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DETERMINE THE OPTIMAL SOLUTION USING VOGEL'S APPROXIMATION METHOD

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ABSTRACT

This paper focuses on communities and nations out of date and the exchange of transport problems to solve these problems through attention to planning for these deviations that have occurred in transportation. Where he began to study transport planning and attempting to simulate this problem through the use of the best way to solve the transport problems which is a transfer of assets with similar materials (which center is the production or marketing or other movement of goods it) to the endings (which is the center or center of consumption demand or other goods sent to him). The lowest costs or increase profits and less time as possible by standing on this problem of the transport problem facing the company under study and represent the sport through the planning work around this problem and the best ways relationship scholastic. Finally reached the study the best solution to solving the transport problem of the company is: X11 equal to 2x12 equal to10X21 equal to 3X23 equal to 11X31 equal to 4.

Keywords: transport planning, vogel's-estimate, north west corner method, least cost method.

INTRODUCTION

Baghdad and other regions suffers in recent frequent traffic jams that affected the breathing city that meant the science schematic as a living organism represents tarring roads linking across regions to each other all these congestion affected the course of the marketing movement and the arrival of raw materials and marketing of products to and from factories the laboratories and therefore the impact on the Iraqi consumer, which is the goal and the basis of the planning process so we must stand on some of the reasons that led to the frequent emergence of bottlenecks known causes in advance and do not want to enter, in our research because it is beyond the scope of our research and the use of Dr. Sash ways graphic influencing the organization of the conduct And the entry of raw materials to factories and laboratories and marketing outputs of these laboratories and factories of any study, planning and organization of input operations and output not even one in the above paid to study graphical for a factory with a distinctive and influential production in the Iraqi economy to determine the most important obstacles experienced by this company.

Fundamental of transportation planning

World has witnessed great development in the field of Improving transport, particularly urban transport with Regard to the development of means of transportation Systems on the one hand and roads, streets and Associated facilities of bridges, tunnels, airports and Ports.

This increased attention to the face of urban Developments and the accompanying transport Problems in many of the streets of cities Kalazdham Traffic and traffic accidents associated with Environmental problems of different types of audio-Visual and air pollution came, and what caused it to waste and loss of time, money, and public health and safety in the communities.

Concept of the transportation planning the concept of transport planning process

The transport urban planning process of multi - faceted and multi - issue stages and aim necessary to ensure lasting stability and transport systems set rules to suit the process of continuous, urban development according to the programs and specific objectives to meet as much as possible the wishes of the population mobility easily and safely and the level of appropriate service [1].

So that with the increasing numbers of the population in the cities and the multiplicity of urban life requirements. gradually become available transport systems are unable to achieve an appropriate level of service for the transfer of the population through the growing number of cars on the road networks, causing traffic jams and increasing accidents and vulnerability of urban areas, environmental pollution in all its forms.

Transportation planning is a collaborative process designed to encourage participation by all users of the transport system relevant government entrusted with planning, local councils, environmental organizations, the process, the business community and travelers and shipping companies and the public, through public participation in the questionnaire process carried out by the major cities planning bodies and coordination with the national transport ministries, and operators of transit transport.

And transport planning a key role in achieving the future vision of the transport system in the state and society, which includes a comprehensive study of the strategies possible and evaluate different points of cooperative partnership between transport planning bodies and between the agencies and relevant organizations on the one hand and public participation on the other hand [2].

Types of transportation planning

There are several types of transport planning to reflect the different levels and the desired objectives of the planning process:

a) Effects of traffic studies to assess the impact of traffic, and mitigation strategies for a certain period or for the development of a particular project.

b) Status of a particular or specific area to identify ways to improve the specific mode of transport plans (walking, cycling, public transport, etc.) or area (campus, city center, industrial zone, etc.).

c) Local transportation: which means the municipal transport plans or local development planning within the neighborhoods?

d) Urban and Regional Transportation Planning: Planning a higher level of care plans on the development of transport and urban regional scale integrated major cities.

e) National Transportation Planning: The development of transport cares for a large number of the state or provincial plans, to be implemented by the National Transportation Agency [(3)].

f) Strategic planning for the development of means of transport (long - term plans) and usually between 20-40 years in the future.

g) Improve transport modes or executive action plans to identify specific projects for programs that will be implemented within a few years plans.

h) For the establishment of a specific path of transport plans or identification of projects and programs to be carried out on specific passages, such as the length of one fast own roads, bridge or road.

Foundations and principles of the urban transportation planning

Transport is planning according to the stages and steps, including short - term plans, including the long - term within the overall development process of the state or territory and therefore have a permanent review, development and modification according to the emerging urban evolution within the city or region.

And must be done when the process of urban transport planning, taking into account a set of important foundations and principles which the following steps:

a) Monitoring the existing conditions for the transport sector and evaluation

b) Identify current and projected transportation problems in the future and analyze the requirements of the detailed planning and the various means of transport and strategies to improve the necessary studies [(4)].

c) The outlook for the population and the size of employment, including the assessment of the proposed uses of land in the region and identify key growth hubs.

d) Propose a number of alternatives to programs and plans for long - term and short - term capital improvement and operational strategies to move people and goods.

e) Assess the environmental impacts caused by the introduction of future improvements to the transport, including air quality system.

f) Develop a financial plan to secure enough funds to cover the costs of implementing the strategies of expenditures.

Classification urban roads

The streets networks deficit in many cities to meet traffic requirements. where the lack of absorption and the large number of intersections unwanted and lack of parking lots, bridges, tunnels, and other things that lead to traffic congestion and accident problems need to include the hierarchy of the streets of the city. Showed classification according to the functional importance to them, in order to regulate the relationship and balance between the different land uses and traffic in the streets that serve these uses5].

Check classified as road networks within the city according to the standard rank and amplitude as follows:

a) Free Ways and designed these roads large capacities and high - speed high absorptive and capacity of up to 2,000 vehicles / hour and the number of lines between 4-8 and speed of up to 120 km / h and used roads linking cities and regions and urban areas long distances.

b) Quick Ways and Express Ways are also designed highways for trips between regional and urban areas with a capacity of up to 1400 vehicles / hour and the number of lines 4-8 line and quickly process 80 km / h.

c) Methods of Major Arterial Roads and these methods are designed to accommodate the size of the urban flights between 800-1200 vehicle / h speed up machine 60 km / h and links between the city and its suburbs [(6)].

d) Arterial secondary roads Minor Arterial Roads and mission transfer generated by areas within the urban areas of traffic without going through it.

e) Methods of synthesis and function of the Collector Roads assembling the traffic generated by the area of residential and commercial communities and other areas within the city and link roads and a capacity card of 600-800 vehicle / hour speed operation 40 km / h.

f) Local Roads, a short road that coordinates traffic between aggregate roads and residential buildings directly, a short ways and with a capacity of 500-600 vehicles per hour and speeds of 20-30 km per hour, comes classification of local roads from the hierarchy in the inferior However, it occupies the first place for the standard number and total length within the city.

The following figure shows how to link the hierarchy of urban roads [7].

Form-1. Hierarchy of urban roads.

Congestion

The congestion of the most transport problems of urban prevalent in Arab cities especially at peak times of the day a time where staff and workers to get to their work, or seek to always end time and in most cases be caused by congestion twice the capacity of the road network and inefficient transport system to meet the requirements for the volume of traffic in the cities. Where they reach the speed of traffic in many peak times between 4-5 km / h, which leads to the loss of a lot of time and energy, and congestion affects the psychological state. Which in turn lead to a decline in human performance in work or home result of psychological stress, which suffered along the way.

Definition from the community under study (Eastern Company Limited foods Almtheljah)

Eastern Company for foods chilled , Ltd. is one of the private sector companies which received substantial support from that state like many private sector companies in the production of similar to what has a direct impact on the lives of the Iraqi individual , and in order to reach the desired quality of such products produced by the company as compared to those companies that regionally and meet the needs of the domestic market such as the production of these companies we had this study on the transfer of inputs and outputs of this company through the study of transport problems faced by the company in transporting raw materials and distribute their products locally and in all regions of Iraq.

Company's goal

In accordance with the overall planning approach followed by the Iraqi state in this period and in support of the private sector and promote its products process and thus provide the company's products for all citizens. In all Iraqi provinces we had this study to solve the transportation problem faced by the company in transporting raw materials and marketing of their products and the problems faced by frequent congestion and the difficulty of access to all aspects of cities and the study of the most important ways and solutions to reach a flexible and easy planning to deal with this problem to reach the desired goal and the best solution.

Events offered by the company

a) The company produces various food items frozen and refrigerated distribution of vehicles belonging to the company begins its journey from the company's headquarters in industrial zone located south of Baghdad on the road to Baghdad –hala to various parts of Iraq and various cities.

b) 2-Products Company received a great success among consumers because of its high specification features as compared to those of products produced regionally.

c) The company 's role in supporting the Iraqi economy through the availability of job opportunities for Iraqi youth in addition to providing hard currency and not to import products similar to what is produced from neighboring countries.

d) The company owns numerous licenses and certificates in quality globally and locally and regionally, where the company is trying to reach an optimal solution and to achieve a solution to all the problems faced by the company, including the transport problem we are facing in this research.

e) Try to reach the goal of the year, a company providing various products to all citizens from the north to the south with trying to export its products to neighboring countries and to enter the global market and competition.

Purpose of the research

Study and find a minimum value for the cost of the transfer of goods from several sources of supply and that may represent production centers or marketing or factories transporting such goods and the cost of transport of raw materials to factories and the owner of the effort and time under the current circumstances of the regions and what you suffer from congestion.

Importance of research

The study of transport and the use of a transport models with moving side studies economically in the country planning under conditions that ails the streets of the frequent congestion and the impact on the course of production processes of the delay in the arrival of raw materials in addition to the impact of her on the marketing and stand on the most important solutions by using for a special transport models to address this problem.

To identify the most practical aspects of the problem of transport and to use it in similar research communities and to draw on the results of the study.

Applied: Many companies suffer from the same problem of study because they fall within the same business matrix, and the results of the study can be generalized, especially with regard to the conclusions.

Research methodology

The reliance on descriptive and analytical approach in addition to the use of statistical analysis to study community data under basic solution acceptable SBFS was where (Starting Basic Feasible solution).

RESEARCH PROBLEM

Is it possible to reach the dimensions of the transport problem, the causal factors and the effects?

Research justifications: Baghdad, which is located within the central region, suffers from problems caused by the recent circumstances, including the problem of transportation, congestion and streets as a result of the security situation, which led to confusion in the business matrix of factories and companies in terms of marketing and access to raw materials.

Personal: In finding the minimum cost of transporting the goods produced or raw and the accompanying effort and time.

Theoretical side

(Definition of the model)

Includes transport m model of processing n sources to consumption stations (demand) In addition, suppose that [8]: represents the number of units offered at the source in terms of (i = 1, 2, 3... m).

: The number of units required for the site where j (j = 1, 2, 3... m).

The cost of transport per unit of the goods from the source to the site i j the number of units to be transferred from the source to the site i j and table displays the image follows the general tabular form of transport.

Table-1. Definition's (matrix number of units of the sources of processing was found to sources of tariff consumption)..

supply	N	j	2	1	to / From
a_1	C_{1n}	C_{1j}	C_{12}	C_{11}	1
	X_{1n}	X_{1j}	X_{12}	X_{11}	
a_2	C_{2n}	C_{2j}	C_{22}	C_{21}	2
	X_{2n}	X_{2j}	X_{22}	X_{21}	
a_3	C_{3n}	C_{3j}	C_{32}	C_{31}	3
	X_{3n}	X_{3j}	X_{32}	X_{31}	
.	.	.	.	.	.
.	.	.	.	.	.
.	.	.	.	.	.

It has become clear to us that the goal of the analysis of the transport module is to find and identify the optimal number of units to be transferred from the source i to j at the lowest possible cost c depending on this goal. Where can we review the programming model, and the corresponding linear model of substantial increases in transport: -

According to[9].

$$\min X_0 = \sum_{i=1}^{k} \sum_{j=1}^{n} C_{ij} X_{ij} \qquad (1)$$

Table-2. Matrix of overlaps between processing centers and demand center's by cost.

supply	4	3	2	1	to / From
a_1	C_{14}	C_{13}	C_{12}	C_{11}	1
	X_{14}	X_{13}	X_{12}	X_{11}	
a_2	C_{24}	C_{23}	C_{22}	C_{21}	1
	X_{24}	X_{23}	X_{22}	X_{21}	
	b_4	b_3	b_2	b_1	Demond

$$\sum_{j=1}^{n} X_{ij} = a_i , \quad i = 1,2,3,\ldots,k \qquad (2)$$

$$\sum_{j=1}^{k} X_{ij} = T_j , \quad j = 1,2,3,\ldots,n \qquad (3)$$

$$X_{ij} \geq 0$$

To clarify how we analyze the transport problem in our search as shown below [10]:

Where C11 represents the cost of transporting one unit of goods to Oriental company from the first source to the first site as well as the cost of transporting the same unit of goods C23 for Oriental Company from second source to third site and so either X12 represents the number of units that will be transferred from the first source to site 2 and on the same The baseline defines values.

From the above table it is clear that the amount transferred from the first source to the four locations should not exceed the quantity shown in a1:

$$X_{11}+X_{12}+X_{13}+X_{14}\le a_1 \qquad (4)$$

Similarly, the amount transferred to the second source and to the four locations should not exceed the quantity shown a_2, that is:

$$X_{21}+X_{22}+X_{23}+X_{24}\le a_2$$

In addition, the amount transferred to the first source should not be less than the requirement of that site, which is bi-term in other words: -

$$X_{11}+X_{12}\le b_1 \qquad (5)$$

$$X_{12}+X_{22}\le b_1 \qquad (6)$$

$$X_{13}+X_{23}\le b_1 \qquad (7)$$

$$X_{14}+X_{24}\le b_4 \qquad (8)$$

The total transport cost function
(The target function) will be: -

$$X_0 = C_{11}X_{11}+C_{12}X_{12}+C_{13}X_{13}+C_{14}X_{14} + C_{21}X_{21}+C_{22}X_{22}+C_{23}X_{23}+C_{24}X_{24}$$

Now we can define the transport problem in our research as follows:

$$X_0=\sum_{i=1}^{k}\sum_{j=1}^{n} C_{ij}X_{ij} \qquad (9)$$

According to the following set of restrictions: -

$$\sum_{j=1}^{n} X_{ij}\le a_n \qquad i=1,2,3,\ldots,k \qquad (10)$$

$$\sum_{i=1}^{k} X_{ij}\ge b_j \qquad j=1,2,3,\ldots,n \qquad (11)$$

$$X_{ij}\ge 0 \quad \forall(i,j)$$

If we compare this formula with the general version of Linear programming, we note that the goal function and constraints represent formulas of linear programming formulas so we find it possible use the general method applied when analyzing linear programs (method of Simplex) and to find the required solutions from study to the transport problem by converting The limitations of the above inequalities to equality constraints as we mentioned earlier.

The method of transport model transportation feasible

The basic steps for analyzing the transport model that was followed in our search include the following:

a) Determine the acceptable primary basic solution Starting Basic Feasible solution (S.B.F.S), which we mean the variables that achieve all the restrictions in the transport model, which we have previously referred to as the following equations:

$$\sum_{j=1}^{n} X_{ij}=a_i \qquad (12)$$

$$\sum_{j=1}^{k} X_{ij}=b_j \qquad (13)$$

b) Identification of the variable within the solution (entering Variable) among the non-core variables that resulted from the first step, i.e., after the identification (S.B.F.S), which we must mention, that the number of variables we have made(S.B.F.S) must be equal to 1 and the remaining variables (KN-(k + 1)) represent the non-core set of variables (Non-basic variable) If you achieve non-core variables are the optimization conditions (optimality Conditions) contained in the way of the duplex (that is, their effect on the value of X0 positive). Iterative calculations the solution extracted in the first step is the best solution, and otherwise we resort to the next step 3.

c) Select the outside variable (leaving Variable) from the set of key variables that are (S.B.F.S) and then we will extract a new basic solution and calculations until we get the perfect solution (Optimal solutions) in the acceptable solution that makes the goal value (the overall goal function) less likely
(Minimum).

How to find the acceptable primary solution (VAM):

The general definition of the transport model shows that the quantity shown is equal to the quantity required, as we have explained, and from here we Conclude:- $\sum_{i=1}^{k} a_i = \sum_{j=1}^{n} T_j$

The transport model will include an approved formula and the remaining equations are considered independent and that means that (S.B.F.S) consists of (k +

1) of the core variables which number (KN-(k + 1)) are non-essential (that is, their value is equal to zero) and there are three methods used to determine the primary basic solution to the transport problem, namely:

a) Northwest corner Northwest-corner Method.

b) A less costly method Least cost method.

c) Method of Vogel Vogel's approximation method.

It should be noted that there is a case for the development of the mode of transport where the quantity shown is smaller or larger than the quantity required and the model is then unbalanced (unbalance), as the condition for the amount of quantity shown is equal to the quantity required:

$$\sum_{i=1}^{k} a_n = \sum_{j=1}^{n} b_j$$

A prerequisite for the status of the development of the mode of transport for which we are not in this research

Application side

The application side includes the following:

Data collection

The data collection was carried out through direct interviews by the researcher with some of the officials of the transport lines, access to the company's mechanism and the problems they face in the Oriental Company (a community under Study), especially in the arrival of raw materials and the marketing of output, as well as the previous reports and data of the transport problems encountered by the company.

Presentation of data

After we processed the data after collecting it and showing it and presenting it as a transportation problem the data was processed and studied as a transport problem with goals and standards certain as previously explained then study and analyze this mathematical problem as shown below where we will find the primary basic solution (S.B.F.S) and in a way Vogel Vam is the third method mentioned earlier in finding the accepted primary basic solution that relies on the cost to solve the model primarily.

Method of vogel (VAM)

The Vogel method is one of the best ways to extract (S.B.F.S) The advantage of this method of access to the solution. Optimization of the transport model and directly and below the basic steps we have made to resolve this search:

a) A smaller account of two costs per row and each column of the cost table this difference is called the cost of the penalty (penalty).

b) Selecting the largest difference between the costs of the penalty for both rows and columns and in the case of some differences we choose the row or column corresponding to the highest random difference.

c) After determining the row or column corresponding to the largest difference, the value of the variable to be transported is the lowest in that row and column, or the assigned amount is the largest amount available to meet the need of the site in question.

d) Delete the row or column that has become zero, which has been achieved.

e) We repeat the previous steps and continue to distribute all units before the required units.

To choose the acceptable primary

How to choose the acceptable primary solution fo r optimal solution (For optimum solution (S.B.F.S) Test: The final step after we extract (S.B.F.S) in the analysis of the transport model is under study to obtain the optimum solution, at which the value of the total cost function is less than what is required.

In our search, we will use the winding path method and, according to the following: -we have previously stated that the number of boxes occupied in the transport model (that is, those that are (S.B.F.S) equals (M + 1) and these variables are called base variables, but the unoccupied squares are called non-core variants. The main objective of the test is to study the impact of non-core variables on the value of the goal function if these variables are converted into basic variables and the basic steps of the winding path method consist of:

a) Identify the variable inside (entering Variable) of the set of non-core variables and the outward variable(Leaving Variable) of the set of variables that are (S.B.F.S) and to determine the inside variable, we draw a closed loop (loop close) for each non-core variable. A loop consists of a set of horizontal, vertical (or vertical and horizontal) cascading segments so that the end of each segment is a basic variable. Note that the starting point of the loop should be similar to the end point.

b) We transfer the value of the non-core variable to a positive value equal to one unit to maintain the terms of the acceptable solution (Feasibility condition) and this conversion is done by giving consecutive signals (+ 1,-1, + 1,-1,...).) For the path-configured variables. For example, here in our search if we take the X12 variable and make it equal to 1 instead of zero, this would require a reduction of the X11 variable by one unit to keep the first row total and also increase the value of the X31 variable by one unit and thus reduce the value of the variable x32 by one unit and so on.

c) Assume that CIJ represents the net increase or decrease in the value of the target function as a result of

converting the non-core IJ variable into a basic variable, it will be represented in our study in the following manner:

$$C_{12}^{pl} = C_{12} - C_{11} + C_{31} - C_{32}$$
$$C_{13}^{pl} = C_{13} - C_{23} + C_{21} - C_{11}$$
$$C_{22}^{pl} = C_{22} - C_{21} + C_{31} - C_{32}$$
$$C_{33}^{pl} = C_{33} - C_{23} + C_{21} - C_{31}$$

d) If all values mean that the value of the target function cannot be reduced and the S.B.F.S is optimal.

e) If values contain negative values, then we start by applying the iterative calculations to reduce the value of the target function. These calculations include the identification of the inward and outward variable and continue to apply these calculations until the optimal solution is achieved.

Below, we will present the transport problem of the study community (Oriental Company) and address this problem, as mentioned above. As described below in the description and solution of the transport problem and access to the optimal solution for this transport model (M = 3, n = 3).

Data processing

Table-3. Model transport problem for the study community (M = 3, n = 3).

	3	2	1	Location / Reverence
12	8	1	5	1
14	0	4	2	2
4	7	6	3	3
	11	10	9	

We write the transport problem and after extracting the accepted primary solution in the form of Vogel (VAM) and as shown in Table-4:

Table-4. Primary basic solution matrix.

Cost parts for	ai	3	2	1	Location / Reference
rows					
222	12	8	1	5	1
	1		3	9	
222	14	0	4	2	2
	1	7	7		
--24	4	7	6	3	3
	0	4			
		10	10	10	bj
		10	0	8	
		0		11	
		3	1	1	
		-	1	1	
		-	1	2	

We have the following acceptable primary solution:

Table-5. Matrix after calculating cost of penalty.

	3	2	1	Location / Reference
12	8	1	5	1
		3	9	
	0	4	2	2
14	7	7		
4	7	6	3	3
	4			
	11	10	3	

Then we test (S.B.F.S) and the winding path method as shown below:

$$X_{13} : (+)X_{13} \rightarrow (-)X_{23} \rightarrow (+)X_{22} \rightarrow (-)X_{12} \rightarrow X_{13} \qquad (14)$$

$$C_{13}^{pl} = 8 - 0 + 4 - 1 = 11$$
$$X_{21} : (+)X_{21} \rightarrow (-)X_{11} \rightarrow (+)X_{12} \rightarrow (-)X_{22} \rightarrow X_{21} \qquad (15)$$

$$C_{21}^{pl} = 2 - 5 + 1 - 4 = -6$$

$$X_{31}:(+)X_{31}\rightarrow(-)X_{11}\rightarrow(+)X_{12}\rightarrow$$
$$(-)X_{22}\rightarrow(+)X_{23}\rightarrow(-)X_{33}\rightarrow X_{31} \quad (16)$$

$$\hat{c}_{31}=3-5+1-4+0-7=-12$$
$$X_{32}:(+)X_{32}\rightarrow(-)X_{33}\rightarrow$$
$$(+)X_{23}\rightarrow(-)X_{22}\rightarrow X_{23} \quad (17)$$
$$\hat{c}_{32}=6-7+0-4=-5$$

As the values of both, negative and therefore each of the X21 variables, x31, X32 represents the variables in and as a general rule we choose the variable that it has the largest coefficient with a negative signal i.e. the X31 variable because () represents the inside variable (entering Variable) which in turn requires specifying the variable outside of the set Basic non-existent in a previous table.

The variable outside of the path of the inward variable is defined as the first variable whose value reaches clarity and as shown:

$$X_{31}:(+)X_{31}\rightarrow(-)X_{11}\rightarrow$$
$$(+)X_{12}\rightarrow(-)X_{22}\rightarrow\backslash(+) \quad (18)$$
$$X_{23}\rightarrow(-)X_{33}\rightarrow X_{31}$$

So the variable X33 represents the outside variable, that the variable that has the lowest value at negative corner represents the outward variable as in its way the Simplex then we change the value of x31 from zero to positive value 4 as shown in the following table and represents the first phase of the iterative calculations: -

Table-6. Matrix of first phase of the iterative calculations.

	8			**1**			**9**	
				7			**5**	
	0			4			2	
	11			3				
	7			6			3	
							4	
11			10			3		

Here we will extract values for each of the non-core variables shown in the table above:

$$\hat{c}_{13}=8-0+4-1=11$$
$$\hat{c}_{21}=2-9+1-4=-10$$
$$\hat{c}_{32}=6-3+9-1=-11$$
$$\hat{c}_{33}=7-0+4-1+9-3=16$$

In the second phase of the iterative calculations, we choose the x21 variable to represent the inside variable because an increase in its value by one unit reduces the value of the target function by 10 units () and the outside variable is determined by the X21 variable path:

$$X_{21}:(+)X_{21}\rightarrow(-)X_{11}\rightarrow(+)X_{12}\rightarrow(-)X_{22}\rightarrow X_{21} \quad (19)$$

The variable X22 variable, the next table, represents the second phase of the iterative calculations.

Then we repeat the test again until all of the $\hat{c}_{ij}$ positive or zero values of the paths have been determined, we have reached the values $\hat{c}_{ij}$.

$$\hat{c}_{13}=8-9+2-0=1$$
$$\hat{c}_{22}=4-1+9-2=10$$
$$\hat{c}_{32}=6-1+9-3=11$$
$$\hat{c}_{33}=7-0+2-3=6$$

Table-7. Second phase of the iterative calculations.

21		**8**			**1**			**9**	
					10			**2**	
		0			4			2	
14		11						3	
4		7			6			3	
								4	
	11			10			9		

After you have become all positive values, we stop repeating calculations because it is not possible to shrink the value of the target function and the optimal values for the variables are:

$$X_{11}=2X_{12}=10X_{21}=3X_{23}=11X_{31}=4 \quad (20)$$

The value of X0:

$$X_0=2(9)=10(1)+3(2)$$
$$+11(0)+4(3)=40\,unit's \quad (21)$$

The best solution to solving the transport problem of the company.

CONCLUSIONS

The access of goods and services to persons and places is of social and economic importance for the well-being Communities. Transportation is considered to be one of the basic means of achieving this, and goods and

services must be accessible to people and places at the lowest cost. This is done by improving people's communication opportunities through the diversification of transport options and giving people more options to meet their transport needs.

Transport systems are an important component of the national economy and directly contribute to the building of society and the improvement of the quality of life. So States must provide transport systems that achieve social justice and provide basic transport needs that meet the needs of all people in all their social strata especially the poor, and for all urban and rural areas alike. Sustainable transport system expenditures must therefore be cost-effective, and transport decision makers should create a system of calculation of total and integrated costs, reflecting the social, economic and environmental realities of costs Total, including long-term costs, in order to achieve the standard of equity and equity in payment by users of the means of transport compared with the total costs. The best solution to solving the transport problem of the company is:

$$X_{11} = 2X_{12} = 10X_{21} = 3X_{23} = 11X_{31} = 4$$

The economic impacts, employment and benefits that can be generated by the restructuring of transport systems must also be considered. Also, let us not forget to mention the provision of public health and safety conditions in public transport systems in cities. Where transport systems must be designed and operated in a manner that is not detrimental to public health (physical and mental) and achieve social well-being and safety for all people and improve the quality of life in society.

RECOMMENDATIONS

Decision makers in the transport planning process are responsible for planning that incorporates systems and solutions that are sustainable and integrated among themselves, not just solutions or partial or temporary systems, through the following steps:

a) Ensure coordination between all public and private sector actors and stakeholders in the planning, implementation and operation of transport systems, and decisions should be done on transport and should be integrated with the environment, health, energy and land uses in urban areas.

b) Make decisions on the transfer process open and inclusive, inform the public about transport options and their implications, and encourage them to participate in decision-making in order to ensure that the different needs of society are met.

c) Future predictions of the expected social or environmental impacts of the use of means of transport and the preparation of the necessary decisions, rather than attempt to address them after they occur, and this would result in a lot of costs because decisions on transport often involve costs Substantial and long-term material in infrastructure investments.

d) Consider all the global, local, social, economic and environmental implications of decisions on the transport planning process, depending on the level and objectives of the transport planning process.

e) Concentration of growth and reduction of urban sprawl, and provision of more homogeneous distribution of land uses in urban areas, thus reducing request for transportation especially for private car trips, by the possibility of making the start and end of the journey confined to the same area, through Planning transport systems that achieve efficient use of land and other natural resources.

f) Integrate transport modes, both for travellers and goods, in order to increase the efficiency of the movement of goods, as well as to provide a wide range of transport options.

g) Preservation of historical and archaeological sites, noise reduction and audio pollution in the planning, design and construction of transport networks.

h) Prioritize environmental considerations in the planning process to reduce environmental pollution, reduce the impact of transport on the environment, and adhere to the conditions for the conservation of biological diversity.

i) Ensure that there is emergency management within the components of the transport systems in place to respond to any possible accidents that may lead to environmental disasters (such as oil spills from a giant tanker at sea) and other related incidents.

j) Reduce fossil fuel consumption and reduce emissions through efficient demand management.

k) The development and scientific research of innovative alternative technologies that help to improve transport efficiency protect the environment and promote the use of alternative and renewable energy must be kept abreast.

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