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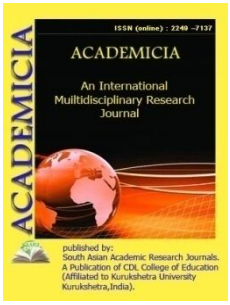

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IMPROVING THE METHOD OF DELIVERY OF CONSTRUCTION CARGO IN AUTOTRANSPORT

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ABSTRACT

The investigation of the construction cargo being delivered in cities indicate that each shipper carries out transportation on the basis of his own interests, not taking into consideration the interests of other shippers, especially the population in the service area. This leads to excessive use of vehicles and, accordingly, an increase in the price of products and services, as well as a harmful effect on the environment in the form of toxic gases, noise, a decrease in the ability to pass the road, etc. The article analyzes the results of working indicators of motor vehicles on centralized and decentralized methods of delivering construction cargo to the address in cities.

KEYWORDS: *Automobile, Construction Cargo Transportation, Independent Transportation, Centralized Transportation, Decentralized Transportation, Road Utilization Factor, Total Mileage, Efficiency, Increase-Decrease, Lost Time, Cost.*

INTRODUCTION

In cities, construction loads are delivered in a radial direction from the production facilities or facilities warehouses (reinforced concrete, brick factories and warehouses) to the warehouses of construction facilities and other places (intermediate warehouses, etc.) that need materials. Thus each reinforced concrete or brick plant or warehouse is the central connecting link in freight transportation.

The traditional model-based approach can no longer adequately cover the efficient assimilation of load flows in a rapidly changing world. Most of the models used to explain and predict freight demand in the past do not pay enough attention to structural, organizational changes.

A number of important global developments taking place today have a significant impact on freight traffic, which means that freight optimization is of paramount importance [1, pp. 97-101].

LITERATURE REVIEW

Increasing freight traffic in cities poses many challenges in terms of sustainability: noise, CO_2, environment (ecology), transportation costs (economic), and the risk of accidents (social), among others [2, pp. 150-159].

Transportation of construction loads has not yet been sufficiently studied and there is no complete methodology for the analysis and planning of regional issues in this area [3, p. 560].

Until the 90s of the twentieth century, two different forms of organization of construction freight flows were used: centralized and decentralized [3, p. 560; 4, p. 304]. Mathematical methods and software systems based on them, as well as automated systems of rapid planning and others are used in the calculation of public transport plans [5, p. 237; 6, p. 23; 7, p. 577] in mix and concrete [8, p. 237], building materials and products, reinforced concrete products and bricks [9, p. 233].

RESEARCH METHODOLOGY

In the course of the research, scientific methods - economic mathematical methods, experimental research, generalization, grouping, logical and comparative methods of analysis, comparative analysis, statistical analysis and other methods were used to deliver construction loads to consumers in urban conditions.

ANALYSIS AND DISCUSSION OF RESULTS

The main indicators of the ATC plan are: traffic volume in tons, freight turnover in tons per kilometer and gross income in soums. In such circumstances, “truckers are not interested in reducing the distance of transportation, timely delivery of goods to the warehouses of the facility, and builders are not interested in the rational use of vehicles” [10, p. 214]. As a result, costs increase and are added to the cost of construction, which falls on the “shoulders” of consumers.

In present-day conditions, the move to a market economy has driven to a encourage disproportion of the interests of the transport process participants. Builders have centered on performing construction projects at the lowest cost whereas guaranteeing commissioning times, whereas carriers have favored to have a most extreme car hour, as there has been a far-reaching extra minutes pay in later a long time [11, pp. 4-7]. Cargo producers are inquisitive about offering the most extreme amount of materials produced.

The authors of the article are “Fabullostroyservis” brick factory, “Innovative reinforced concrete service” LLC, “Muzrobod Sheben Plant” LLC, “Avtoklass” LLC and other enterprises producing construction materials within the company “SurkhanSanoatQurilish”. As a result of monitoring the practice of transportation through the trucking company LLC [12, pp. 43-149] confirmed the following conclusions:

“... the planning and organization of vehicles is, in most cases, based on intuition (inner feeling), down to earth considerations and work encounter; holding up circumstances for vehicles at stacking and emptying focuses and stacking operations, which do not guarantee the security of cargo; utilize of under-loaded or over-burden vehicles, wasteful utilize of vehicles in a timely

way, infringement of cargo transportation demands or requesting over-burden vehicles, etc. In expansion, the study [13, pp. 198-204; 14, pp. 116-120] appeared that the supply of strengthened concrete items and other development materials was significantly sitting out of gear at stacking and emptying focuses for organizational and specialized reasons as a shortcoming within the organization of the transport prepare; usually 80% of the working time.

We analyze the methods of organizing the work of cars in the centralized and decentralized transportation of cargo flows of shippers LLC “Fabullostroyservis” LLC, “Muzrobod Sheben Plant” LLC, “Avtoklass” LLC, part of the Surkhan Industrial Construction Company.

Require multiple consignors to transport different construction loads to a set of multiple consignees. The distances between the consignor and the consignee are known to each consignee's need for cargo.

Cars were ordered, in this example a shift of $T_{ish} = 8$ hours. The vehicles and some initial data to solve the problem are given in Table 1.

TABLE 1 VEHICLES AND SOME PRELIMINARY INFORMATION

Vehicle name (type)	Load carrying capacity q_n, t.	Vehicle operating time T_{ish}, hour	The cost of 1 hour's salary is X_{ish} soums/hour	The loading and unloading norm of one flight time is t_{o-t} hours	The average technical speed of movement is V_{tex} km/h
1	2	3	4	5	6
HOWO	25,0	8	209000	0.22	36
Note: according to the terms of the sample, fine sand is delivered from the Avtoklass plant, gravel, crushed stone and sand from the Muzrobod Sheben Plant LLC.					

The planned cargo capacity is $Q_{kun} = 1500$ tons, while the HOWO car will have a planned capacity of $Z_q = 60$ units.

The load flow diagram is shown in Figure 1.

Strategy 1 “Independent removal”. In this case, the consignees are organized independently within the case of irrelevant transport operations, in which case the products are transported free of the consignor. The demand for motor transport is determined by the consignor freely for each order.

One of the possible variants of the order and the demand for the number of vehicles is given in Table 2, in which the HOWO vehicle was used for each order.

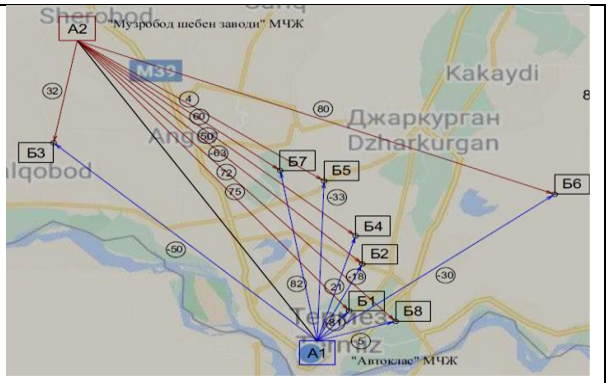

Figure 1. Load flow diagram.

TABLE 2 ORDER AND DEMAND FOR THE NUMBER OF VEHICLES

Carrying capacity, t	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**B8**
A1	250	200			100	200		
A2			200	200			300	50
Number of trips	10	8	8	8	4	8	12	2
Average technical speed of movement, km/h	24	24	24	36	36	36	36	42
Freight distance, km	8	18	22	60	33	50	40	82
Note: -A1, A2 – consignor's symbols (according to "Avtoklass" LLC, "Muzrobod Sheben Plant" LLC); B1 ... B8 - consignee symbols								

One of the possible choices for the use of cars is the "Independent pick-up" calculation, according to which the final flight of cars 11, 17 will not be completed, as emptying at points B3 and B7 is beyond the scope of work of the consignee.

Procedure for adjusting cars at the place of loading: first arrived - first served. In "Independent pick-up" all vehicles arrive at the stacking points at 8:00 am, planned for the start of work, and they are overhauled (stacked) within the order of entry. Amid lunch (12:00 to 13:00) not all pick-up points are open. The work of the loading points will end at the same time (17:00).

The results of the operation of the vehicles in the "Independent pick-up" are decided specifically in agreement with the plan and are given in Table 3.

TABLE 3 RESULTS OF WORK OF CARS IN "INDEPENDENT PICK-UP"

№Automobile number	**Running time on the route, hours**	**Waiting time, hours (loss, thousand soums)**		**Remaining unused time, hours (loss, thousand soums)**		**Total distance covered, km**	**The volume of work done by cars, t**	**Amount of unloaded cargo, t**
		hour	**thousand soums**	**hour**	**thousand soums**			
1	2	3	4	5	6	7	8	9
1	8,0	0	0	0	0	144	225	0
2	6,95	0,3	62,7	0,75	156,7	144	100	0
3	7,33	0,4	83,6	0,67	139,7	144	100	0
4	6,2	0,4	83,6	1,4	292,6	198	75	0
5	6,0	0,5	104,5	1,5	313,5	200	50	0
6	6,0	0,67	140,0	1,33	297,97	200	50	0
7	6,0	0,85	177,6	1,15	240,3	200	50	0
8	6,0	1,0	209,0	1,0	209,0	200	50	0
9	3,65	1,13	234,0	3,22	670,3	82	50	0
10	8,0	0	0	0	0	176	100	0
11	6,05	0,13	27,17	1,82	380,38	132	75	25
12	7,11	0,27	56,43	0,6	125,4	240	50	0

13	7,0	0,53	110,77	0,47	98,23	240	50	0
14	7,0	0,8	167,2	0,2	41,8	240	50	0
15	7,1	0,9	188,1	0	0	240	50	0
16	7,1	0,9	188,1	0	0	240	75	0
17	4,9	1,03	215,27	2,07	432,63	160	50	25
18	4,86	1,17	244,53	1,96	409,64	160	50	0
19	4,57	1,6	334,4	1,83	382,47	160	50	0
20	4,1	1,43	298,87	2,47	516,23	164	50	0
21	4,1	1,56	326,04	2,34	489,06	164	50	0
22	4,21	2,06	430,54	1,73	361,57	160	50	0
Total	**132,23**	**17,63**	**3684,67**	**26,51**	**5540,59**	**3988**	**1450**	**50**

The misfortunes within the table over (columns 3-6) mean that the car has been running for less time than it was paid for.

We consider conceivable strategies of centralized transportation of merchandise [4, p. 304]. The following methods of organization can be:

Strategy 2 Shipping is centralized according to a partitioned shipping strategy for each shipper [15, p. 246; 16, p. 480].

In accordance with the rules for deciding the demand for the number of vehicles [15, p. 246; 16, p. 480], the performance of cars and freight focuses was calculated and given in Table 4, for which time the vehicle is worked. Unused working hours of vehicles depend on the occupancy of emptying equipment at loading points amid the working day.

TABLE 4 RESULTS OF THE WORK OF VEHICLES OPERATED BY THE SHIPPERS WITH A CENTRALIZED FREIGHT METHOD

№Automobile number	Running time on the route, hours	Waiting time, hours (loss, thousand soums)		Remaining unused time, hours (loss, thousand soums)		Total distance covered, km	The volume of work done by cars, t	Amount of unloaded cargo, t
		hour	thousand soums	hour	thousand soums			
1	2	3	4	5	6	7	8	9
1	8,0	0	0	0	0	144	225	0
2	6,13	0	0	1,0	209,0	216	75	0
3	6,93	0	0	0,8	167,2	144	100	0
4	6,93	0	0	0,67	140,03	144	100	0
5	7,1	0,116	24,38	0,25	52,25	232	75	0
6	7,1	0,05	10,45	0,15	31,35	232	75	0
7	6,0	0,33	68,97	0,87	181,83	200	50	0
8	6,0	0,33	68,97	0,74	154,66	200	50	0
9	8,0	0	0	0	0	244	75	0

10	*7,65*	0	0	0,83	173,42	284	50	0
11	7,62	0,117	24,38	0	0	284	50	0
12	6,95	0	0	0,65	135,85	204	75	0
13	6,53	0,117	24,38	0,823	171,38	208	75	0
14	7,33	0	0	0	0	240	75	0
15	6,93	0	0	0,27	55,73	204	75	0
16	6,57	0,53	111,4	0,5	104,5	200	50	0
17	5,98	0	0	0,95	198,55	200	50	0
18	5,98	0	0	0,82	170,68	200	50	0
19	6,53	0	0	0,133	27,86	168	75	0
20	6,27	0	0	0,27	55,73	164	50	0
Total	**136,53**	**1,59**	**332,45**	**9,72**	**2031,48**	**4112**	**1500**	**0**

The losses in the table above (columns 3-6) mean that the car has been running for less time than it was paid for.

We consider possible methods of centralized transportation of merchandise [4, p. 304]. The taking after methods of organization can be:

Method 2 Shipping is centralized concurring to a separate **shipping method** for each shipper [15, p. 246; 16, p. 480].

In accordance with the rules for deciding the request for the number of vehicles [15, p. 246; 16, p. 480], the execution of cars and freight focuses was calculated and given in Table 4, for which time the vehicle is operated. Unused working hours of vehicles depend on the inhabitance of emptying hardware at stacking points amid the working day.

TABLE 4 RESULTS OF THE WORK OF VEHICLES OPERATED BY THE SHIPPERS WITH A CENTRALIZED FREIGHT METHOD

№Automobile number	**Running time on the route, hours**	**Waiting time, hours (loss, thousand soums)**		**Remaining unused time, hours (loss, thousand soums)**		**Total distance covered, km**	**The volume of work done by cars, t**	**Amount of unloaded cargo, t**
		hour	**thousand soums**	**hour**	**thousand soums**			
1	2	3	4	5	6	7	8	9
1	8,0	0	0	0	0	144	225	0
2	6,13	0	0	1,0	209,0	216	75	0
3	6,93	0	0	0,8	167,2	144	100	0
4	6,93	0	0	0,67	140,03	144	100	0
5	7,1	0,116	24,38	0,25	52,25	232	75	0
6	7,1	0,05	10,45	0,15	31,35	232	75	0
7	6,0	0,33	68,97	0,87	181,83	200	50	0
8	6,0	0,33	68,97	0,74	154,66	200	50	0

9	8,0	0	0	0	0	244	75	0
10	*7,65*	0	0	0,83	173,42	284	50	0
11	7,62	0,117	24,38	0	0	284	50	0
12	6,95	0	0	0,65	135,85	204	75	0
13	6,53	0,117	24,38	0,823	171,38	208	75	0
14	7,33	0	0	0	0	240	75	0
15	6,93	0	0	0,27	55,73	204	75	0
16	6,57	0,53	111,4	0,5	104,5	200	50	0
17	5,98	0	0	0,95	198,55	200	50	0
18	5,98	0	0	0,82	170,68	200	50	0
19	6,53	0	0	0,133	27,86	168	75	0
20	6,27	0	0	0,27	55,73	164	50	0
Total	**136,53**	**1,59**	**332,45**	**9,72**	**2031,48**	**4112**	**1500**	**0**

Strategy 3 Transportation is carried out centralized in the vehicle according to the classification [17, p. 480], i.e. according to the regional method of centralization [4, p. 304]. This method allows you to use scientific strategies within the effective organization of cargo. As a result of tackling the given issue, the possible execution indicators for vehicles were calculated (Table 5).

TABLE 5 THE RESULTS OF THE WORK OF CARS IN THE REGIONAL METHOD OF CENTRALIZED TRANSPORTATION

№Automobile number	Running time on the route, hours	Waiting time, hours (loss, thousand soums)		Remaining unused time, hours (loss, thousand soums)		Total distance covered, km	The volume of work done by cars, t	Amount of unloaded cargo, t
		hour	thousand soums	hour	thousand soums			
1	2	3	4	5	6	7	8	9
1	8.0	0	0	0	0	243	100	0
2	7.73	0	0	0.13	27.86	160	125	0
3	7.73	0	0	0	0	160	125	0
4	7.33	0	0	0.26	55.73	227	75	0
5	7.33	0	0	0.13	27.86	227	75	0
6	7.33	0	0	0	0	227	75	0
7	6.9	0	0	0.3	62.7	216	75	0
8	6.93	0	0	0.13	27.86	227	75	0
9	6.93	0	0	0	0	227	75	
10	7.3	0	0	0.7	146.3	204	75	0
11	*7.6*	0	0	0.4	83.6	242	75	0
12	7.46	0	0	0.27	56.43	242	75	0
13	7.33	0	0	0.13	27.17	242	75	0
14	7.33	0	0	0	0	242	75	0
15	6.6	0.1	20.9	0.5	104.5	168	75	0

16	6.53	0.1	20.9	0.33	68.97	168	75	0
17	6.52	0.17	35.53	0.25	52.25	168	75	0
18	6.53	0.17	35.53	0.1	20.9	168	75	0
19	4.92	0	0	1.75	365.75	160	50	0
Жами	**127**	**0.54**	**112.86**	**5.25**	**1097.25**	**3918**	**1525**	**0**

The total results for the above 3 options of transportation organization are given in Table 6, and the unused time lost was 26.51 hours for method 1, 9.72 hours for method 2 and 5.25 hours for method 3.

TABLE 6 GENERAL RESULTS ON ALL OPTIONS OF ORGANIZATION OF TRANSPORTATION

Management methods	Number of transport components	Total time, hours				Printed distance, km			β in a semen	Amount of unloaded cargo, t
		Running time on the route	Working hours in Naryad	Lost time on hold	Time lost without use	routes	Zero travel distance	General		
1	22	132,23	176	17,63	26,51	3988	44	4032	0,496	50
2	20	136,55	147,86	1,59	9,72	4112	40	4152	0,495	0
3	19	127	132.79	0.54	5.25	3918	40	3958	0.565	0

A comparison of costs for all options for the organization of transportation is given in Table 7.

TABLE 7 RESULTS OF COST COMPARISON BY METHODS OF TRANSPORT ORGANIZATION

№ method	Number of transport components	%	Working hours for paid transportation,	Total cost		Lost time on hold		Time lost without use		Total losses	
				thousand soums	%	thousand soums	%	thousand soums	%	thousand soums	%
1	2	3	4	5	6	7	8	9	10	11	12
1	22	100	176,0	36784	100	3684,67	10,02	5540,59	15,06	9225,26	25,08
2	20	91	147,86	30902,74	100	332,45	1,08	2031,48	6,57	2363,93	7,65
3	19	86	127.0	26543.0	100	112.86	0.43	1097.25	4.13	1210.11	4.56

The information in columns 2 and 4 of Table 7 is taken from Tables 3-5. The values of column 5 are inferred from the time paid for the operation of the vehicle (column 4) and the hourly fetched of operation of the vehicle (Table 1). The values of columns 7 and 9 were obtained based on Tables 1 and 3-5.

CONCLUSION

The cost of holding up time and unused time for the above 3 choices of organization of transportation is given in Table 7, 9225.28 thousand soums for method 1, 2363.93 thousand soums for strategy 2 and 1210.11 for strategy 3. thousand soums. That's , it permitted to diminish the cost of holding up time and unused time by 87%.

Moreover based on the investigation of the results of calculations on the over two strategies of centralized transportation in the process of delivery of a given volume (tons) of cargo stream in one move (hour) to the goal; Losses amid loading and emptying decreased by 219.59 thousand soums, or 66%. This, in turn, will reduce the harm from unused time by a total of 934 thousand soums, or 46%.

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