The Islamic University–Gaza
Research and Postgraduate Affairs
Faculty of Engineering
Master ofInfrastructure

الجامعـــــــــة الإســـلاميــةـ غـزة
شئون البحث العلمي والدراسات العليا
كـليـــــة الهندسة
ماجستير البنيةالتحتية

Traffic Impact of Planned Gaza Seaport on Major Roads in Gaza Strip

تأثير إنشاء ميناء غزة البحري على حركة المرور في الشوارع الرئيسة في قطاع غزة

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A thesis submitted in partial fulfilment
of the requirements for the degree of
Master of of Science in Civil Engineering, Infrastructure

March, 2016 -Jumada AlThani, 1437

إقــــــرار

أنا الموقع أدناه مقدم الرسالة التي تحمل العنوان:

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تأثير إنشاء ميناء غزة البحري على حركة المرور في الشوارع الرئيسة في قطاع غزة

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بناءً على موافقة شئون البحث العلمي والدراسات العليا بالجامعة الإسلامية بغزة على تشكيل لجنة الحكم على أطروحة الباحث/ **حسين خليل أحمد أبو ظريفة** لنيل درجة الماجستير في **كلية *الهندسة*** قسم الهندسة المدنية – البنى التحتية وموضوعها:

تأثير إنشاء ميناء غزة البحري على حركة المرور في الشوارع الرئيسة في قطاع غزة

Traffic Impact of Planned Gaza Seaport on Major Roads in Gaza Strip

وبعد المناقشة التي تمت اليوم الأحد 29 شعبان 1437هـ، الموافق2016/06/05م الساعة الحادية عشرة صباحاً، اجتمعت لجنة الحكم على الأطروحة والمكونة من:

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وبعد المداولة أوصت اللجنة بمنح الباحث درجة الماجستير في **كلية *الهندسة*** / قسم الهندسة المدنية- البنى التحتية.

واللجنة إذ تمنحه هذه الدرجة فإنها توصيه بتقوى الله ولزوم طاعته وأن يسخر علمه في خدمة دينه ووطنه.

والله ولي التوفيق ،،،

نائب الرئيس لشئون البحث العلمي والدراسات العليا

أ.د. عبدالرؤوف علي المناعمة

Abstract

Background and Problem: Establishment of a commercial seaport in Gaza Strip is a strategic national project that has several implications on different aspect of life including socioeconomic ones. However, construction of this project without studying its impact on the transportation sector, which is considered among the most important sectors in Gaza Strip, is expected to create a problem in the transportation network in the project area. This may obstruct or even prevent traffic flow as a result of the expected growing demand to access the seaport area especially by trucks.

Aim and Objectives: The aim of this thesis is to study, the impacts of establishing Gaza commercial seaport on the roadway network in the Gaza Strip, To achieve this goal, the objectives wereplanning, management and decision-making process in the transportation sector.

Methodology: In the research methodology, TransCAD program has been utilized as a main research tool. TransCAD is a specialist software in transportation planning. Analysis results showed that the traffic morning peak occurs from 7:00 to 10:00, and that the average Peak Hour Factor is 0.91.The heaviest peak hour traffic flow was 20,915 veh/hr at the intersection of Jalaa and Omar al-Mukhtar streets, known as the Saraya intersection.

Results: Results showed that traffic in the areas near the seaport will be affected more by the seaport construction. Seaport impact on the intersections of Al-Rasheed and Al-HurreyaStreets (Netzarim intersection) is estimated at more than 10%, while no effect has been found on the Saraya intersection. The total travel hours on the network was 19,981 hours in 2015 and has been estimated at23,729 hours in 2020 without the presence of the port. The latter figure is expected to reach 32,635hours in 2020 if the port is constructed..

Keywords:seaport,Gaza Strip,TransCAD,transportation,intersection

Abstract in Arabic

خلفية ومشكلة الدراسة:يعتبرانشاء ميناء تجاري بحري في قطاع غزة مشروعا وطنيا له تداعياته على الكثير من جوانب الحياة الاقتصادية والاجتماعية. وتنفيذ هذا المشروع من دون دراسة تأثيره علي قطاع المواصلات والذي يعتبر من أهم القطاعات في قطاع غزة سيؤدي إلي ظهورمشكلةفيشبكة المواصلات في المنطقة مما قد يؤدي إلي إعاقة حركة المرور أو توقفها أحيانا بسبب زيادة الطلب علىمنطقة الميناء وخاصة من الشاحنات.

هدف الدراسة:وفي هذا البحث تمت دراسة تأثير إنشاء ميناء غزة التجاري البحري علي شبكة الطرق في قطاع غزة وخاصة في المناطق القريبة من الميناء وتحديد اقصر الطرق من مختلف المناطق في قطاع غزة إلي منطقة الميناء.

ومن أهم مخرجات هذا البحث الوصول إلي نموذج محوسبلشبكة الطرق في قطاع غزة وأيضا قاعدة بيانات مربوطة بنظم المعلومات الجغرافية، وذلك من شانه أن يكون داعما ومساعدا في عملية التخطيط والإدارة واتخاذ القرار لقطاع المواصلات.

منهجية الدراسة:-تم الاعتماد في منهجية البحث في هذه الدراسة علي استخدام برنامج TransCAD وهو احد البرامج المتخصصة في تخطيط المواصلات. وقد أوضحت نتائج التحليل أن ساعة الذروة المرورية الصباحية كانت من 7:00 الي 10:00 وبلغ متوسط معامل ساعة الذروة للشبكة (Peak Hour Factor) (0.91) ، وكذلك بلغت اكبر قيمة حركة مرورية في ساعة الذروة 20,915veh/hr في تقاطع شارع الجلاء مع شارع عمر المختار المعروف بتقاطع السرايا.

أهم النتائج:-واستنادا الي النتائج، تم استنتاج ان المناطق القريبة من الميناء ستتأثر بشكل اكبر من المناطق البعيدة حيث بلغت نسبة تأثير الميناء علي تقاطع شارع الرشيد مع شارع الحرية (نتسريم) أكثر من 10% بينما لم يكن هناك أي تأثير علي تقاطع السرايا. وكذلك بلغ مجموع ساعات السفر لمركبات الشبكة19,981 ساعة لعام 2015 و 23,729ساعة لعام 2020 من غير وجود الميناء و 32,635ساعة بوجود الميناء لعام 2020.

كلمات مفتاحيه: ميناء بحري، قطاع غزة، TransCAD، مواصلات،تقاطع.

Dedication

I would like to dedicate this work to my wife and family

for their endless and generous support

Acknowledgment

I would like to express my sincere gratitude and heartfelt thanks to the late Dr. EssamAlmasri and Dr Yahya AL Sarraj; the supervisors of my thesis, for their strong support and guidance throughout theduration of this research. Deep thanks and gratitude are also due to my father Mr. Khalil Abu Zarifa and my mother Mrs. Najah Abu Zarifa for their infinite support and encouragement. I would also like to express my thanks to my wife Walaa Abu Zarifa for her patience, support, encouragement and forbearance during the time in which this workwas done. I also offer great thanks to my brothers and sisters for their love and encouragements. I deeply thank my colleagues in the Civil Engineering Department for their assistance during this research.

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List of Abbreviations

PCBS	Palestinian Central Bureau of Statistics
CCA	Conventional Cross Classification
GDP	Gross domestic Product
GIS	Geographic Information System
GNP	Gross National Product
ITE	Institute of Transportation Engineers
LOS	Level of Service
MCA	Multiple Cross Classification
MLR	Multiple Linear Regression Technique
OD	Origin Destination
PHF	Peak Hour Factor
TAZ	Traffic Analysis Zones
TEU	Twenty-foot Equivalent Unit
VOC	Volume Over Capacity

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Chapter Introduction

Currently thetransportation system in Gaza Strip consists only of road transport. The Gaza strip has a small, poorly developed road network. The road network consists of 61 km of main roads, 57.8 km of regional roads and 511 km of local roads (PCBS, 2007). There was a single railway line running from north to south along its center. Nowadays,the railway trackis deserted and in disrepair, and little parts of the rack remains. Gaza strip had a small airport to the east of Rafah Governorate; however, it was totally destroyed by the (Israeli) occupation several years ago. At the start of the Palestinian National Authority (PNA), a small seaport has been built which is only used by fishermen. Since the time of building this seaport, it was not allowed for foreign ships to dock at the seaport (Almasri, 2012).

1.1 Problem Statement

The Gaza Strip is suffering from strict siegebyland, sea and air. This siege was imposed by the (Israeli) occupation on Gaza Strip after the legislative elections in 2006. (Israeli) then reinforced the blockade in June 2007. The siege Includes closing all borders between Gaza Strip and both Egypt and (Israeli); and preventing cement, gravel, fuel and many other commodities from entering Gaza Strip. Another aspect of the siege is restricting fishing area in the sea. Palestinian National Authority (PNA) has worked hard to create a seaport south of Gaza City, which is considered as one of the most important strategic projects in Palestine; politically and economically. The political importance of this project is embedded in establishing the concept of the rule of the Palestinian State on the international territorial water. The project also works to determine the dimensions of the territorial waters and the right of thePalestinian state in the areas of international water and in exploration of natural resources. In July 2014, the (Israeli) occupation launched new, cruel and devastating aggression on the Gaza Strip, which continued to 52 days. The most important Palestinian demands in the ceasefire negotiations was lifting the siege and establishing a commercial seaport. The aim of the Palestinians of the establishment of this seaport is to create a free crossing from Palestine to the outside world, which would improve the economic situation.This is becausethe construction of the commercial seaport is considered by the Palestinians as one of the important steps to connect the local economy with the global economy. It also helps on expanding international trade and development of exports, local industries and business services.This,inturn,wouldwork to increase the GDP and to raise the level of income in addition to the creation of many permanent jobs.

The Gaza commercial seaport has many expected positive effects on the Palestinian economy; however, the establishment of the new commercial seaport should be based on scientific and systematic planning. Furthermore, the effects resulting from the establishment of the seaport on different sectors must be studied. One of the most important sectors is the transportation sector, which is the subject of study in this research.

1.2 Aim and Objectives

Given the above context, the aim of this research is to study the effect of establishing a new commercial seaport in Gaza Strip on its major highways and on highways close to the seaport by applying a transportation planning process.

The objectives of this research are:

1. To evaluate the current transportation system of Gaza Strip before the seaport construction.
2. To estimate and calibrate the future traffic demand before constructing the seaport.
3. To estimate and calibrate the future traffic demand afterconstructingthe seaport.
4. To analyze the futureoftraffic situation in the system,before and after constructing the Gaza Sea Port.

1.3 Historical Review for the Transportation Planning

Conventional travel demand forecasting begins with collection of general data on land use, socioeconomic, demographic, and network characteristics (Garber et al., 2009).

After collecting data, the conventional travel demand forecasting process follows the sequential four-step model. Prior to start with the four-step model, the study area must be divided into a set of traffic zones that have homogeneous socioeconomic and land use characteristics. These zones form the basis for analysis of travel movement within, into and out of the urban area. The four steps of conventional travel demand forecasting model are sequenced as trip generation, trip distribution, mode choice, and traffic assignment (O'Flaherty et al., 1997):

1. Trip generation determines the number of trips starting or ending at an area (zone) in a given time such as per day or per hour. It is based on determining a relationship between trip making and land uses, household demographics, and other socioeconomic factors.
2. Trip distribution is the process by which the planner calculates the pattern of trips between the zones. It describes the number or proportion of trips from an origin zone spread amongst all destination zones.
3. Mode choice computes the patterns of trips between origin and destination zones that use a particular transportation mode.
4. Traffic assignment determines the volume of travel on each individual movement at intersections of the transportation network.

From the time when the conventional four-stage travel demand forecasting was developed, a number of highly critical reviews to the model have been seen. In response to criticisms, improvements have been made to the four-stage modeling approach and new modeling approaches have come out (Bwire, 2008).

1.4 Study Limitations

The thesis focuses on the Origin Destination matrix estimation and calibration, performance and flow assignment related. The study is limited to the morning traffic peak, based on traffic counts which was performed from 7:00 am to 10:00 am on an average weekday. The thesis faced and overcame many difficulties:

1. Lack of funds needed to cover expenses, especially the data collection and traffic counts process.
2. The thesis focus on software modeling to overcome the lack of physical modeling resource.

This thesis is limited to evaluate Gaza city network through modeling and applying a proper traffic flow assignment and O-D matrix estimation technique.

1.5 Brief Research Methodology

The traffic countswerecarriedoutat 22 intersections distributed around the area of Gaza Strip. This was performed on 25/10/2015 from 7:00 am to 10:00 am by 169 students of the civil engineering under the supervision of the researcher and advisor of this study. The students were divided into groups to cover the Gaza Strip. The researcherand the instructor visited the counting sites and identified thecounting locations.Before starting counting, students were trained on the counting method.

The next step is the network building. An ESRI shape file was transferred to TransCAD and used as a background to draw the network and the zones. Zoning system for Gaza Strip is very essential for the OD matrix estimation and traffic assignment. For that purpose, the overall characteristics of the Strip should be carefully studied. These characteristics include land use, main commercial and industrial activities, governmental and universities locations.

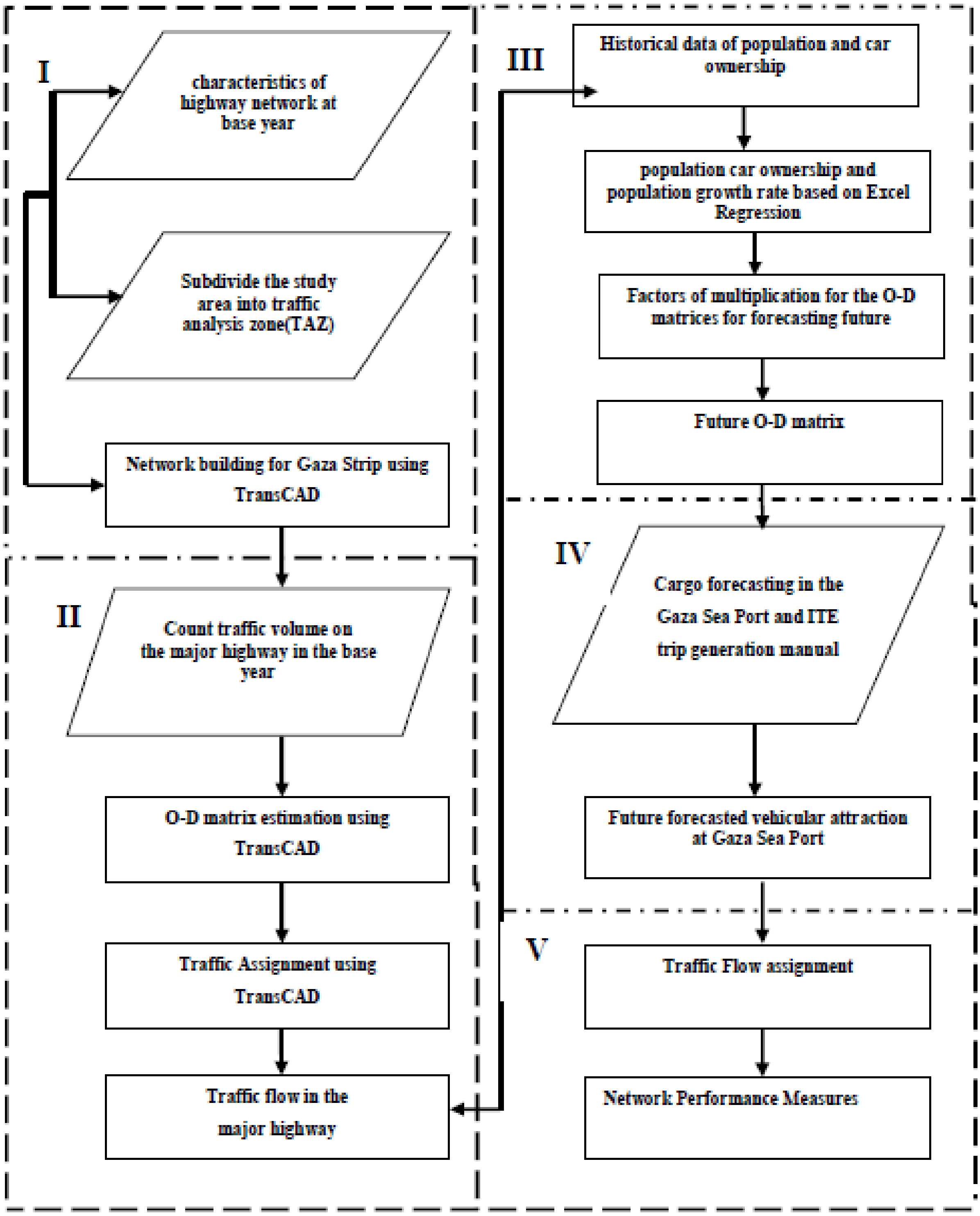
After building the network in TransCAD and entering the network attribute data, matrix estimation was carried out. Because there is no available prior OD matrix, a unit matrix was first assumed for the base year. Based on traffic counts, the OD matrix was estimated and validated. In the process of matrix estimation, the observed traffic flow at intersections and the modelled traffic flow at the intersections using suitable traffic assignment should be close to each other. Future OD matrix was then estimated based on the validated base year OD matrix and information about expected growth in trips produced in each zone; if available. At this case the singly constrained growth factor method might be used (O'Flaherty et al., 1997; Ortúzar et al., 2001).After finishing the future OD matrix,tripsattraction due to the port should be added as suggested by ITE.

This is done by multiplying different growth factors to different rows (or columns) in the O-D matrix. If this information is not available, uniform growth factor method is recommended by multiplying all O-D pair by the same amount.

Several scenarios wereanalysed with projected O-D matrix including open/close streets, over pass, city centre closure, capacity improvement and traffic signal installation. The comparison between the different scenarios was carried out depending on measures obtained by TransCAD as follows:

- Vehicle hours of travel(VHT)
- Vehicle kilometres of travel(VKT)
- Average congestion: Volume / capacity ratio
- Average Travel Speed

The following flowchart Figure 1.1 demonstrates methodology phases and processes



Figure(1.1):Flowchart of proposed forecasting process.(Source: Hamad, 2015).

Chapter 2
Literature Review

2.1 Background on Gaza Strip

The Gaza Strip has a surface area of 361 square kilometers. Its width varies from 9-10 kilometers in the north to 12-13 km in the south, with a minimum width of 5.7 km. The length of its shoreline is 40km. The biggest city is Gaza Town(588,000 inhabitants). Other urban centers are Khan Younis, Rafah and Deir El Balah. Refugee camps exist, such as Jabalia, Nuseirat and Maghazi. Outside the urban centers, the area is mostly used for agriculture to grow citrus and vegetables. This agriculture is of great importance for feeding the population and for exporting. In some areas, light industrial zones have been developed (Smaling,1996).

2.1.1 Geography

Gaza Strip is the southern part of the Palestinian Territories and is composed of five governorates namely; Gaza, Khan-Younis, Rafah, and Middle and North Governorates. Gaza Strip has an area of 365 km^2 and it is a narrow coastal strip of land with a length of 40km along the Mediterranean Sea in the northwest direction. It has 58 km borders with An-Naqab Desert to the east and south and 12 km with Egypt to the southwest. It takes its name from its main city Gaza (Almasri, 2012).

2.1.2 Population

The Gaza Strip has one of the highest densities of population in the world. In 2013 approximately 1.7 million Palestinians lived in the Gaza Strip, the largest city in Gaza Strip is Gaza, according to a 2013 census by the Palestinian Central Bureau of Statistics (PCBS). Gaza city had a population of 588,033 inhabitants, with a Population Density equals to 7,119 (Person/km^2)(PCBS, 2013).

Table(2.1): Demographics of the Gaza Strip, 2013 (Source: Palestinian Central Bureau of Statistics,2013)

City name	Rafah	Khan Yunis	Deir Al-Balah	Gaza city	North Gaza	Gaza Strip
population	221,648	336,205	260,080	616,287	355,790	1,790,010

2.1.3 Gaza blockade

'Israel' has a long history of isolating the Gaza Strip, as it has subjected the Strip to many closures since the 1990s, but the blockade imposed in 2007 was an unprecedented form of severe collective punishment. In September 2007,'Israel'declared Gaza a ‘hostile entity’ and decided that: Additional sanctions will be placed on the Gaza Strip in order to restrict the passage of various goods to the Gaza Strip and reduce the supply of fuel and electricity. Restrictions will also be placed on the movement of people to and from the Gaza Strip. The blockade is preventing reconstruction and recovery of thousands of homes, schools, hospitals and water networks destroyed during Israel’s military offensives in 2014, depleting the resources of a collapsing economy.The population of 1.6 million people, more than half of which are children, suffers from high levels of poverty and dependence on aid(Euro-mid Observer,2013).

2.1.4 Fishing industry

Palestinian fishermen have recently been allowed to resume some fishing activities in the Gaza Strip’s coastal waters following a near total ban since June 2006, restrictions on where they can fish continue to undermine the industry. More than 40,000 Gazans depend on the fishing industry as their primary source of income. At present, the (Israeli) authorities allow Palestinian fishing up to six nautical miles off the Gaza Coast, although a 2002 agreement between the United Nations and 'Israel' allowed for Palestinian fishing up to 12 nautical miles off the coast, while the Oslo Accords stipulated fishing rights up to 20 nautical miles. Starting in April each year, there is a migration of fish from the Nile Delta to Turkish waters on which Palestinian fishermen have traditionally relied. However, the larger schools of fish are present some 10 nautical miles off the Gaza Strip coastline. Many Gaza consumers now buy fish imported from 'Israel' rather than from their own fishermen at a significantly higher price. Fish is beyond the reach of many of the Gaza Strip's 1.5 million inhabitants.Fishing rights appear to be imposed arbitrarily, with fishing allowed in some locations but not others, on some days and not others. A better understanding of the defined fishing limits and a means of communication between (Israeli) naval boats and fishermen would reduce the hazards to fishing(UN Office,2007).

Currently, fishing is a very dangerous activity. Palestinian fishermen, in many occasions, are not allowed to go beyond 3 nautical miles off the coast.The(Israeli) forces usually fire at them, confiscate their boats and sometimes arrest some of them.

2.1.5 RafahCrossing

The Rafah Border Crossing lies on the international border between Egypt and the Gaza Strip that was recognized by the 1979 'Israel'–Egypt Peace Treaty and confirmed during the 1982 (Israeli) withdrawal from the Sinai Peninsula.In June 2007 the Rafah Crossing was closed by the Egyptian authorities after the legislative elections of the Gaza Strip. EU monitors pulled out of the region, and Egypt agreed with 'Israel' to shut down the Rafah Crossing.On 22 January 2008 after 'Israel' imposed a total closure on all crossings to the Gaza Strip, many thousands of Palestinians, with estimates ranging from 200,000 to 700,000, crossed into Egypt to buy goods. Palestinians were seen purchasing food, fuel, cigarettes, shoes, furniture, car parts, and generators. in mid-June 2011 the crossing was closed for several days and after that only a few hundred were allowed to cross each day compared with 'thousands' who applied to cross each day. Egypt reportedly agreed to allow a minimum of 500 people to cross each day.On 5 July 2013, in the wake of attacks on security forces in the Sinai following the overthrow of Mohamed Morsi, the border crossing was closed for several days by the Egyptian Army. It was later reopened for four hours each day(Wikipedia, 2014).

Currently, the Rafah Crossing is completely closed. People and goods are not allowed to cross from or to Gaza Strip. Every six to ten weeks, the crossing is sometimes being opened for two to three days only.

2.1.6 Transportation System

Today the transportation system in Gaza Strip consists only of road transport. The Gaza strip has a small, poorly developed road network. The road network consists of 76 km of main roads, 122 km of regional roads and 99 km of local roads (PCBS, 2013). There was a single railway line running from north to south along its centre. Nowadays it is deserted and in disrepair, and little track age remains. Gaza strip had a small airport to the east of Rafah Governorate; however, it was totally destroyed by the (Israeli) occupation several years ago. At the start of the Palestinian National Authority (PNA), a small seaport has been built which is only used by fishermen. Since the time of building this seaport it was not allowed for foreign ships to dock at the seaport (Almasri, 2012).

Table(2.2): Paved Road Network Length in the Gaza Governorate,2010
(Source: Palestinian Central Bureau of Statistics,2010)

City Name/ Road Type	Local	Regional	Main	Total
	Length in km			
Rafah	16.0	20.0	13.0	49.0
Khan Yunis	24.0	33.0	20.0	77.0
Deir Al-Balah	20.0	20.0	16.0	56.0
Gaza city	18.0	31.0	13.0	62.0
North Gaza	21.0	18.0	14.0	53.0
Gaza Strip	99.0	122.0	76.0	297.0

2.2 Seaport

A Seaport is a location on a coast or shore containing one or more Seaports where ships can dock and transfer people or cargo to or from land. Seaport locations are selected to optimize access to land and navigable water, for commercial demand, and for shelter from wind and waves. Seaports with deeper water are rare, but can handle larger, more economical ships. Since ports throughout history handled every kind of traffic, support and storage facilities vary widely, may extend for miles, and dominate the local economy. Some ports have an important military role(Kahil, Hjeer and Abu Shanab,2001) .

2.2.1 Seaport Features

The main objective of the Seaport is to provide a safe haven for ships that are looking for shelter, or refueling, or repairs or transfer of cargo and passengers. In the harbor, many elements are located such as the entrance, the fairway, the breakwater and quays, ships and stations, dry and closed basins, such as the availability of these elements follow-needed (Kahil,Hjeerand Abu Shanab,2001).

a) Seaport Entrance

The Seaport entrance demands careful consideration to ensure quick and safe entry of vessels in the harbor. The orientation and width of the entrance should reconcile two opposing criteria. For reasons of comfortable navigation, the Seaport entrance should communicate directly with the open sea and should be as wide as possible. On the other hand, the narrower and more protected the entrance, the smaller the degree of wave energy and deposits that penetrate the Seaport basin, resulting in more favorable conditions for attaining tranquility of the in port sea surface. The width of the Seaport entrance is defined in terms of the smallest length vertical to the entrance axis for which the minimum required draft applies. The depth at the entrance is generally determined by the maximum draft of the design vessel to be served(Tsinker,2004).

b) Approach Channel

The depth of the water in all parts of the Seaport to be sufficient for the purposes of vessel traffic in all parts of the Seaport, the waterway leading to the Seaport should be introduced and that deepens enough to provide safe passage for ships between the entrance and sidewalks inside the Seaport.

The term expresses engraved route, which is used by the ships of the sea connected to the aquarium inside the port. In addition, part of the fairway, located in the sea and near the entrance of the so-called outer corridor, but actually part of the corridor between the entrance and the harbor basin is called the internal corridor, is the protection of the internal passage of storms and waves by natural or by breakwaters.

c) Turning Basin

The space you need ship to the process of maneuvering, so when you enter or leave the marina.The size of the basin of rotation depends on the size of ships faring port, and preferably, basin rotation is designed to allow the ship to turn continuously without interference boats to help Tugs, which must be have a wide pelvis rotated so as to allow free ships, keeping in mindthat ships cannot drive back.

d) Sheltered Basin

Water Square is protected by breakwaters and the coast in this basin there areother elements of the Seaport zone like the locked basins.

e) Wharves and Quays

Wharves and Quays are built parallel to the beach or to the breakwater inside the port, which allows the award of ships along the pavement for the purpose of handling payloads, and are created by backfilling with soil or other materials and have a wide berth on the surface(Kahil, Hjeerand Abu Shanab, 2001).

f) Breakwaters

Breakwaters are built to reduce wave action in an area in the lee of the structure. Wave action is reduced through a combination of reflection and dissipation of incoming wave energy. When used for seaports, breakwaters are constructed to create sufficiently calm waters for safe mooring and loading operations, handling of ships, and protection of harbor facilities. Breakwaters are also built to improve maneuvering conditions at harbor entrances and to help regulate sedimentation by directing currents and by creating areas with differing levels of wave disturbance. Protection of water intakes for power stations and protection of coastlines against tsunami waves are other applications of breakwaters(Sannasiraj and Selvam,2014).

g) Jetties and Piers

Jetties are used for stabilization of navigation channels at river mouths and tidal inlets. Jetties are shore-connected structures generally built on either one or both sides of the navigation channel perpendicular to the shore and extending into the ocean. By confining the stream or tidal flow, it is possible to reduce channel shoaling and decrease dredging requirements. Moreover, on coastlines with long shore currents and littoral drift, another function of the jetties is also to arrest the crosscurrent and direct it across the entrance in deeper water where it represents less hazard to navigation. When extended offshore of the breaker zone, jetties improve the maneuvering of ships by providing shelter against storm waves. Jetties are constructed similar to breakwaters(Thomas and Ostbo,2010).

h) Locked Basins

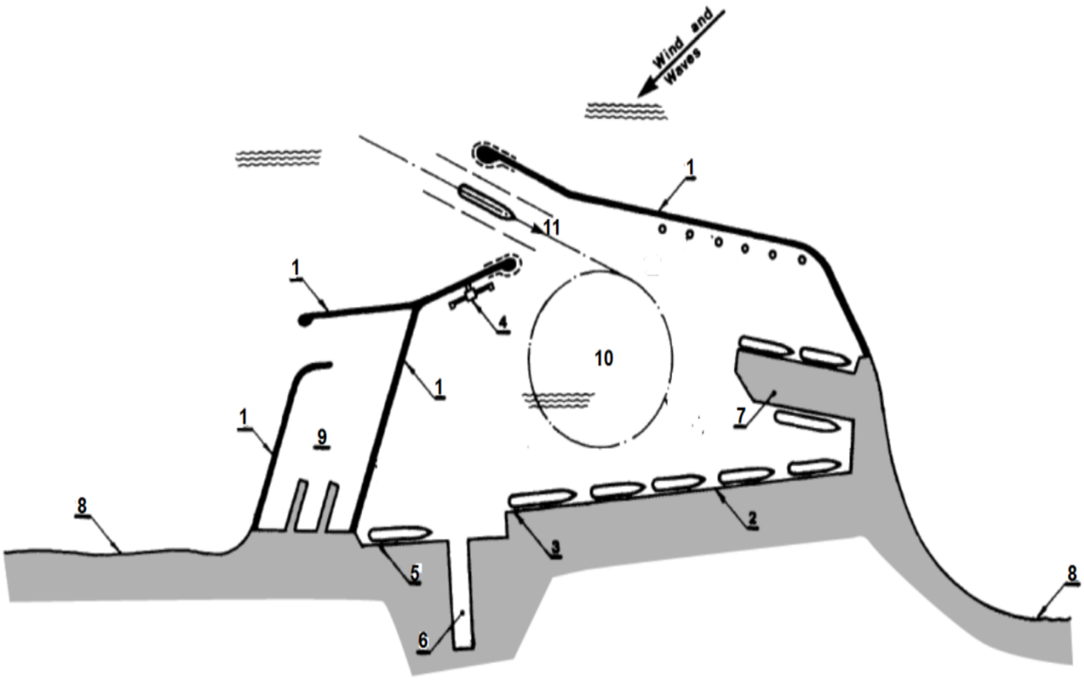
It is a closed basin, can dock their ships, and entrances are controlled via a private gate. In addition, the level of water inside these basins is not affected by changes that occur to the level of the water outside.

i) Dry Docks and slipways

The main purpose of which is the creation and maintenance and ship repair, shipbuilding the basin competent called basin construction, and stays dry for easy work. Pelvis Dry Provider at the entrance gate is closed when the boat entry into the tub and then pumping water to keep it outside dry.

j) Ancillaries

These include anchors, hooks and floats (buoys), and lights, stores and towers, fire protection and other services could be needed here (Kahil, Hjeer and AbuShanab,2001).



Figure(2.1): Layout of a large multipurpose artificial harbor.

(Source: Tsinker, 2004).

Note: 1, breakwater; 2, container terminal; 3, passenger terminal; 4, oil berth; 5, ship repair area; 6, dry dock; 7, general cargo terminal; 8, coastal line; 9, fishing port ;10, turning basin;11, harbor entrance.

2.3 Alternative Forecasting Methods

2.3.1 The Non-Parametric Regression Tree Methods

The first traffic count prediction mechanism is based on Regression Tree (RT) structure (Breiman et al, 1993). The RT structure aims at identifying the most prominent model for the traffic count prediction based on a recursive set of rules forming a non-parametric prediction framework. Here, the structure uses three individual prediction methods able to model highly nonlinear data sets and is based on spline extrapolation tactics. Splines are piecewise functions that have been extensivelyused in data sets smoothing or missing values estimationutilizing their exceptional fitting ability (Draper and Smith, 1998). Especially cubic splines are amongst the most powerful spline types since a third degree polynomial function is used for joining each interpolation point (knots) of the data set domain [a,b]:

$$s(x_t) = P_0(x_t), \quad t_0 \le t \le t_1,$$

$$s(x_t) = P_1(x_t), \quad t_1 \le t \le t_2,$$

$$\vdots$$

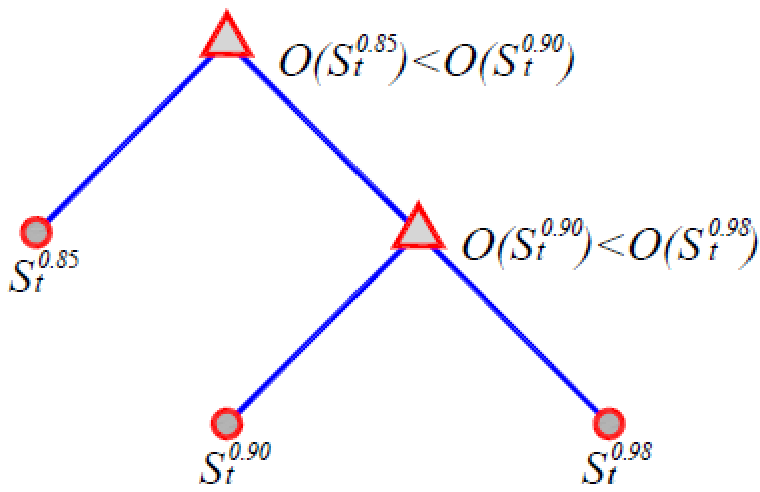
$$S(x_t) = P_{n-2}(x_t), \quad t_{n-2} \le t \le t_{n-1}, \qquad \text{................................... (1)}$$

where a = t0 < t1 < ... < tn−2 < tn−1 = b and Pn a third degree polynomial. Here, knots are selected equidistantly representing each point of the training data set. Data interpolation by splines can be further controlled by a smoothing parameter in order to avoid over-fitting. Smoothing can be based on the following formula:

$$\hat{y}_t = p\sum_t w_t(y_t - s(x_t))^2 + (1-p)\int\left(\frac{d^2s}{dx^2}\right)^2 dx \qquad \text{.................... (2)}$$

where wt stands for a weight factor, y^t) for interpolated value, yt are the observed data and s(xt) for the cubic spline value for data at point t respectively, while p∈(0,1) is the smoothing factor. In time series xt ≡ t As it can be observed in (2) when p tends to 1 a cubic spline interpolation is produced while when p tends to 0 a least squares straight line is fitted to the data. The estimation of s(xt) are based on ordinary least squares. Finally, the extrapolation of one step forecast (t+1 period) is based on (2) by feeding the last cubic polynomial with xt+1 ≡ t +1 .

In order to produce one step forecast, a subset of 20 past observations is used, in a recursive manner. Here, after examining several values for p, three values are selected, namely 0.85, 0.9, 0.98, as alternative spline extrapolation methods, notated as St(0.85) , St(0.9) and St(0.98) respectively. The performance (accuracy of forecast) O(Sit) of these three individual methods i in time t is compared, in order to decide the one in which the forecast for time t+1 will rely on, based on a RT of the following form:



Figure(2.2): The adopted Regression Tree structure.

(Source: Draper and Smith, 1998).

Such a structure provides a gradual transition from a more smoothed spline fit St(0.85) to a more untamed (close to the cubic spline interpolation) one.

2.3.2 The Kalman Filter

Forecasting traffic flow time series with statistical models has the drawback that estimation is based on some strong assumptions about the properties of the statistical distribution of traffic flow that are rarely met in realistic traffic flow time series (Stathopoulos and Karlaftis, 2001). In order to mitigate the effects of this problem on the results of the urban traffic forecasts, this paper uses a linear projection model from the Auto-Regressive Moving Average (ARMA) family with an online adaptive strategy for the updated estimation of the model disturbances according to the real-time prevailing traffic conditions. This strategy is based on the optimal estimator of dynamic linear systems, i.e. the Kalman Filter. The derivation of the Kalman Filter still rests on the assumption that the disturbances and the initial state vector are Gaussian (normally) distributed. However, even when the normality assumption is dropped, the adaptive Kalman Filter (KF) is considered as an optimal estimator within the class of all linear estimators, in the sense that it minimises the Mean Squared Error (MSE) (Harvey, 1989). For this reason, its usage is preferred here as being one of the (two) contributors to the combined forecasting model. In the current application, the prediction mechanism of the traffic flow rate series at some time point t is expressed within a state space form and a time-invariant ARMA (1, 1) process without a constant term is used, as follows:

$$y_t = x_t + \varepsilon_t \qquad \text{.................................... (3)}$$

$$x_{t+1} = \phi x_t + \theta \varepsilon_t , \qquad t = 1,\ldots,n \qquad \text{.................................... (4)}$$

where φ and θ are the model parameters, ε ~ (0, 2) in(3) and (4) denotes the same white noise process, with Ibeing the unitary matrix, and xt is the state variable, with xt=yt-1 and an initial value x1 which is set here equal to zero (x1=0). When new observations yt become available, the KF recursively estimates the system state in order to produce optimal forecasts for yt+1.

Similar expressions of various models from the ARMA family in state space form can be found in Harvey, 1989 and Hamilton, 1994.

2.4 Urban transportation planning

Urban transportation planning is process for evaluation (Tsinker, 2004) and selection of highway or transit facilities to serve current and future land uses. For example, the construction of a new seaport, airport, or a new city will require additional transportation services. In addition, new highways, bus route changes, or parking restrictions(Garber andHoel,2009).

2.4.1 Urban transportation forecasting process

Urban transportation forecasting process is carried out to analyze the performance of different alternatives. There are four basic elements and linked tasks in the process: (1) data collection (or inventories), (2) analysis of existing conditions and calibration of forecasting techniques, (3) forecast of future travel demand, and (4) analysis of the results(Garber andHoel,2009).

2.4.2 Steps in the travel forecasting process

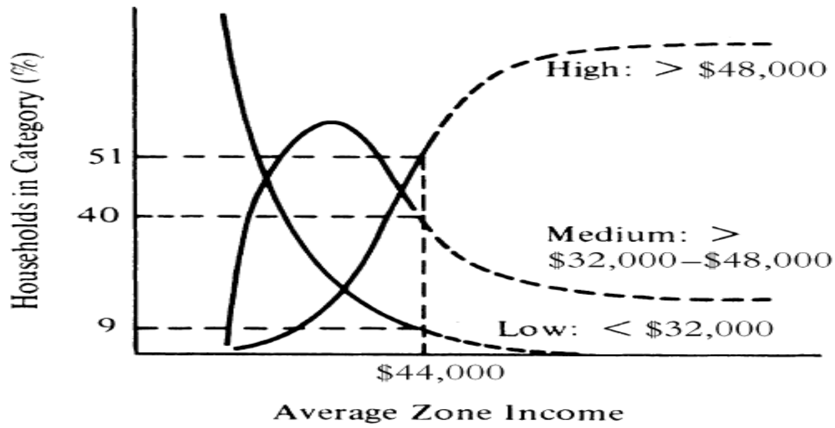
Garber andHoel(2009)describe the travel forecasting is only within the domain of the transportation planner and an integral part of site development and traffic engineering studies as well as area wide transportation planning. The approach most commonly used to forecast travel demand is based on population and economic analysis and Land use analysis that provide the basis for the "four-step process".

step1. Trip Generation

Trip generation is the process of determining the number of trips that will begin or end in each traffic analysis zone within a study area. Since the trips are determined without regard to destination, they are referred to as trip ends. Each trip has two ends, and these are described in terms of trip purpose, or whether the trips are either produced by a traffic zone or attracted to a traffic zone. Trip generation analysis has two functions: (1) to develop a relationship between trip end production or attraction and land use and (2) to use the relationship to estimate the number of trips generated at some future date under a newest of land use conditions. To illustrate the process, two methods are considered:

a) Cross-Classification

Cross-classification is a technique developed by the Federal Highway Administration(FHWA) to determine the number of trips that begin or end at the home. Home-based-trip generation is a useful value because it can represent a significant proportion of all trips. The first step is to develop a relationship between socioeconomic measures and trip production. The two variables most commonly used are average income and auto ownership. Figure 2.4 illustrates the variation in average income within a zone. Other variables that could be considered are household size and stage in the household life cycle. The relationships are developed based on income data and results of O-D surveys.



Figure(2.3): Average Zonal Income versus Households in Income Category. (Source: Garber and Hoel,2009).

b) Rates Based on Activity Units

The preceding section illustrated how trip generation is determined for residential zones where the basic unit is the household. Trips generated at the household end are referred to as productions,and they are attractedto zones for purposes such as work, shopping, visiting friends, and medical trips. Thus, an activity unit can be described by measures such as square feet of floor space or number of employees. Trip generation rates for attraction zones can be determined from survey data.

step2. Trip Distribution

Trip distribution is a process by which the trips generated in one zone are allocated to other zones in the study area. These trips may be within the study area (internal-internal)or between the study area and areas outside the study area (internal-external).In addition, the trip distribution process considers internal-external trips (or vice versa) where one end of the trip is within the study area and the other end is outside the study area. Several basic methods are used for trip distribution. Among these are the:

a) Gravity model

The most widely used and documented trip distribution model is the gravity model, which states that the number of trips between two zones is directly proportional to the number of trip attractions generated by the zone of destination and inversely proportional to a function of time of travel between the two zones. Mathematically, the gravity model is expressed as

$$T_{ij} = P_i \left[\frac{A_j F_{ij} K_{ij}}{\sum_j A_j F_{ij} K_{ij}} \right] \qquad \text{...} \ \mathbf{(5)}$$

Where:

T_{ij}= number of trips that are produced in zone *i* and attracted to zone *j*

P_i= total number of trips produced in zone *i*

A_j= number of trips attracted to zone *j*

F_{ij}= a value which is an inverse function of travel time

K^{ij}= socioeconomic adjustment factor for interchange *ij*

The values for F_{ij} are determined by a calibrating process in which trip generation values as measured in the O-D survey are distributed using the gravity model.

b) Growth factor models.

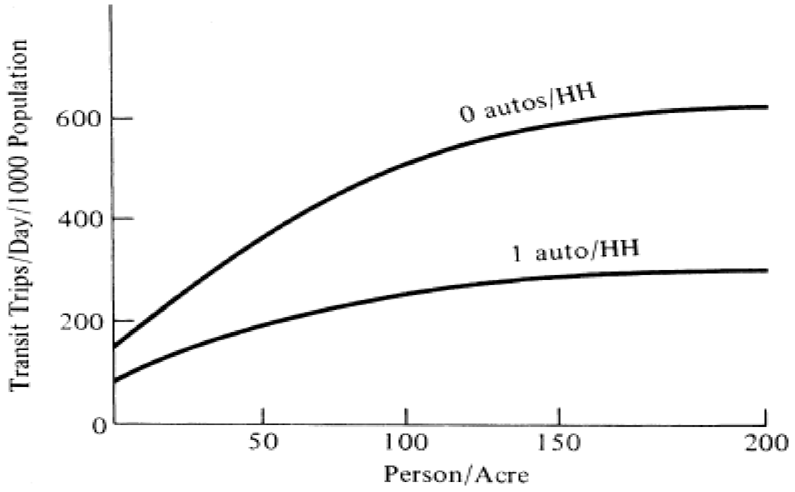
Growth factor models are used primarily to distribute trips between zones in the study area and zones in cities external to the study area. Since they rely upon an existing O-D matrix, they cannot be used to forecast traffic between zones where no traffic currently exists.

step3. Mode choice

Mode choices that aspect of the demand analysis process that determines the number(or percentage) of trips between zones that are made by automobile and by transit. The selection of one mode or another is a complex process that depends on factors such as the traveler's income, the availability of transit service or auto ownership, and the relative advantages of each mode in terms of travel time, cost, comfort, convenience, and safety. Mode choice models attempt to replicate the relevant characteristics of the traveler, the transportation system, and the trip itself, such that a realistic estimate of the number of trips by each mode for each zonal pair is obtained.Depending on the level of detail required, three types of transit estimating procedures are used:

a) Direct generation of transit trips

Transit trips can be generated directly, by estimating either total person trips or auto driver trips. Figure 2.5 is a graph that illustrates the relationship between transit trips per day per 1000 population and persons per acre versus auto owner ship. As density of population increases, it can be expected that transit riding will also increase for a given level of auto ownership.



Figure(2.4): Number of Transit Trips by Population Density and Automobile Ownership per Household.

(Source: Garber and Hoel,2009).

b) Trip end models

To determine the percentage of total person or auto trips thatwill use transit, estimates are made prior to the trip distribution phase based on land-use or socioeconomic. This method does not incorporate the quality of service. The procedure follows:

1. Generate total person trip productions and attractions by trip purpose.

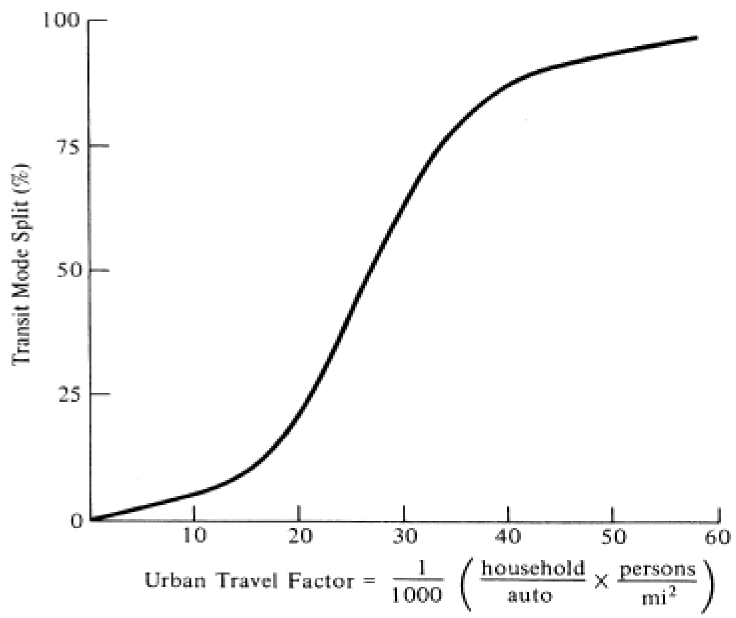
2. Compute the urban travel factor.

3. Determine the percentage of these trips by transit using a mode choice curve.

4. Apply auto occupancy factors.

5. Distribute transit and auto trips separately.

The mode choice model shown in Figure 2.6 is based on two factors: households per auto and persons per square mile. The product of these variables is called the urban travel factor (UTF). Percentage of travel by transit will increase in an S curve fashions the UTF increases.



Figure(2.5): Transit Mode Split versus Urban Travel Factor.

(Source: Garber and Hoel,2009).

c) Trip interchange modal split models.

In this method, system level-of-service variables are considered, including relative travel time, relative travel cost, economic status of the trip maker, and relative travel service. An example of this procedure is illustrated using the QRS method, which takes account of service parameters in estimating mode choice. The QRS method is based on the following relationship

$$MS_a = \frac{I_{ijt}^{-b}}{I_{ija}^{-b} + I_{ija}^{-b}} \times 100 \text{ or } \frac{I_{ija}^{b}}{I_{ijt}^{b} + I_{ija}^{b}} \times 100 \qquad \text{......................} \ \textbf{(6)}$$

$$MS_t = (1 - MS_a) \times 100$$

Where:

M_{St}= proportion of trips between zone i and j using transit

M_{Sa} = proportion of trips between zone i and j using auto

I_{ijm} = a value referred to as the impedance of travel of mode m, between i and j, which is a measure of the total cost of the trip. [Impedance = (in vehicle time min) + (2.5 ×excess time min) + (3 ×trip cost, $ / income earned/min).]

b = an exponent, which depends on trip purpose.

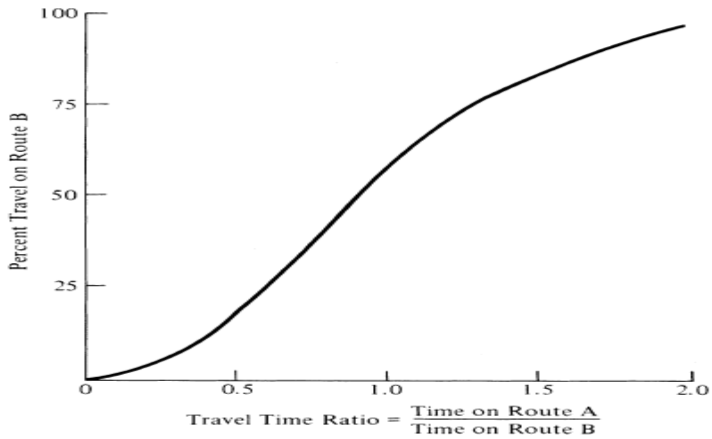
m = t for transit mode; a for auto mode.

step4. Traffic assignment

The final step in the transportation forecasting process is to determine the actual street and highway routes that will be used and the number of automobiles and buses that can be expected on each highway segment. The procedure used to determine the expected traffic volumes is known as traffic assignment. Since the numbers of trips by transit and auto that will travel between zones are known from the previous steps in the process, each trip O-D can be assigned to a highway or transit route. The sum of the results for each segment of the system results in a forecast of the average daily or peak hour traffic volumes that will occur on the urban transportation system that serves the study area. To carry out a trip assignment, the following data are required: (1) number of trips that will be made from one zone to another (this information was determined in the trip distribution phase), (2) available highway or transit routes between zones, (3) how long it will take to travel on each route, (4) a decision rule (or algorithm) that explains how motorists or transit users select a route, and (5) external trips that were not considered in the previous trip generation and distribution steps. Three basic approaches can be used for traffic assignment purposes:

a) Diversion curves

This method is similar in approach to a mode choice curve. The traffic between two routes is determined as a function of relative travel time or cost. Figure 2.7 illustrates a diversion curve based on travel time ratio.



Figure(2.6): Travel Time Ratio versus Percentage of Travel.
(Source: Garber and Hoel,2009).

b) Minimum time path (all-or-nothing) assignment

The minimum path assignment is based on the theory that a motorist or transit user will select the quickest route between any O-D pair. In other words, the traveler will always select the route that represents minimum travel time. Thus, to determine which route that will be, it is necessary to find the shortest route from the zone of origin to all other destination zones.

c) Capacity restraint.

A modification of the process just described is known as capacity restraint. The number of trips assigned to each link is compared with the capacity of the link to determine the extent to which link travel times have been increased by the additional volume placed on the formerly empty link. Using relationships between volume and travel time (or speed), it is possible to recalculate the new link travel time. A reassignment is then made based on these new values. The iteration process continues until a balance is achieved, such that the link travel time based on the loaded volume does not change with successive assignments.

2.5 Modelling and Evaluation Software

Simulation software is getting better in a range of different ways. With new advancements in mathematics, engineering and computing, simulation software programs are increasingly becoming more rapidly, more powerful, more detail oriented and more realistic. Below is a list of well-known simulation software for transportation(Hardy and Wunderlich, 2007).

TransCAD is for Travel Demand Forecasting and designed specifically for use by transportation professionals to store, display, manage, and analyze transportation data. TransCAD combines GIS and transportation modeling capabilities in a single integrated platform, providing capabilities that are unmatched by any other package. TransCAD can be used for all modes of transportation, at any geographic scale or level of detail. (TransCAD Brochure, 2014).

CORSIM is a traffic simulation model it was originally developed for the Federal Highway Administration(FHWA) in the mid-1970s. CORSIM is a comprehensive traffic simulation model package developed to model surface streets, freeway systems, and combined networks having simple or complex control conditions. The best thing in this model its ability to simulate a wide variety of traffic conditions from signalized arterial corridors and freeway corridors to stop controlled intersections(Steven,2004).

2.5.1 Selected Software

For a comprehensive traffic network analysis and evaluation there is a need to use macroscopic software beside a microscopic software. In this study we will use TransCAD software for macroscopic traffic modeling.TransCAD is the only software package thatfully integrates GIS with demand modeling and logistics functionality. There are many reasons why it is valuable to have a GIS as part of a planning or routing and logistics package(Caliper Corporation, 2014).

TransCAD includes a set of procedures for solving network flow problems. These problems involve efficient delivery of goods or services, and arise in transportation and many other contexts.TransCAD also includes a specific evacuation analysis procedure for network evacuation simulation. The evacuation analysis procedure reports network clearance time for an evacuation plan and demonstrates how traffic patterns change over time and over space during the evacuation(Hardy and Wunderlich, 2007). The TransCAD Dynamic Traffic Assignment model assigns O-Dtrips by time period, and effectively manages the interaction of trips introduced to the network at differing time periods. The flow and congestion results are often more realistic and capture the temporal distribution of congestion on the network more effectively. TransCAD also has special tools and procedures for creating and working with transit networks.

2.6 Previous Studies

Many case studies have been applied around the world in the section of transportation planning. The studies aimed at evaluating and testing different transportation policies and solutions. In this research,some studies in cities of developing countries particularly in Palestine are presented, as they have similar status.

2.6.1 Traffic Assessment Study for Nablus City Centre

This study was done by a consultant company (Khatib and Alami 1995). The aim of the study was to identify measures for traffic congestion alleviation for Nablus City Centre. For analyzing the traffic system, they used SATURN; a computer based traffic network model. There was no detailed information in the study report on how the OD matrix was constructed. The study presented seven different scenarios to improve the network system. These scenarios included traffic recirculation, parking prohibition, capacity improvements, and construction of new streets (Douleh, 2000).

2.6.2 Traffic Assignment Study for Nablus City

This study was an M.Sc. thesis by Douleh (2000). The thesis was entitled with “the use of traffic assignment modelling technique in evaluating and testing transportation policies and projects in Nablus City”. The study discussed the methodology and input requirements for traffic assignment and O-D matrix estimation. The stochastic user equilibrium assignment was used for traffic assignment. For O-D matrix estimation, multiple path matrix estimation was used. TransCAD GIS based software was used for the simulation of the existing traffic conditions and model calibration. Based on TransCAD, she tested different scenarios for the existing and future conditions. The scenarios included capacity improvements, traffic signal installation, new overpass roads and city centre closure.

2.6.3 Vehicular Demand Forecasting for Gaza Strip

In this study, Hamadet. al (2015) proposed methodology for future vehicular demand forecasting. He presented two main reasons for the need of this new methodology, which are the rapid urban traffic growth and the lack of resources to conduct major planning studies in developing countries. The methodology combines the use of TransCAD well-known GIS software and Excel, spread sheet software, to make regional transportation planning in the Gaza Strip. In this work, the OD matrix was estimated and calibrated from traffic count. Then, a trip production/attraction model was built based on some socio economic data. After that the future OD matrix is estimated based on the previous steps. The procedure was ended with traffic assignment and testing of improvement scenarios.

2.6.4 Transportation Master Plan for Rafah Governorate

In this project, Natuf(2007)developed a transportation master plan for Rafah governorate. In this project, four traffic surveys were carried out. The first was a questionnaire aimed to investigate the network characteristics and problems. The second was origin destination survey using roadside interview method. The third was traffic flow count at 24 intersections. The fourth was spot speed measurements. Based on OD survey and traffic counts, the OD matrix was estimated using

CONTRAM software. The project proposed development plan in terms of network development, intersection control, markets development, taxi stations development, pedestrian facilities, parking, regulation, control and enforcement, environmental protection measures and safety measures.

2.6.5 Jenin Transportation Study

This was a master thesis by Al-Muslah (2006) entitled with "Analysis and short–term future vision for the transportation plan in Jenin city". The thesis was in Arabic. The study methodology consists of three main parts: Theoretical part which concentrates on overall revision of the terminology and concepts related to the subject under study and similar case studies. Informational part which concentrates on studying the network current situation (population count, land use, development polices) to predict the future increase in the number of cars in the next five coming years. Analytical part, based on the analysis of traffic movement in the network and making proposals to solve the network traffic problems. The study reached to several recommendations, which considered a master plan for the city. The proposed suggestions included plans for the studied intersections, roadways, parking, truck routes, and pedestrian areas. The study found that only one intersection is warranted for signalization in the future.

2.6.6 TransCAD and GIS Technique for Estimating Traffic Demand

In the early nineties of the last century, the transportation system in Gaza Strip was born and new infrastructure projects, especially road networks, were constructed. However, the construction lacked efficient application of a transportation planning process. Transportation planning relies on traffic demand forecasting process. The conventional process is impeded by extensive amount of socioeconomic data. A study was carried out by Almasri and Al-Jazzar (2013) entitled "TransCAD and GIS Technique for Estimating Traffic Demand and its Application in Gaza City". The main objective of this research was to apply TransCAD model in Gaza City for traffic estimation. This model estimates the origin-destination matrix based on traffic count. The traffic count was carried out at 36 intersections distributed around Gaza

City. The results of traffic flow estimation obtained from TransCAD are assigned to the Gaza maps using the GIS techniques for spatial analysis. It showedthat the most congested area at that timewasthe middle of the city especially at Aljala-Omer AlmokhtarIntersection. Network evaluation results showed that the network is expected to be more congested in 2015.

2.6.7 A Trip Generation Model for Gaza City

In this study, Almasri andMoussa (2013) proposed Development of a Trip Generation Model for Gaza City. The aim of the research was to develop a trip generation model for Gaza City using an appropriate technique to determine the household travel characteristics pattern in the study area. It aims also to compare trip rates modelled by way of Conventional cross classification (CCA) and that of Multiple cross classification (MCA) in Gaza city. The methodology of the research is based on using multiple linear regression technique (MLR). In addition, Household interview surveys were conducted to determine the method used for travelling. A number of 425 household surveys were distributed in different districts of Gaza city and truckloadrecords. The findings of the research showed that vehicle ownership, household size, income level and total number of licensed drivers are the strong factors that affect trip production in Gaza City. In addition, it showed that MCA models are more effective in expressing trip rates for trip production than CCA models. An increase in sample size will lead to an increase of the performance of both MCA and CCA matrices in predicting trip rates.School trips are the best model among other models obtained in trip attraction with the best coefficient of determination (R2), followed by college trips in ranking. Home based other trips was the least significant model in expressing trip attraction.

2.6.8 Transportation Strategic Planning Under Uncertainty

In this study, Abu Eishehand Bdair(2011) proposed Transportation Strategic Planning Under Uncertainty. The aim of this study, which was conducted on the transportation sector in Palestine is to explore prospective planning methods capable of dealing uncertainty while preparing an overall framework for transport strategic planning.The methodology of the research was based on A SWOT analysis (Strengths, Weaknesses, Opportunities, and Threats) was conducted to form the basis for defining the strategic goals, objectives and strategies. Four scenarios are identified taking into account the previous studies and the data collected and analysed; each scenario will have its impact on the transport sector. These scenarios are:

- **First Scenario (Status Quo):** This scenario was based on the premise of the continuation of the political and economic situation in the West Bank as it was during the year 2010.
- **Second (Optimistic) Scenario:** This scenario considers the political progress case, assuming the establishment of the Palestinian State and the construction of the corridor between the West Bank and Gaza, no restrictions on the movement of goods and people and marginally greater access to (Israeli)labor markets resulting in greater remittances with accelerating growth in GDP.
- **Third Scenario:** The third scenario assumes that there was an (Israeli) withdrawal from the West Bank with keeping their control over borders, establishing the expanded autonomous area inside the Separation Wall, while the situation in Gaza Strip continues as it is.
- **Fourth (Pessimistic) Scenario:**This scenario considers the political deterioration case, assuming that the PNA might cease to govern, the feasibility of a third Intifada, more frequent closures and more limited access to (Israeli) labor market with decreasing growth of the GDP.

2.7 Conclusions

The approach most commonly used to forecast travel demand is based on population and economic analysis and Land use analysis that provide the basis for the "four-step process". These stepsare trip generation, trip distribution, mode choices and traffic assignment.However, in this study O-D matrix estimation method will be used, because no information is available about therelationship between socioeconomic measures and the average income and auto ownership in Gaza Strip. In order to calculate forecast travel demand TransCAD software will be used. This software is availablefor the researcher and easier than other software.

Chapter 3
Research Methodology

3.1 Introduction

This chapter discusses the methodology which is used in this research. The purpose of research is to discover answers to questions through the application of scientific procedures. In line with this and as stated in Chapter 1, the main purpose of this research is to study the effect of establishing a new commercial seaport in Gaza Strip on its transportation system.Based on the conclusion and the decision reached in the Literature ReviewChapter, a scientific methodology of transportation planning process is developed which is suitable for the conditions in Gaza Strip.The methodology of this research starts with literature review of processes of transportation planning. The concentration will be on travel demand forecasting approaches as it is the major step involved in transportation planning. The literature review should seek for case studies applied in cities of developing countries especially in the cities that have similar conditions. Based on the literature review, the transportation planning process that is appropriate to Gaza Strip hasbeen decided.

After carrying out the literature review and deciding which approach is suitable for Gaza Strip, data needed for the study hasbeen collected. The data includes information needed for modelling the network such as links and zones characteristics. Examples of link characteristics are name, classification, length, free flow speed, travel time, direction and capacity. Zone characteristics contain size, boundaries, centroids and connecters to the links.

For the purpose of analysis of the existing situation, traffic counts at a reasonable number of intersections was conducted. This was performed in 25/10/2015 from 7:00 am to 10:00 am by the civil engineering students under the supervision of the researcher and advisor of this study.

The methodology is divided into four stages:

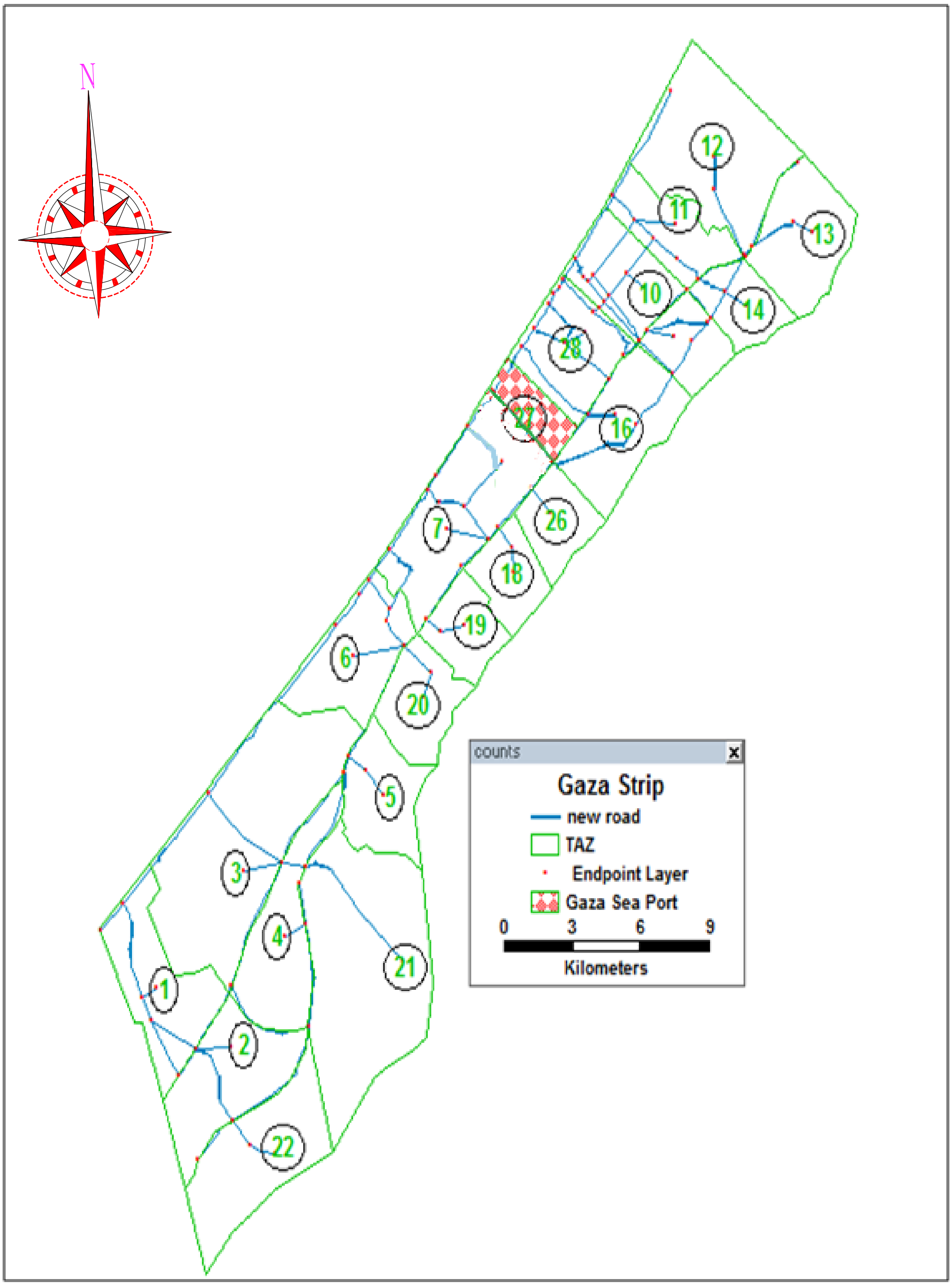
- **First Stage (Network Building):** In this stage, Gaza Strip is divided into traffic analysis zones (TAZ) in order tobuild the network using the Geographic Information Systems Transportation software TransCAD .
- **Second Stage (Base Year O-D Estimation):** In this stage, O-D matrix table is estimated based on traffic volume counts at the major intersections in the base year using TransCAD.
- **Third Stage (Future OD Estimation):** In this stage, future vehicular attraction is forecasted at Gaza Seaportusing Cargo forecasting in the Gaza seaport and ITE trip generation manual.
- **FourthStage (Estimating Traffic from Seaport):** In this stage, the impact of Gaza Seaport on traffic demand and highway network in Gaza Strip is determined.
- **Fifth Stage (Traffic Flow Assignment):**The final step in the transportation forecasting process is to determine the actual street and highway routes that will be used and the number of vehicles that are expected on each highway segment.

3.2 First Stage (Network Building)

In this stage, the network has been built using the Geographic Information Systems Transportation software (TransCAD). The first step in building network is dividing the study area into a number of zones. Prior to collecting and summarizing data, it is usually necessary to delineate the study area boundaries and to further subdivide the area into traffic analysis zones(TAZ) for data tabulation. The selection of these zones is based on the following criteria (Garber andHoel,2009):

1. Socioeconomic characteristics should be homogeneous.
2. Inter-zonal trips should be minimized.
3. Physical, political, and historical boundaries should be utilized where possible.
4. Zones should not be created within other zones.
5. The zoningsystem should generate and attract approximately equal trips, households, population, or area. For example, labor force and employment should be similar.
6. Zones should use census tract boundaries where possible.
7. The total number of zones should not be so large as to overwhelm computer resources.

Gaza Strip is divided into 22traffic analysis zones, as shown in Figure (3.1), based on the municipal boundaries amongthe different cities, parts of cities, and villages.The division considers also the other criteria discussed before. The names of these zonesare shown in Table 3.1

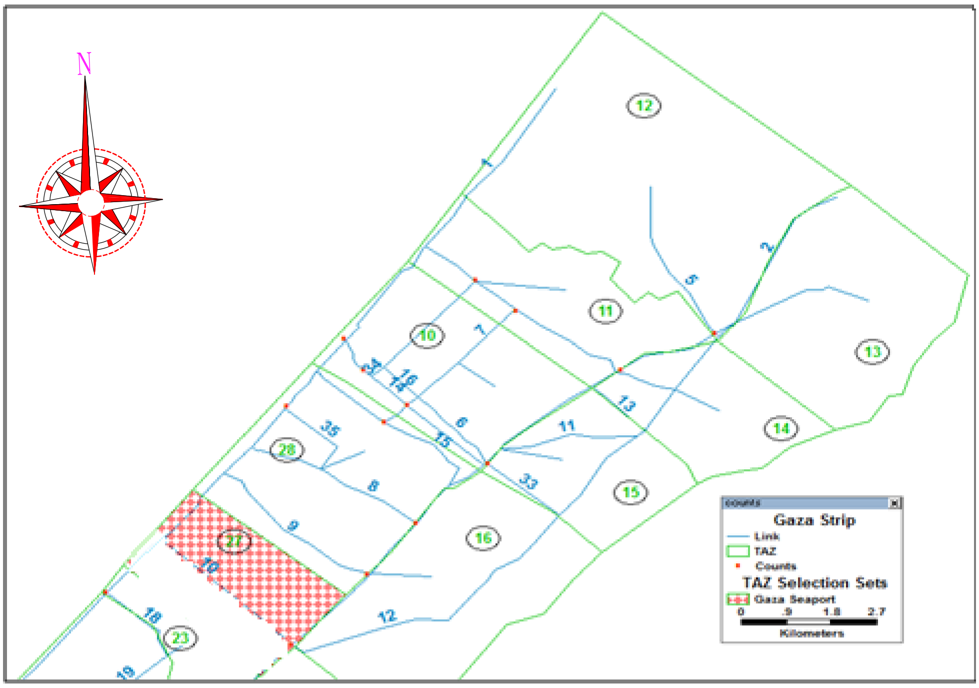


Figure(3.1): Gaza Strip traffic analysis zones

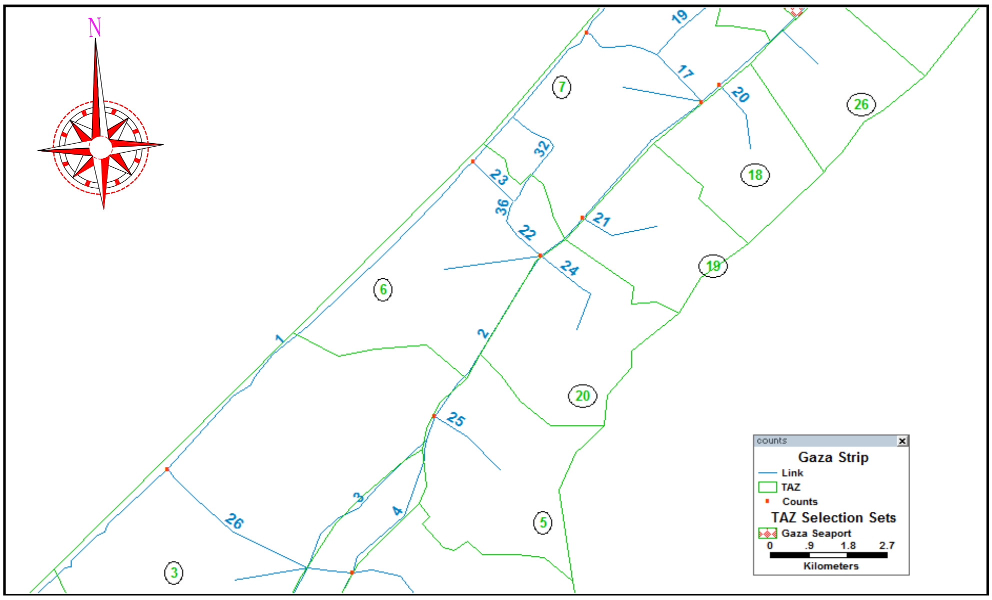
Table(3.1): Gaza Strip Zones Name(TAZ)

ID	Zone Name	Area (Km^2)	ID	Zone Name	Area (Km^2)	ID	Zone Name	Area (Km^2)
1	West Rafah	17.53	11	North Jabalia	11	20	Selga	10.86
2	Center Rafah	17.95	12	Beit-Lahia	27.17	21	East Khan Younis	41.70
3	West Khan Younis	43.27	13	Beit-Hanoun	15.45	22	East Rafah	20.82
4	Center Khan Younis	16.66	14	South Jabalia	8.12	23	Al-Moghraga	6.82
5	AL Qarara	12.18	15	North EastGaza	8.06	26	Johr al-Diek	8.21
6	DeiralBalah	16.09	16	South EastGaza	16.66	27	Gaza Seaport	5.40
7	Al-Nuseirat	19.27	18	Al-Burij	8.14	28	SouthWest Gaza	14.58
10	NorthWest Gaza	12.23	19	Al.Maghazi, AlMsadar	8.26			

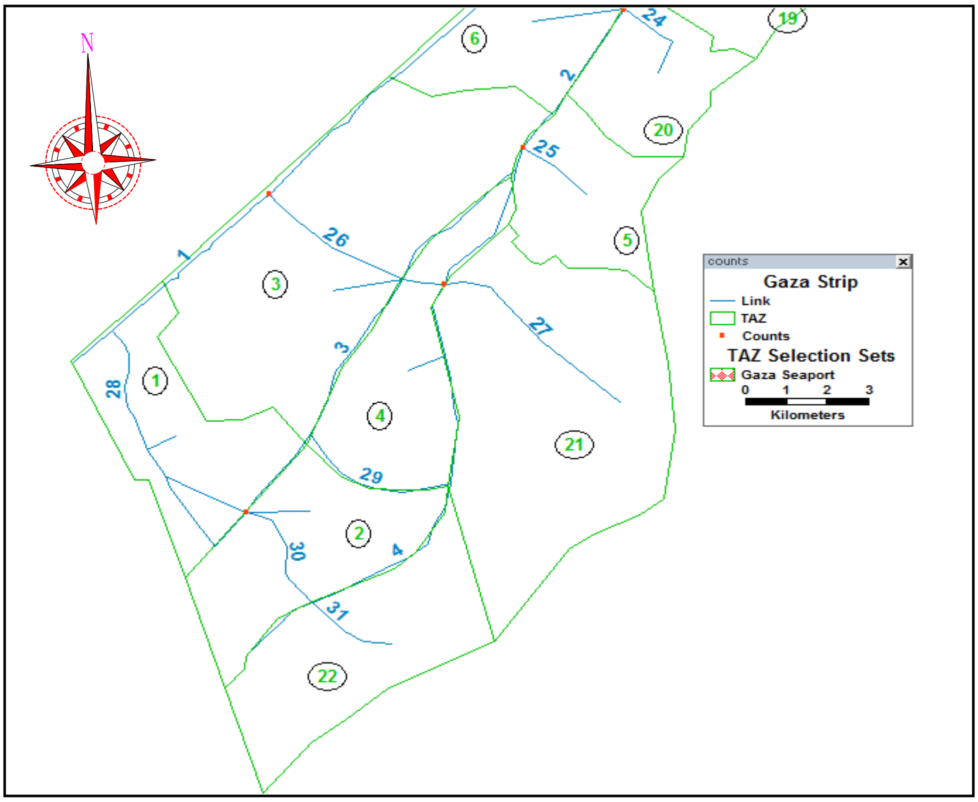
The second step is selecting the links; which are the main streets in Gaza Strip and the main streets linking them;as shown in Figures(3.2, 3.3 and 3.4),and as shown in thefollowing Table 3.2.



Figure(3.2): The North Gaza Strip Streets Network



Figure(3.3): The Middle Gaza Strip Streets Network



Figure(3.4): The South Gaza Strip Streets Network

Table(3.2): Gaza Strip Street Names

ID	Street Name	ID	Street Name
1	Al-Rasheed St.(Gaza Strip)	19	Al Moghraga St. (Al Moghraga)
2	Salah Al-Deen St. (Gaza Strip)	20	ShohdaaAl-Maghazi St.(Al-Maghazi)
3	Salah Al-Deen west St.(Rafah)	21	Al-Msadar St.(Al-Msadar)
4	Salah Al-Deen east St.(Rafah)	22	AL Shohdaa St.(Deir al Balah)
5	Beit-Lahia St.(Beit-Lahia)	23	Akkela St.(Deir al Balah)
6	Al Quds St.(Jabalia)	24	Mohammed Azayzeh St.(WadiSelga)
7	Al-Jalah St.(Gaza)	25	Street No. 2(Al Qarara)
8	Own Al-Shawa St.(Gaza)	26	Ahmed Yassin St. (Khan Younis)
9	Street No. 10(Gaza)	27	Absan Al-Kabara(Khan Younis)
10	Natsrim St. (Gaza)	28	Abo-Baker Al-Seddeq St.(Rafah)
11	Al Jaro St.(Gaza)	29	Morag St.(Rafah)

12	Al-Karama St.(Gaza)	30	Taha Hussein St.(Rafah)
13	SaalahDardona St.(Gaza)	31	Almtar St.(Rafah)
14	Omar Mukhtar St.(Gaza)	32	BaharDeir AL Balah St.(Deir al Balah)
15	Jamal Abd Al-Nasser St.(Gaza)	33	Bagdad St.(Gaza)
16	Al-Wahda St.(Gaza)	34	AL Naser St.(Gaza)
17	Al-Nuseirat St.(Al-Nuseirat)	35	AL- Qahera St.(Gaza)
18	Palestine St.(Al-Nuseirat)	36	Deir al-Balah trade St.(Deir al Balah)

The various characteristics are presented in the attribute table that is attached with the line layer in TransCAD. These characteristics has been used in building the network. The followingare the characteristics thatare needed to be collected for the links in the network:

- Link type: The links in this research are classified into three types in the data base table. These will be used in the network settings for enabling and disabling links in the network for analysis purposes.
- The classification was performed as follows :

Link type (1): for existing arterial roads.

Link type (2): for existingcollector roads.

Link type (3): for future arterial roads.

Link type (4): for future collector roads.

Link type (5): for zone connectors.

- Link length: (in kilometers) which is automatically estimated by TransCAD.
- Link free flow speed: (in kilometer per hour) which is entered according to each link type and speed limits assigned by concerned municipalities.

- Travel time:This is calculated usingthe values of the length and the speed in minutes.
- Links direction: Every line layer contains a special data field (called Direction or DIR) which is used in TransCAD to keep track of one-way streets. This field provides information about the Direction of Flow relative to the line features Topology as follows(Hong and Nimbole,2008):

  (0) Travel is allowed in both directions.

  (1) Travel is one-way in the same direction as the topology. Topology is the direction in which the coordinates of the line feature are stored.

  (-1) Travel is one-way in the opposite direction of the topology.
- Link capacity (maximum flow in veh/hr) is maximum sustainable flow rate at which vehicles or persons reasonably can be expected to traverse a point, uniform segment of a lane or a roadway during a specified time period under a given roadway conditions; usually expressed as vehicles per hour.The capacity is calculated based on the methods described in the Highway Capacity Manual(2000).
- Observer link count (Veh/hr) for the morning peak period for each travel direction.
- Street name codingof the network requires information from the highway inventory in terms of link speeds, length, and capacities. The network is then coded to locate zone centroids, nodes, and the street system(Garber andHoel,2009).

After identifying the boundaries and number of zones within the study area, the network is coded by transferring existing ESRI shape file containing all road of Gaza Strip to TransCAD. Then, the major arterials and collectors, mentioned in Table 3.1, are remained and all other roads are removed.

An important point should be noted here: TransCAD software allows the user to omit volume counts on some links. So, volume count on every single link is not required. This feature can greatly reduce the cost of data collection. However, for accuracy purposes, an effective sample should be comprised of measurements from widely dispersed parts of the network (Hamad,Faghri andLi,2015).

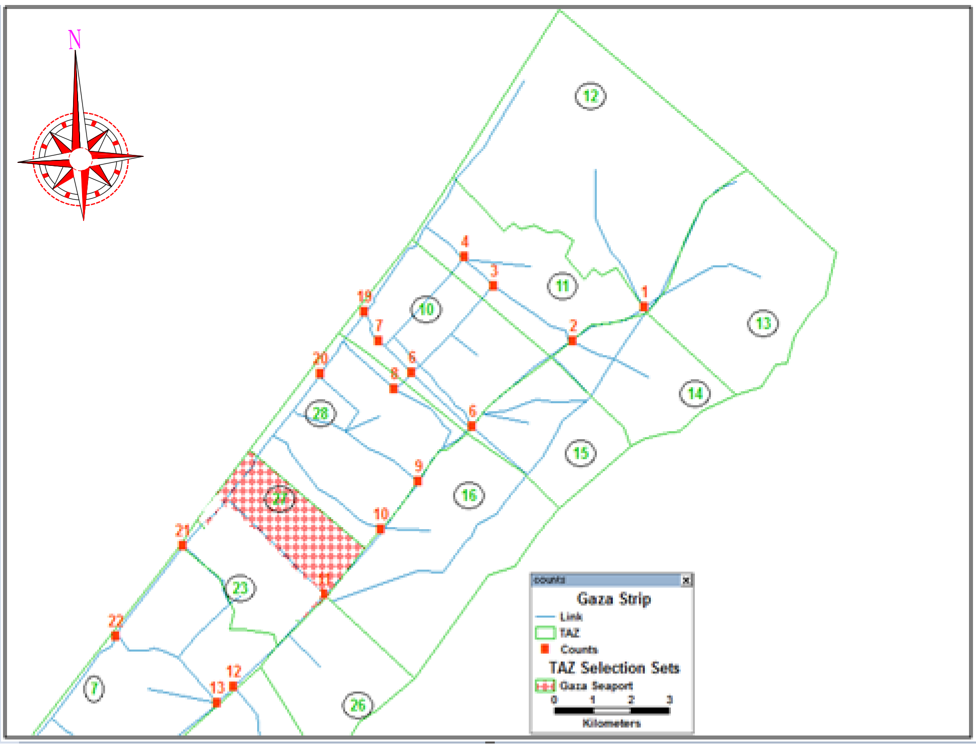
The last step in network building is to determine the nodes and centroids. A node is the end point of a link and represents an intersection or location where a link changes direction, capacity, width, or speed. A centroid is the location within a zone where trips are considered to begin and end.

3.3 Second Stage (Base Year O-D Estimation)

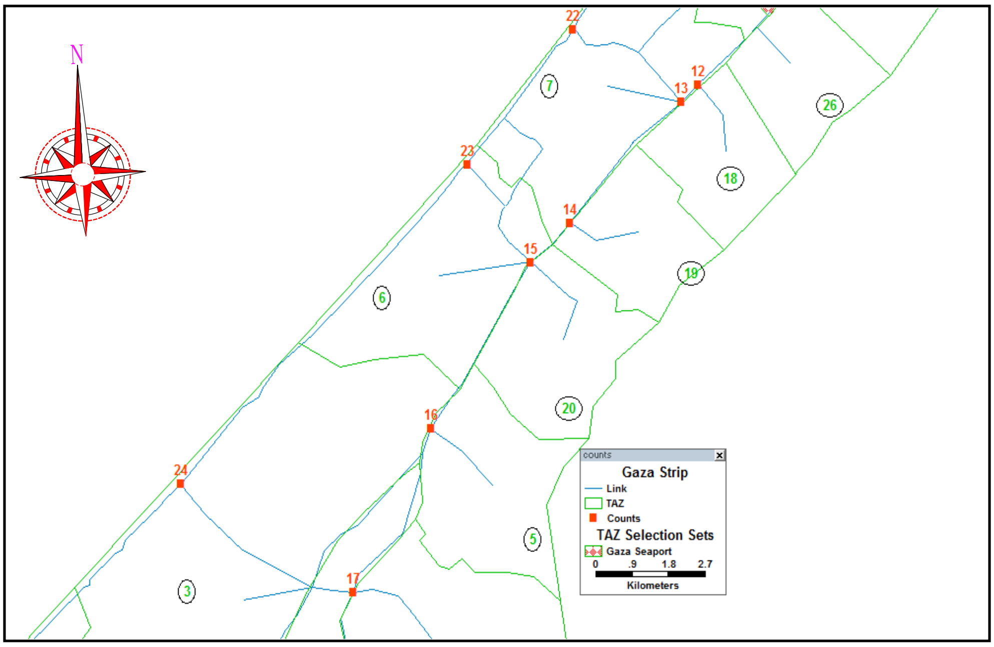
The information of the volume of people and goods travelling from a group of origin zones to a group of destination zones is a pivotal factor for transportation planning, and traffic management and operation. A matrix is usually used as a means to represent this information. It is a two-dimensional table, where each cell inside the table represents the volume of traffic moving from a specific origin zone to a specific destination zone. It can be various links or routes in an urban transportation network. This matrix is commonly called as the Origin-Destination (O-D) matrix or the trip matrix. Thus, it can be seen that there are three important inputs in an O-D matrix table. These are:(1) the magnitude of traffic volume, (2) the O-D pattern, and (3) the total trip production (P) and attraction (A). Those are the basic information used in different aspects of transportation systems planning and operations(Yaldi, Taylor andYue,2011).

The O-D Matrix Estimation procedure in TransCAD is based on the work of Nielsen (1998), who independently developed it as a procedure for TransCAD 2.1. This method has the advantages of treating counts as stochastic variables, as well as working with any traffic assignment method. It is therefore attractive for use with the Stochastic User Equilibrium Assignment method, as well as with User Equilibrium Assignment. Nielsen's method is an iterative (or bi-level) process that switches back and forth between a traffic assignment stage and a matrix estimation stage. The procedure requires an initial estimate of the O-D matrix.

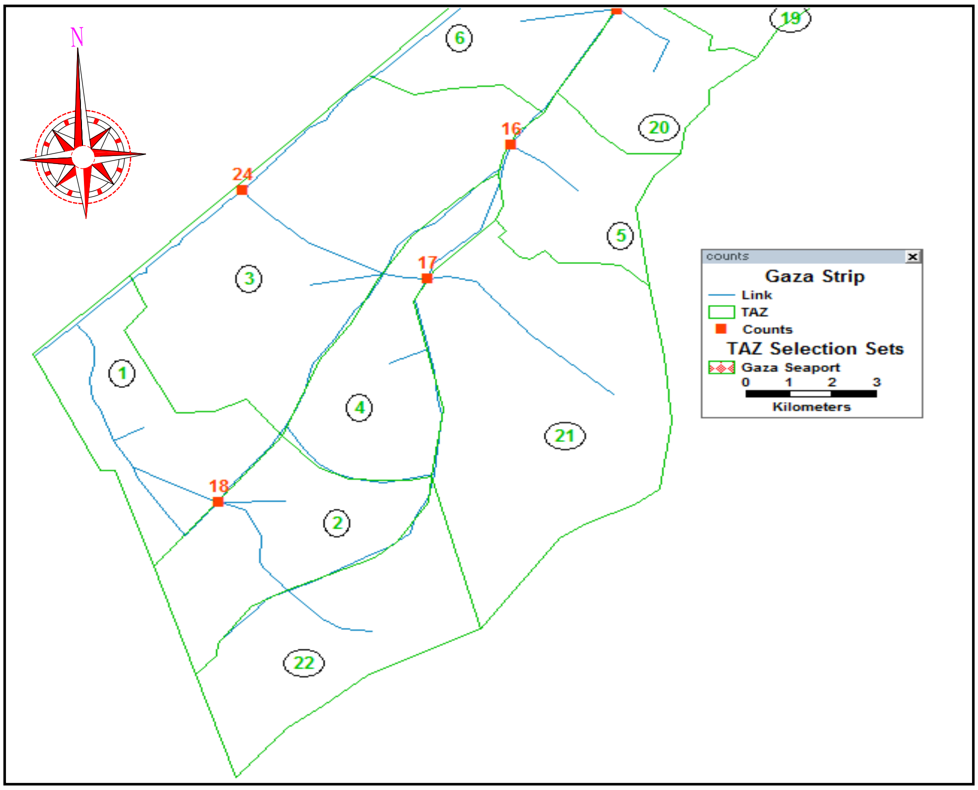
The success of this method is based upon use of a realistic traffic assignment model. Otherwise, a biased trip table will be produced. In practice, Nielsen's method appears to work quite well, and many users have reported good results with its use.The traffic count isthe most important step in base year O-D estimation, where the traffic count is used to find the number of trips generated in each zone using TransCAD. In this study the researcher will determine the traffic volume, flow rate, peak hour, peak hour factor, percentage of traffic composition and traffic volume during the day for streets in Gaza Stip. The transportation network in Gaza Strip suffers from the lack of information. So it is required to carry outtraffic count in areas where there is no information on the volume of traffic, especially at the entrances zone andat the main intersections in Gaza Strip. Because of the difficulty of traffic countsfor the whole Gaza Strip, the traffic count will be limited tothe high traffic volume intersections. These intersection are shown in (Figure3.5 toFigure3.7),and inthe following Table 3.3.



Figure(3.5): Locations of traffic counts in North Gaza Strip



Figure(3.6): Locations of traffic counts in Middle Gaza Strip



Figure(3.7): Locations of traffic counts in South Gaza Strip

Table(3.3): Location of traffic counts

ID	Intersection Name	ID	Intersection Name
1	Salah al-Din intersection with BeitLaha (Hamoda)	14	Salah al-Din intersection with AL Msadr
2	Salah al-Din intersection with AL-Quads(Zemo)	15	Salah al-Din intersection with Deir AL Balah
3	AL-Quadsintersection with AL Jalah	16	Salah al-Din intersection with Number "2"
4	AL-Quadsintersection with AL Naser	17	Salah al-Din intersection with Abasan (BaniSuhaila)
5	Salah al-Din intersection with AL-Wahada and Omar AL makhtar(AL shashea)	18	Salah al-Din intersection with Taha Hussein (Khrbat AL Adas)
6	Omar AL makhtarintersection with AL Jalal (AL Saray)	19	AL-Rashed intersection with AL Shahda (AL Mena)
7	Omar AL makhtarintersection with AL Naser (AL Shawa)	20	AL-Rashed intersection with Beruit
8	Jamal abdnaserintersection with AL Jalal(AL Tearan)	21	AL-Rashed intersection with AL Qahra
9	Salah al-Din intersection with Number "8" (Dolah)	22	AL-Rashed intersection with AL Palestine
10	Salah al-Din intersection with Number "10"	23	Al-Rashed intersection with the Nuseirat
11	Salah al-Din intersection with AL Karama (Netesarem)	24	AL-Rashed intersection with Akeala
12	Salah al-Din intersection with AL Bourij	25	AL-Rashed intersection with Khan Younis
13	Salah al-Din intersection with AL Nuseirat		

3.4 Third Stage (Future O-D Estimation)

It is well known that the future O-D Estimationsis obtained inthe Future Demand O-D Matrix by multiplying base-year O-D matrix with an expected growth in trips as shown in this Equation(O'Flaherty *et al.*, 1997):

$$T_{ijf} = T_{ijP} \times G_{Pf} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \textbf{(7)}$$

Where:

T_{ijf} = trips for O-D pair ij in future year f;

T_{ijP} = trips for O-D pair ij in present year p;

G_{Pf}= expected growth in trips between year fand p.

However, developing countries usually suffer from the lack of socioeconomic and land use data in addition to the expected growth factor.Thus, estimates of the rate of growth in vehicle ownership can be estimated by direct projection of their historical data (DAR Al Handasa, 1999).The study period that was considered forforecast was 5 years from the year 2015 to the year 2020. This is because Gaza Seaport construction is expected to take about 3.5 to 5 years according to the seaport report by the Ministry of Transportation (2005).

3.5 Fourth Stage (Estimating Traffic from Seaport)

The purpose of a traffic impact study or a transportation impact analysis is to determine the impact on traffic and the need for transportation services in the immediate vicinity of a proposed development or as the result of a change in zoning designation. Impact studies are conducted for a variety of reasons(Garber andHoel,2009).However, in this research, the impact of Gaza Seaport construction on major highways and intersectionsis studied.It is required tousecargo forecasting in the Gaza Seaport and ITE trip generation manual to find future forecasted vehicular attraction at Gaza Seaport.

3.6 Fifth Stage (Traffic Flow Assignment):

Traffic Assignment is a key element in the urban travel demand forecasting process. Traffic assignment model can predict the network flows that are associated with future planning scenarios and generate estimates of the link travel time and related attributes. These are considered as the basis for evaluating and testing various transportation policies or alternatives (EishehandDouleh,2000). This is the final stage in the analysis carried out by TransCAD program. Its results include the traffic flow volume in all the streets included in the network in addition to the time required for the expected trips. To evaluate the network performance, it is essential to use Volume Over Capacity (VOC) which helps clarifying the levels of the traffic service offered by the network roads. It is also required to estimate the total future demand and to assess the impacts.

Chapter 4
Results and Discussion

This chapter describes the results of the descriptive analysis of the survey as well as the calibration and validation for revealed and stated preference models. Section 4.1 presents the results of network building. Section 4.2 discusses the OD matrix for base year 2015. Section 4.3 discusses the OD matrix for future year 2020. Section 4.4discusses thetraffic impact studies for Gaza Seaport. Section 4.5 presents the results of traffic flow assignment stage for the base year 2015, the future year 2020 without Gaza Seaport and the same year with Gaza Seaportexistence.

4.1 Network Building

The network building is very important to determine the traffic assignment. The first step of network building is determining the streets in range of this study. Streets must be connected to each other when drawing for TransCAD program to get correct results. The second step is to input the required data for building OD matrix. There are two kinds of data here: the first type is traffic data (traffic flow, and speed) and the second one is geometric data (direction, time, and capacity).

4.1.1 Traffic Data

Traffic flow was calculated onseventy-nine different streets (links) using roadintersection traffic flow counts.This was carried out making use of the traffic turning movement counts at road intersections. Table A.2, in Appendix (A), shows 100 and 28 traffic flow measures on 25 roads. The first columnin Table A.2 shows the intersection numbers on which traffic flow counts were conducted.Traffic flow was calculated for 79 different roads (links) making use of traffic flow counts at 22main road intersections in Gaza Strip. The number of main intersections on Salah AlDeen St. is 13intersections and on Al Rasheed St.is 6intersections.The studied intersections in Gaza city are5 intersections, shown in the TableA.1, in Appendix (A). The first column in the Tableshows the intersection numbers (ID). The second column in the Table present street names as they are known for local people and the formal names of streets.The third column presents the traffic flow in three hours. Al-Sarayaintersection hasthe highest traffic flow of 7,615veh in hour, this is because Al-Saraya intersection is located in the center of Gaza City and it functions asa commercial center, And AL-Rashed intersection with Khan Younis has the lowest traffic flow of 399 veh in hour.

4.1.2 Geometric Data

- Links direction: Every line layer contains a special data field (called Direction

  or DIR) that TransCAD uses to keep track of one-way streets. This field provides information about the Direction of Flow relative to the line features Topology as follows: DIR Value Meaning

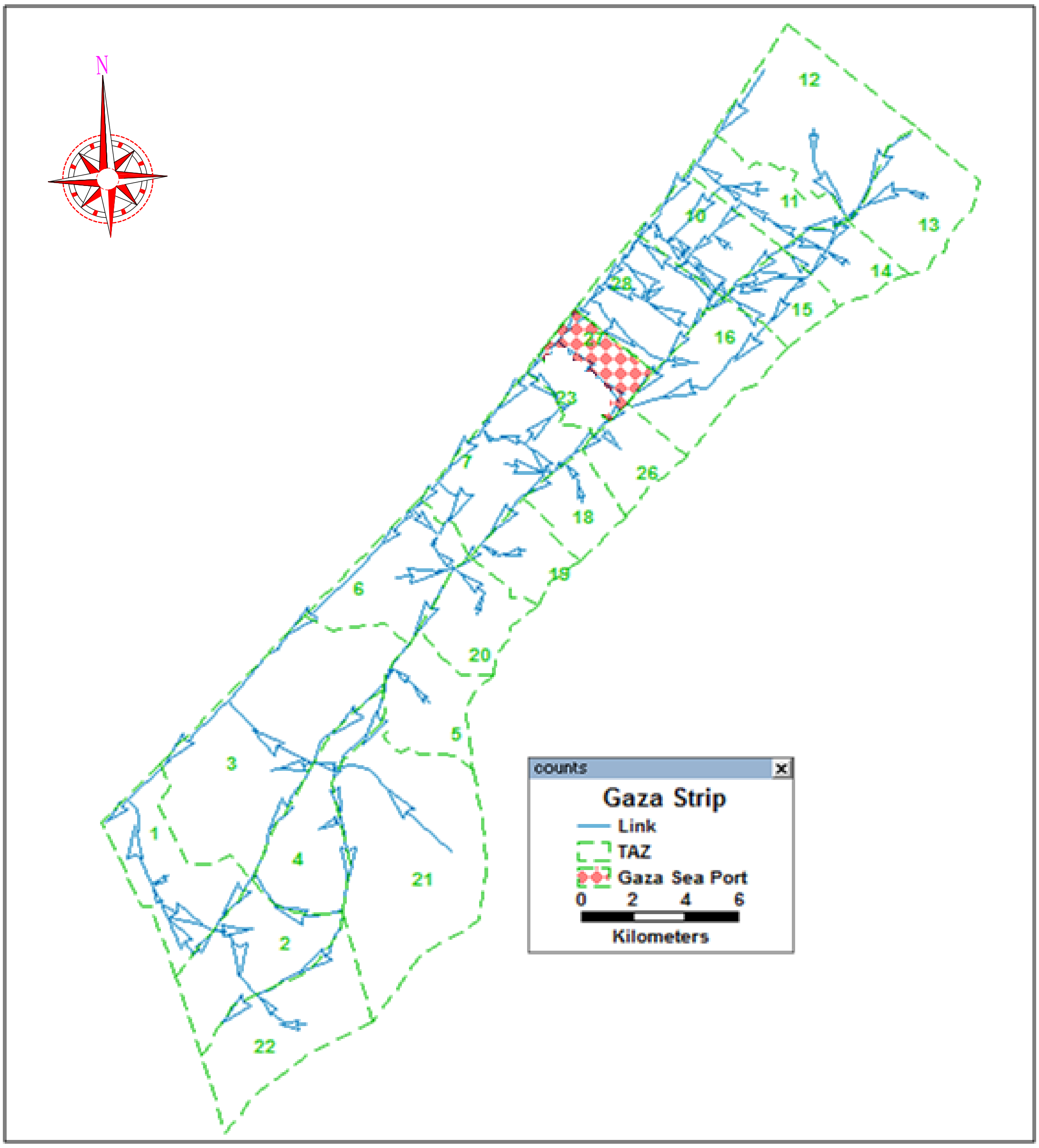
  0 = Travel is allowed in both directions

  1 = Travel is one-way in the same direction as the topology. Topology is the direction in which the coordinates of the line feature are stored

  -1 = Travel is one-way in the opposite direction of the topology.

  Each link in TransCAD network has two types of direction: topological andflow direction.The topological direction is always one direction because it isthe direction of drawing from A to B. However,flow direction could be one or twodirections. Figure 4.1 shows the topological direction.TransCAD offers two ways to set the directionality of segments in a line layer:

  - Indicating nodes along a shortest path and setting segments as one way in the direction of the path, using the Tools-Map Editing-Set One-Way Segments command.
  - Selecting segments and marking them as one way north, south, east, or west, using the Networks/Paths-Link Directions command. This requires first to select all the one-way segments . This command also lets the user to reset one-way segments as two-way ones.



Figure(4.1): Topological Links Directions

- Links flow speed (km/hr):

  Link flow speed in kilometer per hour is estimated as average values of theTravel Speed (average for approach) .

- Links impedance:

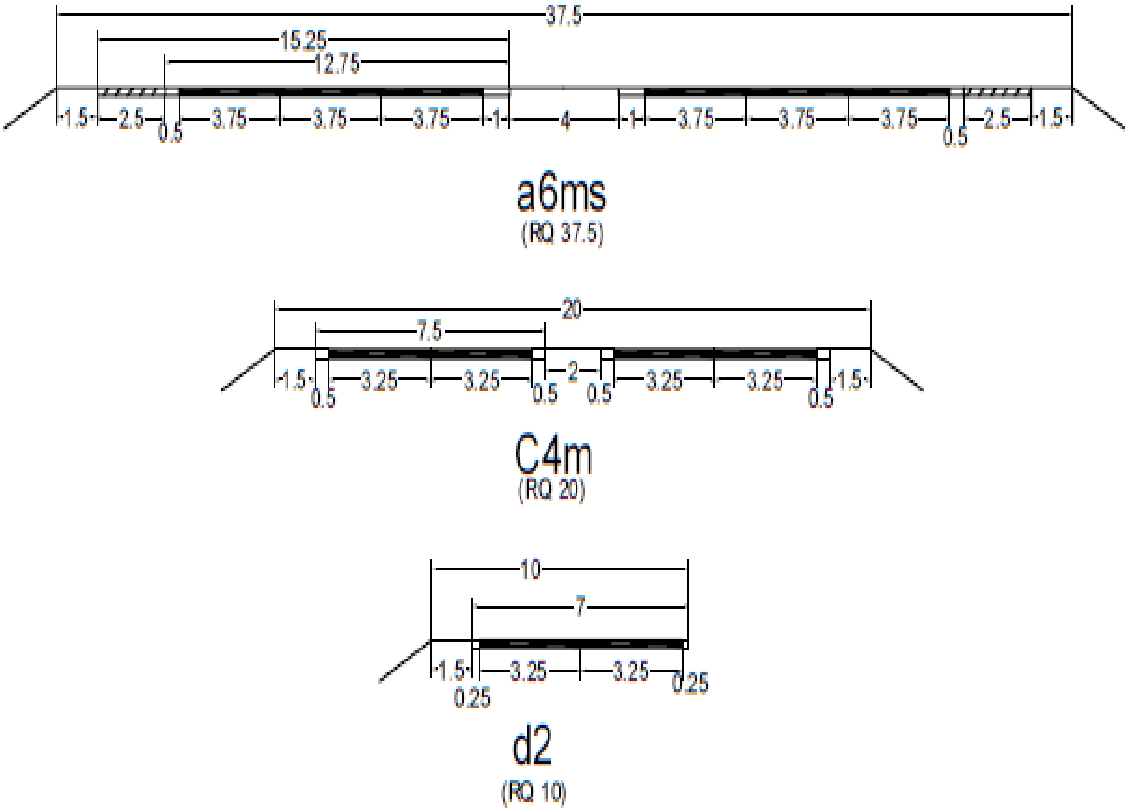
  Links impedance is calculated as a function of the links length and the links speedaccording to the following equation

  Links impedance (min.) = Link length (m) *(3.6/60) / Link speed (km/hr) **(8)**

  = Link length (m) *0.06/ Link speed (km/hr)**….(9)**

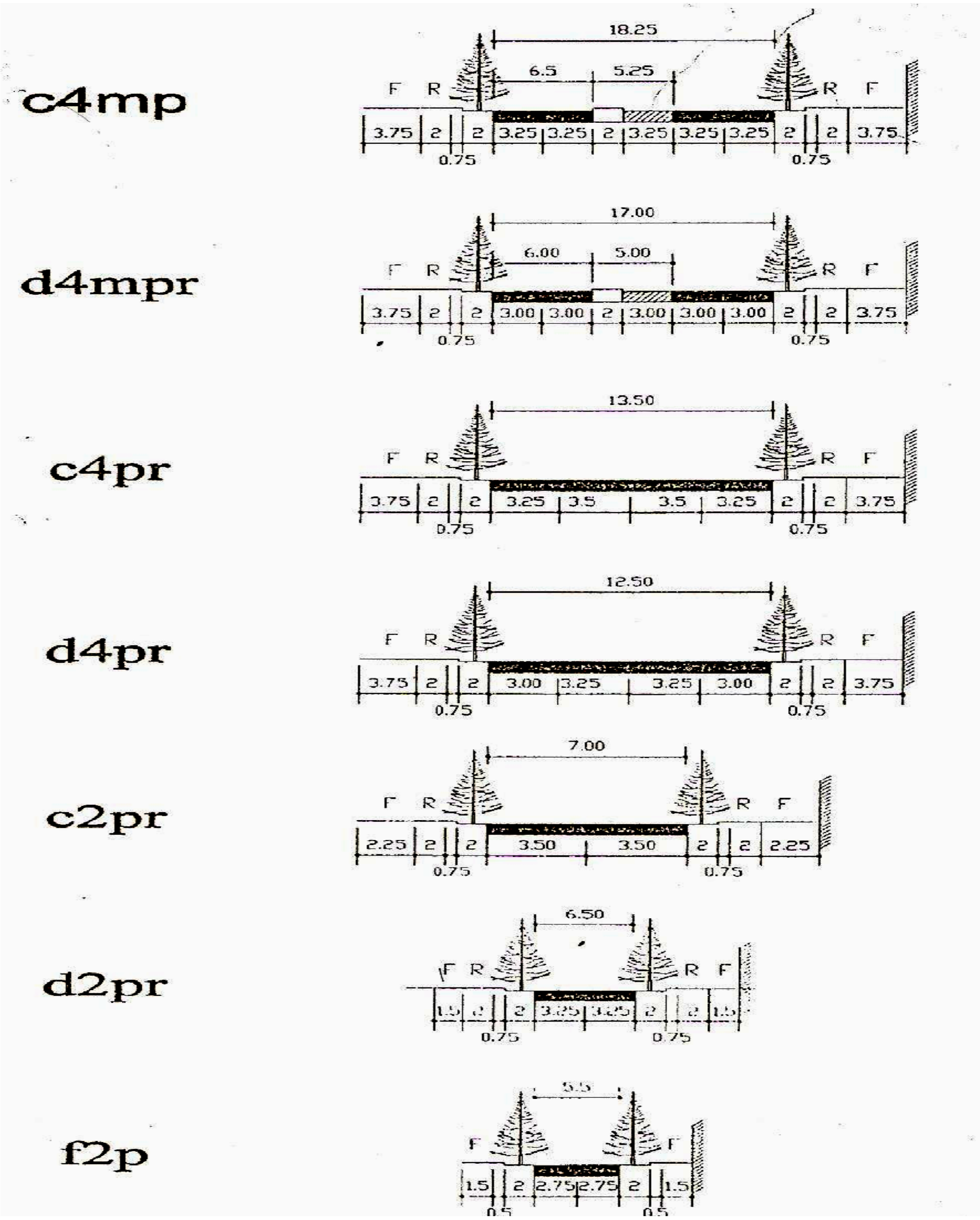
- Link Capacity:

  There are two method to calculated links capacity, Highway Capacity Manual (HCM) method and German standard method, the German standard dependson tables and figures so it more easy. Links capacity was calculated for each road cross section according to theGerman standard (German Federal Ministry of Transport, 1984). First we determinethe type of road (rural or urban) and determine the type of road cross section based on the number of lanes, lane width, and median.Figures 4.2, and 4.3 present therural and urban cross section names and cross section views.



Figure(4.2): Rural cross section type

Source: German Federal Ministry of Transport,1984



Figure(4.3): Urban cross section type

Source: German Federal Ministry of Transport,1984

Table 4.1 shows German standard 1984, where we can find the capacityvalues corresponding to each cross section names.

Table(4.1): Cross section capacity

Source: German Federal Ministry of Transport 1984

Cross Section Group	Cross Section Type	Capacity Per Direction (vph)	Max Speed (Km/h)
A1	a6ms	≤ 3500	120
		≤ 2500	100
A11	c4m	≤ 2300	100
		≤ 2100	80
	d2	≤ 1000	≤ 80
		≤ 700	≤ 80
B11	c4m	≤ 2600	≤ 80
		≤ 2100	≤ 80
C111	c4pr	≤ 1900	50
	c4mpr	≤ 2100	50
	d4pr	≤ 1800	50
	c2pr	≤ 1700	50

A sample of link capacity for the main intersections, and its cross section typeare listed in Table 4.2

Table(4.2): Sample of link capacityfor the main intersections

Street Name	Each Direction Width (m)	Cross Section Type	Capacity per Direction (vph)	Speed (Km/h)
Al-Rasheed St.	9.5	a6ms	≤ 3500	80
Al-Rasheed St.	7	d2	≤ 700	70
Al-Rasheed St. In Gaza City	9.5	c4mpr	≤ 2100	50
Salah Al-Deen St.	19	a6ms+ C4m	≤ 5600	80
Salah Al-Deen St.	7	C4m	≤ 2100	80
Salah Al-Deen St.	9.5	a6ms	≤ 3500	80
Salah Al-Deen St. In Gaza City	7	c4pr	≤ 1700	50
Al Quds St.	7	C4m	≤ 2600	50
Al-Jalah St.	9.5	c4mpr	≤ 2100	50
Own Al-Shawwa St.	7	c4pr	≤ 1700	50
Natsrim St.	7	c4pr	≤ 1700	50
Omar Mukhtar St.	9.5	c4mpr	≤ 2100	50
Jamal Abd Al-Nasser St.	8	c4mpr	≤ 2100	50
Al-Wahda St.	6	d4pr	≤ 1800	50
Al-Nuseirat St.	6.5	d4pr	≤ 1800	50
Taha Hussein St.	5	d4pr	≤ 1800	50
Al-Karama St.	7	c4pr	≤ 1700	50

Street Name	Each Direction Width (m)	Cross Section Type	Capacity per Direction (vph)	Speed (Km/h)
Absan Al-Kabara St.	7	c4pr	$\leq$ 1700	50
Abo-Baker Al-Seddeq St.	9	d4pr	$\leq$ 1800	50
Street No. 10	4.5	c2pr	$\leq$ 1700	50

4.2 Base Year O-D Estimation

O-D matrix estimation from traffic counts is preferred becauseof the lack of data on the socioeconomic characteristics of people living Gaza Strip. In order to find out the number of trips, O-D matrix method is used. This method depends on counting traffic and geometric streets data like capacity andtime.

To use the O-D Matrix of year 2015, the following steps are required:

1. Prepare the base O-D matrix. A unity matrix was used as a base matrixbecause there is no previous O-D matrix. All unity matrix cells are onesthat except the diagonal cells because they are zeros. This is because in this study, internal trips in each region were ignored.

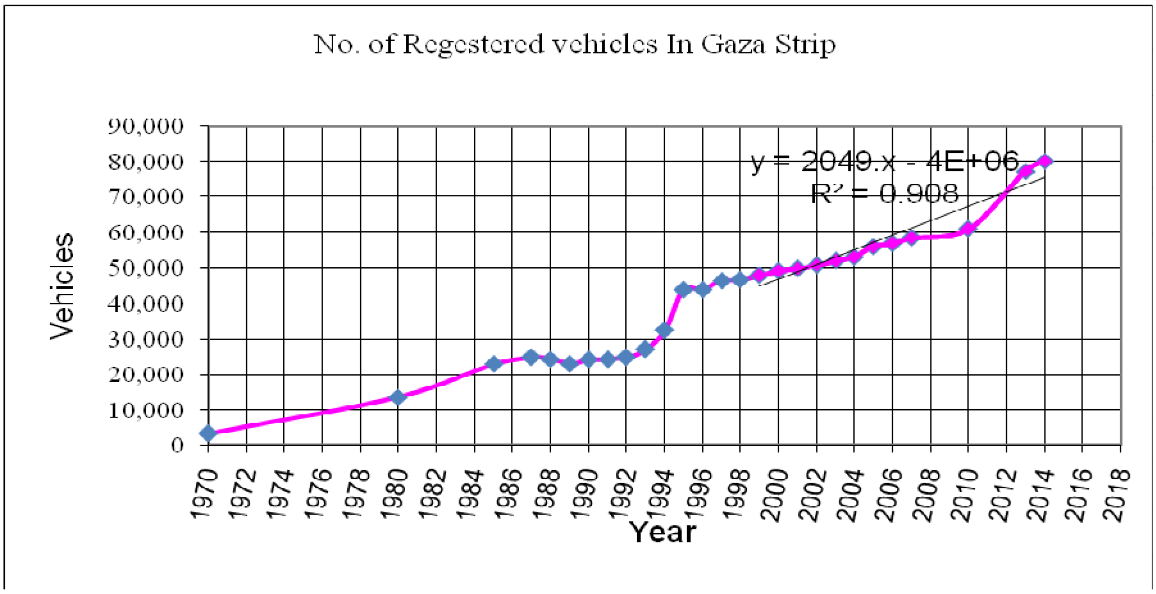
2. Prepare a geographic file containing both a node and a line layer. Naturally,the network line layer shown previously is used as a geographic file.

3. Prepare the required link data. The attributes data described previously are enough for O-D matrix process. Create a network from the line layer, including all the relevant attributes. This step is required to make TransCAD deal with the line layer and its attribute data as a network drawing. To build a network,choose Networks/Paths-Create. The network includes the items (length, traffic count, capacity, speed, and time) .

4.3 Future O-D Estimation

- The Growth Rate of Motor Vehicle in Gaza Strip

In 2014,the number of registered vehicles in Gaza Stripwas80,114 vehicles.However,the number of issued driving licenses was112,675, and the number of old vehicles withproduction date before 1990 wasabout 19,874 vehicles.The number of 3-wheeled vehicles (locally known as toktok) and motorcycles was16,805 according to the Ministry of Transport and Communications Statisticsالمرجع. The statistics show that there was a very sharp and sudden increase of morethan 20% in the number of registered vehicles in the Gaza Strip between 1993 and1994; see Figure (4.6).



Figure(4.4): Number of Registered Vehicles in Gaza Strip

(Source: Palestinian Central Bureau of Statistics,2007)

In 1995, the increase in the number of registered vehicles wasthe greatest(about 35%). This dramatic increase in the number of registered vehicleswasdue to the economicand political invigoration in the period from 1993 to 1995,associated with the establishment of the Palestinian National Authority.

Table(4.3): Growth of the number of vehicles

(Source: Palestinian Central Bureau of Statistics,2014)

Year	No. of Registered vehicles	%of change/year
1970	3,350	
1980	13,587	30.6%
1985	22,938	13.8%
1987	24,865	4.2%
1988	24,367	-2.0%
1989	23,008	-5.6%
1990	24,214	5.2%
1991	24,290	0.3%
1992	24,892	2.5%
1993	26,974	8.4%
1994	32,467	20.4%
1995	43,809	34.9%
1996	43,802	0.0%
1997	46,433	6.0%
1998	46,588	0.3%
1999	47,976	3.0%
2000	49227	2.6%
2001	49848	1.3%
2002	50833	2.0%
2003	51976	2.2%
2004	53097	2.2%
2005	55948	5.4%
2006	56724	1.4%
2007	58315	2.8%
2010	60901	1.5%
2013	77152	8.9%
2014	80114	3.8%

The growth rate of the number of registered motor vehicleswasalmost constantintheperiod 1970-1985,and highly fluctuatingbetween the years 1985 and1995. Then, it seems to be almoststeady duringthe last fewyears. For the benefit of this research, the average growth rate for the past year starting from 1999 to 2014 will be calculated and used to determine the predicted number of vehicles in the future.

The average annual growth rate of vehicles was determined as 3.1%.

According to the analysis of the available data described previously,the estimation of the future O-D Matrix was based on the average growth rate of vehicles in Gaza city, which is 3.1 %. Therefore, the future O-D matrix in 2020 can be obtained by applying this growth rate to each current (2015) O-D matrix cell. The following equation can be used in this regard:

$$OD\ future = OD\ present * (1+i)^n \text{……………………………………..}\textbf{(10)}$$

Where:

i = Growth Rate , n = Number of years

For example:- $OD_{2020} = OD_{2015} * (1+0.031)^5 = OD_{2015} * (1.16)$

4.4 Estimating Additional Traffic Due To New Seaport.

To assessthe impact of sensitive and important new facilities in the area,a study should be conducted on the private sector facilities in the region that may be affected as a result of the creation of this new facility. In order to calculate the number of trips that are attracted to the port there are two ways:

4.4.1 ITE trip generation manual method

This method dependson the number of berths in Seaport. Theberth is a place in which a vessel is moored or secured; place alongside a quay where a ship loads or discharges cargo.The number of berths in Gaza Seaport is differentin each phasesshown in Table 4.4.The ITE trip generation manual equations for a water port/marine terminal are:

Trips/day = 172 × # of berths…………………………………….……..… **(11)**

Trips/hour = (Trips/day)/6

(It was assumedthat the Gaza Seaport works just for 6 hours per day, since the officialdaily working time for civil servants in Gaza is from 8 A.M. to 2 P.M.).

The trips in this method are all trips (trucks and passenger cars)attracted byGaza Seaport .

Table(4.4): Number of Berths and Trips in each phases
Source: Thesis of D. Smaling,1996

	phase I	phase II	phase III
Berths	3	4	7
trips/day	516	686	1201
trips/hr	86	114	200

4.4.2 Average Trucks Load Method

This method dependson the maximum of the import and export forecasts at the Sea Port. The generated trips in this method are just truck trips.The maximum of the import and export forecasts in Gaza Seaport are deferent at each phase. To estimate the number of Trips, it wasassumed that the average truck load is 30 tons,which is the average loading capacity of the trucks that enter Gaza through Karm Abu Salem Crossing (see Table 4.5).

Table(4.5): Import And Export Forecastsat Gaza Seaport And Trips In Each Phase
Source: Thesis of D. Smaling,1996

		phase I	phase II	phase III
Containers	Full (TEU)1	10991	425000	175000
	Empty (TEU)	3428	6428	25000
General cargo (t)		215300	340000	1400000
Dry bulk	Grain (t)	92000	115000	350000
	Marble (t)	100000	100000	100000
Liquid bulk (t)		366000	970000	2000000
Total (t)		905192	2035000	5950000
Trip(Truck 30t)/year		30173	67833	198333
Trip(Truck 30t)/day		96	217	634
Trip(Truck 30t)/hr		16	36	106

Note:- 1 TEU = 12 ton

As could be noticed, ITE method considers all trips that will occur as a result of Gaza seaport construction. This includes cars and trucks. However, the Average Trucks Load Method only considers the resulting trips by trucks. Thus, this study will adopt the first method. Table 4.6shows the number of trips that is expected in each hour for each phasein Gaza Strip after the construction of Gaza Seaport in 2020.

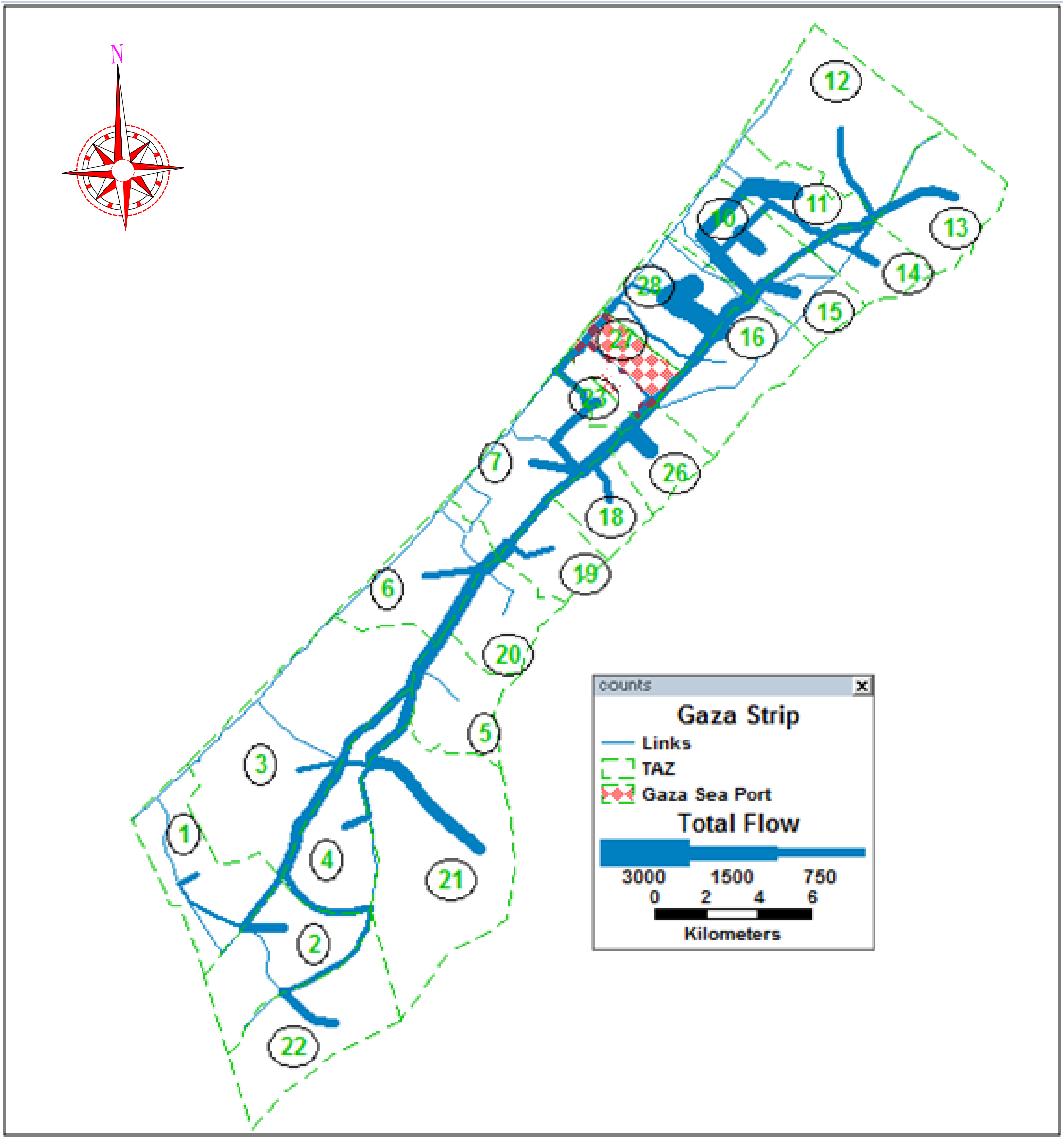
Table(4.6): Number of trips per hour for Gaza Seaport.

Phases of Gaza Seaport	trip/hr
phase I	86
phase II	114
phase III	200

4.5 Traffic Flow Assignment Stage

The first result is the O-D matrix. This is considered as the most essential input forthe current and future traffic prediction when assigned to the network. The trafficassignment process should have a prior accurate O-D matrix. Table 2B in Appendix (B) presents the estimated O-D matrix for the Gaza network model.The last and the most important performance measure is the volume overcapacity ratio(VOC),which is calculated for each line in the network. Figures4.7 presentthe max VOC map for Gaza Strip in base year 2015.

TransCADusually estimates the traffic volumes for each link in the traffic network.This process needs an O-D matrix (the estimated one), and a line network layer with its attributes. TransCAD gives options to choose the assignment method in the O-Dmatrix dialogue box. The Stochastic User Equilibrium was chosen in our modelbecause it gives more realistic results. Figure 4.5 shows the estimated Total traffic flow ineach link represented by line width.



Figure(4.5):Total estimated flow in2015

Table 4.7 presents the links number and percentage on each flow range. The results showthat 7% of the traffic links have more than 900 veh/ hr.

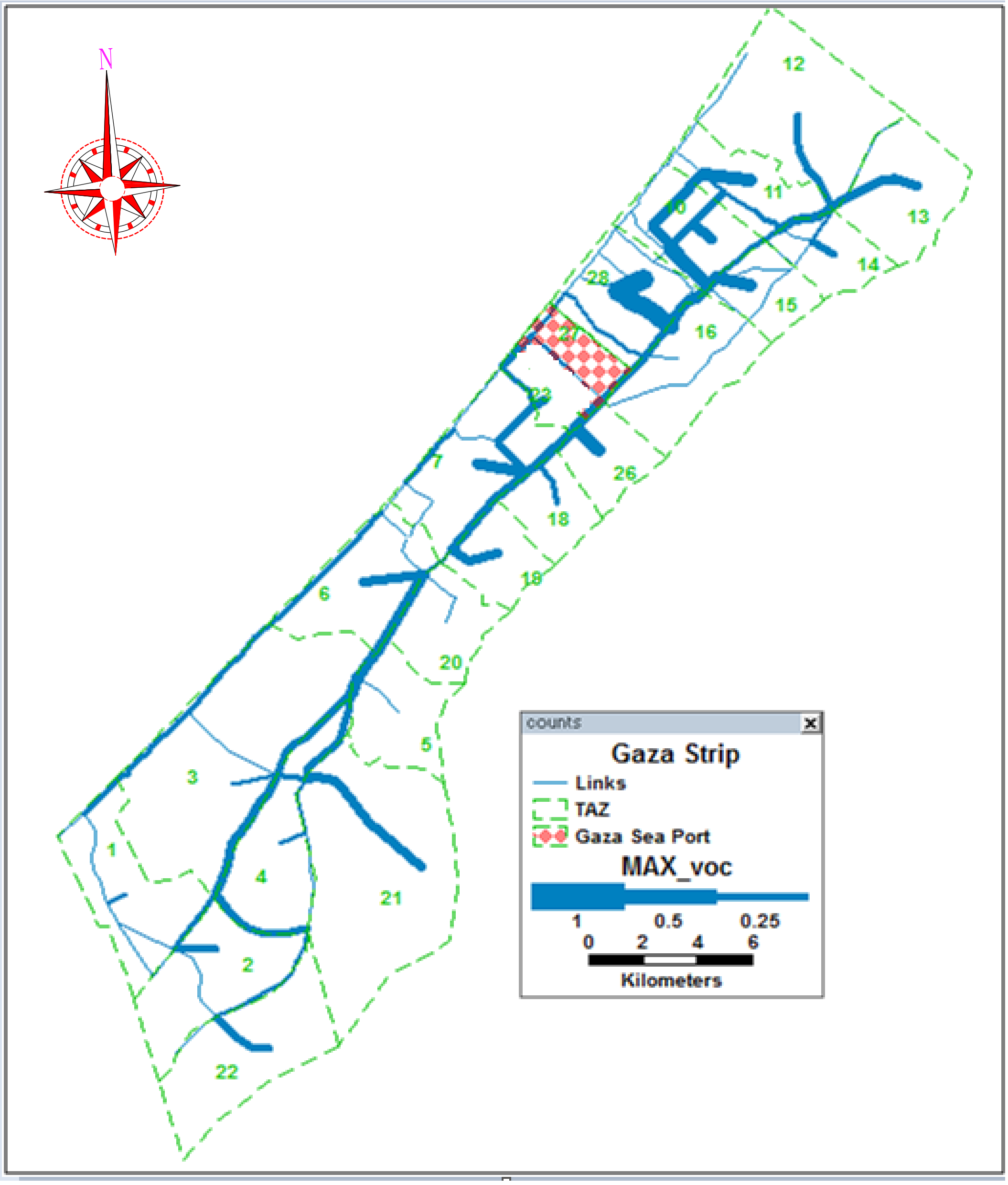
Table(4.7): The estimated flow ranges and percentages in 2015 without Gaza Seaport

	AB - Direction		BA - Direction	
Flow Rangesveh/hr	# Links	% Links	# Links	% Links
0 - 300	71	53	71	53
300 - 600	37	28	37	28
600 - 900	16	12	16	12
900 - 1200	7	5	7	5
1200 - 1500	1	1	1	1
1500 - 1800	1	1	1	1
>1800	0	0	0	0

- **Network Performance Measures of Base Year 2015**

With any successful O-D matrix estimation and traffic assignment, TransCAD produces a report containing general information about the estimation and assignment process. This information includes input file, running time, input data, and network performance summary. The network performance summary consists mainly of two items. The first is total vehicle hours (Total VHT) which is the summation of travel time spent by all the vehicles in the network from its origins to its destinations. The VHT in our network is 19,981 hours. The second is the total vehicles kilometers traveled (VDist- T) which is the summation of the total distance traveled by all the vehicles over the network in one hour. The V-Dist- T in our network is 155,882 Km.The previous two performance measures could be useful for comparing between scenarios associated with any network, where the best scenario has the lowest VHT and V-Dist-T values.

The last and the most important performance measure is the (VOC) volume over capacity ratio which is calculated for each line in the network. Figure 4.6 shows VOC for the base year 2015.



Figure(4.6):Max Volume/Capacity in Gaza Strip for 2015

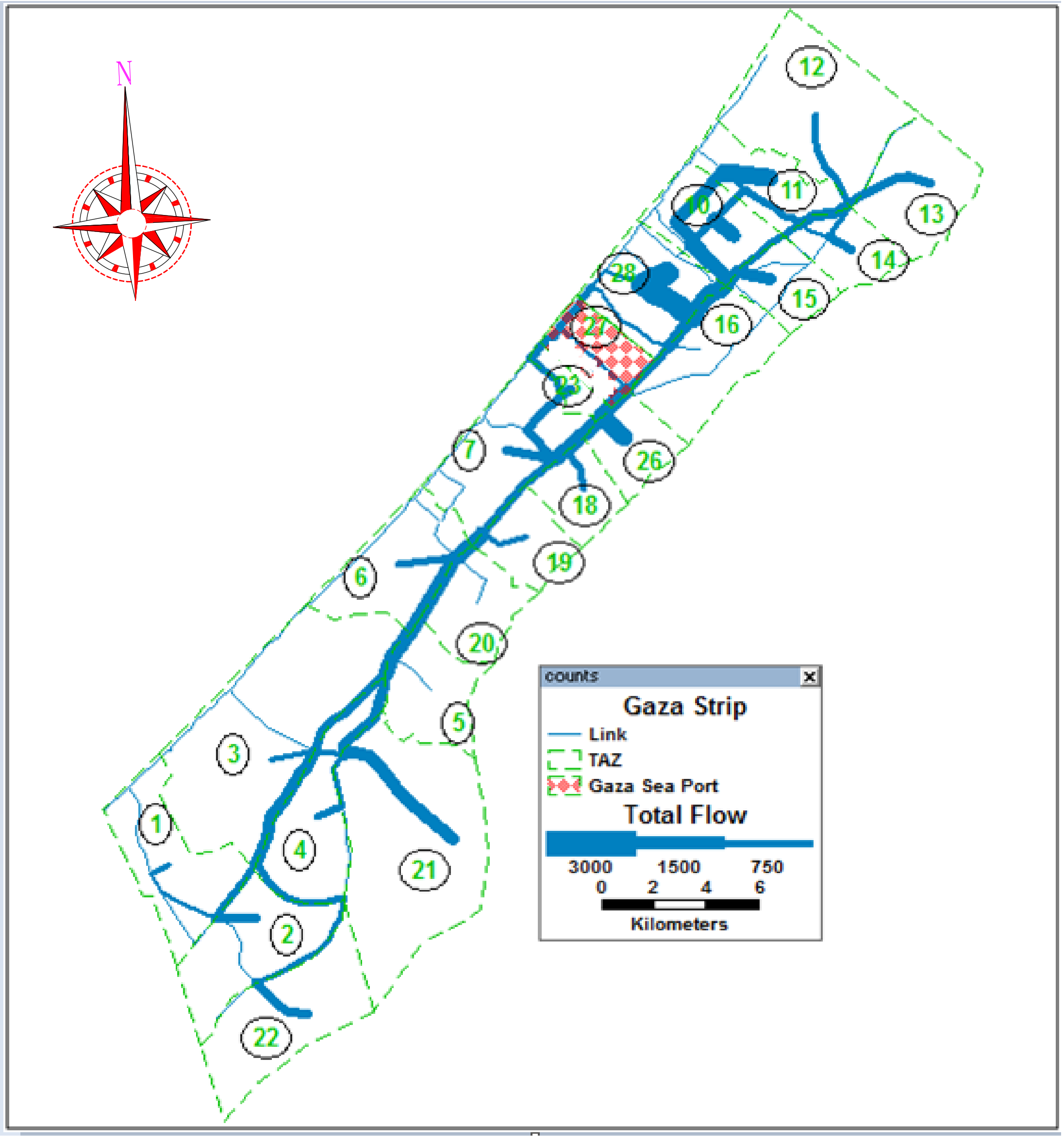
Table 4.8presents the links number and percentage oneach VOC range for year 2015without Gaza Seaport existence. The results show that 59 % of the traffic linkshave level of service (A), and about 28% of the traffic links have level of service (B) in both directions.

Table(4.8): The estimated VOC ranges and percentages in 2015 without Gaza Seaport

		AB - Direction		**BA - Direction**	
VOC Ranges	LOS	# Links	% Links	# Links	% Links
0 – 0.2	A	78	59	78	59
0.2 – 0.4	B	37	28	37	28
0.4 – 0.6	C	15	11	15	11
0.6 – 0.8	D	1	1	1	1
0.8 – 1	E	1	1	1	1
> 1	E	1	1	1	1

- **Future Flow Estimation for Year 2020 without Gaza Seaport.**

Network traffic assignment was carried outbased on future O-D matrix for the year 2020.The resulted traffic flow is the expected flow of the year 2020. This process needs an O-D matrix (for year 2020), and a line network layer with its attributes. The Stochastic User Equilibrium was chosen for this purpose. Figure 4.7 shows the total traffic flow in each link for the future scenario (year 2020), which has been represented by line width.



Figure(4.7): Total estimated flow in 2020 without Gaza Seaport

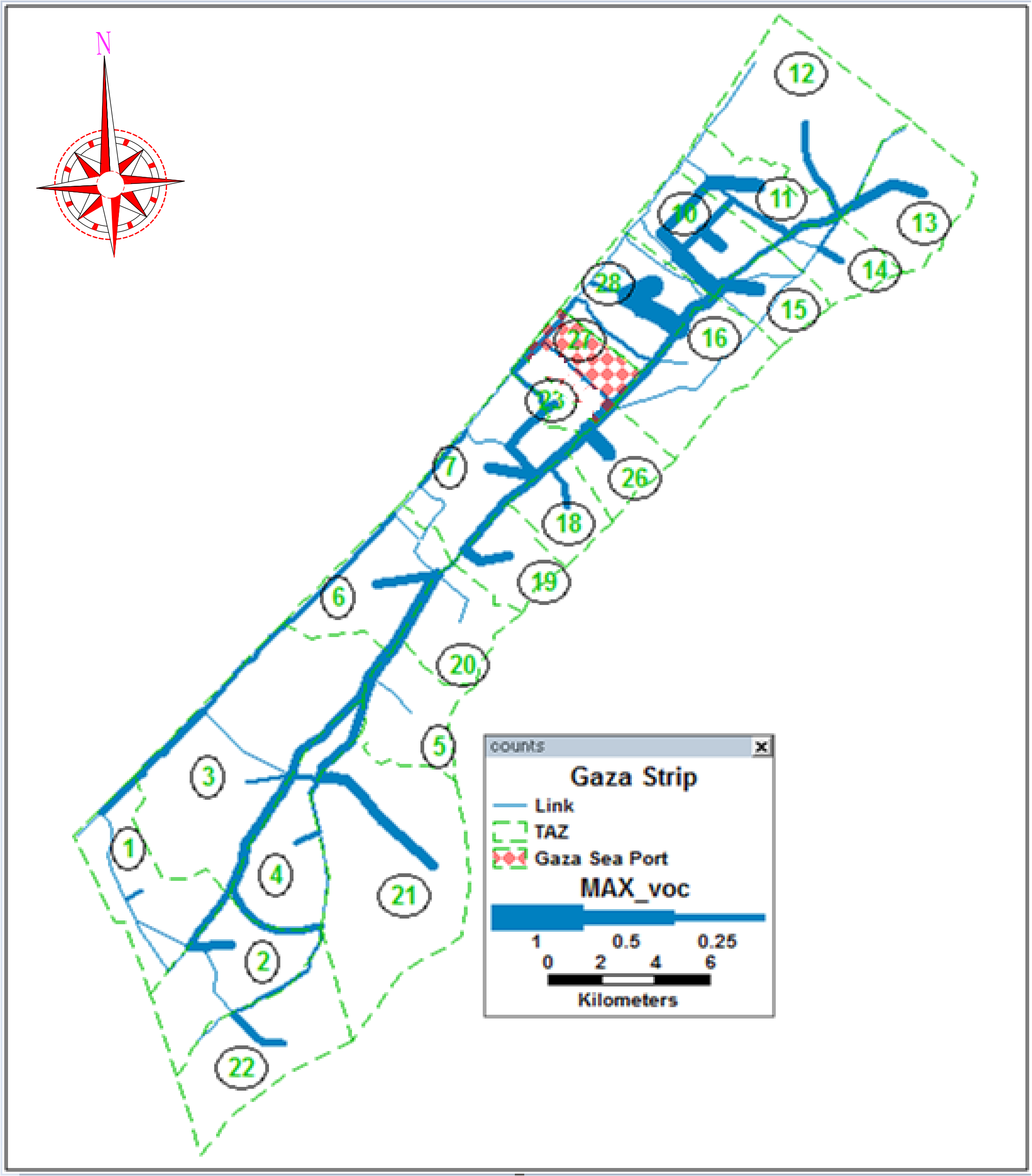
Table 4.9presents the links number and percentage on each flow range. The resultsshow that 11 % of the traffic links have more than 900 veh/hr.

Table(4.9): The estimated flow ranges and percentages in 2020 without Gaza Seaport

	AB - Direction		BA - Direction	
Flow Rangesveh/hr	# Links	% Links	# Links	% Links
0 - 300	65	49	65	49
300 - 600	34	26	34	26
600 - 900	20	15	20	15
900 - 1200	8	6	8	6
1200 - 1500	4	3	4	3
1500 - 1800	2	2	2	2
>1800	0	0	0	0

- **Network Performance Measures of Future Year 2020 without Gaza Seaport existence.**

The total vehicles hours (Total VHT) for future year 2020 without Gaza Seaport were 22,635 hours, while the total vehicles kilometers traveled (V-Dist- T) for future year 2020 without Gaza Seaport equals176,147 Km. The last and the most important performance measure is the (VOC) volume over capacity ratio where it is calculated for each line in the network. (VOC) for future year 2020 without Gaza Seaport is shown in Figure 4.8.



Figure(4.8): Max Volume/Capacity in Gaza Strip for 2020 without Gaza Seaport

Table 4.10 presents the links number and percentage oneach VOC ranges for year 2020 without Gaza Seaport. The results show that 56% of the traffic linkshave level of service (A), and about 26% of the traffic links have level of service (B)in both directions.

Table(4.10): The estimated VOC ranges and percentages in 2020 without Gaza Seaport

		AB - Direction		**BA - Direction**	
VOC Ranges	LOS	# Links	% Links	# Links	% Links
0 – 0.2	A	75	56	75	56
0.2 – 0.4	B	35	26	35	26
0.4 – 0.6	C	20	15	20	15
0.6 – 0.8	D	0	0	0	0
0.8 – 1	E	2	2	2	2
> 1	E	1	1	1	1

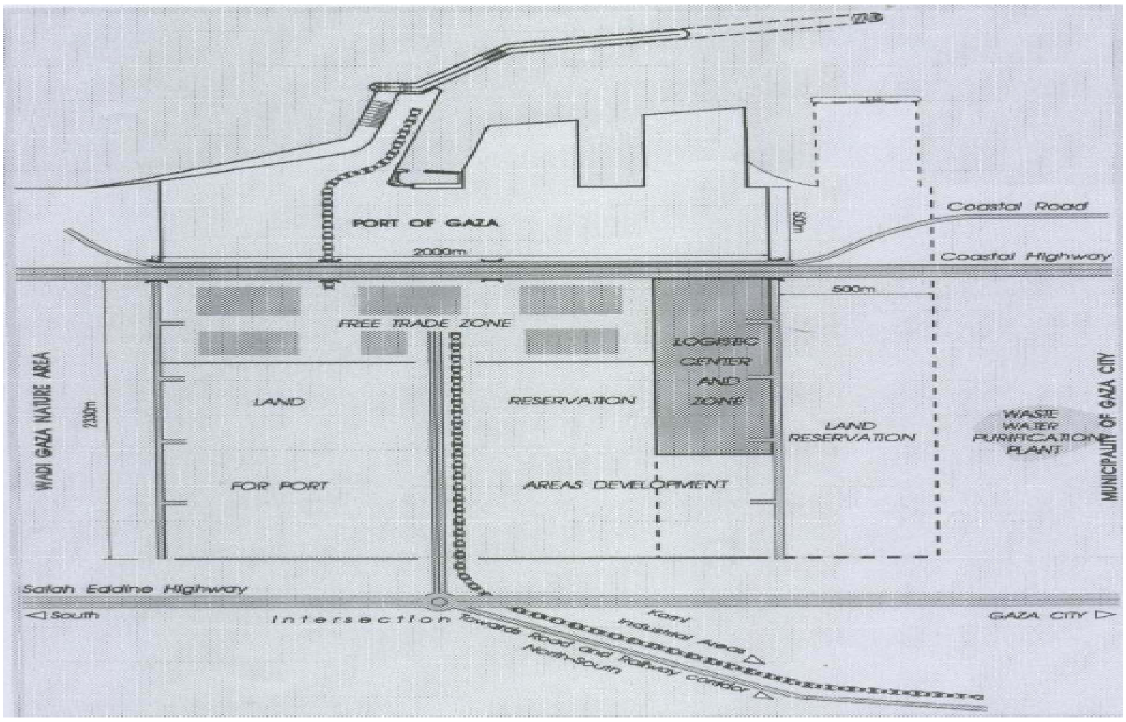
- **Future Flow Estimation for Year 2020 with Gaza Seaport existence**

The number of trips attraction due to the number of Berths in Gaza Seaport was calculated based on the population in each zone. This was carried out for the three phases of constructing the seaport.In Gaza,Khan Yunis and North Gaza there are four zones. However, in the central Gaza Strip there are seven zones and in Rafah there are three zones, as shown in Table 4.11.

Table(4.11): The population and trips in Gaza Strip in each phase

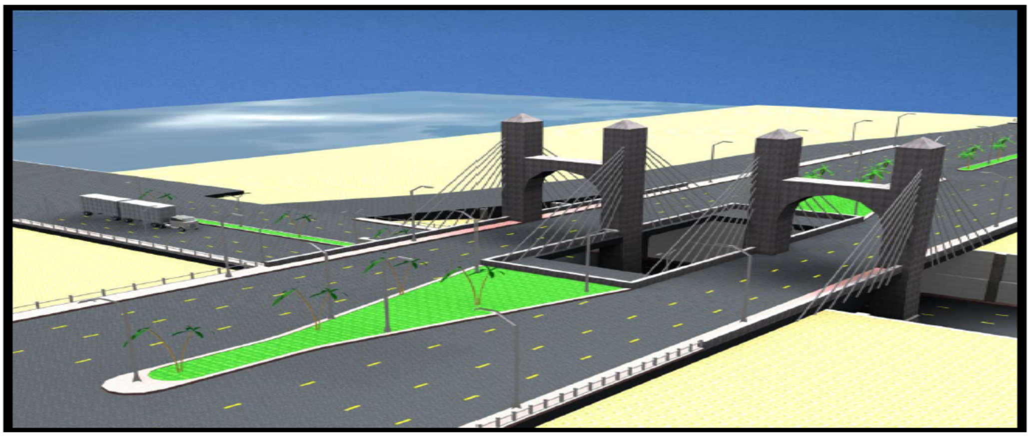
City Name	Gaza	Khan Yunis	Deir Al-Balah	Rafah	North Gaza
Population	616,287	336,205	260,080	221,648	355,790
PhaseI	29.61	16.15	12.50	10.65	17.09
PhaseII	41.29	22.53	17.43	14.85	23.84
PhaseIII	72.44	39.52	30.57	26.05	41.82
# Zone	4	4	7	3	4
Trips/Zone	18.11	9.88	4.37	8.68	10.46

Figure 4.9 shows theproposed plan of theGaza Seaport and the area around the port. In this study,it is assumed that all traffic movementsto the port will take place in thefree trade zone. This is becauseall imports and exports delivered by ships are loaded or unloaded in the port by a bridge located between port berths and the free trade zone.. Goods are delivered through acorridor located below the bridge between Al Rasheed Street and NetzarimStreet to the free trade zone in order to be distributedto the Gaza Strip different regions.



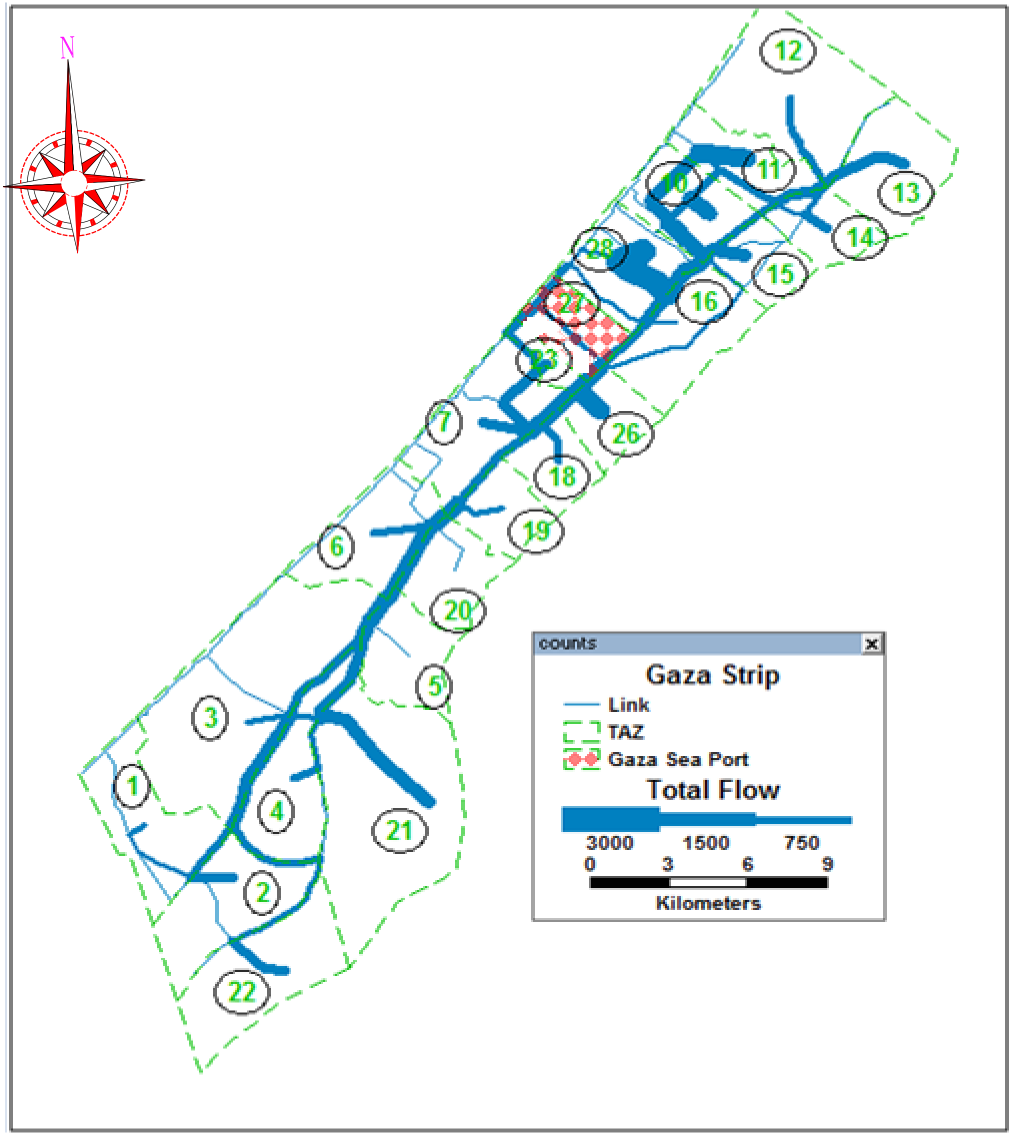
Figure(4.9): Proposed plan of Gaza Seaport
Source: Ministry of Transportation, Palestinian, 2005.

Figure 4.10 illustrates the proposed bridge located at Al Rasheed and NetzarimStreets intersection. Trucks loaded by goods will travel from port berths to the Free Trade Area through a corridor located below the bridge to avoid congestion at the intersection.



Figure(4.10): The bridge in intersection between Al-RashedSt. and NetesaremSt.Source: Ministry of Transportation, Palestinian, 2005.

In order to determine the effect of the establishment of the Gaza seaport on the network in future year 2020, number of trips attraction due to the establishment of the port has to be consideredbased on Table 4.10, especially in phaseIII because it is the critical phase in this study.After O-D matrix completion of the future year 2020 which considers trips that will occur as a result of the seaport construction, it is possible to carry out a traffic assignment using Trans CAD. Figure 4.11 shows the Total traffic flow in each link for future scenario (in 2020), which is represented by line width.



Figure(4.11): Total estimated flow in 2020 with Gaza Seaport

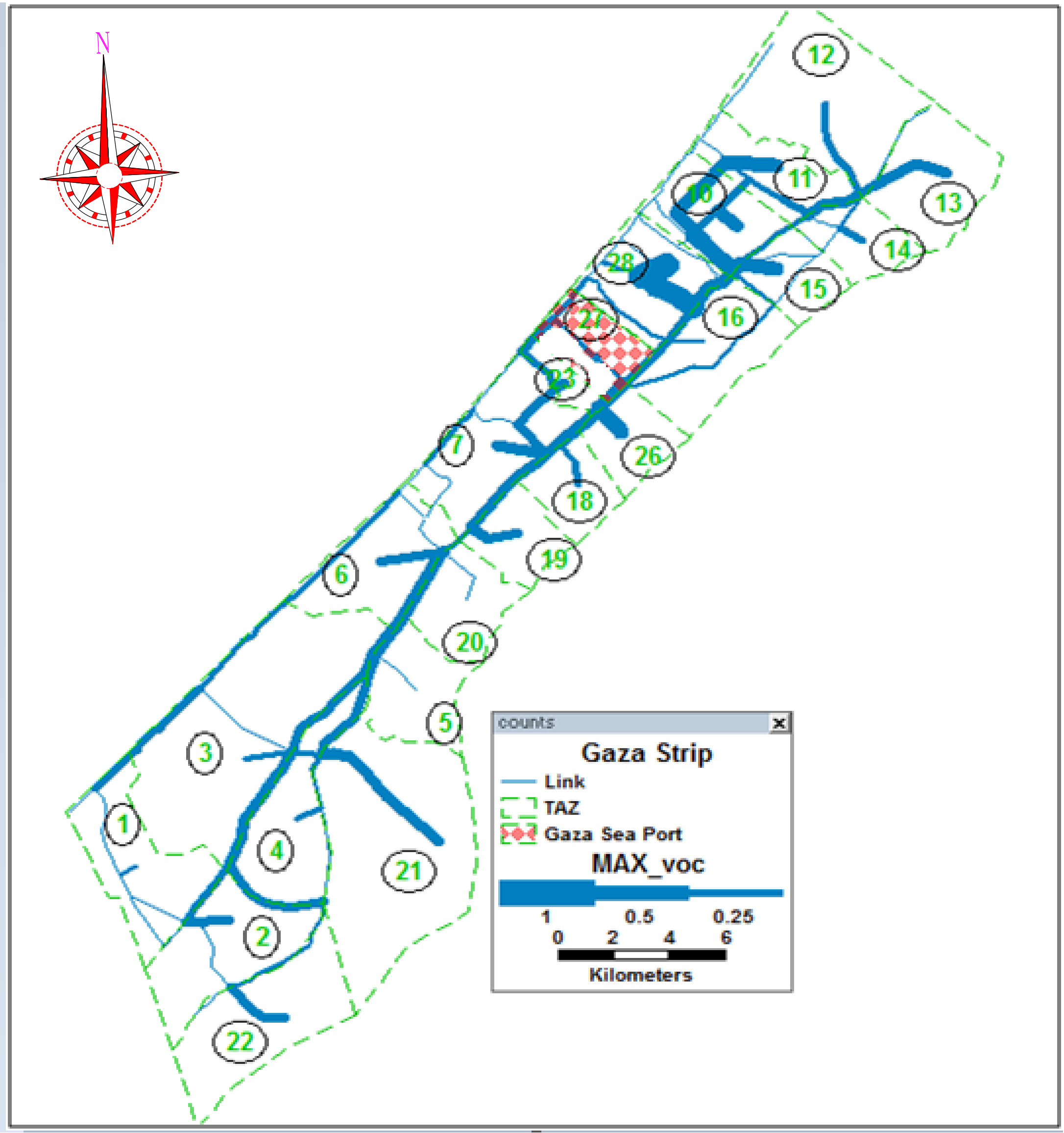
Table 4.12 presents the link numbers and percentages on each flow range. The results show that 14% of the traffic links have more than 900 veh/hr.

Table(4.12): The estimated flow ranges and percentages in 2020 with Gaza Seaport

	AB - Direction		**BA - Direction**	
Flow Rangesveh/hr	# Links	% Links	# Links	% Links
0 - 300	63	47	63	47
300 - 600	35	26	35	26
600 - 900	17	13	17	13
900 - 1200	12	9	12	9
1200 - 1500	4	3	4	3
1500 - 1800	2	2	2	2
> 1800	0	0	0	0

- **Network Performance Measures of Future Year 2020 with Gaza Seaport existence**

The total vehicles hours (Total VHT) for future year 2020 assuming Gaza Seaportexistence were 23,729 hours. While the total vehicles kilometers traveled (V-Dist- T) for future year 2020 with Gaza Seaport equals18,3163 Km. The last and the most important performance measure is the (VOC) volume over capacity ratio,which is calculated for each line in the network. (VOC) for future year 2020 with Gaza Seaport is shown in Figure 4.12.



Figure(4.12): Max Volume/Capacity in Gaza Strip for 2020 with Gaza Seaport

Table 4.13 presents the link numbers and percentagesat each VOC ranges for year 2020 with Gaza Seaport. Results show that 75% of the traffic linkshave level of service (A), and about 36% of the traffic links have level of service (B).

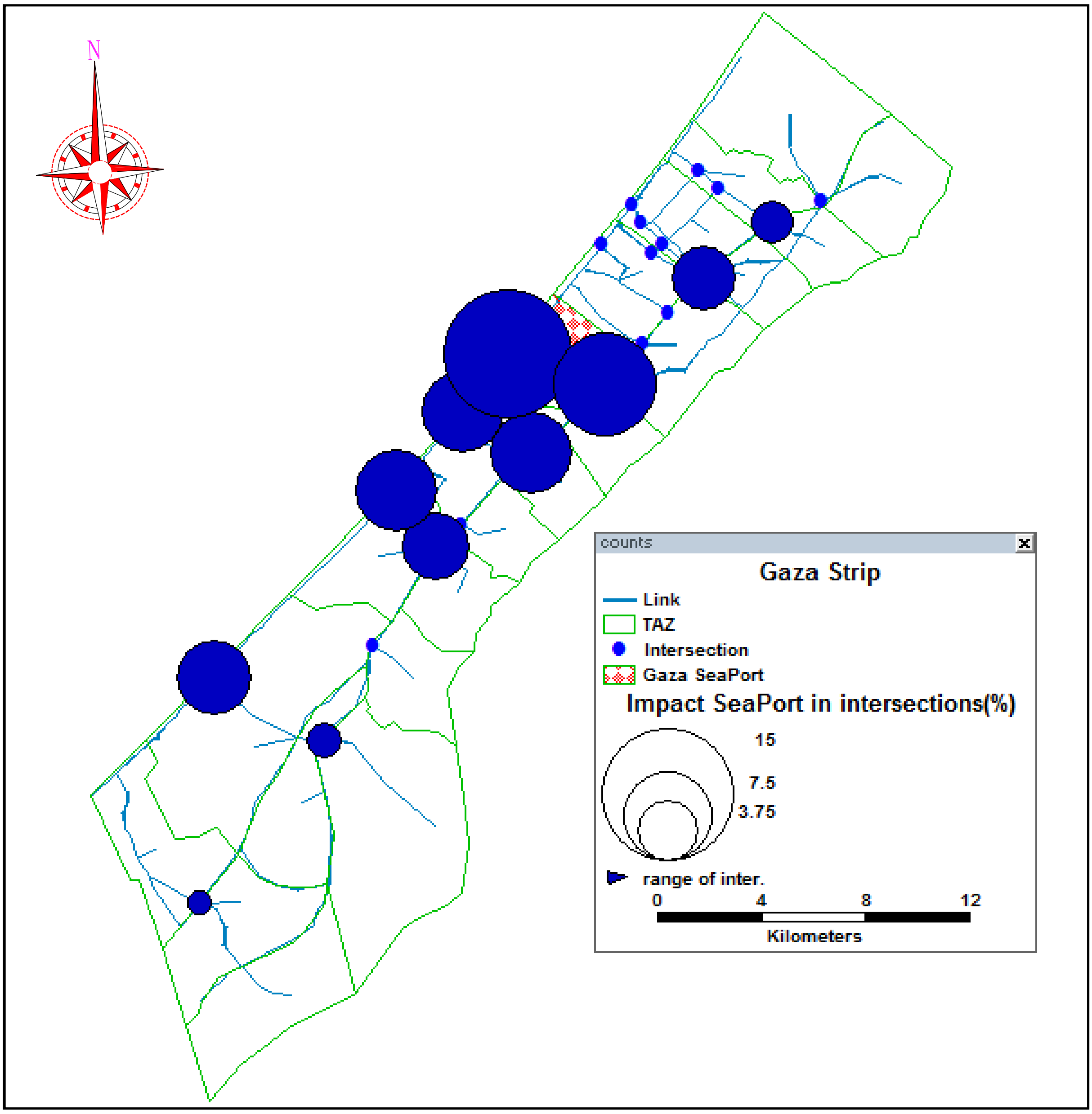
Table(4.13): The estimated VOC ranges and percentages 2020 with Gaza Seaport

		AB - Direction		**BA - Direction**	
VOC Ranges	LOS	# Links	% Links	# Links	% Links
0 – 0.2	A	75	56	75	56
0.2 – 0.4	B	36	27	36	27
0.4 – 0.6	C	20	15	20	15
0.6 – 0.8	D	0	0	0	0
0.8 – 1	E	2	2	2	2
> 1	E	0	0	0	0

In the following Table(4.14), the difference between total flow in the future year 2020 without Gaza Seaport and total flow with Gaza Seaportatthe main intersections is presented. The intersections locatedfar from Gaza Seaportwould not be heavily affectedby the construction of the Gaza Seaport. These intersections include AlSaraya and Dolah intersections. At these intersections, the difference between the future traffic flow in 2020 with the seaport and without itwas close to zero. However, the intersections near the port were heavily affected such asNetesarem intersection, with10.18% in crease, and AlZahra intersection, with14.3% increase. As road intersections get away from the Gaza Seaport the impact on them gets less and less,andvice versa.

Table(4.14): The estimated traffic flow ranges and percentages in 2020

ID	Intersection Name	Total Flow future year 2020 Without Sea Port	Total Flow future year 2020 With Sea Port	Different %
2	Salah al-Din intersection with AL-Quads(Zemo)	3739	3818	2.11
5	Salah al-Din intersection with AL-Wahada and Omar AL makhtar (AL Shejaiya)	7110	7406	4.16
6	Omar AL makhtarintersection with AL Jalal (AL Saraya)	10161	10161	0.00
9	Salah al-Din intersection with Number "8" (Dolah)	6879	6879	0.00
11	Salah al-Din intersection with AL Karama (Netesarem)	3913	4311	10.18
13	Salah al-Din intersection with AL Nuseirat	6218	6671	6.42
15	Salah al-Din intersection with Deir AL Balah	2443	2559	4.77
17	Salah al-Din intersection with Abasan (BaniSuhaila)	4502	5688	1.67
18	Salah al-Din intersection with Taha Hussein (Khrbat AL Adas)	1736	1753	0.95
22	AL-Rashed intersection with AL Palestine (AL Zahra)	2323	2655	14.30
23	Al-Rashed intersection with the Nuseirat	495	528	6.65
24	AL-Rashed intersection with Akeala	495	528	6.65
25	AL-Rashed intersection with Khan Younis	572	605	5.75



Figure(4.13):Impact of Gaza Seaport Constructionon Major intersections in Gaza Strip

Table4.13 showsthe impact of the constructionof Gaza Seaportonthe different Zones in the Gaza Strip.The largest impactof the port was recorded in the area of the port itself (48%) followed by the southeast of Gaza region (9.6%) due to its proximity to the Karama Street. This is because this street is one of the main streets that leads to

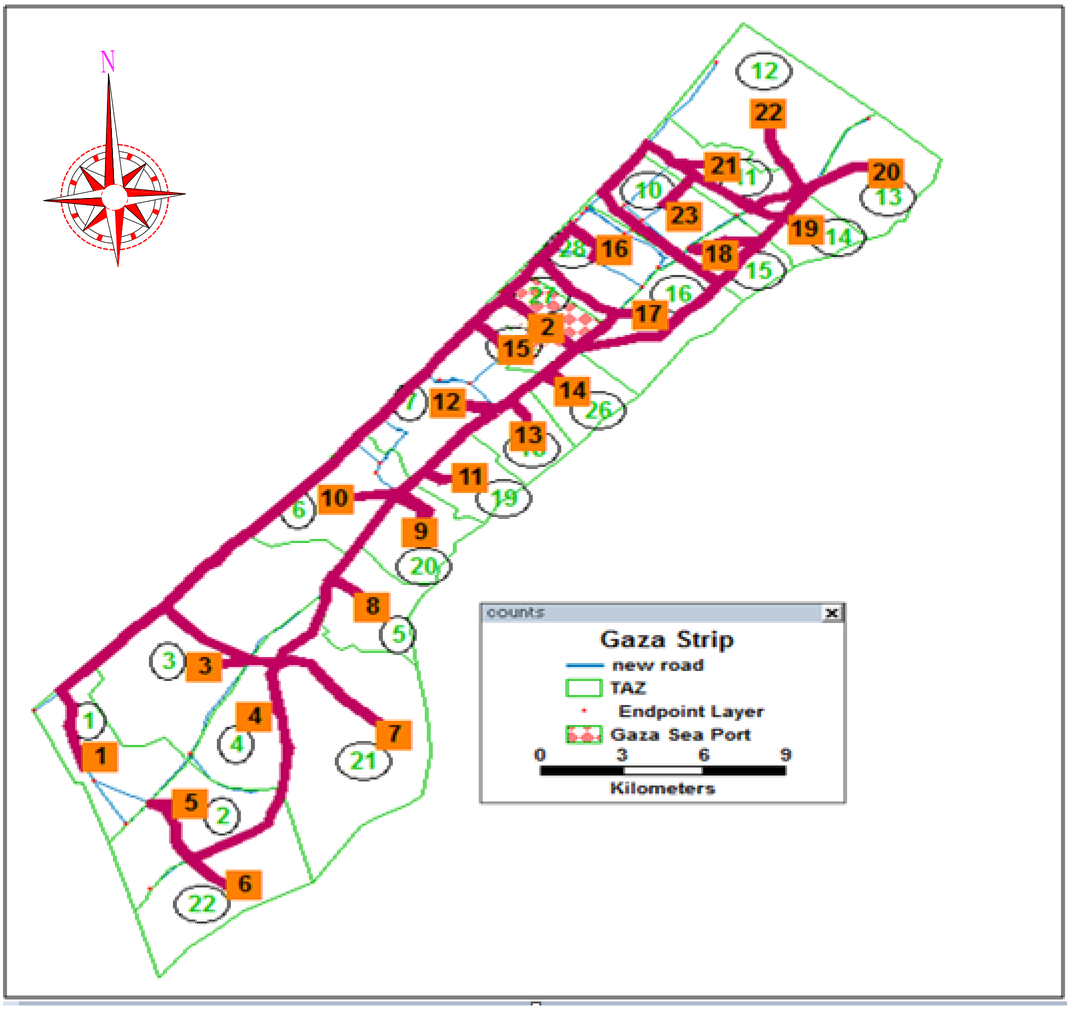
Gaza seaport in addition to the fact that the south-east area of the Gaza Strip is characterized by the industrial land use.

Table(4.15): The estimated flow ranges and percentages per zone in 2020

ID	Zone Name	Total Flow future year 2020	Total Flow future year 2020 with Sea Port	Different %
1	West Rafah	681	697	2.42
2	Center Rafah	1215	1231	1.36
3	West Khan Younis	704	723	2.67
4	Center Khan Younis	935	954	2.02
5	AL Qarara	198	217	0.69
6	Deir al Balah	849	858	0.98
7	Al-Nuseirat	1203	1211	9.52
10	NorthWest Gaza	2118	2153	1.63
11	North Jabalia	2416	2436	0.82
12	Beit-Lahia	1036	1056	1.90
13	Beit-Hanoun	1316	1335	1.50
14	South Jabalia	1185	1205	1.66
15	North EastGaza	1707	1741	2.02
16	South EastGaza	360	395	9.60
18	Al-Burij	872	880	0.95

ID	Zone Name	Total Flow future year 2020	Total Flow future year 2020 with Sea Port	Different %
19	Al-Maghazi,AlMsadar	833	842	1.00
20	Selga	319	327	2.61
21	East Khan Younis	1610	1629	1.17
22	East Rafah	1128	1144	1.47
23	Al- Moghraga	1353	1361	0.61
26	Johr al-Diek	2460	2469	0.34
27	Gaza Seaport	833	1233	47.99
28	SouthWest Gaza	3193	3227	1.08

Figure 4.14 shows the shortest road leading to the Gaza Seaport from the different areas of Gaza Strip.Selection criteria is based on the road VOC, where less VOC value of a road means greater accessopportunity for vehicles in this road, and vice versa.Figure 4.13 shows also that most areas in south and north of the port use Salah AlDeen,Al Rasheed in addition to Al Karama Streets, while the eastern areas use Al Karama Street to reach the Gaza Seaport.



Figure(4.14):Shortest path to Gaza Seaportform other zones

Chapter 5
Conclusions and Recommendations

The construction of a commercial seaport in Gaza Strip without studying its impact on the transportation sector, which is considered among the most important sectors in Gaza Strip,is expected tocreate problem in the transportation network in the project area.In this thesis, the impact of the establishment of Gaza commercial seaport on the road network in the Gaza Striphas been analyzed, with a special focus on the seaport area.

5.1 Conclusions

1. Traffic countshavebeen carried out by IUG civil engineering students from 7 to 10 A.M. at 22 intersections distributed over Gaza Strip.
2. Traffic counts analysis showed that the greatest traffic flow was recorded in Gaza city, namely atthe intersection of Al Jalaa Street with Omar Al Mukhtar Street.Traffic volumeatthis intersection was 20,915 Vehicle /3 hours, and 7,615 Veh/hr in the peak hour. This is followed by the intersection of Al Jalaa Street with Jamal Abdul Nasser Street. Traffic volumeatthis intersection was 18,062 Veh/3 hrs, and 6,656 Veh/ hr in the peak hour.
3. The peak hour factor values ranged from 0.98 to 0.77, and the averagefactor for the network flow was 0.91.
4. The passenger car percentage in Gaza city traffic composition was 79%, while the remaining other vehicles percentage was 21%.
5. The future estimation of O-D Matrix was based on the average growth rate of vehicles in Gaza city, which is 2.53%. The future O-D matrix was obtained by multiplying each cell in the current (2015) O-D matrix by the growth rate for the year 2020.
6. Impact of the Gaza Seaport establishment is concentratedin the nearby main roads intersections in the Gaza Strip. This impact ceases as distance increases between these intersections and the seaport. The most significant impact is

expected at the following intersections: Netzarim intersection, Al- Zahra and Al-Rashid intersection, Deir Al-Balah and Al-Rashid intersection.

7. For the present situation, the total network vehicle hours was 19,981 hours and the estimated vehicle hours for year 2015 without Gaza Seaportexistence is 22,635 hours.This shows anincrease of 13.3%. The total vehicle kilometers traveled was increased from 155,883 Km to 176,147 Km.This shows an increase of 13%.After Gaza Seaportestablishment, the total network vehicles hours was 19,981 hours and the total vehicles kilometers traveled was 183,163 Km.

5.2 Recommendations

The following actions are recommended:

1. To carry out further studies to cover the afternoon traffic activity.
2. To increase the number of roads included in the analysis network used in TransCAD, as well as the number of traffic counting nodes to cover the whole Gaza Strip.
3. To update traffic counting and traffic network every 3-5 years in order to help traffic planning and decision making in Gaza Strip.
4. To carry out further studies to investigate the impact of other strategic facilities on the traffic such as Arafat (Gaza) InternationalAirport.
5. To construct a bridge above the intersection of Salah Al Deen and Al Karama Streets (Netzareem Intersection) in order to serve the increasing traffic flow rate at this intersection especially after the construction of Gaza Seaport. This is because this intersection is planned to be the main seaport entranceby the Ministry of Transportation (2015).
6. It is essential to develop the main roads, which are expected to play a main role in the transport of goods to and from the seaport, which are Al-Karama, Al-Rashid, and Salah Al-Din Streets.
7. To expand theresearch to consider its impact on the traffic network in the West Bank, since the seaport is intended to serve it in addition to Gaza Strip.
8. To carry out sufficient planning studies prior to the establishment of new roads or increasing the capacity of the existing ones.
9. Finally, it is recommended to redesign Gaza Seaport with larger capacity and to expedite its construction in order to respond to the increasing demand on goods considering that this has been found to have a limited effect on traffic network in the Gaza Strip.

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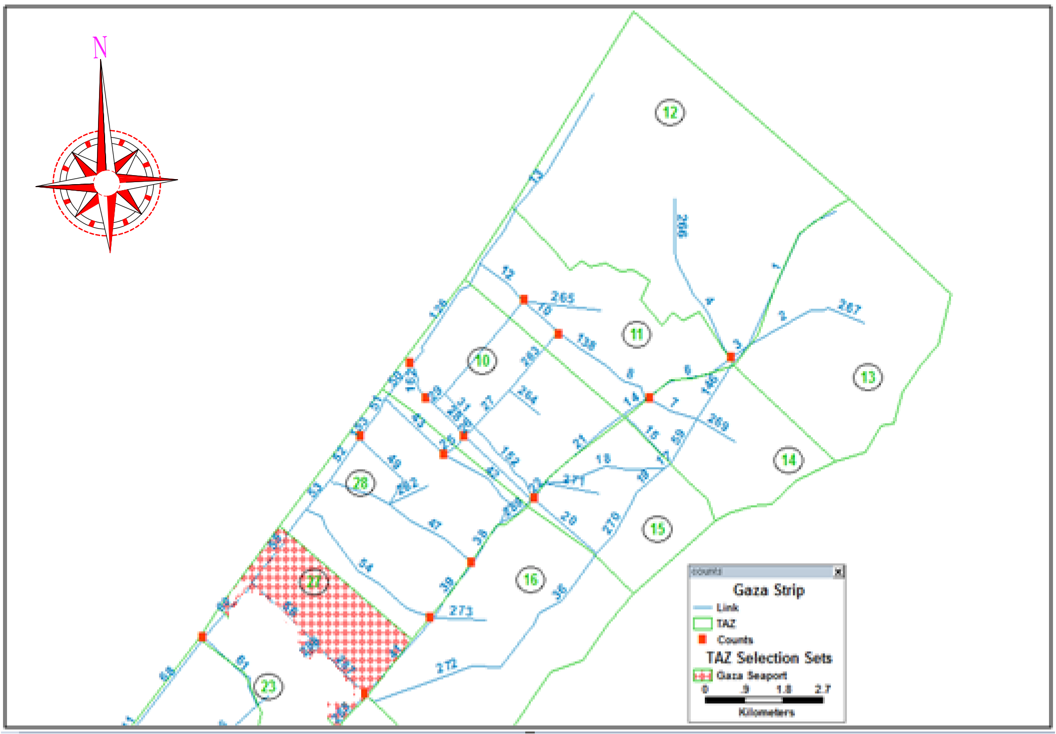
AppendixA: Traffic count and analysis results

Table A1: Intersection traffic count and analysis results

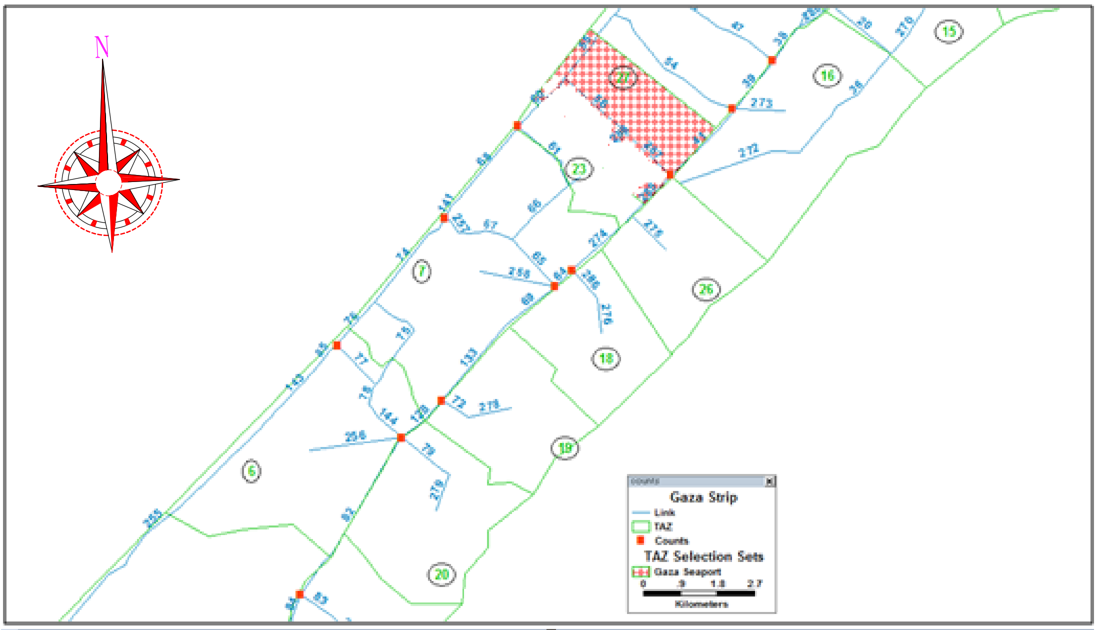
ID	Intersection names	3 hour flow	PH flow	PF Hour		PHF	% Car	Σ% Other
1	Salah al-Dinintersection with BeitLaha(Hamoda)	8678	3029	08:45	09:45	98%	72%	28%
2	Salah al-Din intersection with AL-Quads(Zemo)	11112	3820	08:45	09:45	97%	72%	28%
3	AL-Quadsintersection with AL Jalah	14396	5202	07:15	08:15	92%	84%	16%
4	AL-Quadsintersection with AL Naser	10305	3704	07:45	08:45	97%	84%	16%
5	Salah al-Din intersection with AL-Wahada and Omar AL makhtar (AL Shejaiya)	14028	4986	07:30	08:30	95%	85%	15%
6	Omar AL makhtarintersection with AL Jalal(AL Saray)	20915	7615	07:30	08:30	92%	90%	10%
7	Omar AL makhtarintersection with AL Naser (AL Shawa)	11038	4086	07:30	08:30	89%	88%	12%

ID	Intersection names	3 hour flow	PH flow	PF Hour		PHF	% Car	Σ% Other
8	Jamal abdnaserintersection with AL Jalal(AL Tearan)	18062	6656	07:45	08:45	95%	87%	13%
9	Salah al-Din intersection with Number "8" (Dolah)	15479	5519	07:30	08:30	96%	78%	22%
10	Salah al-Din intersection with Number "10"	1775	671	07:15	08:15	86%	67%	33%
11	Salah al-Din intersection with AL Karama (Netesarem)	10728	3850	07:15	08:15	93%	78%	22%
12	Salah al-Din intersection with AL Bourij	12582	4301	08:30	09:30	96%	76%	24%
13	Salah al-Din intersection with AL Nuseirat	13807	4720	08:30	09:30	98%	77%	23%
14	Salah al-Din intersection with AL Msadr	5215	2179	07:15	08:15	90%	82%	18%
15	Salah al-Din intersection with Deir AL Balah	11767	4167	08:15	09:15	92%	75%	25%

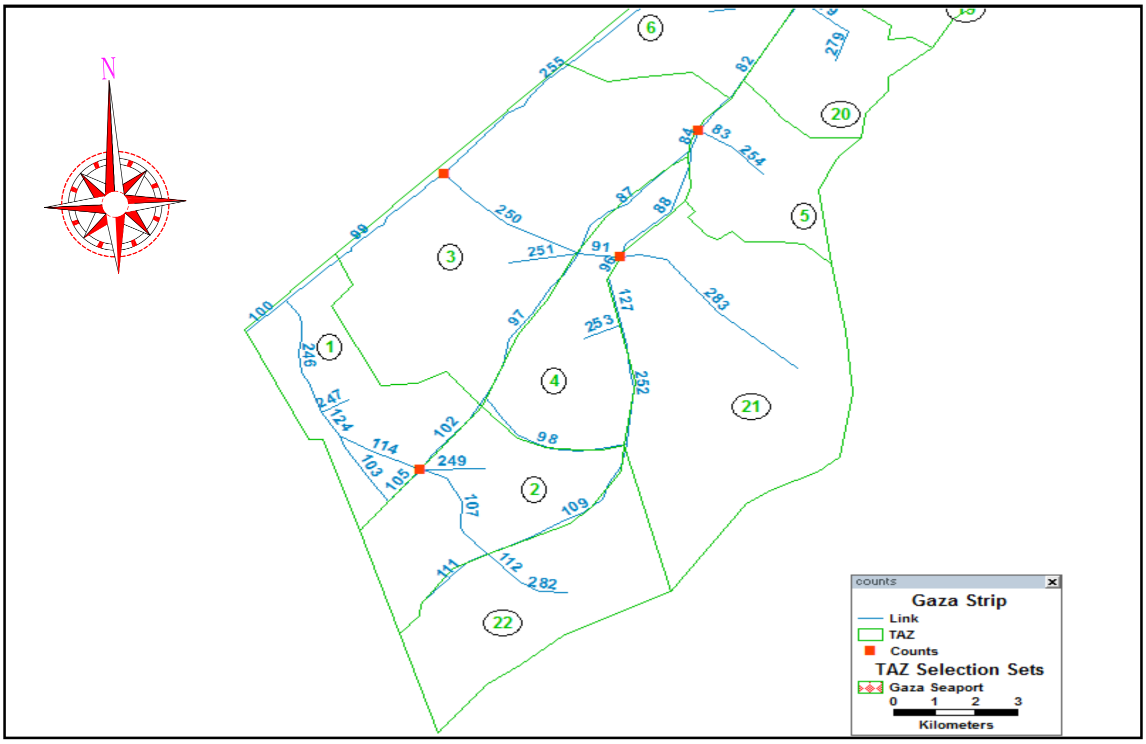
ID	Intersection names	3 hour flow	PH flow	PF Hour		PHF	% Car	Σ% Other
16	Salah al-Din intersection with Number "2"	9216	3287	07:15	08:15	98%	79%	21%
17	Salah al-Din intersection with Abasan (BaniSuhaila)	14790	5140	08:15	09:15	97%	74%	26%
18	Salah al-Din intersection with Taha Hussein (Khrbat AL Adas)	6749	2458	09:00	10:00	93%	68%	32%
19	AL-Rashed intersection with AL Shahda (AL Mena)	5053	2137	07:45	08:45	86%	82%	18%
20	AL-Rashed intersection with Beruit	4783	2089	07:30	08:30	82%	82%	18%
21	AL-Rashed intersection with AL Qahra	2713	1210	07:30	08:30	82%	85%	15%
22	AL-Rashed intersection with AL Palestine	7039	2808	07:30	08:30	89%	80%	20%
23	Al-Rashed intersection with the Nuseirat	1791	798	07:30	08:30	90%	84%	16%
24	AL-Rashed intersection with Akeala	4015	1498	07:15	08:15	87%	75%	25%
25	AL-Rashed intersection with Khan Younis	1118	399	07:15	08:15	77%	70%	30%



Figure(5.1):ID For The North Gaza Strip Network



Figure(5.2):ID For The Middle Gaza Strip Network



Figure(5.3):ID For The South Gaza Strip Network

Appendix (B): Network modeling results

Table B1: Input Data Base Year (2015)

ID	Length	Dir	[street name(AR)]	[width street]	[ID Road]	AB_count	BA_count	AB_capacity	BA_capacity	AB_time	BA_time	AB_speed	BA_speed
1	3.56	0	Salah Al-Deen St.	9.50	2	--	--	2100	2100	0.35	0.35	60	60
2	2.02	0	Al-Karama St.	7.00	12	--	--	1900	1900	0.20	0.20	60	60
3	0.44	0	Salah Al-Deen St.	9.50	2	449	939	2100	2100	0.05	0.05	60	60
4	2.54	0	Beit-Lahia St.	7.00	5	364	360	1900	1900	0.29	0.29	50	50
5	0.43	0	Al-Karama St.	7.00	12	--	--	1900	1900	0.04	0.04	60	60
6	2.19	0	Salah Al-Deen St.	9.50	2	476	663	2100	2100	0.09	0.09	60	60
7	1.24	0	Al Quds St.	7.00	6	175	157	1900	1900	0.14	0.14	50	50
8	1.21	0	Al Quds St.	7.00	6	330	386	1900	1900	0.17	0.17	50	50
10	1.02	0	Al Quds St.	7.00	6	435	359	1900	1900	0.12	0.12	50	50
12	1.27	0	Al Quds St.	7.00	6	433	435	1900	1900	0.15	0.15	50	50
13	4.38	0	Al-Rasheed St.	5.00	1	--	--	1800	1800	0.45	0.45	60	60
14	0.56	0	Salah Al-Deen St.	9.50	2	659	--	2100	2100	0.08	0.08	60	60
15	1.45	0	Salah Dardona St.	7.00	13	--	--	1900	1900	0.14	0.14	60	60
17	0.17	0	Al-Karama St.	7.00	12	--	--	1900	1900	0.01	0.01	60	60
18	2.75	0	Al Jaro St.	4.50	11	--	--	1700	1700	0.34	0.34	50	50
19	0.96	0	Al-Karama St.	7.00	12	--	--	1900	1900	0.10	0.10	60	60
20	1.85	0	Bagdad St.	9.00	33	496	498	2100	2100	0.18	0.18	60	60
21	2.29	0	Salah Al-Deen St.	9.50	2	--	--	2100	2100	0.23	0.23	60	60
22	0.42	0	Salah Al-Deen St.	9.50	2	993	555	2100	2100	0.04	0.04	60	60
25	0.33	0	Al-Jalah St.	9.50	7	1013	1056	2100	2100	0.01	0.01	60	60
26	0.28	0	Al-Jalah St.	9.50	7	1155	1355	2100	2100	0.03	0.03	60	60
27	1.11	0	Al-Jalah St.	9.50	7	--	--	2100	2100	0.12	0.12	60	60
28	0.96	0	Omar Mukhtar St.	9.50	14	932	965	2100	2100	0.10	0.10	60	60
29	0.33	0	AL Naser St.	7.00	34	--	--	1900	1900	0.04	0.04	50	50
30	2.61	0	AL Naser St.	7.00	34	1013	1029	1900	1900	0.31	0.31	50	50
31	0.96	0	Al-Wahda St.	6.00	16	--	--	1800	1800	0.12	0.12	50	50
33	0.20	0	Omar Mukhtar St.	9.50	14	--	--	2100	2100	0.01	0.01	60	60
36	2.35	0	Al-Karama St.	7.00	12	564	428	1900	1900	0.27	0.27	60	60
38	1.05	0	Salah Al-Deen St.	9.50	2	861	931	2500	2500	0.07	0.07	80	80
39	1.44	0	Salah Al-Deen St.	9.50	2	1129	1213	2500	2500	0.12	0.12	80	80
41	2.23	0	Salah Al-Deen St.	7.00	2	1010	784	1900	1900	0.22	0.22	60	60
42	2.28	0	Jamal Abd Al-Nasser St.	8.00	15	1044	1500	2100	2100	0.24	0.24	60	60
43	1.79	0	Jamal Abd Al-Nasser St.	8.00	15	1181	1342	2100	2100	0.03	0.03	60	60
43	1.79	0	Jamal Abd Al-Nasser St.	8.00	15	1181	1342	2100	2100	0.03	0.03	60	60
47	2.28	0	Own Al-Shawa St.	7.00	8	1008	586	1900	1900	0.21	0.21	60	60
49	1.93	0	AL- Qahera	8.00	35	307	227	2100	2100	0.13	0.13	60	60
50	0.93	0	Al-Rasheed St.	9.50	1	329	381	2100	2100	0.06	0.06	60	60
51	0.30	0	Al-Rasheed St.	9.50	1	--	--	2100	2100	0.03	0.03	60	60
52	1.06	0	Al-Rasheed St.	9.50	1	401	530	2100	2100	0.12	0.12	60	60
53	0.82	0	Al-Rasheed St.	9.50	1	--	--	2500	2500	0.03	0.03	80	80
54	3.79	0	Street No. 10	4.50	9	130	315	1700	1700	0.46	0.46	50	50
55	1.94	0	Al-Rasheed St.	9.50	1	--	--	2500	2500	0.17	0.17	80	80
56	2.03	0	Natsrim St.	7.00	10	242	138	1900	1900	0.08	0.08	60	60
59	1.10	0	Al-Karama St.	7.00	12	--	--	1900	1900	0.12	0.12	60	60
60	1.62	0	Al-Rasheed St.	9.50	1	--	670	2100	2100	0.12	0.12	80	80
61	1.94	0	Palestine St.	7.00	18	316	273	1900	1900	0.20	0.20	60	60
64	0.57	0	Salah Al-Deen St.	7.00	2	1117	819	2100	2100	0.02	0.02	80	80
65	1.52	0	Al-Nuseirat St.	6.50	17	544	554	1800	1800	0.17	0.17	50	50
66	1.87	0	Al Moghraga St.	4.50	19	--	--	1700	1700	0.24	0.24	50	50
67	1.14	0	Al-Nuseirat St.	6.50	17	--	--	1800	1800	0.12	0.12	50	50
68	2.22	0	Al-Rasheed St.	9.50	1	171	54	2500	2500	0.17	0.17	80	80
69	1.49	0	Salah Al-Deen St.	7.00	2	1291	935	2100	2100	0.05	0.05	80	80
72	0.75	0	Al-Msadar St.	4.50	21	80	--	1700	1700	0.08	0.08	50	50
74	2.62	0	Al-Rasheed St.	5.00	1	489	158	700	700	0.20	0.20	80	80
75	2.77	0	Bahar Deir AL Balah St.	4.50	32	--	--	1700	1700	0.34	0.34	50	50
76	1.38	0	Al-Rasheed St.	5.00	1	381	152	700	700	0.10	0.10	80	80
77	1.33	0	Akkela St.	5.00	23	91	266	1800	1800	0.16	0.16	50	50
78	0.50	0	Deir al-Balah trade St.	7.00	36	--	--	2600	2600	0.05	0.05	50	50
79	1.43	0	Mohammed Azayzeh St.	4.50	24	147	115	1700	1700	0.16	0.16	50	50
82	4.47	0	Salah Al-Deen St.	7.00	2	960	985	2100	2100	0.14	0.14	80	80
83	0.90	0	Street No. 2	4.50	25	87	77	1700	1700	0.10	0.10	50	50
84	0.58	0	Salah Al-Deen St.	7.00	2	987	784	1900	1900	0.05	0.05	60	60
85	0.65	0	Al-Rasheed St.	5.00	1	531	322	700	700	0.05	0.05	80	80
87	4.13	0	Salah Al-Deen west St.	7.00	3	--	--	1900	1900	0.40	0.40	60	60
88	3.70	0	Salah Al-Deen east St.	8.00	4	767	768	2100	2100	0.37	0.37	60	60
91	1.03	0	Ahmed Yassin St.	7.00	26	485	438	1900	1900	0.10	0.10	60	60

ID	Length	Dir	[street name(AR)]	[width street]	[ID Road]	AB_count	BA_count	AB_capacity	BA_capacity	AB_time	BA_time	AB_speed	BA_speed
91	1.03	0	Ahmed Yassin St.	7.00	26	485	438	1900	1900	0.10	0.10	60	60
96	0.66	0	Salah Al-Deen east St.	5.00	4	--	--	1800	1800	0.04	0.04	60	60
97	4.77	0	Salah Al-Deen west St.	7.00	3	--	--	1900	1900	0.44	0.44	60	60
98	4.05	0	Morag St.	4.50	29	--	--	1700	1700	0.50	0.50	50	50
99	5.37	0	Al-Rasheed St.	5.00	1	61	33	700	700	0.41	0.41	80	80
100	1.30	0	Al-Rasheed St.	5.00	1	--	--	1800	1800	0.13	0.13	60	60
102	2.61	0	Salah Al-Deen west St.	7.00	3	468	445	1900	1900	0.27	0.27	60	60
103	2.24	0	Abo-Baker Al-Seddeq St.	6.00	28	--	--	1800	1800	0.22	0.22	60	60
105	1.19	0	Salah Al-Deen west St.	7.00	3	496	473	1900	1900	0.13	0.13	60	60
107	3.19	0	Taha Hussein St.	4.50	30	143	133	1700	1700	0.17	0.17	50	50
109	4.91	0	Salah Al-Deen east St.	9.00	4	--	--	2500	2500	0.36	0.36	80	80
111	2.06	0	Salah Al-Deen east St.	9.00	4	--	--	2500	2500	0.17	0.17	80	80
112	1.12	0	Almtar St.	5.00	31	--	--	1800	1800	0.18	0.18	50	50
114	2.18	0	Taha Hussein St.	5.00	30	177	172	1800	1800	0.21	0.21	60	60
124	0.82	0	Abo-Baker Al-Seddeq St.	9.00	28	--	--	2100	2100	0.06	0.06	60	60
126	2.71	0	Al-Rasheed St.	5.00	1	--	--	1800	1800	0.24	0.24	60	60
127	1.39	0	Salah Al-Deen east St.	9.00	4	--	--	2500	2500	0.14	0.14	80	80
128	1.32	0	Salah Al-Deen St.	19.00	2	905	997	5600	5600	0.07	0.07	80	80
133	2.37	0	Salah Al-Deen St.	7.00	2	489	158	2100	2100	0.10	0.10	80	80
138	1.29	0	Al Quds St.	7.00	6	--	--	2600	2600	0.14	0.14	50	50
141	0.58	0	Al-Rasheed St.	9.50	1	171	54	2500	2500	0.04	0.04	80	80
143	1.44	0	Al-Rasheed St.	5.00	1	644	1512	700	700	0.12	0.12	80	80
144	1.14	0	Shohdaa Deir al Balah St.	7.00	22	--	531	1900	1900	0.12	0.12	60	60
146	1.47	0	Al-Karama St.	7.00	12	--	--	1900	1900	0.14	0.14	60	60
147	0.10	0	Beit-Lahia St.	7.00	5	531	322	2600	2600	0.01	0.01	50	50
149	0.06	0	Salah Al-Deen St.	9.50	2	738	902	2500	2500	0.00	0.00	80	80
150	2.01	0	Omar Mukhtar St.	9.50	14	910	1004	2100	2100	0.24	0.24	50	50
152	2.03	0	Al-Wahda St.	6.00	6	900	500	1800	1800	0.22	0.22	50	50
153	0.38	0	Al-Rasheed St.	9.50	1	355	277	2100	2100	0.03	0.03	60	60
156	0.35	0	Al-Rasheed St.	9.50	1	355	277	2100	2100	0.03	0.03	60	60
158	0.26	0	Al-Jalah St.	9.50	7	1384	923	2100	2100	0.04	0.04	50	50
162	0.80	0	Omar Mukhtar St.	9.50	14	303	211	2100	2100	0.09	0.09	60	60
246	3.46	0	Abo-Baker Al-Seddeq St.	9.00	28	--	--	2100	2100	0.36	0.36	60	60

ID	Length	Dir	[street name(AR)]	[width street]	[ID Road]	AB_count	BA_count	AB_capacity	BA_capacity	AB_time	BA_time	AB_speed	BA_speed
246	3.46	0	Abo-Baker Al-Seddeq St.	9.00	28	--	--	2100	2100	0.36	0.36	60	60
247	0.75	0		--	--	--	--	2100	2100	0.09	0.09	50	50
249	1.55	0		--	--	--	--	1700	1700	0.10	0.10	50	50
250	3.99	0	Ahmed Yassin St.	9.00	26	89	93	2100	2100	0.26	0.26	60	60
251	1.71	0		--	--	--	--	2100	2100	0.12	0.12	50	50
252	3.50	0	Salah Al-Deen east St.	9.00	4	--	--	2500	2500	0.26	0.26	80	80
253	1.00	0		--	--	--	--	2500	2500	0.11	0.11	50	50
254	1.07	0		--	--	--	--	1700	1700	0.14	0.14	50	50
255	7.95	0	Al-Rasheed St.	5.00	1	63	82	700	700	0.58	0.58	80	80
256	2.24	0		--	--	--	--	1300	1300	0.15	0.15	50	50
257	0.66	0	Al-Nuseirat St.	6.50	17	119	62	1800	1800	0.10	0.10	50	50
258	1.83	0		--	--	--	--	1800	1800	0.11	0.11	50	50
260	0.38	0		--	--	--	--	1700	1700	0.06	0.06	50	50
261	1.46	0	Own Al-Shawa St.	7.00	8	--	--	1900	1900	0.14	0.14	60	60
262	0.97	0		--	--	--	--	1900	1900	0.07	0.07	50	50
263	1.63	0	Al-Jalah St.	9.50	7	436	775	2100	2100	0.15	0.15	60	60
264	0.87	0		--	--	--	--	2100	2100	0.07	0.07	50	50
265	1.78	0		--	--	797	710	2100	2100	0.04	0.04	50	50
266	1.13	0		--	--	--	--	1900	1900	0.15	0.15	50	50
267	0.86	0		--	--	--	--	1900	1900	0.10	0.10	50	50
269	0.99	0		--	--	--	--	1900	1900	0.12	0.12	50	50
270	1.42	0	Al-Karama St.	7.00	12	--	--	1900	1900	0.14	0.14	60	60
271	1.25	0		--	--	--	--	1900	1900	0.04	0.04	50	50
272	4.15	0	Al-Karama St.	7.00	12	54	41	1900	1900	0.38	0.38	60	60
273	1.19	0		--	--	100	99	1900	1900	0.07	0.07	50	50
274	1.92	0	Salah Al-Deen St.	7.00	2	786	1075	2100	2100	0.16	0.16	80	80
275	1.17	0		--	--	--	--	2100	2100	0.19	0.19	50	50
276	0.80	0		--	--	--	--	1800	1800	0.09	0.09	50	50
278	1.05	0		--	--	--	--	1800	1800	0.05	0.05	50	50
279	0.91	0		--	--	--	--	1700	1700	0.11	0.11	50	50
282	1.21	0		--	--	--	--	1800	1800	0.11	0.11	50	50
283	5.52	0	Absan Al-Kabara	7.00	27	642	543	1900	1900	0.55	0.55	60	60
285	1.32	0	Salah Al-Deen St.	--	2	1075	786	1900	1900	1.65	1.65	50	50

ID	Length	Dir	[street name(AR)]	[width street]	[ID Road]	AB_count	BA_count	AB_capacity	BA_capacity	AB_time	BA_time	AB_speed	BA_speed
251	1.71	0		--	--	--	--	2100	2100	0.12	0.12	50	50
252	3.50	0	Salah Al-Deen east St.	9.00	4	--	--	2500	2500	0.26	0.26	80	80
253	1.00	0		--	--	--	--	2500	2500	0.11	0.11	50	50
254	1.07	0		--	--	--	--	1700	1700	0.14	0.14	50	50
255	7.95	0	Al-Rasheed St.	5.00	1	63	82	700	700	0.58	0.58	80	80
256	2.24	0		--	--	--	--	1300	1300	0.15	0.15	50	50
257	0.66	0	Al-Nuseirat St.	6.50	17	119	62	1800	1800	0.10	0.10	50	50
258	1.83	0		--	--	--	--	1800	1800	0.11	0.11	50	50
260	0.38	0		--	--	--	--	1700	1700	0.06	0.06	50	50
261	1.46	0	Own Al-Shawa St.	7.00	8	--	--	1900	1900	0.14	0.14	60	60
262	0.97	0		--	--	--	--	1900	1900	0.07	0.07	50	50
263	1.63	0	Al-Jalah St.	9.50	7	436	775	2100	2100	0.15	0.15	60	60
264	0.87	0		--	--	--	--	2100	2100	0.07	0.07	50	50
265	1.78	0		--	--	797	710	2100	2100	0.04	0.04	50	50
266	1.13	0		--	--	--	--	1900	1900	0.15	0.15	50	50
267	0.86	0		--	--	--	--	1900	1900	0.10	0.10	50	50
269	0.99	0		--	--	--	--	1900	1900	0.12	0.12	50	50
270	1.42	0	Al-Karama St.	7.00	12	--	--	1900	1900	0.14	0.14	60	60
271	1.25	0		--	--	--	--	1900	1900	0.04	0.04	50	50
272	4.15	0	Al-Karama St.	7.00	12	54	41	1900	1900	0.38	0.38	60	60
273	1.19	0		--	--	100	99	1900	1900	0.07	0.07	50	50
274	1.92	0	Salah Al-Deen St.	7.00	2	786	1075	2100	2100	0.16	0.16	80	80
275	1.17	0		--	--	--	--	2100	2100	0.19	0.19	50	50
276	0.80	0		--	--	--	--	1800	1800	0.09	0.09	50	50
278	1.05	0		--	--	--	--	1800	1800	0.05	0.05	50	50
279	0.91	0		--	--	--	--	1700	1700	0.11	0.11	50	50
282	1.21	0		--	--	--	--	1800	1800	0.11	0.11	50	50
283	5.52	0	Absan Al-Kabara	7.00	27	642	543	1900	1900	0.55	0.55	60	60
285	1.32	0	Salah Al-Deen St.	--	2	1075	786	1900	1900	1.65	1.65	50	50
286	0.91	0	Shohdaa Al-Maghazi St.	--	20	326	331	1900	1900	1.09	1.09	--	--
287	1.44	0	Natsrim St.	7.00	10	242	138	1900	1900	1.73	1.73	60	60
288	0.32	0		--	--	--	--	--	--	0.41	0.41	50	50
289	0.85	0		--	--	--	--	2500	2500	1.02	1.02	--	--

Table B2: OD matrix Base Year (2015)

	1	2	3	4	5	6	7	10	11	12
1	--	59.81	0.04	50.18	0.22	0.58	0.50	0.74	1.01	0.83
2	58.61	--	62.05	62.05	4.13	33.29	2.57	1.60	2.05	1.63
3	0.05	57.91	--	1.00	1.67	28.16	1.72	1.34	1.77	1.39
4	49.96	57.91	1.00	--	9.13	88.09	3.78	1.90	2.39	1.89
5	0.34	7.62	3.85	18.01	--	5.40	1.09	1.12	1.50	1.19
6	0.65	29.39	23.95	76.53	2.12	--	0.45	0.87	1.26	0.96
7	1.47	10.97	8.78	16.96	3.46	4.89	--	1.19	1.83	1.26
10	1.10	2.49	2.12	2.99	1.54	1.46	0.96	--	219.14	38.34
11	1.52	3.21	2.82	3.77	2.11	2.11	1.66	149.09	--	18.92
12	1.55	3.14	2.77	3.64	2.11	2.11	1.69	22.36	14.78	--
13	1.96	4.09	3.67	4.77	2.78	2.91	2.55	73.66	36.16	38.75
14	1.00	2.23	1.89	2.68	1.37	1.28	0.79	127.25	43.82	257.77
15	1.00	2.23	1.89	2.68	1.37	1.28	0.79	424.68	163.23	14.09
16	16.63	4.20	3.36	5.29	2.03	2.05	22.36	0.24	82.33	0.37
18	2.54	13.45	11.59	18.66	5.61	8.82	30.71	0.66	1.15	0.81
19	1.17	12.12	9.50	20.72	3.04	4.43	0.14	0.59	0.90	0.70
20	0.93	17.57	13.33	34.70	2.66	4.59	0.73	0.97	1.35	1.06
21	0.97	136.56	141.87	23.10	9.17	53.18	4.06	2.00	2.48	1.99
22	63.52	69.42	1.00	1.00	1.67	28.16	1.72	1.34	1.77	1.39
23	2.08	13.07	11.06	19.05	4.89	7.77	43.80	1.10	179.76	1.20
26	3.47	20.16	18.51	28.50	8.80	16.88	176.10	0.30	0.68	0.45
27	63.06	10.69	9.14	14.18	4.89	6.78	10.90	0.27	0.62	0.41
28	62.07	8.78	7.21	12.02	3.63	4.65	4.86	168.82	295.27	27.63

	12	13	14	15	16	18	19	20	21	22
1	0.83	1.07	0.66	0.66	9.59	1.09	1.46	0.64	0.72	67.01
2	1.63	2.20	1.39	1.39	2.37	4.67	50.40	11.67	127.95	76.00
3	1.39	1.92	1.16	1.16	1.88	3.67	53.00	7.87	97.45	1.00
4	1.89	2.57	1.66	1.66	2.89	6.32	108.13	22.29	12.92	1.00
5	1.19	1.63	0.97	0.97	1.46	2.52	15.90	3.00	13.92	3.85
6	0.96	1.38	0.74	0.74	1.08	1.90	222.92	1.04	42.35	23.95
7	1.26	2.08	0.94	0.94	20.20	54.72	2.35	3.24	14.69	8.78
10	38.34	191.34	132.64	164.29	0.17	0.62	1.13	1.40	3.02	2.12
11	18.92	61.55	35.10	97.86	70.90	1.16	1.74	1.99	3.78	2.82
12	--	67.43	293.29	29.49	0.52	1.23	1.77	2.00	3.67	2.77
13	38.75	--	1.00	164.26	0.77	1.83	2.49	2.68	4.72	3.67
14	257.77	1.00	--	1.00	0.14	0.51	0.97	1.24	2.73	1.89
15	14.09	295.47	1.00	--	0.14	0.51	0.97	1.24	2.73	1.89
16	0.37	0.60	0.19	0.19	--	11.28	1.43	1.87	5.43	3.36
18	0.81	1.29	0.53	0.53	8.60	--	6.95	5.91	16.72	11.59
19	0.70	0.99	0.51	0.51	0.65	0.83	--	2.65	16.75	9.50
20	1.06	1.47	0.84	0.84	1.25	2.15	26.15	--	25.34	13.33
21	1.99	2.65	1.75	1.75	3.15	6.44	66.85	19.41	--	252.43
22	1.39	1.92	1.16	1.16	1.88	3.67	53.00	7.87	205.71	--
23	1.20	1.87	0.90	0.90	1.11	49.22	5.40	5.00	16.62	11.06
26	0.45	0.80	0.23	0.23	4.58	24.96	15.33	9.94	23.95	18.51
27	0.41	0.74	0.20	0.20	4.22	50.39	5.35	5.03	13.22	9.14
28	27.63	74.25	40.74	40.74	1.16	117.89	3.19	3.55	11.29	7.21

	16	18	19	20	21	22	23	26	27	28
1	9.59	1.09	1.46	0.64	0.72	67.01	0.84	1.47	32.25	35.24
2	2.37	4.67	50.40	11.67	127.95	76.00	4.00	6.79	5.84	5.36
3	1.88	3.67	53.00	7.87	97.45	1.00	2.98	5.60	4.89	4.38
4	2.89	6.32	108.13	22.29	12.92	1.00	5.63	9.32	7.44	7.02
5	1.46	2.52	15.90	3.00	13.92	3.85	1.97	3.80	3.60	3.12
6	1.08	1.90	222.92	1.04	42.35	23.95	1.26	3.35	3.22	2.63
7	20.20	54.72	2.35	3.24	14.69	8.78	140.07	388.26	28.08	35.05
10	0.17	0.62	1.13	1.40	3.02	2.12	0.58	0.25	0.23	124.61
11	70.90	1.16	1.74	1.99	3.78	2.82	229.09	0.65	0.61	390.40
12	0.52	1.23	1.77	2.00	3.67	2.77	1.18	0.74	0.70	44.98
13	0.77	1.83	2.49	2.68	4.72	3.67	1.75	1.19	1.13	91.22
14	0.14	0.51	0.97	1.24	2.73	1.89	0.49	0.20	0.18	80.95
15	0.14	0.51	0.97	1.24	2.73	1.89	0.49	0.20	0.18	80.95
16	--	11.28	1.43	1.87	5.43	3.36	0.46	7.27	7.19	1.91
18	8.60	--	6.95	5.91	16.72	11.59	49.12	26.73	58.18	143.52
19	0.65	0.83	--	2.65	16.75	9.50	0.48	1.40	1.70	1.28
20	1.25	2.15	26.15	--	25.34	13.33	1.57	3.46	3.34	2.81
21	3.15	6.44	66.85	19.41	--	252.43	5.76	9.03	7.49	7.08
22	1.88	3.67	53.00	7.87	205.71	--	2.98	5.60	4.89	4.38
23	1.11	49.22	5.40	5.00	16.62	11.06	--	166.27	17.58	19.03
26	4.58	24.96	15.33	9.94	23.95	18.51	161.07	--	137.27	406.78
27	4.22	50.39	5.35	5.03	13.22	9.14	5.83	108.56	--	72.12
28	1.16	117.89	3.19	3.55	11.29	7.21	0.81	349.75	15.19	--

Table B3: Output Data Base Year (2015)

ID1	AB_Flow	BA_Flow	TOT_Flow	AB_Time	BA_Time	MAX_Time	AB_voc	BA_voc	MAX_voc
1	0.0000	0.0000	0.0000	0.3545	0.3545	0.3545	0.0000	0.0000	0.0000
2	448.0024	716.2249	1164.2272	0.1997	0.2002	0.2002	0.2358	0.3770	0.3770
3	447.0024	715.2249	1162.2272	0.0500	0.0501	0.0501	0.2129	0.3406	0.3406
4	503.9098	413.0337	916.9435	0.2943	0.2942	0.2943	0.2652	0.2174	0.2652
5	1.0000	1.0000	2.0000	0.0439	0.0439	0.0439	0.0005	0.0005	0.0005
6	551.4430	764.3131	1315.7561	0.0912	0.0914	0.0914	0.2626	0.3640	0.3640
7	167.7348	171.0728	338.8076	0.1394	0.1394	0.1394	0.0883	0.0900	0.0900
8	318.0384	477.8836	795.9220	0.1653	0.1654	0.1654	0.1674	0.2515	0.2515
10	313.8967	264.6664	578.5631	0.1182	0.1182	0.1182	0.1652	0.1393	0.1652
12	0.0000	0.0000	0.0000	0.1487	0.1487	0.1487	0.0000	0.0000	0.0000
13	0.0000	0.0000	0.0000	0.4512	0.4512	0.4512	0.0000	0.0000	0.0000
14	404.4774	454.1643	858.6417	0.0791	0.0791	0.0791	0.1926	0.2163	0.2163
15	1.0000	1.0000	2.0000	0.1446	0.1446	0.1446	0.0005	0.0005	0.0005
17	100.5447	54.5626	155.1072	0.0096	0.0096	0.0096	0.0529	0.0287	0.0529
18	54.5626	100.5447	155.1072	0.3365	0.3365	0.3365	0.0321	0.0591	0.0591
19	0.0000	0.0000	0.0000	0.0978	0.0978	0.0978	0.0000	0.0000	0.0000
20	107.3605	165.8463	273.2068	0.1756	0.1756	0.1756	0.0511	0.0790	0.0790
21	405.4774	455.1643	860.6417	0.2308	0.2308	0.2308	0.1931	0.2167	0.2167
22	999.7227	515.8694	1515.5921	0.0395	0.0392	0.0395	0.4761	0.2457	0.4761
25	0.0000	0.0000	0.0000	0.0134	0.0134	0.0134	0.0000	0.0000	0.0000
26	690.3802	557.3589	1247.7390	0.0305	0.0304	0.0305	0.3288	0.2654	0.3288
27	311.0883	609.7204	920.8087	0.1154	0.1155	0.1155	0.1481	0.2903	0.2903
28	0.0000	0.0000	0.0000	0.0960	0.0960	0.0960	0.0000	0.0000	0.0000
29	0.0000	0.0000	0.0000	0.0442	0.0442	0.0442	0.0000	0.0000	0.0000
30	818.1872	741.3519	1559.5390	0.3165	0.3160	0.3165	0.4306	0.3902	0.4306
31	741.3519	818.1872	1559.5390	0.1182	0.1184	0.1184	0.4119	0.4545	0.4545
33	0.0000	0.0000	0.0000	0.0125	0.0125	0.0125	0.0000	0.0000	0.0000
36	165.8463	107.3605	273.2068	0.2709	0.2709	0.2709	0.0873	0.0565	0.0873
38	1113.1004	909.5297	2022.6301	0.0661	0.0659	0.0661	0.4452	0.3638	0.4452
39	768.7802	814.2916	1583.0719	0.1200	0.1200	0.1200	0.3075	0.3257	0.3257
41	523.2818	594.1292	1117.4110	0.2199	0.2200	0.2200	0.2754	0.3127	0.3127
42	0.0000	0.0000	0.0000	0.2357	0.2357	0.2357	0.0000	0.0000	0.0000
43	0.0000	0.0000	0.0000	0.0283	0.0283	0.0283	0.0000	0.0000	0.0000

ID1	AB_Flow	BA_Flow	TOT_Flow	AB_Time	BA_Time	MAX_Time	AB_voc	BA_voc	MAX_voc
43	0.0000	0.0000	0.0000	0.0283	0.0283	0.0283	0.0000	0.0000	0.0000
47	1365.3188	1116.2368	2481.5556	0.2198	0.2151	0.2198	0.7186	0.5875	0.7186
49	0.0000	0.0000	0.0000	0.1314	0.1314	0.1314	0.0000	0.0000	0.0000
50	0.0000	0.0000	0.0000	0.0625	0.0625	0.0625	0.0000	0.0000	0.0000
51	0.0000	0.0000	0.0000	0.0269	0.0269	0.0269	0.0000	0.0000	0.0000
52	0.0000	0.0000	0.0000	0.1205	0.1205	0.1205	0.0000	0.0000	0.0000
53	144.4570	199.4855	343.9425	0.0259	0.0259	0.0259	0.0578	0.0798	0.0798
54	213.0291	279.6768	492.7060	0.4644	0.4644	0.4644	0.1253	0.1645	0.1645
55	424.1338	412.5146	836.6484	0.1741	0.1741	0.1741	0.1697	0.1650	0.1697
56	230.3443	135.5216	365.8659	0.0752	0.0751	0.0752	0.1212	0.0713	0.1212
59	101.5447	55.5626	157.1072	0.1169	0.1169	0.1169	0.0534	0.0292	0.0534
60	567.1643	460.7225	1027.8868	0.1220	0.1219	0.1220	0.2701	0.2194	0.2701
61	425.3979	383.6431	809.0410	0.1992	0.1992	0.1992	0.2239	0.2019	0.2239
64	852.7284	851.4549	1704.1832	0.0220	0.0220	0.0220	0.4061	0.4055	0.4061
65	537.9194	540.0068	1077.9262	0.1737	0.1737	0.1737	0.2988	0.3000	0.3000
66	537.9194	540.0068	1077.9262	0.2379	0.2379	0.2379	0.3164	0.3177	0.3177
67	0.0000	0.0000	0.0000	0.1217	0.1217	0.1217	0.0000	0.0000	0.0000
68	141.7664	77.0794	218.8458	0.1682	0.1682	0.1682	0.0567	0.0308	0.0567
69	745.4819	305.8345	1051.3164	0.0463	0.0462	0.0463	0.3550	0.1456	0.3550
72	90.5502	646.8986	737.4488	0.0816	0.0818	0.0818	0.0533	0.3805	0.3805
74	141.7664	77.0794	218.8458	0.1979	0.1979	0.1979	0.2025	0.1101	0.2025
75	141.7664	77.0794	218.8458	0.3361	0.3361	0.3361	0.0834	0.0453	0.0834
76	0.0000	0.0000	0.0000	0.1011	0.1011	0.1011	0.0000	0.0000	0.0000
77	77.0794	141.7664	218.8458	0.1620	0.1620	0.1620	0.0428	0.0788	0.0788
78	0.0000	0.0000	0.0000	0.0516	0.0516	0.0516	0.0000	0.0000	0.0000
79	160.4383	121.5067	281.9449	0.1621	0.1621	0.1621	0.0944	0.0715	0.0944
82	967.9486	911.8173	1879.7659	0.1447	0.1445	0.1447	0.4609	0.4342	0.4609
83	96.8221	78.3877	175.2099	0.0978	0.0978	0.0978	0.0570	0.0461	0.0570
84	963.1381	888.5724	1851.7105	0.0546	0.0544	0.0546	0.5069	0.4677	0.5069
85	141.7664	77.0794	218.8458	0.0485	0.0485	0.0485	0.2025	0.1101	0.2025
87	599.9123	500.3880	1100.3004	0.3985	0.3982	0.3985	0.3157	0.2634	0.3157
88	604.2318	629.1904	1233.4222	0.3708	0.3709	0.3709	0.2877	0.2996	0.2996
91	388.9878	333.6654	722.6532	0.1047	0.1046	0.1047	0.2047	0.1756	0.2047

ID1	AB_Flow	BA_Flow	TOT_Flow	AB_Time	BA_Time	MAX_Time	AB_voc	BA_voc	MAX_voc
91	388.9878	333.6654	722.6532	0.1047	0.1046	0.1047	0.2047	0.1756	0.2047
96	308.2406	295.0347	603.2754	0.0368	0.0368	0.0368	0.1712	0.1639	0.1712
97	749.7418	663.6135	1413.3554	0.4425	0.4419	0.4425	0.3946	0.3493	0.3946
98	440.1435	502.0902	942.2337	0.4979	0.4982	0.4982	0.2589	0.2953	0.2953
99	163.5772	89.5986	253.1758	0.4056	0.4054	0.4056	0.2337	0.1280	0.2337
100	0.0000	0.0000	0.0000	0.1265	0.1265	0.1265	0.0000	0.0000	0.0000
102	467.7473	443.5658	911.3131	0.2695	0.2695	0.2695	0.2462	0.2335	0.2462
103	0.0000	0.0000	0.0000	0.2218	0.2218	0.2218	0.0000	0.0000	0.0000
105	0.0000	0.0000	0.0000	0.1292	0.1292	0.1292	0.0000	0.0000	0.0000
107	143.0133	132.9487	275.9619	0.1668	0.1668	0.1668	0.0841	0.0782	0.0841
109	389.8664	332.2716	722.1380	0.3633	0.3633	0.3633	0.1559	0.1329	0.1559
111	0.0000	0.0000	0.0000	0.1711	0.1711	0.1711	0.0000	0.0000	0.0000
112	465.2203	532.8797	998.1000	0.1786	0.1787	0.1787	0.2585	0.2960	0.2960
114	176.9998	172.0910	349.0908	0.2123	0.2123	0.2123	0.0983	0.0956	0.0983
124	172.0910	176.9998	349.0908	0.0645	0.0645	0.0645	0.0819	0.0843	0.0843
126	0.0000	0.0000	0.0000	0.2430	0.2430	0.2430	0.0000	0.0000	0.0000
127	308.2406	295.0347	603.2754	0.1423	0.1423	0.1423	0.1233	0.1180	0.1233
128	776.2894	892.9905	1669.2799	0.0684	0.0684	0.0684	0.1386	0.1595	0.1595
133	745.4819	305.8345	1051.3164	0.1029	0.1027	0.1029	0.3550	0.1456	0.3550
138	318.0384	477.8836	795.9220	0.1401	0.1401	0.1401	0.1223	0.1838	0.1838
141	141.7664	77.0794	218.8458	0.0420	0.0420	0.0420	0.0567	0.0308	0.0567
143	141.7664	77.0794	218.8458	0.1231	0.1231	0.1231	0.2025	0.1101	0.2025
144	0.0000	0.0000	0.0000	0.1223	0.1223	0.1223	0.0000	0.0000	0.0000
146	294.2928	258.7691	553.0618	0.1365	0.1365	0.1365	0.1549	0.1362	0.1549
147	293.2928	257.7691	551.0618	0.0126	0.0126	0.0126	0.1128	0.0991	0.1128
149	422.7202	352.1708	774.8911	0.0033	0.0033	0.0033	0.1691	0.1409	0.1691
150	557.3589	690.3802	1247.7390	0.2413	0.2416	0.2416	0.2654	0.3288	0.3288
152	793.7134	438.8953	1232.6087	0.2246	0.2234	0.2246	0.4410	0.2438	0.4410
153	0.0000	0.0000	0.0000	0.0325	0.0325	0.0325	0.0000	0.0000	0.0000
156	0.0000	0.0000	0.0000	0.0343	0.0343	0.0343	0.0000	0.0000	0.0000
158	0.0000	0.0000	0.0000	0.0421	0.0421	0.0421	0.0000	0.0000	0.0000
162	0.0000	0.0000	0.0000	0.0921	0.0921	0.0921	0.0000	0.0000	0.0000
246	89.5986	163.5772	253.1758	0.3597	0.3597	0.3597	0.0427	0.0779	0.0779

ID1	AB_Flow	BA_Flow	TOT_Flow	AB_Time	BA_Time	MAX_Time	AB_voc	BA_voc	MAX_voc
246	89.5986	163.5772	253.1758	0.3597	0.3597	0.3597	0.0427	0.0779	0.0779
247	266.5984	335.6682	602.2666	0.0876	0.0876	0.0876	0.1270	0.1598	0.1598
249	547.0213	527.9956	1075.0169	0.0953	0.0953	0.0953	0.3218	0.3106	0.3218
250	21.8108	12.5192	34.3300	0.2648	0.2648	0.2648	0.0104	0.0060	0.0104
251	341.3938	281.9671	623.3609	0.1234	0.1234	0.1234	0.1626	0.1343	0.1626
252	109.8719	114.2238	224.0957	0.2599	0.2599	0.2599	0.0439	0.0457	0.0457
253	422.4645	404.9066	827.3711	0.1128	0.1128	0.1128	0.1690	0.1620	0.1690
254	96.8221	78.3877	175.2099	0.1435	0.1435	0.1435	0.0570	0.0461	0.0570
255	141.7664	77.0794	218.8458	0.5823	0.5822	0.5823	0.2025	0.1101	0.2025
256	442.7428	308.8420	751.5848	0.1472	0.1470	0.1472	0.3406	0.2376	0.3406
257	0.0000	0.0000	0.0000	0.0958	0.0958	0.0958	0.0000	0.0000	0.0000
258	750.2294	313.9429	1064.1724	0.1102	0.1097	0.1102	0.4168	0.1744	0.4168
260	618.4117	578.7444	1197.1562	0.0586	0.0586	0.0586	0.3638	0.3404	0.3638
261	144.4570	199.4855	343.9425	0.1425	0.1425	0.1425	0.0760	0.1050	0.1050
262	1564.8043	1260.6938	2825.4981	0.0720	0.0693	0.0720	0.8236	0.6635	0.8236
263	372.3754	581.4509	953.8263	0.1524	0.1525	0.1525	0.1773	0.2769	0.2769
264	892.5392	982.0958	1874.6350	0.0713	0.0715	0.0715	0.4250	0.4677	0.4677
265	1082.8536	1055.2486	2138.1022	0.0427	0.0427	0.0427	0.5156	0.5025	0.5156
266	503.9098	413.0337	916.9435	0.1471	0.1470	0.1471	0.2652	0.2174	0.2652
267	448.0024	716.2249	1164.2272	0.1037	0.1039	0.1039	0.2358	0.3770	0.3770
269	531.3866	517.5901	1048.9766	0.1176	0.1176	0.1176	0.2797	0.2724	0.2797
270	0.0000	0.0000	0.0000	0.1394	0.1394	0.1394	0.0000	0.0000	0.0000
271	511.4580	999.0162	1510.4742	0.0388	0.0392	0.0392	0.2692	0.5258	0.5258
272	165.8463	107.3605	273.2068	0.3835	0.3835	0.3835	0.0873	0.0565	0.0873
273	138.7032	180.0149	318.7181	0.0679	0.0679	0.0679	0.0730	0.0947	0.0947
274	881.4263	956.2550	1837.6813	0.1591	0.1594	0.1594	0.4197	0.4554	0.4554
275	1099.8833	1077.4766	2177.3599	0.1878	0.1876	0.1878	0.5238	0.5131	0.5238
276	423.6767	347.5744	771.2511	0.0939	0.0938	0.0939	0.2354	0.1931	0.2354
278	90.5502	646.8986	737.4488	0.0530	0.0532	0.0532	0.0503	0.3594	0.3594
279	160.4383	121.5067	281.9449	0.1121	0.1121	0.1121	0.0944	0.0715	0.0944
282	465.2203	532.8797	998.1000	0.1108	0.1109	0.1109	0.2585	0.2960	0.2960
283	759.1697	665.6828	1424.8525	0.5532	0.5523	0.5532	0.3996	0.3504	0.3996
285	824.0568	876.4788	1700.5357	1.6588	1.6612	1.6612	0.4337	0.4613	0.4613

ID1	AB_Flow	BA_Flow	TOT_Flow	AB_Time	BA_Time	MAX_Time	AB_voc	BA_voc	MAX_voc
251	341.3938	281.9671	623.3609	0.1234	0.1234	0.1234	0.1626	0.1343	0.1626
252	109.8719	114.2238	224.0957	0.2599	0.2599	0.2599	0.0439	0.0457	0.0457
253	422.4645	404.9066	827.3711	0.1128	0.1128	0.1128	0.1690	0.1620	0.1690
254	96.8221	78.3877	175.2099	0.1435	0.1435	0.1435	0.0570	0.0461	0.0570
255	141.7664	77.0794	218.8458	0.5823	0.5822	0.5823	0.2025	0.1101	0.2025
256	442.7428	308.8420	751.5848	0.1472	0.1470	0.1472	0.3406	0.2376	0.3406
257	0.0000	0.0000	0.0000	0.0958	0.0958	0.0958	0.0000	0.0000	0.0000
258	750.2294	313.9429	1064.1724	0.1102	0.1097	0.1102	0.4168	0.1744	0.4168
260	618.4117	578.7444	1197.1562	0.0586	0.0586	0.0586	0.3638	0.3404	0.3638
261	144.4570	199.4855	343.9425	0.1425	0.1425	0.1425	0.0760	0.1050	0.1050
262	1564.8043	1260.6938	2825.4981	0.0720	0.0693	0.0720	0.8236	0.6635	0.8236
263	372.3754	581.4509	953.8263	0.1524	0.1525	0.1525	0.1773	0.2769	0.2769
264	892.5392	982.0958	1874.6350	0.0713	0.0715	0.0715	0.4250	0.4677	0.4677
265	1082.8536	1055.2486	2138.1022	0.0427	0.0427	0.0427	0.5156	0.5025	0.5156
266	503.9098	413.0337	916.9435	0.1471	0.1470	0.1471	0.2652	0.2174	0.2652
267	448.0024	716.2249	1164.2272	0.1037	0.1039	0.1039	0.2358	0.3770	0.3770
269	531.3866	517.5901	1048.9766	0.1176	0.1176	0.1176	0.2797	0.2724	0.2797
270	0.0000	0.0000	0.0000	0.1394	0.1394	0.1394	0.0000	0.0000	0.0000
271	511.4580	999.0162	1510.4742	0.0388	0.0392	0.0392	0.2692	0.5258	0.5258
272	165.8463	107.3605	273.2068	0.3835	0.3835	0.3835	0.0873	0.0565	0.0873
273	138.7032	180.0149	318.7181	0.0679	0.0679	0.0679	0.0730	0.0947	0.0947
274	881.4263	956.2550	1837.6813	0.1591	0.1594	0.1594	0.4197	0.4554	0.4554
275	1099.8833	1077.4766	2177.3599	0.1878	0.1876	0.1878	0.5238	0.5131	0.5238
276	423.6767	347.5744	771.2511	0.0939	0.0938	0.0939	0.2354	0.1931	0.2354
278	90.5502	646.8986	737.4488	0.0530	0.0532	0.0532	0.0503	0.3594	0.3594
279	160.4383	121.5067	281.9449	0.1121	0.1121	0.1121	0.0944	0.0715	0.0944
282	465.2203	532.8797	998.1000	0.1108	0.1109	0.1109	0.2585	0.2960	0.2960
283	759.1697	665.6828	1424.8525	0.5532	0.5523	0.5532	0.3996	0.3504	0.3996
285	824.0568	876.4788	1700.5357	1.6588	1.6612	1.6612	0.4337	0.4613	0.4613
286	423.6767	347.5744	771.2511	1.0904	1.0902	1.0904	0.2230	0.1829	0.2230
287	205.6705	165.6101	371.2805	1.7300	1.7300	1.7300	0.1082	0.0872	0.1082
288	341.1921	395.9543	737.1464	0.4080	0.4080	0.4080	--	--	--
289	1113.1004	909.5297	2022.6301	1.0260	1.0227	1.0260	0.4452	0.3638	0.4452

B4: OD matrix Future Year Without Gaza Sea Port(2020)

	1	2	3	4	5	6	7	10	11	12
1	--	67.58	0.05	56.70	0.24	0.65	0.57	0.84	1.14	0.93
2	66.23	--	70.11	70.11	4.66	37.61	2.91	1.80	2.32	1.84
3	0.05	65.44	--	1.13	1.89	31.82	1.94	1.51	2.00	1.57
4	56.45	65.44	1.13	--	10.32	99.54	4.27	2.15	2.70	2.14
5	0.38	8.61	4.35	20.35	--	6.10	1.23	1.26	1.70	1.34
6	0.74	33.21	27.07	86.47	2.40	--	0.51	0.98	1.42	1.09
7	1.66	12.40	9.92	19.17	3.91	5.53	--	1.35	2.07	1.43
10	1.25	2.81	2.40	3.38	1.74	1.65	1.09	--	247.63	43.32
11	1.72	3.63	3.18	4.26	2.38	2.39	1.87	168.48	--	21.38
12	1.75	3.54	3.13	4.12	2.38	2.39	1.91	25.27	16.70	--
13	2.21	4.62	4.15	5.39	3.14	3.28	2.88	83.24	40.86	43.78
14	1.13	2.52	2.13	3.02	1.55	1.44	0.90	143.80	49.52	291.28
15	1.13	2.52	2.13	3.02	1.55	1.44	0.90	479.89	184.44	15.92
16	18.79	4.74	3.80	5.97	2.29	2.32	25.26	0.27	93.03	0.41
18	2.87	15.20	13.10	21.09	6.34	9.97	34.70	0.75	1.30	0.91
19	1.32	13.69	10.74	23.41	3.43	5.01	0.16	0.67	1.02	0.79
20	1.05	19.85	15.06	39.21	3.01	5.18	0.82	1.10	1.53	1.19
21	1.10	154.31	160.32	26.11	10.36	60.09	4.59	2.26	2.81	2.25
22	71.78	78.45	1.13	1.13	1.89	31.82	1.94	1.51	2.00	1.57
23	2.36	14.77	12.49	21.53	5.53	8.78	49.50	1.24	203.13	1.36
26	3.92	22.78	20.91	32.20	9.94	19.07	198.99	0.34	0.77	0.51
27	71.26	12.08	10.33	16.02	5.53	7.66	12.32	0.30	0.71	0.47
28	70.14	9.92	8.14	13.58	4.11	5.26	5.50	190.76	333.65	31.23

	12	13	14	15	16	18	19	20	21	22
1	0.93	1.21	0.74	0.74	10.83	1.24	1.65	0.73	0.81	75.72
2	1.84	2.49	1.58	1.58	2.68	5.28	56.95	13.18	144.59	85.88
3	1.57	2.16	1.31	1.31	2.12	4.14	59.89	8.89	110.11	1.13
4	2.14	2.90	1.87	1.87	3.27	7.14	122.18	25.18	14.60	1.13
5	1.34	1.84	1.10	1.10	1.65	2.84	17.97	3.39	15.73	4.35
6	1.09	1.56	0.84	0.84	1.22	2.14	251.90	1.18	47.85	27.07
7	1.43	2.35	1.06	1.06	22.82	61.83	2.66	3.66	16.60	9.92
10	43.32	216.21	149.88	185.65	0.20	0.70	1.27	1.58	3.41	2.40
11	21.38	69.55	39.66	110.58	80.11	1.32	1.97	2.25	4.28	3.18
12	--	76.20	331.42	33.32	0.58	1.39	2.00	2.26	4.14	3.13
13	43.78	--	1.13	185.62	0.88	2.07	2.81	3.03	5.34	4.15
14	291.28	1.13	--	1.13	0.16	0.58	1.10	1.40	3.08	2.13
15	15.92	333.89	1.13	--	0.16	0.58	1.10	1.40	3.08	2.13
16	0.41	0.68	0.22	0.22	--	12.74	1.62	2.11	6.13	3.80
18	0.91	1.46	0.60	0.60	9.72	--	7.86	6.68	18.90	13.10
19	0.79	1.11	0.58	0.58	0.73	0.93	--	2.99	18.93	10.74
20	1.19	1.67	0.94	0.94	1.41	2.43	29.55	--	28.64	15.06
21	2.25	3.00	1.98	1.98	3.55	7.27	75.55	21.93	--	285.25
22	1.57	2.16	1.31	1.31	2.12	4.14	59.89	8.89	232.45	--
23	1.36	2.11	1.01	1.01	1.26	55.62	6.10	5.65	18.78	12.49
26	0.51	0.91	0.26	0.26	5.17	28.21	17.33	11.24	27.06	20.91
27	0.47	0.83	0.23	0.23	4.77	56.94	6.05	5.68	14.94	10.33
28	31.23	83.90	46.03	46.03	1.31	133.21	3.60	4.01	12.75	8.14

	16	18	19	20	21	22	23	26	27	28
1	10.83	1.24	1.65	0.73	0.81	75.72	0.95	1.66	36.44	39.82
2	2.68	5.28	56.95	13.18	144.59	85.88	4.52	7.67	6.59	6.05
3	2.12	4.14	59.89	8.89	110.11	1.13	3.37	6.33	5.53	4.94
4	3.27	7.14	122.18	25.18	14.60	1.13	6.36	10.53	8.41	7.93
5	1.65	2.84	17.97	3.39	15.73	4.35	2.23	4.29	4.07	3.53
6	1.22	2.14	251.90	1.18	47.85	27.07	1.43	3.79	3.64	2.97
7	22.82	61.83	2.66	3.66	16.60	9.92	158.28	438.74	31.73	39.61
10	0.20	0.70	1.27	1.58	3.41	2.40	0.66	0.28	0.26	140.81
11	80.11	1.32	1.97	2.25	4.28	3.18	258.87	0.73	0.69	441.15
12	0.58	1.39	2.00	2.26	4.14	3.13	1.34	0.83	0.79	50.83
13	0.88	2.07	2.81	3.03	5.34	4.15	1.98	1.35	1.28	103.07
14	0.16	0.58	1.10	1.40	3.08	2.13	0.55	0.22	0.20	91.48
15	0.16	0.58	1.10	1.40	3.08	2.13	0.55	0.22	0.20	91.48
16	--	12.74	1.62	2.11	6.13	3.80	0.52	8.21	8.12	2.16
18	9.72	--	7.86	6.68	18.90	13.10	55.50	30.20	65.74	162.18
19	0.73	0.93	--	2.99	18.93	10.74	0.54	1.58	1.92	1.44
20	1.41	2.43	29.55	--	28.64	15.06	1.77	3.91	3.78	3.18
21	3.55	7.27	75.55	21.93	--	285.25	6.51	10.20	8.46	8.00
22	2.12	4.14	59.89	8.89	232.45	--	3.37	6.33	5.53	4.94
23	1.26	55.62	6.10	5.65	18.78	12.49	--	187.88	19.87	21.50
26	5.17	28.21	17.33	11.24	27.06	20.91	182.01	--	155.11	459.66
27	4.77	56.94	6.05	5.68	14.94	10.33	6.59	122.67	--	81.50
28	1.31	133.21	3.60	4.01	12.75	8.14	0.92	395.22	17.16	--

B5: Output Data Future Year Without Gaza Sea Port (2020)

ID1	AB_Flow	BA_Flow	TOT_Flow	AB_Time	BA_Time	MAX_Time	AB_voc	BA_voc	MAX_voc
1	0.0000	0.0000	0.0000	0.3545	0.3545	0.3545	0.0000	0.0000	0.0000
2	506.2427	809.3341	1315.5768	0.1998	0.2006	0.2006	0.2664	0.4260	0.4260
3	505.1127	808.2041	1313.3168	0.0500	0.0502	0.0502	0.2405	0.3849	0.3849
4	569.4180	466.7281	1036.1461	0.2944	0.2942	0.2944	0.2997	0.2456	0.2997
5	1.1300	1.1300	2.2600	0.0439	0.0439	0.0439	0.0006	0.0006	0.0006
6	623.1306	863.6738	1486.8044	0.0912	0.0915	0.0915	0.2967	0.4113	0.4113
7	189.5403	193.3123	382.8525	0.1394	0.1394	0.1394	0.0998	0.1017	0.1017
8	359.3834	540.0085	899.3919	0.1653	0.1654	0.1654	0.1891	0.2842	0.2842
10	354.7033	299.0731	653.7764	0.1182	0.1182	0.1182	0.1867	0.1574	0.1867
12	0.0000	0.0000	0.0000	0.1487	0.1487	0.1487	0.0000	0.0000	0.0000
13	0.0000	0.0000	0.0000	0.4512	0.4512	0.4512	0.0000	0.0000	0.0000
14	457.0595	513.2056	970.2651	0.0791	0.0791	0.0791	0.2176	0.2444	0.2444
15	1.1300	1.1300	2.2600	0.1446	0.1446	0.1446	0.0006	0.0006	0.0006
17	113.6155	61.6557	175.2712	0.0096	0.0096	0.0096	0.0598	0.0325	0.0598
18	61.6557	113.6155	175.2712	0.3365	0.3365	0.3365	0.0363	0.0668	0.0668
19	0.0000	0.0000	0.0000	0.0978	0.0978	0.0978	0.0000	0.0000	0.0000
20	121.3174	187.4064	308.7237	0.1756	0.1756	0.1756	0.0578	0.0892	0.0892
21	458.1895	514.3356	972.5251	0.2308	0.2308	0.2308	0.2182	0.2449	0.2449
22	1129.6867	582.9324	1712.6191	0.0397	0.0392	0.0397	0.5379	0.2776	0.5379
25	0.0000	0.0000	0.0000	0.0134	0.0134	0.0134	0.0000	0.0000	0.0000
26	780.1296	629.8155	1409.9451	0.0305	0.0304	0.0305	0.3715	0.2999	0.3715
27	351.5298	688.9841	1040.5138	0.1154	0.1156	0.1156	0.1674	0.3281	0.3281
28	0.0000	0.0000	0.0000	0.0960	0.0960	0.0960	0.0000	0.0000	0.0000
29	0.0000	0.0000	0.0000	0.0442	0.0442	0.0442	0.0000	0.0000	0.0000
30	924.5515	837.7276	1762.2791	0.3175	0.3167	0.3175	0.4866	0.4409	0.4866
31	837.7276	924.5515	1762.2791	0.1185	0.1189	0.1189	0.4654	0.5136	0.5136
33	0.0000	0.0000	0.0000	0.0125	0.0125	0.0125	0.0000	0.0000	0.0000
36	187.4064	121.3174	308.7237	0.2709	0.2709	0.2709	0.0986	0.0639	0.0986
38	1257.8035	1027.7686	2285.5721	0.0664	0.0660	0.0664	0.5031	0.4111	0.5031
39	868.7217	920.1495	1788.8712	0.1201	0.1201	0.1201	0.3475	0.3681	0.3681
41	591.3084	671.3660	1262.6744	0.2200	0.2202	0.2202	0.3112	0.3534	0.3534
42	0.0000	0.0000	0.0000	0.2357	0.2357	0.2357	0.0000	0.0000	0.0000
43	0.0000	0.0000	0.0000	0.0283	0.0283	0.0283	0.0000	0.0000	0.0000

ID1	AB_Flow	BA_Flow	TOT_Flow	AB_Time	BA_Time	MAX_Time	AB_voc	BA_voc	MAX_voc
43	0.0000	0.0000	0.0000	0.0283	0.0283	0.0283	0.0000	0.0000	0.0000
47	1542.8103	1261.3476	2804.1579	0.2252	0.2175	0.2252	0.8120	0.6639	0.8120
49	0.0000	0.0000	0.0000	0.1314	0.1314	0.1314	0.0000	0.0000	0.0000
50	0.0000	0.0000	0.0000	0.0625	0.0625	0.0625	0.0000	0.0000	0.0000
51	0.0000	0.0000	0.0000	0.0269	0.0269	0.0269	0.0000	0.0000	0.0000
52	0.0000	0.0000	0.0000	0.1205	0.1205	0.1205	0.0000	0.0000	0.0000
53	163.2364	225.4186	388.6550	0.0259	0.0259	0.0259	0.0653	0.0902	0.0902
54	240.7229	316.0348	556.7577	0.4644	0.4644	0.4644	0.1416	0.1859	0.1859
55	479.2712	466.1416	945.4127	0.1741	0.1741	0.1741	0.1917	0.1865	0.1917
56	260.2890	153.1394	413.4284	0.0752	0.0751	0.0752	0.1370	0.0806	0.1370
59	114.7455	62.7857	177.5312	0.1169	0.1169	0.1169	0.0604	0.0330	0.0604
60	640.8956	520.6164	1161.5121	0.1221	0.1220	0.1221	0.3052	0.2479	0.3052
61	480.6996	433.5167	914.2163	0.1993	0.1992	0.1993	0.2530	0.2282	0.2530
64	963.5830	962.1440	1925.7271	0.0220	0.0220	0.0220	0.4588	0.4582	0.4588
65	607.8489	610.2077	1218.0566	0.1738	0.1738	0.1738	0.3377	0.3390	0.3390
66	607.8489	610.2077	1218.0566	0.2381	0.2381	0.2381	0.3576	0.3589	0.3589
67	0.0000	0.0000	0.0000	0.1217	0.1217	0.1217	0.0000	0.0000	0.0000
68	160.1961	87.0997	247.2957	0.1682	0.1682	0.1682	0.0641	0.0348	0.0641
69	842.3945	345.5930	1187.9875	0.0464	0.0462	0.0464	0.4011	0.1646	0.4011
72	102.3217	730.9955	833.3171	0.0816	0.0820	0.0820	0.0602	0.4300	0.4300
74	160.1961	87.0997	247.2957	0.1980	0.1979	0.1980	0.2289	0.1244	0.2289
75	160.1961	87.0997	247.2957	0.3361	0.3361	0.3361	0.0942	0.0512	0.0942
76	0.0000	0.0000	0.0000	0.1011	0.1011	0.1011	0.0000	0.0000	0.0000
77	87.0997	160.1961	247.2957	0.1620	0.1620	0.1620	0.0484	0.0890	0.0890
78	0.0000	0.0000	0.0000	0.0516	0.0516	0.0516	0.0000	0.0000	0.0000
79	181.2953	137.3025	318.5978	0.1621	0.1621	0.1621	0.1066	0.0808	0.1066
82	1093.7819	1030.3535	2124.1354	0.1454	0.1450	0.1454	0.5208	0.4906	0.5208
83	109.4090	88.5781	197.9871	0.0978	0.0978	0.0978	0.0644	0.0521	0.0644
84	1088.3461	1004.0868	2092.4329	0.0549	0.0546	0.0549	0.5728	0.5285	0.5728
85	160.1961	87.0997	247.2957	0.0485	0.0485	0.0485	0.2289	0.1244	0.2289
87	677.9009	565.4385	1243.3394	0.3989	0.3984	0.3989	0.3568	0.2976	0.3568
88	682.7820	710.9852	1393.7671	0.3711	0.3712	0.3712	0.3251	0.3386	0.3386
91	439.5562	377.0419	816.5982	0.1047	0.1046	0.1047	0.2313	0.1984	0.2313

ID1	AB_Flow	BA_Flow	TOT_Flow	AB_Time	BA_Time	MAX_Time	AB_voc	BA_voc	MAX_voc
91	439.5562	377.0419	816.5982	0.1047	0.1046	0.1047	0.2313	0.1984	0.2313
96	348.3119	333.3893	681.7012	0.0368	0.0368	0.0368	0.1935	0.1852	0.1935
97	847.2083	749.8833	1597.0916	0.4435	0.4425	0.4435	0.4459	0.3947	0.4459
98	497.3621	567.3620	1064.7241	0.4981	0.4985	0.4985	0.2926	0.3337	0.3337
99	184.8423	101.2464	286.0887	0.4057	0.4054	0.4057	0.2641	0.1446	0.2641
100	0.0000	0.0000	0.0000	0.1265	0.1265	0.1265	0.0000	0.0000	0.0000
102	528.5545	501.2293	1029.7838	0.2696	0.2695	0.2696	0.2782	0.2638	0.2782
103	0.0000	0.0000	0.0000	0.2218	0.2218	0.2218	0.0000	0.0000	0.0000
105	0.0000	0.0000	0.0000	0.1292	0.1292	0.1292	0.0000	0.0000	0.0000
107	161.6050	150.2320	311.8370	0.1668	0.1668	0.1668	0.0951	0.0884	0.0951
109	440.5490	375.4669	816.0159	0.3634	0.3633	0.3634	0.1762	0.1502	0.1762
111	0.0000	0.0000	0.0000	0.1711	0.1711	0.1711	0.0000	0.0000	0.0000
112	525.6989	602.1540	1127.8529	0.1787	0.1789	0.1789	0.2921	0.3345	0.3345
114	200.0098	194.4628	394.4726	0.2123	0.2123	0.2123	0.1111	0.1080	0.1111
124	194.4628	200.0098	394.4726	0.0645	0.0645	0.0645	0.0926	0.0952	0.0952
126	0.0000	0.0000	0.0000	0.2430	0.2430	0.2430	0.0000	0.0000	0.0000
127	348.3119	333.3893	681.7012	0.1423	0.1423	0.1423	0.1393	0.1334	0.1393
128	877.2070	1009.0793	1886.2863	0.0684	0.0684	0.0684	0.1566	0.1802	0.1802
133	842.3945	345.5930	1187.9875	0.1030	0.1027	0.1030	0.4011	0.1646	0.4011
138	359.3834	540.0085	899.3919	0.1401	0.1401	0.1401	0.1382	0.2077	0.2077
141	160.1961	87.0997	247.2957	0.0420	0.0420	0.0420	0.0641	0.0348	0.0641
143	160.1961	87.0997	247.2957	0.1231	0.1231	0.1231	0.2289	0.1244	0.2289
144	0.0000	0.0000	0.0000	0.1223	0.1223	0.1223	0.0000	0.0000	0.0000
146	332.5508	292.4091	624.9599	0.1365	0.1365	0.1365	0.1750	0.1539	0.1750
147	331.4208	291.2791	622.6999	0.0126	0.0126	0.0126	0.1275	0.1120	0.1275
149	477.6739	397.9531	875.6269	0.0033	0.0033	0.0033	0.1911	0.1592	0.1911
150	629.8155	780.1296	1409.9451	0.2414	0.2418	0.2418	0.2999	0.3715	0.3715
152	896.8962	495.9517	1392.8478	0.2254	0.2235	0.2254	0.4983	0.2755	0.4983
153	0.0000	0.0000	0.0000	0.0325	0.0325	0.0325	0.0000	0.0000	0.0000
156	0.0000	0.0000	0.0000	0.0343	0.0343	0.0343	0.0000	0.0000	0.0000
158	0.0000	0.0000	0.0000	0.0421	0.0421	0.0421	0.0000	0.0000	0.0000
162	0.0000	0.0000	0.0000	0.0921	0.0921	0.0921	0.0000	0.0000	0.0000
246	101.2464	184.8423	286.0887	0.3597	0.3597	0.3597	0.0482	0.0880	0.0880

ID1	AB_Flow	BA_Flow	TOT_Flow	AB_Time	BA_Time	MAX_Time	AB_voc	BA_voc	MAX_voc
146	332.5508	292.4091	624.9599	0.1365	0.1365	0.1365	0.1750	0.1539	0.1750
147	331.4208	291.2791	622.6999	0.0126	0.0126	0.0126	0.1275	0.1120	0.1275
149	477.6739	397.9531	875.6269	0.0033	0.0033	0.0033	0.1911	0.1592	0.1911
150	629.8155	780.1296	1409.9451	0.2414	0.2418	0.2418	0.2999	0.3715	0.3715
152	896.8962	495.9517	1392.8478	0.2254	0.2235	0.2254	0.4983	0.2755	0.4983
153	0.0000	0.0000	0.0000	0.0325	0.0325	0.0325	0.0000	0.0000	0.0000
156	0.0000	0.0000	0.0000	0.0343	0.0343	0.0343	0.0000	0.0000	0.0000
158	0.0000	0.0000	0.0000	0.0421	0.0421	0.0421	0.0000	0.0000	0.0000
162	0.0000	0.0000	0.0000	0.0921	0.0921	0.0921	0.0000	0.0000	0.0000
246	101.2464	184.8423	286.0887	0.3597	0.3597	0.3597	0.0482	0.0880	0.0880
247	301.2562	379.3051	680.5613	0.0876	0.0876	0.0876	0.1435	0.1806	0.1806
249	618.1341	596.6350	1214.7691	0.0954	0.0954	0.0954	0.3636	0.3510	0.3636
250	24.6462	14.1467	38.7929	0.2648	0.2648	0.2648	0.0117	0.0067	0.0117
251	385.7750	318.6228	704.3978	0.1234	0.1234	0.1234	0.1837	0.1517	0.1837
252	124.1552	129.0729	253.2282	0.2599	0.2599	0.2599	0.0497	0.0516	0.0516
253	477.3848	457.5445	934.9293	0.1128	0.1128	0.1128	0.1910	0.1830	0.1910
254	109.4090	88.5781	197.9871	0.1435	0.1435	0.1435	0.0644	0.0521	0.0644
255	160.1961	87.0997	247.2957	0.5824	0.5822	0.5824	0.2289	0.1244	0.2289
256	500.2994	348.9914	849.2908	0.1474	0.1470	0.1474	0.3848	0.2685	0.3848
257	0.0000	0.0000	0.0000	0.0958	0.0958	0.0958	0.0000	0.0000	0.0000
258	847.7593	354.7555	1202.5148	0.1105	0.1097	0.1105	0.4710	0.1971	0.4710
260	698.8053	653.9812	1352.7865	0.0587	0.0587	0.0587	0.4111	0.3847	0.4111
261	163.2364	225.4186	388.6550	0.1425	0.1425	0.1425	0.0859	0.1186	0.1186
262	1768.2289	1424.5839	3192.8129	0.0749	0.0705	0.0749	0.9306	0.7498	0.9306
263	420.7842	657.0395	1077.8238	0.1524	0.1526	0.1526	0.2004	0.3129	0.3129
264	1008.5693	1109.7683	2118.3376	0.0715	0.0718	0.0718	0.4803	0.5285	0.5285
265	1223.6246	1192.4309	2416.0555	0.0430	0.0429	0.0430	0.5827	0.5678	0.5827
266	569.4180	466.7281	1036.1461	0.1472	0.1471	0.1472	0.2997	0.2456	0.2997
267	506.2427	809.3341	1315.5768	0.1037	0.1041	0.1041	0.2664	0.4260	0.4260
269	600.4668	584.8768	1185.3436	0.1177	0.1177	0.1177	0.3160	0.3078	0.3160
270	0.0000	0.0000	0.0000	0.1394	0.1394	0.1394	0.0000	0.0000	0.0000
271	577.9476	1128.8882	1706.8358	0.0388	0.0395	0.0395	0.3042	0.5942	0.5942
272	187.4064	121.3174	308.7237	0.3835	0.3835	0.3835	0.0986	0.0639	0.0986

ID1	AB_Flow	BA_Flow	TOT_Flow	AB_Time	BA_Time	MAX_Time	AB_voc	BA_voc	MAX_voc
251	385.7750	318.6228	704.3978	0.1234	0.1234	0.1234	0.1837	0.1517	0.1837
252	124.1552	129.0729	253.2282	0.2599	0.2599	0.2599	0.0497	0.0516	0.0516
253	477.3848	457.5445	934.9293	0.1128	0.1128	0.1128	0.1910	0.1830	0.1910
254	109.4090	88.5781	197.9871	0.1435	0.1435	0.1435	0.0644	0.0521	0.0644
255	160.1961	87.0997	247.2957	0.5824	0.5822	0.5824	0.2289	0.1244	0.2289
256	500.2994	348.9914	849.2908	0.1474	0.1470	0.1474	0.3848	0.2685	0.3848
257	0.0000	0.0000	0.0000	0.0958	0.0958	0.0958	0.0000	0.0000	0.0000
258	847.7593	354.7555	1202.5148	0.1105	0.1097	0.1105	0.4710	0.1971	0.4710
260	698.8053	653.9812	1352.7865	0.0587	0.0587	0.0587	0.4111	0.3847	0.4111
261	163.2364	225.4186	388.6550	0.1425	0.1425	0.1425	0.0859	0.1186	0.1186
262	1768.2289	1424.5839	3192.8129	0.0749	0.0705	0.0749	0.9306	0.7498	0.9306
263	420.7842	657.0395	1077.8238	0.1524	0.1526	0.1526	0.2004	0.3129	0.3129
264	1008.5693	1109.7683	2118.3376	0.0715	0.0718	0.0718	0.4803	0.5285	0.5285
265	1223.6246	1192.4309	2416.0555	0.0430	0.0429	0.0430	0.5827	0.5678	0.5827
266	569.4180	466.7281	1036.1461	0.1472	0.1471	0.1472	0.2997	0.2456	0.2997
267	506.2427	809.3341	1315.5768	0.1037	0.1041	0.1041	0.2664	0.4260	0.4260
269	600.4668	584.8768	1185.3436	0.1177	0.1177	0.1177	0.3160	0.3078	0.3160
270	0.0000	0.0000	0.0000	0.1394	0.1394	0.1394	0.0000	0.0000	0.0000
271	577.9476	1128.8882	1706.8358	0.0388	0.0395	0.0395	0.3042	0.5942	0.5942
272	187.4064	121.3174	308.7237	0.3835	0.3835	0.3835	0.0986	0.0639	0.0986
273	156.7347	203.4168	360.1515	0.0679	0.0679	0.0679	0.0825	0.1071	0.1071
274	996.0117	1080.5682	2076.5799	0.1595	0.1600	0.1600	0.4743	0.5146	0.5146
275	1242.8681	1217.5485	2460.4167	0.1891	0.1888	0.1891	0.5918	0.5798	0.5918
276	478.7546	392.7591	871.5138	0.0939	0.0939	0.0939	0.2660	0.2182	0.2660
278	102.3217	730.9955	833.3171	0.0530	0.0532	0.0532	0.0568	0.4061	0.4061
279	181.2953	137.3025	318.5978	0.1121	0.1121	0.1121	0.1066	0.0808	0.1066
282	525.6989	602.1540	1127.8529	0.1109	0.1109	0.1109	0.2921	0.3345	0.3345
283	857.8617	752.2216	1610.0834	0.5545	0.5531	0.5545	0.4515	0.3959	0.4515
285	931.1842	990.4211	1921.6053	1.6643	1.6683	1.6683	0.4901	0.5213	0.5213
286	478.7546	392.7591	871.5138	1.0907	1.0903	1.0907	0.2520	0.2067	0.2520
287	232.4076	187.1394	419.5470	1.7301	1.7300	1.7301	0.1223	0.0985	0.1223
288	385.5471	447.4284	832.9755	0.4080	0.4080	0.4080	--	--	--
289	1257.8035	1027.7686	2285.5721	1.0298	1.0244	1.0298	0.5031	0.4111	0.5031

B6: OD matrix Future Year With Gaza Sea Port (2020)

	1	2	3	4	5	6	7	10	11	12
1	--	67.58	0.05	56.70	0.24	0.65	0.57	0.84	1.14	0.93
2	66.23	--	70.11	70.11	4.66	37.61	2.91	1.80	2.32	1.84
3	0.05	65.44	--	1.13	1.89	31.82	1.94	1.51	2.00	1.57
4	56.45	65.44	1.13	--	10.32	99.54	4.27	2.15	2.70	2.14
5	0.38	8.61	4.35	20.35	--	6.10	1.23	1.26	1.70	1.34
6	0.74	33.21	27.07	86.47	2.40	--	0.51	0.98	1.42	1.09
7	1.66	12.40	9.92	19.17	3.91	5.53	--	1.35	2.07	1.43
10	1.25	2.81	2.40	3.38	1.74	1.65	1.09	--	247.63	43.32
11	1.72	3.63	3.18	4.26	2.38	2.39	1.87	168.48	--	21.38
12	1.75	3.54	3.13	4.12	2.38	2.39	1.91	25.27	16.70	--
13	2.21	4.62	4.15	5.39	3.14	3.28	2.88	83.24	40.86	43.78
14	1.13	2.52	2.13	3.02	1.55	1.44	0.90	143.80	49.52	291.28
15	1.13	2.52	2.13	3.02	1.55	1.44	0.90	479.89	184.44	15.92
16	18.79	4.74	3.80	5.97	2.29	2.32	25.26	0.27	93.03	0.41
18	2.87	15.20	13.10	21.09	6.34	9.97	34.70	0.75	1.30	0.91
19	1.32	13.69	10.74	23.41	3.43	5.01	0.16	0.67	1.02	0.79
20	1.05	19.85	15.06	39.21	3.01	5.18	0.82	1.10	1.53	1.19
21	1.10	154.31	160.32	26.11	10.36	60.09	4.59	2.26	2.81	2.25
22	71.78	78.45	1.13	1.13	1.89	31.82	1.94	1.51	2.00	1.57
23	2.36	14.77	12.49	21.53	5.53	8.78	49.50	1.24	203.13	1.36
26	3.92	22.78	20.91	32.20	9.94	19.07	198.99	0.34	0.77	0.51
27	79.49	20.31	19.75	25.44	14.95	11.81	16.47	17.58	10.56	10.32
28	70.14	9.92	8.14	13.58	4.11	5.26	5.50	190.76	333.65	31.23

	12	13	14	15	16	18	19	20	21	22
1	0.93	1.21	0.74	0.74	10.83	1.24	1.65	0.73	0.81	75.72
2	1.84	2.49	1.58	1.58	2.68	5.28	56.95	13.18	144.59	85.88
3	1.57	2.16	1.31	1.31	2.12	4.14	59.89	8.89	110.11	1.13
4	2.14	2.90	1.87	1.87	3.27	7.14	122.18	25.18	14.60	1.13
5	1.34	1.84	1.10	1.10	1.65	2.84	17.97	3.39	15.73	4.35
6	1.09	1.56	0.84	0.84	1.22	2.14	251.90	1.18	47.85	27.07
7	1.43	2.35	1.06	1.06	22.82	61.83	2.66	3.66	16.60	9.92
10	43.32	216.21	149.88	185.65	0.20	0.70	1.27	1.58	3.41	2.40
11	21.38	69.55	39.66	110.58	80.11	1.32	1.97	2.25	4.28	3.18
12	--	76.20	331.42	33.32	0.58	1.39	2.00	2.26	4.14	3.13
13	43.78	--	1.13	185.62	0.88	2.07	2.81	3.03	5.34	4.15
14	291.28	1.13	--	1.13	0.16	0.58	1.10	1.40	3.08	2.13
15	15.92	333.89	1.13	--	0.16	0.58	1.10	1.40	3.08	2.13
16	0.41	0.68	0.22	0.22	--	12.74	1.62	2.11	6.13	3.80
18	0.91	1.46	0.60	0.60	9.72	--	7.86	6.68	18.90	13.10
19	0.79	1.11	0.58	0.58	0.73	0.93	--	2.99	18.93	10.74
20	1.19	1.67	0.94	0.94	1.41	2.43	29.55	--	28.64	15.06
21	2.25	3.00	1.98	1.98	3.55	7.27	75.55	21.93	--	285.25
22	1.57	2.16	1.31	1.31	2.12	4.14	59.89	8.89	232.45	--
23	1.36	2.11	1.01	1.01	1.26	55.62	6.10	5.65	18.78	12.49
26	0.51	0.91	0.26	0.26	5.17	28.21	17.33	11.24	27.06	20.91
27	10.32	10.68	10.08	17.51	22.05	61.09	10.20	9.83	24.36	18.56
28	31.23	83.90	46.03	46.03	1.31	133.21	3.60	4.01	12.75	8.14

	16	18	19	20	21	22	23	26	27	28
1	10.83	1.24	1.65	0.73	0.81	75.72	0.95	1.66	44.67	39.82
2	2.68	5.28	56.95	13.18	144.59	85.88	4.52	7.67	14.82	6.05
3	2.12	4.14	59.89	8.89	110.11	1.13	3.37	6.33	14.95	4.94
4	3.27	7.14	122.18	25.18	14.60	1.13	6.36	10.53	17.83	7.93
5	1.65	2.84	17.97	3.39	15.73	4.35	2.23	4.29	13.49	3.53
6	1.22	2.14	251.90	1.18	47.85	27.07	1.43	3.79	7.79	2.97
7	22.82	61.83	2.66	3.66	16.60	9.92	158.28	438.74	35.88	39.61
10	0.20	0.70	1.27	1.58	3.41	2.40	0.66	0.28	17.54	140.81
11	80.11	1.32	1.97	2.25	4.28	3.18	258.87	0.73	10.54	441.15
12	0.58	1.39	2.00	2.26	4.14	3.13	1.34	0.83	10.64	50.83
13	0.88	2.07	2.81	3.03	5.34	4.15	1.98	1.35	11.13	103.07
14	0.16	0.58	1.10	1.40	3.08	2.13	0.55	0.22	10.05	91.48
15	0.16	0.58	1.10	1.40	3.08	2.13	0.55	0.22	17.48	91.48
16	--	12.74	1.62	2.11	6.13	3.80	0.52	8.21	25.40	2.16
18	9.72	--	7.86	6.68	18.90	13.10	55.50	30.20	69.89	162.18
19	0.73	0.93	--	2.99	18.93	10.74	0.54	1.58	6.07	1.44
20	1.41	2.43	29.55	--	28.64	15.06	1.77	3.91	7.93	3.18
21	3.55	7.27	75.55	21.93	--	285.25	6.51	10.20	17.76	8.00
22	2.12	4.14	59.89	8.89	232.45	--	3.37	6.33	13.76	4.94
23	1.26	55.62	6.10	5.65	18.78	12.49	--	187.88	24.02	21.50
26	5.17	28.21	17.33	11.24	27.06	20.91	182.01	--	159.26	459.66
27	22.05	61.09	10.20	9.83	24.36	18.56	10.74	126.82	--	98.78
28	1.31	133.21	3.60	4.01	12.75	8.14	0.92	395.22	34.44	--

B7: Output Data Future Year With Gaza Sea Port (2020)

ID1	AB_Flow	BA_Flow	TOT_Flow	AB_Time	BA_Time	MAX_Time	AB_voc	BA_voc	MAX_voc
1	0.0000	0.0000	0.0000	0.3545	0.3545	0.3545	0.0000	0.0000	0.0000
2	516.0936	819.1831	1335.2768	0.1998	0.2006	0.2006	0.2716	0.4311	0.4311
3	514.9636	818.0531	1333.0168	0.0500	0.0502	0.0502	0.2452	0.3895	0.3895
4	579.2636	476.5844	1055.8480	0.2944	0.2942	0.2944	0.3049	0.2508	0.3049
5	1.1300	1.1300	2.2600	0.0439	0.0439	0.0439	0.0006	0.0006	0.0006
6	642.8271	883.3792	1526.2063	0.0912	0.0915	0.0915	0.3061	0.4207	0.4207
7	189.5403	193.3123	382.8525	0.1394	0.1394	0.1394	0.0998	0.1017	0.1017
8	359.3834	540.0085	899.3919	0.1653	0.1654	0.1654	0.1891	0.2842	0.2842
10	354.7033	299.0731	653.7764	0.1182	0.1182	0.1182	0.1867	0.1574	0.1867
12	0.0000	0.0000	0.0000	0.1487	0.1487	0.1487	0.0000	0.0000	0.0000
13	0.0000	0.0000	0.0000	0.4512	0.4512	0.4512	0.0000	0.0000	0.0000
14	476.7560	532.9110	1009.6670	0.0791	0.0791	0.0791	0.2270	0.2538	0.2538
15	1.1300	1.1300	2.2600	0.1446	0.1446	0.1446	0.0006	0.0006	0.0006
17	123.4617	71.5074	194.9690	0.0096	0.0096	0.0096	0.0650	0.0376	0.0650
18	71.5074	123.4617	194.9690	0.3365	0.3365	0.3365	0.0421	0.0726	0.0726
19	0.0000	0.0000	0.0000	0.0978	0.0978	0.0978	0.0000	0.0000	0.0000
20	195.2915	261.3537	456.6452	0.1756	0.1756	0.1756	0.0930	0.1245	0.1245
21	477.8860	534.0410	1011.9270	0.2308	0.2309	0.2309	0.2276	0.2543	0.2543
22	1176.5055	629.7711	1806.2767	0.0398	0.0393	0.0398	0.5602	0.2999	0.5602
25	0.0000	0.0000	0.0000	0.0134	0.0134	0.0134	0.0000	0.0000	0.0000
26	780.1296	629.8155	1409.9451	0.0305	0.0304	0.0305	0.3715	0.2999	0.3715
27	368.8119	706.2637	1075.0755	0.1154	0.1156	0.1156	0.1756	0.3363	0.3363
28	0.0000	0.0000	0.0000	0.0960	0.0960	0.0960	0.0000	0.0000	0.0000
29	0.0000	0.0000	0.0000	0.0442	0.0442	0.0442	0.0000	0.0000	0.0000
30	934.3979	847.5834	1781.9814	0.3177	0.3168	0.3177	0.4918	0.4461	0.4918
31	847.5834	934.3979	1781.9814	0.1185	0.1189	0.1189	0.4709	0.5191	0.5191
33	0.0000	0.0000	0.0000	0.0125	0.0125	0.0125	0.0000	0.0000	0.0000
36	261.3537	195.2915	456.6452	0.2709	0.2709	0.2709	0.1376	0.1028	0.1376
38	1257.8035	1027.7686	2285.5721	0.0664	0.0660	0.0664	0.5031	0.4111	0.5031
39	868.7217	920.1495	1788.8712	0.1201	0.1201	0.1201	0.3475	0.3681	0.3681
41	608.5872	688.6500	1297.2372	0.2200	0.2203	0.2203	0.3203	0.3624	0.3624
42	0.0000	0.0000	0.0000	0.2357	0.2357	0.2357	0.0000	0.0000	0.0000
43	0.0000	0.0000	0.0000	0.0283	0.0283	0.0283	0.0000	0.0000	0.0000

ID1	AB_Flow	BA_Flow	TOT_Flow	AB_Time	BA_Time	MAX_Time	AB_voc	BA_voc	MAX_voc
43	0.0000	0.0000	0.0000	0.0283	0.0283	0.0283	0.0000	0.0000	0.0000
47	1542.8103	1261.3476	2804.1579	0.2252	0.2175	0.2252	0.8120	0.6639	0.8120
49	0.0000	0.0000	0.0000	0.1314	0.1314	0.1314	0.0000	0.0000	0.0000
50	0.0000	0.0000	0.0000	0.0625	0.0625	0.0625	0.0000	0.0000	0.0000
51	0.0000	0.0000	0.0000	0.0269	0.0269	0.0269	0.0000	0.0000	0.0000
52	0.0000	0.0000	0.0000	0.1205	0.1205	0.1205	0.0000	0.0000	0.0000
53	180.5119	242.6986	423.2105	0.0259	0.0259	0.0259	0.0722	0.0971	0.0971
54	240.7229	316.0348	556.7577	0.4644	0.4644	0.4644	0.1416	0.1859	0.1859
55	496.5467	483.4215	979.9682	0.1741	0.1741	0.1741	0.1986	0.1934	0.1986
56	360.6900	253.4100	614.1000	0.0752	0.0752	0.0752	0.1898	0.1334	0.1898
59	124.5917	72.6374	197.2290	0.1169	0.1169	0.1169	0.0656	0.0382	0.0656
60	724.0167	603.6115	1327.6282	0.1222	0.1220	0.1222	0.3448	0.2874	0.3448
61	555.5912	508.2848	1063.8760	0.1994	0.1993	0.1994	0.2924	0.2675	0.2924
64	963.5850	962.1440	1925.7290	0.0220	0.0220	0.0220	0.4588	0.4582	0.4588
65	678.4674	680.9514	1359.4188	0.1740	0.1740	0.1740	0.3769	0.3783	0.3783
66	678.4674	680.9514	1359.4188	0.2384	0.2384	0.2384	0.3991	0.4006	0.4006
67	0.0000	0.0000	0.0000	0.1217	0.1217	0.1217	0.0000	0.0000	0.0000
68	168.4254	95.3267	263.7522	0.1682	0.1682	0.1682	0.0674	0.0381	0.0674
69	908.9869	412.0631	1321.0500	0.0464	0.0462	0.0464	0.4329	0.1962	0.4329
72	106.4714	735.1473	841.6187	0.0816	0.0820	0.0820	0.0626	0.4324	0.4324
74	168.4254	95.3267	263.7522	0.1980	0.1979	0.1980	0.2406	0.1362	0.2406
75	168.4254	95.3267	263.7522	0.3361	0.3361	0.3361	0.0991	0.0561	0.0991
76	0.0000	0.0000	0.0000	0.1011	0.1011	0.1011	0.0000	0.0000	0.0000
77	95.3267	168.4254	263.7522	0.1620	0.1620	0.1620	0.0530	0.0936	0.0936
78	0.0000	0.0000	0.0000	0.0516	0.0516	0.0516	0.0000	0.0000	0.0000
79	185.4495	141.4532	326.9027	0.1621	0.1621	0.1621	0.1091	0.0832	0.1091
82	1147.9227	1084.3664	2232.2891	0.1457	0.1453	0.1457	0.5466	0.5164	0.5466
83	118.8318	98.0020	216.8338	0.0978	0.0978	0.0978	0.0699	0.0576	0.0699
84	1133.0631	1048.6768	2181.7399	0.0550	0.0548	0.0550	0.5963	0.5519	0.5963
85	168.4254	95.3267	263.7522	0.0485	0.0485	0.0485	0.2406	0.1362	0.2406
87	703.7800	591.3159	1295.0959	0.3991	0.3985	0.3991	0.3704	0.3112	0.3704
88	701.6199	729.6977	1431.3176	0.3711	0.3712	0.3712	0.3341	0.3475	0.3475
91	439.5562	377.0419	816.5982	0.1047	0.1046	0.1047	0.2313	0.1984	0.2313

ID1	AB_Flow	BA_Flow	TOT_Flow	AB_Time	BA_Time	MAX_Time	AB_voc	BA_voc	MAX_voc
91	439.5562	377.0419	816.5982	0.1047	0.1046	0.1047	0.2313	0.1984	0.2313
96	357.7309	342.8068	700.5377	0.0368	0.0368	0.0368	0.1987	0.1904	0.1987
97	863.6693	766.3402	1630.0095	0.4437	0.4426	0.4437	0.4546	0.4033	0.4546
98	505.5927	575.5900	1081.1827	0.4982	0.4986	0.4986	0.2974	0.3386	0.3386
99	193.0717	109.4735	302.5451	0.4058	0.4054	0.4058	0.2758	0.1564	0.2758
100	0.0000	0.0000	0.0000	0.1265	0.1265	0.1265	0.0000	0.0000	0.0000
102	536.7875	509.4557	1046.2431	0.2696	0.2696	0.2696	0.2825	0.2681	0.2825
103	0.0000	0.0000	0.0000	0.2218	0.2218	0.2218	0.0000	0.0000	0.0000
105	0.0000	0.0000	0.0000	0.1292	0.1292	0.1292	0.0000	0.0000	0.0000
107	161.6050	150.2320	311.8370	0.1668	0.1668	0.1668	0.0951	0.0884	0.0951
109	448.7771	383.6975	832.4745	0.3634	0.3633	0.3634	0.1795	0.1535	0.1795
111	0.0000	0.0000	0.0000	0.1711	0.1711	0.1711	0.0000	0.0000	0.0000
112	533.9294	610.3821	1144.3115	0.1787	0.1789	0.1789	0.2966	0.3391	0.3391
114	200.0098	194.4628	394.4726	0.2123	0.2123	0.2123	0.1111	0.1080	0.1111
124	194.4628	200.0098	394.4726	0.0645	0.0645	0.0645	0.0926	0.0952	0.0952
126	0.0000	0.0000	0.0000	0.2430	0.2430	0.2430	0.0000	0.0000	0.0000
127	357.7309	342.8068	700.5377	0.1423	0.1423	0.1423	0.1431	0.1371	0.1431
128	939.6476	1071.3997	2011.0473	0.0684	0.0684	0.0684	0.1678	0.1913	0.1913
133	908.9869	412.0631	1321.0500	0.1032	0.1027	0.1032	0.4329	0.1962	0.4329
138	359.3834	540.0085	899.3919	0.1401	0.1401	0.1401	0.1382	0.2077	0.2077
141	168.4254	95.3267	263.7522	0.0420	0.0420	0.0420	0.0674	0.0381	0.0674
143	168.4254	95.3267	263.7522	0.1232	0.1231	0.1232	0.2406	0.1362	0.2406
144	0.0000	0.0000	0.0000	0.1223	0.1223	0.1223	0.0000	0.0000	0.0000
146	332.5508	292.4091	624.9599	0.1365	0.1365	0.1365	0.1750	0.1539	0.1750
147	331.4208	291.2791	622.6999	0.0126	0.0126	0.0126	0.1275	0.1120	0.1275
149	477.6739	397.9531	875.6269	0.0033	0.0033	0.0033	0.1911	0.1592	0.1911
150	629.8155	780.1296	1409.9451	0.2414	0.2418	0.2418	0.2999	0.3715	0.3715
152	924.0316	523.0802	1447.1118	0.2256	0.2235	0.2256	0.5134	0.2906	0.5134
153	0.0000	0.0000	0.0000	0.0325	0.0325	0.0325	0.0000	0.0000	0.0000
156	0.0000	0.0000	0.0000	0.0343	0.0343	0.0343	0.0000	0.0000	0.0000
158	0.0000	0.0000	0.0000	0.0421	0.0421	0.0421	0.0000	0.0000	0.0000
162	0.0000	0.0000	0.0000	0.0921	0.0921	0.0921	0.0000	0.0000	0.0000
246	109.4735	193.0717	302.5451	0.3597	0.3597	0.3597	0.0521	0.0919	0.0919

ID1	AB_Flow	BA_Flow	TOT_Flow	AB_Time	BA_Time	MAX_Time	AB_voc	BA_voc	MAX_voc
146	332.5508	292.4091	624.9599	0.1365	0.1365	0.1365	0.1750	0.1539	0.1750
147	331.4208	291.2791	622.6999	0.0126	0.0126	0.0126	0.1275	0.1120	0.1275
149	477.6739	397.9531	875.6269	0.0033	0.0033	0.0033	0.1911	0.1592	0.1911
150	629.8155	780.1296	1409.9451	0.2414	0.2418	0.2418	0.2999	0.3715	0.3715
152	924.0316	523.0802	1447.1118	0.2256	0.2235	0.2256	0.5134	0.2906	0.5134
153	0.0000	0.0000	0.0000	0.0325	0.0325	0.0325	0.0000	0.0000	0.0000
156	0.0000	0.0000	0.0000	0.0343	0.0343	0.0343	0.0000	0.0000	0.0000
158	0.0000	0.0000	0.0000	0.0421	0.0421	0.0421	0.0000	0.0000	0.0000
162	0.0000	0.0000	0.0000	0.0921	0.0921	0.0921	0.0000	0.0000	0.0000
246	109.4735	193.0717	302.5451	0.3597	0.3597	0.3597	0.0521	0.0919	0.0919
247	309.4832	387.5345	697.0177	0.0876	0.0876	0.0876	0.1474	0.1845	0.1845
249	626.3671	604.8614	1231.2285	0.0954	0.0954	0.0954	0.3685	0.3558	0.3685
250	24.6462	14.1467	38.7929	0.2648	0.2648	0.2648	0.0117	0.0067	0.0117
251	395.1930	328.0433	723.2364	0.1234	0.1234	0.1234	0.1882	0.1562	0.1882
252	124.1552	129.0729	253.2282	0.2599	0.2599	0.2599	0.0497	0.0516	0.0516
253	486.8038	466.9620	953.7658	0.1128	0.1128	0.1128	0.1947	0.1868	0.1947
254	118.8318	98.0020	216.8338	0.1435	0.1435	0.1435	0.0699	0.0576	0.0699
255	168.4254	95.3267	263.7522	0.5825	0.5822	0.5825	0.2406	0.1362	0.2406
256	504.4527	353.1405	857.5932	0.1474	0.1470	0.1474	0.3880	0.2716	0.3880
257	0.0000	0.0000	0.0000	0.0958	0.0958	0.0958	0.0000	0.0000	0.0000
258	851.9076	358.9088	1210.8165	0.1105	0.1097	0.1105	0.4733	0.1994	0.4733
260	702.9532	658.1307	1361.0839	0.0587	0.0587	0.0587	0.4135	0.3871	0.4135
261	180.5119	242.6986	423.2105	0.1425	0.1425	0.1425	0.0950	0.1277	0.1277
262	1785.5089	1441.8594	3227.3683	0.0752	0.0707	0.0752	0.9397	0.7589	0.9397
263	420.7842	657.0395	1077.8238	0.1524	0.1526	0.1526	0.2004	0.3129	0.3129
264	1025.8514	1127.0479	2152.8993	0.0716	0.0718	0.0718	0.4885	0.5367	0.5367
265	1233.4710	1202.2867	2435.7577	0.0430	0.0429	0.0430	0.5874	0.5725	0.5874
266	579.2636	476.5844	1055.8480	0.1472	0.1471	0.1472	0.3049	0.2508	0.3049
267	516.0936	819.1831	1335.2768	0.1037	0.1042	0.1042	0.2716	0.4311	0.4311
269	610.3130	594.7285	1205.0414	0.1177	0.1177	0.1177	0.3212	0.3130	0.3212
270	0.0000	0.0000	0.0000	0.1394	0.1394	0.1394	0.0000	0.0000	0.0000
271	595.2293	1146.1644	1741.3937	0.0388	0.0395	0.0395	0.3133	0.6032	0.6032
272	261.3537	195.2915	456.6452	0.3835	0.3835	0.3835	0.1376	0.1028	0.1376

ID1	AB_Flow	BA_Flow	TOT_Flow	AB_Time	BA_Time	MAX_Time	AB_voc	BA_voc	MAX_voc
251	395.1930	328.0433	723.2364	0.1234	0.1234	0.1234	0.1882	0.1562	0.1882
252	124.1552	129.0729	253.2282	0.2599	0.2599	0.2599	0.0497	0.0516	0.0516
253	486.8038	466.9620	953.7658	0.1128	0.1128	0.1128	0.1947	0.1868	0.1947
254	118.8318	98.0020	216.8338	0.1435	0.1435	0.1435	0.0699	0.0576	0.0699
255	168.4254	95.3267	263.7522	0.5825	0.5822	0.5825	0.2406	0.1362	0.2406
256	504.4527	353.1405	857.5932	0.1474	0.1470	0.1474	0.3880	0.2716	0.3880
257	0.0000	0.0000	0.0000	0.0958	0.0958	0.0958	0.0000	0.0000	0.0000
258	851.9076	358.9088	1210.8165	0.1105	0.1097	0.1105	0.4733	0.1994	0.4733
260	702.9532	658.1307	1361.0839	0.0587	0.0587	0.0587	0.4135	0.3871	0.4135
261	180.5119	242.6986	423.2105	0.1425	0.1425	0.1425	0.0950	0.1277	0.1277
262	1785.5089	1441.8594	3227.3683	0.0752	0.0707	0.0752	0.9397	0.7589	0.9397
263	420.7842	657.0395	1077.8238	0.1524	0.1526	0.1526	0.2004	0.3129	0.3129
264	1025.8514	1127.0479	2152.8993	0.0716	0.0718	0.0718	0.4885	0.5367	0.5367
265	1233.4710	1202.2867	2435.7577	0.0430	0.0429	0.0430	0.5874	0.5725	0.5874
266	579.2636	476.5844	1055.8480	0.1472	0.1471	0.1472	0.3049	0.2508	0.3049
267	516.0936	819.1831	1335.2768	0.1037	0.1042	0.1042	0.2716	0.4311	0.4311
269	610.3130	594.7285	1205.0414	0.1177	0.1177	0.1177	0.3212	0.3130	0.3212
270	0.0000	0.0000	0.0000	0.1394	0.1394	0.1394	0.0000	0.0000	0.0000
271	595.2293	1146.1644	1741.3937	0.0388	0.0395	0.0395	0.3133	0.6032	0.6032
272	261.3537	195.2915	456.6452	0.3835	0.3835	0.3835	0.1376	0.1028	0.1376
273	174.0187	220.6956	394.7143	0.0679	0.0679	0.0679	0.0916	0.1162	0.1162
274	1000.1606	1084.7162	2084.8768	0.1596	0.1600	0.1600	0.4763	0.5165	0.5165
275	1247.0157	1221.6967	2468.7124	0.1892	0.1889	0.1892	0.5938	0.5818	0.5938
276	482.9045	396.9080	879.8126	0.0939	0.0939	0.0939	0.2683	0.2205	0.2683
278	106.4714	735.1473	841.6187	0.0530	0.0532	0.0532	0.0592	0.4084	0.4084
279	185.4495	141.4532	326.9027	0.1121	0.1121	0.1121	0.1091	0.0832	0.1091
282	533.9294	610.3821	1144.3115	0.1109	0.1110	0.1110	0.2966	0.3391	0.3391
283	867.1568	761.6405	1628.7974	0.5547	0.5532	0.5547	0.4564	0.4009	0.4564
285	939.4807	998.7172	1938.1980	1.6648	1.6689	1.6689	0.4945	0.5256	0.5256
286	482.9045	396.9080	879.8126	1.0907	1.0903	1.0907	0.2542	0.2089	0.2542
287	331.9300	286.6940	618.6240	1.7302	1.7301	1.7302	0.1747	0.1509	0.1747
288	585.3400	647.3840	1232.7240	0.4080	0.4080	0.4080	--	--	--
289	1257.8035	1027.7686	2285.5721	1.0298	1.0244	1.0298	0.5031	0.4111	0.5031