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A City Divided: A GIS-Informed Study of Urban Planning in Amman, Jordan

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A CITY DIVIDED: A GIS-INFORMED STUDY OF URBAN PLANNING IN
AMMAN, JORDAN

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Abstract

Amman, the capital of Jordan, faces an impending infrastructure crisis. The city is plagued by water shortages, a lack of affordable housing, extreme traffic congestion, and dwindling open space. Over the past seventy-five years, several urban planning commissions have attempted to address these issues through policy change and other municipal directives. These plans help illustrate the different forces at play in constructing the city—whether they be the residents themselves, city officials, or international consultants. All the plans use neighborhoods as a primary metric for measuring need and organizing development. Likewise, all the plans focus on the importance of green and open space within those neighborhoods. Despite the work and resources devoted to urban plans, a gap remains between the vision expressed in these documents and the physical reality of the city. This research explores the relationship between top-down and bottom-up forces on the city's urban identity through a GIS-led analysis.

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List of Abbreviations

GACDP	Greater Amman Comprehensive Development Plan
GAM	Greater Amman Municipality
GIS	Geographic Information System
JTM	Jordan Transverse Mercator
MGP	Metropolitan Growth Plan

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Introduction

Amman, the capital of Jordan, is a city known for being 'unplanned'. Intense internal urbanization coupled with seventy-five years of refugee influxes have placed serious and imminent strain on the city's infrastructure. Residents face daily and long-term challenges regarding traffic, informal housing, and water insecurity. The city is also known for drastic socio-economic inequalities along an East-West divide. Through zoning regulations and urban planning commissions, local and international officials have helped create these divisions. Thus, it is important to understand how urban planners have approached Amman and what their impact has been. This study analyzes Jordanian neighborhoods to see how urban planners' depictions of them changed from 1955 to 2008 and how landuse changed from 2013 to 2018.

Figure 1 General Map of Amman, Jordan
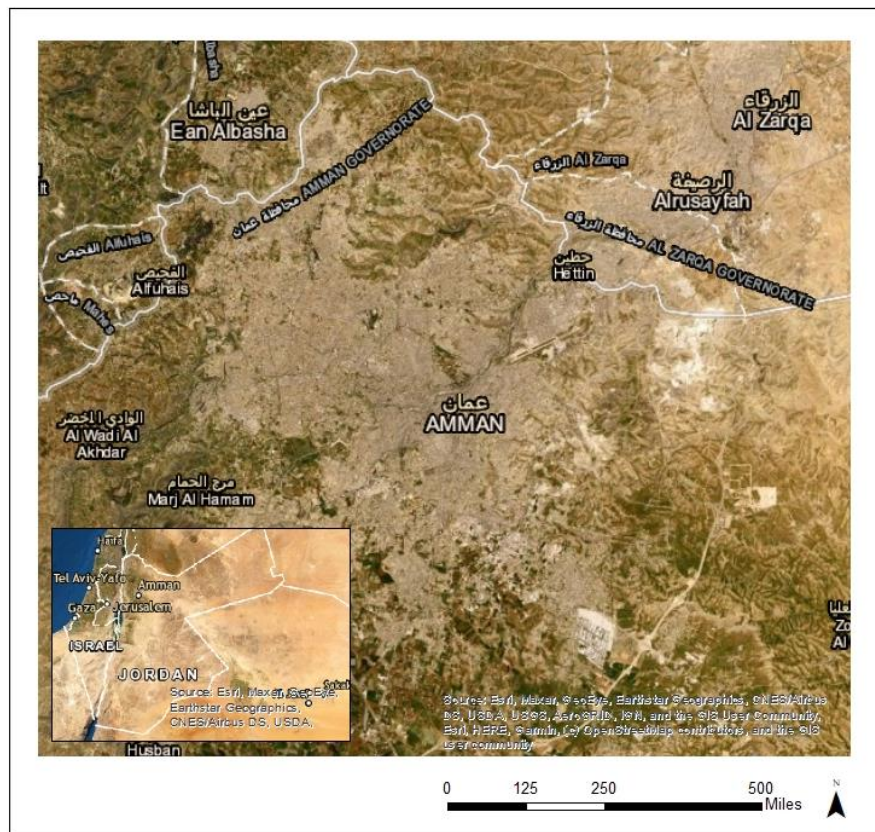
The city of Amman lies in the northwest of Jordan. The country is known for its dry, arid desert climate with wadis, or valleys, that fill with water during the rainy season. Amman has many jabals, or hills, and wadis and most of the city lies at an elevation of 725-875 meters.[1] Limestone is both a common feature of the physical geography of Amman and is used as a key component in building. The physical geography of the area influences settlement and urban development since residents must plan around all sorts of issues from water scarcity to steep mountainsides. Across the backdrop of this taupe and bronze landscape, urban planning commissions and municipal policies have worked to cement the divide between the East and West of the city. Western neighborhoods such as Sweileh, Abdoun, and L'weibdeh are known for high property values and wealthy residents, while eastern neighborhoods like Quisma and Al-Nasser are known for high rates of poverty. Between the two areas is Wast al-Balad, the downtown area, as well as Jabal al-Qala'a, site of Roman ruins. Along the western peripheries of the city, new developments are springing up. To the northwest lies cities like As-Salt and Fuheis and to the northeast is a refugee camp and beyond that, the Zarqa governorate.

Both municipal directives and settlement patterns led to the extreme disparity between the two halves of Amman. These forces tended to be reinforcing. For example, the Ottoman Empire's encouragement of wealthier Circassian migrants to settle on the West side in the 19th century was followed by British and Jordanian zoning regulations which allotted larger plot sizes to these districts. These larger plot sizes attracted wealthier residents who could afford to advocate more for their district and whose wealth

[1] Potter, Robert B., Khadija Darmame, Nasim Barham, Stephen Nortcliff, and A. M. Mannion. "An introduction to the urban geography of Amman, Jordan." *Reading Geographical Papers* 182 (2007): 5.

attracted more businesses. Thus, there are two Ammans--one abundant in green space, malls, and mansions and the other marked by informal housing and poor infrastructure. Urban plans and government directives both contributed to this socio-economic divide and offer a path towards a more equitable future.

The existence of the text and maps of these urban plans alone reveals a mischaracterization of the history of Amman. Consistently, Amman is painted as an unplanned city, and its shortcomings in infrastructure are attributed to a lack of forethought and development. In reality, Amman has been under one urban planning commission or another since the 1950s. The Jordanian government has brought in experts, both international and local, to address the city's challenges, but they have not been able to keep up with the ever-increasing population. These urban plans are important in the lives of residents. They both impact the physical landscape of the city through their housing and movement and are impacted by the city's decisions to develop one neighborhood or another or to build a road here or there. Often, the city's decisions are influenced by preexisting neighborhood identities. These identities formed throughout the history of Amman and were reinforced by urban plans.

The overall effect of the urban plans on the physical landscape of Amman remains ambiguous. It is difficult to disentangle the colliding influences of past urban plans on present urban plans, urban plans on the landscape, and the landscape on urban plans. Which came first—the plan or the place? The answer is somewhere between a neither/nor and a both/and. The two are so interrelated that without extensive on-the-ground mapping and comprehensive satellite imagery analysis it is impossible to concretely measure the implementation of the grand strategy of urban plans.

Nevertheless, to a limited extent it is possible to discuss how the effectiveness of urban plans has changed over time, especially regarding specific goals like increasing green space. From the 1950s to the present, control over Amman's urban plans has become more centralized. Abu-Dayyeh explains that "it was the idea of 'control', represented by the Municipality of Greater Amman and its concomitant riches, that eventually made possible implementation of visions of 'spectacular action'."[2] Early plans could not be implemented partly because they lacked funding and partly because, prior to the establishment of the Greater Amman Municipality (GAM) smaller municipal authorities existed at the neighborhood level. These small municipalities managed development for their areas and were not directly controlled by any central authority or single urban planning commission. Regardless, since the 1950s, urban plans have set goals for increasing green and open space. Unfortunately, achieving this goal was and continues to be an uphill battle. Crowding, development, and water shortages all present immense challenges for city officials and despite their hopeful visions, little has been accomplished.

First, it is necessary to take a broad view of the development of the socio-economic disparity between East and West Amman by exploring the historical layers of this capital city and its evolution from Rabbath Ammon to Philadelphia to present-day Amman.

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[2] Nabil Abu-Dayyeh, "Persisting Vision: Plans for a Modern Arab Capital, Amman, 1955-2002," *Planning Perspectives* 19 (2004): 106.

Historical Background

Amman's origins lie in myth and legend. Just like Rome and many other ancient (and pretending to be ancient) cities, Amman claims to be founded on seven hills.[3] Taking Amman's history into account is not only important for its social and cultural implications, but for achieving an accurate understanding of the layers that make up the city. Structures built in one era influence the structures in the next. The prominent Roman ruins of the citadel and amphitheater are not merely a tourist sites or landmarks, but are part of the human landscape of Amman, acquiring new meanings and purposes as defined by Ammanis. In 1909, the American geographer Ellsworth Huntington recorded that residents were actually living among the ruins, which was then larger than the 'new' city of Amman.[4] Thus, the way these historical places are enveloped in Amman and reinterpreted by its residents is crucial to understanding the process of urban planning.

The first traces of formal settlement date back to the Neolithic Era and the founding of the community at 'Ain Ghazal located near Wadi Zarqa.[5] This community, considered one of the largest of its time in the Middle East was inhabited for around 2,000 years, even while settlements at Jericho, Beidha, and Munhata were deserted by 6000 BC.[6] The residents were able to continue living there despite the growing degradation of the environment by transitioning from agriculture to herding practices.[7]

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[3] Hamzah Ali Khawaldah, "A Prediction of Future Land Use/Land Cover in Amman Area Using GIS-Based Markov Model and Remote Sensing," *Journal of Geographic Information Systems 8*, (2016): 412.

[4] Marwan D. Hanania, "From Colony to Capital: Reconsidering the Socio-Economic and Political History of Amman, 1878-1928." *Middle Eastern Studies 55,* no. 1 (2019): 5.

[5] Gary O. Rollefson, Alan H. Simmons, and Zeidan Kafafi, "Neolithic Cultures at 'Ain Ghazal, Jordan," *Journal of Field Archaeology* 19, no. 4 (1992): 443.

[6] Ibid 468.

[7] Ibid. Henry David Thoreau, "Walking," in *The Making of the American Essay*, ed. John D'Agata (Minneapolis: Graywolf Press, 2016), 177–78.

Amman was likely continuously inhabited, in one form or another, in the intervening period between the height of 'Ain Ghazal and the founding of Rabbath Ammon. By the Bronze Age (a. 3200-3000 BC), the villages coalesced into the Canaanite city-state Rabbath Ammon the first to build the citadel.[8] At the beginning of the 10th century BC, King David of Israel conquered Rabbath Ammon and consolidated the political union through a marriage between his son and an Ammonite princess, but by the middle of the same century, Israel split in two and Ammon was once again independent.[9] The city of Ammon became the capital of the Ammonite kingdom. During the 8th and 7th centuries BC, Rabbath Ammon flourished as an Assyrian vassal state and extensively developed its Citadel area.[10] The Babylonian Empire conquered Rabbath Ammon in the 6th century BC and removed its capital status, and then in 539 BC, Rabbath Ammon was under the control of the Achaemenid Empire.[11] Throughout both the Babylonian and Achaemenid occupations, evidence suggests that rural settlements south of the capital flourished but data on the capital city itself remains elusive, except for a trail of destruction leading into the city from the west. [12] After this, there is relatively little record of Ammon until the Hellenistic period.

In the 3rd century BC, the Ptolemies of Egypt took control and Ptolemy II Philadelphus re-named the city Philadelphia.[13] For a brief period afterward, the

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[8] Ulrich Hübner, "Amman Before the Hellenistic Period," in *Studies on Roman and Islamic 'Amman: The Excavations of Mrs C-M Bennet and Other Investigations Volume I*, ed. Alastair Northedge (Oxford University Press, 1993), 24.

[9] Ibid.

[10] Ibid.

[11] Hübner, "Amman Before," 25.

[12] Oded Lipschits, "The Rural Settlement in Judah in the Sixth Century B.C.E.: A Rejoinder," *Palestine Exploration Quarterly* 136, no. 2 (2004): 100.

[13] David Kennedy, "Losing—and Salvaging?—the Rural Landscape of Graeco-Roman Philadelphia," *Palestine Exploration Quarterly* 149, no. 2 (2017) 137.

Hasmonaean dynasty ruled over Philadelphia, before the Romans annexed the area, ruling for the next six centuries. They built the citadel, amphitheater, and other features which would be repurposed by future groups. The Ummayads arrived next and the span of time between Ptolemy and their rule is considered a time of not only the "peak of urban expansion but also—with an unparalleled extension of settlement in the rural hinterland, overall population of town and country reached levels not seen again until perhaps the 1920s".[14] By the late Umayyad period, Amman was reduced to "village status" and largely disappeared from the written record until the arrival of the Ottomans.[15]

The area around Amman was brought under Ottoman control in 1516, and at that point Amman had been reduced greatly by plague and depopulation.[16] Hanania writes that "during these years, the area was not organized into a single administrative or political entity by the Ottoman state, nor was it seen as such by the local population."[17] However, Ottoman directives eventually restructured administrative boundaries and encourage growth in the area, especially at the end of their rule. Though in 1871 there were only 200 households in Amman, by 1908, there were 800 households.[18] The Ottomans sought to create a new political center in the region to balance other local powers, like leaders in local Bedouin communities or the larger city of As-Salt. The Ottoman government sent Circassian immigrants to the area to increase its population, they established a train station for the Hijaz Railway in Amman, and formally created the

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[14] Ibid.
[15] Ibid.
[16] Hanania, "From Colony to Capital," 1.
[17] Hanania, "From Colony to Capital," 1.
[18] Ibid 1, 3.

municipality of Amman in 1908.[19] After this designation, the government began to distribute land, a process which helped to create class differences while simultaneously tying the population to Ottoman rule. For example,

> "Circassians with more money … were able to buy more land and invest in their property, or sell the land and live off other sources of wealth. The process of land distribution interrupted the local independence the Circassians enjoyed, binding them more to the Ottoman state system … [and] the Arabs 'thus came to identify the Circassians with Ottoman rule'."[20]

The Circassians lived in all the major neighborhoods of Amman: Shapsug (including Jabal al-Qalʿa and Jofa Hill), Sayl Amman, Wadi al-Sir Street, Khirfan Area, Muhajirin, Suweileh, Wadi al-Sir, Naʿur, al-Rusayfa, al-Zarqaʾ, Jabal al-Nazif and Wadi al-Surur.[21] Many of these neighborhoods continue to exist to today under the same names and many carry the vestiges of these early class differences. For example, Muhajirin, a Circassian neighborhood in Western Amman, has been known for its wealth from the Ottoman period to the present. As these changes occurred, the town's identity likewise shifted. No longer was it a village, but a town and no longer was it called Rabbath Ammon or Philadelphia but instead Amman.[22]

During the First World War, Amman was seen as a strategic military location for both Ottoman and Allied forces.[23] Though the local population generally favored the

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[19] Ibid 2, 5.
[20] Ibid 9.
[21] Ibid.
[22] Hanania, "From Colony to Capital," 10.
[23] Ibid.

Ottoman Empire, Britain ended up in control in 1918.[24] King Abdullah bin Al-Hussein, or King Abdullah I, consolidated power among local ruling groups and compelled the British to accept him as leader of the area, later called Transjordan, including the city of Amman. Even at this point, Amman was not yet the clear choice for a capital city. It was still a small agricultural town, only making up about 2-3.5% of the country's overall population.[25] However, the lack of established local political elites, a growing Circassian-Hashemite alliance, communication capabilities fostered by the railway, and its use as a military position eventually led to the city being declared the capital in 1928. From this time onward, Amman began its exponential growth especially with improvements to infrastructure and refugee migrations. Transjordan remained a British mandate until it gained its autonomy in 1946.[26] Coordinated efforts to plan the urban growth of the city begin a decade later and are heavily influenced by the way the city formed.

One other element of historical background that shapes Amman is a series of refugee influxes primarily from Palestine and Syria. After the 1948 Arab-Israeli War and the Six-Day War in 1967, millions of Palestinian refugees fled to neighboring countries with an estimated 2.2 million formally being registered as refugees in Jordan.[27] The number of unregistered refugees is also large and though uncounted, the total number of Palestinian refugees is estimated to represent over half of Jordan's population.[28] Palestinian refugees generally settled in refugee camps to the north of Amman or in

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[24] Ibid, 10. There are reports of Circassians firing on British troops.
[25] Ibid, 12.
[26] Robert B. Satloff, *From Abdullah to Hussein: Jordan in Transition*, Oxford University Press, 1994, 4.
[27] "Where We Work: Jordan," The United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWA), last modified December 31, 2019, https://www.unrwa.org/where-we-work/jordan.
[28] Oroub Al Abed, "Palestinian Refugees in Jordan," *Palestinians in Europe Conference* (2004).

eastern neighborhoods. The Syrian Civil War led to about 655,000 Syrian refugees in Jordan.[29] There are also 67,000 registered refugees from Iraq, 15,000 from Yemen, and 6,000 from Sudan.[30] While the presence of these refugees has implications for the economy and society in Jordan, they also shape the physical nature of its capital city. Refugee camps, informal housing, and planned neighborhoods, such as the Jubilee Neighborhood on the outskirts of eastern Amman, offer a few options for these displaced groups.

Thus, the building projects and formations of the inhabitants of Amman shape how the landscape of Amman appears today. Ancient ruins, Bedouin nomads, Circassian migrants, Ottoman planning, British military bases, Palestinian and Syrian refugees, and Hashemite reorganization—all these factors molded the city. The urban plans respond to these forces and attempt to offer a direction for the city's continued growth.

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[29] "UNHCR continues to support refugees in Jordan throughout 2019," United Nations High Commissioner for Refugees (UNHCR), last modified December 31, 2019, https://www.unhcr.org/jo/12449-unhcr-continues-to-support-refugees-in-jordan-throughout-2019.html.
[30] Ibid.

Research Question

What results from this long and varied history is a multilayered city, "one

manifestation of composite images … an immigrant city show[ing] newfound wealth and

status in several localities and a sense of struggle and displacement … [and] a social and

spatial 'coming together' of difference and diversity, chaos and order, and fascination and

intrigue."[31] With this in mind, the unlikely rise of Amman from agricultural village to

capital city with nearly a third of the country's total population makes it an ideal case in

which to study the motivations and methods of urban planners working in the Middle

East. Amman has grown from seven hills to nineteen and the population of Jordan has

increased from nearly 935 thousand in 1960 to over 10 million in 2019.[32] However,

settlement has not been evenly distributed, and neighborhoods have formed which range

widely in socio-economic makeup. Neighborhoods are not only socially important

markers but also a key classification tool for urban planning maps. Green space is a

thread running through all the urban plans—nearly every single commission sought to

increase public access to open space. Global urban planning norms favor green space as

an important aesthetic attribute as a city. Additionally, much modern research ties access

to open and green space to quality-of-life indicators. Parks, gardens, playgrounds, and the

like suit both the idealistic desires of urban planners for an aesthetically pleasing

landscape and the everyday needs of residents. Unfortunately, much of the research

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[31] Raed Salem Al-Tal and Hala Hesham Ahmad Ghanem, "Impact of the Syrian Crisis on the Socio-Spatial Transformation google of Eastern Amman, Jordan," *Frontiers of Architectural Research 8* (2019): 592. Al-Tal writes specifically about the Jubilee neighborhood here, but I find that this statement can apply to the entire city as well.
[32] "Population, total – Jordan," The World Bank, last modified 2019, https://data.worldbank.org/indicator/SP.POP.TOTL?locations=JO.

surrounding Amman's urban landscape has focused on refugees and population growth. This has left a gap in our understanding of the role of city planning in Amman.

Since the 1950s, there has been a new city-wide urban plan of Amman every decade. Although Jordan is often perceived as having a lack of planning, between 1960 and 1990 there were 56 different plans made for the country ranging from the local to national level.[33] In 1955, two British urban planners, Max Lock and Gerald King, were sent to Amman with the support of the United Nations to create "A Development Plan for the Capital City of Amman". This plan established proposals for Amman's neighborhoods, public open spaces, and zoning. Despite this and ensuing plans in 1955, 1968, 1978, 1988 and 2008--Amman is still largely known for uncontrolled growth as a result of several refugee influxes over the past seventy years. Many of the early urban plans were conducted by non-Jordanians, raising questions related to imperialism and local agency.

In order to better understand how Jordanians and urban planners conceptualize place and space in Amman, this research addresses two questions. To what extent have Amman's urban plans been realized? How have notions about Amman's urban identity changed over time? These questions are studied through a GIS-informed quantitative analysis and a brief qualitative examination of the backgrounds and perspectives of urban planners. These two angles help explain how Amman changed both in the views of city planners and in terms of the human landscape. A number of other questions come up in the course of this research, specifically on the contents of the plans, the urban planning paradigms at play, the socio-political context, and the implementation process. To a

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[33] Abu-Dayyeh, "Persisting Vision," 79.

limited extent, this research grapples with the role of imperialism and top-down urban

planning in the development of the city and its relationship to resident-led, bottom-up

creation. It is important to understand how Amman has developed because it helps

explain why there are disparities in development and access to resources.

This research also analyzes changes in green space in the center of Amman from

2013 to 2018. Green space is a valued commodity, especially in an arid climate, and it is

a key feature in every single urban plan of the last century. Moreover, past studies have

connected green and public spaces to quality-of-life indicators, so it is important in the

lives of residents.[34] Scholars also find that the creation of open spaces has divided the city

and cemented social divisions and have fragmented the city.[35] By studying changes to

green space during this short, modern period, it is possible to discuss the impact of urban

planners on the everyday lives of Jordanians even when it is not possible to quantify the

comprehensive impact of urban plans.

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[34] Hikmat H. Ali, Fuad K. Malkawi, and Yamen N. Al-Betawi, "Quality of Life in Cities: Setting up Criteria for Amman-Jordan," *Social Indicators Research 93* (2009): 419-420.
[35] Yahya Farhan and Sireen Al-Shawamreh, "Impact of Rapid Urbanization and Changing Housing Patterns on Urban Open Public Space of Amman, Jordan: A GIS and RS Perspective," *Journal of Environmental Protection* 10 (2019): 68. Mahmoud M.S. Albattah, "Remote Sensing and Topographic Information in a GIS Environment for Urban Growth and Change: Case Study Amman the Capital of Jordan," *International Journal for Innovation Education and Research* 3, no. 2 (2015): 126.

Literature Review

The question of Amman's urban geography begins with space and place: two simple words for inexplicably complex topics. To understand these terms broadly, it is best to see how their definitions progressed over time.

The philosophy of space and place stretches back to Ancient Egypt and spans all of human civilization from the Incan Empire to Classical China, but its codification as a formal discipline in the West is traditionally marked by the establishment of the Royal Geographic Society in 1830.[36] Henri Lefebvre is considered to be the first to tie society to space and much of his work remains relevant in what is now termed humanistic geography. Also known as human geography or anthropogeography, this field deals with the relationship between humans and their environment. Lefebvre--under the influence of philosophers such as Hegel, Marx, and Nietzsche--argues that space represents the political use of knowledge, implies an ideology designed to conceal that use, and embodies at best a technological utopia.[37] Moreover, he categorizes space according to spatial practice (production, competence, performance), representations of space (relations of production, order), and representational spaces (symbolism).[38] Yi Fu-Tuan, another founder of humanistic geography, provides a more straightforward approach to space and place. He writes, "*Space* is more abstract than *place*. What begins as undifferentiated space becomes place as we get to know it better and endow it with

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[36] "History of the Society," Royal Geographic Society, accessed 7 April 2021, https://www.rgs.org/about/the-society/history-and-future/.

[37] Henri Lefebvre, *The Production of Space*, trans. Donald Nicholson-Smith, (Cambridge: Basil Blackwell, 1991), 18-19.

[38] Ibid, 33.

value."[39] Edward Relph advocates for very similar definitions and he was the first to explore place and placelessness from a phenomenological approach.[40] John Agnew, a prominent political geographer, writes that for space to be considered a place it must be a specific location, be a locale (shape), and have a sense of place (i.e. personal and emotional attachment).[41] In sum, these theorists establish the notion that place is space which people imbue with meaning. Now, this meaning may be important for different reasons depending on the branch of geography and this meaning can be studied from a variety of directions, whether using tools of phenomenology or GIS.

Since this research focuses on urban planning in a modern Middle Eastern city, these broad concepts of place and space must be narrowed to better fit the scale of the question. In the field of urban planning Kevin Lynch stands out as a preeminent scholar. He revolutionized city planning by defining points of study as paths, edges, districts, nodes, and landmarks.[42] Mohammed Matouq provides a way to operationalize these elements in GIS.[43] Table 1 combines their work:

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[39] Yi-Fu Tuan, *Space and Place: The Perspective of Experience,* (Minneapolis: University of Minnesota Press, 1977).
[40] Edward Relph, *Place and Placelessness*, (London: Pion Unlimited, 1976).
[41] John Agnew, *Place and Politics: The Geographic Mediation of State and Society, (*Boston: Allen & Unwin, 1987*).*
[42] Kevin Lynch, *The Image of the City*, (Harvard University Press, Cambridge, 1960), 47-48.
[43] Mohammed Matouq, Hussam Al-Bilbisi, Tayel El-Hasan, and Saeid Eslamian, "GIS Applications in a Changing Climate," *Handbook of Engineering Hydrology*, (Taylor and Francis: 2014), 301.

Table 1 Territorial Elements

Based on Lynch 1960, 47-48; Matouq et.al. 2014, 301.				
	GIS	Definition	Local	Global
Paths	Line	channels along which the observer moves	street, walkway, canal, railroad line	Silk Road, flight paths, interstate, EU rail, Saharan trade routes
Edges	Line	linear elements not used as paths, barriers and seams between planes	shores, walls, edges of development	state borders, ocean shores, mountain range
Districts	Polygon	areas with common, identifiable aspect into which the observer can enter	neighborhoods (ex: Soho, Harlem, Upper West Side)	region, continents, neighbors
Nodes	Point	convergence of paths or concentration of districts	junctures, cores (ex: street corner hangout spot, town square)	international cities (Abu Dhabi, Hong Kong, Jerusalem, Hague)
Landmarks	Point, Image	external, physical point reference	towers, domes, hills, signs	important religious or cultural sites (Mecca), landforms

In addition to humanistic geography, it is also important to understand cartography, the study of making and using maps, which is another expansive and diverse discipline found across many different cultures and societies. Ahmet Karamustafa addresses the unique nature of Islamic maps, an area unduly neglected. Many ancient maps reflected a Greek heritage, Islamic aesthetic, and the values of whichever culture created it.[44] The urban planning maps studied here follow the style and assumptions followed by Western cartographers, with an emphasis on characteristics such as an accurate projection and administrative borders.

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[44] Ahmet T. Karamustafa, "Introduction to Islamic Maps," In *The History of Cartography: Cartography in the Traditional Islamic and South Asian Societies*, ed. J.B. Harley and David Woodward, (Chicago: University of Chicago Press, 1992), 4.

Much of the existing secondary literature on Amman's geography focuses on urban sprawl and the impact of refugee influxes. There is an abundance of research completed with land use and land cover analysis, using LANDSAT data from the 1970s and 2000s. For example, Al Rawadesh and Saleh layer several maps of Amman to track urbanization in Amman and measure the decline of green and water spaces. They found that from 1918-2002 Amman's urban area increased by 162 km^2 and became over 509 times the original urban area.[45] Along with this change, came a 23% loss in fertile lands.[46] They found that growth was largely due to refugee influxes and argued that unplanned and uncontrolled urbanization leads to destruction of green areas and water resources.[47]

However, their work leaves room for further exploration. Khalwaldah studied Amman's urbanization, in terms of intensification and sprawl, using a USGS Landsat archive and Post Classification Change Detection.[48] Intensification refers to an increasing density within a given area, while sprawl refers to an extension beyond the area's original borders. He provides a more useful methodology to replicate, dividing landuse into several categories including built-up area, agricultural/forest land, rangeland, and barren land.[49] Farhan and Sireen narrow their study of land use/land cover to open space and ultimately create a stronger argument than their academic predecessors by tying open spaces to the cementing of social divisions.[50] As Amman has developed and available

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[45] Samih Al Rawadesh and Bassam Saleh, "Satellite Monitoring of Urban Spatial Growth in the Amman Area, Jordan," *Journal of Urban Planning and Development 132,* no. 4 (December 2006): 211.

[46] Ibid.

[47] Ibid.

[48] Khawaldah, "A Prediction of Future Land Use," 413.

[49] Khawaldah, "A Prediction of Future Land Use," 418.

[50] Farhan, "Impact of Rapid Urbanization," 57.

spaces for new construction have declines, preferences have transitioned from single-family homes to apartment complexes and many open spaces have been privatized.[51] Taken with other neo-liberal policies of Jordan, these two components have reduced open, rural, and green spaces across the city and increased social stratification especially between the East and West.[52] This study follows in suit by tying social realities to the city's territorial elements while also adding the direct study of urban planning maps.

Some authors specifically study the importance of urban planning. Hanania argues that the traditional narrative of Amman's founding and rise excludes the impact of Ottoman planning and bureaucracy.[53] In reality, Ottoman directives had a large effect on the city, since their favoring of Circassians essentially created an upper class.[54] She demonstrates how urban plans have an impact over time and cement socio-economic disparities in the city's landscape. Khirfan and Momani focused on the city's rebranding programs in 2002 and 2009.[55] Ultimately, they found that the 2002 outward-focused program had much less of an effect than the 2009 in-ward focused program.[56] What is important from this case in particular is that city officials have the ability to give symbolic meaning to places.

A few authors combine this discussion of land use, city planning, and socio-economic effect. Ababsa reflects on the growing divide between the eastern and western

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[51] Farhan, "Impact of Rapid Urbanization," 57.
[52] Ibid.
[53] Hanania, "From Colony to Capital," 9.
[54] Ibid.
[55] Luna Khirfan and Bessma Momani, "(Re)branding Amman: A 'Lived' City's Values, Image and Identity," *Place Branding and Public Diplomacy 9*, no. 1 (2013): 49.
[56] Ibid.

halves of Amman, finding data as far back as the 1950 British zoning regulations.[57] For example, city planning has favored western neighborhoods, like the Shmeisani business district and the Abdali shopping district.[58] In the 1980s and 1990s, Amman became famous for developing its poor urban areas according to the developmentalist norms held by international organizations of that era.[59] Since the 1990s, Jordan began focusing more on supply of services to these areas, while focusing their long-term development strategies on middle to upper class neighborhoods.[60] Resource allocation is an important component of identifying the disparity between urban planner's vision and on-the-ground reality. For example, El-Samen finds that shopping malls are clustered in West Amman, an area with too small of a population to provide enough demand.[61]

Like Al Rawadesh and Farhan, Albattah uses Landsat to study urban growth and target land use/land cover changes since 1972.[62] He brings up two aspects: fragmentation of the landscape and differences between the center and the periphery.[63] His most interesting argument is that "spontaneous growth results in a homogeneous and sparse spatial pattern, which contains more random components, whereas self-organizational growth results in spatial agglomeration pattern, which is combined with more socio-economic activities."[64] Spontaneous growth is correlated with lower socio-economic activities and thus would be something for urban planners to avoid. He also finds that

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[57] Myriam Ababsa, "The Evolution of Upgrading Policies in Amman," *Sustainable Architecture and Urban Development* (July 2010): 1.
[58] Ibid.
[59] Ibid.
[60] Ibid.
[61] Amjad Ahmad Abu ELSamen and Rund Ibrahim Hiyasat, "Beyond the Random Location of Shopping Malls: A GIS Perspective in Amman, Jordan," *Journal of Retailing and Consumer Services* 34 (2017): 30.
[62] Albattah, "Remote Sensing," 126.
[63] Ibid.
[64] Ibid, 130.

urban expansion follows the main roads of the city.[65]

Abu-Dayyeh has conducted a series of studies on urban planning and Amman. He is the only author who lays out the process of each urban planning commission from the 1950s to 2004.[66] He begins with the *Development Plan for Amman* (1955) and he explains how the values and grand concepts established in this plan became a part of ensuing plans.[67] After this came two 1968 plans, both sponsored by the United States.[68] The 1960s saw a change of powers in the region, as the British stepped back and the US stepped forward. International influence continued with the IECA proposals of 1978 which were conducted by the Japanese government under invitation from the Jordanian government.[69] Then came the Greater Amman Comprehensive Development Plan (1988).[70] These plans show both the persisting influence of international actors and the persisting vision of the 1955 plan. Although there are differences in scope and aim of the urban plans, all contain a discussion of "ring roads, open green areas in the heart of the city, street-bridges, commandingly situation public edifices, [and] public plazas."[71] The feasibility of all these plans is questionable, but Abu-Dayyeh finds that the early ideas set out in the 1955 plan were implemented in later projects were implemented albeit in a more restrained form.[72]

Abu-Dayyeh also does some general studies of the relationship between physical

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[65] Albattah, "Remote Sensing," 130.
[66] Abu-Dayyeh, "Persisting Vision," 79.
[67] Ibid, 85.
[68] Ibid, 89, 92.
[69] Ibid, 95.
[70] Ibid, 98.
[71] Ibid, 104.
[72] Abu-Dayyeh, 105.

and social change in the city.[73] Additionally, he takes the neighborhood Jabal L'weibdeh

as a case study for using GIS to study data-poor areas.[74] By tracking land ownership, he

makes the argument that social fabric and historic identity are tied to Islamic values of

land succession.[75] He argues that neighborhood identity comes from the municipality of

Amman since the municipalities define the boundaries.[76] His case study of Jabal

L'weibdeh is a useful model for me to base my small case study off, since he walks

through the British conceptualization of neighborhood, the Islamic understanding of land

succession, changes brought on by natural disaster, legal changes, and more.

When taking a cumulative view of scholarly literature surrounding Amman and

geography, there is some research on individual neighborhoods, but nothing on

neighborhoods as a whole. Overall, there is a lack of research connecting past urban plans

to the physical structure of the city revealed through satellite imagery. Using the research

of Hanania, Ababsa, Al-Battah, Makhamera, and Abu-Dayyeh as a springboard, this

study investigates the relationships among Amman, urban planning, and neighborhood

identity.

Amman is an important political, economic, and cultural city in the Levant. It has

many examples of urban planning proposals from both international and domestic

officials. Evaluating the implementation of these plans can shed a light on how effective

these urban plans have been and whether Amman should continue spending resources on

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[73] Nabil Abu-Dayyeh and Firas Ziadat, "GIS for Understanding Physical and Social Change in Urban
Settings: A Case from Amman, Jordan," *Environment and Planning B: Planning and Design* 32 (2005):
127.
[74] Nabil Abu-Dayyeh, "Prospects for Historic Neighborhoods in Atypical Islamic Cities: The View from
Amman, Jordan," *Habitat International* 30 (2006): 46.
[75] Ibid.
[76] Ibid.

these projects. It may also suggest some answers to the nature of the city, and whether it

developed more from a top-down or bottom-up approach. This research brings together

digitized historic maps from urban planning commissions, the text and context of urban

plans, the power of GIS analysis, and satellite imagery to evaluate the relationship

between urban plans and the physical landscape of Amman.

Historic Maps and GIS

Geographic Information System (GIS) is a framework for gathering, managing, and analyzing data. These digital maps are made of layers of points, lines, and polygons. Each component is connected to an attribute table which contains more information such as name, address, characteristic, etc. The power of GIS comes from its ability to analyze these components and display the results graphically. Put simply, GIS makes it easy to study and depict spatial patterns.

GIS first came into existence in the 1960s and was created to meet the needs of surveyors, geologists, and geographers. Its rise coincided with the growing field of humanistic and historical geography. In time, scholars developed a vision of open-source access to historical maps converted to the GIS system. Though this vision is far from being realized, it is still compelling, and many scholars have discussed the best practices for working with historical maps in GIS.

Rumsey and Williams argue that there are two main advantages that come from converting a historical map into GIS. The first is standardization--many historical maps were created by individuals without uniform measurements or projection, and it is possible through GIS to create a map that conforms to topographic realities.[77] The second advantage is that the map's information is now accessible for running analyses within the GIS system.[78] They outline the steps to convert a historical map into a digital, standardized, and measurable one. First, the historical map must be scanned at high resolution. Then, it must be georeferenced. Specific locations, known as control points,

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[77] David Rumsey and Meredith Rumsey, "Historical Maps in GIS," in *Past Time, Past Place: GIS for History,* ed. Anne Kelly Knowles, 2, Esri Press, 2002.
[78] Ibid, 3.

must be selected on the historical map then on a modern, accurate digital map. Finally, mathematical algorithms warp the historical map and fit it to the modern map in accordance with the control points. The result is imperfect, and it is important to discuss residual error even after very thorough georeferencing. Rumsey and Williams are also quick to point out that much is lost when georeferencing a historical map from the nature of its lines and shapes to aesthetic and cultural value.[79]

Lloyd et al. describes the issues that may arise when working with historical maps and GIS. While these limitations cannot be overcome in every scenario, they must be addressed. In their case studies of historic urban change, Lloyd et al. emphasizes the necessity of collecting metadata--data on the data--to better understand the significance of certain spatial attributes.[80] For historical maps, this metadata can be obtained by comparing maps to other primary and secondary sources that contextualize not only the spatial features but also the perspectives of the cartographers.

Table 2 Limitations of GIS

Lloyd et al. pg. 72-73.	
What is represented or measured	How characteristics/properties are represented
· Geographical coverage · Attribute coverage · Rationale · Purpose of data · Attributes or categories	· Attribute accuracy · Spatial/positional accuracy · Spatial scale · Generalization · Aggregation · Conventions

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[79] Rumsey, "Historical Maps," 6.
[80] Christopher Lloyd, Ian Gregory, Ian Shuttleworth and Keith Lilley, "Exploring Change in Urban Areas Using GIS: Data Sources, Linkages, and Problems," *Annals of GIS* 18, no. 1 (2012): 75.

Gregory et.al argues that since GIS originated as an earth science, it is not a perfect fit for all social science fields. For example, he states that it cannot handle ambiguity, has limited analytical abilities for measuring change over time and is an imperfect method of integrating qualitative and quantitative data.[81] Bailey and Schick disagree, claiming that the power of GIS comes from its ability to graphically represent even "fuzzy" information, making it possible for researchers to see patterns that were unidentifiable prior.[82] Though analyzing these ambiguities may be difficult, it is possible to visualize them using GIS.

A few other scholars offer notable approaches to using GIS to study historic maps. Lafreniere and Rivet find a rather interesting solution to mapping the past. They advocate for a mosaic-style approach where they join a series of maps from the same time period to create a more holistic map of a large area.[83] Interestingly, they also recommend image pre-processing the scanned copies of historic maps before georeferencing them. Gregory and Healey show that historical GIS has the potential to offer a revisionist history by countering traditionally accepted narratives with maps.[84] Yet, much of this work is still nascent since database creation takes so long and ties between historical GIS and theory is still weak.

Finally, there are two relevant case studies which offer different routes for analyzing historic maps. Brigante and Radiocioni studied an Italian city before and after a

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[81] Ian Gregory, Karen Kemp and Ruth Mostern, "Geographical Information and Historical Research: Current Progress and Future Directions," *Humanities and Computing* 13 (2003): 19.
[82] Thomas Bailey and James Shick, "Enabling the Collision of History and Geography," *Social Science Computer Review,* (2009): 1-6.
[83] Donald Lafreniere and Douglas Rivet, "Rescaling the Past through Mosaic Historical Cartography," *Journal of Maps* 6, no. 1 (2010): 418.
[84] Ian Gregory and Richard Healey, "Historical GIS: Structuring, Mapping, and Analysing Geographies of the Past," *Progress in Human Geography* 31, no. 5 (2007).

1997 earthquake.[85] They look at maps as far back as 1873 to see how landuse changed

over time. These changes in landuse help explain why some parts of the city suffered

more damage than others. For example, they theorized that the construction of a parking

lot changed the groundwater hydrological balance of an area and led to a greater

collapse.[86] Levin et al. studied historic maps of Palestine focusing on the accuracy of

maps, their impact on historical settlement processes, their relationship to imperialism,

and role in land ownership disputes.[87] They were able to see how changes in land use and

land ownership were correlated.

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[85] Rafaella Brigante and Fabio Radicioni, "Georeferencing of Historical Maps: GIS Technology for Urban Analysis," *Geographica Technica* 9, no. 1 (2014): 12.

[86] Ibid, 18.

[87] Noam Levin, Ruth Kark and Emir Galilee. "Maps and the Settlement of Southern Palestine, 1799-1948: An Historical/GIS Analysis." *Journal of Historical Geography* 36 (2010): 1-18.

Methodology

Urban Planning Maps		
Author	Title	Date
Gerald King and Max Lock	*A Development Plan for the Capital City of Amman*	1955
Municipality of Greater Amman	*Greater Amman Comprehensive Development Plan*	1988
The Amman Institute for Urban Development	*The Amman Plan; Greater Amman Comprehensive Plan*	2008
Satellite Imagery		
Landsat	Date	
8 OLI	21 March 2013	
8 OLI	18 July 2018	

In order to analyze the historic maps, I first obtained copies of the three urban plans: King and Lock's 1955 *A Development Plan for the Capital City of Amman*, the Municipality of Greater Amman's 1988 *Greater Amman Comprehensive Development Plan*, and the Amman Institute's 2008 *The Amman Plan*.[88] From these, I selected a map of the city's neighborhoods and brought it into ArcMap as a JPEG image. Using a vector map of Amman's roads and neighborhoods retrieved from the University of Jordan, I georeferenced the three maps individually, selecting recognizable points to align the urban planning map with the basemap. The Jordan Transverse Mercator (JTM) projection is the most commonly used projection in Jordan, since it was created by the Royal Jordan Geographic Center, and so it is used here. This projection uses the 1924 Hayford

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[88] Thanks to the University of Westminster Archive for providing access to King and Lock's *1955 A Development Plan for the Capital City of Amman*.

Ellipsoid as its geodetic reference. Since this projection system and ellipsoid are uncommon, I used Arizona State University's ReprojectME! Program to transform all the data to the JTM system. After georeferencing the historic maps, I created a personal geodatabase and a feature class to start editing and drawing polygons for each neighborhood, tracing the outline provided by the urban planners. In order to focus on the center of the city, I only used neighborhoods included in the district of Amman, not the entire municipality. This approach allows for more detailed analysis of many of the core neighborhoods of the city and allows for more direct comparison, since all three maps feature this area. Through this, I created digital replicas of the historic maps which are now measurable and comparable since they share a projection system. With these changes, it is possible to measure the lengths and areas of neighborhoods, compare changes to shape and size across time, and overlay maps to visually depict changes.

For the satellite imagery, I obtained data sets from the United States Geological Survey (USGS) through their GLOVIS application at a ground resolution of 30 x 30 meters. I selected images from two years: 2013 and 2018. These two dates are within the range of Landsat 8, the most recent and most detailed of the Landsat satellites. The selected dates have less than 20% cloud cover. After unzipping the files and adding bands one through seven to ArcMap, I used an image analysis to create a composite band. I then repeated this process across satellite images from all selected dates. Then, I adjusted the colors to match the bands as 6-5-4. I clipped the images to the extent of the city of Amman's boundaries. Next, I took the difference of the two rasters using image analysis. Then, I used Iso Cluster Unsupervised Classification to classify the raster into five parts. After identifying which classified sections best represented a change, I used the raster

calculator to set similar classified sections equal to each other. Next, I converted the raster into a polygon and dissolved it into a single polygon. Finally, I measured the area. Using neighborhood polygons from the University of Jordan, I was also able to individually analyze changes across neighborhoods and sections of the city.

Though I hoped to find more concrete evidence on the effectiveness of the implementation of urban plans, I found that it would require higher-quality satellite imagery than I had access to as well as in-person, on-the-ground research which I was unable to do. Nevertheless, the brief study of green space using satellite imagery provides a suitable, but limited lens for examining the effect of urban plans.

Urban Planning Maps

A Development Plan for the Capital City of Amman (1955)

From November 1954 to December 1955, a team of United Nations representatives travelled across Jordan, taking notes and creating an urban plan for Amman. Gerald King, the United Nations Field Town Planner, and Max Lock, the United Nations Town Planning Consultant, aimed to create "a 'Grand Conception'[of Amman] and a basic framework upon which the future city can be built."[89] Though their vision was impressive in scope, it went unrealized. They envisioned a city of "self-contained mountain neighborhoods, grouped around the valley … and linked by a series of inter-mountain roads which also give access to the city center."[90]

Figure 2 A Development Plan for the Capital City of Amman (1955)

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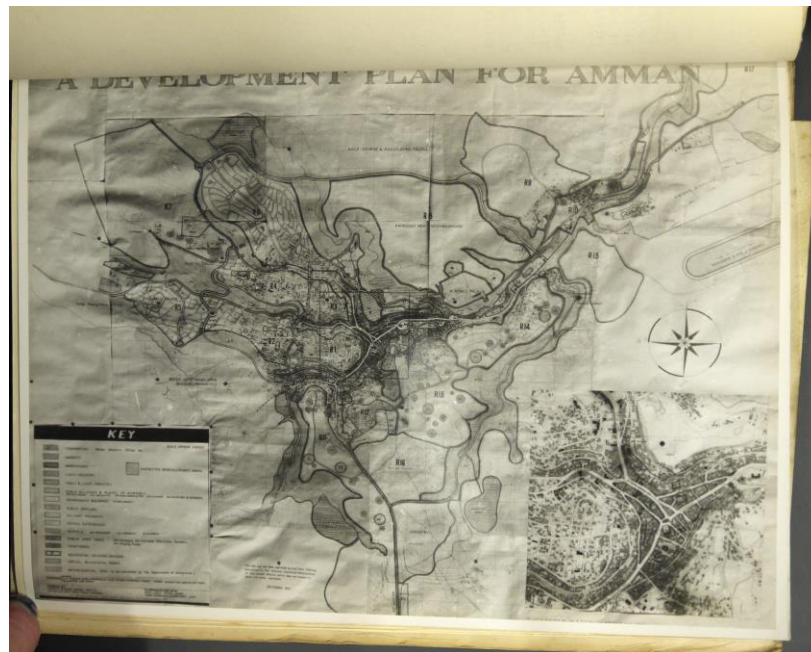
[89] Gerald W. King and Max Lock, *The Final Report of the United Nations Field Town Planner Jordan: A Development Plan for the Capital City of Amman*, 1955, 5. From Westminster Archives.
[90] Ibid, 6.

They were brought into Amman as a part of a United Nations technical assistant program to Jordan in order to address the urban crisis caused by the immense Palestinian refugee influx following the first Arab-Israeli War. The issues facing the city remain today. Then and now, rapid urbanization brought such a great increase in population that the infrastructure could not keep up. In the 1940s, Amman's population quadrupled and its area doubled.[91] The road network was underdeveloped and traffic jams severely impeded travel across the city.

King and Lock also brought their own ideals to the project. They sought to integrate the natural environment with the city by growing trees in public open spaces and by cleaning the river to "form a pleasant and refreshing stretch of water."[92] They also sought to improve government buildings, believing that "by good architecture and civic design, lasting dignity can be achieved."[93] These ideas were largely grounded in British urban planning concepts. Patrick Abercrombie's Greater London Plan of 1944 also emphasized comprehensive planning of roads.[94] Max Lock was a follower of Patrick Geddes, a Scottish urban planner who coupled urban planning with detailed surveys and sociological studies.[95] The American urban planner Clarence Perry's neighborhood unit theory also impacted the work of King and Lock.[96] He believed that well-functioning neighborhoods could not arise organically, but rather they had to be cultivated by an urban planner.

[91] King and Lock, "The Final Report," 1.
[92] Ibid, 4.
[93] Ibid, 4.
[94] Abu-Dayyeh, Nabil. Amman: Past and Future of a Modern Arab Capital. p. 3.
[95] "Lock, Cecil Max (1909-1988), town planner," University of Westminster Records and Archives, accessed on 7 April 2021, https://westminster-atom.arkivum.net/index.php/max-lock.
[96] Clarence Arthur Perry, City Planning for Neighborhood Life, *Social Forces* vol 8, no. 1 (1929) 98.

The way that Lock and King described Amman reflects many of the assumptions and misconceptions about non-Western urban planning and architecture of the time. On the one hand, they critique the aesthetic quality of the city, saying of the local limestone which most of the city is built with, "This stone is an excellent building material, but as it is not supported or relieved by any colour contrast, the general effect tends to be monotonous."[97] They also characterize aspects of the city as "oriental," of "no particular style," or "unfinished."[98] Sometimes, their attitude towards Amman appears to be starkly different from their treatment of British cities. In a letter written to the City Engineer of the Municipality of Amman, King recommended that an "interim planning law" be established to suspend any development "which might be detrimental to the proposed Development Plan."[99] He intended that this law continue until a later, more permanent version was put into place by the government. However, Max Lock opposed a similar law in England.[100] He and Lock were advising the Jordanian government in a different way than they advised the British. In Jordan, they were outsides, brought in by an international organization. At that point, the British mandate over Jordan had ended, but the presence of these two British urban planners in Amman suggests neo-imperialist efforts, or at the very least, the oversight of the Global North through international organizations.

King and Lock used these theories to justify their new ideas for the structure of Amman. Even in 1954, they found Amman's neighborhoods to be "clearly defined" in

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[97] King and Lock, "The Final Report," 23.
[98] Ibid, 24.
[99] G.W. King to The City Engineer of the Municipality of Amman, March 24, 1955, Max Lock Archive: University of Westminster.
[100] "Lock," University of Westminster.

terms of space and characteristics although they lacked facilities such as shopping centers

and schools.[101] They decided to define the current neighborhoods of Amman, designate

four for improvement, and create an entirely new one. These neighborhoods would be

shaped by new roads, such as the Inner Link Road and several overhead roads. R8, the

new neighborhood, was expected to provide "an excellent opportunity to set an example

of good neighborhood planning."[102] Using GIS, it is possible to see exactly what changes

they sought. Some of their plans seem a bit ridiculous in the modern age, like putting an

enormous golf course in one of the most water-poor countries in the world.

Other plans of theirs were more realistic and had a larger impact on the growth of

the city. The roads advocated for by Lock and King are important because these transport

lines affect settlement. Albattath finds that "the urban expansion in Amman (the study

region) is governed by the transport network. The main arteries along which the sprawl is

taking place include, the downtown, Sweileh, Naour, and along the national highways

connecting the major cities of the Kingdom."[103] This example shows how one component

of an urban plan can affect others, even if the effects are seen decades later.

One other element to keep in mind is how the British background of Lock and

King impacted their decisions. At the time, British zoning regulations favored residential

plot sizes that were too big for the evermore crowded city and its lower income residents.

The largest size was over 1000 square meters and the smallest was set at 250.[104] By using

these measurements, Lock and King exacerbated the growing informal-formal housing

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[101] King and Lock, "The Final Report," 3.
[102] King and Lock, "The Final Report," 22.
[103] Albattah, "Remote Sensing," 139.
[104] Ababsa, "The Evolution of Upgrading," 2.

divide, and so most of the settlements built by the ordinary residents of Amman throughout the "1950s and late 60s were built on the edge of hills and in the floodable areas of valleys," thus situating residents of Amman in a precarious situation, on the edge of the municipal and legal realm as well as the geographic.[105]

Figure 3 A Development Plan for Amman (Georeferenced)

The first item of note is the size of the city. It includes only the center and northeast portions of what is currently the subdistrict of Amman. Though many of the central roads and traffic circles are present, many side streets do not yet exist. It is important to note that this is a planning map, so it did not merely present the reality of Amman, but a potential reality. Because of the irregularities in the composition and projection of this map, it was the most challenging to georeference. Few of the roads lined up precisely with the modern sources and the JTM projection so there was an

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[105] Ababsa, "The Evolution of Upgrading," 2.

unusually high RMS error of 33.79.[106] Nevertheless, the map still teaches us a great deal about Lock and King's perspective of the city.

In this map, neighborhoods are conceptualized with ambiguous borders. For the sake of comparison, I used the nearest boundary lines to draw the polygons, but Lock and King simply labelled the general area where the neighborhood was located. This detail suggests that they viewed neighborhoods not always as discrete areas. Sometimes there are spaces between neighborhoods for parks and roads and there are potential areas for overlap. Additionally, they included plans for additional features to be added to the city including more residential neighborhoods, cemeteries, and even a British military base and golf course. The values of Lock and King, and through them the larger values of contemporary urban planners and the UN, become visible when studying their map and what is included and excluded in it.

*Greater Amman Comprehensive Development Plan (GACDP 1988)*

The next overarching urban plan was published in 1988, this time under the direction of the Jordan government and bringing together local and national representatives.[107] It was led by a single municipal head, the Greater Amman Municipality. The main priorities were directing growth, creating a radial road network, strengthening public transportation, and furthering new development projects. This project came after a series of others sponsored by USAID and World Bank. Prior to the

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[106] RMS Error, or root-mean-square error, is a way of quantifying the error of a given map. Although there is no generally accepted value for the error, this figure was particularly high when compared with the other maps I was working with. This can be attributed to the age of the map, and the quality of the scan.

[107] Ian James, "Amman's 1987 and 2008 Master Plans," Center for the Study of the Built Environment, October 2017. The '1987 Plan' first began in 1985, but it was not published until 1988. For consistency, it will be referred to according to its 1988 publishing date.

creation of the Greater Amman Municipality, individual municipalities made their own

individual plans, but no comprehensive city-wide plan existed. These municipalities

controlled zoning and in an attempt to attract Amman's wealthiest residents, would only

include A and B zones, which were the largest plot sizes available.[108] The GACDP

designated the majority of the remaining residential land as C or D, the smaller sizes.[109]

So, the disparity remained and many of the West Amman neighborhoods had vastly

wealthier residents with larger plots.

Figure 4 Greater Amman Comprehensive Development Plan (1988)

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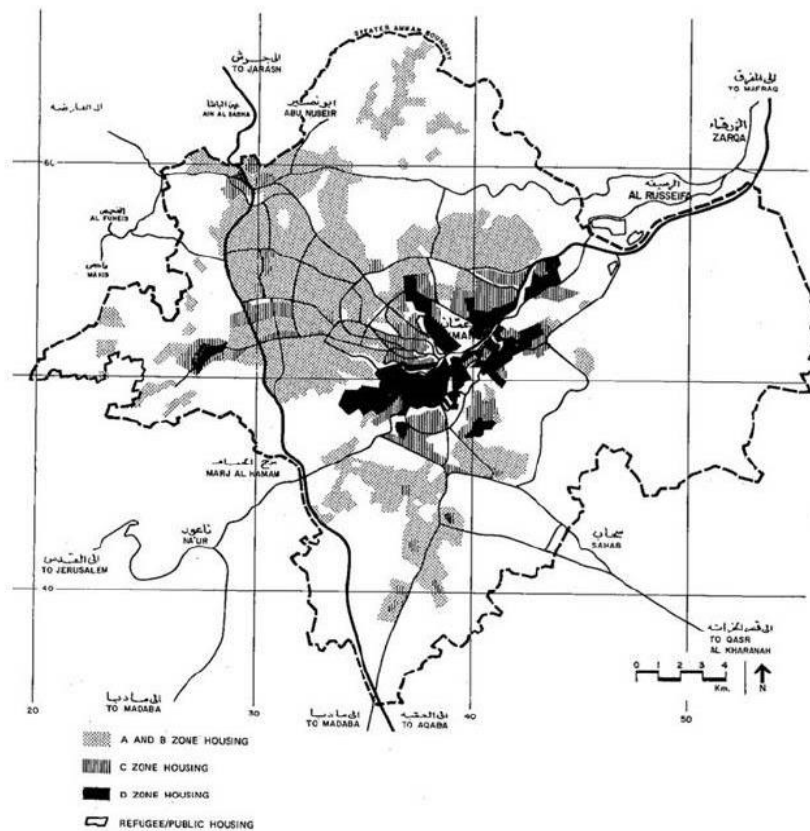
[108] James, "Amman's 1987 Plan."
[109] Ibid.

Unlike King and Lock's plan, the GACDP also included a discussion of employment. The team developed three structure plans to estimate the future growth of commercial districts in this city. The GAM hoped to encourage business in each of the eleven districts they created, not just the central. However, "the lack of any strong variation between the three structure plans is a reflection of the extent of existing development, and the difficulty of restructuring the city."[110] Many of the great changes planned by the GAM occurred at the neighborhood level rather than the city-wide. The GACDP hoped to increase facilities such as parks, roads, gardens, municipal buildings, places of worship, and sewage networks.[111] Since the government owned a relatively small proportion of land in Amman, they planned to use Law 11 of 1986 and Law 9 of 1984 which permitted the municipality to make a plan for even the private property in the jurisdiction and to even re-allocate it.[112] Many of the areas within the new municipality of Amman had been under the control of smaller municipalities prior, so in effect, the GACDP was overriding their previous plans, a difficulty only increased by how built-up the area was.

However, the GACDP's hopes were dashed by the 1989 economic crisis.[113] Though the municipal boundaries were changed by the plan, much of the building work went undone.

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[110] James, "Amman's 1987 Plan."
[111] Ibid.
[112] Ibid.
[113] Stephen Franklin, "Jordanian's Economic Remedy Inflates Deadly Politic Crisis," *Chicago Tribune* (23 April 1989).

Figure 5 GACDP (Georeferenced)

In the GACDP's conception of Amman, neighborhoods and zoning are closely connected. The D zones are clustered around the center of Amman. These smaller plot sizes are both a reflection of contemporary settlement patterns and an explanation for the density of population distribution in the downtown area. The A and B zoning delineates larger plot sizes and their prevalence in the western portion of Amman explains why these districts, neighborhoods like Abdoun and Abdali, attracted upper-income residents and cemented their characterization of wealth. The plan also provided district centers for growing neighborhoods in the north, places like Sweileh and Jubeiha. Another point of note is that the neighborhoods have more discrete boundaries by this point, though they do not entirely follow the boundaries suggested by Lock and King. Like Lock and King,

the GACDP planners were intensely concerned about growth. While they did less

predictive planning in regard to creating neighborhoods, they hoped to create change via

zoning regulation changes and a centralization of urban planning authority.

<center>*The Amman Plan* (2008)</center>

In the introduction to the 2008 Amman Plan, Mayor Omar Maani remarked, "This

development has been happening without a plan; we can no longer afford to grow without

direction for it will damage what is special about Amman and we will miss opportunities

to become a modern world city while retaining the soul of our community."[114] The

Amman Plan was led by the Greater Amman Municipality (GAM), which had originated

<center>*Figure 6 Amman Plan (2008)*</center>

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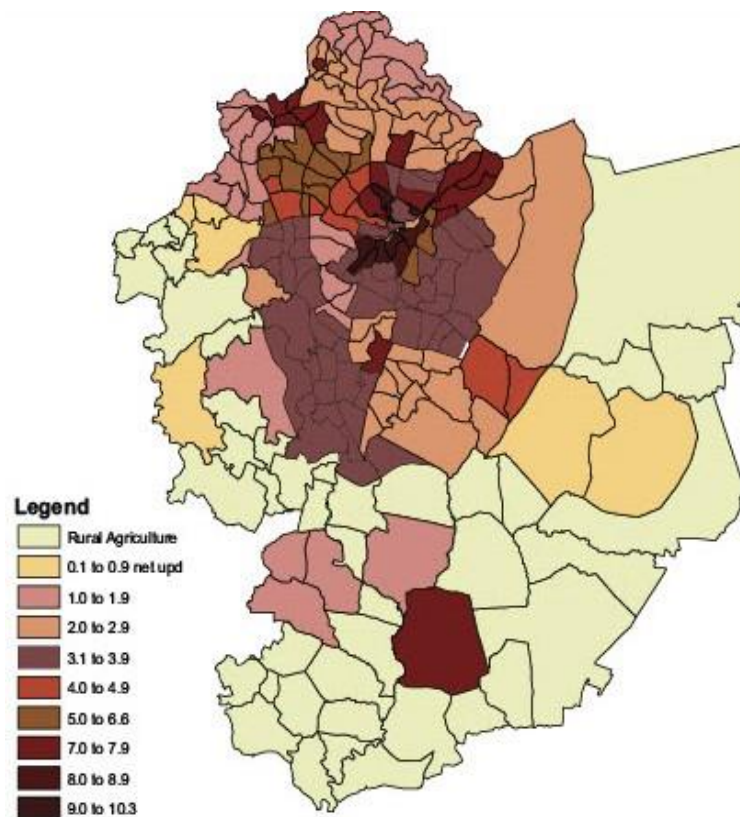
[114] *The Amman Plan: Metropolitan Growth Summary Report*, Greater Amman Municipality, May 2008.

<center>39</center>

from the GACDP, and included plans not just for urban planning but for a broader

consideration of the city. The Plan is a part of a broader Amman 2025 Vision.

Although the introductory letter from the mayor establishes the need to counter

current issues in Amman with a broader vision, the descriptions of the city throughout the

document are idyllic, painting a picture of an effortlessly modern and traditional city,

friendly to residents and travelers alike. The report says

> "Amman is a city of choice. One can step back in history by walking through the
>
> designated heritage districts. These pedestrian-friendly neighborhoods have been
>
> thoughtfully restored and generously landscaped to provide ample shade … The old
>
> Downtown has been transformed into a meeting place for Ammanis and has been
>
> 'greened' to become the City's 'lung'. [115]

Despite these grand descriptions of the city, the GAM still saw it necessary to create the

Amman Plan, "an unorthodox approach to metropolitan, urban, and community

planning."[116] It distinguishes itself from past master urban plans, claiming to combine

both "the top down and the bottom up" approaches to planning.[117]

The Amman Plan counts 228 existing neighborhoods within the GAM.[118] Like

Lock and King, the creators of the Amman Plan are very concerned with roads and

transportation between different parts of the city.[119] However, the document centers

around the Metropolitan Growth Plan (MGP), which provides an overview of all the

other phases and components of the Amman Plan. Uniquely, the MGP advocates not just

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[115] *Amman Plan* 11.
[116] Ibid 14.
[117] Ibid.
[118] Ibid 23.
[119] Ibid 24.

changing administrative regulations and fostering the growth of specific areas but also for

preserving heritage.[120] With Ammanis in charge of the product instead of external actors,

cultural preservation becomes much more important. The MGP defines areas of primary

growth for residential areas, business districts, and roads and areas of limited and no

growth for natural and cultural heritage areas, agriculture, and mining locations.[121]

Regarding the areas of primary growth, GAM hoped to increase settlement densification,

intensification, and expansion. The MGP also advocated for an increase in open and

green space through their Open Space System, which is discussed further in the section

on satellite imagery.

Figure 7 The Amman Plan Growth Map
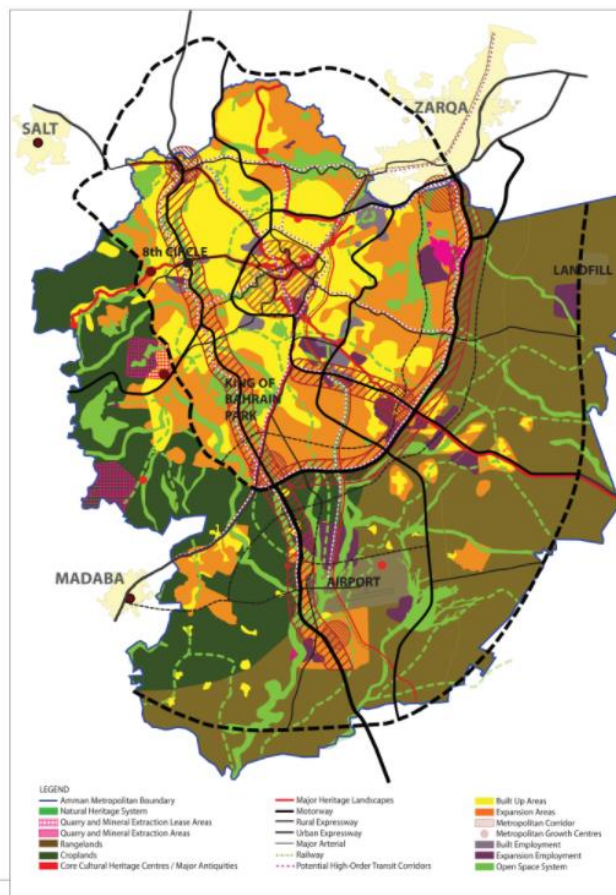
GAM is primarily concerned with neighborhoods because of housing density, but these neighborhoods are also used to divide up work across different phases of the project: near term (2008-2013), medium term (2014-2019), and long-term (2020-2025).[122] Like the GACDP, the Amman Plan also involved extensive changes with zoning regulations and government structure. Here, zones support mixed-use districts instead of emphasizing smaller plot sizes. The GAM was restructured to create a planning board and a series of subcommittees. Power is vested in the city council, which "will be responsible for all metropolitan-wide planning decisions" and the mayor, who heads the planning board.[123]

Figure 8 The Amman Plan (Georeferenced)
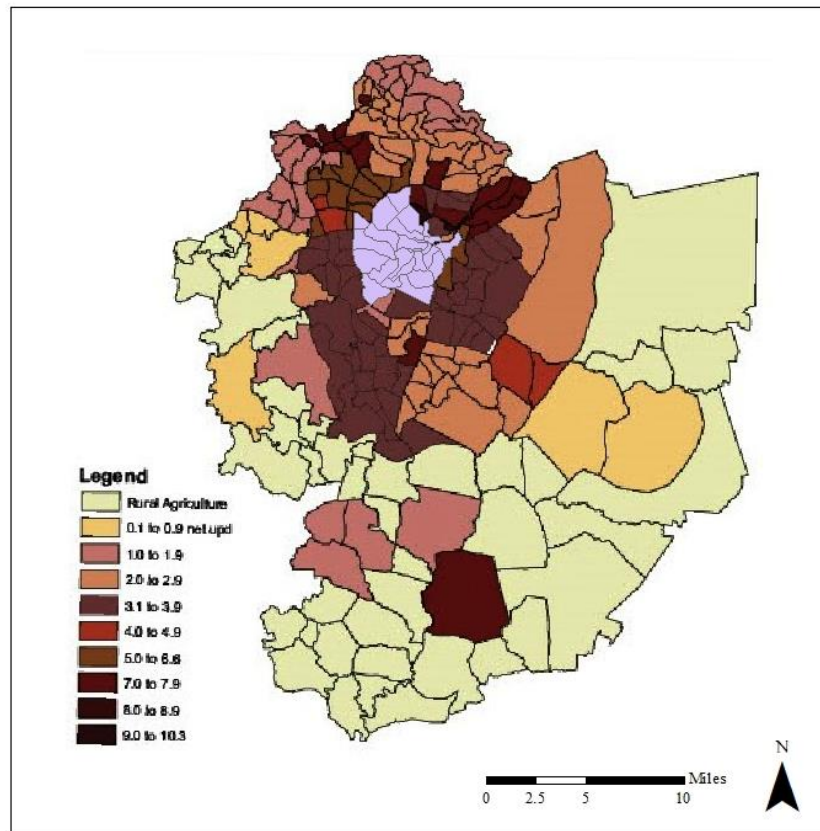
[122] *Amman Plan* 70-74.
[123] Ibid 77.

The resulting map of planned growth in Amman illustrates a different view of neighborhoods when compared to the two previous reports. These neighborhoods have very discrete boundaries with no room for variation or the consideration that neighborhoods may have ambiguous neighborhoods. The central subdistrict of Amman and surrounding areas are densely inhabited. Additionally, unlike the two previous maps, this plan includes a clearly defined border for the municipality. While the other maps had roads and borders trail off beyond the centrally defined neighborhoods, this map is closed off. This map also makes use of digital GIS systems. While the first and second maps appear to be drawn, this map uses standard GIS depictions and measurement systems. It may be this turn towards more digital and computerized analysis systems that prompted the hard boundaries for neighborhoods since GIS systems do not display geographic ambiguities easily. Many of the other maps in this report, especially those which do not focus on neighborhoods, feature less exact boundaries and allow for more variance. One other point of note is that Amman did bring in a wide variety of voices for their roundtable on The Amman Plan--from a high school student to an artist to engineers to local and national officials, which suggests that they did follow through on their goal to include both a bottom-up and top-down approach.

Cross-Comparison

Looking at these georeferenced and drawn depictions of Amman's neighborhoods together may reveal some further conclusions about how neighborhoods are conceptualized within the city's urban plans. The word 'Amman' itself carries an ever-changing spatial meaning. It can refer to (in ascending order): the neighborhood of Jabal Amman, the subdistrict of Amman, the district of Amman, the city of Amman, the

municipality of Amman, or the governorate of Amman. Over time, the shapes, sizes, and exact meanings of these conceptualizations of Amman have changed depending on who is conducting the measurement and the line is often blurred between what is in Amman and what is not. By comparing both the quantity of space that these maps are drawn with and the nature of their descriptions it is evident that not only is Amman itself growing in terms of space and population size, but so are the definitions of Amman used by urban planners.

*Figure 9 Cross-Comparison of Urban Planning Maps*
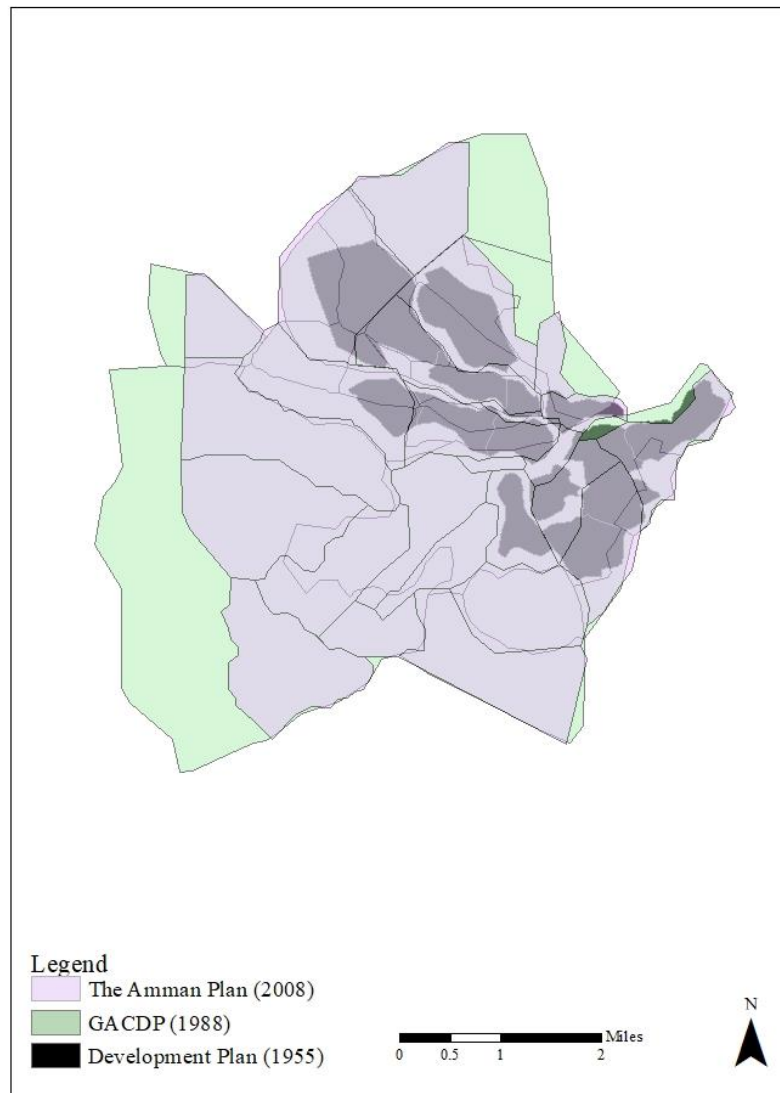
The clearest change that occurs between the urban planning maps relates to the overall size of Amman. Each iteration of the map of Amman grows tremendously, not only as a result of a growing population and an expanding collection of neighborhoods around the city, but also as definitions of Amman changed. In the 1950s, Amman was still a relatively small capital city with about 200,000 residents out of a total of 586, 200 in the country.[124] The neighborhoods were defined by the mountains at the heart of the city. As shown in the figure above, these mountains heavily impacted the nature of the central part of the city, as defined by the modern designation of subdistrict of Amman. This central area of Amman remains relatively unchanged across the maps. Since the neighborhoods are shaped around the valleys and tops of the mountains, and the mountains are a fixed component of the landscape, the neighborhoods change very little with respect to them. Especially between the 1988 and 2008 maps, the neighborhoods retain much of the same size and shape. However, what is considered part of the central district of Amman is still changing.

It is also important to recognize that while this central part of Amman remains relatively stable, the exterior boundaries of Amman undergo quite drastic changes. In a way, the growth of Amman helps show the relationship between top-down and bottom-up forces. The city expands while maintaining its general shape. Expansion and settlement are not random but follow roads or the outlines of neighborhoods.

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[124] "Population of the Kingdom 1952-2019," Department of Statistics The Hashemite Kingdom of Jordan, 2021.
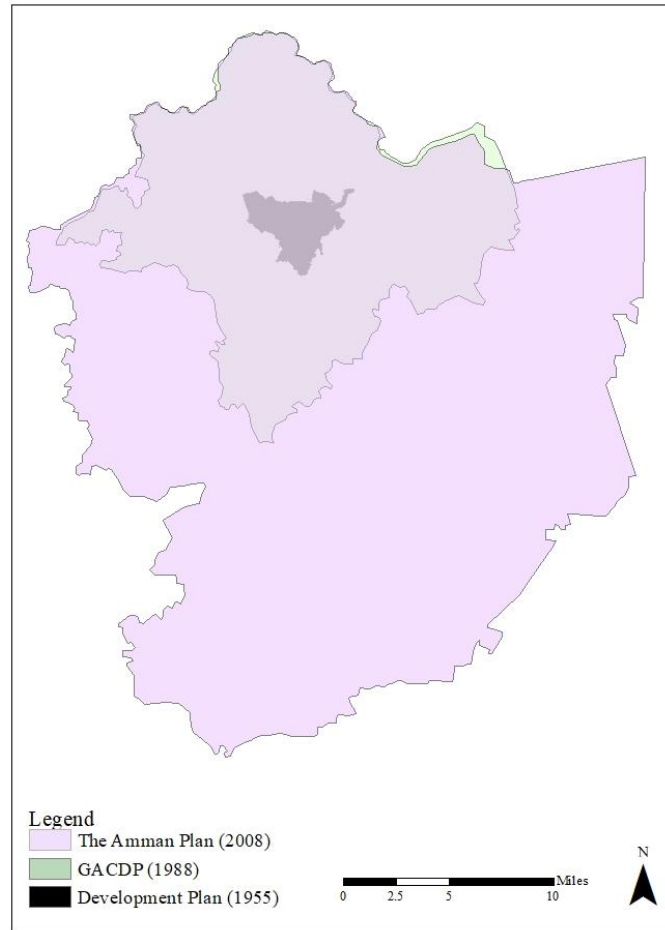
The shape of the 1955 map of Amman is by far the smallest, but it establishes a shape which is reflected in the successive maps of Amman with an elongated southern tip as well as extensions to the west and east. The city continued to grow along these areas with some expansion northward as well. However, between the 1988 and 2005 map there are relatively little changes to the northern border, possibly because the municipalities to the north, places like As-Salt and Zarqa had already established their identity. The city cannot expand where there are physical or human boundaries, so growth continues towards the south, particularly for the 2008 map.

Some of these expanding definitions are connected to the growing population. The following graphs demonstrate how both the population and area of Amman increased at an exponential rate over the past seventy-five years.

Table 4 Population and Area of Amman

Size and Urban Planning Maps: Amman, Jordan		
Map	Population	Area (mi^2)
1955	200,000[125]	10.29
1988	780,000[126]	202.36
2008	2,645,900[127]	645.64

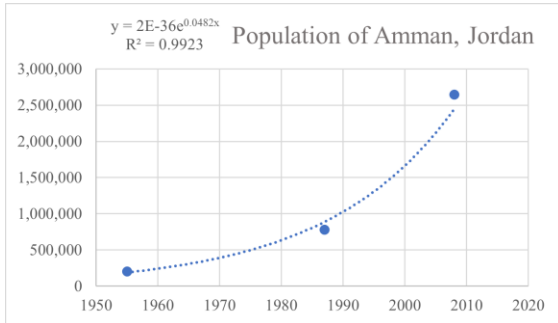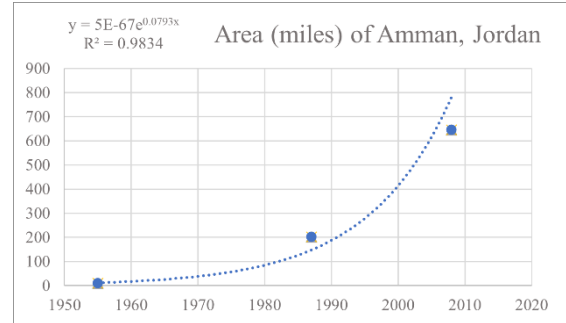*Figure 12 Population 1955-2008*   *Figure 11 Change in Area 1955-2008*

Based on this information, it is clear that understandings of the city and its size grew to absorb the increasing population. Not only did the density of Amman increase but so did the urban sprawl.

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[125] Lock and King, *Final Report,* 6.
[126] "Population," World Bank.
[127] "Population of the Kingdom," DoS.

Landuse Change

Efforts to increase green space in Amman have been present since the 1950s.

Even then, Max Lock and Gerald King argued to increase green space throughout the city

by building parks or planting trees by the river and the 1988 plan likewise hoped to

increase public open space. Additionally, the 2008 Amman Plan states that "the old

Downtown has been transformed into a meeting place for Ammanis and has been

'greened' to become the City's 'lung'" and that the city is actively participating in

'greening' activities.[128] However the city suffers greatly from its location in an arid,

desert climate and the difficulty of creating a green space in that location in the midst of a

water crisis should not be underestimated.

Green space has a unique social importance, especially in Jordan, one of the most

water-poor countries in the world. Ali et. al. found that the most salient issues residents of

Amman cared about were related to land and urban issues, particularly those relating to

public space and pollution.[129] Green space is also important for refugee groups, who find

it lacking in Amman. Al-Naili relates the experience of a group of Palestinian women

living in an eastern neighborhood of Amman:

> "For those who have left, the image of Artas's lush gardens—al-basatin—stands
>
> in stark contrast with what they see around them: Eastern Amman's working-class
>
> neighborhoods where most of them live are gray and lack green space. In their
>
> memory narratives, life in Artas followed the rhythm of nature and agriculture,
>
> whereas they see life in Amman as dominated by the struggle for survival in a

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[128] Amman Plan 11.
[129] Hikmat, "Quality of Life," 419.

highly stratified urban environment. It is not surprising that in their mind's eye, the gardens of Artas come close to the image of a paradise lost."[130]

The lack of green space in the city reduces individuals' connections to it and decreases quality of life. Unfortunately, over the past century, and despite the efforts of urban planners, green space has continued to shrink. Al-Rawadesh explains that as Amman's urban area increased by 162 km^2 from 1918 to 2002, fertile lands decreased by 86 km^2.[131] They tie this 23% reduction in fertile land to refugee influxes and "unplanned and uncontrolled urbanization."[132]

A landuse analysis helps to evaluate the change in green space between 2013 to 2018. Comparing satellite images from the two dates reveals that there was a great deal of change in landuse. The changes were concentrated in the southwest and southern portions of Amman. The majority of it transitioned from green space to developed land, which includes items like buildings, roads, or parking lots, or from green space to barren land. However, a few pockets of vegetation remained.

This area is in central Amman, a place which has been continuously inhabited for at least the past two hundred years. Its roads follow the wadis and jabals and its densely packed with shops, homes, mosques, and other buildings. This area leaves little room for open or green space. Any available space is highly attractive to developers since the area is so heavily trafficked. Even in recent years, green space has decreased and given way to developed land.

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[130] Falestin Naïli, "Memories of Home and Stories of Displacement: The Women of Artas and the 'Peasant Past'," *Journal of Palestine Studies 38*, no. 4 (2009): 65.
[131] Al Rawadesh, "Satellite Monitoring," 211-212.
[132] Ibid.
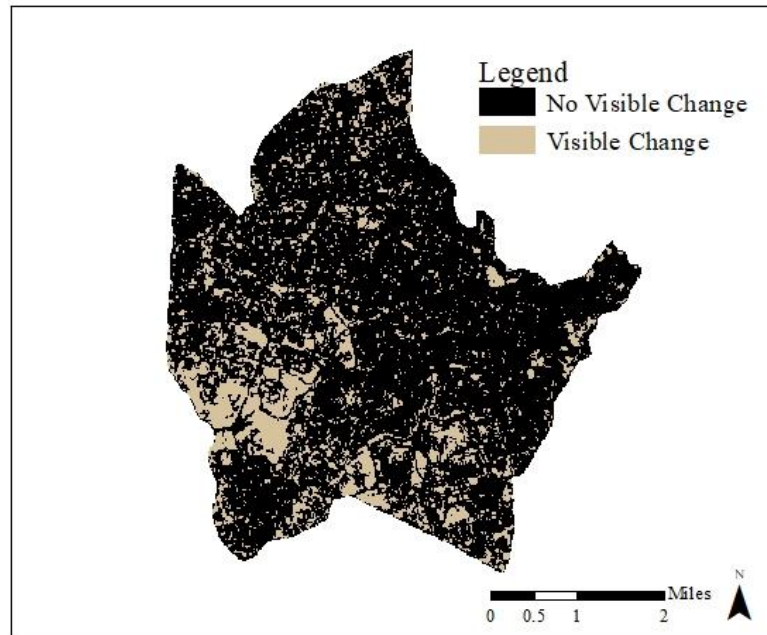
This change from green space to developed land is the opposite of what urban planners have intended. Though some green space remains, it has not increased as they have aimed for in each one of their past plans. This suggests a failing either in approach of the urban planners or in implementation. It may also be that the circumstances that they are facing are so averse to green space that it is immensely difficult for them to make any headway. Water scarcity is a serious issue in Jordan and it is difficult to create parks, gardens, etc. because of the lack of natural resources. These findings suggest that the government should reconsider its strategies on green space so that their projects are more effective.

Conclusion

Over the past seventy-five years, the conceptualization of Amman has developed and stretched to fit a changing cast of urban planners as well as an ever-growing population. These urban planners have set goals and visions for the city that leave an impact to this day. Although perspectives and ideas have changed over time, the importance of neighborhoods and the desire for green space has continued. While actual implementation of these urban plans varies, the ideas of the urban planners trickle down through whatever actually takes form--whether it is the creation of a municipality or a neighborhood, the building of a new road, or the changing of plot sizes--these decisions signal what is valued and thus what is not. At times, these plans are used to assert international norms of urban identity, and at other times, the local take precedence. In a way, these plans visualize the push and pull occurring between the residents of Amman and government officials who attempt to bring order to the city's growth. Through legal changes, adjustment to zoning laws. drawing new neighborhood boundaries, and changing traffic circles, the Greater Amman Municipality and other governmental offices are able to assert their vision and authority over the city.

When thinking about these plans in conjunction, it is evident that Amman's urban history is woefully misunderstood. First, it is painted as an 'unplanned' city, one without any direction, simply shaped by the waves of refugees coming in and out of the country. In fact, there have been numerous urban planning commissions, nearly one major commission every decade since the country became independent. The woes of contemporary Amman's infrastructure have not resulted from a lack of planning. Though it is easy to blame all the traffic jams on city planners, it simply does not match the

reality of Amman's plentiful and frequent urban planning commissions. Moreover, despite the rapid growth and development of recent years, Amman itself is not a new city. Much of the modern human landscape of Amman began taking shape during the Ottoman Empire and it was during this era that the drastic socio-economic disparity between different neighborhoods began taking form.

Here is where urban planning is proved to be important. It was Ottoman land redistribution directives which first gave land, employment, and resources to Circassian migrants. Then, the British and the Hashemites saw the area as valuable for its relative wealth and infrastructure. When urban planning commissions began, these areas were able to better advocate for their needs and attain more resources than poorer districts. The results were self-increasing, with wealthier areas advocating for larger residential zones and thus attracting wealthier residents who were able to further develop the area. These urban plans can also reinforce normative values, defining what is valuable and what is not.

Over time, Amman's urban planning commissions have become more centralized. In the 1950s, although the British mandate of Jordan had ended, the British still managed to influence the country through urban planners sent by international organizations. These indirect means of influencing a country had a limited effect. Though no golf course was built, Lock and King impacted the shapes of roads and neighborhoods. Later commissions included experts from Japan and other countries, but in more modern attempts, urban plans have been largely led by Ammanis themselves. Prior to the 1988 plan, neighborhoods had more autonomy over their future growth. The creation of GAM

consolidated that control in one municipal body. In the most recent urban plan, control over planning has been centralized further, under the mayor.

The characterization of neighborhoods matters for resource allocation. Neighborhoods present different assumptions to the residents of Amman. Just like how the Lower East Side, the Bronx, Brooklyn, Harlem, SoHo, and Long Island all conjure up different images in the minds of New Yorkers, so does Abdoun, Jubeiha, L'weibdeh, and al-Taj lead to different images for Ammanis. These characterizations may be detrimental for neighborhoods and discourage development because of preconceived notions of poverty or criminality. They may also benefit neighborhoods and encourage development.

There is a gap between the urban plans and their implementation. Throughout this research, the emphasis and focus has been on the urban plans themselves. However, these documents present a potential reality, not simply what exists on-the-ground. Therefore, it is necessary to note that urban plans diverge from physical realities of a place. For example, green space continues to decrease despite urban planners' attempts to increase it. Additionally, the values of urban planners must be understood as distinct from the values of the residents of the city. Whether or not the urban planners are Jordanians or outsiders, the features of the city they seek to accentuate or diminish are not necessarily the same ones that residents themselves would choose. The values of urban planners represent the values of their organizing body, whether it be the mayor, the municipality, or another organization.

There are many avenues for moving this research forward. Since many of the urban planners are historic actors, it is difficult to know precisely what they were

considering when making decisions, so having more information on their mindsets and perspectives would be immensely beneficial. Additionally, the research would be strengthened by additional satellite imagery analysis that could measure how correlated the changes on-the-ground were to the urban plans. Finally, it would also be helpful to speak to residents of Amman and modern urban planners to have a better understanding of how people perceive neighborhood boundaries and the city as a whole.

Still, this research makes a good deal of headway into showing just how key studying urban plans are to understanding Amman. The city faces many infrastructure and economic challenges both now and in the future. If urban plans continue to be developed and implemented without fully recognizing the importance of neighborhoods, socio-economic stratification will continue to occur along neighborhood borders. If Amman genuinely wants to increase its green and open space, it will have to consider taking new strategies, because current methods are not producing results. Amman's identity will continue to be influenced by residents and urban planners alike, and it will take cohesion and cooperation to prepare the city for coming challenges.

Bibliography

Ababsa, Myriam. "The Evolution of Upgrading Policies in Amman." *Sustainable Architecture and Urban Development* (July 2010): 1-17.

Abu-Dayyeh, Nabil. "Persisting Vision: Plans for a Modern Arab Capital, Amman, 1955-2002." *Planning Perspectives* 19 (2004): 79-110.

Abu-Dayyeh, Nabil and Firas Ziadat. "GIS for Understanding Physical and Social Change in Urban Settings: A Case from Amman, Jordan." *Environment and Planning B: Planning and Design* 32 (2005): 127-140.

Abu-Dayyeh, Nabil. "Prospects for Historic Neighborhoods in Atypical Islamic Cities: The View from Amman, Jordan." *Habitat International* 30 (2006): 46-60.

Abu-Dayyeh, Nabil. "Amman, Past and Future of a Modern Arab Capital." *University of Jordan, Amman* (2011), 1-11.

Agnew, John. *Place and Politics: The Geographic Mediation of State and Society*. Boston: Allen & Unwin, 1987.

Al Abed, Oroub. "Palestinian Refugees in Jordan." *Palestinians in Europe Conference* (2004).

Al-Bakri, Jawad T., Mohmmad Duqqah, and Tim Brewer. "Application of Remote Sensing and GIS for Modeling and Assessment of Land Use/Cover Change in Amman/Jordan." *Journal of Geographic Information System 5* (2013): 509-519.

Albattah, Mahmoud M.S.. "Remote Sensing and Topographic Information in a GIS Environment for Urban Growth and Change: Case Study Amman the Capital of Jordan." *International Journal for Innovation Education and Research* 3, no. 2 (2015): 126-142.

Ali, Hikmat H., Fuad K. Malkawi, and Yamen N. Al-Betawi. "Quality of Life in Cities:

    Setting up Criteria for Amman-Jordan." *Social Indicators Research 93* (2009):

    407-432.

Al Rawadesh, Samih and Bassam Saleh. "Satellite Monitoring of Urban Spatial Growth

    in the Amman Area, Jordan." *Journal of Urban Planning and Development 132,*

    no. 4 (December 2006): 211-216.

Al-Tal, Raed Salem and Hala Hesham Ahmad Ghanem. "Impact of the Syrian Crisis on

    the Socio-Spatial Transformation of Eastern Amman, Jordan." *Frontiers of*

    Architectural Research 8 (2019): 591-603.

The Amman Plan: Metropolitan Growth Summary Report. Greater Amman Municipality.

    May 2008.

Bailey, Thomas and James Shick. "Enabling the Collision of History and Geography."

    Social Science Computer Review (2009): 1-6.

Brigante, Rafaella and Fabio Radicioni. "Georeferencing of Historical Maps: GIS

    Technology for Urban Analysis." *Geographica Technica* 9, no. 1 (2014).

Cosgrove, Denis. "Moving Maps." *Geography and Vision: Seeing, Imagining, and*

    Representing the World. London, IB Tauris (2008): 155-168.

Department of Statistics: The Hashemite Kingdom of Jordan. "Population of the

    Kingdom 1952-2019." 2021.

ELSamen, Amjad Ahmad Abu and Rund Ibrahim Hiyasat. "Beyond the Random

    Location of Shopping Malls: A GIS Perspective in Amman, Jordan." *Journal of*

    Retailing and Consumer Services 34 (2017): 30-37.

Farhan, Yahya and Sireen Al-Shawamreh. "Impact of Rapid Urbanization and Changing

    Housing Patterns on Urban Open Public Space of Amman, Jordan: A GIS and RS

    Perspective." *Journal of Environmental Protection* 10 (2019): 57-79.

Franklin, Stephen. "Jordanian's Economic Remedy Inflates Deadly Politic Crisis."

    Chicago Tribune (23 April 1989).

Gregory, Ian, Karen Kemp and Ruth Mostern. "Geographical Information and Historical

    Research: Current Progress and Future Directions." *Humanities and Computing*

    13 (2003).

Gregory, Ian and Richard Healey. "Historical GIS: Structuring, Mapping, and Analysing

    Geographies of the Past." *Progress in Human Geography* 31, no. 5 (2007).

Gregory, Ian, et al. "Spatializing and Analyzing Digital Texts: Corpora, GIS, and Places."

    In *Deep Maps and Spatial Narratives*, edited by David J. Bodenhamer, John

    Corrigan, and Trevor M. Harris, 150-178, Bloomington: Indiana University Press,

    2015.

Hanania, Marwan D. "From Colony to Capital: Reconsidering the Socio-Economic and

    Political History of Amman, 1878-1928." *Middle Eastern Studies 55,* no. 1

    (2019): 1-21.

Hübner, Ulrich. "Amman Before the Hellenistic Period." in *Studies on Roman and

    Islamic 'Amman: The Excavations of Mrs C-M Bennet and other Investigations

    Volume I*, edited by Alastair Northedge, 23-26. Oxford University Press: 1993.

James, Ian. "Amman's 1987 and 2008 Master Plans." Center for the Study of the Built

    Environment (October 2017).

Karamustafa, Ahmet T. "Introduction to Islamic Maps." In *The History of Cartography: Cartography in the Traditional Islamic and South Asian Societies*. Edited by J.B. Harley and David Woodward, 3-11. Chicago: University of Chicago Press, 1992.

Kennedy, David. "Losing—and Salvaging?—the Rural Landscape of Graeco-Roman Philadelphia." *Palestine Exploration Quarterly* 149, no. 2 (2017): 135-161.

Khawaldah, Hamzah Ali. "A Prediction of Future Land Use/Land Cover in Amman Area Using GIS-Based Markov Model and Remote Sensing." *Journal of Geographic Information Systems* 8, (2016): 412-427.

Khirfan, Luna and Bessma Momani. "(Re)branding Amman: A 'Lived' City's Values, Image and Identity." *Place Branding and Public Diplomacy 9*, no. 1 (2013): 49-65.

King, Gerald W. and Max Lock. *The Final Report of the United Nations Field Town Planner Jordan*, 1955. From Westminster Archives.

King, Gerald W. Gerald W. King to The City Engineer of the Municipality of Amman. March 24, 1955. Max Lock Archive: University of Westminster.

Lafreniere, Donald and Douglas Rivet. "Rescaling the Past through Mosaic Historical Cartography." *Journal of Maps* 6, no. 1 (2010).

Lefebvre, Henri. *The Production of Space*. Translated by Donald Nicholson-Smith. Cambridge: Basil Blackwell, 1991.

Levin, Noam, Ruth Kark and Emir Galilee. "Maps and the Settlement of Southern Palestine, 1799-1948: An Historical/GIS Analysis." *Journal of Historical Geography* 36 (2010): 1-18.

Lipschits, Oded. "The Rural Settlement in Judah in the Sixth Century B.C.E.: A

    Rejoinder." *Palestine Exploration Quarterly* 136, no. 2 (2004): 99-107.

Lloyd, Christopher, Ian Gregory, Ian Shuttleworth and Keith Lilley. "Exploring Change

    in Urban Areas Using GIS: Data Sources, Linkages, and Problems." *Annals of*

    GIS 18, no. 1 (2012): 71-80.

Makhamreha, Zeyad and Nazeeh Almanasyeha. "Analyzing the State and Pattern of

    Urban Growth and City Planning in Amman Using Satellite Images and GIS."

    European Journal of Social Sciences 24, no. 2 (2011): 252-264.

Mamou, Regina. "Mapping Collected Memory: An Exploration of Memory-Based

    Navigation in Amman, Jordan." *Contemporaneity: Historical Presence in Visual*

    Culture 3, no. 1 (2014): 139-159.

Naïli, Falestin. "Memories of Home and Stories of Displacement: The Women of Artas

    and the 'Peasant Past'." *Journal of Palestine Studies* 38, no. 4 (2009): 63-74.

Perry, Clarence Arthur. City Planning for Neighborhood Life, *Social Forces* 8, no. 1

    (1929) 98-100.

Potter, Robert B., Khadija Darmame, Nasim Barham, Stephen Nortcliff, and A. M.

    Mannion. "An Introduction to the Urban Geography of Amman, Jordan." *Reading*

    Geographical Papers 182 (2007): 1-29.

Relph, Edward. *Place and Placelessness.* London: Pion Unlimited, 1976.

Rollefson, Gary O., Alan H. Simmons, and Zeidan Kafafi. "Neolithic Cultures at'Ain

    Ghazal, Jordan." *Journal of Field Archaeology* 19, no. 4 (1992): 443-470.

Royal Geographic Society. "History of the Society." Accessed 7 April 2021.

    https://www.rgs.org/about/the-society/history-and-future/.

Rumsey, David and Meredith Rumsey. "Historical Maps in GIS." in *Past Time, Past Place: GIS for History*. Edited by Anne Kelly Knowles. Esri Press, 2002.

Satloff, Robert B.. *From Abdullah to Hussein: Jordan in Transition*, Oxford University Press, 1994.

Tuan, Yi-Fu Tuan. *Space and Place: The Perspective of Experience*. University of Minnesota Press: Minneapolis, 1977.

United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWA). "Where We Work: Jordan." Last modified December 31, 2019. https://www.unrwa.org/where-we-work/jordan.

University of Westminster Records and Archives. "Lock, Cecil Max (1909-1988), town planner." Accessed on 7 April 2021. https://westminster-atom.arkivum.net/index.php/max-lock.

World Bank. "Population, total – Jordan." Last modified 2019. https://data.worldbank.org/indicator/SP.POP.TOTL?locations=JO.