An-Najah National University

Faculty of Graduate Studies

AN ANALYTICAL STUDY OF THE ISRAELI OCCUPATION AUTHORITIES POLICIES AND PRACTICES IN THE ROADS AND TRANSPORTATION SECTOR IN THE WEST BANK: NORTHERN GOVERNORATES CASE STUDY

By

Ahmad Hussam Muhammad Abu Yaqoub

Supervisor

Prof. Sameer Abu-Eisheh

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

2025

AN ANALYTICAL STUDY OF THE ISRAELI OCCUPATION AUTHORITIES POLICIES AND PRACTICES IN THE ROADS AND TRANSPORTATION SECTOR IN THE WEST BANK: NORTHERN GOVERNORATES CASE STUDY

By

Ahmad Hussam Muhammad Abu Yaqoub

This Thesis Was Defended Successfully On 27 / 2 / 2025 And Approved By

Prof. Sameer Abu-Eisheh	
----------	----------
Supervisor	**Signature**
Dr. Samer Raddad	
----------	----------
External Examiner	**Signature**
Dr. Amjad Issa	
----------	----------
Internal Examiner	**Signature**

Dedication

This work is dedicated to the souls of all those who moved to their Lord's side during this war, in order to seek their Lord's consent and in pursuit of a decent life, to this people who always dreamed of their freedom without receiving it, to the souls of my grandfather and my grandmothers, to dear parents who did everything they could for me, to my dear brother and my sisters, to my teachers who gave their knowledge to get from him, to friends, to everyone I knew who had a beautiful impact.

Acknowledgement

I would like to thank everyone who contributed and helped to accomplish this work, starting with professor Sameer Abu-Eisheh, for providing his experience, information and data available to him in order to accomplish this work.

I also thank with all my heart all those who studied me at this stage, and the previous stages, as they had all a good effect on me.

I would also like to thank the brothers, each in his position and named in the Palestinian Police, especially Brigadier General Riyad Barham, as well as the Ministry of Public Works and Housing, specifically Eng. Sawsan Abu Daqr, in addition to the Ministry of Local Government Eng. Jehan Metwally and the GeoMOLG crews represented by its director Jamal Zaitawi and the municipality of Sinjel Mr. Fouad Shabana, and all the institutions that I contacted to come up with this work, Where I found generosity, good treatment and provision of information without delay.

Finally, I repeat my thanks and appreciation to those who have given me all the credit, my dear parents, my dear brother and sisters who have been and continue to support me.

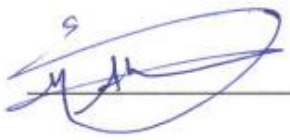
Declaration

I the undersigned, declare that I submitted the thesis entitled

AN ANALYTICAL STUDY OF THE ISRAELI OCCUPATION AUTHORITIES POLICIES AND PRACTICES IN THE ROADS AND TRANSPORTATION SECTOR IN THE WEST BANK: NORTHERN GOVERNORATES CASE STUDY

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: Ahmad Hussam M. Abu Ya'qoub

Signature: 

Date: 27/2/2025

List of Contents

List of Tables

List of Figures

List of Appendices

AN ANALYTICAL STUDY OF THE ISRAELI OCCUPATION AUTHORITIES POLICIES AND PRACTICES IN THE ROADS AND TRANSPORTATION SECTOR IN THE WEST BANK: NORTHERN GOVERNORATES CASE STUDY

By
Ahmad Hussam Muhammad Abu Yaqoub
Supervisor
Prof. Sameer Abu-Eisheh

Abstract

Background: The roads and transportation sector in the West Bank, Palestine, has been impacted by the Israeli authorities since occupation in 1967, which radically restructured the sector to serve their colonial interests. This has disrupted accessibility and mobility of the Palestinians. This research uniquely addresses this sector within the Zionist colonial context.

Aims: The main goal of the research is to identify the Israeli policies, procedures, and practices concerning roads and transportation in West Bank, and define countermeasures to improve the Palestinians' ability to travel. The objectives include defining the road network changes made by the Israeli occupation authorities serving the ambitions, assessing their impacts on the Palestinians and the discrimination between Palestinians and settlers concerning transportation issues, and proposing countermeasures to ease the related suffering of the Palestinians.

Methodology: Both quantitative and qualitative methods were used. Collected literature, Israeli plans and military orders, were reviewed. Interviews with official representatives of relevant institutions were conducted. Spatial and technical Analyses were conducted concerning the Israeli policies and practices concerning mobility, accessibility, geometric design, traffic safety, traffic control, and planning of roads, mainly through case studies. GIS tools were well utilized in spatial analysis. Temporal analysis was conducted through change detection analysis.

Main results: The research shows that Israeli measures severely restrict Palestinian's accessibility and mobility. The results confirm the presence of apartheid policies between the Palestinians and settlers, including those related to planning and constructing bypass roads and limiting their use by Palestinians. It is found that these measures deliberately

ignore the mobility, accessibility, and traffic safely aspects for the Palestinians. Such Israeli measures limiting the Palestinians mobility have been intensified in the past few years. Domination over the road network could impact the establishment of an independent Palestinian State.

Conclusions of the study: The Palestinian National Authority must take immediate action, including seeking support from international courts and UN institutions. Realistic countermeasures, such as improving connections among Palestinian communities and developing alternative roads, are needed to alleviate the suffering of Palestinians accessibility and movement.

Keywords: West Bank roads and transportation; Israeli colonial regime; Israeli bypass roads; Palestinian's mobility and accessibility; Impacts of Israeli measures.

Chapter One

Introduction

1.1 Background

It is known that one of the measures of a country's prosperity is the level of development of roads and transportation sector. This requires having good road and transportation infrastructure, which provide connectivity, accessibility, and mobility though proper planning, design, and construction of road and transportation facilities. However, when it comes to a country being under occupation by a colonial regime, the occupier's one of the top priorities is to exhibit full control of the roads and transportation to facilitate its control on that land. In such case, the road and transportation system becomes a tool to disconnect and fragment the occupied territory, limit accessibility, and restrict mobility of the nation under occupation.

This is what actually is happening on the part of Palestine that the Israeli colonial authorities occupied in 1967. The Israeli occupation authorities are still in control of the vast majority of main and regional roads of the West Bank, claimed to be located in the so-called area "C", forming about 60% on the total area of the West Bank [1]. On the other hand, the Israeli occupation authorities still restrict the movement of people and goods from and to Gaza Strip, despite it has apparently withdrew its occupation forces from inside the strip in 2005.

Since the occupation of the West Bank in 1967, the Israeli occupation authorities started to plan and construct roads to serve their claimed security and settlements objectives. This is continued until today, despite the signed Oslo agreement with the Palestine Liberation Organization (PLO) in 1993, and the establishment of the Palestinian National Authority (PNA) on parts of the West Bank and Gaza Strip in 1994. The Israeli restrictive measures were intensified during and after the start of Second Intifada in 2000, where the Palestinians mobility was greatly restricted. The occupation authorities started building the apartheid wall in 2002, which was planned to isolate 46% of all roads in the West Bank [2].

The Israeli occupation authorities have been systematically separating the roads and transportation network in the West Bank to form two systems of roads, one for colonial

settlers and the other for the original Palestinian citizens. Of course, the settlers' network has high standards in planning, design, and construction, unlike the network serving the Palestinians, which is lagging behind.

One of the most recent plans to ensure the separation and control of the road network in the West Bank was the so-called "Deal of the Century" announced by the former US President Donald Trump in 2019, which was well coordinated with the Israeli plans to continue their control of the road system in the West Bank. It included proposals and financing mechanisms for the future road system in the West Bank by constructing many links and tunnels to be managed by the Israeli occupation authorities, which connect the cantons of the rest of the West Bank lands, away from the roads used by settlers.

The Israeli occupation authorities have invented many policies, and have implemented procedures, as well as conducted practices, that aim to limit accessibility and restrict the Palestinian citizens' mobility. Other road-related adopted policies and implemented practices and procedures, at the opposite, aimed to serve the colonial settlers in the West Bank through new bypass roads, and to ensure the claimed objectives of their security and free movement on roads. All the roads serving the colonial settlers have been built on confiscated Palestinian land. Ironically, Palestinians are totally and permanently forbidden to use some of these roads, while the passage of the Palestinians on the most of these roads is restricted thorough military check points.

In this research, the policies, procedures, and practices that have been taken by the Israeli occupying forces concerning the road and transportation sector in the West Bank will be analyzed and assessed. The extent of the related impacts on the Palestinian road network in the West Bank and on the Palestinian citizens will be thoroughly studied and evaluated, proper connections will be drawn, and specific recommendations will be identified to counterfort the Israeli Authority policies, procedures, and practices.

1.2 Significance of the Research

The importance of this research lies in the fact that it is a unique study in addressing the road and transportation sector in the West Bank in the Zionist colonial context.

The importance of this research also lies in the need for better understanding of the policies, procedures, and practices of the Israeli occupation authorities concerning the road network in the West Bank, which have been limiting the use of the Palestinian citizens to various parts of the network. In addition, it will identify the differences and compare these with the policies and practices aiming to serve the settlers in the West Bank, which have resulted in a sort of "apartheid" road system.

The importance of the research also stems from the need to identify the short- and long-term effects of such policies, procedures, and practices on the connectivity, accessibility, and mobility, which have been observed over the course of years of the occupation. This will facilitate identifying and proposing countermeasures that will help the decision-makers to act with the aim at relieving the Palestinian citizens and ensuring having a safe and fast road network with proper accessibility and mobility as an ad-hoc measure until the sovereign Palestinian State is established.

1.3 Research Objectives

The aim of the research is to understand the policies, procedures and practices of the Israeli occupation authorities related to the roads and transportation sector in West Bank, in order to improve the Palestinians' mobility and ability to travel in light of the policies and practices of the Zionist occupation of the West Bank. This can be achieved through considering the following objectives:

- Identify the policies and plans set by the Israeli occupation authorities and their effects regarding the roads and transportation network in the West Bank, as well as their impacts on the Palestinian citizens.
- Assess the changes in the road network in the West Bank in so-called area "C over the years of occupation.
- Compare the Israeli policies, procedures, and practices concerning roads and transportation for the Palestinian citizens with those for the colonial settlers, and assess to what extent a dual apartheid road system is being planned and implemented in the West Bank to examine the extent of the Israeli apartheid policy.

- Propose countermeasures to these policies, procedures, and practices that aim at helping the Palestinian decision-makers to alleviate the suffering of the Palestinian citizens until the sovereign Palestinian State is established.

1.4. Methodology

In this section, the methodology that is used to complete this thesis is presented. Both quantitative and qualitative methods were used. The study area was specified, the relevant literature was reviewed, and the necessary data and information were determined in order to be collected from its various sources. It also presents the approach for analyzing the data and coming up with results and making appropriate conclusions and recommendations.

1.4.1 Study Area

The West Bank region, which constitutes the northern governorates of Palestine, was chosen as the study area due to the clear impact of the policies, procedures and practices of the Israeli occupation since 1967 on its roads and transportation sector. To be more precise, the study area concentrates on Area C defined based on Oslo Accords, which constitutes 60% of the West Bank lands. Case studies targeted for detailed analysis were selected from specific parts of the West Bank.

1.4.2 Literature Review

Literature review was conducted to study and benefit from previous studies on the subject. Official reports as well as previous studies and research related to the Israeli plans and policies concerning the road and transportation sector in the West Bank was collected and reviewed, whether from Israeli, Palestinian, or international sources. This also includes reviewing the relevant military orders.

1.4.3 Data Collection

- Data were collected concerning the Israeli occupation authorities plans and policies related to the road network in the West Bank. Moreover, information were gathered on what has been implemented from these, and what future relevant plans have been prepared regarding the road network in the West Bank. Relevant Palestinian plans were collected as well.

- For proper spatial analysis, necessary GIS layers were collected from their sources as follows:

- Layers for the road network in the West Bank from the GeoMOLG, the geospatial web mapping application in Palestine.
- Layers for future plans to be implemented by the Israeli occupation authorities from Israeli occupation authorities' websites, as well as layers for the old road network and what was built afterwards through change detection analysis via Google Maps.
- Layers for the locations of Palestinian communities as well as settlements and outposts from GeoMOLG.
- Layers related to traffic safety, such as the layer of black spots in the road network from Ministry of Public Works and Housing (MPWH).
- Layers on the political division of the territories of the West Bank from GeoMOLG.

- Old and recent aerial photographs and maps over several years, were collected from Google maps and GeoMOLG, in order to monitor and analyze changes in the structure of the road network in the West Bank made by Israeli authorities to serve the occupation security and colonial settlement goals.
- A sample of road design plans was collected, which were prepared and/or submitted by the Palestinians to connect their communities with the nearby main and regional roads located in so-called area "C". Information on the Israeli authorities' response to these plans were also collected.

1.4.4 Interviews

Semi-structured interviews will be conducted with officials and experts to obtain more information about the plans of the Israeli occupation authorities, as well as their policies and practices related to roads in the West Bank. The associated effects on the Palestinians will also be investigated through the interviews. The findings in the interviews, information on what was planned by the PNA in the road and transportation sector in the so-called area "C", and was accepted or rejected by the Israeli occupation authorities.

1.4.5 Analysis

The collected data will be analyzed as follows:

- Analyze the collected data regarding accessibility and mobility. The accessibility index for specified routes connecting Palestinian communities will be calculated and analyzed.
- Conduct analysis of geometric design and traffic control on a selected sample of roads and intersections in the northern governorates of the West Bank. The outcomes will be examined to assess the degree to which the Israeli policies, procedures, and practices discriminate against the Palestinians.
- Conduct analysis of the collected data regarding the extent of the related impacts on the comfort of Palestinian citizens using the roads.
- Use change detection analysis to analyze changes in the structure of the road network made by the Israeli occupation authorities with time.
- Conduct a comparative analysis of the impacts of the road-related policies, practices, and procedures concerning accessibility, and mobility of the Palestinian citizens with respect to the Israeli colonial settlers.
- Conduct a detailed case study analysis on selected intersections in the northern governorates of the West Bank, and compare the policies, procedures, and practices of the Israeli occupation authorities concerning the selected intersections.

1.4.6 Conclusion and Recommendations

Based on the results of analysis, conclusions will be identified, as well as recommendations will be proposed to ensure mobility, accessibility, and safety of Palestinian citizens on road network in the West Bank.

1.5 Contents of the Thesis

The study consists of four chapters. The first chapter is an introduction to the topic related to identifying and highlighting the policies, practices, and actions taken by the Israeli occupation authorities in the roads and transportation sector in the West Bank, significance of the research, as well as its objectives and the research methodology. In addition, it includes a review of related literature to the subject of research that helps in understanding the subject. This is followed by the second chapter, which presents

the collected data and information, and analyzes these in depth using the tools presented in the methodology, in order to come up later with conclusions about the policies, procedures, and practices taken by the Israeli occupation authorities in the West Bank concerning the road network and the transportation sector. The third chapter presents the research results and summary. Finally, the fourth chapter presents the conclusions and recommendations that include proposed countermeasures.

1.6 Literature Review

1.6.1 Introduction

In this section, studies, documents, papers, and statistics related to what the Israeli occupation authorities have done in the roads and transportation sector in the West Bank, will be reviewed. This will illustrate the stages carried out by the Israeli occupation authorities in changing the road network in the West Bank, since the occupation of the West Bank in 1967 until the Oslo agreement through the second intifada to the present period.

Review of what has been published on the bypass roads in the West Bank as well as the restrictions imposed on the movement of Palestinian citizens are presented in this chapter. Moreover, literature review includes what has been published about the apartheid wall and its impact on the road and transportation sector in the West Bank, and a review of the impact of the bypass roads and apartheid wall on Palestinian citizens as a result of the changes, procedures, practices and policies applied by the Israeli occupation authorities. Finally, review of the published literature about the apartheid regime in South Africa as related to road and transportation, comparing it with what has happened and is happening in the West Bank by the Israeli occupation authorities.

Over the years of the occupation of the West Bank, the Israeli occupation authorities have made major changes to the roads and transportation network in order to serve the interests of its occupation, and these changes will be described in the following section.

In this section, global colonial policies and practices related to road and transportation is presented first, then literature is presented concerning the stages of evolution of such policies and practices by the Israeli colonial regime in the West Bank.

1.6.2 Global Colonial Policies and Practices Related to Road and Transportation

Colonial transportation systems were engineered to consolidate power and exploit resources, often disregarding indigenous people needs. Roads, railways, and ports prioritized extracting raw materials (e.g., minerals, crops) for imperial markets while enabling military control over territories. These infrastructures reinforced spatial hierarchies, segregating colonized populations from settler zones. Postcolonial nations inherited fragmented networks that still shape urban inequities and environmental degradation today. Colonial road planning reveals how infrastructure served as both a physical and ideological tool of domination, embedding enduring legacies of inequality in global landscapes.

Hereafter are some global examples of colonial systems and the impact of the related policies and practices concerning road and transportation.

Scott argues that colonial powers designed infrastructure like roads and railways to make territories "legible" for governance and exploitation. For example, straight-line roads in Southeast Asia replaced indigenous footpaths to facilitate military movement and tax collection, erasing local spatial knowledge. This "high modernism" prioritized efficiency for colonial administrators over the needs of colonized populations, often leading to social and environmental disruption [3].

Kerr examines how British-built railways in India were primarily designed to extract raw materials (e.g., cotton, coal) for export to Britain, rather than to serve local economies. The railway network connected inland resource hubs to coastal ports, reinforcing economic dependency. While railways later became a unifying force in India, their colonial-era construction displaced communities and prioritized imperial profit over regional development [4].

By using GIS mapping to show how colonial-era railways in Kenya (e.g., the Uganda Railway, nicknamed the "Lunatic Express") shaped long-term economic geography. The railways were built to transport goods from inland farms to ports for European markets, sidelining indigenous trade routes. Post-independence, these rail lines continued to influence urban growth and trade patterns, perpetuating colonial spatial inequalities [5].

1.6.3 Stages of Road Changes in the West Bank Since Occupation

After the establishment of the Israeli regime in 1948 and until the occupation of the West Bank in1967, the West Bank and the Gaza Strip were regulated by Jordan and Egypt, respectively.

The total length of the West Bank paved road system was 656 km in 1947, and 1332 km in 1967. The additional 350 km of paved roads by the Israeli administration represents a 26.2 % increase. There has been a considerable improvement in road quality, as the length of class one roads increased from 368 km to 731 km, the additional length of 363 km is due mainly to Israeli partisan interests [6].

Road alignment as well as road construction reflect the geo-political planning strategies of the prevailing Israeli occupation authorities. Under the Israeli occupation authorities rule for the West Bank, the roads alignment has changed in conformity with the geostrategic conceptions of the different Israeli governments [6].

Interestingly, beginning around 1967, the Palestinians in the occupied Palestinian territories (oPt) had the option to travel freely in generally, between the three regions (West Bank, the Gaza strip and the region inside the green line) for around 20 years.

This was permitted in order to integrate the economy of the oPt with the Israeli economy in order to limit the Palestinian national aspirations and undermine the establishment of an independent Palestinian state, not in order to achieve equality between settlers and Palestinian citizens. [7].

Since the early days of the occupation, in the 1970s and 1980s, the Israeli occupation authorities built many express bypass roads in the West Bank. The main goal of these was to connect the settlements to the main cities inside Israel, which was a decisive basis for settlement expansion according to the Israeli government's awareness [8].

By mid-1970s, the Israeli occupation authorities began planning the so-called Trans-Samaria Road, intended mainly for military purposes to facilitate rapid travel from the coastal plain to the defense line along the Jordan Valley [6].

With the Likud party in power, the linear orientation (north-south) of the road network was abandoned, and replaced by a road system based on east-west axes, where the

goal was to completely integrate the West Bank and Israeli road systems and to facilitate the establishment and expansion of Jewish settlements in all parts of the West Bank [6].

In the mid-1980s, the document of Israeli settlement planning indicated that the road is the main factor motivating settlement activity in areas where settlements are important, and their advancement would lead to development [8].

There are many Israeli plans that have been launched to divide the West Bank through bypass roads over the years of the Israeli occupation, including the Allon plan in 1967, the Gush Ammonim plan in 1976, and the Sharon plan published in 1981. However, the most important is the Matityahu Drobles plan announced in 1978 [9].

Figures 1a, 1b, 1c, and 1d in Appendix 1 illustrate the maps of Allon plan, Gush Ammonim plan, Matityahu Drobles plan, and Sharon plan, respectively.

Many military orders have been issued by the Israeli occupation authorities with the same goal; dividing the West Bank into cantons through constructing bypass roads. A number of relevant military orders include the following:

- Military order No. 321 in 1969. This authorizes the Israeli military to confiscate private land for public uses (the meaning of public uses has not been specified) and without providing compensation to the affected party. The Israeli army used this military order mainly to build a road network for the army inside the West Bank, as well as for Israeli settlers, for whom the Israeli occupation authorities fled alternative routes away from Palestinian residential communities in the occupied areas [10].
- Military order 418 in 1971. Through this military order the participation of Palestinian local authorities and relevant institutions such as the engineer's union in road planning operations was withdrawn, contrary to Jordanian law, which was in force on the territory of the West Bank. By this order, the Israeli occupation authorities took advantage of the road planning process in the West Bank [11].
- The most important of these are the military order No. 50 in 1984, which establishes a new road network in the West Bank. Figure 1a illustrates the road network, considering the main and regional roads and excluding the local roads,

that existed before 1984 and Figure 1b shows the road network that was implemented until 1989 following Order No. 50.

The majority of these plans were based on two parallel road systems in the West Bank; one for Israeli use, and the other in existence prior to 1967 for the Palestinian use. These plans have created these two road systems later.

“Matityahu Drobles plan aimed to establish 70 settlers’ community settlements in the West Bank over a period of 13 years. It envisioned a steady increase in settlers to 120-150 thousand through the establishment and intensification of settlements. Key principles of the project included the creation of 12-15 new settlements annually and the expansion of existing ones, with the goal of shaping the demographic landscape of the region” [9].

All the indicated plans had led to a reduction in the Palestinian land on which Palestinian communities can be expanded and established.

With regard to public transportation in the West Bank, the network of Arab bus lines reflects the regional character of the Palestinian public transportation system. This network has remained virtually unchanged for about two decades under Israeli administration, and the system, being inefficient, shows the lack of regional planning and negligence by the Israeli occupation authorities [6].

On the contrary, The Israeli public transportation system in the West Bank is operated by Egged, the Israeli national bus company. All bus lines originate in towns situated within the "Green Line" (except Kiryat Arba close to Hebron), and the West Bank grid is fully integrated into the national system. All the Israeli settlements are connected, and Arab localities are usually bypassed. A comparison of Arab and Israeli grids illuminates the dual nature of Israeli and Palestinian systems on the West Bank [6].

1.6.2.1 Pre-Oslo Agreements

The Oslo agreement is an agreement concluded between the Palestinians represented by the PLO and the Israeli regime in 1993. It had included a partial handover of the West Bank and the Gaza Strip to the Palestinians within a certain period of time (a transition period of up to five years) in two stages:

1. The withdrawal of the Israeli occupation forces from parts of the territories of the West Bank and the Gaza Strip and the establishment of self-government for the Palestinians.
2. Start of negotiations between the Palestinians and the Israeli regime on final status issues.
3. Oslo Agreement constitutes key milestone in the history of the conflict between the Palestinians and the Israelis, through which members of the PLO were allowed to enter the West Bank and the Gaza Strip, and where the PNA was established in the hope of forming a Palestinian State that meets the aspiration of the Palestinians.

Figure 1

Map of Existing Road Network Before 1984 and Implemented Network According to Order No. 50 by the Israeli occupation authorities

Figure 1a

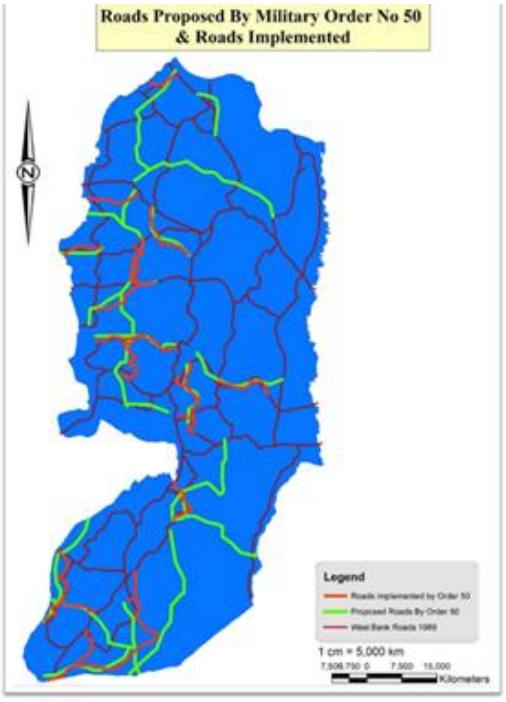


Figure 1b

Data Source: [12] [13]

Among the needs of the Palestinians is the necessity to develop the road and transportation sector in the West Bank and the Gaza Strip to serve the interest of the Palestinians.

Since occupation of the West Bank in 1967, the Israeli occupation authorities have begun to build a system of roads that is characterized to be complex, in order to establish control over the Palestinian territories in the West Bank, in addition to promote and support the Israeli settlements establishment and expansion. Since then, Palestinians use of the road network has been restricted and/or controlled by the Israeli occupying forces, which have denied or limited access of the Palestinians to considerable sections of the road network.

Most of the roads that the Israeli authorities' control, as well as the bypass roads which they built around the Palestinian communities, were constructed on private Palestinian land under the umbrella of two legal means; the seizure for military needs and expropriation for public use [14]. Successive Israeli governments since 1967 have built a network of these bypass roads, restricting the free movement of the Palestinians and the ability to build and develop.

Soon after the occupation in 1967, the Israeli military authorities realigned the road network in the West Bank to serve their interest, and accomplish their strategy, by integrating the West Bank with Israel [15]. They also planned for the construction of new roads to guarantee security and easy access for Jewish settlers.

The main Israeli military authorities' efforts in road planning in the West Bank was the Regional Partial Outline Plan for Roads - Order No. 50 for the year 1984, which created two separate road systems, one for the Palestinians and the other for the Israeli settlers [14]. This plan includes determining the types of roads that will be included in the network at the end of its construction in the occupied West Bank, specifying their lengths, the width of their right of way (ROW), and the setback of construction lines on both sides of the roads. Highlights of relevant items included in this scheme are summarized in Table 1. The map in Figure 2 illustrates the extent of the road network included in the plan.

The World Zionist Organization prepared in 1986 a plan that proposed the construction of about 345 km of roads. Part of this plan was later implemented. It is

worth mentioning that the Palestinian roads were totally ignored whether in planning or development. Very light routine maintenance activities were implemented by the general public works department chaired by a military officer [15]. The new constructed and improved roads were intended to serve the Israeli military forces and Jewish settlers without taking into consideration the Palestinian interests and needs.

Table 1

Highlights of the Regional Partial Outline Plan for Roads - Order No. 50

Road Type	Road width ROW (m)	Setback from the middle of the road to construction line* (m)	Road length (km)	Road Area** (km^2)	Set Back Area*** (km^2)
Highways	120	150	93.5	11.2	28
Main Roads	100	120	517.5	51.7	124.2
Regional Roads	60	100	636	38.2	127.2
Local Roads	40	70	727	29.1	87.6
Total			1873.5	130.2	367

* Setback distance for one side of the road, for both sides to be multiplied by 2.

** Areas confiscated for the construction of the road network by the Israeli occupation authorities.

*** Areas cannot be used by Palestinian citizens in urban expansion.

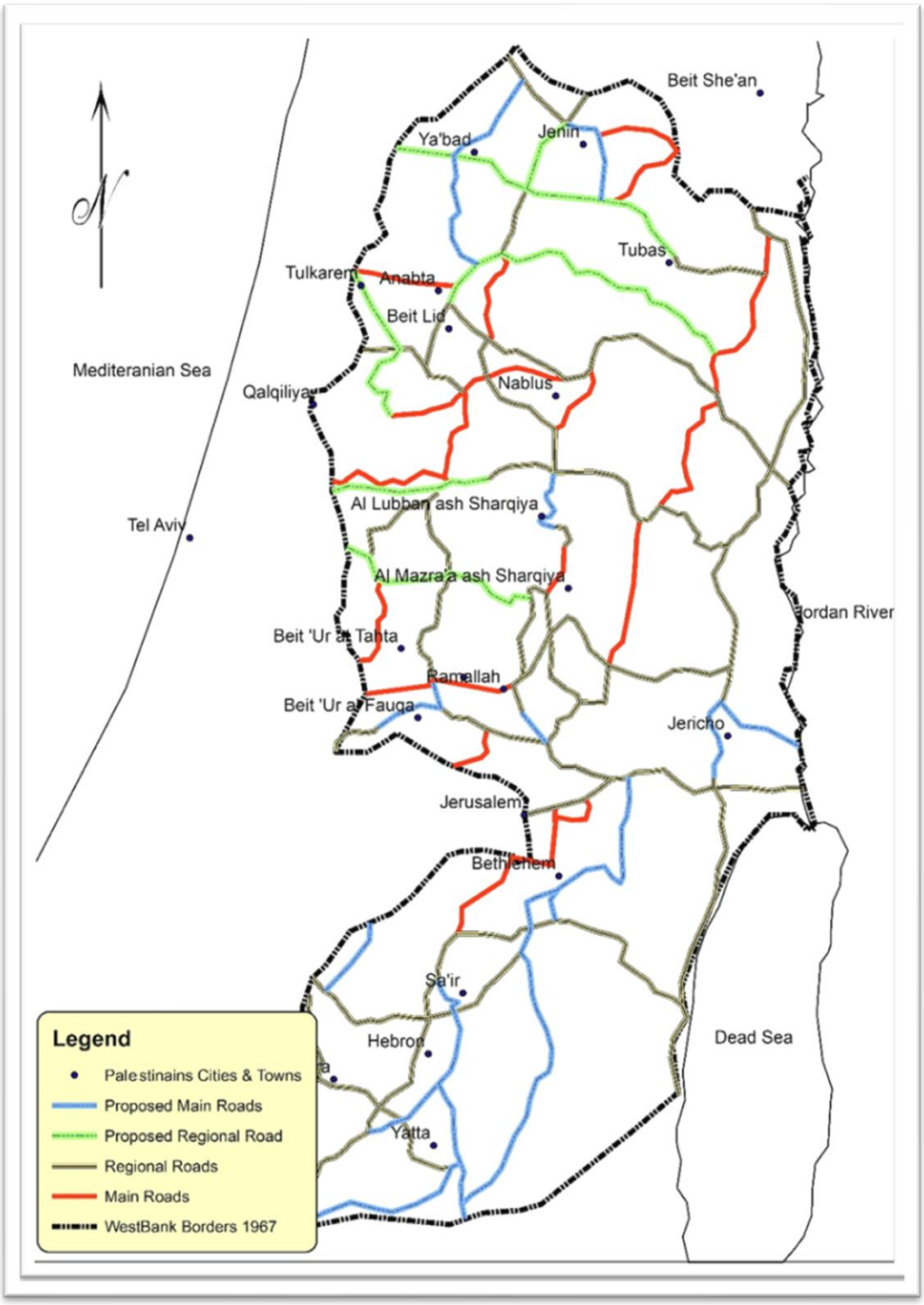
Source: [16]

The road network planning and development was based on principles that include integrating the two roads' networks of the West Bank and Israel, developing the Jewish settlement processes, bypassing the Palestinian urban centers, and linking the existing Jewish settlements together [15].

Benvenisti in 1988 noted that "in practice, two parallel road systems have been created on the West Bank, a new/upgraded road system for Israelis/settlers, and another, in existence prior to 1967 and with certain improvements, for Palestinian use" [7].

Figure 2

The road network of the Regional Partial Outline Plan for Roads - Order No. 50



Data Source: [16]

1.6.2.2 Post-Oslo Agreements

The post-Oslo Agreement bypass roads were intended to serve the Israelis traveling in the West Bank. Accessibility to a number of these bypass roads is limited to Jews, such as the bypass road west of the city of Bethlehem, connecting Gush Etzion block of settlements with Jerusalem [17].

The Israeli writer and journalist "Amos Oz", in his book "Life on Earth" published in 1983, referred to the "Forbidden Roads Regime" as a way of describing restrictions on the movement of the Palestinians in the West Bank, indicating what it was designed in accordance with the geopolitical area designation established in Oslo Agreements. Israeli officials contend that this arrangement is a reasonable solution. Palestinians who need to travel from a Palestinian canton to another, must cross the so-called Area C, which is subject to the Forbidden Roads Regime. On the other hand, Israelis can move freely between the settlement blocks and to/from Israel, without the need to enter Areas B or A [18].

The territories of the West Bank were divided according to the Oslo agreement into five jurisdictions. These include the following:

- The first jurisdiction, called (Area A), includes the areas that are under the security and administrative control of the PNA. These areas were concentrated in or around Palestinian cities, which constitutes 17.7% of the area of the West Bank with an area of 1037.2 km^2.
- The second jurisdiction, called (Area B), includes areas that are administratively under the PNA, while their security is controlled by the Israeli occupation authorities. These areas were concentrated in or around the Palestinian villages and towns, which constitutes 18.4% of the area of the West Bank with an area of 1078.2 km^2.
- The third jurisdiction, called (Area C), includes the areas that are administratively and security-controlled by the Israeli occupation authorities, which make up the rest of the West Bank, which constitutes 59.6 percent of the area of the West Bank with an area of 3492.6 km^2.
- The fourth is called (Area H1& H2), where these areas are located in the Hebron City for H1 and H2, where H1 area administratively and security-wise falls under

the PNA, while H2 administratively and security-wise is controlled by the Israeli occupation authorities.

- The fifth in Jerusalem Governorate is called (J1 & J2), where J1 was annexed by the Israeli authorities after occupation in 1967. It is under full control by the Israeli occupation authorities. J2 area which constitute the remaining communities of the Jerusalem Governorate, and is administratively under the PNA.

Figure 2 in Appendix 1 illustrates the map of jurisdiction areas in West Bank according to political classification.

B'TSELEM (the Israeli pro-peace organization) research indicated that the West Bank contained 17 sections of roads or roads, where Palestinian vehicles were totally prohibited in 2004, which are still closed to present period. These include, for example, Road No. 557 that connects the settlements of Itamar and Alon Moreh that surrounds the city of Nablus, which also leads to Palestinian communities such as Beit Furik and Beit Dejan.

There is also Road No. 443 that passes through the lands of villages west of Ramallah/Al-Bireh Governorate, which connects the areas inside the green line with Ramallah area and extends to the north of Jerusalem.

The length of these 17 roads is close to 120 kilometers. The West Bank contained 10 sections of roads or roads that fell in the category “partially prohibited”, totaling 245 kilometers. Moreover, it was found that there were 14 roads or sections of roads in the West Bank within the category “travel is restricted”, totaling some 365 kilometers [18].

Figure 3a in Appendix 1 illustrates the map of the forbidden roads regime which has not changed since 2004 and remained the same until now.

It is to be noted that the category of “completely prohibited roads” is fixed in a way or another, as is the enforcement level of travel prohibition. During periods of so-called "calm," the Israeli military authorities was less enforcing the prohibiting the Palestinians to travel on these roads. Thus, Palestinians travel on such roads could increase and a decrease of the difference between these categories could be noticed [18].

The Israelis have been trying to implement their strategy of "Disinfected Road System", where they were trying to create two road systems [19]. The increase in the area of land confiscated in favor of the bypass road network reached 100% in 2009 compared to 1997 [1]. In Bethlehem city-region alone, there was about 114 km of bypass roads that connect the Israeli settlements and bypass the Palestinian communities and left these in isolated cantons [1].

Many plans and projects prepared by officials of successive Israeli occupation authorities have been implemented, the most prominent of which is the Mattiyahu-Drobles plan, that guided the Likud's settlement policies until 1983, and then followed by Sharon's plans, which significantly strengthened the settlements during the years 1983-1987, aiming to add 100,000 settlers to the West Bank settlements [9].

Sharon's plans continued until 1993, when he launched the so-called 7 Stars project, which aims to establish a continuous series of settlements along the Fourth of June line from 1967 [9].

Then Benjamin Netanyahu completed settlement projects in the West Bank in 1996, under the name of the permanent solution map [9], which included three No's:

1. No to the Palestinian state.
2. No to redeploy.
3. No to stop the settlement.

These plans and projects had a significant impact on the road network in the West Bank.

1.6.2.3 During the Second Intifada

During the Second Intifada and following years, the Israeli occupation authorities built and established the infrastructure for various types of barriers in addition to the racist apartheid wall, and considered it a decisive stage for that [20].

The Israeli occupation authorities have dismembered the West Bank by building the apartheid wall, in addition to preventing the Palestinians from entering the areas of Jerusalem and the areas within the Green Line unless they have special permits from the Israeli occupation authorities [20].

The Israeli occupation authorities have sought, through many colonial measures such as the Apartheid Wall, the watchtowers, the settlements, the cement blocks, the checkpoints, the tunnels, the bridges, the security cameras, the barbed wire, the "blue wolf" technologies, as well as other regimes of control, bypasses, domination, and punishment, to divide any geographical continuity and fragment what is already disjointed, because the geographical connection does not exist between the areas of the West Bank, or it is fragile and tortuous where the use of which after the Second Intifada increased very significantly through restricting movement policy [20].

This led to severely impacting the transportation sector, which is consider to be providing essential services to the Palestinians and their various socio-economic aspects [20].

According to reports issued by the B'TSELEM published in 2007, there were 537 barriers of various types. These tangible barriers included all types of obstacles as follows (iron gates, boulders, cement blocks, ditches, walls and mounds of earth), reaching 445 obstacles. There were 82 permanent checkpoints, 35 of which were permanent barriers examining closely all who entered Israel, and 47 checkpoints to control (reducing, prohibit and allowed movements) the movement of Palestinians inside the West Bank, in addition to restrictions on movement through the Apartheid Wall, "flying checkpoints", a state of siege and bypass roads during second Intifada and the period after [20].

The Palestinians responded to those closures. They opened new roads during the First Intifada while others connecting the Palestinian villages with each other were opened during the Second Intifada. These roads now constitute the lengthy alternative for Palestinians who need to travel between West Bank communities [20].

Israel built bypass roads around Palestinian population centers without the need of the Israelis to entering them, in order to connect the settlements to each other and to Israel, creating two separate networks of roads, with the high-quality characteristics bypass road network reserved for the use of Israeli settlers. This was done during the Second Intifada by preventing Palestinians from using the bypass roads, which led to the formation of isolated enclaves. An Israeli planning document for Israeli settlements in the West Bank, prepared in 1997, which clarifies roads reserved for Palestinians and

roads for Israelis as an alternative to shared roads. The document also states that the separation system and separate roads are the preferred system that provides a solution to the separation system [8].

1.6.2.4 After Second Intifada Until Now

The following years after second intifada, a significant increase in investment in the construction of bypass roads in the West Bank was noted, in addition to investment in transportation planning, which worked mainly to improve the connectivity and integration of the express bypass roads between the West Bank and Israel, which is an indication that Israeli officials are moving towards unified planning between the West Bank and Israel roads. This move has helped aid what former Minister of Transportation Bezalel Smotrich termed “sovereignty through transportation” in the 2019 infrastructure work plan for the settlements that he published. In Smotrich’s words, “whoever wants to bring a million settlers to West Bank needs to build a network of transportation infrastructure, roads, and public transportation” [8].

The Master Plan for Roads and Transportation for the year 2045 covering the area of the West Bank was recently issued by the current Israeli Minister of Transportation, Miri Regev, in continuation of the directions of successive Israeli governments. The aim of this plan is to guide the work of the ministry during the following years in the implementation of the vision of the Israeli occupation authorities for the transportation sector in the West Bank. In the words of the Head of the settlements of Yesha Council, David Elhayani, "It is exciting to see, after 53 years of settlement, the master plan for transportation in Judea, Samaria and the Jordan Valley. This plan brings about de facto sovereignty and connects the settlements to the rest of the country. It's time to turn it into reality on the ground” [8].

Peace Now’s Settlement Watch team has documented at least nine new unauthorized roads that have been paved since the onset of the war after 7th October, 2023. Each of these roads spans hundreds of meters, with many extending for several kilometers. Often, the construction of a new road facilitates takes over significant area, hindering or preventing Palestinians from accessing their lands near the road. These new roads provide convenient access from main highways or settlements to recently established outposts and agricultural settlements areas used by settlers. Some of these roads have been laid on private Palestinian lands. During the war, some of the paved roads were

asphalted, allowing smooth travel with minimal obstacles. In some instances, the initial road construction was facilitated using heavy mechanical equipment. In at least one case, a road was paved within a declared nature reserve [21].

Examples of such unauthorized roads that were built during the war after 7th October period according to Peace Now team [21] include:

1. Sneh Yaakov/Gigawatt Ronen Outpost near the village of Burin-Unauthorized Road on the lands of the village of Burin.
2. Peduel Settlement, on the lands of Kufr ad–Dik - Lengthy unauthorized road south of the settlement and west towards the village of Kufr ad–Dik. The road leads to a new outpost.
3. Wadi Qana new road connecting the Alonei Shilo outpost with the Immanuel settlement. The construction of the road was initially started in 2018, and Peace Now had filed a complaint regarding the conducted works.
4. Shilo Outposts. A road connecting the Esh Kodesh outposts to the east has been established, likely serving as access to agricultural lands owned by the settlements.
5. Shilo Outposts. A road along Alon Road (Road No. 458) from the east towards the Shilo Outposts has been established.
6. Wadi A-Sik leading from Alon Road (Road No. 458) towards the new outpost of Ben Fazi. The road continues for several kilometers along a dirt road that existed previously. Ben Fazi's outpost was established in June of 2023, and the new road crosses the area of Wadi A-Sik, eastward to the village of Deir Dibwan, among the Bedouin communities of Wadi A-Sik who were displaced from their lands during the war.
7. Sde Yonatan Outpost. A road has been constructed to the renewed outpost through private land.
8. Negohot North Breach. An asphalt-covered road from the Nogohot settlement towards a northern outpost, established only in July of 2023.
9. HaMor/Tene Omarim Agricultural Road. It breaches from the east towards the Tene Omrim settlement and eastwards to the Hamor's and Shabtay's farm.

1.6.4 Bypass Roads in West Bank

The bypass roads in the West Bank started to be constructed after of its occupation by the Israeli authorities in 1967. According to Asad, "The first comprehensive structural plan for bypass streets in the West Bank was developed in 1970" [22]. The main goal was to control the Palestinian territories, reduce them and converted them into disconnected ghettos and establish Israeli settlements. However, the most prominent scheme for these roads was the one that was attached with Order No. 50 as mentioned earlier.

The bypass roads connect Israeli settlements with each other and allow settlers to move without having to pass through the Palestinian built-up and populated areas.

The bypass roads had significant negative effects on Palestinians, including:

- Confiscation of agricultural land: The construction of roads led to the confiscation of thousands of dunums of agricultural land, which harmed the Palestinian economy.
- Land fragmentation: Bypass roads have divided the West Bank into isolated areas, making it difficult for Palestinians to move between their communities.
- Restriction of freedom of movement: Bypass roads have imposed restrictions on the freedom of movement of the Palestinians, leading to difficulties in accessing basic services such as education and health care.

Al-Azza believes that through the bypass roads, the map of the West Bank is redrawn by the Israeli occupation [22]. The actual route of these roads scattered throughout the West Bank and its environment indicates a discriminatory policy that promotes the goals of spatial domination and isolation or separation imposed by Israel on the West Bank and its inhabitants.

"It can be said that the bypass routes increased following the Palestinian-Israeli negotiations (Oslo Agreement in 1993) to impose a new reality on the ground that would prevent the establishment of a Palestinian state" [22].

These bypass roads are located on the borders of the areas classified C according to the Oslo agreement, where they confine the territories of the Palestinian cities, towns,

and villages and restrict urban growth in them due to the setbacks imposed by the Israeli occupation authorities as indicated earlier in Table 1.

The bypass roads and the setbacks of the bypass road have led to the swallowing up and colonization of a third of the area of the West Bank, where an annual report issued in 2014 by the land Research Center-Jerusalem showed that the Israeli occupation authorities had established colonial bypass roads that plundered more than 196,000 dunums, and deprived Palestinians of using their lands near those roads, which amounted to more than 98,000 dunums. The report also pointed out: "the total area of land lost by Palestinians due to settlement and protection of settlements, their roads and the Apartheid Wall is about (1864) km^2, and this includes an area of 33% of the total area of the West Bank, including East Jerusalem" [22].

Despite all roads that have been built over the past decades, the Israeli occupation authorities are still issuing plans to implement new roads, including what has already been started, such as the Hawwara bypass, which are still in operation until the moment even after it was opened to traffic, and the Arruob refugee camp bypass project that was opened a few months ago, and more and more roads that have been planned by Israeli occupation authorities in advance and their plans have been put forward for objection, in addition to future plans, including railway plans, where Figure 3b & 3c in Appendix 1 illustrates these future plans and roads under construction, while Figure 3d in Appendix 1 shows the distribution of the road restrictions in the West Bank.

1.6.5 Movement Restrictions

The restrictions on movement in the West Bank have increased in the years following the Oslo Agreement. In March of 1993, during the second month of the Oslo negotiations, Israel restricted Palestinian access to East Jerusalem and Israel for the first time, through various inspection systems, checkpoints, and special permits. In doing so, Israel slowly eased Palestinian access to their cultural, religious, commercial, economic and institutional capital. By 1995, Israel had established 30 permanent checkpoints throughout the West Bank [7].

The neglect of the roads serving the Palestinians over the years of occupation led to the emergence of many problems in the Palestinian road networks [25]. Table 2 shows

the impact of Israeli measures on the transportation sector in the West Bank from 2000-2001.

With the Palestinian population present mainly in areas classified as A and B according to the Oslo Accords, Israel aimed to control the areas surrounding them, called as Area C according to those accords. This enabled Israel to place barriers and checkpoints in strategic locations to control the movement of Palestinians and confine them. In return, this allows settlers to move without any significant obstacles on the bypass road network in the West Bank, which is located in Area C and is under Israeli control.

Table 2

Impact of Israeli measures on the road and transportation sector in the West Bank from 2000-2001

The scale	Percentage change in West Bank governorates
Increase in average trip length	14 - 111%
Increase in average trip time	58 - 325%
Increase in the use of unqualified roads	8 - 47%
Decrease in the number of trips performed per vehicle	(-10) - (-58) %
Increase in the public transportation fare	32 - 114%
Increase in vehicle fuel consumption and the necessary maintenance work	12 - 270%

Source: [25]

Halper calls this system the "matrix of control," defining it as "an interlocking series of mechanisms, only a few of which require physical occupation that allow Israel to control every aspect of Palestinian life in the occupied territories" [7]. Such control includes the Apartheid Wall, trenches, flying checkpoints, road gates, earth mounds, gates, roadblocks, road barriers, permanent and flying checkpoints, and the permit regime.

A total of 705 permanent checkpoints were monitored on the road network in the West Bank by OCHA. This is in addition to temporary flying checkpoints at a weekly rate of 60 checkpoints, which represents a 3% increase compared to 2016, based on the surveys of OCHA. According to their field surveys, most of these checkpoints are

unstaffed, where constitute 80% of these obstacles, which are used to direct the Palestinians movement towards a number of limited intersections controlled by the Israeli occupation forces to better inspect and control them [7].

Table 3 shows a summary of Israeli barriers in the West Bank, which influence the road and transportation sector.

Figure 4 in Appendix 1 presents the annual number of four main kinds of road obstacles from 1995 to 2018, which illustrates how the overall number of checkpoints was almost constant during the Second Intifada. The Israeli occupation authorities systematically controlled the access of Palestinians to east Jerusalem and Israel during the Second Intifada through comprehensive closures, according to B'TSELEM, which led to limiting the movement of the Palestinians, even if they had the necessary permits [7]. Figure 3d in Appendix 1 which is prepared by OCHA presents the distribution of restrictions within the West Bank in 2023.

Table 3 illustrates the number of movement obstacles in West Bank in 2023 according to OCHA, where it documented 593 movement obstacles, including those in East Jerusalem and H2.

It has been noted through the surveys conducted by the OCHA that the number of roadblocks being erected on the roads in the West Bank has increased by 35% and that the number of road gates has increased by 8%, which enables the Israeli occupation authorities to close the roads at any moment. In 2022, there 293 days where non-permanent checkpoints were staffed by the Israeli military across the West Bank. Most of the obstacles (339 of 645) were assessed by OCHA to have a severe impact on the Palestinians by restricting access or preventing movement on the main roads, urban centers, and agricultural lands [24].

The Israeli occupation forces had deployed flying roadblocks on the roads in the West Bank at an average of four every week. In addition, the apartheid wall, with most of its length of 712 km (about 65% of it was constructed), isolates the lands of the Palestinians, who were obliged access their lands for to cultivation through 69 gates, which were distributed along the wall after obtaining the necessary permits by the Israeli occupation authorities. However, most of these gates are closed most of the

time. The Palestinians need special permits from the Israeli occupation authorities to access east Jerusalem through three specific checkpoints [24].

The Israeli police Department, through its patrols spreading across the road network in the West Bank, strictly and unfairly enforce traffic laws against Palestinian vehicles. Officers of these patrols impose heavy fines on the Palestinian drivers under the pretext of committing various traffic violations. B'TSELEM's daily observations of the road network in the West Bank during 2003, showed that the Israeli police concentrates on enforcing the law on Palestinian drivers and rarely stops Israeli drivers. The Israeli police claimed that the enforcement of these fines comes within the framework of enforcing traffic laws and protecting security, not preventing Palestinians from traveling on the road network. In practice, they are used in a biased and harmful manner and are directed only against Palestinians, and thus pose a problem for Palestinians in terms of the available transportation options. As a result, Palestinian travel on the roads that they are ostensibly allowed to use has been decreasing [18].

Table 3

Types and number of road obstacles in the West Bank (2023)

Type of Road Obstacle	Number in 2023
West Bank including East Jerusalem	
Checkpoints constantly staffed by Israeli forces or private security companies	49
Occasionally staffed checkpoints	139
Roadblocks	304
Earth-mounds and road gates, and earth walls	73
H2 Area in Hebron	
Constantly staffed checkpoints	28
Total	593

Data Source: [24]

Gordon indicated that the Israelis ability to control the road network in the West Bank has been demonstrated effectively by monitoring, restricting, and regulating the Palestinians movement. The roads that Israel has built create enclaves by fragmenting spaces to form entry and exit checkpoints. This controls and regulates the movement of Palestinians in the West Bank [26].

Exclusionary policies include restrictive permits that are administered by the Israeli Civil Administration District Coordination and Liaison Office, which regulate Palestinians' movement into East Jerusalem and Israel. The occupation forces while restricting or preventing the Palestinians to use about 400 km of the roads and made them for settlers' exclusively, had imposed pressure on the Palestinians who are forced to find alternate roads. These alternative routes are between 2-5 times the length of the original routes for the nearest city or to the nearest activity centers [27].

The Apartheid Wall and checkpoints caused a significant increase in transportation distance and travel time, higher fuel consumption, and more greenhouse gas emissions. Rijke and Minca in their published article in 2019 argued that the checkpoints create new geopolitical realities, with a mobility uncertainty travel regime due to travel time varying delays [28]. Table 4 shows the average delay time at permanent checkpoints in the West Bank in 2019. Figure 3a in Appendix 1 illustrates these roads and their classification by restrictions.

Table 4

The Average delay time at permanent checkpoints in the West Bank in 2019

Checkpoint	Governorate	Average Delay Time
Jalameh	Jenin	29
Kafriat	Tulkarem	42
Qalqilya DCO	Qalqilya	80
Jaljoulia	Qalqilya	89
Ni'lin (workers)	Ramallah	23
Maccabim	Ramallah	55
Qalandiya	Jerusalem	81
Glo300	Bethlehem	34
Al Jab'a	Bethlehem	50
Tarqumiya	Hebron	26
Meitar	Hebron	35

Source: [28]

1.6.6 Apartheid Wall and Relation with Roads and Transportation in the West Bank

The Apartheid Wall, which started to be built shortly after the start of the Second Intifada in June 2002, led to severely limiting the connection between parts of the West Bank and turn it into an area fragmented especially from the eastern and western sides and close to the settlements, as Abu-Eisheh indicated [2].

The wall also led to the separation of areas in the middle of the West Bank within isolated enclaves. Accordingly, the Apartheid wall placed restrictions on the possibility of free access and mobility for hundreds of thousands of Palestinians in dozens of cities and villages located behind the Apartheid wall with the rest of the population in other Palestinian cities and villages, and with the outside world. Therefore, the Apartheid wall has significantly contributed to siege of Palestinian cities, towns, and villages and turn them into "ghettos" surrounded by settlements, military bases, bypass roads, and military checkpoints, without granting their residents the possibility of movement and transportation except through special permits or traffic permits [2].

There are many access problems that are linked to some major restrictions such as the gates of the apartheid wall and the various checkpoints. These problems are caused, for example, by having limited and varied operating hours set by the Israeli occupation authorities, as these gates are opened and closed randomly without prior notice and contrary to the specified schedule. In most cases, passage is granted arbitrarily. Unofficial permit policies have been announced, according to the areas in the West Bank [27].

A study on the construction of the Apartheid wall in the West Bank showed that it has significant effects on accessibly to the various activities, which led to significant impacts on the Palestinian's travel behavior. The Apartheid wall construction increased trip distance and travel time, and caused changes in destinations and travel modes. Access to cultivated lands was restricted for the Palestinians and consequently limited their accessibility to these lands [29].

Despite the practices of the Israeli occupation authorities in carrying out apartheid in various fields in the West Bank, the roads and transportation sector had its share as

well, which was clearly manifested after the construction of the apartheid wall, which isolated sections of roads from the road network in the West Bank, Figure 5 in Appendix 1 illustrates what roads were isolated by the Apartheid Wall in the West Bank. The Israeli occupation authorities has and continues to carry out policies, practices and procedures that promote apartheid on the road network used by the Palestinians in the West Bank because there is no current alternative to the use of settlers, or there is no alternative to the use of Palestinians away from settlers.

1.6.7 Impacts on the Palestinians

Bypass roads, traffic restrictions, in addition to the Apartheid Wall, and all that was mentioned in previous chapters had serious harm to families and social life, and the regular humiliation that the entire Palestinian population suffered as a result of the blatant discrimination. The effects of this regime on the daily life of Palestinians were felt in several ways [18]:

- Wasted time resulting from the additional time needed to reach their destinations, and from the hardship entailed in using their cars;
- Arriving late, or not at all, to destinations as a result of the uncertainty of travel;
- Increased cost of travel resulting from the longer routes which drivers are forced to use; and
- Wear-and-tear on vehicles resulting from travel on run-down dirt roads.

Palestinians have not been able to move freely between the Palestinian communities since the Oslo agreement, which has limited access to various institutions such as hospitals, schools, and workplaces. A system of goods transport that is considered an apartheid system was created as part of the comprehensive closure system imposed on the road network in the West Bank under the name of the back-to-back transport system, where this system requires to unload goods from trucks on one side of the checkpoints and transfer them to other trucks on the opposite side of the checkpoints that were established by the Israeli occupation authorities between logistics sites and even between the Palestinian communities themselves. This in turn led to an increase in transportation costs for the Palestinian traders and thus reflected on the Palestinian citizens and the Palestinian economy, while in return, products from illegal Israeli settlements that are not subject to the back-to-back transportation system are

promoted, which leads to unfair competition with an advantage to settlements products. The Roads and Tunnels Plan shown in Figure 6 in Appendix 1, which was launched in 2004 by the Israeli occupation authorities, as a response to pressure from the international community to allow Palestinians to travel and trade within the Palestinian territory, and to ensure the following objectives as indicated by Negotiations Affairs Department of the PLO [30]:

- To consolidate Israeli colonies (settlements) throughout the West Bank;
- To take more Palestinian land and resources for settlement expansion on both sides of the Wall; and
- To isolate remaining Palestinians into discrete Palestinian population centers, connected only by circuitous roads.

The problems of access in the West Bank are not due to a lack of infrastructure, where the Palestinians have a relatively adequate road network, but these are rather due to the Israeli authority's restriction on the use of this network and access to it through a comprehensive closure system that completely restricts movement between Palestinian population centers and the West Bank lands [27].

On the other hand, the Israeli settlements benefit much from massive Israeli investment in roads and other infrastructure. Settlers use bypass roads, combined with the Palestinian road network, as well as the roads connecting the settlements together and to Israel. Figure 7 in Appendix 1 is a map prepared by OCHA, which shows that the road network in the West Bank that is primarily for Israeli use was 1,661 km long in 2018 [27].

The West Bank road system suffers from deficiencies as indicators showed, compared with the system inside Israel. By comparing the road network in the West Bank with the road network in Israel, it was found that one square kilometer contains an average of 0.51 km of roads in the West Bank compared to 0.70 km of roads in Israel in 1997. In addition, every 1,000 people in the West Bank are served by 1.86 km of roads, while the ratio in Israel is 2.5 km for each 1000 people.

The road network in the West Bank ca be described as a multi-tiered system. There are roads that do not provide continuity of movement for the Palestinian citizens as there are 1,255 km of roads shared between the Palestinians and the Israelis, in addition

to 225 km of bypass roads designated for the Israeli settlers that connect the Israeli settlements in the West Bank to each other, and 2,556 km of roads designated for the Palestinians with poor characteristics and very limited maintenance. As a result, the road sector in the West Bank has become one of the main issues in the conflict [31].

1.6.8 Road and Transportation Apartheid System in South Africa compared with Palestine

Limited literature is found globally on similar situations of discrimination in the roads and transportation sector against the population of a nation under occupation, mainly because colonial regimes were not intending in general to substitute such nations. However, there in similarity between the Palestinian case and that of South Africa, at specific, as illustrated hereafter.

There had been apartheid in transportation sector in South Africa, as part of the overall system of apartheid. Apartheid in public means of transportation (buses) was not imposed overnight. In the environment that can be described as hostile in the late 1950s in South Africa, and in Cape Town at specific, it was enforced in stages only, where having the organized resistance waned gradually, a new bus travel norm was allowed to take root and social cleavages became accentuated [32]. Since the late 1960s, there had been a growing in white opinion for more inclusive racism as a reward for apartheid. After pressure from Cape Town residents affected by apartheid at that time, the abolition of bus segregation was little and slowly brought about a decade later.

In the period extending from the late 1960s and early 1970s, apartheid in South Africa was at its most extreme in the railway sector. However, the beginnings of apartheid between black and white passengers did not begin in 1948, but rather it began in an unofficial form at the beginning of the last century and officially since 1918 based on the legislation adopted in the Transvaal colony in 1908 through an enabling parliamentary act specific to the railways [33].

Over more than four decades (1948-1994), black South African population was systematically marginalized, in terms of accommodation, leisure, employment, as well as transportation. Apartheid and its effects of low density in sprawl led to shortcomings in the structure of apartheid cities in South Africa, which in turn led to new patterns of work and long travel distances. As a result, a dual geographical civilization emerged

consisting of two classes of the population. The first, called the elite class, living in advanced areas and using cars for transportation, unlike the second class, which is characterized by poverty and uses, walking, or using taxis, minibuses, trains, and bicycles as means of transportation [34].

Marwan Bshara -a political analyst- said in a TV report in 2012 "We saw that there is a system for the whites in South Africa and a system for the Jews in the occupied territories, with transportation networks, roads, etc., compared with that of the indigenous population, and this is the similarity between the two cases" [35]. In the same report, Jonathan Ariel -a former counselor at the South African Embassy in Israel- said that "I do not like the existence of two separate roads, the Jewish roads and the Arab roads, and this matter is beginning to become close to apartheid" [35].

1.6.9 Summary

Since their occupation of the West Bank in 1967, the Israeli occupation authorities have been trying to change the features of the land and its identity from Palestinian Arab to the so-called Israel, using roads and transportation as a tool to satisfy this.

Literature review showed that the Israeli occupation authorities over the previous years have established bypass roads that connect settlements to each other, and to connect with settlements beyond the green line, through a new road network as separate as possible from the existing network of roads used by Palestinians.

The Israeli occupation authorities issued many military orders related to the roads and transportation sector in the West Bank through which they formed the existing road networks, as mentioned earlier. After the issuance of Order No. 50 in 1984, the Israeli occupation authorities began to implement the roads that had been planned, and continued to implementing pre-planned roads according to this military order.

In light of the above, all previous studies related to the road and transportation sector in the West Bank have highlighted the policies and procedures of the Israeli occupation authorities in spreading the network of bypass roads in the West Bank. Moreover, studies have presented the procedures of cutting the West Bank into cantons and separating Palestinian communities from each other in exchange for linking Israeli settlements to each other and to the Green Line. In addition to highlighting the closure

mechanisms used by the Israeli occupation authorities in the roads network used by the Palestinian citizens only, their distribution and preparation over time, as well as what caused the construction of the Apartheid Wall in the West Bank, the impact of these policies on the Palestinian citizens socially, economically, environmentally and politically has been studied.

Measures, policies, and practices carried out by the Israeli occupation authorities have not been studied in terms of the engineering aspects, in relation to what was implemented in reality, whether these are appropriate or not? Are they meeting the required standards or not? If they meet the required standards, then to whom they are addressed? Do they serve the Palestinian citizens? With regard to the plans proposed by the parties (the Israeli occupation authorities and the PNA), do they match or not? In case that there do not match, do the suggested plans prepared by the Israeli occupation authorities satisfy the demands of Palestinian citizens?

Based on what has been illustrated in this chapter, the policies, procedures, and practices carried out by the Israeli occupation authorities in the road and transportation sector in the West Bank will be analyzed in next chapter, as well as the extent of their impact on Palestinian citizens.

Chapter Two

Data Collection and Analysis

2.1 Introduction

In this chapter, the collected data and information from their sources are presented, with identification of the mechanism of extracting such information and the outcome of analysis in a way that satisfies the study purpose. The chapter presents the analysis of these data and information to come up with the results of the study, and consequently, form a basis for appropriate recommendations.

2.2 Sources of Data Collection

The data and information related to this study have been gathered, whether for the study area is the West Bank in general, or the northern governorates of the West Bank in particular. This includes:

- Information from conducted interviews with officials and experts.
- Field observations collected from the reality of the road network in the West Bank, as well as on the procedures, policies, and practices applied by the Israeli occupation authorities, through navigating and documenting by taking photos.
- Collecting available Palestinian plans for the road network and what will be implemented in the future according to the vision of the PNA from previous studies and from GeoMOLG.
- Collecting plans put forward by the Israeli occupation authorities through the Israelis sources including websites.
- Gathering information related to traffic accidents and injuries statistics from the Palestinian Police Department.
- Downloading old and modern aerial photos from different locations Google Maps and GeoMOLG through the time lapse and change detection analysis.
- Collecting relevant GIS layers:

1. Layers for the road network in the West Bank from GeoMOLG.
2. Layers for future plans to be implemented by the Israeli occupation authorities from Israeli occupation authorities' websites, as well as layers for the old road network and what was built afterwards through Google Maps, for change detection analysis.

3. Layers for the locations of Palestinian communities as well as settlements and outposts from GeoMOLG.
4. Layers related to traffic safety, identifying the black spots in the road network from MPWH.
5. Layers on the political division of the territories of the West Bank from GeoMOLG.

- Collecting geometric plans for specific roads or intersections form Palestinian ministries.

2.3 Interviews

2.3.1 Introduction

Interviews were conducted with officials from the PNA, whose positions are related to the planning processes in the road and transportation sector in the West Bank as well as to road safety.

Interviews were conducted on what is being planned by the Palestinians for the road network in the West Bank and discussing obstacles related to the implementation of these plans, as well as the plans that have been submitted to the Israeli occupation authorities and on the consequences and the outcome of submission.

In case the plans were rejected by the Israeli occupation authorities, the interviewees were asked on the reasons for rejection. In addition, they were asked on examples of what has been discussed.

They also were asked on the plans of the Israeli occupation authorities if they are partnered with the PNA to meet the needs of Palestinian citizens during the preparation of these plans.

Appendix 2 illustrates the interviewees, the positions they hold, in which institution they work, as well as the locations and dates of the interviews.

2.3.2 Interviews

2.3.2.1 Ministry of Public Works and Housing

An interview was held with the Director General of the General Directorate of Roads at the MPWH, as it is the ministry responsible for the rural road network in the West Bank from the Palestinian side. The interviewee was asked about the road projects implemented by the ministry. It was clarified that the projects carried out by the ministry are projects located within the areas classified A or B according to the Oslo agreement.

If the PNA wishes to work on project outside of these areas, (i.e., in the areas classified C according to Oslo agreement) as illustrates in Figure 2, the PNA must submit request to the Israeli occupation authorities. The PNA will not be able to take any measures to work on such project without no objection from the Israeli occupation authorities. For example, the Palestinian MPWH wanted to conduct engineering surveys, to prepare appropriate engineering plans in order to implement corrective works at the Bizzarya junction on Nablus-Jenin Main Road, located in areas classified C, due to the high number of accidents that occurred there (classified as a black spot according to the ministry's map of black spots). However, the Israeli occupation authorities rejected the request submitted by the ministry in 2022, and therefore the ministry did not conduct the necessary engineering surveys until the date of the interview.

With regard to the projects that are approved by the Israeli occupation authorities, these authorities rarely gave approval to projects that are located in areas classified C, and in such cases, it is found to be only for projects in areas within Palestinian communities that have become densely urbanized, such as the Kufr Aqab main road project.

It is be noted that, even if the Israeli occupation authorities gave approval to a project, they can at any moment to stop the project. They had cancelled the approved and stopped working in. For example, regarding Ain Qinia Road rehabilitation project in Ramallah/Al-Bireh Governorate, the Israeli occupation authorities confiscated the contractor’s site equipment and machinery working on the site in 2022. After the project was approved by the Israeli occupation authorities and after implementation of

the project was launched, and work began for months, they requested suddenly to stop without specifying any reasons for that.

2.3.2.2 Ministry of Local Government

Official of the Ministry of Local Government (MOLG) has been contacted, as the ministry is working on the master plans and the local road networks within the boundaries of the Palestinian communities in the West Bank, including those located partially or totally in areas classified as C.

The official at the ministry who follow up recently prepared urban plans in the areas classified C was contacted. It was indicated by the interviewed official that the draft urban plans submitted by the MOLG to the Israeli occupation authorities are mostly rejected for reasons related to the proximity of the plans to bypass roads, which have setbacks specified by the Israeli occupation authorities, the Apartheid Wall, or the Israeli settlements, as well as to limit the expansion of the Palestinian communities.

Consequently, there have been no approvals for urban extensions or services, including road networks, water and other utilities, for the vast majority of cases. The Israeli occupation authorities rejected plans because of the Palestinian communities do not match the standards applied by the Israeli occupation authorities to their communities beyond the Green Line.

In the interview, it was also indicated that MOLG had submitted 126 urban plans since 2011 to the Israeli occupation authorities, but of these, only 7 plans were approved. In addition, there are five plans that have been rejected by Israeli occupation authorities, and the remaining of the 126 are still subject to technical discussions between the Israeli occupation authorities and the ministry since 2011.

2.3.2.3 Traffic Police

An officer of the Palestinian Traffic Police was interviewed on their role in the roads sector in the areas classified C according to the Oslo agreement. He indicated that the traffic police role is limited to specific traffic accidents, due to the imposed Israeli occupation measures and limitations concerning claimed of security and administrative sovereignty on those areas.

As for the traffic accidents in these areas, these accidents are classified into three types:

- Palestinian parties traffic accidents.
- Palestinian-Israeli traffic accidents.
- Israeli parties traffic accidents.

The Palestinian traffic police officers, in coordination with the Israeli occupation authorities, are allowed to arrive and take all the procedures followed in accidents involving physical injuries and deaths only in areas where there is no Israeli settlers traffic, such as areas on the outskirts of Jerusalem.

As for those areas where Israeli settlers are present, for example, Road No. 60, the Palestinian traffic police officers are not given coordination to be present in uniform in the area of the accident, but police officers with plainclothes are sent to take the information of the accident. Sometimes cooperation is carried out with the agents of insurance companies where the parties to the accident are insured.

In case accidents involving between Palestinian parties, with physical damage only, the Palestinian police are not given the necessary coordination to be present at the site of the accident, because of the procedures set by the Israeli occupation authorities in this type of accidents, are not intervened by the police, but is terminated by insurance companies.

With regard to traffic accidents that involve a Palestinian party and an Israeli party, the Palestinian police is not allowed to intervene definitively in that incident, and information about those incidents is not obtained definitively.

In case the Palestinian party is convicted by the Israeli traffic police arbitrarily and unjustly, the Palestinian party submits a request to the Palestinian traffic police, and in turn, it opens a file for the accident and takes the necessary procedures with the Israeli traffic police through the coordination and liaison office.

In terms of traffic accidents that occur between Israeli parties, the information of these accidents is not obtained definitively, and are not included in the accident records of Palestinian traffic police in the West Bank.

According to the interview, the number of traffic accidents on the roads in the areas classified C for the year 2023 amounted to 6,174 traffic accidents (Palestinian parties), indicating an increase of 4.3% compared to the year 2022. These accidents that

occurred in areas C, constitute 37.3% of all accidents registered by the Palestinian traffic police.

It should be noted that the last 3 months of the year 2023, the number of traffic accidents decreased as a result of the decrease in traffic in general due to the restrictions set by the Israeli occupation authorities following the events of October 7, 2023. It indicated that speeding and wrong passing -during the period of the report issued by the Palestinian police- are two of the most common causes of accidents on roads in areas classified C. In addition to speeding and wrong passing, there are reasons for traffic accidents related to the conditions of the site where these accidents occur, which the Israeli occupation authorities do not allow to change.

The conditions of the site could be problems in the geometric design of the road, or related to the traffic control devices imposed by the Israeli occupation authorities. As these sites form black spots, as considered by the Palestinian traffic police, where they work with the participation of the MPWH to determine the locations of these black spots by applying Equation 1 to the sites where there are eight accidents or more in order to determine the priorities for countermeasure to those spots, where they are allowed to work.

Index = 20*No. of accidents that contain deaths + 10*No. of accidents that contain serious injuries + 2*No. of accidents that contain moderate injuries + 1* No. of accidents that contain minor injuries. Equation 1

In case the black spot's location does not meet the condition of classifying the site as black spot for three consecutive years, the site will be removed from the black spots list of the Palestinian police and the MPWH.

Based on the index calculated using Equation 1, remedial decisions are made based on the value of the index. The higher this index, the higher the priority of the related site to remedy.

According to the Palestinian traffic police records. A total of 18 accidents occurred at this site in 2022 (Palestinian parties only) causing 12 injuries. Among those sites that are considered as black spots, but the Israeli occupation authorities do not allow countermeasure to be implemented to them, examples include:

1. The section of Road No. 60 along the town of Sinjel, where this section suffers from a narrow road without shoulders, which leads to traffic accidents, as due to lack of conformity, the section is connected to wider sections conforming to specifications that allow higher speeds. The Israeli occupation authorities were asked to allow the expansion of that section during the years 2017 and 2018, but they rejected the requests based on that the section falls within their jurisdiction, that the Israeli occupation authorities are who prioritize work in these areas.
2. The Junction of Road No. 35 and Road No. 60, which is considered the main entrance to the Hebron City in the south of the West Bank, this site is also considered one of the sites that constitute a black spot. There were 13 accidents in this location in 2022 resulting in 27 injuries. Due to the density of traffic volume in this location, which is not configured to accommodate such a traffic volume, as the junction has a stop sign on it and because of the long delays due to that sign, drivers do not comply with that traffic sign, this causing traffic accidents. In addition, the Israeli occupation authorities do not allow the development of this intersection into a traffic signal intersection. But in 2023, they installed a traffic signal at the intersection to improve the traffic conditions for Israeli settlers using Road No. 35.
3. The junctions of the entrances of the towns of As-Samu' and Al-Dahiriya, are also considered black spots, where in 2022, 15 traffic accidents occurred, leading to one death and 17 injuries. It is also one of the sites that the Israeli occupation authorities do not allow to modify.
4. The intersections of the entrances of the towns of Al-Sawiya and Al-Luban Al-Sharqiya on Road No. 60, where a total of 36 accidents occurred at these intersections in 2022.
5. The entrance to the town of Al-Eizariya junction, as it is considered the only road connecting the southern and central governorates and from there to the north, the traffic density on it is very high. The Israeli occupation authorities were placing a stop sign on it to give priority to traffic towards the settlement of Kedar. After several meetings and demands by the PNA, the signs at the intersection were switched so that the priority would be for Palestinian traffic.

After the Palestinian traffic police record these accidents and the black spots, they are shared with the Palestinian MPWH. A map is prepared periodically showing the most important sites that need development and repairs based on Equation 1.

However, such information is not published by the Palestinian traffic police, and then MPWH is carried out implementation of countermeasures on those sites as allowed by the Israeli occupation authorities.

2.3.2.4 Sinjel Municipality

Official in Sinjel Municipality was interviewed concerning the junction of the main entrance to the town on Road No. 60, where the official reported that the junction and the main entrance of the town is considered a very important entrance to the towns and Palestinian communities of the north of Ramallah/Al-Bireh Governorate, as well as the Palestinian communities in south Nablus Governorate and east Salfeet Governorate. The town is considered a link between the three governorates.

The importance of the main junction in the town is that it is one of two entrances to the villages of the north of Ramallah/Al-Bireh Governorate, which is inhabited by about 20,000 people. In addition, proper control of the junction is considered a solution to traffic jams on Road No. 60 because of its insufficient capacity. It is also considered as an entrance connected with an alternative route to a number of towns and population centers in Salfeet Governorate in cases of closures, specifically after the events of October 7, 2023.

There was also indicated the design of the current junction, where the Israeli occupation authorities have implemented the junction in right-in/right-out configuration, that does not allow entry to the town and the nearby communities coming from the south through Road No. 60. Moreover, the design does not allow leaving the town to the north.

This has the greatest impact on the behavior of users of Palestinian drivers, who are forced to drive at the junction in a reverse manner to enter the junction using the opposite right turn lane, as the other entrance to the town is 2 km away.

The percentage of violators in normal security conditions is approximately 20% of Palestinian drivers to/from the town and nearby communities, but after the events of

October 7, 2023, the percentage of violators reached 100%, as the Israeli occupation authorities have closed the other entrance of the town, and therefore, this entrance remains the only access point for the Palestinian citizens.

Despite forcing Palestinian citizens to use this junction, the Israeli occupation authorities release traffic fines to everyone who enter the junction in a reverse way, where the value of the fines released are 1500 NIS, with 20-30 violations on a daily basis and at various intervals during the day. This is after the events of October 7, 2023, but before that, the fines were imposed on drivers in addition to impounding vehicles and paying booking fines and taking the Palestinian drivers to the court.

As for the role of the municipality and the Palestinian Government in solving the problem of that intersection, the Palestinian Government has tried several times to solve the problem of the junction and a design suitable for the use of Palestinian citizens was prepared in 2013 through a USAID-funded project. All the necessary approvals were taken, but before the implementation of the project began, the Israeli occupation authorities objected on flimsy security grounds, and the project was canceled. The Israeli occupation authorities also requested some designs, and then request future designs, and so on, until a final design is not approved for implementation.

Recently, a proposal was also prepared for a traffic signal at the intersection similar to the junctions in the vicinity of the Israeli settlements, but the events of October 7, 2023 led to the suspension of work on submitting it to obtain the necessary approvals.

2.4 Analysis

2.4.1 Introduction

Through a review of what the Israeli occupation authorities have implemented in the road and transportation sector over the past 30 years, that is, after the Oslo agreement, it is noted that the Israeli occupation authorities have several policies, practices, and procedures that increase and reinforce apartheid to use the existing road network in the West Bank.

The policies, practices, and procedures carried out by the Israeli occupation authorities in the roads and transportation sector affect different areas related to the main functions

and issues related roads and transportation networks, represented by ease of access, mobility, safety, costs, and comfort, are analyzed.

In addition, transportation network design and traffic control and management issues for roads and intersections are also analyzed.

2.4.2 Accessibility Analysis

Palestinian people suffered from problems reflected in the lack of ease of access, mainly by disconnecting Palestinian cities, towns, and villages, with the road network that was built by the Israeli occupation authorities through the past years. This is because of the Israeli occupation authorities control over 60% of the area of the West Bank (area classified C).

- **Limiting Accessibility**

The road network lies on areas classified C has been surrounding the Palestinian communities with bypass Roads. Where the Palestinians have limited access to these or are not allowed to use. For example, when the Israeli occupation authorities built the road called Trans-Samaria Road No. 5 through the years 1997-2007, it connected all its nearby settlements on this road -such as Barkan settlement, Ariel Industrial settlement, as well as Road No. 446 that connects many settlements- through distinctive and safe interchanges as illustrates in Figures 3a and 3b respectively, while on the contrary, it did not connect the surrounding Palestinian towns and villages, like Biddya, Az-zawia, Masha, and Rafat, illustrated in Figures 3a & 3c respectively. As such, the Palestinian citizens have to drive for 20-40 minutes to the nearest point with Road No. 5, while in case the drivers would use Road No. 5, if the Palestinian communities were connected to this road, the trip time to reach the same point will be at most 5 minutes.

Figures 3a, 3b, and 3c illustrate this area, as well as the sizes of the Palestinian communities that the Israeli occupation authorities did not connect with Road No. 5. It also shows the Israeli settlements, their sizes, and how they are connected with the same indicated road.

The same applies to the latest projects implemented or still being implemented by the Israeli occupation authorities as new bypass, such as that road around the communities

of Hawwara, Beita, Oudla and Awarta, where the road was built with a length of 7 km at a level higher than the natural ground up to 10 meters for a length of 4 km. The mentioned Palestinian towns and villages were not connected to the road at all. On the other hand, many of the roads that connect these communities to each other were excluded. A limited number of the main roads of these Palestinian communities were left, through the construction of bridges over them, without connecting them through interchanges to the road that was built.

Figure 3

Separating Palestinian communities from the Road Network constructed by Israeli Occupation Authorities and connecting Israeli settlements.

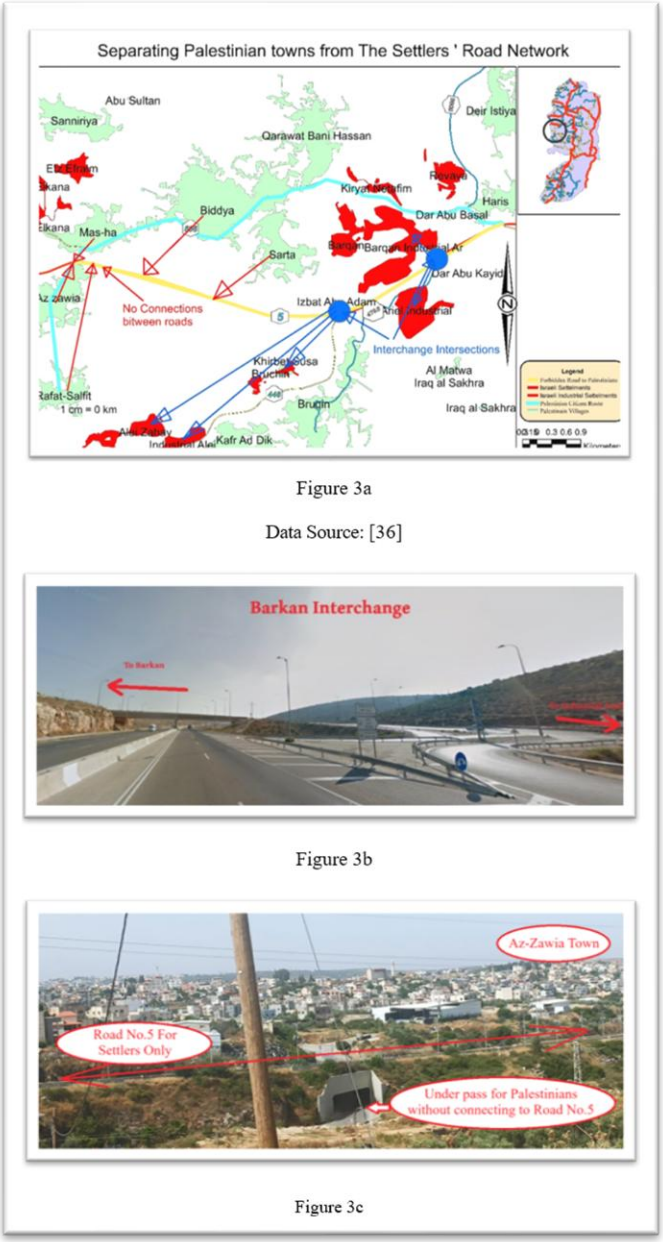


Figure 3a

Data Source: [36]

Figure 3b

Figure 3c

- **Accessibility Index Assessment**

The Palestinian citizens suffer from the frequent closures of the roads in several ways, including the presence of iron gates, which are hardly devoid of any entrance to a Palestinian town, in addition to the closure with piles of dirt and fixed or flying barriers as mentioned in the literature review chapter.

The policies, procedures, and practices related to the closure of Palestinian communities have been in existence since the Oslo agreement. But these increased significantly during the Second Intifada (Second Intifada), as well as after the events of the October 7th, 2023. These led to the cutting of the cantons inhabited by the Palestinians for. some of them, which make them seek for alternative ways away from the gates and barriers of various kinds.

There are practices related to allow driving on specific roads in the West Bank according to the vehicle license plate, as was indicated in the forbidden roads system, illustrated in the previous chapter. For example, the Palestinian citizens with Palestinian vehicle license plates are prevented from entering Road No. 555, which connects Awarta village and Beit Furik town, both located in Nablus Governorate. Instead of using this road directly, the Palestinian citizens are forced to enter the city of Nablus and pass through the military checkpoint located at the entrance to the town of Beit Furik, and vice versa. To find out the impact of preventing Palestinians from using the road, the accessibility index can be calculated between the two communities as presented in Equation 2.

$$Accessibilty\ Index\ (AI) = \frac{Distance\ in\ case}{Air\ Distance} \qquad \text{Equation 2}$$

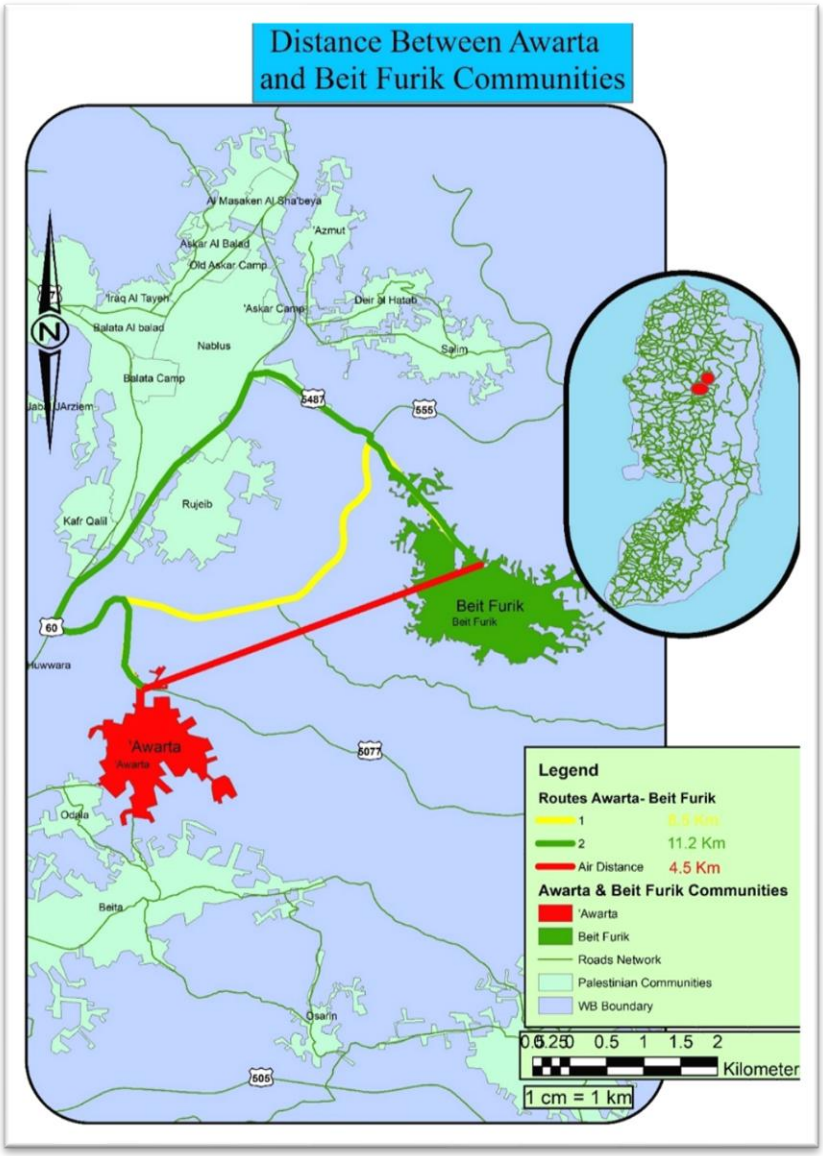
For Awarta-Beit Furik, and considering the route used by the Palestinian citizens, AI = 2.48, While using Road No.555, AI = 1.9.

This indicates that the Palestinian citizens are forced to drive more, due to the system of forbidden roads in the West Bank. This is clear from Figure 4, where Palestinian citizens are prohibited from driving through the nearest and easiest route via road No. 555 in yellow, and are forced to take the road in green, due to the apartheid policy pursued by the Israeli occupation authorities through the practice of the Forbidden

roads system. On the contrary, these roads are open to the movement of settlers without any obstacles.

Figure 4

Distances between Awarta and Beit Furik communities



Data Source: [36]

In addition to the system of forbidden roads, there are many obstacles that raise the accessibility index for Palestinian citizens, such as the iron gates deployed at the entrances of Palestinian communities, as well as fixed and flying military barriers, and dirt piles, in addition to the apartheid wall.

Another example, is presented here, where the Apartheid Wall separates the villages of Azzun Atma from the town of Az-Zawiya in the governorates of Qalqilya and Salfet, respectively. This raises the accessibility index to 3.7.

Figure 8 in Appendix 1 illustrates some of the iron gates placed by the Israeli occupation forces at the entrances of Palestinian towns, dirt piles, fixed and flying barriers, which are intended to obstruct Palestinian traffic.

Through the policies, procedures, and practices of the Israeli occupation authorities in the road network in the West Bank, the accessibility index can only be reduced by taking countermeasures by Palestinian officials. In order to better serve the Palestinian citizens.

2.4.3 Mobility Analysis

The Israeli occupation authorities have always been working to obstruct the movement of Palestinians throughout the West Bank. In many cases, the movement is completely blocked, as mentioned earlier in the chapter of literature review.

- **Limited Mobility**

The speed and capacity indicators are the tools for determining the level of mobility on the road network, as these affect the travel time, causing delays and limiting mobility.

In addition to the delays as mentioned above, there are mobility limitations concerns connecting the Palestinian communities with the road network, while the settlers' vehicles freely move without traffic jams and without delay in the trip time for them, in addition to the secure their trips.

Some roads are completely closed to the movement of Palestinian citizens for a certain period, which could reach to weeks or months. Since October 7, 2023, main roads, such as Road No. 1 in a section between Jerusalem city and the interchange of Adumim Junction, and the southern entrance of Nablus City on Road No. 60 (Hawwara Checkpoint), were closed in front of the Palestinians.

The Israeli occupation authorities racially closed the main Road No. 60 through Hawwara, which is considered a major artery connecting the northern West Bank

governorates with the central and southern governorates, during the period of three months started since October 7, 2023. It was closed to vehicles with green Palestinian license plates. On the other hand, with regard to the Palestinian citizens, the roads are closed to them for hours as in the example of Deir Sharaf entrance which is considered as the entrance to Nablus City from the west. Therefore, the Palestinians are either obliged to wait for hours until the road is opened, or to use other alternative routes, which lead to an increase in the travel time of the trips and, thus in result considerable delays. This is in addition to causes increase in the cost of the trips and increase in traffic volume on alternative roads that are not equipped to accommodate such traffic loads, both in terms of the dimensions of the roads cross-section or in terms of the construction of the roads.

This section of the road No. 60 was never closed to cars with yellow Israeli license plates. However, it was opened for the passage of Palestinian vehicles after the opening of the new bypass road (Hawwara bypass Road No.60) for settlers ' vehicles.

The Israeli occupation authorities have also placed iron gates at the entrances of Palestinian communities after the opening of the Hawwara bypass road, in addition to Earth piles and permanent or flying barriers, which affect the movement of Palestinian citizens very badly. This is evident in many previous studies and reports as annual reports prepared by OHCA, and studies prepared by ARIJ.

Figure 19 in Appendix 1 illustrates the installation of a sign by the Israeli occupation forces showing that Palestinian citizens are specifically prohibited from entering the road with the sign installed from 6 pm to 1 am.

The Apartheid Wall, which irrationally separates Palestinian communities as indicated earlier, it forcing the Palestinian citizens to moving through roads that increase the trip time, leading to high delays.

To determine the amount of impact on mobility in the West Bank road network, a travel time index is used in analysis, with an illustrative analysis, an example.

- Travel Time Index Analysis

Travel Time Index (TTI) is defined as presented in Equation 3.

$$TTI = \frac{travel\ time\ in\ case}{travel\ time\ at\ free\ flow\ speed} \qquad \text{Equation 3}$$

Taking into consideration the previous condition of the road between Awarta and Beit Furik.

In case traveling through Road No. 555, TTI = 1.0. However, in the current status, where the Palestinians are traveling through entering Nablus City, TTI = 4.0.

This means the travel time needed is four times the actual required time. This in a small distance between the communities. If taking the other case caused by the Apartheid Wall considering the travel time, between Azzun Atma and Az-Zawiya the TTI is increased to be 5.0.

This depends on the type of policies, procedures, and practices followed by the Israeli occupation authorities. For example, the system of forbidden roads as a policy, preventing the Palestinians from using those roads as procedures, violation and violence, and may reach the killing of those who violate that policy as a practice.

This applies to all the policies of the Israeli occupation authorities, including the apartheid wall, earth piles, iron gates, etc.

2.4.4 Geometric Design

2.4.4.1 Intersections Design

The Israeli occupation authorities have always deliberately ignored engineering standards to intersections connected with roads leading to Palestinian communities. On the opposite, clear comparison can be found between the Palestinian citizens and the settlers, where the Israeli occupation authorities apply the highest engineering standards to the colonial intersections that connect with roads leading to colonial settlements.

Intentional negligence expressed in not applying of engineering standards is manifested in ignoring the entrances of Palestinian communities from being taken into account in the case of the development of the road network. This appears in several entrances of Palestinian communities such as:

- Not considering the development of the entrances of Palestinian communities, and preventing the Palestinian authorities from expanding and developing those entrances under the pretext of being within the areas classified C, such as Aqraba entrance junction.
- Narrowing of roads leading to Palestinian communities through the construction of military towers or the installation of an iron gates on those entrances, such as the observed entrance to the town of Kefel Haris as well as many other Palestinian communities.
- Preventing the modification of dangerous junctions and entrances to Palestinian communities, which are considered black spots due to recorded frequent accidents on them, such as, the entrance to the village of Al-Luban Al-Sharqiya, where the junction is located on a sharp horizontal curve on Road No. 60 with a limited radius that does not allow proper visibility, and the junction itself has no auxiliary lanes for acceleration and deceleration or left turn for vehicles entering the village from the main road.

Figure 9a in Appendix 1 illustrates the case of the entrance of Kefel Hares Palestinian community, indicating its geometric design problem of narrowing its width, as an example.

This case is analyzed in the following paragraphs. A comparative approach is utilized to illustrate the difference in dealing with intersections for Palestinian citizens and Israeli settlers.

Kefel Hares town is located in Salfeet Governorate, adjacent to Road No. 5. The entrance was modified as shown in Figure 9b in Appendix 1, only in order to modify the entrance of Ariel settlement and connect it to the new Road No. 5 at that time (2007), which was built as an alternative to road No. 505. Despite the modification to the road, Figure 9b in Appendix 1 also shows that the entrance to the settlement was paved with a width of at least 26 m including 2 lanes for each direction with width of 3.6 for each lane, a raised median with width of 3m, sidewalks width 3 m for each side, and a ditch on one side with 2 m width.

On the other hand, Kefel Hares entrance was paved by the Israeli occupation authority with a width not exceeding a total of 4 m for the two lanes (one for each direction),

despite the relative high volume of traffic passing through it, as it is considered the entrance to five Palestinian towns and villages (Kefel Hares, Hares, Qira, Deir Istiya and Zaita-Jamma'in). A military tower, an iron gate, and concrete barriers were placed to control the entrance, which led to the narrowing of the entrance in such a way as not to allow the passage of two vehicles at the same time, although the width of the paved road inside the iron gate reaches 10 m as illustrates in Figure 9a and 9b in Appendix 1.

On the other hand, the Israeli occupation authorities are developing and continuously working at the entrances to the settlements in an intensified manner, as indicated earlier. They are doing so according to the highest engineering specifications including merging lanes, diverging lanes, roundabouts and roads with sufficient widths with a division median for achieving highest traffic safety conditions at the same time, such as the entrances to the following settlements:

- Ariel, converting the entrance intersection from 3 legs with stop sign into roundabout in 2007.
- Yakir, converting the entrance intersection from 3 legs with stop sign into roundabout in 2013.
- Eili, modifying the intersection from an unchannelized intersection to a channelized signalized intersection and modifying the lengths of the auxiliary lanes and width of roads in 2022 as illustrates in the case study section below.
- Shilo, modifying the intersection from an unchannelized intersection to a channelized signalized one and modifying the lengths of the auxiliary lanes in 2021, as Figure 9c in Appendix 1 illustrates.

It’s to be indicated that the construction of roundabouts at the entrances of settlements change priority at the intersection, giving the settler’s vehicles coming from an Israeli settlement similar priority as all vehicles on the main roads, despite the lesser volume of traffic on the approach from the settlement, compared with when the intersections are controlled with a stop signs or yield signs, where the priority is for vehicles on the main road.

Examples of this include Kadumim settlement roundabout at Road No. 55, Ariel roundabout at Road No. 5, and the recently constructed roundabouts in the interchange

at the entrances of settlements Barkan and Industrial Ariel. All of these are designed and implemented considering safe design and high engineering specifications that distinguishes the network of roads and infrastructures used by the settlers.

2.4.4.2 Road Links Design

Racism is manifested in the discrimination between vehicles with different license plates during the design of a new road by the Israeli occupation authorities. Examples include what is presented hereafter.

The first is the diversion of roads and modification of old roads in the interest of those used by settlers' vehicles, such as the recently constructed bypass road of Hawwara in Nablus Governorate, and the bypass road of Al-Aroub camp in Hebron Governorate. For the former example, the large Palestinian volumes of traffic whose route is from south of Nablus Governorate and southern Governorates in West Bank to Nablus City or vice versa, via Hawwara was ignored and the construction of a new bypass road towards Road No. 60, which continues to the Israeli settlements in Nablus Governorate.

Palestinian vehicles have limited access to the bypass roads, in addition to the closure of many roads on the previously existing road network, which limits using road network by Palestinian citizens, according to the prevailing security situation imposed by the Israeli occupation authorities in the West Bank.

The road leading to town of Hawwara from the south was realigned by adding of three consecutive horizontal sharp curves with radii of 275m, 135m, and 260 m designed as reversed curves, and vertical curves were constructed in a very small section of the road with a length of 340 m, replacing the previous section with two horizontal curves with radii of 525 m and 490 m, respectively, and a longitudinal profile that had a uniform slope. This a striking example of road geometric design inconstancy, which should be avoided in proper road design.

This leads to reducing design speed from 90 km/hr to 60 km/hr. Safety on this section is expected to be decreased. This section will to be used by Palestinian only. The realignment section was implemented to ensure an excellent route for the bypass road,

which will be intended to be used mainly by settlers ' vehicles, as well as to reduce the length of the bridge constructed at that location to facilitate settlers' movement.

Figures 10a, 10b ,10c and 10d in Appendix 1 show new bypass road, which is almost completed, illustrating the design plans of the road, traffic diversions that serve settlers at the expense of Palestinians, and realignment in the original road, which will be left for the use of the Palestinian citizens.

Figure 10a in Appendix 1 represents the new plan for this bypass road, which allowed a continuous flow for the settlers. Many Intersections that could serve the Palestinian citizens who make up most of the traffic on the road from south to north and vice versa where neglected. The settlers' vehicles traffic made up 14% of the total traffic at the northern intersection of Hawwara town, as found in field traffic studies in 2013, which is presented in Figure 10a in Appendix 1 [37].

It's to be stated that, the number of Israeli vehicles passing through the roads and intersections in the region could be increasing, due to the Israeli government's plan to increase the number of settlers living in the northern West Bank and raise them to more than one million settlers in coming few years. In order to accommodate the increasing numbers of settlers, the Israeli government is planning to develop some regional roads, such as Road No. 5 from its junction with Road No. 505 eastward, within the next year [38].

2.4.4.3 Right of Way and Set Backs

According to Oslo agreement, the classification of areas resulted in having 60% of the West Bank area classified as Area C, where the security and administration falls under the control of the Israeli occupation authorities [39]. Therefore, the Israeli occupation authorities over the previous years developed a network of roads in the C areas serving the settlers, which defined very generous setbacks for these roads as Table 1 illustrates.

This led to the separation of the Palestinian territories in the West Bank into cantons and islands, where there are approximately 16 cantons and 41 Palestinian villages that are considered as isolated areas [40], as Figure 2 in Appendix 1 illustrates.

On the contrary, settlements setbacks from the nearby roads are allowed to be less than those allowed for Palestinians. For example, the industrial settlement of Barkan, as

shown from the aerial photo in Figure 11a in Appendix 1, the distance between Road No. 5 and the buildings in the industrial settlement of Barkan is only 120 m, while for the Palestinian communities, the required setback distance is 150 m.

Similarly, in the West Ariel industrial settlement, the Road No. 4765 that surrounding the settlement, according to Order No. 50, the setback distance should be 120 m, but the buildings were placed at a setback distance of 22 m as shown in Figure11b in Appendix 1. A third example is related to the residential houses in the settlement of Qiryat Netafim, where these are no more than 37 m away from the Road No. 505, as shown in Figure11c in Appendix 1.

The generous and more than needed widths of right of way as well as the setbacks devours the lands of the Palestinians and prevents them from using these for their developmental purposes, including for building roads. This is reflected on restricting the extension of the master plans for the Palestinians communities in the vicinity of these roads. The Israeli occupation authorities pay attention to the infrastructure and road networks leading to, or within, the settlements, while on the other hand, they prevent and limit the construction roads in local Palestinian communities, by restricting the expansion of the Palestinian communities and the deployment the network of bypass roads with wide right of way widths and setbacks.

The Israeli occupation authorities prevent the local Palestinian authorities from developing roads in areas classified C by impounding equipment operating in those areas, as well as detaining and arresting the drivers of those equipment, and imposing fines on them. Figures 12a and 12 b in Appendix 1 illustrates the Israeli occupation authorities' actions related to impounding equipment's and its drivers in Kefel Hares, Hares and Kufr Al-Deek communities in the West Bank. This equipment was operating in the lands of Palestinian citizens in an area classified C, in nearby setbacks areas of the nearby bypass road, where it was confiscated by the Israeli army and its drivers were assaulted, arrested, and fined.

Based on the above, it can ben stated that there is no way to build roads and have urban development for Palestinian communities in the territories classified C without obtaining prior permits from the Israeli occupation authorities, being administratively in control of the territories classified C. Such permits are almost impossible to be

obtained from the Israeli side, and therefore, the Palestinian urban areas are limited to the cantons classified A and B. This leads to problems with Palestinian citizens during the construction of roads to serve their developmental needs. This is due to the fact that the Israeli occupation authorities have deployed a network of bypass roads with large right of way widths, and larger setbacks in the vicinity of the Palestinian communities in the West Bank.

2.4.5 Safety

The black spots are identified as the most critical spots concerning with traffic safety, and therefore are given top priority to take appropriate corrective measures to enhance safety. According to the records of the Palestinian Traffic Police and the MPWH, there is a total number of 269 black spots sites in the West Bank in 2023. These sites are treated according to priorities based on Equation 1. Due to the limitations set by the Israeli occupation authorities, it is not possible to deal with all these black spots, as many of these are located in areas classified as C.

The black spots scattered in the areas classified C constitute 24% of all black spots in the West Bank. These black spots are based only on the records of the Palestinian traffic police, where the percentage may be higher due to the lack of records showing traffic accidents that occur with Israeli settlers.

It is worth mentioning here that the Israeli occupation authorities do not allow any remedial measures to be taken for many of these black spots by the PNA in areas classified C, where it is forbidden in any case to make any changes to the main roads, where the Israeli occupation authorities administrate.

Adjustments measures taken by the Israeli occupation authorities concerning the black spots are considered as to ensure their safety of the Israeli settlers, such as the black spot that was at the Jabba' junction at the intersection between Road No. 60 and Road No. 437, where the entrance of Al-Luban Al-Sharqiya on Road No. 60 blackspot is not allowed to be dealt to impellent countermeasures to improve safety of the Palestinians entering or leaving the village.

The Israeli occupation authorities converted the mentioned intersection near Jabba' into an interchange topped by a roundabout, and diverted the direction of the main

Road No. 60 towards Road No. 437, with the addition of entry and exit lanes to the roundabout, due to the heavy traffic. The modification to the black spot in this junction is due to that the area is located nearby several settlements in addition to entrances to the city of Jerusalem, where the road is considered as the only road connecting the central governorates with the governorates of the South in the West Bank.

As for the safety aspects, the Israeli occupation authorities are interested in the safety of Israeli settlers at the expense of the movement of Palestinian citizens. As there is no doubt that the degree of safety on the road network is increasing, but this increase is at the expense of the mobility of Palestinian citizens.

For example, Road No. 55, which connects the cities of Nablus and Qalqilya and many communities, most of the entrances to the settlements were converted into roundabouts and entrances to Palestinian communities to traffic lights, this led to raising the degree of safety aspects, but on the other side, it led to delays in the travel time for the Palestinian users of Road 55.

As for the Palestinian citizens, the Israeli occupation authorities are working to obstruct and prevent modifications to the sites of the black spots by the PNA. For example, the entrances to the towns of Deir Istiya and Jamma'in, for the junction of the Jbara checkpoint, where coordination was not obtained from the Israeli occupation authorities. The Israeli occupation authorities stopped remedial work being made to the junction by Palestinian MPWH.

Figure 13 in Appendix 1 illustrates the black spots and their locations in the West Bank according to the Palestinian MPWH database. It illustrates the presence of blackspots in classified areas C compared to those in areas A and B. It turns out that the black spots over the past 8 years remained untreated and without improvement due to the lack of measures taken because of occupation authorities' policies and procedures forbidding the Palestinians to improve such locations and not taking any action form their side when it comes to blackspots in locations heavy Palestinian traffic.

It's to be noted that there is decrease in the numbers of black spots in the years 2020, 2021 and 2023 due to the closures that took place in the country due to the Covid-19 pandemic, and due to the closures followed the October 7th, 2023.

Figure 13 in Appendix 1 illustrates also the locations of the black spots on the connecting regional roads, which the Israeli occupation authorities categorically prohibit any action taken by the PNA in those sites. Some intersections connecting the Palestinian communities require development in terms of traffic safety, where many fatal traffic accidents occur, such as the entrances to the town of Jamma'in in Nablus Governorate and the village of Marda in Salfeet Governorate, both located closely on Road No.505. This site is classified as a black spot in the database of the Palestinian MPWH. The junction connects the communities of Jamma'in, ‘Einabus, Qira and Oreef to Road No. 505. The speed is relatively low in the connecting leg, but the junction does not contain any auxiliary lanes, including acceleration or deceleration lanes, which contributes to increasing the potential of having serious traffic accidents.

According to the data base of the Palestinian Traffic Police, the number of accidents that have occurred at this junction over the past years are as presented in Table 5, while the Figures 15a and 15b in Appendix 1 illustrate the accidents occur at that junction and aerial photo of the junction that illustrates there is no merging or diverging lanes or channelization to separate the low-speed vehicles from the high-speed vehicles or separate turning movements.

There are no records showing the numbers of deaths due to preventing the Palestinian police from intervening in these traffic accidents by the Israeli occupation authorities.

Other examples include Fassail intersection in Jericho Governorate, which is commonly called among Palestinians as the intersection of death. In addition to the entrances of Al-Sawiya, Al-Luban Al-Sharqiya and the main northern Hebron City entrance.

As the geometric design of indicated intersections does not meet the requirements of traffic safety, and the traffic control devices installed at those locations, analyzed later, the Palestinian MPWH submitted requests to the Israeli occupation authorities to modify these intersections and these requests were rejected as mentioned previously.

On the other hand, the road junctions at the entrances of settlements are modified and developed by converting the junctions into roundabouts or by adding traffic lights with channelization of lanes or by adding merging and diverging lanes as illustrates in

Figures 14a and 14b in Appendix 1, leading to enhancement of traffic safety on the intersections at the entrances of settlements.

Table 5

Accidents and injuries at Jamma'in Junction

Year	2019	2020	2021
Number of Accidents	7	5	7
Number of injuries in the accident not including deaths	8	5	11

2.4.6 Traffic Control Design

2.4.6.1 Surface Traffic Control Devices

Entrances to the Palestinian communities that do not have geometric design problems as related to the intersections, have in many cases traffic safety issues related to lack of proper traffic control, whether related to signing, marking, or signalization.

The marked roads centerlines are continuous at the intersections of the entrances of many Palestinian communities, where crossing these lines to move from the entrance of the community to the left is forbidden or making a left turn to enter the roads leading to these communities. The Israeli police is usually waiting to release a traffic violation, such as the entrance to the city of Nablus from the side of the village of Tel on the bypass of Road No. 60, and the entrance to the town of Deir Istiya from Road No. 5066.

Despite all these practices, the entrances of Palestinian communities are neglected, where there are no proper traffic control devices. In case there were traffic control devices, these do not meet the needs or traffic volumes demand of the Palestinian citizens.

Figures 16a and 16b show the neglect and avoidance of proper marking of intersections by the Israeli occupation authorities, which in turn cause releasing traffic violations in case of crossing of what is marked as continues centerline, regardless of the existence of a flaw in the marking, as shown in Figure 16a and 16b in Appendix 1.

On the other hand, the Israeli occupation authorities are developing all the entrances to settlements and even outposts, with marking road centerline to allow for entrances

or exits to the roads connecting these with the main roads, as in the case of the Israeli settlement Havat Gilad, Local Council of Kadumim and Mitzapi Yashai outposts, where they are taken into account in the road marking process. This is despite that in some cases, such as the Havat Gilad tiny outpost entrance is located on a dangerous location where there is a combination of horizonal curve and vertical curve. Figures 16c and 16d in Appendix 1 illustrates those outposts and their entrances in year 2012 where the center line was continuous and in 2022 where the centerline became dashed.

More recently, development is observed through the expansion of these entrances and the construction of intersections that contain auxiliary lanes for acceleration and deceleration.

2.4.6.2 Traffic Signal Devices

The Israeli occupation authorities construct traffic signals that disrupt traffic in favor for some settlers' vehicles, such as the intersections leading to the settlements of Ariel, Eili, Shilo, Ofra, and Shaar Binyamin, all located on Road No. 60. Figures 14a and 14b in Appendix 1 illustrate the scale of development and the attention paid by the Israeli occupation authorities to intersections control at settlements entrances. This is quite the opposite with the regard to the Palestinian communities' entrances. Analysis of traffic signals warrants is illustrated later in the case study section.

Racism in dealing with vehicles according to the color of registration plates is reflected in the establishment of traffic signals at the entrances to settlements and at intersections that lead to roads forbidden to Palestinians and allowed to be used by settlers. These traffic signals are created to ensure the safety and ease of access for the settlers at the expense of the safety and obstruction of the Palestinians. These signals are either pretimed to ensure the flow of traffic for settlers, or actuated if the traffic volume of settlers ' vehicles is negligible compared to the traffic volume of Palestinian vehicles. Therefore, traffic signals obstruct traffic volume of Palestinian vehicles for two or three vehicles at most and sometimes even one vehicle for settlers.

Figures 17a and 17b in Appendix 1 illustrates Haris junction in Salfeet Governorate that links the Roads 505 with Road No. 5066, where it was a junction without a traffic signal. A traffic signal was placed at this junction in 2017, so that the vehicles with yellow license plates are taken into account in the design of the traffic signal regardless

of their traffic volumes, where the traffic on road branching towards the north (from Road No. 505 to Road No. 5066), which connects with some nearby settlements (Ravava, Yakir, Emnwaeel, and settlements on Road No. 55) is observed to be given a green time longer time than needed, where most of the vehicles in this direction have Israeli yellow license plates.

On the other hand, the continuity of the main road was cut off by a red signal most of the time, where the main road leads mainly to Palestinian communities with vehicles with Palestinian green registration plates, causing the formation of considerable traffic jams, so that the length of the queue of vehicles sometimes reaches 1 km, which makes road users commit traffic violations by forming another lane besides the original. This is in addition to passing through the opposite lane as recent photos presented in Figure 17b in Appendix 1 show, where the photos were taken on several different days and the presence of the same problem on a daily basis.

This racism in giving priority to Israeli vehicles over Palestinian vehicles leads to significant delays for Palestinian vehicles estimated to be 20 minutes on average, increasing the duration of the trip and the related costs, and most importantly impacts traffic safety. The long delay period caused by the traffic signal leads to committing of dangerous passing violations by some drivers, which constitute a danger to all road users.

2.4.6.3 Traffic Guidance Signs

Due to the fact that the main roads and bypass roads in the West Bank are located in areas classified C, with full control by the Israeli occupation authorities according to Oslo agreement, these authorities' place traffic signs on the roads, including guidance signs that indicate the names of communities and the distances that those communities are located, in addition to the services available along the roads.

The Israeli occupation authorities place the names of illegally existing settlements and outposts on the lands of citizens in the West Bank, also, the names of main cities beyond the green line, and adjacent to and near the apartheid wall. This is in addition to determining the directions for those cities, settlements, entrances and exits, and indicating the routes leading to them at the junctions. On the other hand, there are none of these signs on all West Bank roads bearing the names, directions and distances of

Palestinian towns and villages, except for the main cities, for example, Nablus and Ramallah. This leads to problems with Palestinian citizens while moving between the governorates in the West Bank.

Changing intersections from simple intersections to intersections that include roundabouts, or even interchanges, causes difficulties in guiding the Palestinian citizens, as no proper guiding signs targeting the Palestinian communities are installed. It's to be started that, it is not easy to navigate the roads of the West Bank without these signs due to the fact that some roads lead to Israeli settlements or to border crossings with areas beyond green line, where the Palestinian citizens are not allowed to pass.

The Palestinian citizens who travel on many of the bypass roads or those leading to Israeli settlements by mistake, due to lack of, or insufficient, guidance signs, are detained by the Israeli army for long hours, if not shot immediately upon travel on those roads.

On the other hand, the Israeli occupation authorities place traffic signs in front of the entrance of every Palestinian community indicating the name of that communities, not for the sake of Palestinian citizens, but for the sake of Israeli settlers to ensure that they do not enter Palestinian communities by mistake. Red-colored signs were placed, which have relatively large sizes that explain to the settlers that the road leads to a Palestinian community and they are forbidden to enter it as illustrates in Figure 18b in Appendix 1.

The Israeli occupation authorities also place guidance traffic signs frequently at the intersections of settlements entrances, to the direction of exit the settlements, so that they show the settlers their destination, while on the other hand, the entrances intersections of the Palestinians communities rarely have guidance signs for them.

Figure 18a in Appendix 1 illustrates the road signs in the West Bank that bear the names of Israeli settlements and do not bear the names of Palestinian towns.

2.4.7 Road and Transportation Planning

A review of the plans prepared by the Israeli occupation authorities, as illustrated in chapter Two (Figure 3b), illustrates that there are proposed roads and railways in West

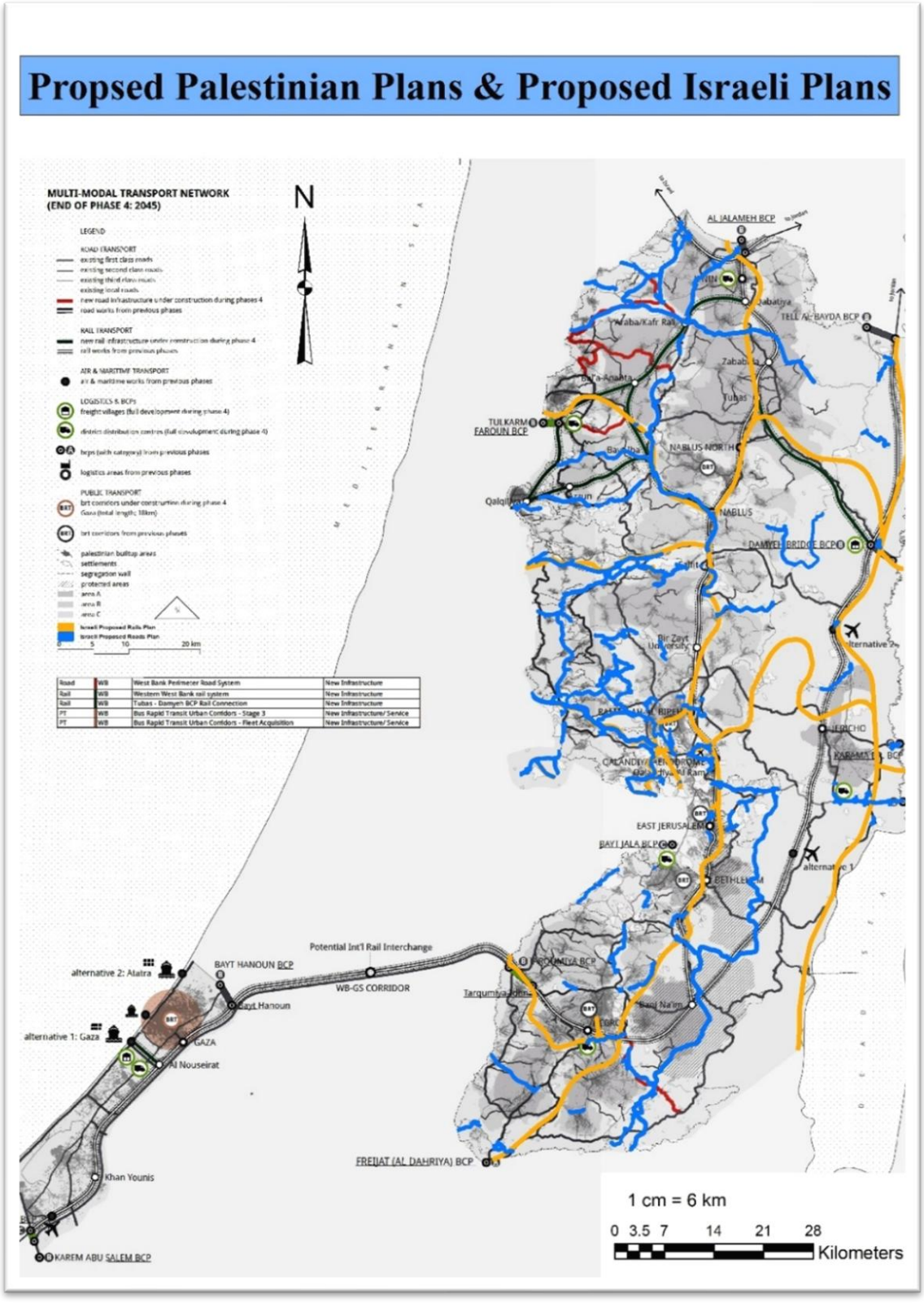
Bank planned to serve their interests. Comparing these plans with the plans proposed by the PNA, as shown in Figure 5, which was prepared according to the needs of the Palestinians and according to the distribution of their populations. It is noticed that there is a considerable difference between the plans from both parties for the same geographical area of the West Bank. Moreover, it noticed that the Israeli occupation authorities plan establishes bypass roads and railways networks that do not take into account the Palestinian presence, as mentioned in Sections 3.4.1 - 3.4.5.

2.4.8 Other Transportation Facilities

With regard to the Israeli occupation authorities' policies related to public transportation in the West Bank, Palestinian citizens who do not own private vehicles, and there is no direct public transportation to their destinations, they are forced to move between the Palestinian governorates by sharing the ride with cars passing on the same destination. Therefore, the Palestinian citizen must stop in places where it is easy for Palestinian vehicles to pass. In such cases, the Israeli occupation forces deliberately harass the Palestinian commuters and direct them to waiting areas far from the intersections, and away from the waiting stations distributed on the roads only to serve the settlers.

Figure 5

Proposed Palestinian Transportation Plan for the West Bank compared with the Israeli Plan



Data Source: [41] & [23]

Palestinians are not allowed cross the intersecting sidewalks to pass through the places designated by the Israeli occupation authorities through the paved road, but foot unpaved paths are created inside the lands surrounding intersections to pass through them.

For example, Za’tara Junction that connects the northern governates with the middle governorates and south of West Bank, which is considered transfer points for Palestinian riders, the Israeli occupation authorities prevent the Palestinian civilian riders from using the intersection sidewalks or crossing the intersection through the paved road.

The Palestinians are obliged to cross the nearby lands to stop and wait far away of the intersection. Figures 20a, 20b and 20c in Appendix 1 illustrate the Bus Stations for settlers, and the waiting spaces for Palestinians and the paths through which Palestinian citizens use away from the paved road sidewalks.

2.4.9 Change Detection Analysis

Through the time tracking of the road network in the West Bank, and observing the changes that occurred on the network, using Google Earth for the years before 1997, and the use of GeoMOLG for the years after 1997, the map that reflects changes over time is created, as illustrates in Figure 6, showing changes in roads between 1984 to 2024.

Figure 21 in Appendix 1 illustrates change detection analysis through aerial photos for a region that lies in Bethlehem Governorate between the years 2002 to 2009.

2.4.10 Case Study: Sinjel Entrance and Eili Settlement Entrance

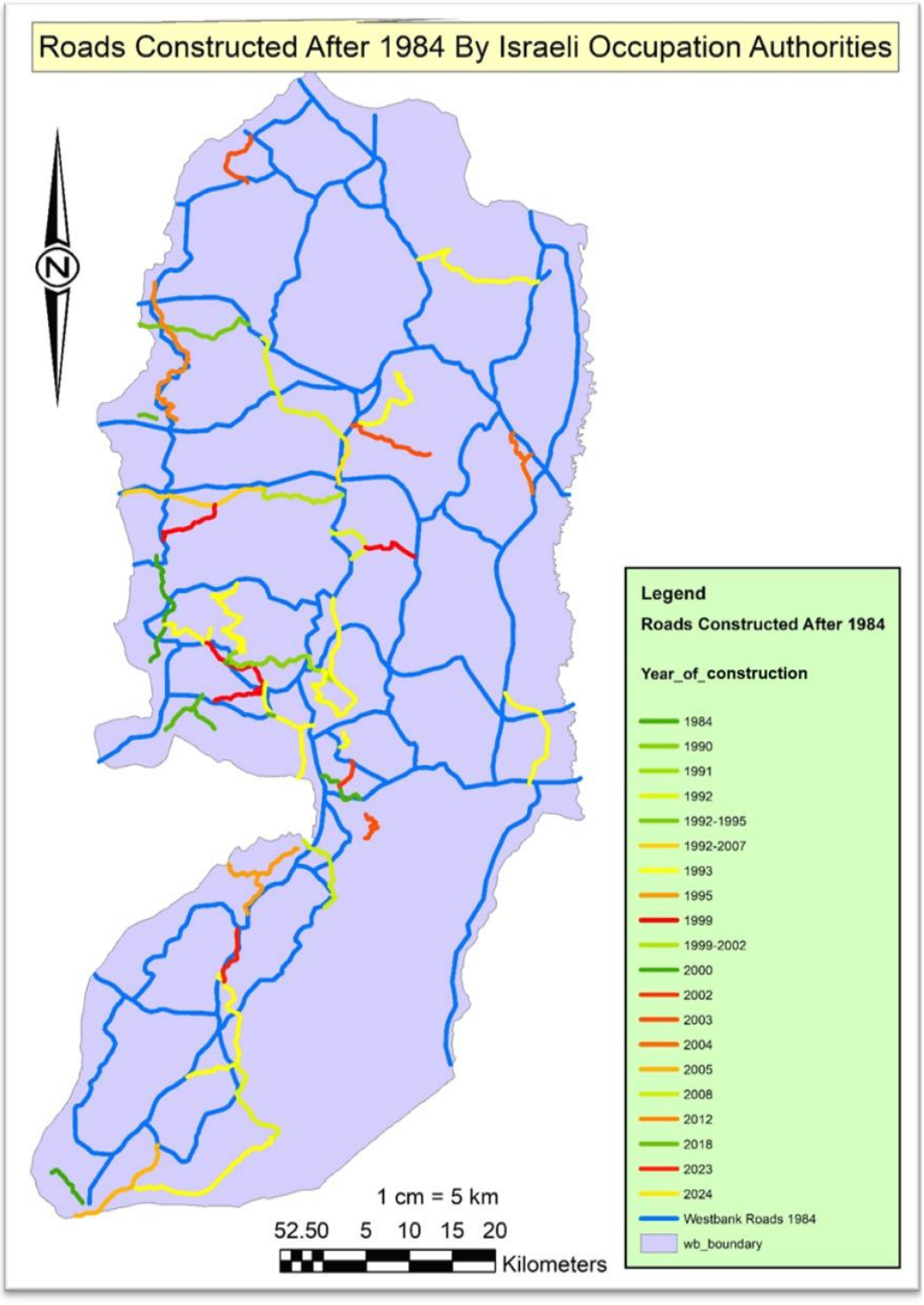
The intersection at the entrance of the town of Sinjel, located on main Road No. 60, as well as the intersection at the entrance of the settlement of Eili, also located on the same Road No. 60, the main artery in the road network in the West Bank, are chosen in this case study.

Both intersections are located 7 km apart. The through traffic volume passing through both intersections is approximately the same due to the presence of a Palestinian town (Turmus'ayya) as well as an Israeli settlement (Shilo) between them. It is noticeable

that there is difference between the two intersections in terms of geometric design as well as in traffic control devices. These are presented hereafter.

Figure 6

Change detection analysis for roads constructed in the West Bank during 1984-2024



Data Source: [36] & [42]

2.4.10.1 Geometric Design

1. Sinjel Intersection

The intersection of Sinjel town was rebuilt in 2015 after being closed through the earth mounds by the Israeli occupation authorities since 2002. This was the reason for the search for alternative roads for the citizens of the neighboring Palestinian communities. This in turn led to an increase in the travel time, as well as direct and indirect costs for Palestinian citizens.

The Intersection was rebuilt through a USAID funded project. The Israeli occupation authorities have approved the rehabilitation of the intersection according to their conditions, and therefore, the rebuilt intersection did not meet the requirements of the Palestinian citizens.

The intersection is considered as the major entrance to Sinjel town, as well as the villages of Jiljliya and ‘Abwein, and other communities to the west of these, where the intersection is one of two intersections is connecting these communities with the old alignment of Road No. 60, while the other intersection is being closed in various ways by the Israeli occupation authorities.

The rebuilt intersection does not meet the international specifications of the design of roads that are followed during the works on intersections leading to Israeli settlements. However, the intersection has been designated for two traffic movements only (right-in and right-out) without allowing other movements, whether through the intersection, or any alternate roundabout or interchange, that could allow proper consideration the opposite direction of traffic.

These allowed two movements were identified with a triangular raised island that allows the southbound traffic to enter the town to the right and allows to exit the town only in the direction towards the south to the right only (i.e., right-in/right-out intersection).

The above led to the wrong use as practiced by the Palestinian drivers, who are forced to make wrong entry or movements contrary to the direction of traffic, which increases considerably the risk of traffic accidents in addition to receiving violations from the Israeli police.

The Status before and after improvement is illustrated as follows:

- Before Improvement of the intersection in 2015, and specifically before 2002, when the intersection was opened, the intersection was a simple 3-leg intersection. Like the rest of the intersections serving the Palestinian communities, it lacked proper control, with no islands, no auxiliary lanes, no right-angle intersection (the angle of intersection is 33 degrees with the main road), and without proper turning radii. The intersection was located in an area considered dangerous for road users as it is located between two curves, the first one in north with radius of 157 m which is not appropriate for the road design speed of 90 km/hr, and the second curve in south with radius 232 m which is also not appropriate for same design speed.
- After improvement the intersection in 2015, the features of the rebuilt intersection include:

- The angel of intersection was modified to be 90 degrees,
- A raised triangle island was added with an area of 395 m^2 at the minor road that prevents left turn movement from both directions (exit from the town to the northbound direction and entering the town from the southbound direction),
- Auxiliary lanes were added for right turn movements with length of 100 m for southbound direction (deceleration lane) and 40 m for northbound direction (acceleration lane) which does not meet the safety requirements according to AASHTO specification (130 m at operating speed 80 km/hr for deceleration lane and 245 m at design speed 90 km/hr and initial speed 20 km/hr).
- Curves on the main road (Road No. 60) where realigned to be curves with large radii (210 m and 330 m, from north to south respectively) which is appropriate for design speed of 80 km/hr where the settlers use the road.
- Turning radii for the right turns equal 12 m which is less than the specification (15 m).
- Lane's width equals 5.5 m and 5.5 m for right turns towards and from Sinjel main road, respectively, which is adequate.

Figure 22a in Appendix 1 illustrates the geometric design and the dimensions for old and rebuilt intersection at the entrance of Sinjel town.

It can be concluded that the modification of the intersection as per the USAID funded project was only to control the traffic of Palestinian vehicles and adjust the horizontal curves on the highway in favor of the settlers ' traffic safety, based on the approval of the Israeli occupation authorities. Moreover, the modification in the intersection dedicated to the entry of Palestinian vehicles to the town of Sinjel did not achieve the safety specifications as well as in the exit from the town, which is in contrast to what is done in the settlements.

2. Eili Settlement Intersection

The intersection at the entrance of Eili settlement was improved during the year of 2022. The intersection is a 3-leg intersection that intersects at an angle of 90 degrees with Road No. 60. The intersection lies on a curve with a radius of 710 m which is appropriate for the design speed of 90km/hr, with appropriate sight distance for users of the road.

- Before Improvement of the intersection in 2022, it was unsignalized and unchannelized on the major road. It was containing auxiliary lanes for acceleration and deceleration. Other features include:

- A diverging deceleration lane was constructed in the westbound direction for right turn with length of 65 m, which is less than AASHTO specifications (130 m at design speed of 80 km/hr).
- Merging acceleration lane for left movement in the eastbound direction, on the main road No. 60, in the direction of exit the settlement with a long 115 m.
- Right parallel auxiliary lane for deceleration in the westbound with length of 65 m which is also less than AASHTO specification (140 m at design speed of 90 km/hr, design speed on exit curve 20 km/hr).
- Main road lanes at the intersection are one lane for each direction, with operating speed 80 km/hr.
- Right turn lane width 6.7 m, which is suitable for design vehicle of SU-12.
- There is a splitter island between the two directions of the leg settlement entrance with a size equals 58 m^2, which is larger than the AASHTO specifications (minimum 14 m^2).
- The volume of left turn traffic to the settlement or from it cannot be determined because of the political and security situations, which does not allow

accommodating the necessary storage distance, but through the visual inspections, the volume will exceed 100 veh/hr in the peak hour, which requires exclusive left turn movement according to AASHTO specifications.

- Turning radii at the intersection was 15 m.

- After improvement the intersection in 2022, the upgraded intersection included signalization and channelization, where a traffic signal was installing at the intersection with proper islands. Other features of the improvement's intersection included:

- Raised divisional islands ware added to main road (Road No. 60) with a width of about 2.6 m. For the minor road (the settlement road), the divisional islands were rebuilt with a new shape, with a width of 2.3 m, in addition to two triangle islands to separate right turn movements with areas of 20 and 50 m2, which are considered larger than the specifications (minimum 14 m2).
- The turning lane widths range from 6.0 m to 7.0 m which is suitable for SU-12 design vehicle.
- The number of lanes at the intersection where developed to be 2 lanes for the westbound direction, in addition to an auxiliary parallel type lane for deceleration with a length of 175 m, which is larger than the specification of AASTHO (140 m for design speed of 90 km/hr and on exit curve 20 km/hr).
- An auxiliary deceleration left lane in the eastbound direction was developed with a length of 143 m, which is larger than AASHTO specifications (140 m for design speed 90 km/hr) in addition to one lane for the through traffic on the eastbound direction of the main road.
- Adding an auxiliary parallel acceleration lane for right turn movement from minor road to the main road with a length of 179 m.
- Turning radii for the right turns at the intersection are reached 15 m.

Figure 22b in Appendix 1 illustrates the geometry design and dimensions for old and developed same intersection of the Eili settlement.

2.4.10.2 Traffic Control Devices

1. Sinjel Intersection:

- **Before Improvement:**

The intersection lacked proper traffic control devices before improvement. It only had a stop sign at the minor road controlling traffic coming out of the town.

- **After Improvement:**

When the intersection was rebuilt by the USAID, it was not developed geometrically to suit the needs of the town and the Palestinian communities, as indicated earlier. No proper traffic control devices were installed, such as the pedestrian crossing marking and signs. Therefore, the design of the road does not allow the safe passage of Palestinian pedestrians, except those traffic control devices that limit the movements of the intersection to only two movements (right-in and right-out).

In 2013, a proposal for the intersection design was prepared through a USAID funded project as indicated earlier, which contained auxiliary lanes at the main Road No. 60, for acceleration and deceleration towards the north and south, respectively, with the addition of islands and the addition of the necessary traffic signs. All official approvals were obtained from the Israeli occupation authorities. However, before the implementation began, the work was objected by the Israeli occupation authorities then, and therefore, work was stopped before it began for flimsy security arguments. Figure 22c in Appendix 1 illustrates the schemes of the above-mentioned proposal.

In the year 2022, Sinjel Municipality prepared studies and engineering plans to develop the intersection in accordance with the needs of Palestinian citizens, where the study showed the number of vehicles passing through the intersection and included appropriate engineering design, which implied adding a traffic signal to the intersection with convenient pedestrian crossing as well as opening the intersection to all traffic that takes place on a 3-leg intersection to increase accessibility and avoid violations that are imposed by the Israeli Police on the Palestinian citizens.

The number of traffic lanes was increased to two lanes in each direction. The proposal would have been submitted to obtain the necessary approvals, but the events of

October 7, 2023 prevented the submission of the study to obtain the required approvals.

Figure 22d in Appendix 1 illustrates the studies that were prepared for the intersection and volumes of traffic at different peak hours in morning and evening, while Figure 22e in Appendix 1 illustrates the proposed plans of the intersection which would have been submitted to take the necessary approvals from Israeli occupation authorities by Sinjel Municipality.

2. Eili Intersection:

- **Before Improvement:**

The intersection was organized through traffic control devices through appropriate marking on the road surface in terms of marking the centerline separating the traffic lanes, as well as the auxiliary lanes. Traffic was controlled through a stop sign that was causing delays for settlers' vehicles due to the large volume of vehicles passing from the main Road No. 60. Figure 22b in Appendix 1 illustrates the layout of the intersection before the development process in 2022.

- **After Improvement:**

When the intersection was developed in 2022, the improvement was not limited to its geometric design, but also included installing proper traffic control devices. Actuated traffic signals were added, in addition to updating the markings, taking into account all vehicle movements and pedestrian traffic as well. Figure 22a in Appendix 1 shows the appropriate marking for traffic lanes, pedestrian crossings, and arrows installed on the pavement surface, in addition to the guidance and warning signs that were added before and after the intersection.

2.4.10.3 Traffic Signal Warrants

Based on the traffic counts carried out on April 7, 2022 at the junction at the entrance of the town of Sinjel (the count records are included in Appendix 3), traffic signal warrants analysis of the intersection traffic is carried out as presented hereafter to examine if a traffic signal issued at the intersection.

After analyzing traffic counts, the maximum 8 hours traffic volume is summarized as presented in Table 6. Warrants are checked in accordance to the applicable warrants

1, 2, and 3 of the internationally used guidelines of the Manual of Traffic Control Devices (MUTCD), as follows:

Table 6

Maximum 8 hours volumes for Sinjel Intersection

No.	Hours	Major Road Volume in Both Directions (Vehicles per hour)	Minor Road Volume (Vehicles per hour)
1	6:45 - 7:45	1774	165
2	14:15 - 15:15	1380	107
3	15:15 - 16:15	1378	61
4	10:15 - 11:15	1339	60
5	7:45 - 8:45	1258	99
6	16:15 - 17:15	1247	56
7	8:45 - 9:45	1221	73
8	13:15 - 14:15	1196	87

Source: [43].

Warrant 1: Eight-hour vehicular volume.

It is satisfied when traffic volumes on the major-road and the volume of minor road for each of any eight hours of an average day are at least equal to the volumes specified in the 100 percent columns in Table 7.

Table 7

Standards volumes for warrants

Condition	Number of Lanes		Vehicles/ Hr on Major Road (Both approaches)	Vehicles/ Hr on Minor Road	100% A Major/ Minor	80% B Major/ Minor	70% C Major/ Minor	56% D Major/ Minor
	Major road	Minor road						
A	1	1	From Table 6	From Table 6	500/150	400/120	350/105	280/84
B	1	1	From Table 6	From Table 6	750/75	600/60	525/53	420/42

Source: [44]

- B: Used for combination of Condition A and B (see Table 8.2) after adequate trial of other remedial measures
- C: May be used when the major-road speed exceeds 65 Km/h or in an isolated community with a population of less than 10,000
- D: May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 65 Km/h or in an isolated community with a population of less than 10,000.

- ✓ Condition A for Warrant 1 does not satisfy.
- ✓ Condition B for Warrant 1 is satisfied by using C column in Table 7.

Based on the above, warrant 1 is satisfied.

- Warrant 2: Four-hour vehicular volume.

By applying max four-hour vehicular volumes on the Figure 7a, which illustrates the volumes of Sinjel intersection compared with requirements of warrant 2.

According to warrant 2, the traffic whereas do not satisfy the warrant for normal condition. However, applying maximum four-hour vehicular volumes on the Figure 7b, which illustrates the traffic volumes of Sinjel intersection with the requirements of warrant 2 in 70% reduction condition due to major-street speed limit is above 65 Km/h.

Accordingly, warrant 2 is satisfied.

- Warrant 3: Peak-hour vehicular volume.

Because of the geometric design of the Sinjel town intersection, which is designed to be only right-in/right-out, the intersection does not have a stop sign and does not have delays, which leads to not satisfying warrant 3 by delay condition (condition A).

Applying volumes of vehicles (1,774 Veh/hr for major road, 165 Veh/hr for minor road) at the intersection on Figure 7c (condition B), which illustrates the volumes of vehicles at Sinjel intersection applied to warrant 3.

Accordingly, warrant 3 is satisfied.

The intersection counted traffic volumes satisfy the warrants related to traffic volumes. This necessitates the addition of a traffic signal at the intersection, as per the current traffic volumes intersection.

In the case that the intersection is upgraded appropriately, the volumes of traffic that will pass on the minor road (Sinjel Entrance) will increase, however, the Israeli occupation authorities left the intersection as it is and do not allow the process of improve it to meet the Palestinian requirements.

Figure 7

Applying volumes of vehicles at Sinjel Intersection to warrant 2 and warrant 3 (Condition B) specifications in normal condition

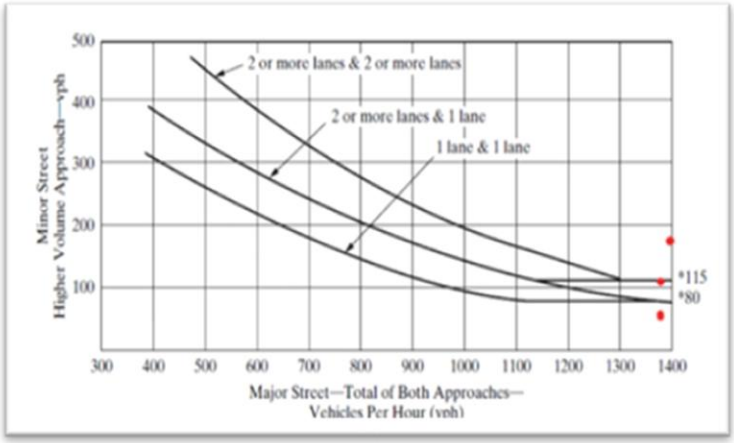


Figure 7a

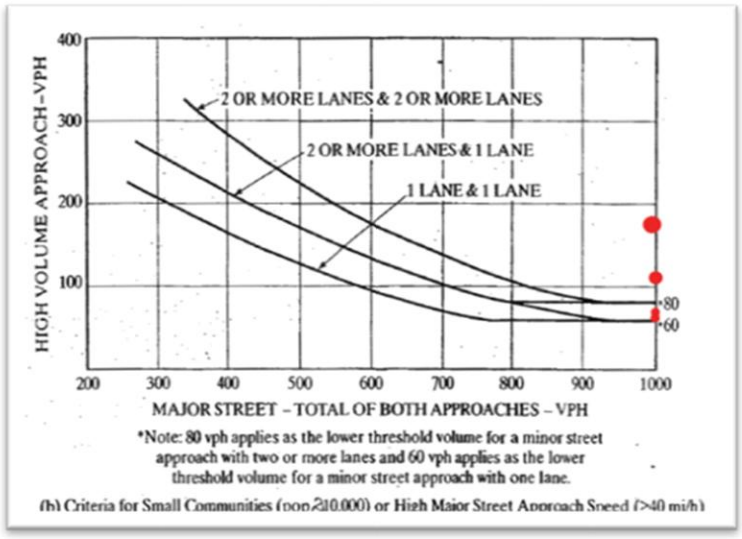


Figure 7b

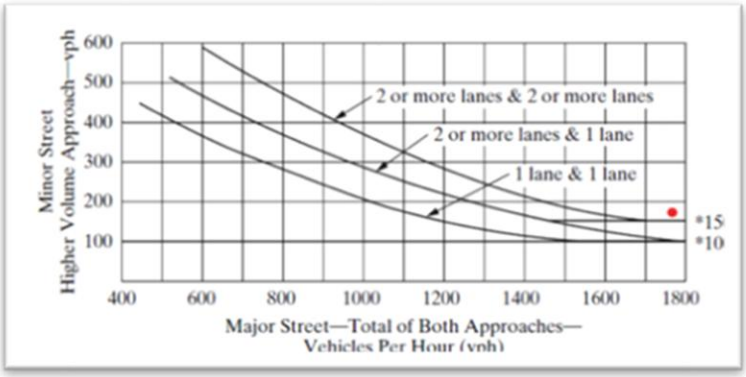


Figure 7c

On the other hand, for the settlements that were mentioned earlier and were provided with traffic signals, most of these signals do not fulfill the warrants that allow adding traffic signals, but were placed for a limited number of Israeli vehicles, a traffic count was not conducted for one of those settlements due to the prevailing security conditions in the West Bank.

Chapter Three

Results and Summary

This chapter summarizes the findings that Israeli caused by the Israeli occupation authorities' policies, procedures, and practices concerning the road network in the West Bank, especially in Area C, highlighting those related to the Palestinians citizens compared with those to the illegal settlers.

Conducted analysis reveals that the Israeli occupation authorities are continuously working through their successive governments on the policy of apartheid between Israeli settlers and Palestinian citizens in the West Bank. This policy of apartheid is carried out through procedures and practices that the Israeli occupation authorities apply to the road and transportation sector in the West Bank.

These procedures and practices followed by the Israeli occupation authorities in the West Bank on the road and transportation network can be summarized as follows:

1) The Israeli occupation authorities are constantly working to restrict Palestinian citizens and limit their right of access by not linking or even separating the Palestinian communities with the road networks in area C that is controlled by the Israeli occupation authorities, in addition to separating the Palestinian communities from each other by building bypass roads around the Palestinian communities. The calculated accessibility index for particular representative cases, it was found that it has increased by 29% or more due to such policies.
   The study of movement of the Palestinians in the West Bank show that it was clearly influenced by the policies, procedures and practices of the Israeli occupation authorities, represented by significant delays through all kinds of barriers and obstacles, in addition to delays caused by changes made on the road network in the West Bank by these authorities to serve mainly the settlers. The calculated travel time index for the same cases for which the accessibility index was calculated shows that the percentage of increase in the index reached 400% or more, resulting in impact on the environment and the Palestinian economy.
2) There is deliberate negligence of the entrances to Palestinian cities, towns, and villages in contrast to the entrances to Israeli settlements, both in terms of

connecting Palestinian communities with new roads or in terms of developing the existing entrances of Palestinian communities.

3) There is intended give priority by the Israeli occupation authorities to the traffic of settler's vehicles at the expense of Palestinian vehicles.
4) The Israeli occupation authorities design the bypass roads in such a way that prevents the urban sprawl of Palestinian communities. They also make unsafe changes to existing roads for the Palestinians and do not conform to engineering specifications, on the contrary, they achieve safe design according to engineering specifications for roads used by the settlers.
5) There is policy of using the ROW and the setbacks of the bypass roads intended for use by the settlers, which leads to a reduction in the area where the Palestinian communities could expand, which is reflected on the local road networks and preventing to expansion in C areas.
6) There is clear impact of the policies, procedures and practices of the Israeli occupation authorities concerning not allowing the PNA to work on the road network in the West Bank to enhance traffic safety, and not taking appropriate measures from the Israelis side, which is evident in the number of black spots that increase over time without implementing countermeasures, on contrary with the roads used by settlers.
7) There is clear racism in the placement of guidance traffic signs on the main roads in the West Bank.
8) There is temporal division of traffic in roads between the Palestinian citizens and the Israeli settlers, so that the use of shared roads is separated from time to time between Palestinians and settlers in order to serve the interests of settlers.
9) The Israeli occupation authorities have prepared their future planning of transportation networks in the West Bank in a way that serves its settlements and security concerns. When these plans are compared to the transportation needs expressed in the plans prepared for the PNA, they do not take into account the needs of the Palestinians.
10) There is discrimination against the Palestinians by preventing them from being present at public transportation stops close to some major intersections located in areas C, and redirecting the Palestinian pedestrians at such intersections to use footpaths that are far from the pedestrians' sidewalks and crossing at these intersections, which are allowed to be only used by the Israelis.

11) There is inappropriate geometric design and TCD plans including traffic signs, signals, marking, etc., at intersections leading to the Palestinian communities or being used mainly by the Palestinian citizens.
12) The changes in the road network in the West Bank over time through change detection analysis show the effects of the policies and practices of the Israeli occupation authorities on the West Bank over years, as well as continuous expansion of settlements and their connections with the road networks beyond green line.

These measures and practices carried out by the Israeli occupation authorities, in addition to the closures of roads through gates, dirt piles, permanent or flying barriers, etc., as was presented and analyzed, imply that their main goal is to reflect apartheid between Israeli settlers and Palestinian citizens. These practices led to the creation of two networks of roads in the West Bank, one advanced for the settlers and one lagging behind with lesser traffic safety for the Palestinian citizens.

The outcome of the conducted analysis showed that the Israeli occupation authorities has been devoted only to serve the settlements and their interconnections with each other through invented justifications related to security to facilitate their task of controlling the Palestinian land. Figure 23 in Appendix 1 illustrates the locations of Israeli settlements and the Palestinian communities and shows the roads established and planned by the Israeli occupation authorities, which connect their settlements with each other, and avoid Palestinians communities. This is in accordance with the apartheid policy adopted in the road and transportation network system.

Chapter Four

Conclusions and Recommendations

4.1 Conclusions

The Israeli occupation authorities have been devising policies and procedures, and conducting discriminatory practices concerning the road and transportation sector in the West Bank, in line with their aim to impose their dominance over the entire territory of the West Bank. This is reflected in cutting the West Bank into geographical cantons that are linked through controlled connections, while having a road and transportation system with the backbone of bypass roads that facilitate connectivity between the Israeli settlements and with Israel beyond the green line.

The use of the road and transportation system in the West Bank by the Palestinians is being restricted through various type of obstacles. New roads have been built by Israeli occupation authorities to serve settlement and security purposes, while these authorities prevent the PNA to implement its plans related to road and transportation sector to achieve the objectives of providing a proper and safe system that satisfies the mobility and accessibility needs of the Palestinians. The road network located in area C, is controlled by the Israeli occupation authorities. It has been shown that the Israeli policies have resulted is a road and transportation system that reflects apartheid.

The Israeli policy of deliberately non-linking of the Palestinian communities with the road network in the West Bank, turning the West Bank into isolated cantons connected to each other through specific links, which may not be connected properly with the road network, this significantly affecting the accessibility and mobility of the Palestinian communities. This, in turn, affects the Palestinian citizens in terms of travel time, cost, and the surrounding environment, which is reflected on the Palestinian economy.

The policy of deliberate negligence adopted by the Israeli occupation authorities with regard to the Palestinian communities, had impacts concerning appropriate linkage with the road network in areas C, and the development of entrances to the communities, especially the capacity and safety of the related intersections, which lead to a decrease in the level of service in those intersections.

The Israeli occupation authorities are also pursuing policies of constructing bypass roads with wide right of way widths and imposing generous setbacks around them, which harm Palestinian citizens in several ways; the most important of which is preventing the urban expansion of Palestinian communities, unlike Israeli settlements, in addition to the impact on the local road network in Palestinian communities.

The Israeli occupation authorities do not allow the PNA to remedy the black spots on the road network in the West Bank, thus significantly affecting the safety of the Palestinian citizens.

The result of analysis show that the Palestinians are being challenged to have proper road infrastructure towards their future state, due to the lack of an adequate infrastructure including high standards road and transportation network, and the imposed constraints. The Israeli occupation authorities are keen to hinder what may later lead to a Palestinian state, as this is evident through the practices carried out by the Israeli occupation authorities since 1967, as previous studies had illustrated, through the establishment of road networks intended to serve the settlement purposes, the apartheid policies, and the deployment of various types of barriers. These policies and practices have been inclined to worse after the October 7, 2023.

In conclusion, the Israeli occupation policies and practices followed in the road and transportation sector in the West Bank seek to achieve an apartheid system which could lead to ethnic cleansing of the West Bank territories from their original inhabitants.

4.2 Recommendations

Based on the outcome of the research, the following recommendations are proposed:

1) The Palestinian officials must take measures and develop policies to stop the Israeli deliberate confiscating the Palestinian rights in all aspects, including as related to land and to the road and transportation system. It is recommended to take actions to take decisions and pressure the occupying power to grant the Palestinians their rights in this regard, through the relevant international courts, the UN institutions, as well as the international community.

2) It is recommended that the PNA should apply appropriate measures on the ground, that will improve the reality of the road transportation sector in the West Bank to reach a transportation system that serves Palestinian citizens considering proper engineering practices to ensure safety and satisfy the mobility and accessibility needs.

3) It is recommended to develop measures, policies, and practices that counter what the Israeli occupation authorities are doing to gain access to a free transportation network, that could form the basic infrastructure in preparation for the future independent Palestinian State.

4) It is recommended to prepare plans and update prepared ones to develop the entrances of Palestinian communities in addition to integrating them with regional roads in accordance with the highest engineering standards. It is recommended to work on the establishment of an interconnected road network that includes several entrances and exits to each Palestinian community. This could be done based on the Roads and Transportation Master Plan which was recently prepared through funds from the Europe Investment Bank and later approved by the PNA. It is recommended to mobilize the international community to pressure the Israeli occupation authorities, to allow this and to provide the necessary funds.

5) It is recommended to prepare all the documentations needed to enable the Palestinian officials to protest in front or international courts and object to what the Israeli occupation authorities are illegally doing as related to land and transportation in oPt.

6) It is recommended to allocate the basic funds needed to providing the necessary equipment and manpower for the implementation of projects on the ground to exercise to counter the efforts of the Israeli occupation authorities in this regard.

7) It is recommended that the PNA put all the necessary traffic signs that indicate the identity of the land and communities on all the road network in the West Bank.

8) It is recommended that the PNA enhances the connections among the Palestinian communities and develops opens more alternate roads to facilitate the movement of the Palestinians.

List of Abbreviations

Abbreviation	Meaning
AASHTO	American Association of State Highway and Transportation Officials
AI	Accessibility Index
ARIJ	Applied Research Institute - Jerusalem
GeoMOLG	Geomolg Portal for Spatial Information in Palestine
GIS	Geographic Information System
MOLG	Ministry of Local Government
MPWH	Ministry of Public Works and Housing
MUTCD	Manual of Uniform Traffic Control Devices
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
oPt	Occupied Palestinian territories
PLO	Palestinian Liberation Organization
PNA	Palestinian National Authority
ROW	Right of Way
TCD	Traffic Control Devices
TTI	Travel Time Index
UN	United Nations
USAID	United State Agency for International Development

References

1. El-Atrash, A. (2014a). Political Geography of Israeli Settlements (In Arabic). The Palestinian Forum for Israeli Studies (Madar).

2. Abu-Eisheh, S. (2004). The Impacts of the Separation Wall on the Sustainability of the Transport Systems and Services in the Palestinian Territories", An-Najah University Journal for Research-A, An-Najah National University, Vol. 18, No. 2, pp. 285-313.

3. Scott, J.C. (1998). Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed. Yale University Press, New Haven, CT, USA.

4. Conlon, F.F. (2008). Engines of Change: The Railroads That Made India. Technology and Culture. The Johns Hopkins University Press and the Society for the History of Technology Stable. Vol. 49, No. 2. pp. 471-472

   URL: https://www.jstor.org/stable/40061533

5. Jedwab, R., Kerby, E., Moradi, A. (2015). History, Path Dependence and Development: Evidence from Colonial Railways, Settlers and Cities in Kenya. The Economic Journal. Willy Online Library. Vol. 127. Issue 603. pp. 1467- 1494. URL: https://doi.org/10.1111/ecoj.12347

6. Benvenisti, M., Khayat, S. (1988). The West Bank and Gaza Atlas Jerusalem . The Jerusalem Post. Jerusalem.

7. Issac, J., Miaari, S., Zboun, I., Hadweh, P., Abu Zahra, A., Isaac, F., Bader, A.

   (2019). Assessing the Impacts of Israeli Movement Restrictions on the Mobility of People and Goods in the West Bank. Jerusalem: Apply Research Institute – Jerusalem (ARIJ).

8. Rosen, M., Shaul, Y., Inbar, T. (2020) Highway to Annexation, Israeli Road and Transportation Infrastructure Development in the West Bank. The Israeli Centre for Public Affairs and Breaking the Silence.

9. Palestinian News & info Agency (2010). *Palestinian News & info Agency*. Retrieved from https://info.wafa.ps/ar_page.aspx?id=0HEv64a3907897818a0HEv64

10. Land Research Center (LRC). (2020) Israeli Military Orders In the Service of Israeli Intrests . POICA. [Online] [cited 2024 5 12. Available from: HYPERLINK http://poica.org/2020/07/%D8%A3%D9%88%D8%A7%D9%85%D8%B1-%D8%B9%D8%B3%D9%83%D8%B1%D9%8A%D8%A9-%D8%A7%D8%B3%D8%B1%D8%A7%D8%A6%D9%8A%D9%84%D9%8A%D8%A9-%D9%81%D9%8A-%D8%AE%D8%AF%D9%85%D8%A9-%D8%A7%D9%84%D9%85%D8%B5%D8%A7%D9%84 .

11. Europian Committee of The Regions (2024) Palestine - Economic, Social and Territorial Cohesion. Division on Powers. [Online]. [cited 2024 5 12. Available from: HYPERLINK https://portal.cor.europa.eu/divisionpowers/Pages/Palestine-Economic-social-and-territorial-cohesion-.aspx .

12. Abdulhadi, R. (1989). Living Conditions of the Palestinian People. United Nations. [Online] Available from: HYPERLINK https://www.un.org/unispal/document/auto-insert-179709/ .

13. Mashaqi, B. (2020). Freedom of movement in the West Bank in light of Israeli Political Challenges. Graduation Project. Nablus: An-Najah National University.

14. El-Atrash, A. (2014b). Spatial Planning Strategies Towards Sustainability in the Geo- Political Context of Present Palestine, The Case of Bethlehem. Dortmund, Germany.

15. Suliman, A. I. (2000). By-Bass Roads Effects on the Physical Environment in the West Bank. Nablus: An-Najah National University.

16. Jarbawi, A. & Abdulhadi, R. (1990). Israeli "Organization" Schemes: The Latent Tool for Integrating the Occupied Palestinian Territories into Israel. *Institute for Palestine Studies*, pp. 22-.

17. Isaac, J. & Hosh, L. (1996). Environmental Challenges in Palestine and the Peace Process. Rhode Island: Applied Research Institute - Jerusalem (ARIJ).

18. B'TSELEM (2004). Forbidden Roads Israel's Discriminatory Road Regime in the West Bank. 8 Hata'asiya St. Jerusalem: B'TSELEM.

19. El-Atrash, A., Isaac, J., & Salem, H. (2009). Planning Towards a Sustainable Land Transportation System in a Future Palestinian State. *Journal of Nature Science and Sustainable Technology*, pp. 305-324.

20. As'ad, A. (2023). Barriers, closures and restrictions on movement in the West Bank following October 7. Institute for Palestine Studies.

21. Peace Now team (2023). Peace Now. [Online]. [cited 2024 5 14. Available from: HYPERLINK https://peacenow.org.il/en/new-roads-and-outposts-flourish-in-the-west-bank-amid-gaza-war .

22. As'ad, A. (2020). Israeli Bypass Roads: Separating the Colonized and Linking the Colonizer. Institute for Palestine Studies. [Online]. Available from: HYPERLINK https://www.palestine-studies.org/ar/node/1650336 .

23. Al-Sahili. K. (2007). The New Patterns of the Israeli Road Measures and their Impacts on the Transport Sector. *An-Najah University Journal for Research-A*, An-Najah National University, Vol. 21, No. 1, pp. 169-200.

24. The Civil Administration for Judea and Samaria (2023). GIS Maps by The Civil Administration for Judea and Samaria. [Online]. Available from: https://tapash-mnz.opendata.arcgis.com/ .

25. United Nations Office for the Coordination of Humanitarian Affairs (2023). OCHA. [Online] [cited 2024 2. Available from: https://www.unocha.org/publications/report/occupied-palestinian-territory/fact-sheet-movement-and-access-west-bank-august-2023 .

26. Sowa, C. (2014). Smoothing the Striated Space of Occupation – the Struggle over Space in the West Bank. PAL PAPERS.

27. Arafat, A. & Wael, E. (2019). The Wall, Bypass Roads and the Dual Transportation. Birzeit. Birzeit University.

28. Aburas, H. and Shahrour. I. (2021). Impact of the Mobility Restrictions in the Palestinian Territory on the Population and the Environment. *Sustainability* 2021, 13,13457. https://doi.org/10.3390/su132313457.

29. Elias, W. (n.d.). The Impacts of the Segregation Wall on Travel Behavior in the Palestinian Territory. Haifa. Technion-Israel Institute of Technology, Technion City.

30. Negotiations Afford Department (2005). [cited 2024 05 12. Available from :https://www.nad.ps/en/publication-resources/faqs/israel%E2%80%99s-roads-and-tunnels-plan .

31. Isaac, J. & Maoh, H. (n.d.). The Status of Transportation in the West Bank. Bethlehem: Applied Research Institute – Jerusalem.

32. Pirie, G. H. (1989). Implanting racial ideology: Bus apartheid in Cape Town, Social

    Dynamics, 15:1, 61-74.

33. Pirie, G. H. (1992). Rolling Segregation into Apartheid: South African Railways, 1948- 53. Journal of Contemporary History, 27(4), 671–693. http://www.jstor.org/stable/260948.

34. Thomas D. (2016). Public Transportation in South Africa: Challenges and Opportunities. World Journal of Social Science Research. Vol. 3, No. 3, (2016). https://www.scholink.org/ojs/index.php/wjssr

35. Al-Jazeera (2012). Apartheid: Israel and South Africa. Retrieved from Al-Jazeera.net: https://2u.pw/PS9Pva.

36. GeoMOLG (2023). Orthophotos and Data layers. Ministry of Local Goverment. [cited 2023 09. Available from: https://geomolg.ps/L5/index.html?viewer=A3.V1 .

37. Odeh, A. Awayssa, Q. Abu Shamma, A. (2014) Planning and Design of An Alternate Route to Howwara Road. Nablus. Grduation Project. Nablus. An-Najah National University.

38. Al-Arabi, Z. (2023). Al-Jadid. Available from: https://www.alaraby.co.uk/politics/%D8%A7%D8%AA%D9%81%D8%A7%D9%82-D8%A5%D8%B3%D8%B1%D8%A7%D8%A6%D9%8A%D9%84%D9%8A-%D8%B9%D9%84%D9%89-%D8%AA%D8%B7%D9%88%D9%8A%D8%B1-%D8%B9%D8%AF%D8%A9-%D8%B4%D9%88%D8%A7%D8%B1%D8%B9-%D9%81%D9%8A-%D8%A7%D9%84%D8%B6%D9%81%D8 .

39. Aljazeera (2023). Map and powers of the Palestinian Authority and Israel in the West Bank. Aljazeera.net. [Online].;. Available from: https://www.aljazeera.net/news/2023/2/27/%D8%AE%D8%A7%D8%B1%D8%B7%D8%A9-%D9%88%D8%B5%D9%84%D8%A7%D8%AD%D9%8A%D8%A7%D8%AA-%D8%A7%D9%84%D8%B3%D9%84%D8%B7%D8%A9-%D8%A7%D9%84%D9%81%D9%84%D8%B3%D8%B7%D9%8A%D9%86%D9%8A%D8%A9 .

40. Hindi, E. (2023). Position assessment on: future Palestinian cantons and settlements in Israeli plans. Colonization & Wall Resistance Commission. Rammallah. Available from: https://www.cwrc.ps/page-1098-ar.html.

41. Ministry Of Transport (2016). Multi-Modal Transport Network. Road And Transportation Master Plan / West Bank And Gaza Strip Project. Ministry of Transport. Rammallah.

42. Google Maps (2012). Orthophotos. Available from: https://www.google.com/maps/@32.0999821,35.2461074,247m/data=!3m1!1e3?entry=ttu .

43. Sinjel Municipality (2022). Trafiic Count at Main Entrance of Sinjel. Sinjel Municipality. Sinjel.

44. Roger, P. (2011). Traffic Engineering. Fourth Edition ed. Stark H, editor. United States.

45. In Site (in Hebrow בשטח). (2023). C. Civil Eng. Civil Engineering Group. Available from: https://www.civileng.co.il/%D7%99%D7%95%D7%A8%D7%93%D7%99%D7%9D-%D7%9C%D7%A9%D7%98%D7%97-

%D7%A4%D7%A8%D7%95%D7%99%D7%A7%D7%98-
%D7%A2%D7%95%D7%A7%D7%A3-
%D7%97%D7%95%D7%95%D7%90%D7%A8%D7%94 .

46. Govmap (2023). Govmap Orthophotos. Govmap.il. Available from: https://www.govmap.gov.il/?c=204000,595000&z=0 .

47. Ministry of Public Works and Housing (2023). Blackspots Map. Ministry of Public Works and Housing. Rammallah. Available from: https://gisportal.mopwh.ps/portal/apps/webappviewer/index.html?id=57396c544a0846cdbad3699e82991266 .

48. Shehadeh, A. Shehadeh, F. Shehadeh, R. (1984). Road Plan 50, Israeli proposed road plan for the West Bank. United Nations. Available from: https://www.un.org/unispal/document/auto-insert-197095.

49. Nofal, A. (2023). It Increased In 2022 By An Unprecedented Percentage Since 1967. Will 2023 Be The Year Of Completion Of Settlements In The West Bank And Jerusalem?. Al-Jazeera.Net. Available from: https://www.aljazeera.net/politics/2023/1/6/2023-%D9%87%D9%84-%D9%8A%D9%83%D9%88%D9%86-%D8%B9%D8%A7%D9%85-%D8%AD%D8%B3%D9%85-%D8%A7%D9%84%D8%A7%D8%B3%D8%AA%D9%8A%D8%B7%D8%A7%D9%86-%D9%81%D9%8A-%D8%A7%D9%84%D8%B6%D9%81%D8%A9 .

50. i24news (2024). Statements By Israeli National Security Minister Ben-Gvir. i24news. Available from: https://www.i24news.tv/ar/%D8%A3%D8%AE%D8%A8%D8%A7%D8%B1/middle-east/1708597517-%D8%A8%D9%86-%D8%BA%D9%81%D9%8A%D8%B1-%D9%8A%D8%AA%D9%81%D9%82%D8%AF-%D9%85%D9%88%D9%82%D8%B9-%D8%A7%D9%84%D9%87%D8%AC%D9%88%D9%85-%D9%82%D8%B1%D8%A8-%D9%85%D8%B9%D8%A7%D9%84% .

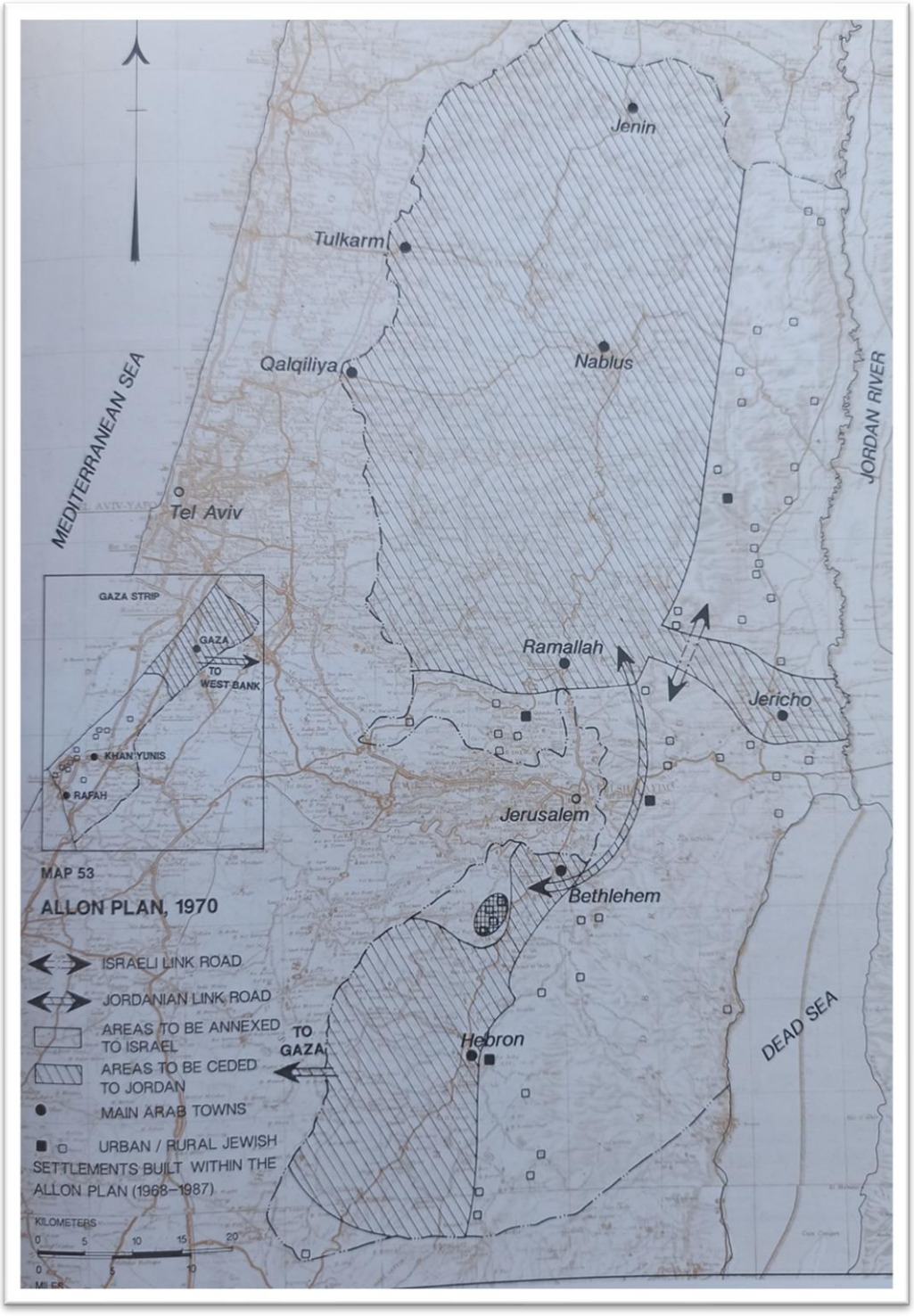
51. Palestinian Central Bureau of Statistics (PCBS) (2022). Palestinian Statistics Reviews The Situation Of The Population In Palestine On The Occasion Of World Population Day. Palestinian Central Bureau of Statistics. PCBS website. Available from: https://pcbs.gov.ps/postar.aspx?lang=ar&ItemID=4280 .

Appendix 1

Figures & Maps

Figure 1a

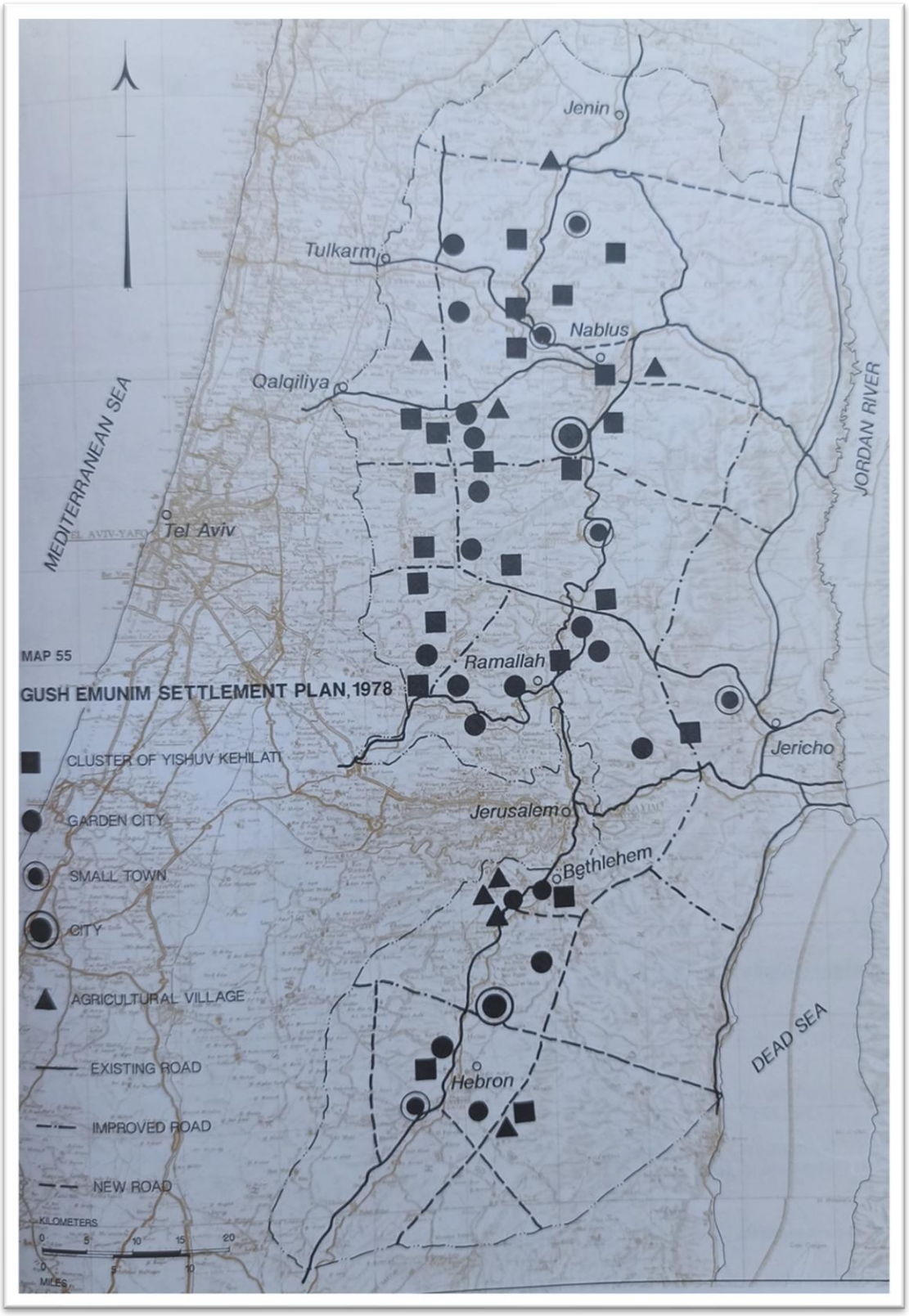
Map of Allon Plan set in 1970.



Source: [6]

Figure 1b

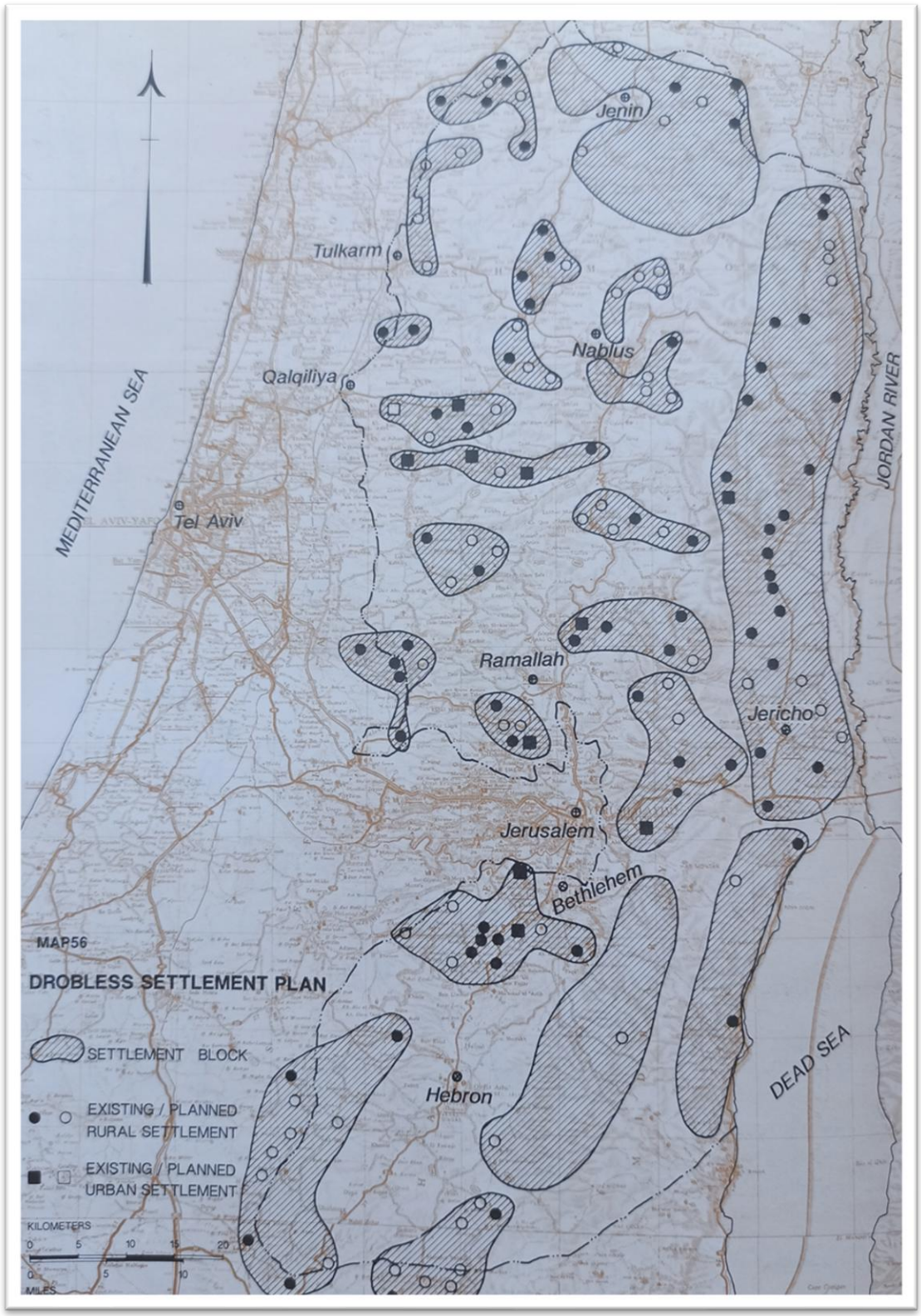
Map of Gosh Ammonim Plan set in 1978.



Source: [6]

Figure 1c

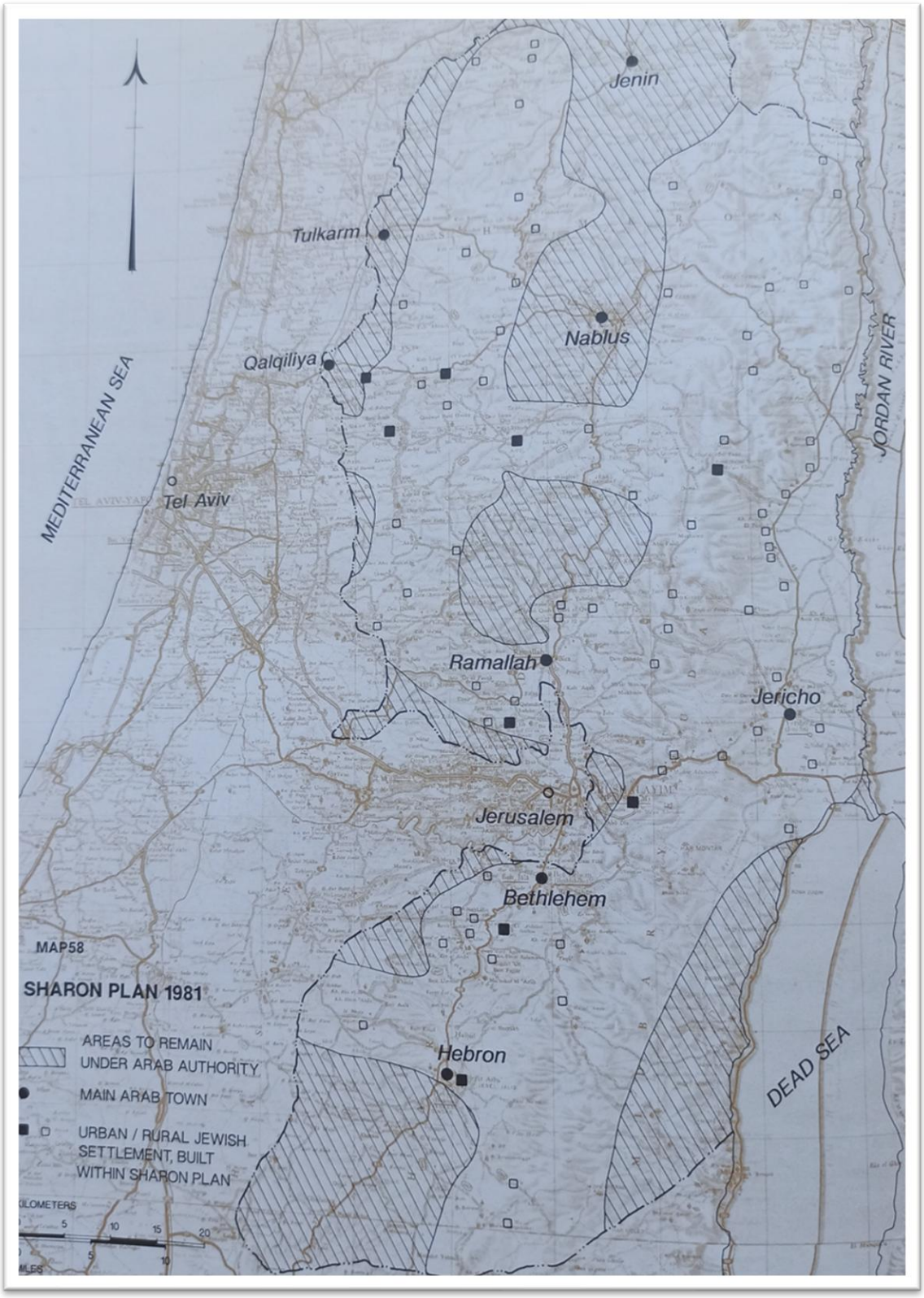
Map of Cantons According to Matityahu Plan set in 1979.



Source: [6]

Figure 1d

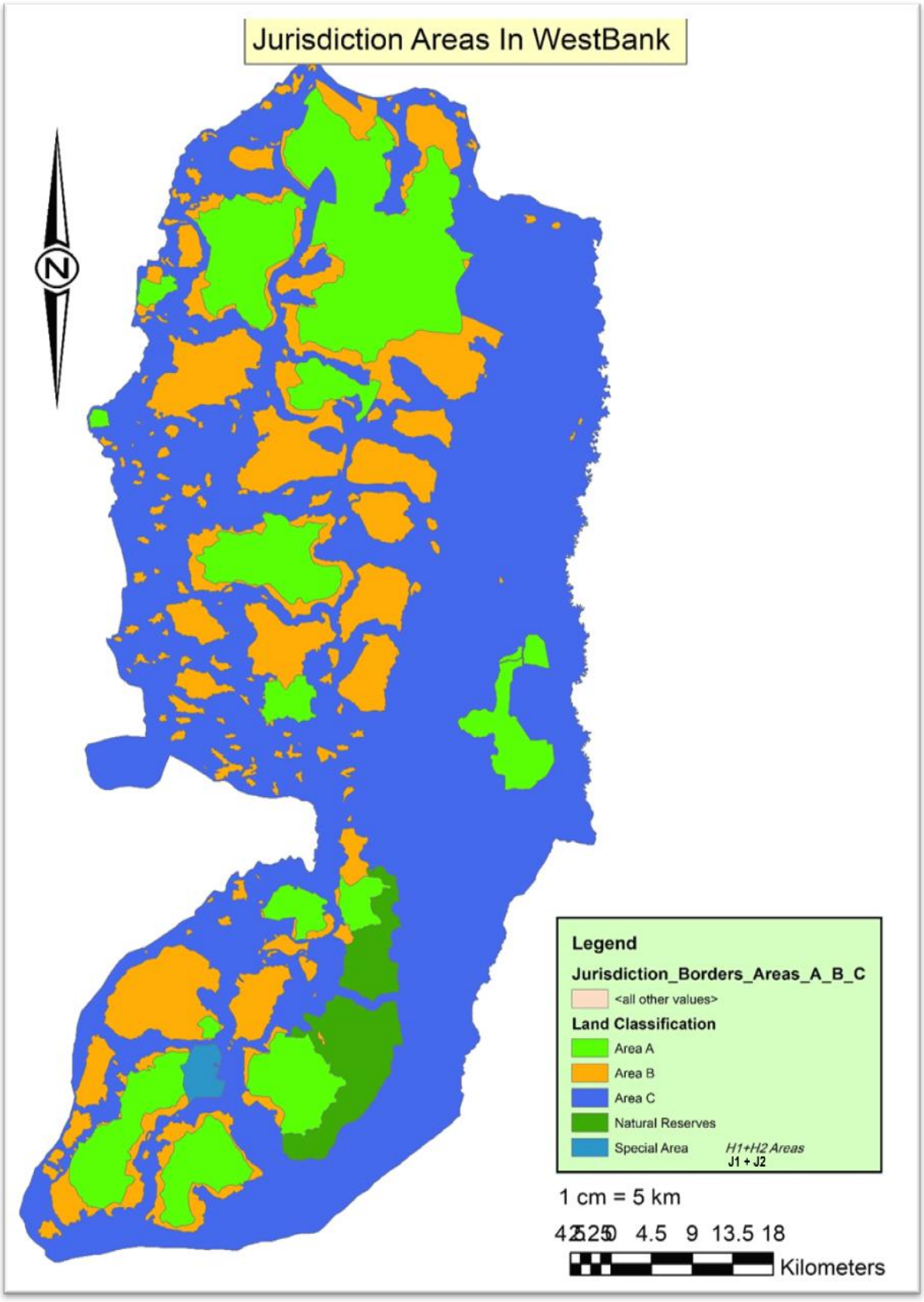
Map of Sharon Plan set in 1981.



Source: [6]

Figure 2

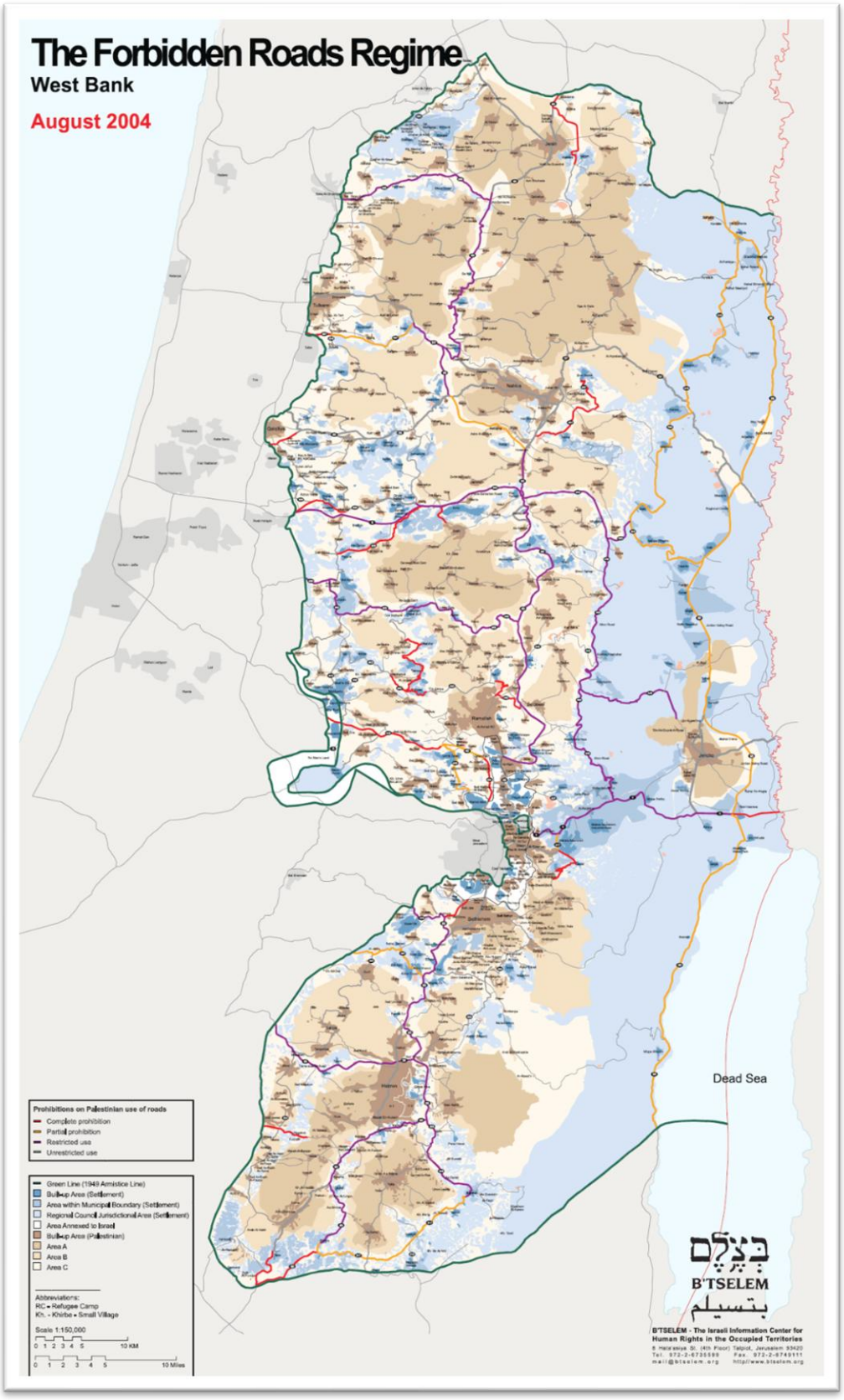
The Political Classification of the West Bank.



Data Source: [36]

Figure 3a

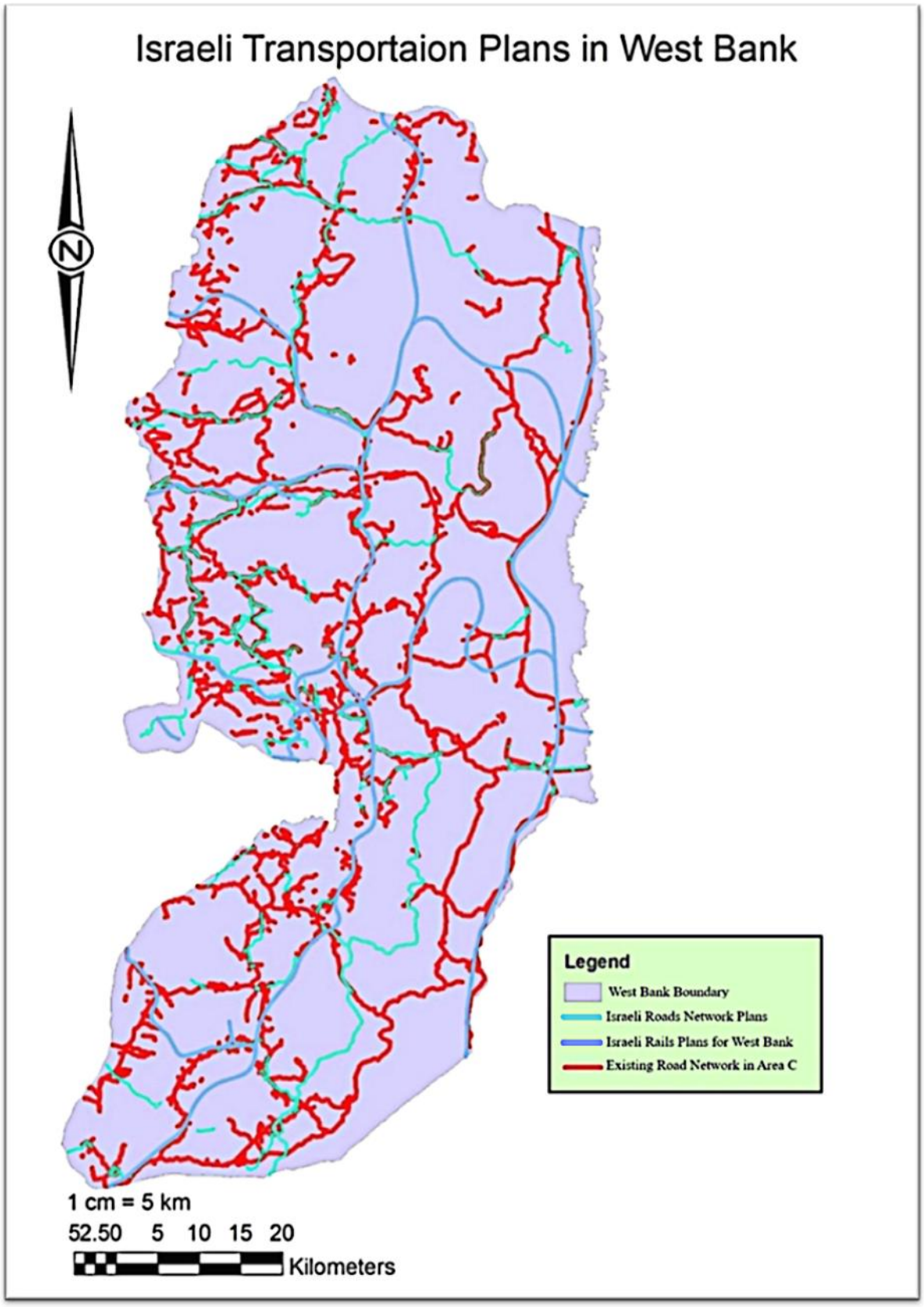
The Forbidden Roads in West Bank Based on B'TSELEM in 2004.



Source: [18]

Figure 3b

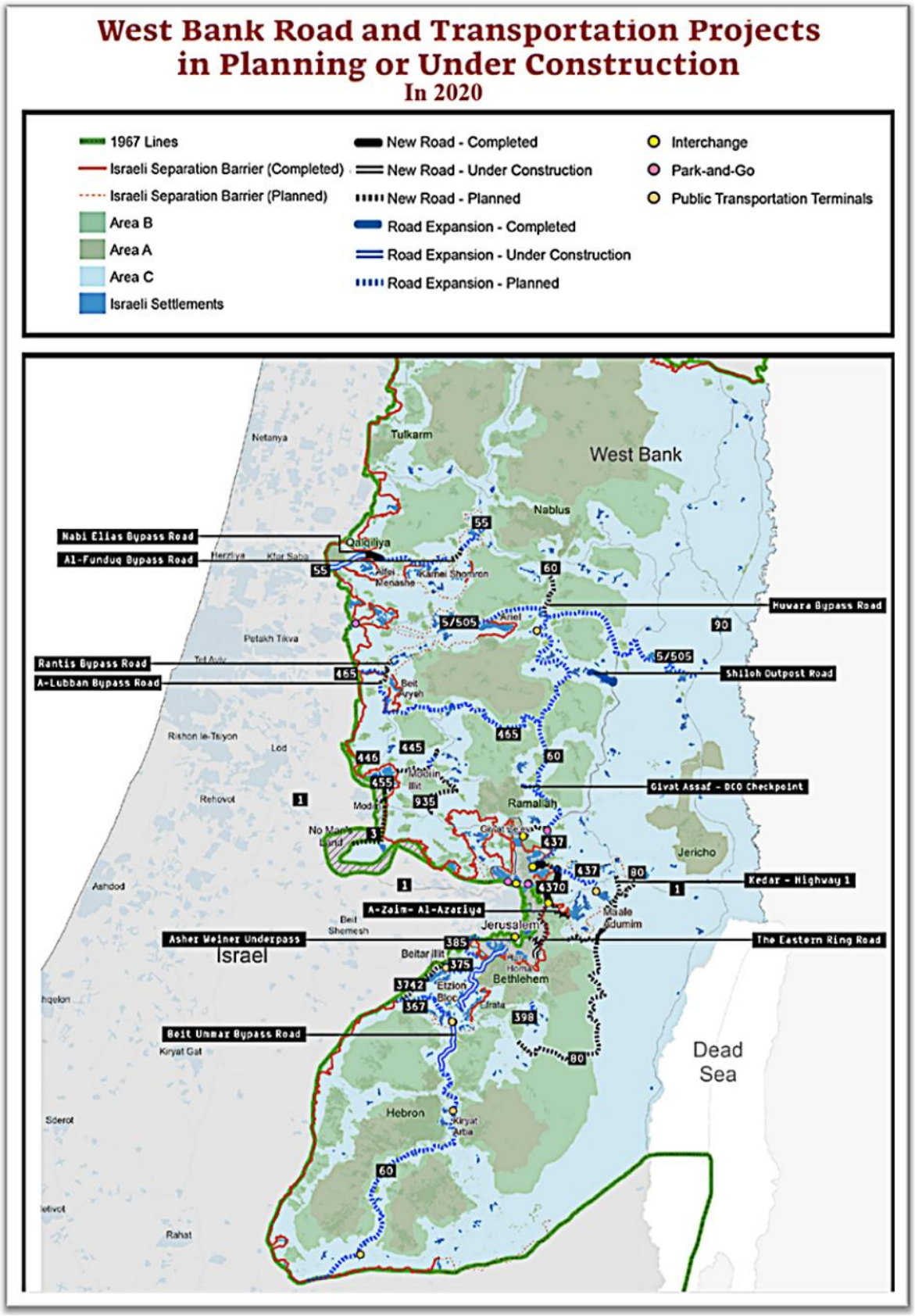
Proposed roads and railways by Israeli occupation authorities.



Data Source: [23]

Figure 3c

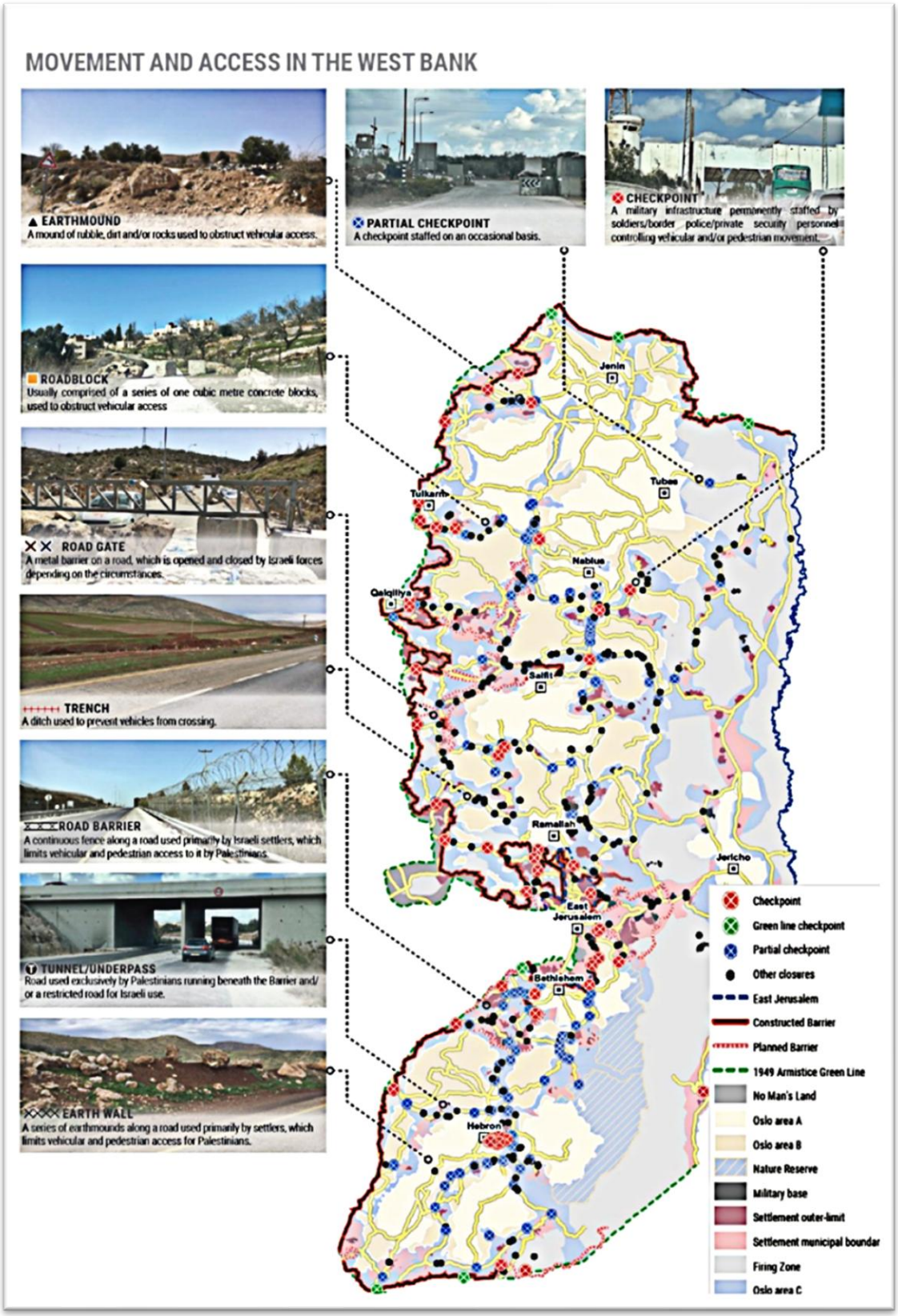
Proposed roads plans and roads under construction by Israeli occupation authorities.



Source: [8]

Figure 3d

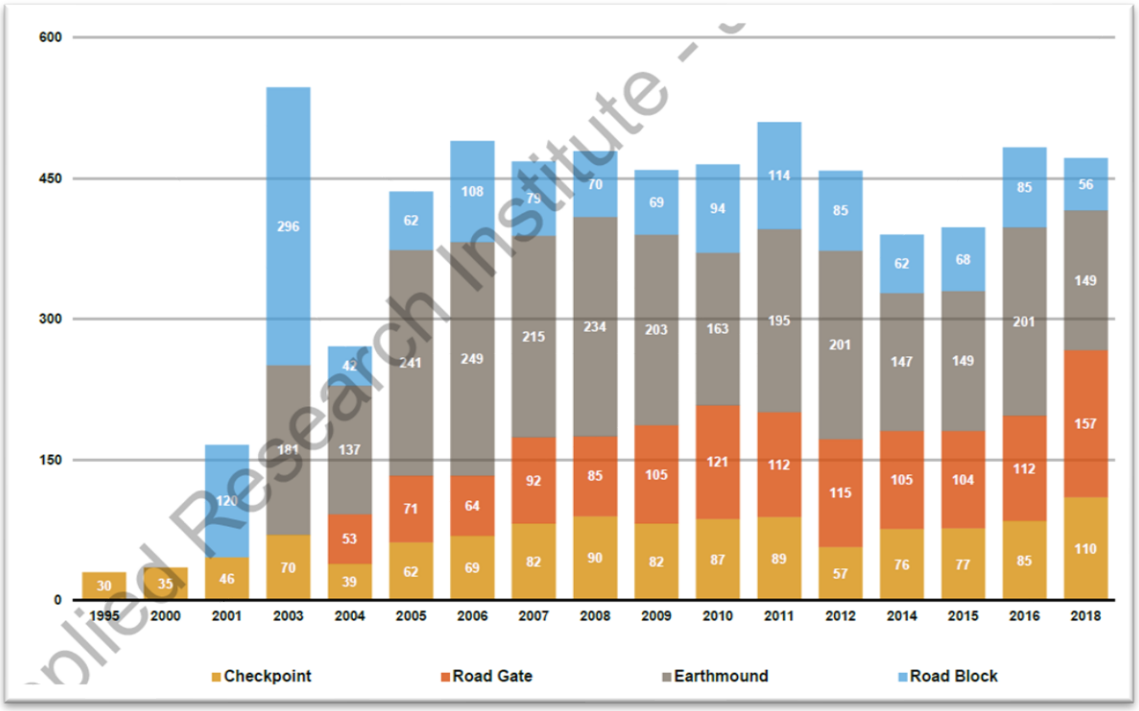
The distribution of all internal restrictions in the West Bank in 2023.



Source: [24]

Figure 4

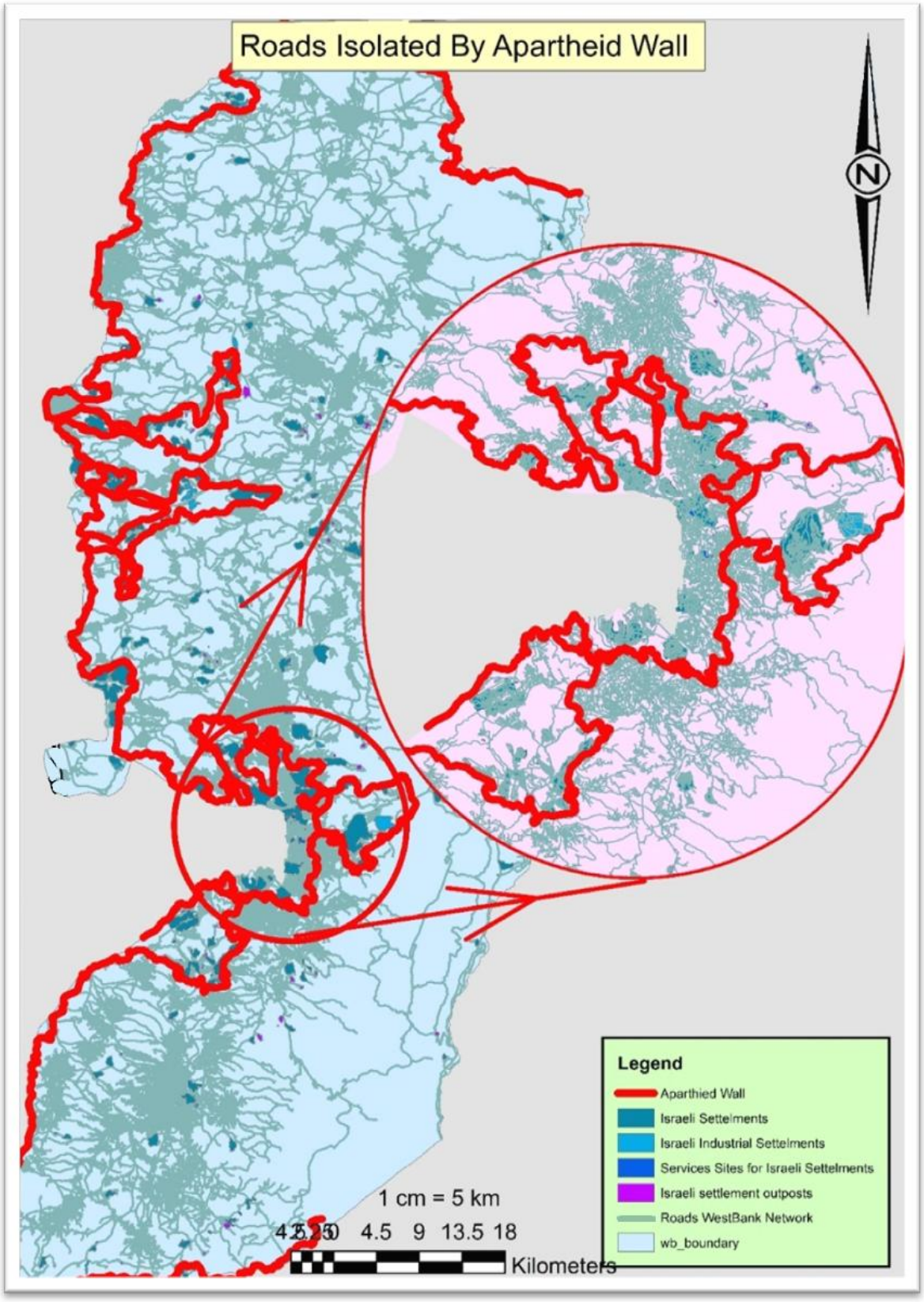
Number and type of road obstacles by year for 1985 - 2018.



Source: [7]

Figure 5

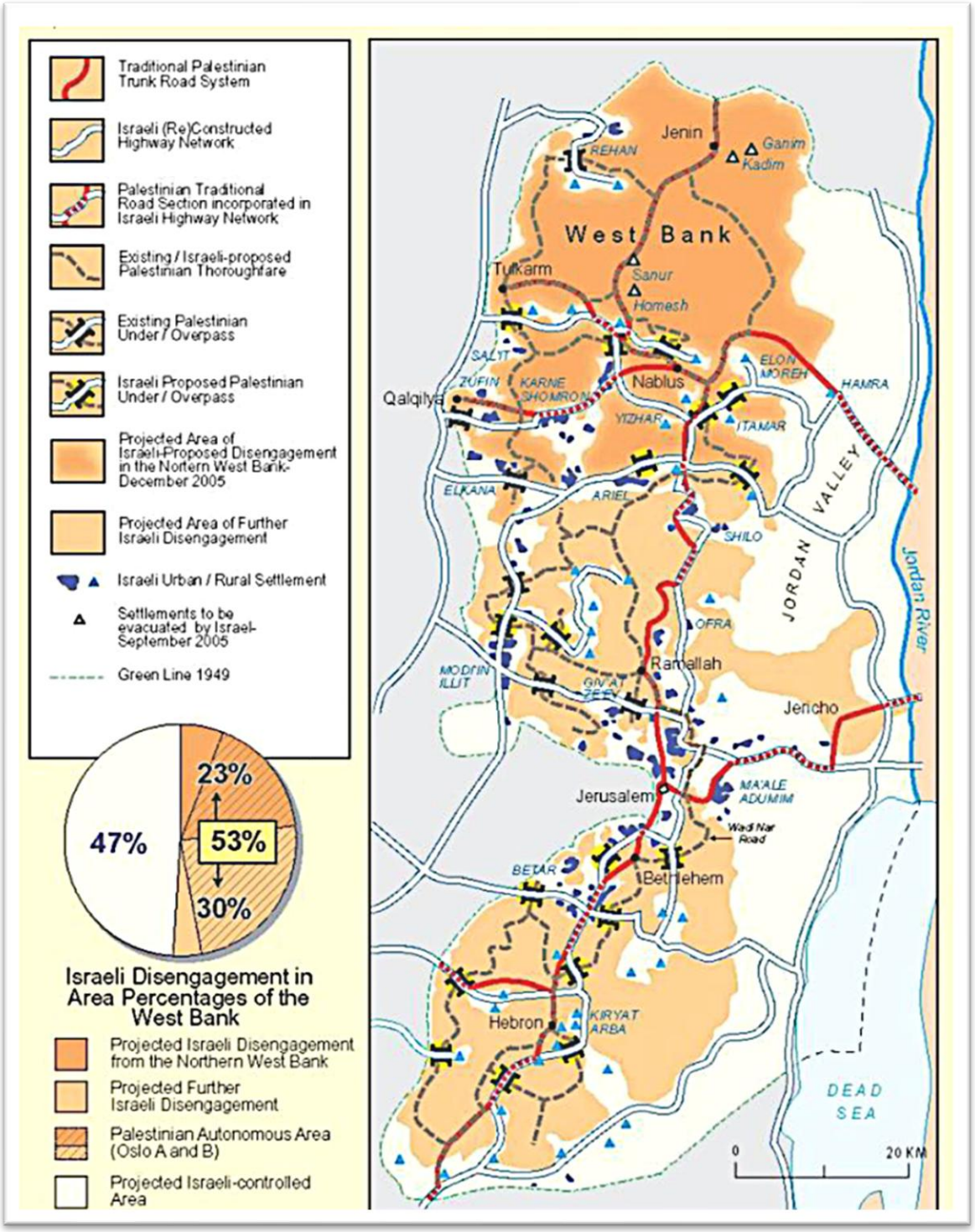
Roads Isolated by the Apartheid Wall in 2006.



Data Source: [23]

Figure 6

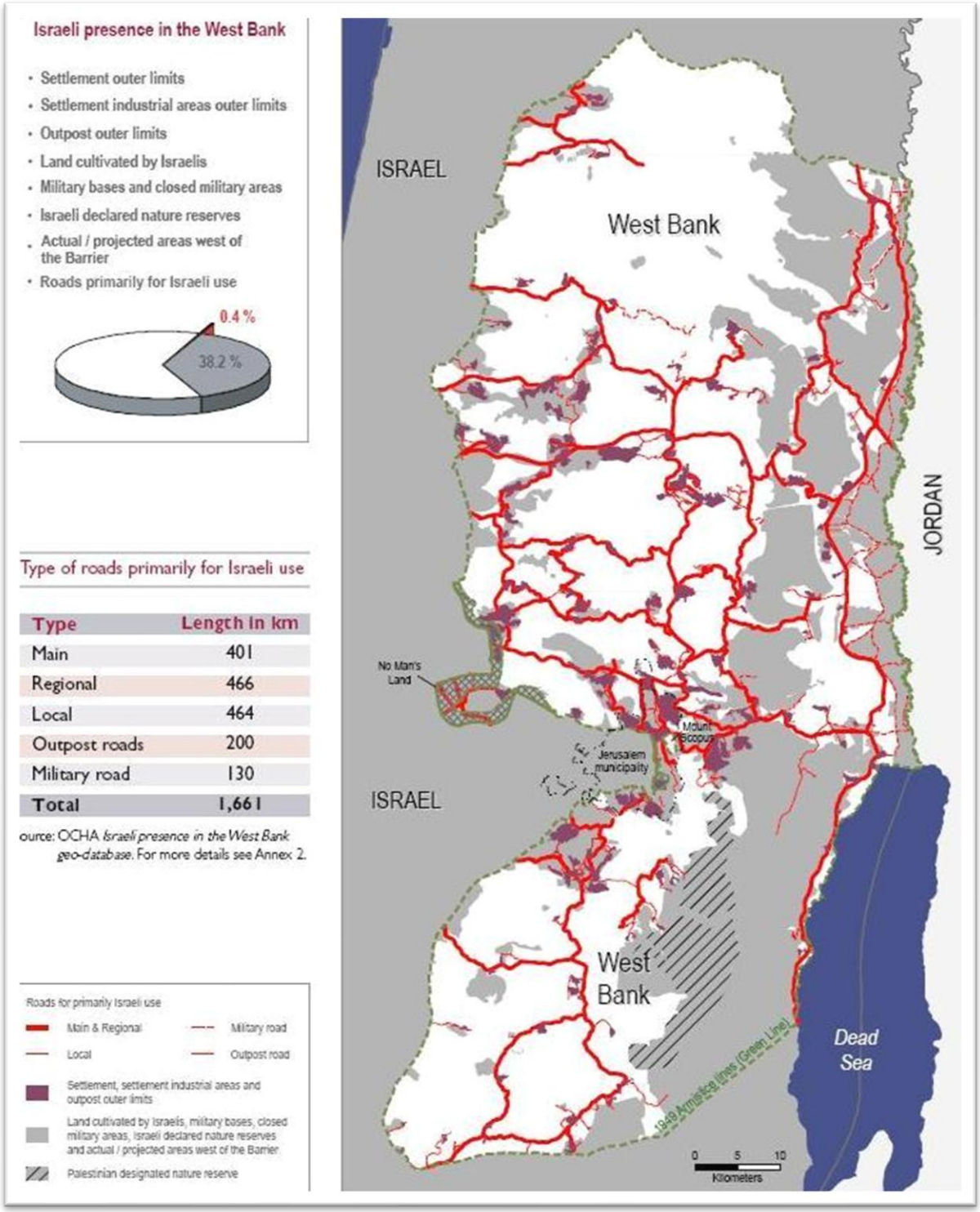
The Roads and Tunnel Plan for the West Bank prepared by Abdul Naser Arafat & Evana Wael in 2019.



Source: [27]

Figure 7

Map of the road network that is primarily for Israeli use in the West Bank in 2018 based on OHCA.

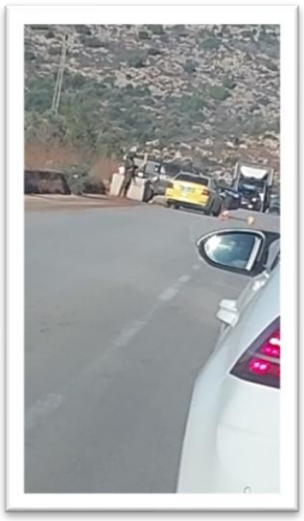


Source: [27]

Figure 8

Road barriers limiting Palestinian's accessibility, including iron gates, dirt piles, fixed and flying checkpoints.

(A) Installing Iron Gates at Qarawat Bani Hassan and Biddya Entrances



(B) Flying Checkpoint Salfeet

(C) Salfeet Northern Entrance Iron Gate and Dirt Pile

(D) Iron Gate at Hares Entrance

(E) Sarra Checkpoint at western entrance for Nablus City

Figure 9a

Kefel Hares Entrance widths.

Figure 9b

Kefel Hares Entrance in the past and now.

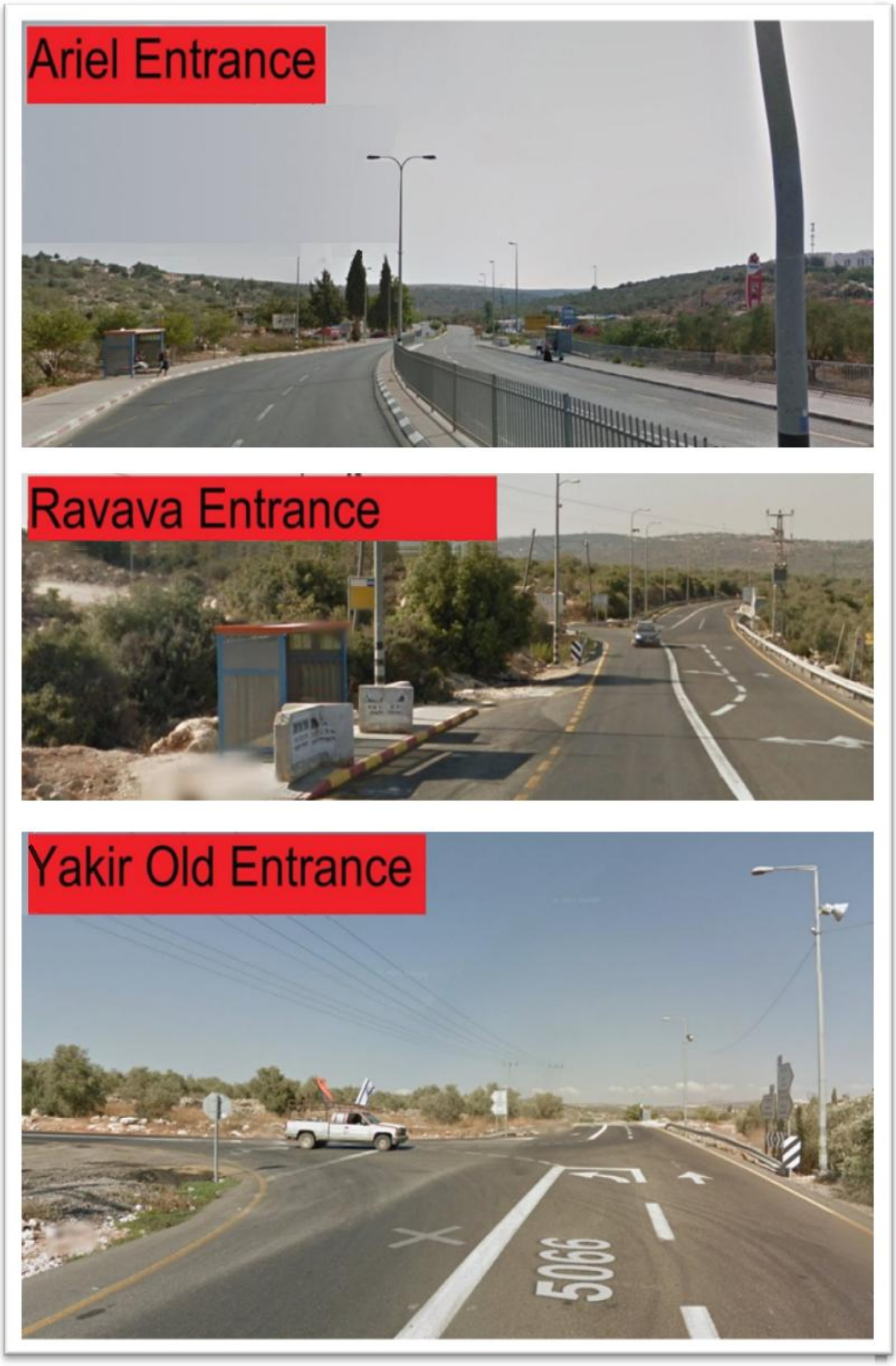
Source: [36]

Figure 9c

Traffic at Kefel Hares entrance at the peak hour.

Figure 9d

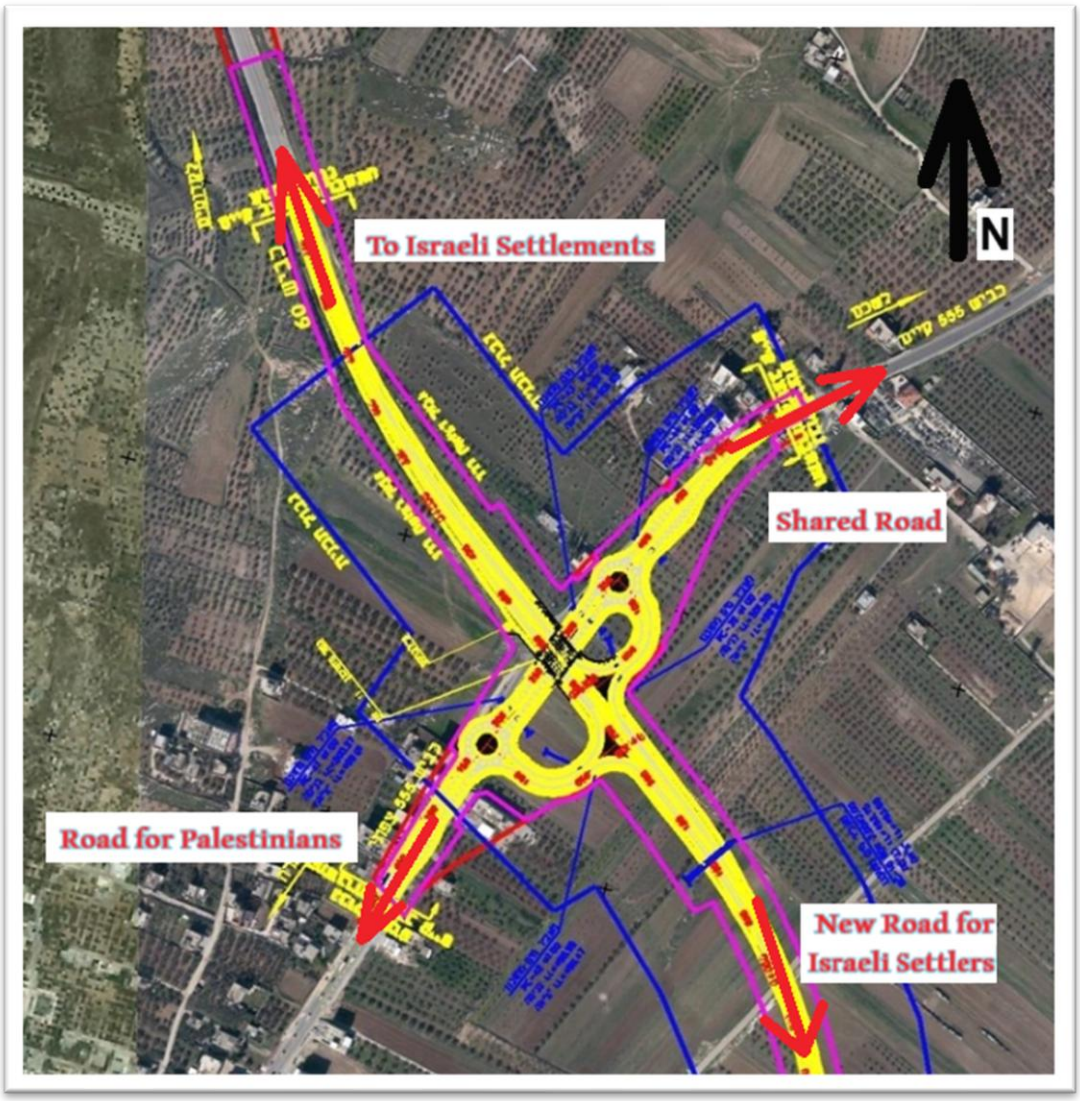
Settlements Entrances.



Source: [42]

Figure 10a

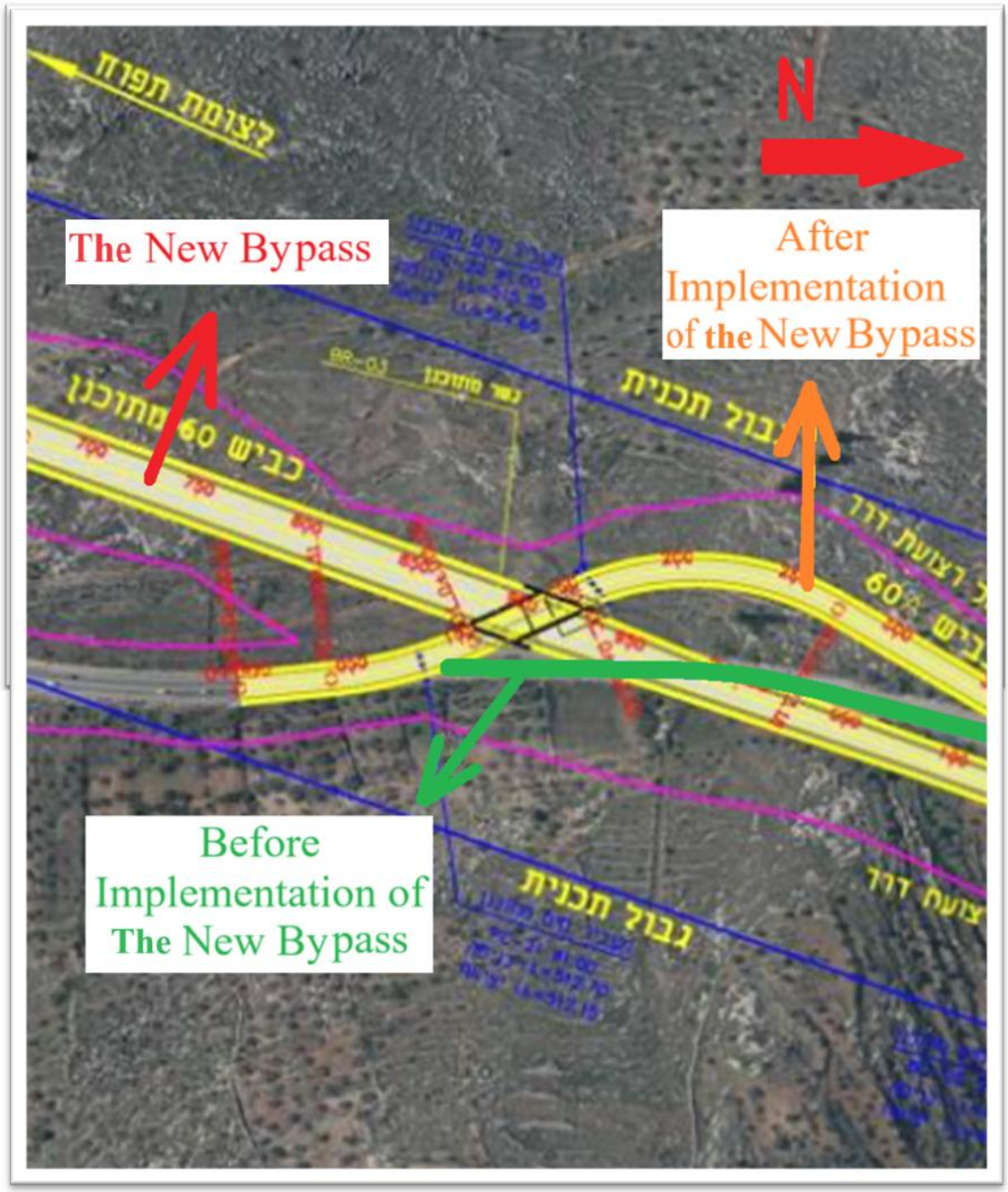
Plan of the Road No. 60 with the new Northern and southern Bypass.



Data Source: [45]

Figure 10b

Plan of New and Old Road No.60 at the southern entrance of Huwara.



Source: [45]

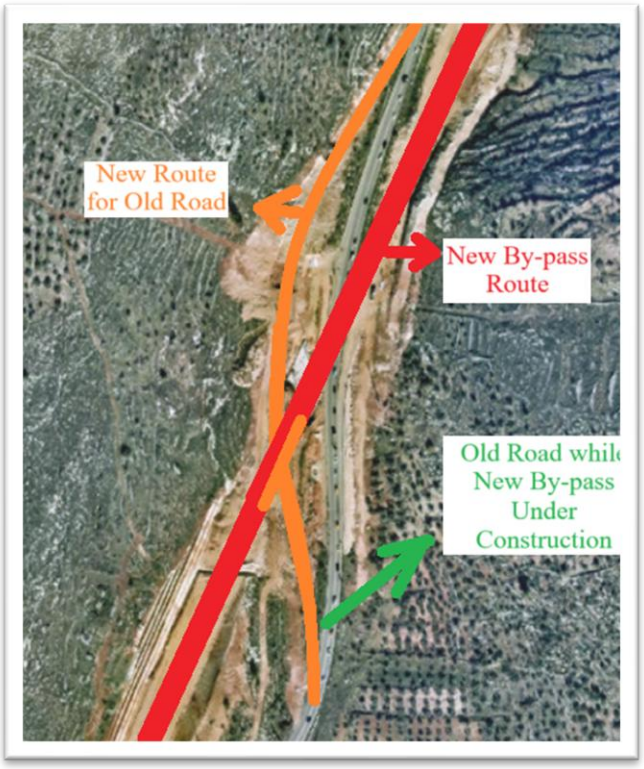
Figure 10c

Old Road No. 60 realignment.

Source: [45]

Figure 10d

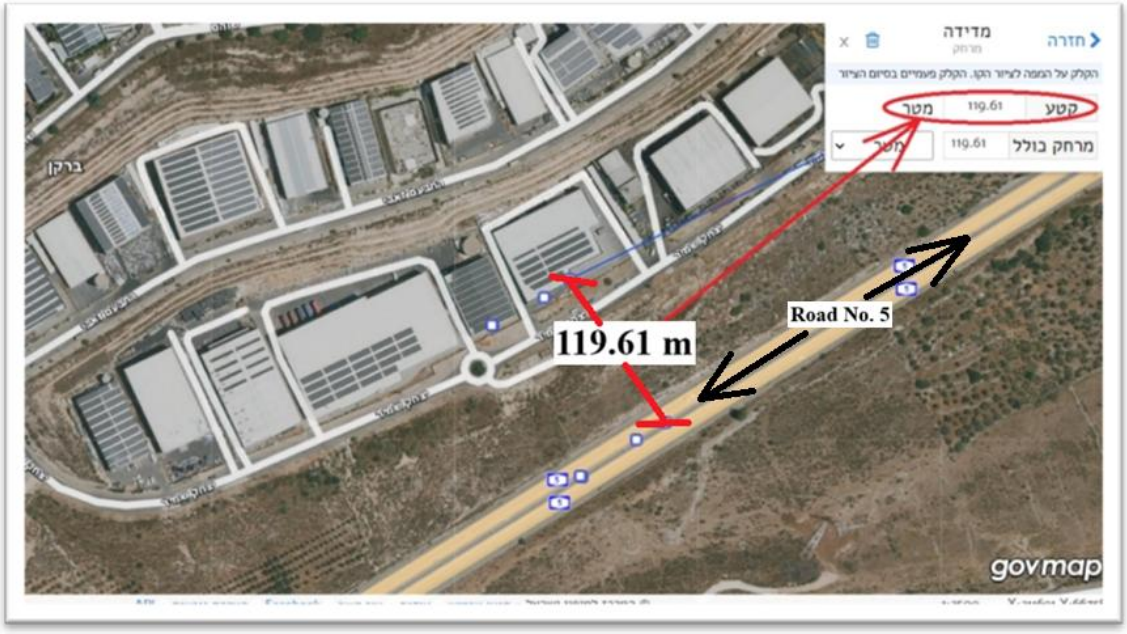
Road No.60 while bypass construction.



Source: [36]

Figure 11a

Aerial photo of Road No.5 showing setbacks for Barkan Settlement.



Source: [46]

Figure 11b

Aerial photo of West Ariel Settlement Next to Main Road.

Source: [46]

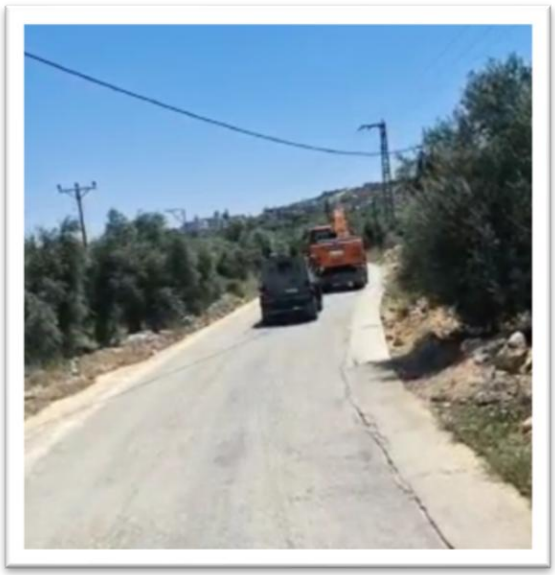
Figure 11c

Aerial photo of Qiryat Netafim Settlement Next to Road No. 505.

Source: [36]

Figure 12a

Photos showing confiscating equipment operating in C areas in many Palestinian communities by the Israeli occupation authorities.



(1) Hares Village

(2) Qarawat Bani Hassan Town

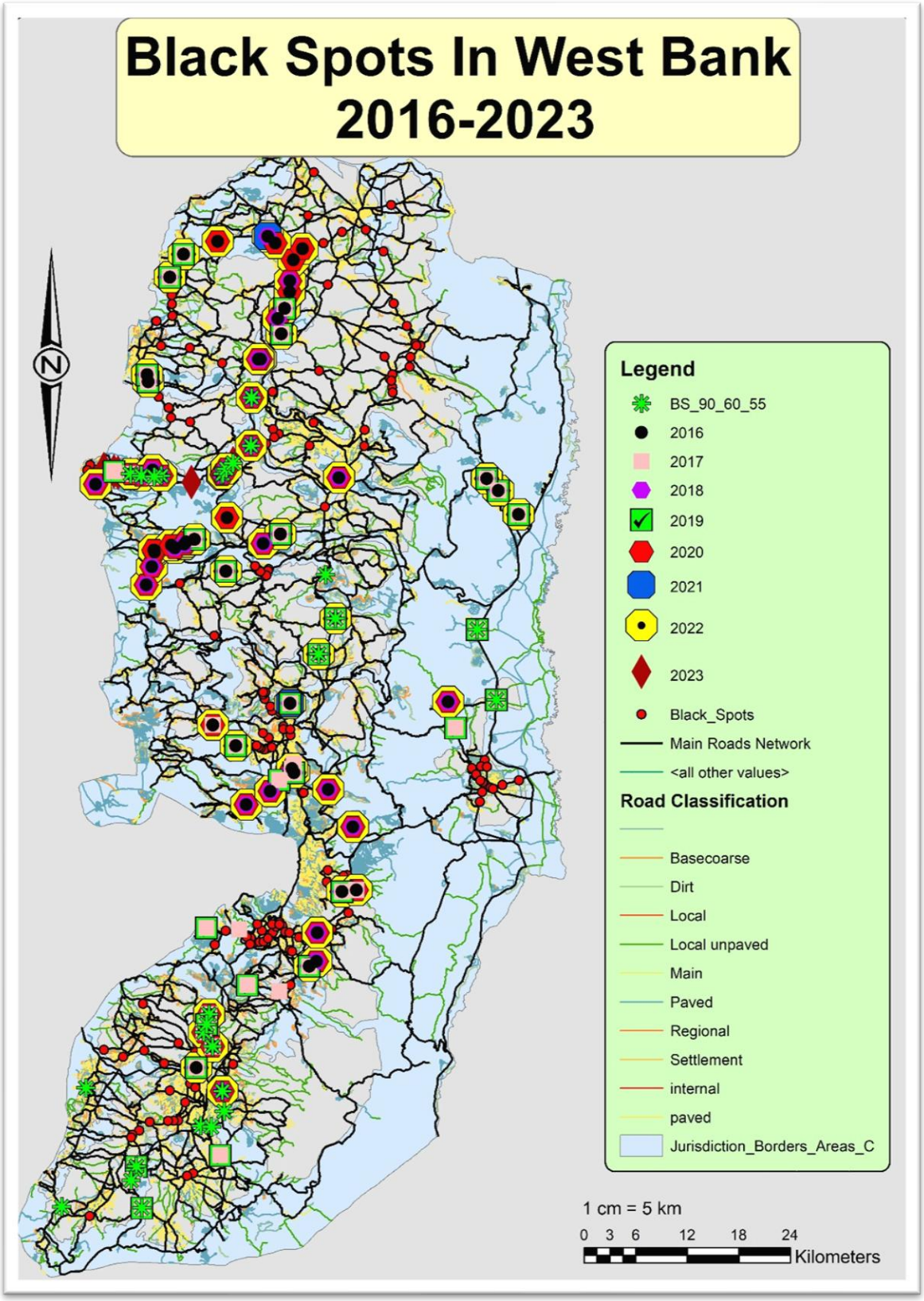
(3) Kefel Hares Town

Figure 12b

Photo showing confiscating equipment operating in C areas in kufr Al-Deek town by the Israeli occupation authorities.

Figure 13

Black spots in the West Bank based on Palestinian MPWH database during 2016 - 2023.



Data Source: [47]

Figure 14a

Entrances of Israeli Settlements and outposts before developments on Road No. 60.

Data Source: [42]

Figure 14b

Entrances of Israeli Settlements and outposts after development with traffic signals on Road No. 60.

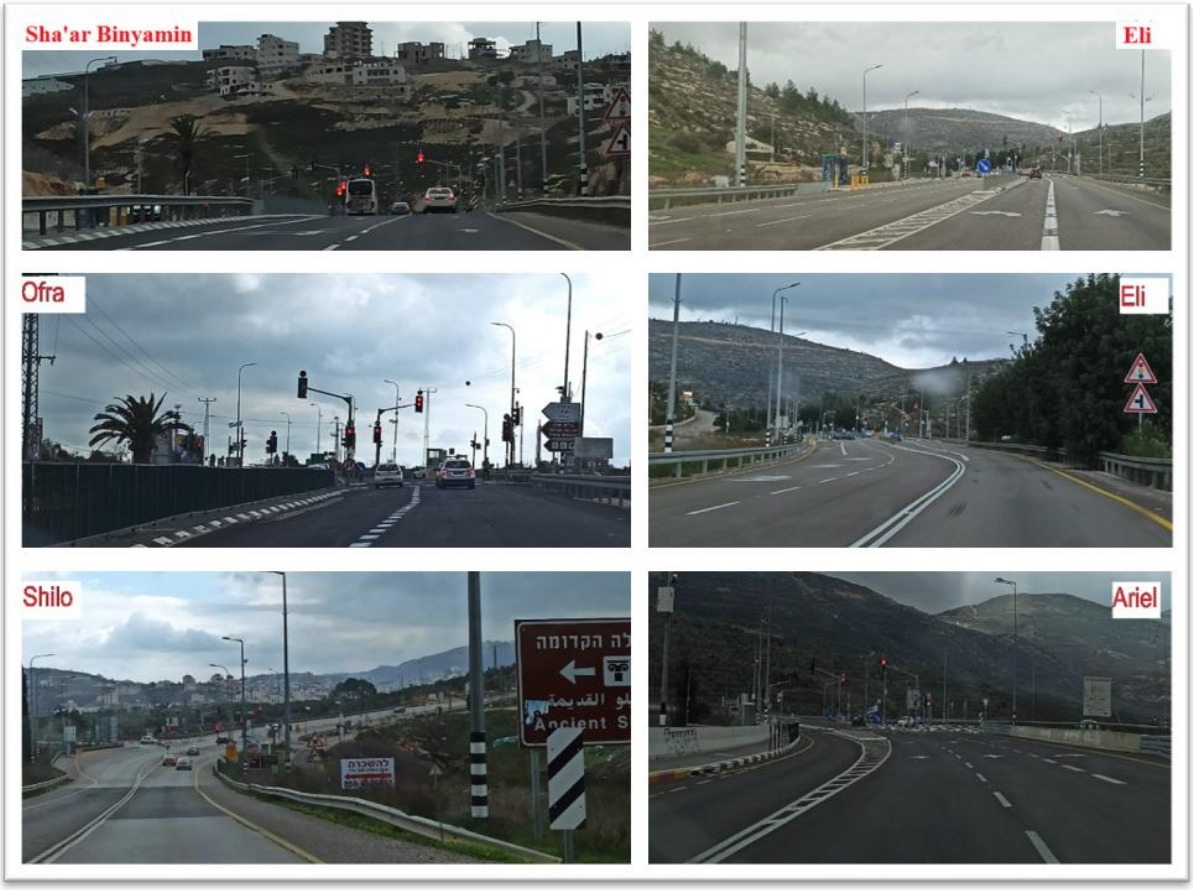


Figure 15a

Road accident at the junction of Jamma'in.

Figure 15b

Aerial Photo showing Jamma'in and Marda entrances junctions on Road No. 505.

Data Source: [36]

Figure 16a

Aerial Photo showing Tel and Nablus City southern Entrance on Road No. 60.

Data Source: [36]

Figure 16b

Aerial Photo for Kefel Hares second Entrance and Israeli Power Station Entrance on Road No. 505.

Data Source: [36]

Figure 16c

Havat Gilad outpost entrance with continuous marking of centerline on Road No. 60 in 2012.

Data Source: [42]

Figure 16d

Havat Gilad outpost entrance with dashed marking of centerline on Road No. 60 in 2022.

Data Source: [36]

Figure 17a

Hares Junction on Road No. 505 and Road No. 5066 plans and photos, showing the status before and after, where the traffic signal was installed in 2017.

Data Source: [36] & [42]

Figure 17b

Photos of Hares Junction on Road No. 505 and Road No. 5066 showing traffic jam in many times at road used mainly by the Palestinians in peak hours.

Figure 18a

Traffic guidance signs on various roads in the West Bank, showing names of Israeli cities beyond green line, and settlements mainly, with names of main Palestinian cities only.

Figure 18b

A photo of a sign warning the Israeli settlers to enter A areas.

Figure 19

Temporal division of traffic in road No. 55 which connect Nablus and Qalqilya cities.

Figure 20a

A photo showing bus stops for Settlers compared with Palestinians on Za'tara Junction on Road No. 60.

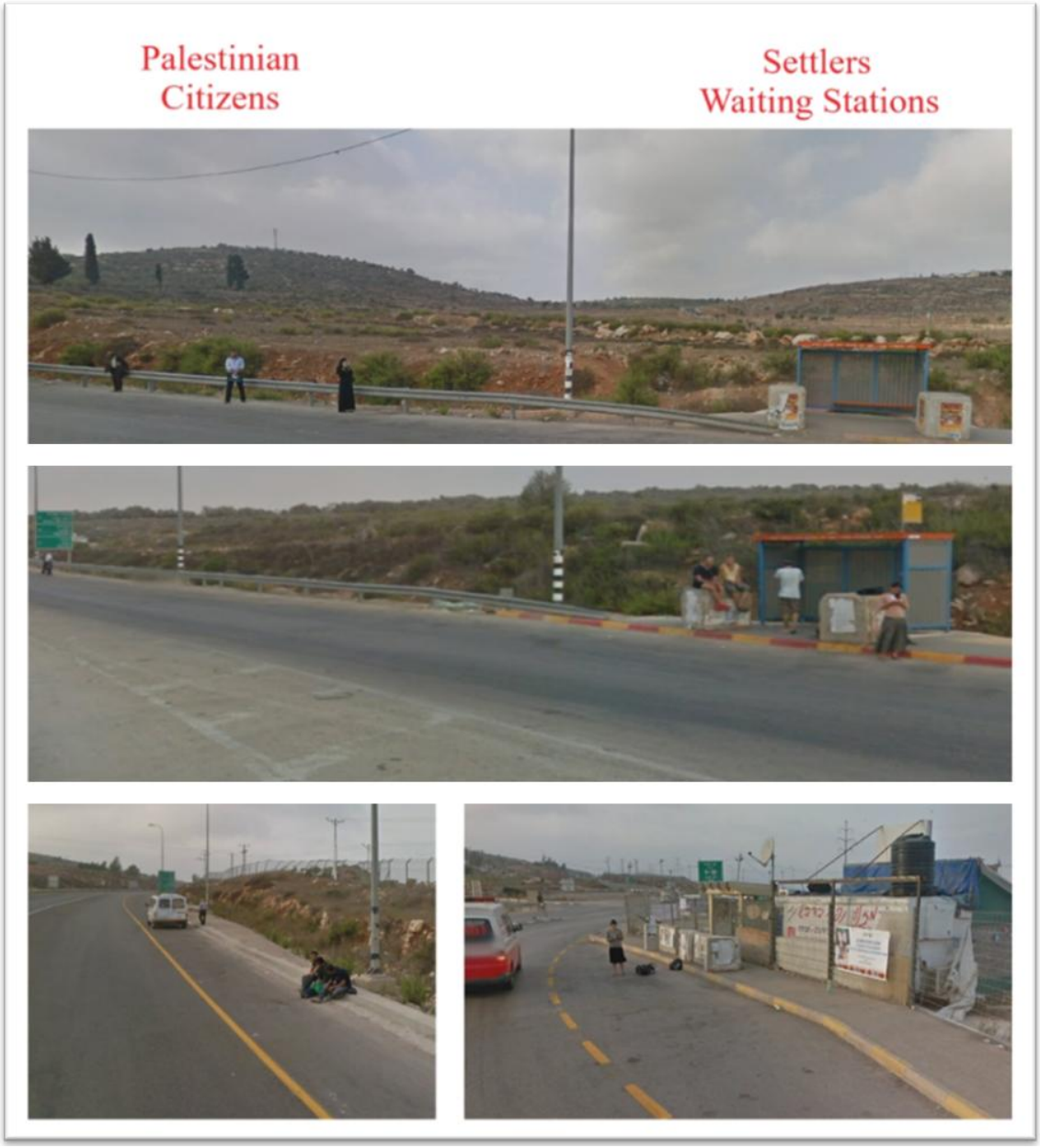


Figure 20b

A plan showing the Palestinians bus stops and pedestrian routes on Za'tara Junction on Road No. 60.

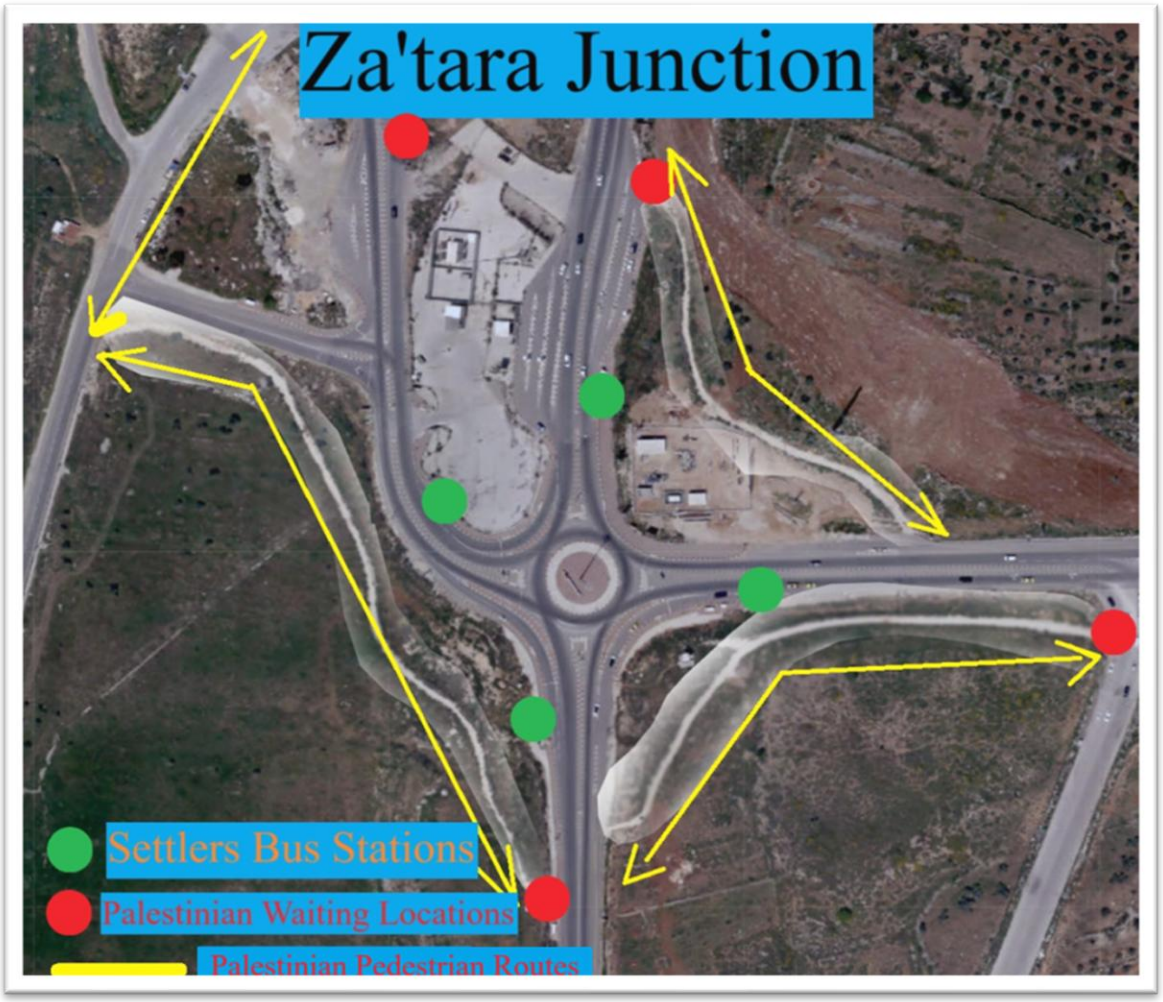
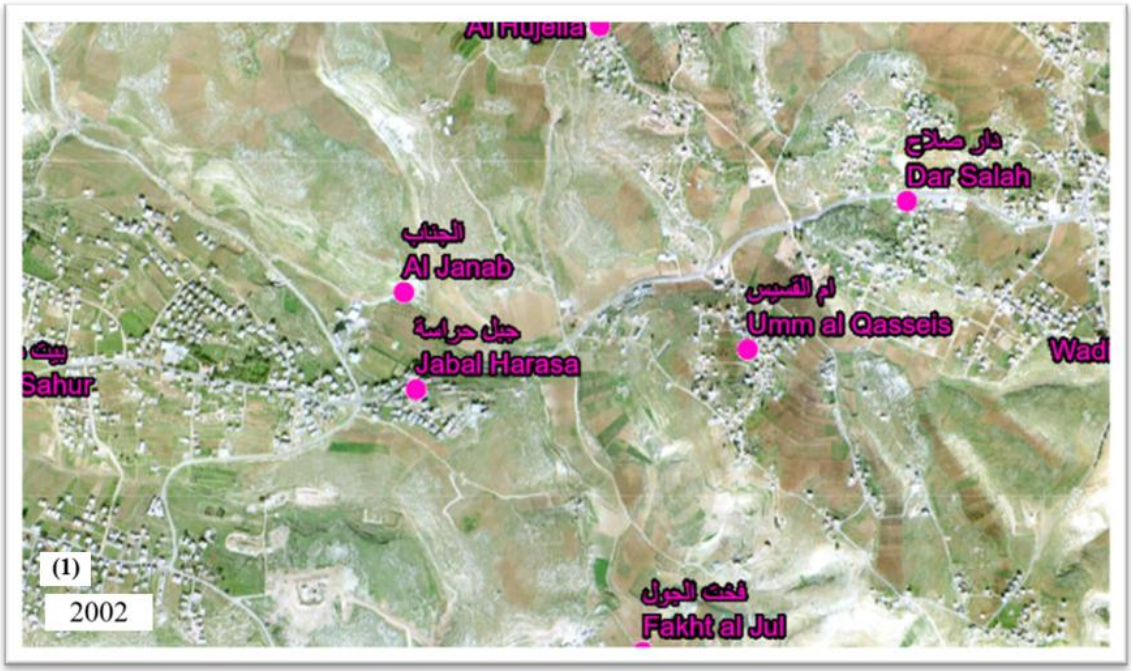


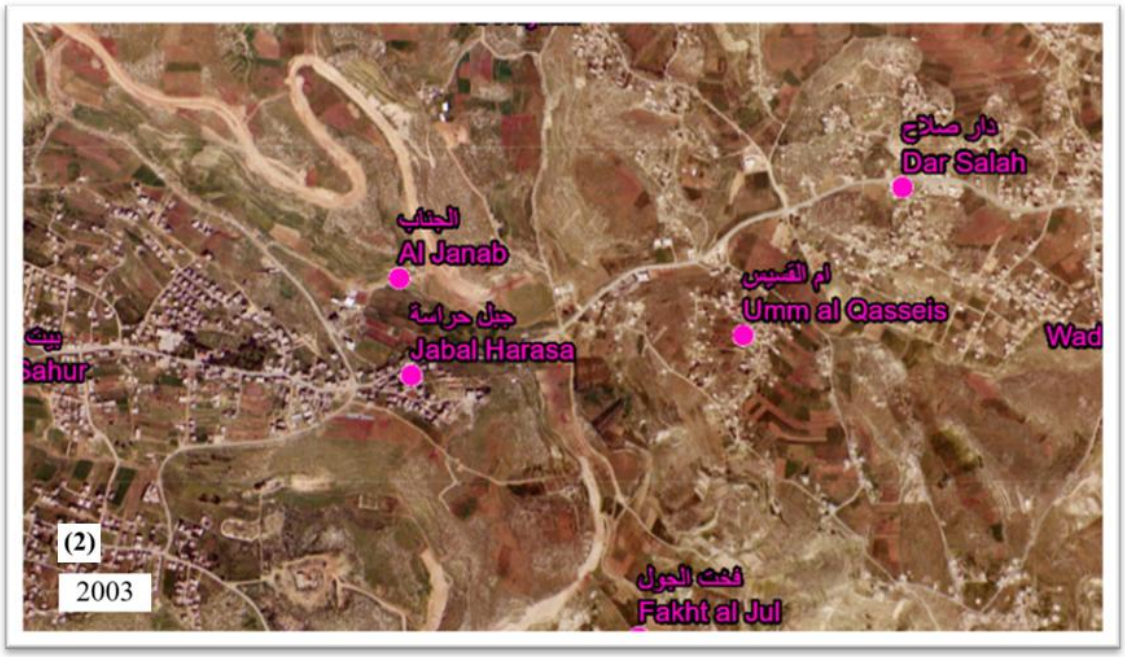
Figure 20c

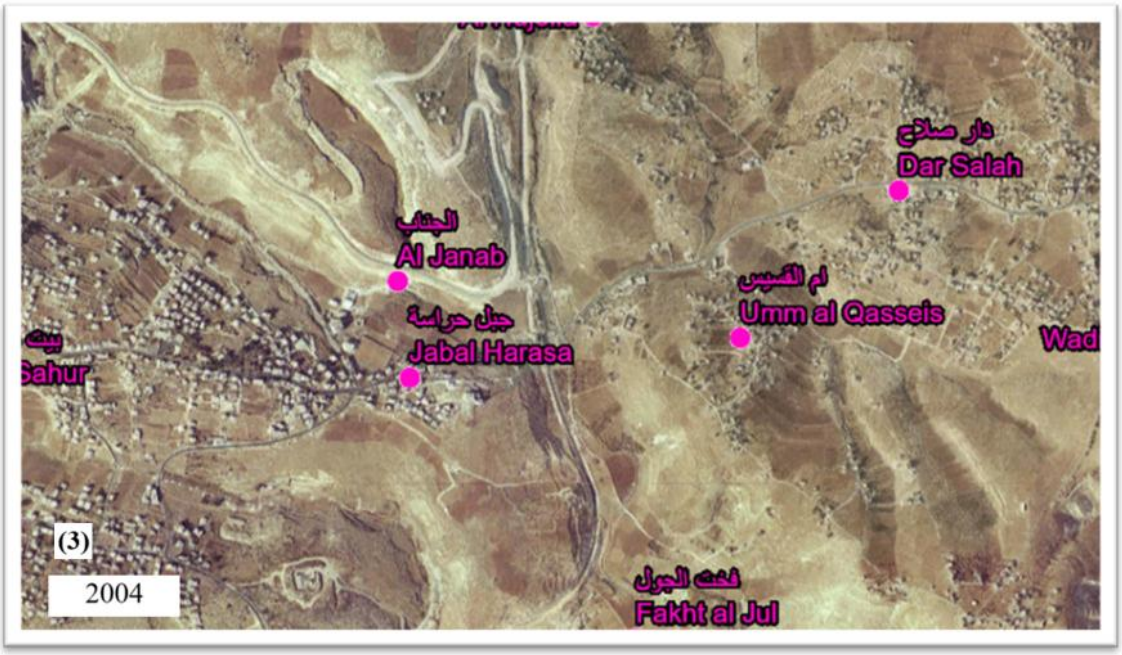
Photos showing the Palestinians' pedestrian routes on Za'tara Junction on Road No. 60.

Figures 21(1-9)

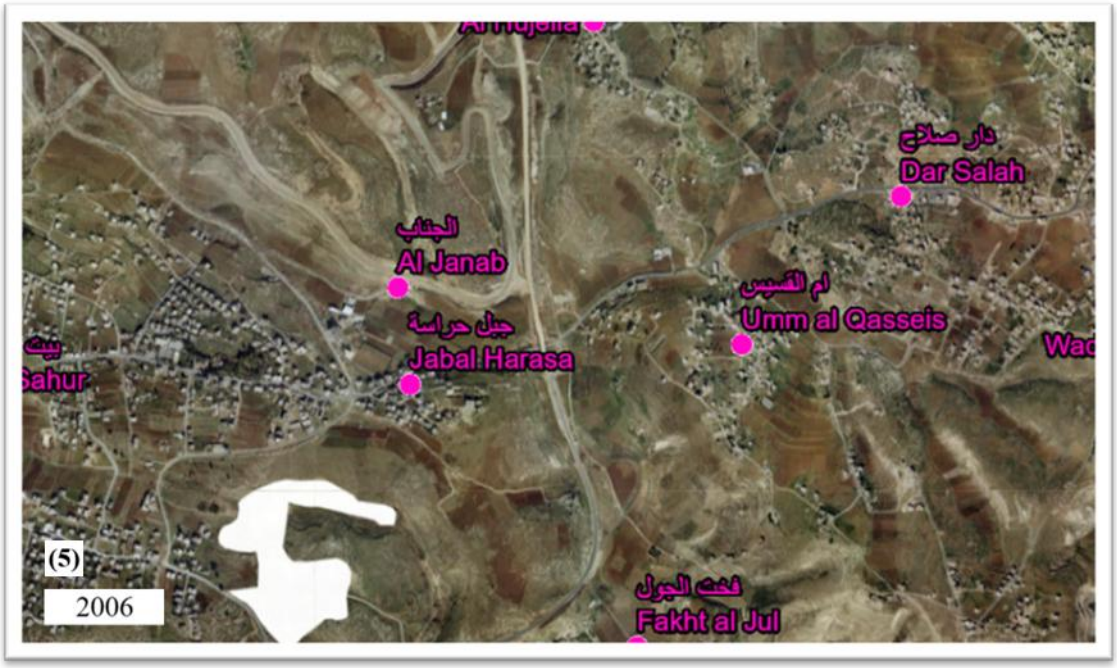
Change Detection Analysis (Example of area in Bethlehem Governorate) between 2002 – 2009 and 2023.





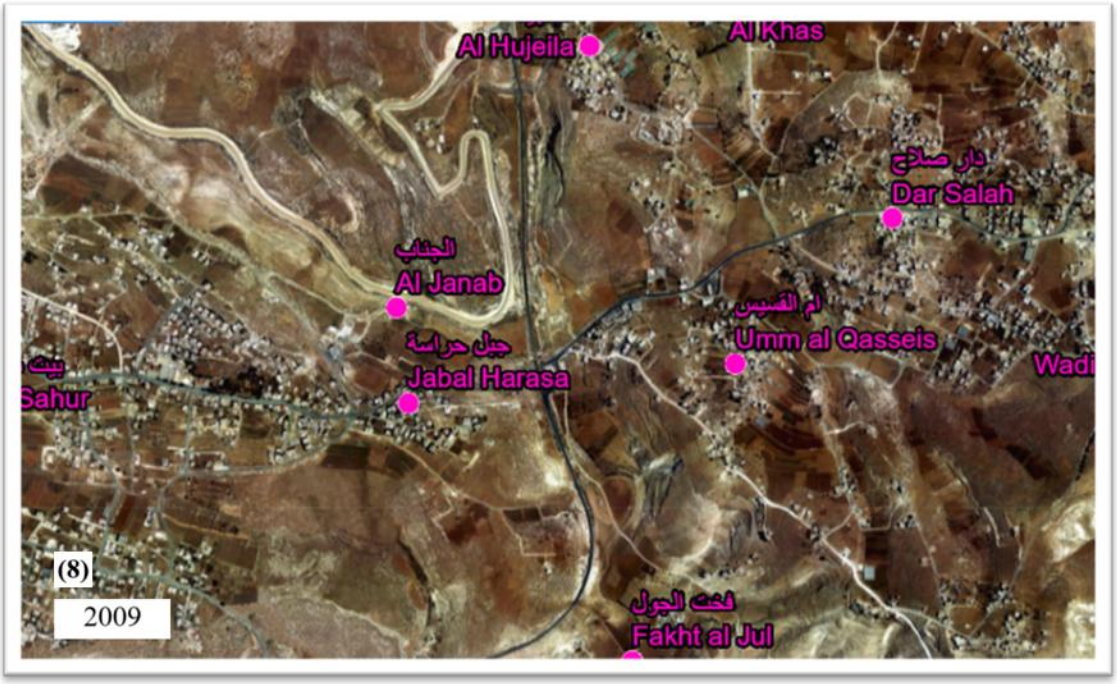

دار صلاح
Dar Salah
الجناب
Al Janab
جبل حراسة
Jabal Harasa
ام القسيس
Umm al Qasseis
Wad
(3)
2004
فخت الجول
Fakht al Jul


دار صلاح
Dar Salah
الجناب
Al Janab
جبل حراسة
Jabal Harasa
ام القسيس
Umm al Qasseis
Wad
(4)
2005
فخت الجول
Fakht al Jul


دار صلاح
Dar Salah
الجناب
Al Janab
ام القسيس
Umm al Qasseis
جبل حراسة
Jabal Harasa
Sahur
(5)
2006
فخت الجول
Fakht al Jul


دار صلاح
Dar Salah
الجناب
Al Janab
ام القسيس
Umm al Qasseis
جبل حراسة
Jabal Harasa
Sahur
(6)
2007
فخت الجول
Fakht al Jul


دار صلاح
Dar Salah
الجناب
Al Janab
ام القسيس
Umm al Qasseis
جبل حراسة
Jabal Harasa
Wadi
(7)
2008
فخت الجول
Fakht al Jul


Al Khas
Al Hujeila
دار صلاح
Dar Salah
الجناب
Al Janab
ام القسيس
Umm al Qasseis
جبل حراسة
Jabal Harasa
Wadi
(8)
2009
فخت الجول
Fakht al Jul

Data Source: [36]

Figure 22a

Sinjel intersection (Before and After improvement).

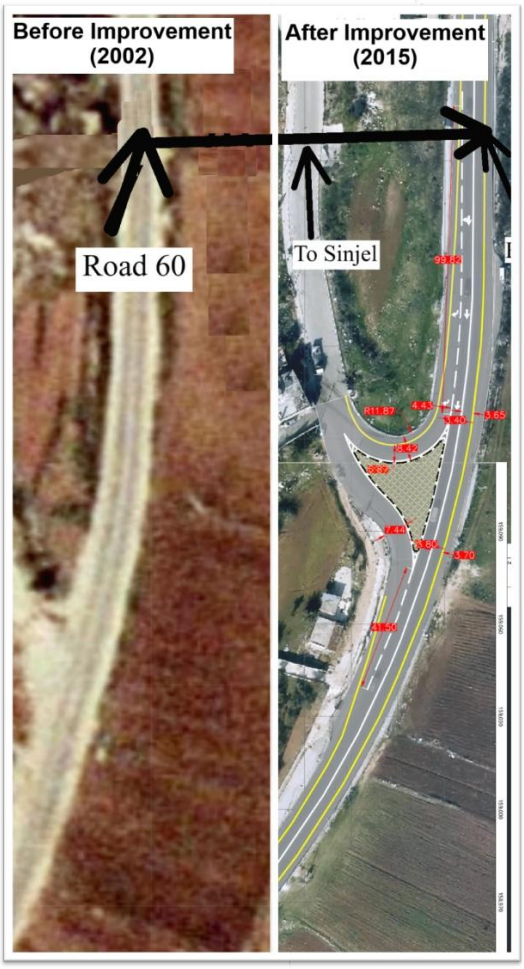


Figure 22b

Eili Settlement intersection (Before and After improvement).

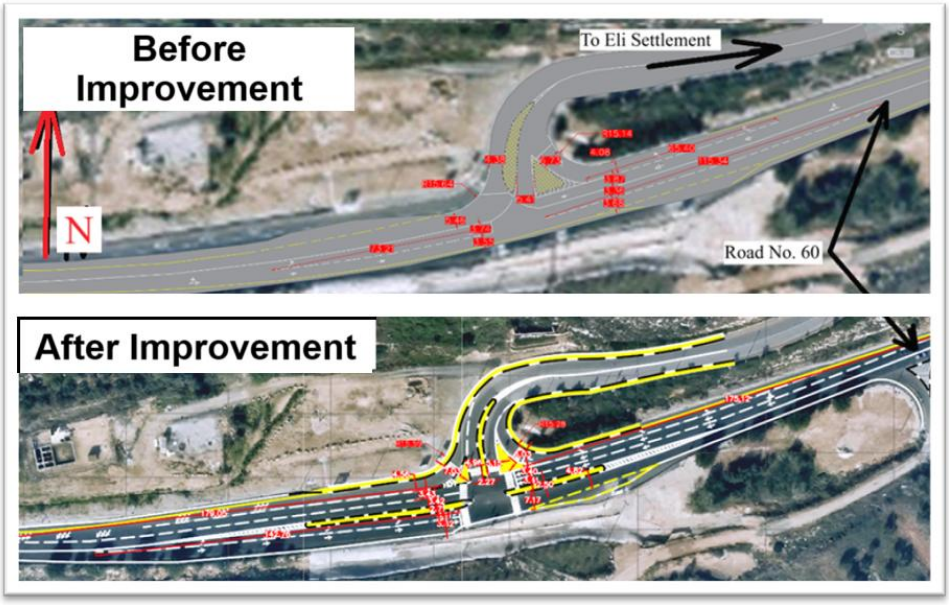


Figure 22c

First proposal of Sinjel intersection through USAID funded project in 2013

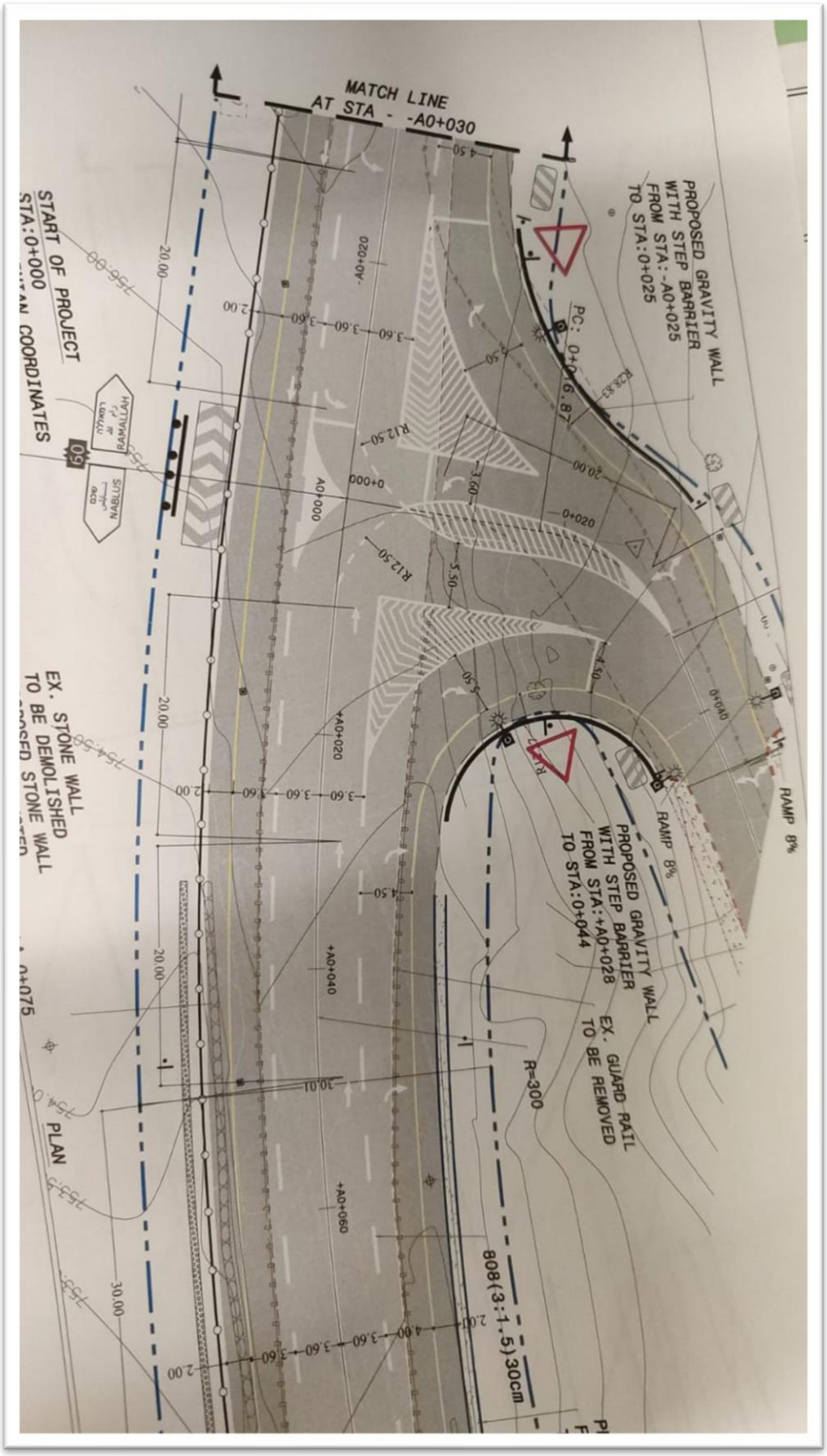


Figure 22d

Sinjel intersection studies prepared by Sinjel Municipality.

Figure 22e

Sinjel intersection proposed plan prepared by Sinjel Municipality.

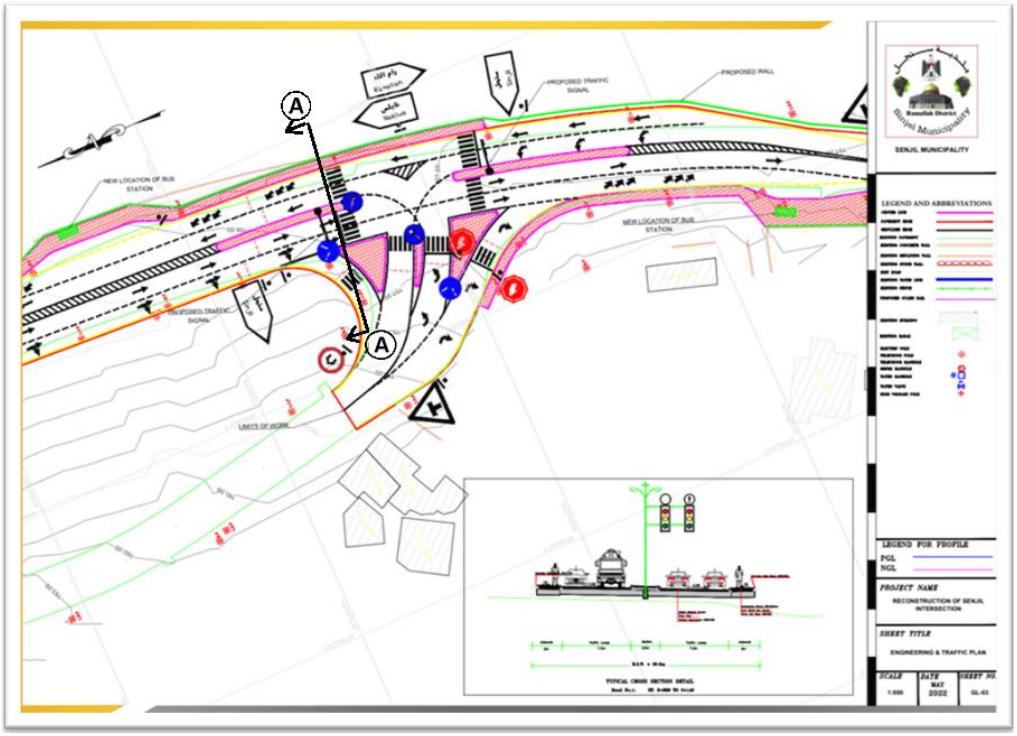
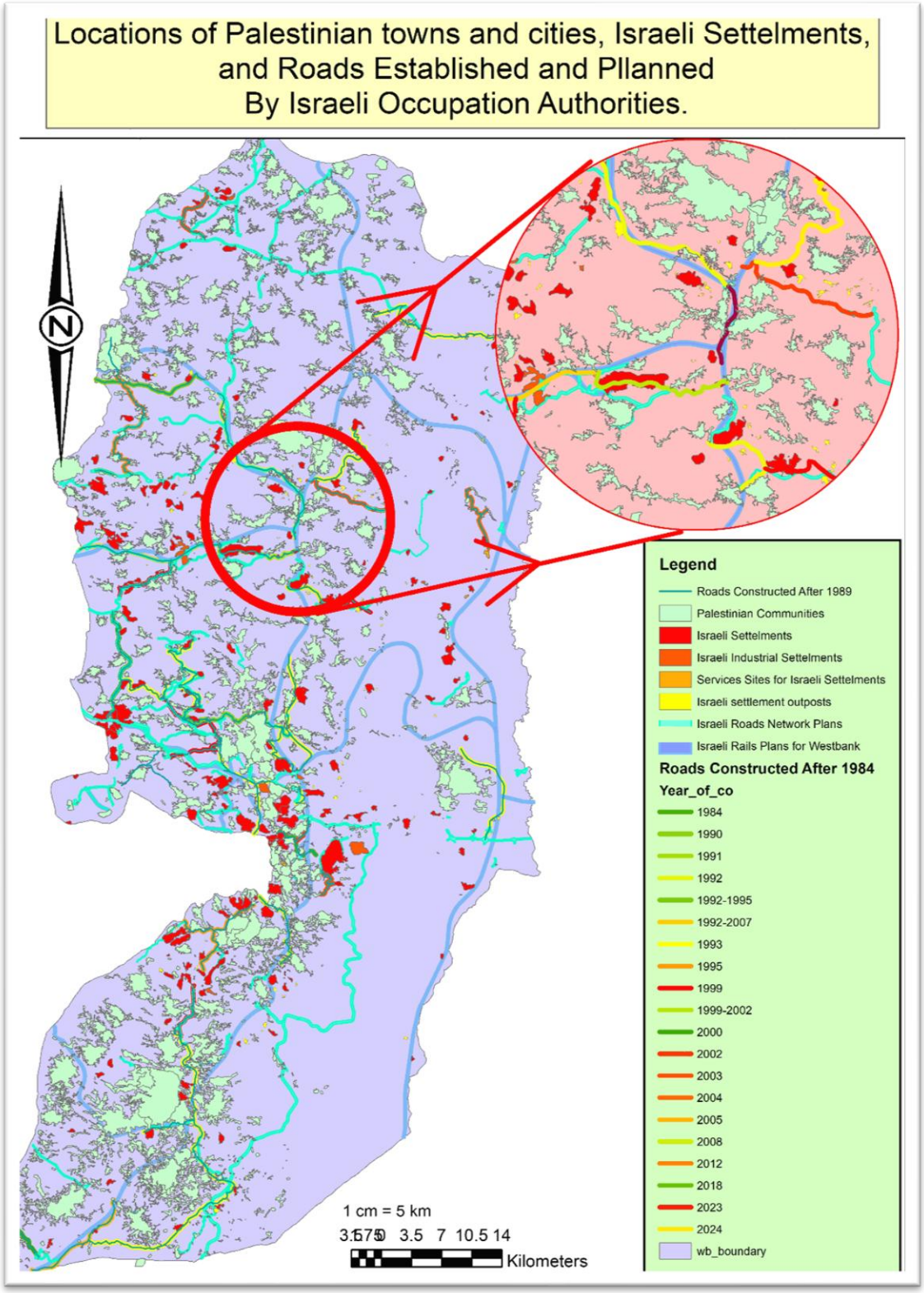


Figure 23

Locations of Palestinian communities and Israeli settlements, as well as planned and contracted Roads by the Israeli occupation authorities during 1984 - 2024.



Data Source: [36]

Appendix 2

Interviewees

The officials who were interviewed are as follows:

- Ministry of Public Works and Housing: Engineer Sawsan Abu Daqr, who holds the position of Acting Director General of the General Directorate of Roads, was interviewed on 10/4/2024 at the headquarters of the Ministry of Public Works and housing in Ramallah.
- Ministry of Local Government: Engineer Jehan Metwally, who holds the position of Director of the Planning Department at the General Directorate of Organization and Urban Planning, was interviewed on 26/3/2024 at the headquarters of the Ministry of Local Government in Ramallah.
- Palestinian Traffic Police: Brigadier General Riyad Barham, who is the Director of in the Traffic Police Department at the General Directorate of the Palestinian Police, was interviewed on 10/4/2024 at the headquarters of the General Directorate of Police in Ramallah.
- Sinjel Municipality: Engineer Fouad Shabaneh, who works as the Municipality Engineer at Sinjel Municipality, was interviewed on 29/4/2024 at Sinjel Municipality headquarters.

Appendix 3

Traffic Count

Table 1

Traffic count of Sinjel Intersection.

3-Leg Intersection							Total			
			Southbound		Northbound	Eastbound	Southbound		Northbound	Eastbound
Date	From	To	Through	Right	Through	Right	Through	Right	Through	Right
17/4/2022	06:00	06:15	69	0	50	6				
17/4/2022	06:15	06:30	120	0	56	14				
17/4/2022	06:30	06:45	155	1	56	16				
17/4/2022	06:45	07:00	459	2	82	30	803	3	244	66
17/4/2022	07:00	07:15	358	3	63	54	1092	6	257	114
17/4/2022	07:15	07:30	310	0	90	43	1282	6	291	143
17/4/2022	07:30	07:45	299	4	104	38	1426	9	339	165
17/4/2022	07:45	08:00	261	1	76	34	1228	8	333	169
17/4/2022	08:00	08:15	221	3	127	27	1091	8	397	142
17/4/2022	08:15	08:30	191	1	97	16	972	9	404	115
17/4/2022	08:30	08:45	185	2	93	22	858	7	393	99
17/4/2022	08:45	09:00	184	3	139	29	781	9	456	94
17/4/2022	09:00	09:15	160	1	87	12	720	7	416	79

17/4/2022	09:15	09:30	206	0	131	18	735	6	450	81
17/4/2022	09:30	09:45	160	2	148	14	710	6	505	73
17/4/2022	09:45	10:00	141	12	107	5	667	15	473	49
17/4/2022	10:00	10:15	167	4	150	17	674	18	536	54
17/4/2022	10:15	10:30	165	3	144	19	633	21	549	55
17/4/2022	10:30	10:45	164	4	191	17	637	23	592	58
17/4/2022	10:45	11:00	162	5	167	13	658	16	652	66
17/4/2022	11:00	11:15	163	4	167	11	654	16	669	60
17/4/2022	11:15	11:30	141	3	154	14	630	16	679	55
17/4/2022	11:30	11:45	149	4	152	9	615	16	640	47
17/4/2022	11:45	12:00	141	3	158	13	594	14	631	47
17/4/2022	12:00	12:15	152	5	153	13	583	15	617	49
17/4/2022	12:15	12:30	151	5	156	16	593	17	619	51
17/4/2022	12:30	12:45	137	4	140	21	581	17	607	63
17/4/2022	12:45	13:00	130	4	139	23	570	18	588	73
17/4/2022	13:00	13:15	151	5	136	25	569	18	571	85
17/4/2022	13:15	13:30	138	1	144	13	556	14	559	82
17/4/2022	13:30	13:45	139	3	148	18	558	13	567	79
17/4/2022	13:45	14:00	147	5	161	21	575	14	589	77
17/4/2022	14:00	14:15	152	8	150	35	576	17	603	87
17/4/2022	14:15	14:30	169	6	176	29	607	22	635	103
17/4/2022	14:30	14:45	172	3	189	21	640	22	676	106
17/4/2022	14:45	15:00	165	2	168	26	658	19	683	111
17/4/2022	15:00	15:15	158	3	169	31	664	14	702	107
17/4/2022	15:15	15:30	165	3	180	21	660	11	706	99
17/4/2022	15:30	15:45	156	1	179	19	644	9	696	97
17/4/2022	15:45	16:00	177	3	175	14	656	10	703	85
17/4/2022	16:00	16:15	170	3	166	7	668	10	700	61
17/4/2022	16:15	16:30	167	4	152	13	670	11	672	53

17/4/2022	16:30	16:45	154	1	171	16	668	11	664	50
17/4/2022	16:45	17:00	143	1	160	21	634	9	649	57
17/4/2022	17:00	17:15	142	4	148	6	606	10	631	56
17/4/2022	17:15	17:30	150	4	144	10	589	10	623	53
17/4/2022	17:30	17:45	138	1	137	14	573	10	589	51
17/4/2022	17:45	18:00	134	3	130	14	564	12	559	44
17/4/2022	18:00	18:15	110	6	160	20	532	14	571	58
17/4/2022	18:15	18:30	121	3	148	5	503	13	575	53
17/4/2022	18:30	18:45	104	1	118	9	469	13	556	48
17/4/2022	18:45	19:00	97	1	115	10	432	11	541	44
17/4/2022	19:00	19:15	74	4	108	4	396	9	489	28
17/4/2022	19:15	19:30	74	3	104	10	349	9	445	33
17/4/2022	19:30	19:45	82	4	81	14	327	12	408	38
17/4/2022	19:45	20:00	59	5	106	3	289	16	399	31
17/4/2022	20:00	20:15	68	5	103	1	283	17	394	28
17/4/2022	20:15	20:30	83	3	96	4	292	17	386	22
17/4/2022	20:30	20:45	92	4	79	6	302	17	384	14
17/4/2022	20:45	21:00	111	6	69	5	354	18	347	16
17/4/2022	21:00	21:15	109	2	89	2	395	15	333	17
17/4/2022	21:15	21:30	107	3	92	5	419	15	329	18
17/4/2022	21:30	21:45	94	2	75	2	421	13	325	14
17/4/2022	21:45	22:00	84	4	87	0	394	11	343	9

جـامعــة النجاح الوطنية

كليــة الدراســات العليــا

دراسة تحليلية حول سياسات سلطات الاحتلال الاسرائيلي وممارساته في قطاع الطرق والمواصلات في الضفة الغربية: المحافظات الشمالية كحالة دراسية

إعداد

أحمد حسام محمد أبو يعقوب

إشراف

أ.د. سمير أبو عيشة

قدمت هذه الرسالة استكمالا لمتطلبات الحصول على درجه الماجستير في هندسة الطرق والمواصلات، من كلية الدراسات العليا، في جامعة النجاح الوطنية، نابلس- فلسطين.

2025

دراسة تحليلية حول سياسات سلطات الاحتلال الاسرائيلي وممارساته في قطاع الطرق والمواصلات في الضفة الغربية: المحافظات الشمالية كحالة دراسية

إعداد

أحمد حسام محمد أبو يعقوب

إشراف

أ.د. سمير أبو عيشة

الملخص

خلفية: لقد تأثر قطاع الطرق والمواصلات في الضفة الغربية بفلسطين من قبل سلطات الاحتلال الإسرائيلي منذ احتلالها عام 1967، والتي غيرت بشكل جذري شبكة الطرق والمواصلات لخدمة مصالحها، مما أدى لعرقلة وصول الفلسطينيين وتنقلهم. وتبرز أهمية هذا البحث بتفرده في تناول قطاع الطرق والمواصلات في الضفة الغربية في السياق الاستعماري الصهيوني.

الأهداف: الهدف الرئيسي من البحث هو التعرف على سياسات وإجراءات وممارسات سلطات الاحتلال الإسرائيلي المتعلقة بقطاع الطرق والمواصلات في الضفة الغربية، وتحسين قدرة الفلسطينيين على التنقل. ويهدف البحث إلى تقييم التغييرات التي أجرتها سلطات الاحتلال الإسرائيلي على شبكة الطرق بما يخدم طموحاتها، وتقييم آثارها على الفلسطينيين، وتقييم التمييز بين الفلسطينيين والمستوطنين فيما يتعلق بقضايا النقل والمواصلات، واقتراح التدابير اللازمة لتخفيف معاناة الفلسطينيين المرتبطة بذلك.

المنهجية: استُخدمت في هذا البحث المنهجيّة الكمّية والنوعية. وتمت مراجعة الأدبيات والخطط والأوامر العسكرية الإسرائيلية، كما تم إجراء مقابلات مع ممثلي عدد من المؤسسات المعنية. وتم إجراء تحليل مكاني باستخدام نظم المعلومات الجغرافية وتحليل فني لتقييم سهولة التنقل، وإمكانية الوصول، والتصميم

الهندسي، والسلامة المرورية، والتحكم المروري، وتخطيط شبكة الطرق، وذلك من خلال حالات دراسية. كما تم تحليل التغييرات على مدى السنوات.

النتائج الرئيسية: تظهر النتائج أن سلطات الاحتلال الإسرائيلي تتبع سياسات وإجراءات وممارسات مختلفة، لتقييد إمكانية وصول الفلسطينيين وتنقلهم. وتؤكد النتائج وجود سياسة الفصل العنصري بين الفلسطينيين والمستوطنين، بما في ذلك في تخطيط وبناء الطرق الالتفافية. ووجد أه هناك تجاهل متعمد في التنقل وإمكانية الوصول وحركة المرور بأمان للفلسطينيين، حيث أن التدابير الإسرائيلية المتعلقة بالفلسطينيين تقييد حركتهم وإمكانيات الوصول، والتي تكثفت خلال السنوات القليلة الماضية. وتبين النتائج أن الهيمنة على شبكة الطرق من شأنها أن تعرقل إقامة دولة فلسطينية مستقلة.

الاستنتاجات من الدراسة: إن التهديدات التي يتعرض لها الوجود الفلسطيني تتطلب من مسؤولي السلطة الوطنية الفلسطينية اتخاذ إجراءات فورية من خلال المحاكم الدولية ذات الصلة ومؤسسات الأمم المتحدة، والنظر في تدابير مضادة واقعية يمكن تنفيذها على الأرض، والتي من شأنها أن تخفف من معاناة المواطنين الفلسطينيين في سياق سهولة الوصول والتنقل، مثل تعزيز التواصل بين التجمعات الفلسطينية وفتح وتطوير المزيد من الطرق البديلة.

الكلمات المفتاحية: الطرق والمواصلات في الضفة الغربية؛ النظام الاستعماري الإسرائيلي؛ الطرق الالتفافية الإسرائيلية؛ قدرة الفلسطينيين على التنقل والوصول؛ آثار التدابير الإسرائيلية.