



Integrating Urban Land-use and Road Networks in Developing
Countries: Applying TOD methods to the Case of Gaza City

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Declaration

This thesis is presented as an original contribution based on Doctor of Philosophy Research at the University of Salford, United Kingdom and has not been previously submitted to meet requirements for an award at any higher education under my name or that of any other individuals. To the best of my knowledge and belief, the thesis contains no materials previously published or written by another person except where due reference is made.

Ahmad Yusuf Shabat

List of Abbreviations

TOD	Transit-Oriented Development.
USA	United States of America.
BC	Before Christ
CBD	Central Business District
GDP	Gross Domestic Product
TAD	Transit Adjacent Development
SMCA	Spatial Multiple Criteria Analysis
RTS	Rubber-tiring System
BRTS	Bus Rapid Transit System
PPS	Project for Public Spaces
LRT	Light Rail Transit
PNA	Palestinian National Authority
PLO	Palestine Liberation Organization
MOLG	Ministry of Local Government
UCL	University College London
SPSS	Statistical Package for Social Scientists
UK	United Kingdom

Abstract

Land use is rapidly changing and progressively facing more complex challenges in sustaining people's needs, therefore the planning and design of road networks. For example, accessibility and transport are a key factors driving the expansion and effectiveness of cities. This mutual relationship between transport and land-use is receiving more attention, and recent studies concern the urban planning of developing countries. For example, if commercial activities and public services are not properly planned within city centres, issues arise with overcrowding and other haphazard patterns of movement. As a result, new strategies are required to incorporate new technologies to enable transit-oriented development (TOD). Therefore, the aim of this study is to develop a TOD model to adopt in Gaza that integrates land-use and road networks. This entails a review of transit-oriented development (TOD) principles for a typical suburban municipality in Gaza City. The besieged city and restricted political circumstances in Gaza have blocked further expansion despite rapid population growth. Determining general planning guidelines, which have already been applied in the USA and Europe, could help to develop a comprehensive land-use and transport integrated plan.

The TOD model principally aims to address the environmental, economic, and social problems associated with excessive car use and urban sprawl. To achieve this aim, the study utilises a mixed research approach and adopts a single case study strategy by triangulating the data collected through different techniques (semi-structured interviews with experts and a citizens' survey). Indicators, strategic transactions, and scenarios that support the TOD approach are reviewed and discussed to identify priorities and develop the existing quality of life. It is hoped that the outcome of this research will enable the development of an effective TOD that is integral and an ongoing part of the decision-making planning framework.

Suggestions for further research identify new points for future development that will provide a useful point of reference for academics and researchers. It is suggested that people should be encouraged to adopt public transport, and an advance transport system should be purchased for motivation purpose. It is suggested that political leaders and other major social influencers can play positive role in shifting

people's choice from taxi to public transport. Moreover, it is recommended that key stakeholders should engage investors in TOD, while there is a consensus among experts about the need to redesign and widen the roads. In addition, educating people on the benefits of TOD adoption such as better mobility, lower car traffic, lack of pollution, and so on, will also encourage its greater adoption.

CHAPTER 1

Introduction

CHAPTER 1: Introduction

This research aims to understand the challenges and opportunities associated with integrating transport with land-use and the importance of applying this integration to achieve more effective planning in developing cities, particularly Gaza City. This study offers a platform and stepping-stone for further research into urban transport that should be applied by planners and other institutions.

1.1 Rationale for the Study

A city is a place of production and consumption and a centre of interlocking political and administrative authorities. Urban growth is a phenomenon of economic and social dimensions that results from the relationship between people and the environment, and constantly changes by altering the interaction relationship, (Clark, 2003). The term urban planning emerged in the United States in the late 1940s as a prominent modern concept concerning population groups and the planning of city centres. Because urban areas tend to be large, the fabric must be renewed, and there is a need for continuous expansion (Asfaw, Zeluel, & Berhe, 2011). Urban planning in countries is designed to organize the city according to street patterns and land-use while accommodating the needs of the population and the modern age (Turner, 2014).

The use of land in the city is one of its most important elements. The type of use may change more than once, and any city has a combination of integrated uses that give the space its specificity (Alfarra, 2010). The most important studies or surveys are those carried out by planning authorities before embarking on planning. These include a precise study of the types of land-use in the place to be planned, which is considered the basis for planning. The distribution of land-use is considered crucial, namely the allocation of its types to different parts of the city (Mohaisen, Mohamed, & Abu Warda, 2011). The map of land-use is a major tool for planners when they study the functional structure of the city (Yeh, 1999), where the patterns of land-use are a product of its evolution through history and a logical reflection of the importance of the functions the city exercises (Kaiser, Godschalk, & Chapin, 1995).

Transport is the consequence of the spatial separation of different types of land-use in an urban area. At the same time, improved accessibility results from transport networks and can lead to increased separation and changes in the nature of land-use. This fundamental relationship between transport and land-use produces the movement and

traffic flow patterns seen in cities. The accessibility of places has a major impact on land values and shapes the pattern of land-use (Litman, 2011). Unfortunately, transport and land development decisions have all too often been regarded as distinctly separate issues in analysis, planning, design, and evaluation. However, disregarding this crucial link has contributed to adverse consequences for transport and imposed significant costs to the community (Wadhwa, 2004). It is, therefore, imperative that this link is explicitly considered in transport planning for cities.

Recent studies in the urban planning of developing countries are more concerned with the design and distribution of road networks and land-use (Gwilliam, 2003). The design of road networks is a key factor driving the expansion and effectiveness of land-use and requires further study to measure the integration between road networks and land-use (Manual, 2010). Most cities have been re-planning by incorporating transport technology priorities alongside economic and cultural priorities on the use of urban space (Van, Korniiichuk, Dauby & Pourbaix, 2014; Lerner & Van, 2012). In many developing countries, urban planning is characterised by a lack of attention to public transport (PT) and other urban services (Habitat, 2013). This is inevitably accompanied by automobile-oriented real estate development practices. Van et al (2014) and Lerner et al. (2012) argue that changing transport priorities from an auto-dependent city structure to public transport system represents an instrumental step in the creation of a sustainable city.

The City of Gaza is striving to bridge the gap between transport demand and supply and in response to this, large scale road projects are underway to improve the quality and capacity of existing road transport infrastructure and service provision.

1.2 Background

TOD was first introduced by an American architect, Calthorpe (1993) who defined it as mixed-use communities along a system of regional transit within a range of ten minutes' walking distance which includes public services, complementary jobs, and retail in the neighbourhood. Moreover, its uses and services act as points of strategic development. Moreover, Boarnet and Crane (1997) was argued that in order to influence public investment and promote the use of rail transit systems, the development or redevelopment of land near rail transit stations should be included under the heading of TOD. The concept of TOD was presented by Parker et al., (2002)

as a strategy of land usage related to transport that enables coordination between a public transit system and communities. TOD was considered an amalgamated approach where the transport and planning of land use increased pedestrian access to the transit point (Schlossberg & Brown, 2004). Nasri and Zhang (2018) considered it as planning approach for transit services which enhanced the benefits of such transit and promoted high density development and mixed use. A lot of definitions related to TOD have been proposed, although the political and scientific communities do not have any single definition. Nevertheless, combining land use with roads is a common purpose of TOD which typically promotes public transit systems within characteristic features of development (moderate to high density) around transit points with mixed use and walkable communities.

American planners first adopted the principle of TOD which was applied to New York, Washington, New Jersey, Florida, Massachusetts, Georgia and California. TOD was implemented by many European cities, such as Zurich, Stockholm, Rome, Naples, Munich, Lisbon, Karlsruhe, Helsinki, Copenhagen and Amsterdam, as a primary approach for land use (Papa & Bertolini, 2015; Vale, 2015). TOD has also been adopted by the governments of Asia like Singapore, Japan, South Korea and China (Cervero, & Day, 2010; Loo, et al., 2010; Sung, & Oh, 2011). However, one basic philosophy was followed by different cities when adopting TOD although specific focuses mean great variation between the cases. According to Bertolini, & Spit (1998), European governors were keen to redevelopment of areas related to existing transit stations, while the reconstruction of urban development around transit points was underlined by American planners (Hemsley, 2009). In Asia the growth of megaregions related to TOD which became the source of mass transit corridors (Zhang, 2007; Yang, & Lew, 2009) through which existing areas of dense urban development are re-connected around the transit (Lindau et al., 2010).

TOD represents the integration of a land use transit model involving medium to high level density and development, mixed urban functions, and cycling and pedestrian friendly approaches that are closer to the transit system. It was formally conceptualized in 1993 as a planning scheme and strategy (Calthrope, 1993) and since then has gained worldwide recognition. Ibraeva et al. (2020) conducted a review of over 300 TOD studies including empirical research on the impact of TOD on real estate markets, travel behaviour, urban forms, the choice of residential location, and community life. TOD also part of the system plan of different transit agencies while TOD plans and

guidelines are increasingly included by different regional and national level development agencies in their plans.

The modern TOD discussion is gaining momentum in European cities where there are extensive transit cities and a long tradition of development around transit schemes. It is also increasingly adopted by other developing countries. In the US, the states of Texas, and Colorado have formally enacted TOD ordinances (City of Denver, 2014; City of Austin, 2006). Asian countries have also implemented TOD plans across their megacities, such as Delhi (India), Shenzhen (China), and Ho Chi Ming (Vietnam) (Mehta et al., 2016; Fang & Xue, 2015; Phuc, 2015). Moreover, Malaysia and China have devised national level guidelines concerning TOD (Zhou, 2016; Ahamad, 2014) while professional groups and international agencies such as the Institute of Transport & Development Policy, and the World Bank have also developed guidelines related to TOD (The World Bank, 2018; ITDP, 2017).

Although significant achievements have been made within research and practise in TOD, there is still a significant gap in research concerning the planning of TOD beyond individual stations (Ibraeva et al., 2020). Effective planning along with innovative financing, a collaborative institutional setting, and political support are features which make TOD projects successful (Edmonds, 2018; Renne, 2009; Cervero, 2004). Current TOD practices focus on individual stations and their surrounding areas; however, this has meant a network-oriented approach remains unexplored both in research and in practise.

While some TOD plans have considered the probability of developing the road networks of areas in metropolitan cities (URS Corp, 2011), many plans have only focused on adding up TOD nodes rather than fully predicting the effect of multiple TOD nodes in a metropolis and the related individual and collective benefits for the surrounding community (Curtis, 2016). It has also been observed that developments near stations alone are insufficient to achieve TOD as they need to be integrated synergically to realize the full effect (Renne, 2009). Moreover, merely collecting TODs in the same area or connecting them one way or the other does not create synergy unless they are combined in a transit network. The network effect of TODs has been studied in the context of European cities (Papa, et al. 2013) and the Centre for TOD (2010) recommended that planning should be carried out on multiple scales. This finding has been reiterated by World Bank (2018).

According to Liu et al. (2021), various studies have investigated the relationship between the attributes of TOD and travel behaviour to determine if the relationship is static. However, they found out that the relationship was changed with the change in transit share, density of land usage, distribution of trip length, carbon emission from vehicles, and rate of pollution. Moreover, countries across the world are now focusing on sustainable development (Liu, et al., 2021). This research aims to enhance the tractability and applicability of TOD in practice.

1.2.1 TOD Implications

Concerns about the negative impact of urban growth are also growing alongside those related to increased levels of mobility. This has prompted debate concerning concrete planning strategies to manage the development and its pace. One of the common strategies is the integration of the transport system and land usage with TOD (Suzuki, et al. 2013; Pan, et al. 2011; Banister, 2008). In this approach, the urban development is clustered around the public transport nodes so that high density urban areas remain closer to public transport nodes which also include the residential areas, retail spaces, pedestrian/cycling track, and medical facilities (Cervero, 2004; Dittmar & Ohland, 2004; Bertolini & Spit, 1998). Although the main philosophy underlying TOD is similar across other contexts, studies highlight the differences in their application. For example, Australia and the USA focus on recentring suburban areas around transit stops (Hemsley, 2009; Cervero, 2004) whereas in Europe the focus is on redeveloping existing stations (Bertolini & Spit, 1998). In Asia, the main goal is to develop transit corridors (Yang & Lew, 2009; Zhang & Liu, 2007), while in South America it is on reconnecting current transit with more areas (Lindau, et al., 2010).

TOD aims to account for local contextual differences and thereby support the planners, policy makers, designers, and developers whose development are based on different assumptions. Firstly, similarities with respect to type, enables transport and urban planners, and policy makers to develop targeted sets of strategies to promote TOD (Reusser et al., 2008; Renne & Wells, 2005). Secondly, each station area possesses morphological characteristics, such as street density and number of directions from one station to another, and functional characteristics, such as diverse economic units in a particular station area, which are helpful in answering questions related to design and planning operations (Kamruzzaman et al., 2014; Belzer et al. 2002). These questions include the number of passengers that a station can support, whether

relocating residences and jobs enable better usage of a station, and whether there is a need to improve the walkability of the area surrounding the station. Thirdly, the classification model, enables developers and local government to invest in certain TOD types to achieve benefits across the space for development (Centre for TOD, 2011). Fourthly, policy makers are better able to understand the relationships between the urban problems of the area and TOD by accounting for the context-oriented typology, which involves analysing the effect of different TOD types (Xie, 2012).

There are also several accompanying challenges which can be addressed through TOD e.g. the fast pace which the urban land is utilised and questions concerning space for future generations (Suzuki et al., 2013; Xie, 2012), long commute times (Clower et al., 2011; Wang & Chai, 2009), increased air pollution and greenhouse gas emissions (Pan et al., 2013; Xie, 2012), and inequitable spatial accessibility (Cervero & Day, 2008). Different studies have also shown that, for several years, the implementation of TOD in Chinese metropolitan cities has been regarded as a solution although the systematic typology of TOD in China has not yet been discussed (Lyu, Bertolini, & Pfeffer, 2016).

Relevant research has focused on the assessment of TOD at the station-area and neighbourhood level when evaluating the standard of TOD and its relationship with the intended outcomes. Furthermore, some studies have focused on variable development within or across the metropolitan area. Kamruzzaman et al. (2014) used cluster analysis when gathering the environmental indicators such as mixed land use, road network, residential density, and employment. These were used to identify and validate the typologies of TOD for neighbourhoods in Brisbane and was achieved by highlighting their importance when predicting mode choice. When examining the metropolitan area of Baltimore (MD) and Washington DC, Nasri et al., (2018) analyzed different zones of traffic, based on the relative concentration of jobs or residents, the different characteristics of mixed use, and the proximity between transit and zone. They found that people in the TOD zones of Washington DC have lower distances to travel compared to Baltimore. In comparison, Singh et al. (2014) utilized multiple criteria analysis of space to evaluate TOD levels. They utilized economic indicators and land use (e.g. employment density, residential density, streetscape qualities, land use mix, and number of businesses) to measure high TOD areas in the city region of Arnhem & Nijmegen (Netherlands).

A similar approach was applied by Singh et al. (2017) when evaluating the station-area to derive suggestions to improve TOD. Higgins and Kanaroglou (2016) applied probability-based clustering analysis by utilizing eight indicators of land usage to determine ten types of TOD across 372 stations in Toronto. They found that stations with high transit rates had high TOD-related measures. Such stations were also found to have lower household. Furthermore, in their research involving cross-city comparison, Papa and Bertolini (2015) found a positive relationship between rail accessibility and the node index (approximately 30 minutes reach to jobs and residential areas). Their research involved six cities in Europe and utilized node place model.

In recent years, practical and academic approaches have accounted planning strategies to overcome the adverse effect of urbanization and mobilization (Wey et al., 2016; Lyu et al., 2016). One chief suggestion is to integrate transport with the usage of land (Suzuki et al., 2013; Pan et al., 2011; Banister, 2008; Cervero, 2004). Although diverse definitions have been proposed by researchers (Cervero, 2004; Parker et al., 2002; Boarnet & Crane, 1997) TOD planning involves the promotion of walking, cycling, and public transport (Wey et al., 2016; Vale, 2015). TOD also means maximizing urban development around transport nodes only and creating communities which promote efficient space utilization and a walkable environment (Dittmar & Ohland, 2004; Bertolini & Spit, 1998). This is also referred to as New Urbanism or Smart Growth (Sung & Chang, 2017; Bertolini, et al. 2012; Givoni & Banister, 2010 Dittmar & Ohland, 2004). TOD has thus become a dominant approach when planning of urbanization.

Figure 1.1 presents a number of benefits from the TOD approach such as the efficient and widespread coverage of public transport, reduced traffic congestion, the efficient consumption of energy, healthier lifestyle, creative destinations, and economic growth due to the availability of retail spaces (Huang, et al. 2017; Singh et al., 2017; Langlois et al. 2016; Lyu, et al., 2016; Papa & Bertolini, 2015; Lindau et al., 2010). Accordingly, the benefits listed in Figure 1.1 and those listed in the TOD approach are closely related and together highlight the benefits of a transport-oriented development approach focusing on reduced car dependence, improved accessibility, healthier lives and the economy increase. For example, efficient and comprehensive public transport in TODs has numerous advantages. It reduces dependence on one's own vehicle and promotes alternatives to driving. Residents have access to nearby work, leisure and

leisure facilities via public transport, promoting a contented lifestyle. In addition, efficient public transport can improve access to important services such as healthcare, education and shopping. It stimulates economic growth by improving business convenience and creating easily accessible business centres. TODs act as connections between cities and suburbs, enabling efficient transport and reducing long commutes. This improves accessibility between cities and suburbs, which corresponds to the fifth benefit. In addition, public transportation in TOD provides more entertainment and leisure options, promoting a healthier lifestyle in line with the sixth benefit. It also improves employment opportunities and plays a vital role in revitalizing cities by increasing population density and supporting businesses. This may explain why 200 TODs have so far been developed in North America and 400 more sites are being considered (America, 2007). A number of TOD forms have been devised by planners; these comprise different operational and morphological characteristics among individual TODs in a particular system (Belzer & Autler, 2002). However, it is imperative to explore different variations of TOD to fully realize their advantages (Centre for TOD, 2011).

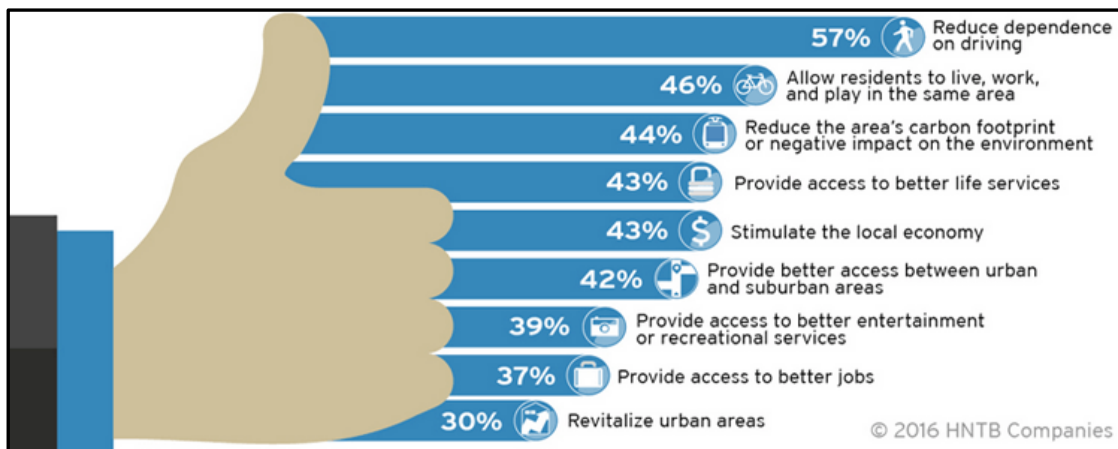


Figure 1-1 The benefits of a TOD approach (<http://www.tod.org>).

The nature of each TOD typology varies in the clustering of nodes, which are grouped according to their morphological and functional characteristics (Lyu et al., 2016). From such analysis, remedial actions can be devised by planners to improve the prevailing situation and further targeted strategies can be developed to promote TOD, such as investment in particular TODs, selecting new TODs, etc. (Lyu, et al. 2016; Kamruzzaman et al., 2014; Arrington & Cervero, 2008; Reusser, et al. 2008; Renne, 2007). Different methodologies have been developed by researchers to evaluate the variations in TOD and their related typologies (Lyu, et al. 2016; Papa & Bertolini, 2015; Vale, 2015; Nasri et al., 2018; Singh, et al. 2014). However, neither issue has been

examined in a single case study of land use reduction in the developing city of Gaza. Furthermore, there is also a dearth of literature on the quantitative results of land usage planning. Indeed, many studies has been conducted in the developed world and less attention has been paid to the underdeveloped or developing world. Thus, it is important to bridge this knowledge gap by implementing a TOD for reduce the land use in a developing city.

1.2.2 Challenges Affecting Gaza City's Road Network

Understanding any phenomenon necessitates addressing the associated challenges. This section delves into the intricate issues that impede the development and functionality of Gaza City's road network, stemming from a blend of natural and human influences.

Challenges Arising from Natural Factors

Gaza City's road infrastructure predominantly features semi-flat terrain, typically conducive to unhindered traffic flow. However, a seasonal hurdle emerges during winter when rainwater accumulates on less sloping roads, disrupting traffic. Furthermore, the city's climatic nuances manifest prominently in winter, with rain causing impediments, particularly on sloping roads. The challenge escalates on dirt roads, where traction loss occurs, especially in moderate temperatures. Intriguingly, traffic intensity surges near Gaza City's seashore as temperatures rise.

Challenges Stemming from Human Factors

Human factors, chiefly political and economic dimensions, wield substantial influence over Gaza City's transport landscape, with their interplay undermining its infrastructure.

Challenges Linked to Political Circumstances.

Historically, political conditions have significantly impacted Gaza City's transport network, particularly post-1948 Palestine occupation. Road expansion abruptly ceased at the truce line, and subsequent direct control of Gaza Strip in 1967 led to road dismemberment due to settlements. These settlements not only introduced strategic road closures but also witnessed intentional neglect by the Occupation. Notably, road construction and maintenance only gained momentum post the 1994 Oslo agreement between the Palestine Liberation Organization (PLO) and the Occupation.

The 2006 legislative elections, culminating in the Change and Reform Bloc's victory, resulted in a siege on Gaza City. This blockade curtailed modern transportation introduction and infrastructure maintenance, extended to raw material imports required for road upkeep. This led to route deterioration and, in some instances, transportation cessation, imposing extended waiting times on passengers.

Additionally, the closure of key crossings and Gaza Strip residents' prohibition from employment in occupied Palestinian territories fuelled a surge in individuals turning to driving as a livelihood, exacerbating traffic congestion.

Challenges Intrinsic to Economic Conditions

An intricate interplay between political and economic circumstances has emerged from Palestine's occupation, rendering its population dependent on the Occupation, detrimentally affecting Gaza City's transportation. The economic ramifications manifest as insufficient funding for road construction and maintenance, despite a modest revival post the Oslo accord. Donor countries did provide financial support for infrastructural development, road construction, and maintenance, albeit partially.

Significantly, these economic conditions transcend the road transport network. Rigorous restrictions on modern transportation modes and vital vehicle spare parts have further deteriorated existing transport methods, imposing an exacerbated economic burden on both the governing authority and drivers.

1.3 Problem Definition

The world has witnessed an astonishing population growth, which has played an important role in the emergence of urban areas. This growth has been accompanied by the rapid development of cities, the expansion of their areas, their economic development, and improvements in the population's standard of living (Schneider & Mertes, 2014). The car, one of the most important influences on the development of transport in the twentieth century, has accelerated the development of urban areas. However, experiences in both developed and developing cities show that investments in car transport and road infrastructure represent both the problem and solution to the relief of excessive congestion (Rodrigue, 2009). The construction of new auto-oriented road infrastructures encourages car use and ownership, yet this results in the congestion of such highways or roads. Conventional ways of planning urban transport

infrastructure are unable to solve these cycles of congestion and excessive car and road use (Pojani & Stead, 2015).

Moreover, in Gaza complicated political circumstances have led to the destruction of road networks and infrastructure, as shown in figure 1.2. In addition, the besieged city has blocked further expansion despite experiencing a rapid population growth. Therefore, conventional planning along with limited economics and a lack of public transport have led even to greater pressure to plan a transit-oriented development (Skaik, 2015). The problems of population mobility relate to the distribution of areas of activity and services in the city. The centrality of the activities leads to high density and severe traffic pressure on the roads and side streets. Commercial activities are concentrated in city centres, which increase their population density and lead to overcrowding. The nature of land-use in the city and its uneven distribution of services lead to complex city planning (Mohsen, 2015). As a result, new strategies are required to incorporate new technologies which enable transit-oriented development (TOD). A key challenge is to better integrate the transport priorities - private transport and/or public transport and road network infrastructure - alongside the land-use patterns of its urban environment (Bedear, 2011).

Between 1998 and 2015, the Ministry of Planning and International Cooperation initiated a regional plan for Gaza's governorates, outlining a framework for action. However, political events, such as the Al-Aqsa Intifada in 2001 and the evacuation of Occupation settlements, led to an extension of the plan to 2020. During this time, only general principles were adopted, reflecting the ever-changing geopolitical landscape (Salamah, 2015). These developments highlight the need for adaptable urban planning strategies in conflict-ridden areas, such as applying the principles of TOD.

In Gaza City, problems related to land-use have created numerous challenges, including overcrowding and road congestion. Residential issues encompass indiscriminate construction, an absence of clear urban harmony, and a lack of coordination between property owners and city planning (Sha'at, 2002; Asheakh-Eid, 2015). Additionally, the heterogeneous distribution of services and the intensity of traffic on city roads further complicate urban planning.

In terms of agriculture, the continuous urbanization of agricultural lands has led to erosion and decreased biodiversity. Industrial problems include the location of factories in residential neighbourhoods, causing pollution and congestion. Commercial

challenges relate to the centralization of services and a lack of suitable parking and infrastructure. Issues with services include their centralization, a lack of green spaces, and insufficient educational, health, and recreational facilities, further compounded by a lack of urban land owned by the Gaza Municipality (Sha'at, 2002).

Moreover, road and infrastructure problems, such as a lack of hierarchy in road levels, crossing regional roads through the city centre, and inadequate road networks, have hindered accessibility and transportation (Asheakh Eid, 2015).

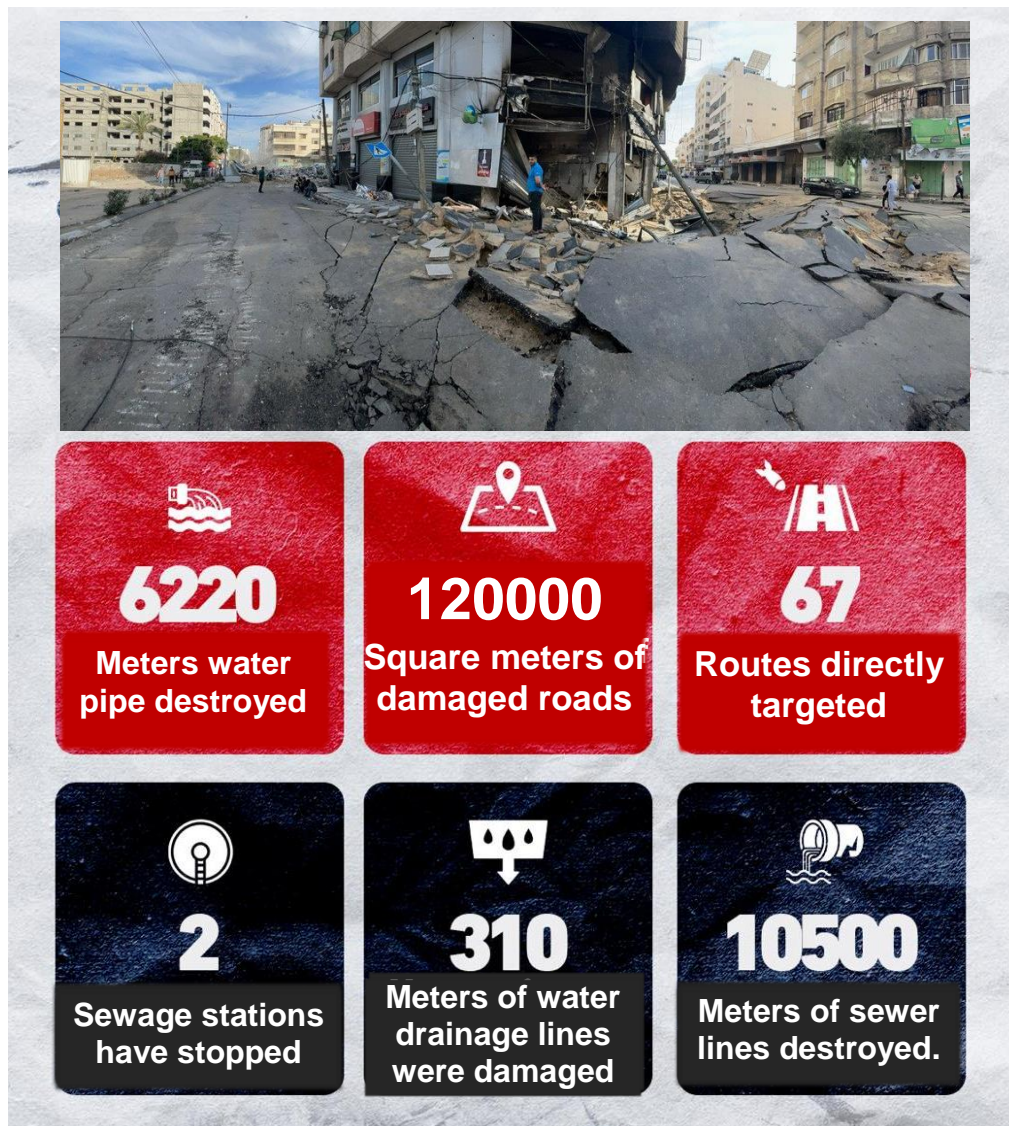


Figure 1-2 Damage to the infrastructure as a result of the Occupation aggression 19 May 2021, Gaza Municipality.

The study's primary focus is on the potential implementation of TOD principles in Gaza City, aiming to ascertain their compatibility with the city's planning guidelines and their capacity to provide a holistic approach encompassing land use and transport. TOD, as a model, primarily seeks to mitigate the environmental, economic, and social

challenges associated with excessive car use and urban sprawl. Moreover, the study intends to formulate a specific TOD model tailored to the unique context of Gaza.

In response to the municipality and decision makers to the extensive destruction of infrastructure in Gaza City, particularly in areas like Omar Al-Mukhtar and Gamal Abdel Nasser, the study advocates for the adoption of TOD principles in the process of reconstruction. This approach entails the integration of efficient public transportation systems, mixed land-use planning, and sustainable urban design. By doing so, we can create resilient and efficient neighbourhoods that not only accommodate the growing population but also mitigate issues such as congestion and environmental pollution.

The study suggests to the municipality and decision makers a strategic solution by embracing a decentralized planning strategy as a means to alleviate the strain on specific areas within Gaza City. This approach involves the redistribution of essential services, including education, healthcare, and commercial facilities, across various neighbourhoods. By dispersing population density and ensuring equitable access to vital services, we can foster more balanced urban development while improving overall accessibility.

These proposed solutions collectively represent proactive measures to steer Gaza City towards sustainable urban development. They address immediate challenges while aligning with the city's long-term goals of enhancing liveability and resilience within the urban environment.

1.4 Research Question

Based on the literature review and analysis of previous studies, the following three research questions are formalized which aim to meet the objectives:

1. What are the general characteristics and factors influencing land-use development and road networks in the city of Gaza?
2. What type of land-use and road network distribution plan is practised in the city and how compatible and competent are these practices to current and future challenges for the city?
3. What planning approach needs to be practised to integrate road networks and land-use and how can the road network be designed at the city level by applying TOD principles?

1.5 Aim and Objectives

The main aim of this research is to ***develop a TOD model to adopt in Gaza that integrates land-use and road networks***. The specific research objectives are as follows:

1. To identify the existing planning for the road network and land-use, and identify the related opportunities and challenges.
2. To explore the recent studies and concepts of land-use and road networks practices using a TOD approach.
3. To identify and evaluate the key factors required to facilitate TOD implementation in Gaza city.
4. To propose a set of performance indicators to introduce local bus stations distribution map.
5. To develop and validate a practical framework to facilitate TOD implementation in Gaza City.

1.6 Gap in Knowledge

Effective planning along with innovative financing, a collaborative institutional setting, and political support are features which make TOD projects successful (Edmonds, 2018; Renne, 2009; Cervero, 2004). Although significant achievements have been made within research and practise in TOD, there is still a significant gap in research concerning the planning of TOD beyond individual stations (Ibraeva et al., 2020). Current TOD practices focus on individual stations and their surrounding areas; however, this has meant a network-oriented approach remains unexplored both in research and in practise.

While some TOD plans consider the possibility of road network development in metropolitan areas (URS Corp, 2011), many plans only focus on adding TOD nodes, rather than fully predicting the impact of multiple TOD nodes in a metropolitan area, which is associated with surrounding individual and collective benefits to the community (Curtis, 2016). It has also been observed that developments near train stations alone are not sufficient to achieve TOD as they need to be synergistically integrated to achieve full impact (Renne, 2009). Furthermore, simply collecting TODs in the same area or connecting them in one way or another will not create synergies unless they are combined into a transportation network. Network effects of TOD have

been studied in the context of European cities (Papa et al., 2013), and the TOD Center (2010) recommends planning at multiple levels. The World Bank reiterated this finding (2018).

Numerous studies in Gaza city have focused on analysing the road network and land use as separate entities. For instance, ASarraj (2015), Atawi (2008), Khudaib (2011), Abu Laila (2005), and Al-Hariri and Muhaisen (2012) conducted research specifically on the road network separately from land use, examining various aspects such as road characteristics, studied the traffic flow patterns, road management, classifications, distribution, and identified challenges and factors influencing them. In contrast, Moheisen (2012), Siam (2014), Sheikh Eid (2015), Al-Mughni (2002), and Salha (1997) conducted studies on urbanization and land use within Gaza City. These research endeavors explored the planning patterns in Gaza City, including its historical context, factors that influence planning decisions, distribution of land use, and the prevalent planning problems faced in region.

The fact that Gaza is under conflict/violence which made it an isolated city from the rest of the world and that its parts have different planning legacies. However, neither issue has been examined in a single case study in the developing and conflict city of Gaza. The research identifies a significant gap in the current knowledge and understanding of Transit-Oriented Development (TOD) implementation in the context of Gaza City which is conflict city. While TOD principles have been discussed and applied in various cities around the world, there appears to be limited research and practical implementation of TOD in the Gaza region. The study seeks to address this gap by exploring the feasibility and potential benefits of integrating land-use and road networks through a TOD approach in Gaza City. Thus, it is important to bridge this knowledge gap by implementing a TOD to connect them. So TOD could connect difference and furnish post-conflict potential for the community's socioeconomic growth.

The study extends its significance by providing actionable recommendations for policymakers and urban planners in Gaza City. This guidance is poised to serve as a practical roadmap for addressing the city's pressing urban planning challenges. Decision-makers can utilize these insights to navigate the complex terrain of urban development effectively. Because decentralized planning is one of the fundamental characteristic of TOD, in the event of a conflict and the destruction of part of Gaza City,

the TOD application facilitates to create alternative strategies and plans within Gaza City.

The implementation of the TOD model is anticipated to have a tangible impact on the quality of life for Gaza City's residents. By mitigating traffic congestion, bolstering public transport, and promoting mixed-use development, the city can evolve into a more sustainable and liveable urban centre and the city can reduce pollution and ameliorate environmental degradation, fostering long-term sustainability.

1.6.1 Existing studies on the implications of TOD

Example of TOD implementation in Europe

Policy conceptions typically undergo cycles of initial neglect or rejection, followed by subsequent revival or acceptance. In Europe, numerous scholars have advocated for the reconsideration of the 'TOD construct' based on various factors such as advancements in logistics and transit technology, privatization-related rail transit reforms, the pursuit of sustainable development patterns, and the changing spatial dynamics of society (Poiani, D., & Stead, D. 2014). Poiani and Stead (2014) conducted a re-examination of the TOD construct in the Netherlands. Some argue that prior concepts related to the development of property using rail, such as streetcar suburbs, serve as the foundation for Transit-Oriented Development (TOD). However, it was first believed to be a strategy imported from North American cities (e.g. Keller, 1969; Warner, 1962). The transfer of information is heavily reliant on human effort, and the process of knowledge sharing often encounters fragmentation and incoordination (Poiani & Stead, 2014). Policy makers frequently draw inspiration from planning concepts originating from other sources, although this does not impact modifications in implementation or the development of policies.

Examples of re-planning after wars in Europe

The urban environment of Gaza City suffered significant damage and its infrastructure was left in a condition of ruins as a consequence of the recent 2024 War. Amidst the aftermath of conflict, the city is faced with the significant challenge of reconstruction, which requires the implementation of comprehensive measures to rebuild and rejuvenate its urban structure. By studying the experiences of European towns such as Dresden and others, Gaza might gain useful lessons from their enormous rehabilitation efforts after the devastating effects of World War II.

The process of reconstructing European towns in the aftermath of World War II serves as a remarkable demonstration of perseverance, unwavering will, and pioneering urban planning. Dresden and similar cities saw a revitalization after the destruction, undertaking ambitious initiatives to rebuild vital infrastructure, save cultural heritage, and envision urban areas for the future (Altrock, U. 2023). Following the conclusion of the 2024 War, Gaza is currently facing a comparable dilemma, as it must reconstruct its fundamental infrastructure while preserving its valuable historic heritage.

European cities prioritised the conservation of historical sites and cultural identity throughout their post-war rebuilding. The endeavours undertaken in Dresden to restore renowned structures like the Frauenkirche highlight the significance of heritage preservation in fostering a feeling of coherence and distinctiveness within the urban environment Rehberg, K. S., & Neutzner, M. (2015). The lessons of Dresden have a tremendous impact on Gaza, given its centuries-old past and significant historical importance. They provide inspiration for preserving and integrating cultural assets into urban reconstruction efforts.

Sustainability has been a fundamental aspect of urban development in Europe since the war, as cities have adopted environmentally friendly programmes, implemented energy efficiency measures, and adopted sustainable transportation options. According to Pelle (2016), the city of Freiburg in Germany exemplified the significant impact of sustainable urban planning by fostering environmental resilience and enhancing the overall quality of life for its inhabitants. In the context of post-conflict reconstruction in Gaza, the implementation of sustainable development strategies is a viable avenue for fostering resilience, adaptability, and enduring economic well-being.

Transit-oriented development (TOD) and smart mobility solutions have become essential elements of urban design in European cities after the war. These initiatives have played a crucial role in enhancing transport networks and decreasing reliance on cars. The efficacy of integrated transportation networks and pedestrian-friendly architecture in promoting lively and livable urban environments is shown by cities such as Thessaloniki (Papagiannakis, et al., 2021). The exploration of Transit-Oriented Development (TOD) concepts and smart mobility solutions in Gaza shows potential for improving accessibility, expanding mobility alternatives, and promoting environmental sustainability in the reconstructed urban landscape.

In the 2024 War, Gaza finds itself at a crucial point, ready to begin a process of rejuvenation, adaptability, and change. Gaza may gain great insights on urban planning, historical conservation, sustainable development, and community engagement by studying the experiences of European towns in post-war rebuilding. These ideas, based on scholarly analysis and practical experience, provide a clear plan for Gaza's rebuilding endeavours, directing the city towards a future that is more inclusive, sustainable, and dynamic.

Example of TOD implementation in Asia

Qatar:

Developing nations are experiencing rapid urbanisation, leading to transportation and mobility issues such as extensive urban sprawl, congestion, and high traffic demand (Xu et al., 2017). Cities are increasingly implementing TOD tactics to address these issues. A mixed-use community promotes residents to locate their homes in close proximity to transit services, while a reduced dependence on driving is seen as a defining feature of Transit-Oriented Development (TOD) (Carlton, 2009). Transit-Oriented Development (TOD) encompasses sufficient activities and users who utilise public transportation on a daily basis for pedestrian-friendly distances (MoUD, 2017; USDOT, 2005). Hence, the presence of dense commercial and residential areas within mixed-use structures is a defining feature of Transit-Oriented Development (TOD) (Calthorpe, 1993; Calthorpe et al., 1990). Transit-Oriented Development (TOD) has the potential to facilitate sustainable urbanism by incentivizing citizens to opt for public transport over private transportation (Cervero, 2010, 2006; Belzer & Autler, 2002).

Furlan and AlMohannadi (2016) began by doing a thorough examination of existing literature and conducting a meticulous investigation of the site. They next explored the complex relationship between the physical structure and cultural identity. The findings of this study have significant implications for Transit-Oriented Development (TOD) in both Qatar and Gaza City. The study conducted by Furlan and AlMohannadi serves as an enlightening case study that offers valuable insights and recommendations for the strategic development and execution of Transit-Oriented Development (TOD) initiatives in various settings. The study places particular emphasis on cultural sensitivity, the integration of urban elements, climate-responsive design, public engagement, sustainability, interdisciplinary collaboration, mixed-use, and density.

Ultimately, these factors contribute to the establishment of dynamic and sustainable transit-oriented communities.

Furlan and AlMohannadi (2016) underscored the significance of the interplay of the preexisting urban structure, cultural heritage, and transit-oriented development (TOD) infrastructure as a pivotal element that warrants careful consideration. The researchers verified that the efficacy of Transit-Oriented Development (TOD) initiatives was intricately tied to their capacity to assimilate with the indigenous culture and architectural legacy. The integration of many elements not only fostered a feeling of place and identity, but also bolstered the community's general acceptance and adoption of Transit-Oriented Development (TOD) concepts. The local community is more likely to adopt TOD initiatives when they take into account and demonstrate respect for the cultural character and architectural legacy of the region. Consequently, this improves the achievement and long-term viability of such initiatives.

Furthermore, Furlan and AlMohannadi (2016) emphasise the need of establishing a robust research framework in the development of Transit-Oriented Development (TOD). Commencing projects by conducting a comprehensive literature research and site analysis facilitates a more profound comprehension of the specific local environment, transportation requirements, and geographical limitations. Equipped with this information, planners and stakeholders may make well-informed choices on transit routes, station placements, land-use legislation, and urban planning. This method not only guarantees that Transit-Oriented Development (TOD) is in accordance with the particular requirements of the community but also reduces the likelihood of expensive and unfeasible interventions.

Moreover, the study undertaken by Furlan and AlMohannadi (2016) serves as a poignant reminder of the dynamic and continuous character of Transit-Oriented Development (TOD) initiatives. Although the original designs may be well-conceived, it is vital to adjust the concepts of Transit-Oriented Development (TOD) in response to the changing demands and preferences of the community. The integration of continuing research and community feedback in a dynamic manner assures the continued relevance and effectiveness of Transit-Oriented Development (TOD) in the long term.

The study conducted by Al-Qassar provides significant contributions to the field of TOD development, highlighting the significance of cultural sensitivity, rigorous research, and adaptation. The relevance of these teachings is significant within the specific context of Gaza City, since it has a common Arab Islamic cultural legacy that is shared across the two territories. They possess the ability to provide guidance in the development of a Transit-Oriented Development (TOD) framework that not only improves transportation but also aligns with the cultural identity and goals of the city, therefore promoting sustainable and harmonious urban development.

Singapore:

The establishment of a rail transit station for an Asian transit village in a new town in Singapore gave rise to a specific Transit-Oriented Development (TOD) land use concept (Niu et al., 2019). The variations in the characteristics of TOD stations, which are associated with land utilisation, have arisen as a consequence of the growth of new towns and the establishment of an urban-oriented hierarchy. According to Niu et al. (2019), it is suggested that the mixed-use growth of the TOD station area should be tailored to the specific conditions of the local area. Additionally, it is recommended that a certain proportion of open spaces, parks, and public service facilities be provided to facilitate the sustainable development of the society, environment, and land economy (Niu et al., 2019). Niu et al. (2019) found that in order to achieve sustainable growth in the TOD, it is important to ensure the presence of 'white sites', which refer to the precise proportion of open space and parks, as well as enough public service facilities. Additionally, the focus should be on promoting commercial growth in the core region. The presence of walkable areas and sufficient open and green space facilitated the development of ecological transportation and an environmentally friendly village, resulting in a harmonious integration of society, economy, and land economy (Niu et al., 2019).

Xie et al. (2012) conducted a study that examined the interaction linkages between land use under Transit-Oriented Development (TOD) and arterial transit lines, as well as their essential features. An interaction connection model was established between land use and urban arterial transportation using nonlinear differential equations. Xie et al. (2012) did a study on land usage, urban arterial transit inclinations, and dynamic evolution. They employed a theory of differential equation stability to demonstrate the conditions and sustainability at points of equilibrium. In order to determine the ability

of an arterial route to exceed the state of equilibrium in traffic capacity, a simulation was performed. Additionally, they noted that achieving sustainable balance may be accomplished by the combination of land-use and an urban arterial transportation route. Nevertheless, the expansion of urban transit routes is deemed excessive when there is a lack of effective administration and control (Xie et al., 2012).

Thailand:

Nyunt et al. (2020) conducted a study in Thailand that advocated for the implementation of Transit-Oriented Development (TOD). The primary objective of their research was to investigate the relationship between indicators of TOD and ridership. According to Nyunt et al. (2020), developers must answer the following major questions while implementing their developmental strategies. According to Nyunt et al. (2020), the success of Transit-Oriented Development (TOD) in Bangkok necessitates collaboration among various transport authorities, including the public bus authority responsible for enhancing bus services, as well as other pertinent authorities such as the metro system, which can enhance public access to public transport services through joint operations. While the increased demand for transport ridership has been attributed to changes in land use, it is important to acknowledge that land authority has also had a role in this phenomenon (Nyunt et al., 2020). Additional comprehensive analysis may be required to examine the effects and trends of land use modification in order to enhance transportation accessibility within the area. In order to ensure the sustainability of land development in the region, it is imperative to establish clear and precise guidelines (Nyunt et al., 2020).

China:

The The research conducted by Lyu et al. (2016) aimed to build a typology for Transit-Oriented Development (TOD) in Chinese cities, with a specific focus on the Beijing metro station region. Upon careful examination of the contextual factors, the primary objective of this study was to enhance and refine existing practices, while also considering the wider implications of the research. The researchers in this work have devised a methodical and adaptable categorization approach that may be applied in several geographical settings (Lyu et al., 2016). To achieve this objective, we examined indicators from worldwide literature on Transit-Oriented Development (TOD) and chose a specific set that is applicable to the instance. Based on this foundation, a cluster analysis was performed to ascertain the optimal number of clusters. The study

conducted by Lyu et al. (2016) identified six distinct categories of Beijing metro station areas. The paper included hypothetical examples to demonstrate how this categorization might assist policy makers, designers, and planners in developing focused strategies for Transit-Oriented Development (TOD). According to Lyu et al. (2016), it is recommended that future research should focus on investigating the potential utility of TOD typologies, since this is seen as a critical field of study.

While sustainability is given priority in initiatives, many research studies on Transit-Oriented Development (TOD) have mostly focused on environmental and economic sustainability rather than social equality. Moreover, the attainment of enduring sustainability necessitates improved land use planning, which has yet to be accomplished or specifically focused on, despite heightened endeavours by governments worldwide. Resolving concerns of unsustainability has proven challenging because to the significant rise in urbanisation. However, implementing a Transit-Oriented Development (TOD) paradigm might help to tackle this issue.

Liang et al. (2020) put up a proposition for the development of a Transit-Oriented Development (TOD) planning paradigm within the Chinese setting. The framework was determined to possess potential applicability for policymakers and specialists beyond the realm of planning, as it would facilitate the integration of land use planning with road networks, so contributing to the attainment of sustainability. Liang et al. (2020) conducted a practical study in Jiaomei, China to illustrate the implementation of the developed framework. A novel paradigm was introduced to comprehend the progression of sustainable transport by means of land use management. The objective was to investigate novel pragmatic approaches and sustainable strategies for urban processes. Liang et al. (2020) stated that they provided a broad framework for urban policymakers and planning professionals. However, they acknowledged that this framework was not suitable for cities due to variations in policy implementation. The aforementioned phenomenon was shaped by economic circumstances and regional attributes (Liang et al., 2020). Nevertheless, the implementation of the suggested framework was limited to Jiaomei as a result of time constraints. However, the experts exerted significant effort and took into account the aspects pertaining to land planning and Transit-Oriented Development (TOD) (Liang et al., 2020). In addition to prioritising efficiency, it is imperative to simultaneously strive for sustainable development and equality. According to Liang et al. (2020), it is advisable to allocate greater emphasis on panel studies in the development of TOD models. Additionally, it is advised to take

into account land use plans for various cities, including economic situations, geographical locations, and distinct city tiers.

The implementation of Transit-Oriented Development (TOD) and the Rubber-tiring System (RTS), which involves the integration of various stations, corridors, and buses for the transportation of individuals, may be achieved by the use of a fixed rail system, such as a metro, or a non-rail system (Berdiyrov, T. 2020). The system exhibits a high level of operational efficiency and, in comparison to the rail system, necessitates less financial resources for deployment. The other features of the Bus Rapid Transit System (BRTS) are its passenger information system and adaptability (Wirasingle, et al., 2013; Hossain, 2006; Polzin, & Baltes, 2002). Cities such as Brisbane, Ottawa, and Curitiba have witnessed the advantages of implementing BRTS land use. The alteration of land uses through the implementation of BRTS necessitates the prompt integration of land use planning for stations (Cervero, 2006; Satiennam, et al., 2006; Levinson et al., 2002). Developing nations are using Transit-Oriented Development (TOD) plans as a means to mitigate congestion within their transportation networks. The implementation of these methods can only be achieved subsequent to the formulation of land use plans.

The paragraph presented is pertinent to the analysis in section 3.5.2 ("Existing studies on the implications of Transit-Oriented Development"), since it delineates the precise objective and approach of the research. This information is of utmost importance in comprehending the manner in which the research adds to the current corpus of knowledge on Transit-Oriented Development (TOD).

India:

In a study conducted by Sahu (2018), the criteria of TOD in India were examined, including the ranges, weights, and views. Rules were formulated to govern the distribution of land use, while also establishing functional objectives. A set of objectives was employed in this study;

1. Maximising the percentage of mixed land usage in terms of residential and employment density.
2. Shaping diversity and density while considering the distance.
3. Minimising the degree of change with respect to land use.
4. Increasing the compactness of allocation regarding land use.

When developing sustainability solutions for urban areas, significant emphasis has been placed on Transit-Oriented Development (TOD), since it effectively combines land use and transportation systems (Li et al., 2019). The typology and variety of Transit-Oriented Development (TOD) require more investigation in order to maximise the benefits derived from its practical implementation. Li et al. (2019) expanded upon a node-place model by incorporating additional variables that elucidate the functional and physical interconnections between land use and transport. Li et al. (2019) showcased the implementation of this methodology in Shanghai, China. A significant reduction in the TOD index value is noted when one moves from metropolitan areas towards the outskirts of urban regions. The research conducted by Li et al. (2019) has contributed valuable insights that may be applied to the practice of Transit-Oriented Development (TOD) in land use planning.

1.7 Significance and Expected Contributions

The significance and expected contributions of this thesis in the context of Transit-Oriented Development (TOD) in Gaza City are multifaceted, encompassing theoretical, conceptual, and practical dimensions. One of the expected theoretical contributions is the implementation of TOD principles to Gaza City, a city facing unique challenges due to its long-standing conflict situation. This application expands the theoretical understanding of TOD beyond its typical context and demonstrates its adaptability to conflict-affected urban areas. In addition, the study will develop a comprehensive conceptual framework for TOD implementation. This framework will offer a novel approach to understanding the key factors and challenges involved in TOD implementation, making it a valuable theoretical contribution.

The study will emphasize the importance of integrating land use and road networks in urban planning, a critical concept for sustainable urban development. By proposing a TOD model, the thesis will contribute to the conceptual understanding of how to harmonize these two essential aspects of city planning.

The expected contributions aim to provide practical recommendations for policymakers and urban planners in the context of Gaza City. This advice will provide practical insights on how to effectively execute Transit-Oriented Development (TOD) and serve as a roadmap for tackling the urgent urban planning difficulties faced by the city. These insights may be utilised by decision-makers to effectively tackle the urban planning

difficulties faced by the city, so making a valuable contribution to the enhancement of infrastructure, urban harmony, and overall liveability.

By optimising land use around transit nodes and promoting alternative modes of transportation, TOD can substantially reduce traffic congestion, thereby enhancing residents' mobility and quality of life. Furthermore, by ensuring that vital facilities and amenities are accessible to all, irrespective of location, the TOD approach can improve the city's service distribution imbalance.

This research will also provide contextual explanations for some of the primary issues in urban planning. With this understanding, the planner may be able to address urban planning issues. This can be considered a starting point for scientists, researchers, and decision-makers.

1.8 Research Limitations

1. Palestine is different from other countries in the world due to its challenging political and economic conditions which result from the occupation. This has created serious challenges in terms of the study period. Gaza City has been besieged for more than 14 years, which has made it difficult to reach the area, and it was difficult for the researcher to have free access to Gaza because of the long closure period.
2. In focusing on urban planning in Gaza City, the research employed a single case study research strategy, hence one of the major limitations of this research is the specificity of study's findings to Gaza City. However, the researcher provided clear descriptions about the phenomenon studied, the unit of analysis and the participants involved so that the findings could be generalized to other cities, particularly along the Gaza strip.
3. The urban planning of Gaza City seems to be unique in its composition and context. This uniqueness relate to its mixed planning practice which is controlled and experienced by many external forces and not by local bodies. As TOD has never been completely implemented in Gaza, the literature review had to rely on studies outside this context. Some of these studies, such as those based on TOD, were characterized by issues that differed from those prevalent in Gaza.
4. To achieve the aim of this exploratory study, it is important for the researcher to access various documents on the current state of urban planning in Gaza. However, the researcher also found it difficult to collect precise data regarding

the urban issues from ministries and municipalities because it is considered highly confidential.

1.9 Scope of the research

Gaza City is the economic capital and the largest urban centre in the provinces of the southern cities called the Gaza strip (Mohaisen, 2012), where a number of major roads intersect (Douleh, 2000). The scope of the study focuses on implementing developed urban planning strategies that integrate land-use and road networks using a TOD approach. The TOD sector is the main scope, therefore, the study investigates the possibility of introducing transit-oriented development (TOD) principles to the municipality of Gaza, by determining whether the general planning guidelines applied in the USA and Europe could serve as a comprehensive, integrated land-use and transport plan. The TOD model principally aims to address the environmental, economic, and social problems associated with excessive car use and urban sprawl. Accordingly, this research focuses on Gaza as the case study in order to develop a framework that facilitates TOD implementation in its urban planning sector. Figure 1-3 shows the geographical location of Gaza City.

The research will have implications for enhancing urban planning and public transport in general, and it is anticipated that the following stakeholder groups will find it particularly beneficial: public authorities, decision-makers, organisations, and professionals.

The purpose of this research is to investigate the complex interplay between road networks and land-use patterns, as well as how they can be integrated using a TOD methodology. The primary objective is to develop a framework model that effectively tackles the issues that emerge due to the inadequate integration of land-use and the road network, including overconsumption of automobiles, traffic congestion, and urban expansion. Crucial domains of inquiry encompassed within the purview of this study:

The focus of this research is solely on the urban environment of Gaza City, which is utilised as the principal case study. Gaza City is an intricate and captivating setting owing to its prolonged state of conflict, unique urban obstacles, and sociopolitical intricacies. An examination of the current urban planning methodologies in Gaza City will be conducted, focusing specifically on the interplay between transportation

infrastructure, land-use allocation, and the former. This assessment will provide insight into the potential advantages and obstacles that are intrinsic to the existing system.

Motivated by prosperous Transit-Oriented Development (TOD) initiatives observed globally, this study will investigate the feasibility of incorporating and modifying TOD principles within the urban planning structure of Gaza City. This encompasses factors such as sustainable urban growth, diversified land-use development, pedestrian-friendly environments, and improvements to public transport.

In light of Gaza City's unique political and economic circumstances, this study will investigate the ways in which TOD principles can be modified to accommodate the local milieu. This entails the examination of various elements, including economic activities, mobility patterns, social dynamics, and resource availability.

A set of performance indicators that can direct the implementation of a TOD model in Gaza City will be proposed by the study. The utilisation of these indicators will facilitate the evaluation of the proposed strategies' efficacy in attaining objectives including diminished congestion, improved accessibility, and enhanced quality of life.

Although the central emphasis is on Gaza City, the study will endeavour to derive more general conclusions and understandings that might be applicable to other urban areas in the region or even further afield that confront comparable obstacles.

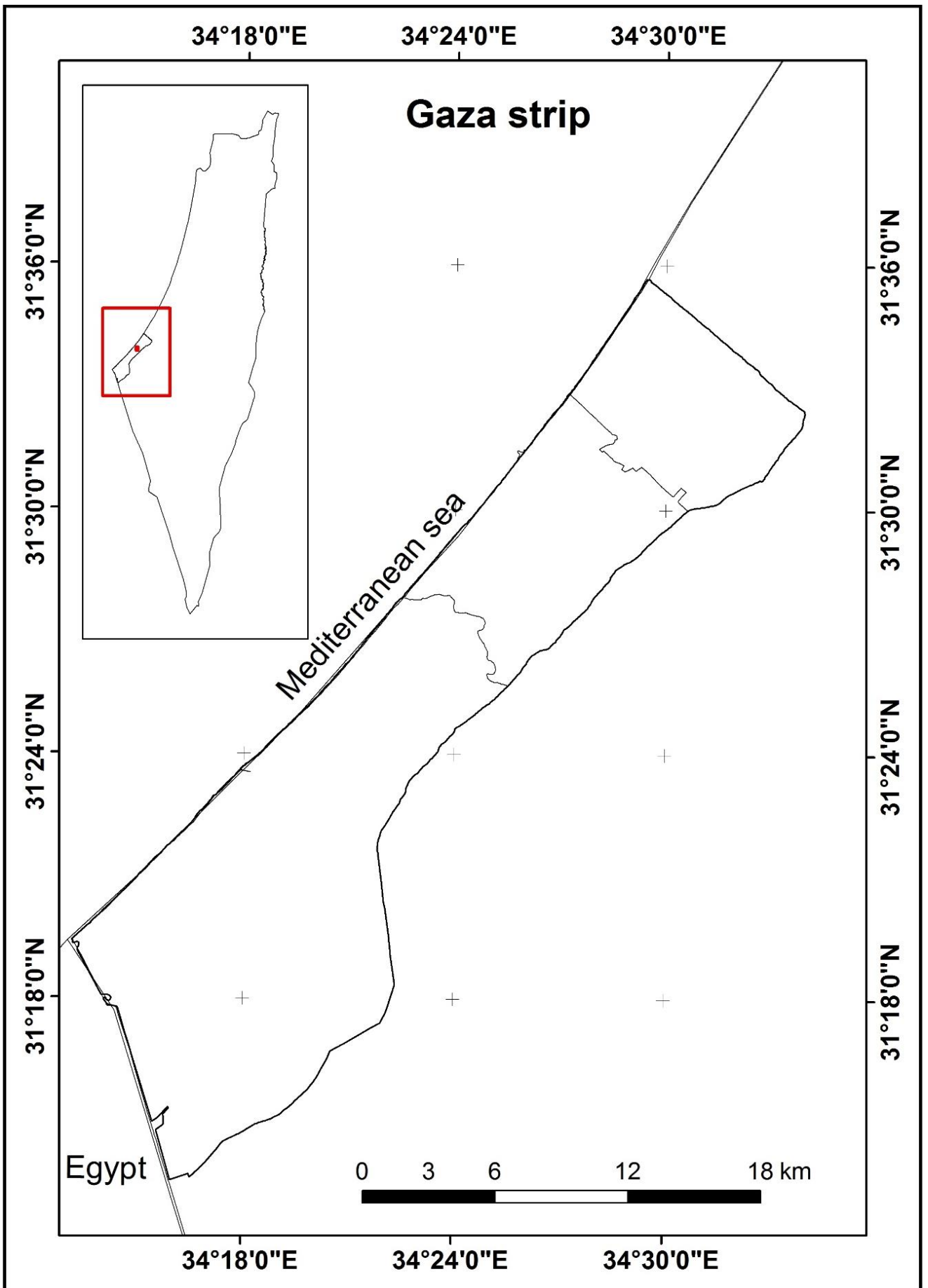


Figure 1-3 The geographical location of Gaza City. (Ministry of Planning, 2010).

1.10 Sustainable Development Goals (SDGs)

The focus of this study is the application of transit-oriented development (TOD) principles to urban planning in Gaza City. To strengthen the research framework, the investigation is also aligned with significant Sustainable Development Goals (SDGs). Gaza City, as the principal economic and most populous urban area in the Gaza Strip, poses a distinctive and complex urban planning challenge that is impacted by various external factors such as political, economic, and social limitations. Although the initial presentation of the study does not explicitly link it to the Sustainable Development Goals (SDGs), it will be expanded to include pertinent SDGs, thus increasing its comprehensiveness and practicality.

In addition to addressing the issues raised by excessive automobile usage and urban encroachment, this research endeavour aims to make a scholarly contribution to the wider Sustainable Development Goals (SDG) framework, particularly in the areas of sustainable communities and cities (SDG 11) and climate action (SDG 13). The study endeavours to promote a comprehensive approach that not only improves urban planning methodologies but also actively contributes to the wider international agenda for sustainable development by incorporating these SDGs into its research scope. Blair et al. (2021) state....

SDG 11 is explicitly supported by this research, which aims to enhance land-use, transport, and urban planning in Gaza City. It supports the objective of creating cities that are more sustainable, inclusive, secure, and resilient through the promotion of TOD.

The potential for greenhouse gas emissions reduction exists through the promotion of sustainable transport modalities and the reduction of dependence on private vehicles through the implementation of the TOD model. This contributes to the pursuit of SDG 13, which urges immediate action to mitigate the effects of climate change. The study endeavours to promote a comprehensive approach that not only improves urban planning methodologies but also actively contributes to the wider international agenda for sustainable development by incorporating these SDGs into its research scope. Blair et al. (2021) state...

The particular areas of emphasis in this study comprise various interconnected aspects. An in-depth examination of urban planning methodologies in Gaza City, with

a particular focus on transport infrastructure and land-use allocation, is required for the evaluation of current practices in order to identify opportunities and challenges within the current system. In accordance with the SDGs, the application of TOD principles from international contexts will be adapted to Gaza's specific circumstances, including resource availability, mobility patterns, economic activities, and social dynamics. Contributing to SDG 11, the development of performance indicators will facilitate the evaluation of the efficacy of proposed strategies with respect to reduced congestion, enhanced accessibility, and improved quality of life (United Nations, 2023).

By incorporating essential Sustainable Development Goals, this research will effectively strengthen its reliability and consistency, thus augmenting its overall impact on the more extensive endeavour to establish resilient, equitable, and sustainable urban environments. By situating the research within the framework of the Sustainable Development Goals (SDGs), this study aims to provide a more all-encompassing and influential analysis of transit-oriented development in Gaza City, all the while contributing to the broader objectives of inclusive growth and sustainable urbanisation.

1.11 Structure of the research

This research is organised into nine chapters. A brief description of each chapter is presented below to summarise the contents of the whole report.

Chapter One has provided an introduction to the subject of the report, including its background and the rationale of the study. The chapter has also defined the problem, outlined the research questions alongside the aim and objectives; these provide the foundation for all discussion in the following chapters. In addition, the significance of the study and expected contributions, research limitations, and scope have been discussed. Finally, the chapter has presented the structure of the thesis.

Chapter Two considers land-use planning and transport by providing an overview of the literature concerning the principles, and the different fundamental issues of land-use and transport. In addition, this chapter will address the definition and overall concept of land-use and transport. It includes a detailed exploration of current and past literature pertaining to land-use and transport. This chapter proceeds with the identification and classification of key factors for urban planning, which helps in determining the gap in the knowledge regarding the integration between land-uses and road networks.

Chapter Three addresses Transit-Oriented Development (TOD) by presenting a clear explanation on its main aspects. This includes the definition and indicators of integrated road network and urban development (land-use). It also incorporates a detailed exploration of current and past literature pertaining to TOD and considers the benefits of exploring its implementation in Gaza City.

Chapter Four examines land-use and road networks in Gaza City by discussing the background to Gaza urban planning, the historical development of urban planning in Gaza City and the problems it faces, which could be resolved with the aid of planning. The chapter considers current planning patterns and their impact on the urban fabric of Gaza City and highlights the general characteristics of land-use and road networks in Gaza City including its determinants and problems. Finally, the chapter explains the relationship of road networks to land-use in Gaza City and proposed procedures of a distributing local bus stations map

Chapter Five outlines the research methodology, by describing the study design and methods selected. The philosophical standpoint of the research, techniques adopted, and research approach are discussed and details of the major steps followed and methods employed are explained. Finally, the chapter offers an explanation and justification of the formulation and design of the data collection methods employed in this research.

Chapter Six: outlines the qualitative data analysis. In this chapter, the student will discuss on the qualitative data analysis of the collected data from the online semi-structured interviews. The aim of this chapter is to explore the situation of the TOD application in Gaza City and the possibility of its implementation through the perception of particular interviewees.

Chapter Seven describes the quantitative data analysis. It discusses the findings from the descriptive and quantitative data analysis that were extracted from the questionnaire survey. It includes a discussion of the sample included in the statistical methods used in the study and the findings from each section of the questionnaire, also identifying the relationship between the categories.

Chapter Eight provides a discussion of the research findings and offers an extensive understanding and discussion of the qualitative and quantitative findings in accordance with the objectives from the initial stage of this research. This stage outlines the basis

for proposing and developing the framework for the TOD implementation model in Gaza City.

Chapter Nine is the conclusion and the final chapter of this study. It includes the contribution to knowledge, recommendations, limitations, and suggestions for future research and practise-based directions.

CHAPTER 2

Land-use planning and Transport

CHAPTER 2: Land-use Planning and Transport

A variety of land-use planning and transport-related topics are addressed in this chapter, such as definitions, objectives, principles, theories, and transport infrastructure categories. A comprehensive grasp of urban development, transportation systems, and their societal and environmental ramifications necessitates an awareness of these concepts.

Governments use land-use planning to manage the development of land within their jurisdictions. In doing so, the governmental units can plan for the needs of the community while safeguarding natural resources, and economic and social conditions to select and adopt the best land-use options (Godschalk, 2004).

The issue of land competition in Gaza City is a significant and urgent matter, which is further complicated by the region's limited geographical area and political and economic difficulties (Abreek-Zubiedat, F., & Nitzan-Shiftan, A. 2021). Abuelaish (2018) argues that this phenomenon generates a complex interplay between the preservation of agricultural lands and conservation areas and the demand for residential, commercial, and industrial developments, thereby increasing the strain on available land resources. Due to its constrained area and burgeoning population, land-use planning in Gaza City must be executed with the utmost care and efficiency (Abuelaish, B. 2018). The complex interaction between historical circumstances and geopolitical forces adds to the difficulty of the situation, which requires inventive resolutions and strategic judgements (Slesinger, I. 2022). Scholars underscore the necessity for any land-use planning and transport strategy in Gaza City to address the limited availability of land in order to accommodate the varied and frequently conflicting demands of the local populace (Slesinger, I. 2022).

From the emergence of a city, there is competition for land among the various functions. Therefore, it is necessary to plan cities and regulate the uses of their land. In this chapter, we address planning after addressing the general concepts. The focus will be on land-use planning and transport, its origins, objectives, stages, types, and the most important theories in this field.

2.1 The Definition of a City

In the context of the research topic the definition of a city holds significant relevance and serves as a foundational concept for understanding the urban dynamics and challenges within the chosen context.

A city is the gathering of the population, where social, cultural, commercial, and economic activity exchange take place. The city is also a centre to meet the interests, and multiple and diverse needs of the population (Simone, 2004). The city is a design based on geometric, philosophical, ideological, and symbolic formations. Cities express the development of urban art that has passed through the ages while highlighting the aesthetics that attract people (Jayne, 2005). In addition, the city's urban monuments include paved roads, built houses, trade centres and places of worship. So, with the development and growth of cities, there is an urgent need for urban planning (Hall, 2014).

Godschalk (2003) defines the city as a large human settlement with extensive systems for housing, transport, sanitation, utilities, land-use, and communication. Its density facilitates interaction between people, government organizations and businesses, sometimes benefiting different parties in the process. A city is also distinguished from other human settlements by its relatively great size, its functions and its special symbolic status. The term can also refer either to the road networks and land-use of the city or to the people who live there. A city can be used in a general sense to mean urban rather than rural territory (Ratcliffe et al., 2009).

Researchers are better able to comprehend the fundamental characteristics of urban areas as centres of social, cultural, economic, and commercial activities when the term "city" is defined (Latham, A., & Layton, J. 2019). In the context of Gaza City, it is imperative to comprehend the intricacies of these operations in order to discern the interplay between transportation networks and land-use patterns. Furthermore, the definition emphasises that cities function as hubs to fulfil the varied requirements of the populace (Van Liempt, I. 2023). This is significant for the research, as Gaza City, being an urban area in the process of development, is presumably confronted with obstacles pertaining to economic prospects, housing, transportation accessibility, and social services. As a crucial component of the research, examining how land-use planning and transportation strategies resolve these requirements emerges.

The allusion to urban planning underscores the imperative nature of structured development and administration in expanding metropolises. In light of the ongoing development and expansion in Gaza City, it is critical to comprehend the ways in which urban planning methodologies can efficiently merge land-use and transportation networks in order to guarantee urban environments that are both sustainable and operational.

The definitions of a city furnish a fundamental comprehension that is pertinent to the investigation of land-use and road network integration in developing nations. By adopting a transdisciplinary perspective and engaging in a critical discourse, scholars are able to investigate the interconnections between historical context, social inclusion, power dynamics, environmental sustainability, and cultural advancement in the context of Gaza City's urban development. By conducting a comprehensive analysis, valuable insights can be revealed that support the development of equitable and efficient urban planning strategies.

2.2 Land-use Planning

In the context of the research, the concept of land-use planning holds significant relevance. It serves as a fundamental pillar for understanding the challenges and opportunities associated with urban development in developing countries like Gaza City.

Land-use planning is the process of regulating the use of land to promote more desirable social and environmental outcomes as well as a more efficient use of resources. Land-use planning may include environmental conservation, the restraint of urban sprawl, the minimization of transport costs, the prevention of land-use conflicts, and a reduction in exposure to pollutants. By and large, the uses of the land determine the diverse socioeconomic activities that occur in a specific area, the patterns of human behaviour they produce, and their impact on the environment (Godschalk, 2004). In urban planning, land-use planning seeks to order and regulate land-use in an efficient way, thus preventing land-use conflict. The elements of a comprehensive plan provide a vision for the future possibilities of development in neighbourhoods, districts, cities, or any defined planning area (Needham et al., 2018).

Despite confusing nomenclature, the essential function of land-use planning remains the same regardless of how the term is applied. The Canadian Institute of Planners offers a definition that land-use planning means the scientific, aesthetic, and orderly disposition of land, resources, facilities, and services with a view to securing the physical, economic, and social efficiency, health, and well-being of urban and rural communities. The American Planning Association states that the goal of land-use planning is to further the welfare of people and their communities by creating convenient, equitable, healthful, efficient, and attractive environments for present and future generations (Maxwell, 2011).

Particularly in the context of developing countries such as Gaza City, where rapid urbanisation can result in disorganised expansion, depletion of natural resources, and insufficient infrastructure, land-use planning is of the highest priority. It is of vital significance to comprehend and implement efficient land-use planning strategies in order to tackle issues including environmental degradation, inefficiency in transport, and urban expansion. Land-use planning further supports the objectives of sustainable development through its facilitation of favourable social, economic, and environmental results. S. Nogués et al. (2020). When considering the situation in Gaza City, the integration of transport networks and land-use planning has the potential to yield several benefits: reduced pollution, enhanced accessibility, improved quality of life, and the conservation of natural resources.

Land-use planning is an essential component of the research concerning the integration of transportation networks and urban land-use in developing nations such as Gaza City. By conducting a land-use planning analysis, scholars are able to investigate the ways in which cultural, social, economic, and environmental factors intersect with land-use planning (Enoguanbhor, E. C., et al 2021). This comprehensive analysis offers valuable insights into the customisation of land-use planning strategies to effectively tackle the unique obstacles and prospects associated with urban development in Gaza City, all the while promoting sustainability and overall welfare.

2.2.1 The Objectives of Land-use Planning According to De Groot

The purpose of land-use planning goals is to establish an overall framework to provide a direction for future planning. They also provide a rational basis for regulating the city by integrating land-uses on the one hand, and land-use and road networks on the other. In addition, land-use areas create preconditions for a favourable living

environment and promote an ecologically, economically, socially and culturally sustainable development. To address this situation, several criteria and targets must be established to build a good plan. The main objectives of land-use planning are as follows (De Groot, 2006):

- ❖ To ascertain what type of balance should be struck between agricultural lands, conservation areas, residential, commercial and industrial development now, and in the future.

This aim, which is to determine the most advantageous proportions of urban development, agricultural lands, and conservation areas, functions as a fundamental component interwoven with a number of essential facets of the thesis. As emphasised in the urban planning literature by Niu et al. (2019), achieving a balance in land use is crucial for the development of resilient and sustainable cities. The incorporation of conservation areas into this equilibrium is consistent with more extensive environmental planning objectives. As discussed by Calthorpe (2013), the principles of TOD advocate for mixed-use, compact developments that maximise land utilisation efficiency. By harmonising land-use planning with TOD principles, a balance can be achieved among various land use types. By utilising strategic land-use planning, this viewpoint aligns with this objective.

- ❖ To establish the relationship between the city's existing and future development and provide for an appropriate arrangement of land-uses in relation to existing or planned road networks.

This objective serves to establish a connection between land-use planning and transport infrastructure. It acknowledges the inherent connection between urban development and transport. An efficient urban plan necessitates the alignment of land-use decisions with road networks in order to accommodate both current and future development. The integration of various elements is of particular relevance in Gaza City, given its distinctive geopolitical circumstances that have resulted in fragmented patterns of urban development. Furthermore, the achievement of the objective can lead to enhanced urban planning for all inhabitants. Consequently, this promotes social fairness by guaranteeing that crucial services are reasonably available to every individual.

- ❖ Protect and enhance the quality of the city's natural environment and conserve its natural resources.

This objective aligns with broader sustainability principles and establishes crucial connections with other components of the research. Preserving the quality of the natural environment resonates with the principles of Transit-Oriented Development (TOD). TOD emphasizes compact, walkable communities with green spaces, aligning with Objective 3's commitment to environmental conservation. Integration of TOD principles involves not only efficient transportation but also the creation of environmentally friendly urban spaces. The objective serves as a nexus, connecting diverse elements of the thesis. It embodies a commitment to environmental sustainability, influencing land-use patterns, infrastructure development, and the overall quality of urban life. This interconnected approach underscores the integral role of environmental considerations in shaping a holistic and sustainable urban future.

- ❖ Ensure that opportunities for convenient and concentrated commercial development are provided to support both the local and regional market.

This the achievement of this objective is crucial in promoting the economy and creating synergistic effects with other aspects of the research. The objective is in accordance with the principles of TOD, which prioritise the development of dynamic, diverse urban areas in proximity to transit nodes. The clustering of commercial development in nearby to transit hubs enables easier accessibility for both residents and commuters, thereby promoting economic activities. The objective of integrating commercial spaces with transit infrastructure aligns with the vision of (TOD), which aims to create compact and walkable communities that decrease reliance on private vehicles. Ensuring effective road connectivity to commercial hubs is of paramount importance for facilitating accessibility and fostering the prosperity of commercial enterprises. The aforementioned objective is closely linked to the considerations pertaining to road infrastructure, thereby emphasising the interdependent connection between land-use planning goals and transport networks.

- ❖ Ensure that the physical character and form of the region reflect its historic setting and that the built environment is compatible with the natural environment.

Preserving According to TOD principles includes maintaining the historical setting and ensuring compatibility with the natural environment. TOD prioritises the development of urban environments that are both sustainable and culturally vibrant. The study recognises the significance of historical preservation and environmental factors in transit-oriented urban development by incorporating them into TOD considerations. The incorporation of this objective into the planning of road networks serves to strengthen the imperative for infrastructure development that upholds the historical heritage and ecological environment of the region. By safeguarding the physical attributes and configuration associated with historical contexts, the cultural identity of the region is further enhanced. The preservation of the historic character necessitates the active participation of both the general public and decision-makers. This correlation underscores the cooperative aspect of efficient land-use planning that takes into account the viewpoints of residents and interested stakeholders.

- ❖ Encourage the concept of mixed-use development to create diverse and self-sufficient neighbourhoods.

Promoting mixed-use development is related to the principles of TOD. TOD prioritises the development of small, diverse communities to improve ease accessibility and decrease reliance on private vehicles. This objective is strongly connected to the topic of road network planning, specifically in relation to the incorporation in different land-use patterns. The incorporation of mixed-use development into the evaluation of road networks serves to strengthen the need for infrastructure that facilitates a diverse range of activities within local communities. This integration highlights the significance of roads in effectively connecting and serving mixed-use areas. The integration of residential, commercial, and recreational elements in mixed-use development promotes the creation of diverse and self-sufficient neighbourhoods, thereby enhancing social inclusivity.

- ❖ To provide physical accessibility throughout the region.

This objective is in alignment with the principles of Transit-Oriented Development (TOD) by giving priority to accessibility and highlighting the importance of land-use planning in creating well-connected as well as readily accessible regions. The facilitation of accessibility is closely related to the planning of road networks. This objective underscores the idea that the

establishment of well-planned road networks is imperative in order to achieve constant accessibility within the given geographical area. Ensuring accessibility is of paramount importance in the context of urban sustainability and the mitigation of environmental consequences. This correlation highlights the capacity of land-use planning to make a positive impact on the development of sustainable and easily accessible areas.

2.2.2 Principles of Land-use Planning

Some might consider an effort to lay out the principles of land-use planning. New definitions of planning and the role of planning in today's society are constantly being proposed and debated. Thus, the basic principles of land-use planning are not totally accepted by some. The last decade has seen some measure of agreement among most practising land-use planners about the basic purposes and methods of land-use planning. Thus, one can identify some rules or principles that guide land-use planners. Land-use planning principles, which should be applied by groups such as municipal planning commissions and town councils, should include the principles described below (Othoniel et al., 2019).

Principle of Optimal Use of Land-use:

Where each part of the earth must perform a certain function in urban planning. It is important to allocate land-use in cities to a specific function, but there are cases where the planner has been forced to overcome this consideration for other national needs. Therefore, the function of land-use planning is determined in the optimal use of each piece of land of the territory or state to serve the public interest (Markanday et al., 2019).

The Principle of Multiple Uses of Land-use:

The planners attempted to overcome the problem of limited land area by encouraging the multiple uses of land wherever possible, especially in regions and countries with limited space. Basic human demands must be met by suitable land-use and some of these include the use of land (housing, work, agriculture, transport) where the population intensifies (Wehrmann, 2012).

2.2.3 Theories of Land-use Planning

The theories of land-use planning, such as the Concentric Model, Hoyt Model, and Multiple Nuclei Model, offer valuable insights into understanding the spatial distribution of land uses and their implications for transport and urban development (Li, Z. et al. 2021).

Cities are not just primarily formed by the actions of local politicians or town planners, but rather from the aggregated activity of all types of property development, which ultimately determine its form. Multiple and conflicting factors influence developers' decisions and ultimately influence the land-use distribution within a city. These factors, which tend to drive demand, can generally be categorised as: demographic, economic, sociological, legal, and political. Economic factors are employed as the decision-making tool when choosing between various alternatives whereas legal and political factors will establish the framework within which the development takes place and will influence the direction of that development (McDonagh, 2007).

The relationship of factors under the previous headings is extremely complex and one factor cannot be adequately viewed in isolation from the others. One "holistic" technique that can be used to analyse this interaction is the study of historic urban land-use throughout the world which can help to determine consistent patterns of development. If such urban land-use patterns can be identified, their causes can also be deduced, which help to predict the future shape of cities in similar circumstances (McDonagh, 2007).

The Concentric (or Burgess) Model

In 1925, a model of urban land-use was presented by Burgess, which divided a city into a set of circles expanding from downtown to the suburbs (shown in Figure 2.1). This representation was built from Burgess' observations of a number of American cities, such as Chicago, which provided empirical evidence. The model assumes a relationship between the socio-economic status of households and the distance from the 'Central Business District'. The further the area from the Central Business District, the better the quality of housing, although a longer travel time is expected. Thus, better housing is accessed at the expense of longer commute times and costs. According to this monocentric model, a large city is divided into five concentric zones (Rodrigue et al., 2017).

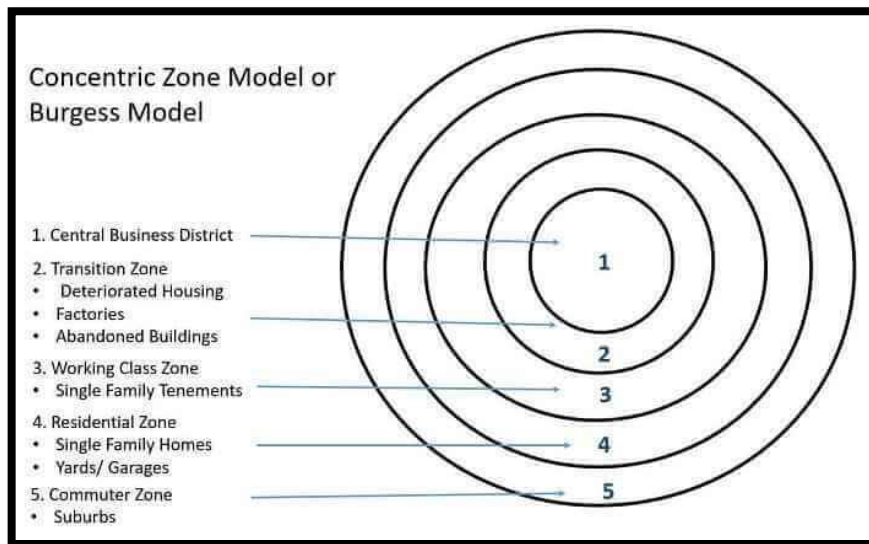


Figure 2-1 The Concentric Model or Burgess, (Rodrigue et al., 2017).

Zone I (Central Business District)

This is the centre (innermost zone) with the highest land value and where the central business district is located. The zone has tertiary activities and earns maximum economic returns. Another feature is the commercial activity in and accessibility of the area due to the convergence of transport networks from surrounding and far-flung places in the city. This part has tall buildings and noticeably high density (Rodrigue et al., 2017).

Zone II (Transition Zone)

Mixed residential and commercial use characterizes this zone. This is located adjacent and around the CBD and is continuously changing. Another feature is the range of activities taking place such as mixed land-use, car parks, cafes and old buildings. This zone is considered to “decay” due to the presence of a large number of old structures that were previously used for factories and housing. This zone had a high population density when industrial activities were at their peak (Rodrigue et al., 2017).

Zone III (Inner City/ Working Class Zone)

This area has a residential purpose and is also known as the “inner city” or “inner suburbs.” It consists of houses built to accommodate factory workers but in a better condition than the transition zone. This area has a mix of new and old development and generally requires orderly redevelopment. People living in this zone are second-generation immigrants as many move out of the transition zone to this zone when they can afford to do so. This zone is nearest to the working area with modest living

conditions. Another feature is the inclusion of large rental housing occupied by single workers (Rodrigue et al., 2017).

Zone IV (Outer Suburbs/White Collar Homes)

This zone has bigger houses and new developments occupied by the middle class. Many of the homes are detached, and families reside in these homes. Better facilities are available to residents like parks, open spaces, shops, large gardens but this comes at an increased cost for commuting (Rodrigue et al., 2017).

Zone V (Commuter Zone)

This is the peripheral area, the farthest from the CBD, and as a result the highest commuting cost compared to the other zones. People living in this zone are high-income groups which lead to lower population density. These inhabitants can afford large houses, pay commuting charges, have access to different transport modes, and enjoy modern facilities and large gardens (Rodrigue et al., 2017).

Hoyt Model

The Hoyt Model is somewhat similar to the concentric model but considered an improvement. Hoyt suggested that cities do not develop in the form of simple rings as the Burgess model indicated, but rather have sectors. Hoyt indicated that few activities grow in the form of sectors which branch out along the main travel roads as land-use within each sector would stay the same. The high-class sector would remain high-class because it is the most looked after area, so only the rich could afford to live there. The industrial sector would stay industrial because the area would have a typical advantage of a railway or river. These sectors can include housing and industrial activities, and grow along highways, railways or rivers, as figure 2-2 illustrates (Fyfield, 2003).

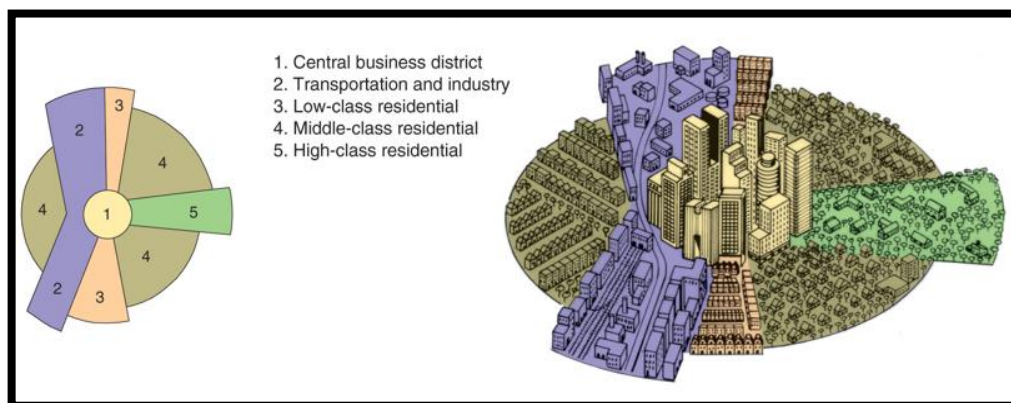


Figure 2-2 Hoyt model, (Fyfield, 2003).

Multiple nuclei model

Multiple nuclei model was developed in 1945 by Harris and Edward and built on the debate that the cities have multiple growth points or nuclei around which growth takes place. This is one of the most adopted models applicable to modern cities. It is built on the structure of Chicago just like the Burgess model, see figure 2.3. Harris and Ullman argued that a city could start with a single central business district but the activities are modified over time. The modified activities attract people from surrounding areas and act as smaller nuclei. Then, these initial nuclei grow in importance and size and start to affect the growth of activities around them (Nelson, 1969).

This model needs to provide a more authentic explanation of cities. The influence of vehicles on travel and the movement of goods offers opportunities for different places instead of concentrating economic activities in one area. In addition, this model is considered more suitable for cities which are large and expanding (Morris et al., 1979).

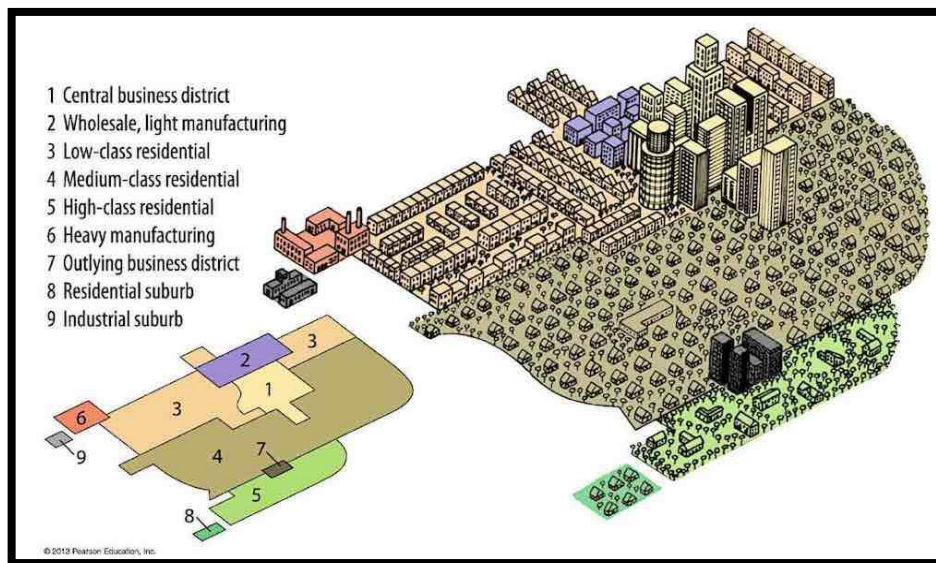


Figure 2-3 Multiple nuclei model, (Morris et al., 1979).

Land-use planning theories produce conceptual frameworks that facilitate comprehension of the spatial distribution and time-based evolution of land uses within an urban setting (Long, H. 2022). Understanding these spatial configurations is of crucial significance in the context of Gaza City in order to effectively integrate road and land-use networks, given the city's constrained resources and rapid urban growth. Moreover, these models incorporate the correlation between transportation and land use by design. Efficient transport planning is of significance in the research topic at

hand, as it dictates the integration of road and land-use networks in order to attain sustainable urban development.

The impact of socioeconomic factors on land-use decisions is recognised by the theories (Long, H., et al. 2021). Socioeconomic factors play a critical role in Gaza City by influencing land-use planning to align with the desires and requirements of the local populace. Furthermore, land-use planning theories facilitate the examination of various potential futures for Gaza City by considering diverse road network and land-use scenarios. How might these theories contribute to the development of resilient urban futures that account for fluctuating technological, economic, and social trends?

Land-use planning theories, such as the Multiple Nuclei Model, Concentric Model, and Hoyt Model, provide significant contributions to our understanding of the spatial configuration of urban areas and their interconnections with transportation systems. These theoretical frameworks empower scholars to conduct a critical analysis within the particular setting of Gaza City, taking into account socioeconomic, cultural, environmental, and political elements. These theoretical perspectives enhance the collective comprehension of how these models can guide urban development strategies that effectively integrate road and land systems in Gaza City in a manner that is equitable, sustainable, and adaptable to its particular challenges.

It is essential to note that although the Multiple Nuclei Model, Hoyt Model, and Concentric Model are influential theories in the field of land-use planning, they are not the only ones that support land-use planning. An extensive array of additional theories and concepts exist that aid in the comprehension of land-use distribution and urban spatial patterns. Potentially applicable theories to the research:

Central Place Theory: Developed by Walter Christaller, this theory exclusively examines the spatial organisation and hierarchy of central places (cities or towns) and the services they provide in relation to market areas. Urban centres function as central nodes for economic activities and services, exerting an influence on transport networks and land-use patterns (Vionis, A. K., & Papantoniou, G. 2019). This information is especially valuable in this regard. Although it overtly disregards other facets of the city, this theory could be strengthened by investigating the manner in which land-use and road networks in Gaza City are integrated exclusively in central locations.

Sector Model: which is comparable to the Hoyt Model, argues that urban development occurs in segments or wedges that extend from the core of the city. The impact of transport routes on land-use patterns is accounted for in this model (Mensah, B., et al. 2020).

Polycentric Model: The Polycentric Model places significant emphasis on the existence of numerous "edge cities" or sub-centres within a metropolitan area. The economic activities and functions of these sub-centres influence the distribution of land use and transport networks (Chen, W., et al. 2019). The potential for multiple growth points in Gaza City renders the Polycentric Model amenable to examining the ways in which different sub-centres facilitate the integration of road and land-use networks. This theory has the potential for advanced application once land use and the traffic network have been successfully integrated.

Network Theory: This theory is an academic framework that investigates the interdependence of diverse components within an urban environment, such as transport and land-use networks (Ding, R. 2019). This framework has the potential to facilitate the examination of the reciprocal influences among various elements of urban systems, thereby contributing to the comprehension of the intricate interplay between road networks and land-use in Gaza City.

Implementing the Multiple Nuclei Model, Hoyt Model, and Concentric Model is a sound strategy, given that these models provide established insights into the connection between transportation networks and urban spatial patterns. These theoretical frameworks establish an effective basis for the investigation and thoroughly examine the particular circumstances of Gaza City. Nevertheless, your recognition of alternative theories and concepts shows your comprehension of the broader field of land-use planning theories. Furthermore, these theories have the potential to enhance the research by offering supplementary viewpoints on the integration of road and land-use networks in developing nations, such as Gaza City.

With a lengthy history of implementation in urban planning, these theories have had a significant impact on the comprehension of land-use patterns in numerous cities. They furnish a robust framework for the examination of the spatial organisation of urban areas. Furthermore, the Concentric Model, Hoyt Model, and Multiple Nuclei Model provide significant contributions to the understanding of land use distribution within a municipality, taking into account socioeconomic status, transportation infrastructure,

and the progression of urban structure. H. Briassoulis (2020). In Gaza City, these factors are of the utmost importance to the research topic. Moreover, these theories overtly recognise the impact of socioeconomic variables on decisions regarding land use, which is consistent with the investigation's objective of comprehending the significance of economic, social, and technological factors. (H. G. Farooq, 2022). Urban development trends in Gaza City.

Relevant Theory not applicable to TOD in Gaza

Central Place Theory: Although Central Place Theory is a valuable framework for comprehending the hierarchy of market areas and central places, its applicability to the intricacies of land-use planning and road network integration in Gaza City may be limited. The primary emphasis of the study is on market services and central locations, potentially limiting the coverage of the entire research scope.

Sector Model: shares a similarity to the Hoyt Model and possesses certain pertinence; however, the research has opted to concentrate on Hoyt's model on account of its historical import and comprehensive sectoral analysis.

Polycentric Model: The Polycentric Model may have relevance to the potential for multiple growth points in Gaza City. Nevertheless, the study might have placed greater emphasis on the implementation of the Multiple Nuclei Model, which presently considers the existence of numerous nuclei and the dynamics of their growth.

Network Theory: Network theory is a pertinent framework for comprehending the interrelationships among urban components; however, its application may introduce intricacy to the analysis. For preliminary investigation, the Concentric, Hoyt, and Multiple Nuclei Models offer a more straightforward structure.

Although the Concentric Model, Hoyt Model, and Multiple Nuclei Model provide solid foundations for the investigation, it is imperative to acknowledge that the intricacies of urban development cannot be comprehensively captured by a single theory. Hence, by integrating perspectives from these theoretical frameworks and taking into account their dynamic interaction, a more holistic comprehension of the unique urban environment of Gaza City could be achieved.

2.2.4 Land-use Classification Systems

Land-use describes the intensity and type of human activities occurring in a given location. Land-use classification facilitates the monitoring and prediction of urban development patterns, the management of water and other natural resources, and land-use planning and regulation (Anderson, 1976).

- A. The British land-use survey classification system was applied in 1930 by L.Dudley Stamp, and contains eight patterns. In 1960, a new classification system was used by Alice Coleman, with five new patterns added to the previous system (Southall et al., 2007).
- B. In 1949, a classification system was adopted by the International Geographical Union Conference, which was held in Lisbon. A uniform classification system was chosen that could be applied to all different world countries. In 1960, some adjustments were introduced, which meant the inclusion of nine patterns (Pearson & Heffernan, 2015).
- C. The Dutch land-use classification system contains seven types of land-use (Anderson, 1976).
- D. The land-use classification system was implemented by the Palestinian Central Bureau of Statistics in 2007. The classification contains 8 different major types of land-use (Palestinian Central Bureau of Statistics, 2009).

There are many land-use classifications systems used in many countries, such as the American Survey Authority, and the Ecological Land Classification System. It is noted that these systems contain classifications that do not exist or are not used in Palestine, such as forests, savannahs and swamps. In addition, the land-use classification system used by the Palestinian Central Bureau of Statistics contains classifications that do not exist in the governorates of Gaza, such as forests, settlement lands and nature reserves. Therefore, the student will rely on the classification of the Gaza Municipality.

2.3 Transport

Transport is one of the most important services in developed and developing countries. It has become one of the most important indicators of the progress of countries and their strength; therefore, several subjects such as Geography, Engineering, and Economics are considers transport a key discipline (Rodrigue et al., 2017).

Transport System development seeks to create an urban environment that maximizes economic and social development, whilst minimizing negative external influences upon the natural environment from a land-use and transport perspective. This means reducing the dependence on automobiles through mixed-use cities with an array of travel alternatives which include walking, bicycling, and public transport (Renne, 2009).

Public transport can be viewed as an expression of sustainable development in the transport sector. Public transport addresses local, regional, national, and global issues and therefore requires considerable coordination. It is important to apply public transport in a holistic and integrated manner across various sectors to ensure that key concerns, such as the depletion of resources, global climate change, and toxic pollution, are effectively addressed. (Rode et al., 2017).

Public transport allows the basic needs of individuals and societies to be met safely and in a manner consistent with human and ecosystem health. Also, it is affordable, operates efficiently, offers a choice of transport modes, and limits emissions. Moreover, sustainable transport limits the consumption of renewable resources to a sustainable yield level that reuses and recycles its components (Black, 2004).

On the other hand, smart transport as a term recommends a new approach to roadway planning and design where transport investments are tailored to the specific needs of each project. Figure 2.4 shows the financial contexts, community, land-use, transport, and environmental issues. This helps to determine the best transport solution from a process in which a multi-subject team considers a wide range of solutions that work with the community (Amekudzi et al., 2011).

The influence of transport on land-use patterns within an urban area is crucial. The accessibility of various sections of the city is impacted by the efficiency of transport systems, which in turn affects the distribution of activities and shapes decisions regarding urban development (Lahoorpoor, B., et al 2022). This correlation is intrinsically linked to the scientific objective of integrating road and land networks in Gaza City.

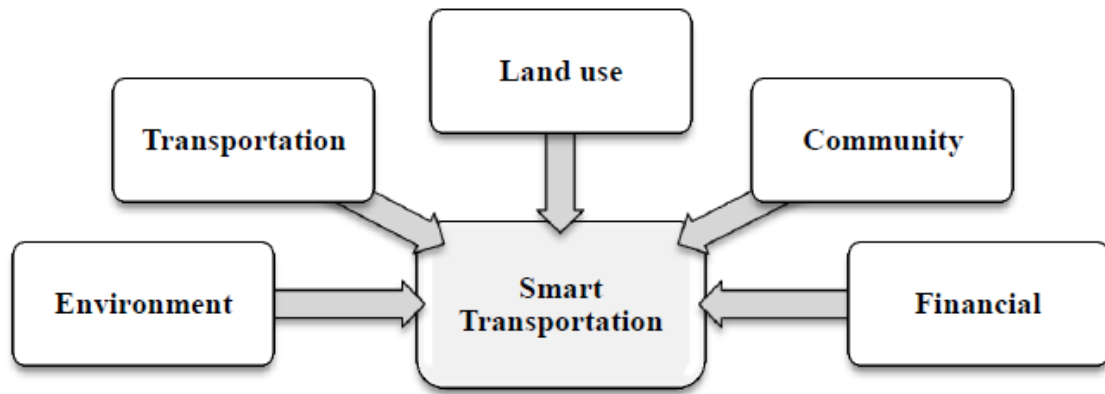


Figure 2-4 The context of ideal smart transport, (Amekudzi et al., 2011).

2.3.1 Definition of Transport

The concept of transport holds great significance. It is a critical factor in achieving the goal of integrating urban land-use and road networks, especially in developing countries.

There are several definitions of transport which differ according to the subject. However, the definition of the concept of transport is the first step to determine the field of study. Ramstedt et al. defined transport as "the movement of people and goods for a particular purpose," (Ramstedt, et al. 2013) while (Nayyar, D. 2002) stated, "It is the movement of individuals, goods, information and ideas." Rodrigue, defined transport as a science that studies the geographical distribution, characteristics and analysis of different transport networks, the study of transport means transfer, goods, inventions, and ideas from one place to another (Rodrigue, J. P. 2020). Moreover, Rodrigue et al. (2009) argued that transport means carrying people, goods and products by changing their place and cutting distances including rail, water, air, and pipe transport.

Transport is a fundamental concept that enables the integration of road and urban land-use networks. Connecting various sections of a city, facilitating the movement of people, goods, and services, and ensuring accessibility are all dependent on the efficacy of transportation systems (Porru, S., et al. 2020). When considering Gaza City, a region where political complexities and limited land availability are intertwined with urban development, an effectively planned transport infrastructure has the potential to foster sustainable development and improve connectivity. Moreover, the concept of transport is intricately linked to the tenets of Transit-Oriented Development (TOD). TOD prioritises the development of urban environments in which walking, cycling, and

public transport take precedence over automobile use (Berawi, M. A., et al. 2020). By ensuring that land-use patterns in Gaza City are in harmony with efficient transport networks, TOD methods have the potential to mitigate congestion, pollution, and reliance on private vehicles.

The definition of transport corresponds to the requirement for comprehensive urban planning. A TOD approach is necessary for the integration of road and land use networks; it must take into account technological advancements, economic factors, social implications, and geographical distribution. Transport functions as an intermediary that links diverse facets of urban existence, encompassing economic operations as well as ecological sustainability.

2.3.2 The Development of Transport

Early human migration began two million years ago and represents the earliest expansion of archaic and modern humans across continents (Bellwood, 2014). Undoubtedly, natural conditions have been more influential on past human travel and transport when humans lived a primitive life. As animals were domesticated, horses, oxen and donkeys became an element in track-creation. With the growth of trade, tracks were flattened and widened to accommodate animal traffic. Later, the travois, a frame used to drag loads, was developed. Animal-drawn wheeled vehicles were probably developed in the ancient near east in the 4th or 5th millennium BC and spread to Europe and India in the 4th millennium BC and China in about 1200 BC (Lapperre, 1992).

During the Industrial Revolution, John Loudon McAdam (1756–1836) designed the first modern highways using inexpensive paving material of soil and stone (macadam). He embanked roads a few feet higher than the surrounding area to enable water to drain away from the surface. With the development of motor transport there was an increased need for hard-topped roads to reduce waterways, bogging and dust on both urban and rural roads. This was originally resolved using cobblestones and wooden paving in major western cities but in the early 20th-century, macadam (tarmac) and concrete paving were extended into the countryside (Freitag, 1979).

The eleventh century saw a qualitative evolution in transport when technology emerged. This has helped the emergence of smart roads and cities, which have been heavily used by transport. Technology is seen by many transport actors (planners,

operators) as a solution to a wide range of transport problems. It involves the use of information technologies to provide better information and control over traffic flow and individual vehicle use. This is an approach that has achieved wide acceptance where there is strong emphasis on engineering solutions to transport problems (Pojani & Stead, 2015).

2.3.3 Types of Transport

Types of transport is a term used to distinguish substantially different means of transport. The different modes of transport are air, water, and land, which includes rail, road and off-road. Other modes also exist, including pipelines, cable, and space while human-powered and animal-powered transport are sometimes regarded as their own mode. Each mode of transport has a fundamentally different technological solution; some require a separate environment, and others have their own infrastructure, vehicles, and operations (Rodrigue, 2017).

Road Transport

Road transport means the transport of goods and personnel from one place to the other by road. The road is a route between two destinations, which has either been paved or not to enable movement by way of motorised and non-motorised carriages. There are many advantages to road transport compared with other means of transport. The investment required in road transport is very less compared to other modes such as railways and air. Furthermore, the cost of construction, operating and maintaining roads is cheaper than the railways (Abadi et al., 2015).

The major advantage of road transport is that it can enable the door-to-door delivery of goods and materials and provide a very cost-effective means of cartage, loading and unloading. Sometimes road transport is the only way to carry goods and people to and from rural areas which are not catered for by rail, water or air. Thus, the delivery of goods between cities, towns and small villages is only possible via road.

However, in spite of its merits, road transport has some major limitations. For instance, there is a greater risk of accidents and breakdowns in the case of road transport, meaning it is not as safe as other means of transport. It is also less organised compared with other modes (Richardson, Ampt & Meyburg, 1995). Rates for road transport are also unstable and unequal, while the speed tends to be slow and limited, which is another major drawback. Today, traffic congestion is an issue and a key

challenge for cities around the world to manage. Very few cities have implemented effective solutions for congestion problems, which may be explained by the lack of concrete agreement on the definition of congestion. However, in simple terms, 'congestion' relates to the impacts of motor vehicle traffic and increases in the number of vehicles on a roadway to a point that causes decreased speeds, longer travel times and vehicle queues. This definition may fit well in a highway environment where speeds and queuing are top indicators of congestion. Alternatively, in an urban setting it may involve an increasing number of traffic signals, pedestrians and cyclists also crossing the street as well as additional turning and parking manoeuvres, vehicle volume and speed (Cervero, 2013).

Water Transport

Water transport is the conveyance of people or goods by water and can be realized over any distance by boat, ship, sailboat or barge, over oceans and lakes, through canals or along rivers. Shipping may be used for commerce, recreation, or military purposes (Crouch, 2003). The major waterways of the world including many canals which are very important integral parts of the worldwide economies. They can transport large quantities of raw materials at the lowest cost compared with other transport methods. Therefore, water transport is highly cost-effective with regular schedulable cargoes, such as the trans-oceanic shipping of consumer products. This mode is especially useful for heavy loads or bulk cargoes, such as coal, oil, or grains. Arguably, one of the main drawbacks of this system is that it is slow and requires the construction of expensive stations, such as ports equipped with mechanical machines and cranes (Mansouri et al., 2009).

Air Transport

Air travel is a form of travel in which vehicles - such as helicopters, aeroplanes or jets - that can sustain flight. The use of air travel has greatly increased in recent decades; indeed, it doubled worldwide between the mid-1980s and the year 2000 (Crouch, 2003). Air travel can be separated into two general classifications: international or national/domestic flights. Travellers tend to use domestic or international flights via either private or public travel. Air transport facilitates integration within the global economy and provides vital connectivity on national, regional, and international scales. It helps generate trade, promote tourism, and create employment opportunities (Rodrigue, 2017).

2.3.4 Types of Transport Infrastructure Investment

Infrastructure development is an important way to enhance integration between road networks and land-use, as a means to strengthen regional cohesion in countries. In order to increase the capacity of transport, some countries have set objectives to offer users a high-quality and safe infrastructure that includes all transport modes, and to allow for the optimal use of existing capacities by either creating new or upgrading existing infrastructure.

The term 'transport infrastructure' refers only to infrastructure that is open to the general public. It covers buildings and other constructions. Investment in infrastructure covers expenditure on new construction and the extension of existing infrastructure. Infrastructure includes land, permanent-way construction, buildings, bridges and tunnels. For road networks, maintenance includes surface maintenance, and the patching and running of repairs. This is achieved by using the following infrastructure initiative typology (Melo et. al., 2013):

- Strategic (or city-shaping infrastructure),
- Structural infrastructure,
- Local infrastructure.

Strategic infrastructure

A country's infrastructure plays a major strategic role in its global competitiveness and economic development. High-quality infrastructure facilities could be costly to build and maintain but offer many economic advantages as they facilitate production and trade efficiencies for other manufactures. Various studies have illustrated the positive effect of infrastructure on the national economy: Indeed, depending on the current infrastructure stock, a 1% increase in infrastructure assets would boost gross domestic product (GDP) by 0.05% to 0.25% in the long term. (Banister & Berechman, 2003). Functioning infrastructure leads to a positive influence on the economy, and on the environment and society. City-forming infrastructure includes works that are nearly exclusively in the transport field and have the power to improve accessibility across the city. These investments drive where people to live and businesses locate, and create new economic groups (Yılmaz & Çetin, 2017).

Structural infrastructure

Structural infrastructure represents higher-order facilities and networks (excluding strategic infrastructure) which form a region’s urban framework. It includes arterial roads and public transport connections. These items are distinguished by their districts, services and cost (Transport & Council, 2016).

Local infrastructure

Local infrastructure includes services and facilities with localized services. While vital to community wellbeing and business efficiency, local infrastructure neither shapes development patterns nor provides an overarching structure for community and industrial development. It provides services into a suburb or neighbourhood once the area has been enabled by investment in higher-order infrastructure initiatives. Due to its impact on relative accessibility local infrastructure is not significant in influencing the shape of the city (Kemmerling & Stephan, 2002). Figure 2.5 illustrates the integration of land-use and transport outcomes.

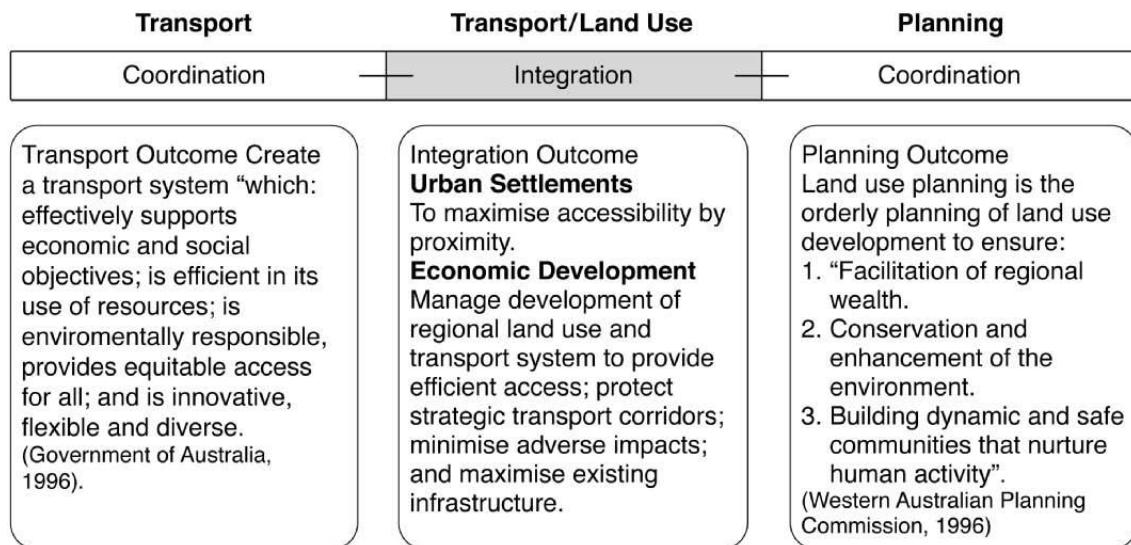


Figure 2-5 Integration of land-use and transport outcomes, (Kemmerling, & Stephan, 2002).

CHAPTER 3

Transit-Oriented Development (TOD) Approach

CHAPTER 3: Transit-Oriented Development (TOD) Approach

3.1 Transit Oriented Development (TOD)

In the late 1990s, a definition of TOD was provided by Peter Calthorpe. He stated that TOD is a mixed-use community that inspires individuals to become less dependent on driving and persuades them to live closer to transit services. After the publication of his book "*The New American of Metropolis*" (Calthorpe, 1993), TOD appeared as a feature of contemporary planning of metropolitan areas. Knowles and Sweetman (2004) described it in context of commuter railway journeys and urban form. TOD is denotes mixed-use and compact neighbourhoods surrounding the areas of transit stations, which along with the surrounding public space, appear to be the focal point of neighbourhoods (Bernick & Cervero, 1997). The connection between neighbourhoods and other sites is established by transit station sites which become a transit hub, whereas an area for public meeting & significant activity is considered a public space. A TOD is also defined as a mixed-purpose neighbourhood that encourages individuals to reside nearby transit services to lower their dependency on private vehicles (Still, 2002).

Moreover, a TOD is defined as a mixed-purpose neighbourhood that includes a mix of public services, commercial, employment and residential spaces and ensures the availability of large rail or bus transit stations at a walkable distance. Preference is given to biking and riding, while automobiles are used to access the neighbourhood (Littman, T. 2017). Although these definitions differ, their common emphasis is on development of mixed-use land, transit services nearness, and transit development (Cervero et al., 2002).

Key elements form the focus of research into TOD theory; indeed, TOD is viewed as a construct of structure layout and urban development that develops spaces near public transit systems. Thus, researchers advocate the sustainable and healthy development of a spatial structure via the synergy of land use and transport planning. Rene (2009) conducted analysis of TOD planning at the regional level in Perth, a city in Australia, and found that an activity centre, activity corridor and transport corridor form three spatial elements integrated within its planning. Furthermore, TOD is referenced as a level as a public transport facilities-oriented development. This generally describes

land construction and development patterns surrounding the sites of transit stations and the development of the neighbourhood through such patterns.

Figure 3.1 shows the land use proportion of TOD sites related to the neighbourhood and urban areas recommended by Calthorpe. Although mixed land use has been recommended by both kinds of TOD, difference is observed in their emphasis. Larger office space and commercial core areas are developed using urban TODs, whereas the focus of neighbourhood TODs has been on the greater proportion of residential development which is forms the basis of essential commercial core areas mentioned by Calthorpe (1990). Localized TOD strategies have been implemented by diverse regions depending on their own developmental features, which include development density related recommendations, definitions about various kinds of TODs and proposed TOD categorization. However, it is noteworthy that the majority of such research has been carried out in US cities which have distinct social backgrounds and development conditions for each urban area, (Architecture, 2001). For instance, the categorization of TOD station sites was conducted at three levels in Florida, United States where they had their own design guide and planning (FDOT, 2012). Moreover, seven US TOD projects were analysed by Jacobson and Forsyth (2008) who followed an urban design angle. By considering perspectives like facilities, location and developmental process, they proposed twelve principles for a successful TOD design. However, in Asia there is lack of related research on high-density cities. Due to the differences between urban density and the development background of cities in US, there is a need for more studies that analyse experiments in Asian cities. This would enable research concerning the characteristics of land use in TOD (Jacobson & Forsyth, 2008).

Use	Neighborhood TOD	Urban TOD
Public	10% minimum	10% minimum
Core	10-15%	10-30%
Housing	40-80%	20-60%
Office	0-40%	20-60%

Figure 3-1 Design guidelines: Final Public Review Draft for Sacramento County Planning Community Development Department. (Calthorpe, 1990).

Scholars argue that the facilities such as access to educational institutions, workplaces and public transport are increased by TODs which enables greater transport options

among households. There are six 'Ds' which are considered the most fundamental TOD principles to provide the maximum benefits to communities: Demand management, diversity, design, density, distance, destinations. Its consequences are the encouragement of a pleasant and safe pedestrian environment near transit stations, the increase in ridership transit, a reduction of clashes between pedestrians and vehicles, and finally a reduction in road and traffic congestion.

Additionally, TODs contribute to a reduction in urban sprawl and parking requirements by encouraging various transport systems and shared parking. Scholars argue that they encourage a sense of liveliness and activity, making neighbourhoods more liveable (Bessee & Dannenberg, 2005), located within half a mile of public transport, TOD is a type of community development that includes a mixture of offices, houses, retail and other facilities which are connected within a walkable neighbourhood. TOD characteristics are:

- Support for public transport through moderate to high density development.
- The facilitation and attraction of participation in activities within such places through a mixture of land use that includes institutional, recreational, commercial and residential.
- The integration of activities with an active transport by means of a well-connected network of streets.

Significantly, through the planning of transit stations TOD considers the development of areas where local people can socialize, engage in recreational activities, shop and live. Thus, 'centralized decentralization' is the characteristic of urban development related to TOD (Cervero & Kockelman, 1997; Cervero, 2000).

3.2 The Goals of TOD

There are three main terms related to TOD; density, diversity and design, called 3Ds. (Li & Lai, 2006).

1. Density: Density is raised around transit stations.
2. Diversity: Mixed land use, wide-range of choice of commuting and housing.
3. Design: pedestrian-oriented design.

These terms aim to increase transit ridership, biking and walking, and decrease the use of private motorised vehicles. TOD strategies are based on a theory that land-uses close to a rail/ public transit stop will enable a greater range of travel designs than land-uses in a vehicle focused area. Providing solid analytic evidence about TOD effectiveness is the most appropriate way to ensure that TOD can help solve urban challenges. The range of TOD advantages include environmental, economic and social effectiveness, which suggests that TOD strategies are able to accomplish the objectives of smart and sustainable development.

3.3 Definition of Transit-Oriented Development (TOD)

Transit-oriented development (TOD) is one method of urban development that increases the proportion of residential, business and leisure space around the walking distance of public transport. It enhances a relationship between public transport use and a compact, dense urban form. In this regard, TOD aims to raise public transport passengers by decreasing the use of private vehicles and promoting sustainable urban growth (Cervero Ferrell, & Murphy, 2002).

Bernick and Cervero (1997) offered the definition of TOD, namely a compact, mixed-use community, situated around a transit station that mean, by design, workers, residents, and shoppers drive their cars less and ride public transit more. The transit point extends around a 600m radius from the transit station, which is a distance that can be covered in about five minutes by foot. The transit station itself and the civic and public spaces that surround it form the centrepiece of the transit point. Moreover, the transit station connects neighbourhood residents to the rest of the city. The surrounding public area serves the significant capacity of being a community gathering point, a site for exceptional occasions, and a place for celebrations (Bernick and Cervero 1997). In addition, Maryland Department of Transport (2000) defined the TOD as an area of comparative high density that contains a mixture of employment, residential and commercial activities which are located within a close walk of a bus or rail transit centre. The development design prioritises bicyclists and pedestrians and might be accessed by vehicles.

3.4 Trends Supporting TOD

To promote TOD, the following four major trends have been identified (Goodwill & Hendricks, 2002) which rely upon the local vision of growth issues:

3.4.1 Environmental Trend

The public policy environment has become more responsive to the integration of transport and land-use planning through the application of laws. Numerous global foundations have standards that pay favourable attention to projects that integrate transit and land use, and they reward transit-supportive local government policies.

3.4.2 Demographic Trend

Dense districts and high populations cause uncontrolled and unplanned urban areas, which result in the disorganized distribution of services. Likewise, childless couples wanting smaller houses, youthful single adults and immigrants emerge as new business sectors for transit-based housing.

3.4.3 Traffic Congestion Trend

A lot of people are deciding to live near transit due to the increasing problems associated with traffic congestion; this makes their commutes easier and more accessible.

3.4.4 Economic Trend

TOD becomes an attractive means of investment so companies are beginning to relocate around transit station areas to provide customers with additional benefits, such as easy accessibility.

3.5 The Integration of Transport and Land-use Planning: Transit-Oriented Development (TOD)

Considerable professional and academic research has analysed the integration between land-use planning and road networks, and the evidence leads to one compelling conclusion. Where the sustainability of transport is an integral consideration

in the land-use planning process, non-car modes of travel become dominant, but where development proceeds without regard to transport considerations, car dependence is the outcome (Waddell, 2011).

The integration of transport and land-use planning is a key issue for sustainable development (Toth, 2011; Farr, 2008; Bertolini et al., 2005). Apart from their role in catalysing the social and economic activities of cities, transit corridors provide the backbone of urban structures and can dictate future developments meaning they can be used as a framework around which sustainable approaches can be built (Toth G. 2011). However, Farr (2008) described sustainability in a more practical and perceivable way when he defined sustainable urbanism as 'high-performance infrastructures and buildings' that are walkable and transit-oriented. Moreover, Cervero (1998) used the terms density, diversity and design to describe the type of urban environments that are transit supportive which correspond to compact development. An extensive literature review identified successful land-use and transport policies based on theories, and empirical and modelling studies (Wegener, 2004; Greiving and Kemper, 1999) the review concluded that:

1. Land-use and transport policies are only successful with respect to criteria which are essential for sustainable urban transport (the reduction of travel distances and travel time, and the reduction of car travel).
2. Land-use policies to increase urban density or mixed land-use without accompanying measures to make car travel more expensive or slower only have a limited effect.
3. Transport policies that make car travel less attractive (more expensive or slower) are very effective in achieving the goals in reducing travel distance and car travel. However, they depend on the distribution of homes, jobs, and services, which should not be too dispersed.
4. Large retail and leisure facilities that are not spatially integrated with the urban area increase the distance travelled by car and car travel in general.
5. Transport policies to improve the attractiveness of public transport have in general not had a major effect on the reduction of car use. They have only attracted limited development at public transport stations.

3.5.1 Comparative Analysis of Transit-Oriented Development (TOD) Models.

In this section, a comprehensive introduction and analysis of different Transit-Oriented Development (TOD) models will be provided. This entails presenting a comprehensive outline of various Transit-Oriented Development (TOD) models, emphasising their fundamental tenets, and assessing their potential suitability for the distinctive urban environment of Gaza City. The objective of this section is to clarify the various methodologies utilised in TOD planning and their applicability within the specific context of Gaza City.

Researchers define TOD differently. It is an approach towards expansion that encourages the development of multipurpose, compact public transport and can accommodate an increased number of people to create more liveable neighbourhoods (Zhou et al., 2019). Calthorpe, 1993 cited by Maheshwari, et al defined TOD as a mixed-use community within an average walking distance of a one-quarter mile of a transit stop and a core commercial area (Maheshwari, R., et al 2022). Calthorpe further specified the definition as the configuration, design, and mix of uses, emphasizing a pedestrian-focused environment and reinforcing the use of public transportation. A TOD's mixture of retail, residential and office space alongside public uses which are located within a comfortable walking distance make it convenient for employees and residents to travel by bicycle, public transit, foot or car (Cervero, et al., 2011).

The concept of TOD was first presented by Calthorpe (1993) and described as communities built for mixed use purposes within a walking distance of 10 minutes from a regional transit system. These were intended as strategic communities which provided jobs, public services, retail, parks, schools, medical facilities, and so forth. Boarnet & Crane (1997) argued that TOD represented the redevelopment of land neighbouring the rail transit so that further public investment could be brought into use for public development. Parker et al. (2002) observed that TOD involved the strategic use of land in a way that communities could coordinate through public transport. Moreover, Schlossberg and Brown (2004) observed that TOD represented an integrated approach where land was planned in a way that enabled easy pedestrian access to transport. Nasri and Zhang (2014) observed that TOD represented a planning approach that provided a transit service along with high density and mixed-use development. Although the universal definition of TOD does not exist, there are common goals among the scientific and political community. These are their integration within different communities through transport and the provision of mixed-use land development that includes walkable spaces besides other uses.

There are communities which thrive with the use of cars and have much lower dependency than traditional developments. Reduced car dependency has two variables: reduced car trips per household and a reduced number of kilometres travelled by per car per household (Chatman, 2013). TODs are (linked) anchored by a transit station (bus or rail) that provides visitors and residents with the opportunity to conduct regional travel by public transit instead of private car. Furthermore, the implementation of the integrated transit system in Curitiba, which incorporates dedicated bus lanes and stations, has caused a substantial decrease in automobile reliance and traffic congestion (Bergman, K. 2017).

However, TOD generally comprise a finite size, i.e. about 200 hectares, which is usually diagrammatically represented by a radius of 800 meters around a transit station. This may be regarded as the broad 'walkable' which represents a 10-minute walk from the transit station to the edge of the radius. Due to a finely connected street network, all landholdings are typically within a kilometre from the transit station and centre (Nigro et al., 2019). This provides an opportunity for most journeys to be (done) conducted by foot or bicycle within the TOD through a complete infrastructure of bicycle lane and footpaths. Nevertheless, some literature emphasizes a five-minute walk and a 400-meter radius (Ewing, et al., 2019). The inner radius of a TOD represents the most strategic place to locate activity intense developments which subsequently form the central feature of the concept (Thrun et al., 2016).

Nasri et al. (2018) differentiated between different types of TODs on the basis of the extent of the area, i.e. regional TODs and neighbourhood TODs. Neighbourhood TODs represent a neighbourhood within a community, whereas regional TODs represent the entire region (Baker & Lee, 2019). In a neighbourhood TOD the focus is on residential use with local shopping facilities which are sized for serving the population living in close proximity (Staricco & Brovarone, 2018). Therefore, neighbourhood TODS are beneficial for existing and new residents, local governments, transit agencies, developers, local merchants, property owners, investors, and all those who do not want to drive (Yu et al., 2018). Furthermore, there are some other reasons to promote TODs in a suburban context:

- A TOD is sustainable with an efficient use of energy, land and other resources (Appleyard et al., 2019).

- A TOD helps to conserve open space, enable a cleaner environment, and encourages walking (Venigall et al., 2018).
- The The promotion of public transport, cycling, and walking is facilitated by a concentration of development in nearby of transit stations, resulting in a reduction in the number of private vehicle journeys. As a consequence of this transition, air pollution is diminished and air quality is enhanced, making TOD an urban planning strategy that is environmentally sustainable (Guo et al., 2015). By reducing reliance on private vehicles and encouraging the use of public transport, TOD has improved air quality in Curitiba. Further reducing urban sprawl has been the municipality's focus on mixed-use, compact construction along transit corridors (Bergman, K. (2017).
- It increases transit ridership at a lower cost compared to parking structures, and bus services are needed to bring riders to stations (Yap & Goh, 2017).
- It also increases pedestrian traffic and provides opportunities for mixed-income housing, TOD promotes social equity and promotes the development of diverse, mixed-income neighbourhoods by offering affordable housing options and reducing transport expenses (Correia, et al 2022). Similarly, Transit-Oriented Development (TOD) in Vancouver has improved social fairness by offering a wide range of housing choices and facilities that are conveniently located near public transportation stations. The city's focus on creating streets and public spaces that are easy for pedestrians to navigate has fostered active participation and unity within the community. (Guthrie, 2018).
- A TOD promotes safer neighbourhoods and healthy lifestyles as more people are active on the streets (Poiani & Stead, 2014).

Transport as a science, studies the geographical distribution, characteristics and analysis of different transport networks, and considers the study of transport means, goods, inventions and ideas from one place to another (Al-Rakeiba, 1991). Encouraging the use of public transport through land-use planning involves land management and development so that:

- The condition of public transport is improved to become an efficient means of transport (Li et al., 2019).
- Urban areas become easily accessible and people are able to travel via alternative modes (Kamruzzaman et al., 2019).

- The demand for public transport increases and people tend to prefer public transport instead of cars (Kamruzzaman, et al., 2014).

Transit-oriented development (TOD) means the integration of urban places which are designed to bring people, buildings, activities, and public space together along with easy cycling and walking connections (Ma et al., 2018). It implies inclusive access for all to opportunities and resources across the city via the most healthful and efficient combination of mobility modes at the lowest environmental and financial cost and with a higher resilience against events which can disrupt commutation (Lyu et al., 2016). Therefore, a TOD would be helpful to answer the research question 'What type of land-use and road network distribution plan is practised in the city and how compatible and competent are these practices to current and future challenges for the city?'

Inclusive TOD is a vital foundation for long-term equity, sustainability, civil peace, and shared prosperity in cities. However, it is not recognized all over the world as public transport or transit-oriented development (TOD) (Ratner & Goetz, 2013). Rather, it represents mixed-use, compact, pedestrian-friendly, and cycling-friendly development which is oriented to public transport (Singh et al., 2014). By concentrating a mix of cyclist oriented and pedestrian-oriented development around public transport nodes, visitors, pedestrians, and workers are likely to catch a bus or train for out-of-neighbourhood trips or may walk or cycle to the nearest places (Sahu, 2018). Therefore, a TOD would be helpful to understand the issues related to catching a bus or train for out-of-neighbourhood trips or in walking or cycling to the nearest places (see Figure 3.2). This would help to answer the following research questions:

- What planning approach needs to be practised to integrate road networks and land-use and how can the road network be designed at the city level by applying TOD principles?

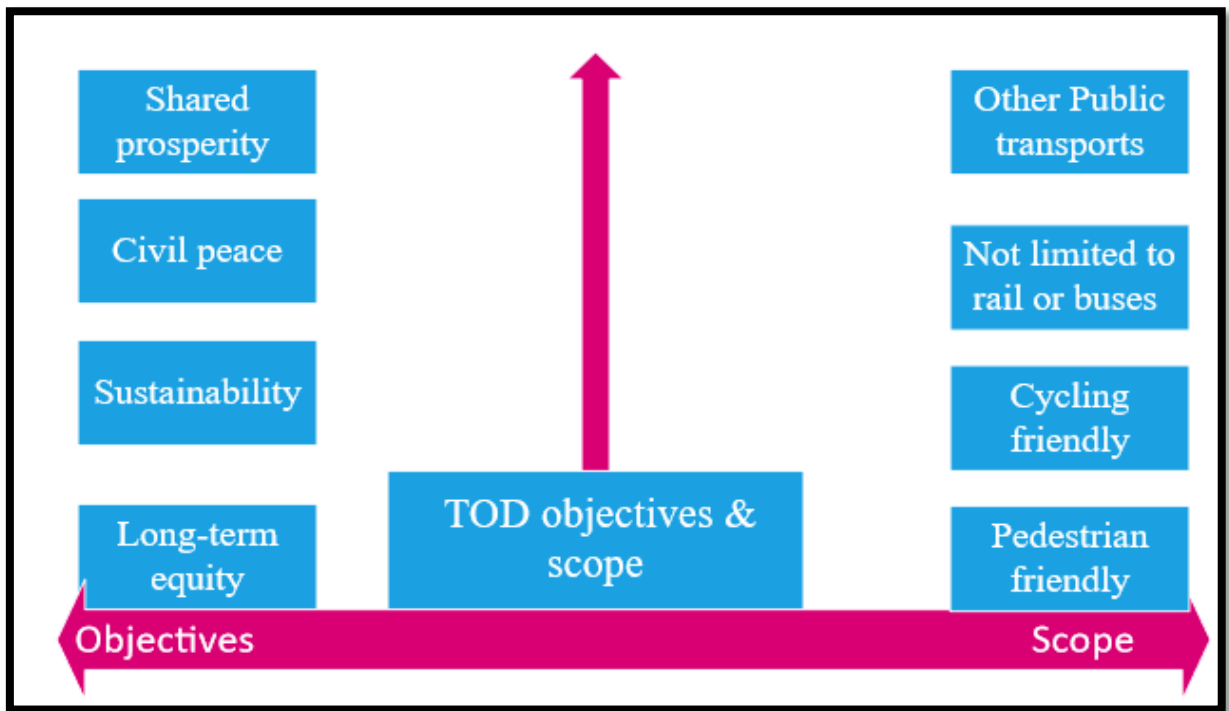


Figure 3-2, Development based on the major TOD objectives and scope (Singh, et al., 2014; Ratner & Goetz, 2013), edited by author.

Public transport stops represent a logical place to concentrate on urban development. Well-connected and high-quality public transport services must be in place to draw passengers to the station area in the first place. Therefore, TOD assumes that public transport should be safe and reliable and must also be time-efficient in comparison with the private car (Thomas & Bertolini, 2015).

Ewing, et al. (2019) highlighted several factors considered vital TOD so that residents rely less on cars and more on alternate modes such as cycling, car-sharing, public transport, and taxis. These factors also underpin a high level of local accessibility in contrast with the elements of Transit Adjacent Development (TAD) as TAD is automobile-oriented development, conventional, and located near transit stations, as contrasted in figure 3.3

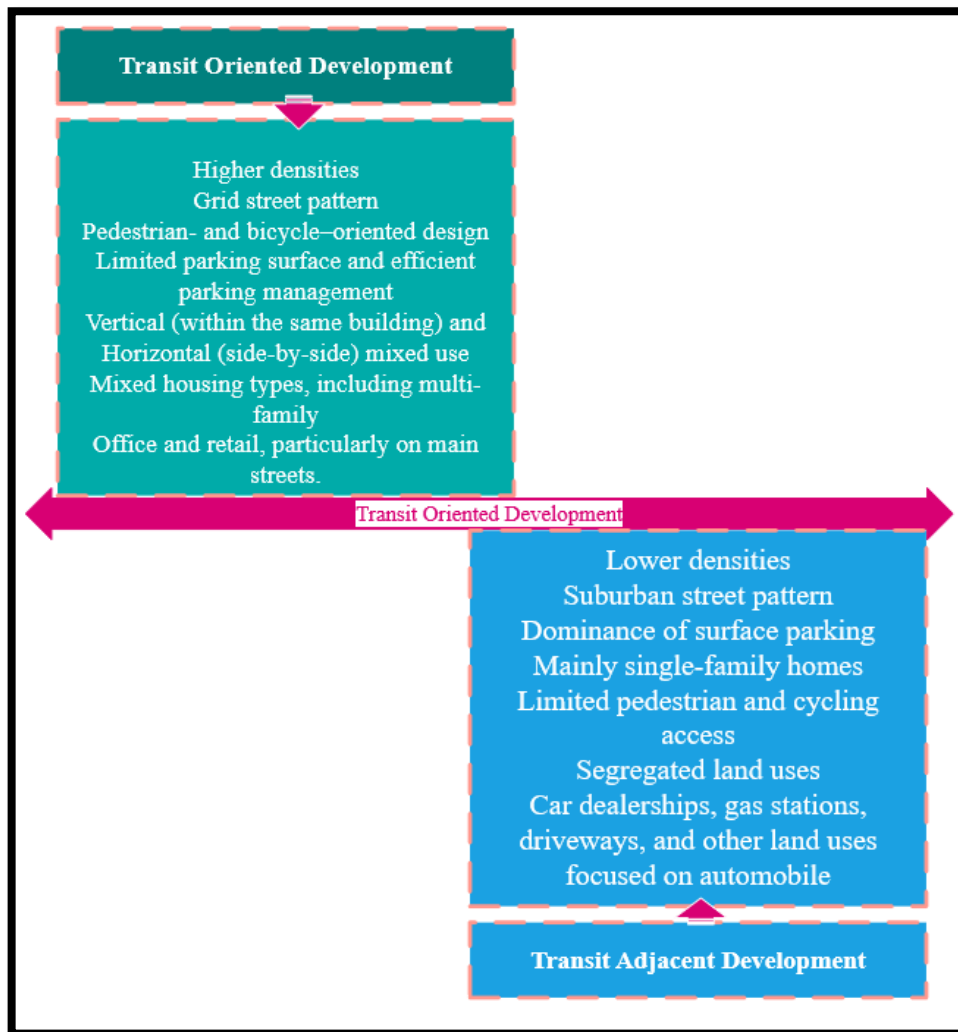


Figure 3-3 Transit Oriented Versus Adjacent Development (Shao, et al., 2019), edited by author.

As a planning tool which integrates land usage and road networks, TOD represents a promising approach in promoting transit patronage and dissuading citizens from using their private cars by providing better alternate means of transport (Dong, 2017). It is usually understood that the development of transit stations occurs around walkable and high-density mixed land-use and cycle-friendly designed environments. As diversity, density, and design are regarded as the three main dimensions of TOD (Vale, et al., 2018), these would be helpful to incorporate when proposing a road for transport authorities to consider when developing Gaza City. Indeed, smart transport characteristics align with the TOD model. As TOD is located at rapid transit systems to compete with automobiles on longer trips and attracts people to cycling or walking on short trips (Xie, et al., 2012) this model is employed to develop a research framework for this study. This can lead to the use of denser urban fabric and the consumption of less fossil fuel (Papa & Bertolini, 2015).

Two new criteria of the built environment have subsequently been added since the emergence of the three ‘Ds’: Distance to transit, and destination accessibility (Phani et al., 2018). Destination accessibility represents the ease of access to trip attractions and distance to transit is evaluated as the average shortest street route from workplace or residence to the nearest transit node (Higgins & Kanaroglou, 2016).

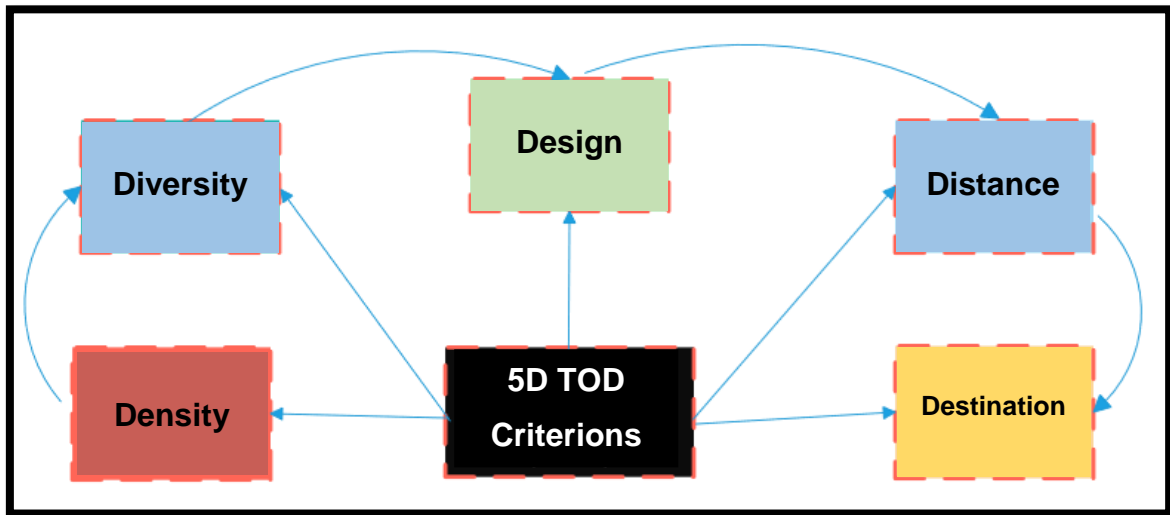


Figure 3-4, Five criterias related to TOD (Li & Lai, 2006)

These 5D criterias (illustrated in figure 3.4) are usually interrelated as Tian, (2017) argued that diversity and density coexist meaning that various benefits are inextricable and may perhaps overlap (indeed destination accessibility and diversity are to some extent related to the trip attraction), (Mathur, 2019). The interrelations showed that a TOD criterias is not isolated which also indicates that there should be a multi-dimensional implementation of TOD. However, it is therefore important not only to take into account the available number of destinations at a particular transit station or the diversity of land usage available at the node level, but also to increase non-motorized type of transport within the node. These aspects reinforce each another and are critical to consider in the proposal of transport for Gaza city. When TOD is correctly implemented, it brings plenty of benefits. Van et al. (2017) found that TOD is suitable for financing the infrastructure of railways, particularly in instances characterized by high densities. In the instance of suburbanization, TOD may also be adopted to address the issue of declining accessibility. According to Cervero and Day (2008), (TOD) has been linked to economic advantages such as higher property values, the generation of employment opportunities, and a stimulation of local enterprises. The amalgamation of residential, commercial, and office spaces within Transit-Oriented Developments (TODs) engenders dynamic and economically dynamic settings that

entice investments and foster the holistic economic advancement of the locality. (TOD) initiatives in Portland have rejuvenated urban neighbourhoods, drawing in businesses and investment to sectors in close proximity to transport hubs. Efforts have been made to promote affordable housing and social inclusion in conjunction with the observed economic growth (Dill, J., & McNeil, N. 2023). Studies also found that there are associated positive effects in creating rich, vibrant, and liveable urban places which ultimately result in better health and improved quality of life (Lee et al., 2016). It can therefore be concluded that TOD is a multi-functional concept as there are plenty of rich outcomes. It reduces car usage and increases the transit ridership that can generate the benefits for the city listed in Figure 3.5 (Hartenstein & Laberteaux, 2009).

Economic development	Fiscal benefits	Household benefits	Environmental benefits
<ul style="list-style-type: none"> Increases productivity and saves time Encourages concentration of business activity Increases economic competitiveness and promotes a green economy Increases property values and development potential 	<ul style="list-style-type: none"> Savings on cost to build and maintain highways and roads Generates stronger tax revenues 	<ul style="list-style-type: none"> Savings from reduced cost of driving Improved access to jobs, schools and other destinations Promotes health 	<ul style="list-style-type: none"> Reduces greenhouse gas emissions Preserves agricultural land and assists with food security Promotes energy independence

Figure 3-5 TOD advantages (Hartenstei, & Laberteaux, 2009).

The focus of recent researches has been on evaluating the performance of transit nodes in a TOD network by utilising methods such as Spatial Multiple Criteria Analysis (SMCA) (Suzuki et al., 2015). This is helpful in arriving at the aggregate level of TOD value for different transit nodes. Such an evaluation is significant in realising the extent to which an area can be transit oriented. However, it is insufficient in understanding the heterogeneous built environment characteristics of the area around train stations. This is because the characteristics of TOD at the node level tend to be lost in the indicator aggregation process (Singh, et al., 2014). Studies shows that heterogeneous built environments critically influence the implementation of TOD (Dorsey & Mulder, 2013). This means that there could be different typologies of TOD depending on its

built environment, which implies that the general aggregate level of TOD may not reflect performances across different node types in a transit network where there may be different node roles. As a network system, there could be synergy effects between different nodes, such as complementarity, competition, and collaboration, as illustrated in figure 3.6 (Arvis et al., 2011).

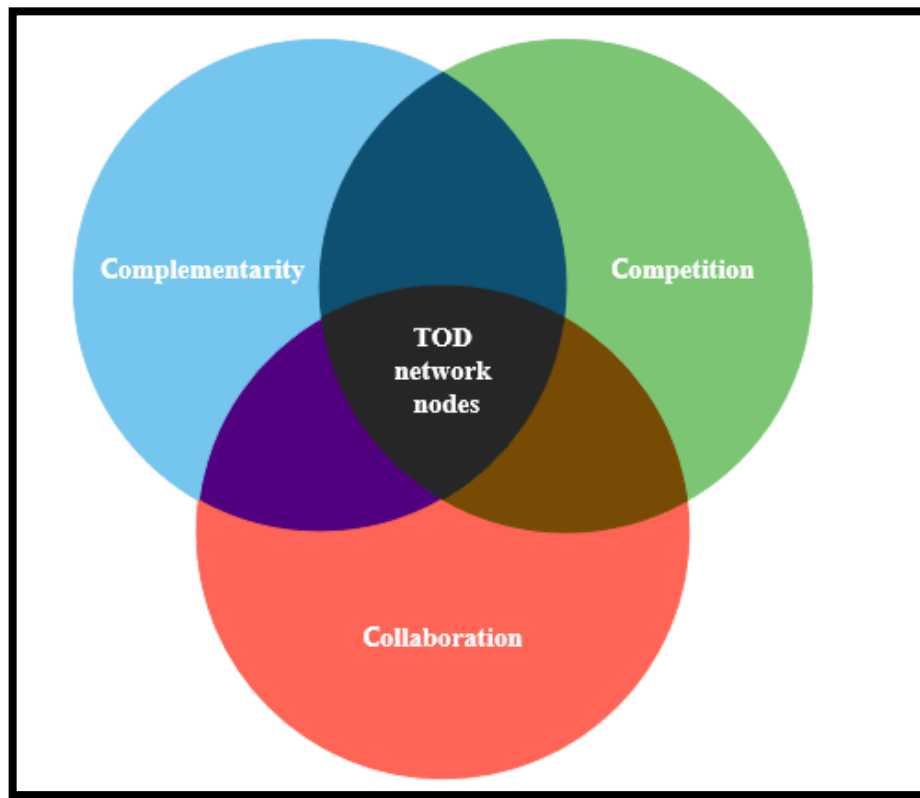


Figure 3-6, TOD network nodes (Arvis et al., 2011).

A TOD implementation may differ depending on the conditions of different stations. It is vital to understand the heterogeneity of the built environment and assess existing conditions before implementing a project, so that the success rate can be enhanced by analysing the existing built environment, so future TOD implementations can be facilitated (Kamruzzaman et al., 2019).

Motieyan and Mesgari (2018) argued that, it is a prerequisite to measure the existing level of TOD through scientific means, so that the extent to which an area is transit-oriented can be determined. Singh et al. (2014) analysed the TOD network of Arnhem-Nijmegen (the Netherlands) by utilizing SMCA framework whereby multiple spatial indicators were aggregated to arrive at a general TOD level value. However, to measure the existing level of TOD, it is essential to have a general value, although it is insufficient to understand the heterogeneous built environment as characteristics of TOD are lost in the indicator aggregation process. It is important to understand the

heterogeneous built environment of TOD because it is helpful in understanding its different development across the system (Atkinson-Palombo & Kuby, 2011). As TOD is multi-functional and multi-dimensional, with different aims and purposes, its implementation can take different forms and individual nodes can perform different roles within the system of network, potentially complementing each other (Atkinson-Palombo & Kuby, 2011). Thus, Austin et al. (2010) argued that a one-size-fits-all approach is not useful and practical. The development of TOD rarely starts from ground zero as it is considered around an existing structure (Pan et al., 2014). Thus, a well-performing TOD transit node may not be ideal for all dimensions of traditional TOD criteria and a determining role could be played by different characteristics of the existing built environment; this constitutes the heterogeneous typologies of TOD when developing transport for the City of Gaza.

The researcher examined various Transit-Oriented Development (TOD) models, such as traditional TOD, urban suburban, regional TOD, and neighbourhood TOD. Each model provides a unique perspective on urban development and transportation planning. Although there may be variations in certain aspects, these models collectively aim to advance the development of urban environments that are sustainable, efficient, and accessible.

Through a comparative analysis, it becomes evident that these (TOD) models exhibit shared characteristics and principles. These include the incorporation of mixed land uses, compact development, the prioritisation of transit access, and the promotion of pedestrian-friendly design. Nevertheless, they also demonstrate variations in size, concentration, modes of transport, and adaptability to specific circumstances. Neighbourhood TODs and urban suburban areas prioritise localised and compact development, incorporating a combination of residential, commercial, and recreational areas. Regional TOD focuses on the transportation links between cities and their neighbouring regions.

Comprehending these shared characteristics and distinctions is essential for determining the most appropriate TOD strategy for Gaza City. By leveraging the advantages of diverse models and customising them to address the unique requirements and obstacles faced by Gaza City, it is possible to construct a comprehensive TOD framework that is in line with the city's objectives of fostering

sustainable urban growth, enhancing transport alternatives, and elevating the overall standard of living.

3.6 Defining the Indicators of an Integrated Road Network and Urban Development (Land-use)

Cities are places of change on a larger scale and influenced by a range of social and economic activities which are dynamic in nature. Complex processes propel the development of cities across space and time. At the heart of a city structure lies the urban transport system that defines both the nature of the built environment and the complex processes emanating from the urban fabric. Transport is the engine of urban life that propels the day to day social and economic activities of cities and drives the global economy on a larger scale. Accessibility and mobility, as functions of a transport system have played an integral role in shaping the urban form, influencing the location of social and economic activities and determining economies of scale (Litman, 2007).

The need for integrated road networks and land-uses is widely acknowledged to counter the growing challenges of a rapidly urbanizing world (Schiller & Kenworthy, 2017). Transit-Oriented Development (TOD) transport infrastructures and a compact urban form can address the multifaceted challenges of urban sprawl, urbanization, climate change and energy consumption, and unsustainable environmental practices. As the integration between road networks and land-use is a key part of sustainable, transport development plans has become a central issue in transport planning (Abreha, 2007), there is a growing need to strengthen the role of the integration. This is needed both in developed cities where it enables competent and quality service provision, and developing cities where there is poor service provision and a considerable gap between supply and demand.

However, sustainability involves a broad spectrum of efficient utilization of natural resources to maintain current and future social and economic development. A development that recognises the scarcity of resources (land, water, energy, material) and which is geared to social well-being. The integration of road networks and land-use planning is a key issue for sustainable development (Hoballah et al., 2012). Apart from their role in catalysing the social and economic activities of cities, the integration between road networks and land-use is the backbone of urban structures and can dictate future developments. It can thus be used as the framework around which

sustainability can be built. Integrating transport systems (bus and metros) and functional land-use activities forms the core element of sustainable urbanism (Farr, 2011). Cervero (1998) used the terms density, diversity, and design to describe the type of urban environments that are transit supportive which correspond to compact, mixed-use and pedestrian-friendly built environments (Farr, 2011). The following are the indicators of an integrated road network and urban development (land-use)

3.6.1 Accessibility: Perspectives and Definitions

Although a wide range of definitions has explained the term 'accessibility', there is no agreed conceptualisation application across a broad spectrum of scientific fields (e.g. urban planning, transport planning, geography, IT) (Al Kahtani et al., 2008). Definitions and interpretations of the term vary depending on the intended purpose and area of application. In the urban planning and policies, the term is used in two different contexts; when referring to people's 'closeness' to public transport and a disabled person's competencies to use public transport (Hull, Silva & Bertolini, 2012). The latter is an issue for public transport vehicle design, which makes it accessible for people of limited flexibility and mobility (elderly, disabled). On the other hand, closeness is a function of distance, which can be explained by the spatial arrangement of the transport infrastructure and land-use and is a question of how far nearby transport facilities are from home. However, proximity does not explain the concept overall, as accessibility concerns land-use diversity and how well the built environment is designed to maximise accessibility (Geurs & Wee, 2004).

A grid pattern, namely a walkable and interconnected network of streets with a high intersection density enhances accessibility. In addition, transport infrastructures like highways, roads and interchanges can be both facilitators and inhibitors of accessibility depending on whether they are designed for all groups of road users or just for vehicles. A change in transport technology or land-use alters activity patterns which in turn affect the overall levels of accessibility (Rodrigue, 2017).

A compact urban form served by a well-designed road network system offers a higher level of accessibility. Indeed, Rodrigue (2017) underlines that accessibility is a key element in urban planning and linked with an activities of social and economic opportunities whose level of accessibility are dependent on the distance to destinations and location of transport infrastructure and urban density, as shown in figure 3.7.

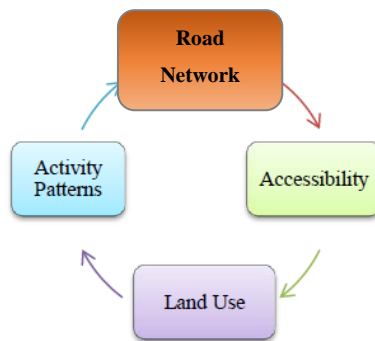


Figure 3-7 Relationship between road network and land-use. (Rodrigue, 2017).

According to Rodrigue (2017), urban density is the determining factor that affects the availability of social opportunities (access to employment and social interactions, services and goods) and economic opportunities. As it is constantly accessible, an urban area of high built-up density will have a higher level of accessibility than a low-density area (Rodrigue, 2017).

Accessibility is an important indicator of how well road networks and land-use are integrated. Here, the concept of accessibility means the possibility or ease of reaching the desired destination from a given point in space by a certain mode of transport and can be used as a useful framework for integrating road network and land-use planning (Bertolini et al., 2005). Geurs and Van Wee (2004) describe it as the extent to which a transport system facilitates people’s participation in activities. By focusing on passenger transport, Geurs and van Wee (2004) define accessibility as: “the extent to which land-use and road network systems enable individuals to reach activities or destinations by means of a transport mode”. In contrast, Abreha (2007) clarifies that accessibility is a much broader concept than mobility that can describe in terms of travel patterns; instead, Abreha defined it as “mobility for opportunities”.

Accessibility is a function of the qualities of the road network and qualities of land-use diversity. The integration of the two systems defines the extent to which a destination is accessible from a certain point (Huang et al., 2014). Elements of the built environment, such as building density, road network and its design, and land-use variety are some of the more important parameters to affect the level of accessibility. Therefore, a well-designed urban environment and an efficient transport system provide a higher level of accessibility compared with a less developed area (Huang et al., 2014). As figure 3.8 illustrates, a transport system connects people to desired destinations (work, school, recreation, shopping, and services), which are functions of land use diversity. Thus, accessibility is a broader concept that incorporates mobility,

proximity, and connectivity due to the interaction of people with the transport system and land-use activities (Geurs & Ritsema, 2001).

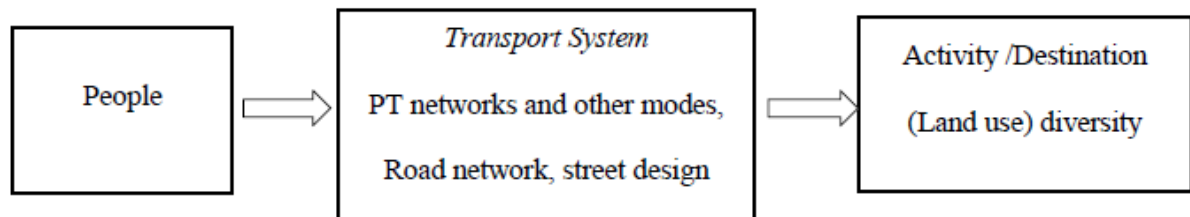


Figure 3-8 Accessibility Components. (Geurs & Ritsema 2001).

The integration of road network interfaces in a compact urban form involve many activities and destinations in transit-oriented development. This means TOD are projects involving accessibility. The need for improved accessibility generally resulted in a rebirth of TOD, which supports urban living and transport choices by involving the efficient use of land space. Common measures of accessibility include walking distances and travel time from origin to destinations, from living places to nearby shops/schools or transit stations (Suzuki et al., 2013).

3.6.2 Urban Space Quality – Place-making

The quality of the urban space has been adversely affected by providing urban spaces that are specially designed for cars. Roads are seen as spaces for vehicles at the expense of public space (Pojani & Stead, 2015). Banister (2008) argues that a transport policy system that encourages modal change should be in place to enable the best use of free space. The design of streets for cars needs to be changed as it needs to no longer be perceived as a road but also as a space for walking and cycling people needing green areas and public transport (Banister, 2008).

Cities are known as attractive places in terms of what offer to their residents and visitors. The sense of place and experience is what remains in the minds of people once they have left a place. The quality of urban space refers to the art of creating attractive public spaces and is an important indicator of integration between transport and urban planning. Public spaces contain transit stations/stops, buildings, green areas, and open spaces. In addition, streets, sidewalks, and parks (Carmona, et al 2004). Public spaces offer important meeting areas where experiences are created and shared. Access, sociability, use and activities, and comfort and image are the four key elements of successful place-making as identified by Project for Public Spaces

(PPS). Successful public spaces are accessible, sociable, and have a mix of activities and comfortable space and good image (Project for Public Spaces, 2000).

Complete and walkable streets improve the quality of urban environments by attracting economic activities and social events which then give life to the place. Approaching transport planning and designing work from the perspective of place-making helps to integrate the road network and land-use activities (Vale, 2015).

Apart from enhancing mobility and accessibility, light rail transit (LRT) and bus-based public transport have an important function in revitalizing city centres. The place making of light railways and busways lies on either side of transit corridors, which offer two linear and elongated cores of the highest attractiveness (Vale, 2015).



Figure 3-9 Dual-Use Rail Tracks: Enhancing Place-Making with Light Railways and Trams.

The longitudinal place-making of light railways and busways change the appearance of the open urban space and creates a safe and vibrant street (as illustrated in Figure 3.9). The running of modern trams on roads and shared streets make them suitable for place-making. The 'live-ability' that trams and busways promote in the cities is limited to urban centres and they are not competent with cars at regional scale since their average speed is 15 to 20 km/hr (Vale, 2015). Vale (2015) argues that apart from being regionally incompetent, trams and busways are partly permeable and partly barriers, and within the perspective of regional accessibility, high-speed public transport networks like metros and trains are required to regionally compete with cars.

In the context of the research on the usability of TOD for Gaza City, this assessing the potential challenges and considerations associated with different modes of public transport. This could contribute to discussions on selecting appropriate transport modes within a TOD framework for Gaza City, considering regional accessibility and

the need to compete with private car usage. It emphasizes the importance of choosing transport modes that align with the unique characteristics and regional requirements of Gaza.

3.6.3 Complete Streets

Within the built environment, the road is arguably the most important element to affect destination accessibility on the city, regional and neighbourhood scale. Greater accessibility and transport alternatives including smart transport are achieved when road networks and street patterns are properly designed at the street level (Pojani & Stead, 2015). Complete streets are designed to be suitable for all travel modes, namely public transport, and cars, cycling, and walking. It is necessary to change the method of transport planning from designing roads purely based on the physics of moving vehicles to multimodal street designs which also enable the integration of road network and land-use (Klassen, 2015). Toth (2011) also highlights that “land-use that prioritize mobility and cars over accessibility and places is no longer viable” or sustainable as because the concentrate on high mobility belittle the non-motorized transport and public transport networks that are important for revitalising city centres.” A complete street means its design considers all road users which enables a range of transport choices. At a city and neighbourhood level, having a sidewalk on both sides of the road network across the entire length increases the neighbourhood and urban interconnectivity (Farr, 2011).

The integration of the road network and land-use requires the conjugation of community-based policies and programs from the respective domains. The coupling of a road network with land-use can be realized through a complete street design and compact and mixed-use developments that promote the facility and liveability of cities. A well-designed complete street contains the following characteristics (Farr, 2011).

- Multimodal (driving, transit, cycling and walking).
- Compatibility with adjacent land-uses and mixed-use.
- Compact and walkable neighbourhoods.
- High-quality public spaces.
- Environmental quality (green strips, trees).

3.6.4 Public Transport Performance Indicators

Performance can be measured on the basis of a predetermined set of social, economic and environmental goals for which a public service is designed. Performance measures are usually policy-driven and involve decision-making (Abreha, 2007). In economic terms, public transport is far from performing well both in the developing and developed countries as tends to be heavily subsidised (with the exception of Asian countries like Japan). Even in transit-oriented European cities, more than 50% of the operational costs of public transport are subsidized by government taxes (Kottenhoff, 2012; Rodrigue, 2009).

In general, the performance indicators of a sustainable transport system can address the following questions (The Centre for Sustainable Transportation, 2002 cited by Abreha, 2007).

- Is the social (health impact) and environmental performance of the transport system improving?
- Are land-use, urban form and transport systems changing so as to reduce the demand for transport? Are we creating accessible cities?
- Are we increasing the efficiency of the current transport infrastructure and changing the infrastructure supply in a sustainable way?
- Are the development practices and investments by governments, companies, and other actors coordinated and consistent with sustainability and accessibility objectives?

It is argued that, whilst existing literature feature studies on the integration between road networks and urban planning, the field has only recently received attention. Moreover, little research has been carried out to identify the integration between road networks and urban planning in developing aspects related to TOD. It is concluded that most research has been undertaken to determine the influence of transport on land-use by studying the economic and environmental effects of the road network, while others have studied the effect of land-use on transport through travel patterns. Despite the plethora of research, no prior study has attempted to develop a balanced and equitable urban planning strategy between land-use and road networks using innovative, intelligent methods for the City of Gaza. Consequently, the review has found that transport is a necessity for economic development and acts as a link and interaction with land-use.

3.7 TOD Typology and its Benefits when Exploring its Implementation within Gaza City

The streets within TODs should provide comfort, a high level of amenity, safety, and convenience for cyclists and pedestrians. Cars can be permitted for travelling along most streets but at lower speeds. Intersections should be designed for the convenient and safe usage of pedestrians even if their capacity is reduced for use by motor vehicles. The mixed-use of land is encouraged in TOD as no single usage is prioritized over other uses. TODs should not be entirely business or entirely residential. This mixed usage purpose provides opportunities for some people to reside and work in the same TOD and enables socialization and shopping in the same TOD. Figure 3.10 lists the advantages of TOD.

Improved Service	Increased Use of Alt. Modes	Reduced Automobile Travel	More Compact Development
<ul style="list-style-type: none"> Improved walking, cycling and transit service, benefits existing users of these modes Reduced automobile traffic speeds and volumes improves safety and livability Improved street conditions increases local property values 	<ul style="list-style-type: none"> User cost savings User enjoyment Economic development benefits from increased access to education and employment Increased public fitness and health 	<ul style="list-style-type: none"> Reduced traffic and parking congestion Road and parking cost savings Consumer cost savings Reduced crash risk to others Air and noise pollution reductions Energy conservation Economic development benefits 	<ul style="list-style-type: none"> Improved accessibility, particularly for non-drivers Reduced land consumption, heritage and openspace preservation, and public service cost savings Reduced sprawl costs.

Figure 3-10, TOD Advantages. ([http://www.slideshare.net/EMBARQNetwork/implementing-transit-oriented-development-in-indian-cities-learnings-and-challenges.](http://www.slideshare.net/EMBARQNetwork/implementing-transit-oriented-development-in-indian-cities-learnings-and-challenges))

It is desirable to have a centre around TOD within a 400 meters radius and this should comprise civic, residential, and entertainment facilities as well as retail and other facilities. This is expected to be the densest area of the TOD (Cervero, 2005). Generally, there should be transition from the centre of a TOD to its other parts. As the transition takes place from the centre to outer areas, the denser areas become less packed eventually becoming lower dense suburban areas (Belzer & Autler, 2002). Figure 3.11 shows the basic structure of a TOD scheme in a city.

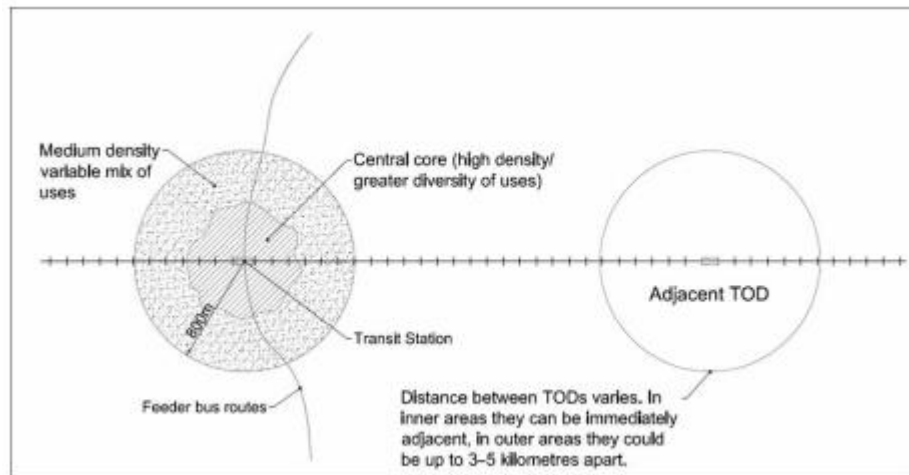


Figure 3-11, Schematic structure of TOD. (Belzer, & Autler, 2002).

Developing a typology is a way to group areas with common characteristics. Therefore, a TOD typology involves several combinations of place types and nodes meaning there are common elements of all areas within one combination (Kamruzzaman, et al., 2014). By categorizing TOD into typologies, the design, planning, and operational activities are enhanced in several ways. For example, the similarities within a particular type enable stakeholders and policymakers to create common strategies for planning and improving performance (Li et al., 2019). This classification is also helpful in identifying the potential for general development and in accommodating future adaptations for Gaza City. It can also help to understand each type of TOD in terms of its desired levels of connectivity, density, land-use mix, and transit system functions. Therefore, a typology supports the design an optimal TOD at a particular site, such as Gaza City (Kamruzzaman et al., 2019).

Moreover, the typology is helpful in answering questions such as ‘under what conditions will a particular mixture of uses enable an effective mixed-use development?’ Or ‘what are the requisite levels and densities of a transit service in Gaza City?’ The answers to such questions are significant for the effective design and planning of TOD for Gaza city. For example, increased density has the potential to increase the ridership but at the same time degrades the quality of living and social equity. Thus, it is important to strike a balance between these elements when considering Gaza TOD transport.

In addition, classification minimizes the management of complexity for infrastructure organizations by enabling the application of standards to development and operations, and securing consistent actions (Ma et al., 2018). Similarly, it also enables the

identification of actors and sites with comparable challenges or experiences for spatial planning. Classification enables performance assessments and comparisons within the station classes, highlighting a need for action, and identifying successful benchmarks (Lyu et al., 2016). In the absence of benchmarks, there is no way of judging the quality of a TOD (Ratner & Goetz, 2013).

A helpful aspect when defining the TOD type is the utility of transit technology. Singh et al., (2014) indicated that the characteristics of transit technology and transit service influence the potential ridership and area design of the station. The cost of transit, frequency of transit service, station space, station design, and mode influence the density, intensity, and mix of uses in a station area while knowing these elements helps to achieve the transit ridership goals (Sahu, 2018; Tian et al., 2017; Thomas & Bertolini, 2015).

While the type of transit is usually determined by the needs of a system, ridership estimates, capital costs, corridor right-of-way dimensions, and factors related to TOD around stations can significantly influence the ridership potential for the entire system (Lu et al., 2018). Hence, the technology and design of a transit system also has to take into account the plans for future development and the potential for redevelopment in station areas (Shao et al., 2019). Thus, modern street cars (trams) offer a tailor-made choice of transit when implementing TOD in an already developed neighbourhood. They run on a dedicated railway line and serve as urban circulators for shorter trips (Dong, 2017). The stations are located closely with emphasis on access to walking. The tracks of streetcars pass through road with shared traffic lines, but can also have dedicated tracks (Vale et al., 2018). Since the infrastructure of a streetcar can be integrated easily into the existing urban environment, its cost is generally less than a light rail infrastructure. Therefore, modern streetcars can function on a continuum between bus transit and rail transit (Xie et al., 2012).

Streetcars are widely known as a new transit technology which is uniquely suitable for promoting TOD. Streetcars represent a paradigm change in the way transit agencies and cities are thinking and planning travel as they not only provide transport but their infrastructure allows room for redevelopment (Papa & Bertolini, 2015). Thus, streetcars are increasingly providing cities with cheaper and faster rail alternatives which promotes walkable, dense, and mixed-use development (Phani et al., 2018). Since streetcars are less expensive, smaller, and less intrusive, they can be quickly built with

minimum disruption to existing businesses and residents (Higgins & Kanaroglou, 2016). Moreover, streetcars have frequent stops, run in mixed traffic and their stops can be shared with buses. As such, they do not consume space that is needed by exclusive right of way traffic such as by trains (Van et al., 2017). The typical length of a streetcar's route is usually 2 to 3 miles and its focus is on local trips instead of a corridor. A study of Portland streetcars found out that the properties located closer to a streetcar developed to 90% of their permitted density whereas those which were three to four blocks away developed at 43% density. The blocks considered to be less attractive for development became most attractive when streetcars ran closer (Van et al., 2017). For instance, when involving kerb-extension platforms, the platform forces vehicular traffic onto the track of streetcar; whereas drive-over platforms use a kerbside waiting area and upon arrival of the streetcar the vehicular traffic stops so that passengers can board or alight (Mathur, 2019). A kerb-extension platform may be necessary for busy areas while a drive-over platform needs considerable discipline on the part of passengers and drivers. Thus, traffic lights assist the streetcar to conduct safe operations, as shown in figure 3.12 (Dorsey & Mulder, 2013).



Figure 3-12, *Modern Streetcars (trams)*, (Dorsey & Mulder, 2013).

A major advantage of the streetcar system is that circulation in the area is improved and development is stimulated along the corridor typically with a vibrant street life and greater walkability. Therefore, the streetcar is an efficient way of revitalizing the neighbourhoods of an inner city. In order to evaluate its implementation, a TOD index metric has been selected. Researchers have indicated that there is great interest in defining the markers of a successful TOD. Gu et al., (2019) pointed out that this interest applies both to the assessment and evaluation of existing TOD examples, and to forward-looking design guidelines, forecasting, and regulatory applications. Dorsey and Mulder (2013) designed a TOD Index as a device for evaluating the extent of a

project's success. They recommended the values for essential TOD index indicators when describing the needs of a development project. Therefore, TOD would be helpful to answer the following questions:

- What planning approaches need to be practised when integrating road networks and land-use, and how can the street network be designed at both city and neighbourhood scales to address the principles of sustainable accessibility?
- What are the effects of conventional transport planning? What are the alternatives?
- What are the benefits and challenges of accessibility-based transport planning?

Therefore, the advantages associated with TOD reinforces the value in applying it to the development of transport for Gaza City.

The literature also points out a link between the built form and transport behaviour. For example, different researchers indicate that while the built environment significantly influences trip length or modal split, it has less impact on trip frequency (Kamruzzaman et al., 2019; Motieyan & Mesgari, 2018; Thomas et al., 2018). In comparison, other researchers argue that commuting trips are impacted by density (Pan et al., 2017). Where there is greater density there is a better case for business due to rapid transport and greater potential patronage. While the relationship between the two can be likened to the 'chicken or egg' argument (i.e. whether density must precede investment in public transport for it to be viable or vice versa), evidence suggests that in a dense environment people drive less as they tend to use a public transport system.

TOD is the key to sustainable, efficient, and equitable communities as it prioritizes 3Cs: coordinate, compact, and connected (Nasri et al., 2018). Therefore, urban planners and decision-makers can follow a TOD approach to strengthen their communities.

3.8 Keys to Successful TOD Implementation

Following from review these are seven principles which the Gaza City need to follow to ensure TOD are suggested:

3.8.1 Quality Public Transit

Public transit is strongly associated with urban development. Convenient and high-quality transport depends on connected and dense neighbourhoods. The chief aim of

any transport system is to connect the maximum number of riders in the city in an efficient, comfortable, and affordable way (Baker & Lee, 2019).

3.8.2 Active Transport

The interests of cyclists and pedestrians should be at the core of urban planning. Decision making should provide active transport to residents in the area. Many commuters have to take two non-motorized trips every day by walking from home to a transit stop and then back from the transit stop to home. Therefore, it is important to build on this and develop holistic, non-motorized transport (Staricco & Brovarone, 2018).

3.8.3 Car Use Management

A significant role is played by car use and parking policies to create a safe and humane urban environment (Yu et al., 2019).

3.8.4 Mixed-Use Neighbourhoods with Efficient Buildings

A mixture of land use increases the local economy by diversifying and densifying the design of the community. Mixed-use neighbourhoods favour short trips by bike or on foot. Similarly, buildings should reduce the water and energy consumption needed for the maintenance of building, i.e. enabling efficiency in consumption (Appleyard et al., 2019).

3.8.5 Neighbourhood Centres and Vibrant Ground Floors

A built environment that has adequate public space furthers social interaction among residents. Sustainable urban communities must be sufficiently dense and useable for different purposes which reflect modern living standards. Public space should also be connected with an urban transport network and serve as human-centred places with vibrant activity (Venigalla et al., 2018).

3.8.6 Public Spaces

The purpose of a public space is to provide a safe environment to cyclists and pedestrians while providing a space for social interaction. Public space represents the place of exchange, encounter, and circulation within a community. All individuals have the right to access the public space, regardless of their social, personal, or economic situation (Guo et al., 2019).

3.8.7 Community Participation and Collective Identity

The participation of the community is fundamental to building an inclusive and vibrant neighbourhood that is equitable and safe. Stimulating the participation of the community creates a harmonious and equitable relationship between different social groups who live in the same area. Respecting the unique identity of the local community is helpful in encouraging residents to engage in cultural, civic, and economic activities and in generating a sense of ownership and belonging to a city (Yap et al., 2017).

3.9 The Initial Conceptual Framework for Gaza City

This section will discuss the concept of the framework over two sub-sections. The first subsection highlights the significance of framework in general while the second elaborates specifically on the initial conceptual framework of TOD in relation to this study.

3.9.1 The Importance of a Conceptual Framework

The framework illustrates the key concepts associated with this research, their interrelationships, and the context within which the concepts and interrelationships are applicable (Yin, 2014). Another contribution to the meaning of “framework” was offered by Yusof and Aspinwall (2000) who considered it a schema based on certain assumptions and principles with the purpose of guiding thoughts and actions. Voss et al. (2002) viewed the conceptual framework as a graphical representation of key issues and how they interrelate. Thus, a conceptual framework coherently displays how variables central to the research are linked to one another. These variables have emerged from a comprehensive literature review and the framework design shows how research questions are addressed, while the underlying methodology, data collection methods, and analysis are interlinked in order to provide a valid and reliable source of scholarly research. Thayaparan (2012) views a framework as a research tool that is designed to help the researcher and reader understand the nature of the matter under investigation and how that investigation should proceed.

However, Nilsen (2015) distinguishes between a model and a theory by asserting that a model is descriptive in nature, a theory is both descriptive and explanatory. In a more abstract way, a model can be understood as a theoretical construct that represents something using a set of variable quantities and the logical and quantitative

relationships among them. In scientific research, these are crucial concepts and allow for an investigation into the phenomena including its reasoning. Nevertheless, a model may idealize the situation within the given framework by making assumptions to simplify or remove the error through natural variations within the system. However, literature argues that using the model inappropriate among agencies that have not previously utilized a similar method. This implies that the adoption of a model for the first time is likely to result in problems (Stambler & Barbera, 2014). Furthermore, Rocco and Plakhotnik (2009) pointed out that a conceptual framework may guide the researcher to be selective and to omit important aspects that should be.

The establishment of the conceptual framework is an essential component in the study's context, allowing to direct the research and methodology. Following an examination of established conceptual frameworks associated with (TOD) in the literature review, this study adapts and synthesises components from these frameworks in order to develop a framework that is specific to the aims and objectives of this study.

The procedure includes the identification of crucial elements, variables, and parameters that hold the most importance in relation to the research objectives, specifically pertaining to land use planning associated with (TOD). The study considers the objectives and characteristics of (TOD), including factors such as distance to public transportation, ease of accessibility, variety, and population density, as these factors are the main focus of the study.

The study ensures that the developed conceptual framework aligns neatly with the research goals by carefully selecting, adapting, and synthesising elements from existing frameworks. This customised framework acts as the foundation of the study, offering a systematic method to achieve the objective of the research, specifically in facilitating the alteration of land use to align with TOD objectives.

Creating a conceptual framework is crucial in this study to customise the research approach, integrate important variables, establish structure, and maintain focus on the research objectives. It functions as a fundamental instrument for conducting meticulous and intentional research in the domain of TOD (Wan, T., Lu, W., & Sun, P. 2023). Therefore, it is preferable to use a conceptual framework as a guide for addressing concepts that help to identify main areas during the study by creating a

map that guides the researcher to subject area. In the following section, the conceptual framework of this research is presented in detail.

3.9.2 The Initial Conceptual Framework of the Integration between Road Networks and Land-Use of this Research

The initial conceptual framework of the integration between road networks and land-use implementation was developed from the key issues and concepts identified within the literature review and based on the researcher's knowledge and understanding of the phenomena.

The study carried out an extensive review of relevant literature on land-use planning, road networks, and their integration in the context of TOD. Finding key theories, concepts, and variables that are relevant to the study is the goal of this review of the literature. The candidate determined critical variables and factors that are essential to the integration of land use and road networks within TOD based on the literature review. Road connectivity, land-use types (residential, commercial, etc.), accessibility to transit stations, and the effect of road networks on land-use patterns included among these variables.

The conceptual framework that enabled the study's methodology for understanding the integration of land-use and road networks was either adopted or developed. This framework provided an opening through which to explain the relationships between different concepts and variables. The conceptual framework serves two basic purposes in this research. The first is that it acts as a framework to understand the integration between road networks and land-use; therefore, the framework will be refined throughout the research process based on the knowledge obtained from the experts in Gaza city. The second purpose is that the final framework will act as a baseline to facilitate urban planning in Gaza Council.

Three major categories are included in the conceptual framework which was derived from the literature review. The key factors required to facilitate integration between road networks and land-use (objective), TOD approach (objective) and the potential benefits of integrating road networks and land-use within the Gaza City (objective). This framework (shown in Figure 3.13) illustrates the overall understanding and purpose of the research.

The theoretical framework proposed in this study demonstrates its relevance in Gaza City due to its alignment with the city's overarching objectives, which include urban development, improved transport, congestion reduction, and enhanced overall quality of life. These objectives are essential for Gaza's urban planning endeavours and align with the fundamental principles of the theoretical framework. Moreover, the theoretical framework tackles the urgent requirement for urban spaces that are both easily accessible and environmentally sustainable, which is especially relevant in the highly populated setting of Gaza City. The theoretical framework proves to be a valuable tool for effectively and fairly guiding the urban development of the city by addressing these objectives.

The applicability of the theoretical framework to Gaza's unique context is significantly influenced by the concept of Cultural Sensitivity. The city of Gaza possesses a unique cultural identity that is strongly influenced by its historical background. Therefore, it is crucial to incorporate indicators such as community involvement and shared identity. The information obtained from secondary data sources and local conversations highlights the crucial importance of safeguarding and honouring the city's abundant cultural heritage for the effectiveness of TOD projects. The historical and cultural identity of Gaza is closely connected to its urban structure, which requires the theoretical framework to consider these aspects. By aligning itself with the city's cultural values and aspirations, the theoretical framework promotes a more sustainable and culturally vibrant urban landscape.

Moreover, the theoretical framework emphasises significant importance on the indicators of community participation and collective identity, as they play an active role in promoting social cohesion, cultivating local ownership of development initiatives, and fostering a unique sense of place. The significance of community involvement in decision-making processes and the importance of development projects that align with the cultural identity of Gaza City are underscored by the evidence derived from secondary data sources and local dialogues. The aforementioned indicators exhibit a synergistic relationship with other components of the theoretical framework, thereby fostering inclusivity and cultivating a collective sense of belonging among the inhabitants of Gaza City. As a result, this collaboration enhances the capacity of the theoretical framework to promote a more sustainable and culturally meaningful urban setting. The presence of a strong body of evidence that substantiates these principles

guarantees that the theoretical framework is appropriately customised to address the distinct requirements and cultural milieu of Gaza City.

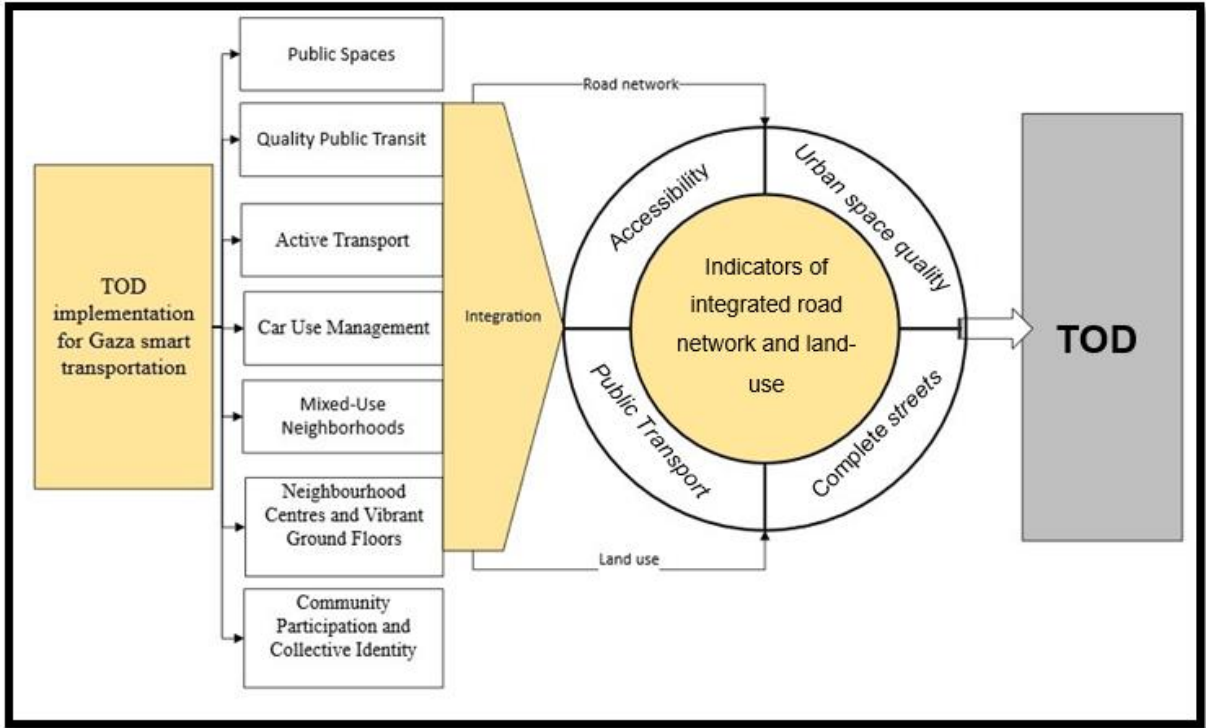


Figure 3-13, The developed theoretical framework on the base TOD major objective.

CHAPTER 4

Land-use and Road Networks in Gaza City

CHAPTER 4: Land-use and Road Networks in Gaza City

Chapter four of this study assumes a crucial role in the exploration of the implementation dynamics of TOD. This chapter delves extensively into the existing literature pertaining to Gaza City, which serves as the fundamental basis for the research. This chapter thoroughly examines the diverse range of factors that impact TOD outcomes within the expansive realm of urban planning and development. In this study, our objective is to provide insight into the complex relationship between demographic data, economic indicators, urban planning policies, and the condition of transport infrastructure. We seek to clarify how these factors significantly influence the feasibility and effectiveness of TOD.

The aim of this chapter is essentially congruent with broader research inquiries and goals. In the attempt of clarifying the factors contributing to the effective implementation of TOD, it is crucial to comprehend the contextual factors. In Chapter four, the study provides a comprehensive analysis of each contextual variable, revealing their importance and the complex ways in which they influence TOD within the particular context being investigated. The objective of Chapter four is to provide a comprehensive understanding of the interaction between demographic trends, economic factors, urban planning regulations, and transport infrastructure conditions in shaping the direction of TOD. This chapter will explore how urban planning policies can either support or hinder the implementation of TOD, as well as how the condition of transport infrastructure can either enhance or hinder its advancement.

Moreover, this chapter seeks to describe the wider context in which the research is conducted. It functions as the connective element that connects the empirical investigations of the study with its theoretical foundations. The insights obtained in this study are not merely theoretical conclusions; rather, they serve as the fundamental elements that connect the various components of the research, shedding light on the trajectory towards a more intricate comprehension of how TOD can be efficiently cultivated and incorporated into the urban environment.

As the chapter initiates its exploration of the literature related to Gaza City, it is necessary to acknowledge that the objective is not only to figure out the complexity, but rather to utilise this understanding in order to adopt a more sustainable and well-informed approach to TOD, which aligns with the particular context of the research.

The subsequent pages in chapter 4 offer a thorough analysis of the urban development that incorporates TOD, paving the way for a more nuanced and contextually sensitive comprehension of how TOD can be efficiently cultivated and incorporated into the urban landscape.

4.1 Historical Development of Urban Planning in Gaza City

Atawi (2008), Liu, Ma, Tian, Jia & Li (2015) and Nielsen (2015) have demonstrated that urban transport is one of the most important central structures of city land-use due to the range of its interconnections across various areas. In saving time and effort, and facilitating accessibility, transport has a great impact on the function of land-use (Khatib, 2011). Similarly, Atawi (2008) explains that urban transport is considered a force to attract jobs with the potential for competition amongst commercial trading, travel and services. However, Awwada, (2007) argues that possibility of linking a city with its suburbs for daily transport has led to changes in its infrastructure design and its construction framework. Nevertheless, Abolya (2005) mentions that this issue was not previously possible, especially before the invention of modern means of transport, particularly the vehicle. In the context of Gaza City, the high rates of vehicle ownership have led to variations in its use inside the city, which have had a substantial impact on the development planning of the city (Alhariri, 2011). According to Asarraaj (2015), the significant increase in the population of Gaza City has led to a large rise in the number of vehicles on roads. Moreover, difficult economic conditions have caused record unemployment rates which have prompted many citizens to take up taxi driving as their main job (Asarraaj, 2015). As a consequence, the number of vehicles has surged creating pressure on the roads. This has prompted management at the local government level whose plans to develop the cities require solutions for this complicated problem (Ministry of Planning, 2010). As a consequence, and on the basis of the literature review, it seems that transport represents a need and requirement within Gaza City. It is necessary for economic development and acts as a link between and interacts with land-use. Hence urban planning research is interested in transport planning inside cities (e.g. Amekudzi, Thomas-Mobley & Ross, 2015; Hirsch, Roux, Rodriguez, & Moore, 2013), and has prompted specialists to deal with these issues including the detection and pinpointing of solutions for such complications (Faroq, 2004).

4.1.1 Gaza City

The study area is located at Gaza City, which is the economic capital and largest urban centre in the provinces of the southern cities, called Gaza strip (Mohaisen, 2012), where a number of major roads intersect (Douleh, 2000). Figure 4.1 shows its geographical position among (Ministry of Planning, 2010). The Gaza Strip is one of the most densely populated places on the earth, with a total area of 365 km², a population of over 2 million, nearly 600000 inhabitants, and a population growth of 3.37% (Palestinian Central Bureau of Statistics, 2016). The Gaza Strip has been subjected to many external and internal political, economic, and social pressures that have led to poor socioeconomic conditions for its population (Palestinian Central Bureau of Statistics, 2016). The city is also important for its governmental and educational institutions (Koheal, 2013). Despite the fact that the Gaza Strip is still under siege, there are construction works, new roads, but encroachment by some citizens on public and open lands (Hearzallah, 2014).

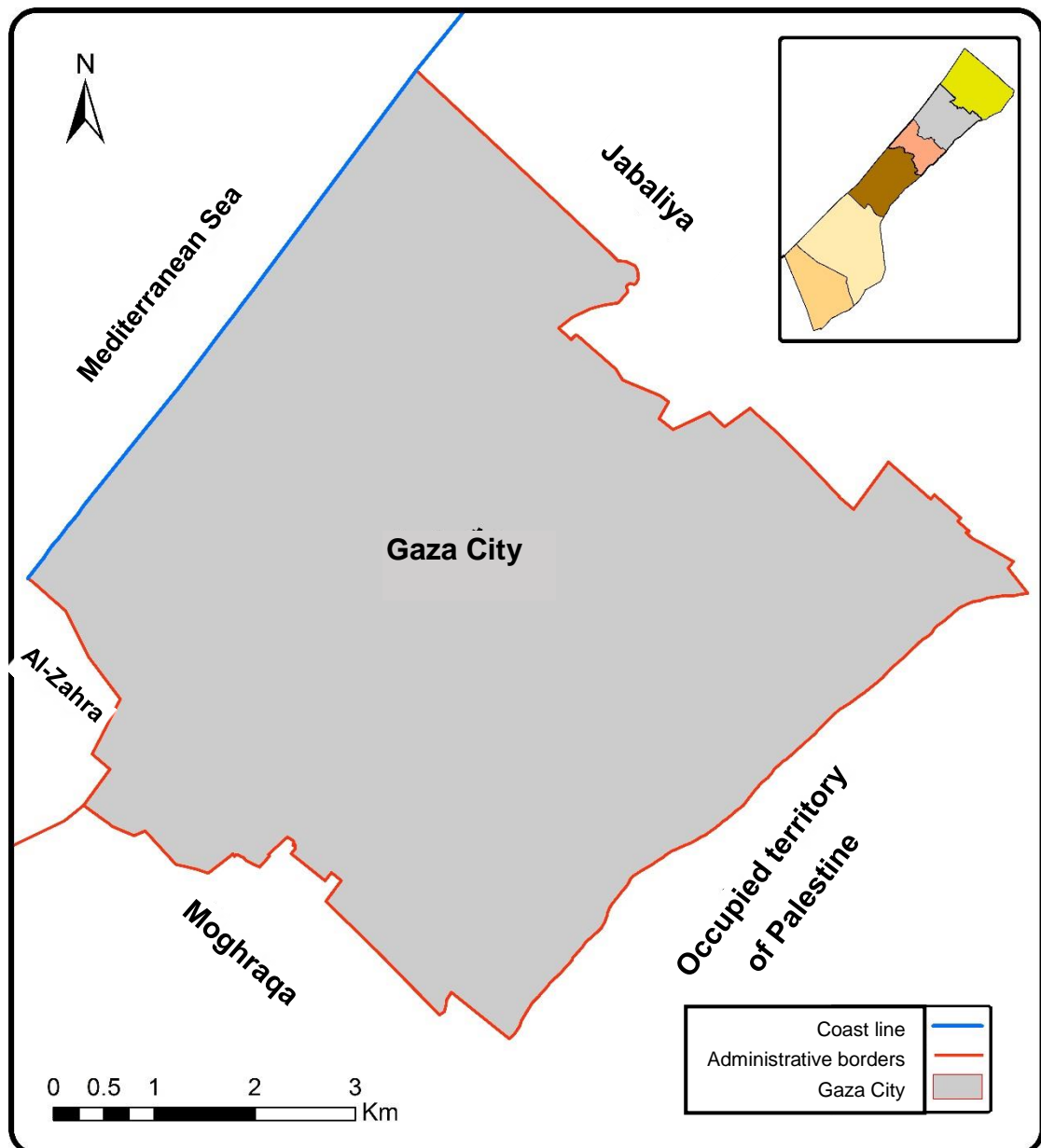


Figure 4-1 Gaza City location. (Ministry of Planning, 2010)

The Palestinian urban planning and local government system has not been updated due to old, inefficient administrative systems especially in municipalities and local government units. These conditions were created by governments ruled by different foreign powers namely, the Ottomans, the British, the Jordanians, the Egyptians and the Occupation. Then in 1994, the Palestinian authority took over (El-Hallaq, & Khalid, 2016). Moreover, challenges and risks associated with urban development in Palestine have arisen due to a lack of jobs, and experiences in different fields than those required (Abu-Eisheh, 2004).

The City of Gaza is one of the oldest Palestinian cities and, since ancient times, it has been an important central region offering a link between the world's commercial and tourist destinations. Travellers move through it due to the importance of its strategic

geographical location between the three continents: Asia and Africa by land, and Europe by sea. It was the temporary headquarters of the Palestinian Authority that held many of headquarters and ministries before the events of the Palestinian division in 2007 (Hearzallah, 2014).

In the fifteenth century BC, the City of Gaza was founded by the Canaanites. In ancient history, Gaza City was occupied by many invaders such as the Pharaohs, Greeks, Romans, and Byzantines. In recent history, Gaza fell into the hands of British forces during the First World War, and became part of the British occupation of Palestine. After this, it was granted to the Occupations in 1948 following which Egypt took control of the land on the Gaza Strip and made several improvements to the city. In 1967 the Occupations reoccupied the Gaza Strip until the Oslo agreement, which then formed the Palestinian Authority in 1994 (Skeik, 2016).

The ancient city is characterized by its maritime location, and most important is its ancient seaports (Mioumas and Anthedon) which are located on the shore of Gaza. Gaza City is an Arab Canaanite city and one of the most important five Canaanite cities, as it is considered one of the oldest city in the world dating back to 3000 BC. Some archaeologists believe that the beginning of the emergence of Gaza City was in Tal Elojool (hill of calves) near Gaza Valley (Wadi Gaza), but its inhabitants abandoned it for the current Gaza Strip because of the destruction and the spread of epidemics and diseases in the Greek and Roman period. Other scientists believe that Gaza City has been in its present position since ancient times, that calves' hill was only its commercial seaport, and that the city was destroyed and rebuilt more than once (Algharaply, 2016).

The old town of Gaza City was initially located on a hill in the middle of a coastal area, which explains its name 'hill city'. It rises 45 meters above sea level, and had a wall and gates. Outside the wall were farms on the slopes of the hill. This was the first stage known as the first belt. Then Gaza expanded during the time of Ayyubid and Mamluk in the seventh and eighth centuries AD, when buildings appeared and neighbourhoods were established outside the walls of the city. This included the neighbourhood of Elshujaeya, which was established during the reign of Salah al-Din, as well as the Altoffah and Alzytoon neighbourhood (Al-Tabaa, 1999). Figure 4.2 shows the location of the old city.

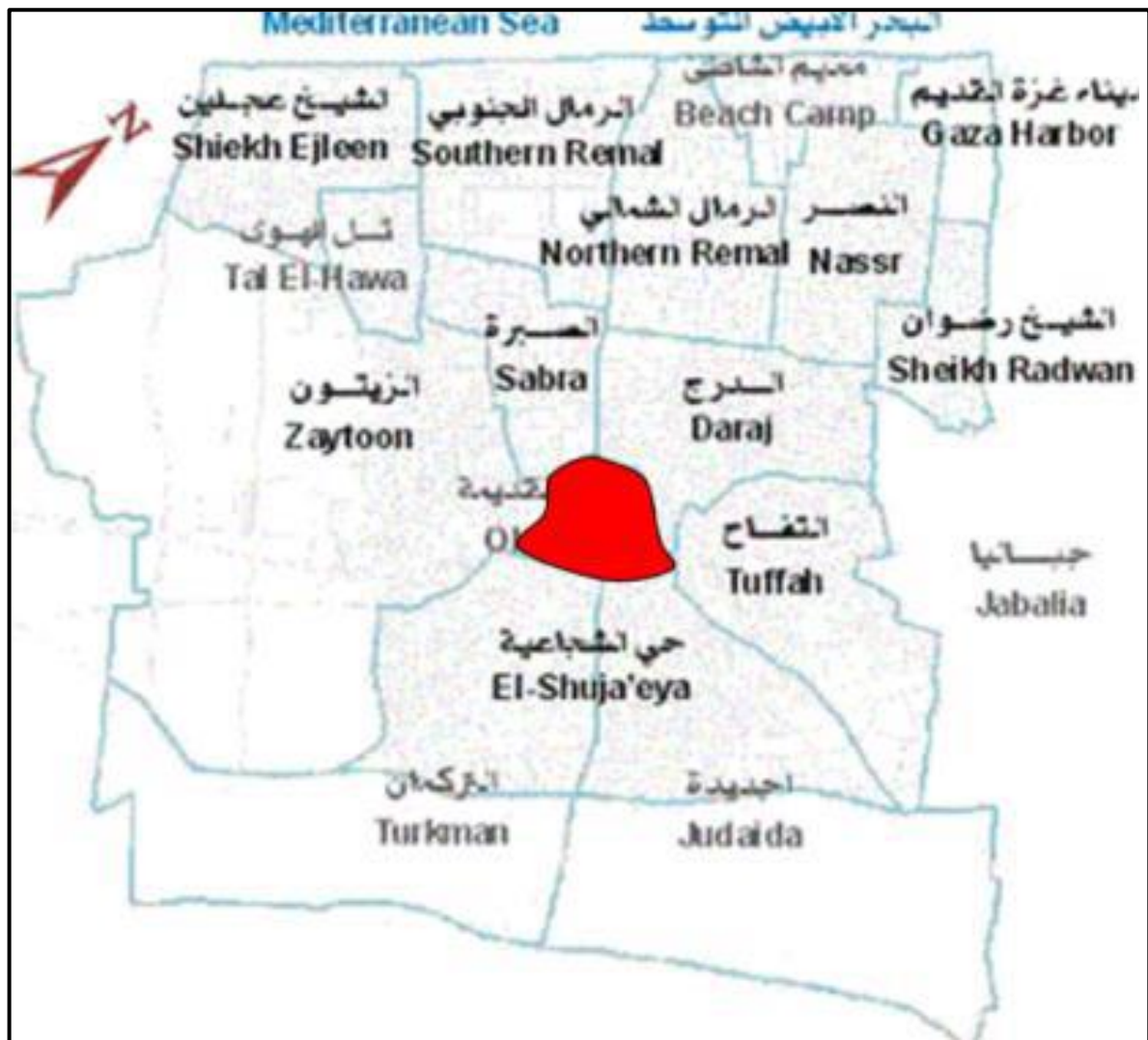


Figure 4-2 Old Gaza city location. (Al-Tabaa, 1999)

4.1.2 The History of Gaza City

The planning and urbanization of Gaza developed over various historical periods. Because of its important location, it has been used as a base for the ambitions of invaders throughout history. The history of the city and its building systems can be divided into two periods: the period of ancient history from its inception to the end of the Ottoman Empire, and the period of modern history since the British occupation until now (Almogani, 2006).

4.2 Geographical Location

Gaza City is located in the centre of Palestine on the coast, and in the northern part of the Gaza Strip on a longitude of 34 and latitude of 31. Gaza City is characterised by its strategic position due to its unique geographical location between Asia and Africa, and between the desert on the south and the Mediterranean on the north. Gaza is

surrounded by the occupied territory of Palestine from the east, on the west by the Mediterranean Sea, on the north Jabaliya, and on the south Moghraqa and Al-Zahra city. It is 12.5 km long and 5.5 km wide, with a total area of 69 km², accounting for 19.9% of the Gaza Strip (Ministry of Planning, 2010). Figure 4.3 shows the geographical location of Gaza City.

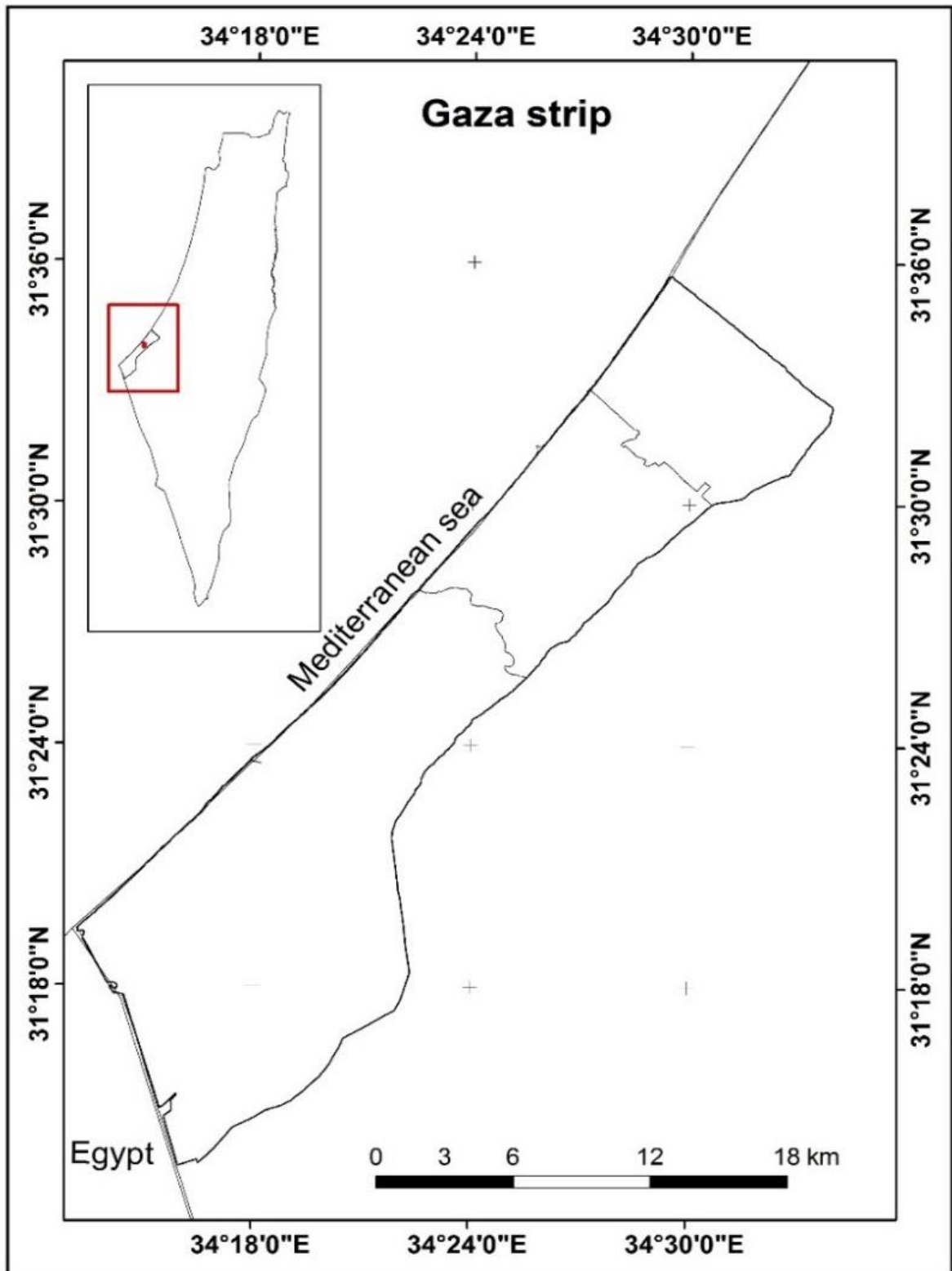


Figure 4-3 The geographical location of Gaza city, (Ministry of Planning, 2010).

4.3 A Summary of the History of Gaza Municipality and its Establishment

The Municipality of Gaza was established in 1893. The first head of the municipal council in Gaza City was Hajj Mustafa Al-Alami, and the last head of the Ottoman age was Mr. Said Alshawa, who completed the municipal hospital. This later became the headquarters of the municipality of Gaza and continues to this day. The City of Gaza was alternatively led by several municipal councils and began in 1893 in the Ottoman Empire. After that, the British Mandate period 1918-1948 occurred, then the Egyptian administration, then the occupation of 1948, and finally the establishment of the Palestinian Authority in 1994.

For the first time in the history of Gaza, President Yasser Arafat issued a decision to form a new municipal council for the administration of municipal affairs, and appointed Mr. Aoun Saadi Al-Shawa to form a city council for the city in accordance with public interest and urgent city requirements. Al-Shawa formed the Council on 26th July 1994, which is now considered the first municipal council under the Palestinian Authority (Siam, 2012).

4.3.1 The Stages of Development Urban Planning in the City of Gaza

The Canaanite Age (3000 - 1200 BC)

In this time, Gaza emerged as a small nucleus, and its coastal road (called Horus Coastal Road) gained special importance. It served as a main commercial route connecting between Egypt and Syria (Karim, 2000). The aforementioned disagreement among the historians as to the original location of the city meant that some believed it emerged on the hill of calves to the north of the valley of Gaza, although its inhabitants abandoned it for the site of the old town between 1580 and 1557 BC. Others said it was in the same place as the current old town, while a different group said it was next to the beach neighbouring Anthidon area on the northwest of the city (Sayam, 2014). This is illustrated in figure 4.4.

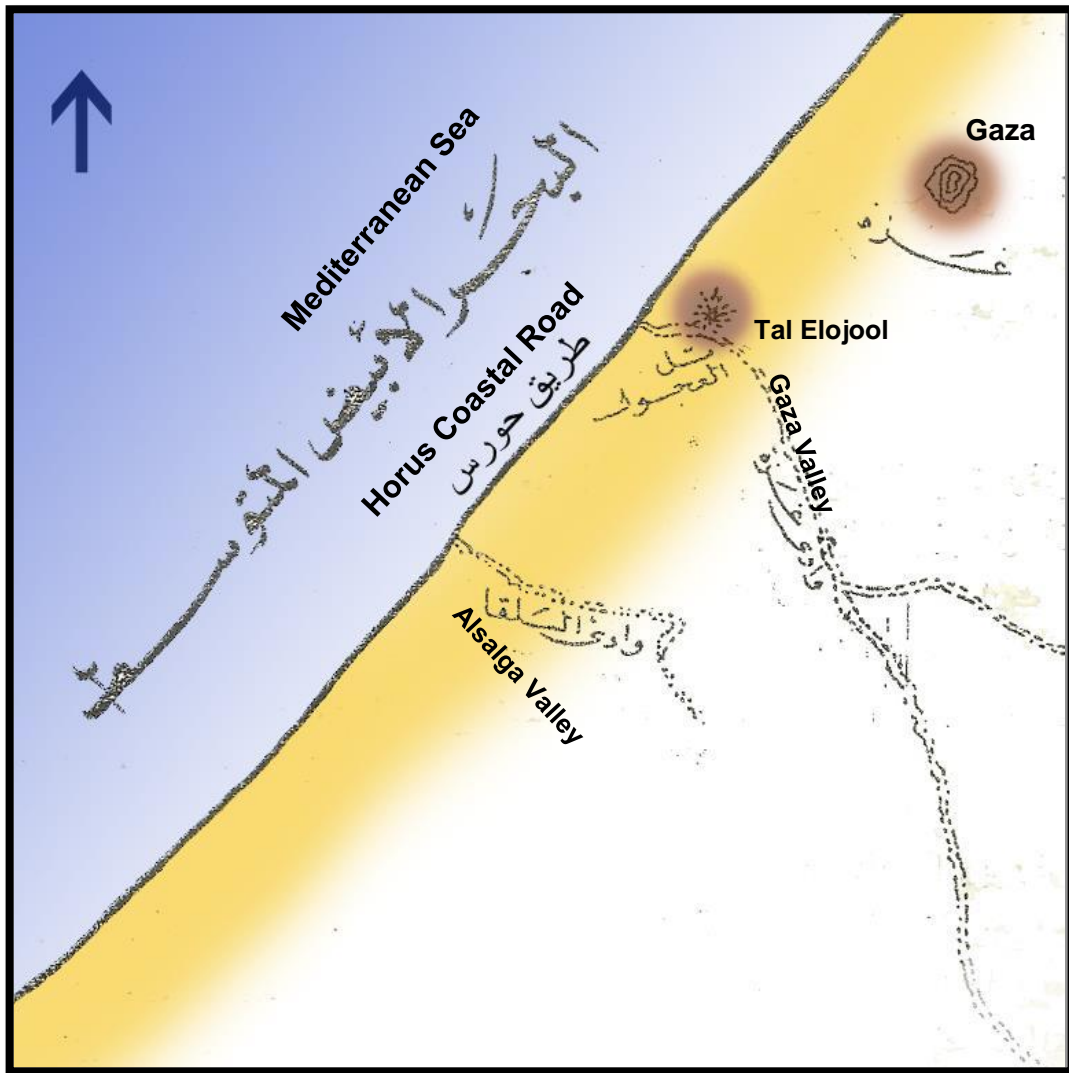


Figure 4-4 Gaza in the Canaanite age 3000 - 1200 BC (Sayam, 2014)

The Greek Period 332 - 65 BC

The City was surrounded by a defensive wall with eight main gates. The seaport of Entheidun was built on the northwest of the city, and the current Sidra Street is part of the old road between the city centre and the seaport (Skeik, 2016). Figure 4.5 illustrates this position.

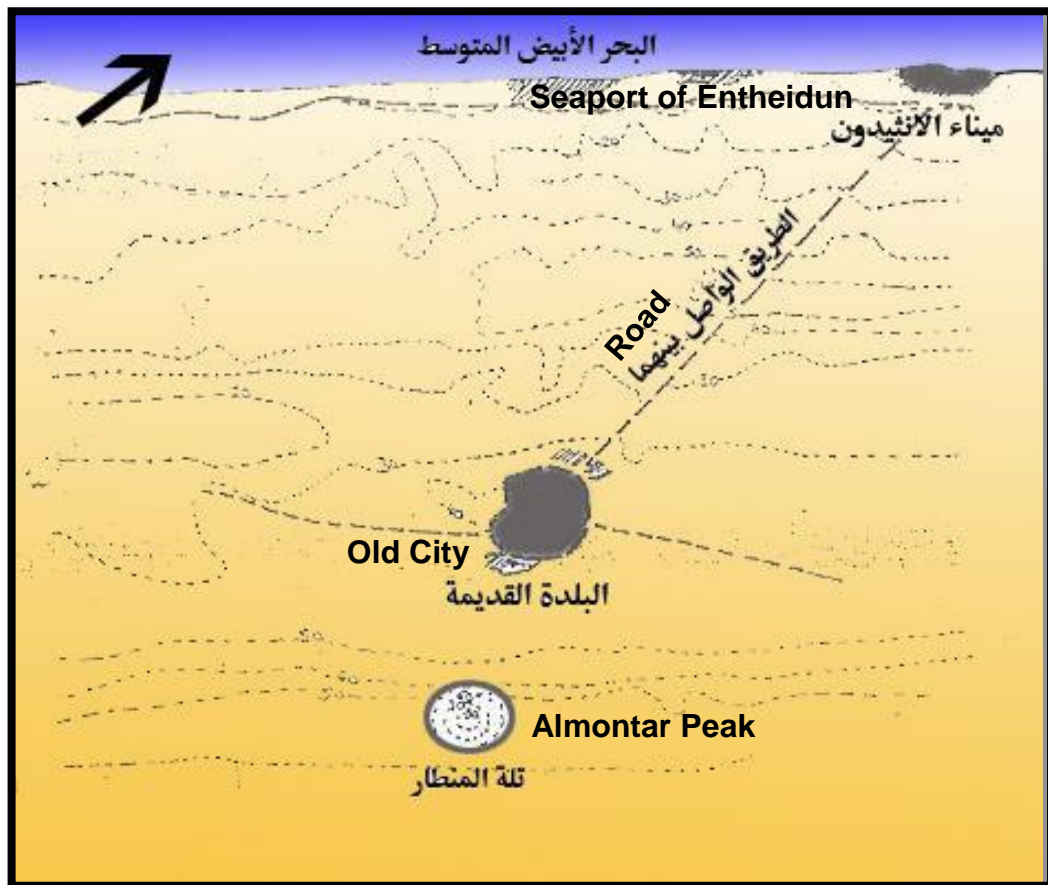


Figure 4-5 Gaza in the Greek Period (Sayam, 2014)

Roman and Byzantine Age (65 BC – 634 AD)

In this phase, the city erected a massive fence with castles of defence spread over four strategic points near the gates. The streets were planned in an orthogonal form this period, and the city had two main perpendicular roads. In the centre of the intersection was the city's central market (Al-Mubaid, 1987). The city was rebuilt after the demolition of roads and dams, and the remains of the Roman wall for Gaza City were found in Al-Balakhia area to the east of the seaport of Al-Anthidun and north of Shati refugee camp (Al-Mughni, 2007).

Gaza became a commercial centre in the second and third centuries. As a result, the Romans established a residential city in the Al-Balkhia area to the east of the seaport of Al-Anthideen. A map of the city of Gaza during the reign of Emperor Justinian 565 - 537 AD, shows streets, public buildings, markets, and the city theatre (Mohaisen, 2012), as shown in Figure 4.6.

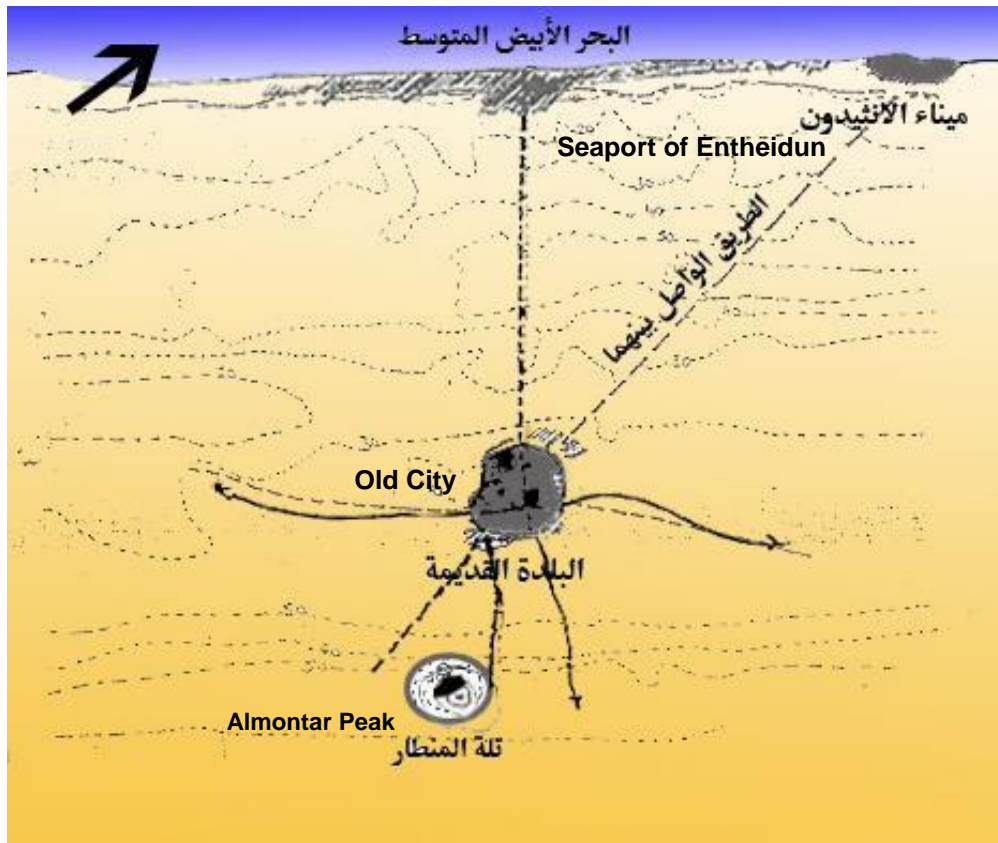


Figure 4-6 Gaza in the Roman and Byzantine age (Sayam, 2014).

The Islamic Period from the Islamic Conquest until Mamluk Period (637 – 1517)

Since the Islamic conquest, the governor had it an administrative capital. Due to its special location, the city remained walled with doors until the twelfth century (see Figure 5.7). After the return of Saladin to Gaza, new neighbourhoods outside the fence began to appear on the eastern side of Elshuja'eya neighbourhood and the southern part of the Turkoman neighbourhood. In the middle of the thirteenth century, the number and density of the population increased in and around Gaza City, who settled north of the city in Al-Tuffah neighbourhood. At this period, the main streets were established, such as Salah al-Din Street, which today is one of the city's most important roads. In the Mamluk period, the city was developed when masjids and schools were built and Gaza City was then considered the main city in Palestine. At this point it became one of the most important postal centres (Karim, 2000), see figure 4.7.

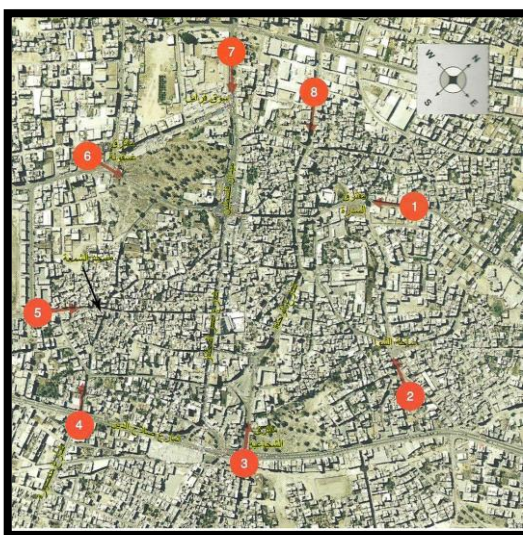


Figure 4-7 Gates of the old Gaza wall (Karim, 2000).

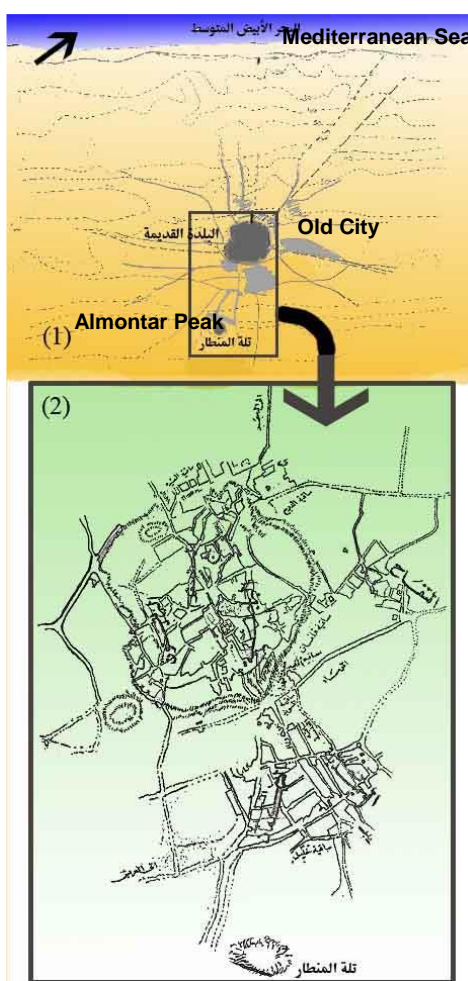


Figure 4-8 The Islamic period from the Islamic conquest until Mamluk showing the expansion of neighbourhoods outside the fence (Sayam, 2014)

The Ottoman Period (1517 – 1917)

Since the establishment of the Ottoman Empire between 1530 and 1681 until Gaza became the capital of Palestine, the city witnessed the renovation and reconstruction of some public buildings and a large number of houses (Al-Mubaid, 1987). In this

period, Omar Al-Mukhtar Street was established when streets were narrow and winding, and some other schools were built. This age saw the development of urbanisation and many markets and masjids appeared, alongside the railway.

However, the wall of the city disappeared and during the First World War, the city suffered from destruction and later succumbed to the British occupation (Jineana, 2017). Aldrich's map of Gaza in 1841 is the oldest map of the city in the Ottoman period, showing some of the public buildings that still exist until now (Al-Mughni, 2007), as shown in figure 4.9.

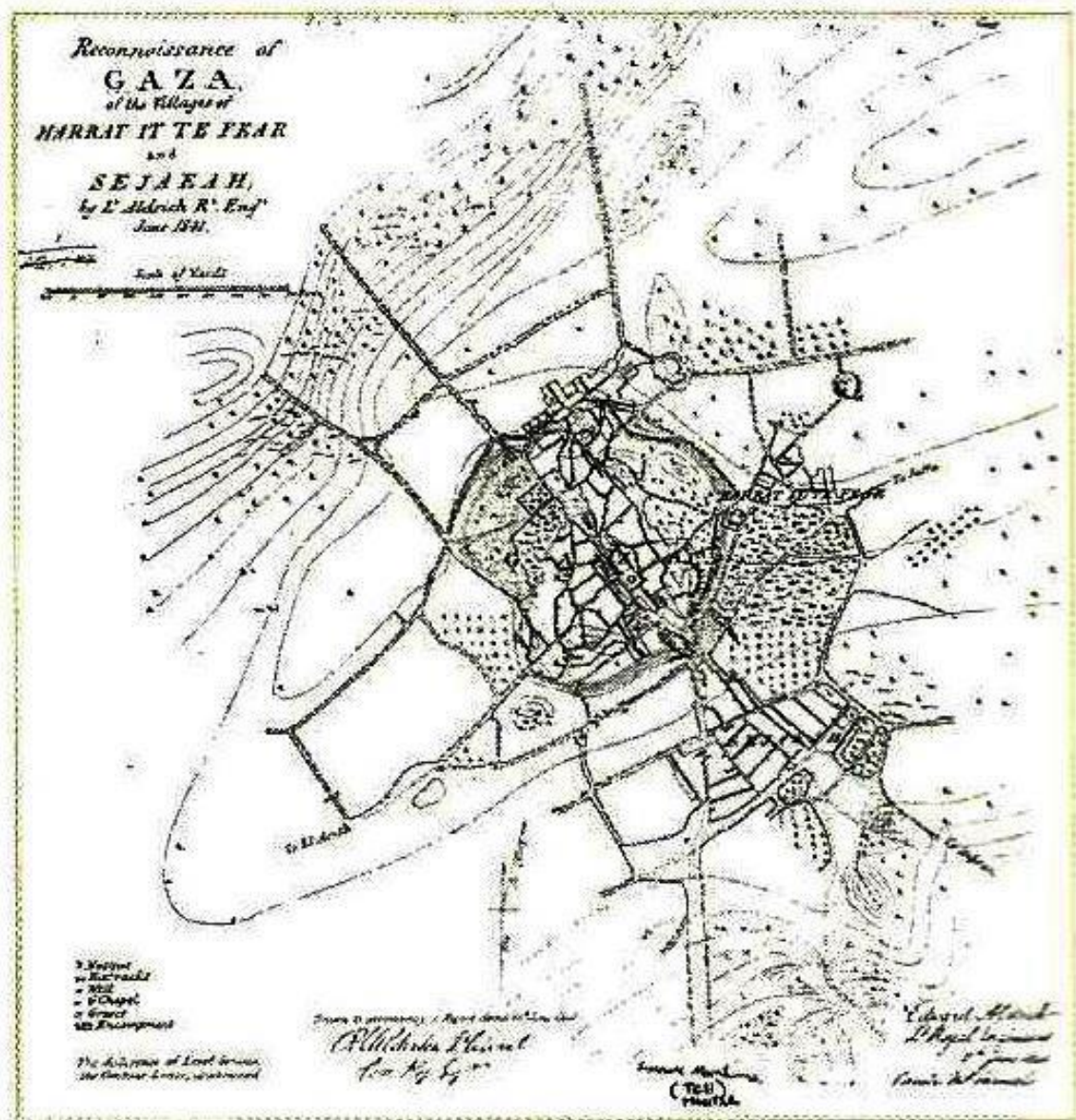


Figure 4-9 Aldrich's map of Gaza in 1841. (Al-Mughni, 2007).

British Occupation (1917-1948)

In this period, Gaza City expanded differently from its previous traditional style, especially in the western region named Alrimal neighbourhood. This pattern was

characterized by an orthogonal grid layout, straight and wide streets, and separation between buildings, while the area was renamed the new Gaza.

At this stage, special laws were issued concerning the organization of cities, such as the Cities Regulation Act of 1936 and the building system in the old city in 1938, which has not changed or developed. These laws had an impact on the shape and layout of the city, and the architectural character differed due to the emergence of new building materials and a different pattern where the land was divided into parts. This led to the emergence of separate buildings rather than adjacent traditional buildings (Abed, 2015). Figure 4.10 shows the development of Gaza during the British Occupation.

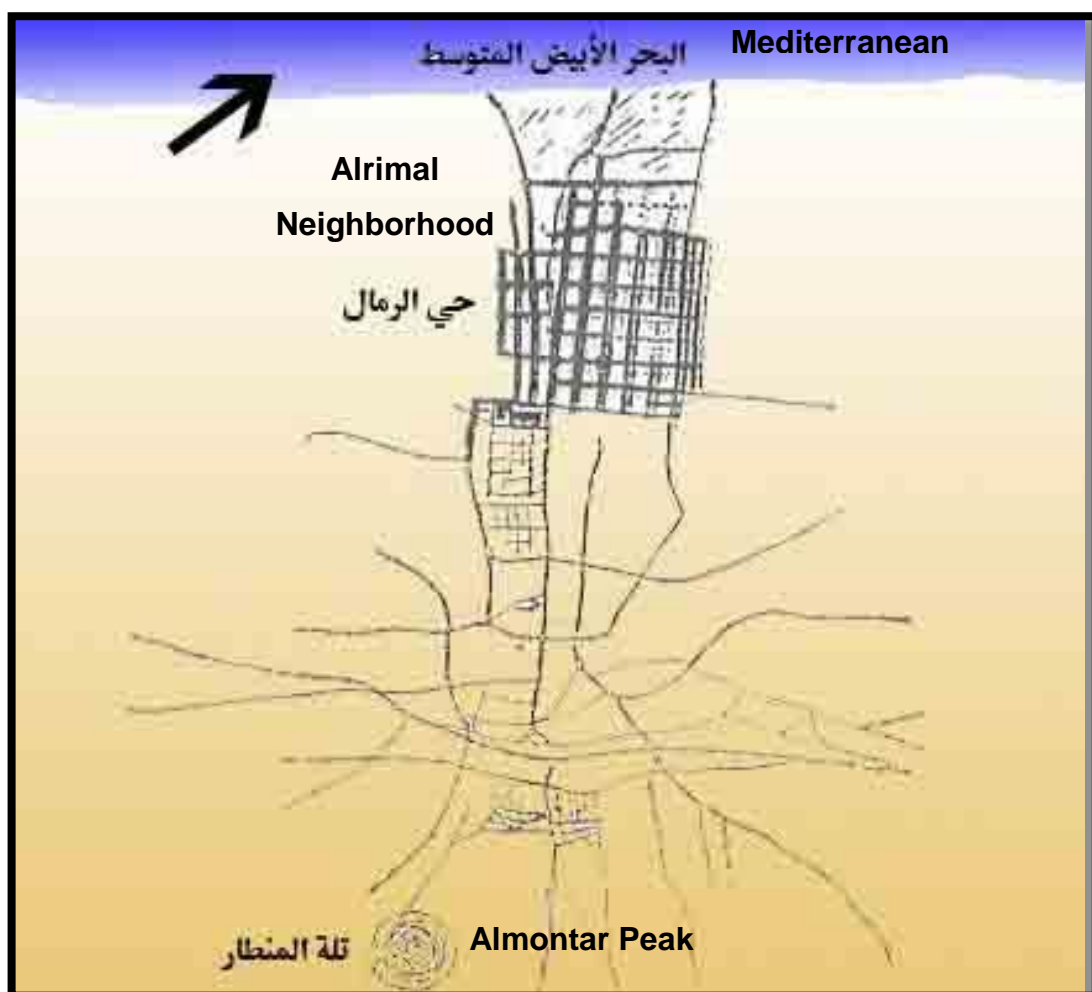


Figure 4-10 Gaza during the British Occupation (Sayam, 2014).

Egyptian Administration (1948 - 1967)

After the Occupation of Palestine in 1948, large numbers of immigrants from other cities came to Gaza. Gaza became under the rule of the Egyptian government with new laws and legislation. In the early 1950s, Shati refugee camp was built, which was

characterized by its high density. Furthermore, Alnasir Street was paved which led to the emergence of the neighbourhood of Alnasir.

At the beginning of the 1960s, Al Wahda Street, an important road in the city, was paved and expanded. The Egyptian administration continued to divide land in the western part of the city, and in 1957, a structural plan was established for 'new Gaza', which included the 'Alrimal Alsh mali' northern sand zone and 'Alrimal Eljnobi'"southern sand zone. Many buildings and institutions were established, such as schools and colleges (Al-Baghdadi, 2009), as illustrated in figures 4.11 and 4.12.

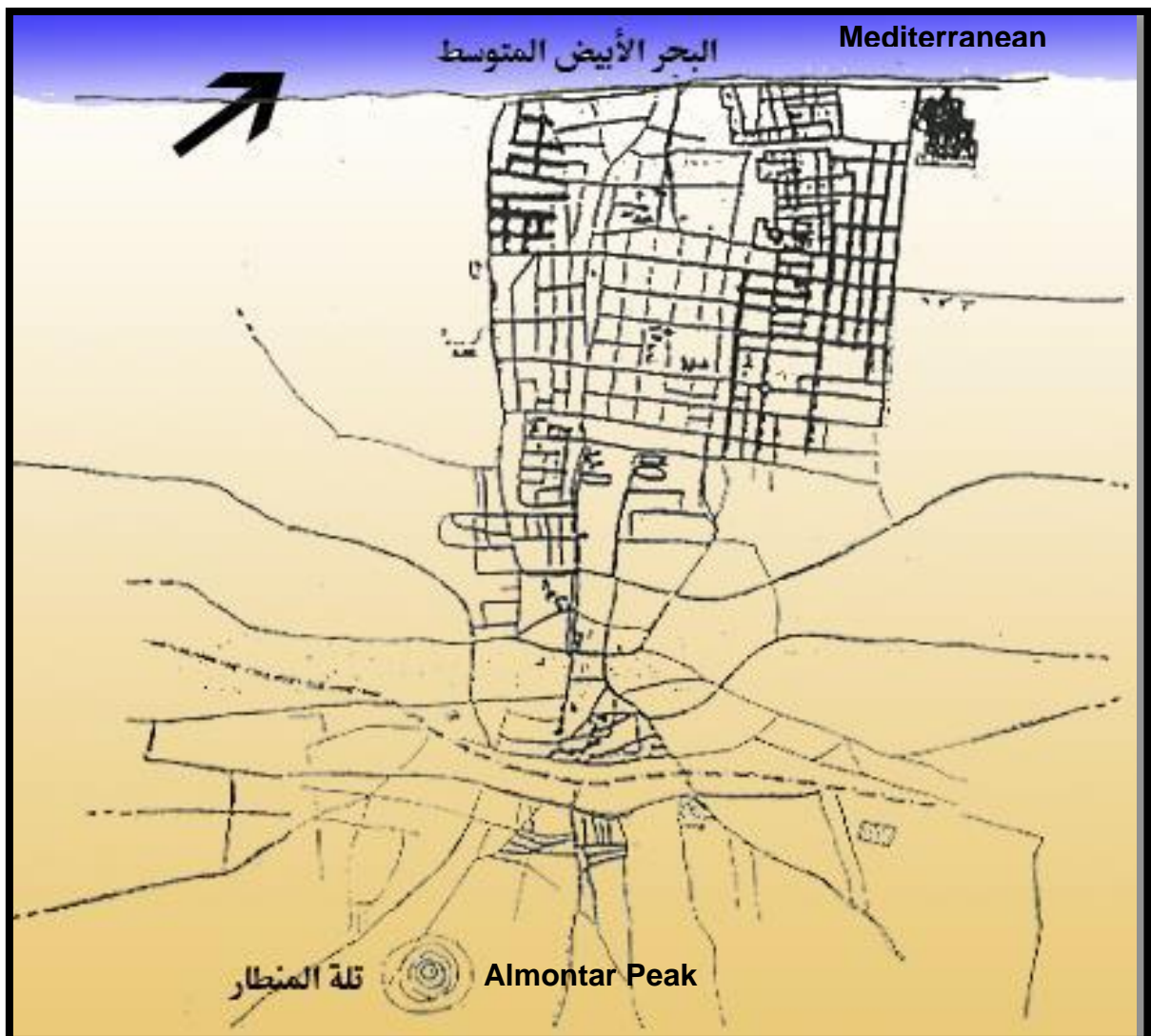


Figure 4-11 Gaza during the period of the Egyptian administration (Sayam, 2014).

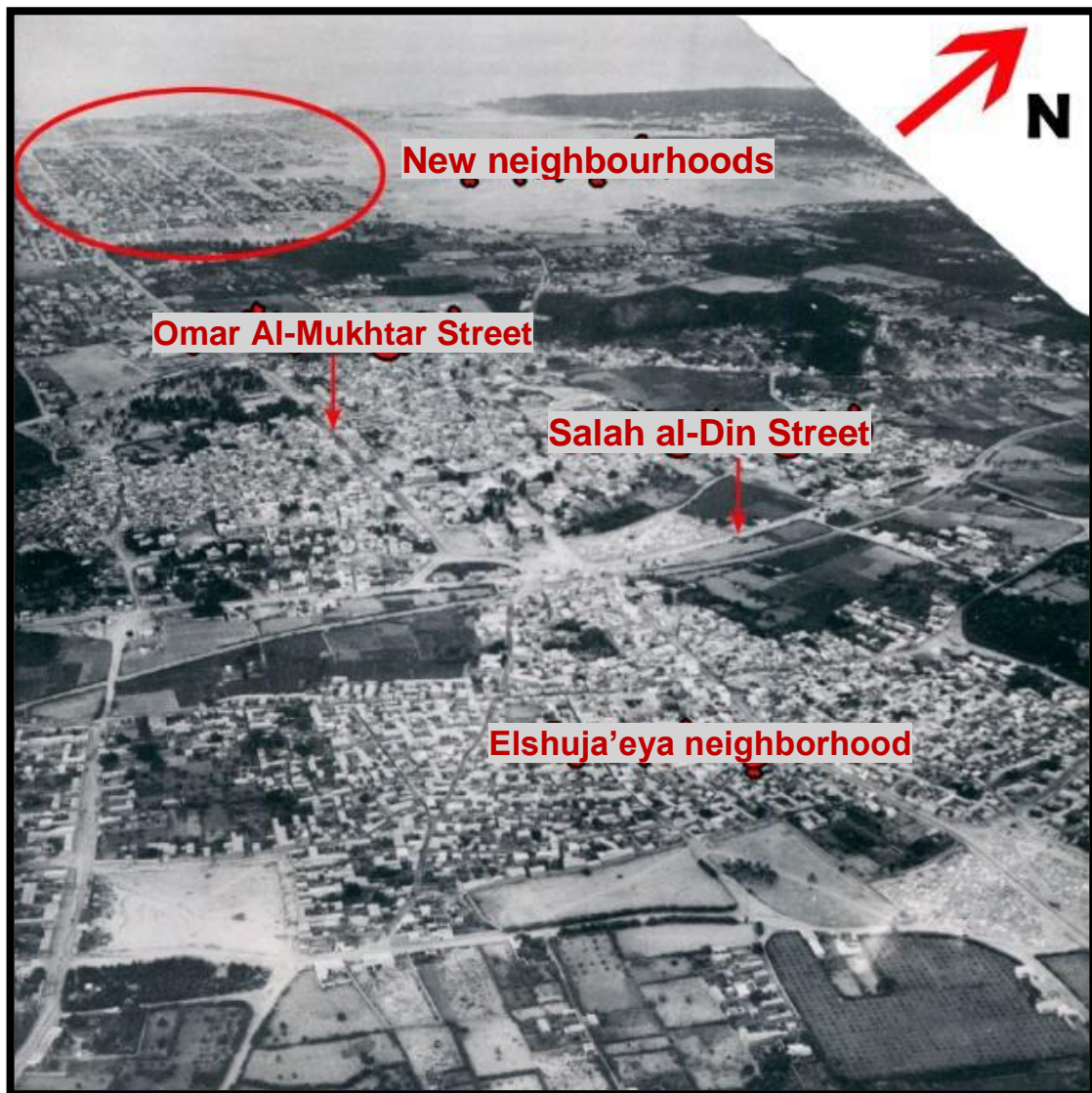


Figure 44-12 City of Gaza in 1956 the period of the Egyptian administration (Al-Baghdadi, 2009).

The Occupation (1967-1994)

In 1967, the Gaza Strip was again subjected to the occupation and new laws and legislation were issued. A new neighbourhood was established in the northwest of the city, called Sheikh Radwan. During this period, the building area in the city declined, as building permits were complex and expensive.

Neighbourhood planning accorded with the occupation military vision, as the occupation authorities created new obstacles to urban development by closing some streets, changed the path of others, and destroyed houses. During the Palestinian uprising, the '*Intefada*' of 1987-1994, the development of the city was halted, and pollution and general destruction to the physical structure occurred across all components of the urban environment. The rate of encroachment on land and public

property increased, leading to an increase in slums (Hearzallah, 2014), as illustrated in Figure 4.13.

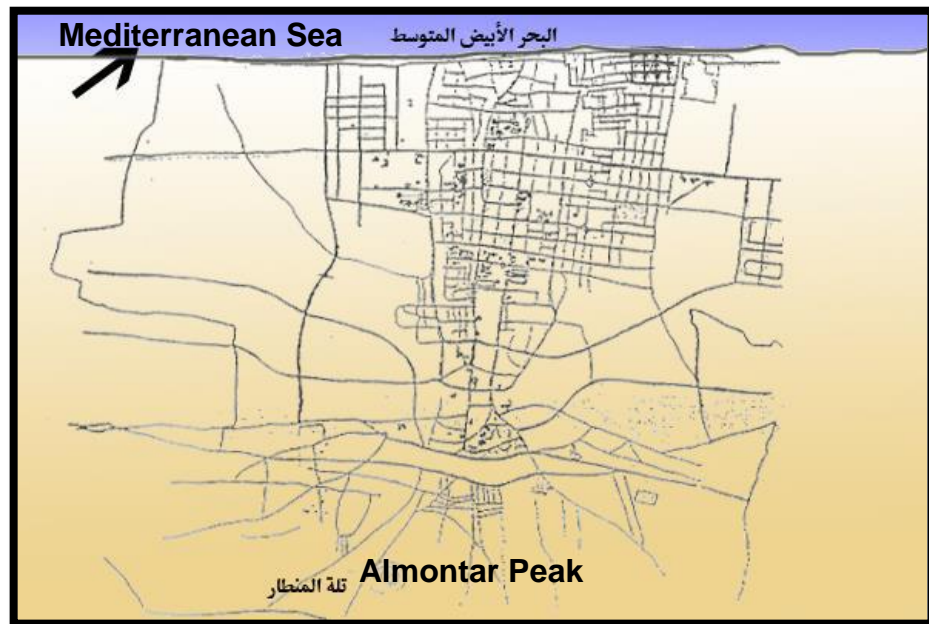


Figure 4-13 Gaza during the period of the Occupation (Sayam, 2014).

The Palestinian Authority (1994-2006)

After the arrival of the Palestinian Authority, the civil powers of the Palestinian Authority were transferred in accordance with the Oslo agreement. This helped to eliminate many of the obstacles that the Occupation erected which prevented urban growth. This led to rapid urbanization, but without urban plans it resulted in random construction and planning. In this period, residential towers spread, and many factories emerged related to construction. New roads were paved and constructed which led to a rise in the price of land and properties (Alkhaldi, 2016).

The conflict between regulatory laws and land ownership has often led to various urban problems including land misuse and an inability to make optimal use of land. These issues arise because some citizens do not observe regulatory laws and build without license without complying with the conditions and regulations. The urban expansion of Gaza City began with its vertical and the horizontal extension (Shanti, 2014).

Since 2006, the situation has worsened again, especially after Hamas won the parliamentary elections, which resulted in a political split within the Fatah movement. After that, the Occupation besieged the City of Gaza and three wars were fought which led to the destruction of infrastructure, including many administrative buildings, towers and masjids. The Occupation has reduced the entry of building materials into Gaza,

which has slowed urban development and the maintenance of road infrastructure. Figure 4.14 shows the stages of development urban planning in the City of Gaza.

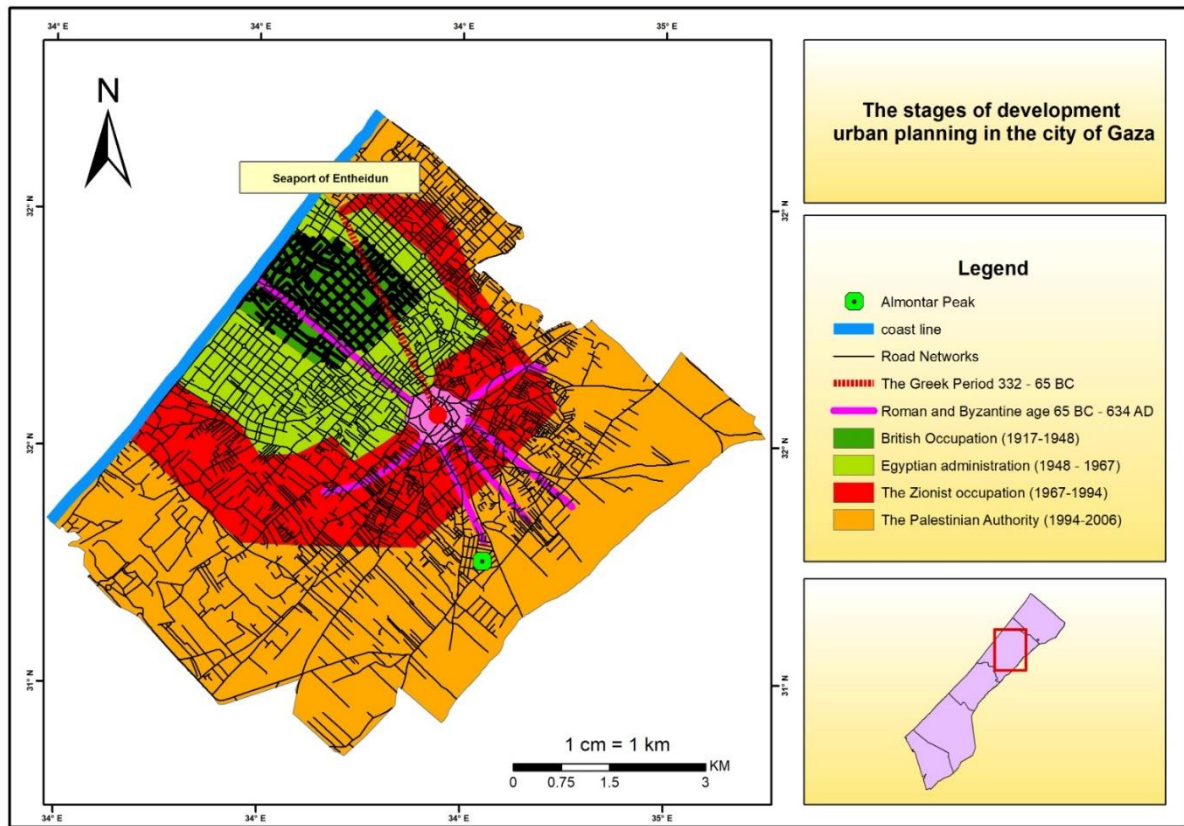


Figure 4-14 The stages of development urban planning in the city of Gaza.

4.4 Land-use in Gaza City

The study of land-use and its form produces information about the natural structure of the city, its inhabitants and their activities. It seeks to organize the city in an efficient manner to prevent conflict in land-use. To achieve this goal, a systematic assessment of the potential alternative uses of land can be carried out, which will help to identify and adopt the best options for land-use. Thus, a land-use plan provides a possible future vision for development in regions and cities (Asheakh Eid, 2015).

The use of land in Palestinian territories has not been properly planned. Urban expansion occupies a large part of the city's territory, and the projected expansion of urban areas to 2025 indicates a serious threat to natural resources. Therefore, it is very important that the natural and functional relationships between different regions are understood to enable good urban planning. This understanding can help to accurately identify areas for future urban development in order to reduce the contrast between urban development, and natural and environmental resources. Indeed, it will

not be possible to integrate urban planning with the land-use if it is not well considered (Asheakh Eid, 2015).

This chapter considers land-use and the road network in Gaza City, in order to analyse and evaluate it.

4.4.1 Planning Patterns and their Impact on the Urban Fabric of Gaza City

Figure 4.15 shows that planning patterns in Gaza City are divided into two types of area - planned and unplanned - which are defined as follows:

Planned Areas

This denotes the neighbourhoods located in the western and north-western parts of Gaza City. They are characterized by network planning, such as Al-Rimal, Al-Nasr, Sheikh Radwan and parts of the Sabra neighbourhood.

Unplanned areas:

These areas are located in the old neighbourhoods and camps which grew randomly, and are characterised by weak planning. The road network is irregular and inefficient at accommodating traffic and parking. There is also a clear lack of green spaces, playgrounds, and public facilities, especially for children. Owing to the ownership and inheritance of private land, it is difficult to create the necessary services for the population such as schools, health centres, and clubs. Therefore, these areas lack basic services, such as public services and utilities from water, electricity, and sewage networks (Al-Mughni, 2002).

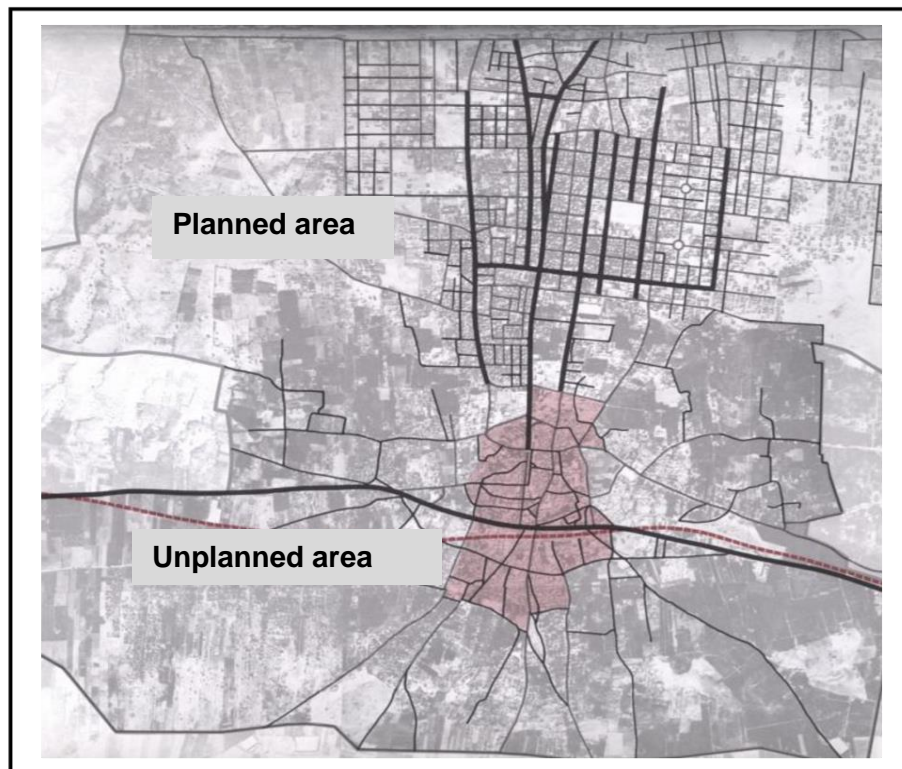


Figure 4-15 Planning patterns in Gaza City, (Gaza Municipality, 1996).

4.4.2 Urban Development Controls

The urban growth factors of Gaza City changed according to the different ages experienced by the city. The historical events that the city experienced politically and economically have had a clear impact on urban growth. The following are the most important factors for urban development in Gaza City (Salha, 1997).

The City Wall

The city wall is the limit that cannot be exceeded by urban growth. It represents the first line of defence of the population, so the expansion of the city has occurred within the wall. In the context of Gaza, an area with limited land availability and high population density, the city wall might function as a significant factor in discussions regarding the expansion of public transport infrastructure. Planners have the opportunity to investigate various strategies for incorporating transport hubs or stations in nearby to the wall, thereby enhancing convenient accessibility for both residents and visitors (Mohsen, 2015). The city can encourage TOD by strategically placing transportation nodes, which will decrease dependence on private cars and alleviate traffic congestion. Furthermore, efficiency of land use can be achieved through the promotion of mixed-use development in nearby of urban areas. The proposed methodology integrates residential, commercial, and cultural areas within a shared

geographical area. The implementation of this initiative has the potential to encourage economic activity, decrease commuting distances, and develop a dynamic urban environment. To ensure that new developments comply with the historical character of the area, it is possible to implement specific zoning regulations. (Berawi et al., 2020).

Land Ownership

Land ownership has played a prominent role in controlling urban growth and land-uses. The extension of the government's land was linked to a policy inherited by successive governments. The British occupation divided many of the lands and distributed it to citizens in the west of Gaza City as well as the Egyptian government. This led to urban expansion west of Gaza city and has limited use to the population. Also, the Occupation government established many housing projects in the north of Gaza City, such as Al-Rimal and Sheikh Radwan, which resulted in a concentrated population in the north and west of Gaza City. In addition, commercial and industrial initiatives were neglected in development projects. The lack of government lands has meant the urban extension process is associated with the process of land selling. Thus has also meant that urban growth and the distribution of land-use has occurred according to the desires of individuals rather than a clear structural plan (Mohsen, 2015).

According to Asarraj (2015) explained that, "effectively addressing the challenges posed by limited government-owned land and the dependence on individual landowners to drive urban growth in Gaza necessitates a comprehensive and strategic approach. One key strategy is the establishment of clear zoning regulations that delineate specific land use categories, including residential, commercial, industrial, and cultural zones. Additionally, special attention should be given to areas of historical significance, with tailored incentives or regulations designed to encourage their preservation. Strategic infrastructure investments, particularly those aligned with the city's development goals, should be prioritized. Infrastructure, such as public transport corridors, can significantly influence land use and development patterns. By strategically locating transport hubs or routes, urban planners can guide development to specific areas while relieving pressures on others".

Population Growth

After Palestine was occupied in 1948, the number of people in Gaza City increased significantly due to wars and the migration of residents to Gaza from neighbouring

cities. As a result, the city experienced a substantial increase in population, (as table 4.1 illustrates) leading to various urban challenges and opportunities. At this point, the Al-Shati camp was set up randomly in the west of Gaza City (Mohaisen, 2012).

Table 4-1 Population of Gaza City 2017-2024, (Palestinian Central Bureau of Statistics, 2021)

Year	Population
2017	583447
2018	598633
2019	614071
2020	629723
2021	645576
2022	661613
2023	677799
2024	694146

Considering the current increase in population, it is crucial to develop a comprehensive urban plan that effectively meets to the requirements of the expanding population. A comprehensive strategy should thoroughly delineate appropriate locations for housing development, considering critical elements such as proximity to employment prospects, availability of essential public services, and effective transport infrastructure (Bibri, S. E., et al 2020).

In order to effectively manage land resources and address the issue of urban sprawl resulting from the migration of residents to Gaza, it is necessary for the municipality and decision makers to prioritise the implementation of land use policies that emphasise efficient land use. This may include the implementation of vertical construction techniques for residential units, thereby optimising the utilisation of limited land resources and reducing the need for urban expansion. These policies facilitate an equitable distribution of land and promote sustainable urban development (Salha, 1997).

Moreover, Furthermore, the Gaza city and decision makers should take into account the synergy between population growth and transport infrastructure. Enhancements and expansions of railways, roads, and transport hubs are appealing factors for residents, impacting their choices to relocate to urban areas. The phenomenon of

population movement results in the redistribution of residents, thereby potentially influencing the demand for transport services.

There is a clear connection between population density and transport routes, whereby higher population densities are associated with increasing traffic volumes on roads. Hence, it is imperative to comprehend the population dynamics of the urban area in order to efficiently strategize transport networks (Chang, et al., 2021). Table 4.5 shows the relationship.

Administrative Factors

Gaza City is considered the administrative capital of Gaza Strip, making it a central attraction to residents from neighbouring areas. Moreover, the existence of government and educational institutions such as ministries and universities in addition to health services has influenced many employees' decision to live in Gaza City (Mohaisen, 2012).

The concentration of government and educational institutions in Gaza City has significant effects on the demand for housing and the needs for urban infrastructure. The presence of government offices, ministries, and universities in Gaza City attracts a large number of employees and students. The increase in the number of people looking for jobs and education has led to a higher demand for housing, especially in areas close to these institutions. As a result, the increased demand has caused a shortage of housing, causing property prices to rise and making it less affordable for many residents (Abuhayya, M. I. 2022).

Furthermore, the concentration of governmental and educational establishments creates significant strain on the urban transportation infrastructure, including both roadways and public transport networks. According to Pereira et al. (2017), the need to accommodate daily commuting places additional pressure on the city's transport infrastructure. One possible approach to address these difficulties is to distribute government and educational resources to different areas. Implementing this strategic allocation can facilitate a more equitable regional progress, easing the demand on Gaza City while stimulating expansion in other areas. The implementation of decentralisation in Gaza City shows possibilities in addressing the issue of housing demand, thereby improving the accessibility and affordability of housing options for its inhabitants.

Moreover, the implementation of decentralisation has the potential to achieve enhanced transport systems and decrease congestion by minimising the necessity for extensive commuting to Gaza City. Additionally, this decentralisation strategy is in accordance with the principles of TOD, which can be more efficiently performed through the geographical separation of government and educational institutions across diverse regions. This allocation facilitates the establishment of transport hubs and diverse residential areas, promoting environmentally friendly and easily reachable urban lifestyles.

Government Restrictions

The influence of government regulations in Gaza City on urban planning objectives is significant, as these alignments or conflicts have significant implications for the future prospects of TOD. Government laws work to limit urban growth in Gaza City. One of these restrictions is the prevention of construction in areas adjacent to the line between the Gaza Strip and the 1948 occupied territories. In addition, the municipality of Gaza does not allow construction in areas outside its jurisdiction and does not provide any services (Mohaisen, 2012).

There are specific regulations that correspond with the broader goals of conserving sensitive border regions, ensuring security, and protecting natural resources, particularly those that limit construction in areas close to the Gaza Strip's border with the occupied territories of 1948. The rules align with broader imperatives related to protecting and management of land. Additionally, the administrative authority of the municipality in relation to construction is in accordance with the core principles of urban planning, which include maintaining order, promoting infrastructure development, and effectively regulating land use. The synergy of urban development strategies is significantly influenced by municipal control (Abreek-Zubiedat, F., & Nitzan-Shiftan, A. 2021). However, the interaction between these regulations and the objectives of urban planning can sometimes lead to conflicts, especially in efforts to accommodate population growth and promote holistic development. According to Schilderman and Lowe (2002), the implementation of regulatory limitations on construction in certain areas can lead to issues such as overcrowding and limited land availability for new development projects. This can potentially hinder the progress towards achieving (TOD).

Moreover, the limitations faced by the municipality in delivering services to specific areas as a result of the ongoing Occupation present a hindrance to the development of essential infrastructure necessary for TOD, such as the creation of public transport centres and the incorporation of mixed-use projects. This situation greatly hinders the possibility of achieving sustainable urban living.

4.4.3 Development of Land-use in Gaza City

Throughout periods of history, cities with different geographical locations have experienced different types of land-use. It is natural that these patterns are formed according to many factors, such as function, location, and position. Land-use in Gaza City has undergone several stages, and has been influenced by the prevailing political, economic, and social conditions. The British government was considered the first government to develop an urban plan for Gaza City in 1934. The planning was characterized by wide streets perpendicular to each other, but the plan neglected the provision of markets and parks (Salha, 1997). It was followed by a period of Egyptian rule which completed the British scheme. Figure 4.16 shows the land-uses of Gaza City in 1978. Land-uses were limited to population, agricultural, graveyards and space use at that time. It is noted that agricultural land-use was prevalent in that period.

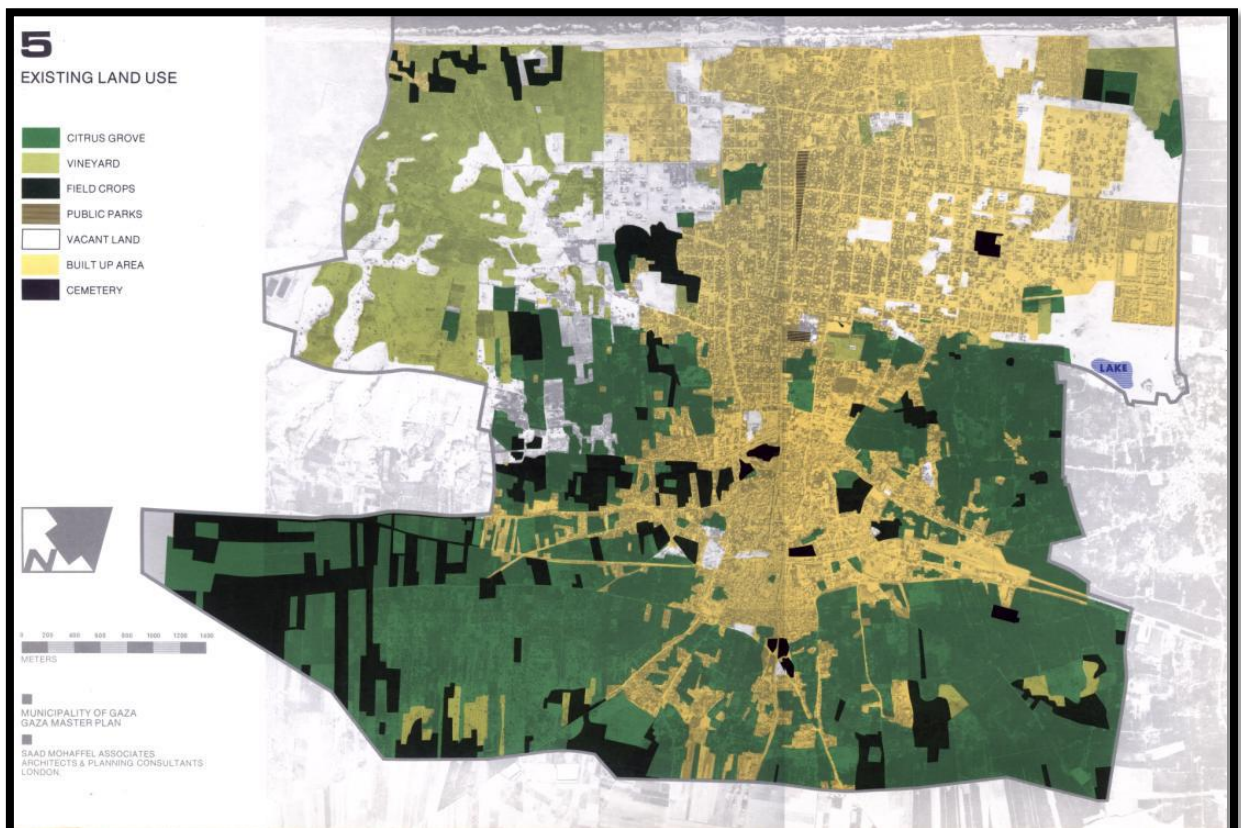


Figure 4-16 Land-use in Gaza City 1978, (Gaza Municipality, 1996).

A plan for the City of Gaza was drawn up in 1979, as shown in figure 4.17. However, this plan had many problems; the services were not available as required, such as markets and parks. In addition, the plan was not implemented because it needed huge sums of money, while the obstacles imposed by the Occupation caused problems (Asheakh Eid, 2015).



Figure 4-17 The structural plan proposed for Gaza City in 1979, (Gaza Municipality, 1996).

Gaza City continued to grow indiscriminately for a period of time without the control of urban plans until the end of 1992. Then, a structural plan was approved by the Occupation, as shown in figure 4.18. This scheme, like the previous ones, had many drawbacks: agricultural areas, green areas and commercial areas were reduced, and industrial zones were placed on the southern edge of the city (Al-Mughni, 2002).

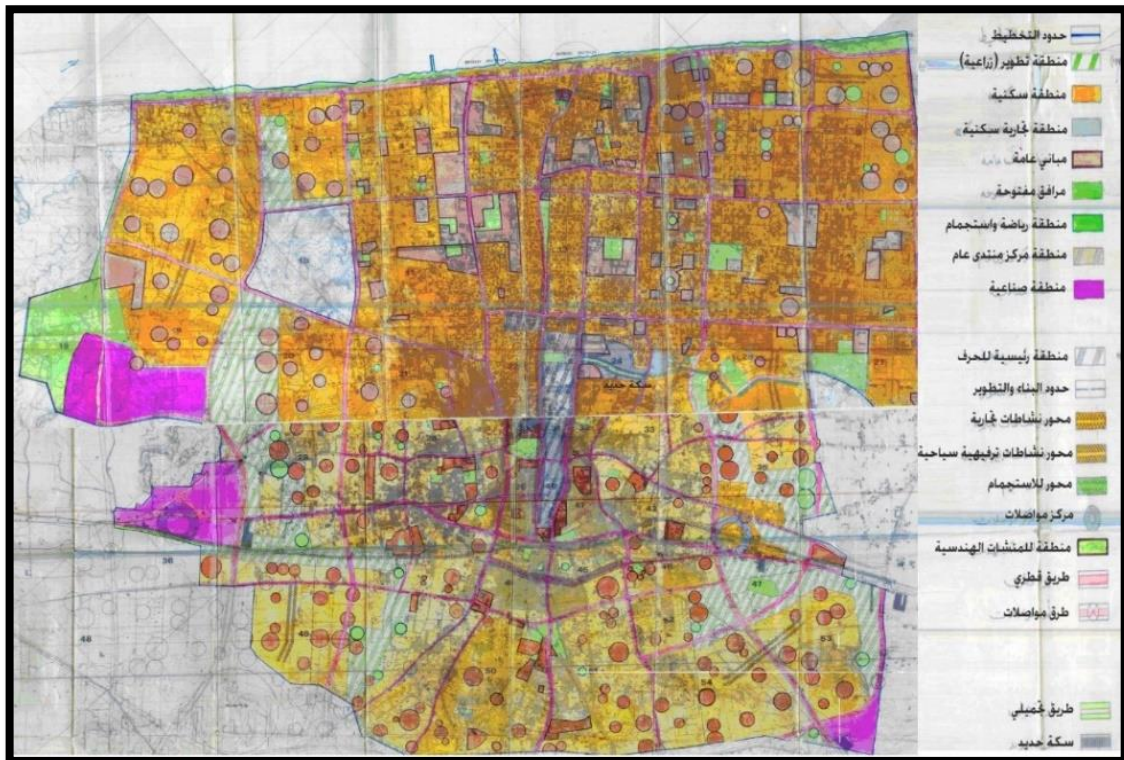


Figure 4-18, The structural plan proposed for Gaza City in 1992, (Gaza Municipality, 1996).

After the advent of the Palestinian National Authority, a master plan for Gaza City was carried out; it was adopted in 1998 and helped to achieve several objectives. These objectives were intended to guide the processes of urbanization in the city, provide a healthy and safe residential environment and develop basic services which corresponded with increases in the population. Also, the master plan attempted to prepare a high-efficiency transport network. Moreover, it aimed to protect natural resources and develop infrastructure (sanitation, water, and solid waste). It is clear from the objectives of the proposed master plan that it was designed to address urban issues, and can be seen as a contingency plan to deal with urgent planning problems of planning. Therefore, it is not a comprehensive and detailed plan (Al-Mughni, 2002). See an illustration of the Master Plan in figure 4.19.

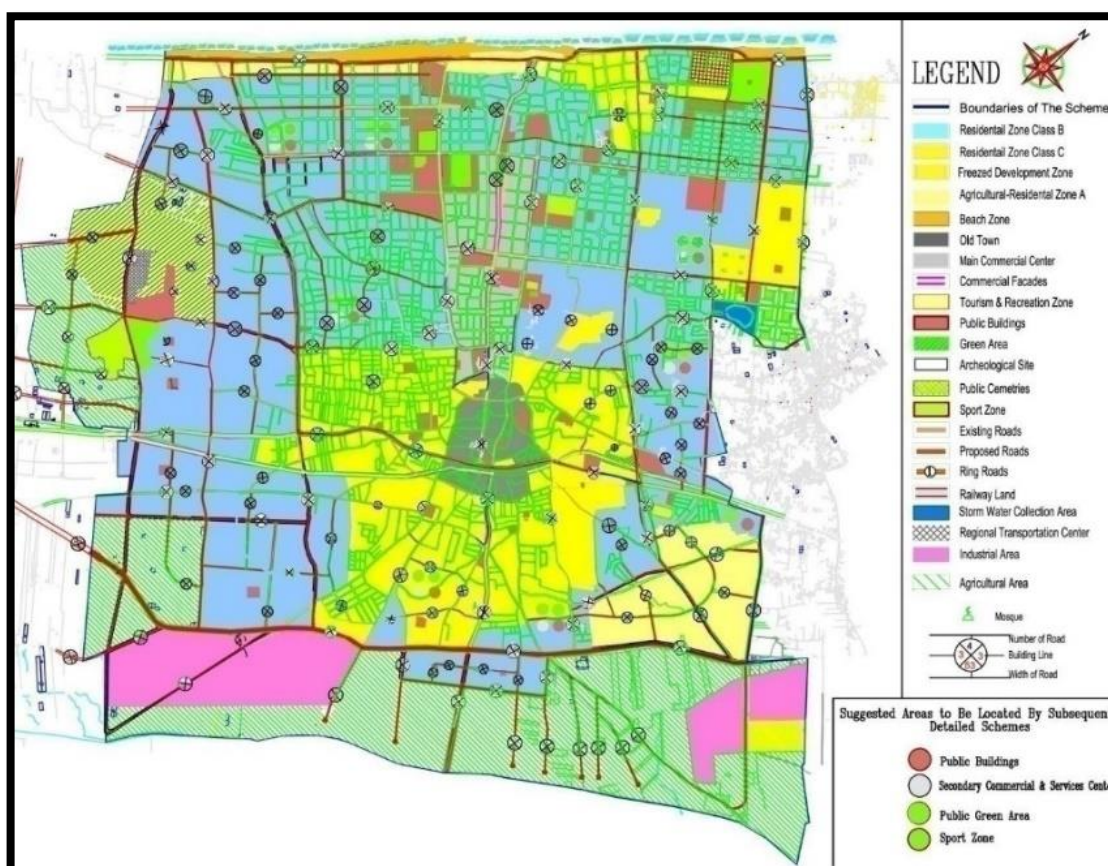


Figure 4-19, Master plan (1997) of Gaza City. (Gaza Municipality, 1996).

After the adoption of the master plan of Gaza, detailed plans for different areas were prepared. These plans aimed to achieve urban development and meet social and economic needs. The plans were based on accurate studies that examined the current situation and projected the future. The preparation of such plans encountered problems related to the established slums, in addition to barriers associated with private land ownership and Gaza City's social and economic configuration. Table 4.1 shows the land-use ratios according to the general plan for 1998.

Table 4-2 The adopted details of land-use in the master plan of Gaza City. (Al-Mughni, 2002).

Land-use	Area (Donum)	Percentage of total area (%)
Total area	45000	% 100.0
Residential	18900	% 40
Old town	8600	% 2.00
Agriculture zones	900	% 22.80
Freeze development zone (Al-Shati')	10260	% 1.55
Shore zone	700	% 1.11
Main commercial centre	500	% 4.44

Touristic and recreation zones	2000	% 4.00
Public buildings	1800	% 2.00
Sport	900	% 0.66
Industrial	300	% 04.76
Green areas	390	% 00.87
Other (roads, rain collectors, cemeteries, regional transport center)	6210	% 13.81

These percentages reflect the inability of the plan to meet the needs of the population. For example, if the space required for public buildings is calculated, the percentage in the scheme totals only 2%, including government requirements, services, religious and cultural facilities. This does not meet the population's needs (Al-Mughni, 2002).

4.4.4 Current Situation of Urban Structure and Land-use

Gaza City includes many land-uses with variations in size over time. Also, population growth is increasing dramatically, and this leads to the creation of other land-uses related to the needs of the population. On the other hand, there is a reduction in green land and open spaces, which can be considered an environmental and agricultural resource, and an outlet for the city. Generally, the urban troubles of Gaza City can be summed up within the following points (Mohaisen et al., 2011):

- Population growth, which leads to a shortage of available land for future expansion.
- A lack of services.
- Deficits in infrastructure.
- Environmental pollution, especially water (contamination of the aquifer).
- Traffic congestion, especially in the city centre.
- A lack of recreational areas.
- The existence of Al-Shati refugee camp, which limits the development process for some parts of the coastal zone.

Table 4.2 shows the spatial distribution and relative patterns of existing land-uses in Gaza City according to the latest statistics calculated by the Municipality of Gaza and the Ministry of Local Government (MOLG):

Table 4-3, The spatial distribution and relative patterns of existing land-uses in Gaza City, according to the latest statistics. (Mohaisen et al., 2011).

Land use	Area (Donum)	Percentage of total area (%)
Total area	45,000	% 100.0
Agriculture uses	7,405	% 16.46
Residential and services uses	23,986.5	% 53.30
Al-Shate' refugee camp	700	% 01.55
Industrial uses	2,140	% 04.76
Roads	5,140	% 11.43
Railway land	140	% 00.30
Touristic and recreation uses	1,800	% 04.00
Adjunctive areas for agriculture uses	2,855	% 06.34
Shore Zone	500	% 01.11
Cemeteries	333.5	% 00.75

It is clear from Table 4.2 that the city's structural plan has overlapping land-use between parts of the city, and that 54.85% of the city is for population use and only 16.46% for agricultural use. This means that the building sprawl is expanding while agricultural lands are decreasing, and foreshadows a future environmental imbalance.

4.4.5 Determinants of Land-use in Gaza City

Political, economic, and social factors have played a major role in shaping land-use in Gaza City. They all merged to offer different patterns of land-use. These determinants can be summarized as follows:

Land Price:

The difference in land prices in the city is one of the most important factors affecting urban growth and the distribution of land-use. The price of land in the city centre is considered the highest, with the greatest volume of traffic, housing and the commercial centre of the city. When moving away from the city centre towards the outskirts land is less expensive. An indication of the price of the land is its distance to the city centre or main road, which has affected land-use. Where residents have located at the outskirts, new neighbourhoods have emerged, such as Sheikh Ajlin and Tel Hawa (Mohaisen, 2012).

Land Ownership:

The majority of the land of the Old City (city centre) is divided into small plots owned by a large number of partners as a result of inheritance. This has made it difficult for the municipality of Gaza and successive governments to develop some areas in the city centre. Also, the sale of privately-owned land has played a prominent role in the distribution of land-use, as urbanization began to expand from the south. Besides, most government land is located in the western part of the city and has been used by successive governments for its institutions, especially the military and police (Salamah, 2015).

Political Conditions:

The succession of different governments in Gaza City, as well as the killing of Palestinian residents and their migration to the City, have led to the emergence of refugee camps and slums, such as al-Shati camp and Al-Nasr neighbourhood. Since 2006 and the siege of Gaza City, the Occupation has controlled crossings. In addition, it has prevented the entry of building materials into the city which has reduced the number of projects and development of services (Mohaisen, 2012).

4.4.6 The Planning Reality of Gaza City

Between 1998 and 2015, the Ministry of Planning and International Cooperation completed a regional plan for the governorates of Gaza as a framework for action. The start of the Al-Aqsa Intifada in 2001 saw the subsequent destruction of infrastructure and the evacuation of Occupation settlements from Gaza. The proposed regional plan was reviewed and extended to 2020. Only general principles were adopted until a change occurred in the geopolitical situation, thus the update and modification process was as follows (Salamah, 2015):

- Evacuation of Occupation settlements from the Gaza Strip.
- Expected opening of national and international crossings for the entry of goods that could contribute to the restoration of Rafah airport and the establishment of the Gaza seaport.
- Linking of urban development with land-use plans.

The objectives of the regional plan were as follows:

- To organise and rationalise land-use and develop a vision for its future.

- To protect natural resources and ensure their optimal use.
- To protect cultural heritage and archaeological sites of national importance.
- To integrate and reuse vacated areas and colonies according to development priorities and needs.
- To acknowledge the main points of the plans and priorities of projects and future investment programs.

The basic principles of the regional plan were to:

- Provide the necessary land for different urban uses in a manner that did not contradict the protection of natural resources and direct urban development to areas of lesser value.
- Enable urban development based on two regional centres: Gaza in the north and Khan Younis in the south.
- Provide a road network linking different communities with the main sites and crossings.
- Provide a qualified infrastructure to encourage agriculture, industry, tourism and commercial development. (Salamah, 2015):

4.4.7 Problems Associated with the Current Land-use

Many cities suffer problems affecting their development, such as overcrowding, road and land-use problems. The problems of land-use are outlined below (Sha'at, 2002; Asheakh-Eid, 2015).

The following are residential problems that need addressing:

- The phenomenon of indiscriminate construction, where narrow streets are not commensurate with the expected volume of traffic, and indiscriminate construction occurs without a license such as camps and seized government land.
- The presence of multiple urban areas in the city with special features such as the area of Tel Hawa, Al-shati Camp, and Sheikh Radwan neighbourhood. This has led to a lack of clear urban harmony in the city, and has reflected negatively on the distribution of public facilities and services.
- The heterogeneity of the urban fabric is due to different land ownership, as building on private property and buildings in general are allowed on the basis of

individual freedom other than a structural plan. Moreover, roads are opened based on the desire of property owners rather than a city plan.

- Mixed land-use uses mean many factories are located in the middle of population areas.

Problems associated with agricultural use:

- Continuous urbanization of agricultural lands, which has led to the high rate of erosion amongst agricultural lands.
- Decreased biodiversity due to lack of agricultural areas.

Issues associated with industrial use:

- The presence of many factories in residential neighbourhoods such as brick and iron factories. These cause many problems such as noise, environmental pollution and traffic congestion.
- A weak infrastructure supporting the industrial sector and a lack of adequate transport services.

Problems with commercial use:

- The centralisation of commercial services in a specific area of the city, especially its centre.
- A functional overlap in the distribution of shops and the mixing of some dangerous commercial uses with residential use, such as the presence of gas stations very close to the population.
- A lack of suitable parking for vehicles in markets and commercial areas to enable the loading and unloading goods, and narrow sidewalks on both sides of the road that are exploited by traders and leads to traffic congestion.

Issues with service:

- Centralisation in the planning of urban services (commercial, government, and financial), whereby many services are located in one place, even on one road, such as Omar UI-Mukhtar. Therefore, the urban pattern in Gaza City is characterized by a uni-center. One of the central features of the city is the existence of three large shopping places in the Old City all within an area of only 1 km². This centralisation has contributed to the heterogeneous distribution of services and the volume and intensity of traffic on city roads. It has also been affected by a lack of integration between the road network and land-use.

- A lack of green and open areas.
- A lack of educational, health and recreational services to meet the population's needs. The problem is exacerbated by a lack of urban land owned by the Gaza Municipality, which barely covers areas allocated to the road network (Sha'at, 2002).

In addition, road and infrastructure problems:

- A lack of hierarchy in the level of roads in some areas where some local roads intersect with regional ones impeding accessibility.
- Crossing regional roads through the city centre meaning that traffic overlaps and slows down.
- A road network that is not commensurate with increases in the population and increases in the number of vehicles. In addition, most roads are unpaved and do not have sidewalks, making it difficult for pedestrians.
- The infringement of roads and their use as places to play, sit and display commercial products (Asheakh Eid, 2015), as shown in Figure 4.20.



Figure 4-20 Infringement of shop owners on pavement and roads.

4.4.8 The Fundamental Role of Land Use in Urban Development

Land use plays a crucial role in the process of urban development, particularly in situations where resources are restricted. Land is a limited resource that plays a crucial

role in various urban activities, including residential and economic development, infrastructure for transport, and public facilities. The importance of precise and strategic land allocation is highlighted by the limited availability of land, which has implications for the effective utilisation of other essential resources like financial capital, labour, and basic supplies (Han, W., et al. 2020).

Furthermore, land use patterns have a significant impact on urban density and efficiency, which are influenced by the process of urbanisation. The optimisation of urban density can be achieved through effective land use, which involves the diligent utilisation of available land and the rational allocation of investments in infrastructure, such as public transport systems, to adequately serve a densely populated area. The optimisation of density serves as a contrasting approach to the resource-intensive expansion of urban areas, offering a pathway towards the adoption of more sustainable practices in urban development (He, S. et al, 2020).

Infrastructure planning is tightly interconnected with land use, as the features and diversity of land use significantly shape the infrastructure that is required. This includes the establishment and improvement of transportation networks, utilities, and public services. Insufficient land use planning can place excessive pressure on infrastructure resources, resulting in increased expenses and a decline in the effectiveness of service provision. Furthermore, the selection of land use has a significant impact on the environmental impact of urbanisation. Strategic planning has the potential to foster the development of green areas, reduce pollution, and promote sustainable behaviours, thus making a valuable contribution to the preservation of the environment. In contrast, the uncontrolled utilisation of land can result in the deterioration of the environment and the escalation of resource consumption, thereby emphasising the crucial significance of land in urban development that prioritises resource conservation. (Arfanuzzaman, M., & Dahiya, B. 2019).

Land use is strongly linked with social and economic factors, extending beyond the categories of infrastructure and environment. The planning of land use can have a significant influence on the availability of vital services, opportunities for employment, and housing. A well-designed land use strategy has the capacity to promote better access to these resources, thus leading to favourable outcomes for social welfare and economic advancement. On the other hand, inappropriate land use can give rise to inequalities in the availability of resources, hindering progress in both social and

economic sectors. Therefore, in situations where resources are limited, land use plays a crucial role in determining the careful distribution of resources and influencing the effectiveness and long-term viability of urban development initiatives. (Behbahani, H., et al. 2019).

Land use plays an essential part in determining the allocation of resources, the functional effectiveness of urban areas, and their ability to meet the needs of their residents. In a scenario characterised by limited resources, the optimisation of land use assumes heightened significance due to its direct impact on the feasibility and efficacy of attaining the interrelated success factors outlined in Chapter Four. Urban planners and policymakers can establish a strong basis for sustainable and resilient urban development by giving priority to and meticulously planning land use.

4.5 Transport Networks in Gaza City

Due to its importance, many countries - both developed and developing - have taken care over the development of their transport network. The road network plays a key role in the geographic linking of different populations and has become a manifestation of the civilization of these countries.

In Palestine, there were many means of transport. The railway was established in Palestine in 1904 with a length of 710.5 km. In 1948, during the Occupation, all lines connecting Palestinian cities and neighbouring Arab countries were disrupted, and the railway lines were neglected and permanently abandoned. In the third millennium BC, the Canaanites established several ports, including the port of Gaza City, which lasted until the British occupation of Palestine in 1920, when the military prevailed. At the time of the Occupation the port of Gaza was suspended.

Despite the establishment of the Palestinian Authority following the Oslo Accord in 1993, the seaport and railway line still abandoned. Meanwhile, there were some improvements in the road network, many of which were paved and maintained. However, after the outbreak of the Al-Aqsa Intifada in 2000, these problems worsened again when road networks were subject to extensive destruction. Furthermore, the fishermen's port and Gaza International Airport were destroyed completely. Therefore, the only transport system in the governorates of Gaza is road networks.

4.5.1 General Characteristics of the Road Networks in Gaza City

Although Gaza City is one of the old Palestinian cities that evolved from a growing population, its road networks have not kept pace. This is due to the successive periods of occupation and the resultant deteriorating economic situation. Many problems have arisen in the road network where will be described in this chapter. Appendix 2 shows a map showing the features of Gaza City.

Type of Roads in Gaza City:

The road network is classified into several categories, including by road function (i.e. regional, main, and local roads. Another is classification is the surface treatment of the road, including paved and unpaved, as illustrated in figure 4.21. (Gaza Municipality, 2019).

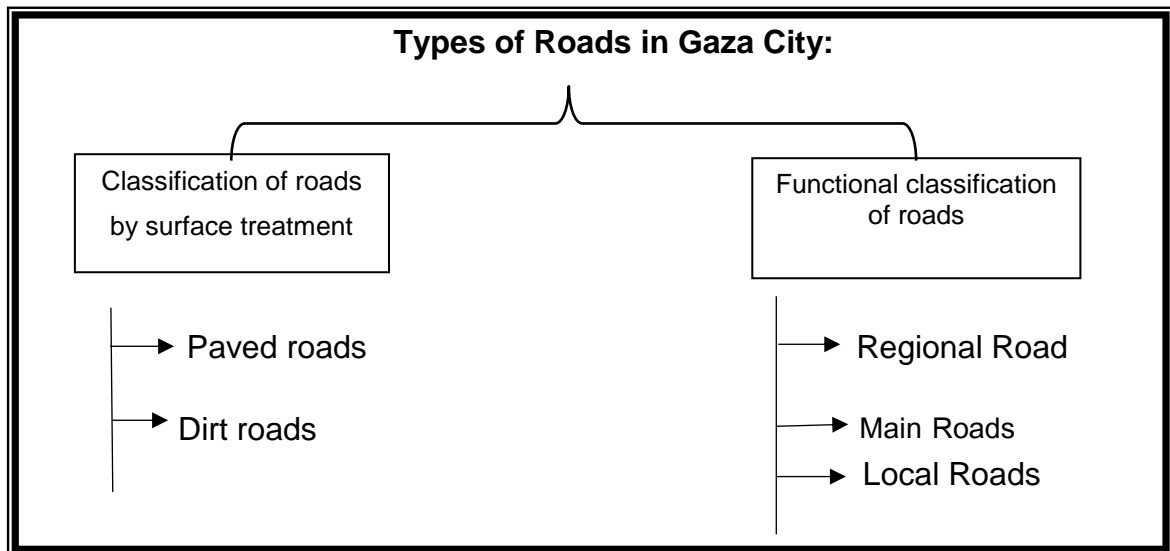


Figure 4-21, Types of road in Gaza City, 2019. (Gaza Municipality, Student Editing).

Functional Classification of Roads:

The functional classification of roads differs between the type road services. The most important of these services are road traffic, accessibility, and speed. Therefore, they are classified by regional roads, which totals 41,981m in Gaza City, main roads at 133,916m, and local roads comprising 506,470m. Figure 4.22 shows the length of roads in Gaza City (Gaza Municipality, 2019).

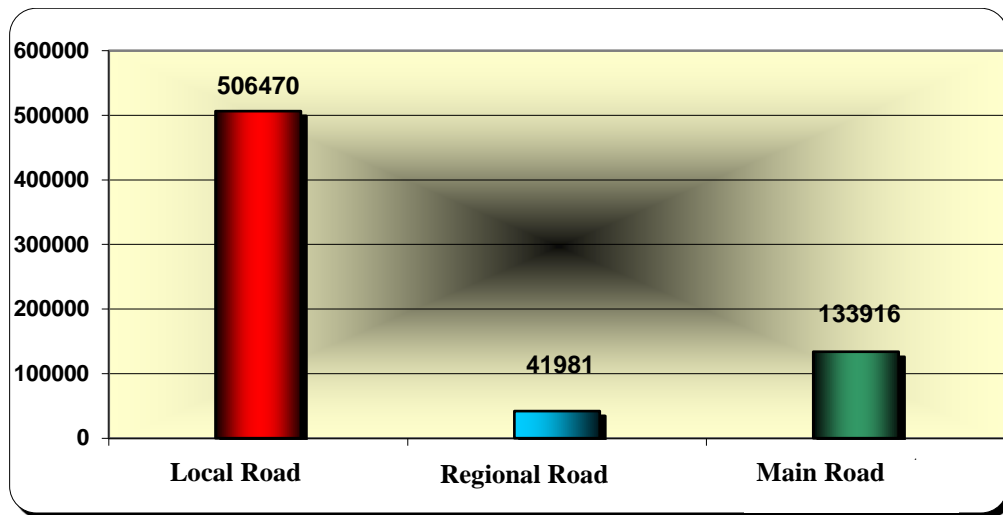


Figure 4-22 Length of roads in Gaza City by functional classification/km, 2019. (Gaza Municipality, Student Editing).

a) Regional Roads:

These roads were designed to provide large facilities to accommodate a large volume and wide variety of transport over long distances and at high speeds. These are generally considered the links between cities and governorates in the region. There are several regional roads in Gaza City (Gaza Municipality, 2019) and the most important are Salah al-Din and Al-Rasheed. Table 4.3 shows the regional roads in Gaza City.

Table 4-4 Arterial roads in Gaza City 2019, (Gaza Municipality, unpublished data, Student Editing).

Road name	Length (meters)	Width (meters)	Direction
Al-Rasheed	6519	60 – 20	North-South
Al sika Alhadeed	5012	30 – 18	North-South
Al-karama	8906	55 – 53	North-South
Salah al-Din	7866	38 – 26	North-South
Khalil Alwazir	6151	30 – 10	East-west
Aoun Al-Shawa	6366	40 – 14	East-west

As indicated in table 4.3, Al Karama is the longest road, yet it is located to the furthest east of the city where there are few residents and it close to the border of the occupied territories. However, the direction shows that roads tends towards the north-south, with the exception of Khalil al-Wazir and Aoun al-Shawa, which are east-west.

Through the field study the length and width of the road was found to have no effect on the importance of the road and the determination of the movement of the transport. Karama is considered one of the longest and widest road although traffic volume was noted as very low, influenced by its geographical location. The geographical location

of Salah El-Din is in the middle of the strip and at the centre of Gaza City. As such, it has more traffic than some other roads, and the map (figure 4.23) shows the regional roads in Gaza City.

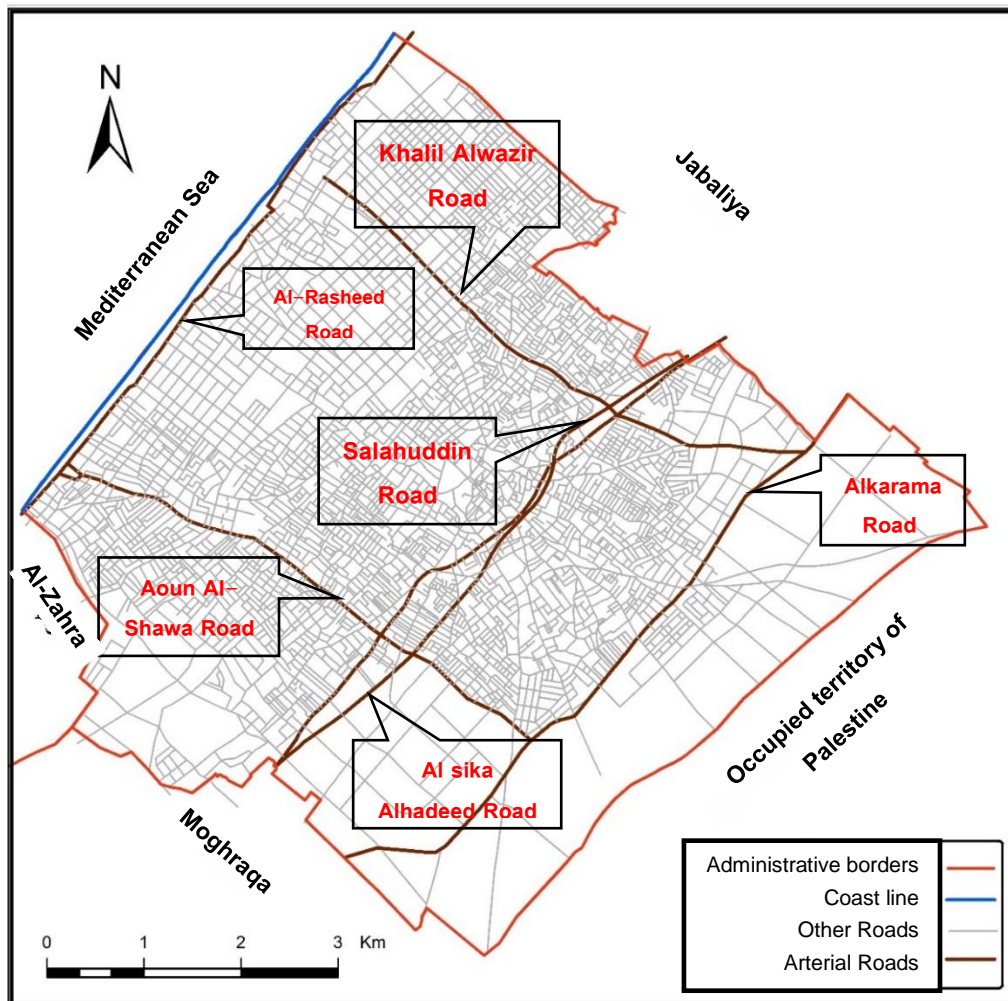


Figure 4-23 Regional roads in Gaza City, 2019, (Gaza Municipality, Student Editing).

Salah al-Din Road and Al-Rashid Road are particularly notable for the following reasons:

i. Salah al-Din Road:

Salah al-Din road extends from the administrative boundary of the city from the north to its borders in the south. It is considered one of the important regional roads in Gaza City. The entrance to Gaza City is on the northern side which connects Gaza City with the North Governorate. In addition, the entrance of the city is from the south, where it connects with the rest of the cities in other provinces. The road is 7866m long and 36m to 38m wide. This variation in width is due to the variation of urban period it has witnessed and its density (Gaza Municipality, 2019), as shown in the sketch scheme in Appendix 3.

ii. Al-Rasheed Road:

Al-Rasheed Road is located to the west of Gaza City near the seashore. It extends from the northern administrative border to the southern city boundary. It is considered the entrance to the city from the north side, but this entrance offers poor movement compared to the southern entrance of the city. This is because its northern entrance is far from the city centre and vital areas in the Northern provinces. In comparison, the southern side is considered one of the most important entrances to Gaza City as it connects with other governorates, such as Deir El-Balah, Khan Younis and Rafah. (Gaza Municipality, 2019). This is illustrated in the sketch scheme of Rashid in Appendix 3.

b. Main Roads:

These are travelled at a lower speed and are at a narrower width than regional roads. Furthermore, entry and exit are less risky than regional roads. The main roads are considered a link between regional and local roads. Their services are within the city among neighbourhoods, and they serve the most land-uses including commercial, educational, and residential. The main roads in Gaza City comprise 133,916km, including a paved and unpaved roads. The main roads include Omar UI-Mukhtar, Al Wahda, Jamal Abdul Nasser, Al Galaa and Al Nasr (Gaza Municipality, 2019) and their details are listed in table 4.4.

Table 4-5, The main roads in Gaza City, 2019. (Gaza Municipality).

Road name	Length (meters)	Width (meters)	Direction	Road name	Length (meters)	Width (meters)	Direction
Abu Ali Iyad	1659	20 . 9	North-South	Jamal Abdunnasser	3207	32 . 20	East-West
Ahmed Abdel Aziz	1712	15 . 12	East-West	Khaled Al Hassan	1925	20	East-West
Al-Aqsa	3292	32	North-South	Khalid ibn al-Walid	1766	12	North-South
Al Thawra	1290	20	East - West	Dimashq	894	20	East - West
Algeria	898	20	East - West	Ashra	5885	30	East - West
Al-Jalaa	2966	30	North - South	Tesaa	4390	20 . 12	East - West
Al Khartoum	1740	20	North-South	Saad Sayel	1749	20 . 12	North-South
Al Rebat	1525	20 . 14	North - South	Said Al Aas	2926	14	North - South
Al Riyadh	4636	26 . 16	East-West	Salah Khalaf	2870	20	East-West
Al Shuhadaa	1887	20	East - West	Sana'a	1674	20	North - South
Al Sahaba	1291	20 . 10	East - West	Siam	2454	32 . 12	North - South
Al Awameed	951	20 . 8	North-South	Tariq bin Ziyad	2164	19 . 15	East-West
Al Qaheera	1312	30	East-West	Abdul Qader Al Hussein	1765	16	North-South
Al Quds	2807	30	North-South	Izz al-Din al - Qassam	3012	20	East-West

Al Mashahrah	1454	20 . 12	North-South	Oman	1918	20	North-South
Al Moghrabi	1723	20	North - South	Omar Ul Mukhtar	5197	30 . 10	East - West
Al Mansoura	4317	40 . 16	East - West	Omar bin al-khattab	2383	30	East - West
Al Montar	2456	46 . 12	East - West	Omar Bin Abdulaziz	1337	20	East - West
Alnasr	3003	20	North - South	Palestine	3369	20 . 12	North - South
Al Nafaq	1842	30 . 12	North - South	Kamal Adwan	1333	20	East - West
Al Weahda	3367	20 . 16	East - West	Kamal Nasser	3967	32 . 16	East - West
Al Yarmouk	2998	15 . 12	North-South	Yusuf Al Najjar	1406	20	East-West
Umm Al Lemon	1533	20 . 12	North-South	Mostafa Hafez	1515	16 . 12	North-South
Ahmed Shuqairi	2324	20 . 12	East - West	Mamdouh Saidem	1407	20	East - West
Amin Al - Hussein	2412	16 . 10	East-West	Hayel Abdel Hamid	1208	15	North-South
Baghdad	3043	34 . 16	East - West	Wadi Al Arayes	3913	34 . 20	North - South
Por Said	1338	25 . 20	North - South	Jaffa	2475	16	North - South
Beirut	1399	30	East - West	Yusuf Al - Azma	2493	20 . 15	East - West
Tunisia	1500	20	East-West	Jameaat Al dowl Al Arabiya	1907	20 . 10	North-South

The roads travel in two directions, and north-south accounts for 55.2% of the total, while the rest travel east-west and constitute 44.8%, as illustrated in figure 4.24.

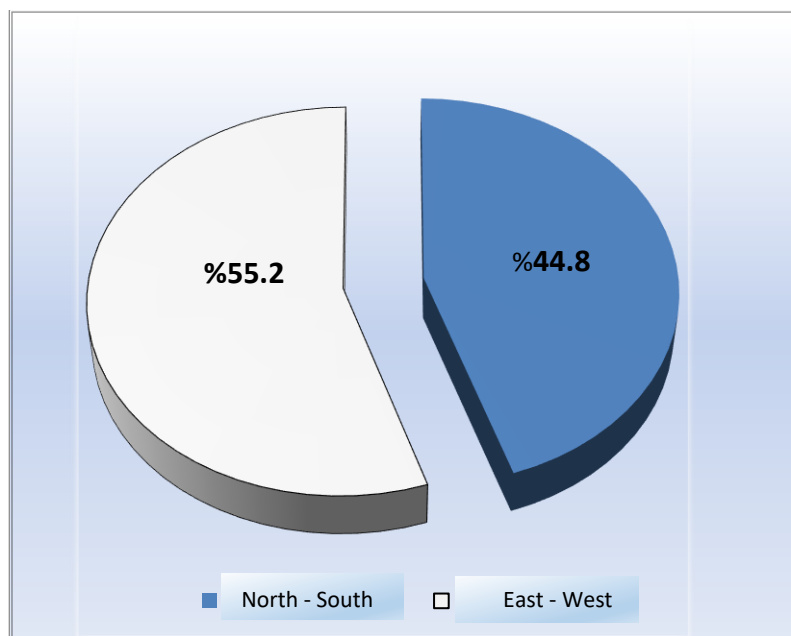


Figure 4-24 Classification of roads in Gaza City, according to the direction 2019. (Gaza Municipality, Student Editing).

The roads predominantly follow a straight-line. Therefore, the road network in Gaza City is classified within the road network system, where they are perpendicular to each other. Most of the main roads are located in the western part of Gaza City. Figure 4.25 illustrated the road layout after which follows a discussion of the main roads.

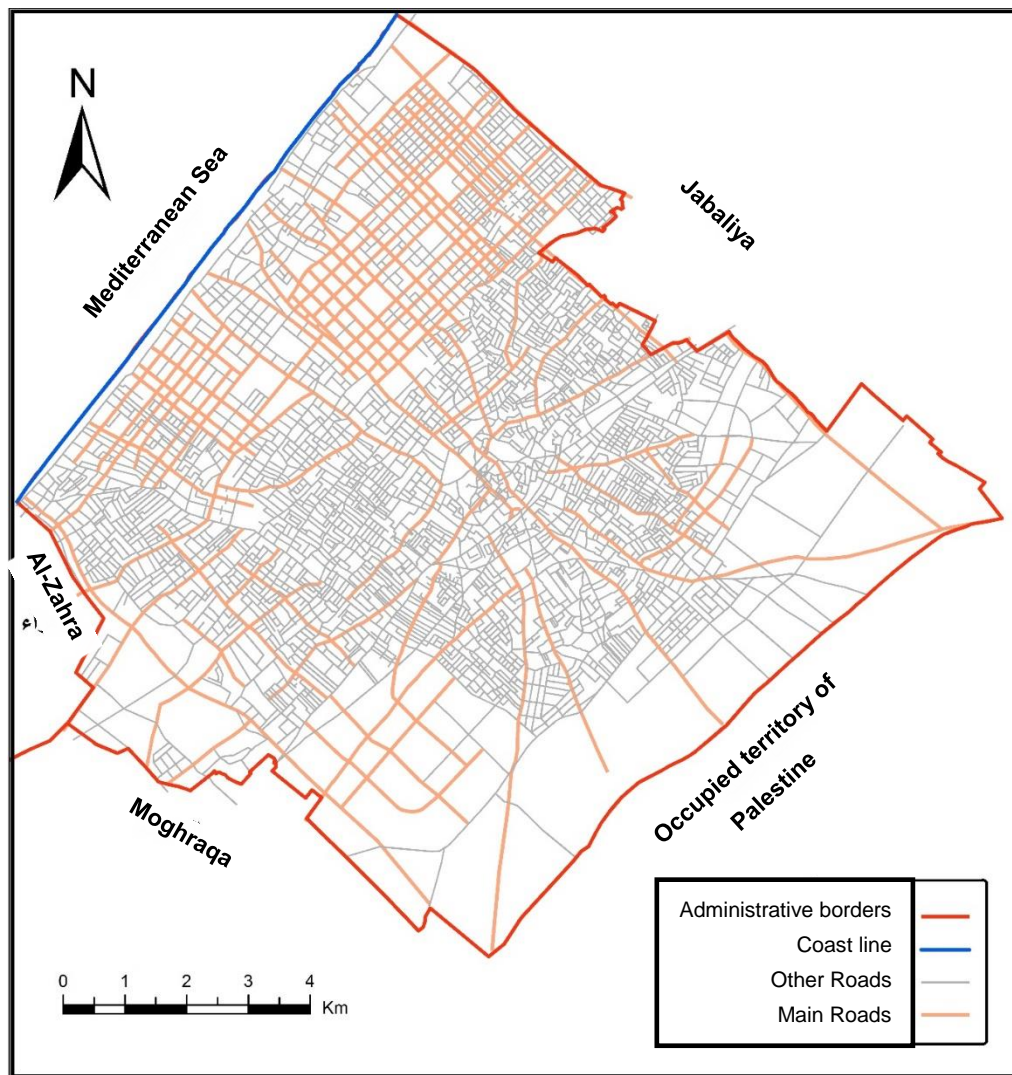


Figure 4-25 Main Roads in Gaza City, 2019. (Gaza Municipality, Student Editing).

i. *Omar Ul-Mukhtar Road:*

Omar Ul-Mukhtar Road is located in the centre of Gaza City and is considered one of the oldest roads in the city. It is characterised as a commercial service road where shops run throughout its extension. In addition, it connects with Palestine Square (the centre of the city), which is the most important area of the city where the municipality of Gaza is located. It is also the area through which residents travel to all neighbourhoods of the city.

The road increases its width when travelling west, due to urban development. The narrowest width of Omar Ul-Mukhtar is located in the old town while the widest reaches 30m and is located in Samer. It runs to the coastal road Rashid, where a newer urban area is located dating back to 1979 (Gaza Municipality, 2019). Therefore, more urban areas where there are laws governing their planning tend to have roads in a better

condition. These details are illustrated in the sketch scheme of Omar UI-Mukhtar road in Appendix 3.

ii. Al Wahda Road

Al Wahda Road is located in the centre of Gaza City, to the north of Omar UI-Mukhtar Road. It is considered one of the oldest roads after Omar UI-Mukhtar. It is predominantly a commercial road but also residential in parts. It extends from Fahmi Beck and Sheikh Mansour Roads which leads to the city centre (Gaza Municipality, 2019), as illustrated in the sketch scheme in Appendix 3.

iii. Jamal Abdalnasser Road (Altlatini)

Gamal Abdel Nasser Road is located south of Omar UI-Mukhtar Road. The road is considered one of the main roads in Gaza, as it is located in the city centre. It serves many educational institutions, such as the Islamic University, University of Al-Azhar and Al-Aqsa University (Gaza Municipality, 2019), as shown in the sketch scheme in Appendix 3.

iv. Al-Jalaa Road

Al-Jalaa road is located in the northern part of Gaza City. Although it is considered a residential commercial road it is predominantly residential. It connects the far north of Gaza City and its centre to the Saraya compound. It is considered the entrance to the city from the north side, which connects it with the north governorate. There is stability in the width of the road because it was newly established between 1979 and 1996 (Gaza Municipality, 2019), as shown in the sketch scheme of the evacuation road in Appendix 3.

v. Al-Nasr Road

Al-Nasr is one of the main roads in the city and located in the north-western part of Gaza City. Al-Nasr is considered a residential commercial road but predominantly residential. There are also health services including many hospitals such as Al Nasr for Children, the Eye Hospital and Al Rimal Health Center (Al Suwaidi). Al-Nasr Road is one of the entrances to Gaza City from the north (Gaza Municipality, 2019), as shown in the sketch scheme of Al-Nasr Road in Appendix 3.

c. Local Roads:

These roads are travelled at slower speeds, narrower widths and shorter lengths than other roads. They branch from the main roads and accommodate services within the neighbourhood. They serve short transport trips to reach and link residential houses (Figure 4.26 shows the local roads in Gaza City).

Local roads vary in their width from one road to another, where the narrowest in width is only 1.6m, and the widest is 36m. The length of roads in general is 506,470m, although the length of roads range from 32m to 2122m, (Gaza Municipality, 2019). Local roads differ in the nature of the surface layer; some are earth and unpaved, and others paved with a layer of asphalt or tile. Moreover, some roads have a pavement while others do not, either because the road is too narrow or it has not been paved.

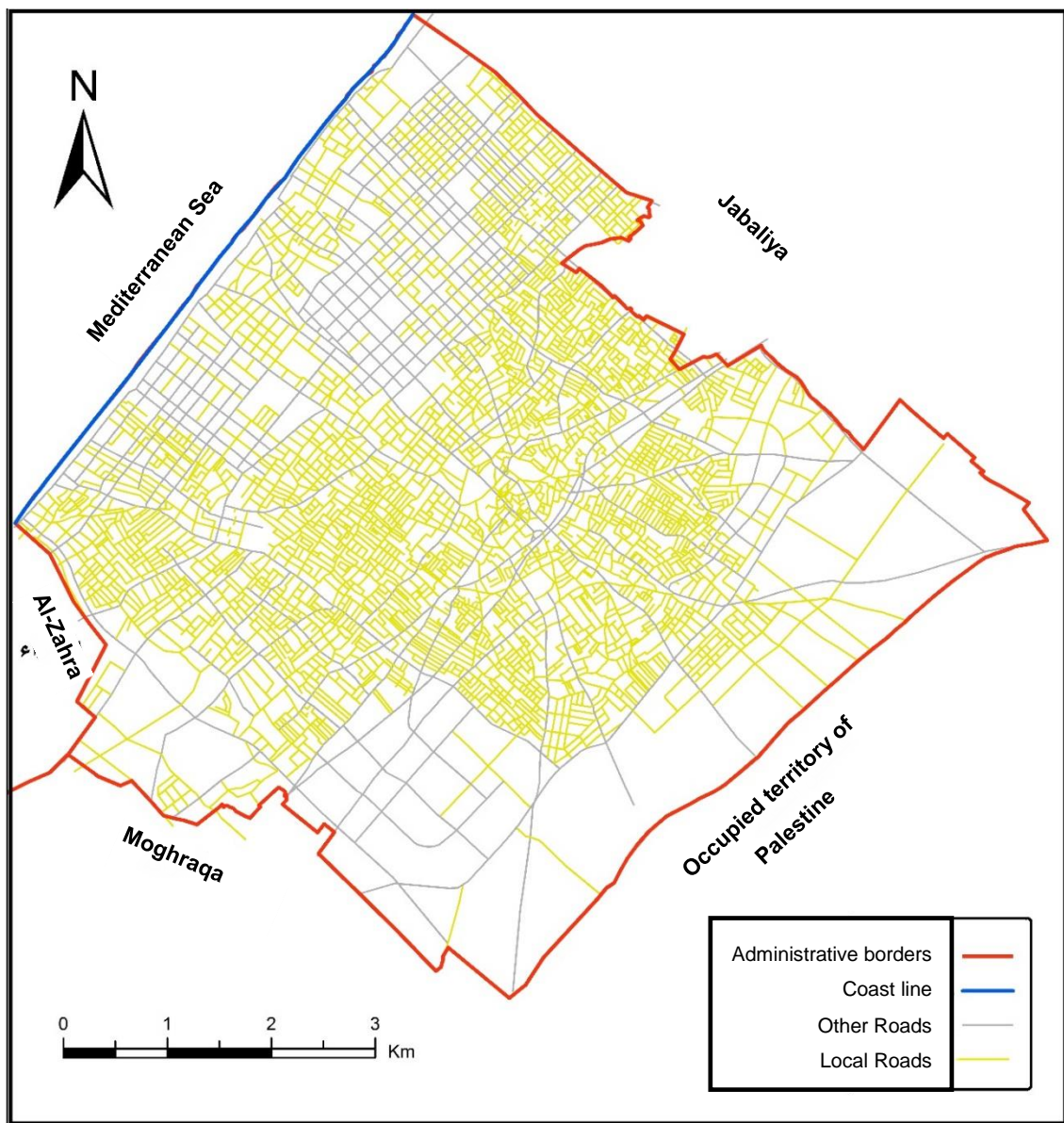


Figure 4-26 Local Roads in Gaza City, 2019. (Gaza Municipality, Student Editing).

Classification of roads by surface treatment

Paved Roads:

Paved roads are located at the centre of Gaza City and extend towards the west to the coast of Gaza City in the neighbourhood of Rimal and parts of Tel al-Hawa. On the eastern side, there are fewer paved roads than in Shujaiya, (Gaza Municipality, 2019), which is illustrated in figure 4.27.

Unpaved roads:

The geographical distribution of unpaved roads are located on the outskirts of Gaza City, on the eastern and southern sides of the city, as well as the north-eastern part of the City of Gaza (Gaza Municipality, 2019). This is illustrated in the figure 4.27.

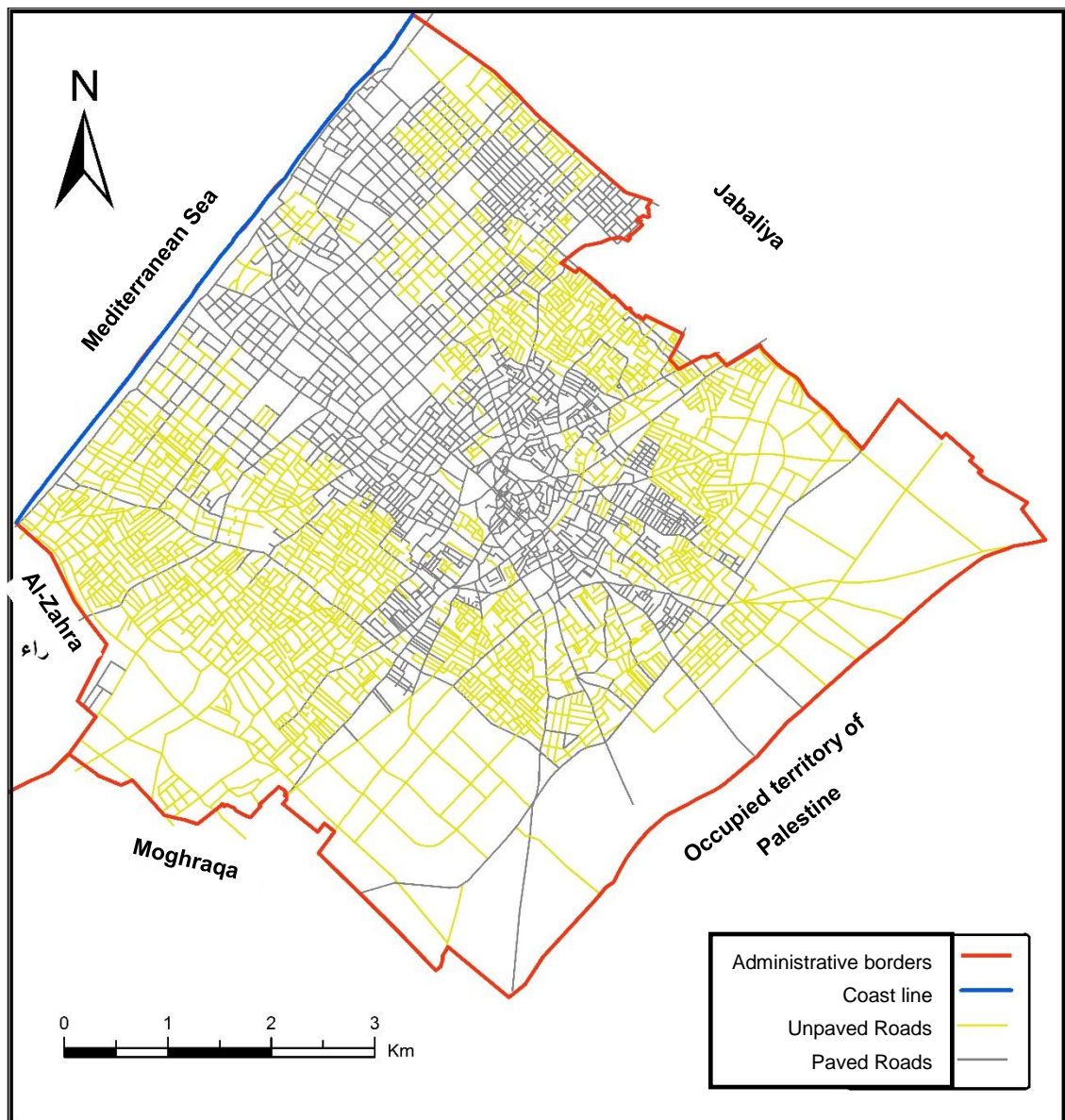


Figure 4-27 Roads by surface nature in Gaza City, 2019, (Gaza Municipality, Student Editing).

4.5.2 Geographical Distribution of the Road Network:

Gaza City is considered the 'mother city' of the Gaza Strip governorates, as it represents an important transport point through which roads link the northern governorates with the southern. This reflects the impact of the transport network in terms of the extension and length of roads, as well as the distribution of the road network across the city (Mohaisen, 2012), the road network is distributed as follows:

Regional Roads:

We find that three of the six regional roads are located in the eastern part of Gaza City, and they are Salah al-Din, the Railway and Al-Karama roads. Only one road is located at the far west of the Gaza coast, while another road is located on the southern part of the city. These details are illustrated in figure 4.23.

Main Roads

The main roads are located more in the western part of Gaza City than any other area, and they increase significantly in the north-western part. There are fewer main roads in the eastern part of Gaza City, perhaps due to the policies of the Occupation, which has prevented urbanization, due to its proximity to the boundary line with the territories of 1948. These details are shown in figure 4.25.

Local Roads

Local roads are distributed throughout Gaza City but have a high concentration in the centre of Gaza City, which it is the oldest urban area of the city (illustrated in figure 4.26).

4.5.3 Road Network Directions:

Due to the semi-level nature of Gaza City, the road network extends in almost all directions, serving transport in and out of Gaza City. Because it is a coastal city and located in the middle of Gaza's governorates, the roads follow a north-westerly direction. For example, Salah Al-Din and Al-Rasheed connect the city with other governorates, which connects the city with other provinces. The extension also followed an east-west direction, and included Omar UI-Mukhtar, Al-Wahda, and Gamal Abdel-Nasser, which connect the city's neighbourhoods. Other roads branch off in all directions.

4.5.4 The Schematic Model of Roads in Gaza City:

The road map for Gaza City shows two types of road networks in Gaza City. The first type is unplanned and clearly visible at the centre of Gaza City, known as the Old City. There is a radioactive pattern of road networks that travel towards the city side. The second pattern, planned, is clearly visible on the western side of the city and characterized by a grid pattern, where roads travel perpendicular to each other (Salha, 1997).

4.5.5 Determinants of Road Network Factors in Gaza City.

When studying a road network, it is necessary to study the natural and human factors that affect it. This is due to their mutual influence, and these results are important on a human and economic scale. The quality, shape, and density of road networks depend on natural and human geographic factors, which may be an impediment to some road and even to the planning of an entire project. It may also be a factor in the prosperity and development of a region's road network. The following section discusses the natural and human factors that affect Gaza's road network (Wang et al., 2018).

Natural Factors:

Understanding the natural factors of the study area and developing familiarity with its characteristics is important for the study of the region. It is possible to understand its implications for the road network, and their direct or indirect effect on different locations and characteristics. The following factors are influential:

Geographical Location:

Geographical location denotes a place relative to its surroundings, or adjacent parts, which has a geographical significance. The location of the phenomenon is usually a region or area. Gaza City is characterised by its strategic location due to its unique geographical placement between Asia and Africa (Ministry of Planning, 2010). The city's geographical location on the Mediterranean coast has been important since ancient times. Due to political changes, the city's maritime location has not been exploited. Occupiers have prevented the establishment of a port on the coast of Gaza (Jarrar, 2000). Nevertheless, the city has maintained its status and continued as the centre of the cities of Gaza. Roads built in the past are still active and have become the main locations for transport services between the city districts, as well as between

cities. As Gaza is a magnet for neighbouring areas, traffic in the city has increased, which has led to traffic congestion in the centre.

Nature of the Surface:

The nature of the surface is an important factor affecting the road network, due to its importance in determining the most suitable placement for construction. They also affect the shape, extension, and layout of roads (D'Amico et al., 2016).

Gaza City is part of the coastal plain of Palestine, figure 4.28 shows that the coast of Gaza City is characterized by straightness, which facilitated the development of a coastal road parallel to the seashore. However, the straightness of the beach is an obstacle to the existence of a natural seaport, which costs a substantial amount to establish (Gaza Municipality, 2019).

The surface in Gaza City runs slightly downhill from east to west. It extends from the highest elevated area of Al-Muntar hill, at 85m above sea level, and gradually descends until it reaches Salah al-Din road at 33m above sea level. As a result, the rains slashed some slopes on the eastern and western hills of the city, which then became roads for residents, such as the Riyadh Road in the neighbourhood of Al-Shojaeya. Also, some roads were constructed parallel to the coastline, such as Al-Jalaa, Al-Nasr, Al-Yarmouk, and Salah Al-Din. In addition, other roads have been paved with via the extension of the regression, such as Omar UI-Mukhtar, Al-Wahda, and Gamal Abdel-Nasser. Thus, the road network in Gaza City took a network form in running perpendicular to each other (Salha, 1997).

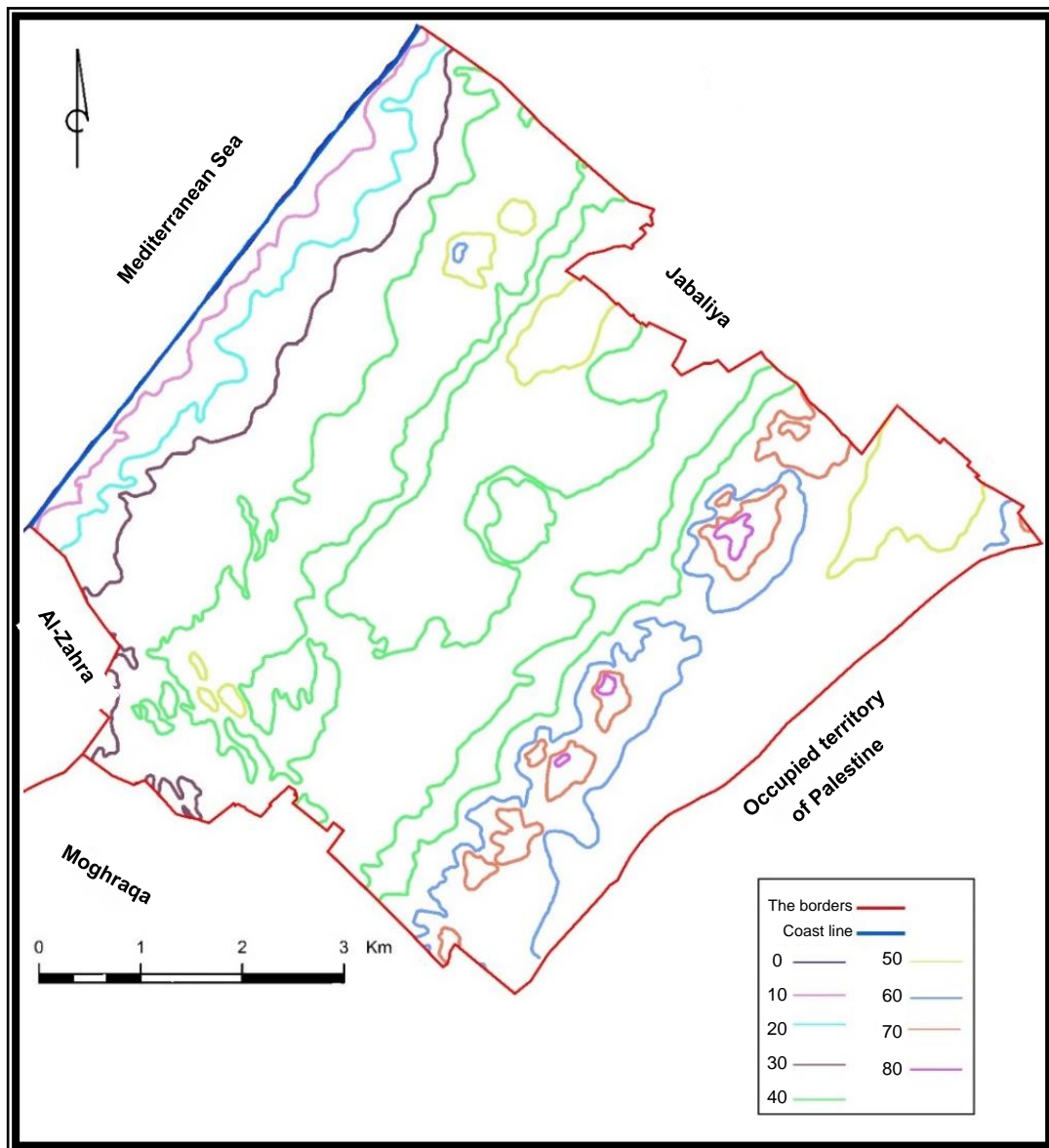


Figure 4-28 Topography of Gaza City, 2019, (Gaza Municipality, at the student's disposal).

The Soil

Soil means the fragile layer that covers the surface of the land; its thickness varies and reflect the surrounding climatic conditions and geological formation. Thus, the soil differs across the road network (Chen et al., 2009). Gaza City consists of red clay soils covering 90% of the area, and yellow sandy soil in the far west of the city covering 10%; this was formed during, Pliocene, the modern geological age (Al-Mubaid, 1987). Therefore, the city of Gaza is devoid of rocks on its surface, which reflects positively on the construction of the roads, which are paved faster at a lower cost.

In road works, the soil constitutes one of the construction materials, whether in the construction of landfill or paving layers, and its mechanical properties are improved to reduce cracks. Therefore, cracks are clearly visible in paved roads over clay soils

because of the natural process expansion and contraction, while paved roads over sandy soils are almost without cracks, such as Rasheed coastal road.

The Climate

Palestine is a transitional areas, between the Mediterranean and the Sinai Desert, which reflects in its climate. This means a hot, dry summer climate and mild rainy winter, which is known as the Mediterranean climate, according to the Köppen classification. Therefore, this is also reflected on the road network in Gaza City, and is affected by several elements, as follows:

a. Temperature

Temperature is one of the most important elements of climate; it can differ widely across regions of the world, and even within the region itself. The temperature has obvious effects on humans, as it can prompt an increase in activity and movement when the temperature is moderate, and a decreases when it lowers (Thabit, 2011).

Based on the above, the importance of temperature and the extent of its impact on transport, we see that the temperature of Gaza City decreases in December, January, February and March, which is restricted by the movement of traffic due to cold and precipitation. The temperature rises in the rest of the months, especially in June, July, August and September, when movement increases and people tend to increase movement in terms of trade and transport as well as education and recreation. Figure 4.29 shows the impact of heat on the movement of traffic in Gaza City.



Figure 4-29 The impact of heat on the movement of transport, 2019, by the student: photo (B) Jamal Abdul Nasser road, next to UNRWA, and photo (A) Salah al-Din road - Al-Shuja'iya Market.

b. Rain

The impact of rain on the road network relates to the amount of rain experienced and the type of road surface layer. An increase in the amount of rain leads to increases in

some of the road defects, such as longitudinal and transverse cracks and increased the pit sizes. Rain also erodes all sides of unpaved roads. Thus, part of the asphalt layer can collapse, hindering movement and forcing people to use alternative roads (Pregnoiato et al., 2017). Figure 4.30 illustrates the accumulation of rainwater on the road to Salah al-Din at the Sanafur junction next to the United Nations Relief and Works Agency (UNRWA), at the junction of Samer and Alshaabeya junction.

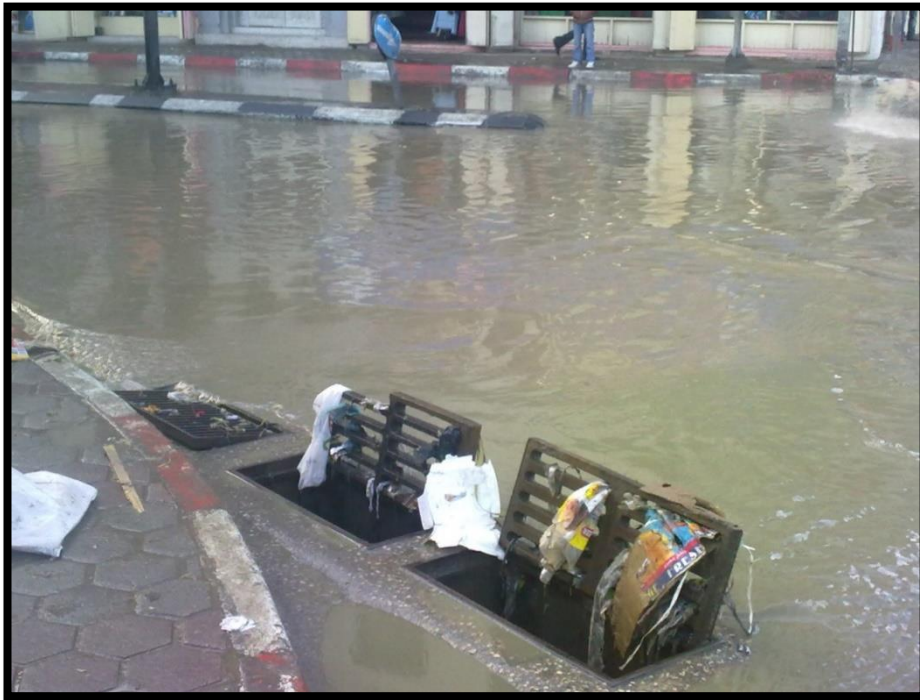


Figure 4-30 Flooding roads from rainwater: Intersection of Jamal Abdul Nasser Road with Najm Al-Din Al-Arabi Road (by the Student)

From the field study, it was observed that the movement of traffic in Gaza City was less in January, February, March, November and December than in other months. Thus, we found that rainfall affected the movement of transport in Gaza City, as shown in figure 4.31 (A) and (B).

(A)



(B)



Figure 4-31 The impact of rain on the movement of transport (by the student).

It is clear in figure 4.31 (A) the extent of the impact of rain on the movement of traffic, as Omar Ul-Mukhtar road appears as completely free of pedestrians, although it is considered the centre of Gaza City. In comparison, there is an active transport movement in the figure 4.31 (B) under different weather conditions.

Human Factors

By exploring the impact of natural factors on the road network, the study has shown their impact on the direction, distribution and slopes of roads, as well as on traffic. However, human conditions also impact the roads and therefore the transport network. A high population density increases the density of the roads as well as the economic activity. Such activity increases the density of the roads as trade and industry requires the use of many modes of transport. Thus, the impact of human factors is not only limited to population density and economic activity. Indeed, political boundaries also guide the road network from one place to another (Borsos Birth, & Vollpracht, 2015). The most important human factors affecting the road network in Gaza City are the population, urban centres, economic activity, and political conditions, which are discussed in detail as follows:

Population:

Some argue that the population and transport routes exert a reciprocal influence. The extension and paving of railways and roads, and the construction of land, sea and

airports are considered attractive factors for people, which prompts them to move into villages and cities thus redistributing the population (Cervero, Guerra & Al., 2017). The role of the population is evident in the extension of various types of transport routes, as the relationship between the distribution of the population and the distribution of roads is direct (Zornoza-Gallego, 2022). Thus, the higher the population density, the greater the movement of traffic on the roads. Therefore, it is necessary to identify the population of the city because of its impact on the spread of transport lines. Table 4.6 shows the relationship between the population and the length of roads in Gaza City.

Table 4-6 The relationship between the population and the length of roads.

Year	Population	Length of roads/km	Per capita/road km
1997	⁽¹⁾ 359941	⁽²⁾ 43.6	8255.5
2006	⁽³⁾ 514851	⁽⁴⁾ 135.5	3799.6
2018	⁽⁵⁾ 641936	⁽⁶⁾ 682.3	756

1. Palestinian Central Bureau of Statistics, (1997), p. 45.
2. Palestinian Central Bureau of Statistics, (1998), p. 56.
3. Palestinian Central Bureau of Statistics, (2006), p. 15.
4. Palestinian Central Bureau of Statistics, (2007), p. 57.
5. Palestinian Central Bureau of Statistics, (2019), p. 47.
6. Gaza Municipality.

As shown in table 4.6, when the population increases, there is an increase in the length of the road network, thus affecting its distribution. An increasing population means an increasing volume of built-up land, which means opening new roads. However, after the installation of the Palestinian Authority between 1997 and 2018, the roads decreased.

Urban Centres

The city is seen as the centre of the convergence of the road network, which meant those involved in planning had to consider this in its urban transport (Litman, 2007). As cities grow and expand, the road network also grows alongside the city centre. Cities are interested in the construction of wide roads aimed at stimulating the traffic with other cities as well as within its neighbourhoods. Thus, roads were classified according to their function, with the most important being the commercial roads, which accommodates pedestrians but could lead to barriers to the entry of transport, or enforcing a one way system, such as Omar UI-Mukhtar road from Palestine Square to its intersection with Salah al-Din road, and part of Alweahda road. In addition, urban construction influenced the shape and length of the road network among the city's neighbourhoods, where some are long covering several kilometres, while others are

only a few meters. In addition, this can also affect the breadth of the road creating wide and narrow roads.

Through the field study in Gaza City, it is clear that the nature and classification of the road attracts urban centres to its vicinity. The main road is more attractive to urban centres than the arterial road and local roads. Thus, we found that main roads were more densely urban than other roads than on shops in other roads. For example, the road Omar Al-Mukhtar has an urban population and commercial density, like Salah Al-Din and Al-Jalaa Road. These differ from Mustafa Hafez Road and Saeed Al-Aas Road, in which the urban and commercial densities are less. The Old City is considered the first neighbourhood in Gaza City, and the Beach Camp is a refugee camp.

Therefore, it is clear that the urban centres and their densities have an impact on the road network. Neighbourhoods with dense urban have less spacious roads which are long and winding unlike the road network in less dense and modern urban areas. For example, in Al-Remal neighbourhood, the road network is wider and longer, and between neighbourhoods the roads in Shati refugee camp were noted as short and narrow, as construction was carried out randomly as a result of forced migration from the Occupation. Hence, urban density directly or indirectly affects roads.

The Economic Activity

The road network and economic activity are closely interrelated, as the road network we know today has evolved throughout the stages of its economic activity. Therefore, we see that the road network is greatly affected by economic activity, as it is based on internal and external trade routes, industry, agriculture, and tourism. Capital is valuable and no less important than humans according to the road network; it is a means to achieve production (Iacono & Levinson, 2016). Economically developed countries have a developed road network that reaches all places, unlike developing countries, whose transport routes are weak.

As previously explained, there is a link between the road network and the functional specialisation of the population of a region. Indeed, the city of Gaza is predominantly commercial, where the number of employees total 20,654. This reflects the type of roads and traffic. It is clear that both traffic and road densities are located in the commercial heart of the city while industrial activity is limited due to the blockade imposed on the Gaza Strip. However, the field study showed that some roads saw increased movement because it is close to some factories, such as Sahaba road,

where there are several factories manufacturing construction tools and materials. In addition, there is a close correlation between economic and political factors. Palestinians are prevented from working in the occupied territories by the Occupation after the outbreak of the Al-Aqsa Intifada. For this reason, some of the unemployed started work as taxi drivers, where the number of drivers who worked between 7 to 12 years, comprised 196, or 39.2% of the total drivers. This was compounded by the blockade of the Gaza Strip after the Change and Reform block was won which saw political division, when the number of drivers who worked less than 6 years totalled 134 or 26.8% of the total drivers. This statistical breakdown is listed in table 4.7.

Table 4-7, Duration of Working as a driver, A Field Study.

Year	Repetition	Percentage	Time	Repetition	Percentage
Less 1 year	10	2.0	19	9	1.8
1	14	2.8	20	24	4.8
2	14	2.8	21	3	0.6
3	18	3.6	22	4	0.8
4	29	5.8	23	3	0.6
5	25	5.0	24	1	0.2
6	24	4.8	25	8	1.6
7	46	9.2	27	2	0.4
8	43	8.6	28	5	1.0
9	29	5.8	29	1	0.2
10	27	5.4	30	7	1.4
11	13	2.6	32	4	0.8
12	38	7.6	33	1	0.2
13	12	2.4	35	2	0.4
14	11	2.2	36	1	0.2
15	27	5.4	37	1	0.2
16	10	2.0	40	2	0.4
17	11	2.2	Total	500	100
18	21	4.2			

Political Changes

It is not possible to study the political changes of Gaza City regardless of the changes that have impacted Palestine in general, as Gaza City is a geographical part of Palestine. These changes have had a clear impact on the general situation of Gaza City, in terms of the decrease or increase in its area, the extension of the road network or change in its direction and impacts on the movement of transport (Khatib, 2011), When Palestine was occupied in 1948 by the Occupation entity, there was a new reality, where roads stopped extending at the truce line. Consequently, geographical

communication between the Gaza Strip and the rest of the occupied Palestinian cities was cut off.

Upon the arrival of the Palestinian National Authority (PNA) in 1994 under the Oslo Accords, the (PNA) took over the infrastructure, and built and paved new roads. The administrative area of Gaza City was also expanded from the southern side by an area of ten thousand acres, which increased the area of roads, (Gaza Municipality, 2010).

The change of the 10th government also affected the movement of transport. Some roads were closed to public vehicles outside Gamal Abdel Nasser Road from Al-Tayaran junction to Al-Azhar junction, while the closure of Palestine Square aimed to alleviate traffic congestion. However, it is believed that this decision was misplaced and other solutions should be found, such as only allowing external public drivers passage without passenger pick-up or drop-off. Also, roads that were closed to transport were opened, such as Al-Rasheed Road opposite the President's Forum to Hesbat Alsayadin (a market where fishermen sell fish), (Gaza Municipality, 2010).

After the success of the Change and Reform bloc, and the formation of the government in 2006, the Gaza Strip was besieged by the Occupation, which prevented the entry of construction materials and many other materials, especially fuels. This has resulted in a crisis in the availability of fuel, affecting the movement of transport. Therefore, many of the modes of transport are without fuel, and it is clear that political changes have affected roads and the movement of transport, as shown in figure 4.32.



Figure.4-32 The impact of transport by the fuel crisis, 2012, (researcher's photographs).

Figure 4.32 (A) shows people waiting for transport until the fuel is filled on Salah al-Din roadside in Gaza City. This can last for several hours. Figure 4.32 (B) shows citizens

waiting for transport home on Gamal Abdul Nasser Road opposite the Islamic University.

4.5.6 Road Network Problems in Gaza City

Any phenomenon or subject studied is not without problems, and the researcher found that the road network in Gaza City faces problems (natural and human) that are an obstacle to its development.

Problems Associated with Natural Factors

The researcher found that the surface manifestations of the transport network are semi-flat meaning their impact does not hinder the movement of traffic, except in winter when rainwater accumulates on roads that are less steep than the surrounding areas.

Some climatic conditions affect transport in Gaza City, especially in winter when rain impedes traffic as it accumulates on the sloping roads. Traffic is further hampered on dirt roads where tyres slide; this increases when the temperature is moderate. However, as the temperature rises, we find that the intensity of traffic on roads is located near Gaza City Sea shore.

Problems Associated with Human Factors

Two of the most important human factors affecting transport in Gaza City are political and economic. Moreover, there is an overlap in their impact on transport in Gaza City.

Problems Related to Political Circumstances

Political conditions greatly affected the transport network in Gaza City, after the occupation of Palestine in 1948. The extension of roads stopped at the truce line, and after direct control of the Gaza Strip in 1967, were dismembered by settlements where roads were built and closed according to security settlers. The Occupation deliberately neglected and did not maintain the roads, although after the Oslo agreement between the Palestine Liberation Organization (PLO) and the Occupation in 1994, new roads were constructed and others paved.

After legislative elections and victory over the Change and Reform Bloc in 2006, a siege was imposed on Gaza City, which prevented the entry of modern and the maintenance of old transport. It also prevented the entry of raw materials to pave roads and carry out maintenance, which led to the deterioration of many routes. It even

prevented the flow of transport fuel to Gaza City, until some transport stopped working and passengers began waiting a long amount of time to be transported home.

The closure of crossings and the prevention of residents work along the Gaza Strip in the occupied Palestinian territories has led to many working as drivers, which has increased traffic congestion.

Problems Associated with Economic Conditions

We note from the study that there is a correlation between the political and economic conditions as the occupation of Palestine has led to the dependence of its people on the Occupation, which has negatively impacted transportation. This has particularly affected Gaza City, while there is insufficient funding for the construction and maintenance of roads. After the Oslo accord, areas of the authority recovered somewhat and started to receive financial support from donor countries to enable infrastructure and road construction and maintenance.

The impact of economic conditions has not been limited to the road transport network. Rather, it has affected the modes of transportation. The entry of modern modes of transport and vehicle spare parts has been prevented, which has led to further deterioration, thus increasing the economic burden on the authority and the driver.

4.5.7 The Relationship of Road Networks to Land-Use in Gaza City

The road network is a key element in urban planning, occupying a large part of the city. It has functional relationships with other land-uses and their integration influences the image of the city. The road network in the urban centres of Gaza City is one of the most important elements in the basic planning of the city. Therefore, urban centres rely heavily on this network which ensures the easy movement of residents; it is one of the important factors that led to the increasing integration between land-uses within the city as well as between the city and neighbouring areas.

Transport is only effective if there is a sophisticated and integrated road network that can provide service and speed of movement within and outside the city. Therefore, when planning, the roads must consider the uses of the land, the classifications based on the road purpose, and the ease of access to neighbouring land-uses. (Mohaisen, 2012. P81) explained that there is a weak relationship between the road network and

land-use in Gaza City, as there is no consideration of the hierarchy of the ranks of roads in some areas, where local roads intersect with other major routes.

The road network takes different forms according to the city's topographical shape, its geographical location, space, land ownership, and territorial function. The city's road network has two main functions:

1. To serve the uses of the surrounding land.
2. To serve vehicles, i.e. traffic in large quantities such as highways.

4.6 Quantitative Analysis of the Transport Network in Gaza City

4.6.1 Urban Nodes

A road network can be defined as the nodes' positions between the links which underlie the transport activity, or natural flow of passenger and goods movement between two points. These often form urban centres, and become lines that represent ways in which nodes interact.

Urban nodes are also a loop connected by links, which can be accessed by roads, or they are the places where transmission lines approach and converge. There are 17 neighbourhoods in Gaza City so it is important to study existing nodes on arterial roads and the most important of the main roads are Omar UI-Mukhtar, Jamal Abdel Nasser, Al Wehda, Al Thawra, Alkarama, Al - Aqsa. The number of nodes on the main arterial roads total 20 in Gaza City. Figure 4-33 shows the urban nodes of Gaza City.

Map 4.33 is produced by employing a methodology that entails the identification of urban nodes, which is determined by calculating the degree of node centrality as determined by the Koing index. Below is an explanation of the process by how Map 4.33 was generated:

Identification of Urban Nodes: The process of identifying urban nodes. Within the framework of Gaza City, there exist a total of 17 distinct neighbourhoods, necessitating a comprehensive examination of the present nodes located along arterial roads. The main roads highlighted contain Omar UI-Mukhtar, Jamal Abdel Nasser, Al Wehda, Al Thawra, Alkarama, and Al-Aqsa. This study aims to determine the number of nodes present on the main arterial roads. The main arterial roads in Gaza City consist of a total of 20 nodes.

Degree of Centralization Measurement: The degree of centralization of these nodes is determined by calculating the Koing index, a measure that was invented in 1963. This index measures the position of a network node within the range between the total average and the total extreme. The objective is to ascertain the maximum number of connections that can be established between the network lines and the farthest node, utilising the shortest possible path.

Mapping Urban Nodes: The identification of urban nodes is based on their degree of centrality, as determined by the Koing index. This index is used to identify urban nodes, and maps depicted in Figures 4-22 and 4-24.

Transformation into Map 4.33: The urban nodes are identified based on the maps presented in Figures 4-22 and 4-24. It is assumed that those mentioned nodes are subsequently converted into Map 4.33, which illustrates the distribution and centrality of urban nodes within Gaza City, as determined by the computed Koing index values.

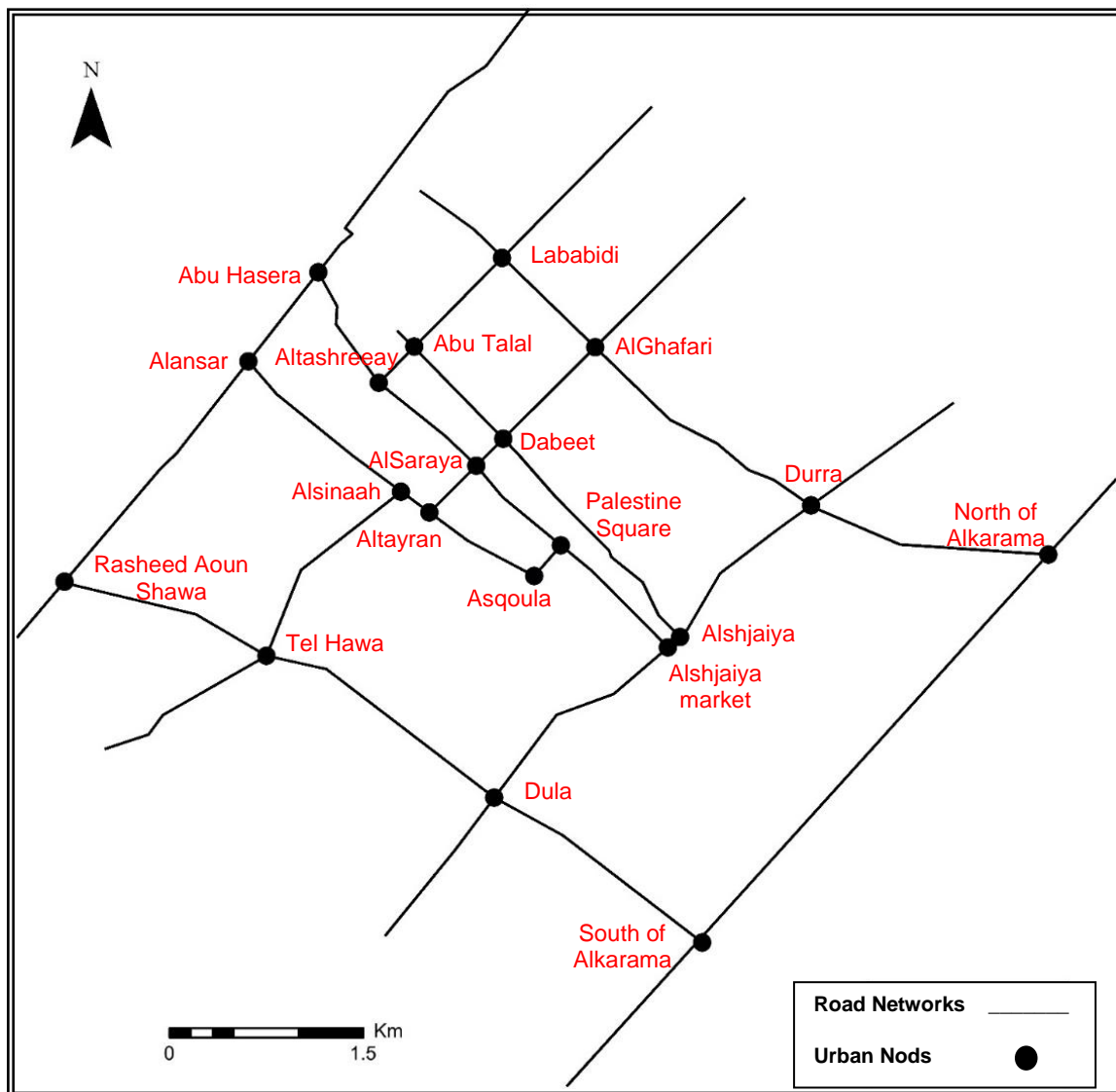


Figure.4-33 Urban nodes in Gaza City, 2019. (Researcher's image based on Figures 4-22 and 4-24)

4.6.2 The Degree of Centralization of the Nodes:

A measurement of the location of any network node between the total average and total extreme is calculated by the Koing index that was developed in 1963. It determines the maximum number of connections leading to the farthest node through the shortest path possible along the network lines. The node with the lowest number in the network is the most central node while the greater the value, the less centralised the node, as shown in table 4-8.

Table 4-8, Centralisation of the central nodes in the road network in Gaza City, (Researcher's work based on Figure 4-33).

	Palestine Square	Asqoula	Altayran	AlSaraya	Dabeet	AlGhafari	Alsinaah	Tel Hawa	Lababidi	Abu Talal	Altashreeay	Abu Hasera	Alansar	Rasheed Aoun Shawa	Durra	Alshjaiya	Alshjaiya market	Dula	North of Alkarama	South of Alkarama
Palestine Square		1	2	1	2	3	3	4	4	3	2	3	4	5	3	2	1	2	4	3
Asqoula	1		1	2	3	4	2	3	5	4	3	4	3	4	4	3	2	3	5	4
Altayran	2	1		1	2	3	1	2	4	3	2	3	2	3	5	4	3	4	6	5
AlSaraya	1	2	1		1	2	2	3	3	2	1	2	3	4	4	3	2	4	5	4
Dabeet	2	3	2	1		1	3	4	2	1	2	3	4	5	2	4	3	5	3	5
AlGhafari	3	4	3	2	1		4	5	1	2	3	4	5	6	1	2	4	6	2	5
Alsinaah	3	2	1	2	3	4		1	5	4	3	2	1	2	6	5	4	2	7	3
Tel Hawa	4	3	2	3	4	5	1		6	5	4	3	2	1	7	6	5	1	7	2
Lababidi	4	5	4	3	2	1	5	6		1	2	3	4	5	2	3	5	6	3	7
Abu Talal	3	4	3	2	1	2	4	5	1		1	2	3	4	3	5	4	5	4	6
Altashreeay	2	3	2	1	2	3	3	4	2	1		1	2	3	5	4	3	4	6	5
Abu Hasera	3	4	3	2	3	4	2	3	3	2	1		1	2	6	5	4	5	7	6
Alansar	4	3	2	3	4	5	1	2	4	3	2	1		1	7	6	5	6	8	7
Rasheed Aoun Shawa	5	4	3	4	5	6	2	1	5	4	3	2	1		8	7	3	2	4	3
Durra	3	5	4	3	2	1	5	6	2	3	4	5	6	7		1	2	3	1	4
Alshjaiya	2	4	3	2	1	2	4	5	3	2	3	4	5	6	1		1	2	2	3
Alshjaiya market	1	5	4	3	2	3	5	2	4	3	4	5	6	7	2	1		1	3	2
Dula	2	4	5	4	3	4	2	1	5	4	5	4	3	2	3	2	1		4	1
North of Alkarama	4	6	5	4	3	2	6	7	3	4	5	6	7	8	1	2	3	4		1
South of Alkarama	3	5	5	5	4	5	3	2	6	5	6	7	4	3	4	3	2	1	1	
	52	68	55	48	48	60	58	66	68	56	56	64	66	78	74	68	57	67	82	75

Table 4-8 shows that the most central nodes are those that occupy locations around the centre of Gaza City at the intersection of roads. These lead to vital and important areas and are located on main roads in the city, such as Omar UI-Mukhtar, Al-Wahda, Al-Jalaa and Jamal Abdul Nasser. These are some the most important in the city, as in the nodes of Saraya and Dabit junction, where it was the lowest node in terms of the number of links. Thus, the number of links reached 48 for each junction. These were then ranked against the Palestine Square node, which is considered a commercial area for the residents of Gaza City, where the number of links with the rest of the nodes reached 52. These were also compared with Abu Talal and Al-Tashari' nodes, where the number of links per node reached 56.

The Al-Shuja'iya market node (57 links), the industrial junction (58 links), the Al-Ghafari junction nodes (60 links), Abu Hasira (64 links) and Al-Ansar and Tal al-Hawa nodes (66 links per node), they are considered secondary nodes, as they are far from the city centre, also the population movement as well as the commercial activity is less there.

Amongst the rest of the nodes, such as the State of Asqoula, Lababidi, Al-Shuja'iyyah, Al-Durra, South Karama, Al-Rasheed Aoun Al-Shawwa and North Karama, the number of links was greater, meaning they are considered marginal nodes. We note that they are located at the outskirts of the city and at the entrances, where the density of the population is low and there is no vital centre.

4.6.3 The Detour Index

The Detour Index represents a path that connects two or more urban centres, which is desirable, but in reality is rarely achieved. The road may deviate from a straight line, influenced by natural, economic, human, and political factors (Lukovits, 1996) and this deviation has two meanings:

Firstly, as a measure of the efficiency of a transport network in terms of how well it overcomes distance or the friction of distance. The closer the detour index gets to 1, the more the network is spatially efficient. Networks with a detour index of 1 are rarely, if ever, seen and most networks would fit on an asymptotic

curve close to 1 but never reaching it. For instance, the straight distance, $D(S)$, between two nodes may be 40km but the transport distance, $D(T)$ or real distance, may be 50 km. The detour index is thus 0.8 (40 / 50). This is often a good indicator of the level of the detour.

$$DI = \frac{D(S)}{D(T)}$$

In order to derive a measure of relative efficiency, the Detour Index Relative Efficiency is the ratio between the Detour Index calculated from the original network while the Detour Index is calculated either from the MST (Minimum Spanning Tree) or the GT (Greedy Triangulation) (Comtois & Slack, 2009).

The closer the output to 100%, the closer the road will be to straightening and thus the more efficient the road network. The further away from 100%, the closer the road is to the detour and the less efficient the road network (Ducruet & Rodrigue, 2013). The actual length of the road may not be shorter than a straight line, but it can be equal in rare cases. By applying the detour index to a regional and main road network in Gaza City, we note that, at the level of the total road network the detour index is 107.1%, which indicates that the road network in Gaza City is almost straight. This is perhaps because Gaza City has a surface free of mountains and water bodies that force the route of the road to turn. Since the detour signal of the total roads is low, the highest ratio in five roads exceeds 120%. This is due to the fact that Gaza City has a surface devoid of mountains and water bodies that force the path of the road to turn. It helps decision makers in the planning process of Gaza City in general and in public transport planning in particular. Also, the cost of establishing the public transport network is lower because the surface in Gaza City is semi flat (further details are shown in Appendix 4).

4.6.4 Connectivity Index

The analysis of interconnection in a road network depends on the transformation of the real network into a simplified network, known as a topological form. This consists of a number of nodes that are represented by starting and access

stations along with the intersection of network lines. In addition, a set of links are confined between the nodes and represent the road network, as in figure 5-33.

The theory that deals with nodes and connections is known as the theory of networks or data. ¹This means that the degree of correlation refers to the degree of interrelationship between the network nodes and links. It is determined by several measures, all of which agree that the greater the number of links, the greater the degree of interconnection in the road network. A set of quantitative indicators will be adopted to analyse the degree of interdependence of the road network in Gaza City:

- a. Beta index.
- b. Gamma index.
- c. Alpha index.

Peter Davis has identified three types of network based on the degree of node and link presence (Hu et al., 2007):

Segmented network:

Where links are connected between some nodes and are non-existent between others.

Interconnected network

The network is characterized by the fact that all nodes are directly or indirectly connected.

Integrated network

The network is characterized by the fact that each node is directly connected to the rest of the nodes.

¹ Garrison is considered the first geographer to use this theory to analyse road networks in 1960 (Xie & Levinson, 2007).

a. Beta Index

Measures the level of connectivity in a graph and is expressed by the relationship between the numbers of links (e) over the number of nodes (v). Trees and simple networks have a Beta value of less than one. A connected network with one cycle has a value of 1. More complex networks have a value greater than 1. In a network with a fixed number of nodes, the higher the number of links, the higher the number of paths possible in the network. Complex networks have a high value of Beta. The rich-club coefficient is the Beta index applied to relations among larger order (degree) nodes; it verifies whether the connectivity is higher among larger degree nodes than for the whole network.

$$\beta = \frac{e}{v} = \frac{28}{20} = 1.4$$

The Beta index is 1.4, which indicates a strong correlation in Gaza's road network. However, this indicator is limited in value and effectiveness.

b. Gamma Index

A measure of connectivity that considers the relationship between the numbers of observed links and the number of possible links. The value of gamma is between 0 and 1 where a value of 1 indicates a completely connected network that would be extremely unlikely in reality. Gamma is an efficient value to measure the progression of a network over time. By applying the indicator to the road network in Gaza City

$$\varphi = \frac{e}{3(v-2)} = \frac{28}{3(20-2)} = \frac{28}{54} = 0.51$$

This means that the network connectivity is not complete, and in order for the transport network in Gaza City to reach a complete network, we need to add 26 roads.

c. The Alpha Index

The alpha index provides a ratio measure of the number of circuits in a network relative to the maximum number possible. Symbolically, in order to construct an alpha index, the number of linkages in a network is represented by v , and the number of linkages is equal to one less than the number of nodes represented by $(e=v-1)$ (minimal connection only). When circuits are present in a network, the number of linkages is larger than $(v-1)$ or $(e>v-1)$. To arrive at the number of circuits in a network, subtract the number of linkages needed for a minimally connected system $(v-1)$ from the actual number of linkages; $e - (v-1) = e - v + 1$. This will provide a measure of the number of independent circuits in a network.

The maximum number of independent circuits possible is directly related to the number of nodes and number of linkages needed to minimally connect the nodes in a system. The basic mathematical formula used to calculate an alpha index is $\alpha = \frac{e-v+1}{2v-5}$. Alpha values range from 0 for minimal connectivity to 1 for maximum connectivity. To apply this indicator to the road network in Gaza City, the degree of interconnection of the road network in Gaza City according to the Alpha index:

$$\alpha = \frac{e-v+1}{2v-5} = \frac{28-20+1}{2(20-5)} = \frac{9}{30} = 0.3$$

This means that the degree of interconnection of the road network in Gaza City is weak according to this indicator. The road network in Gaza City needs 21 connections to reach maximum interconnection.

4.6.5 Accessibility

Accessibility between network nodes can be expressed by the number of links between nodes. To measure this, the nodes are placed along the axes of a matrix. It is measured either by the number of links between nodes or by the distance of the links between the nodes (Geurs & Wee, 2004).

Accessibility by a Number of Links between Nodes

Accessibility can be calculated by the number of links between nodes where the number of links is placed in a matrix, and the nodes are based on accessibility. The node that is connected to the rest of the nodes in the road network throughout the fewest links is the most accessible (Litman, 2007). This indicator is applied to the road network in Gaza City as detailed in Table 4-9.

Table 4-9, Accessibility between nodes according to the number of links in Gaza's road network, (Researcher's work based on Figure 4-33)

	Palestine Square	Asqoula	Altayran	AlSaraya	Dabeet	AlGhafari	Alsinaah	Tel Hawa	Lababidi	Abu Talal	Altashreeay	Abu Hasera	Alansar	Rasheed Aoun Shawa	Durra	Alshjaiya	Alshjaiya market	Dula	North of Alkarama	South of Alkarama
Palestine Square		1	2	1	2	3	3	4	4	3	2	3	4	5	3	2	1	2	4	3
Asqoula	1		1	2	3	4	2	3	5	4	3	4	3	4	4	3	2	3	5	4
Altayran	2	1		1	2	3	1	2	4	3	2	3	2	3	5	4	3	4	6	5
AlSaraya	1	2	1		1	2	2	3	3	2	1	2	3	4	4	3	2	3	5	4
Dabeet	2	3	2	1		1	3	4	2	1	2	3	4	5	2	1	2	3	3	4
AlGhafari	3	4	3	2	1		4	5	1	2	3	4	5	6	1	2	4	5	2	6
Alsinaah	3	2	1	2	3	4		1	5	4	3	4	1	2	6	5	4	5	6	6
Tel Hawa	4	3	2	3	4	5	1		6	5	4	5	2	1	7	6	5	1	8	2
Lababidi	4	5	4	3	2	1	5	6		1	2	3	4	5	2	3	5	6	3	6
Abu Talal	3	4	3	2	1	2	4	5	1		1	2	3	4	3	2	3	5	4	6
Altashreeay	2	3	2	1	2	3	3	4	2	1		1	1	3	5	4	3	4	6	5
Abu Hasera	3	4	3	2	3	4	4	5	3	2	1		1	2	6	5	4	5	7	6
Alansar	4	3	2	3	4	5	1	2	4	3	1	1		1	7	6	5	6	8	7
Rasheed Aoun Shawa	5	4	3	4	5	6	2	1	5	4	3	2	1		8	7	6	2	4	3
Durra	3	4	5	4	2	1	6	7	2	3	5	6	7	8		1	2	3	1	4
Alshjaiya	2	3	4	3	1	2	5	6	3	2	4	5	6	7	1		1	2	2	3
Alshjaiya market	1	2	3	2	2	4	4	5	5	3	3	4	5	6	2	1		1	3	2
Dula	2	3	4	3	3	5	5	1	6	5	4	5	6	2	3	2	1		4	1
North of Alkarama	4	5	6	5	3	2	6	8	3	4	6	7	8	4	1	2	3	4		1
South of Alkarama	3	4	5	4	4	6	6	2	6	6	5	6	7	3	4	3	2	1	1	
	52	59	54	47	46	60	64	70	66	55	53	67	69	70	71	60	57	63	78	75

Table 4-9 shows that Dabeit node is the first in Gaza City in terms of accessibility. This is explained by the number of links (46) between its nodes. Dabeit is followed by Saraya at 47 nodes, then the Palestine Square (Alsaha) with 52 nodes. As previously earlier, this is due to the location of these nodes in vital areas of Gaza City, as well as their centrality to Gaza City. In comparison, North Karama node ranks last because of its remote geographical location.

Access between nodes according to link lengths

Accessibility can be calculated by the distance between nodes, where the actual length of the road is placed in the matrix. The nodes are then arranged on the basis that the node that is connected with the road network nodes in Gaza City with the lowest distance as the most accessible. This indicator is applied to the road network in Gaza City as shown in table 4-10.

Table 4-10 Accessibility between nodes according to the length of links in Gaza's road network, (Researcher's work based on Figure 5-33)

	Palestine Square	Asqoula	Altayran	AlSaraya	Dabeet	AlGhafari	Alsinaah	Tel Hawa	Lababidi	Abu Talal	Altashreeay	Abu Hasera	Alansar	Rasheed Aoun Shawa	Durra	Alshjaiya	Alshjaiya market	Dula	North of Alkarama	South of Alkarama
Palestine Square		354	1686	1418	1713	2709	1903	3645	3628	2684	2253	3280	4153	6416	2352	815	636	2362	4343	4509
Asqoula	354		1332	1821	2116	3112	1549	3291	4084	3040	2656	2040	3147	5410	2706	1169	990	2716	4697	4890
Altayran	1686	1332		489	784	1780	217	1959	2752	1708	1324	2688	1815	4078	4038	2501	2322	4048	6029	6222
AlSaraya	1418	1821	489		295	1291	706	2448	2263	1219	835	1862	2735	4998	3770	2233	2054	3780	5761	5954
Dabeet	1713	2116	784	295		996	1001	2743	1968	971	1335	2157	3030	5293	3739	2202	2349	4075	5730	6249
AlGhafari	2709	3112	1780	1291	996		1997	3739	972	1963	2126	3153	4026	6289	2334	3871	4050	5776	4325	7950
Alsinaah	1903	1549	217	706	1001	1997		1724	2969	1925	1541	2471	1598	3861	4255	2939	2760	4486	6246	6660
Tel Hawa	3645	3291	1959	2448	2743	3739	1742		4711	3667	3283	4213	3340	1628	6006	4469	4290	2561	8225	4738
Lababidi	3628	4084	2752	2263	1968	972	2969	7411		991	1375	2402	3275	5538	3306	4164	4343	6069	5297	8784
Abu Talal	2684	3040	1708	1219	971	1963	1925	3667	991		384	1411	2284	4547	4357	3173	3352	5078	6288	7852
Altashreeay	2253	2656	1324	835	1335	2126	1541	3283	1375	384		1027	1900	4163	4065	2528	2349	4075	6596	6249
Abu Hasera	3280	2040	2688	1862	2157	3153	2471	4213	2402	1411	1027		873	3136	5092	3555	3376	5102	7083	7276
Alansar	4153	3147	1815	2735	3030	4026	1598	3340	3275	2284	1900	873		2263	5965	4428	4249	6755	7956	8629
Rasheed Aoun Shawa	6416	5410	4078	4998	5293	6289	3861	1628	5538	2263	4163	3136	2263		7634	6097	9518	4192	9625	6366

Durra	2352	270 6	4038	37 70	37 39	23 34	42 55	60 06	33 06	43 57	4065	5092	5965	7634		1537	1616	337 8	1991	5478
Alshjaiya	815	116 9	2501	22 33	22 02	38 41	29 39	44 69	41 64	31 73	2528	3555	4428	6097	1537		179	190 5	3528	4079
Alshjaiya market	636	990	2322	20 54	23 49	40 50	27 60	42 90	43 43	33 52	3249	3376	4249	5918	1616	179		172 6	3707	3900
Dula	2362	271 6	4048	37 80	40 75	57 76	44 86	25 64	60 69	50 78	4075	5102	6455	4192	3378	1905	1726		5661	2174
North of Alkarama	4343	469 7	6029	57 61	57 30	43 25	62 46	82 25	52 97	62 88	6596	7083	7956	6925	1991	3528	3707	655 1		3487
South of Alkarama	4509	489 0	6222	59 54	62 49	79 50	66 60	47 38	87 84	72 53	6249	7276	8629	6366	5478	4079	3900	217 4	3487	
	5092 2	511 20	4777 2	45 93 2	48 74 6	62 45 9	50 82 6	70 70 1	68 89 1	56 29 5	50064	6219 7	72121	9745 2	7361 9	5537 2	5416 6	756 22	1065 75	1108 46

It is clear from Table 4.10 that Al-Saraya Junction is ranked first among the Gaza City nodes, as it had the shortest distance between the nodes, at reached 45,932 meters. This was followed by Altayaran Junction node at 47,772 meters, and then Dabeet node. We note that the previous nodes are located in vital areas of Gaza City, as well as on Al Jalaa and Canal roads. In contrast, the north and south of Al Karama were ranked last because of their more remote locations in Gaza City.

4.6.6 Proposed Procedures of a distributing local bus stations map.

Distributing local bus stations map is essential to generate an axial representation to the Gaza city. The axial map is an intersecting road networks. In simple terms, the axial map is represented by the longest lines of sight that can be used to characterize every street segment as in figure (4.33). The axial map can be presented as a graph; the lines of the graph represent the roads and the nodes represent the intersections of the roads (Liu, X., & Jiang, B. 2012).

The following procedures are to convert the map into an acceptable format on UCL Depthmap:

1. Drawing the map, which is gained from Gaza municipality, by AutoCAD (*.dxf) to be imported in UCL Depthmap, see figure (4.34)

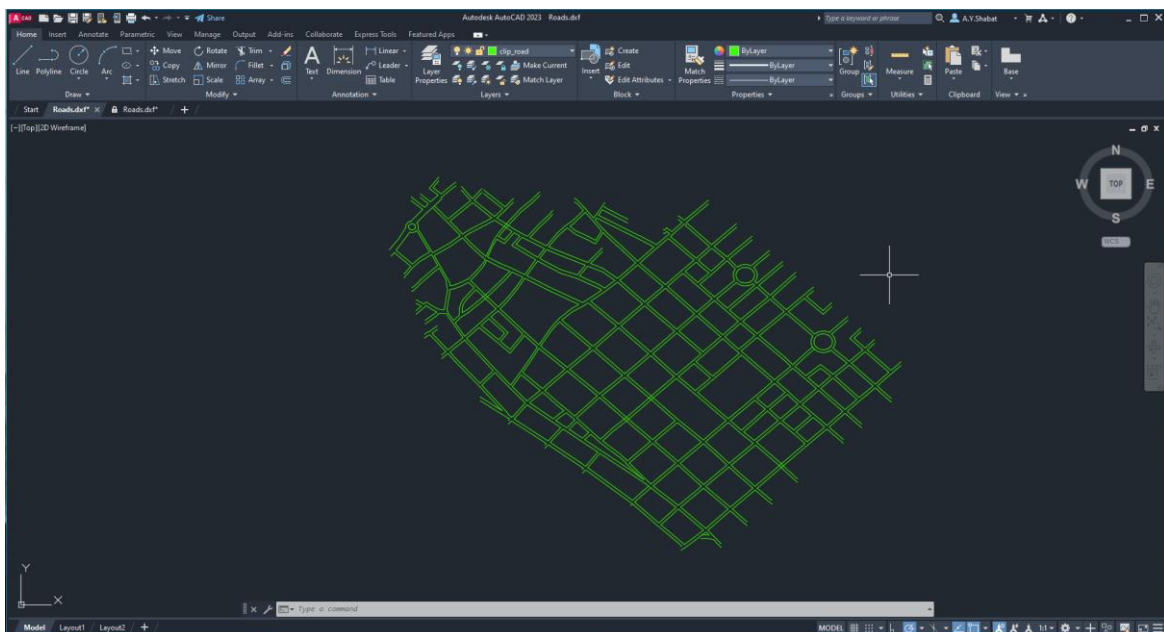


Figure 4-34 Drawing the map by AutoCAD (*.dxf)

2. Converting the graph into axial map to apply the analysis; as in figure (4.35).

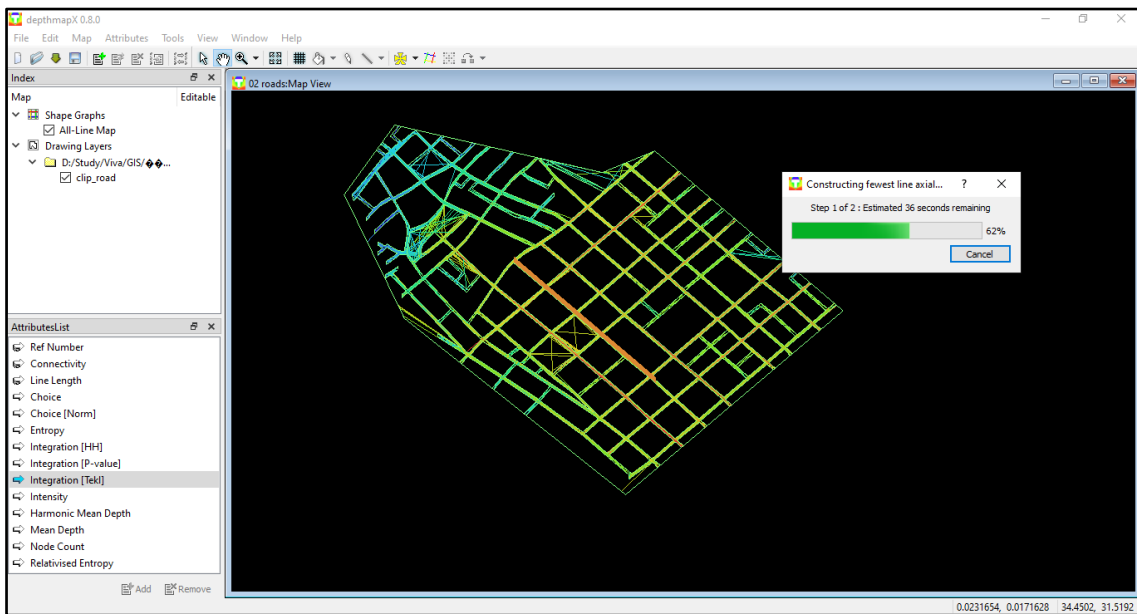


Figure 4-35 Converting the graph into axial map

3. Converting axial map into connectivity and Integration graph as in figure (4.36).

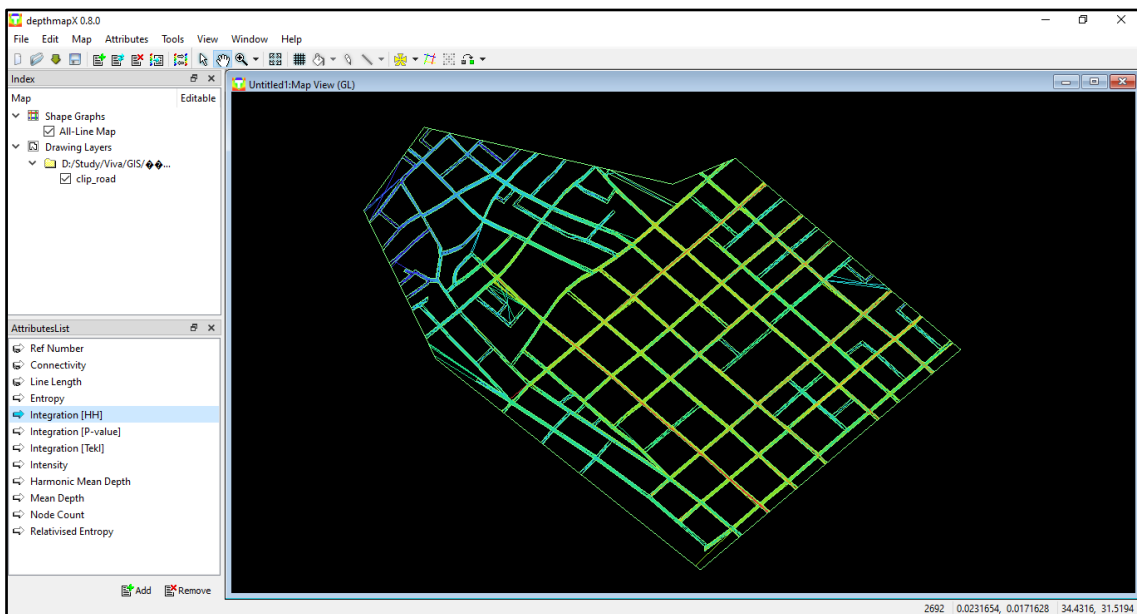


Figure 4-36 Converting axial map into connectivity and Integration graph.

Integration

The integration, is one of essential features for a complete connection between land-use and road networks. Integration can be defined as the combination of more than one method to better develop simulation algorithms in land-use change models, where is considered an indicator of how easily someone can reach a destination area easily and smoothly (Rashid, et al 2014). Arithmetic the

Integration definition is the number of destination that are needed to pass through to reach somewhere from all the axial lines in the system. Additionally, integration measures mean how many turns someone has to make from a bus station to reach all other stations in the road networks. Using shortest paths the roads that require the less numbers of turns to reach all other road are considered as complete integrated (Charalambous, N., & Mavridou, M. 2012), figure (4.37) illustrates integration is applied on axial map.



Figure 4-37 Axial map shows the integration of each axis

Connectivity

Connectivity gives the number of roads/lines that are directly linked to other line. Also, indicates the number of choices that can be seen from urban node. The Connectivity counts all nodes that connect axial line with other lines of the spatial system that intersect with. Based on these finding, it can be suggested that connectivity measures of space syntax can be used for analysing accessibility and way determine bus stations (Rodrigue, J. P., & Ducruet, C. 2020), figure (4.38) illustrates the most connective area is applied on axial map.



Figure 4-38 Most connective area is applied on axial map.

Proposed of a distributing local bus stations

Local bus stations represents a chain that consists a number of transport nodes and roads. This requires an efficient allocation of the elements of the chain. According to the urban nodes in Gaza City as shown in figure (4.33) and, connectivity and Integration axial map figures (4.37), (4.38) Accordingly, Figure (4.39) shows the proposed scenario for distributing local bus stations in Gaza City.

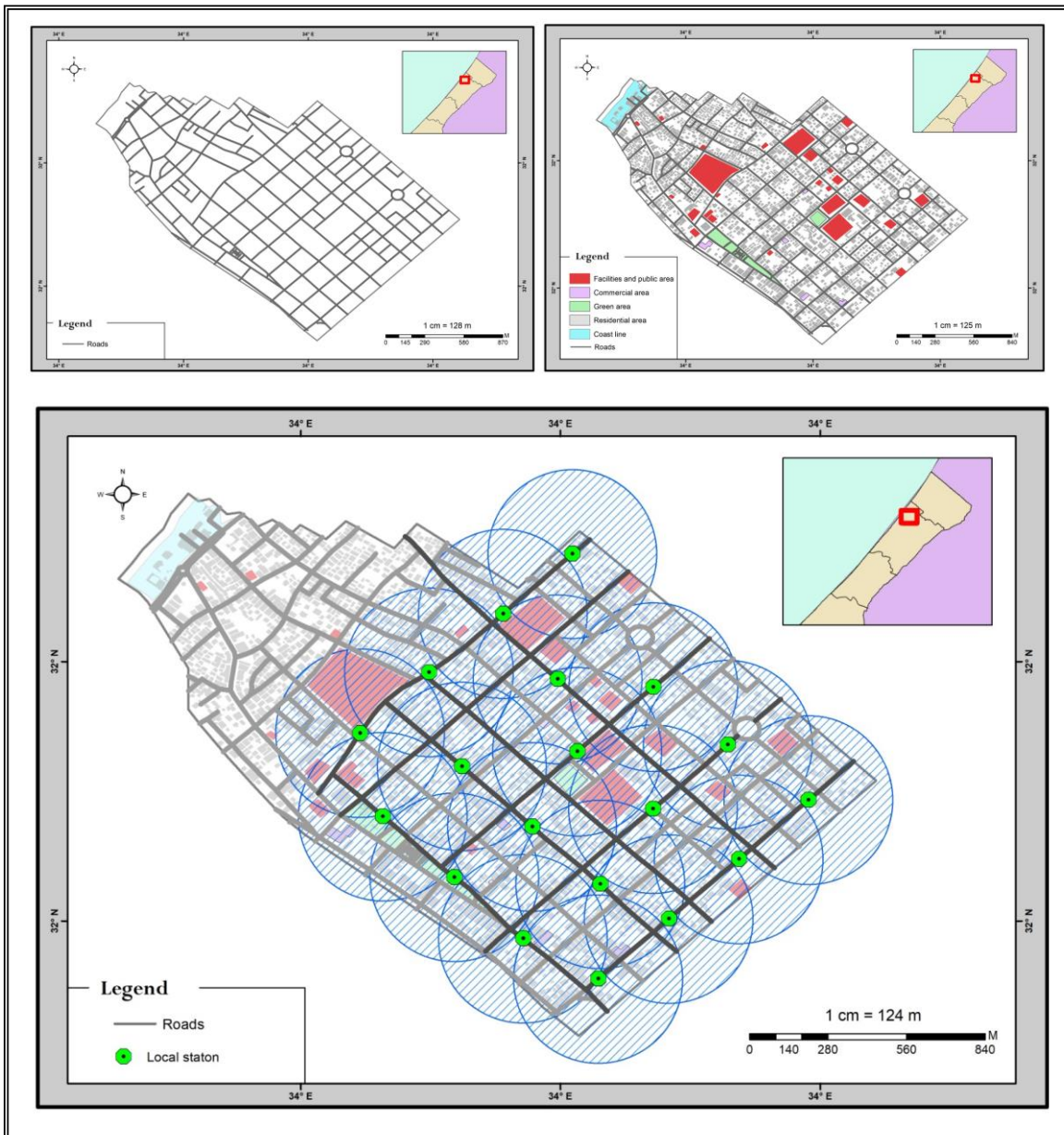


Figure 4-39 Proposed scenario for distributing local bus stations in Gaza City.

CHAPTER 5

Research Methodology

5. CHAPTER 5: Research Methodology

This applied research uses an analytical method to identify urban transport challenges and explore the practice of TOD as a planning guideline for a liveable and accessible urban environment. This methodological approach is based on four key indicators for integrated transport and land-use planning: Accessibility, complete streets, placemaking and PT performance. The factors are further investigated in the case study - Gaza Strip - which discusses the challenges of implementing TOD.

5.1 Distribution of Research Methodologies and the Selected Approach

The methodology is an integral part of any academic research, so the success of any study is dependent on the effective application of available methodological techniques to examine the research problems (Fellows & Liu, 2015). The determination of methodology through known paradigms helps the researcher to define which approach is most applicable to their research and helps them to choose an appropriate strategy to implement (Creswell, et. al 2009).

Research methodology refers to logical thought processes, procedures and principles that can be used for scientific enquiry (Knight & Ruddock, 2008). Holden and Lynch (2004) imply that a philosophical review can have a dual effect on the researcher: Firstly, it may open their mind to other possibilities, therefore enriching their own research abilities, and secondly, it can enhance their confidence in the appropriateness of their methodology for the research problem.

Kumar and Phrommathed (2005) suggest that a research methodology comprises the philosophy and science that support the investigation. According to an extensive review of methodologies and methods, this chapter will discuss the selection and justification of the most appropriate approach to answer the research questions within the study's scope and context.

Two main approaches to research methodology were considered for this study. The first approach considered was developed by Kagioglou et al. (2000) and is a

nested approach to research, where the selection of techniques/tools is made by a process of narrowing down from the philosophical stance to an appropriate paradigm, illustrated in figure 5.1. A nested approach has just three layers, which can make it easier to follow but might not cover the essential requirements to meet the research needs.



Figure 5-1 Nested methodology research model (Kagioglou et al., 2000).

The second approach considered was developed by Saunders, Lewis and Thornhill (2016) and represents a research methodology in different layers, like an 'onion'. As shown in figure 5.2, the main layers, from outer to inner, include the research approach, research philosophy, time horizon, research strategies, and data collection methods. In this study, Saunders et al.'s (2016) classification of the layers is adopted to guide the review of possible research concepts and methodological approaches that can be applied to the study.

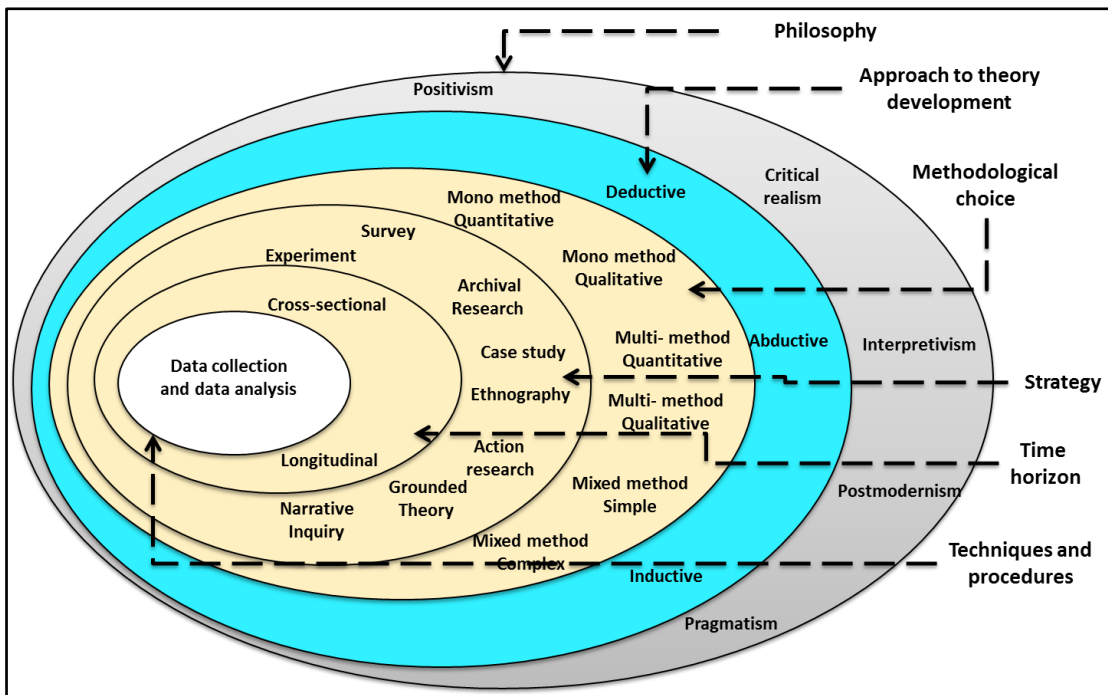


Figure 5-2, Saunders' Research Onion Model (Saunders et al., 2019).

To understand the components of a research methodology, this study adopted the latest version of the 'research onion' (Saunders et al., 2019).

5.2 Research Philosophy

The research philosophy represents the philosophical worldview that forms the grounds for the conceptualisation of a research problem (Creswell, 2014). The research philosophy is dependent on the researcher's assumptions regarding the progress of knowledge, and affects the way the research is conducted (Saunders et al., 2009). The quality of research is highly dependent on philosophical issues. The philosophical position questions how we acquire knowledge as well as its acceptability to a field of enquiry (Easterby-Smith et al., 2008) therefore, it represents an understanding of the ways of seeking knowledge.

As Saunders et al. (2019) reported, the research philosophy demonstrates the fundamental assumptions regarding the style in which a researcher sees the world. The research philosophy is comprised of two standpoints: interpretivism and positivism (Easterby-Smith et al., 2012; Williamson, 2006), theoretical perspectives (Creswell, 2014), and perceptions of reality (Sarantakos, 2012). The assumptions will support the choice of research strategy and methods used in

achieving the objectives. When conducting research, an underlying theoretical perspective should be implemented by the researcher (Gray & Malins, 2016). This underlying theoretical perspective is referred to as the 'philosophical paradigm' (Collins, 2018; Saunders et al., 2016; Fellows and Liu, 2015; Trochim and Donnelly, 2006).

The chosen research philosophy also precepts the assumptions on how the world is observed by the researcher (Collins, 2018). These assumptions will enhance the research strategy (Creswell et al., 2009). Fumerton (2008) defines axiology, ontology and epistemology as three sections of philosophy. These philosophical assumptions include: *Ontology* (nature of science and truth), and *axiology* (role of values). Bryman (2016) explains 'ontology' as the reflection of reality with respect to social units and defines '*epistemology*' as the reflection of the adequacy of knowledge. Meanwhile, axiology is defined as a branch of philosophy that studies judgments about value (Saunders et al., 2016).

5.2.1 Ontology

In the context of social research, ontology is concerned with the nature of reality. It is a philosophical attitude influenced by what is known or what comprises social reality. It encompasses all the questions that a researcher has about the way the world operates and commitments held to particular views (Bryman & Bell, 2007). Hatch and Cunliffe (2006) identified the two positions of ontology as 'objectivism' and 'subjectivism' which can be described as the poles of a continuum. Objectivism signifies the position where social objects exist or the question whether reality exists independently of those who live in it. Subjectivism implies social phenomena and the categories that are used every day resulting from the views and actions of social actors concerned with their existence (Saunders et al., 2016).

5.2.2 Axiology

Heron and Reason (1997) indicate that our values are the reason and control behind all human actions. Researchers illustrate axiological skill by being able to elucidate their values as the basis for making decisions about what research they

are conducting and how they will conduct it (Saunders et al., 2009). Sexton (2007) implies that axiological assumptions concern the nature of value and the grounds of value judgements, which can be specified as value-free and unbiased or value-laden and biased. Axiology depends on concepts of value and sometimes addresses the groundwork for philosophical fields of study (Nawi, 2012; Tobi, 2011). Figure 5.3 indicates the philosophical directions of research, and how axiological perspectives have created congruence between the epistemological and ontological positions. These further inform the requirements and standards of an acceptable research approach and research technique (Sexton, 2007). At all steps of the research process, the researcher will be demonstrating their values.

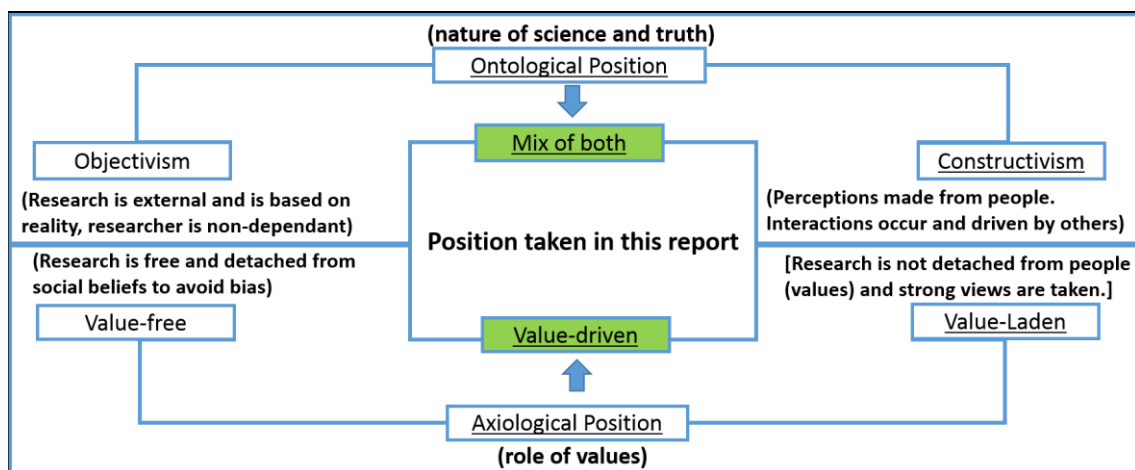


Figure 5-3, Ontological and Axiological positions taken (Aouad, 2011).

The ontological position will represent a variation of constructivism (subjectivism) and objectivism since a set of considerations are taken that integrate the *Road Networks and Land-use Assessment Model*. This considers the model construction and data collected. A value-driven axiological position will be selected since considerations are taken that demand the identification of problems that exist in Gaza city planning, such as the absence of Integration between road networks and land-use, and the delivery of practical solutions that aim to overcome problems through the proposed model. Thus, a mixed of value-free and value-laden will be used.

The first layer of the research onion considers the epistemological position. The research philosophy for this study adopts a critical approach since it helps to take

the important steps needed to make the right decisions when selecting the research methods. According to Crotty (1998), a philosophical position allows the researcher to interrogate what is known.

5.2.3 Epistemology - Research Philosophy

Epistemology concerns what is satisfactory information in a field of study. Epistemology is impacted by what makes appropriate learning in a particular field of study (Saunders et al., 2016). Five noteworthy methods of insight are noted on this premise, namely: Positivism (separate from the researcher), Critical Realism (truth is essential and seen as outer), Interpretivism (open to new learning), Postmodernism (no supreme truth to the real world), and Logic (critical thinking and educated future practice).

In epistemology, the primary issue is to know whether the social world can be considered in a comparable way as the regular sciences, which can be examined by standards, systems, and ethos. Sutrisna (2009) states that epistemology sees the hypothesis of information as the strategies, approval, and conceivable techniques for procuring learning in an expected reality. There are two differentiating positions under epistemological contemplations, specifically positivism and interpretivism.

5.2.3.1 Adopted Research Philosophical Position

This research aims to explore the requirements for integrated land-use and road networks. It is evident that research requires generalisation and measurement to establish relationships. Pragmatism is the selected research philosophy since the research starts with a problem, namely the absence of integration between land-use and road networks that is open to new knowledge with the aim of solving these problems and improving future practice. This is attempted by developing a balanced and equitable urban planning strategy that combines these two concepts in an assessment framework that is based on current literature (Bryman, 2016).

5.3 Research Approach

The research approach depends on a theoretical position utilised to expand on the research structure and define the philosophical position chosen (Johnson & Onwuegbuzie, 2004). The degree to which a researcher is clear about the hypothesis helps to elicit essential issues from the examination plan (Saunders et al., 2009). Saunders et al. (2016) describes the research approach as how theory is built up; three approaches expand on the philosophical position. These are: Induction (generating and testing a theory from the information accumulated), deduction (testing a theory from writing its creation) and abduction: (generalising from the associations of theory, carried out from writing and theory and tested through information gathering). A researcher needs to figure out which approach is most appropriate fit to answer the exploratory questions. The following section will talk about the three approaches in more detail (Sekaran & Bougie, 2016).

5.3.1 Deductive Approach

The hypothesis is deductive as it is dependent on what is known from the field, which is exposed to experimental testing. A deductive methodology incorporates the advancement of a hypothesis that is systematically tested. The underlying step is to identify a theory linked to a subject of interest, and this theory is then narrowed down into a more specific hypothesis that can be surveyed before narrowing down further (Gallaire et al., 1989). Trochim and Donnelly (2006) state that deductive reasoning works from the broad to the increasingly specific which is known as a 'top-down' technique (Hyde, 2000). Deductive thinking steps are outlined in figure 5.4.

DEDUCTION

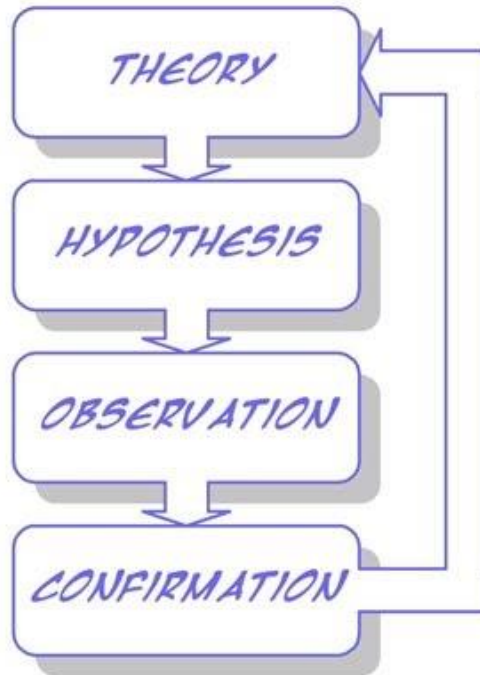


Figure 5-4: Deductive Reasoning (Trochim & Donnelly, 2006)

5.3.2 Inductive Approach

Conversely, the inductive approach involves observations that enable the development of a hypothesis. An inductive approach is regularly utilised in a subjectivist ontology and is frequently alluded to as a 'bottom-up' approach in that it goes from the specific to the general (Bryman & Bell, 2007). Trochim and Donnelly (2001) state that inductive reasoning moves from particular observations to more extensive generalisations and theories. The inductive reasoning procedure is outlined in figure 5.5.

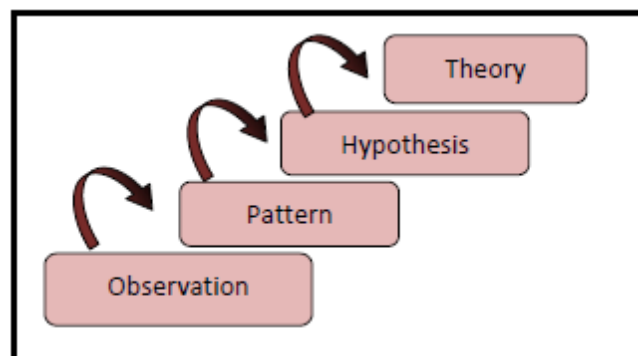


Figure 5-5, Inductive Reasoning (Trochim and Donnelly, 2001).

5.3.3 Abductive Approach

The abductive approach is a blend of both deductive and inductive approaches, known as the "V" or "W" pattern, or "top-down versus bottom up". Blending inductive and deductive can prompt a more significant outcome. Abductive reasoning is a successful method for research, as the result is agreeable if an unadulterated inductive or deductive approach is executed (Bryman, 2016; Tashakkori & Teddie, 2009). An abductive reasoning approach is illustrated in figure 5.6.

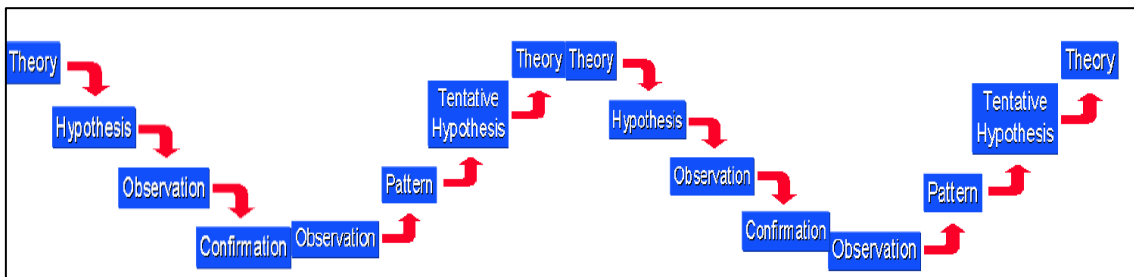


Figure 5-6, Abductive Reasoning (Trochim & Donnelly, 2001)

5.3.4 Adopted Research Approach Position

The approach that will suit this exploration is abduction, since the study will expand on existing literature concerning the integration of land-use and road networks, and then develop theory through a framework. The framework will subsequently be refined and considered by Gaza city, and results got will be utilised to create an update to the framework. This will involve information gathering, and will be conducted through the utilisation of deduction and induction approaches (Bryman, 2016; Dim, 2014).

5.4 Research Methodological Choices

When the philosophies and approaches have been chosen, the next stage entails an investigation of an accessible research methodology. The choices defined in the research onion incorporate mono, multi- and the mixed method (Saunders et al., 2016). The mono-method utilises only one research approach, while the mixed-method requires the utilisation of at least two strategies and alludes to the utilisation of both a qualitative and quantitative methodology. In a multi-method approach, a more extensive range of methods is utilised (Bryman, 2016; Page 180

Saunders et al., 2016; Creswell, 2014). Saunders et al. (2009) explained that the research strategy is fundamental in empowering the researcher to answer the research questions and accomplish the research objectives.

The methods utilised will depend on the type of information to be gathered, whether numerical, based on personal opinions or both. There are three primary methods distinguished in this layer, which are known as follows: Quantitative (data gathered through numerical terms), qualitative (data gathered through analysing perspectives and participant opinions) and mixed methods (data could be introduced in various ways from statistical and graphical means and meaningful patterns identified). According to Saunders (2016), three methods contain blended elements that support the coherence of the research design. The following section aims to clarify each of the three methodological choices in more detail.

5.4.1 Quantitative Research Methodological Choice (Mono-Method)

This alludes to a research method that depends on methods and procedures that consider facts, figures and statistical data as opposed to subjective opinions (Saunders et al., 2016). Quantitative research is regularly used to describe empirical enquiry into phenomena through computational or statistical systems (Denscombe, 2010). Creswell et al. (2009) depict a quantitative report as, "... an investigation into a social or human issue, based on testing a theory made out of factors, measured with numbers, and analysed with statistical methods, to decide if predictive generalisations of the theory hold true." Moreover, "Quantitative research is principally associated with experiments, archival research, survey research strategies and the case studies." (Saunders et al., 2016).

5.4.2 Qualitative Research Methodological Choices (Mono-Method)

Robson (2011) indicated that qualitative methods can successfully illustrate individual and group perspectives on a phenomenon. Qualitative research is characterised as "... an investigation of the subject is attempted without earlier formulations – the object is to gain understanding and gather data and information such that theories will emerge" (Fellows & Liu, 2015). Qualitative studies depend

upon the researcher being a fundamental part of the data gathering process in a certifiable setting, and the results are analysed in an enumerative way (Saini & Shlonsky, 2012). It gives a means of investigating and understanding the subjective thoughts that people or gatherings attribute to a phenomenon (Creswell, 2009). The scope of strategies used within qualitative research incorporates case study, action research, grounded theory, narrative research and ethnography. Bryman (2016) outlines the differences between qualitative and quantitative research, which are listed in table 5.1

Table 5-1, Comparison between qualitative and quantitative research (Bryman, 2016)

	Qualitative study	Quantitative study
1	Words	Numbers
2	Point of view of the participant	Point of view of the researcher
3	Researcher is close	Researcher is distant
4	Theory Emergent	Theory Tested
5	Process	Static
6	Unstructured	Structured
7	Contextual Understanding	Generalization
8	Rich Deep Data	Hard Reliable Data Macro
9	Micro	Macro
10	Meaning	Behavior
11	Natural Setting	Artificial Setting

5.4.3 Mixed and Multi Method Research Methodological Choices

Creswell et al. (2009) clarified that a mixed methodology includes the collection or analysis of both quantitative and qualitative data in a single study in which information is gathered sequentially or concurrently. It includes the integration of information at one or more stages during the research. This approach adopts both qualitative and quantitative techniques in a single study. Creswell (2009) states that the concurrent utilisation of more than one research system (qualitative and quantitative) is alluded to as a mixed, multi or triangulated technique. Mixed method research is appropriate in situations where the nature of the problem fits the utilisation of the data collection methods (Amaratunga et

al., 2002). Creswell (2014) recommends that mixing quantitative and qualitative methods leads to a procedure of 'triangulation' which enables the search for concordance amongst the outcomes. Triangulation is a mix of methodologies in a study of the same phenomenon with the objective of improving the legitimacy of measurement (Amaratunga et al., 2002).

Different types of mixed methods exist that accord with the manner in which strategies are integrated. This varies from the degree of dependence on one strategy or more than the other or the succession of use.

- a) Mono-method research is based on either a quantitative or qualitative research decision as opposed to a combination of both.
- b) In multi-method research, more than one philosophical worldview is utilised, although this approach is restricted to either subjectivism or objectivism (Bryman, 2016; Saunders et al., 2016; Creswell, 2014). For multi-method qualitative studies, the researcher adopts a subjectivist philosophical pattern to establish the proposed ideas, which are validated by executing various sorts of qualitative methods (for instance, in-depth interviews) with associated analysis procedures (Tashakkori & Teddie, 2009).
- c) In mixed-method research, both quantitative and qualitative research is combined. This implies the researcher can begin with an objectivist philosophy and pursue this with a subjectivist philosophy, or the other way around (Collis & Hussey, 2010; Kothari, 2004; Patton, 2015; Tashakkori & Teddie, 1998). The data is then incorporated at one or more stage(s) in the research process (Creswell, 2009). When choosing a mixed methods design, it is essential to know each design, the reason for the research, and the strengths and weaknesses of each design. The three most commonly chosen mixed methods designs are listed in table 5.2 and compared regarding their strengths, weaknesses and purposes (Bryman, 2016; Creswell, 2014; Tashakkori & Teddie, 2009).

Table 5-2, Mixed method types (Bryman, 2016; Creswell, 2014; Tashakkori & Teddlie, 1998).

Mixed Method types					
	Mixed method type	Definitions for each type	Purpose of Usage	Strengths	Weaknesses
1	Sequential Mixed Method (Exploratory design)	This strategy allows findings of one method to be verified by another.	This may involve beginning with a qualitative strategy followed by a quantitative strategy or vice versa (Tashakkori and Teddlie, 2009).	<ul style="list-style-type: none"> • Exploration may help the researcher to build general knowledge about proposed variables to be studied that aids development of an instrument (such as a questionnaire) and then study variables with a large sample of individuals quantitatively through this instrument. • Qualitative analysis can be used to provide depth as well as contextualise statistical results (Creswell, 2014). 	Could require a huge amount of time to complete.
2	Concurrent Mixed Method (Triangulated or nested)	Parallel or simultaneous design (Tashakkori and Teddlie, 1998).	Only one data collection phase is used, but both qualitative and quantitative strategies are engaged concurrently to collect the data. The data is then merged to provide a complete understanding of the phenomenon being researched (Amaratunga et al., 2002).	<ul style="list-style-type: none"> • Concurrent mixed method is advocated as a result of shorter data collection time due to the parallel nature of data collection (Creswell, 2014). • Provides well-validated and substantiated findings. • Two types of data are collected simultaneously and provides a study with the advantages of both quantitative and qualitative data. 	<ul style="list-style-type: none"> • Challenges may also arise in finding an appropriate method of integrating the diverse data during analysis (Tashakkori and Teddlie, 1998; Creswell, 2014). • Requires great effort and skill to adequately use two separate methods the same time. • It can be difficult to compare the results.
3	Transformative Mixed Method	Combination of sequential and concurrent.	Rely on a dual theoretical lens within which quantitative and qualitative data could be deployed.	A theoretical perspective could be ideological and involve either sequential or concurrent approach (Creswell, 2014).	Remains minimal guidance on this strategy, hence, lack of popularity within the mixed method research community (Creswell, 2014).

5.4.4 Adopted Research Methodological Choice Position

The methodological choice adopted for this research is a mixed method exploratory design since the study will integrate a road network and land-use assessment framework for Gaza City Council and deliver practical solutions that will aim to overcome challenges. This requires a mix of value-free and value-laden. Numerical relationships will be involved, such as the relationships between road networks and land-use, and observations and personal views will be gathered on the presented model. This will require both methods to operate together to enhance the linkage between road networks and land-use. This also allows for an exploration of the concepts through qualitative methods testing in the quantitative study.

5.5 Research Design Reasoning Associated With Research Methodological Choice.

Research design reasoning relates to all layers of the research onion. Some of the reasoning is associated with the design choices, which can be explanatory, exploratory, descriptive or evaluative (Saunders et al., 2016; Alturki, R. 2021):

- Explanatory means clarifying relationships between factors by addressing their current circumstances;

- Exploratory means applying inquiring open questions to investigate a phenomenon;
- Descriptive means collecting and describing information.
- Evaluative means assessing the effectiveness of an organisational or business strategy.

In combined studies, researchers can combine different research reasoning.

5.5.1 Adopted Research Design: Purpose Position

The adopted research design for Gaza City is crafted to encompass a comprehensive framework, combining exploratory, explanatory, and evaluative elements. This tripartite approach is deemed essential for a nuanced understanding and assessment of the intricate dynamics between road networks and land use in the context of Gaza City. The reasoning underpinning this research is a combination of explanatory, exploratory and evaluative since the framework will be investigated within urban planning and adapted in accordance with the data gathered.

The exploratory is pivotal for identifying contextual variables, potential challenges, and opportunities that may influence the integration of road networks and land use. In addition, the explanatory phase aims to establish causal relationships and elucidate underlying mechanisms. This phase is crucial for validating the identified factors and understanding how they interplay in shaping the urban landscape of Gaza City. According to the need for evaluation, an evaluative component is integrated into the research design. This phase involves a critical assessment of the effectiveness and efficiency of existing road network and land-use integration strategies in Gaza City. Moreover, it will involve explanation to check the framework is appropriate. The framework will be validated whereby data will be gathered which seeks to refine the framework based on the feedback gathered.

5.6 Research Strategy

A research strategy or design gives the researcher a 'roadmap' or a 'plan of action' so as to interpret the aims into achievable outcomes (Bryman & Bell, 2007; Page 185

Sexton, 2003). Saunders et al. (2009) demonstrated that a strategy is fundamental in empowering the researcher to address research questions and achieve the objectives. A research strategy aims to accomplish the end objective through an action plan that details how the data will be collected (Saunders et al., 2016).

In choosing an appropriate research strategy, Yin (2009) noted three explicit conditions; the kind of research question, the control of the researcher over behavioural occasions, and the level of a spotlight on contemporary instead of historical events. The author examined a variety research strategies, as follows: Experiments (hypothesis to envision if a relationship shall exist), surveys (collecting information from a huge sample), archival research (using community printed archives), case study (in-depth usage of a subject or phenomenon in a real-life situation), ethnography (examining the way of life of a social group), action research (creating answers to real organisational issues through collaborative means), design science (an 'artefact' made by humans to tackle issues and depicted as graphical portrayals), grounded theory (theory that is found through systematic information collection) and narrative inquiry (interpreting a sequence of events).

5.6.1 Case Study

Yin (2014, p.16) defined a case study as an “empirical inquiry that investigates a contemporary phenomenon (the case) in depth and within its real-world context, especially when the boundaries between phenomenon and context may not be clearly. Case studies are utilised to develop an in-depth comprehension of a phenomenon (Yin, 2014). They are regularly conducted within a defined context called the case, which may refer to a particular set or limiting qualities; for example, an establishment, organisation, or geographic location (Fellows & Liu, 2015). Case studies are regularly performed within a characterised time limit, where detailed data about the phenomenon is gathered and examined (Yin, 2009). The phenomenon examined within case study research may incorporate projects, activities, events, and the practices of groups of people or individuals.

They typically utilise an assortment of information sources and procedures (Knight & Ruddock, 2008).

Due to the exploratory nature of this research, and since there is little previous knowledge about the phenomenon and no clear understanding of the subject researched, this study will adopt a case study data collection strategy as the most appropriate strategy for answering the research questions of this study, which are exploratory in nature. Having chosen a case study as the research strategy, the next section explains the choices made between single and multiple case studies.

Identification of the Case Study and Selection Criteria

It is imperative to design the case study accurately and identify the unit of analysis. Yin (2014) indicated that there are four sorts of case study design known as single case study embedded, single case study holistic, multiple case study embedded, and multiple case study holistic. Each case study design is presented in figure 5.7.

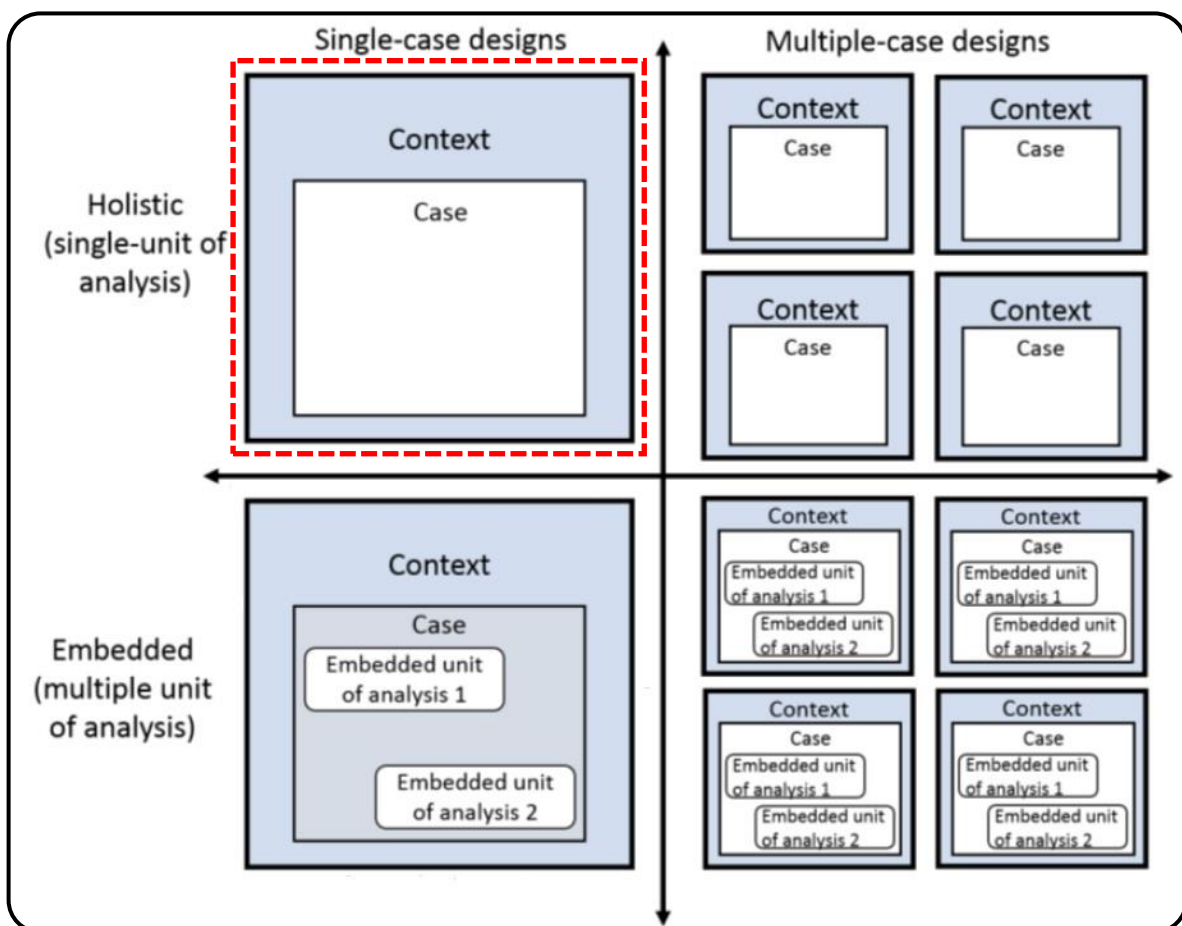


Figure 5-7, Types of case studies based on the number and units (Yin, 2014).

In a single case study design, the research focuses on one case so as to confirm critical issues, add contributions to theory or examine a new and unique phenomenon. In comparison, a multiple-case study makes comparisons between various cases on the same phenomenon and allows for a more in-depth understanding (Yin, 2014). Also, Saunders et al. (2016) indicated that case studies can be either embedded or holistic. Embedded and holistic designs refer to the unit of analysis utilised. A holistic case study includes an organisation as a whole while an embedded case study includes subunits within an organisation, for example sections or departments. Subsequently, the unit of analysis can include more than one unit (Yin, 2014). Saunders et al. (2016) stated that a unit of analysis may be a group, organisation, industry, country, individual, program or another issue. This research has adopted a single holistic case study.

Yin (2014) states that one of the main reasons for a single case study is when a phenomenon is unique. Accordingly, a single case study data collection strategy was used as the most appropriate strategy because this research focused on one of the most important and unique cities on the Gaza strip. Yin (2014) expressed that a single case study allowed two alternatives: embedded design and holistic design. As Gaza City has the same urban planning system as most of the other cities on the Gaza strip, the research boundary takes the city as a case study boundary, thus a comprehensive structure is appropriate. Additionally, since the major concern of this research is urban planning and the TOD, this research centre on engineers and planning experts.

In summary, the selection of the single case study is based on the following criteria:

1. Gaza city is considered one of the most important cities on the Gaza Strip because of its significant role in the area in general, and in the economy in particular. Also, it represents the administrative capital of Palestine.
2. Since the aim of this research is to develop a balanced and equitable urban planning strategy that integrates land-use and road networks using TOD approach, the researcher has chosen Gaza city as representative of other cities.

Having discussed the research strategy, the next section will explain the research choice.

5.7 The Research Choice

Yin (2009) characterise the research choice as a plan for a route through the research study. The research choice is, accordingly, a general plan to effectively address the research inquiry after identifying the research philosophy, strategies, methods and techniques (Creswell et al., 2009). In the research onion, the research choice follows the option of adopting either a qualitative or quantitative method or a mixed-methods approach (Saunders et al., 2016).

Conversely, some statistics may be used within qualitative data although they are predominantly textual or narrative in nature. The qualitative method indicates expressions of reality through inhabitants' perceptions of natural circumstances (Amaratunga et al., 2002). In the qualitative method, the researcher does not begin their research by testing a theory or concepts (Jonker, 2009). Furthermore, a mixed-methods approach means utilising a single data collection strategy and corresponding analysis procedures as a mono-method, or utilizing more than one data collection technique and analysis procedure as in multiple methods. Figure 5.8 delineates the kinds of research choices that could be utilized in the research study (Saunders et al., 2016).

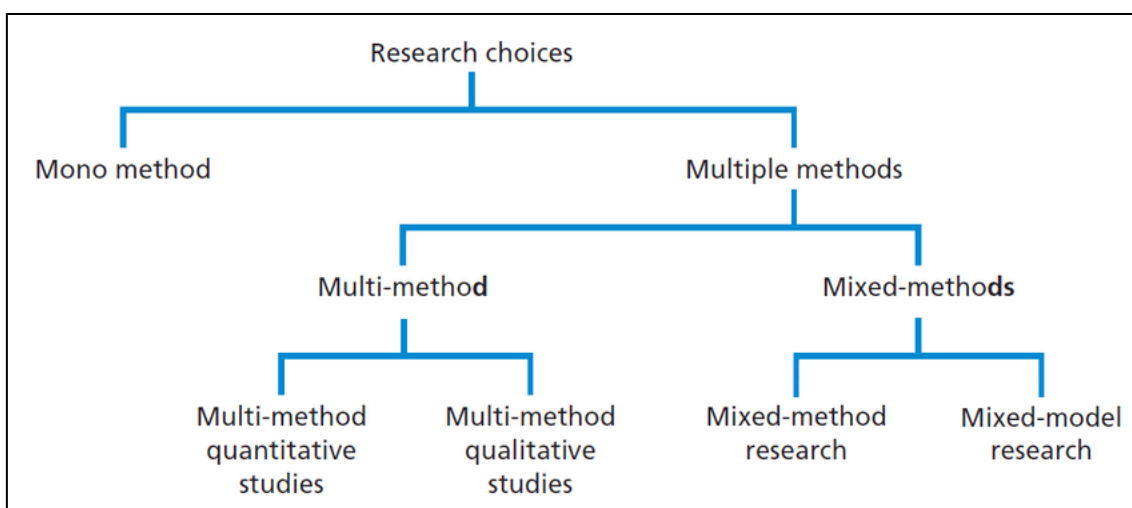


Figure 5-8, The research choices, (Saunders et al., 2016).

Mixed method research utilises both qualitative and quantitative data collection methods and analysis procedures (Saunders et al., 2019). These can happen in parallel in which case they are analysed and conducted independently of each other. A mixing phase is then required, for example, triangulation to integrate the outcomes. Moreover, there is the danger of an absence of corroboration between the findings from each stage. An alternative mixed methods approach is successive in nature where either a qualitative or quantitative strategy is conducted and fully analysed. From this analysis, the second stage is then prepared and directed so there is less risk of little corroboration. Thus, in a sequential mixed-methods approach, one stage prevails. For instance, an exploratory mixed-method may start with a qualitative method and, in view of the analysis and findings, is followed up with a quantitative method in order to generalise the results from the qualitative phase (Saunders et al., 2019).

This research aims to develop a framework to integrate land-use and road networks using a TOD approach. Therefore, it is important to employ adequate data collection and analysis methods, which bolster the workability of the proposed framework. The research adopted a mix-method, therefore the qualitative technique used endeavoured to give a complete image of the present status and future direction of urban planning in terms of the integration between land-use and road networks. It was selected due to the fundamental philosophical assumption that people's experiences and behaviour play a significant role in this research.

Furthermore, a qualitative phase was utilised in order to design instruments and a quantitative stage was applied to test the initial results. The researcher chose quantitative research techniques due to the significant amount of information and feedback elicited, the access it permitted to participants and the low cost involved. In addition, the quantitative technique stressed the critical issues found in the qualitative method. Along these lines, a blend of qualitative and quantitative evidence including a questionnaire and semi-structured interviews strengthened the case study, which also helped the collection of in-depth data. The following section will concentrate on the time horizon.

5.8 The Research Time Horizon

According to Saunders et al. (2019), the time horizon is the time framework used by most studies when undertaking a research project. A PhD study has a limited time period, and therefore all activities and stages of research have an external finite point. The authors declared that a time horizon can be classified into two types: cross-sectional and longitudinal. Cross-sectional studies resolve research problems; during this study the researcher studies one phenomenon over a particular period of time. Alternatively, a longitudinal study focuses on a particular phenomenon and observes its changes over time. Thus, it conducts research in an open timeframe. Therefore, a cross-sectional time horizon will be adopted due to the limitations time of this research. Also, the nature of the research means the project needs to be delivered in a controlled timeframe. In other words, this research focuses on a particular phenomenon at a particular time and is being conducted as a PhD thesis that must meet strict university rules for the timely gathering of data and presentation of findings. In the next section, data collecting techniques are discussed and the collection techniques used are presented.

5.9 Data Collection and Management

The gathering of relevant data is important to satisfy the aim and objectives of the research (Fellows & Liu, 2009). Data is collected in order to gather reliable and valid data from citizens to address the research questions. With limitations on time, cost, and client confidentiality, the gathering of relevant data can be an intricate procedure. Two sorts of data that can be gathered: The first is referred to as essential data as it represents new data that is the study itself generates. In comparison, secondary data has been gathered by another researcher, which can be utilised by other researchers. (Saunders et al., 2016).

In this study, primary data will be collected from questionnaires, interviews and the other sources of data which are brought together through triangulation. The researcher uses this process to minimise participant and researcher bias and to improve validity and reliability in the research findings.

5.9.1 Interview

In a case study, the interview is considered the most significant source of evidence since most case studies examine people's actions or values (Yin, 2014). An interview is a powerful tool for obtaining rich information and is based on social actors' knowledge, attitudes, views, and values (Gray, 2014). The interview has a specific strength; it can yield data quickly and in great quantity. Nevertheless, it has limitations and weaknesses (Yin, 2014). For example, interviewees may be unwilling or uncomfortable in sharing the subject that the interviewer hopes to explore. Many research commentators, including Saunders et al. (2019), classify interviewing techniques as either structured, semi-structured, or unstructured. Each kind of interview has its own drawbacks and benefits. When using a predetermined instrument, such as a questionnaire or a structured interview, an identical set of questions is applied which is considered quantitatively. In contrast, unstructured and semi-structured interviews are considered qualitative research instruments, because in general, the researcher has a list of topics or themes to cover, rather than standard questions to be answered. This exploration is relevant to addressing the research questions and objectives (Saunders et al., 2019; Greener, 2008).

An unstructured type of interview is utilised to investigate in depth a general zone of interest. Additionally, it permits interviewees, freely and without limitation, to express themselves which enable richness in the data (Saunders et al., 2019). Moreover, semi-structured interviews depend on question guides, as opposed to a strict sequence of questions. In this sort of interview, questions can be answered according to interviewee preference, meaning the focus is the interviewee not the questioner (Greener, 2008). Likewise, it enables the interviewer to build trust with interviewees, which helps to share honest answers that will improve the validity of the research findings (Gray, 2014). It also allows the interviewer the flexibility to ask further questions to explain issues in greater detail or depth.

Saunders et al. (2019) state that a semi-structured interview in an exploratory study can be useful to understand a context and what is happening, or to understand the reasons behind participants' attitudes. Moreover, Bryman (2016)

points out that in situations when a researcher is familiar with the idea being researched and the research focus is in a concentrated area, semi-structured interviews are an appropriate data collection technique. This research will examine particular themes related to the development of a framework to integrate land-use with road networks. Thus, semi-structured interviews are an appropriate technique to gather data from the interviewees.

Aim of the Interview

The main aim of the interview is to determine if decision-makers and planners would implement the concept of TOD, as described in the literature review. Furthermore, the interview also seeks to establish if decision-makers and planners are aware of TOD practices and whether they would consider applying them in Gaza. In addition, the interview aims to determine if TOD factors could be implemented and to identify which could be applied to Gaza City.

The researcher conducted semi-structured interviewees that were conducted online via Zoom software due to the quarantine of the Covid 19 virus which meant the researcher was unable to travel to the interviewees. The interview process comprised a series of semi-structured “what”, “which” and “how” questions which were intended to be delivered face-to-face.

The researcher engaged with six experts who occupied high-level positions, experts in the field of urban planning and have different levels of experience and work in different departments; hence they were expected to be able to provide a breadth and depth of information and enhance the data richness and reliability. This helped to gather perspectives on certain issues that would have been difficult to extract through a quantitative approach. According to Saunders et al. (2019), it is more likely for managers to agree to a semi-structured interview, especially when the topic is considered interesting and relevant to their work. Semi-structured interviews may be the most suitable approach for either complex or open-ended questions, thus it can be used in an exploratory study to seek new insights.

Design of the Interview Process

The data collection stage is designed to achieve some of the research objectives through themes; this enables the categorisation of all information received from participants. The interview sessions were conducted for an hour and sometimes more, with the aid of a semi-structured, three-part interview schedule, as attached in Appendix (5). These three parts are described as follows:

Part 1 – Participants

This section began with specific questions about TOD which aimed to capture information about how knowledgeable the participants are about TOD. In this section, the researcher captured: the participants' name, their background in the field and their experience as well as the date of the interview. The participants were also asked about lessons learnt in their experience with urban planning, road networks land-use. The general data was important in profiling the participants in this phase of the research and for drawing conclusions from the difference of opinions among the participants. It should be mentioned that, although the name of the participant was written in the interview, for the purpose of anonymity these names were not published in the analysis or anywhere in this thesis. This protected the individuals concerned and met the ethical requirement of the University.

Part 2 – Current Urban Planning Practices.

This section investigated the awareness of participants of urban planning in the city. Furthermore, participants were asked about the current planning for Gaza City according to TOD.

Part 3 –TOD Implementation Method

The questions posed in this section will reveal if experts have different perceptions of the 'TOD' plan and the planning process they have experienced. In addition, the questions aimed to determine the TOD planning steps required for Gaza city; for example, by identifying the most important factors for implementing TOD. The other questions targeted at the opinions of experts on

whether TOD would work in Gaza, and what could be done to enable its implementation.

Qualitative Data Analysis and Findings

Saunders et al. (2019) explained that the main purpose of conducting qualitative interviews is to understand and gain insight into a particular phenomenon investigated by a researcher. Therefore, in this study, the researcher conducted interviews to gather opinions that could not be fully elicited purely through a quantitative method. The data from the recorded interviews, which were conducted in Arabic, was transcribed into a Word file and then translated into English. After that, the data was manually classified into two main themes, aligning with the study's objective of extracting nuanced perspectives from high-level experts in the field of urban planning in Gaza City.

As mentioned in the research sampling, the researcher conducted semi-structured interviewees with six experts who occupied high-level positions in the case study. The interviewees have different levels of experience and work in different departments; hence they were expected to be able to provide a breadth and depth of information and enhance the data richness and reliability. For the purpose of anonymity and in keeping with the ethical approval process, participants were randomly labelled P1, P2, P3 and so on. All of interviewee information is presented in Table 5.3.

Table 5.3 Interviewee Information

Interviewee Code	Position
P1	Manager of Gaza Municipality
P2	Planning consultant for the Gaza Municipality
P3	Expert in urban planning
P4	Transport planning expert
P5	Manager of the Ministry of Local Government
P6	Expert in urban planning

5.9.2 Questionnaire

Introduction

The questionnaire is a pre-formulated written set of questions distributed to specific individuals and aiming at gathering information (Saunders et al., 2019). It is one of the most common data collection techniques in the world of education and business. Moreover, many individuals have experience of using the questionnaire as a data collection method (Gray, 2014). Although questionnaires can be used as the only data collection technique, it is often recommended that they are linked with other methods in a mixed-method research design (Saunders et al., 2019). However, Gray (2014) has shown that the use of just questionnaires has many advantages. First, questionnaires save both money and time since they can be sent to many respondents at a low cost. Secondly, respondent feedback and replies are returned within a short amount of time. Thirdly, coding questions is often a very simple and quick process. Lastly, respondents can complete questionnaires at times and places that are suitable for them meaning they can be convenient. Moreover, there are many questionnaire designs including self-administered and interviewer-administered. The former is usually answered by respondents such as an electronic questionnaires using the internet; indeed, some companies offer online questionnaire sites for this purpose such as www.surveymonkey.com (Greener, 2008).

In this study, a questionnaire is used to provide quantitative data as part of the case study. The process of designing and developing the questionnaire was carried out after gaining a comprehensive understanding from interviews with experts in the subject. In addition, the researcher conducted an extensive review of the most relevant literature that included books, journals, articles, internet materials, and PhD theses. Furthermore, the researcher reviewed previous questionnaires on the subject of urban planning in order to draw up the final version of the questionnaire. This was undertaken to ensure that the content and structure of the questionnaire are completely valid.

Sampling and Distributing the Questionnaire

The first step in selecting an appropriate sample is to determine the population of the study (Bryman, 2015). The population can be identified by those who are

engaging with the phenomenon of interest (Bryman, 2015). As this study aims to develop balanced and equitable urban planning strategies that integrate land-use and road networks using the TOD approach, it investigates ordinary people living in Gaza City who use the road and transport network (Emmitt & Yeomans, 2008).

Regarding the questionnaire sample, quantitative research requires a large sample of participants. Larger sample sizes imply lower errors when generalising to the full population (Saunders et al., 2016). Sekaran and Bogie (2010) indicated that selecting a suitable sample is an essential part of any successful data collection process. Therefore, Bryman (2015) and Creswell (2014) suggest that researchers should always aim to narrow the population's scope and purpose. It is essential that the sample is designed carefully to represent the entire population and, as such, it must sufficiently reflect the populations' characteristics. The population of Gaza City is approximately 600,000, therefore a sample size of 384 is required for this research according to Sekaran and Bogie (2010) and Survey Monkey: sample size calculator. Simple random sampling was selected, which allows the researcher to choose a sample number without bias. It is best used when the researcher has an accurate number for the entire population of the study. The researcher targeted the online questionnaire survey at citizens of Gaza city via Facebook such as (Beit Hanoun deserves a lot, Municipality of Gaza and The Rafah crossing group) and email. This mode was chosen due to the Covid 19 virus quarantine which prevented travel. Of the 384 distributed questionnaires, 260 responses were received, which means a response rate of 67.70 percent.

Study Approach

A descriptive-analytical approach has been used to study the development of appropriate and effective urban planning strategies using a transit-oriented development approach to integrate land use and road networks. Two main sources of information were used:

- 1.Secondary sources: The theoretical framework of the research was constructed using secondary data sources such as literature related to the subject of the study, books, and related references such as periodicals, articles, and research.

2.Primary Sources: The analytical aspects of the research topic were addressed via the primary data collection. This was achieved by using a questionnaire as a research tool, designed specifically for this purpose, and distributed to approximate 260 road users on the Gaza Strip.

The data collected via the questionnaire survey was analysed using SPSS (Field, 2009) and used to compare similar data obtained through qualitative methods.

Study Tool

The questionnaire includes different kinds of questions that relate to land-use and road networks. To measure the relevant factors and indicators, the questionnaire invited responses via a Likert-style rating scale. Many research design authors, such as Saunders et al. (2019), comment on the usefulness of Likert-style questions for measuring the strength of agreement or disagreement with statements designed to gauge the relative importance of certain factors. Likert scales can have many points, including an even number where there is no neutral position and in which the respondent is forced to select one side or the other. However, in this research, a five-point scale was considered adequate for gauging the strength of opinion or behaviour, and the middle neutral position is valid as it may genuinely reflect a respondent's position.

The questionnaire was divided into two main sections; the first concerned the characteristics of the respondents (gender, place of residence, age, job, and mobility), while the second addressed the main theme of the study. This second section consisted of two parts:

- First part: Mobility and the means of transport. This consisted of five questions.
- Second part: Evaluation of the integration factors between road networks and land use. This section consisted of ten questions.

5.10 Research Sampling

Sampling techniques that can be used for data collection can be categorised into two major categories: non-probability and probability sampling (Saunders et al. 2016). Probability sampling techniques are used in quantitative studies when the

probability of each item being included is known (Teddlie & Yu, 2007). Probability sampling includes, systematic random, simple random, cluster random and stratified random sampling (Saunders et al., 2019).

In random probability sampling, each member of the population has an equal chance of being selected by the researcher. Moreover, non-probability sampling techniques are used when the probability of inclusion for each member of the whole population is not known; this mainly occurs in qualitative studies (Gary, 2014). A non-probability sampling includes quota, purposive, snowball, self-selection and convenience sampling (Saunders et al., 2019). Sekaran (2003, p.269) mentions that “probability sampling designs are used when the representativeness of the sample is of importance in the interests of wider generalisability”. However, when other factors, such as time, becomes critical, non-probability sampling is generally used. Saunders et al. (2019) indicates that, if a researcher needs to answer a research question or achieve a research objective, non-probability sampling can be the best option. Indeed, non-probability sampling focuses on a small group of participants or a case study selected by the researcher for a specific purpose. In contrast, quantitative research depends on large samples of participants whereas qualitative research relies on small numbers or even a single case. Finally, purposive sampling is used when participants are chosen because they can provide important knowledge that cannot be gained from other sampling techniques (Gray, 2014).

In terms of the sample size, Yin (2014) stated that there is no fixed number of interviews in qualitative research; instead, this number depend on what needs to be known. Moreover, Saunders et al. (2019) point out that, while sample sizes in quantitative studies depend on the overall population size, a different logic called ‘replication logic’ is applied in qualitative research. In other words, a qualitative researcher must keep interviewing until they achieve ‘replication’ or the saturation point (i.e. hearing the same stories repeated again and again), at which point no new information is expected to emerge during the interview process. In addition, a selective sample represents the real world and could lead to objective conclusions.

This study aims to develop a framework to develop balanced and equitable urban planning strategies that integrate land-use and road networks using TOD. To obtain rich and sufficient data from respondents, the quality of the sample is more important than quantity. Additionally, to achieve maximum benefit from the data gathered, the selective sample should include qualified participants who can provide informed answers to the study questions. Thus, the researcher will select a purposive sample of six planning experts in Gaza City as participants for semi-structured interviews. Purposive sampling is best when selecting participants as it is based on the personal judgment of the researcher which accord with the requirements of the research.

In comparison, a quantitative research requires a large sample of participants. Larger sample sizes imply lower errors when generalising to the full population (Saunders et al., 2019). Sekaran and Bogie (2010) indicated that the selection of a suitable sample was an essential part of the successful data collection process. In this research, the population size is 600,000 which will require of a wide range of participants to enable generalisation. Therefore, Sekaran and Bogie (2010) stated that to calculate the sample size for 600,000, a sample size of 384 is required (Survey Monkey: sample size calculator). Therefore, simple random sampling was selected, which allowed the researcher to select a sample number without bias. It is best used when the researcher has an accurate sampling number that lists the entire population of the study.

5.11 Pilot Study

A pilot is a limited study carried out prior to the full study that aims to test a questionnaire, interview, checklist or direct observations. The intention is to minimise participant problems when answering the questions or gathering observations (Saunders et al., 2019). The internal validity and reliability of a study's data depends on the clarity and structure of the questions, as well as the rigour of the pilot testing. A pilot study also facilitates an assessment of the questions' validity and reliability and ensures that the questions are clear, unambiguous, and sensible. It is considered a small experiment designed to gather comments and information prior to the major study; this offers the researcher an understanding of the challenges or problems with some interview

or questionnaire questions (Yates, 2004). It helps the researcher to identify ambiguities or the use of technical or unfamiliar language which could lead to misunderstanding and ultimately affecting the validity of the research. Therefore, a pilot study represents a significant preliminary step before conducting the actual interview and questionnaire (Sekaran, 2003). Moreover, it seeks to provide valuable information that can contribute to the accomplishment of the full study.

The pilot study for the questionnaire was undertaken in the UK and conducted in three stages. The first stage of the pilot study was carried out by the researcher's supervisor after which the primary draft was modified to enhance the validity of the questions (see Appendix 6). For the second stage, the questionnaire was distributed to a small size sample, (five current PhD students at the University of Salford). The researcher focused on students with previous experience of questionnaire design who could provide feedback related to the design, wording, and layout. The third stage was questionnaire distributed to three academic staff. The researcher approached specific experts with experience of urban planning who could provide useful comments related to content and structure and highlight any potential misunderstandings or unclear questions. Therefore, nine questionnaires were distributed as a pilot experiment in order to evaluate the instrument. The feedback received was encouraging and helped in developing the final draft.

Following the completion of the pilot study, participants' feedback and opinions were used to modify the questions. Participants' comments were particularly insightful, offering valuable perspectives on the clarity and relevance of the questions. The comments were considered helpful in noting the changes needed which included: omitting irrelevant questions, such as question A.3 Educational degree. In addition, make some important additions. For example, an option (other) to the answers so that the researcher can obtain more data and the questions to be more flexible for the participants, also the time of the questionnaire in order to encourage participants to fill it out. Rephrasing and adjusting the language to make the questions clearer and understandable such as question B. Trips and Transport means: changed to C. Commuting and used means of Transport, the evaluation questions were also changed from (yes, partly or no) to (strongly satisfied to dissatisfied from 1 -5) in order to be more

understandable and clear to the participant and to obtain more accurate information, such as question C.2 Which path is preferable for you to walk in? Is changed to question D. Factors of integrating road networks and land-use.

According to TOD factors, adjustments were made to the language, structure, and formatting of the questions. This meticulous refinement aimed to enhance the overall comprehensibility of the questionnaire, making it more accessible and user-friendly for subscribers. These modifications were undertaken with the utmost consideration for ensuring that participants could engage with the survey seamlessly, contributing to the robustness of the collected data and aligning with the study's overarching research objectives (as illustrated in Appendix 6 and 7).

CHAPTER 6

Qualitative Data Analysis

6. CHAPTER 6: Qualitative Data Analysis

6.1 Introduction

This chapter elaborates in detail the qualitative data analysis undertaken for this research. The aim of this chapter is to analyse and discuss the qualitative results from the face-to-face semi-structured interviews conducted in Gaza city. According to Saunders et al. (2009), the main purpose of a qualitative interview is to understand and obtain a clear picture about a specific phenomenon. Six semi-structured interviews were conducted with experts in the field of urban planning and decision-makers in the Gaza City. This helped to gather perspectives on certain issues that would have been difficult to extract through a quantitative approach.

The researcher combined the responses to semi-structured interviews to reflect the themes and sub-themes which emerged from the data analysis. The data analysis began with the classification of data related to the research study's objectives. There were four main topics for the following subsections under which the results of the semi-structured interviews were analysed and discussed:

- Characteristics and influential factors
- TOD adoption and implementation.

Figure 6.1 shows the implemented theme structure which collects and analyses transcripts from the semi-structured interviews.



Figure 6-1 The implemented theme structure which collected and analysed

6.4.1 Theme 1: Characteristics and Influential Factors

Several influential factors were noted as impacting the growth of the transport and infrastructure network. These challenges included: Congestion, urban sprawl, rising trend of personal transport and increasing transport costs. Therefore, this research aimed to understand the characteristics and influential factors on integrating road networks with land-use, and the importance of applying this integration to achieve the highest levels of planning in developing cities, particularly Gaza city.

Infrastructure Development

Emergence of Keywords:

Keywords emerged from the interviews, which included: ill-equipped, uneasy access, ownership issue, traffic congestion, technical expertise, imbalance roads, widening roads, parking spaces, war, investment, occupation.

Infrastructure development was recognised as an important way to enhance the integration between road networks and land-use, and as a means to strengthen regional cohesion in the countries. Infrastructure can be considered as land, permanent-way constructions, buildings, bridges, and tunnels.

Private Landownership Impediments:

Significant issues were noted to influence the adoption of TOD in Gaza City. It was found that most land in Gaza City is under private ownership. Moreover, the government does not have enough financial resources meaning the development of public transport is relatively slow. Interviewee P2 highlighted a *lack of government lands* and mentioned that: *“Infrastructure is ill-equipped for public transport which hinders easy access. Lack of government lands, as most lands in Gaza City, are private lands”*.

It was found that Gaza city is facing challenges associated with its road expansion, especially in crowded places where there is a lack of wide streets. This also demonstrates a lack of strategic planning in the past. As such, there is consensus among participants that there is strong need to redesign the streets to overcome current issues of congestion. For instance, interviewee P1 stated:

“We need large areas and wide streets, and this is not available in Gaza City, and we need to re-plan most of the roads of Gaza. It is true that there are wide streets, but due to the current congestion, it is difficult to implement the completed roads. This means that you need strategic planning in order to take part of the street and turn it into a complete road for bicycles and buses, as you mentioned”.

As many developments obstacles exist, including land occupied by private owners and a lack of financial resources, the Al-Rasheed Road project in Al-Shaati camp is still underdeveloped. In the same context, P2 indicates that, *“the Al-Rasheed Road project in the Al-Shaati camp area was not completed due to the presence of many obstacles”*

Unfortunately, there is no regular public transport in Gaza city excepting a few old buses for university students and government employees. This ultimately increases the number of cars and creates high congestion on the roads. Interviewee P4 said, *“with regard to public transport, unfortunately, it did not happen because we are still in the beginning of thinking. There are ideas put forward for public transport, for example, creating buses, or a metro or tram line”*.

A road expansion cannot easily be carried out in the presence of private landowners as they have built houses, and other commercial markets and are

charging higher values for their current land. Therefore, administrators and strategic planners are now planning to expand the roads which are not fully controlled by private land investors where there is still agriculture which means it is relatively cheap. However, this will negatively influence the agriculture product market in Gaza City because agricultural products will have to be imported from far locations that can increase its cost. Interviewee P3 explained that, *“with regard to road expansion, it is difficult, unless it is near to agriculture areas, but it can influence agriculture market in many ways”*. Some participants are not happy with the current infrastructure development work as they believe that it can only address the needs of a small group of people. In reality, they have to redesign and widen the roads if they are to focus on major infrastructure development, especially along the main axes of Gaza City where the population rate is comparatively very high. Interviewee P5 declared that:

“There is the infrastructural obstacle, as we mentioned previously. It only helps in the construction of public transport in a small way. There must be strategic planning to address road infrastructure problems in some of the main axes of Gaza City”.

Parking and Market Redesign

Due to road congestion and an increasing number of vehicles, the current parking system is no longer effective, especially in crowded areas of Gaza city. Therefore, residents are facing severe challenges over the busy hours especially in the morning and evening when they have to park their car for work and later return home. Similarly P1 revealed that:

“One of the most important things necessary for Gaza City from the point of view of transport at the moment is the development of an effective car parking system that addresses the lack of parking spaces available in crowded places in Gaza City”.

Some participants stated that existing retail and wholesale centres do not fulfil the needs of small businesses and individuals. Therefore, when people visit to these centres on weekends they find car parking challenging and purchase only the required items in a timely manner. Therefore, there is need for private investors and the local government to establish new centres to overcome the issue of high congestion, especially at the weekends. Interviewee P1 responded:

“I think we need to establish new centres, so there are plans to establish a new centre for the city in the new influence expansion area located southwest of the city. We are currently thinking of putting them in the plans, but they need time to be implemented”.

Some participants believe that most of the markets are individually owned and do not have an advance technological system that can address consumer needs within a limited time. Therefore, there is need to redesign this market by following the market structure of the UK and U.S. In the same context, P1 stated that:

“We support decentralized planning, but the biggest problem is that these markets were established in a very primitive and communal way, so I think that they must be re-planned in a modern and suitable way, and that they would be a civilized centre and not just a communal market”.

However, there is a lack of parking for cars in these commercial centres, and therefore it creates traffic congestion spots. This is one of the challenges that must be addressed.

The analysis of infrastructure development within the framework of TOD in Gaza City highlights the challenges associated with creating a balance between economic, social, and environmental factors. The complexity of implementing TOD in a city with unique constraints is influenced by various emerging themes, including challenges related to private landownership, strategic planning needs, the initiation of public transport, and the redesign of parking and market systems. In order to effectively address these challenges and establish a comprehensive and enduring urban transport system, it is imperative to adopt a holistic and collaborative approach.

The development of infrastructure in Gaza City requires a comprehensive strategy that tackles various challenges, including land ownership concerns, road congestion, parking difficulties, and market restructuring. The interviews have provided valuable insights that highlight the intricate nature of the issue at hand, while also indicating potential resolutions and opportunities for strategic intervention. According to interviewee P5, “There is the infrastructural obstacle. There must be strategic planning to address road infrastructure problems in some

of the main axes of Gaza City.” Thus, a concerted effort involving public and private stakeholders is imperative to navigate these challenges and pave the way for sustainable development in Gaza City.

Public Transport and Road Infrastructure and Conditions.

It was found that traffic congestion is an issue for Gaza city, and it is not easy to manage. Gaza city cannot currently offer effective solutions to congestion problems. Therefore, P1 mentioned that, *“The Gaza Municipality focuses on solving traffic problems, such as traffic congestion and paving roads”*. It was found that poor road work and improper planning in the past created more hurdles to expanding the roads, especially when dealing with private landowners. It was found that some roads are imbalanced which created the stress for municipality planners when operating large-scale public transport. Indeed, P5 indicates that, *“poor road infrastructure and unsuitability for public transport. You will find a road a little wide in one part and in another narrow part”*. Infrastructure development requires the necessary tools and equipment so that public transport infrastructure can function smoothly. However, the results reveal a lack of technical equipment and tools meaning public transport infrastructure is ill-equipped. Likewise, interviewee P1 recognised that, *“the lack of equipment and tools necessary for the establishment of public transport and the lack of spare parts for the maintenance of roads and buses”*. Overall, these results reveal that the infrastructure of Gaza city is not fully capable of implementing TOD as the existing challenges of paving roads, traffic congestion, a lack of technical equipment, and the private ownership of land.

Political and Economic Conditions

All of Palestine and especially Gaza remains within the cycle of war, restoration, reconstruction and re-planning. As a result, instead of investing in new car parking, expanding roads, and developing new centres and markets, planners are focusing on how to restore occupations and the existing road infrastructure. Therefore, they are unable to implement advance planning and road infrastructure development. Interviewee P1 explained:

“Aggression or war takes some thinking time; for example, war can last from a week to a month, but it results in long years of restoration,

reconstruction, and re-planning. Therefore, not all administrators and planners think about development, but rather their thinking becomes how to restore what the occupation destroyed for years, which may be ten years ago. Where all the infrastructure has been destroyed, and this is a very severe obstacle”.

Currently the maintenance of infrastructure and restoration of destroyed occupation areas represents a major priority for strategic planners. Therefore, they are unable to develop public transport and build roads to meet the needs of the increasing population over the upcoming years. Interviewee P4 stated that: *“due to the political and economic conditions as a result of the occupation and the siege imposed on the city of Gaza, the Gaza municipality is trying to maintain and rehabilitate the roads after the occupation destroyed them in the previous periods”.*

Although respondents believed that TOD represents a major solution to infrastructure development problems, they also shared that the maintenance of roads and sewage lines, the lack of electricity, and the limited amount of equipment for road maintenance have kept the municipality planners busy. Therefore, they cannot think of bigger picture whilst overcoming these problems. Interviewee P4 indicated that,

“It is true that TOD reduces congestion and reduces pollution, but the municipality cannot think about this matter before it solves the basic problems such as maintenance of roads destroyed by the occupation from time to time, maintenance of infrastructure and sewage lines, also there is a lack of electricity and road maintenance equipment”

The current municipality has insufficient resources to purchasing land from private owners, to maintain and widen the roads, increase electrical power, buy road maintenance equipment, and purchase advanced metro trains and public buses with the capacity for 50 passengers. Therefore, there is a strong need to create investment and collaboration in the private and public sector. For instance, interviewee P4 suggested that:

“The most important factor for implementing TOD in Gaza City is that there should be cooperation between the private sector and the public sector, especially in investment, whether by the government or the

private sector. The investment should be specifically in the infrastructure, such as paving and maintaining roads, and bus stops, because it is essential in the implementation of TOD so that it works to link areas and neighbourhoods among them through the bus route”.

The conditions of existing roads are miserable for the people of Gaza city as they cannot support large buses to meet the needs of the maximum amount of people, as in developed countries. Likewise, *“roads are not designed for large buses that can accommodate up to 50 passengers”* (P2). Indeed, public transport needs wide streets that are designed to accommodate such vehicles. Moreover, the re-widening of the roads in Gaza City is difficult and faces many obstacles. Most respondents shared that private land ownership is biggest hurdle to advancing the infrastructure of Gaza City. They demand a lot of money for their land as they know that the land can be used to build advanced metro lines that can generate regular revenue for the local government. Thus, these views represent a major obstacle to the social welfare of people in Gaza City. For example, *“private property prevents and impedes the implementation of many projects in Gaza City ... if we want to establish a metro line that passes through private property, whether from above ground or from underground”*. (P4)

Another obstacle for TOD in the city of Gaza is the lack of and narrowness of spaces. Therefore, widening roads for TOD has become major challenge for strategic planners. Interviewee P5 revealed that, *“TOD in Gaza City needs spaces, and needs to provide stations for loading and unloading passengers, and bus stops, as well as expanding roads, which means taking part of the citizens’ lands or green spaces”*

This data highlights the complex obstacles that hinder the progress of infrastructure development in Gaza City, while also emphasising the interdependence of these obstacles. The emerging themes highlight the necessity of strategic planning, collaborative endeavours, and a comprehensive approach to tackle the distinct intricacies of the urban environment. The interviewees' poignant narratives contribute a humanistic perspective to the challenges at hand, thereby presenting a persuasive argument in favour of

implementing comprehensive and sustainable urban development strategies in Gaza City.

Culture and Awareness

Emergence of Keywords:

Keywords which emerged from interviews connected with this theme included: Low commitment, traffic law violation, educating citizens, more personal cars, culture of taxis use, driving behaviour, law obligation, loading/unloading, draught animals use, over speeding, seat belt, and traffic accidents.

The successful implementation of TOD requires an adequate level of cultural awareness for individuals and an increased level of creativity. There should be awareness among people about follow the traffic law as it can reduce the time travelled and make journeys easier for everyone.

Challenges in Law Compliance.

Interviewees shared that the people of Gaza city have a lower level of commitment to obey traffic laws as there is more rush/urgency; this prompts the need to adopt a TOD system. Interviewee P1 highlighted, *“its young people’s culture and lack of commitment to the traffic law. But by implementing TOD, we can preserve the citizen's time by quickly reaching the workplace, by meeting their needs easily, and reducing the time of the journey”*. There is need to conduct seminars to educate people regarding the benefits of TOD such as better mobility, lower spending on transport, lower car traffic, a lack of pollution, and a lack of suburban sprawl. By educating people, there should be a greater willingness and support to give private lands to the government in order to develop a public transport system that is beneficial for everyone. For example, this means *“educating young citizens about the importance of public transport and its benefits for the city (P3)”*.

As unusual driving behaviour and the violation of traffic laws has become routine among residents of Gaza City, the traffic accidents and congestion has significantly increased. It was found that many people were involved in illegal parking across roads, and drive cars in the opposite direction in traffic jams. These habits create hurdles for those who follow the rules. Therefore, participants

of this study believe that there is need for serious punishments in the form of jail sentences and fines, so that people will feel afraid of violating traffic laws. Interviewee P2 specified that, *“there are many traffic violations on basic things, for example, wrong parking by young generation, which is widespread and driving in the opposite direction and this occurs in many areas, not following traffic signs also exists”*. It was found that people do not obey safety traffic laws, such as fastening their seat belt, speeding on highways, driving in the opposite direction, and loading and unloading on roads that creates further traffic congestion. As a result, sometimes people can face serious issues, road accidents and hospital emergencies. Interviewee P4 explained,

“Law is a very urgent matter. Strategies must be developed for it so that the citizen feels that their lack of commitment to the red light or their failure to park in the right place or the wrong loading and unloading, and even the seat belt, speed, overloading passengers, these violations increase traffic congestion and burden the Gaza municipality, as they cause many problems and accidents on the road”.

The use of draught animals - such as donkeys and horses - are common in Gaza City. These are typically used for selling fruits/vegetables or loading/unloading construction materials. However, their speeds are too slow and it takes time to load/unload material which creates traffic congestion. Furthermore, it also increases the presence of animal faeces on roads and the municipality has insufficient staff to clean this, which further creates issues when alternative roads are not available. As a result, this can create human allergies/diseases. Interviewee P3 clarified that,

“... there is also in Gaza City the problem of draught animals/mobile animal carts, which make noise and nuisance to the citizens, as the citizens demanded to prevent them from roaming the roads and to allocate a place for them, but the municipal response was that sellers have to pay an annual subscription, estimated at 2000 shekels, and this amount is not possible for street vendors to provide, and therefore we cannot prevent them from roaming the streets”.

Taxis and Public Transport Culture.

The accessibility of taxis has made travel easier in Gaza City as people believe that they can save time (time is money) and do not need to go to specific locations

to access public transport. Therefore, they are more willing to pay extra for taxis which has developed as a habit in society. Therefore, there is a need to create cultural change to overcome this habit. Interviewee P1 mentioned that:

“I think that because of a spontaneous change to the citizens or a cultural change, a change of habits, young generation more turns to taxis, as it stops anywhere, arrives quickly, the fare is little, and therefore public transport in the traditional sense no longer exists from an economic or social point of view”.

Political leaders, celebrities, and other major social influencers can play a role in changing people's focus from taxis to public transport. For example, like western countries, if famous personalities started to travel by public transport this could encourage more residents of Gaza City to adopt this habit. It would help to reduce the assumption that public transport is usually for poor people and only the rich take taxis, etc. For instance, interviewee P2 stated that,

“... Changing people's culture towards public transport; the politicians and social influencers must get used to public transport. It is not a disgrace and not only as some younger people think is for school or university students or for the poor, which makes them feel ashamed to ride in buses. In countries of the world, especially developed ones, public transport is desirable and acceptable, so you see the minister or eminent personalities who use public transport without any embarrassment”.

Cultural Shift and TOD Adoption

Due to the minimal execution of law, some people with more political connections and resources may not follow planning law and as a result use it for their own interest. Interviewee P6 stated, *“People's culture and their lack of commitment to the planning law, as some citizens do not adhere to the planning standards for building”.* Some participants have suggested that the adoption of TOD could improve problems associated with traffic congestion; therefore, there is need to educate people to increase their level of awareness and adoption. Similarly, P6 revealed that, *“There is culture to use high number of personal cars and taxis which increased traffic congestion so there is need to guide the TOD environmental and economic benefits to people”.* It was found that the violation of traffic laws has become routine activity meaning it has become challenging to

change this violation culture and impose the punishments to force Gaza City's residents to change their habits. Interviewee P1 explained, *"It will be a challenge because young people's culture has so far been dominated by non-compliance with the law, especially traffic laws"*.

Some specific roads and markets face particular hurdles with respect to either establishing new markets or using the full capacity of the road to overcome congestion. There is common culture in Gaza City whereby political leaders or VIP personalities erect road barriers/blockage (partially/fully) to ensure their safety. This results in further traffic congestion especially when some roads, such as part of Al-rasheed coastal road, cannot be used due to these barriers. Interviewee P2 declared that:

"It also contradicts the culture of the people, for example, on the Al-Rasheed coastal road because of the traffic congestion and because there is a barrier in the middle of the road to provide safety to people, a pedestrian tunnel has been built from east to west, but unfortunately people ignore it and do not use it, so it was cancelled by the municipality".

Political Barriers

The municipality of Gaza City plans to establish more markets, such as in the neighbourhood of Tel Al-Hawa, as it can decrease road traffic as residents currently have to travel further to buy from existing markets. However, some political parties are very strong financially and politically, which means that establishing a market in Tel Al-Hawa may not be possible. Interviewee P1 revealed that:

"... there are ideas to establish a market in the neighbourhood of Tel Al-Hawa, but there are obstacles in its implementation, not financial, but unfortunately the land is seized by some parties at the moment, and it is difficult to get them out of it, and does this matter take time".

The analysis shows a multifaceted interaction of cultural, political, and economic factors that impact navigation and urban development in Gaza City. Although the interviews offer valuable perspectives on the cultural, political, and infrastructural elements, a more thorough examination of

possible remedies, stakeholder cooperation, and the enduring viability of suggested modifications would augment the analysis.

The aforementioned challenges highlight the necessity of adopting a holistic strategy that encompasses cultural sensitivity, educational initiatives, and collaborative efforts among diverse stakeholders in order to effectively execute Traffic-Oriented Development. Furthermore, it is imperative to incorporate continuous monitoring and adaptive strategies into any TOD implementation plan, given the ever-changing nature of urban environments.

Economic aspects

Keywords that emerged in relation to this theme were: financial constraints, environmental pollution, low diseases, overcome emission, city's economy, budget, occupation, license fee, unemployment, donors, and investment conditions.

The TOD model principally aims to address environmental, economic, and social problems associated with excessive car use and urban sprawl. The implementation of TOD could enable the best utilisation of resources across the city via the most healthful and efficient combination of mobility modes with a low environmental and financial cost and with high resilience against disruptive events. However, there is a need to understand the challenges and opportunities which influence the implementation of TOD.

Financial Capabilities

Some interviewees highlighted that lack of financial capabilities is one of major hurdles to restrict the infrastructure planning of the municipality of Gaza City. Interviewee P1 specified that, "*there is lack of financial capabilities of the municipality of Gaza City, as well as the Palestinian Authority*". Other participants noted an urgent need to adopt TOD as it can protect the natural environment by reducing the number of vehicles which increases CO² as well chronic diseases such as asthma. Interviewee P6 confirmed, "*Benefits in the field of the environment, such as reducing environmental pollution by reducing the number of vehicles and thus reducing the emissions*". Other participants shared a need

to implement TOD to enable economic benefits such as increasing Gaza City's income and reducing pollution and diseases. Interviewee P1 mentioned that *"there are environmental and economic benefits, such as reducing pollution as well as improving the city's economy."* Overall, it was found that although there are significant economic and environment benefits such as improving the local GDP, economy, and air pollution there is a lack of financial capability which is one of the most significant hurdles to delay the implementation of TOD in Gaza city.

There are many benefits of charging for parking as it can provide extra money to develop new parking and roads. Also, it forces the people out of their personal cars and encourages them to travel via public transport. However, some busy areas of Gaza city were noted to offer free parking which encourages people to travel via personal vehicles. Therefore, there is a need for the municipality charge for this parking. Interviewee P1 indicated that, *"... it is one of the things that encourage cars, because it is free. Some busy areas in Gaza City have free parking some areas do not, but they are very limited. I think that this is the problem that we are facing"*.

In the beginning, the most important obstacles are financial as Gaza city economy is not very strong due to the war; therefore they are not in position to construct metro lines and buy buses that are eco-friendly. Interviewee P1 clarified:

"It may be underground, but this is very expensive and exceeds the capabilities of Gaza city and the Palestinian Authority. You need a large budget to buy a public transport fleet, but the economic condition of government is not very good".

Some participants knew the financial condition of Gaza municipality and believe that to start development projects they have to buy private property which is expensive. This is particularly problematic given that there is insufficient economic means to do so by Gaza municipality. Interviewee P3 clarified that:

"Gaza municipality does not have the financial means to compensate them for their properties that will be confiscated for the sake of development projects. For example, when the municipality takes 1,000

square meters from me, I have the right to demand financial compensation, as nothing is free”.

This highlights the need for effective municipal policies to regulate parking fees and promote a shift towards more sustainable transport options.

Unemployment and Taxi Occupation

Unemployment is a major reason for workplaces to offer lowest wages as few benefits to employees; therefore, many people of Gaza city are forced to drive for a living (full time and part time) to cover their monthly expenses. Interviewee P1 highlighted that:

“Unemployment is widespread, more than 50 or 60 percent, and sometimes 70 percent, and many people resort to work as a taxi driver, although they are not qualified in various aspects to drive this taxi, but it is the available means of livelihood, of course, its income is small, and it does not require high skill according to the local culture and practically anyone can work as a taxi driver”.

However, it is common social practice to adopt part time/full time taxi driving as an occupation in developed and developing countries. Interviewee P3 said that, “[the] majority of young unemployed people who are known for me adopted taxis as part-time and full-time profession as there is affordable license fee for everyone”. In Gaza City, there are no particular skills and money required to become a taxi driver as driving licences can be easily achieved at the cost of a normal license. Furthermore, there is no requirement stipulating the model of cars which can be used as taxis. For instance, interviewee P3 suggested that *“I think there is need to increase license cost and car model requirements for taxis to discourage them to adopt as occupation and also it is good for public transport.”* Therefore the local government of Gaza city should increase the license fee, and implement a requirement to get an appropriate licence. They should also stipulate the car models appropriate for use as taxis in order to discourage people to adopt this as an occupation. It can also be a strategy to promote public transport in Gaza city. The increasing number of taxis and traffic congestion also increases CO² emissions which negatively impact the environment and health of residents.

Some participants believed that we cannot discourage people by adopting different tactics to deter them from taxis driving as an occupation. They argued that there are not many employment opportunities in Gaza city and not everyone has the skills to get a different job if they stop taxi driving. As such, there is a need to create a balance between taxis and public transport which is not possible without the creation of more jobs. Interviewee P4 explained, *“If you want to direct people to public transport, unemployment will increase, and this option may be difficult.”* Some participants shared that if the municipality builds metro lines for trains so that people can spend less and travel faster in Gaza City but it also negatively influences the occupation of taxi drivers as their families are fully dependant on this occupation. As interviewee P5 revealed,

“...if we build a metro line, drivers will stop working and you will not see cars on the road, and this is a positive thing, but what will we do with the unemployment that resulted from the construction of the metro, how will the driver who stopped working as a result of that live? This is a big problem”.

Project donors, and Technical Considerations

Moreover, nothing is available free of charge; either from neighbouring Muslim countries or international western investors. They can give loans to the municipality to buy property and transport for these development projects but they have to provide economic models assure how they invest sees a profitable return. Interviewee P4 explained that:

“... Another obstacle is the project donors, whether it’s Qatar, Turkey, Saudi Arabia, the European Union, or any other party. They have conditions for financing the project. Also, this funding does not support financial compensation for citizens in the event that the municipality wants to confiscate part of the land, and this is the first obstacle”.

The reliance on international donors and their influence on local projects underscore the need for strategic economic planning and self-sufficiency.

The Gaza municipality is waiting for aid from neighbouring countries or developed countries to implement projects, which unfortunately carry conditional support according to the donor’s vision, not the municipality’s planning. Interviewee P1 declared: *“a donation comes to maintain Omar Al-Mukhtar Road or Salah Al-Din*

Road, while the municipality needs this amount to pave a new road, but due to the conditions of the donor, the municipality cannot do this". Donors only provide a limited amount of money for projects, and many have not been completed due to financial limitations. Similarly, P2 indicates that, "there was funding for paving three roads, but in reality what was done was only two roads were paved. Even donating to build mosques, there is control over the shape and size of the mosque by the donors".

There are also technical considerations as the municipality of Gaza does not have advanced technology, they must use foreign expertise, which also requires investment. Interviewee P2 stated: *"if the project costs one million dollars in Europe, it needs two to three million dollars in Gaza due to the lack of technical experts here, and this is clear extortion of the people of Gaza because we need them"*. Instead of looking for international donors/investments, there is need to focus on national private investors. The most important factor for implementing TOD in Gaza City is cooperation between the private and public sector, especially in investment, whether via the government or the private sector. Investment should specifically be made in infrastructure, such as paving and maintaining roads and bus stops. This is essential in the implementation of TOD so that it links areas and neighbourhoods through.

The implementation of TOD in Gaza City entails a complex variety of challenges and opportunities from an economic perspective. Significant obstacles are presented by financial constraints, unemployment, and reliance on international aid. Nevertheless, the analysis proposes several potential strategies for aligning economic realities with the objectives of sustainable development. These strategies include the regulation of taxi occupations, the implementation of parking fees, and the promotion of national private investment. Ensuring an equitable integration of economic progress with environmental and social factors is imperative for the effective execution of TOD in the context of Gaza City.

Political Aspect

The keywords that emerged from the interviews included: Political conflict, violent conflict, government guarantee, war and terror, restoration, reconstruction, re-

planning, administrators, extension of Gaza, Occupation, Palestinian-Palestinian conflict.

The political landscape emerges as a critical factor shaping urban development in Gaza City, with interviews revealing the profound impact of political conflict, both internal and external, on the municipality's ability to plan and execute development projects. This analysis delves into key themes such as the Occupation, internal Palestinian political divisions, historical influences, and the persistent challenges posed by political instability.

The Occupation and Gaza Development

There is violent and political conflict between Palestine and the Occupation. Violent conflict has many negative consequences for the economy, politics, finance, society, education, security and safety in any country. For example, violent conflict can displace residents, destroy infrastructure and capital, raise famine and health issues, disrupt schooling, and endanger civil liberties in society. Due to political and violent conflict between Palestine and the Occupation, there are delays in development projects. For example, *“there is war situation in some areas of Gaza city which is under the Occupation troops control so our municipality cannot plan big to start development projects for long term period” (P1).*

There should be more political stability and a comfortable business environment to create a belief that investments are not at risk, and a government guarantee that investments will be returned otherwise, investors will not be interested. For example, *“there are many private and international investors ready to invest in public transport infrastructure, but they need government guarantees to return their investment due to any political instability or war and terror situation” (P4).* The obstacles to implementing development oriented towards public transport, including political issues. People and decision-makers have long neglected the issue of urban planning and city development because they have other political priorities, for example, *“aggression or war. This takes some thinking time; for example, war can last from a week to a month, but it results in long years of restoration, reconstruction, and re-planning” (P1).* Therefore, not all administrators and planners think about development, but rather how to restore

what the occupation destroyed over the years, some of which may be ten years ago. Where all the infrastructure has been destroyed, this represents a severe obstacle.

The main obstacle to the development of public transport, is the Occupation. From time to time, they destroy the infrastructure of the City of Gaza, such as roads, residential towers, and bridges (the Wadi Gaza Bridge was destroyed due to the Occupation intervention). This continuous destruction of its infrastructure means Gaza City has to focus on the maintenance and repair of roads, which leave limited time to consider the development and improvement of roads. For example:

“... the new government was also accused by the Occupation of being a government of terror that supports the resistance, which resulted in the siege of Gaza city to this day, and the destruction of the infrastructure from time to time, and the suspension of many development projects in Gaza City” (P5).

Palestinian-Palestinian division

There is internal politics between the government of the Gaza Strip and the government on the West Bank within the Palestine territory. For example, *“the Palestinian-Palestinian division is also certainly an essential element in the issue. The internal division is sometimes a greater problem than the problem of the occupation” (P2)*. This internal political dispute creates hurdles for central government when making any decision. Therefore, internal political dispute is also delaying the planning and confirmation of development projects on the Gaza strip. For example,

“... Due to conflict, which led to the existence of contradictory political decisions. A government in the Gaza Strip and a government in the West Bank, this division led to delaying the adoption of plans for many cities in the Gaza Strip, including the city of Gaza” (P3).

After the 2006 when the Palestinian opposition won the majority in the Legislative Council elections, it was able to form a Palestinian government. However, the previous government did not accept the results of the elections, which lead to a Palestinian-Palestinian conflict over power that resulted in the division of the two

parts of the country, and a government on each side claiming to be the legal government. For example:

“... the political instability changed many governments as a result each government declare corruption and losses in the development project of previous government that created Palestinian-Palestinian conflict because the political elected members of previous government always support the actions of their political party” (P6).

Another obstacle to the implementation of public transport is politics and the Palestinian-Palestinian political conflict, which resulted in the suspension of many projects, and slack and weak law enforcement in Gaza City. Thus:

“... the current government in Gaza City asks the municipality not to collect taxes from its citizens, and to be lenient in implementing planning laws in view of the difficult economic conditions. This negatively affected the municipality, as it was unable to provide its services and develop its facilities” (P4).

Influences of Political Governments and Regimes

There have been many political governments and regimes which have influenced urban planning and development in Gaza city. The participants acknowledged the contribution of different political tenure in which urban development occurred in Gaza City. For example,

“... we want to talk about the planning in the city of Gaza, we will talk about the Ottoman period and then the British Mandate, which had a great impact on urban planning in the city of Gaza. New Gaza began during the British Mandate time. After that, the planning projects were completed during the Egyptian period, then the Occupation came and carried out a number of housing projects, such as Al-Sheikh Radwan neighborhood, Al-Amal neighborhood, and some neighborhoods in Jabalia” (P4).

Some participants have discussed the extension of areas in Gaza city as they mentioned that due to the advent of the Palestinian Authority, the geographical area of Gaza city is significantly increased. They have mentioned that a multi-floor building or residential towers was started under the control of the Palestinian Authority as the population of Gaza city significantly increased. Moreover, many new roads have been constructed during this period. For example:

“... as for the period of the Palestinian Authority, it actually established a large number of projects, and the city of Gaza took a qualitative and distinctive leap in 1994, because the area of the city of Gaza was limited, as it was only 18 square kilometers, and with the advent of the authority, it became 54 square kilometers. Now we can say that its area has become 72 square kilometers. The last period of the Palestinian Authority, from 1994 to 2006, was characterized by multi-floor buildings which are so-called residential towers in the Gaza Strip, and the paving of many roads” (P4).

During the last hundred years, Palestine has been subjected to more than one occupation and more than one administration, which began with the Ottoman Empire, then the British occupation, Occupation, Jordanian administration on the West Bank and the Egyptian administration in Gaza, and then the Palestinian Authority. Thus:

“... each of different administrations from Ottoman to Palestine authority come with a different plan from the other, so you find that the city of Gaza has different types of planning that do not correspond to a specific planning vision. This difference in planning for the city of Gaza has led to the misdistribution of land use, so you find that most of the vital centers, whether shops, banks, parks, government offices, are all located on Omar Mukhtar Road only. This difference also resulted in poor road infrastructure and unsuitability for public transport. You will find a road a little wide in one part and in another narrow part” (P6).

Siege and Perpetual Infrastructure Devastation

After Hamas won the Palestinian Legislative Council elections in 2006 and the government was formed, the Occupation refused to recognize it and accused it of supporting the resistance. Therefore, the siege on Gaza City intensified, and the occupation's attacks on the Gaza Strip increased, especially in Gaza City, which is considered the Strip's capital and a political city. Over successive periods, the occupation destroyed the infrastructure of Gaza City, residential buildings, and even places of worship. Therefore:

“... as a result of the occupation and the siege imposed on the city of Gaza. The Gaza municipality is trying to maintain and rehabilitate the roads after the occupation destroyed them in the previous periods. This is a basic matter and the most important priority of the municipality. How can the municipality think about implementing TOD while it is still

looking into solving problems that are considered essential in planning” (P6).

A key question arises: How can a municipality whose infrastructure is constantly being destroyed by occupying forces think about implementing TOD? After the municipality repaired what was destroyed, the occupation returns to destroy it again. Some participants stated that political influences create major barriers to the implementation of TOD in Gaza City. For example:

“As I mentioned to you earlier, the main factor in not implementing the TOD in the city of Gaza is the occupation. Any country under occupation will not find development or progress because its thinking is about freedom, and also because the occupier aims to destroy the country, fight it and plunder its resources. This is what happened to Palestine, of which the city of Gaza is a part. Palestine is the only country that has been under occupation for 100 years” (P5).

The political aspect emerges as a dominant theme, shaping the urban development landscape in Gaza City. From the Occupation's destructive impact to internal political divisions and historical influences, the municipality grapples with multifaceted challenges. As a result, long-term planning and the implementation of transit-oriented development remain elusive, emphasizing the need for political stability and resolution to pave the way for sustainable urban growth. Addressing these intertwined political challenges is crucial to fostering sustainable growth, enhancing public services, and improving the quality of life for Gaza City residents.

Land-Use

The keywords that emerged from the interviews included: Land use limit, crowded places, markets, land use planning, land use distribution, private ownership, regulatory laws, nuisance, replanning, larger spaces, southern side.

Outdated Urban Planning and Inefficient Landuse Planning

Urban planning is designed to organize the city in accordance with the needs of the population and those of the modern age which are reflected in street patterns and land-use. However, the urban planning design of Gaza City is obsolete and there is need to replan the land use standards as there are challenges to building

the public transport infrastructure. For example, one participant suggested, *“Re-planning the distribution of land use in accordance with planning standards”* (P2). Other participants highlighted that decision makers such as political forces with control over the resources lack the experience in the planning of land distribution and the building of advanced public infrastructure. Therefore, competent people should be involved in the renewal of land use planning standards. For example, *“[a] lack of interest from the decision-makers, may be due to their lack of experience or their lack of specialization in planning.”* (P2).

Some participants believe that previous governments did not plan public transport by investing in land and as a result most of land is now under the control of private owners. Therefore, the government is now facing many obstacles in acquiring these lands to expand the roads and built metro lines. Indeed, *“Most of the land uses in Gaza City are private property, 70% to 80% of lands are private lands, and the rest are governmental, just as there are no large government lands”* (P5).

Some participants have shared that there was very poor land use planning in the past and as a result there are challenges for planners and administrators in how they can initiate the development work to facilitate the implementation of TOD in Gaza city. For example,

“... there is a gold market, a currency market, a vegetable market, a fruit market, a wholesale market, the Gaza Square and the Gaza municipality, a bank or two, a heritage area, a large mosque, the Pasha Palace and a library, everything, cultural centres, religious centres, all in a piece of land that does not exceed a square kilometre that is difficult to walk” (P3).

Salah El-Din Road is considered the main hub for people who are searching for a place to live and an occupation but there is also more environmental pollution here because of the limited land and greater crowding. For example:

“Salah El-Din Road where there is traffic congestion, parking lots, and diversity of use (vegetable and fruit vendors and Al- Shejaiya market), therefore this area is very crowded as Salah El-Din Road, which is supposed to be regional in this area” (P1).

Areas with heavy passenger transport are especially located around the city's commercial centres and universities, which experience the largest number of passengers, and government places. The biggest problem is that there is traffic congestion around hospitals and schools, which leads to severe congestion. Hospitals were previously on the outskirts of the city, but due to urban growth this became the centre of the city, which means that the nature of land distribution and use is one of the causes of the problem. For example,

“... there is the Firas market and then heading west from the Al-Samer Cinema area to the Al-Saraya junction, there are no services, a very contradictory distribution of services. If you look from the intersection of Boor Saeed Road, the Al-Samer Cinema area, to the beginning of the Al-Saraya, it is very strange, there's no commercial activity or anything else. Then the commercial activity returns from the Al-Saraya to the Al-Rimal neighbourhood next to the Legislative Council, then from the Legislative Council until reaching the sea, there are no public services for citizens, although it is the same road, which is Omar Al-Mukhtar. This matter needs to be reviewed by planners and decision makers” (P3).

Private Ownership and Regulatory Challenges

As most lands in Gaza City are under private ownership and the government has insufficient financial resources, the public transport development process is relatively slow which creates further barriers to the implementation of TOD in Gaza City. For example, the, *“Ownership of lands, as most of the lands belong to private ownership, which impedes planning for the landowners not giving up their lands or some of them to Gaza City, and the municipality cannot buy these lands due to the financial crisis” (P3).*

There is ineffective planning and standards for land distribution and use; as a result the local government of Gaza city is unable to secure ownership of important lands to expand roads for public transport. Results of this study reveal a conflict between land ownership and regulatory laws which increases urban problems and land misuse, and means it is not possible to make optimal use of land. This is because citizens do not observe regulatory laws and build many buildings without licenses and without complying with conditions and regulations. The weak legal environment, a lack of law enforcement, and a lack of planning in land distribution and use are major hurdles in the successful implementation of

TOD in Gaza city. For example, *“private land owners and investors have strong connections with political leaders so that they can bypass regulatory laws and build many buildings without licenses and without complying with the conditions and regulations”* (P3).

Some participants believe that residential towers which do not following the regulatory laws and unemployment has forced people to move from other places to Gaza City. Private investors reap the benefits of residential towers as they can charge the highest rent because there are limited places to live, meanwhile increasing numbers of people come to search for work in Gaza city. For example, *“now places are limited and cause a nuisance. Many people from other places migrated here for searching occupation that’s why private investor who has residential towers is more prosperous here”* (P6).

Agricultural Lands and Future Planning

Currently, land use inside the city is almost at its limit because the city is very crowded; most of the neighbourhoods have become residential and there is erosion of agricultural lands. Therefore, they have suggested that it is better to expand the city to the southern side where there is cheaper land available. For example, *“after so many crowded places on limited land, the only thing left in land use, if we are talking about Gaza City, is the expansion of the city’s influence in the southern side”* (P2). Some participants believe that the planning and implementation of TOD requires larger spaces which are not available due to the existence of residential towers, private lands, and crowded markets. Therefore, they believe that the only way to secure land use and development for TOD is to explore places outside the city such as the southern side. They stated: *“... it needs larger spaces, and this is not available inside the city, but it may be outside the city”* (P1). Due to the increasing population and number of markets and residential occupations in Gaza city, some participants predicted building statistics over the upcoming years. They believed serious attention is required by the local government of Gaza City to ensure the effective use of the limited land. For example,

“... the land use in the Gaza Strip, I think in 2060 there will be no agricultural land left in Gaza City. I made a prediction of the number

of buildings in the years 2030, 2060, and 2090. It was found that in the years 2030 and 2060, the number of buildings exceeded the borders of Gaza City, and so Gaza City is a block of cement” (P3).

The complicated issues and challenges surrounding land use planning in Gaza City are multifaceted, involving issues of private ownership, regulatory laws, population influx, and inefficient urban distribution. Replanning and addressing these issues are crucial for the successful implementation of Transit-Oriented Development and sustainable urban growth and necessitate immediate attention, informed decision-making, and collaborative efforts. The call for attention to larger spaces and future planning emphasizes the need for a comprehensive, forward-looking approach by local authorities to ensure the effective and sustainable use of limited land resources. As the city grapples with burgeoning demands and spatial constraints, proactive interventions, such as southward expansion and rigorous enforcement mechanisms, emerge as imperative solutions to sculpt a sustainable, inclusive, and vibrant urban landscape.

6.4.2 Theme 2: TOD Adoption and Implementation

Public Transport Development

Keywords which emerged concerning this theme included: Time and safety, connecting regions, taxis, occupation, advance transport services, smarter city, fast and competitive, regional highway linking, special lanes, metro, tram line, private companies' interest, occasional use, political campaign.

The exploration of public transport development in Gaza City unveils a numerous of challenges and potential solutions. Examining the keywords, themes, and participant quotes reveals a narrative shaped by the urgency for advanced urban transport, economic collaborations, and the overcoming of existing limitations.

Awareness on the Importance of Public Transport

As there is always a need for high-speed public transport networks - like metros and trains - to compete regionally with cars and provide easy access to the workplace, the adoption TOD has increased across the world. The participants of this study provided various reasons to implement TOD on the Gaza strip, for

example the P1 stated that *“public transport between the cities of the Gaza Strip is limited, especially for students, as public transport is linked to university time”*. Due to the violation of traffic rules and the high number of privately owned vehicles, local people are consuming more time to reach their destinations and the risk of accidents has increased. Therefore, participants suggested that the implementation of TOD can save time and better ensure safety when travelling. These views were gathered from the interview with P1 who stated the importance of *“raising awareness among citizens on the importance of public transport and that it solves major problems in several aspects to change the negative image of public transport such as time, safety, and cleanliness”*.

Economic Collaborations and Investment

The interviewees identified a need to invest in public and private buildings to develop the public transport infrastructure as Gaza City's economy is sufficiently not affluent to independently build a public transport infrastructure. P2 shared some useful thoughts on this: *“Investments in public transport and infrastructure to initially connect the regions with each other by buses”*. Similarly, other participants also proposed attracting private investors as they have a high portion of land ownership and financial resources that can help to build an advanced public transport infrastructure. P4 suggested, *“attracting private investors and encouraging them to invest in public transport in partnership with the government and municipality”*. It is important to discuss the economic model (profit sharing plan) to engage the private domestic investor and landowner of Gaza city; this discussion could open new avenues for public transport development which is essential for the successful adoption of TOD.

Unemployment, Competition, and Development of Roads

There is need to build advanced urban transport as it is considered critical in attracting jobs with the potential for commercial trading, travelling and services. With the passage of time, tough economic conditions have caused record unemployment rates which have forced many citizens to take up taxi driver as their main job which ultimately influences the public transport infrastructure. P3 said *“the absence of competition between public transport and private transport or taxi transport, which makes the citizens go to taxis. Reducing licenses for taxis*

to encourage residents to use public transport". Other participants argued a strong need for TOD as the existing public transport infrastructure is too old and it cannot attract citizens. For example, P5 stated that, "*public transport existed from 50 years ago, but the presence of the occupation led to its cessation*". However, for the development of an advanced public transport system, there is a need to build more roads and expand existing roads so that the public transport system can perform effectively. P3 and P6 shared "*[the] expansion of some main roads to help establish public transport. Furthermore, the expansion and development of Salah El-Din Road to become a regional highway linking Gaza City with the other governorates in the north and south*". There is a need to discuss incentives/profit sharing with residents, private lands owners, and investors as it can speed up the process of constructing new roads in Gaza City.

Current public transport services are not competitive, fast, efficient, or advanced in terms of the internet and other facilities. There is need to introduce such services so that people can encourage, motivate, and support the government adoption of TOD. P1 stated that "*In the field of finding a public transport service, it must be efficient, Wi-Fi, IT, air conditioning available to people, fast and competitive, it must also be associated with other factors*". The people usually take taxis because they are comfortable, air conditioned, and fast; moreover, if public transport offer the same features at an economical price, it could attract travellers to adopt this mode instead. Many developed and underdeveloped countries are specified lanes on roads so that travellers can reach on their destination without delay due to traffic congestion; therefore is a need to adopt this in Gaza in building a smarter city. For example, P1 stated that, "*[a] special lane does not exist in Gaza, and in order to establish it, you will face difficulty at first, and people do not accept that you reserve this route for buses only*". The government should offering advanced IT, Internet access, comfort, and special lanes to attract commuters to implement TOD and address the challenges with the current system.

Private Sector management

Tram lines and metro buses offer some of the best solutions to develop advanced public transport systems and these are also essential to build people's trust in the

government's performance in developing Gaza. This evidence was gathered from the interview with P2 who indicated: *"there are ideas put forward for public transport, for example, creating buses, or a metro or tram line"*. Private bus routes are not controlled and organised by the local government as they prefer to take busy routes that enable greater profits. These give an edge over taxi drivers who look for places with less public transport. For example, P2 and similarly (P6) shared that,

"... each company operates from 10 to 20 buses and makes transport travel according to its business view to transport school and university students and it is not organized by the government, and you cannot depend on the private sector because everyone works according to his own vision and his own interest."

Few public transport companies were found and their use is limited to meeting the needs of university students, political festivals and campaigns, and sometimes weddings. For example, P2 shared some useful experiences:

"... there is one or two public transport companies, but they are private companies and manage public transport according to their vision. The work of these companies is limited in transporting university students and some occasions such as weddings and political campaigns."

The analysis of public transport development in Gaza City highlights a variety of obstacles, including financial limitations, regulatory issues, and inadequate infrastructure. Nevertheless, within these intricate circumstances, there exist prospects for innovation, collaboration, and change. Collaborative efforts, economic investments, and public awareness are identified as crucial factors. To foster public support for Transit-Oriented Development (TOD), it is crucial to address unemployment, improve competitiveness, and incorporate technological advancements. Strategic interventions are necessary to address the coordination challenges that exist within the private sector. The successful implementation of Transit-Oriented Development (TOD) in Gaza City requires the consideration of various complex issues. By applying the synergies of the private sector, prioritising infrastructure improvements, and reimagining regulatory frameworks, Gaza City can effectively steer its public transport trajectory

towards a future that is more efficient, inclusive, and sustainable. As expounded upon by the participants, the path ahead requires collaborative endeavours, forward-thinking guidance, and a dedication to cultivating a paradigm that prioritises the needs and preferences of commuters.

Planning

The keywords that emerged from the interviews on this theme were: Decision makers, decentralisation, smart cities, legal powers, land distribution, private ownership, experience, specialisation, residential area, parking, road plan,

The analysis of urban planning challenges in Gaza City reveals a range of connected complexity, including centralised decision-making and insufficient land-use regulations. Through an in-depth exploration of the theme keywords and perspectives of the interviewees, a thorough examination uncovers the complex barriers that impede the effective implementation of urban planning, particularly in relation to the integration of TOD.

Centralised and Decentralized Planning

There is need to encourage collaboration between the community, government, private investors, and other stakeholders' when implementing TOD. There should be clear communication and coordination about the roles in the development of public infrastructure otherwise decisions can be negatively influenced. P2 shared their understanding on this: *"[a] lack of clarity in making planning decisions, whether it is from the municipality, the Ministry of Local Government, or from the policy of the country."* Some participants suggested a need to integrate smart transport with land-use and the importance of applying this to achieve the most effective levels of planning in developing cities, particularly Gaza City. P1 stated the importance of the, *"integration between central and decentralised planning, as well as between the method of development towards public transport and land use."*

In centralised planning, a few political forces control the finances and other resources, which can delay decision making and this could particularly affect the development of TOD in Gaza City. Therefore it is suggested that such power should be distributed at the lower administration of Gaza City so that independent

and timely decisions can be taken on the development of its public transport infrastructure. For example, P4 said “*adopting decentralized planning and granting more planning and legal powers to Gaza City.*” The strategic planner should focus on decentralized planning as it can involve the input of most stakeholders on the effective use of land for TOD adoption.

Obsolete Planning and the Need for Replanning and Experts

Urban planning is designed to organise the city in accordance with the needs of the population and the modern age, also considering street patterns and land-use. However, the urban planning design of Gaza city is obsolete meaning there is need to replan the land use standards to address challenges in building the public transport infrastructure. P2 shared their understanding that “*re-planning the distribution of land use in accordance with public road in*”. Some participants highlighted that decision makers, such as political forces who have control over the resources, lack experience regarding the planning of land distribution and the building of advance public infrastructure. Therefore, there is a need for the involvement of competent people when renewing land use planning standards. This evidence was collected from P2 who indicated that, “[a] *lack of interest from the decision-makers, which may be due to their lack of experience or their lack of specialisation in planning.*” Urban planning, such as replanning land use standards, is urgently needed when building public road infrastructure and TOD adoption.

Strategic Planning and the Challenges

A major strategic challenge is the increasing population and amount of private transport, such taxis and private cars when place particular pressure on the current system. Furthermore, the popularity markets also increase this pressure, meaning the local municipality cannot plan effectively for parking places. Therefore, transport suffers especially when people leave their cars in front of hospitals and markets which block the flow of traffic and further increases congestion. This evidence was collected from P1 who indicated: “*the biggest problem now in Gaza City is the problem of parking, especially in commercial areas and markets, and even in residential areas, people are starting to suffer.*”

The current local municipality should develop a road plan that focuses on increasing the width of streets which would allow for special bus lanes and room for bicycles. Indeed, P2 confirmed, *“we need large areas and wide streets, and this is not available in Gaza City, and we need to re-plan most of the roads of Gaza. This means that you need strategic planning in order to take part of the street and turn it into a complete road for bicycles and buses.”* Some participants shared an appropriate solution for building wider roads in Tel Al-Hawa suggesting that the local government should involve law enforcement public prosecution against those who create hurdles to the development of roads in Gaza City. For example:

“... there are ideas to widen the road of Tel Al-Hawa, but there are obstacles in its implementation, not financial, but unfortunately the land is seized by some parties at the moment, and it is difficult to get them out of it, and does this matter take time.” (P6).

The local government should take appropriate legal planning against private parties who illegally seize land or prevent any road development that is essential for the adoption of TOD.

Other participants highlighted that the limited amount of future planning regarding land distribution and use. As a result, when they are planning to expand and build roads and the street network they have insufficient resources to purchase land. P3 said that, *“[the] ownership of lands, as most of the lands belong to private ownership, which impedes planning. The landowners not giving up their lands or some of them to Gaza City, and the municipality cannot buy these lands due to the financial crisis.”*

Overall, it was found that power and financial resources are not fully decentralized meaning there are delays in the construction of roads, streets, and public transport. A lack of planning, experience, and expertise was noted in planning the transport infrastructure. Finally, there is ineffective planning and standards for land distribution and use, which result from the inability of the local government to secure the ownership of important lands to enable expansion for public transport. The results of this study reveal a conflict between land ownership and regulatory laws which increase urban problems, land misuse and the inability to

make optimal use of land. This results from citizens not observing certain regulatory laws and constructing buildings without license or compliance with conditions and regulations. A weak legal environment, the enforcement of law, and a lack of planning on land distribution and use are major hurdles to the successful implementation of TOD in Gaza City.

The topic of urban planning in Gaza City covers an extensive variety of challenges, including centralised decision-making dynamics, complexities in land ownership, gaps in expertise, and strains on infrastructure. The interviews provides light on the urban planning challenges in Gaza City, highlighting the critical necessity for transformative actions. These actions include decentralising planning powers, resolving land ownership conflicts, updating planning frameworks, implementing specialised capacity-building projects, implementing changes to regulations, and strategically enhancing infrastructure. By comprehensively tackling these challenges, Gaza City can effectively implement TOD and facilitate a more sustainable and efficient urban development.

Government Support and Policies

Keywords for this theme from the interviews included: Partnership, financial fundings, parking fee, conditions for taxis, modern facilities, public motivation, government land use, high quality services, ideal land use, economy, policy science,

The review of government assistance and regulations for Transit-Oriented Development (TOD) in Gaza City reveals a complicated relationship of financial limitations, policy factors, and the necessity for strategic cooperation between the public and private sectors. This analysis explores the emerging themes, including the difficulties in obtaining funding, the frameworks of policies, the government's influence on public behaviour, and the possibility of involvement from the private sector.

Cooperation Between the Governmental and the Private Sector

In a democratic government, support the role of government is important especially when there is high inflation and the government has insufficient funding to build an advanced public transport system. The management of health,

unemployment, and refugees are some major priorities which take precedent over transport. However, it is important that the government plays a role in managing private transport and/or public transport, and the road network infrastructure alongside land-use patterns which shape Gaza City's urban environment. For example, P2 stated that *"cooperation between the public sector and the private sector with government support for public transport. There is need to increase financial funding from the government to support public transport."*

Funding is one of the major barriers that has limited the execution of a government plan to develop an advanced road infrastructure. As such, there is a need to engage and share incentives with private investors, and a need to redefine government policy when planning the best use of land (such as widening existing and constructing new roads). However, it was found that government policies on ideal use are currently not in favour of TOD adoption. For example, P2 shared that, *"I think that the majority of government lands were used for housing and other projects."* Government policies with respect to funding involve private investors and planning the most effective use of land requires serious attention as it can create an appropriate road infrastructure for TOD adoption.

The Palestinian government should engage the public on media platforms where they can promote these solutions to transport congestion and advise the public on how public transport can be useful in addressing many existing problems.

Due to corruption, unemployment, and a weak economy the government policies on building public transport are not appropriate. Therefore, there is need to involve private investors who can provide financial support, expertise, advanced building technologies, special lanes, and metro trains which can transport large number of people. For example, P1 questioned:

"Who will organise the public transport? Is it the government or the private sector? In many countries, the government organizes public transport in cooperation with the private sector. The government has a difficult economic situation."

Enhance and Restrictions on Public and Private Transport

The government has control over certain policies which could discourage the use of private transport and taxis; for example, it is recommended that parking and maintenance fees are increased so that more people are encouraged to adopt public transport. For example, P5 suggested:

“establishing new policies related to parking, especially setting up fees for private transport and taxis. The government should adopt decentralised planning for city neighbourhoods. There must be government support for public transport. The government should enforce law on citizens and drivers.”

Some participants highlighted that unemployment and the increasing number of taxis are strongly correlated; therefore, there is need for the government to place some restrictions on this to manage any negative influence on the future adoption of TOD. For example, the P6 said *“unemployment increased, which led to many residents of Gaza City to work as drivers, due to the availability of the profession without any conditions.”* Thus, the government should build public transport with a range of modern facilities such as comfortable seats, air conditioning, bus hostess, as it can increase the public motivation to adopt public transport. For example, P1 suggested:

“If [the] government start[s] gradually support the public transport sector and modern air-conditioned vehicles with tempting services such as Wi-Fi, IT, air conditioning available to people and have priority on the road, not parking in congestion areas and have a special path so that they by pass traffic lights.”

Experts Engagement and Policy Science

There is a need to focus on policy science as it is useful when involving researchers with the best expertise to solve public transport related issues in Gaza City. For example, P5 shared: *“the government should set plans and strategies for going to public transport by researching scientific research and experts.”* It was found that the execution of government policies regarding encroachments and unauthorized public land use require attention as addressing this can help to effectively use available land and build an appropriate public transport infrastructure for the people. For example, P5 said *“the Gaza*

municipality has to maintain some roads and remove the encroachments on them by the citizens.” Thus, involving private investors, engaging researchers in policy science, and executing policies and laws with respect to encroachments and unauthorized public land use are helpful in the adoption of TOD.

The analysis highlights the crucial role of government support and policies in facilitating the successful adoption of TOD in Gaza City. The challenges encompass various factors such as limitations in funding, policy frameworks, rules and regulations, and engagement from the private sector. To address these challenges, it is necessary to promote cooperative governance, modify regulations, utilise the knowledge and skills of the private sector, and adopt evidence-based policy science techniques. In order to effectively address the complex issues and utilise the transformative capacity of TOD, it is imperative to adopt a comprehensive and multifaceted strategy that is specifically designed to suit the unique socio-economic circumstances of Gaza City. By cultivating collaborations among various parties involved, the city has the potential to guide its urban transport path towards a future that is both sustainable and inclusive, while also overcoming limitations and capitalising on opportunities for significant and positive transformation.

Accessibility

Keywords which emerged from the interviews included: Road development, expansion, incentives for public, public transport, high cost, link roads, micro buses, waiting time, arrive quickly, route, traffic signal, 500 meters.

The accessibility in Gaza City's transport infrastructure is crucial for understanding the challenges and potential avenues for improvement. This analysis explores the emerging themes such as road development, the cost of public transport, integration of road networks and land-use, and the quality of available services, all of which influence the accessibility of the transport system.

Road Development and Convincing citizens

Certain planning approaches are currently practiced or planned to integrate road networks and land-use as there is a strong need for a street network that is designed at the city and neighbourhood scales to address the principles of

sustainable accessibility. Though the construction and expansion of roads, more citizens can be encouraged to access public transport which can save citizen's time and better ensure their safety. For example, P4 suggested the "*development and expansion of Salah El-Din Road, which is the southern entrance to the centre of Gaza City.*" Some participants indicated that there were no significant changes in the fares for transport; therefore, there is a strong need to incentivise the public in order to discourage the use of private transport. For example, P5 said "*it needs intensive work and creating incentives for the public to move towards public transport*". Some participants identified a lack of accessibility to implement TOD as Gaza City transport decision makers have insufficient expertise, financial budgets, and technical equipment. For example, P4 noted: "*[a] lack of expertise, capabilities, equipment, and technology to implement TOD*" While P6 stated that, "*The high economic cost of public transport, which exceeds the capabilities of Gaza Municipality and the Palestinian Authority*". Overall, these participants shared valuable views about the current and future state of public transport infrastructure planning in Gaza city.

The participants of this study specifically mentioned a need to integrate road networks and land-use as the street network should be designed at the city and neighbourhood scale to address the principles of sustainable accessibility. For example, P6 stated that the, "*expansion and development of Salah El-Din Road to become a regional highway linking Gaza City with the other governorates in the north and south.*" Some major road infrastructure developments and expansions are suggested to connect roads and increase the accessibility of people who can travel easier to Gaza city. For example, P6 suggested: "*[the] development and expansion of Al-Rasheed coastal road, which is the southern entrance to Gaza City. Implementation of development TOD on Al-Rasheed and Al-Jalaa Roads at the outset*". Overall, view on this theme noted a need to tax private transport and offer incentives to encourage the use of public transport in Gaza City. They suggested that the expansion and development of various roads, such as Salah El-Din, Al-Rasheed, and Al-Jalaa, can connect Gaza City to other regions and attract tourists and citizens to use public transport. These are some of the recommendations for the local government of Gaza City to help inform the design of an accessible TOD.

Public Transport Challenges

Although public transport is available, it is via micro/minibuses that are not Wi-Fi-enabled, have no air conditioning and are incapable of meeting demand from passengers. Therefore the wait time for this form of public transport is very long. For example, P1 shared, *“there is no advantage for public transport (microbuses, minibus), because the waiting time is long and there is crowding inside the buses.”* Due to extend waiting times, public transport is accessible to everyone as people cannot afford to wait long. Therefore, there is need to build a system for metro trains and buses which can carry more passengers and offer high quality services. For example, P1 shared, *“everyone turns to taxis, as it stops anywhere, arrives quickly, the fare is little, and therefore public transport in the traditional sense no longer exists.”*

Some participants shared how specific locations and lengthy traffic signal can increase the challenges for public transport while taxis and private cars can take alternate routes to minimise this delay. For example, P2 shared, *“Nowadays, in some areas, such as Abu Talal Junction in the Al-Nasr area, you may wait up to three or four minutes at the light.”* Therefore, public transport must have advanced technology and services and there must be special lanes for public transport that can reduce wait times and increase the capacity of passengers.

Quality of Services and Citizen Comfort

It is suggested that there is need for public buses to stop every 500 meters as opposed to the current system whereby many people are unable to access public transport. For example, P2 said, *“we really need a place for parking, a place for buses to move without any obstacles, and to stop every 500 meters.”* It was found that public transport is usually known for its high quality services, which include Internet access, air conditioning, and timely departure and arrival. However, public transport in Gaza City is less accessible for those with limited time. For example, P3 stated:

“As a citizen, I can use public transport, but is there any confidence in these companies that I will arrive on time and not crowded for women’s travel especially. ‘By a minute and seconds?’ Private transport in Gaza does not move its buses except when the bus is full of 40 or 50 passengers.”

The interview results revealed that the accessibility of public transport can be improved by specifying more stops as well as departing and arriving on time at every 500 meter stop, otherwise people are more comfortable sharing taxi rides. For example, P5 stated:

“I think that the accessibility factor is more a condition for the success of TOD in Gaza City than it is a factor in implementing TOD. This is because the citizens of Gaza City are used to using a taxi, which carries four passengers, and then moves quickly, and sometimes the taxi moves with one or two passengers.”

There is also a need for public buses to avoid overcrowding, which the citizens of Gaza will not accept, especially women.

This analysis provides a comprehensive analysis of the complex factors that contribute to accessibility in Gaza City. It addresses various aspects such as the necessity of road development, challenges related to the quality of public transport, dynamics of congestion, and strategic recommendations. To tackle these complex challenges, it is necessary to promote cooperative governance plans, incorporate technological advancements, give priority to transport solutions that consider gender, and foster public confidence in accepting TOD and a resilient transport system in Gaza City. By giving priority to these factors, Gaza City can direct its transport path towards promoting fair and equal access, improving the use of TOD, and achieving its goals for sustainable urban development. The analysis of accessibility within the transport infrastructure of Gaza City unveils a complex and multifaceted landscapes. Participants recognise the necessity of road development, but they also emphasise the difficulties in the current public transport system. The multifaceted nature of the accessibility issue is underscored by recommendations for comprehensive road planning, efficient public transport, and addressing the impact of traffic congestion. The successful implementation of TOD in Gaza City requires the comprehensive consideration and management of accessibility, reliability, and comfort.

Experts

Keywords for this theme included: 'New to me', 'never heard', TOD specialist, practical experience, traffic management, right decision, videos, some countries, training course, participation, public transport.

The engaging experts in TOD for Gaza City emerges as a crucial aspect in the discourse on urban planning and transport infrastructure. The analysis delves into the perspectives of interview participants, revealing the gaps in knowledge, the need for training, and the importance of incorporating external expertise for successful TOD adoption.

Training Programs and Educational Initiatives

The term expert means those with an appropriate level of knowledge and experience of TOD to enable its adoption in the building of Gaza as a smarter city. These experts should have specific knowledge about commercial and residential land in order to help to build TOD and increase access to the benefits of public transport. The sense of a residential or commercial place can be provided by those who are directly or indirectly involved in the planning of road infrastructure and public transport. P1 admitted: *"to be honest, this is new to me, and I've never heard of it before."* It was found that the interview participant has no theoretical knowledge of TOD and its implementation, which indicates the value of involving researchers and universities in educating the local municipality on TOD. Such involvement could consider how TOD can address costs, waiting time, traffic congestion, road accidents, long journeys, advanced IT and other problems with facilities. P2 admitted: *"personally, I did not participate in or take training courses in development oriented towards public transport."* This suggests a need for the government and other stakeholders to conduct seminars and training programs on attracting investors, and people in TOD. By building awareness, more people can show learn and gain practical experience on TOD.

Expert Shortage and Strategic Decision-Making

Local municipality, traffic management, and the strategic public transport infrastructure planners of Gaza City can work with experts who have knowledge and experience. This addresses one of the major barriers to the adoption of TOD.

Evidence was gathered on this from P4 *“I think there are no TOD specialists in the committee, also in Gaza City. There is also a shortage of experts or specialists in the field of public transport.”* It was also suggested that traffic management and the local municipality should hire experts who know how to bring the public, buildings, activities, and government together to enable easy walking and travel on public transport. For example, P1 suggested, *“there is also a major problem currently in traffic management in the city, where there are few experts present, which negatively reflects on making the right decisions.”* There is a need for the local government to involve experts on TOD from other cities or foreign countries who can offer practical and tested solutions to resolve the issues with public transport use among the citizens of Gaza City. Most respondents agreed that they have some knowledge after watching a video but no practical experience. P4 shared *“there is no experience, but when I watched the video, I knew the concept of TOD, as it is applied in some countries outside Gaza.”* In the absence of experience, private investors may not be ready to go into partnership with the government as they may be unwilling to risk their land or money.

The analysis highlights the complex dynamics related to the lack of expertise, the promote of knowledge, and the need to build capacity in Gaza City's TOD scenario. The key function of experts is crucial in overcoming knowledge gaps, facilitating training, and contributing to knowledgeable decision-making for the successful adoption of TOD in Gaza City. The implementation of collaborative efforts with experienced professionals, the cultivation of academic and institutional participation, and the coordination of comprehensive training programmes emerge as pivotal measures. The establishment of partnerships among local institutions, international experts, and private investors might create an environment that is favourable for the exchange of knowledge, training, and implementation of plans. By strategically addressing these aspects, Gaza City can effectively utilise the transformative potential of TOD, resulting in a more sustainable urban landscape that prioritises the development of expertise and the promotion of innovation.

6.2 Summary

This chapter focused on the analysis of the interviews, which were conducted with six experts and managers in the case study. The main aim of the interviews was to determine if decision-makers and planners implement the concept of TOD as described in literature. Moreover, the interview also sought to identify whether decision-makers and planners are aware of TOD practices and if they would consider apply them in Gaza. In addition. The interviews aimed to determine the factors for TOD implementation and to understand which could be applied to Gaza City. As the analysis indicates, this objective was satisfied and the data enabled an analysis of the key themes in relation to TOD. The main results indicated that the city has a foundation that might be used as an introduction to the implementation of TOD. Moreover, the interviewees had similar opinions in terms of TOD adoption and implementation while most interviewees strongly believed that infrastructure development is an important way to enhance the integration between road networks and land-use

Additionally, most respondents agreed on the need to attract private investors and encourage them to invest in public transport. Notably, these aspects were implicitly addressed by interviewees when respondents were asked to identify the TOD factors related to Gaza planning. Consequently, it is possible to conclude that investment, raising awareness among citizens, collaboration in the implementation of TOD, and a lack of experience are all agreed essential components. Furthermore, adopting decentralized planning and granting more planning and legal powers to Gaza City is another key factor for the implementation of TOD which was not initially considered in the initial conceptual framework.

The study identified barriers that hinder successful implementation in the case study, as translated in the figure. These barriers are a lack of financial resources, a lack of financial resources, a lack of specialists and experts in planning, a weak legal government that does not enforce the law, poor understanding, and private land ownership. However, the results confirmed that TOD implementation is perceived to be beneficial for the case study in terms of improving accessibility,

improving environmental and economic aspects, and improving financial performance. The majority of unemployed/low salaried people who could not find reasonable jobs following their skills or did not earn enough have adopted taxis as their part- and full-time profession, encouraged by an affordable license fee. It was found that more people were involved in traffic violation (i.e., breaking signals, increasing speed, or driving in the opposite direction) with the purpose to reaching their jobs on time. Furthermore, the findings revealed that the younger generation turned to taxis more, as they stop anywhere, the fare is small, and they arrive quickly. In comparison, public transport cannot compete.

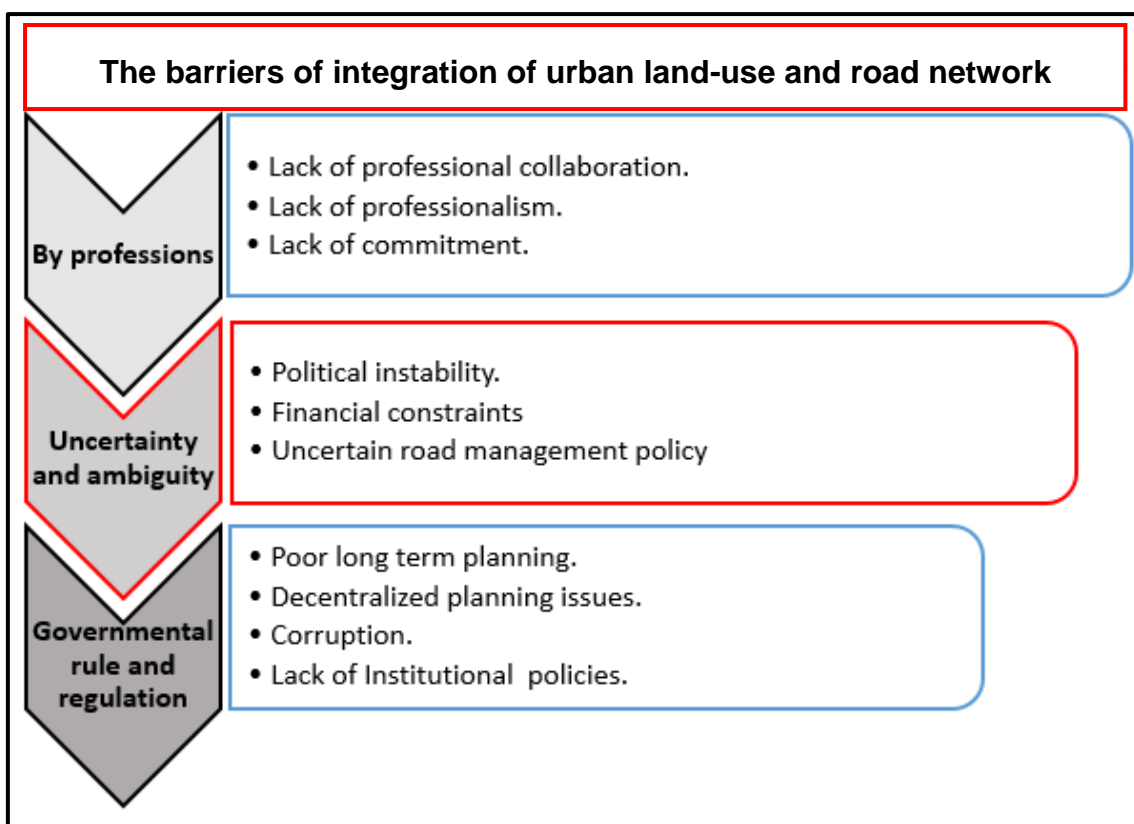


Figure 6-2 The barriers of institutional Integration of urban land-use and road network.

The findings also revealed that illegal parking is common among the citizens which increased the likelihood of traffic congestion in many busy areas. Moreover, the results revealed a need to involve politicians and social influencers to change people's culture towards public transport, as some people believes that public transport is only suitable for school children, university students, or the poor. Thus, riding buses is perceived as shaming. There is a need to change the perceptions of both younger and older people who see car/taxi use as a sign of

their social status in society. Thus, promotional sessions and material could be arranged to educate and secure the support of young and older people regarding the benefits of TOD adoption such as better mobility, lower car traffic, lower spending on transport, a lack of pollution, and a lack of suburban sprawl.

CHAPTER 7

Quantitative Data Analysis

7. CHAPTER 7: Quantitative Data Analysis

7.1 Introduction

The objective of this chapter is to present the analysis of the quantitative data, which was collected from the survey questionnaire. As a method of quantitative data collection, the questionnaire will be discussed, and its design explained. This chapter also presents the results of the reliability test and discusses detailed the findings obtained. The key findings will be analysed under the main aim of this study and the development of a framework for TOD implementation in Gaza. The statistics were produced utilizing Excel and SPSS (Statistical Package for Social Scientists) software programs.

7.2 The Validity of the Questionnaire

The validity of the questionnaire means that the questions measure what they were designed to measure. The validity of this questionnaire was verified in three ways:

7.2.1 Internal Consistency

The internal consistency of a questionnaire is often calculated using the Cronbach alpha values; these are applied to each question as well as the overall questionnaire. Table 7.1 gives the Cronbach alpha values for this research instrument which ranged from .726 to .719. These values indicate acceptable Cronbach alpha values confirming the internal consistency of the questionnaire items.

Table 7-1 Reliability of the questionnaire

Questionnaire	Cronbach alpha values
Road network	0.726
Land use	0.798
Public transport performance	0.812
Accessibility	0.719

7.2.2 Descriptive Results

This section considers the presentation and analysis of the most important statistical results, which considers the development of balanced and equal urban planning strategies using a transit-oriented development approach to integrate land use and road networks. Based on the analysis of the study results, the questions were tested, discussed, commented on, and interpreted in line with the study problem.

A five-point Likert scale was used within the research instrument; this mean the study relied mainly on the arithmetic mean and standard deviation. Descriptive analysis was also used to examine the minimum, maximum, mean, and standard deviation, as illustrated in Table 7-2. The mean value range shows that most responses were between neutral to agree while the standard deviation values showed there is not high risk involved as the scores are under 1. This means the results are satisfactory for further analysis.

Table 7-2 Minimum, maximum, mean, and standard deviation results.

Variables	Minimum value	Maximum value	Mean	Standard deviation
Road network	1	5	3.15	.88
Land use	1	5	3.57	.77
Public transport performance	1	5	3.77	.56
Accessibility	1	5	3.93	.97

7.2.3 The Correlation Coefficient

Each of the questions evaluated the integration factors between road networks and land uses and the total degree, which shows that the indicated correlation coefficients are acceptable at the level of significance $\alpha = 0.05$, and it measured what it was set to measure. Table 7.3 provides the correlation values and revealed no significant relationship found between the control variables and public transport performance. In comparison, there is a significant positive relationship found between the road network, land use, and accessibility with public transport performance.

Table 7-3 Correlation coefficient

Variables	A	G	R	RN	LU	AC
Age (A)	1					
Gender (G)	.12	1				
Residence (R)	.19	.21				
Road network (RN)	.21	.31	1			
Land use (LU)	.13	.14	.15	1		
Accessibility (AC)	.17	.19	.21	.26	1	
Public transport performance (PTP)	.12	.15	.17	.19*	.33*	.39**

*Statistically significant at 0.05

**Statistically significant at 0.01

The Control variables, including gender (G), age (A), and residence (R), show correlation coefficients that are not statistically significant. This means that, within the context studied, individual characteristics such as age, gender, and residential location do not significantly affect public transport performance. The result confirms the need to focus on other factors, especially those related to infrastructure and planning. In contrast, the correlation coefficients of road network (RN), land use (LU), and accessibility (AC) provide compelling evidence of their impact on public transport performance. The positive relationship between these variables and public transport performance is statistically significant, highlighting their crucial role in shaping the effectiveness of the public transport system. The results indicate that well-designed land use patterns and enhanced accessibility positively influence public transport efficiency. In addition, an efficient and developed road network contributes positively to public transport performance. This underscores the importance of investing in road infrastructure to enhance the comprehensive transportation system.

The correlation analysis reinforces the importance of infrastructure-related factors in Gaza City, specifically road network quality, land use integration, and accessibility, in their impact on public transport performance. These findings provide a basis for urban planners and policy makers to prioritize effective

planning, investments and interventions that enhance these aspects for more effective public transport.

7.3 Questionnaire Stability

The stability of the questionnaire was estimated from the members of the exploratory sample, using the two methods of Cronbach's alpha: Split-half and coefficient.

7.3.1 The Split-Half Method

The stability of the questionnaire means that this questionnaire gives the same result if the questionnaire was redistributed more than once under the same conditions. In other words, the stability of the resolution means stability in the results of the questionnaire meaning they would not change significantly if it was redistributed to the sample members several times during same periods of time. The test items were divided into two parts (odd-numbered questions and even-numbered questions), then the correlation coefficient was calculated between the scores of the odd questions and the scores of the even questions. The correlation coefficient was then corrected by the Spearman-Brown equation.

The adjusted correlation coefficient = $\frac{2r}{1+r}$ where R is the correlation coefficient between the scores of the odd questions and the scores of the even questions. The results are shown in table 7.4.

Table 7-4 Split-half method for measuring the reliability of the questionnaire.

	Correlation coefficient before modification	Correlation coefficient after modification
Evaluation of integration factors between road networks and land use	0.726	0.798

It is clear from the results in table 7.4, that the value of the adjusted correlation coefficient (Spearman is acceptable and statistically significant), and thus the stability of the study questionnaire has been confirmed. This enables full confidence in the validity of the questionnaire including its validity to analyse the results and answer the questions.

7.3.2 Alpha Cronbach Method

Another method was used to calculate the stability and the results are shown in the table 7.5; this indicates that the questionnaire has a high degree of stability.

Table 7-5 Value of the alpha coefficient.

	Alpha Cronbach method
Evaluation of integration factors between road networks and land use	0.729

Constant = positive square root of Cronbach's alpha coefficient.

It is clear from the results in Table 7.5 that the value of the alpha coefficient for all the axis items was 0.729. This means that the reliability coefficient is excellent, and the questionnaire is in its final form. Thus, the validity and reliability of the study questionnaire is confirmed.

7.4 Statistical Methods Used in the Study

The questionnaire was analysed through the statistical analysis program SPSS (Statistical Package for the Social Sciences) and the following statistical tools were used:

1. Percentages, frequencies, arithmetic mean, relative weight, and order. This command is mainly used for the purpose of knowing the frequency of the categories of a variable. It is useful for describing the study sample.
2. Cronbach's Alpha test and the split-half method to determine the stability of the questionnaire items.
3. Pearson Correlation Coefficient: This test is used to find the validity of the internal resolution.

7.5 Descriptive Analysis

The targeted sample for this research was Gaza city residents, who were over the age of 18 years. A brief description of the research focus was attached to each questionnaire. The questionnaire fulfilled all ethical requirements as confirmed by the University of Salford's Ethical Committee. In total, 384 questionnaires (Survey Monkey: sample size calculator) were distributed and 260 were completed and returned. A random sample method of distribution was used,

and all questionnaire responses were anonymised in accordance with the ethical requirements of the University of Salford.

7.5.1 Section One: Characteristics of the Respondents

In this section, the researcher presented the main characteristics of the respondents.

Gender of the Respondents

Over half of the respondents (67%) were male and 33% were female, as Figure 7.1 shows.

The reason behind the discrepancy in gender distribution data is the difference in employment rates between males and females within the studied sample. This clear gender deviation indicates that the employment rate among males is much higher than that among females.

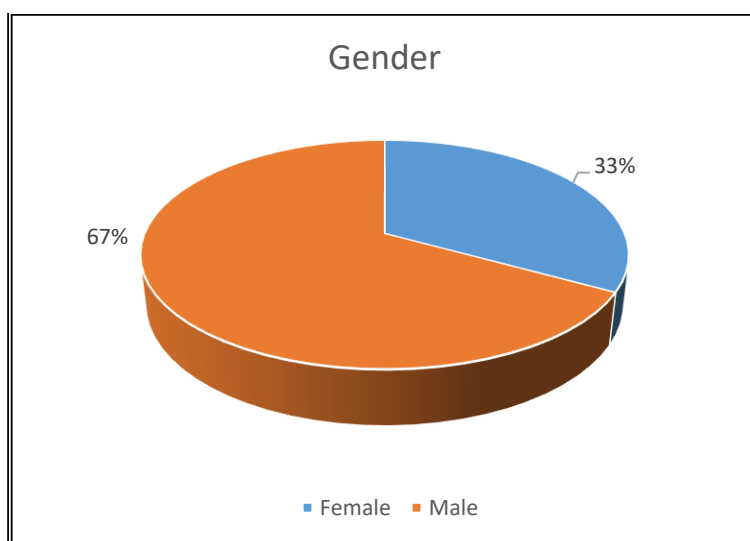


Figure 7-1 Frequency Distribution of Gender.

Age Categories

No respondent was below the age of 18 in accordance with the University's ethical requirements. The main age group in the sample was 18 to 24 years, which main age group for university students; this accounted for 31.1% of the entire sample. The presence of many educational institutions in Gaza City, including six universities and several community colleges, likely contributes to

attracting the 18- to 24-year-old age group to Gaza City. This geographic and institutional context is a key consideration for contextualizing the age distribution results. The oldest age group of respondents was the 55+, which comprised 12.3% of the sample. This age group mainly involved the top management of construction firms with job titles such as Director, Managing Director and Associate Director. The respondents' ages are illustrated in figure 7.2.

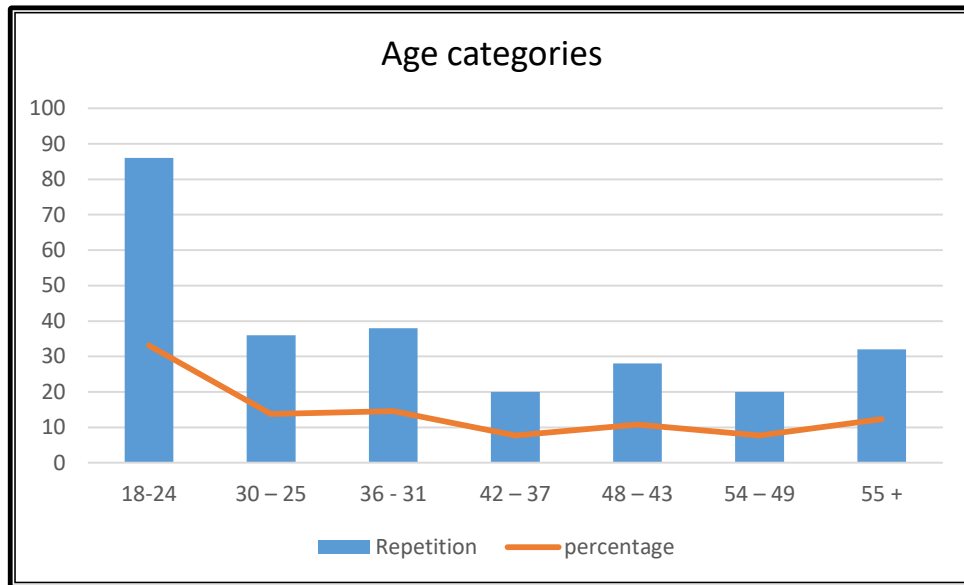


Figure 7-2 Age categories.

Job Title

To help profile the sample, respondents are asked about their current job titles. The job titles of respondents were categorised into five groups and figure 7.3 shows the distribution according to job title across Gaza City. It clearly indicates that 'student' has the highest percentage in the sample at 32.3%. This is consistent with the high percentage of youth in Palestine, which confirms the youth of society in Gaza City.

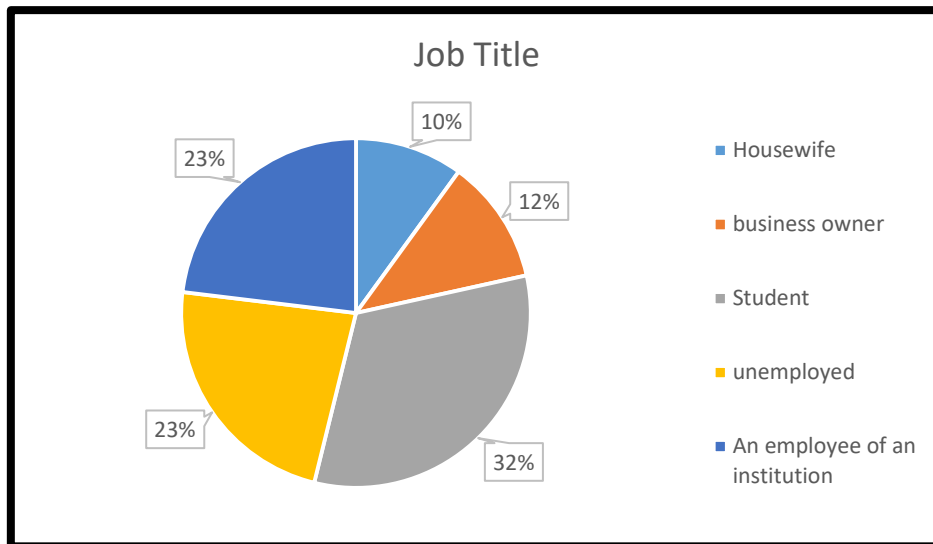


Figure 7-3 Job title.

Place of Residence

The respondents were also asked about their place of residence. This information is important to identify the areas the population is moving to and from. Thus, approximately 50% of the surveyed sample are residents of Gaza City. It is clear that Gaza City, as the capital of the Gaza Strip, is the centre of gravity for a large portion of the population. This confirms the importance of the city in terms of economic activities, job opportunities and infrastructure development. It is an indication to decision-makers of the need for balance in distributing public facilities to all governorates of the Gaza Strip. The results for the distribution of place of residence can be seen in figure 7.4.

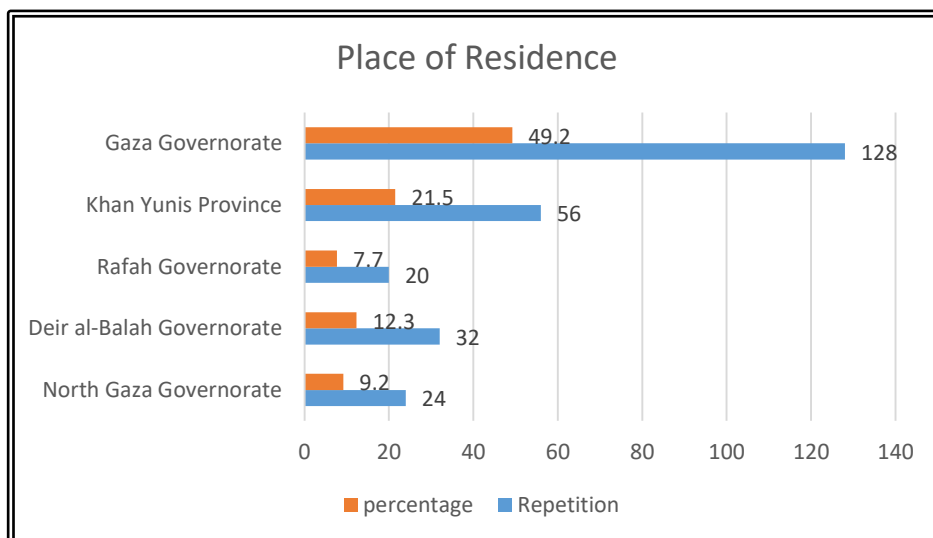


Figure 7-4 Place of residence.

Mobility

With regards to the mobility in Gaza City, the findings illustrated in table 7.6 show that 66.2% of the sample use cars, and just 15.3% do not use transport but rather travel on foot. The reliance on private cars or taxi for daily mobility within Gaza City, as evidenced by the substantial 66.2%, reflects a transportation landscape dominated by individualized modes of commuting. This emergent theme points towards potential challenges in the existing transportation infrastructure and highlights the need for a comprehensive and sustainable urban mobility strategy.

Table 7-6 Mobility to the workplace.

	Repetition	Percentage
From outside Gaza City	48	18.5
Inside Gaza City, travels and goes to work on foot	40	15.3
Inside Gaza City, and transport is used	172	66.2
Total	260	100

As shown in Table 7.6, the high percentage (66.3%) of participants using private cars or taxis could be an indicator of several interconnected issues. First, it may highlight the inadequacy of current public transportation options within Gaza City and the limited availability or accessibility of public transportation pushing a significant portion of the population toward car use. This is in line with the observation that only 15.3% of participants travel on foot, indicating a notable reliance on motorized transport.

The increasing reliance on private cars and taxis for daily transportation underscores the importance of addressing gaps in public transport infrastructure. This is in line with the study's objective of relying on public transportation and applying TOD in Gaza City. The lack of a robust public transportation system, as reflected in high percentages of car use, strengthens the case for implementing TOD principles. By integrating land use planning with the development of efficient public transportation, TOD has the potential to reshape the mobility landscape, reduce car dependence, and promote a more sustainable urban environment.

7.5.2 Section Two: Focus of the study

This section describes the findings from the first part of section two, namely the mobility and means of transport. It should be highlighted that section two (parts one and two) is parallel to the themes addressed in the interview, as discussed in the previous (qualitative data analysis) chapter.

Section Two, Part One: Mobility and Use of Transport

The following section outlines the questions and range of responses for section two, part one:

Q. What is the main reason for your daily journey?

To answer this question, the researcher calculated frequencies and percentages, which are shown in table 7.7.

Table 7-7 The main reason of respondents' daily journey.

The reason for the trip	Repetition	Percentage
Work/ Job	90	21.8%
Shopping	114	27.6
Social communication	104	25.2
Study	90	21.8
Other	14	3.3
Total	408	100.0

The results shown in table 7.7 show that 27.6% of the sample indicated the main reason for their daily journey was shopping trips, while 21.8% indicated work and study, and 25.2% selected social communication. Furthermore, 3.3% of the sample stated that the main reason for their daily trip was 'other reasons' (tourism, entertainment). As we delve deeper into the patterns, it becomes evident that the city's role as the economic and administrative centre of the Gaza Strip significantly influences these mobility trends.

It is worth noting the large percentage of participants who indicated that "shopping" is the main reason for their daily travel (27.6%). This can be attributed to Gaza City's status as the economic and administrative capital of the Gaza Strip.

In addition, employees or students can engage in shopping activities after their work or study hours, highlighting the commercial vitality of the city and the need for efficient transport networks that cater to these activities. Therefore, urban planners and policy makers should consider developing public transportation infrastructure or providing flexible transportation solutions to accommodate commercial activities in the city.

Furthermore, the percentages of participants who cited “work/job” (21.8%) and “study” (21.8%) as the main reasons for their daily commutes highlight the important role of educational and employment activities in shaping mobility patterns. This finding underscores the need for transport strategies that facilitate seamless connectivity between residential areas, educational institutions and employment centres.

Q. What are your usual modes of transport?

To answer this question, the researcher calculated frequencies and percentages, which are shown in table 7.8.

The analysis of these modes reveals essential insights into the existing transport landscape, shedding light on the challenges and opportunities within the city's mobility framework.

.Table 7-8 Usual modes of transport in mobility.

Mobility	Repetition	Percentages
Walk	114	27.27
Private car	42	10.04
Taxi	222	53.11
Buses	40	9.56
Total	418	100.0

The heavy reliance on “taxis” as the primary means of transport in Gaza City, which constitute 53.11% of the sample. This dominance comes primarily in response to the limited availability of public transport services, which are limited to serving students and some social events such as weddings. The reliance on low-cost taxis, which compete with public transport fares, underscores the gap in the city's public transport infrastructure. This reinforces the urgent need to

implement TOD strategies, aligning land use planning with enhancing public transportation options. The prominence of “walking” as a mode of transport for 27.27% of participants is a noteworthy finding. It indicates a preference for active transport, emphasizing the importance of pedestrian-friendly urban planning. The trend toward walking underscores the need for urban planners to prioritize infrastructure that supports and encourages walking, such as sidewalks and pedestrian crossings.

Conversely, the low percentages for “private car” (10.04%) and “bus” (9.56%) indicate limited reliance on individual car ownership and lack of utilization of existing bus services. This is due to the dominance of taxis in providing convenient and flexible transport services. Hesitation, especially among young people and women, to travel by public buses due to social status concerns further exacerbates the challenges faced in promoting public transport. This social dimension highlights a critical aspect of TOD implementation, emphasizing the need to address not only infrastructure gaps but also societal perceptions and cultural factors that influence transportation choices.

Q. How satisfied are you with the performance of transport in Gaza City, including the road network?

To answer this question, the researcher calculated frequencies and percentages which are shown in table 7.9.

Table 7-9 How satisfied are you with the performance of transport in Gaza City, including the road network?

Performance of transport satisfaction	Repetition	Percentages
Strongly Disagree	28	10.8
Disagree	112	43.1
Neutral	66	25.4
Agree	54	20.8
Strongly Agree	0	0
Total	1633	100.0%
arithmetic mean = 2.56, relative weight = 51.2%, standard deviation = 0.938		

The data in Table 7.9 summarize the opinions of the sample participants regarding their satisfaction with the performance of transport in Gaza City,

including the road network. The data showed that 43.1% of the sample expressed their dissatisfaction with the performance of the transportation network in Gaza City by choosing the word “disagree,” while 25.4% of respondents remained in the “neutral” position. It is worth noting that a large percentage of the sample, 10.8%, “strongly disagree” with the performance of transport means in Gaza City. Together, these numbers (53.8%) indicate a widespread feeling of dissatisfaction among participants. The quantitative representation of dissatisfaction is consistent with the qualitative evidence presented previously, highlighting issues such as traffic congestion, violations of traffic laws, limited availability of public transport and poor infrastructure.

The absence of participants who strongly agree with transportation performance, as evidenced by the “strongly agree” category scoring zero, underscores the systemic challenges and areas for improvement within the transportation infrastructure that Gaza City faces. The absence of strong satisfaction indicates an urgent need for interventions to enhance overall performance and user satisfaction with the transportation system, underscoring the necessity of implementing TOD strategies.

The arithmetic mean of 2.56 and the relative weight of 51.2% tend toward the negative satisfaction spectrum. The standard deviation of 0.938 indicates a significant dispersion in the answers, which demonstrates the diversity of opinions and experiences among respondents. This dispersion indicates the complex and multifaceted nature of transportation challenges in Gaza City.

Q. How long do you need to reach your destination (the place you want to reach)?

To answer this question, the researcher calculated frequencies and percentages which are shown in table 7.10.

Table 7-10 Time you need to reach your destination (the place you want to reach).

Destination time	Repetition	Percentages
Less than 15 minutes	28	10.8
16 – 30 minutes	140	53.8

31 – 45 minutes	42	16.2
minutes Over 45	50	19.2
Total	260	100.0

The results in Table 7.10 show the time needed by citizens to reach their intended destinations in Gaza City. Analysis of frequencies and percentages provides valuable insights into factors affecting travel time which reinforces the need for TOD application. The majority of respondents, 53.8%, reported that travel times range between 16 and 30 minutes. This time indicates a moderate and common duration for trips within the city which is probably because many participants use private cars or taxis for their daily commute, given the flexibility and speed they can provide and the inefficiency and limitations of public transport.

The 16.2% of respondents indicate that travel time ranges from 31 to 45 minutes. These citizens face longer trips, perhaps due to factors such as traffic congestion, less direct roads, or the use of slower means of transportation. This finding reinforces the need to improve transportation efficiency and infrastructure in Gaza City. The 19.2% of respondents who reported travel times exceeding 45 minutes indicates that a significant portion of them experience longer and potentially more difficult journeys. The long travel time can be attributed to several factors, perhaps due to relying on less efficient means of transportation, residing in areas with limited accessibility or coming from other cities, especially in the Rafah and Khan Yunis governorates. The 10.8% of respondents who reported travel times of less than 15 minutes would likely benefit from proximity to their destinations, efficient transport options, or both. This section can provide insights into best practices that contribute to reducing travel times, and provide models and solutions for planners and decision makers.

Q. What is the path that you prefer to walk?

To answer this question, the researcher calculated frequencies and percentages which are shown in table 7.11.

Table 7-11 Path you prefer to walk.

Path you prefer to walk	Repetition	Percentage
Walking through markets and trade routes	144	55.4

Shortcuts	116	44.6
Total	260	100.0

Table 7.11 shows the respondents' choices regarding the paths they choose for walking in Gaza City. The data provides valuable insights into the factors that influence the choice of walking routes. This analysis contributes to a more comprehensive understanding of pedestrian dynamics in the city, which is crucial for urban planning decision-making in Gaza City.

The majority of sample respondents (55.4%) expressed their preference for walking through markets and trade routes. This tendency indicates that these paths are not only for reaching destinations, but also serve as vital and essential components of the urban fabric, which is considered a first step towards implementing active transportation, which is one of the factors for implementing TOD. Conversely, 44.6% of participants prefer shortcuts, indicating their preference for more direct and efficient methods. This preference may stem from a desire to reduce travel time or avoid congestion along traditional routes. Urban planners and policy makers must take these preferences into account when designing and improving pedestrian infrastructure.

Q. Analysis of the results of the second axis: Evaluating the factors of integration between road networks and land use.

The researcher calculated the mean, standard deviation, relative weight, and order of the paragraphs of the second axis as illustrated in table 7.12.

Table 7-12 Arithmetic mean, standard deviation, relative weight and order of the paragraphs for the second axis.

	Paragraph	Arithmetic mean	Standard deviation	Relative weight	Order
Urban space (public spaces)					
1	I can walk to wherever I want without hindrance	2.30	1.17	46.00	2
2	The current corridors are meeting the pedestrians needs and there is no need for any further development	1.73	.99	34.60	3

3	I believe walking will have a benefit on both greater economic (saving fuel), social (gathering) and environmental (healthy) impacts	3.77	1.30	75.40	1
	The total score for the first factor	2.60	.67	52.00	4
Completed street compatible with vehicles, bicycles, pedestrians, and suitable for) (...different ages and genders					
4	Planners should provide wider pavements for pedestrians	3.95	1.14	79.00	3
5	Planners should add special lane(s) for bicycle riders?	3.21	1.30	64.20	4
6	I walk on streets that are safe and appealing	4.16	1.28	83.20	1
7	I prefer using mixed-use patterns rather than separating landuse (residential, commercial, entertainment, etc)	4.05	1.11	81.00	2
	The total score for the second factor	3.84	.87	76.85	1
Public Transport Performance					
8	Citizens should rely more on public transport rather than using private cars	3.52	1.23	70.40	2
9	Providing the appropriate infrastructure for public transport	4.12	1.24	82.40	1
	Overall score for the third factor	3.82	1.07	76.46	2
Accessibility					
10	I have different accessible ways to approach my destination	2.68	1.25	53.60	
	fourth The overall score for the factor	3.35	.65	67.00	

Table 7.12 provides a comprehensive assessment of various factors related to the integration between road networks and land use in Gaza City. The table systematically divides participants' opinions across different paragraphs or statements, and provides an in-depth analysis of their preferences, priorities and concerns related to urban planning and infrastructure development.

The relative weight following an evaluation of the integration factors between road networks and land use was 67%, which indicates a moderate degree of approval between the responses to the questionnaire statements.

It is clear from table 7.12 that the factor **Urban Space (Public Spaces)**. For the first factor, which focuses on urban spaces and public areas, participants showed a greater tendency toward statements emphasizing the multifaceted benefits of walking. Specifically, Paragraph 3, which highlights the economic, social and environmental benefits of walking, received the highest mean score of 3.77 and a relative weight of 75.40%, making it the highest priority. This underscores the importance people place on walking as a sustainable and comprehensive means of transportation and leisure. However, there is a marked variation in perceptions regarding the adequacy of existing walkways, highlighting the importance of considering footpaths when planning the road network.

Within the factor, **Completed Street (Compatible with Vehicles, Bicycles, Pedestrians, etc.)**. This factor emphasizes the importance of developing roads that accommodate various means of transportation. Data within this category showed significantly high scores, with Paragraph 6 emphasizing safe and attractive streets, topping the group with an arithmetic mean of 4.16 and a relative weight of 83.20%. This underscores the community's strong desire for roads that prioritize safety, aesthetics and inclusivity, indicating a strong preference for comprehensive urban planning.

Moreover, for the factor '**Public Transport Performance**' the answers of citizens in Gaza City reveal a balanced opinion among them. While the importance of infrastructure was recognized (paragraph 9) with a high mean of 4.12, there was still high recognition (3.52) of the need for citizens to increasingly rely on public transportation rather than private cars, with participants expressing a desire to

increase reliance on transportation. General and the need for adequate infrastructure to support its effectiveness. This indicates awareness of the benefits of public transportation but also highlights challenges or shortcomings in Gaza City's infrastructure.

Lastly, the fourth factor '**Accessibility**' relates to accessibility to urban areas, with a focus on the various routes leading to the destination. Although this factor received a relatively lower overall score compared to the other factors, it still indicates the importance of ensuring diverse paths that facilitate residents' access to their destination.

The Analysis of Table 7.12 reveals a continued focus on creating pedestrian-friendly urban spaces, complete streets, and efficient public transport infrastructure. Participants prioritize safety, efficient road design, and mixed use patterns, indicating a strong preference for comprehensive and integrated urban planning strategies. The results also underscore the importance of public transportation, indicating the need for increased reliance on public transportation and infrastructure development. In addition, improving accessibility is a key factor for potential improvements, which provides a roadmap for urban planners and decision-makers, highlighting areas that require immediate attention and intervention to promote a more sustainable urban environment in Gaza City.

The study examined the opinions of the study sample about the integration factor between road networks and land uses due in accordance with demographic variables (gender, place of residence, age)? A One Way Anova test was used and the null hypothesis (H0) tested. This stated there is no difference between the opinions of the study sample when evaluating the integration factors between road networks and land uses due to demographic variables (place of residence, age), compared to the alternative hypothesis (H1) which states there is a difference between the opinions of the study sample when evaluating the integration factors between road networks and land uses due to demographic variables (place of residence, age). This verified the hypothesis, table 7.13 shows that:

Table 7-13 One Way ANOVA coefficient to find statistically significant differences due to demographic variables (place of residence, age).

Variables	sum of squares	sum of squares	degree of freedom	mean squares	f-mean	Indication value	Indication level
Residence	Between groups.	6.304	4	1.576	3.908	3.908	Statistical function
	Within groups	102.826	255	.403			
	Total	109.130	259				
Age	Between groups.	6.220	6	1.037	2.528	2.528	Not statistically significant
	Within groups	102.905	251	.410			
	Total	109.125	257				

The results of Table 7.13 show a noteworthy result regarding place of residence. The One Way ANOVA test indicated that there were statistically significant differences in the opinions of the study sample members regarding the evaluation of integration factors between road networks and land uses due to the residence variable, and in favor of the Gaza Governorate specifically. The respondents from the Gaza governorate held different views compared to those from other governorates. The mean values favoured the Gaza governorate, suggesting a more positive perception of the integration factors between road networks and land uses among residents of Gaza compared to other regions. This differential point of view could stem from the fact that the majority of the sample sampled are residents of Gaza City. Contrastingly, the results in table 7-13 showed that there is no difference between the opinions of the study sample about the evaluation of the integration factors between road networks and land uses due to the variable (age). This implies that, within the study sample, age did not significantly impact the evaluation of integration factors between road networks and land uses.

Using the Independent Sample T Test, the null hypothesis (H0) was tested, which states that there is no difference between the opinions of the study sample about the evaluation of the integration factors between road networks and land uses due to the variable (gender), compared to the alternative hypothesis (H1) which states that there is a difference between the opinions of the sample when evaluating the integration factors due to the variable (gender). To verify the hypothesis, an Independent Sample T Test was used, and Table 7-14 shows the results:

Table 7-14 Independent Sample T Test coefficient to find statistically significant differences due to the variable (sex).

Categories	Number	Average arithmetic	Deviation normative	"Value " t	Indication value	Indication level
Male	174	3.4057	.52726	1.981	0.049	Statistical function
Female	86	3.2372	.83596			

The results in table 7.14 show that the calculated t value is less than the tabulated t value, meaning there is a difference between the opinions of the study sample when evaluating the integration factors between road networks and land uses due to the variable (gender). Thus, the significance value was statistically significant at a significance level greater than 0.05. The differences were higher amongst males, as the mean value of males was higher than females. The higher mean among males indicates a more positive perception of the integration factors between road networks and land uses compared to females. This may be due to their experience in infrastructure construction.

CHAPTER 8

Discussion of the Research Findings

8 CHAPTER 8: Discussion of the Research Findings

8.1 Introduction

This chapter discusses the main findings from analysed data of the questionnaire and semi-structured interviews, which were presented in the previous chapters. Moreover, this chapter aims to provide a comprehensive analysis of the various factors affecting TOD implementation in Gaza through a careful examination of the barriers to TOD implementation and awareness and knowledge of TOD, which contributes to exploring aspects related to TOD implementation in Gaza City.

The findings will be discussed by dividing the discussion into sections in this chapter, which are structured as follows: The level of TOD awareness and knowledge; the barriers that hinder and benefits of TOD implementation; the relationship between the barriers that hinder TOD and the key factors required for TOD implementation; the relationship between key TOD factors and the benefit of TOD implementation; the final theoretical framework based on the empirical findings; theory, and the validation and amendment of the findings related to the revised conceptual framework.

Chapter 8 serves as a pivotal element of the thesis, providing a detailed examination of the extent to which TOD has been implemented in Gaza City. Through a structured approach and careful analysis, this chapter seeks to propose a practical framework that will help planners and decision-makers implement TOD in Gaza City

8.2 Awareness and Knowledge

This study aimed to identify the level of TOD awareness and knowledge as well as the barriers that hinder TOD implementation. As the literature indicated, the use of innovative technology can help to integrate knowledge base activities and collaboration among various institutions in order to build collective intelligence into cities (Abdoulatef, 2011). Therefore, this study focused on the level of TOD awareness and knowledge among experts who are responsible for planning and executing the road infrastructure of Gaza City. Both the qualitative and

quantitative research results confirmed that experts and citizens agreed on the need to upgrade the public transport infrastructure in Gaza City. Moreover, this study offered insights about generalised knowledge that can be useful for the application of TOD practice when planning land use.

The interviews highlighted that most of experts did not have sufficient theoretical or practical knowledge of TOD and its implementation in Gaza City, These barriers resonate with the global urbanization discourse, as highlighted by Parker and Street (2021), emphasize the challenges faced by both developed and developing nations in acquiring funding, skills, and resources for advanced TOD. In addition, they also face challenges in terms of costly road maintenance, this challenge is consistent with global trends highlighted by Abdi, & Lamíquiz-Daudén, (2022)., who emphasize that even developed nations encounter limitations in funding and resources for advanced TOD. Also, longer waiting times for public transport, traffic congestion and pollution, long journey times, frequent road accidents, and a lack of advance IT system for traffic management. Other findings revealed that public transport such as buses should not be overcrowded as many people (particularly women) from the Muslim culture do not feel safe travelling in such conditions. These fears ultimately increase the attraction of taxis.

As the results of the quantitative study revealed, there is a high percentage of students (32% of the total population) in Gaza city, which also creates traffic congestion around universities and colleges, see figure 8.1. The quantitative results also revealed that 27.6% of the sample confirmed they took shopping trips, which adds to the severe traffic jams, illegal car parking, and air pollution around Gaza City's markets. The empirical findings reveal that to expand roads, rebuild the public transport infrastructure and provide green spaces, the local and government needs to offer financial compensation to the private land owner's affected. This represents another obstacle for Gaza municipality in moving towards TOD. The results of the qualitative studies revealed that most land inside city is now unavailable which prevents the government from widening the streets.

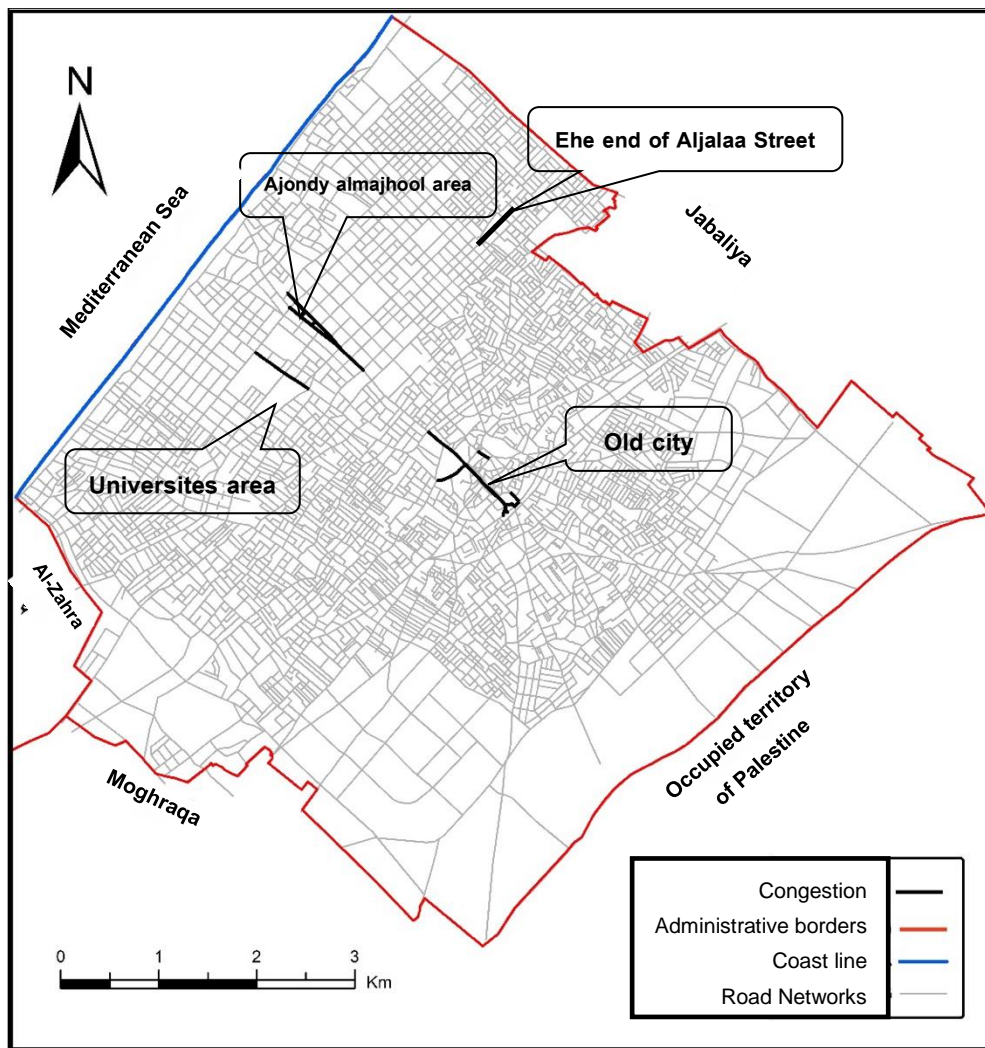


Figure 8-1 Traffic congestion in Gaza City.

The literature highlighted that most strategists in developing countries conduct training programs to increase their level of awareness about how they can further develop their transport system. In comparison, this study found that experts in Gaza City have not participated in training courses on development oriented towards public transport. Some experts shared that their department does not currently employ experts with experience in TOD implementation planning - either nationally or internationally. Therefore, the city lacks experts in this area (especially related to TOD negatively influencing decision making). Thomas and Bertolini (2020) highlighted that due to health and financial crises across the world even developed nations have insufficient funding, skills and resources to implement advanced level TOD. Other findings highlighted that most land in Gaza City are under private ownership which requires a substantial amount of financial capital to buy from private. Therefore, the local municipality of Gaza City would

face challenges in adopting TOD. Hearzallah (2014) also confirmed that the Gaza Strip is not very developed while construction work and planning for new roads are negatively influenced by the encroachment of some residents.

8.3 Barriers to TOD Implementation

The lack of experience and strategic planning amongst local municipality experts increases the challenges with respect to road expansion, especially in crowded places as there is shortage of wide streets. Therefore, experts are challenged as to how they can build wider roads to tackle traffic congestion in Gaza city. The quantitative study highlighted that 55.4% of the study sample prefer to walk through markets and commercial roads, indicating the potential for healthier less polluting modes of traversing the city. This suggests that time wastage in traffic at crowded places could be addressed by widening the roads around markets for pedestrians in Gaza city. The challenges with respect to road expansion in crowded areas underscores the need for strategic urban development, aligning with global practices to address congestion (Derakhti & Baeten, 2020).

Furthermore, the empirical findings revealed that 43.1% of those who participated in survey were not satisfied from the performance of public transport, such as buses, which has increased opportunities for private transport to flourish, such as taxi. Another quantitative result revealed that unemployment also influenced travel choices as 75.40% of the sample stated they prefer to walk to save fuel or reduce monthly expenses aligns with the work of Suzuki et al. (2015). Suzuki et al. highlight financial constraints as a major challenge to TOD adoption, emphasizing the need for economic incentives to encourage sustainable transport choices. The qualitative results confirmed alarming rates of 50, 60, and sometimes 70% unemployment alongside the high rate of unqualified young people to choose taxi driving for their livelihood due to its accessibility. Results reveal the significant associated between unemployment and work as a taxi driver in Gaza city as the more people unemployment means an increased rate of taxi drivers, as people believe that it is an easier job to access particularly in periods of high unemployment, shedding light on the social dynamics influencing travel preferences during periods of economic uncertainty (Suzuki et al., 2015). Thus,

the government need to help increase the social acceptability of TOD as some people believe that when planned and executed in Gaza City many drivers will lose their jobs.

One of the main reasons why people of developed and developing nations are often not in favour of TOD implementation is because they believe that it can negatively influence house buying power (Derakhti & Baeten, 2020; Dawkins & Moeckel, 2016). Furthermore, some experts believe that the public transport should not be the responsibility of the local municipality especially when it demands enormous capabilities and resources which they do not possess. One of main challenges associated with financial constraint is the belief amongst investors that public transport may be not viable and profitable especially when people's preferences are for personal cars or walking. Suzuki et al. (2015) highlighted that financial constraint is a major challenge to the adoption of TOD therefore many countries cannot take advantage of the development plan.

This study also highlighted the challenges faced due to the violent conflict and political instability experienced in Gaza City. Indeed, the qualitative findings revealed that the occupation, infrastructure, residential buildings, and places of worship have been destroyed during such conflict. Abujidi (2014) found that destruction and violence significantly increased during the occupation of Palestine therefore urban development and economic growth process is very slow and they do not have their own currency which negatively influences their economy. In addition, the study noted that further uncertainty for both local government and the government was based on financial constraints, the high rate of inflation minimal job creation, repeated wars, the Palestinian-Palestinian division, and the weak execution of law. Findings revealed that it is difficult for the Gaza municipality to implement TOD while it is busy maintaining roads and reconstructing a city that has been destroyed by the Occupation (Figure 8.2 shows examples of the destroyed infrastructure).



Figure 8-2 The destruction of infrastructure by the Occupation.

Results also revealed that industrial units have stopped working due to violent conflict which has increased the level of insecurity and fear among citizens in particular areas in Gaza City; this has also significantly increased the unemployment rate. Due to these difficult economic conditions, the Gaza municipality is currently unable to provide sufficient funds to implement TOD.

Moreover, due to this violent conflict, there are issues as to how public transport planning will be organised especially when the government faces a difficult economic situation. Therefore, they are expecting the participation of the private sector in helping to address these challenges. However, some participants shared that private transport companies may not be in the position to accept the risk of investing in public transport which is difficult without government support. This aligns with the broader literature on public-private partnerships and underscores the challenges faced in conflict zones where economic uncertainties and security issues are prevalent (Derakhti & Baeten, 2020). It is particularly challenging in a crowded place where time wastage and fuel consumption is high, and people prefer to either walk or use private cars.

The intra conflict has created another challenge in the upgrade of public transport infrastructure, as political unrest and the change of government regime has negatively influenced development projects. This has been influenced by attempts by political parties to prove that the previous government was corrupt which make it unfeasible to complete such development projects.

8.4 Key Factors for TOD Implementation

This study also provided knowledge about the key factors required for the implementation of TOD as well as the associated benefits. Existing studies have highlighted the need to implement TOD in every country arguing for: the better utilisation of urban land and more space for upcoming generations (Suzuki et al., 2013; Dittmar & Ohland, 2012); the resolution of congestion issues (Clower et al., 2011; Wang & Chai, 2009); overcoming issues associated with environmental pollution (Pa et al., 2013; Xie, 2012), and accessibility (Chapple & Loukaitou-Sideris, 2019). However, there is a lack of knowledge and awareness of the challenges among experts and public about TOD. Therefore, participants highlighted that educational institutions and professional researchers could engage and educate the community while local municipality experts could increase their theoretical knowledge and help to educate the public about the benefits of TOD. They noted this would help to overcome the current challenges for the public of Gaza City which include: high cost, long waiting times, traffic congestion, road accidents, and long journeys.

The findings of this study revealed a need to educate people including private home landers on the benefits of TOD to the community. It was noted that this could enhance support among people and prompt them to give their private lands to the government in order to develop a public transport system that is beneficial for everyone. For example, when private investors and landowners are aware that the successful implementation of TOD can offer benefits associated with lower car traffic, less pollution, better mobility, lower spending on transport, less suburban sprawl they may be more encouraged to support the local municipality implementation of TOD. Some people suggested that there is a need to create collaboration between the private sector and government In Gaza City, in terms of investment planning, profit sharing models, and investment recovery times. This echoes global practices where public-private partnerships (PPPs) have been instrumental in financing and sustaining TOD projects (Lehner, 2018). The investment should be specifically in the infrastructure, such as paving and maintaining roads and bus stops, in order to link areas and neighbourhoods

through bus routes. Also, in order for TOD to succeed, it is necessary to establish a system bus movement (timings) and to specify the path for each bus.

Participants shared views on the barriers associated with the existing public transport infrastructure; for example, currently the people of Gaza City commonly use personal cars and taxis which is one of the major reasons for traffic congestion. Both the qualitative and quantitative results (i.e., 66.2% of the sample use personal cars and 53.11% prefer to travel by taxi) confirmed that the majority of residents are car users. Moreover, the quantitative and qualitative findings confirmed that many residents hesitate to travel by public bus as many feel that it is beneath their social status (many have the perception that public buses are only used by lower income people). Therefore, time is needed to educate the public to change this culture by promoting the environmental and economic benefits of TOD. Consequently, Tian et al.'s (2017) argument that TOD success hinges on a shift away from car reliance.

Another reason for public transport's lack of popularity is its slow travel times; public buses cannot move as quickly as taxis and private cars. Furthermore, there is no specific time for large meaning that there is no schedule followed by public transport. However, citizens travelling with a specific timeframe in mind cannot wait until a bus is filled before departure. Therefore, such citizens are more likely to patronise private minibuses which can load quickly, move easily in crowded places, and thus arrive in a more timely manner. Tian et al. (2017) highlighted that TOD can only be successfully implemented when local people do not rely on cars and instead choose alternate modes such as cycling, car-sharing, public transport, and taxis. Therefore, experts suggested that the local government should increase tax on private transport to discourage citizens from using it and offer good incentives to choose public transport, such as highlighting the benefits of public transport. To help change public opinion, celebrities, political leaders and the media can be persuaded to promote social responsibility among the public and set an example by supporting (and using) public transport. The results from this study reveal that by conducting seminars and awareness programs, strategists can educate people about the economic, environmental, and health benefits of TOD. These include increasing local GDP and reducing

the level of air pollution (which is helpful in tackling respiratory diseases among developing countries such as Palestine).

Other findings reveal that accessibility is one of the major challenges to the adoption of TOD in Gaza City as many residents habitually use taxis, as they are economical and time saving. Such transport can move easily which contrasts with public buses which have to follow specific routes. Results reveal that many local residents are involved in illegal parking across roads and drive cars in the opposite direction during traffic jams. This further creates hurdles for public bus routes which must follow the same route even in the worst driving conditions, such as traffic congestion. Therefore, public transport in Gaza City must be designed according to routes that are easy, fast and without obstruction. Furthermore, buses should not wait until it filled with passengers but must travel on time. This will encourage citizens to use public transport and limit their use of taxis. These are some of the enablers that can strengthen the public transport system, prompt greater social responsibility, and encourage residents to routinely use public transport.

Existing literature revealed the difficult economic conditions in Palestine that result from political instability that ultimately increase unemployment rates and impact the adoption of taxis as a profession (Esman, 2020; Asarraaj, 2015). When skilled people are getting lower salaries/wages which do not meet their essential needs they are forced to adopt another profession (in this case driving) as a full time or part time occupation. This study has revealed the reasons why taxi culture is popular in Gaza city as it meets the needs of drivers as well as the public who seek comfort, fast accessibility to their desired location, air conditioning, and safety. The results of quantitative study revealed that 43.1% of the sample are not happy with the performance of public transport, particularly buses. This increases the opportunities for alternative transport such as taxis. Another factor that increases the success of taxi culture and negatively influences the use of public transport is that buses routes are not either fully organized and controlled by the local municipality therefore these private owners of buses do not prioritise time but select busy routes that increase time wastage. The literature by Nasser, et al. (2021) and EEA, E (2018) on environmental concerns and congestion

issues aligns with the identified challenges. The study emphasizes the importance of strategic planning, efficient route design, and time-sensitive scheduling to enhance the attractiveness of public transport. Furthermore, it highlights the need for creating a seamless and obstruction-free public transport system to compete effectively with private alternatives. Therefore, it can be concluded that there is strong need to plan and execute a TOD in Gaza city that can compete with taxi culture in terms of comfort, cost, safety, staffing, air conditioning, and timeliness.

8.5 Practical Framework of the Research

This study has constructed a practical research framework based on the empirical findings that can facilitate the implementation of TOD in the urban planning sector. Through this research framework, the planner can address urban planning issues and use the framework as a starting point for scientists, researchers, and decision-makers in the planning and execution of TOD in Gaza City. This study could be a platform and a stepping-stone for further research into urban transport that should be applied by planners and other stakeholders.

The practical framework of this study is supported by a TOD model and the institutional forces noted by DiMaggio and Powell (1983). A TOD model is selected as it is useful for resolving the economic, environmental, and social problems associated with excessive car use and urban sprawl in Gaza City. Therefore, this study presents several solutions on how to resolve the challenges described (i.e., economic, environmental, and social). Recent research by Li et al. (2020) emphasizes the significance of TOD in promoting sustainable urban development, particularly in reducing car dependency and mitigating environmental impacts. Additionally, Smith and Johnson (2020) argue that TOD can serve as a catalyst for economic growth by creating job opportunities and enhancing land value. Therefore, the government should plan and execute a TOD model that is able to overcome these challenges. Furthermore, the TOD model is able to strengthen the economy by producing more job opportunities and increase the value of land; therefore, it can also influence the economic growth of the city.

This study developed a TOD model as it helps to shape a rapid transit system that competes with automobiles on longer trips and attracts people to cycling or walking on short trips (Xie et al., 2012). The empirical findings reveal that most people are either unemployed or living below the poverty line; therefore, they prefer to walk as it is economical as well as time saving. A TOD model is useful in creating economic activities, as evidenced by Cervero & Day (2008) who argued that TOD implementation enables more economic activities and fast transport which is useful in creating and accessing more jobs in other cities as well as Gaza. This study highlighted that many countries are supportive of Palestine due to religion; therefore these countries could offer interest free or lower interest loans to the municipality to help to buy in expertise and resources that will help to implement TOD in Gaza City.

The institutional setting has three elements - governmental power, professionalism, and uncertainty or ambiguity. These bring overall social legitimacy and support the process of implementing a new system by involving all stakeholders (Greve, H. R., & Man Zhang, C. 2017). Political or legal force concerns legislation, including the execution of law and policies, and forces people to follow law and order (Greve, H. R., & Man Zhang, C. 2017). For example, participants shared a lack of clarity when making planning decisions involving centralised authorities, such as the municipality and the Ministry of Local Government. This negatively influences their social legitimacy meaning that people are less likely to adhere to the law and more likely to be involved in violations (such as traffic violations). This increases the challenges for existing transport infrastructure. The findings revealed that limited law enforcement, a weak legal environment, and a lack of planning concerning land distribution and use are major hurdles in the successful implementation of TOD in Gaza City. Addressing the challenge of limited law enforcement and weak legal environments, the recent study by Perrin, C., et al. (2020) highlights the need for robust legal frameworks to facilitate effective TOD implementation.

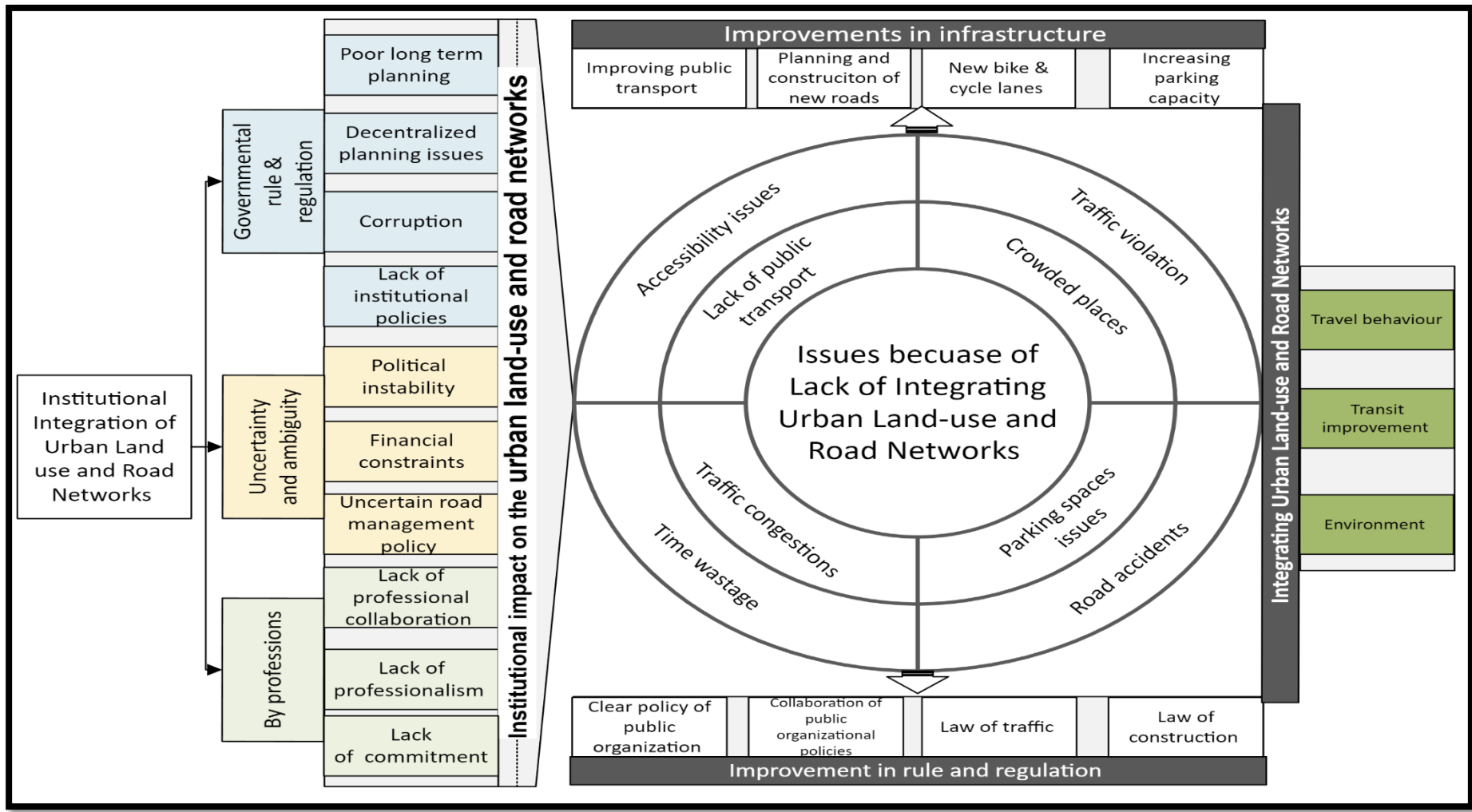


Figure 8-3 practical framework for this study (Developed by the author of this study).

The practical framework (shown in Figure 8.3) illustrates our understanding of how traffic congestion, limited land availability for wider streets and crowded places increase the barriers to effective land use, meaning more challenges for TOD implementation. This framework highlights that time is needed to engage investors and the community to introduce public transport and integrate road networks and land-use in order to enable the development of policies to improve urban planning in Gaza City. It is suggested that intersections and other roads should be planned to enable convenient and safe use for walking even if the capacity for car usage is reduced. The mixed-use of land is encouraged by TOD as no single uses is prioritised over other usage. They recommended that the coupling of a road network with land-use can be facilitated through a complete street design, and compact mixed-use developments that promote facilities and residences in Gaza city. Klassen (2015) highlighted the methods of transport planning change according to the design of the road which is based on the physics of moving vehicles, for integrating land use and road networks, accommodating pedestrians and cyclists. Only a multimodal street design enables the integration of both land use and road networks, accommodating pedestrians and cyclists by separating streets from adjacent land-use activities.

Some studies highlighted that local, cultural, political, financial, strategic planning, and organisational factors vary among countries; therefore, the development of TOD rarely starts from ground zero. Instead, it is based about around an existing structure (Dittmar et al., 2012; Curtis et al., 2009). The absence of competition between public transport and private transport or taxi transport was noted, which prompts citizens use taxis. Reducing the licenses for taxis to encourage residents to use public transport is one strategy. Furthermore, the private ownership of lands impedes planning when landowners refuse to give up some land, while the municipality cannot afford to buy these lands due to the financial crisis. De Paula et al. (2023) explores successful models of public-private partnerships in urban development, providing insights into effective collaboration strategies. Therefore, this framework highlights a need for collaboration between the government, investors, and the municipality in order to arrange financial resources and human capital to implement TOD in Gaza city. Furthermore, there is an urgent need to create a culture that enforces abidance with the law and planning standards as

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several participants reported a lack of commitment amongst the population. It is strongly suggested that there is need to increase taxes by 50% on imported cars, so that the citizens find it difficult to buy taxis to work as a driver, which limits their number in Gaza City, thus enforces citizens indirectly to go to use public transport. As well as managing the time for parking on the roads, for example, park for two hours only on the roads located near the city centre and vital areas. It is also possible to prevent parking at all on specific roads, such as Omar Al-Mukhtar Road from Palestine Square to Al-Shujaiya market. Additionally, imposing a parking fees on roads or at parking area, which are considered free. This encourages car owners to park cars for a long time, as there is culture to use high number of cars and taxis which increased traffic congestion. A study by Yan, et al. (2019) delve into the effectiveness of such interventions in curbing car ownership and promoting sustainable transportation practices, so there is need to guide the TOD environmental and economic benefits to people. These are some of useful initiatives which are urgently required as it can help to develop the way to plan and implement TOD in Gaza city.

8.5.1 Governmental Rule and Regulation.

Poor Long-term Planning.

Turner (2014) revealed that urban planning in developing countries is suffering due to a lack of expertise on long-term planning to organise the city in accordance with the needs of the population and modern age in a way that is relevant to street patterns and land-use. Which, deficiency often results in disorganized city structures that fail to meet the evolving needs of the population. Data collection results reveal that in Gaza City and along the Gaza Strip, no housing project adopts the new city planning method, but instead relies on decentralized planning. However, a city plan must consist of neighbourhood units or independent housing cells. One expert explained in the interview, there is poor planning in Gaza city and there is a need to upgrade some areas by adopting public transport. Previous studies have also confirmed the absence of urban planning integration with public transport, (Habitat, 2013), exacerbates the issues of congestion and inadequate infrastructure.

There are difficulties in all options, but in the long run TOD planning will serve all residents of Gaza City by removing and re-planning some areas, especially refugee camps and illegal areas. This happened during the re-planning of Al-Rasheed Road, where many illegal buildings were removed. Moreover, there is a need to learn from poor planning to enable successful planning, and lessons can be learnt from the experience of European countries after the First and Second World Wars. These countries took advantage of the devastation that occurred to re-plan their cities (Matless, D. 2016). Thus, the City of Gaza can take advantage of the occupation's destruction of roads and residential neighbourhoods by re-planning them and engineering plans in accordance with TOD standards. Results of this study reveal that structured infrastructure exists that cannot address the needs of Gaza City while existing literature confirmed that conventional ways of planning urban transport infrastructure cannot provide solutions to resolve congestion and the excessive use of car and roads (Poiani & Stead, 2015).

Decentralised planning issues.

Data collection reveal that Gaza municipality does not have full power regarding management of financial resources and major urban projects in Gaza City. Therefore, experts suggested redefining the plan by shifting its centralised power into decentralised authorities as it is not easy to resolve the issues of wider streets and traffic congestion around these areas. Furthermore recent literature suggests redefining planning frameworks to empower decentralized authorities, enabling more effective management of infrastructure and addressing issues like traffic congestion (Helmrich, et al 2021). However, there are issues with decentralised planning as Gaza municipality cannot afford to hire planning consultants with the appropriate experience in urban planning and TOD in order to apply this to Gaza City. Thus, results highlight a lack of collaboration and consensus in making planning decisions, whether by the municipality, the Ministry of Local Government, or via the policy of the country. Therefore, mega projects like TOD cannot currently be properly planned and executed. Moreover, the decision-makers of Gaza municipality and the planning ministry who have control over the resources cannot properly plan the land distribution and build an advanced public

infrastructure. Consequently, there is a need for the involvement of competent people to help redesign land use planning standards and take timely decisions regarding TOD. There are also decentralized planning issues to consider, as Gaza municipality will not take decisions about managing the use of car parking (i.e. not allowing parking, limiting parking time). At the same time, it is essential to find an appropriate alternative for public transport as authorities will consider the responsibility of the Ministry of Planning.

Corruption.

One of major issues in developing countries is weak law and order, interference and control by other countries, and political instability which results to change; these are all issues faced by Palestine's governments. Typically, previous central governments have not transparently carried out projects, while existing politicians have accused corruption and loss in the development project of the previous government, which has prompted ongoing Palestinian-Palestinian conflict (Tartir, A. et al 2021).

The municipality and traffic police must monitor the movement of vehicles and mobile animal carts, impose the law on violators, organise traffic, make a traffic plan and update it constantly. However, the secondary data also highlighted corruption in imposing the law due to violations by rich families and politicians who are sometimes involved in speeding and violating traffic signals. There are potentially corrupt employees in some departments signifying difficulties with maintaining some roads and removing encroachments by the citizens. There are many encroachments that must be removed in order for the roads to be widened. Initially, would be possible for Gaza Municipality to start implementing public transport on specific roads that are distinguished by their size and ability to accommodate public transport. The war and terror threat, high unemployment rates, and high rates of corruption, have increased challenges in implementing a TOD model in Gaza city. Therefore, in order to enable comparison the results of future studies could identify and evaluate the key factors required to facilitate TOD implementation in different contexts. Moreover, another issue arises in the connection of investors and private land owners to political leaders who subsequently facilitate personal interests and bypass regulatory laws to build

housing projects and markets without licenses or compliance with standards and regulations.

Lack of Institutional Policies.

The participants of this study suggested a redefinition of local government policies in order to enable the effective use of land, such as widening existing and constructing new roads to facilitate the implementation of TOD in Gaza city. The findings also revealed how ineffective planning in the City of Gaza has led to the misdistribution of land use and as a result most of the vital centres such as shops, banks, parks, government offices, are all located on Omar Mukhtar Road. This makes the area more crowded with regular traffic congestion. Similarly, other findings revealed that the poor performance of previous local governments has created issues concerning limited land around Omar Al-Mukhtar Street, particularly in the Rimal area. As a result, if they try to implement TOD in this area, many private landowners may not leave or accept attractive prices for their land, especially if their businesses are stable. Some participants shared that ineffective planning in the past has created obstacles to local municipality planning especially when land is distributed between residential, commercial, agricultural, and industrial areas, and roads.

8.5.2 Uncertainty and Ambiguity

The second institutional force element involves professional networking and professionalism, which enables an understanding about educational practices, professional networking and collaboration, and occupational and operating standards and procedures (Scott, 2013). For example, the empirical results revealed a need to involve researchers, educational institutions, and local municipality professionals to educate people and increase their support and acceptance of TOD to enable better mobility, lower car traffic, lower spending on transport, less pollution, and less suburban sprawl. Experts in the local municipality and researchers can review the shared knowledge of international agencies (i.e. the World Bank) as well as Institute of Transport & Development Policy which offers comprehensive guidelines on the successful execution of TOD plans (The World Bank, 2018; ITDP, 2017).

Political Instability.

This study also highlighted the challenges faced due to violent conflict and political instability in Gaza city. The qualitative findings revealed that the occupation destroyed the infrastructure of Gaza City including its residential buildings and places of worship. Abujidi (2014) found that destruction and violence significantly increased in Palestine over this time meaning that urban development and economic growth are very slow, and further hampered by not having their own currency. Existing literature confirmed, due to political instability, investors may not feel comfortable investing their money in development projects without a government guarantee of return (Haudi, and et al. 2020). Evidence found that centralized political instability is also unable to resolve conflict between local governments and may lead to the existence of contradictory political decisions. A government on the Gaza Strip and a government on the West Bank are unable to coordinate with each other and thereby delay the adoption of plans for many cities on the Gaza Strip, including the City of Gaza.

Financial Constraints

Financial constraints present formidable obstacles to TOD implementation, demanding innovative financing solutions particularly in conflict zones like Gaza City (World Bank, 2020). Because TOD requires huge funding, there is a lack of financial resources and a need to attract investments from abroad to invest in TOD. The government should finance projects in public transport or bring financial aid from developed countries. It is possible for the Gaza Municipality to start implementing public transport gradually on specific roads that do not require a large budget. Due to financial constraints, it is suggested that the Gaza Municipality should encourage investment in the field of public transport, and there should be cooperation between the municipality and private companies to guarantee compensation to companies in the case of loss. Deep, & et al (2019) explained that public-private partnerships offer avenues for collaboration, mitigating financial risks and accelerating infrastructure development implementation. This would help to encourage investment and key for collaboration as the City of Gaza is considered a conflict zone.

One of the major issues in the implementation of TOD is Land ownership as most of the lands in Gaza City are under private ownership, which present formidable obstacle to TOD implementation. As Gaza Municipality and the central government lack financial resources, the public transport development process is relatively slow. The slow development pace due to private landownership and financial constraints aligns with global challenges in funding urban projects (Robinson, & et al 2021). Many experts have reported the negative impact of financial constraints on the development of projects in Gaza City and the results of this study highlighted that both urban planning power and financial resources are not fully controlled by the Gaza Municipality meaning a delay in the construction of roads, streets, and public transport in Gaza City.

The intersection of financial constraints and land ownership underscores the complex nature of TOD implementation. Global perspectives on funding challenges (Robinson et al., 2021) contribute to the understanding that Gaza City's experience is not unique. The proposed collaboration between the municipality and private companies aligns with contemporary strategies for mitigating financial risks in urban infrastructure projects (Deep et al., 2019). To fortify the scholarly foundation, continued exploration of innovative financing mechanisms and successful case studies in conflict zones is warranted.

Uncertain Road Management Policy.

The uncertainty and ambiguity of local institutions on road management policy can negatively impact on the performance of the government institutions (Scott, 2013). The empirical results revealed that the local government should help the municipality of Gaza by hiring TOD specialist from other countries to offer practical and tested solutions, and help resolve issues with the current public transport infrastructure including a redefinition of road management policy. Existing literature highlighted that successful TOD planning requires collaborative institutional management, innovative financing, and political support (Edmonds, 2018; Renne, 2009; Cervero, 2004). Recent studies stress the significance of embracing best practices from developed countries where the implementation of special lanes for public transport has effectively alleviated traffic congestion (Abdulrazzaq, & et al. 2020). Therefore, management is required to follow the

successful practices of developed countries which commonly use special lanes on roads to facilitate faster travel by public transport by avoiding traffic congestion. Emulating successful models from developed countries, such as the implementation of special lanes, is a practical approach supported by recent literature (Abdulrazzaq, & et al. 2020). This collaborative and innovative strategy not only addresses uncertainty and ambiguity in road management policies but also ensures the integration of global best practices into Gaza City's urban transport framework.

8.5.3 Professionalism

Lack of Professional Collaboration and Professionalism.

Previous studies have highlighted the importance of professional groups and other agencies which offer useful guidelines related to TOD (The World Bank, 2018; ITDP, 2017) and can help the government to build their own expertise and planning. Participants revealed a lack of financial resources, expertise, and limited knowledge and awareness about the benefits of TOD. Therefore, it is suggested that collaboration with educational institutions and professional researchers could help to educate local municipality experts and the public. The engagement of professional experts can educate stakeholders about the benefits of TOD in order to overcome current challenges to the public of Gaza City such as high cost, long waiting times, traffic congestion, road accidents, and long journeys. There is a need for professional experts to educate people about the importance of public transport and to encourage its adoption alongside walking for shorter journeys. In addition, there must be incentives for citizens to encourage them to use public transport, such lower costs. Thus, the institutional setting has three elements: governmental power, professionalism, and uncertainty or ambiguity. These bring social legitimacy and support the process of implementation of a new system by involving all stakeholders (Greve, H. R., & Man Zhang, C. 2017).

The identified lack of financial resources and expertise aligns with global challenges faced in TOD implementations (The World Bank, 2018). Greve and Zhang's insights (2017) on the empirical evidence from governmental agencies

provide a contextual framework, emphasizing the importance of collaboration, expertise, and stakeholder involvement for successful implementation. By leveraging the knowledge and guidance provided by international agencies and professional organizations, Gaza City can develop tailored strategies to enhance public transport infrastructure and promote sustainable urban development.

Lack of Commitment.

Addressing the lack of commitment to traffic regulations and the need for market redesign are crucial aspects in fostering effective TOD in Gaza City, most of markets which are either privately owned by a few people and/or locally do not have an advanced technological system to resolve the issues of traffic congestion or land for wider streets. As such, there is a need to redesign such markets.

Another major issue is the availability of free parking spaces on streets. Therefore, the government should hand over the management of these parking spaces to contractors who can generate useful revenue for the local municipality, which can – to some extent - help to alleviate financial constraints. According to Curtis et al. (2009), TOD should be implemented as it can address issues associated with a lack of suitable parking for vehicles around commercial markets, particularly with respect to loading and unloading goods. In addition, the presence of narrow sidewalks on both sides of the road and their exploitation by traders need addressing as this also contributes to traffic congestion.

The integration of foreign expertise in TOD, as suggested by Curtis et al. (2009), could offer practical solutions to enhance public transport utilization in Gaza City. However, the enforcement of traffic regulations and the redesign of markets demand local commitment and stakeholder engagement.

8.6 Summary

This chapter has compared the findings with those from existing literature in order to fulfil the study objectives, namely: to identify the existing situation planning concerning the road network and land-use, and identify related opportunities and challenges; to explore recent studies and the concepts of integrated land-use and road network practices using a TOD approach; to identify and evaluate the key

factors required to facilitate TOD implementation in Gaza City; to develop strategic methodological links to improve the integrated planning framework between the road networks and the planned structure for the city; and to validate the efficiency of the framework to be implemented, and hence meet the current and future challenges of Gaza City. In relation to first objective, (to identify the existing situation planning concerning the road network and land-use, and identify related opportunities and challenges) it was found that previous governments cannot conduct advance planning by purchasing or leaving some land for the purpose of widening streets. Therefore, now the financial situation of the current government is no longer viable to buy these lands. As a result, it is suggested that they engage private national and international investors in a profit-sharing model to help overcome economic, environmental, and social challenges by implementing TOD in Gaza City.

This study also identified and evaluated the key factors required to facilitate TOD implementation in Gaza City. The empirical findings revealed that the local municipality should focus on infrastructure development as it is a key method to enhance integration between road networks and land-use and to implement a TOD model in Gaza City. The results revealed a need to redefine its planning mechanism to support decentralised planning which is one of the biggest problems, meaning it is not easy to resolve the issues of wider streets and traffic congestion. One of the most important suggestions is that as there is limited land in Gaza City it is more suitable to re-plan to expand the city from the southern side where there is cheaper land available. This can help to implement the TOD model in Gaza City. There is need to tighten laws and regulations with respect to encroachments and land misuse as it can negatively influence the interest of private investors who will be uncertain about regulatory laws and may build without license or compliance with conditions and regulations.

One of the core objectives of this study is to develop strategic methodological links for a better-integrated planning framework between the road networks and planned structure for the city. This study has constructed a theoretical framework by using the understanding of TOD models alongside the empirical findings from the study. This theoretical research framework has extended our understanding

on how planning policymakers and experts should acquire and utilise available resources to address the issues associated with public transport infrastructure and provide various solutions to implement a TOD model in Gaza City. For example, this framework has provided an understanding of the need to control the political instability that directly influences the economic growth of Gaza City and increases its unemployment rate. Furthermore, this framework has also extended knowledge that local governments should be involved and own this project, although they face issues associated with financial constraint and difficulties in managing funding. Therefore, local government involvement is crucial within a profit sharing model that TOD investors can commit to that will help ease the implementation of TOD.

Chapter 9

Conclusion

9 Chapter 9: Conclusion

9.1 Introduction

The conclusion provides an overview of the findings of this study and explains how it fulfils the aim and objectives. The researcher identified existing issues with the infrastructure of Gaza City and discussed the possibility of introducing (TOD) principles. Moreover, the researcher identified general planning guidelines which have already been applied in the USA and Europe, and could serve as a comprehensive land-use and transport plan. This chapter provides the practical recommendations for policy makers of Gaza City with respect to implementing TOD. Furthermore, this chapter also provided an understanding of the limitations of the methodology and findings that could inform future research directions.

9.2 Synthesis on the objectives of the study

As mentioned, the research aimed to develop a TOD model to adopt in Gaza that integrates land-use and road networks. The aim was examined through five research objectives. **The first** objective is to identify the existing planning for the road network and land-use, and identify the related opportunities and challenges; this is achieved by the literature review and supported by semi-structured interviews with expert and decision-makers. **The second** objective is to explore the recent studies and concepts of integrated land-use and road networks practices using a TOD approach; this is also achieved by literature review.

The third objective is to identify and evaluate the key factors required to facilitate TOD implementation in Gaza city; this is addressed through semi-structured interviews and a questionnaire survey supported by literature review. **The fourth** objective is to propose a set of performance indicators to introduce local bus stations distribution map; this is achieved by conducting the literature review. **The fifth** objective is to validate the efficiency of the framework for implementation, and hence address the current and future challenges of Gaza city, this is validated by using semi-structured interviews with expert and decision-makers.

9.2.1 The Achievement of the First Objective

To identify the existing planning for the road network and land-use, and identify the related opportunities and challenges.

The objective of identifying the existing planning for the road network and land-use, along with related opportunities and challenges, was achieved through a combination of literature review and semi-structured interviews.

Objective one was achieved in Chapters 2, 4 and 6 by outlining the current research aim and objectives and providing a brief background on the existing planning of Gaza City. To achieve this objective, an overview of the overall land use planning and transport was addressed in detail in chapter 2, and the researcher built up an understanding from the outcomes of this chapter through semi-structured interviews with expert and decision-makers (Chapter 6 section 6.4.1), and a critical literature review (Chapter 2); which serves as a foundational pillar for understanding land use planning and transport dynamics in Gaza City, (Salha, 1997, Needham et al., 2018). offering a broad overview, into planning strategies such as The Concentric (Rodrigue et al., 2017), Hoyt Model (Fyfield, 2003), and Multiple nuclei model (Morris et al., 1979), and the unique challenges facing Gaza City, thus, different books, articles and academic papers, were reviewed, which provided directions in setting the major determinants for investigation through the study. In Chapter 4, Section 4.3, a critical literature review delved into historical developments in urban planning in Gaza City. This section provided insights into the factors shaping urban planning, including historical aspects, political conditions, cultural influences, land prices, ownership issues, and economic activities (Sayam, 2014, Khatib, 2011). In addition, chapter 4, Section 4.5, focused on the transport networks in Gaza City, offering a comprehensive exploration of the current state of road networks identifying strengths and weaknesses that impact urban planning initiatives, such as geographical Location, political and economic conditions (Gaza Municipality, 2019, Pearson & Khatib, 2011, Mohaisen, 2012). The literature review in this section incorporated various sources, including books, articles, and academic papers.

The study dealt with the planning patterns and their Impact on the urban planning of Gaza City and the current situation of road networks and land-use (Chapter 4, Section 4.4.4 and 4.5.1). Therefore, based on these aspects that have been stated in (sections 4.4.5, 4.5.6 and 6.4.1), the researcher have identified the factors that affect planning in Gaza City, such as the political conditions, where many successive governments have run Gaza and the impact of conflict, culture and awareness, land price, land ownership and the economic activity, were identified through both literature review and interviews, providing a comprehensive view.

The study, through a literature review and interviews in (Chapters 4 and 6 Section 4.3, 6.4.1) has also revealed that there is a discrepancy in the planning of Gaza City due to political changes and there are many destroyed roads as a result of the continuation of the Occupation aggression on Gaza City that hinder TOD implementation. The integration of literature review findings with insights from semi-structured interviews, as discussed in Chapter 6, enriches the analysis by providing real-world perspectives from experts and decision-makers. Through interviews, factors affecting planning in Gaza City, including political instability, cultural dynamics, and economic constraints, are elucidated P1 explained:

“Aggression or war takes some thinking time; for example, war can last from a week to a month, but it results in long years of restoration, reconstruction, and re-planning. Therefore, not all administrators and planners think about development, but rather their thinking becomes how to restore what the occupation destroyed for years, which may be ten years ago. Where all the infrastructure has been destroyed, and this is a very severe obstacle”.

This step allowed the researcher to gather insights from individuals with practical knowledge and experience related to Gaza City's planning. This provided a real-world perspective on the existing planning for the road network and land-use in Gaza City and the challenges hindering the implementation of (TOD).The findings of (Chapter 4, Section 4.6) have identified that the degree of interconnection of the road network in Gaza City is weak and the road network in Gaza City needs 21 connections to reach maximum interconnection calculated by The Alpha

Index, (Hu et al., 2007). Likewise the network connectivity is not complete, and in order for the transport network in Gaza City to reach a complete network, we need to add 26 roads, calculated by Gamma Index, (Hu et al., 2007).

Through a comprehensive literature review and insightful semi-structured interviews, the study successfully achieved its objective of identifying the existing planning for the road network and land-use in Gaza City, along with associated opportunities and challenges. The synthesis of qualitative and quantitative data provided a nuanced understanding of the complexities surrounding urban planning in the context of Gaza City's unique socio-political environment.

9.2.2 The Achievement of the Second Objective

To explore the recent studies and concepts of integrated land-use and road networks practices using a TOD approach.

The second objective of the study required the recent studies and concepts, and comprehensive understanding of TOD (Chapter 3). The researcher conducted a thorough literature review, examining articles, academic papers, and websites to gain insights into recent studies and concepts related to TOD particularly focusing on its impact on accessibility, urban space quality, complete streets, and public transport performance. This review helped in establishing a conceptual framework for TOD implementation in Gaza City. This enabled emphasis on the main categories of TOD. For instance, the researcher indicated the trends (Environmental trend, Demographic trend, Traffic Congestion trend, Economic trend) in supporting TOD Chapter 3, section 3.4 (Goodwill & Hendricks, 2002) . In addition to clarifying the existing studies on the implications of TOD. Moreover, the researcher emphasized main categories of TOD, highlighting trends that support TOD implementation. Chapter 3 provides a comprehensive analysis of recent trends supporting TOD (Cervero, 2013), implications of TOD implementation (Maheshwari, 2015), and key elements necessary for successful TOD implementation (Nasri & Murphy, 2017). (See section 3.2 in chapter 3).

The study determined the Indicators of an Integrated road network and land-use (see section 3.6 in chapter 3), which are accessibility, urban space quality,

complete streets and public transport performance. In addition, its impact on accessibility, urban space quality, complete streets, and public transport performance. (Litman, 2007, Rodrigue, 2017, Vale, 2015, Klassen, 2015) and an analysis of the elements contributing to successful TOD implementation, such as quality public transit, active transport, and mixed-use neighbourhoods, (Cervero, 2013; Maheshwari, 2015; Nasri, 2018; Murphy, 2020), which determine the extent to which TOD can be implemented in Gaza City. In order to apply TOD in Gaza City the keys successful of TOD Implementation were outlined, thus, the findings of section 3.8 in the literature review have identified seven keys: quality public transit, active transport, car use management, mixed-use neighbourhoods with efficient buildings, neighbourhood centres and vibrant ground floors, public spaces and community participation and collective identity, (Baker & Lee, 2019, Staricco & Brovarone, 2018, (Appleyard et al., 2019, Venigalla et al., 2018 and other

The literature review culminated in the proposal of an Initial Conceptual Framework for Gaza City (section 3.9), this section discussed the concept of the framework over two sub-sections. The first subsection highlights the significance of framework in general while the second elaborates specifically on the initial conceptual framework of TOD in relation to Gaza City.

Through an exhaustive literature review, the study synthesized recent studies and concepts related to integrated land-use and road networks practices using a TOD approach. By delineating the key trends, implications, indicators, and elements of successful TOD implementation, the research provided a foundation for understanding the potential applicability of TOD principles in Gaza City. The proposed Initial Conceptual Framework laid the groundwork for further exploration and practical application of TOD strategies within the unique socio-economic and political landscape of Gaza City.

9.2.3 The Achievement of the Third Objective

To identify and evaluate the key factors required to facilitate TOD implementation in Gaza city.

To achieve objective 3 through the systematic literature review findings in chapter 3 the researcher directed to initiate work through highlighted the keys to successfully implementation of TOD as mentioned in (chapter 3 sections 3.6 and 3.8). These factors include accessibility, public transport, complete streets, car use management, people culture, government support and policies, urban planning expertise, economic aspects, and political aspects.

Both semi-structured interviews and a questionnaire survey (Chapter 7, section 7.5.1) applied by the researcher to collect primary data related to the objective. The semi-structured interview results revealed similarities viewpoints regarding identification and verification of successfully implementation key of TOD as explained in (chapters 6 and 7) as P5 stated: "I think that the accessibility factor is more a condition for the success of TOD in Gaza City than it is a factor in implementing TOD. This is because the citizens of Gaza City are used to using a taxi, which carries four passengers, and then moves quickly, and sometimes the taxi moves with one or two passengers." The interviewees have had similar opinions in terms of identification and verification the factors are essential for TOD implementation mentioned, namely; "accessibility, public transport, complete streets, car use management and people culture, government support and policies, urban planning expertise, economic aspects, and political aspects outlined in Chapter 3, These factors were identified through a comprehensive analysis of existing studies and concepts related to TOD practices (Cervero, 2013; Maheshwari, 2015; Nasri, 2018; Murphy, 2020).

The results revealed that there were additional factors has been add by the interviewees, all of these factors were named when the respondents were asked to identify other TOD factors related to TOD planning. Consequently, it is possible to conclude that "government support and policies, urban planning expert, economic aspects and political aspect" are all agreed as essential factors. Additionally, the findings of the questionnaire in (Chapter 7, section 7.5.1) indicated that (66.3%) of participants using private cars or taxis, which indicates the importance of spreading awareness of public transport and walking among the citizens in Gaza City. It also alerts planners and decision-makers to improve the performance of land use plans and road networks. However, it clarified that

the above mentioned factors represented the main key factors of TOD implementation (section 7.5.2).

Semi-structured interviews and the questionnaire provided insights and perspectives, ensuring a comprehensive identification and evaluation of key factors crucial for TOD implementation in Gaza City.

Through the integration of literature review findings and insights from semi-structured interviews and questionnaire surveys, the study successfully identified and evaluated key factors essential for TOD implementation in Gaza City. The multi-method approach provided a comprehensive understanding of the challenges and opportunities associated with implementing TOD principles in Gaza City's urban context.

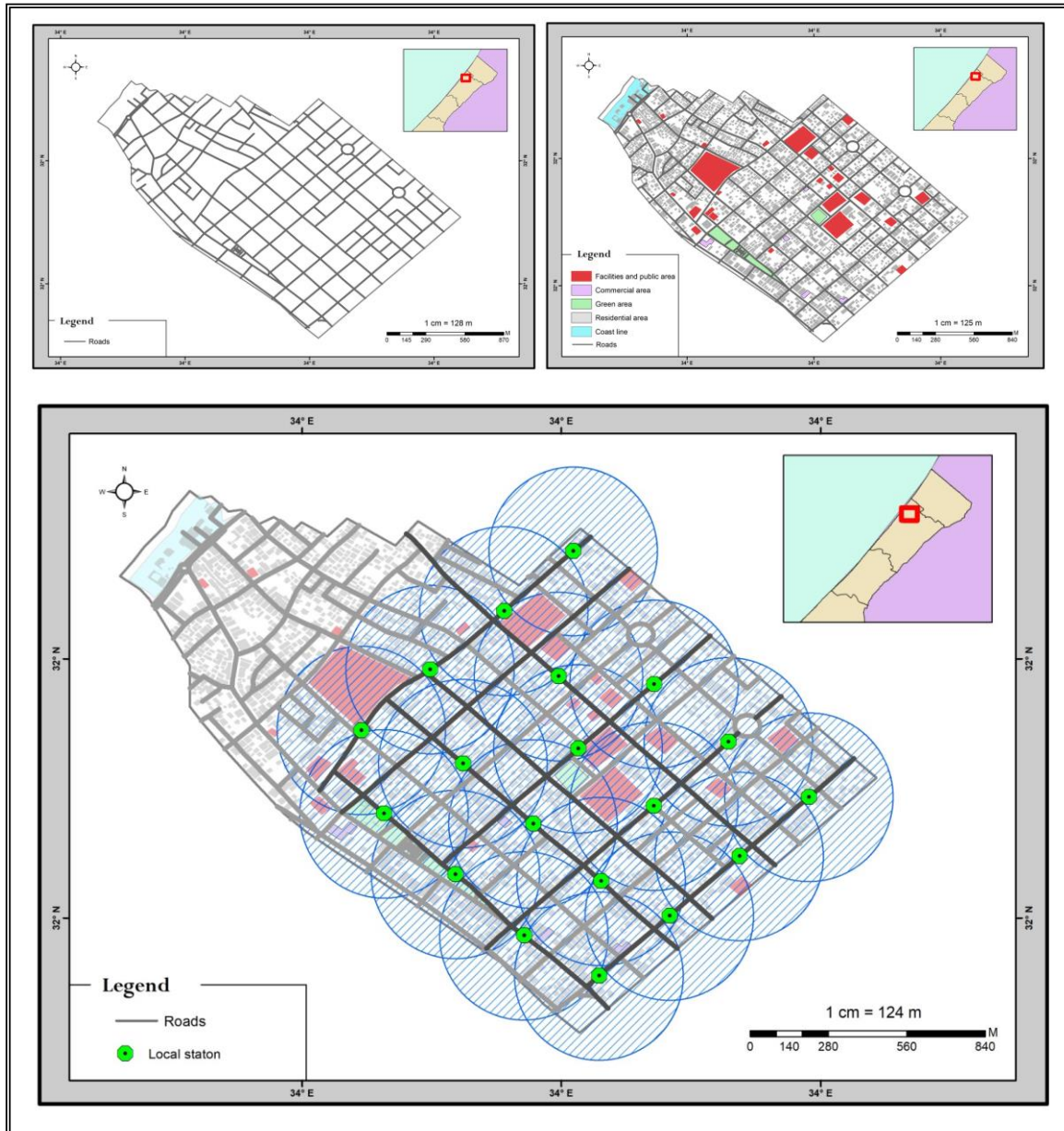
9.2.4 The Achievement of the Fourth Objective

To propose a set of performance indicators to introduce local bus stations distribution map.

To achieve this objective, through an extensive literature review, the researcher gathered insights into existing methodologies and approaches related to urban planning, transport, and the distribution of bus stations (chapter 4) based on the following indicators (urban nodes, the degree of centralization of the nodes, the detour index, connectivity index, accessibility), which help the researcher to propose distributing local bus stations map which is essential to the Gaza city. The literature review helped in identifying relevant methodologies for designing and implementing bus station distribution maps (Liu, X., & Jiang, B. 2012). It provided theoretical frameworks and practical examples that could be adapted to the specific context of Gaza City.

In simple terms, the axial map is represented by the longest lines of sight that can be used to characterize every street segment as in figure (4.33) (chapter 4, section 4.6.6). The procedure has been made to convert the map into an acceptable format by using software tools UCL Depthmap, then drawing the map, by AutoCAD (*.dxf) to be imported in UCL Depthmap, see figure (4.34), then the researcher conducted in-depth analysis of street segments' connectivity and

integration to determine optimal locations for local bus stations. According to the degree of centralization of the nodes (chapter 4, section 4.6.2) and, connectivity and Integration axial map figures (4.37), (4.38) the researcher developed scenarios for distributing local bus stations across Gaza City, see figure 4.39).



The achievement of the fourth objective was a result of combining theoretical knowledge obtained from the literature review with practical implementation methodologies. By integrating theoretical concepts with real-world data and analysis, the researcher was able to propose a comprehensive set of performance indicators for introducing a local bus stations distribution map in

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Gaza City. Achieving objective four not only means a step towards TOD implementation, but also represents an improvement in urban transport infrastructure planning in Gaza City. By providing decision makers with proposals and inputs for implementing TOD, the proposed bus station distribution map facilitates transport planning and links it with land use in accordance with TOD standards, which benefits the community in Gaza City through ease of access, saving time and promoting sustainable mobility

9.2.5 The Achievement of the Fifth Objective

To develop and validate a conceptual framework to facilitate TOD implementation in Gaza City.

When reviewing the achievement of the fifth objective, which aimed to develop and validate a conceptual framework for facilitating TOD implementation in Gaza City, a comprehensive and iterative process was undertaken to integrate theoretical insights (Governmental rule And regulation, Uncertainty and ambiguity, and Professionalism), (Chapter 8, Section 8.5) with empirical evidence gathered from interviews and questionnaire (Chapter 7) as detailed in the research methodology (Chapter 5, Sections 5.9.1 and 5.9.2).

The fifth objective of the research set out to develop the conceptual framework which was previously developed through two stages. The first stage was through literature review (Chapter 3, Section 3.9.2) this literature review provided a theoretical foundation by synthesizing existing knowledge and methodologies related to TOD implementation, and the second stage was through the key findings of analysing data from semi-structured interviews (Chapter 8 Section 8.5) and quantitative data (Chapter 7), which is the method of its design, the number of experts are interviewed, and the sample size of the questionnaire were explained in (Chapter 5, sections 5.9.1 and 5.9.2). Insights from these interviews and survey responses contributed to the validation and refinement of the conceptual framework, ensuring its relevance and applicability to the specific context of Gaza City. These data sources allowed for a nuanced understanding of the specific challenges and opportunities for TOD in Gaza City, as perceived by experts and decision-makers.

This framework highlights that time is needed to engage investors and the community to introduce public transport and integrate road networks and land-use in order to enable the development of policies to improve urban planning in Gaza City TOD implementation (Chapter 8, Sections 8.5.1, 8.5.2, and 8.5.3).. Thus, the key findings from semi-structured interviews, it has been found that the conceptual framework has three elements - governmental power, professionalism, and uncertainty or ambiguity, were recognized as crucial for successful TOD implementation in Gaza City (Chapter 8, Section 8.5). This explains that each elements required from the government and Gaza Municipality to improve them and enhance certain key factors in order to improve its opportunities regarding overcoming or reducing the negative impact of these barriers that impeded successful TOD implementation. Therefore, this framework highlights a need for collaboration between the government, investors, and the municipality in order to arrange financial resources and human capital to implement TOD in Gaza city. Furthermore, there is an urgent need to create a culture that enforces abidance with the law and planning standards (Chapter 8, Section 8.5.1, 8.5.2 and 8.5.3). The empirical results highlighted that a lack of planning, experience, and expertise among local institutions creates a challenge when addressing the issues faced by the existing infrastructure P4 *“I think there are no TOD specialists in the committee, also in Gaza City. There is also a shortage of experts or specialists in the field of public transport.”* So, there is need to hire professionals with practical knowledge that can help to build a TOD infrastructure.

On the other hand, The validation of the conceptual framework was further conducted through the analysis of quantitative data obtained from the questionnaire (Chapter 7, section 7.5) , which considers the development of balanced and equal urban planning strategies using a transit-oriented development approach to integrate land use and road networks. The questionnaire evaluated the integration factors between road networks and land uses, which shows that the integration factors are acceptable to be applied by the citizens of Gaza City. This promote what was stated in the interviews. The suggestion and comments obtained through conducting interviews with six experts (Chapter 6, Table 6.1). Accordingly, the final conceptual framework

required for TOD implementation was illustrated in Chapter 8, specifically in Figure 8.3. This illustration synthesized the insights obtained from the literature review, semi-structured interviews, and quantitative data analysis into a cohesive framework for guiding TOD initiatives in Gaza City.

The achievement of the fifth objective was a result of a comprehensive and iterative process that integrated theoretical insights with empirical evidence gathered through interviews and surveys. The conceptual framework developed and validated through this process serves as a valuable tool for urban planners, policymakers, and decision-makers in Gaza City, providing a structured approach to addressing TOD implementation challenges and promoting sustainable urban development practices. The framework emphasizes the importance of collaboration, government support, professionalism, and the need to create a conducive culture for abiding by planning standards, offering a holistic guide for improving urban planning strategies in the context of Gaza City.

9.3 Summary of the Findings

This study has achieved the objective to examine existing road network and land-use planning and identify the related opportunities and challenges. For example, results revealed that local municipality should focus on connecting the road network with land-use, which can be facilitated by a working complete street design, and via compact and mixed-use developments. On the other hand, it found that previous governments and strategic planners have not conducted effective planning in the City of Gaza which means the misdistribution of land use related to parks, government offices, shops, and banks which are all located on Omar Mukhtar Road. This makes the area crowded and increases traffic congestion. Moreover, the urbanisation of the city demonstrates ineffective planning as hospitals were on the edge of the city, but through urban growth have become central to the city. Thus, distribution and land use is one of the causes of the City's problems. Due to limited land within the city and the erosion of agricultural lands, experts believe that there is need to plan to expand to the southern side where there is cheap land available. This can help in the TOD infrastructure design. A major challenge regarding land use is that most experts do not have much experience in planning and land distribution or in building an

advance public infrastructure. As a result there is a need to engage skilled experts who can help to renew the land use planning standards in Gaza city.

This study identifies and evaluates the key factors required to facilitate TOD implementation in Gaza City. Experts suggested focusing on decentralised planning and exercising legal powers to Gaza City to enable the best land use and develop the infrastructure to implement TOD. It was found that experts and government officials should engage private local and international investors as it could encourage private landowners to give their lands to the government to help develop the TOD system. Time is needed to encourage the private sector to collaborate with the government within a profit sharing model, investment plan, and consensus on the recovery period to invest in TOD. Such investment can help to expand Gaza City on the southern side and buy resources to pave and maintain roads, as well as build an advanced train and bus system as part of the TOD implementation. The experts suggested a need to discourage taxi and private car use, especially in areas where traffic congestion is high and limited possibility to widen the roads. They suggested increasing tax on private transport as it can increase the financial burden on citizens when using private cars and motivate them to adopt public transport system by reducing the level of traffic congestion.

There are many benefits to applying TOD in Gaza City. For example, results reveal a need to increase awareness about the environmental, economic, and health benefits of TOD, such as reducing the level of pollution and protecting nature, increasing the local GDP for Gaza city, and reducing the risk of respiratory disease which is very common in low developing countries such as Palestine. Findings reveal that the implementation of TOD would be helpful to overcome issues such as traffic congestion, the high consumption of energy, obsolete technology on existing public transport, air pollution and health issues, delays to reaching destinations, and low economic growth due to limited retail spaces. Experts suggested that mixed-use of land is possible, although TODs cannot be entirely for business or entirely residential. Therefore, it is important to offer the opportunity for some people to reside and work in the same TOD and to socialize and shop in the same area.

The TOD model integrates land-use implementation and road networks, and can bring benefits such as improved urban planning and transport. The results revealed a need to build high quality metro trains and buses with the capacity to carry more passengers. There is need to hire experts who can help to apply specific knowledge on mixed-use land that can contribute to the development of TOD and increase the benefits from using public transport.

Finally, this study developed strategic methodological links to suggest a better-integrated planning framework between the road network and planned structure for the city. Furthermore, one of the objectives of this study was to validate the efficiency of the framework to be implemented, and hence absorb the current and future challenges of Gaza City. There is need to implement TOD in Gaza City as it can help to overcome the environmental, economic, and social challenges which are strongly linked with excessive car use and urban sprawl. Results revealed that the implementation of TOD model would be beneficial in overcoming issues such as traffic congestion, the excessive use of personal cars, and crowded places which increase air pollution.

Furthermore, it was concluded that the implementation of a TOD model could enhance the speed of economic activities in Gaza City as it is evident that fast transport for people is useful in accessing more jobs, addressing issues with high unemployment, and reducing traffic congestion. The implementation of a TOD model can help the transport authorities to build a sustainable city because sustainable transport can address the environmental and traffic congestion. In addition, the degree of interconnection within the road network in Gaza City is weak according to the Alpha Index indicator. Moreover, the road network in Gaza City needs 21 connections to reach its maximum accessibility and to offer a complete transport network, requiring the addition of 26 roads to the network in Gaza City.

9.4 Contribution to the Body of Knowledge.

This study contributes to the body of TOD knowledge through the following academic and practical contributions:

9.4.1 Academic Contributions

- This research represents the first effort in developing a framework tailored specifically for Transit-Oriented Development (TOD) in Gaza City. By addressing the unique challenges posed by conflict zones and division, the framework serves as a blueprint for similar contexts worldwide. To illustrate, let's consider the case of Beirut, Lebanon (Shanti, 2014), which shares some urban challenges with Gaza City due to historical conflict and division. By applying the TOD framework developed here, Beirut can potentially revitalize its urban infrastructure and promote sustainable development amid complex socio-political dynamics.
- The research introduces an innovative methodological approach for assessing the feasibility and implementation of TOD in conflict-affected urban environments like Gaza City. Drawing from literature on urban development methodologies, and primary data collected through semi-structured interviews and questionnaires, the research concluded new factors for applying TOD in cities under conflict, such as Gaza City, which are Governmental Rule and Regulation, Uncertainty and Ambiguity, and Professionalism, (Chapter 8, section 8.5) for evaluating urban development strategies in complex socio-political contexts. By developing and applying a practical framework from literature on urban development methodologies, and primary data collected through semi-structured interviews and questionnaires, this study pioneers a new methodological avenue for urban planners and policymakers to address complex urban development challenges in conflict zones.
- This study is contributed by introducing the TOD framework principally aims to address the environmental, economic, and social problems associated with excessive car use, where (66.3%) of participants from the questionnaire using private cars or taxis. According to empirical evidence and theoretical insights, the framework emphasizes the importance of integrated land use and transport planning. For instance, examining the case of Curitiba, Brazil, known for its successful Bus Rapid Transit (BRT) system, provides valuable lessons on how TOD principles can be applied to alleviate traffic congestion and reduce carbon emissions in densely

populated urban areas. Although this study provided many qualitative insights to build this framework it also has opportunities for future studies to test and extend this model in the context of other countries.

- While this study lays the foundation for TOD implementation in Gaza City, there are ample opportunities for future research to test and extend the proposed model. For instance, conducting comparative studies across different cultural and geographical contexts can enrich our understanding of the factors influencing the usability and effectiveness of TOD frameworks. Collaborating with urban planners and policymakers in cities, which faces similar challenges of rapid urbanization and transportation issues, can yield valuable insights into refining TOD strategies for diverse urban landscapes.
- The framework is contributed by discussing the rules and regulations such as clear policy for the municipality, collaboration among the local and government, centralized planning system, law of land distribution as well as the land of construction that are rarely discussed in the existing literature and creating as a major challenge of TOD implementation as P3 said “private land owners and investors have strong connections with political leaders so that they can bypass regulatory laws and build many buildings without licenses and without complying with the conditions and regulations”. By delving into the regulatory aspects of TOD implementation, this research sheds light on often overlooked factors such as municipal policies, governmental collaboration, and land distribution laws. Analysing case studies from cities like Al-Qassar, Qatar, (Furlan and AlMohannadi 2016) can provide valuable insights into the role of governance structures in facilitating sustainable urban development. Through empirical studies and policy analysis, future research can explore the impact of regulatory frameworks on TOD success rates across different cultural and political contexts.
- The research will contribute to minimising the gap identified concerning the limited amount of empirical research on TOD implementation in Gaza City and in developing countries. By generating empirical evidence and identifying key challenges and opportunities, this research sets the stage

for further empirical studies in similar contexts. For instance, examining the experiences of cities like European cities, in integrating public transport systems with urban development can offer valuable lessons for improving mobility and accessibility in conflict-affected regions such as Dresden city (Chapter 1, section 16.1). Therefore, this study provides an opportunity for future researchers to conduct empirical research in developing countries and test the usability of given framework in different political, social, cultural, and financial context.

- This study proposed a practical framework to integrate the road network and land use by apply TOD. There is a strong need for street networks to be designed at the city and neighbourhood scales to address the principles of urbanism. This study also represents a first and key step in the use of other planning methods; thus, future studies should consider the cause-effect relationship when improving the quality of life by using a smart city model and green TOD plans to enable sustainable development.
- This study provided empirical evidence that contributes to raising the awareness of the significant role of TOD practices as an important strategy and planning, By disseminating empirical evidence and theoretical insights, the research contributes to ongoing discussions on sustainable urban development in conflict-affected cities. which could help Gaza City improve its entire performance. Literature on sustainable urban development strategies, such as (Pelle 2016, Hearzallah 2014, Bibri, et. al 2020)., is referenced to highlight the importance of integrating TOD principles into urban planning initiatives.
- The results of the current research are expected to stimulate and encourage others to undertake follow-up research on quality, particularly in the area of TOD. Indeed this research has opened the doors for researchers and academics to get understanding about all the enablers and barriers such as political conflict and economic conditions, in adoption of TOD since it is becoming an increasingly important and critical part of the business world.

9.4.2 Practical Contributions.

1. The outcomes of this research may be employed as a framework that encourages the implementation of TOD, not only in Gaza City, but also in other cities. Moreover, they can be used to better coordinate, plan and amend city planning by adopting and implementing TOD, by synthesizing insights from literature review, semi-structured interviews, which confirmed that addressing Governmental Rule and Regulation, Uncertainty and Ambiguity, and Professionalism, (Chapter 8, section 8.5), is the first step to implementing TOD, especially in conflict cities such as Gaza City, and questionnaire data, as table 7.12 also shows the citizens' acceptance of TOD approach, as the results showed, participants prioritize safety, efficient road design, the importance of public transport and mixed use patterns, indicating a strong preference for comprehensive and integrated urban planning strategies. The framework provides actionable guidelines for coordinating and amending city planning processes to integrate TOD principles effectively (Gaza Municipality, 2019; Pearson & Khatib, 2011; Mohaisen, 2012).
2. There is a strong need for street networks to be designed at the city and neighbourhood scales to address the principles of urbanism as Farr (2011) said a complete street means its design considers all road users. The Analysis of Table 7.12 reveals complete streets (relative weight of 83.20%.) , and efficient public transport infrastructure as interviewee P1 stated: *"We need large areas and wide streets, and this is not available in Gaza City, and we need to re-plan most of the roads of Gaza. It is true that there are wide streets, but due to the current congestion, it is difficult to implement the completed roads. This means that you need strategic planning in order to take part of the street and turn it into a complete road for bicycles and buses, as you mentioned"*. This study proposed a distributing local bus stations to integrate the road network and land-use by apply TOD. This proposal also represents a first step in the integration between road networks and land-use.

3. One advantage of transit-oriented development is that it has the potential to promote gentrification in conflict areas. In some cases, TOD can increase the links between neighbourhoods, enabling greater connection and transit amongst residents. When this happens, TOD projects can benefit neighbourhoods and help manage the risk of division among communities (Padeiro, et al 2019) offers valuable insights into addressing social inequalities and promoting community resilience through transit-oriented planning .Compact urban development and high-quality public transit mutually reinforce each other while mass transit can support the connection between city neighbourhoods. As a result, TOD typically improves access to neighbourhoods.
4. The findings of this research provided a clear perspective for practitioners on how to develop a conceptual framework to facilitate TOD implementation, not only in Gaza, but also in other developing countries with similar circumstances. P5 stated the importance of the, “establishing new policies related to parking, especially setting up fees for private transport and taxis. The government should adopt decentralised planning for city neighbourhoods. There must be government support for public transport. The government should enforce law on citizens and drivers.” This can be supported through the implementation of decentralised planning, and by city councils exercising their legal powers, by engaging private local and international investors and incentivising the use of taxis and private car use by increasing tax on private transport and motivating travellers to adopt a public transport system to reduce traffic congestion.
5. Transit-based urbanism can substantially shrink the environmental impact of car-oriented development. It is estimated that the carbon emissions and energy consumption of TOD are nearly 30% less than those of conventional development (Cervero, R., & Sullivan, C. 2011) For example, cities like Stockholm, Sweden, which prioritize green infrastructure and sustainable transport systems (Omari 2010). Combining TOD and urbanism includes transit and mixed land uses; enables maximum reuse of wasted heat, and reduces parking surfaces through their replacement with open spaces and community gardens. TOD occurs within a half mile

radius of rapid bus stations, has a mix of retail, commercial and residential uses, and a diversity of housing types suited to a mix of generations and incomes. It is therefore an urbanism strategy that promises to simultaneously meet these seemingly disparate goals.

6. The implementation of TOD can catalyse economic development and attract investment in Gaza City's urban core. By fostering mixed-use developments, transit-oriented commercial zones, and vibrant public spaces, TOD projects create opportunities for entrepreneurship, job creation, and local economic growth, Banister & Berechman, (2003) explained, a 1% increase in infrastructure assets would boost gross domestic product (GDP) by 0.05% to 0.25% in the long term. Moreover, the integration of TOD with strategic land-use planning and infrastructure investments enhances the city's attractiveness to domestic and international investors, thereby stimulating economic activity and revitalizing urban neighbourhoods.
7. This study contributed by introducing a TOD decision-making planning framework that is able to resolve the issues of a traffic violations, crowded places, accessibility issues, parking space problems, and time wastage. This will help the Gaza Municipality, Haiq said P1 mentioned that, "The Gaza Municipality focuses on solving traffic problems, such as traffic congestion and paving roads". Overall, the implementation of this framework is useful to improve travel behaviour, transit improvement, and the quality of the environment (Suzuki et al., 2013; Xie, 2012)
8. This study provides empirical evidence that helps to raise awareness of the role of TOD practices as an important strategy and planning tool, which could help Gaza City improve its economic, political and social performance.
9. The research contributes to policy innovation and institutional capacity building by advocating for proactive governance structures and regulatory frameworks supportive of TOD implementation. By promoting decentralized planning mechanisms, multi-stakeholder partnerships, and participatory decision-making processes, policymakers and urban planners can foster a conducive environment for TOD projects to thrive.

Furthermore, capacity-building initiatives aimed at enhancing technical expertise and institutional coordination empower local authorities to effectively plan, implement, and manage TOD initiatives in Gaza City and beyond.

9.5 Practical Recommendations

1. It is suggested that, to discourage people from using private cars or taxis and, parking and maintenance fees should be increased, P5 suggested: “establishing new policies related to parking, especially setting up fees for private transport and taxis. This would help to encourage more people to adopt a public transport that would increase income particularly when buying an advanced transport system such as those in developed countries (double decker buses and metro trains). For motivation purposes, it is suggested that political leaders and key social influencers play positive role to change people’s behaviours from taxi to public transport use, interviewee P2 stated that, “... Changing people's culture towards public transport; the politicians and social influencers must get used to public transport.
2. As there is a culture traffic law violation, there is a high rate of traffic incidents and congestion which negatively influences the performance of public buses. As such, there is need to increase traffic fines and develop separate routes for public transport, P1 stated that, “[a] special lane does not exist in Gaza, and in order to establish it, you will face difficulty at first, and people do not accept that you reserve this route for buses only”. Raising awareness is essential among people concerning the importance of following traffic laws to reduce the time and make journeys easier and safer for everyone. Moreover, there is a need to educate the people regarding the benefits of TOD adoption such as better mobility, lower spending on transport, less car traffic, less pollution, and less suburban sprawl, P1 who stated the importance of “raising awareness among citizens on the importance of public transport and that it solves major problems in several aspects to change the negative image of public transport such as time, safety, and cleanliness”.

3. As there is high unemployment and more financial constraints on the local and government when implementing a TOD model in Gaza City, it is recommended that they engage investors in a profit-sharing model that can help to overcome the economic, environmental, and social challenges, (Asarraj 2015, Dill, J., & McNeil, N. 2023), P4 suggested, “attracting private investors and encouraging them to invest in public transport in partnership with the government and municipality”.
4. Decentralised planning and management are suggested amongst local authority and decision-making bodies. Furthermore, commercial complexes could be established in the neighbourhoods of Gaza City, akin to developed markets, and the first such project could be located in the area of Tal Al-Hawa. These types of projects are really useful in creating guidance for local builders on advanced markets, parking space and wider roads to enable the easy movement of public and private transport, P1 stated that: the biggest problem is that these markets were established in a very primitive and communal way, so I think that they must be re-planned in a modern and suitable way, and that they would be a civilized centre and not just a communal market”. These could be considered a first step in the implementation of TOD.
5. Another major issue in implementing TOD model is the lack of available land to accommodate wider streets and overcome the issues of traffic congestion. Therefore, experts suggested that the local municipality of Gaza expand on the eastern and southern side where there is empty land on which to implement the TOD model, as it shown in figure 9.1.

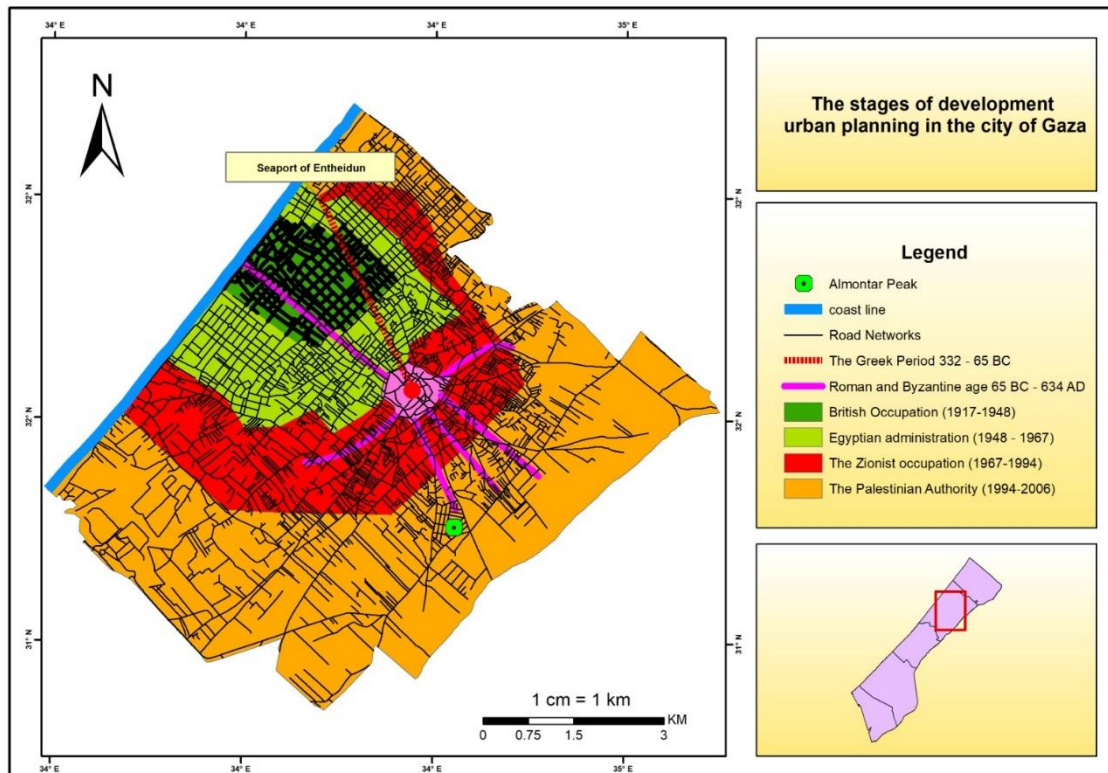


Figure 9-1 Eastern and southern empty land.

6. TOD model implementation is easy when issues related to land ownership and regulatory laws are resolved (Pojani & Stead, 2015, Shanti, 2014). This increases the optimal use of land and supports the construction of buildings with proper planning, licenses, and compliance with conditions and regulations. It is suggested that the government should redefine policy in order to plan the best use of land, such as widening existing and constructing new roads to ease the implementation of a TOD model, as P5 revealed that, "TOD in Gaza City needs spaces, and needs to provide stations for loading and unloading passengers, and bus stops, as well as expanding roads, which means taking part of the citizens' lands or green spaces"
7. Collaboration between the government and private landowners can be fostered through public-private partnerships (PPPs), this echoes global practices where public-private partnerships (PPPs) have been instrumental in financing and sustaining TOD projects (Lehner, 2018) These partnerships can involve joint development ventures, where landowners contribute their properties for development projects in

exchange for a share of the benefits. Such partnerships introduce structure and coordination into the urban landscape. This can be facilitated through negotiation, land swaps, or, when necessary for the city's development goals, compulsory purchase.

8. As P2 shared "re-planning the distribution of land use in accordance with public road infrastructure". To harness the latent synergy between government regulations and TOD objectives, strategic adaptation and revision are imperative:

- A. Rezoning areas proximate to public transport corridors to foster mixed-use development represents a judicious avenue for encouraging TOD, all while prudently accommodating security concerns and other regulatory imperatives.

- B. Collaborative initiatives, entailing the active participation of government authorities, the municipal administration, and urban planners, are pivotal in pinpointing areas amenable to effective TOD implementation sans compromising security or other regulatory prerogatives.

- C. The amendment of existing regulations should proactively prioritize infrastructure development within TOD domains, guaranteeing the seamless integration of vital services such as transport, utilities, and public amenities.

Van, Korniiichuk, Dauby & Pourbaix, (2014), Lerner & Van, (2012) explained that, most cities have been re-planning by incorporating transport priorities alongside economic and cultural priorities.

9. This study found that adopting decentralized planning as well as granting more planning and legal powers is one of the major factors of TOD implementation as it helps the Gaza municipality to take timely decisions at the local level, where Helmrich, et al (2021) argued, empower decentralized authorities, enabling more effective management of infrastructure and addressing issues like traffic congestion. There is a strong need to conduct training programs and seminars that can provide both theoretical and practical knowledge for TOD and its implementation plan in Gaza city as most of the experts lack knowledge which increased challenges such as traffic congestion and pollution, long journey, road

accidents, and lack of advance IT system for traffic management in Gaza city.

10. There is consensus among experts about redesigning and widening the roads especially around markets and hospitals where there is a high volume of visits and a need to provide more space to avoid traffic congestion, as P2 confirmed, "Indeed, public transport needs wide streets that are designed to accommodate such vehicles".
11. Educating citizens on the benefits of TOD adoption means using periodicals, books, and reports or the media, for example, radio, TV, and social media P3 explain "educating young citizens about the importance of public transport and its benefits for the city. In particular key messages should focus on better mobility, less car traffic, less pollution, lower spending on transport (Greve, H. R., & Man Zhang, C. 2017). In addition, private landowners need to be encouraged to donate their lands for use in developing a public transport system that is beneficial for everyone.

9.6 Academic Recommendations

1. The map of land-use in the city is a major tool for planners when they study the functional structure of the city (Yeh, 1999), recent studies in the urban planning of developed countries are more concerned with the designs and distribution of road networks and land-use (Gwilliam, 2003). Road networks design is a key factor driving the expansion and effectiveness of land-use. A different administration from ottoman to Palestine authority come with a different plan from the other, so you find that the city of Gaza has different types of planning that do not correspond to a specific planning vision. This difference in planning for the city of Gaza has led to the misdistribution of land use. The nature of land-use in the city and its uneven distribution of services has led to the complexity of the planning of the city (Mohsen, 2015), and this has led to the lack of clarity of urban harmony in the city, which reflected negatively on the distribution of public facilities and services.

The major challenge with respect to land use distribution is that most of experts are not having much experience with respect to the planning of

land distribution, as a result there is a high need for future studies on land use distribution patterns, and this can help to renew the land use planning standard and to restructure the urban environment of the city of Gaza in a better state. In addition, this requires further research on this topic area to measure the distribution of land-use in the city.

2. There is a need for advanced geospatial analysis techniques to assess the spatial distribution of land use in Gaza City accurately. Future research should explore the application of Geographic Information Systems (GIS) and remote sensing technologies to analyse land use patterns, identify spatial disparities, and inform evidence-based urban planning decisions. By integrating geospatial data with demographic, socio-economic, and environmental indicators, researchers can gain insights into the dynamics of urban development and guide equitable land use policies and interventions.
3. The prioritisation of changing transport from auto-dependent city structure to more sustainable public transport systems is considered a major and new change for the residents of Gaza City. According to Liu et al. (2021), various studies investigated that there is a relationship between travel means and travel behaviour. As a result, this suggests investigating on how to measure the citizens behaviour to determine if the relationship was static or changes after the TOD implementation, and thus requires further research on this subject.
4. Longitudinal studies are essential to assess the long-term impacts of TOD implementation on urban sustainability, social equity, and economic development in Gaza City. Researchers should adopt longitudinal research designs and longitudinal data collection methods to track changes in key indicators over time, monitor the effectiveness of policy interventions, and evaluate the resilience of urban systems to external shocks and stressors. By documenting trajectories of change and identifying emergent trends, longitudinal impact assessments can provide valuable insights for adaptive urban governance and inform iterative policy adjustments to address evolving urban challenges in Gaza City.

5. Researchers and academic associations should look for more integrated solutions for the problems of transport, urban sprawl and environmental issues. These solutions have to be designed appropriately for the context of Gaza City and its current hard circumstances.

9.7 Limitations and Future Research Directions

1. The first limitation of this study is that this study used a single case study as a research strategy, by focusing only on Gaza City. As a result, the findings of this study cannot be generalised to either other Palestinian cities, developing countries or disputed cities. Therefore, future studies could select more than one city and a wider range of experts to help generalise developed, balanced and equitable urban planning strategies that integrate land-use and road networks using a TOD approach.
2. The war situation, high unemployment rate, and high rate of corruption, have increased the challenges in implementing a TOD model in Gaza City. Therefore, future studies could identify and evaluate the key factors required to facilitate TOD implementation in a different context.
3. Other developed countries have e-government/digital open government systems which can be useful in collecting data on investment in the infrastructure in their urban/capital cities. However, the researcher found it challenging to extract such data from these ministries and municipalities as these documents are highly confidential and cannot be revealed outside the organisation. Therefore, future studies could seek to gain more information on this to inform TOD projects.
4. Despite the weak execution of legal infrastructure, lack of experience in TOD and urban planning, low economic growth, the TOD approach may offer a key planning solution for Gaza City. Future studies may produce different results and influencing factors on successful TOD model implementations. Although mixed method results are useful in generalising findings, self-reporting bias especially in quantitative studies may limit the use of some results for specific contexts.
5. Capacity building and knowledge transmission initiatives are of the utmost importance in Gaza City in order to enable policymakers, urban planners,

and local authorities to efficiently strategize, execute, and oversee TOD projects, P4 said *“I think there are no TOD specialists in the committee, also in Gaza City. There is also a shortage of experts or specialists in the field of public transport.”* Further investigation is warranted into the establishment of knowledge-sharing platforms, training programmes, and seminars that augment institutional capacity and technical expertise in the planning and execution of TOD. Effective collaboration among academic institutions, government agencies, and international organisations can foster the interchange of innovative approaches to TOD, best practices, and lessons learned. Gaza City can support sustainable urban development and TOD initiatives with a knowledgeable workforce and institutional infrastructure by investing in capacity building and knowledge transmission.

9.8 Conclusion

This study has explored the integration between road networks and land use by using a TOD approach in Gaza city and proposed new areas of further research in decentralized planning and management. Advocates of decentralisation argue that providing a greater authority to local decision-making bodies can improve the efficiency of urbanism and transport.

This study also represents a first and key step in the use of other planning methods. The framework suggested that there are existing obstacles related to the TOD implementation and has provides with a number of recommendations on how to improve the overall infrastructure usage within the Gaza city context. Therefore, this framework highlighted a need for collaboration between the government, investors, and the municipality in order to arrange financial resources and human capital to implement TOD in Gaza city. In addition to this, there is need to guide the TOD environmental and economic benefits to people.

Future studies could examine the cause-effect relationship in terms of improvements to quality of life through the use of smart cities and green TOD plans which also consider sustainable development.

According to the fourth chapter, the road network in Gaza City needs 21 connections to reach the maximum, similarly the network connectivity did not complete, and in order for the transport network in Gaza City to reach complete network, we need to add 26 roads, to the road network in Gaza City. So the government and the municipality of Gaza must coordinate and cooperate among themselves and hold workshops with specialists or support and encourage study research to determine the locations of these roads in accordance with planning criteria.

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10 Appendix

Appendix 1 Ethical Approval



University of
Salford
MANCHESTER

Research, Innovation and Academic
Engagement Ethical Approval Panel

Research Centres Support Team
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29 June 2018

Ahmad Shabat

Dear Ahmed,

RE: ETHICS APPLICATION STR1718-49: The Integration Between Road Networks and the Land-use in Developing Countries: Case Study of Gaza

Based on the information you provided, I am pleased to inform you that your application STR1718-49 has been approved.

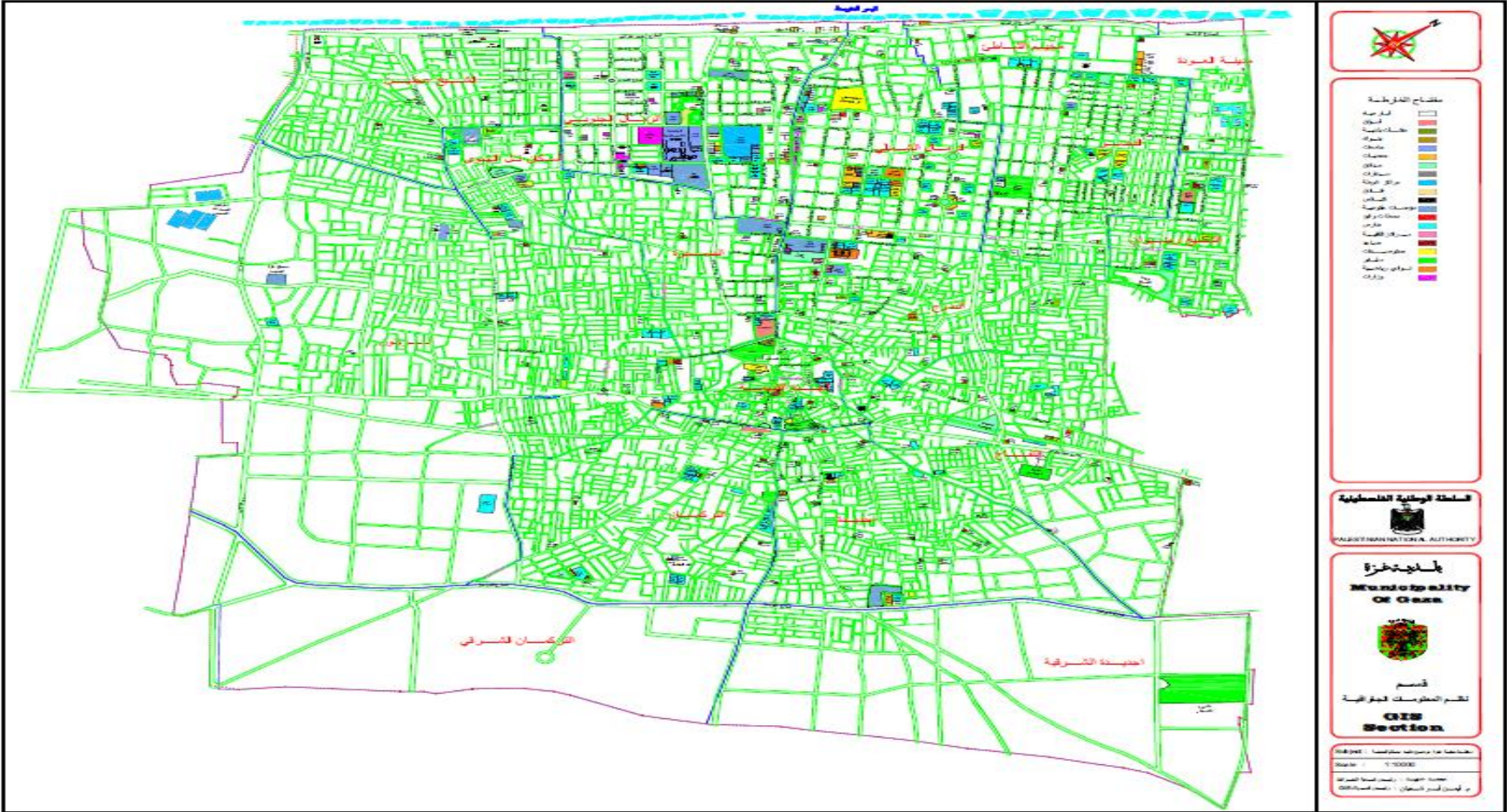
If there are any changes to the project and/ or its methodology, please inform the Panel as soon as possible by contacting S&T-ResearchEthics@salford.ac.uk

Yours sincerely,

A handwritten signature in black ink that reads "A Higham".

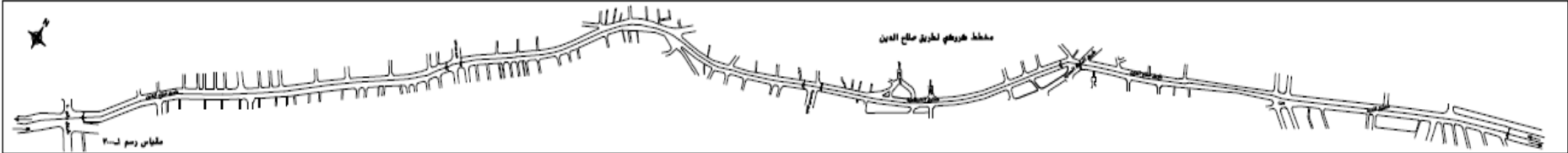
Dr Anthony Higham
Chair of the Science & Technology Research Ethics Panel

Appendix 2 The features of Gaza City.

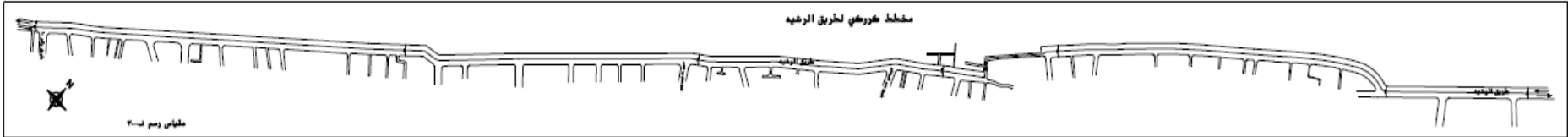


Appendix 3 Main roads in Gaza

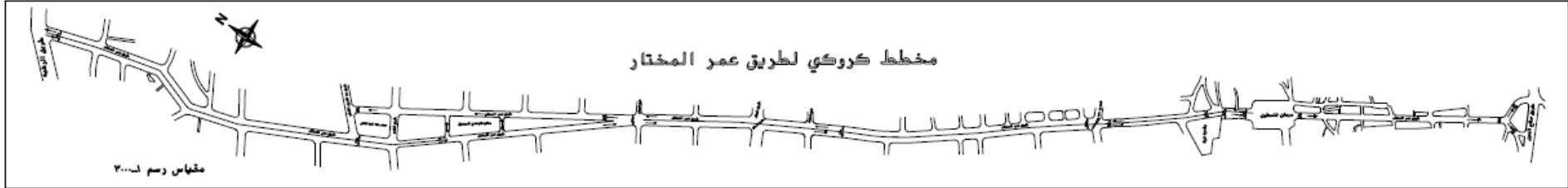
Salah al-Din Road



Al-Rasheed Road



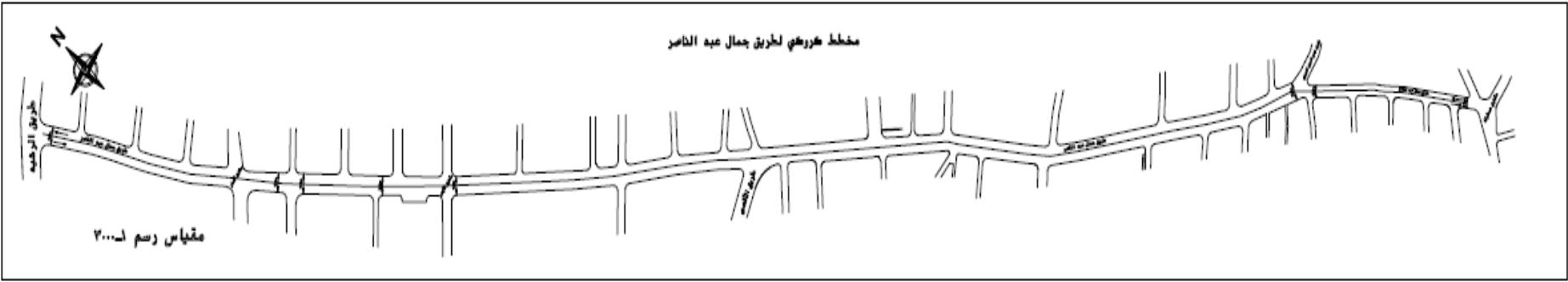
Omar UI-Mukhtar Road



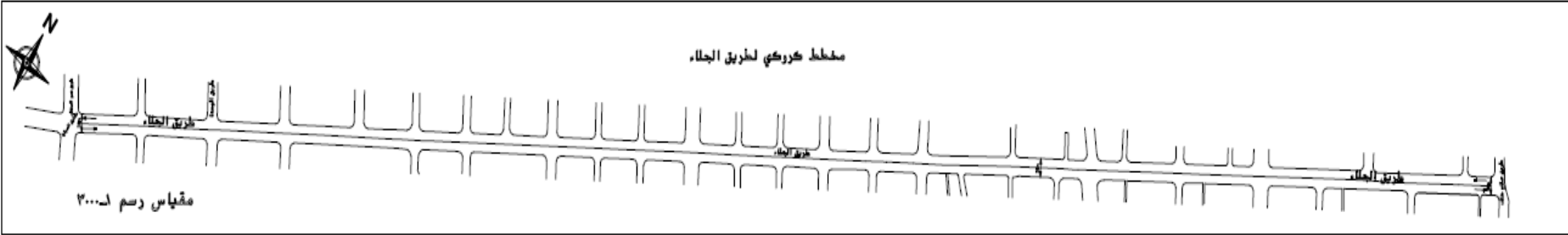
Al Weahda Road



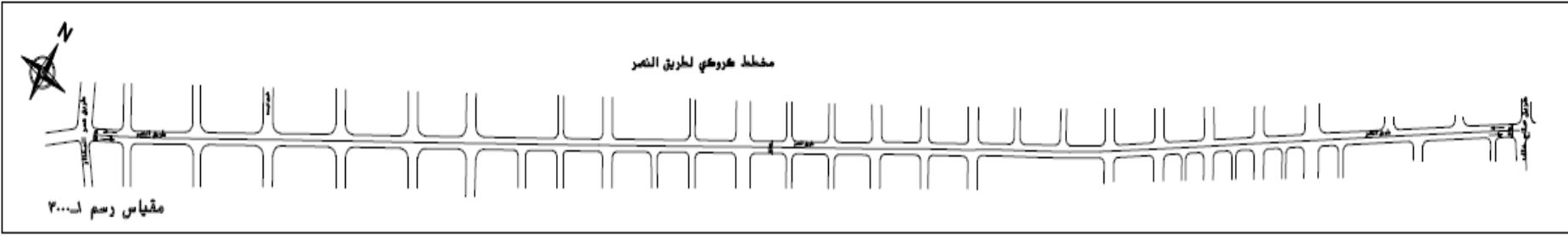
Jamal Abdalnasser Road (Altlatini)



Al-Jalaa Road



Al-Nasr Road



Appendix 4 The detour index

The Road	Real length	Straight length	The detour index
Al Rasheed	6519	6397.9	101.8
Al sika Alhadeed	5012	4862	103
Karama	8906	7673.8	116
Salah al-Din	7866	5932.5	132.5
Khalil Alwazir	6151	5685	108.1
Aoun Al-Shawa	6366	5529	115.1
Abu Ali Iyad	1659	1632	101.6
Ahmed Abdel Aziz	1712	1689	101.3
Al-Aqsa	3292	3116	105.6
Al Thawra	1290	1270	101.5
Algeria	898	853.7	105.1
Galaa	2966	2922	101.5
Khartoum	1740	1661	104.7
Rabat	1525	1478	103.3
Riyadh	4636	4193.5	110.5
Shuhada	1887	1815.9	103.9
Assahaba	1291	1238	104.2
Al Awameed	951	876.5	108.4
Al Qahira	1312	1256.6	104.4
Al Quds	2807	2641	106.2
Al Mashahrah	1454	1328	109.4
Al Moghrabi	1732	1531	113.1
Al Mansoura	4317	4199.6	102.7
Al Montar	2456	1964	125
Al Nasr	3003	2972.5	101.2
El Nafaq	1842	1558.4	118.1
Al Wahda	3367	3209	104.9
Al Yarmouk	2998	2945	101.7
Umm El Laimon	1533	1477.9	103.7
Ahmed Al Shukairy	2324	1900	122.3
Amin Al - Hussein	2412	2369.8	101.7
Baghdad	3043	2945	103.3
Por Said	1338	1278	104.6
Beirut	1399	1353.5	103.3
Beirut	1500	1295	115.8
Jamal Abdunasser	3207	3174	101
Khaled Al Hassan	1925	1894	103.2
Khalid ibn al-Walid	1766	1726	102.3
Dimashq	894	861	103.8
Ashara	5885	5708	103.1
Tesaa	4390	4303.9	102
Saad Sayel	1749	1703.8	102.6
Said Al Aas	2926	2899.5	100.9

Salah Khalaf	2870	2671	107.4
Sana'a	1674	1627	102.8
Siam	2454	2000.8	122.6
Tariq bin Ziyad	2164	2139	101.1
Abdul Qader Al - Husseini	1765	1730	102
Izz al - Din al - Qassam	3012	2961	101.7
Amman	1918	1872	102.4
Omar Ul Mukhtar	5197	3972.5	130.8
Omar bin al-khattab	2383	2330	102.2
Omar Bin Abdulaziz	1337	1273	105
Filastin	3369	2909	115.8
Kamal Adwan	1333	1304.8	102.1
Kamal Nasser	3967	3767.5	105.2
Mohammed Yousef Al Najjar	1406	1379	101.9
Mostafa Hafez	1515	1482.5	102.1
Mamdouh Saidem	1407	1386.6	101.4
Hayel Abdel Hamid	1208	1186	101.8
Wadi Al Arayes	3913	3175	123.2
Yaffa	2475	2078	119.1
Yousef Al - Azma	2493	2438	102.2
Jameaat Al dowl Al Arabiya	1907	1676	113.7

Appendix 5 Semi-structure interview questions

Research Participation Information Sheet

Research Title:

Urban Land-use and Road Networks in Developing Countries: Applying TOD methods to the Case of Gaza City

Researcher: Ahmad Yusuf Shabat, Doctoral Research Student, Salford Built Environment School, UK.

Introduction

I would like to invite you to take part in my PhD research study about Urban Land-use and Road Networks in Developing Countries: Applying TOD methods to the Case of Gaza City

This research will contribute to understanding the problems and solutions related to integrating the road networks and land-use and the importance of applying those to achieve the highest levels of planning in developing cities particularly Gaza city. This study could be a platform and a stepping stone for further research in urban transport that should be applied by planners and other Institutions.

What is the purpose of the study?

The overall aim of this research is to ***develop a balanced and equitable urban planning strategies that integration land-use and road networks using smart city approach.***

Why have I been invited to participate?

I am seeking to gather valuable opinions and views from key employees and employer representatives of urban planning and transport engineer experts. I am also looking for thought-provoking knowledge about quality and development visions. For these reasons, I have found you with, your expert capabilities, an ultimate choice.

Is participation voluntary?

Participation is entirely voluntary. If you are willing to participate, I will ask you to sign a consent form agreeing to this before we begin the interview. You will also be free to withdraw from the research study at any stage, without giving a reason why.

Semi-structure Interview Guide

“Urban Land-use and Road Networks in Developing Countries: Applying TOD methods to the Case of Gaza City”.

This thesis is prepared in partial fulfilment of the requirements for the PhD degree. The researcher seeks ***to develop a balanced and equitable urban planning strategies that integration land-use and road networks using smart city approach.***

1. Based on your work activity what does the word TOD means to you?
2. Have you participated in training programmes or courses related to TOD?

If yes, give details?

If no, give reasons?

3. What are the main reasons for not implementing a TOD in Gaza City?
4. To what extent are you familiar with the TOD concept?
5. If Gaza City is seeking to adopt and implement TOD, what are the key factors required for successful?
6. Which of the following factors are essential for TOD implementation and why?
(Chose from the following list)

- Accessibility -Perspectives and definitions
- Urban space quality –Place-making
- Complete streets

- Public Transport
- Mixed-Use Neighbourhoods with Efficient Buildings
- Neighbourhood Centres and Vibrant Ground Floors
- Car Use Management
- People culture

Are there other factors that you would add.....?

7. Do you think that adopting and implementing TOD in will face barriers?

If yes what are the main barriers that may face the adoption and implementation of TOD in Gaza City?

If no, give reasons?

8. Do you think that the implementation of TOD will achieve important and useful benefits for Gaza City?

If yes what are the main potential benefits that will be acquired by applying TOD?

If no, give reasons?

9. Please, briefly list the goals Gaza City has set for future planning and developmental projects?

Researcher: Ahmad Yusuf Shabat

Supervisor: Athina Moustaka

Appendix 6 The first draft of the questionnaire

Research Participation Information Sheet

Research Title:

Urban Land-use and Road Networks in Developing Countries: Applying TOD methods to the Case of Gaza City

Researcher: Ahmad Yusuf Shabat, Doctoral Research Student, Salford Built Environment School, UK.

Introduction

I would like to invite you to take part in my PhD research study about Urban Land-use and Road Networks in Developing Countries: Applying TOD methods to the Case of Gaza City

This research will contribute to understanding the problems and solutions related to integrating the road networks and land-use and the importance of applying those to achieve the highest levels of planning in developing cities particularly Gaza city. This study could be a platform and a stepping stone for further research in urban transport that should be applied by planners and other Institutions.

A.4 Job:

Employee Student Private business H
ousewife Without work Other (determine)

A.5 Workplace:

Inside neighbourhood outside neighbourhood
 outside city

Other
(determine) _____

B. Trips and Transport means:

B.1 What are the most trips that you do during a week?

Work trips Social trips Shopping trips

Other trips (determine) _____

B.2 What is transport means you mainly depend on to do your daily trips?

Private car Public transpiration Taxi Walking

B.3 How much time do you spend to arrive at your workplace?

Less than 10 min 11-20 min 21-30 min more than 30 min

B.4 What is your evaluation for the performance and efficiency of the current transpiration network and the public transport?

Excellent Acceptable Weak

C. Walk and Using Public Transport

C.1 How long can you walk on feet to the work, home or any other trip?

5 min

10 min

15 min

more than 15 min

C.2 Which path is preferable for you to walk in?

Shortest with least metric distance
changes

Simplest with least angular

Question No.		Yes	Partly	No
C.3	Do you agree with walking while going on any trip?			
C.4	Do you agree with the pedestrians' corridors?			
C.5	Do you agree with the establishment of pedestrians' and bicyclists' lanes within the streets?			
C.6	Is the idea of afforesting, lighting and furnishing streets encourage you to walk to reach your destinations?			
C.7	Do you agree with the idea of depending on public transport means after developing it and reduce costs?			
C.8	Do you think that the idea of encouraging walking and using public transport can improve the social relationships between the citizens of the neighbourhood?			
C.9	Do you think that depending on public transport can contribute to solving the fuel problem that effects on Gaza?			

Question No.		Yes	Partly	No
D.1	Do you agree with the foreign vehicles that pass, enter and penetrate the heart of your neighbourhood?			
D.2	Do you agree with the idea of existing all educational, commercial, administrative, health and recreational services in your area?			
D.3	Do you think that a good transport network may increase the quality of the living conditions of the area?			
D.4	Do you think that the direct connection of your area with other areas and the city centre by an efficient transport system may increase the degree of satisfaction of residents?			

Contact details for further information.

Researcher: Ahmad Yusuf Shabat

Supervisor: Athina Moustaka

Appendix 7 The final draft of the questionnaire

Research Participation Information Sheet

Research Title:

**Urban Land-use and Road Networks in Developing Countries:
Applying TOD methods to the Case of Gaza City**

Researcher: Ahmad Yusuf Shabat, PhD Student @ School of Built Environment, University of Salford, UK.

I would like to invite you to take part in my PhD research study titled above. The questionnaire will only take 20 to 30 mins.

This thesis is prepared in partial fulfilment of the requirements for the PhD degree. The researcher seeks *to develop a balanced and equitable urban planning strategies using smart city approach to integrate land-use and road networks.*

This research will contribute to understanding the challenges and opportunities for applying TOD methods as a new way of integrating the main features of road networks with land-use patterns, with a special emphasis at planning and policy issues in developing cities particularly Gaza city. This study could be a platform and a stepping stone for further research in urban transport that should be applied by planners and other Institutions.

**Questionnaire Category
Gaza City Local Citizens**

Questionnaire Survey Instructions

* We would like to invite you to take part on a questionnaire survey. This study aims to investigate *“Urban Land-use and Road Networks in Developing Countries: Applying TOD methods to the Case of Gaza City”*. If you can kindly spare a few moments of your time to answer all questions to the best of your knowledge/experience.

* I am seeking to gather valuable opinions and views from key employees and employer representatives of urban planning and transport engineer experts. I am also looking for thought-provoking knowledge about quality and development visions. For these reasons, I have found you with, your expert capabilities, an ultimate choice.

* This questionnaire is anonymous and unbiased. If there is any question(s) that you are unwilling or unable to answer, please skip to the next question.

* All information will be used for academic purposes. Participation in this study is completely voluntary; if you decide not to participate there will not be any negative consequences.

* The questionnaire should take between **5-10 minutes**

* If you have a concern about any aspect of this study, then please contact me:

Name: Ahmad Yusuf Shabat
Email: a.y.shabat@edu.salford.ac.uk

B. General Information:

A1. Gender:				
Male <input type="checkbox"/>		Female <input type="checkbox"/>		
A2. Age:				
Less than 18 <input type="checkbox"/>	19-26 <input type="checkbox"/>	27-45 <input type="checkbox"/>	46-65 <input type="checkbox"/>	more than 65 <input type="checkbox"/>
A3. Job: (if employed please go to question A4)				
Employed <input type="checkbox"/>	Self-employed <input type="checkbox"/>	Student <input type="checkbox"/>	Housewife <input type="checkbox"/>	Others (plz specify) _____
A4. Workplace:				

Inside city walkable distance <input type="checkbox"/>	Inside city long distance <input type="checkbox"/>	outside city <input type="checkbox"/>
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C. Commuting and used means of Transport

B1. The main purpose of your usual trips is for (Place-making)				
Work <input type="checkbox"/>	Social <input type="checkbox"/>	Shopping <input type="checkbox"/>	Others -----	
B2. What is your usual mean(s) of transport (pick more than one if applicable)				
Walking <input type="checkbox"/>	Private car <input type="checkbox"/>	Taxi <input type="checkbox"/>	Bus <input type="checkbox"/>	Others -----
B3. Please rate your satisfaction at the performance of the local transport (Complete streets)				
Strongly Satisfied <input type="checkbox"/>	Satisfied <input type="checkbox"/>	Don't know or doesn't apply <input type="checkbox"/>	Unsatisfied <input type="checkbox"/>	Strongly Unsatisfied <input type="checkbox"/>
B4-1. How much time do you spend to arrive at your destination? (Accessibility)				
Less than 15 min <input type="checkbox"/>	16-30 min <input type="checkbox"/>	31-45 min <input type="checkbox"/>	more than 45 mins <input type="checkbox"/>	
B4-2. Which path is preferable for you to walk in?				
Shortest distance <input type="checkbox"/>		Walking through market <input type="checkbox"/>		

D. Factors of integrating road networks and land-use

From a scale of 1 to 5, with 5 being the highest and 1 being the lowest, please rate the following:

Q No.	<i>Urban Space Quality –Place-making</i>	1 Strongly Unsatisfied	2	3	4	5 Strongly Satisfied
PM1	I always walk to my destinations					
PM2	The current corridors are meeting the pedestrians'					

	needs and there is no need for any further development					
PM3	I believe walking will have a benefit on both greater economic (saving fuel), social (gathering) and environmental (healthy) impacts					

Q No.	Complete streets	1 Strongly Unsatisfied	2	3	4	5 Strongly Satisfied
CS1	Planners should provide wider pavements for pedestrians					
CS2	Planners should add special lane(s) for bicycle riders?					
CS3	I only walk on streets that are safe and appealing					
CS4	I prefer using mixed-use patterns rather than separating land-use (residential, commercial, entertainment, etc)					

Q No.	Public Transport performance	1 Strongly Unsatisfied	2	3	4	5 Strongly Satisfied

PTP1	Citizens should rely more on public transport rather than using private cars					
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Q No.	Accessibility	1 Strongly Unsatisfied	2	3	4	5 Strongly Satisfied
A1	I have different accessible ways to approach my destination					

Thank you

Contact details for further information

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