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Studying the Impact of New Proposed Passageways across Suez Canal on Multiple Freight Activities Performance

Mohamed A. Hamed[1], Ahmed I. El-hattab[2],Mohamed S. Sadek[3],MarwaS. Elbany[4]
[1]Post Graduate Engineer, B.Sc. Civil Engineering, Suez Canal University, Egypt, Email: engmohamed388@gmail.com
[2]Professor of Surveying Engineering, Faculty of Engineering, Port Said University,Egypt, Email:dr.ahmed.elhattab@gmail.com
[3]Professor of Transportation Planning and Traffic Eng., Giza Higher Institute of Engineering and Technology, Egypt, Email: sadek1234@hotmail.com
[4]A lecturer of transportation planning and traffic engineering, Faculty of Engineering, Port Said University, 42523, Egypt,Email:mr2.elbany@gmail.com

ABSTRACT

For a short time, transportation activities through Suez Canal, using the regular passages, face troubles with transport freight /people because of a big flow rate. Five new passageways were proposed to help in transporting freights through the canal. It tends to support the activities of transport mobility across the canal. This study aims at studying the effect of the new passageways by predicting the multiple freight activities performance. As the travel time, cost, and distance are the performance modules of driver utility when choosing among passageways, the real distance and time are estimated using ArcGIS which is a Geographic Information System GIS tool before and after the new passageways. For the chosen case, from Cairo to Sinai cities, the saving of real-time values is calculated for the three modes; lorry, pick-up car, and personal car. Also, it estimates the utility functions and analyzes the monetary cost of time using Value of Time VOT inferred from the utility function and the saved time in each trip. For activities carried by the selected modes, the average estimated monetary costs of time-saving are 2192, 668, and 48 L.E/trip with different values of the time that show the proposed optimistic effect of new passageways.

Key words: ArcGIS, freight activities, Suez Canal passageways, utility function, VOT.

1. INTRODUCTION

Sinai is an authentic partfrom Egypt that has a large amount of resources and its activities that need to connect to all parts of Egypt and handled many of essential freights. Transportation infrastructure will enable to have the needed benefit from Sinai resources when the transport facilities are accessible.

The triangular Sinai Peninsula is located in a strategic space in the international balancing map since the begging of time [1]. The total area of Sinai Peninsula is about 61,000 km² which is nearly 6% of Egypt's total area. It considers the concourse of the two continents: The African and Asian continents and the land bridge that connects both of them from dawn [2]. It shapes as a triangle with northern base that is located at the Mediterranean Sea (from Port Said at east to Rafah at west) along 200 km. Its head is located in south at Ras Mohammed, which is 390 km off the Mediterranean. The western extension of Sinai triangle is about 510 km including Suez Canal and bay, while the eastern extension is about 455 km including Al-Aqaba bay and Egypt's political borders [1].

Transportation from/to Sinai needs new passages on Suez Canal to save time. So, fourteen passageways are proposed to be constructed as shown in Figure1these projects that cost passive amount of money, so it must play its role to facilitate transportation.

Figure 1 The positions new proposed passageways in Sinai [1]

Suez Canal is a part of the transportation network for the transport activity from/to Sinai. The transportation activities are like:

- Al-Areesh Cement activity: Al-Areesh Cement Company was established in 2010 in JabalLubna, south of Al-Arish, North Sinai Governorate, to provide job opportunities for the people of the Sinai region, where the basic ingredients of the cement industry is available with a capacity of 3.2 million tons / year [3]. Its production of cement transports everywhere in the country.
- Marble quarries activity: North Sinai is currently witnessing the establishment of a complex for marble industries.
- Working activity for people: a lot of people from Sinai working on western part of Egypt and others from the western part of Egypt working in Sinai, so easing the transportation of people to and from Sinai is a necessary requirement.

Multiple freight Activities use routes connecting eastern cities in Sinai; Elareesh, Berelabd, Rafah, Ezpetelnakhl, Taba, Eltor, Saint Cathrine, and SharmElshekh with cities in the western area of ; Cairo, Zagazeg, Domiata, ElkorimatewelEklemy (upper Egypt), and Elashermn Ramadan as shown in Fig.2. Cairo city was chosen to be an example of western city because it is the capital of Egypt and has a larger population than another governorate [4]. It is also considered a natural gateway to other cities for trips coming from Sinai, such as Giza, 6 October, Sheikh Zayed and others because it is surrounded by main roads. Also, it has most of the important ministries, embassies and government headquarters.

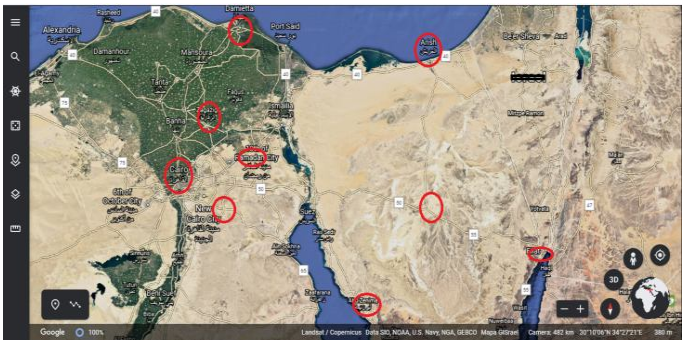

Figure 2 Routes connecting eastern cities in Sinai with cities in the western area

1.1 Geographic Information Systems for Transportation (GIS–T)

Gubara A. et. al. developed a GIS based application for healthcare emerging the south of Cairo, Egypt [5]. Based on travel time, Vaishali M. et al. used GIS to develop Dahod city transport network it is facing problem of congestion at many places. That city has also been proposed by the Government of India to be developed as smart city considering future needs [6]. About route choice, Ahmed S. et al. focused on finding the best route between two locations on the road network and finding the nearest healthcare service providers to an incident location based on the travel time. This can preserve the travel time with 20% to 22%, depending on the travel distances [7].

Foda M. A. and Abdel-Daim A. M. investigated the impact of such a major super highway of the proposed developed corridor on the general movement of vehicle traffic in Egypt especially in the North – South direction [1, 8]. All previous studies concentrated on time or distance analysis to find the best route or the shortest route to help in making decisions and some of them used distance only without making a utility function. This study deals with transport activities across new passageways before and after new passageways and discusses the effect of save on time, distance and waiting time using a real time calculation estimated by ArcGIS software.

Transportation is very significant tool for a nation's development. It is essential for a nation's development and growth. It has consumed a considerable portion of its time and resources. The human needs many hours per day in transportation. The essential requirement for transportation is economic; the person needs transportation for several objectives such as travel in search of food, work, trade, exploration, or for many other things.

1.2 Utility functions and value of time VOT

The early 1980s; only then, the disaggregate demand models started to be seriously considered. The disaggregate demand models, on the other hand, are based on observed choices made by individual travelers [9]. To represent the attractiveness of the alternatives, the concept of utility is used. Utility is the mathematical transformation which is usually constructed as linear combination of variables such as alternative attributes (travel time, travel costs, etc.) and the traveler attributes (car ownership, income, etc.). Elements such as perceived comfort and convenience which are not easy to measure or observe can be reflected in the mode-specific constants [10].

Both logit and probit mathematical models are based on the random utility principle, and can predict the probability of mode choice by comparing the alternatives mode utilities. The simplest and most popular practical discrete choice model is the logit model. A choice from a set of travel alternatives requires setting the decision rule that describes the process of evaluating the available information to reach a discrete choice. One class of decisions assumes that the attractiveness of a travel alternative is expressed by alternative's utility which is known as utility maximization principle. The utility is defined by a vector of alternatives

attributes that can be reduced to a single number, whose value is obtained as a linear combination of alternatives attributes [9].

The decision rule is the process used by the decision-maker to evaluate the attributes of the alternatives in the choice set and determine a choice. Most models used for travel behavior applications are based on utility theory, which assumes that the decision-maker's preference for an alternative is captured by a value, called utility, and the decision-maker selects the alternative in the choice set with the highest utility [11]. Many previous studies cared about studying the value of time such as Abdel-Aal M. who determined the value of time for the city of Alexandria through calibrating a dis-aggregate linear-in parameter utility-based binary logit mode choice model of the city [12].

The estimated models prove that the utility has sensitivity to income level of the traveler, the total trip time of trading, and the travel cost. The richer the traveler, the more he can pay in order to reduce his trip time. In addition, the estimated model proves the effect of the trip time in a sense that the shorter the trip originally is the more precious the time is more significantly; both factors can collectively affect the mode choice. Frank and Chandra estimated the time and cost portion of the utility function by the following equation [13]:

$$V_i = \beta_{TVT}\, TVT_i + \beta_{cost}\, Cost_i + \ldots\ldots \quad (1)$$

Where:

Vi is the utility for new passageway i

TVTi is the total travel time

Costi is the monetary cost of the trip

β_{cost} is the derivative of utility with respect to cost

β_{TVT} is the derivative of utility with respect to time

In general, the value of time VOT is the ratio between the derivative of utility with respect to time and the derivative of utility with respect to cost. It is given by the following equations:

$$VOT = \frac{\beta_{TVT}}{\beta_{cost}} \quad (2)$$

The monetary cost of time Tc is calculated by the following equation:

$$Tc = VOT \times time \quad (3)$$

Decision makers proposed new passageways to advance the activities trip performance across Suez Canal. To ensure this adjective, the trip performance modules; time, distance, and cost should be studied. So, this study aims at predicting the effect of the new passageway across Suez Canal on transportation activities. The effect of time, as an independent variable on the utility function for each passageway, has been analyzed. Time has a monetary cost depends on user and trip characteristics.

The work plan has four main sequential objectives need to be achieved as follows:

1. Estimating the real travel time by ArcGIS map constructing by running the best route between cities in Sinai (El-areesh, Berelabd, Rafah, Ezpet el-nakhl, Taba, Eltor, Saint Cathrine, and Sharm El-shekh) and the cities in the western area of Egypt that represent main destinations (Cairo, Zagazeg, Domiata, ElkorimatewelEklemy (upper Egypt), and El-ashermn Ramadan). As there are a lot of data for many origins at the western area, Cairo is taken as a sample of trip origin but the same steps can be used for other origins. The recorded time values for each trip is calculated using the following steps:
   - Preparing a road map for Suez Canal with around roads from East to West of the canal.
   - Defining the important cities which consider the origins and destinations of the trips.
   - Constructing transport network with real times (Transportation network data base).
   - Running the best route by ArcGIS between cities with recording times of trips (the first case).
2. Adding the new proposed passages and re-running the best route to record the new trip times (the second case).
3. Comparing the effect of the new proposed passages on the trip times using the observed and estimated trip time values. Major of activities go towards/from Cairo city (a capital of Egypt), so it was taken as a destination for all activities trips of the Egyptian West cities. Cairo was chosen because it is the capital of Egypt and has a larger population than another governorate [4]. Trip time, from/to Cairo city, includes several items; the moving time, passing time and the waiting time for the queue waiting for the ferry intended to give more accurate results for their values of time to estimate the total cost of trips for all activities.
4. Studying the impact of the new passages on the main transportation activities performance using the estimated the value of time VOT values. The effect of time as an independent variable on the utility function for each passageway is analyzed after collecting data. The time includes three items; the travel time, passing time and the waiting time for the queue waiting to the existence passageways intended to give more accurate results for the two scenarios before/after the existence of new passageways. The effect of the new passageway across Suez Canal on transportation activities are discussed in the results.

2. DATA COLLECTION

In this study, collecting data using the manual method is used. In this study, revealed data is the way to collect data by asking Lorry drivers about their travel times by the existing passageways and the stated data is their prediction time value after passageways construction. 310 drivers are the sample size that is available to fill the questionnaire for one week at the two peak hours from 7.00AM to 9:00AM and from 4:00PM to 6:00PM. A questionnaire contains a waiting time and a passing time through Suez Canal in order to identify the actual time before and after passageways.

Table 1: A questionnaire for travel time data through the Suez Canal using new passageways

A questionnaire of time passing through the Suez Canal from passageway	
Date	--------
Trip Activity	--------
vehicle type	--------
Trip Origin	--------
Trip Destination	--------
Arrival to passageway time	--------
Number of Waiting Cars in the Waiting queue	--------
Waiting time in Waiting queue	--------
Security inspection	--------
waiting for the ferry	--------
time for passing Suez Canal	--------
Total time	---------

Data is collected to study the effect of the proposed new passageways on the transportation activates carried by Lorry, bus, pickup car and personal car. The effect of the new proposed passageways on the mean of transport is analyzed by estimating the utility function of passageways for each kind of activities using a linear regression analysis [15, 16]. Table 2 presents an example of a questionnaire. It was collected from drivers about time waiting, passing time, travel time, vehicle information and travel cost to estimate the Value of Time VOT after estimating the utility function.

Table 2: Data collection for the utility function

Kind of the vehicle	Lorry	Pickup truck	Personal car	Other	
Goods type	People	Cement	Marble	Fruits	Other
Cost / ton (L.E/ton)	< 40	40 - 80	80 - 110	> 110	
Number of trips for the vehicle per month	1 - 2	2 - 5	5 -15	> 15	
The one trip average cost (Gas, Oil, Destruction)					
Does the vehicle load goods in the trip backing to Sinai	Yes	No			
The waiting time of vehicle in the waiting queue					
trip distance (km)(to convert it to distance)	Origin	Destination			
Average travel time (min.)					

Drivers are asked about the waiting times to enter the passageways or the waiting time inside the passageways itself, travel time, trip costs, type of vehicle and vehicle load. All these data are collected and sorted into three cases, which is the case of using the lorry, pick-up cars, or personal car then using likelihood maximization technique and was performed in EXCEL to obtain utility equations. The VOT values are obtained for the three multiple freight activities; Lorry, pickup cars, and personal cars. Applying the principles and applications of geographic information systems technologies to transportation problems is referred to as Geographic Information Systems for Transportation (GIS–T).

3. ARCGIS TOOLS APPLICATION

To estimate the real time before and after passageways, ArcGIS is used to construct a Sinai map using Google Earth from the Google Earth pro by zooming the needed area to clarify details then marking the shown screen with four or five land marks as shown in Fig.3. To rectify the photo, the photo is added to the ArcGIS [14]. These steps are repeated for all selected photos as shown in Figure 4. These steps are needed to reach a good resolution and maximum number of coordinates.

Figure 3 Photo taken from Google Earth with land marks

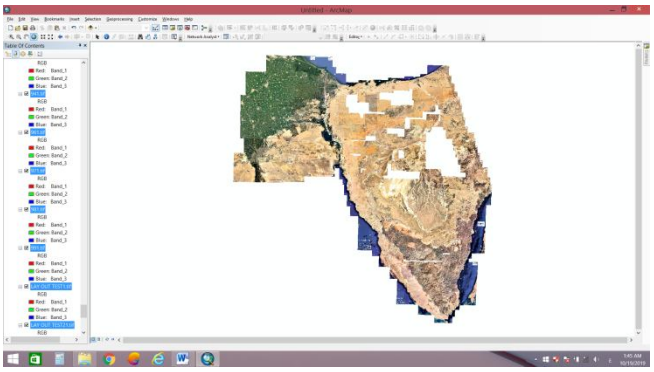

Figure 4 Photos after rectifying in ArcGIS

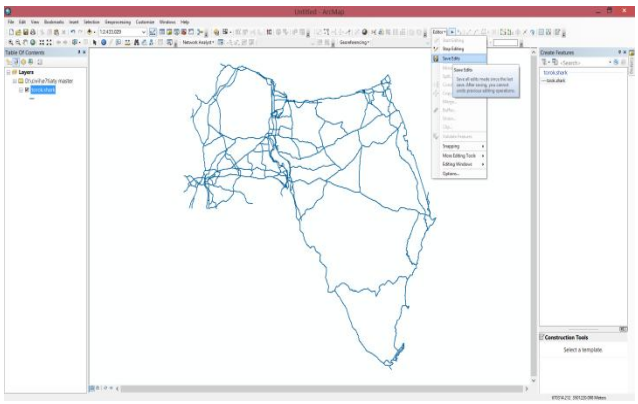

Figure 5 Polyline shapefile for roads in the needed area

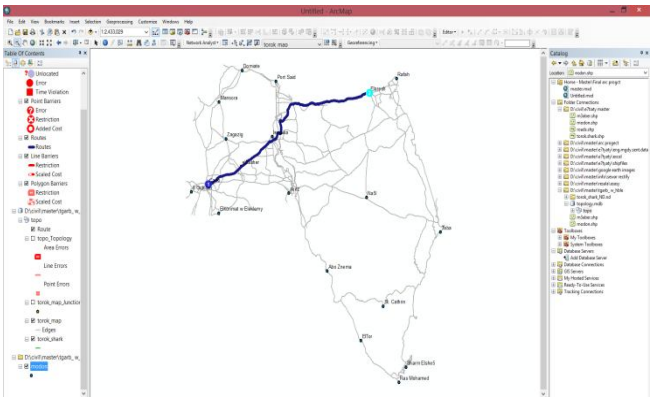

Figure 6 Best route between Cairo and El-aresh (an example)

To reach the maximum accurate results, the map has been expanded to include important western and eastern cities. About 140 images with about 400 place marks have been constructed. in Figure 4, the georeferenced image is used to construct a road network for the selected area to anlyze and modify to get results from the network analysis. Creating a polyline shapefile for roads in the needed area and a network dataset is needed to run the software. The final step is running the best route using a network dataset between the needed cities as shown in Figure 6.

The program is run 90 times for the two cases to estimate the real time of routes connecting eastern cities in Sinai with western cities of Egypt that represent main destinations and record time for each trip. The second part is converting back to shape file to add the proposed passageways then make another network as the previous steps then make the best route. The new real time of the two studied cases had been compared in the results. Maps for Sinai are constructed on ArcGIS tools to be easily modified for the two studied cases to calculate the real time for routes from West to East of the canal.

4. RESULTS, ANALYSIS & DISCUSSION

4.1 The comparison between the estimated real time before and after new passageways

Data is analyzed using ArcGIS to estimate real time values for freight trips from Cairo to the main cities in Sinai; BerElabd, El-aresh, Rafah, Ezbet el-nakhl, Taba Abo Znema, Saint Cathrine, E-ltor, Sharm El-shekh before and after the passageways as illustrated in Table 3. There are another four cities; Domiatte, Zagazig, Elashermn Ramadan, ElkorimatwelEleklemy are neglected because they have the same analysis data of distance. After running the software 90 times, the saving of real time values between two cases for lorry, pick-up car and personal car can be noticed in Figures 7, 8 and 9; respectively.

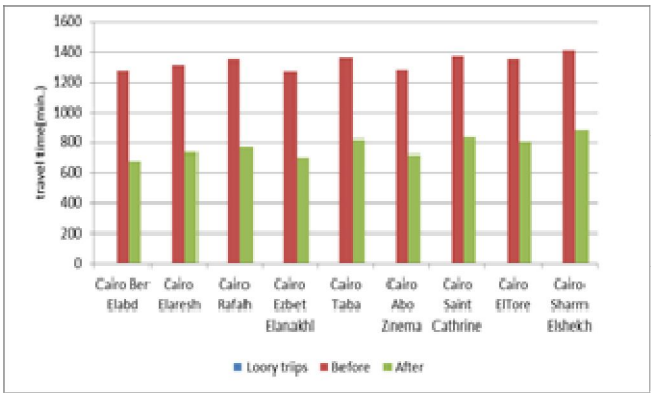

Figure 7 The estimated real time (min.) from Cairo to the other cities in Sinai before/ after the proposed passageways for lorry

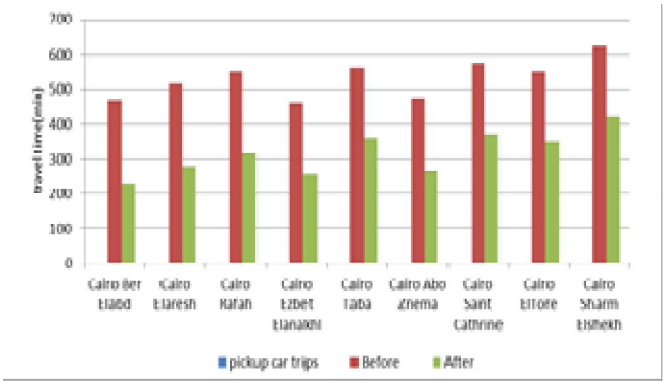

Figure 8 The estimated real time (min.) from Cairo to the other cities in Sinai before/ after the proposed passageways for pick-up car

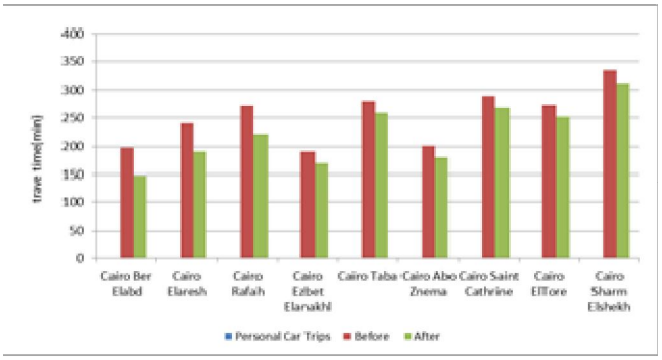

Figure 9 The estimated real time (min.) from Cairo to the other cities in Sinai before/ after the proposed passageways for personal car

4.2 The estimated utility functions and value of time

The parameter estimation procedure was based on the likelihood maximization technique and was performed in Excel. VOT value is obtained for each mode by applying the Statistical Package for the Social Sciences SPSS program using the results of the questionnaire (see table 2). Three utility functions of new passageways are obtained for modes; Lorry, Pickup car, and Personal car to find out the monetary effect of them. Out of twenty proposed models, only three models are considered successful in terms of the parameters estimates correct signs and the magnitude of their significance (t-statistics value) as seen in the following equations:

$$V_L = -9.79 - 0.0108X_1 - 0.00409X_2 - 0.00348X_3 - 0.0238X_4 \quad (4)$$

$$V_P = -9.02 - 0.03226\,X_1 - 0.02503\,X_2 - 0.01416\,X_3 - 0.0742\,X_4 \quad (5)$$

$$V_C = -10.23 - 0.0231\,X_1 - 0.01475\,X_2 - 0.00344\,X_3 - 0.023\,X_4 \quad (6)$$

As V_L, V_P, V_C are the utilities of new passageway for lorry, pick-up car, personal car, X_1, X_2, X_3, $X_4$4 are waiting time, travel on route time, passageway time, trip cost . Relative errors of models are +8.4%, +11.8% and +11.3%. From the coefficients of cost and time, VOT values are estimated for an average hourly salary LE 10.9/hr using equation 2. The estimated three models prove to be sensitive to the selected variables; trip time and cost that affect the choice mechanism for the chosen mode but it changes from mode to another depending on the trip characteristics.

4.3 The monetary cost of saving time

At the west of the canal, Cairo is a destination of all trips and Ber El-abd, Elaresh, Rafah, Ezbet el-nakhl, Taba Abo Znema, Saint Cathrine, Eltor, Sharm El-shekh as origin. The following table is a review of the values that were reached through the questionnaire for the various means of transportation. Table 4 shows the travel times for lorry of the trip to Cairo from several cities before and after the new passageways and the monetary cost of time saving for the lorry using equation 3.

Table 4: The estimated time and the saved VOT values for the lorry

Origin- Destination	Travel time case1 (lorry)	Travel time case2 (lorry)	Travel time difference	The monetary cost of saving Tc = time saving *VoT
Cairo -Ber Elabd	1277.2	672.7	604.5	2351.5
Cairo- Elaresh	1320.2	728.6	591.5	2301.0
Cairo- Rafah	1351.3	769.2	582.1	2264.5
Cairo- Ezbet Elanakhl	1270.6	700.3	570.2	2218.3
Cairo- Taba	1360.3	816.9	543.3	2113.6
Cairo- Abo Znema	1281.7	714.7	566.9	2205.3
Cairo-Saint Cathrine	1369.6	829.1	540.5	2102.6
Cairo- ElTore	1352.3	806.7	545.5	2122.2
Cairo-Sharm Elshekh	1413.6	886.2	527.3	2051.4

Table 5 shows the travel times for pickup cars to Cairo from several cities before and after the new passageways and the monetary cost of time saving. Table 6 shows the travel time for personal cars from Cairo to several cities before and after constructing.

Table 5: The pickup time and the saved VOT values for pickup

Origin- Destination	Travel time case1 (lorry)	Travel time case2 (lorry)	Travel time difference	The monetary cost of saving Tc= time saving *VoT
Cairo Ber Elabd	466.8	230.4	236.3	734.9
Cairo Elaresh	516.2	279.9	236.2	734.7
Cairo Rafah	552.1	315.8	236.2	734.6
Cairo Ezbet Elanakhl	459.2	254.9	204.2	635.3
Cairo Taba	562.3	358.0	204.2	635.3
Cairo Abo Znema	471.9	267.6	204.2	635.2
Cairo Saint Cathrine	573.1	368.8	204.2	635.2
Cairo ElTore	553.2	349.0	204.1	634.8
Cairo Sharm Elshekh	623.6	419.4	204.2	635.3

Table 6: The trip time before/after and the saved VOT values from Cairo to several cities in Sinai for personal cars

Origin- Destination	Travel time case1 (lorry)	Travel time case2 (lorry)	Travel time difference	The monetary cost of saving Tc = time saving *VoT
Cairo- Ber Elabd	197.2	148.2	48.9	78.3
Cairo- Elaresh	240.2	191.2	48.9	78.2
Cairo- Rafah	271.3	222.4	48.9	78.2
Cairo- Ezbet Elanakhl	190.6	169.51	21.1	33.7
Cairo- Taba	280.3	259.1	21.1	33.7
Cairo-Abo Znema	201.7	180.6	21.1	33.7
Cairo-Saint Cathrine	289.6	268.5	21.1	33.7
Cairo- ElTore	272.3	251.3	20.9	33.5
Cairo-Sharm Elshekh	333.6	312.5	21.1	33.7

From previous tables, the estimated VoT values from the utility function are close to the estimated from travel survey for Lorry, Pick-up car and Personal car. The estimated values are 4.26 LE/min, 3.11 LE/min and 1.67 LE/min; respectively. The estimated value of time (see equation 2), by the model, are 3.89 LE/min, 2.78 LE/min and 1.48 LE/min; respectively with a relative error of +8.4%, 11.8% and 11.3%. Finally, the average monetary costs of time saving are 2192, 668 and 48 L.E/trip. The positive saving in

time and cost of all activities shows the hopeful impact of the proposed passageways on the freight activities performance.

5. CONCLUSION

Suez Canal is the main part of transport routes network in Egypt. Activities using such routes connect eastern cities in Sinai with cities in the western area. Routes include passageways to cross Suez Canal. New passageways of Suez Canal are suggested to increase the performance of transportation trips for people and goods. The real time of such trips is the issue that always concerns in research.

As the transport activities performance reflects transportation improvements all over the world, the multiple freight activities performance is investigated to show the impact of new passageways. In this study, freight activities transported by transport modes; lorry, pick-up car and personal car, are chosen to reflect the impact of new passageways on the transport performance. The real time values are estimated using ArcGIS tool before and after passageways. Data of freight trips from Cairo to Sinai had been collected as an example. The observed value of time had been estimated to calculate the optimum cost of trip for each activity.

After analyzing data using SPSS tool, three utilities functions had been selected. The estimated VOT values, from the collected time and cost data, are 4.26 LE/min, 3.11 LE/min and 1.67 LE/min; respectively. The estimated VOT values are 3.89 LE/min, 2.78 LE/min and 1.48 LE/min for lorry, pick-up car and personal car; respectively with a relative error of +8.4%, 11.8% and 11.3%. The average monetary costs of time saving for each trip are 2192, 668 and 48 L.E/trip that indicates the hopeful impact of new proposed passageways on the main freight activities transport across Suez Canal.

REFERENCES

1. Foda, M. A. ***GIS* Approach to Study the Impact of Suez Canal Proposed Tunnels on Transportation activity for Sinai Region**. The International Maritime Transport & Logistics Conference (MARLOG5) Toward Smart Ports, 2016, pp.13-15.
2. Wen, J., Nie, Z., and Ickert-Bond, S. **Intercontinental disjunctions between eastern Asia and western North America in vascular plants highlight the biogeographic importance of the Bering land bridge from late Cretaceous to Neogene**. Journal of Systematics and Evolution. 2016. 54. DOI:10.1111/jse.12222.
3. Abdou, D..**An assessment of the Oligopoly Cement Industry in Egypt: Is It a Curse or a Blessing?**. International Journal of Green Economics, 2017, VOL.11. DOI: 10.1504/IJGE.2017.10003672.
4. Hegazy I. and Moustafa W. **Toward revitalization of new towns in Egypt case study: Sixth of October**, International Journal of Sustainable Built Environment,2013, Vol. 2. DOI: 10.1016/j.ijsbe.2013.07.002.
5. Gubara, A., Amasha A., Ahmed Z., and El GhazaliS..**Decision Support System Network Analysis for Emergency Applications Informatics and Systems (INFOS)**. 9th International Conference on, Cairo, 2014.
6. Gupta, Kh. and Hall, R. **The Indian perspective of smart cities**, 2017, pp. 1-6. DOI: 10.1109/SCSP.2017.7973837.
7. Ahmed, S., Ibrahim, R., and Hefny, H. **GIS-Based Network Analysis for the Roads Network of the Greater Cairo Area**. Conference: International Conference on Applied Research in Computer Science and Engineering, Beirut, Lebanon, 2017.
8. Foda M. A., Abdel-Daim A. M..**Construction & Building Engineering Dept, AASTMT Abukir, Alexandria**, P. O. Box 1029-Miami, Egypt, The International Maritime Transport & Logistics Conference, 2013.
9. Abdel-Aal, M. **Value of time determination for the city of Alexandria based on a dis-aggregate binary mode choice model**. Alexandria Engineering Journal. 2017, PP. 56. DOI:10.1016/j.aej.2017.04.016.
10. J.de D. Ortuzar, L.G. Willumsem. **Modeling Transport (second ed.), John Wiley & Sons Ltd, England** ,1996.
11. Puaschunder, J.**Towards a Utility Theory of Privacy and Information Sharing and the Introduction of Hyper-Hyperbolic Discounting in the Digital Big Data Age**. SSRN Electronic Journal, 2017. DOI: 10.2139/ssrn.3082060.
12. Amira A., Amira A., Saadiya S. and Maged M. **A Comparative Study on the Vegetation of two Wadis, Sinai Peninsula**. volume 30. 2010, pp. 29-57.
13. Frank S.and Chandra B. **A self instructing course in mode choice modeling; multinomial & nested logit models**, an article on U.S. Department of transportation, Federal Transit Administration, 2006.https://trid.trb.org/view/793000
14. ArcGIS pro help, 2020. **Georeference a raster to a referenced layer**. https://pro.arcgis.com/en/pro-app/latest/help/data/imagery/georeferencing-a-raster-to-a-referenced-layer.htm
15. Elbany, M. and Sadek, M. **Analysis of Speed Hump Effect on Signalized Intersection Performance**. Port-Said Engineering Research Journal, doi: 10.21608/pserj.2020.22086.102., 2020.
16. Rehman, Shafiq&Nadeem, Aamer. **Towards Automated Testing of Multi-agent Systems using Prometheus Design Models**. The International Arab Journal of Information Technology. VOL.16, 2018.