An-Najah National University

Faculty of Graduate Studies

ESTIMATING ISRAELI COLONIAL SETTLEMENTS AREAS, MEASURING EXPANSION, AND ANALYZING THEIR IMPACTS ON PALESTINIAN LOCALITIES IN THE WEST BANK (1997–2023) USING AERIAL PHOTOGRAPHS

By

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This Thesis is Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Geomatics, Faculty of Graduate Studies, An-Najah National University, Nablus - Palestine.

2025

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This Thesis was Defended Successfully on 11/06/2025 and approved by

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Dedication

First and foremost, I dedicate this work to the memory of all those who have sacrificed their lives defending Palestine and whose blood has nourished the struggle for freedom. Their courage and sacrifice will forever be remembered. To my family, especially my father and mother, who have always supported me. To my dear wife, who stands by my side and encourages me to move forward and become a better person. Finally, to all my friends who believe in and support me.

Acknowledgements

First and foremost, I am deeply thankful to Allah for giving me strength, patience and the ability to accomplish this thesis.

I would like to express my sincere appreciation to my supervisor, Dr. Ahmed Ghodieh, for his guidance and expertise throughout this journey.

Thanks to An-Najah National University.

Eng. Abedalrahman Dabe

Declaration

I, the undersigned, declare that I submitted the thesis entitled:

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I declare that the work provided in this thesis, unless otherwise referenced, is the researcher's own work, and has not been submitted elsewhere for any other degree or qualification.

Student's Name: Abedalrahman Kamal Dabe

Signature: 

Date: **11/06/2025**

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Abstract

The West Bank suffers from settler colonialism, which divides and dismembers it while affecting Palestinian localities in several ways. This study aims to estimate the built-up area of Israeli colonial settlements, measure their expansion between 1997 and 2023 through aerial photographs, and assess their impact on Palestinian localities. This study employs a descriptive-analytical approach, utilizing cartographic analysis to digitize the built-up areas and boundaries of Israeli colonial settlements. Spatial analysis tools within ArcGIS Pro were implemented, followed by a descriptive approach to interpret the extracted maps. The results indicate that the built-up area of Israeli colonial settlements reached 88.59 km2, with an expansion rate of 108.59% between 1997 and 2023. The analysis further revealed that the colonial settlements maintain a viewshed of 2,805.76 km^2, comprising 49.62% of the West Bank's total area.

Keywords: Israeli colonial settlements, Palestinian localities, West Bank, GIS (Geographic Information System), spatial analysis.

Chapter One
Introduction

1.1 Background

This thesis seeks to investigate the expansion of Israeli colonial settlements and their impacts on Palestinian localities in the occupied West Bank, Palestine, from the years 1997 to 2023.

The crime of settler colonialism in the West Bank, from the perspective of international law, is one of continuous crimes, which worsen over time. The continued Israeli practices in the West Bank do not only revolve around the colonial settlements; they also include checkpoints, bypass roads, military bases, colonial settlers' violence, the stealing of heritage, controlling natural resources which are rightful for the Palestinian people, and destroying the Palestinian economy due to the existence of an industrial colonial zone.

Since the beginning of 2023, colonial settlers have committed more than 2,410 assaults on Palestinian people, properties, and their lands, which amounts to about 7 assaults per day. The attacks were divided into 48% on properties, 28% on citizens, 11% on crops, 4% on lands, and 9% unclassified (Colonization and Wall Resistance Commission, 2023).

Spatial analysis and description are utilized by various authors to analyze the impacts of colonial settlements and outposts, or to estimate urban expansion and analyze related impacts. (Abu Asida & Bin Jalloul, 2023) used historical, inductive, descriptive, and analytical approaches to find the role of natural geographical characteristics in the establishment of Israeli colonial settlements in the West Bank. This study showed that 72% of the colonial settlements are located in areas with a moderate climate, 75% in areas with rainfall exceeding 300 mm per year, and 71% in areas with a moderate temperature between 17 and 27 degrees Celsius. The concentration of settlements over areas rich in groundwater and close to springs has led to their control over more than 80% of the groundwater in the West Bank basins. (Ghodieh, 2019) used two mosaics of high-resolution aerial photographs to estimate and detect changes in built-up areas, including Israeli colonial settlements, between 1997 and 2016 in the occupied West Bank, Palestine. (Dababseh, 2017) analyzed the spread of Israeli colonial settlements and outposts in the occupied West Bank, Palestine, to identify the reasons behind the choice of outpost locations, to predict the locations that could be targeted for Israeli colonial activity by

using the Statistical Package for the Social Sciences (SPSS) to extract the most effective criteria, then calculate the priority to assign a weight to each criterion to predict potential target locations. (Antari, 2015) conducted a deep literature review on related themes such as colonization and borders. Spatial analysis and description were applied to a 30*30-kilometer square focusing on Qalqiliya and Salfit as main cities. Geographic Information System (GIS) was used for the analysis and map extraction to reveal changes and shifts of the borders and the reasons behind it. (Abu Assida, 2015) used a historical approach to collect relevant data about Israeli colonial settlements, then studied this data using a descriptive-analytical approach to find the impacts of the Israeli colonial settlements in the Nablus governorate, West Bank. The thesis revealed the reasons behind the establishment of colonial settlements in the study area and their effects on agricultural land, water sources, archaeological sites, and the Palestinian people living in Nablus, etc. (Manasra, 2015) evaluated and compared land use conditions and Palestinian built-up area distribution during three time periods (1997, 2006, 2013), while showing the effect of Israeli colonial settlements on Palestinian localities using a quantitative spatial analysis approach. The thesis focused on nine Palestinian localities that were chosen according to specific criteria and demonstrated that there is an increase in the Palestinian localities and Israeli colonial settlement built-up area, which led to a decrease in the agricultural area.

The following chapters of this thesis examine various aspects of colonial settlements' expansion and their impacts on Palestinian localities. The first chapter outlines the study's problem, objectives, and hypotheses. The second chapter presents the thesis methodology and procedure. The third chapter reviews the history of colonialism in Palestine and Israeli colonization plans. The fourth chapter illustrates the results of cartographic and spatial analysis. The fifth chapter discusses the research questions and hypotheses, ending with the final chapter that provides conclusions and recommendations.

1.2 Research Problem

Israeli colonial settlements have undergone continuous expansion throughout the West Bank. This expansion affects numerous sectors, including agriculture, urbanization, the environment, and security. To understand these effects, it is crucial to calculate colonial settlement expansion rates and analyze their impacts on Palestinian localities by utilizing multi-temporal aerial photographs and relevant data through GIS analysis.

1.3 Research Questions

- What is the extent of the Israeli colonial settlement built-up area expansion in the West Bank between 1997 and 2023?
- What is the distribution of Israeli colonial settlements?
- What is the observed area from the colonial settlements?
- Is there a colonial settlement adjacent to the Palestinian localities?
- Are the Israeli colonial industrial zones located at a high elevation?
- Are there Palestinian plans to limit Israeli colonial settlement activity in the West Bank?

1.4 Objectives

- estimate expansion of Israeli colonial settlements built-up area in the West Bank in 2023, and compare it with the year 1997, using multi-temporal aerial photographs.
- Detect the distribution of Israeli colonial settlements in the West Bank.
- Reveal the reason behind choosing the locations of Israeli colonial settlements.
- Find the impacts of Israeli colonial settlements on Palestinian localities using GIS.

1.5 Importance of the Study

The thesis proves valuable for researchers, decision-makers, planners, and those who uphold humanity and human rights, as it illuminates Israeli colonization in Palestine for people worldwide who adhere to peace treaties and agreements. The thesis demonstrates the persistent Israeli violations of international conventions and reveals the dangers of Israeli colonial settlements, which expanded dramatically between 1997 and 2023, leading to ethnic cleansing and causing severe impacts on Palestinian localities.

1.6 Study Area

The West Bank derives its name from its geographical location, situated to the west of the Jordan River. It is located at approximately 32° 00′ N, 35° 15′ E, characterized by mostly rugged terrain in the west, a flat plain towards the Jordan Valley, and a valley to the east (Central Intelligence Agency, n.d.).

Politically, according to the Oslo II geopolitical division, the West Bank is divided into three administrative areas (A, B, and C). Area A falls under Palestinian administration and security, Area B under Palestinian administration but with joint Israeli-Palestinian security, and Area C under Israeli administration and security (Encyclopaedia Britannica, n.d.). The study area map is provided in Appendix A.

1.7 Historical Development of Israeli Colonial Settlements in the West Bank

1.7.1 The Concept of Settler Colonialism

Settler colonialism is a form of colonialism that aims to replace the indigenous population with a settler-colonial society and is based on the dispossession of land to establish a new society on the colonized land (Veracini, 2010).

The initial formation of the concept of settler colonialism emerged in the 1990s as one of the most significant forms of modern European colonialism, where colonialism operates on the "logic of elimination." The displacement of Palestinians between 1947 and 1948 exemplifies this phenomenon. The Israeli colonial settlements most closely parallel the New England model, which relied on replacing and eliminating the indigenous population and their economy, as demonstrated by the British colonies in New England (Habbas, n.d.).

1.7.2 Settler Colonialism in Zionist Thought

The Zionist movement embodied biblical doctrine through settler colonialism in Palestine, based on a Torah-driven belief in returning to the promised land. The Jews commenced migration, after which colonial settler programs were established for Jewish colonial settlements under the guise of Torah-based beliefs. Settler colonialism became the cornerstone of Zionist ideology, as it worked to bring more Jewish immigrants and displace Palestinian citizens while securing control over strategic areas (Palestine Research Center, n.d.).

These migrants represent the establishment of a settler-colonial presence. In essence, the occupation by Jewish groups in Palestine involved not only their physical establishment on the land but also the imposition of control over its indigenous Palestinian population. Zionist ideology, in its own philosophical foundation, was based on negation of the other’s presence, not on coexistence or acceptance of their existence. Therefore, it aims for the evacuation, replacement, and displacement of the Palestinian people in order to settle these immigrants in their place. The core belief is that the called “Jewish problem” has no solution except through the establishment of a Jewish state, represented by the concept of the promised land, and by settling in it. The continuation of Zionism, then, depends only on the continuation of settler colonialism in Palestine (Arab Nation League, n.d.).

1.7.3 Settler Colonialism in Palestine

1.7.4 The Five Successive Waves of Jewish Immigrants (1878 – 1939)

Israeli colonial settlements appeared regularly during the 19th century when a group of Jews established the first Zionist colonial settlement, "Petah Tikvah" (Gate of Hope), in 1878 near Jaffa. To accommodate Jewish immigrants arriving in the first wave of Jewish immigration (1882-1903), the number of Jewish immigrants from Eastern Europe alone reached 25,000, largely due to the financial contributions of wealthy Jews, most prominently Baron Edmond de Rothschild and Baron Maurice de Hirsch. Subsequently, 18 colonial settlements were established during 1882-1889: 8 in the Sanjak of Jerusalem, 3 in the Sanjak of Nablus, and 7 in the Sanjak of Acre.

In 1896, the Jewish Colonization Association (JCA) played a major role in supporting Jewish colonial settlements in Palestine. That same year, Theodor Herzl, the father of modern political Zionism, published his book "The Jewish State," in which he called for establishing a Jewish state in Palestine or any other place.

Between 1902-1910, 12 more colonial settlements were established: 3 in the Sanjak of Jerusalem and 9 in the Sanjak of Acre. During 1904-1914, the second wave of Jewish immigration brought more than 40,000 immigrants, and the first office of the Zionist organization opened in Jaffa in 1907.

Following the Sykes-Picot Agreement in 1916, British Foreign Secretary Arthur James Balfour issued his letter, known as the Balfour Declaration (1917), to Baron Walter de Rothschild, committing British support to establish a national home for the Jewish people in Palestine. Two years later, in 1919, the third wave of Jewish immigration began, which continued until 1923 and resulted in the arrival of 35,000 Zionists.

The population in Palestine was 757,182, divided into 78% Muslims, 11% Jews, and 9.6% Christians, according to the first British census in 1922. The fourth Jewish immigration started in 1924, one year after the British Mandate came into effect, and continued until 1928, resulting in more than 67,000 Zionist immigrants.

The fifth wave brought more than 250,000 Jewish immigrants, raising the Jewish population to 30%, during 1929-1939 (Institute for Palestine Studies, n.d.).

1.7.5 Beliefs Change (1939 – 1949)

After World War II, the Zionists believed that Jews must have their own country. The tragedies that occurred before and during World War II provided support for the Zionist aim of establishing a national homeland in Palestine (Yuksek, 2010).

In May 1939, the UK issued a British policy statement, known as the White Paper, that called for limiting Jewish immigration and land acquisition in Palestine, which contributed to heightened tensions between Palestinians and Jews in Palestine, further fueling the Israeli-Palestinian conflict (American Jewish committee, n.d.).

In 1942, U.S. Zionists adopted the Biltmore Program, calling for the establishment of Palestine as a Jewish commonwealth and for unlimited immigration. (the question of Palestine timeline events united nations). In 1943, after the Biltmore Program, the colonial settlement efforts shifted toward the Negev area, starting from the desert area south of Be'er Sheva. These colonial settlement plans included military and economic aims. Priority was given to agricultural colonial settlement due to lower requirements for investment in human and natural capital and shorter growth periods (Yuksek, 2010).

In 1947, UN General Assembly Resolution 181 (II) proposed partitioning Palestine into an unnamed Jewish state and an Arab state, with Jerusalem under UN trusteeship. Ben-Gurion and Weizmann believed that the partition plan would offer two major benefits: Jewish sovereignty and full control over Jewish immigration. For Zionists, it was seen as a second major victory after the Balfour Declaration (Yuksek, 2010).

From August 1945 until late 1947, fifty-three new colonial settlements were established through various methods, such as blocking canals that caused flooding, draining swamps, and clearing rocky soil (Yuksek, 2010).

In 1948, the Deir Yassin massacre occurred. A month later, in May 1948, Britain terminated its mandate over Palestine, and Israel declared independence. On May 15, 1948, the Palestinian Nakba (catastrophe) occurred, leading to large-scale displacement of Palestinian refugees. The UN General Assembly adopted Resolution 273(III) in 1949, admitting Israel as a UN member (United Nations, n.d.).

1.7.6 Expanding Israel at the Expense of Palestine (1967 – 1993)

During the British Mandate (1917-1947), most Palestinian land was classified as Meri, Mawat, and Matruk. The Jordanian authorities later passed a law allowing the expropriation of land for public infrastructure enhancement, such as road construction. However, this law was exploited by Zionists to expand their territorial control in Palestine, using various policies to seize lands classified as state land and for military use (Antari, 2015).

In June 1967, the Six-Day War broke out in the Middle East between Arab and Israeli forces, resulting in the colonization of the West Bank, Golan Heights, and the Sinai Peninsula. Israeli borders expanded to over three and a half times their original size, despite UN resolutions against territorial expansion (Kardo & Bali, 2017) (see Appendix A for map visualization).

After securing confiscated land, Israel launched an intensive colonial settlement-building program. It began by annexing a large area around East Jerusalem and establishing Jewish colonial settlements around the city. Colonial settlement concentration focused on strategic sites in the West Bank and, to a lesser extent, in Gaza (COHRE & BADIL, 2005).

There are many reasons behind the establishment and expansion of Israeli colonial settlements in the West Bank, reflecting an ongoing strategic planning and the absence of a genuine peace process with the Israeli side. These reasons include, the protection of borders, as outlined in Allon Plan, which calls for the annexation of the Jordan Valley and the eastern slopes through intensification of colonial settlements in those areas. Additionally, Israel relies significantly on water sources located in the West Bank. As a result, any final status arrangement is expected to ensure long term Israeli control over these reservoirs by establishing colonial settlements nearby. Certain areas have also been targeted under the pretext of their historical and cultural significance, such as the city of Hebron, which contains Al-Haram Al-Ibrahimi (also Known as the Cave of the Patriarchs), considered the second holiest site in Judaism after Jerusalem (Institute for Palestine Studies, 1995).

1.7.7 Israeli Colonization Plans

1.7.8 Allon Plan

Through the Nahal Brigade (Noar Halutzi Lohem), the Israeli Labor Party initiated its settler-colonial activities in 1967, based on the premise that the Occupied Territory served as a security zone. Several colonial outposts were established in the Jordan Valley along the Armistice Line. Additionally, large tracts of land were transformed for agricultural and water-extraction purposes. Later, this procedure evolved into an official policy known as the Allon Plan (Palestinian Research Center, n.d.) (see Appendix A for map visualization).

Labor Minister Yigal Allon proposed the Allon Plan in July 1967, which called for the construction of colonial settlements in the occupied West Bank. Although later modified, the plan was not officially approved by the government. The main objective was to annex as much land as possible with a minimum of Arab population. The plan called for creating a belt of land to build agricultural colonial settlements and military bases along the Jordan River, extending from west to east and into the southern occupied West Bank. As a result of this plan, thirty-four colonial settlements were established by 1977 (COHRE & BADIL, 2005).

1.7.9 The Dayan-Weizman Plan

In July 1973, Israeli Defense Minister Moshe Dayan drafted a document, known as the Dayan Document; its primary recommendation was to encourage the purchase of private land by Jews and the expansion of colonial settlements in specific areas, including Jerusalem, the southern Gaza Strip and the northern West Bank (Antari, 2015) (see Appendix A for map visualization).

1.7.10 Sharon Plan

In September 1977, Ariel Sharon introduced a plan affirming that the West Bank and Gaza Strip were an integral part of "Greater Israel." The plan proposed accelerating colonial settlement building in a dispersed rather than concentrated pattern, due to the existence of Palestinian localities. The plan anticipated that 2 million Jews would settle in the occupied West Bank over the subsequent decades and called for the establishment of 50 new colonial settlements over a 15-year period to restrict the development of Palestinian localities (COHRE & BADIL, 2005) (see Appendix A for map visualization).

1.7.11 Drobless Plan

The Drobless Plan, also known as the Master Plan for Settlement Development in Judea and Samaria, is considered the most significant colonial settlement plan that guided the Likud's settlement policy until 1983. This plan was introduced by Matityahu Drobless, who headed the Settlement Department in the Zionist Organization, in 1978. The plan aimed to establish 70 colonial settlements in the West Bank between 1979 and 1993. The plan rested on multiple principles, the most significant being that the settlements should be distributed in interconnected blocks and should not be restricted to areas around Palestinian communities but also positioned between them (COHRE & BADIL, 2005) (see Appendix A for map visualization).

1.7.12 The Seven Stars Plan

The Seven Stars Plan was developed by Ariel Sharon in 1990 and was approved by the Knesset in May 1991. The plan focused on strengthening the pre-1967 borders and intensifying Israeli colonial settlements between high-density Palestinian areas.

The plan proposed the establishment of seven large colonial settlements, "or stars." These colonial settlements were connected by Route 6, starting from Modi'in in the south and ending with Harish in the north. It also included the establishment of 14 industrial zones and new towns, which resulted in the fragmentation of Arab-Israeli village communities in this region (Antari, 2015; Palestinian Academic Society for the Study of International Affairs, n.d.) (see Appendix A for map visualization).

1.7.13 Requisition of Land

Israel employs various methods to seize land for establishing new colonial settlements or expand existing ones. These methods include:

- Seizing land for military purposes.
- Declaring land as state property.
- Confiscating land for public use.

Consequently, half of the West Bank has been seized by these means. Additionally, private Palestinian land is often taken over independently by colonial settlers (Sandeman, 2011).

1.7.14 Israeli Regional Councils

Six regional councils in the West Bank serve as administrative authorities for colonial settlements:

- Shomron Council: includes 35 colonial settlements recognized by the occupying state, with a population of 126,876 settlers.
- Arvot Ha Yarden (The Jordan Valley) Council: includes 19 colonial settlements recognized by the occupying state, with a population of 8,183.
- Matte Benyamin Council: includes 32 colonial settlements recognized by the occupying state, with a population of 240,726 settlers.
- Megilot Council: includes 5 colonial settlements recognized by the occupying state, with a population of 2,057 settlers.
- Gush Etzion Council: includes 16 colonial settlements recognized by the occupying state, with a population of 112,906 settlers.
- Har Hevron (Mount Hebron) Council: includes 15 colonial settlements recognized by the occupying state, with a population of 19,843 settlers (PCBS, 2024).

The locations and boundaries of Israeli regional councils are illustrated in Appendix A.

1.7.15 Amana Movement and Yesha Council: The Facilitators of Israeli Colonial Settlements

- Amana Movement

  The Amana Movement is a settler-colonial movement founded in 1978, based in Jerusalem. It aims to settle the territories of the West Bank and Gaza Strip by establishing new colonial settlements and developing existing ones. The movement functions as a land reserve for Israelis and plays a major role in:

- Absorbing Jewish immigrants
- referring colonial settlers to colonial settlements
- preparing colonial settlement plans

Providing financial and logistic support for colonial settlements (About – Amana, n.d.). The Amana movement has been subjected to many sanctions due to its extremist colonial settlement activities. In addition, it maintains strong ties with several individuals who have been sanctioned by the United States government for committing acts of violence in the West Bank. The British and Canadian governments have also imposed sanctions on

Amana movement for its role in supporting, facilitating, and financially contributing to violence against Palestinian civilians and their property (Peace Now, 2024).

– Yesha Council

  The Yesha Council was founded in 1980 as an organization that promotes Israeli colonial settlements in the West Bank, as it serves as an umbrella organization for all local authorities of the colonial settlements.

  Since 2016, the council has helped pass 13 Israeli government decisions, with a total budget of $3 million USD. The primary goal of the Yesha Council is to prevent the establishment of a Palestinian state in the West Bank. The council plays a crucial role in settler colonialism by strengthening Israeli colonial settlements and controlling strategic expanses (The Yesha Council, n.d.).

Chapter Two
Methodology

This chapter presents the thesis methodology, which adopts a descriptive-analytical approach in assessing Israeli colonial settlements' extent and impacts on Palestinian localities. The approach's applicability is discussed thoroughly, including the analysis plan, study sample, study procedures, and main chapter components.

2.1 Study Design

This thesis employs a descriptive-analytical approach to determine Israeli colonial settlements' extent and their impacts on Palestinian localities. The analytical approach analyzes spatial data using GIS tools, while the descriptive aspect involves collecting and presenting data related to these colonial settlements' spatial expansion.

2.2 Study Population

This study examines Israeli colonial settlements and affected Palestinian localities within the West Bank, Palestine.

2.3 Study Sample

The study sample comprises all Israeli colonial settlements located in the West Bank between 1997 and 2023.

2.4 Instruments of Study and Validation Indicators

- GIS Mapping: ArcGIS Pro 2.5.2 estimates Israeli colonial settlement areas and detects impacts on Palestinian localities.
- Document Analysis: Reviews international conventions and policy documents to contextualize outcomes.
- Validation Indicators: Cross-references multiple spatial data sources to ensure data consistency.

2.5 Study Procedure

2.5.1 Data Collection

Primary Data:

- Geo-referenced mosaic of aerial photographs for the West Bank, acquired from the Ministry of Local Government (MoLG) for the years 2023 and 1997.
- Shapefile data related to Israeli colonial settlements and Palestinian localities from (Ministry of Local Government – State of Palestine, n.d.).
- Digital Elevation Model (DEM) data for the West Bank area, acquired from (U.S. Geological Survey, n.d.).

Secondary Data:
Reports, articles, academic studies, and official documents from international organizations, Palestinian authorities, and Israeli sources related to the study.

2.5.1 Cartographic Analysis

GIS tools facilitated the digitization of Israeli colonial settlements' built-up areas, their boundaries, and the Apartheid Wall. These tools enabled the estimation of total colonial settlement size and areas annexed by the Apartheid Wall. GIS was additionally employed to digitize colonial settlement blocs using a low-resolution image from the Jewish Virtual Library, together with the regional councils responsible for these colonial settlements.

2.5.2 Spatial Analysis

Several spatial analysis techniques were applied to assess the impact of the Israeli colonial settlements on the Palestinian localities. This includes:

Average Nearest Neighbor Analysis: The tool was applied on colonial settlements in the West Bank to determine the spatial pattern of colonial settlements, determining whether they were clustered, dispersed, or randomly distributed.

The Nearest Neighbor Index (NNI) indicates the type of distribution:

- NNI less than 1 indicating clustering.
- NNI near 1 indicating random distribution.
- NNI greater than 1 indicating a dispersed distribution (Esri, n.d.).

The significance of the result was evaluated using the z-score and p-value.

Hot Spot Analysis: The (Getis-Ord Gi*) was applied to determine regions with a significant clustering of colonial settlement expansion rate. This tool helped to detect high-concentration areas (hot spots) and low-concentration areas (cold spots).

For the expansion rate, which was tested using Hot Spot Analysis, calculations were performed using Spatial Join between the 1997 built-up area and 2023 built-up area to merge the attribute tables containing areas. The following equation was applied in Field Calculator:

$$Expansion\ Rate = \frac{!2023Area! - !1997Area!}{!1997Area!} * 100\ if\ !1997Area!\ not\ in\ [None, 0]\ else\ \text{None} \quad (1)$$

Colonial settlements that did not exist in 1997 were excluded from the analysis, to ensure precision.

Near Tool: The Near tool calculated the nearest distance from each colonial settlement to the closest Palestinian localities. This helped identify the Palestinian localities that are considered near the colonial settlements. The results of this tool were categorized into three distances:

- less than or equal to 1,000 m
- less than or equal to 2,000 m
- less than or equal to 3,000 m

Each category was saved as a separate layer for better visualization.

Proximity Analysis: Proximity analysis was applied to natural reserve data obtained from GeoMOLG, using the Buffer tool to create buffer areas around natural reserves. This allowed for identifying which colonial settlements were located nearby.

- inside natural reserves.
- located within 500 m of a reserve.
- 1000 m of a reserve.

The quantity of colonial settlements in each zone was identified.

Viewshed Analysis: A viewshed analysis was performed using a Digital Elevation Model (DEM) to determine visibility from colonial settlements. After placing observer points in each colonial settlement, the analysis provided a cell count indicating how many observers could see each cell. The results were classified using the Reclassify tool to categorize areas as either visible or not visible. The area was then calculated using the Field Calculator with this formula:

$$Area\ (km^2) = \frac{Count * (Cell\ Size)^2}{1{,}000{,}000} \quad 2$$

Zonal Statistics: A zonal statistics tool summarized visibility by calculating the total visible area for each governorate.

Overlay Analysis: Overlay analysis constituted the most frequently used analysis to illustrate several layers, including:

- Geopolitical areas with colonial settlements, identifying their locations and the areas where they appear.
- Colonial industrial area locations with a hillshade layer, showing the relationship between topographic characteristics while presenting the colonial settlements.
- Colonial settlement blocs, after digitization, presented alongside colonial settlements to show regional shaping and observe clustering within these blocs.
- Palestinian population compared to colonial settlers, illustrating population growth ratios related to colonial settlement expansion.

2.6 Maps Extraction

The results of the cartographic and spatial analysis are presented in the form of maps to illustrate and discuss the outcomes.

2.6.1 Comparing Results

Maps extracted from ArcGIS Pro were used to compare the colonial settlements built-up areas, and to discuss the results of the spatial analysis.

Chapter Three

Results

This chapter presents the study results through tables and maps. Colonial settlements encompass all major Israeli colonial settlements, colonial outposts, Israeli industrial zones, houses occupied by colonial settlers, and service sites utilized by colonial settlers.

3.1 Occupied Areas by Colonial Settlements and the Apartheid Wall in the West Bank

The total built-up area occupied by colonial settlements in the West Bank is 88.59 km², the boundaries of the colonial settlements occupy 166.15 km², and the area annexed by the Apartheid Wall is 298.88 km².

Table 1

Occupied areas by colonial settlements and the Apartheid Wall

	Government	Colonial Settlements Built-up Area (Km^2)	Colonial Settlements Boundaries Area (Km^2)	Annexed Area by Apartheid Wall (Km^2)	Governorate Area (Km^2)
1	Jenin	1.76	1.88	34.66	583.01
2	Tulkarm	1.53	2.43	17.65	246.45
3	Tubas	1.16	2.74	2.59	401.67
4	Nablus	4.43	35.37	0.00	605
5	Qalqilya	6.20	5.06	25.08	166.37
6	Salfit	12.21	19.44	14.05	203.7
7	Jericho	5.16	13.82	0.00	592.8
8	Ramallah	15.07	24.48	85.94	855.57
9	Jerusalem	25.98	26.43	94.88	344.54
10	Bethlehem	10.36	20.05	11.38	658.87
11	Hebron	4.75	14.45	12.65	996.64
	Total	88.59	166.15	298.88	5654.62

Table 1 shows the Israeli colonial settlements' built-up area, boundaries, and annexed area by the Apartheid Wall for each governorate.

The colonial settlements' built-up areas occupy 1.57% of the total area of the West Bank; the boundaries of these colonial settlements increase the occupied area to 2.94%. The Apartheid Wall annexes 5.28% of the West Bank land. Therefore, 8.22% of the total West Bank area is occupied by colonial settlements and annexed by the Apartheid Wall.

The largest built-up and annexed area by the Apartheid Wall is in Jerusalem, where the Apartheid Wall occupies 28% of the governorate's area. Additionally, the colonial settlements' boundaries outside the wall occupy 8%. The high level of occupation in this area is due to its significance for the Jews, given its religious and historical importance. According to the colonial settlers' beliefs, Solomon's Temple is located under Al-Aqsa Mosque, and they seek to destroy it. Furthermore, the area has been a focal point of attention since ancient times.

The largest Israeli colonial settlement boundaries are in Nablus, as it is located in the heart of the West Bank and does not have direct contact with the Apartheid Wall, unlike other Palestinian governorates. It also contains some colonial settlements that are not officially recognized by the Israeli government and are classified as colonial outposts in some sources. However, they are all considered colonial settlements, as they contain buildings, not just containers. The legalization of these colonial settlements is expected to occur by the Israeli government sooner or later unless the Palestinian government takes action to prevent it. These random colonial settlements have no fences or walls and were established on the top of hills and mountains. The boundaries were digitized using the Hillshade layer, which illustrates the topographic characteristics of the area.

Ramallah ranks second after Jerusalem, with 46 colonial settlements covering a total built-up area of 15.07 km^2. These colonial settlements are located on hilltops due to their strategic position. Ramallah is next to the Apartheid Wall, and it annexes 85.94 km^2, which is a large area as it represents 10% of the total governorate area. It also borders four other governorates, including Jerusalem from the south.

Salfit contains 21 colonial settlements, with the boundaries of these colonial settlements occupying 10% of the total governorate area. Additionally, the Apartheid Wall annexes 7% of the governorate's total area. The largest colonial settlements in Salfit are Ariel and Barkan, which occupy 5.31 km^2, or 43% of the total colonial settlements area in Salfit. Barkan has a large industrial zone and is centrally located within the governorate.

Jenin's major impact on the land area is due to the Apartheid Wall, which annexes 6% of the total governorate area, equivalent to 34.66 km^2. Tulkarm, similar to Jenin, has 7% of its area annexed by the Apartheid Wall, covering an area of 17.65 km2. The built-up area of the colonial settlements represents 1% of the total governorate area. Tubas is the least affected governorate; the colonial settlement boundaries occupy 1%, while the wall annexes 1% of the total governorate area. The northern governorates - Jenin, Tulkarm, and Tubas - have the smallest colonial settlements' built-up areas, as they are mostly plains and lack the strategic significance of other governorates.

Qalqilya has a significant area annexed by the Apartheid Wall, amounting to 25.08 km2, which represents 15% of the total governorate area. Additionally, the colonial settlements' built-up area is 6.2 km2, equivalent to 4% of the total governorate area. Jericho has a 5.16 km2 colonial settlements' built-up area distributed along the governorate, with the boundaries of the colonial settlements occupying 2% of the total governorate area.

Bethlehem has 2% of its area annexed by the Apartheid Wall, equivalent to 2% of the total governorate area, while the boundaries of the colonial settlements occupy 3% of the total governorate area. Hebron, the largest governorate in the West Bank, has a lower percentage of the colonial settlements' area. However, their impact on the nearby Palestinian localities is severe due to the strategic locations of these colonial settlements, such as Kiryat Arba.

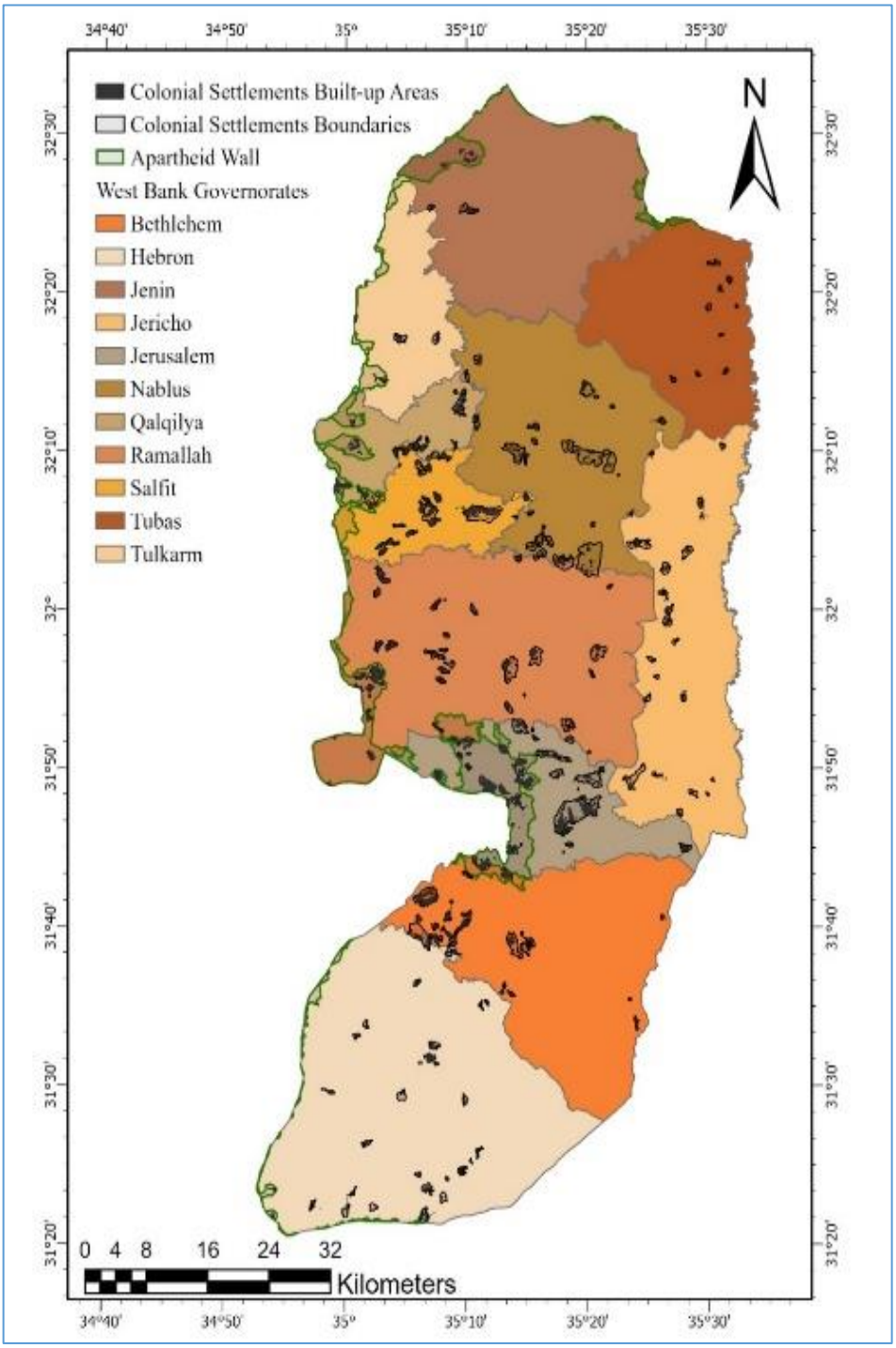
According to (Ministry of Agriculture, 2023), the agricultural sector in the West Bank has been deeply affected. The Israeli occupation imposes severe restrictions on the development of Palestinian water resources, exploiting them instead for colonial settlements' expansion. Additionally, large areas of Palestinian agricultural land have been lost due to Israeli policies declaring these lands as state property or military zones. The construction of the Apartheid Wall has further devastated agricultural lands, restricting access to approximately 170,000 dunums of fertile farmland, which accounts for nearly 10% of the total cultivated area in the West Bank. Furthermore, the flooding of Palestinian markets with Israeli colonial settlements' products (many of which are smuggled from colonial settlements in Area C, where the Palestinian Authority has no control) has severely impacted Palestinian farmers and the local economy. This uncontrolled influx of Israeli goods undercuts Palestinian agricultural production and weakens the sustainability of the local economy. The following map illustrates the

colonial settlements' built-up areas with their boundaries and the Apartheid Wall within the West Bank governorate.

Figure 1 illustrates the colonial settlements built-up areas, boundaries, and the Apartheid Wall, as digitized by the researcher based on 2023 aerial photograph.

Figure 1

Colonial settlements built-up areas, boundaries, and the Apartheid Wall map



3.2 Occupied Areas by Colonial Settlements Built-Up Areas in 1997 and 2023

Figure 2

Colonial settlements built-up areas in 1997 and 2023 map

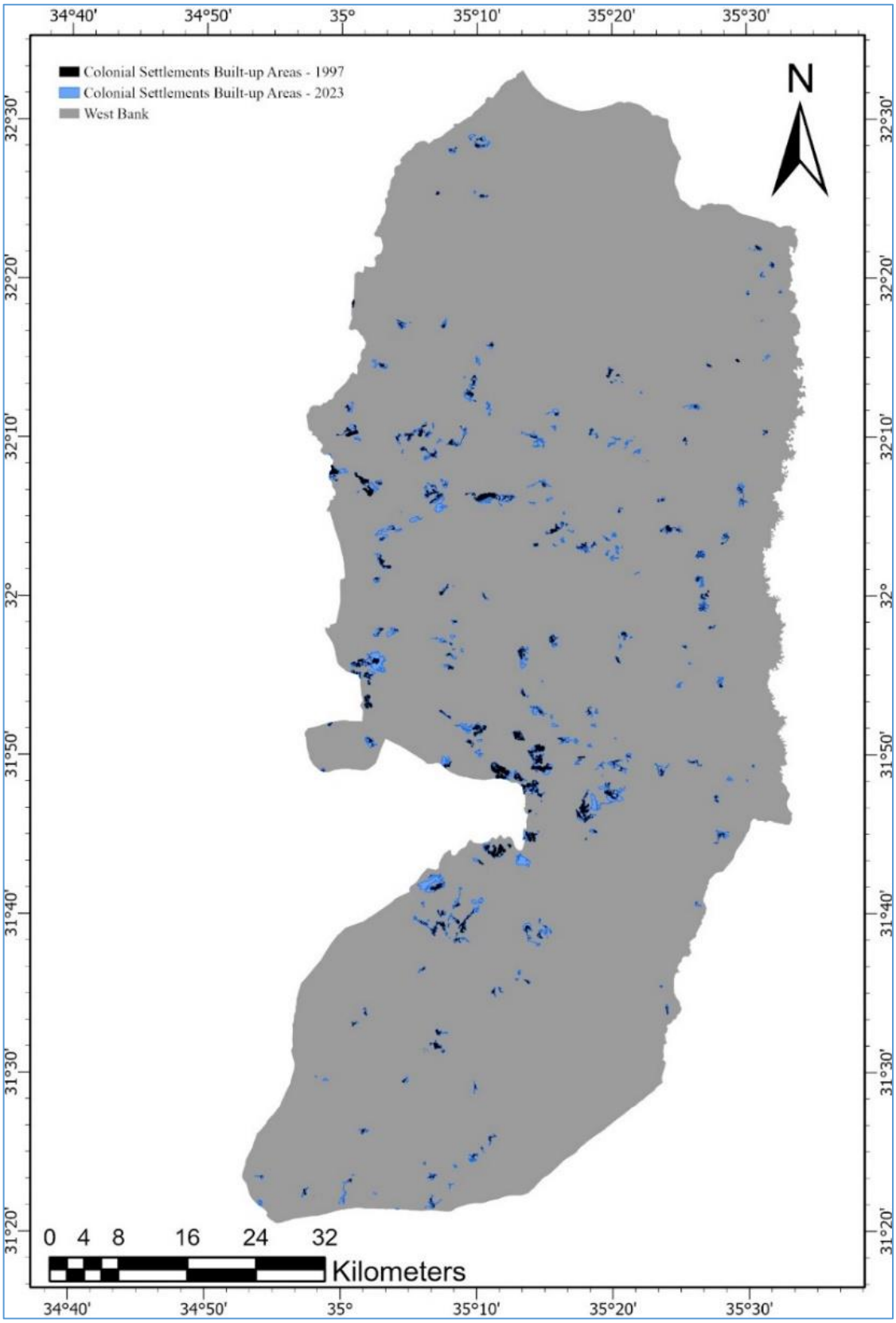


Figure 2 illustrates the built-up areas of Israeli colonial settlements in both 1997 and 2023. The 1997 layer was derived from the 2023 layer by splitting and deleting empty areas, which allowed for a less time-consuming process compared to creating a new built-up area from scratch. The layer was created according to a 1997 aerial photograph, which is the oldest accessible aerial photograph retrieved from the Ministry of Local Government (MoLG). The layer was developed because reliable data for the year 1997 was unavailable.

Table 2

Colonial settlements built-up areas in 1997 and 2023

Year	Colonial Settlement Built-up Area
1997	42.47
2023	88.59
Built-up Area Change Difference	46.12
Expanding Rate	108.59%

Table 2 presents the built-up areas of the colonial settlements for both 1997 and 2023. Over the 26-years period, a total of 46.12 km^2 was fully developed for construction, with an expansion rate of 108.59%.

3.3 Colonial Settlements Distribution in the West Bank

Spatial distribution of colonial settlements in the West Bank was examined using Average Nearest Neighbor Analysis. This analysis helps identify whether colonial settlements are randomly distributed, clustered, or dispersed, which helps in understanding planning strategies. Given the z-score of -7.593578, there is less than a 1% likelihood that this clustered pattern could be the result of random chance.

The result of the Nearest Near Analysis is:

- Nearest Neighbor Ratio: 0.755242
- Z-score: -7.593578
- P-value: 0.000000

According to the tool results, the clustering pattern is statistically significant, which

indicates that colonial settlement distribution is neither random nor dispersed. To identify governorates with high colonial settlement clustering, a Kernel Density tool was applied to colonial settlement point features. The highest clustering regions appear in darker colors, concentrated in Jerusalem, Bethlehem, Salfit, and between Nablus and Ramallah (see Appendix A).

These high-clustering regions can be attributed to several factors. In Jerusalem, clustering occurs due to its religious significance and historical status as a conflict zone. In Bethlehem, the clustering is situated in the Etsion bloc, which is slated for annexation by the Apartheid Wall. Nablus exhibits clustering because of its strategic location as a transportation hub connecting northern and southern governorates. Between Qalqilya and Salfit, a clustering point exists between the Ariel bloc and Shomron bloc, indicating a high density of colonial settlements. The clustering pattern reveals that there is an interest area for settler colonialism, which can be attributed to several factors such as the historical and religious importance of sites like Jerusalem and strategic locations such as hilltops.

3.4 Visible Areas from Colonial Settlements in the West Bank

Viewshed analysis was conducted across the West Bank area. Observer points were selected according to elevation, with higher DEM values chosen after applying graduated-color symbology. This approach helped in identifying the highest points within the colonial settlements.

Table 3

West Bank visible areas from colonial settlements

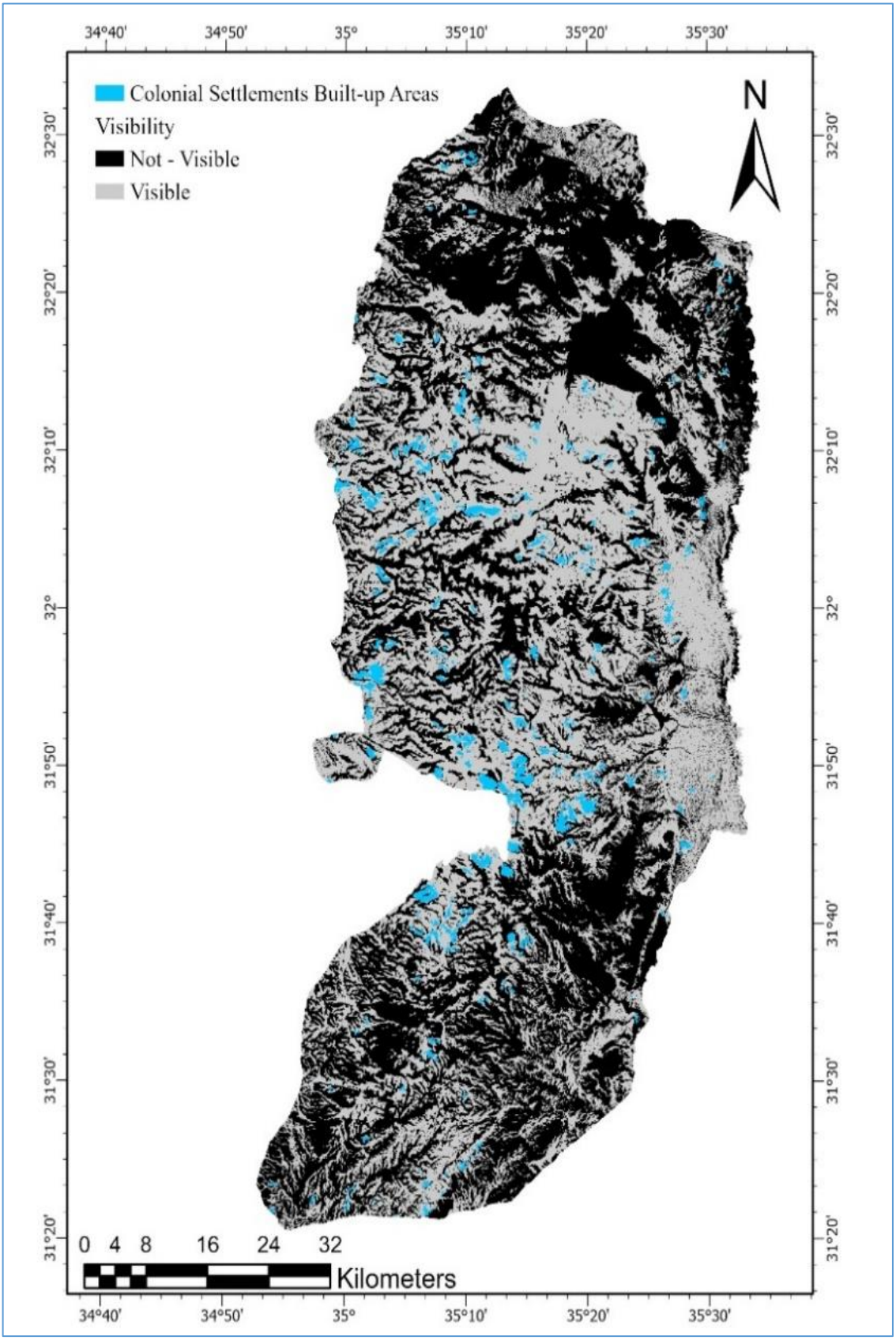
Visibility	Area (Km^2)	Percentage
Visible	2805.76	49.62%
Not Visible	2849.03	50.38%
Total	5654.79	100%

Table 3 shows that approximately 49.62% of the West Bank area is visible from the colonial settlements, while 50.38% is blocked by terrain features such as mountains and hills. This significant visibility reveals that one of the reasons behind the locations of colonial settlements is to monitor the West Bank - specifically, monitoring Palestinian localities.

A layer containing Israeli military bases, obtained from GeoMOLG, was overlaid on the viewshed analysis map. The analysis showed that 67 military bases distributed across Jenin, Tulkarm, Nablus, Jericho, Ramallah, Jerusalem, Bethlehem, and Hebron are located in areas not visible from Israeli colonial settlements, which increases Israel's observed area of the West Bank.

Figure 3

West Bank visible areas from colonial settlements map



The viewshed analysis map illustrates the visible areas in the West Bank from the observer points within the colonial settlements. The light gray color represents areas visible from the colonial settlements, while black represents areas not visible.

3.5 Observed Area from Colonial Settlements for Each Governorate

The zonal statistics tool was used to determine the visible areas for each governorate, and their percentage from the total governorate area.

Figure 4

Visible area percentage observed by colonial settlements for each governorate

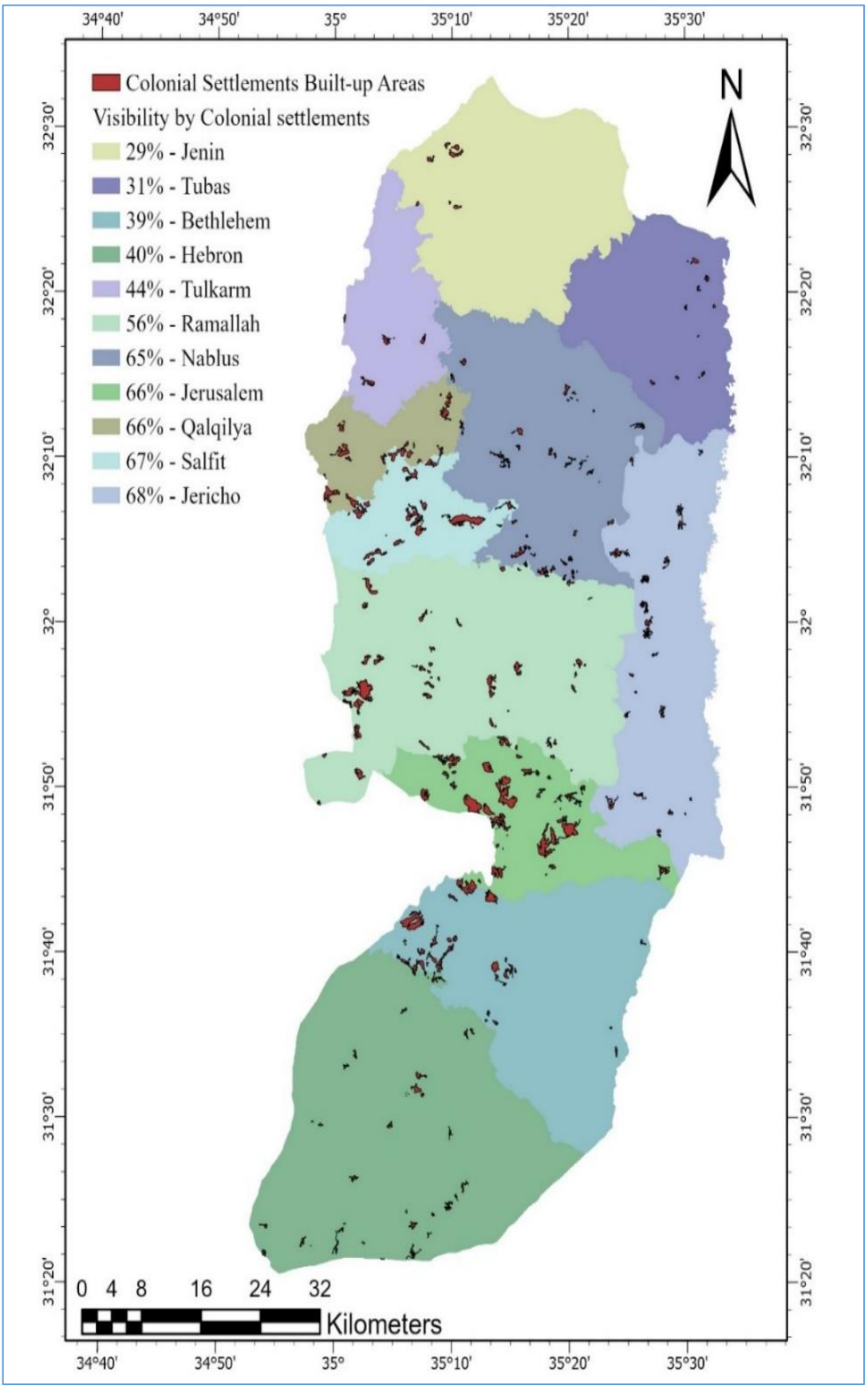


Figure 4 illustrates the visible area percentage for each governorate from the colonial settlements. In six governorates, more than half of their areas are visible from these colonial settlements. All of these governorates are located in the central region of the West Bank, where colonial settlements are denser and situated at higher elevations.

Table 4

Visible area and its percentage for each governorate

	Governorate	Visible Area by Colonial Settlements (KM^2)	Visibility by Colonial Settlements
1	Jenin	168.98	29%
2	Tubas	124.43	31%
3	Bethlehem	256.87	39%
4	Hebron	398.54	40%
5	Tulkarm	108.35	44%
6	Ramallah	479.02	56%
7	Nablus	393.16	65%
8	Jerusalem	227.31	66%
9	Qalqilya	109.70	66%
10	Salfit	136.39	67%
11	Jericho	403.01	68%

Table 4 was generated using the Zonal Statistics tool to calculate the visible area for each governorate. The percentage of each area was then extracted. The highest visible area was observed in Ramallah, while Tulkarm had the lowest visible area due to fewer colonial settlements. Jericho, with its flat, low elevation, showed the highest percentage of visible area at 68%.

3.6 Visible Palestinian Localities from Colonial Settlements

Table 5

Visible Palestinian localities from colonial settlements

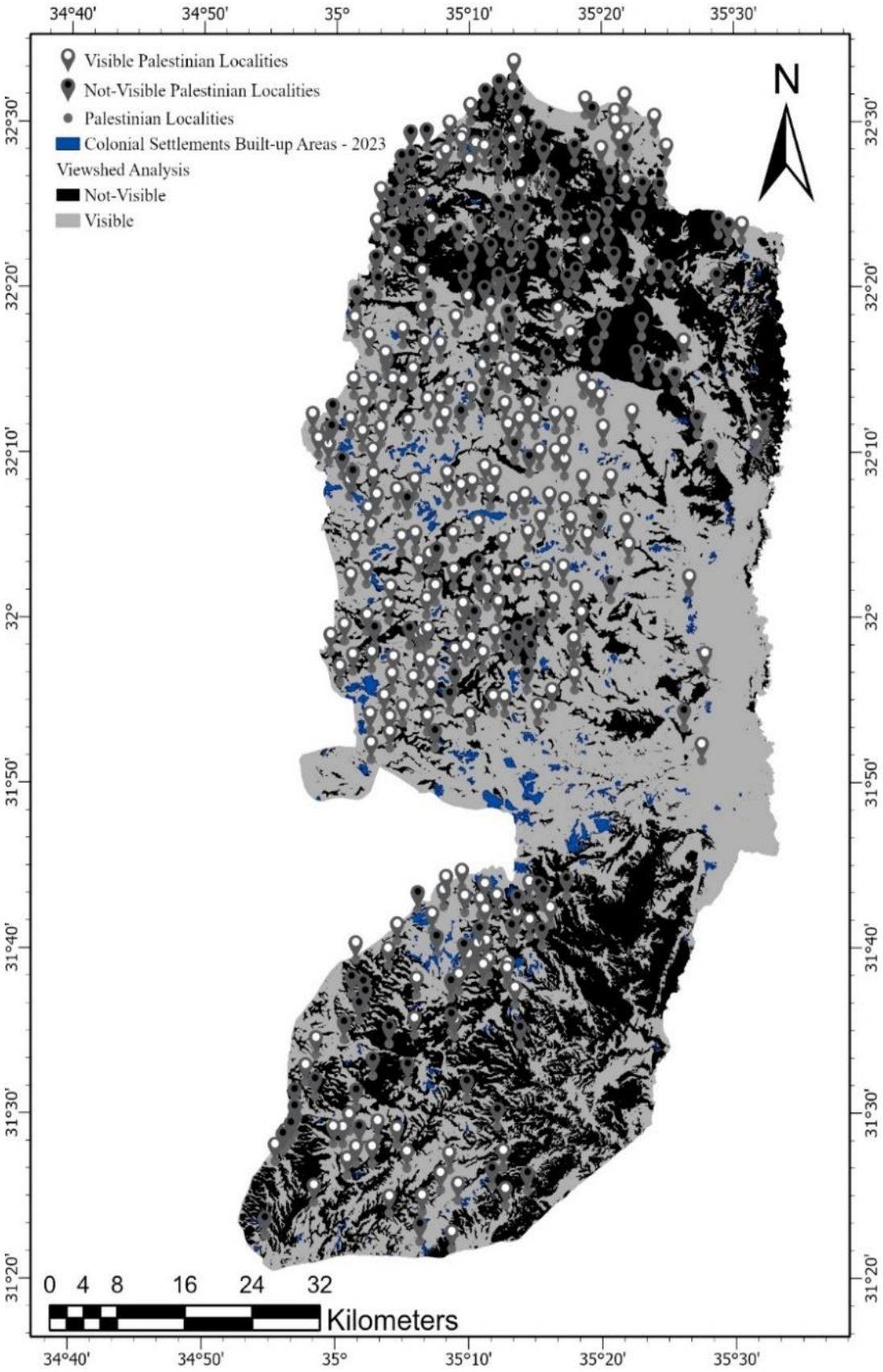
Visibility	Palestinian Localities	Visible Localities Percentage
Visible	237	62.9%
Not-Visible	140	37.1%

Table 5 shows 237 Palestinian localities observed from colonial settlements, which represents 62.9% of all Palestinian localities.

Figure 5 shows Palestinian localities located in the visible areas observed from colonial settlements, and other localities which were not observed from these colonial settlements.

Figure 5

Palestinian localities distribution on visible areas and not-visible areas



3.7 High Clustered Expansion Rate Zones

The Getis-Ord Gi* tool was applied to Israeli colonial settlements in the West Bank, using the expansion rate as an analysis field to identify hot and cold spot areas. This analysis helps identify areas with significant concentrations of colonial settlement expansion rates in the West Bank.

The results of hot spot analysis tools indicate where features with high and low values cluster spatially. High-value features may not constitute a hot spot, as they must be surrounded by other features that also have high values.

The result of hotspot analysis was attached to Appendix. The x-axis represents the number of colonial settlements indicating a higher expansion rate, while the y-axis shows the governorates and their corresponding confidence levels.

As shown, the analysis revealed that Jerusalem is experiencing the highest clustering of colonial settlement expansion rates between 1997 and 2023. This suggests a concentration of colonial settlement expansion. However, this high clustering may be attributed to Jerusalem's religious and historical importance, its politically sensitive situation, and its status as a contested area. Additionally, Jerusalem's location as a central hub, its superior infrastructure, and higher Israeli government investments compared to other regions contribute to this trend. Nablus indicated a higher expansion rate with less clustering than Jerusalem because these marked colonial settlements have higher expansion rates than their neighboring colonial settlements.

Figure 6

Hot Spot Analysis

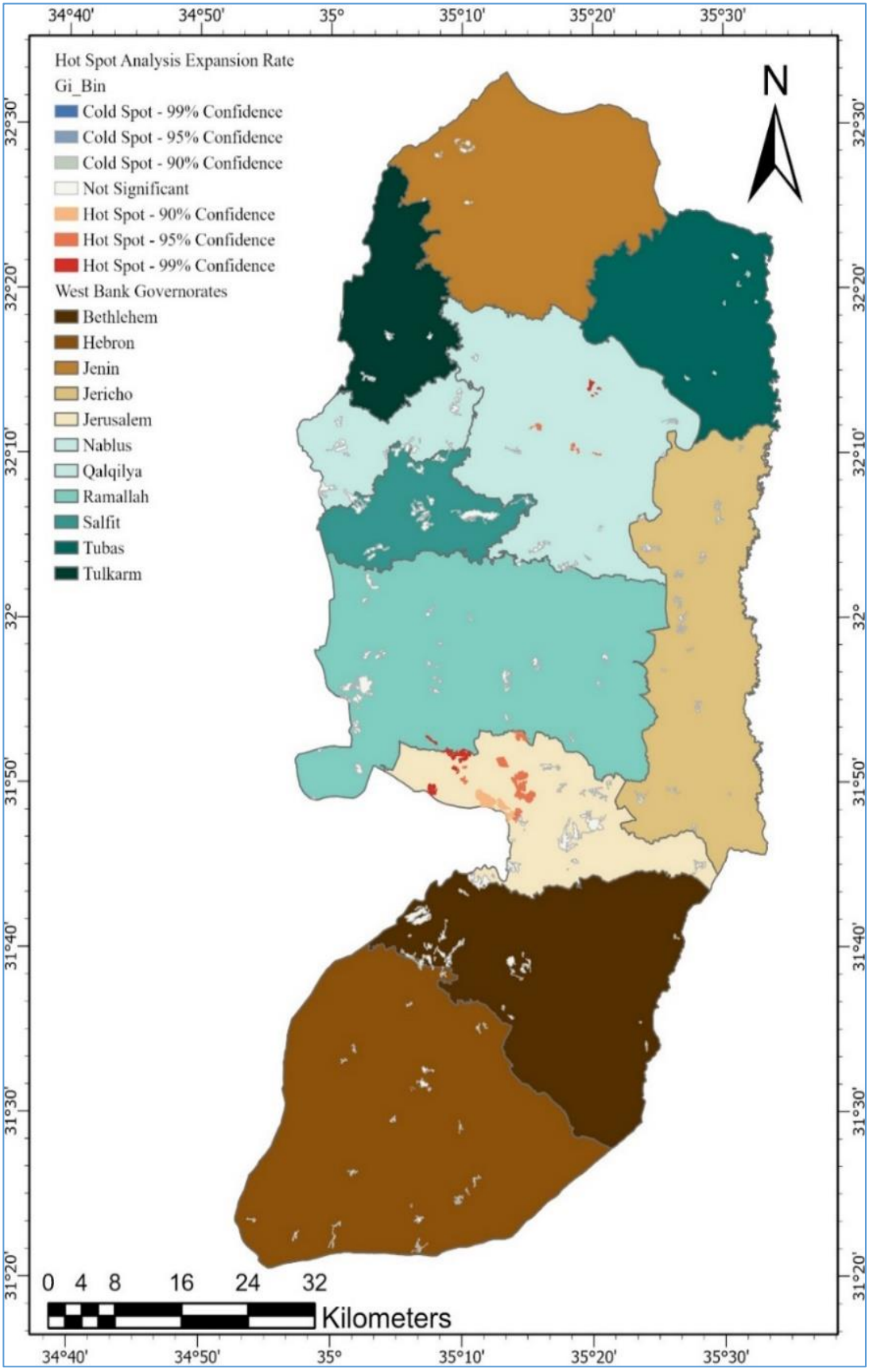


Figure 6 illustrates the results of hot-spot analysis. A hot spot neighboring colonial settlement indicates that this area exhibits a concentrated expansion process rather than random spread, which suggests ongoing urbanization where several adjacent colonial settlements are expanding simultaneously. This pattern can be attributed to multiple factors, including the Israeli government's encouragement of expansion in this region for specific undisclosed agendas or economic opportunities, such as the area's appeal to colonial settlers for business ventures.

3.8 Affected Natural Reserves by Colonial Settlements

Table 6

Affected natural reserves by colonial settlements within a buffer distance

	Buffer	Affected Natural reserves	Built-up Colonial Settlements
1	(0 m) inside	14	34
2	(500 m) direct impact	27	66
3	(1000 m) moderate impact	32	82

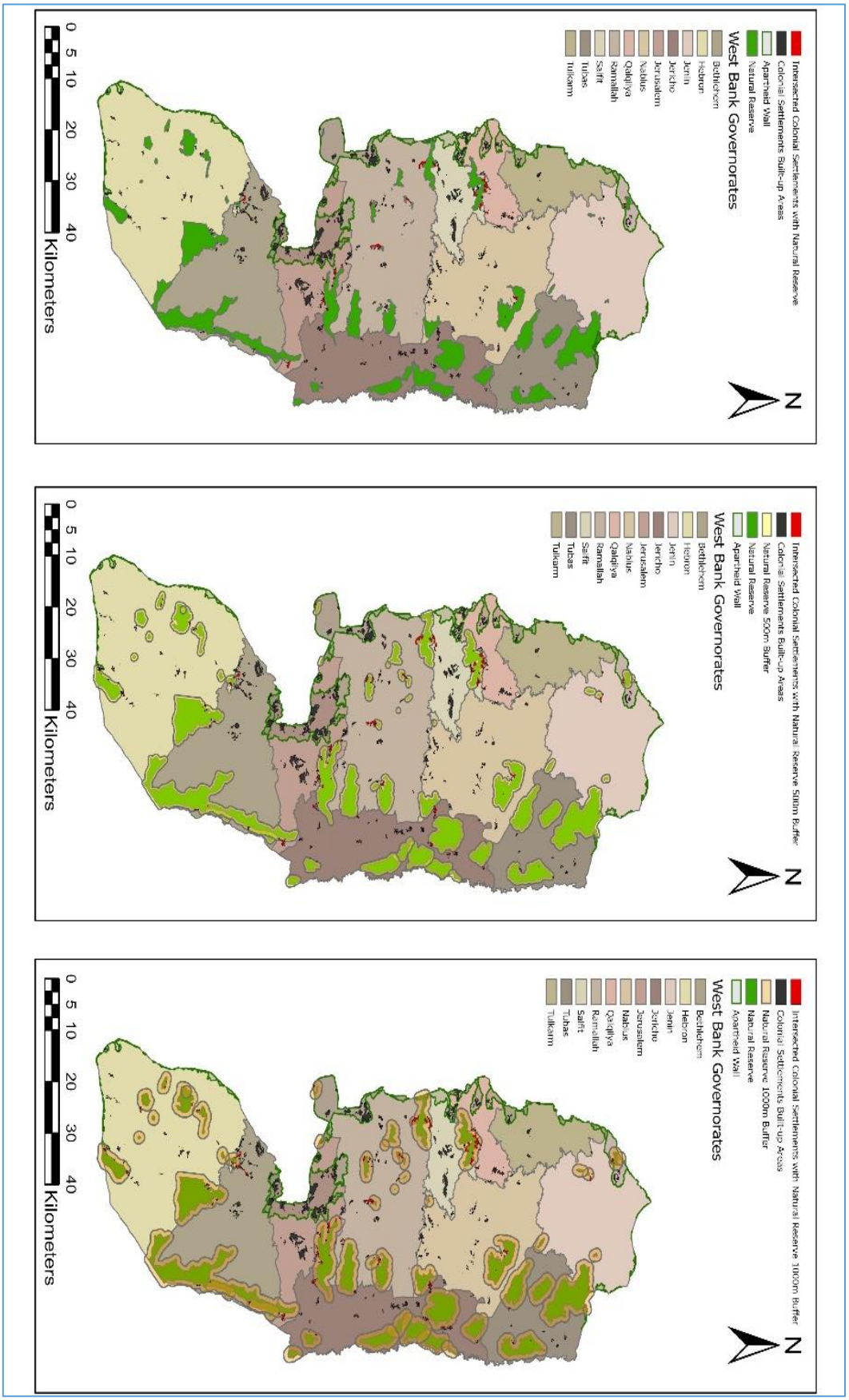
Table 6 shows the affected natural reserves at three different buffer distances, and the number of colonial settlements affecting these natural reserves.

The colonial settlements located within natural reserves cause severe impacts due to the presence of buildings and settlers. The 500-meter buffer zone reflects immediate impacts related to various types of pollution. The 1000-meter buffer zone represents moderate impacts linked to settler activities such as noise pollution, habitat fragmentation, and waste dumping, which severely affect the environment, especially industrial waste.

Figure 7 illustrates the affected natural reserves near colonial settlements, using a layer containing natural reserves obtained from GeoMOLG. The first map displays the colonial settlements' built-up areas within the natural reserves. The second map applies a 500-meter buffer zone to represent direct impacts, while the third map uses a 1000-meter buffer zone to show moderate-impact areas.

Figure 7

Affected natural reserves by colonial settlements



3.9 Israeli Colonial Settlements Within Oslo II Geopolitical Areas and Their Illegality Under International Law

Figure 8

Colonial settlements within Oslo II geopolitical areas

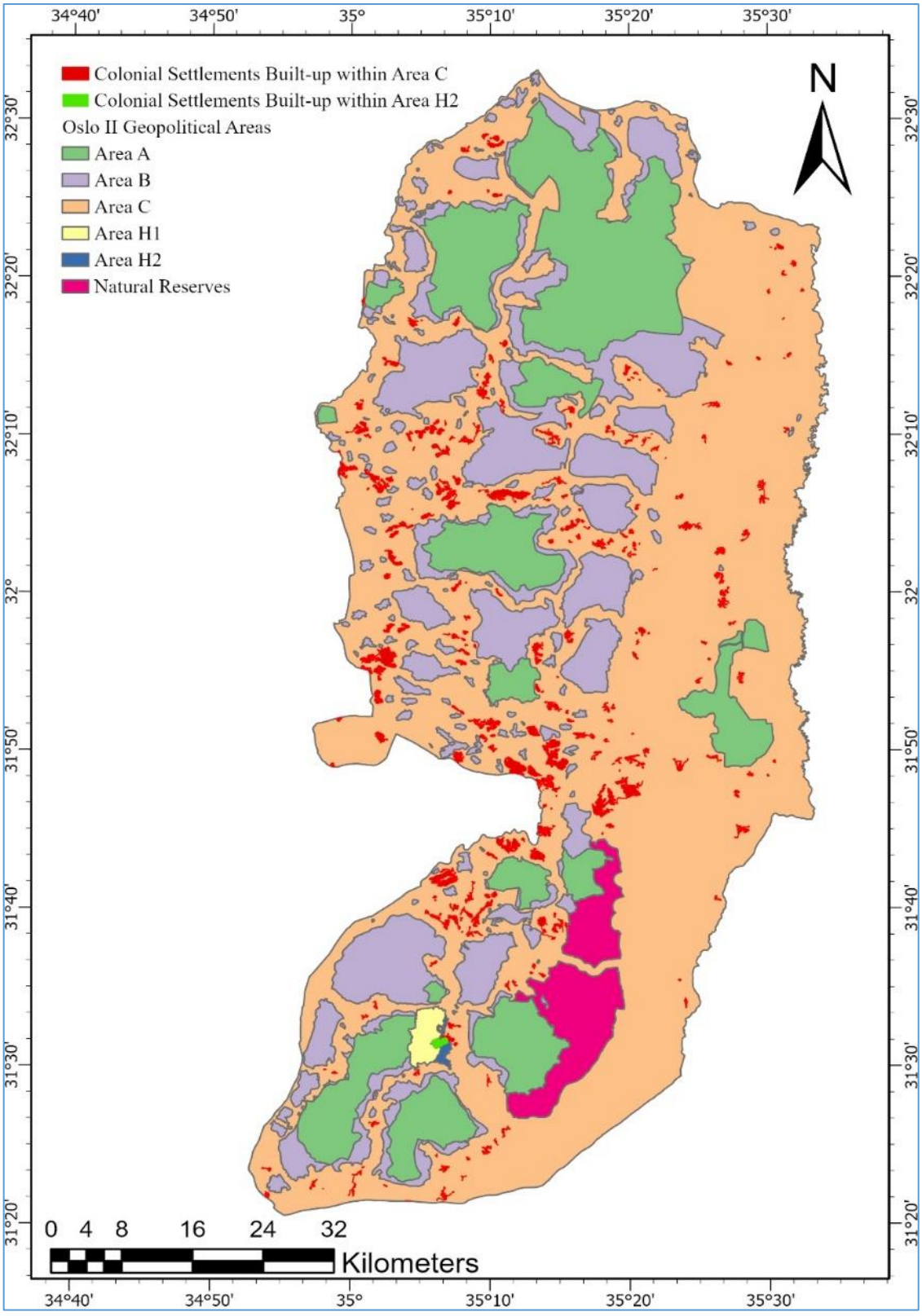


Figure 8 shows the locations of Israeli colonial settlements according to the Oslo II Geopolitical Areas. As illustrated in the map, no Israeli colonial settlements exist in Areas A and B. All colonial settlements are located in Area C, which is under Israeli control. Additionally, in the city of Hebron, five buildings and one tomb are located in Area H2. The city of Hebron was not subjected to division under the Oslo Accords due to its special status. However, in 1997, it was divided into two areas under an agreement known as the Protocol Concerning the Redeployment in Hebron (Institute for Palestine Studies, 2022).

Based on the claim that the Palestinian territories are "disputed" rather than "occupied", Israel claims that it has a legitimate right to the land. This is ongoing historical controversy, as its existence parallels the existence of the Arab-Israeli conflict over the territory. According to the Israeli perspective, the right to settle in these areas derived from the 1922 mandate for Palestine, which they believe recognized a historical Jewish connection to the region.

From the Israeli perspective, Israel's assertion to the territorial rights and its continued establishment of colonial settlements, is regarded as a historical right that Israel has consistently refused to relinquish, particularly as it is linked to the deep-rooted Jewish presence in the region. However, the International Court of Justice (ICJ) has rejected this historical claim as a solid legal basis. The ICJ found it to be highly disputed and insufficient to establish jurisdiction, especially when considered against other facts and legal considerations (Alshdaifat, 2017).

Legally there are international convention that force Israel to stop building colonial settlements in west bank such as Geneva convention, Rome Statute, and united nations security council resolutions.

- 4th Geneva convention (1949): according to article 49 "The Occupying Power shall not deport or transfer parts of its own civilian population into the territory it occupies" (United Nations, 1949). building colonial settlements in Palestinian lands is a clear and blatant violation of this agreement.
- Rome Statute of the International Criminal Court article 8 (War Crimes) "The transfer, directly or indirectly, by the Occupying Power of parts of its own civilian population into the territory it occupies, or the deportation or transfer of all or parts of the population of the occupied territory within or outside this territory;" (International Criminal Court, 2011). Israeli colonial settlements presence it falls

under war crimes.

- United Nations Security Council Resolution 2334 (2016): which concern the Israeli colonial settlements. Security council reaffirms that Israeli colonial settlements have no validity and constitute flagrant violation of international law (StandWithUs, n.d.).

4.9.1 Palestinian Efforts to Limit Colonial Settlement Activity

There are several official and legal efforts led by the Palestinian government and international organizations, aimed to halt the expansion of Israeli colonial settlements in the West Bank.

The most significant initiatives are:

- The establishment of the Colonization and Wall Resistance Commission, a non-ministerial Palestinian governmental body. Its tasks and activities are defined as implementing international resolutions related to the Apartheid Wall and colonial settlements, particularly, the 2004 International Court of Justice decision. The commission works to legally protect lands threatened by colonial settlement activity, and support Palestinian localities affected by colonial settlements and settler violence. It also plays a major role in recording and documenting settler arracks and violations against Palestinian population and their property (Colonization & Wall Resistance Commission, 2023).
- Palestinians and supporters of the Palestinian issue have made many efforts to halt colonial settlement activities and violence in the West Bank, using several methods and strategies. Among the most prominent is the boycott movement, which has played a major role and had a significant impact on the Israeli colonial settlement movement in the West Bank. The most noticeable of these movements is the BDS movement, which is considered one of Israel's main strategic challenges. It is a Palestinian movement with global reach and aims to resist the Israeli occupation, colonial settlements, and annexation policies in order to achieve justice in Palestine. The movement is based on three main pillars:
- Boycott, which involves ending dealings with Israeli and international companies complicit in the violation of Palestinian right.
- Divestment, which pressure investors and contractors to withdraw their investment and terminate contracts with those companies.
- Sanctions, referring to punitive measures taken by government and official institution

against entities that violate human rights, such as military and economic sanctions (BDS, n.d.). (BDS, n.d.)

4.9.2 Obstacles to Palestinian Development in Area C

Area C has the most potential for urban, agricultural, and economic development in the West Bank. Despite this, Israel exploits its complete control over planning in the area to heavily restrict Palestinian urban expansion. In reality, Palestinians are almost entirely prohibited from constructing in Area C. Between 2000 and mid-2016, Palestinians submitted 5,475 applications for building licenses, but only 226 were approved, a mere 4% of the total (B'Tselem, 2017).

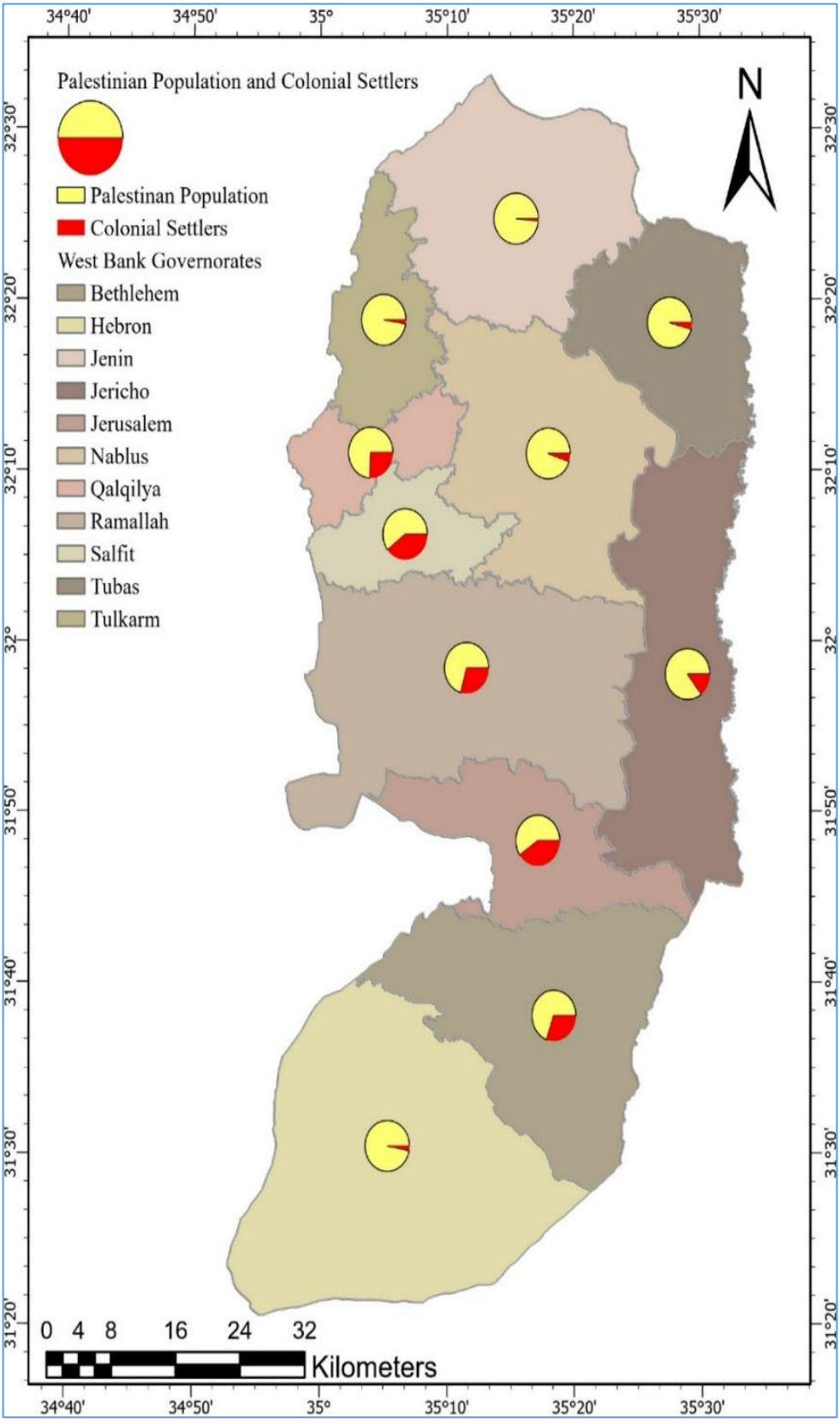
Israel enforces this restriction across roughly 60% of Area C by defining vast large areas as firing zones, nature reserves, or areas under the jurisdiction of colonial settlements and regional councils. In the remaining 40%, Israel applies policies that also limit construction, often by rejecting nearly all permit applications. In contrast, Israeli colonial settlements in the same areas benefit from land allocations, comprehensive planning, and official support. Unauthorized construction within colonial settlements is often ignored, reflecting a clear double standard in how planning laws are applied (B'Tselem, 2017).

4.10 Colonial Settlers Density to Palestinian Population Distribution Across Palestinian Governorate

Figure 9 illustrates the ratio of the Palestinian population to colonial settlers in each governorate of the West Bank, using estimated data retrieved from 2023 PCBS. It shows how heavy the density of the colonial settler population is for certain governorates; this high colonial settler ratio directly relates to colonial settlement expansion. The highest ratio of colonial settlers to the Palestinian population is observed in Jerusalem and Salfit, where it approaches the Palestinian population, resulting in increased land confiscation and movement restrictions. In contrast, the northern governorates - Jenin, Tulkarm, and Tubas - have low numbers of colonial settlers relative to the Palestinian population. Similarly, the southern governorate, Hebron, exhibits a similar pattern to the northern governorates.

Figure 9

Colonial Settlers Density to Palestinian Population Distribution



4.11 Israeli Colonial Industrial Zones

Table 7 presents the elevation of industrial zones, categorized into seven elevation ranges, from -30 to 1,020 meters. The locations of industrial zones on hilltops and mountaintops contribute to wastewater flow into adjacent Palestinian lands, leading to groundwater contamination, especially in high-elevation industrial zones where wastewater can travel over longer distances, leading to environmental harm.

Several industrial zones are located in the West Bank. However, the Israeli government has moved many polluting industrial factories to areas near the West Bank close to the Green Line, such as a pesticide factory that has been moved near Tulkarm. The factory discharges hazardous wastewater that contaminates groundwater and pollutes the soil (ARIJ, n.d.).

Table 7

Israeli colonial industrial zones elevation

Elevation (m)	Israeli Industrial Zones
(-30 - 120)	2
(120 - 270)	5
(270 - 420)	6
(420 - 570)	2
(570 - 720)	4
(720 - 870)	2
(870 - 1020)	3

Israeli industrial zones have had serious health impacts on Palestinian population. According to a study by (Abdel-Fattah, 2011), wastewater discharged from Ariel and Barkan industrial zones has contaminated the surface water, ground water and soil, contributing to the spread of parasitic and cancer-related diseases. The study was involved collecting samples of wastewater, freshwater, and soil from the different sites in the Salfit governorate. laboratory analyses revealed significant pollution from Israeli industrial waste, as minerals concentration in freshwater from the Matwi and Fawwar springs exceeded the world health organization and Palestinian standards. The results of this

study also indicated that the majority of minerals in agricultural soil are contaminated as a result of this wastewater discharge.

A map provided in Appendix A illustrates the locations of colonial settlements that contain industrial zones or factories, overlaid on a hillshade layer derived from the DEM to highlight the topographic characteristics of the industrial zones' locations. There are 24 industrial zones distributed in the West Bank, involving several industries. The layer was created by converting the Israeli industrial zone layer, obtained from GeoMOLG, into points for visualization.

4.12 Classification of Affected Palestinian Localities by Proximity to Colonial Settlements

Figure 10

Palestinian localities adjacent to colonial settlements

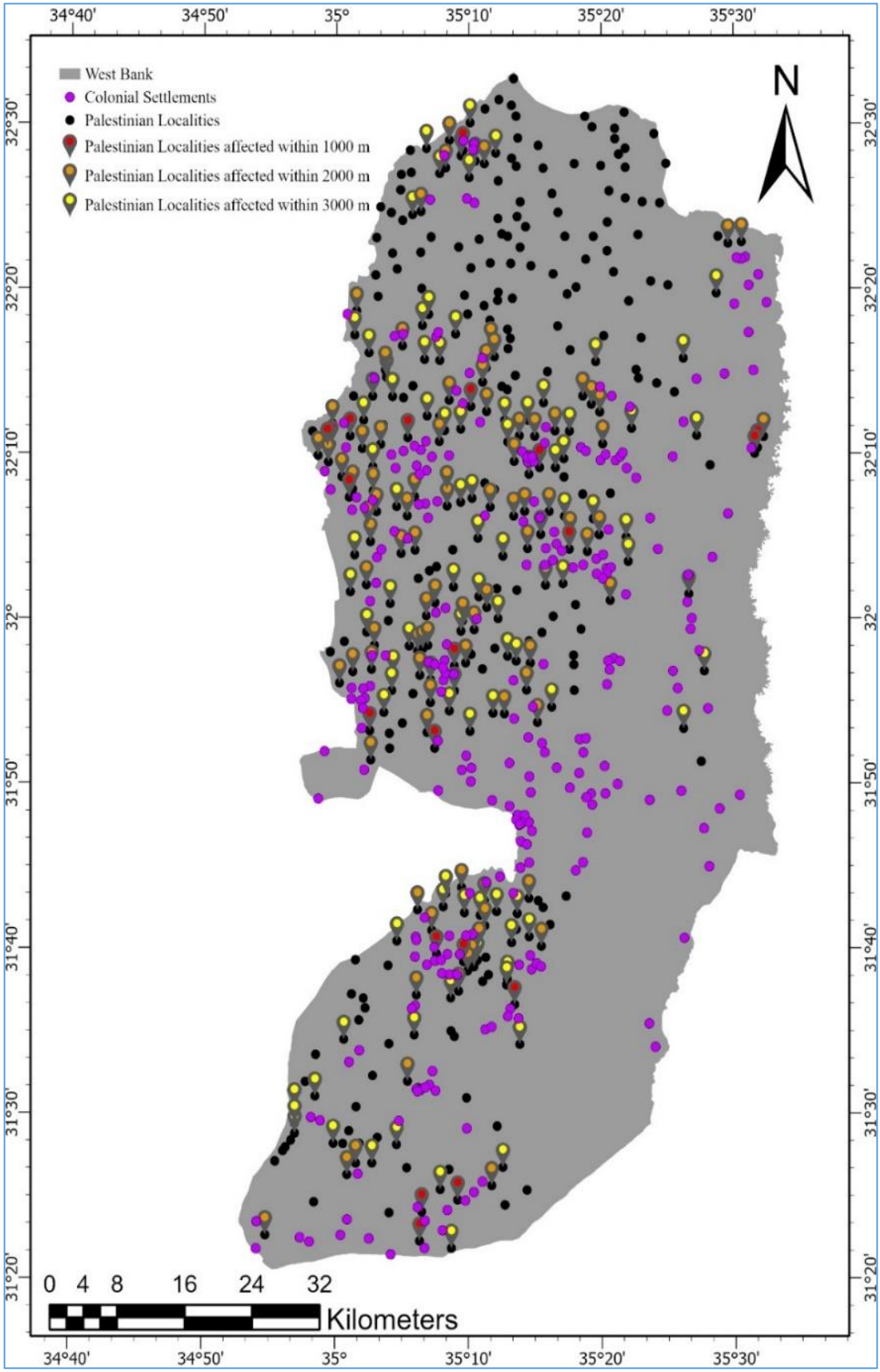


Figure 10 shows Palestinian localities affected by neighboring colonial settlements, with three different distances applied. Many Palestinian localities are surrounded by colonial settlements, making it harder for the Palestinian population to access their lands and restricting their movement. The map clearly shows how colonial settlements are built next to Palestinian localities, which limits these localities' growth.

The layer was derived using the "Near" tool, where the colonial settlements' built-up areas were input as polygons to ensure accuracy and illustrated as points on the map. The Palestinian localities layer, acquired from GeoMOLG, was presented as point layers.

Three different distances were applied: 1 km, 2 km, and 3 km to identify and illustrate the Palestinian localities affected within these distances.

Table 8

Affected Palestinian localities by distance from colonial settlements

Distance (m)	Affected Palestinian Localities
1000	65
2000	160
3000	234

Table 8 presents the number of affected Palestinian localities at different distances from Israeli colonial settlements. A total of 65 Palestinian localities experience direct impacts within a 1-km distance, 160 localities are affected within 2 km, and 234 localities are affected within 3 km.

The presence of Israeli colonial settlements in the West Bank has resulted in several negative effects, especially for Palestinian localities located near these colonial settlements. According to a study by (Qassrawi, 2016), the Palestinian population of the village of Almaleh and nearby Bedouin areas suffered from violent attacks by Israeli forces and colonial settlers, leading to physical harm and, in some cases, the killing of innocent Palestinian civilians. The region is surrounded by several colonial settlements, including Mehola, Maskiyot, Ro'i, and Hemdat, which have not only been sites of physical assaults and property damage but have also contributed to severe environmental degradation. This includes the establishment of eight solid-waste dumping sites and five liquid-waste disposal sites on village lands. Among these, the Mehola colonial settlement

has had the most dangerous and harmful impact. Additionally, Palestinian livestock have been severely affected, with cases of deliberate killing, confiscation, and restrictions on grazing areas. The educational sector has also suffered due to the proximity of these colonial settlements. A significant 49.7% of students in affected areas have dropped out of school, fearing colonial settlers' violence and movement restrictions.

4.13 Colonial Settlement Blocs

There is no precise definition for a "settlement bloc." The term describes the outcomes of intensive and continuous Israeli policies of establishing colonial settlements in adjacent areas, followed by expansion through infrastructure and buildings. This process creates large areas of land in which the colonial settlements and their connecting infrastructure define a unified territorial unit (Canadians for Justice and Peace in the Middle East, 2005).

A map illustrating the major colonial settlement blocs in the West Bank and how they shape the region is presented in Appendix A. Unlike other areas, some of these blocs are marked by high colonial settlement density. As shown, some blocs already contain clusters of colonial settlements, such as those located in Jerusalem, Bethlehem, and Salfit. The blocs were digitized based on a colonial settlement blocs map image obtained from the Jewish Virtual Library.

Chapter Four
Discussion, Conclusion & Recommendations

This chapter discusses the outcomes of this thesis by addressing research questions and proposed hypotheses regarding the expansion, distribution and impacts of Israeli colonial settlements in the West Bank.

Q1: What is the extent of Israeli colonial settlement built-up area expansion in the West Bank between 1997 and 2023?
The digitizing of built-up areas over these two years demonstrates the extent of expansion. The colonial settlements' built-up area difference was 46.12 km2, indicating that the colonial settlements have expanded significantly - more than doubled - with an expansion rate of 108.59%. This expansion reflects both the establishment of new settlements and the expansion of existing colonial settlements, leading to fragmentation of Palestinian localities.

The 108.59% expansion rate has severe consequences, not only in land use but also in the demographics of the West Bank, as expansion of colonial settlements involves further land confiscation, an increase in colonial settler population which raises the ratio of colonial settlers to the Palestinian population - meaning more settler violence, increased industrial waste as they treat the West Bank as a dumping site, and additional restrictions on Palestinian population movement under security pretenses. Palestinian localities face restrictions on urban expansion, not just due to the construction of these colonial settlements but also due to the bypass roads that connect them and cut through these localities.

Q2: What is the distribution of Israeli colonial settlements?
The distribution of Israeli colonial settlements in the West Bank follows a strategic pattern influenced by political, security, and hidden factors. The locations of these settlements demonstrate heightened density in specific regions, particularly in Jerusalem and other settlement blocs.

The clustered distribution reveals that these settlements are constructed as blocs, where multiple settlements group together to form large, continuous Israeli-controlled areas, which makes it easier for the Israeli governorate to annex these colonial settlement blocs

through the apartheid wall. Furthermore, a proposed apartheid wall plan will annex the Etzion bloc in Bethlehem and the Ariel bloc in Salfit once construction is complete.

Q3: What is the observed area from the colonial settlements?

Analysis of viewshed operation results shows that a large area, 2,805.76 km2, of the West Bank is observed from Israeli colonial settlements, representing half of the West Bank area. This significant portion is observable due to the settlements' strategic locations on hilltops and elevated terrain. These locations enable colonial settlers to reinforce surveillance of Palestinian localities. A total of 237 Palestinian localities are observed by these colonial settlements, representing 62.9% of total Palestinian localities, which means that everyday Palestinian activities, farming, and transportation are exposed to surveillance.

Q4: Is there a colonial settlement adjacent to the Palestinian localities?

The spatial analysis illustrates that numerous Israeli colonial settlements are located near Palestinian localities, often expanding onto their lands and restricting these localities' urban expansion. The results of the Near Tool analysis, which measured three different distances between the colonial settlements and Palestinian localities, show that many localities are adjacent to colonial settlements, sometimes within a few hundred meters. The three different distances were applied to count the affected Palestinian localities related to different impacts: 65 Palestinian localities were located in the immediate impact zone, 160 were within the high-influence zone, and 234 were located in the extended impact zone. This proximity has severe consequences for Palestinian localities because settlements were established and expanded on confiscated Palestinian land, leading to population displacement, movement restrictions, and increased settler violence.

Q5: Are the Israeli colonial industrial zones located in a high elevation?

The analysis shows that many Israeli industrial zones in the West Bank are located at high elevations. By overlaying industrial zone locations on a hillshade layer and extracting elevations using DEM data, five industrial zones are located at elevations above 720 meters, and six are at moderate elevations above 420 meters. The high-elevation industrial zones severely impact the Palestinian population's environment through pollution and industrial waste, especially wastewater that can travel longer distances. The industrial zones are at high elevations because they are built next to colonial settlements, which are mostly constructed at elevated locations for surveillance as it provides a strategic position.

Q6: Are there Palestinian plans to limit Israeli colonial settlement activity in the West Bank?

Yes, various efforts have been made by the Palestinian government and international organizations, to limit Israeli colonial settlement activity in the West Bank. These efforts include strategies such as divestment campaigns, boycotts, and the recording of colonial settler violence. Among these, the BDS movement has had the most noticeable worldwide impact. While it has drawn global attention and placed pressure on companies and institutions involved in the occupation, it has not succeeded in halting the expansion of colonial settlements. Furthermore, Palestinian urban expansion remains restricted due to Israeli polices that limits construction in Area C.

4.1 Conclusion

This thesis has investigated the expansion of Israeli colonial settlements from 1997 to 2023, their distribution, and their impact on Palestinian localities in the West Bank through spatial analysis and GIS techniques. The study identified the expansion ratio of Israeli colonial settlements between 1997 and 2023 by digitizing colonial settlement built-up areas over two periods, which exceeded the hypothesis of a 50% increase.

The analysis of Israeli colonial settlement distribution shows that settlements are not randomly located but follow a strategic pattern, with concentration in Jerusalem, settlement blocs, and near Palestinian localities. This positioning maximizes land control while limiting Palestinian localities' urban expansion. The viewshed analysis reveals that nearly half of the West Bank is visible from Israeli colonial settlements, confirming how their placement ensures continuous surveillance over Palestinian areas and localities.

The proximity analysis revealed that numerous Palestinian towns and villages lie within 1, 2, and 3 km of colonial settlements, affecting their life and development. Similarly, the proximity analysis using buffer zones showed that many colonial settlements neighbor natural reserves, threatening the West Bank's environment, as settlement expansion in some areas occurs inside these natural reserves, leading to the destruction of protected areas.

The study revealed that several Israeli colonial industrial zones are situated at higher elevations (above 720 meters). This positioning has a severe effect on the environment and adjacent Palestinian lands.

In conclusion, the outcomes of this thesis confirm that Israeli colonial settlement expansion continues rapidly and is strategically placed to secure maximum land control, surveillance, and restriction of Palestinian development. Their arrangement and expansion affect Palestinian localities and the environment, making them a crucial element in the ongoing land conflict. These findings provide a clear understanding of colonial settlement expansion, distribution patterns, and their consequences in Palestine.

4.2 Limitations

- There are no accurate spatial data showing the built-up areas and boundaries of Israeli colonial settlements for both 1997 and 2023.
- The names of Israeli colonial settlements differ across sources.
- Several sources fail to indicate Israeli colonial settlement locations.
- Multi-temporal aerial photographs require high-performance computers.
- Digitizing consumed significant time due to the vast number of Israeli colonial settlements.
- It is difficult to detect fences in certain colonial settlements to determine occupied areas.
- The 1997 aerial photographs possess low resolution.

4.3 Recommendations

By the outcomes of this study, several recommendations can address the impacts of Israeli colonial settlements expansion in the West Bank and facilitate future research and decision-making:

Palestinian land use planning:
Palestinian authorities and localities should continue mapping and recording Israeli colonial settlement expansion to monitor changes over time and provide evidence for legal and political advocacy. Additionally, urban planning methods should focus on protecting Palestinian land from fragmentation through developing comprehensive land use strategies.

International legal and political support:
International organizations and human rights groups should increase pressure on Israel to halt colonial settlements expansion. Moreover, adherence to international laws

prohibiting colonial settlement activities in the West Bank is crucial. Greater efforts should be made to challenge the expansion of colonial settlements in international courts, utilizing reports and spatial data as evidence.

Protecting the West Bank environment:
Environmental organizations should monitor the impacts of Israeli colonial settlements on natural reserves and the effects of Israeli industrial zones on Palestinian localities and land, while advocating policies to reduce environmental damage caused by colonial settlement expansion and industrial zones.

Future research and data collection:
Further studies should be conducted to analyze colonial settlement expansion beyond 2023 to monitor future patterns and impacts on Palestinian localities. Additional research should examine the social and economic effects of colonial settlements.

List of Abbreviations

Abbreviation	Meaning
SPSS	Statistical Package for the Social Sciences
GIS	Geographic Information System
JCA	Jewish Colonization Association
MoLG	Ministry of Local Government
DEM	Digital Elevation Model
USGS	United States Geological Survey
PCBS	Palestinian Central Bureau of Statistics

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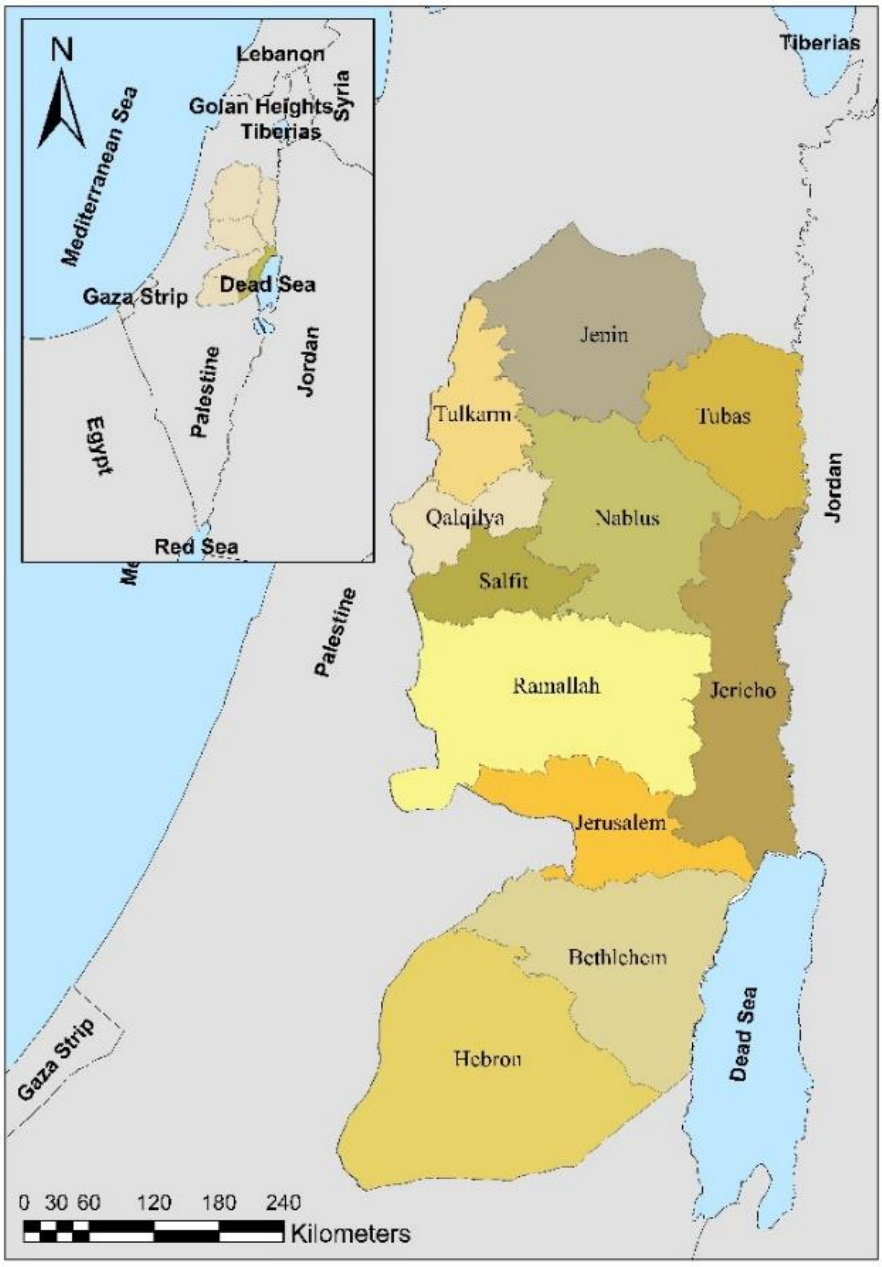
Appendices

Appendix A

Figures

Figure 11

Study area



Note. Adapted by the researcher

Figure 12

Study procedure workflow

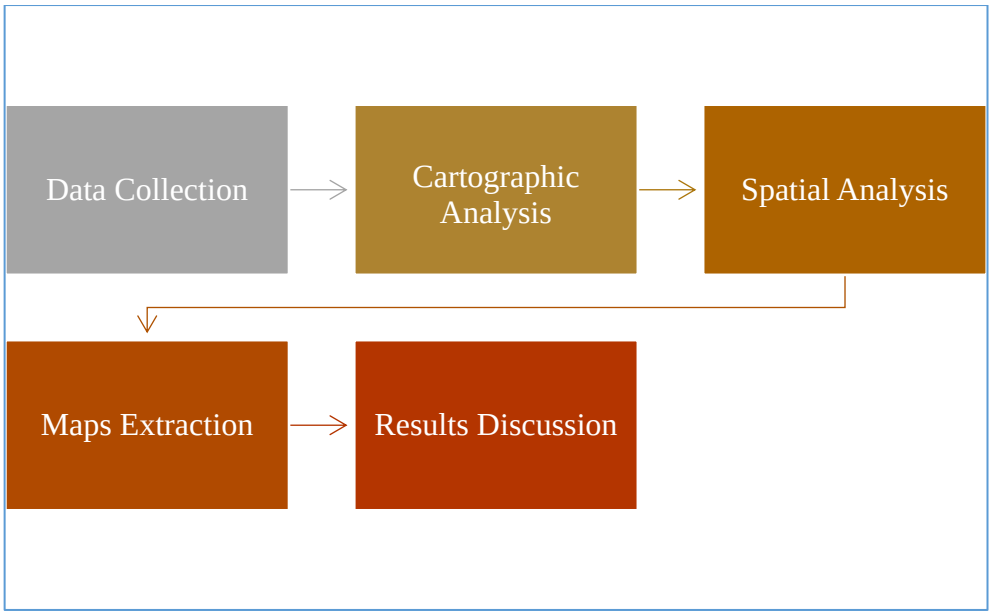


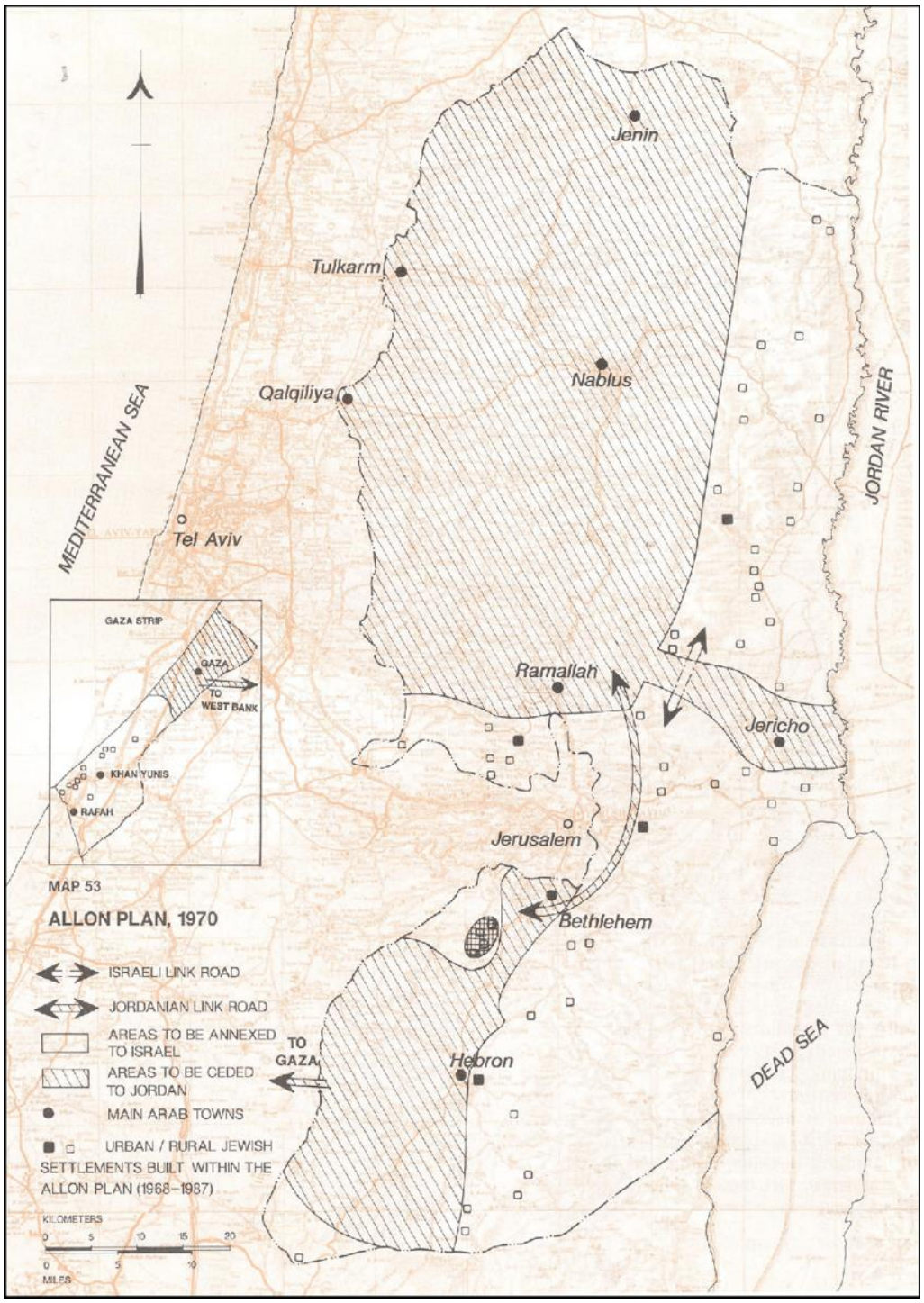
Figure 13

Six-Day War, 1967

Note. Adapted from (Israel Policy Forum, n.d.)

Figure 14

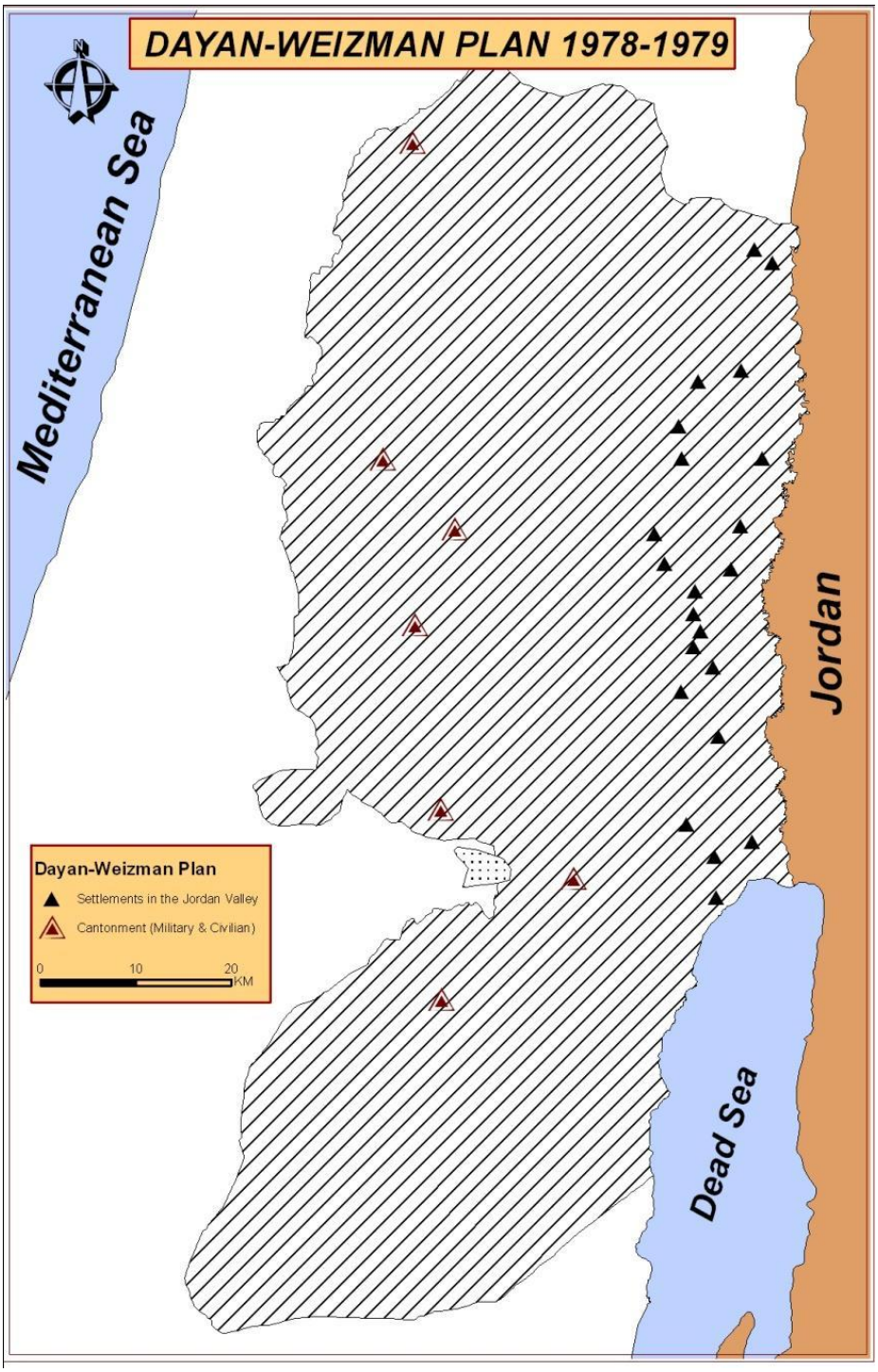
Allon plan



Note. Adapted from (Benvenisti & Khayat, 1988)

Figure 15

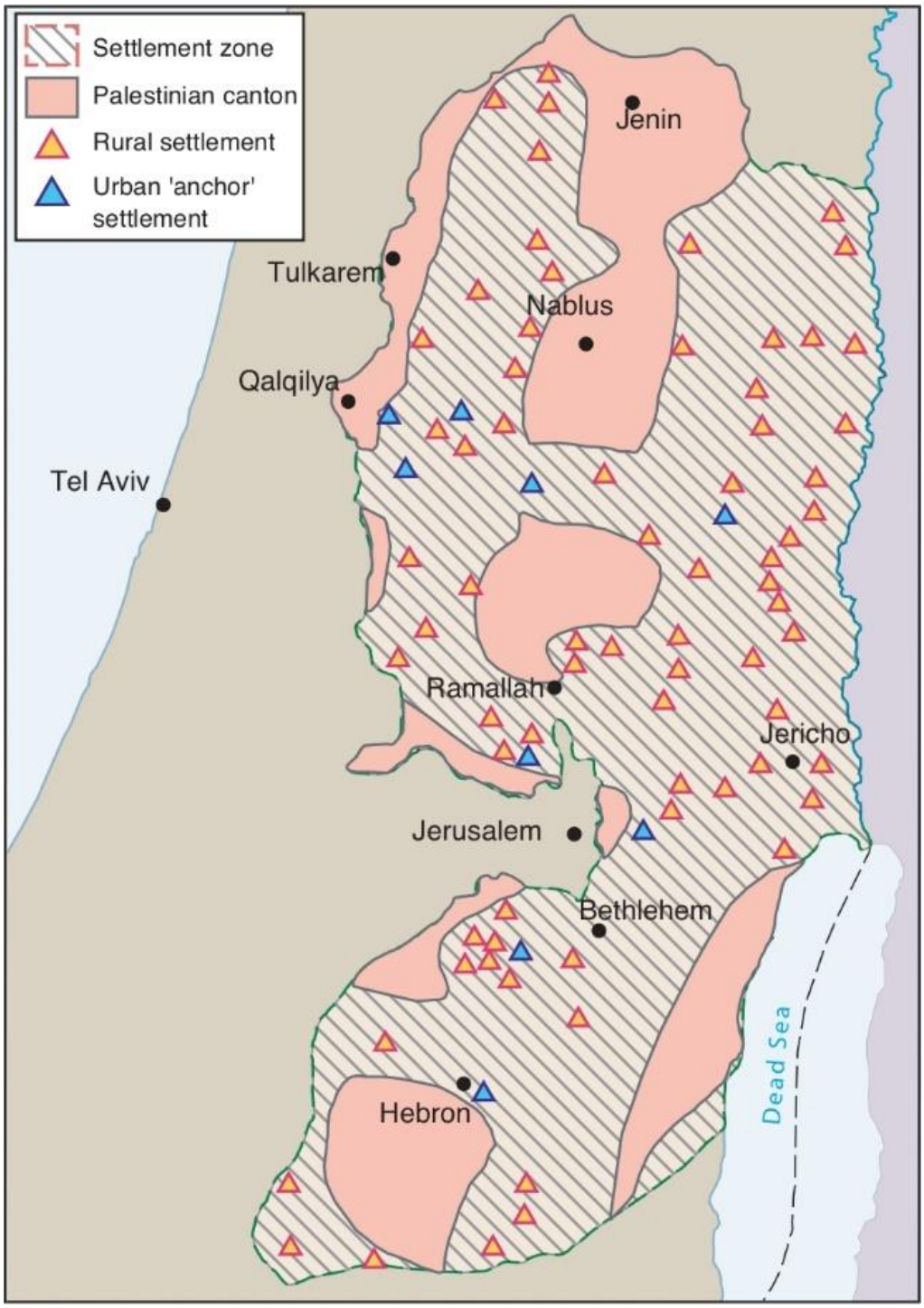
Dayan-Weizman plan 1978 - 1979



Note. Adapted from (Antari, 2015)

Figure 11

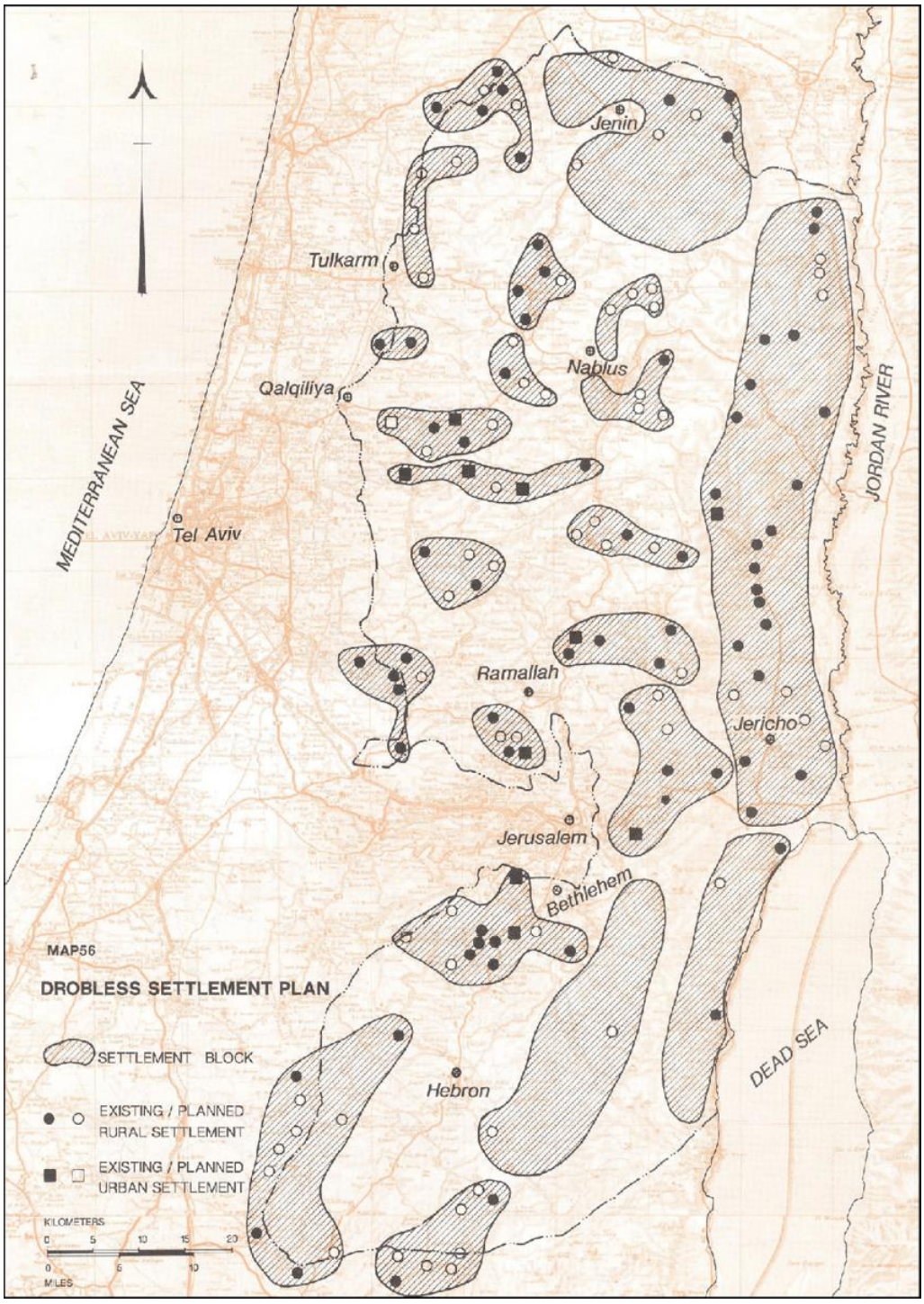
Sharon plan



Note. Adapted from (Palestinian Academic Society for the Study of International Affairs, n.d.)

Figure 12

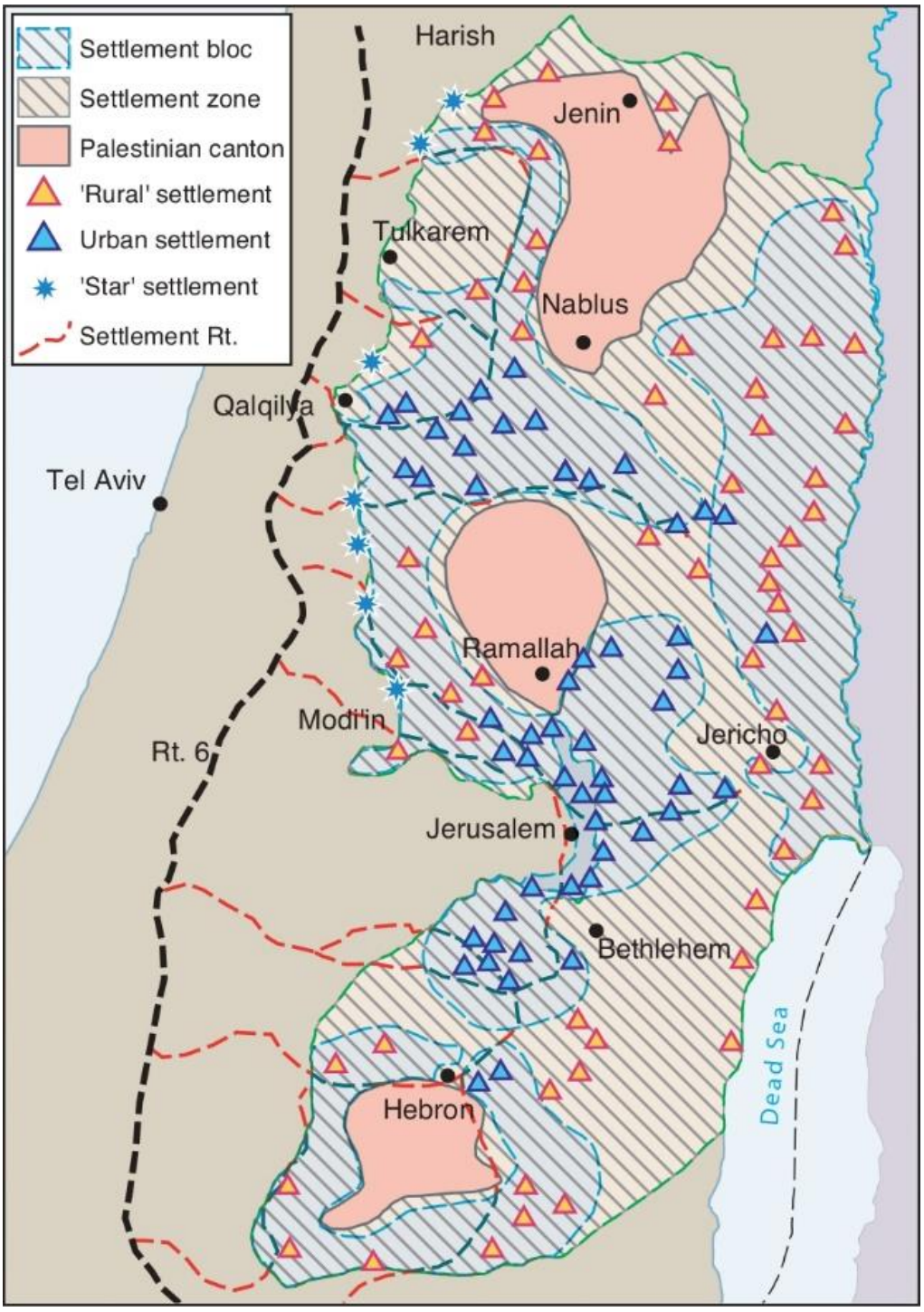
Drobless plan



Note. Adapted from (Benvenisti & Khayat, 1988)

Figure 13

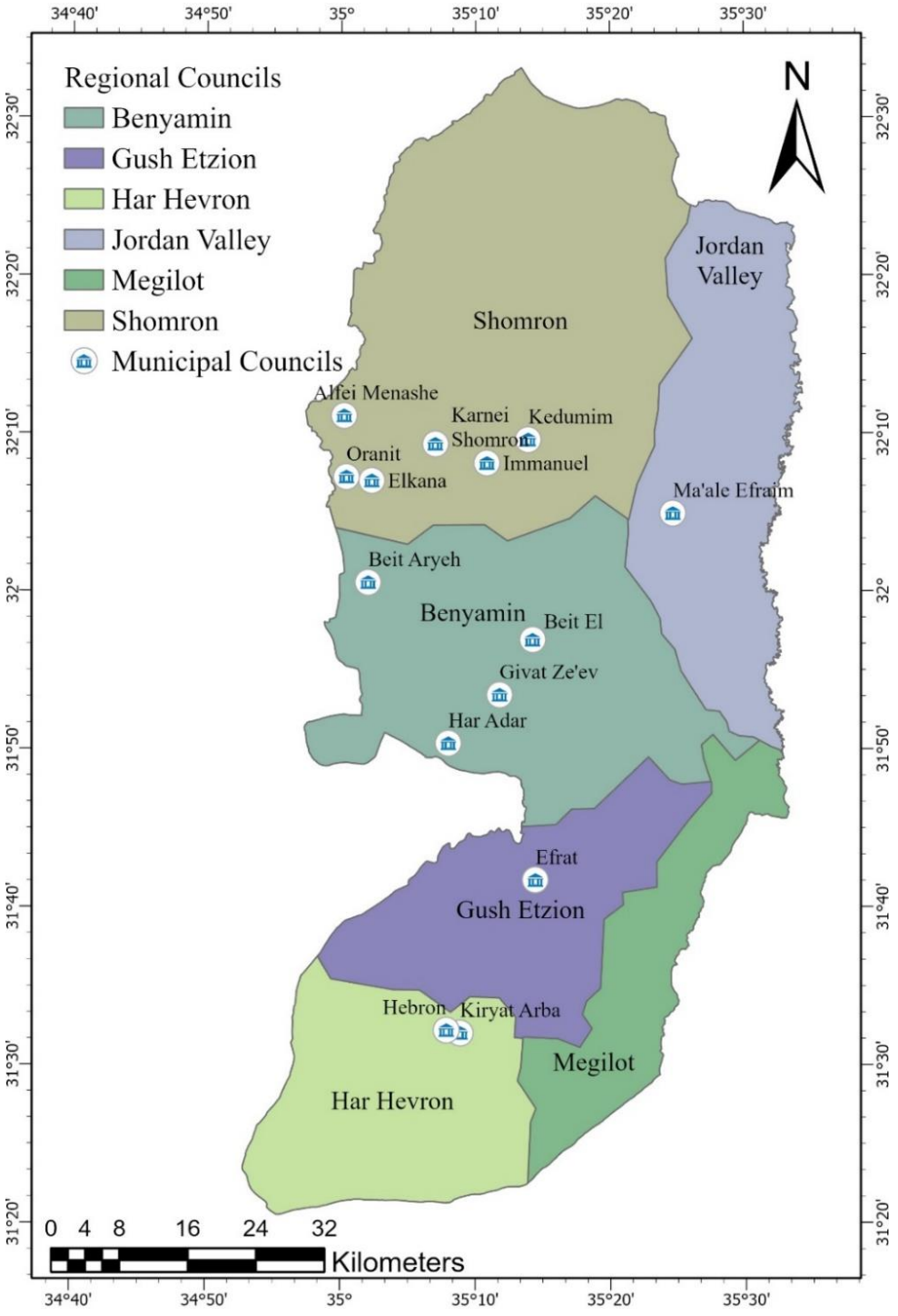
The Seven Stars plan



Note. Adapted from (Palestinian Academic Society for the Study of International Affairs, n.d.)

Figure 14

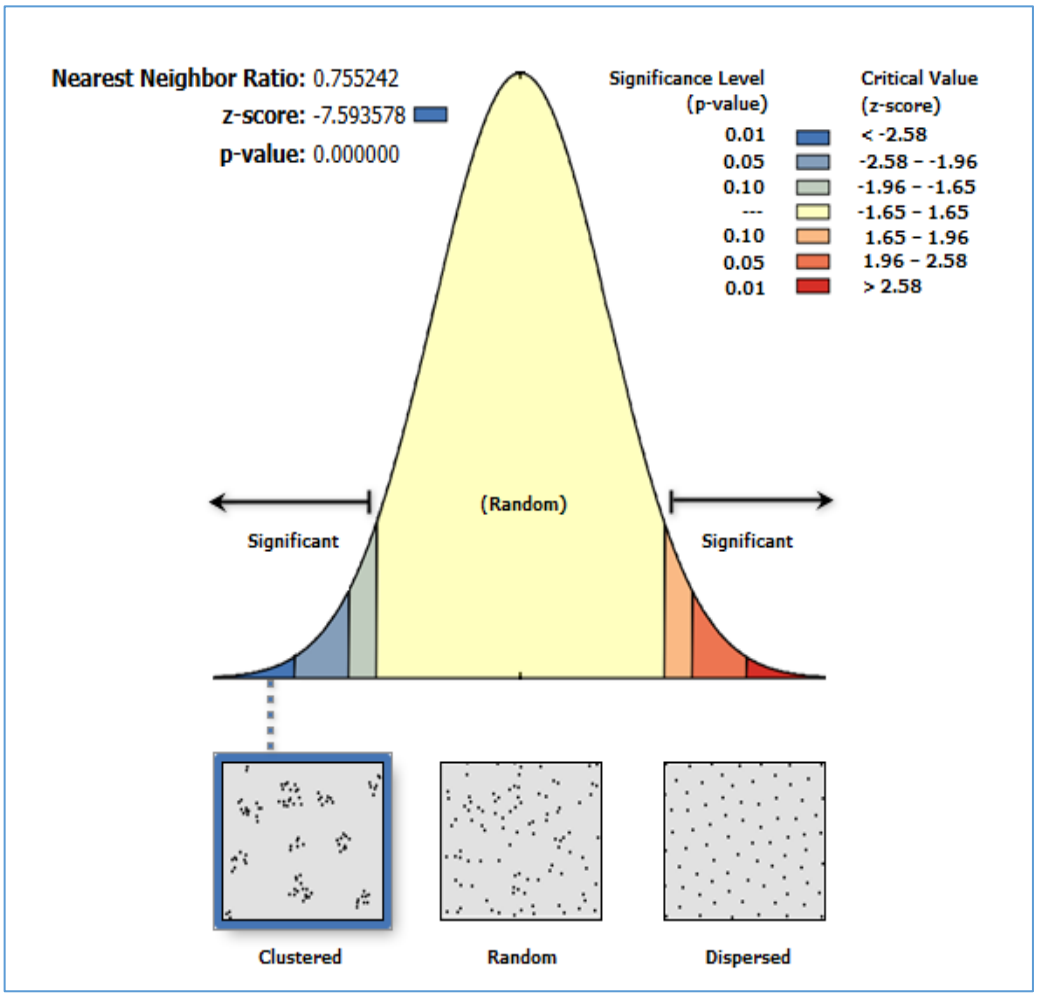
Israeli regional councils in the West Bank



Note. Adapted by the researcher

Figure 15

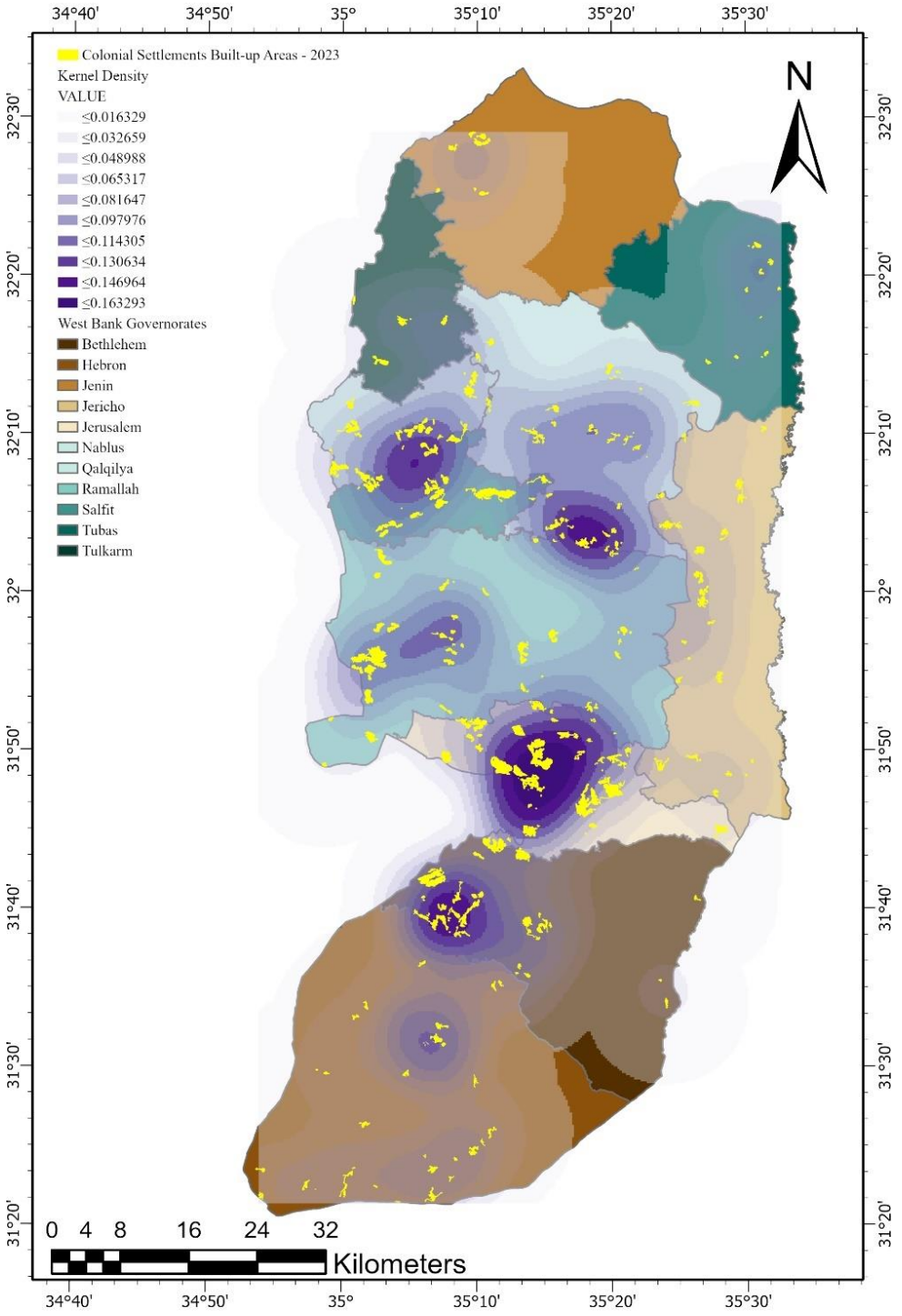
Nearest neighbor analysis



Note. Adapted by the researcher

Figure 16

Kernel Density



Note. Adapted by the researcher

Figure 17

Marked colonial settlements by hot spot analysis chart

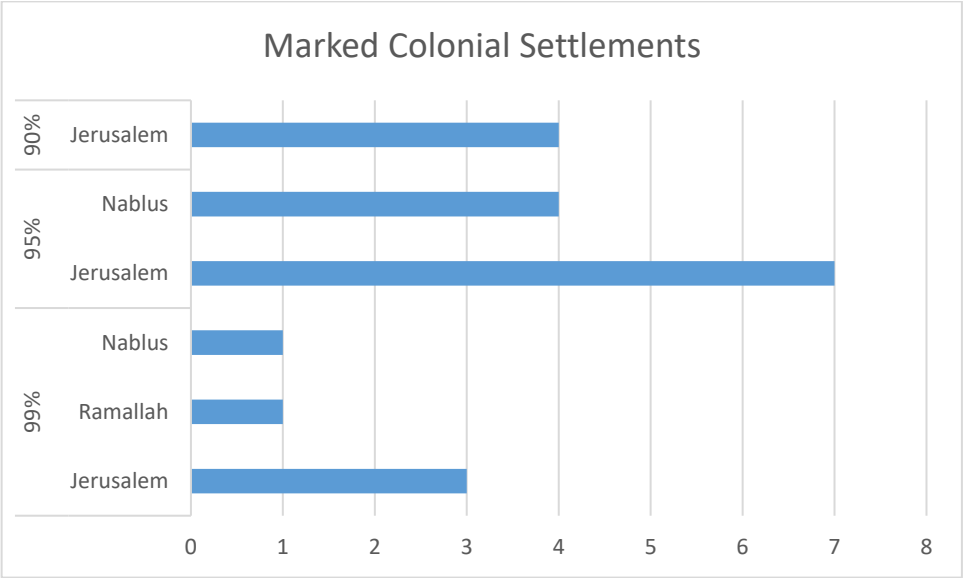


Figure 18

Israeli Colonial Industrial Zones

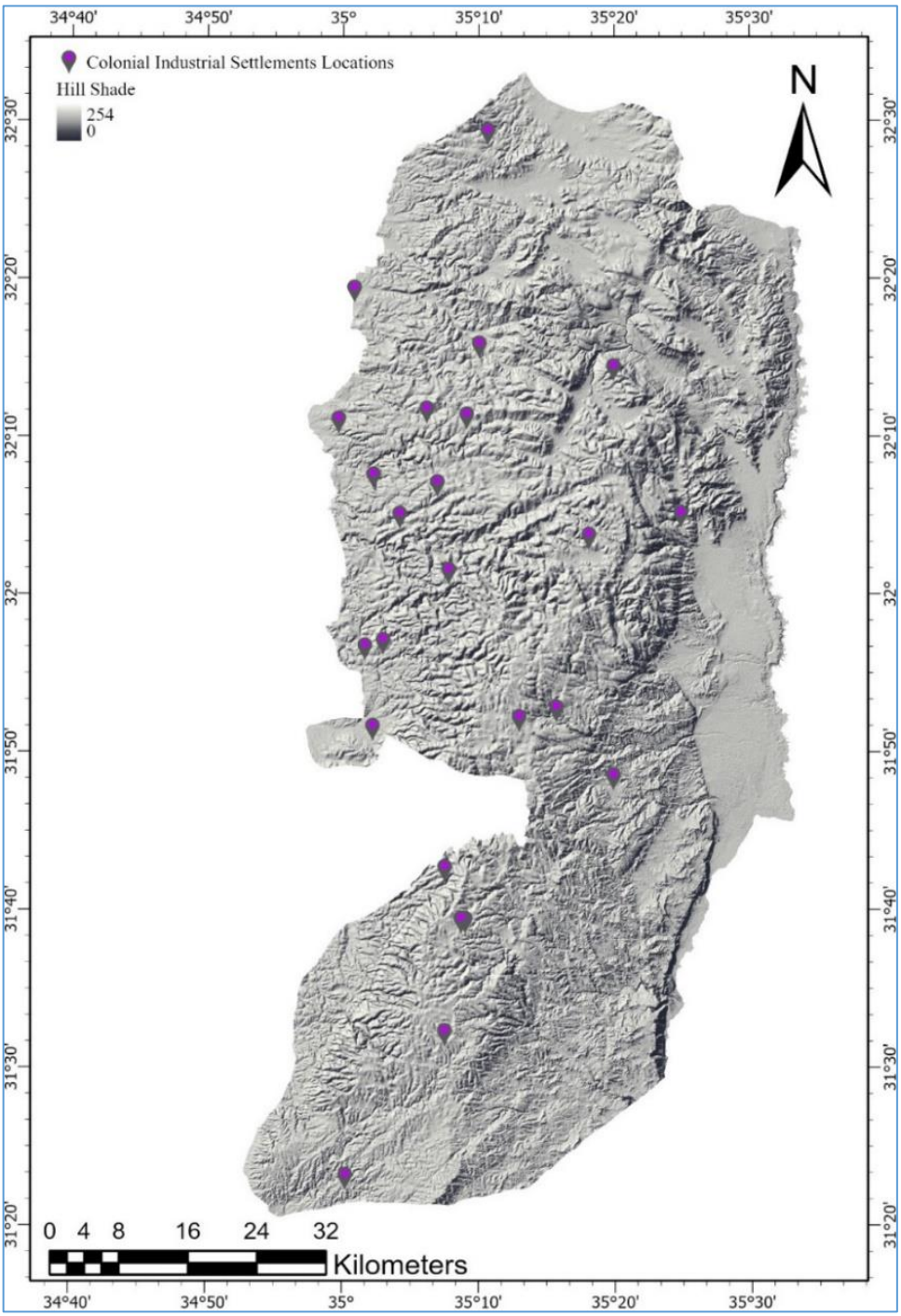
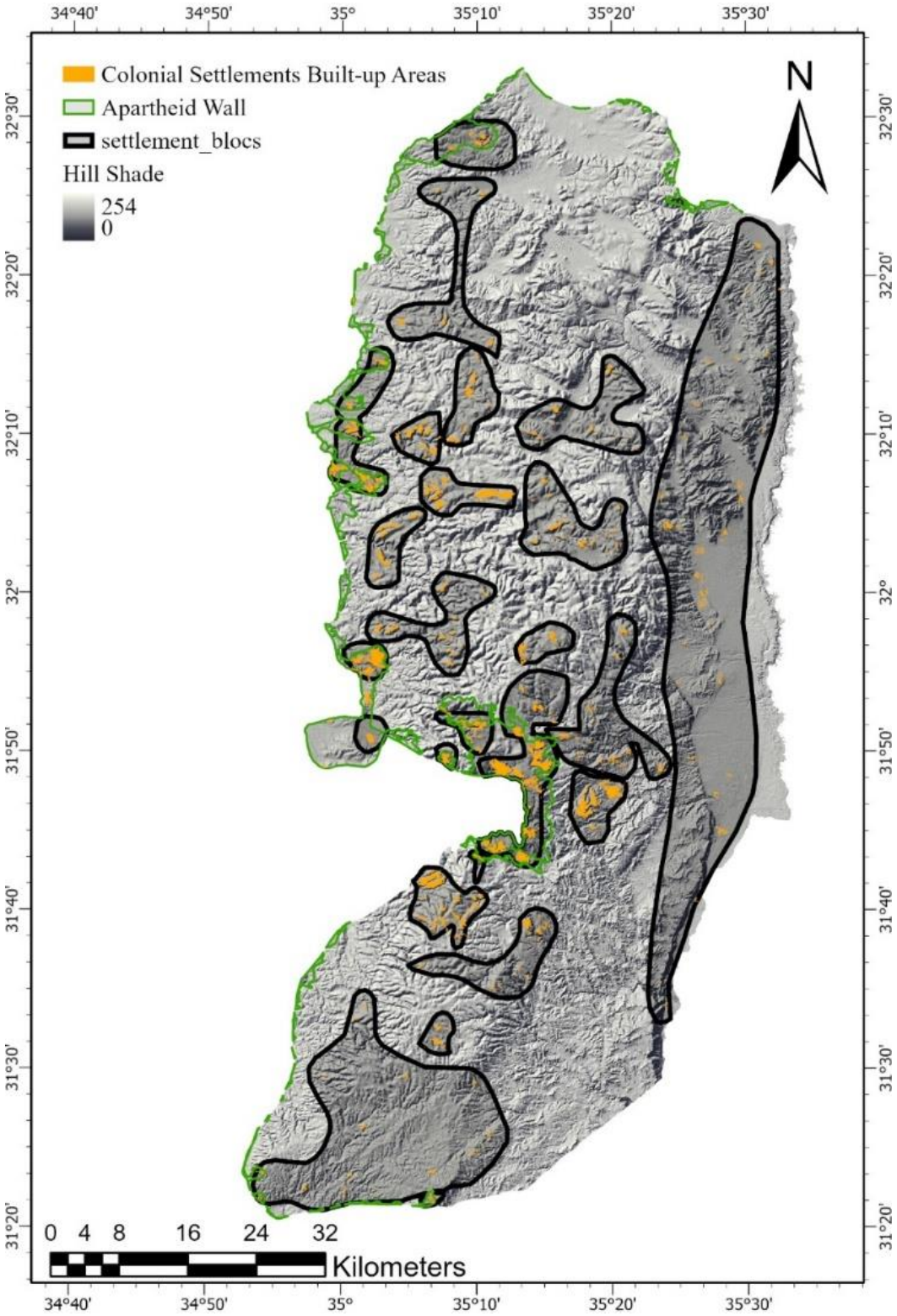


Figure 19

Colonial settlements blocs



Appendix B

Tables

Table 9

Colonial settlements built-up area in Jenin

	Colonial Settlement Name	Establishment Year	Colonial Settlers population	Colonial Settlements Built-up Area (km2)
1	Mevo Dotan	1978	790	0.241356
2	Reihan	1977	466	0.273276
3	Tal Menashe	1992	N/A	0.200767
4	Hinanit	1981	1,847	0.309952
5	Shaked	1981	1,178	0.57148
6	Hermesh	1982	289	0.125782
7	Maoz Tzvi	2001	N/A	0.032648
	Total			1.755261

Table 10

Colonial settlements built-up area in Tulkarm

	Colonial Settlement Name	Establishment Year	Colonial Settlers population	Colonial Settlements Built-up Area (km^2)
1	Netsanei ha-Shalom Industrial zone	N/A	N/A	0.17507
2	Sal'it	1977	1,541	0.585394
3	Hahar	1998	N/A	0.01392
4	Avnei Hefetz	1990	2,581	0.468972
5	Einav	1981	1,213	0.221152
6	Karmei Doron	2002	N/A	0.062012
	Total			1.52652

Table 11

Colonial settlements built-up area in Tubas

	Colonial Settlement Name	Establishment Year	Colonial Settlers population	Colonial Settlements Built-up Area (km^2)
1	Mehola	1968	789	0.276136
2	Givat Sal'it	2002	N/A	0.035904
3	Shadmot Mehola	1978	793	0.193808
4	Rotem	1983	303	0.117237
5	Maskiyot	1986	354	0.080467
6	Brosh Habik'a	2013	N/A	0.073908
7	Hemdat	1980	359	0.131011
8	Ro'i	1976	178	0.104846
9	Beka'ot	1972	228	0.134635
10	Havat Zuriel (Zurie'l Farm)	N/A	N/A	0.007278
11	Nof Gilad Farm	N/A	N/A	0.007893
	Total			1.163123

Table 12

Colonial settlements built-up area in Nablus

	Colonial Settlement Name	Establishment Year	Colonial Settlers population	Colonial Settlements Built-up Area (km^2)
1	Har Brakha	1982	3,190	0.366346
2	Itamar	1984	1,594	0.199064
3	Elon Moreh	1979	1,988	0.469654
4	Rehelim	1991/2013	1,197	0.12957
5	Migdalim	1984	674	0.126854
6	Shavei Shomron	1977	1,182	0.283113
7	Yitzhar	1983	2,288	0.265741
8	Eli	1984	4,531	0.684491
9	Shvut Rahel	1991	N/A	0.170872
10	Hamra	1971	267	0.214981
11	Giv'at Sakli	1999	N/A	0.026514
12	Ahiya	1997	N/A	0.087966
13	Esh Kodesh	2000	N/A	0.133109
14	Kida	2003	N/A	0.12128

15	Amihay	2018	318	0.067667
16	East Kida	2018	N/A	0.009897
17	Yeshuv Hada'at	2002	N/A	0.036569
18	Adei Ad	1998	N/A	0.072777
19	Havat Gil'ad + Yetedot Farm	N/A	N/A	0.116403
20	Shuna Palgei Mayim	1999	N/A	0.038391
21	Nof Harim	1998	N/A	0.050763
22	Hayovel	1998	N/A	0.046413
23	Givat Tkuma	2001	N/A	0.042903
24	Mitspe Yits'har	2002	N/A	0.027559
25	Havat Shaked	2002	N/A	0.027288
26	Giv'at Lahava	1998	N/A	0.092777
27	Giv'at Sne Ya'akov	1999	N/A	0.044385
28	Khavat Alumot	1999	N/A	0.060304
29	Har Gid'on	1998	N/A	0.041316
30	Khavat Giv'ot Olam	1998	N/A	0.061697
31	Giv'at Yanukh	1998	N/A	0.021708
32	Mitzpe Shloshet Hayamim	N/A	N/A	0.003991
33	Giv'at Arnon	1999	N/A	0.056169
34	HeNekuda	1996	N/A	0.060341
35	Nakhalat Yosef	2012	N/A	0.009274
36	Itamar Kohen Farm (Tel Yanoun)	2013	N/A	0.006369
37	Bar-industry Zone	1977	4548	0.151588
	Total			4.426104

Table 13

Colonial settlements built-up area in Qalqilya

	Colonial Settlement Name	Establishment Year	Colonial Settlers population	Colonial Settlements Built-up Area (km^2)
1	Alfei Menashe	1983	8,671	1.264716
2	Neve Menahem	N/A	N/A	0.356942
3	Ma'ale Shomron	1980	2020(980)	0.258789
4	Zufim	N/A	2769	0.420766
5	Sha'arei Tikva	1982	2022(6,079)	0.801987
6	Nirit	1982	N/A	0.284156
7	Oranit	1984	10,151	1.330476
8	Har Hemed	1996	N/A	0.02328
9	Magen Dan	1999	N/A	0.028815
10	Alonei Shilo	1999	N/A	0.091983
11	Ramat Gil'ad	2002	N/A	0.038297
12	Kdumim	1975	4,831	1.303793
	Total			6.204

Table 14

Colonial settlements built-up area in Salfit

	Colonial Settlement Name	Establishment Year	Colonial Settlers population	Colonial Settlements Built-up Area (km^2)
1	Karnei Shomron	1978	10,781	0.570773
2	Ets Efraim	1985	2,608	0.289964
3	Ginot Shomron	N/A	N/A	0.678906
4	Yakir	1981	2,905	0.44903
5	Nofim	1987	1,364	0.31674
6	Elmatan	2002	N/A	0.030881
7	Revava	1991	3,294	0.405454
8	Immanuel	1982	5,597	0.800464
9	Bruchin	1999/2012	2,640	0.384359
10	Pedu'el	1984	2,284	0.31494
11	Elkana	1977	4,556	1.018855
12	Nofei Nekhemia	2002	N/A	0.072441
13	Alei Zahav	1982	5,358	0.834678
14	Kiryat Netafim	1982	940	0.191249

15	Kfar Tapuach	1539	1,978	0.335583
16	Ari'el	1978	21,395	3.153149
17	Barkan	1981	2,271	2.159887
18	Magen Dan	1999	N/A	0.028815
19	Ma'ale Yisra'el	1997	N/A	0.021563
20	Havot Yair	2001	N/A	0.145511
21	Shacharit	2015	N/A	0.007336
	Total			12.210578

Table 15

Colonial settlements built-up area in Jericho

	Colonial Settlement Name	Establishment Year	Colonial Settlers population	Colonial Settlements Built-up Area (km^2)
1	Yitav	1970	333	0.088305
2	Na'aran	1977	135	0.088622
3	Vered Yeriho	1980	436	0.213097
4	Mitzpe Yeriho	1978	2,846	0.443677
5	Gitit	1973	592	0.199066
6	Yafit	1980	279	0.286138
7	Ma'ale Efrayim	1970	1,835	0.68663
8	Argaman	1968	171	0.111106
9	Na'ama	1982	323	0.25669
10	Beit HaArava	1980	538	0.167651
11	Almog	1977	314	0.203445
12	Mehora	1973	221	0.138288
13	Masu'a	1970	393	0.584871
14	Fatsa'el (Petza'el)	1975	451	0.378851
15	Tomer	1978	382	0.40496
16	Gilgal	1970	227	0.319157
17	Netiv HaGdud	1976	227	0.416121
18	Beit Hogla	2001	N/A	0.048349
19	Mevo'ot Yericho	1999	398	0.094721
20	Einot Kedem Farm	N/A	N/A	0.02783
	Total			5.157575

Table 16

Colonial settlements built-up area in Ramallah

	Colonial Settlement Name	Establishment Year	Colonial Settlers population	Colonial Settlements Built-up Area (km^2)
1	Ma'ale Levona	1983	918	0.190726
2	Ofarim	1989	N/A	0.242654
3	Beit Aryeh - Ofarim	1981	5,817	0.958974
4	Ateret	1981	749	0.174909
5	Tsofit	N/A	N/A	0.014761
6	Halamish (Neveh Tsuf)	1977	1451	0.36109
7	Nehliel	1984	775	0.137576
8	Kerem Reim	2012	N/A	0.132849
9	Ofra	1975	3,261	0.661261
10	Zayit Ra'anan	2001	N/A	0.030522
11	Talmon	1989	6,109	0.255316
12	Rimonim	1977	767	0.187379
13	Na'ale	1988	2,879	0.525355
14	Nili	1981	2,191	0.467976
15	Dolev	1983	1,665	0.304825
16	Beit Horon	1977	1,519	0.268088
17	Beit El	1977	6,292	1.141395
18	Psagot	1981	2,297	0.249882
19	Ma'ale Michmash	1981	2,094	0.261878
20	Kochav HaShachar	1977	2,822	0.347602
21	Hashmona'im	1985	3,020	0.744714
22	Modi'in Illit	1981	88,025	2.810379
23	Matityahu	1981	952	0.205713
24	Kfar Ha-Oranim	1998	2,392	0.353347
25	Lapid	1996	2018(2485)	0.387826
26	Talmon B	N/A	N/A	0.249973
27	Talmon A	N/A	N/A	0.017807
28	Maccabim	N/A	N/A	0.808425
29	Sha'alvim	N/A	N/A	0.134497
30	Neve Shalom	N/A	N/A	0.123524
31	Mevo Horon	1970	2,682	0.720452
32	Shiloh	1979	5,637	0.55532
33	Shilat	N/A	N/A	0.411039
34	Kfar Rut	N/A	N/A	0.101071
35	Harasha	1997	N/A	0.059883
36	Horesh Yaron	1997	N/A	0.075545
37	Ahavat Hayim	1999	N/A	0.027837
38	Ma'ale Shlomo	1999	N/A	0.031515
39	Mitzpe Kramim	2001	N/A	0.032225
40	Giv'at Asaf	2002	N/A	0.01927
41	Givat Harel	1998	N/A	0.112132

42	HaRoeh	2002	N/A	0.034828
43	Mitzpe Dani	1999	N/A	0.056588
44	Mitzpe Hagit	1999	N/A	0.015864
45	Neve Erez	2001	N/A	0.034507
46	Malachei Hashalom Farms	2015	N/A	0.027002
	Total			15.066301

Table 17

Colonial settlements built-up area in Jerusalem

	Colonial Settlement Name	Establishment Year	Colonial Settlers population	Colonial Settlements Built-up Area (km^2)
1	The New Migron	2012	N/A	0.078093
2	Giv'at Ze'ev	1982	23,955	1.568503
3	Kokhav Ya'akov	1984	3,792	0.6981
4	Almon	1982	1,566	0.210711
5	Har Shmu'el	1998	N/A	0.257058
6	Ramat Shlomo	1994	N/A	0.85054
7	Alon	1990	N/A	0.194566
8	Kedar	1984	1,,605	0.232274
9	Giv'on (Giv'on Ma'arav +Giv'on Mizrakh)	1977	N/A	0.106602
10	Giv'on HaHadasha	1980	1262	0.214422
11	Ma'ale Adumim + Mishor Adumim	1975	40,651	5.816062
12	Kfar Adumim	1979	5,038	0.604192
13	Geva Binyamin (Adam)	1983	6,226	0.617941
14	Gilo	1971	N/A	2.008174
15	Ramot Alon	N/A	N/A	2.755543
16	Kalya	1968	528	0.524238
17	Har Adar	1986	4,493	0.846762
18	Nofei Prat	1992	N/A	0.140194
19	Pisgat Ze'ev	1985	N/A	2.944492
20	Jewish Quarter	N/A	N/A	0.101237
21	The Hebrew University of Jerusalem	N/A	N/A	0.410671
22	Ramat Eshkol	N/A	N/A	0.634296
23	French Hill	N/A	N/A	0.573291
24	Ma'alot Dafna	N/A	N/A	0.146007
25	Talpiyot Mizrah (North Talpiyot)	N/A	N/A	1.153491
26	Giv'at Hamatos	1991	N/A	0.041218
27	Neve Yaakov	1972	N/A	0.928307
28	South Kedar	1985	N/A	0.019773

29	Bnei Adam	2004	N/A	0.076395
30	Nof Tsiyon	N/A	N/A	0.029929
31	Neve Erez	2001	N/A	0.034507
32	Ha'Ro'eh Ha'lvri Farm	2015	N/A	0.012673
33	Atarot Industrial Zone	N/A	N/A	0.937377
34	Binyamin Industrial	N/A	N/A	0.164367
35	Ma'ale Ha-Zeitim	N/A	N/A	0.011909
36	Beit Urot	N/A	N/A	0.011842
37	Shepard Hotel	N/A	N/A	0.005335
38	Tomb of Simon the Just	N/A	N/A	0.001557
39	Sheikh Jarrah colonized house	N/A	N/A	0.000246
40	Tell 648	2002	N/A	0.01264
	Total			25.975535

Table 18

Colonial settlements built-up area in Bethlehem

	Colonial Settlement Name	Establishment Year	Colonial Settlers population	Colonial Settlements Built-up Area (km^2)
1	Betar Illit	1985	70,813	2.903822
2	Tekoa	1977	4,787	0.881167
3	Sdeh Bar	1998	N/A	0.063386
4	Giv'at Hadagan	1995	N/A	0.199076
5	Giv'at Hatamar	2001	N/A	0.17808
6	Neve Daniel	1982	2,728	0.410382
7	Har Gillo	1972	1,709	0.256783
8	Nokdim	1982	3,191	0.394806
9	Rosh Tzurim	1969	1,108	0.269717
10	Elazar	1975	2,845	0.377316
11	Mitzpe Shalem	1971	241	0.12706
12	Ma'ale Amos	1981	1,327	0.134204

13	Efrat	1980	13,571	1.069602
14	Avnat	1983	270	0.073689
15	Har Homa	1971	N/A	1.240198
16	Gva'ot	1997	N/A	0.068974
17	Kfar Eldad	1982	N/A	0.152824
18	Kfar Ezion	1967	1,074	0.370109
19	Alon Shuvut	1970	3,404	0.561386
20	Bat Ayin	1989	1,905	0.372838
21	Metsoke Dragot	1975	N/A	0.039203
22	Ma'ale Rekhav'am	2002	N/A	0.033341
23	Givat Hahish	1998	N/A	0.035074
24	Ibei HaNahal	1999	N/A	0.100637
25	Ibei Hanachal farm	N/A	N/A	0.028861
26	Havat Kashuala (Kashuala Farm)	2012	N/A	0.014131
	Total			10.356666

Table 19

Colonial settlements built-up area in Hebron

	Colonial Settlement Name	Establishment Year	Colonial Settlers population	Colonial Settlements Built-up Area (km^2)
1	Metzad (Asfar)	1984	1,307	0.168423
2	Ma'ale Hever	1982	628	0.130358
3	Beit Hagai	1984	828	0.180126
4	Giv'at Harsina	N/A	N/A	0.327902
5	Kiryat Arba	1972	8,321	0.511554
6	Adora	1983	563	0.109387
7	Telem	1981	594	0.126052
8	Mitzpe Lachish (Giv'at Habooster)	2002	N/A	0.018594
9	Negohot	1982	581	0.090094
10	Eshkolot	1982	634	0.14722
11	Sansana	1997	835	0.143088
12	Teneh Omarim	1983	1,169	0.223327
13	Mitzpe Eshtemoa	2003	N/A	0.01641
14	Shim'a (Yonadav)	1985	1,070	0.326594
15	Otniel	1983	945	0.213601
16	Carmel	1981	613	0.208718
17	Ma'on	1981	691	0.250803
18	Avigayil	2001	N/A	0.053548
19	Susya	1983	1,641	0.299517
20	Beit Yatir (Metzadot Yehuda)	1980	730	0.319358
21	Livne (Shani)	1989	554	0.132746
22	Migdal Oz	1977	408	0.19925
23	Karmei Zur	1984	1,124	0.124401
24	Asael	2002	N/A	0.042403
25	Tzur Shalem	2001	N/A	0.017035
26	Pnei Kedem	2002	N/A	0.07099
27	Gal	2002	N/A	0.087861
28	Giva't Oz VeGaon (Oz Vegaon Forest)	2014	N/A	0.007741
29	Ancient Susya	2002	N/A	0.011986
30	Khan Meshek Man (Camping Farm)	N/A	N/A	0.040641
31	Gush Etzion Industrial Zone	N/A	N/A	0.089346
32	Beit Hadassah Vistors Center and Museum	N/A	N/A	0.000956
33	Beit Romano Yehivat Shavei Khevron	N/A	N/A	0.00219
34	Chabad of Hebron (Avraham Avinu Neighborhood)	N/A	N/A	0.002772
35	Hebron Observatory	N/A	N/A	0.001602
36	Otni'el Ben Kanz Tomb	N/A	N/A	0.003747
37	Beit HaShalom	N/A	N/A	0.001123
38	Mitzpe Yair	1998	N/A	0.04081
39	Mor Farm	1999	N/A	0.002779
	Total			4.745053

جـامعـــة النجاح الوطنية

كليـــة الدراســـات العليـــا

تقدير مساحات المستوطنات الاستعمارية الإسرائيلية وقياس توسعها وتحليل آثارها على التجمعات الفلسطينية في الضفة الغربية (1997-2023) باستخدام الصور الجوية

إعداد

عبدالرحمن كمال الضبع

إشراف

د. أحمد رأفت غضية

قدمت هذه الرسالة استكمالا لمتطلبات الحصول على درجة الماجستير في الجيوماتيكس، من كلية الدراسات العليا، في جامعة النجاح الوطنية، نابلس- فلسطين.

2025

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الملخص

تعاني الضفة الغربية من الاستعمار الاستيطاني الذي يقسم ويقطع اوصالها، ويؤثر على التجمعات الفلسطينية من عدة جوانب. تهدف هذه الدراسة الى تقدير المساحة المبنية للمستعمرات الاستيطانية الأسرائيلية وقياس مدى التوسع بين عامي 1997 و 2023 باستخادم الصور الجوية، وايجاد اثارها على التجمعات الفلسطينية. تتبع هذه الدراسة المنهج الوصفي التحليلي، حيث تم استخدام التحليل الخرائطي من اجل رسم المساحات المبنية في المستعمرات الاستيطانية الاسرائيلية وحدودها، ومن ثم استخدام ادوات التحليل المكاني في برنامج ال ;ArcGIS Pro تم استخدام المنهج الوصفي من اجل التعليق على الخرائط التي تم استخراجها.

اظهرت النتائج ان مساحة المناطق المبنية في المستعمرات الاستيطانية الاسرائيلية بلغت 88.59 كم2، وكان معدل التوسع بين العامين (1997 و 2023) يساوي 108.59%. كما تبين من نتائج التحليل ان هذه المستعمرات الاستيطانية تكشف 2805.76 كم2، اي ما نسبته 49.62% من مجمل مساحة الضفة الغربية.

الكلمات المفتاحية: المستعمرات الاستيطانية الاسرائيلية، التجمعات الفلسطينية، الضفة الغربية، نظم المعلومات الجغرافية، التحليل المكاني .