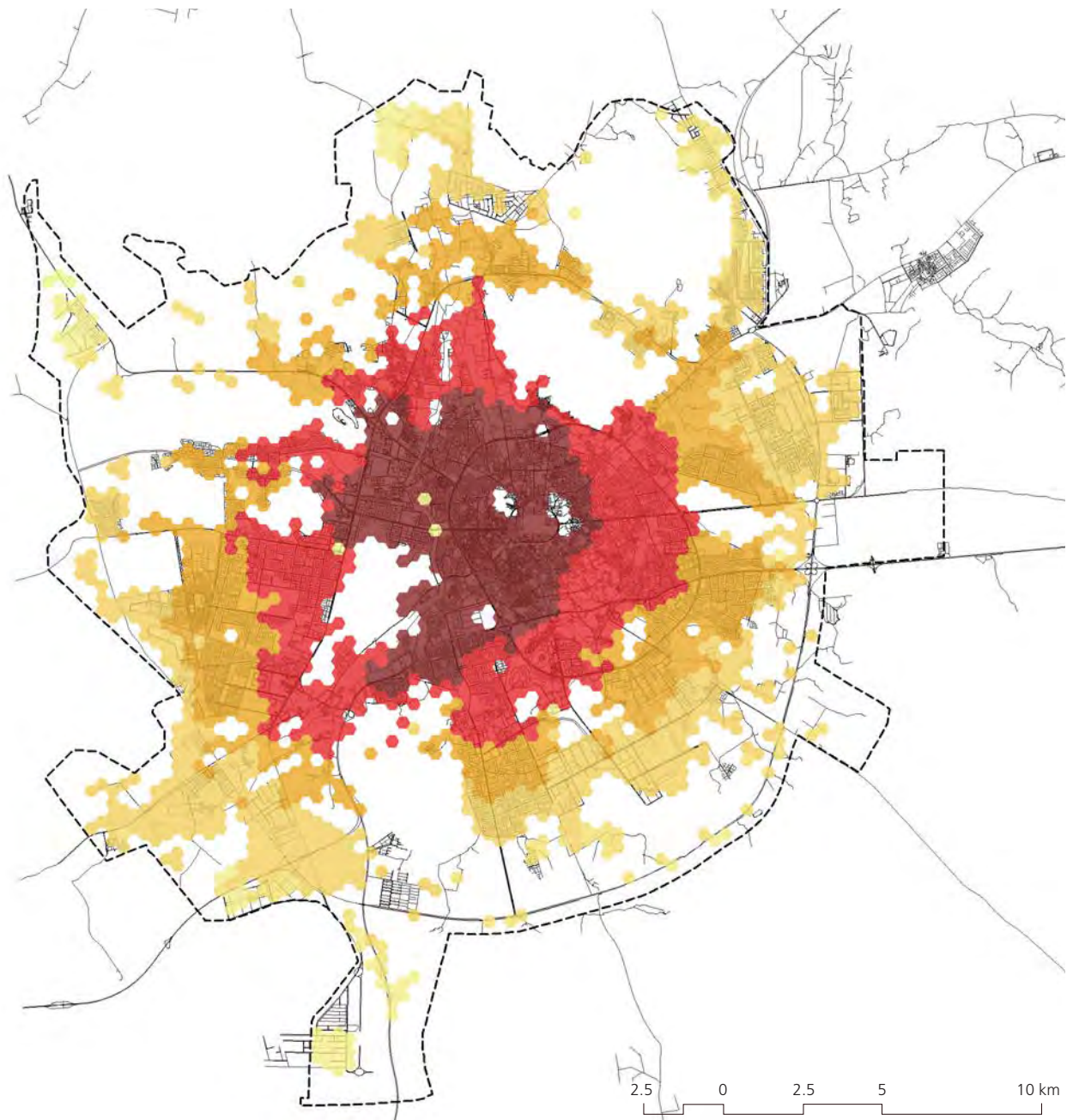


Fig. 62. Current job accessibility within the 20-minute driving distance

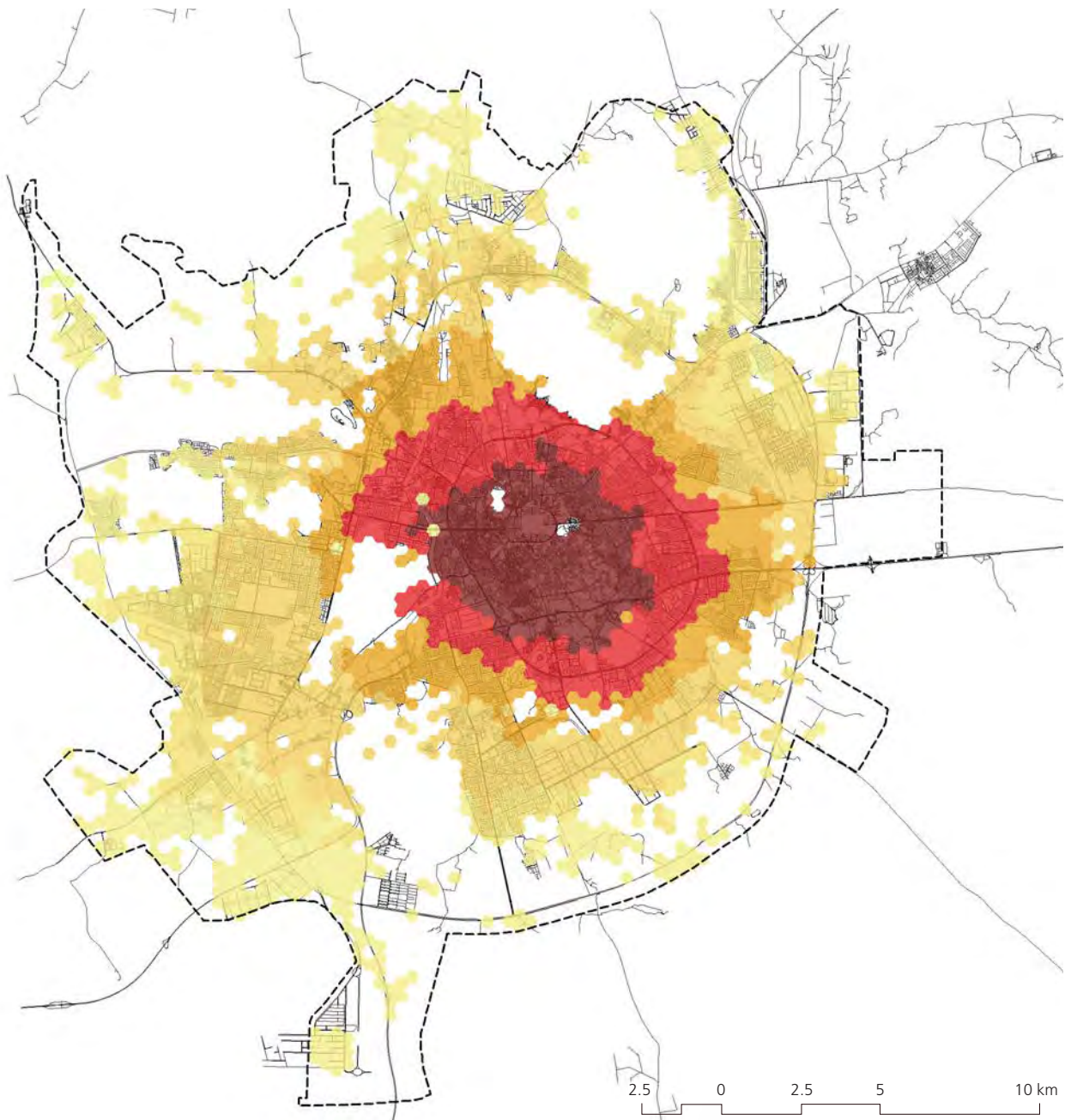
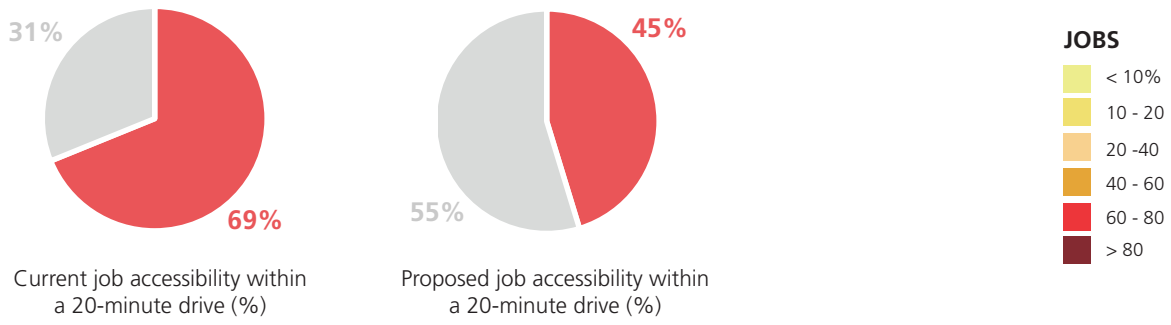


Fig. 63. Proposed job accessibility within the 20-minute driving distance

Accessibility

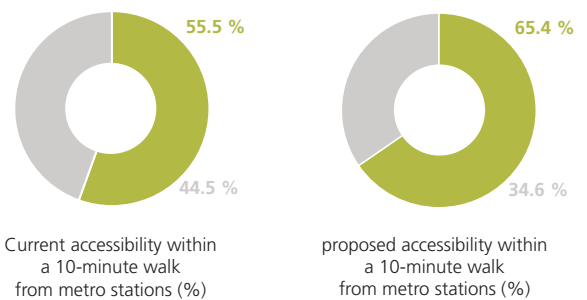
Spatial planning, land use, and urban density impact the overall effectiveness of a public transport system, both in terms of the number of users, travel-time, and distances. In a city with a balanced mix of uses, characterised by compactness and good accessibility to services and facilities, the public transport can generate strong local economic dynamics and trigger social integration.

Implementing the vision for Madinah will have great impact on the number of people accessing public transportation, therefore, the city and its opportunities. The increase in density gives access to public transportation to a greater number of residents, giving them a choice to switch to more sustainable travel modes. In particular, in respect to the foreseen public transport system, the number of users able to access the lines within a 10-minute walking distance will significantly increase from 55.5%, calculated over the current density distribution, to 65.4% calculated over the proposed density patterns distribution. Similarly, the population captured within a 5-minute walking distance to the public transport will increase from 31.6 %, calculated over the current density distribution, to 41.7 % considering the proposed density levels.

Overall, the proposed strategic densification will give access to public transportation to a higher number of residents, with more than 50% of the population located within a 10-minute walking distance from one of the public transport lines, giving the city a better chance to manage movement efficiently and in a more

sustainable manner. The proposed transportation network will, therefore, play a key role in the establishment and the success of a polycentric model, as well as infostering socio-spatial integration across the city by allowing more interaction between permanent and floating population.

Densifying along these corridors will not only improve accessibility and increase density for a more sustainable urban form, but it will also create a coherent and comprehensible structure for the city of Madinah, that is currently plagued with fragmented pockets of sprawling developments. As illustrated in the sections above, the proposed scenario brings together spatial planning policies, urban mobility and economic development in Madinah. By densifying and developing along mobility corridors, the total number of jobs in the city and the access to opportunities increases and the overall social and economic well being of the city benefits from agglomeration advantages.



Residential area of Madinah close to the Uhud Mountain

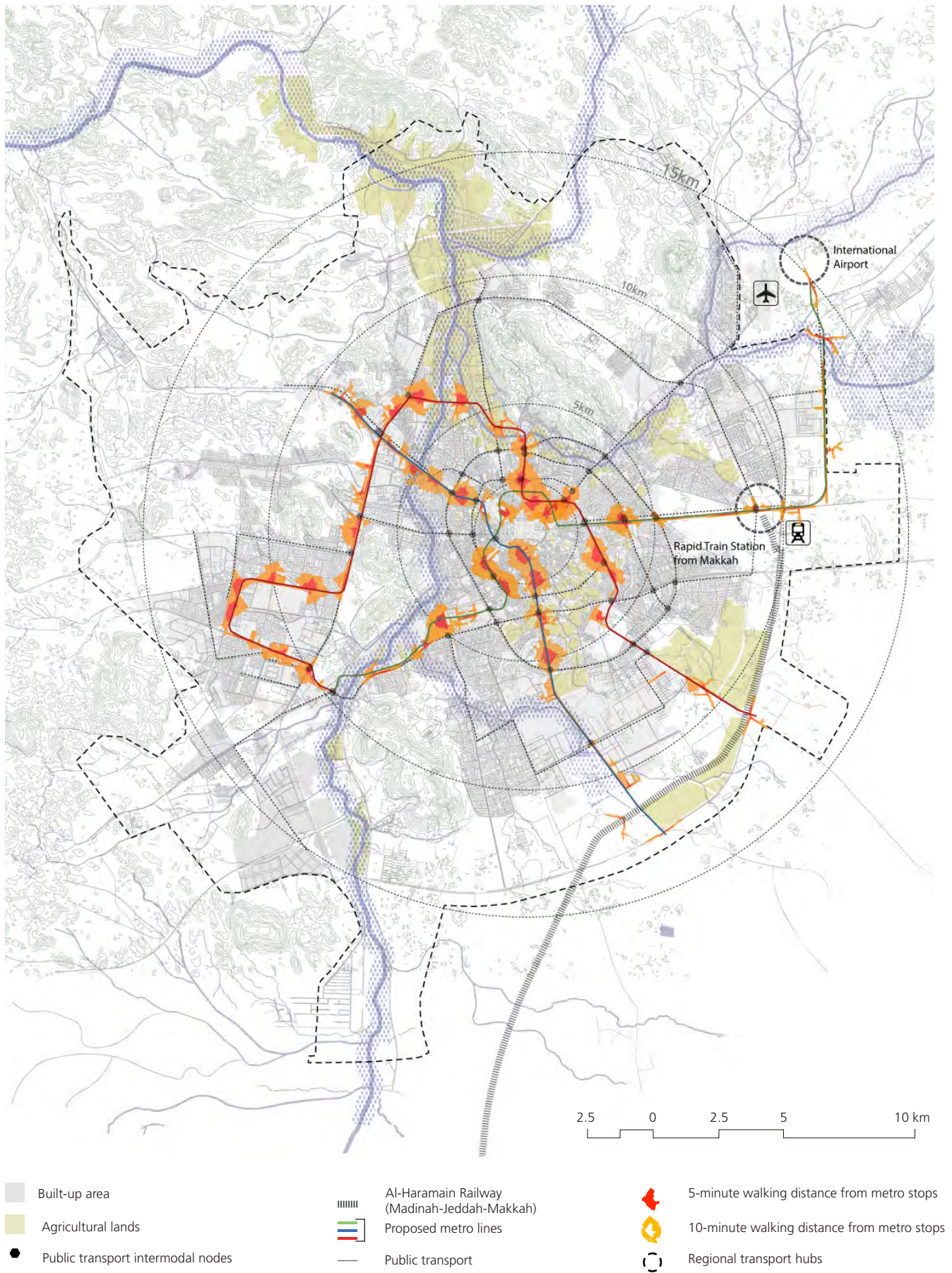
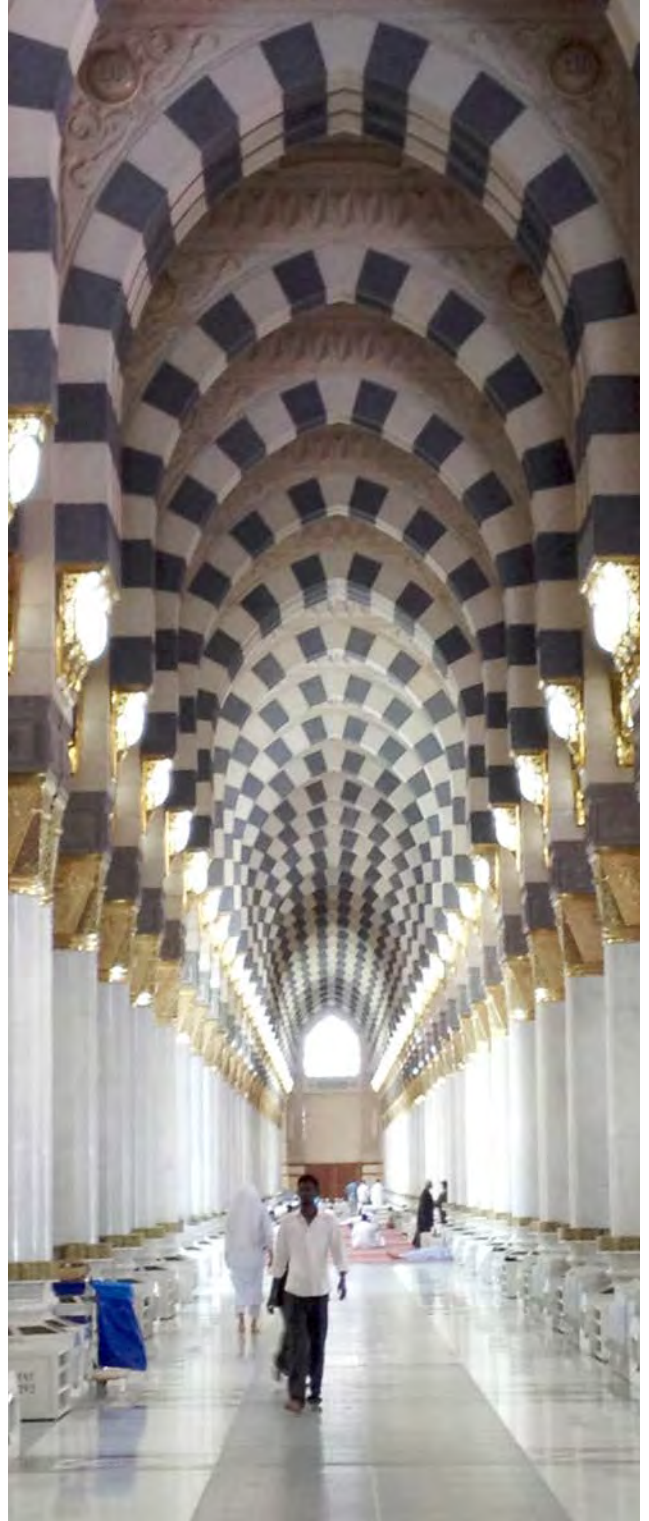


Fig. 64. Public transport accessibility analysis for proposed scenario

ACTION PLAN 7



7.1 From Strategy to Action

Transforming conceptual recommendations into concrete and implementable strategies requires detailed systemic actions, that can incrementally trigger the envisaged spatial, economic, and social transformations. As such, an action plan that is rooted in the four strategic recommendations and grounded in a series of incremental interventions for Madinah serves as a guide in prioritising and detailing the subsequent actions needed for building an integrated and resilient city. The four systemic actions able to trigger a structural change in Madinah's development trajectory are defined as:

- **ACTION 1: Implement the foreseen public transport system to create a backbone for development**
- **ACTION 2: Densify along public transport routes and develop new centralities**
- **ACTION 3: Protect, revitalise, and integrate historic and vernacular areas**
- **ACTION 4: Preserve, enhance, and relink the blue and green networks**

Overall, the Action Plan creates impact at two scales: the urban and the neighbourhood scale. Actions 1 and 2 address the need for a system of urban interventions, in order to address the issue of sprawl and segregation in the city. The implementation of a public transportation network and the creation of new centralities around the main nodes acts at the city scale, rebuilding the relations between different city users, improving integration of the urban outskirts to the rest of the city, and improving transport and mobility network. Action 3 focuses on the neighbourhood scale, targeting preservation, upgrading, and revitalisation of heritage areas, recommending heritage preservation programmes targeting historic and vernacular neighbourhoods. Action 4, on the other hand, promotes punctual interventions by targeting diffused micro public space networks at the neighbourhood scale while addressing the socio-ecological rehabilitation of natural elements, for the whole city, by tackling the blue and green networks. If implemented, these actions have the potential to readdress Madinah's future urban development radically.



Public spaces next to the Prophet's Mosque

© FSCP



- | | | |
|--|---|---|
| <ul style="list-style-type: none"> Vacant land within 10-minute walking distance from metro stops (for density 200p/ha) Secondary vacant land (for density 200p/ha) Vacant land within the 2nd Ring Road (for density 150p/ha) Reserved for open spaces Redevelopment areas | <ul style="list-style-type: none"> Mixed-use nodes Commercial nodes Ecological nodes Secondary nodes Public transport intermodal nodes | <ul style="list-style-type: none"> Blue network Green network Public transport lines Agricultural land and parks Populated areas (> 150p/ha) Populated areas (< 150p/ha) |
|--|---|---|

Fig. 65. Strategic recommendations for Madinah

7.1.1 Action 1: Implement public transport system to create backbone for development

The first action addresses the need to restructure the city starting from its mobility patterns, which represents the first step toward the building of a compact and integrated city. Action 1 acknowledges and builds on the intermodal public transport system envisaged by the 2011 Comprehensive Plan. Increased efficiency of the public transport network will be a necessary condition for promoting an increased urban density and the subsequent consolidation of a system of new centralities around the emerging transport nodes.

Following this rationale, Action 1 sets the priorities for the incremental implementation of the comprehensive and intermodal public transport system, which, over time, will open up large parcels for transformation into high-density, mixed-use areas. This strategic action will also reduce the pressure on the city centre of Madinah, diminishing pedestrian/vehicular conflicts and decreasing car-dependency for people living in the outskirts of the city. Action 1 can be summarised in the following steps:

1.1 Start implementing the public transport network with the three main metro lines

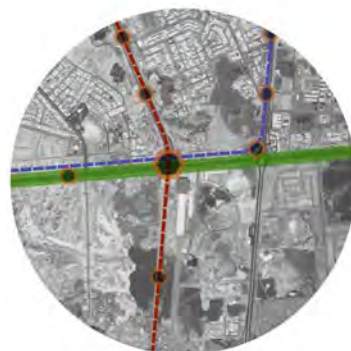
Based on the catchment and accessibility analysis for the proposed public transportation system, it emerged that implementing the three envisaged metro lines would start reshaping the city's mobility patterns. The proposed three metro lines would strategically connect important nodes, such as the Al-Haramain train station and Prince Mohammed Bin Abdulaziz International Airport between themselves and the rest of the city. All three metro lines would pass through the central area, and link to both the Knowledge Economic City and the Pilgrim City, significantly decreasing the pressure on vehicular mobility from these areas to the centre.

1.2 Complement the foreseen network with public transport loop on the new Ring Road and establish feeder systems

The metro network should be complemented with a loop-bus, which would work as an alternative to the proposed extension of the 2nd Ring Road. The alternative public transport link, together with the capillary feeder system, will facilitate the intermodal exchanges, allowing for better integration of the public transport system with the different neighbourhoods, diffusely reconnecting the city.



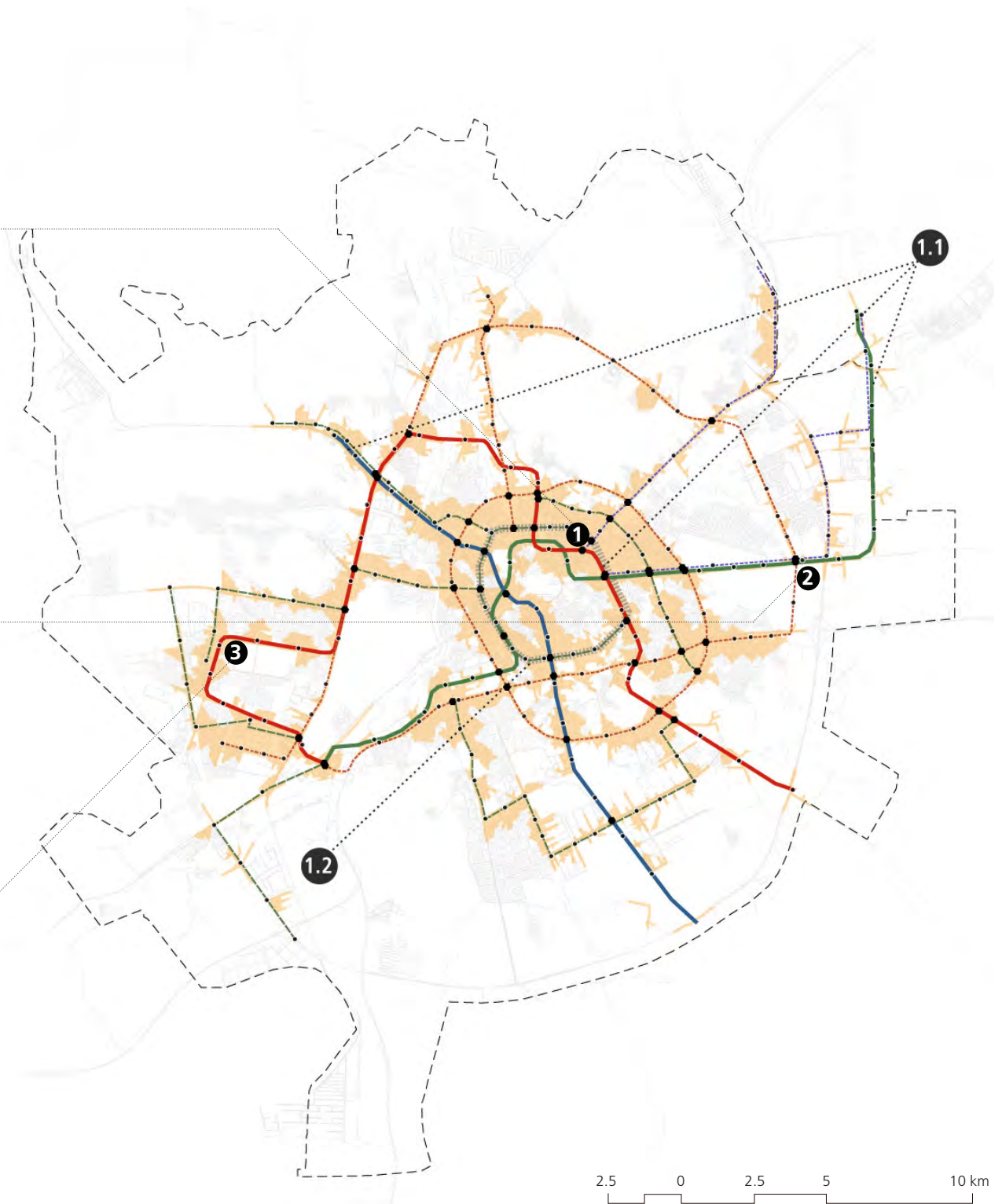
1.
TOD strategy applied around major interchanges



2.
Public transport system connected to the Al-Haramain High-speed Train Station



3.
Implementation of the public transport system connecting the outskirts to the central area



- 10-minute walking distance
- Metro lines
- Public transport loop
- Express lines
- BRT lines
- Feeder lines
- Public transport intermodal nodes
- Public transport stops

Fig. 66. Action 1: Implement public transport system to create backbone for development

7.1.2 Action 2: *Densify along public transport and develop new centralities*

Following the implementation of a public transportation network, strategic densification should be implemented following the principles of Transport Oriented Development (TOD) along the proposed public transport lines and at the main nodes. The city should, therefore, start actively promoting TOD development, incentivising residential densification in the priority areas within a 10-minute walking distance to the public transport lines and promoting mixed-use development around the main nodes, especially at the intermodal intersections between the metro system and the loop-bus. Strategic densification, applied to the selected major nodes and corridors along the public transport system, will incrementally redistribute mixed-use areas, activating major nodes and consolidating them as service centres. The concentration of services and mixed-use functions will, in turn, define the major nodes as new centralities, which will need to be developed with different vocational identities, so as to define a system of complementary and well-connected centres.

The system of new centralities will be inter-connected by the loop-bus, which will support densification along the Ring Road. Strategic densification in this area should follow a gradient, based on different typologies and controlled building heights, that supports the maintenance of a visual axis towards the Prophet's Mosque. This will be in line with respecting and strengthening the city's radial structure and identity, as well as the hierarchy of this unique centrality. Therefore, Action 2 guides operating strategic densification using the TOD principles, and in setting the criteria for the incremental consolidation of new emerging centralities:

2.1 Develop the vacant land within the established boundary

The priority in selecting areas for densification should be the vacant land within 10-minute walking distance to the public transport, which is appropriate for high-density, mixed-use development with the average density of 200 pp/ha. These areas should include a wide range of services and hosting facilities for pilgrims, like boutique hotels and other types of diffused accommodation. Mixing residential areas with facilities for pilgrims will bring residents and pilgrims together, and help to rebalance the current uneven service-distribution.

2.2 Follow with the development of vacant land within the 2nd Ring Road

The areas within the 2nd Ring Road should follow, being developed with an average density of 150 p/ha, represented by low and medium-rise development, integrated within the traditional urban form, so as to respect the city's identity by maintaining visual openness towards the Prophet's Mosque for the rest of the city.

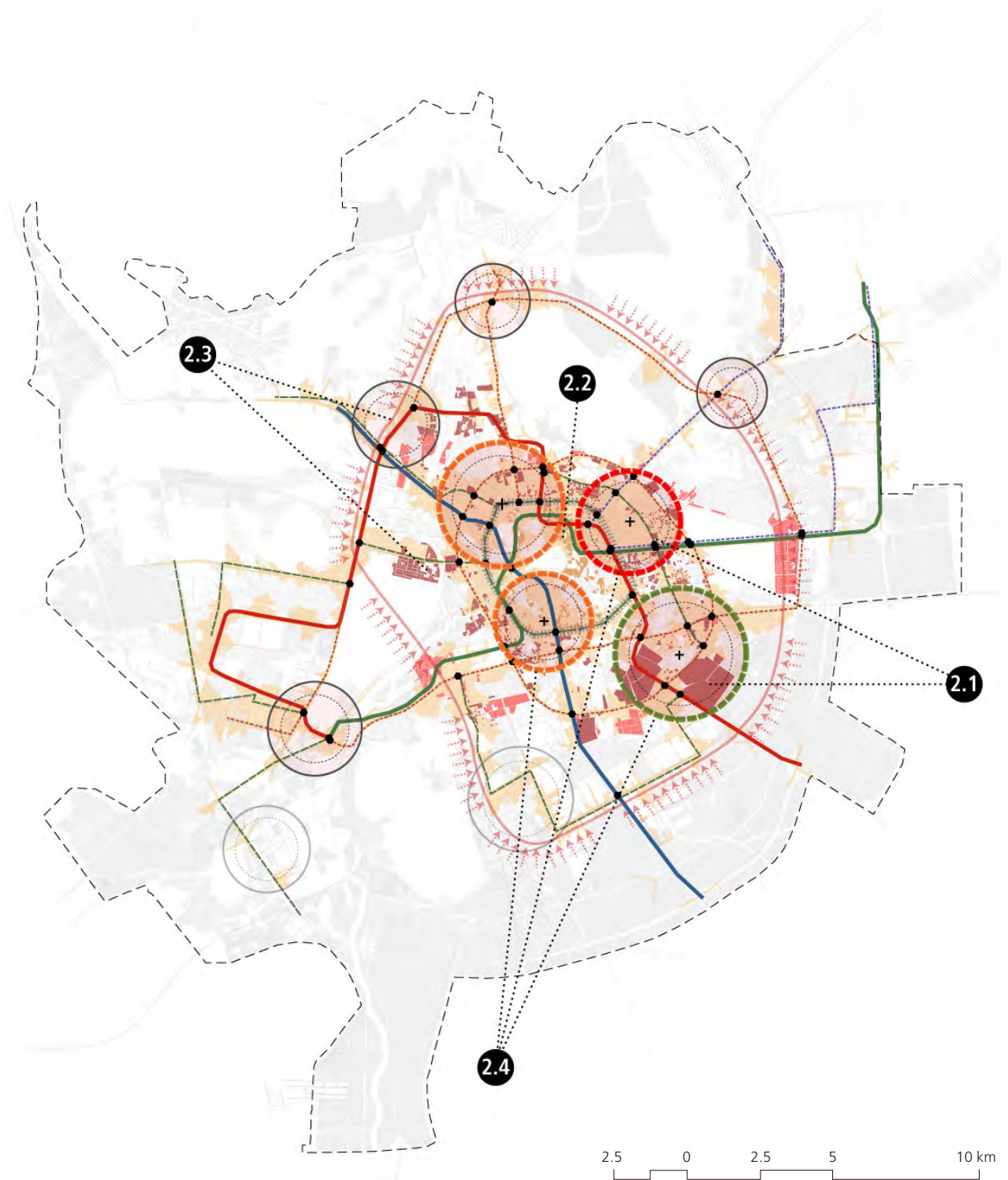
2.3 Promote dense and mixed-use development along the public transport system

The current development pressure, experienced by Madinah should be redirected following the distribution of public transport lines. Distributing urban density following this criterium will increase the number of people serviced by public transport, thus reducing overall car-dependency for both residents and visitors. The density within the consolidated city will start rising homogeneously towards 150-200 p/ha. Consumption of desert land in the outskirts of the city should be consequently avoided, instead focusing development efforts on the structuring of a more sustainable, compact and efficient urban form.

2.4 Develop a system of new centralities enhancing the diverse neighbourhoods identities

As mentioned, some of the newly developed and densified areas around major nodes, embedding the concentration of mixed-use functions and services, will become new centralities. Action 2 suggests three different vocational identities for these new centralities, in relation to their locations:

- Mixed-use nodes, (with prevailing mixed-use and services, concentration functions), located to the North of the loop-bus and next to the Pilgrim city;
- Commercial nodes, (with prevailing commercial functions), located on the axis linking the central area to the Knowledge Economic City;
- Ecological nodes, (intersection with agricultural land and traditional farms), for all those nodes located on areas closely integrated with the green network, the wadis and the system of farmlands
- This will help to create a diversified system of centralities depending on the surrounding conditions, in terms of urban form, functions, and roles within the city, allowing for both diversity and integration of the city's diverse neighbourhoods and features.



- | | | |
|-----------------------|--|-----------------------------------|
| Metro lines | Densification boundary | MixED-use nodes |
| Public transport loop | Vacant land within 10-minute walking distance from metro stops (for density 200p/ha) | Commercial nodes |
| Express lines | Secondary vacant land (for density 200p/ha) | Ecological nodes |
| BRT lines | Vacant land within the 2 nd Ring Road (for density 150p/ha) | Secondary nodes |
| Feeder lines | 10-minute walking distance | Public transport intermodal nodes |

Fig. 67. Action 2: Densify along public transport and develop new centralities

7.1.3 Action 3: Protect, revitalise and integrate historic and vernacular areas

As seen, the significant increase of pilgrims resulted in the expansion of the Prophet's Mosque and the construction of high-rise hotels within the 3rd Ring Road, changing the traditional urban fabric and patterns of the area. The central area, which is the oldest part of the city, with its vernacular patterns, performs as the major high-density area, hosting 304,743 inhabitants, which is nearly 22% of the total population. Labeling these areas as unplanned, as done until now, does not help in avoiding the risk of demolition and radical redevelopment. Preserving and upgrading historic and vernacular areas would treasure the identity of the city against a standardised and stereotypical kind of development made up of high-rise hotels and condominiums. Upgrading, integrating, and revitalising vernacular areas would improve the public realm and maintain a richer socio-spatial pattern, creating new economic opportunities. The upgrading, integration, and revitalisation of both historic and vernacular areas would increase the touristic potential, creating and redistributing economic benefits derived from tourism to a wider population. For this reason, Action 3 asks for the establishment of an appropriate categorisation for these areas, along with a comprehensive regulatory system to detailed intervention guidelines for their upgrading:

3.1 Establish categorisation system for vernacular and historic areas

The careful assessment and the subsequent appropriate categorisation of the various unplanned areas, will help to distinguish which parts of the city to categorise for preservation and which areas to target for potential redevelopment. Action 3 suggests starting with three macro-categories, to be used in a preliminary analysis:

- Historic areas existing from 1929,
- Areas with traditional agricultural pattern within/in the proximity of the green network,
- Unplanned areas within the 1450 UGB in need of redevelopment.

Based on the three described macro-categories, a set of restrictive regulatory controls rules and redevelopment regulations should be set in place. This would help in subsequently formulate an appropriate strategy for each category, targeting the preservation, rehabilitation and upgrading, as well as the integration, and revitalisation of different kinds of neighbourhoods in Madinah.

3.2 Protect and upgrade historical and vernacular urban patterns

The areas presenting the vernacular patterns should have a specific set of regulations and design guidelines for their revitalisation and integration with the consolidated city. This should include the preservation of the irregular street patterns and urban fabric, as well as the existing streetscape, building typologies and massing. Upgrading of the built environment through interventions on both the exterior and interior parts of the buildings should form an integral part of the approach. Selective demolition processes of unsafe and poorly maintained buildings should aim at

increasing hygiene standards while providing necessary services and infrastructure in line with specifically designed structural upgrading and revitalisation plans, in parallel devising small and distributed public spaces. Upgrading the public realm by providing small and distributed public spaces would revitalise the socio-economic vibrancy of the neighbourhoods while increasing the quality of life for residents.

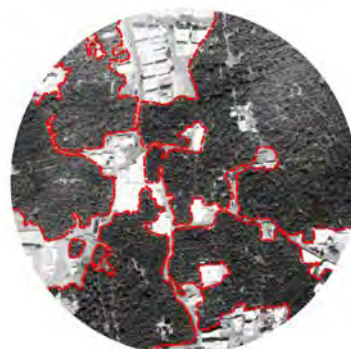
3.3 Preserve, revitalise and integrate traditional farmlands into the urban fabric

The traditional farmlands should be preserved and linked to the comprehensive system of the green and blue network, and become a part of the heritage together with their old mud buildings, therefore, promoting Madinah rich identity. These currently inaccessible areas should be integrated into the green system to revitalise the abandoned agricultural lands, increasing public spaces and forming vegetated pedestrian alleyways. Such an intervention would support the creation of a highly connected green system, going from the regenerated urban farms and the system of wadis to the central historic areas. This would structure a new green infrastructural system, where sustainable neighbourhoods and wadis are equally integrated within the urban environment, creating the possibility for the establishment of eco-villages, recreational farms, and other kinds of micro-enterprises complementing Madinah's tourist offer.



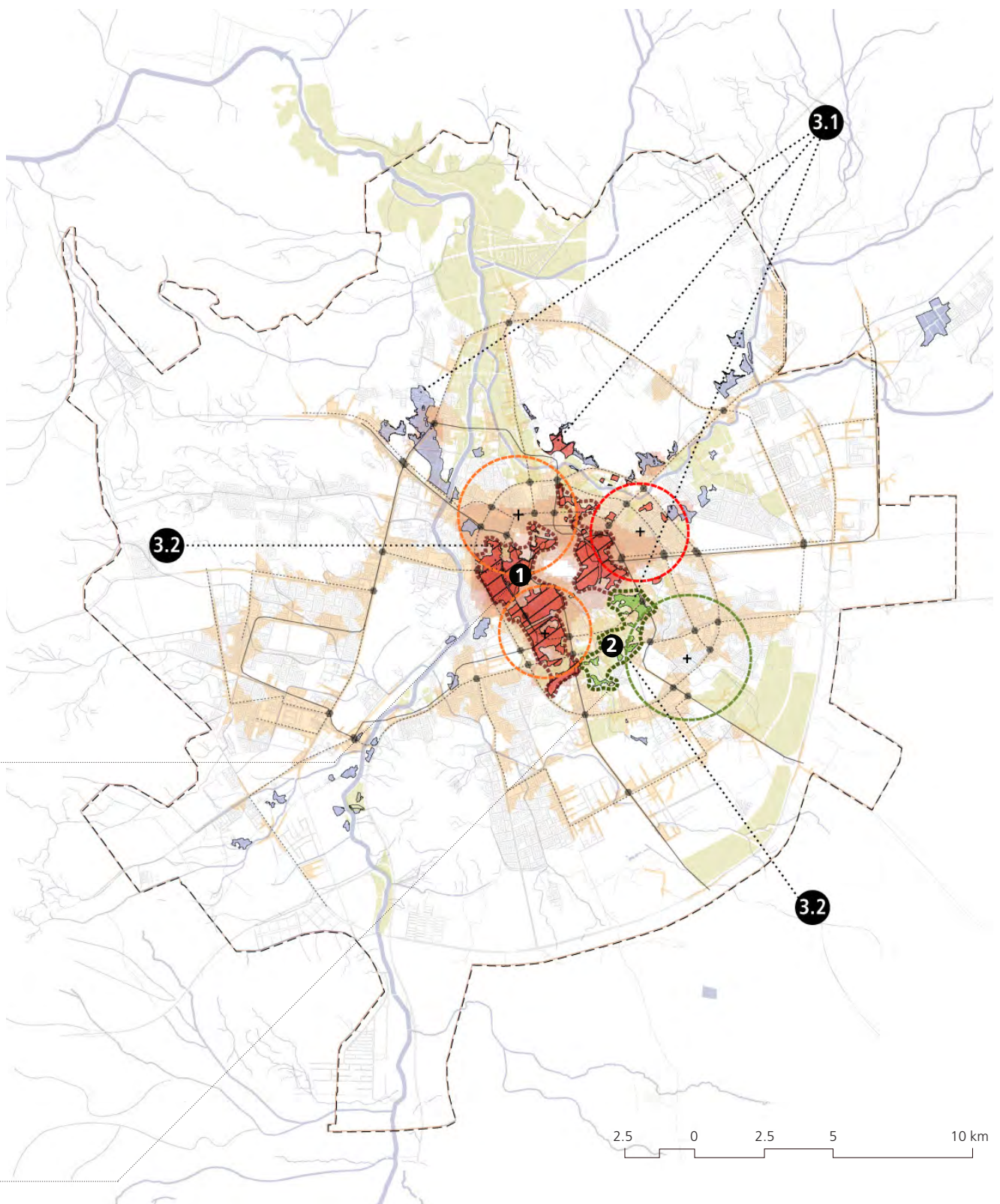
1.

*Area with historical value,
built before 1929*



2.

Traditional farmlands



- | | | |
|---|--|--|
| <ul style="list-style-type: none"> ■ Traditional farmlands to be revitalised and integrated ■ Historical pattern to be protected ● Public transport intermodal nodes ■ 10-minute walking distance | <ul style="list-style-type: none"> ■ Historic areas existing from 1929 ■ Areas with traditional agricultural pattern within / in the proximity of the green network ■ Unplanned areas within the 1450 UGB in need of redevelopment ■ Agricultural land | <p>Priority areas for densification:</p> <ul style="list-style-type: none"> ○ Mixed-use nodes ○ Commercial nodes ○ Ecological nodes — Public transport lines |
|---|--|--|

Fig. 68. Action 3: Protect, revitalise and integrate historic and vernacular areas

7.1.4 Action 4: Preserve, enhance, and relink the blue and green networks

Action 4 aims at making the city more resilient, more sustainable, and enjoyable for both residents and pilgrims. As such, and in parallel to the strategic densification process indicated in Action 2, vacant land will have to be selectively preserved for the creation of green public space, especially within the 2nd Ring Road, in close proximity to the Prophet's Mosque, and in areas subjected to densification. Some of the vacant parcels in these areas should be selectively reserved for the creation of green public spaces, pocket parks, and public gardens. In parallel, the natural system of wadis, currently neglected as a structural element in the city's functioning, will have to be re-naturalised and strengthened, moving towards natural water management systems at the entire urban scale, so as to play a key role in the city's functioning. In addition, promotion of urban and peri-urban agriculture along the wadis, together with the preservation and revitalisation of traditional farmlands, will gradually support the relinking of green and blue networks, while strengthening food security and resilience. As such, Action 4 is articulated in the following steps:

4.1 Selectively preserve and convert vacant land into public spaces, creating a well-distributed network, especially in the city centre

The 2011 Comprehensive Plan for Al Madinah proposes, through an Open Space Strategy, a substantial increase of open public spaces in the city. Accordingly, Action 4 foresees the preservation of existing vacant land for this purpose, especially in close proximity of the new mixed-use nodes previously described and in the central area. All new development areas, should, therefore, be considered as opportunities to increase green public spaces, establishing a network connected to the major parks. Well-distributed, well-designed, and diversified open green spaces should incrementally form a strong and well-linked green network, moving towards and along the wadis system.

4.2 Revitalise natural hydrological system across the city, restoring and preserving wadis and transforming them into linear parks

Primary wadis and existing agricultural land will have to be protected from development encroachment. With the goal of increasing water-table recharge mechanisms, wadis' rehabilitation will require a gradual move towards re-establishing a more natural water management approach, away from the current highly engineered flood-control channeling system. Rehabilitated wadis, together with the adjacent traditional farmlands, should then be transformed into linear parks and linked to a networked system of public spaces across the city. This highly interconnected green network should be supported by policies incentivising urban and peri-urban agriculture where possible, facilitating the process of relinking blue and green systems.

4.3 Create a diffused system of water retention ponds linked to the wadi network to increase storage capacity and prevent flooding

In order to increase Madinah's resilience to floods, while

providing additional water storage opportunities for agricultural uses, a system of small and diffused retention ponds should be incorporated into the wadi system. By reinstating underground water-table recharge mechanisms, and by creating and capillary distributing water retention ponds along the wadis beds, the alluvial overflow could be accommodated sustainably and naturally, while simultaneously increasing water security and resilience to floods. Meanwhile, the reconnected green and blue networks will reduce the evapotranspiration phenomena along the wadis, contributing to the overall water-tables recharge mechanism.



1.

Implementation of the system of water retention ponds



2.

Transformation of wadis into linear parks



3.

Transformation of vacant land into public and green spaces

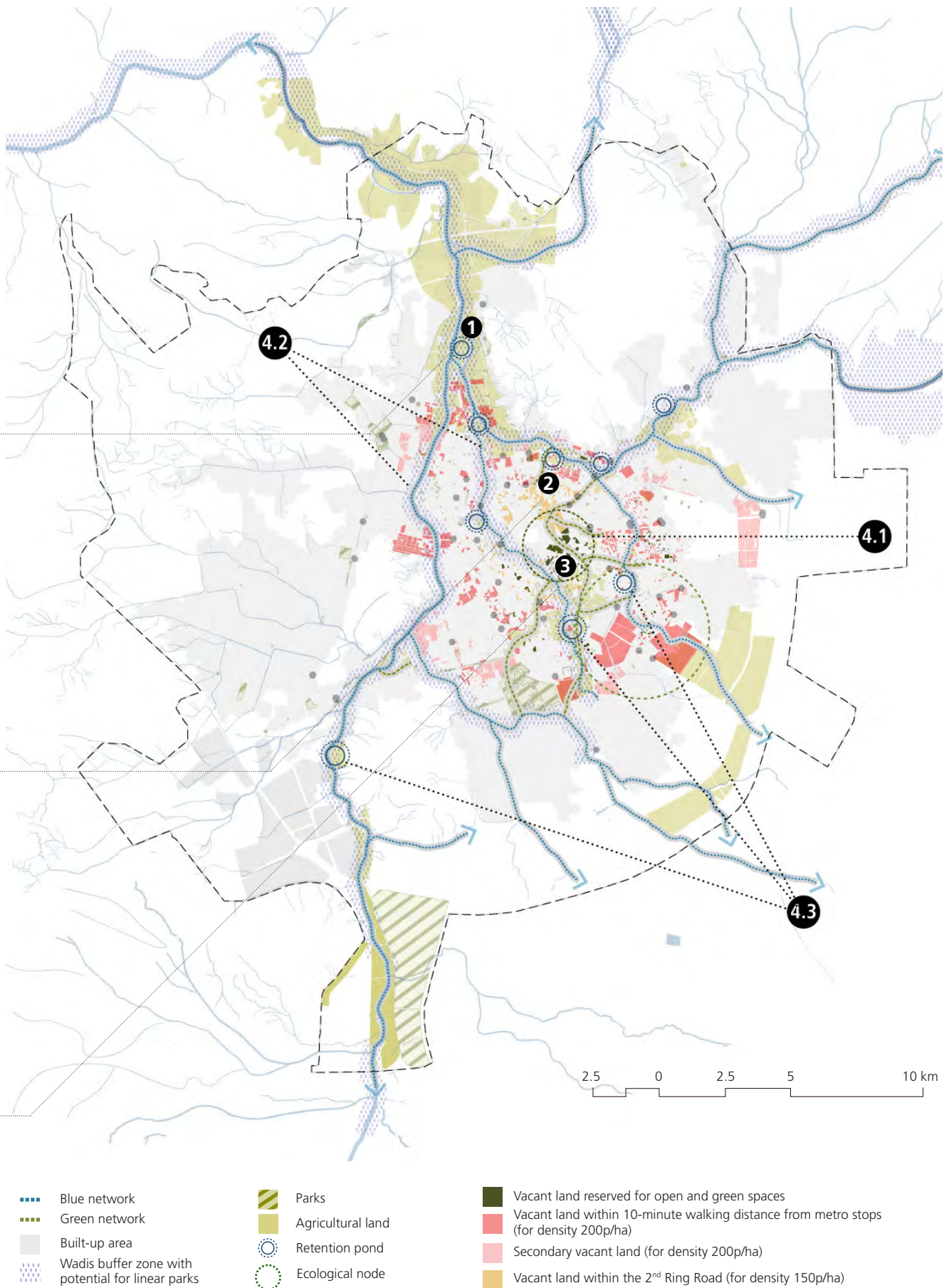


Fig. 69. Action 4: Preserve, enhance, and relink blue and green network

7.2 Four Systemic Actions for Structural Change

The Action Plan presented here can be considered as a guide on how to incrementally trigger a structural change in Madinah, moving away from an unsustainable model towards an integrated, ecological framework for urban development. A sustainable and ecological city (or Eco-City) considers together environmental, social, and economic factors, along with comprehensive urban planning and management efforts for a long-term sustainable development. This implies an integrated approach to sustainable urbanisation that should be based on a holistic view of social development, economic opportunities, environmental management, and governance frameworks.

This integrated approach should entail the coordination of objectives and programmes, among different city stakeholders (e.g., citizens, Government, and the business sector), as well as the development of linkages between and within socio-economic sectors and activities. As such, the above-described scaffolded system of actions will drive an overall transformation on the spatial, the social, and the economic fabric of the city. If the steps illustrated in the Action Plan are followed, Madinah will be radically transformed into a polycentric, ecological city, aligning its identity as an oasis, and as a historic place, to a new sustainable urban structure that is:

- Compact;
- Integrated;
- Historic; and
- Resilient.



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Workshop in Madinah with local stakeholders

**FINAL RECOMMENDATIONS:
THE THREE-PRONGED APPROACH**

8



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8.1 Spatial Recommendations

8.1.1 *A strategic view of the Al Madinah Region*

The Al Madinah Region is considered one of the Saudi regions with the greatest development potentials, qualifying it to attract more investments. Therefore, the regional economic efficiency of existing activities should be developed and improved by providing more facilities and services. In addition, the productive base should be improved, and more investments should be injected into new, untapped sectors and activities.

As per the Central Department of Statistics & Information (CDSI), the average annual growth rate of the overall population in Madinah from 2004 to 2014 was 2.90%, while the average annual growth rate of the Saudi population in the region was 2.02%. This rate is lower than the average overall Kingdom-wide growth rate of Saudi population during the same period. Accordingly, Madinah as a region is one of the least attractive regions to the populations of the Kingdom.⁵⁶ This trend is different at the city level where it's considered to attract a high resident and annual floating population at the same rate of 2.9%.

Regionally, the structural problem in the development of the rural sector is due to the small size and fragmentation of communities. Similarly, it is necessary to improve the geographical redistribution of economic activities, giving priority to the fragmented and marginalised, smaller cities in the region. However, this should not happen at the expense of major cities and urban centres in the region, such as Madinah, Yanbu, and Badr, which are leading with high growth rates in the regional economy as a whole.

In an effort to better connect the region, the plan for the Al Madinah Region included a rail network between Madinah, Al Qassim, and Riyadh, passing through Al-Soweidrah, as well as the reopening of the old Hejaz Railway to connect Madinah with the Northern part of the country. Regionally, this rail network would connect Madinah to satellite cities and help with the transfer of goods and mobilisation of religious visitors, which is key to boosting the economy of the region. On regional recommendations, the key areas of focus include economic diversity, heritage, agriculture, and also an overall spatial rebalancing by infilling the massive vacant lands within the cities. However, in cognisance of the major economic plans and projects with regional impact on the economic and investment environment of the Madinah area, the future should stay guided by the need for urban sustainability while executing them.

Diversifying economic activities in the region

The economic structure of the region is not highly diversified as it is mainly a service-economy, except for Yanbu Industrial City, which is considered a national industrial centre. Whereas the focus of private investment is in trade and construction activities, linked to a demand generated by tourism, population increase, and urban growth, followed by industrial and mining activities, as well

as services. It would be, therefore, key to invest in diversification in order to generate job opportunities in the region, as indicated by Vision 2030, especially by expanding sub-sectors related to tourism, mining, and transportation, whom all enjoy comparative advantages.

The plan for the Al Madinah Region proposes an increase of agricultural land by adding 641.5 square kilometres to the current agricultural and grasslands areas, which shall be concentrated in provinces of Al-Ula, Khyber, Hanakiyah, AL-Mahd, Wadi Al-Ghora, and Wadi Al-Fari. This would more than double the total agricultural area of the region by the target year 2030, at a rate of 2.9% per annum. As the region experienced a population growth rate of 2.9% between 2004 to 2014 and beyond, it's important to protect the existing wadis and agricultural lands from construction, in order to boost production, as projected in the SAGIA economic report of 2014. In this respect, because of the encroachments on the wadis caused by the right of way of some constructions, wadis have been narrowed, causing stormwater issues and exposing properties to destruction. Protecting and re-naturalising the main wadis, like Wadi Reem, Hazra, and Al-Sumariya, amongst others, will support agriculture while improving future resilience to floods. It's worth mentioning, however, that the Amanah of Al-Madinah Al-Munawwarah, has undertaken a number of actions aimed at removing irregular occupancy on the sides of wadis across the region.

Regional heritage sites and areas contribute to the cultural heritage, not only to Madinah and the Kingdom but also to Islamic traditions around the world. With many cultural landscape areas in the region, including landscaped features or ecologically sensitive sites that are integral to the historical relationship of the population of the region, steps should be taken to preserve them. These include the prominent mountains, such as Jabal Sala and Jabal Uhud, and the major agricultural lands around the Quba Mosque.

Also of heritage importance is the historic Hejaz Railway, constructed at the beginning of 1900 to serve the Two Holy Mosques providing modern transportation to pilgrims coming from Asia, Europe, and the Levant, strengthening the ties between the then fragmented Muslim World. The Hejaz Railway was an important interchange of human values, and, together with the fortifications, stations and water works along the Syrian Hajj road, represents an outstanding example of architectural and transport security, as well as technological development of that time. The preservation of these historical pieces, as is happening with the Hejaz Museum, and all spin-off activities associated with the rail, have the potential to boost the economic contribution to the GDP of the regions it crosses while being a living testimony of Islamic history.



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Groups of pilgrims during the journey

8.1.2 Towards Madinah, Eco-historic Oasis

The strategic vision for Madinah, with the four actions described in Chapter 6 promote the development of urban spatial frameworks that support sustainable urbanisation by promoting a more compact urban form, based on adequate densification and polycentrism, and structured along the public transport network. According to the vision for Madinah, public transport, and appropriate strategic densification, together with the creation of new mixed-use centralities, will support a more efficient use of resources and land, while fostering integration between pilgrims and citizens, and connectivity across neighbourhoods. The preservation, enhancement, and integration of agricultural land and green public space, along with a re-naturalised wadi system and a better water management, will strengthen Madinah's ecological networks, while the preservation, improvement, and re-connection of historical and agricultural areas will help greening the city and making it more resilient.

As such, Madinah Compact City is envisioned as well-structured, dense, and well-balanced urban form, where the diversification of housing typologies offers opportunities to increase densities, protects existing environmental resources and offers a pleasant, diverse, and accessible urban environment with a rich historic identity. Most importantly, the future city is well-connected to the central area and the Prophet's Mosque. Historically, the Mosque area is an essential part of the city, which must be considered for the general spatial vision. Thus, Madinah Connected City builds on an intermodal and well-developed public transport

system, based on a hierarchical polycentric model, that is able to support both resident and visitor flows, reducing volume, and impact of traffic congestion, and pollution. While the vision for Madinah Historic City is centred around the preservation of the historical neighbourhoods and vernacular areas, leveraging the historical city identity to support and stimulate, and diversify local economies, creating vibrant zones with accessible public spaces for visitors and residents to share, minimising pedestrian/vehicle and visitor/resident conflict. The same system of open, public spaces, connected amongst them and integrated to the wider network of wadis, agricultural farmlands, and fields, will rebuild and strengthen the natural structuring elements of Madinah. In essence, the strategy for Madinah Resilient City enhances these networks considering preservation of agricultural land, promoting urban agriculture and adequate water management, providing a healthy natural environment which supports the city's functionality and improves the overall quality of life for its residents.

8.2 Institutional and Legal Recommendations

In terms of legal reform, Madinah would benefit from both fiscal and jurisdictional decentralisation to facilitate independent and innovative solutions to urban social problems, at the Amanah level. This should entail:



Workshop discussion in the urban planning roundtable

- The transfer of local planning power, authority and function from MoMRA to the Amanah, with provision for independent action without recourse to effectively address community needs. This is supported by the New Urban Agenda, which specifies that territorial urban design and planning processes should be led by sub-national and local governments, but their implementation will require coordination with all spheres of governments, as well as the participation of the civil society, the public sector, and other relevant stakeholders;
- Fiscal decentralisation, which gives autonomy to the Amanah to source funds to finance development activities. Revenue generation activities in cities may also include taxes and levies. Urban areas should be allowed to collect some form of property taxes to fund development activities. The recent White Lands Act that imposes fees on undeveloped plots in urban areas to tackle land speculation, housing shortages, and indiscriminate land development shows that regulatory mechanisms can be leveraged to generate revenue while fostering an efficient development framework;
- The opening of avenues for actors, including the private and voluntary sector and the general community, to participate in decisions regarding projects that affect them.

The city of Madinah needs a functionally effective by-law that preserves rural open space and agricultural land through clear terms and conditions for land use change with clear and transparent decision-making processes.

Consolidation of the legal planning instruments would also support development intervention of Madinah, along with the review, update, and modernisation of these laws to make them relevant to the current development situation. This should also entail re-thinking the lawmaking process to limit the number of actors. The mere existence of the laws in the KSA will not guarantee sustainable urban development as they must be functionally effective, i.e., precise in achieving their intended results, clear, consistent, and simple to understand. There is a need for a functionally effective urban planning law that, inter alia:

- Introduces incentives/requirements that will enable more compact city growth;
- Defines clear institutional roles and responsibilities at each level;
- Enforces linkage between all levels of plans (national-regional-local);
- Provides effective coordination and monitoring mechanisms; and
- Increases meaningful public participation and engagement in planning.



Meeting with the Mayor of Al-Madinah Al-Munawwarah

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The legal framework also needs to enshrine an acceptable mode of public participation in public decision making to foster equality and inclusion. The consolidation of the urban legislation would also give legitimacy to the plans that Madinah relies on.

Revising the Urban Growth Boundary Law to include clear criteria on how it is set would enhance technical and vertical accountability. The Law also needs to place more emphasis on establishing the Development Protection Boundary as a no-development zone to prevent haphazard development. These initiatives will strengthen policy formulation designed to make the city more sustainable, compact and dense. Primarily, a post-legislative scrutiny of the urban growth boundary law should be done to assess if it has met its policy objectives. This could in turn inform the legal reform process as well as the planning policy options.

8.3 Financial Recommendations

8.3.1 Own-source revenue instruments

In 2015, the KSA began implementing a series of reforms meant to strengthen public finance by diversifying public revenue, introducing new tax mechanisms, improving tax administration, and attracting private investment. In addition to improving local finance and economic dynamism, the reforms were also meant to support the implementation of the New Urban Agenda (NUA) by fostering inclusive, sustainable, and equitable local financial and economic frameworks through progressive tax policies and own-source revenue generation.⁵⁷

The geographic, cultural, social, demographic, and economic advantages of the KSA have made it a crucial international player and economic power. Historically, oil and gas have been the country's primary exports, but the KSA has begun investing in other strategic sectors of the economy.

Under Vision 2030, KSA's development roadmap also supports economic diversification into non-fuel.⁵⁸ One of the objectives of Vision 2030 is to facilitate economic development in new industries and foster innovation and economic competitiveness. In part, NTP 2020 was launched to build the institutional capacity needed to reach the Vision 2030 goals, including supporting economic growth and diversification. The NTP utilises innovative methods to identify economic challenges, seize opportunities, adopt effective planning tools, increase engagement with the private sector, implement reforms, and evaluate performance.

The NTP reforms aim to strengthen the public finance system, introduce new tax mechanisms, and attract private investment into industries that the KSA is most likely to have a competitive advantage in. One example of these reforms is the WLT, introduced in 2015, which requires owners of empty urban plots designated for residential or commercial use to pay an annual tax of 2.5% of the land value. The goal of the WLT is to:

- Promote real estate development that addresses supply shortages in the region;

- Increase the availability of land for affordable housing developments;
- Safeguard competitive markets and minimise monopolistic practices;
- Increase local revenue generation

Thus far, the WLT has been adopted in the cities of Riyadh, Jeddah, and Dammam and applied to 10,000 m² of urban land. In addition to improving the own-source revenue base of these three cities, reforms such as the WLT support the framework for sustainable urbanisation introduced in the New Urban Agenda (NUA).

In the case of Madinah, a policy aimed at deepening and diversifying own-source revenues should consider socio-economic and demographic factors, such as the population growth rate, population density and urban sprawl. Additionally, policies that support agricultural land are encouraged in order to protect local agricultural activities, especially in the production of dates.

Taking all of these factors into consideration, financing instruments that mobilise local revenue with an eye on the trajectory of expenditures in the long-run are crucial to supporting locally sustainable public finance and urban development. Hence, exploring own-source revenue mechanisms through land-based taxation, among others, will be a crucial step in achieving the goals put forth in the NTP.

Land-based taxation is supported by a large body of evidence from a diverse set of countries. In particular, capturing the value created by new infrastructure projects, zoning changes, and / or infrastructure upgrades, (figure 70) through land-value capture has proven to be effective in mobilising local revenue. Land-value capture is based on the idea that individuals, businesses, and landowners in the adjacent areas that benefit from government and/or private investment in infrastructure, (e.g., roads, railway, industrial infrastructure, schools, and hospitals) benefit from the land value increase resulting from these types of public infrastructure projects.

THE IMPACT OF INFRASTRUCTURE DEVELOPMENT ON LAND VALUES	
Case Examples	Key Findings
London, England	The Crossrail Property Impact Study (2012) estimated that capital values in the areas around central London Crossrail stations would rise by 35% for residential properties and 27.5% for office properties; outperforming the baseline projections.
Dubai, United Arab Emirates	The impact of public transportation on property values for dwellings and commercial properties is about 13% and 76% , respectively, within an area of 1.5 kilometres
Dubai, United Arab Emirates	Urban development that included retail facilities resulted in a price premium of 15 – 20%
Cairo, Egypt	Schools increased residential land prices by approximately 13%
	Walkability within a residential community increases home values by up to 9%
Bogotá, Colombia	Research suggests that for every additional 5-minute of walking time to a public transportation station, rental prices fell by 6.8 - 9.3%

Source: GVA (2018); Mohammad et al. (2017); Colliers International (2017); Rodriguez and Targa (2004)

Fig. 70. The impact of infrastructure development on land value



Current streetscape behind the Al-Baqi Cemetery

Land-based financial instruments are particularly well suited to Madinah where the increasing demand for and on public infrastructure is creating opportunities for introducing land-based taxes (e.g., the Smart Mass Transport System planned for 2021).

One type land-based tax mechanism is betterment levies.⁵⁹ Betterment levies are effective financing instruments that enable the cost recovery of large capital investments. Betterment levies are tailored to the type of infrastructure and mixed land use encouraged by the sustainable urbanisation principles supported by UN-Habitat. In practice, betterment levies would enable the municipal government of Madinah to capture a percentage of the additional value created by public infrastructure development projects, and land use changes that accrue to landowners and

other beneficiaries.⁶⁰

Adopting and enforcing betterment levies requires that municipalities remain transparent, accountable, and in communication with the public regarding the use and effectiveness of the betterment levy. In addition, local governments should analyse the costs and the benefits of various types of land-based financing tools.

Conducting a thorough cost-benefit analysis will enable public officials to develop proactive solutions, anticipate potential issues and bottlenecks, and seize opportunities. Figure 72 shows some of the factors that local governments should consider when conducting a cost-benefit analysis of various land-based financing instruments.

KEY FACTORS IN DESIGNING BETTERMENT LEVIES

Determining land value capture objectives

- Revenue targets based on either (a) a percent of infrastructure costs or (b) a percent of the increase in land value
- Betterment levies are a good option for scenarios involving public transportation and waterfront development
- Data on changes in land value and efficient tax administration are critical success factors

Timing and collection of payments

- Payments collected:
 - Upfront, as with developer contributions made before the infrastructure is built
 - Annually, as with an increment to local government rates
 - At the time the property is sold
- Consideration should be given to whether there are negative financial consequences for landowners who may not have the capacity to pay a levy or who are asset rich, but income poor
- The government might consider only requiring the levy to be paid when a property is sold or transferred

Application of the levy by land use groups

- Real estate developers
- Commercial landowners
- Residential landowners
- Application of the levy should be determined using the beneficiary-pays principle
- If it can be demonstrated that benefits will flow to specific types of property owners, then there is a strong case to include them in the land value mechanism design

Application and boundaries of levy

- Levies can be structured to have a broad based (e.g. city-wide) or time/distance based
- In Dammam, land value benefits are maximized for a 1.5 kilometres area with a walking catchment for public transportation.
- This benchmark is given supported by other cases (e.g. Dubai, London, Bogotá) and will require additional analysis focused on project specifics

Setting the rate

- The rate structure is variable and is determined on a case-by-case basis
- The choice of rate structure will need to reflect the choice of who to tax and the revenue base selected.
- In Dammam, the base is related to the percent of land value increase.

Governance structures for land value capture

- Various existing legal instruments that could be used for the purpose of supporting value capture tools
- Regulation of new area-specific levies associated with infrastructure projects or urban planning
- Selecting the right legal instrument reduces the potential for unintended consequences
- KSA and, specifically, Dammam currently use land value capture mechanisms
- Lessons learned from current instruments (e.g. white lands tax) can inform the selection and implementation of appropriate legal instruments that support land value capture instruments.

Source: Youngman, J.M. (1996). *Tax on land and buildings*. In Thuronyi, V., (Eds.) *Tax law design and drafting*. International Monetary Fund. Washington, DC.

Fig. 71. Key factors in designing betterment levies

COST-BENEFIT ANALYSIS FACTORS IN LAND-BASED FINANCING

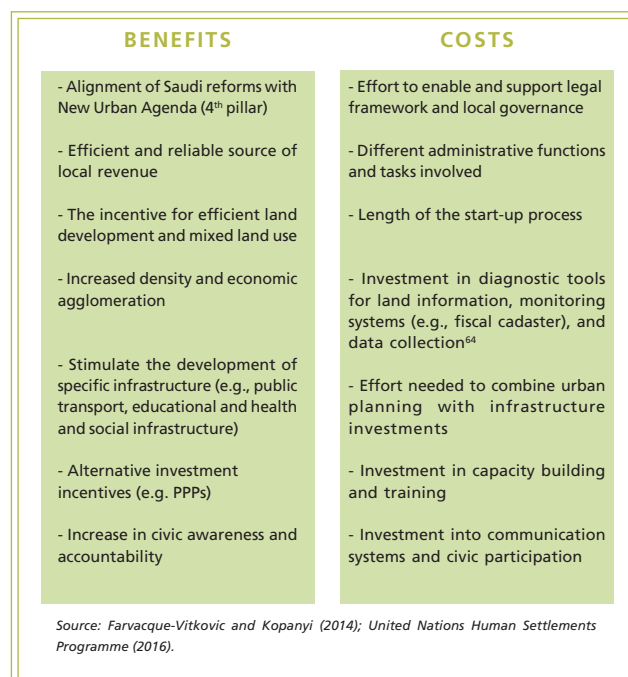


Fig. 72. Cost-benefit analysis factors in land-based financing

8.3.2 Leveraging urban productivity

Harnessing the economic and own-source revenue potential of Madinah will foster development across local industries. In addition, investment in public infrastructure opens the door to improving the accessibility, density, and mixed land use of cities.

One way in which urban productivity can be enhanced is through the use of PPPs. PPPs are effective financing tools that facilitate public-private sector engagement. In PPPs, the private sector can provide the public sector with much-needed expertise in the provision of high-quality public goods and services. Moreover, PPPs can help drive economic innovation and diversification into value-added industries, improve product marketing, and reduce coordination costs among

trading partners. It is important to note here that a crucial input into supporting the development of the workforce, especially in specialised fields, is education. Sustainable urban development, therefore, must include policies that support public education.

Saudi Arabia has already taken steps to support PPPs. The KSA established a Public-Private Partnership body, the National Centre for Privatization, housed in the Ministry of Economy and Planning. PPPs in Madinah could be a powerful financing tools in transportation, tourism, and industry to (1) increase land values through development projects, (2) enhance own-source revenue, (3) efficiently operate and manage public services, (4) create opportunities for collaboration with the private sector on publicly funded projects and services, and (5) attract national and international investment.

Furthermore, private capital can support cities such as Madinah in reaching a variety of development needs through the (1) development of vacant land, (2) increased population density, (3) enhanced local revenue, (4) reduction in municipal dependence on intergovernmental transfers, and (5) economic stimulus.⁶¹ Several tax instruments are available to local governments interested in expanding own-source revenue. Municipal governments can maximise the benefits of these tax instruments, (especially PPPs) by:

- Coordinating and collaborating with different levels of

government to connect national strategies with local priorities. For example, establishing a local liaison office, or a local PPP unit linked to the National Centre for Privatization in charge of proposing, implementing, and monitoring PPP projects.

- Investing in capacity building and improving tax administration. The success of PPP projects is strongly correlated with the ability of officers to manage three strategic phases: (1) feasibility, (2) procurement, and (3) delivery and monitoring.
- Using a comprehensive approach. PPPs should be focused on linking infrastructure investment and land development and, thus, maximising benefits that correspond with mixed land use.
- Generating a diverse portfolio of income streams tailored to local needs. Indeed, sprawling and urban mobility behaviour needs to be faced by the government for the sake of increasing density and reducing the massive vehicle dependency of Saudi citizens for mobility.⁶² In this instance, impact fees might be suitable instruments to constrain sprawling, and in generating additional revenues for local government.⁶³ In parallel, new parking fees and congestion fees are highly recommended to increase the use of public transportation and, consequently, the profitability of investment for the private sector.



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The Green Dome of The Prophet's Mosque

CASE STUDIES AND BEST PRACTICES

WASTE MANAGEMENT

In the Tamil Nadu State of India, a waste management project proposed the central government (35%) and the state government (15%) share 50% of the total project costs. A private entity (via a PPP) would provide the remaining 50% of project funding. The private concessionaire would be responsible for planning, designing, building, financing, operating, and maintaining the municipal solid waste management facility for the concession period. Land would be provided by the municipality through an annual lease as specified by the Government of Tamil Nadu.

CONGESTION FEES

Congestion fees reduced traffic in central London by 26% from 2002 levels, generating £ 122 million net in 2006. Thanks to the introduction of the Ecopass as cordon-pricing scheme in Milan city centre, the traffic was reduced by 16.2% in 2011. The resulting annual revenue was of € 5.9 million. The implementation of the Area Licensing System (ALS) in Singapore reduced traffic volume from 12,400 vehicles to 7,300 vehicles. Revenues from the sale of area licenses amounted to USD 47 million.

PARKING FEES

Chicago leased 34,500 curbside parking metres to the bank Morgan Stanley for 75 years, trading metre revenues for an upfront payment of nearly USD \$1.16 billion. This type of PPP contract includes a fixed schedule of metre rate increases, which raised rates two to four-fold by 2013. As a result, Chicago had the highest curb side metre rates in the United States. Metres were netting USD \$20 million annually while Morgan Stanley managed pricing and maintenance of the metres.

PUBLIC-PRIVATE PARTNERSHIPS

In Vancouver, greenhouse gases emitted from the city's landfill are managed and operated by a private company that transforms the gas emissions into useable energy for the city. The municipal government requested that the private company selected to be responsible for designing, building, operating, and financing the project. Heat generated from the city's waste is recovered and used by village farm greenhouses to produce vegetables and to heat the landfill's administrative and maintenance buildings.

Source: Ernst and Young Pvt Ltd., Ministry of Urban Development of the Government of India, & the Confederation of Indian Industry. Compendium on public private partnerships in urban Infrastructure: case studies. (2017). World Bank. Washington, DC.; Weinberger, R., Kaehny, J., & Rugo, M. (2010). U.S. parking policies: an overview of management strategies. Institute for Transportation and Development Policy. New York, NY.; Croci, E. (2016). Urban Road Pricing: A Comparative Study on the Experiences of London, Stockholm and Milan. Transportation Research Procedia 14, 253-262.; Phang, S., & Toh, R.S. (2004). Road Congestion Pricing in Singapore: 1975-2003. Transportation Journal, 43(2), 16-25. The Canadian Council for Public-Private Partnerships, & PPP Canada. (2011). Public private partnerships: a guide for municipalities. The Canadian Council for Public-Private Partnerships.



View of the interior space of The Prophet's Mosque

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