MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

O. M. BEKETOV NATIONAL UNIVERSITY
of URBAN ECONOMY in KHARKIV

Methodological guidelines
for independent work
and conducting practical classes
on the subject

"SMART TRANSPORT AND LOGISTICS FOR CITIES"

(for 1st-year full time and part-time students second (master) education level
specialty 275 – Transport Technologies (by mode)
educational and scientific programme Smart Transport and Logistics for Cities,
educational programme Transport Systems,
educational programme Organization and Regulation of Road Traffic,
speciality 073 – Management
educational programme Logistics)

Kharkiv – O. M. Beketov NUUE – 2021

Methodological guidelines for independent work and conducting practical classes on the subject “Smart Transport and Logistics for Cities” (for 1st-year full time and part-time students second (master) education level specialty 275 – Transport Technologies (by mode) educational and scientific programme Smart Transport and Logistics for Cities, educational programme Transport Systems, educational programme Organization and Regulation of Road Traffic, speciality 073 – Management educational programme Logistics) / NUUE ; contributors : Mariia Olkhova, Dmytro Roslavtsev. – Kharkiv : O. M. BEKETOV NUUE, 2021. – 24 p.

Compilers: PhD, associate professor Mariia Olkhova

PhD, associate professor Dmytro Roslavtsev

Reviewer full professor in Transport Systems Oleksii Lobashov

Recommended by the Department of Transport Systems and Logistics, record № 1, 26st of August, 2020.

This project has been funded with support from the European Commission. This publication [communication] reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Content

Introduction

The development of technology leads to the need to adapt all areas of management to new conditions. The efficient functioning of the transport system in cities becomes impossible to ensure without the introduction of modern smart technologies. The implementation of Intelligent Transportation Systems (ITS) involves a large number of stakeholders, including government administrations, transport companies and companies from various industries (vehicle manufacturers, telecommunications companies, consumers of electronic services, service providers), urban residents. From a technological and industrial point of view, ITS is one of the most difficult problems facing the information and communication technology community.

The *aim* of the course "Smart Transport and Logistics for Cities" is to provide students with theoretical and practical skills in analyzing, evaluating and applying current existing practices and measures of city logistics, which will make successful decisions to improve the efficiency of city logistics using smart technologies.

The main *tasks* of studying the discipline are to study the mechanism of application of modern existing practices and measures of city logistics, tools to improve the efficiency of city logistics. Acquired theoretical and practical knowledge will allow to form the necessary skills and competencies for making successful decisions to improve the efficiency of city logistics, using smart technologies.

The outcomes of exercise is the obtaining of skills in the analysis of negative effects of urban freight transport; analysis of stakeholders in the urban freight market; assessment of the modern freight market in your own city; formation of professional skills in analysis, design and operational activities based on transit management systems and freight management systems; application of a systematic approach to improve city logistics; modern trends in planning and management of passenger and freight transportation in their own city; design and analysis of the movement of goods flow based on the assessment of the OD matrix.

The main teaching *methods* are descriptive analysis, active learning, simulation training, "living laboratory" approach, seminar, systems approach, observation, static modelling of the transport network.

Control over the implementation of exercises, evaluation of the results of the defense of exercise and the report is carried out by the teacher.

Practical exercise № 1. Urban freight transport: challenges

The aim is to analyze negative effects from urban freight transport.
The methods: descriptive analysis, active learning.

Theoretical base

Problems in the efficiency of urban logistics planning is always a value point in the functioning of the transport system in every city in the world. Also, freight transport is a major factor contributing to congestion and pollution of urban city centers, but also the fast-growing industry is critical to the growth of urban economic activity. Urban freight planning is a complex process and public authorities tend to have less knowledge and capacity on specific issues than passenger mobility, whereas private companies involved in the organization and implementation of urban freight transportation have knowledge of technical aspects.

Sequence for fulfilment

1. Let's introduce yourself. What do you expect from educational program? You should write this information in Moodle course (min 500 characters).
2. Watch the video about city logistics in different cities and set key points: Rotterdam, Rotterdam interview, Netherlands; New Delhi, India; London, United Kingdom. Make a comparison.
3. Discuss your city's urban freight challenges in group of 2–3 students. The results should be shown in the table 1.1. You should provide links (papers, video etc).
4. Write negative effects from UFT in your city. Do range of the effects. The results should be shown in the table 1.2.
5. Present ppossible way to solve the problems if you are one of local authority's members. You should write the detailed description.

Table 1.1 – Urban freight challenges in your city

Problem	Description

Table 1.2 – Negative effects from UFT in your city

Title of negative effects	Description

Questions

1. What are main challenges of urban freight transportation?
2. Could you describe possible negative effect from UFT?
3. What balance should be for supporting sustainable UFT?
4. What effects does UFT have on society and environment?
5. What effects does UFT have on economy?

Practical exercise № 2. Stakeholder analysis and the role of the public sector

The aim is to provide stakeholder analysis of urban freight transport market.
The methods: descriptive analysis, active learning, imitation learning.

Theoretical base

The freight transport industry, particularly the road freight transport sector which is most relevant for UFT, is highly competitive. This means that freight transport operators are highly cost conscious and respond to market signals. It also means that any additional costs that are imposed by the public sector through increased regulation or other measures will, at least in the medium to long term, be passed onto customers and, ultimately, consumers as they cannot be absorbed by the operators. Therefore, while deliveries to and collections from urban areas are essential to the functioning of urban economies, inappropriate policy measures at a local level will have an impact on the efficiency and cost of UFT, which, in turn, will have a detrimental impact on the local economy and/or environment.

Descriptive statistics allow you to characterize your data based on its properties. There are four major types of descriptive statistics:

1. Measures of Frequency (Count, Percent, Frequency; Shows how often something occurs; Use this when you want to show how often a response is given)

2. Measures of Central Tendency (Mean, Median, and Mode; Locates the distribution by various points; Use this when you want to show how an average or most commonly indicated response)

3. Measures of Dispersion or Variation (Range, Variance, Standard Deviation; Identifies the spread of scores by stating intervals; Range = High/Low points; Variance or Standard Deviation = difference between observed score and mean)

4. Measures of Position (Percentile Ranks, Quartile Ranks; Describes how scores fall in relation to one another. Relies on standardized scores; Use this when you need to compare scores to a normalized score (e.g., a national norm))

Sequence for fulfilment

1. To provide the categorization of the different stakeholders in the field of UFT. For this you need to match category of stakeholders with their stakeholders and to determine their interest and goals (Annex A), table 2.1.

Table 2.1 – Categorization of UFT stakeholders

Category of stakeholders	Stakeholders	Main interest in context of UFT

2. To determine interactions between each of stakeholders group, Fig. 2.1. Describe a conflict between stakeholders (for instance, with whom, reasons for conflict).

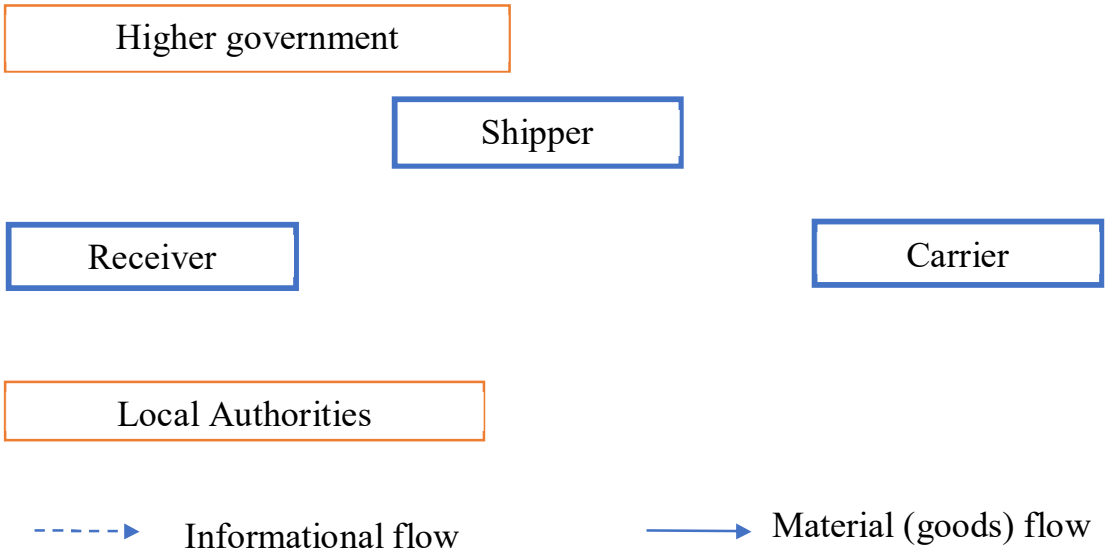

Figure 2.1 – Interactions between stakeholders

3. Divide student group into 2 categories of stakeholders – Public Authorities and Transport Operators. Group of Public Authorities offers measures for regulation of UFT. Group of Transport Operators describes their behavior after regulation measures from Public Authorities. For instance, results can be form as a table 2.2.

Table 2.2 – Measures and impact of UFT

Measures of Public Authorities	Impact on Transport Operators	Impact on consumers	Special feature

There are some key words to restrict access to city centres for HGVs, to improve air quality, protect the health of residents, have to modernise their fleets, ban night time deliveries, noise, greenhouse gas (GHG) emissions, road traffic congestion, want goods to be available in shops, environmental pollution, low emission zone, to promote

sustainable urban distribution, minimizing the economic costs, road congestion, to replenish stocks of food and other retail goods in shops, intimidation and safety.

4. To give a full description of any measure offered depending on belonging to the group, namely pros and cons and its impact to other stakeholders.
5. To provide detailed conclusion.

Questions

1. Do you know groups of UFT stakeholders? Please, list them.
2. Could you describe possible conflict between transport operator and authorities?
3. Could you describe possible conflict between transport operator and supply chain actors?
4. What measures do you suppose national authorities should implement in your city?
5. What measures do you suppose local authorities should implement in your city?

Practical exercise № 3. Analysis of freight transport market in own city

The aim is to know current urban freight transport market in own city (divide into transportation areas).

The methods: descriptive analysis, active learning, living laboratory approach.

Data

City centre in your city, legislative base in EU and Ukraine concerning freight transportation.

Theoretical base

Freight transport market according to the research of CTL of Sapienza University of Rome can be divided into following sectors, Fig. 3.1.

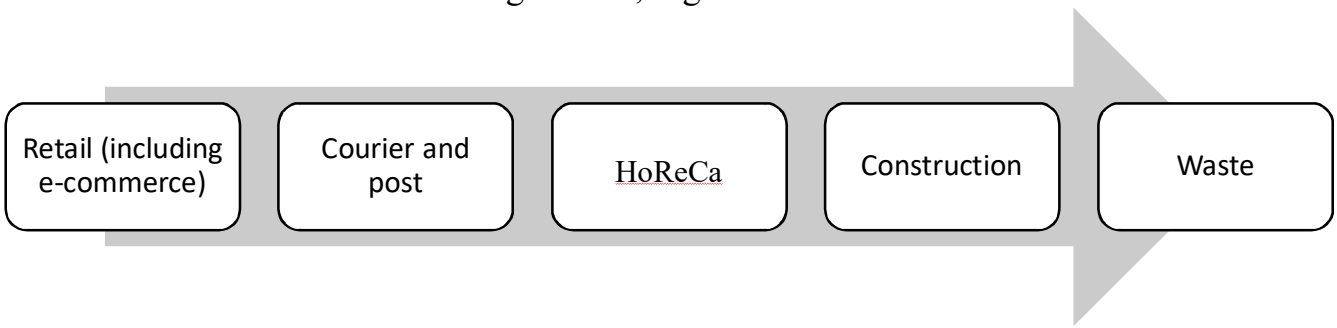

Figure 3.1 – UFT market sectors

The *retail sector* demonstrates how fragmentation of demand for UFT (e.g. numerous independent retail outlets located in a city centre) combined with the fragmentation of supply of UFT (e.g. numerous wholesalers and other suppliers using their own vehicles to make just-in-time deliveries) results in a greater number of UFT movements with only part-loads than would be possible if both demand and supply were more concentrated.

Parcel, courier and express uses large vans or small to medium sized trucks and is based on consolidated delivery and collection tours departing from cross dock terminals located in close proximity to suburban areas.

Hotel, restaurant and catering (*HoReCa*) sector is generally described as a homogenous market sector, but its commercial activities present very different logistics and organisational constraints according to the specific service offered to the final consumers.

Construction activity involves the delivery of a wide range of materials to construction sites, which can be located in already congested areas and sensitive locations such as heritage city centres with pedestrianised zones; it also involves the removal of waste materials for disposal.

Waste collection and transport are specific tasks of municipal waste management. Their optimisation can make a significant contribution to the sustainability of cities by,

for example, improving traffic flows through optimised fleet management and routing, by minimising environmental impacts (e.g. noise and pollutant emissions) and by improving access to waste disposal facilities (e.g. collection points).

Sequence for fulfilment

1. To determine existing laws and regulation measures in EU and Ukraine at the national level. To fill a table 3.1. Working group consists of 2-4 students. Then all together students with teacher compare their results.

Table 3.1 – Analysis of existing laws and regulation measures in EU and Ukraine

Laws and regulation measures		Transport operator rights and obligations	
European Union	Ukraine	European Union	Ukraine

2. To define existent problems concerning UFT in your transportation area (study area). Transportation area is determined by teacher (This task may be performed by 2–3 students). Please, include picture for each problem. Student can introduce the result as a table. While you are filling a table 3.2, put a problem in a priority rate from the most important to the less important one.

Table 3.2 – Existent problems concerning UFT (transportation area)

Problem	Description of problem	Photo, address

3. To determine existing laws and regulation measures in your transportation area at the local level. For instance, include map of your transportation area with road signs of regulation freight transport or other restrictions. For performing of this task students have to observe existing roads in the study area. To account number of freight vehicles, traffic composition. The results should present in graphs.

4. Data collection. To analyse UFT market sectors in your transportation area. To present a map with all of stakeholders. The results should present in table and graphs. To provide graphs with detailed description.

Table 3.3– Existent retailers in transportation area

Major retail chains	Address

Independent retail	

Table 3.4 – Existent Courier and post and other

Courier and post	Address
HoReCa	

5. Make a conclusion describing crucial features of freight transportation in the city (existing and planned measures), challenges and future trend as a prediction from your point of view.

Questions

1. Could you list sectors of UFT market?
2. Could you describe existing problems in your transportation are?
3. Could you describe a distinction between legislative regulation concerning UFT in EU countries and in Ukraine?
4. Could you define the best EU practice regarding UFT, perhaps their major lack?
5. Please, try to predict a situation of freight transportation in your city, country?

Practical exercise № 4. Intensive applications of Transit Management Systems.

The aim is to form professional skills concerning analysis, design and operational activities based on Transit Management Systems.

The methods: seminar.

Theoretical base

Information Communication Technologies (ICT) refers to technologies that provide access to information through telecommunications. The focus is primarily on communication technologies, including the Internet, wireless networks, cell phones, and other communication mediums.

The definition of Intelligent Transportation Systems (ITS) is provided in the EU Directive 2010/40/EU in Article 4 (Directive, 2010) describing ITS as systems in which information and communication technologies are applied.

Transit Management System (TMS) is providing accurate information about position and satisfaction safety and security of traveller.

Sequence for fulfilment

1. The list of topics for seminar the following: Transit Management Systems applications (traveler information, planning, schedule, fare collection etc.).

You have to present a description, challenges, methodology, algorithm and examples of implementation in Europe, Ukraine or other countries. The time of report should be 10 min approximately. Student have to analyze the problem, reveal the causal relationships, to develop problems that require additional study, answer questions and discuss.

Questions

1. What are Information Communication Technologies?
2. What are Intelligent Transportation Systems?
3. What is transport telematics?
4. What is Transit Management Systems?
5. Describe several examples of implementation ITS concerning passenger transportation in your country, city? What, you suppose, should be improved?

Practical exercise № 5. Intensive applications of Fleet Management System

The aim is to form professional skills concerning planning, evaluation of Fleet Management Systems.

The methods: seminar.

Theoretical base

The Fleet Management System collects, store and provide complete comprehensive information about the current state of the vehicles and cargo, the route history, the expected events, as well as the driver activities for the vehicle maintenance and operator companies. The main fields of application are the following: vehicle operation, traffic safety, security of freight, traffic management, environmental protection. General construction of on-line fleet management systems are demonstrated on Figure 5.1. Usually it consists of three main sub-systems: on-board units, central server, user computers.

Resource: http://www.mogi.bme.hu/TAMOP/jarmurendszerek_iranyitasa_angol/

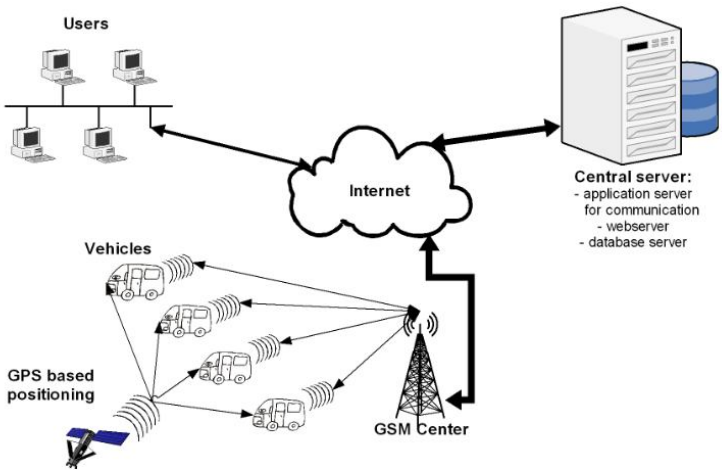

Figure 5.1 – System structure

Sequence for fulfilment

2. The list of topics for seminar concerning fleet management systems: freight transportation, city logistics, floating car data ect. You have to present a description, methodology, algorithm and examples of implementation in Europe, Ukraine or other countries. The time of report should be 10 min approximately. Student have to analyze the problem, reveal the causal relationships, to develop problems that require additional study, answer questions and discuss.

Questions

1. What is the main feature of fleet management systems?
2. What is tracking & tracing systems?

3. What are functions of tracking & tracing systems?

4. Describe several examples of implementation fleet management systems in your country, city? What, you suppose, should be improved?

5. Describe several examples of implementation tracking & tracing systems in your country, city? What, you suppose, should be improved?

Practical exercise № 6. A system approach to city logistics

The aim is to learn how to apply the systems approach for improving city logistics.
The methods: system approach, observation, descriptive analysis.

Theoretical base

The systems approach is the foundation of systems engineering. It is fundamental to systems, systems thinking, systems methodology, systems design, and systems engineering. It is a set of top-level rules from which systems engineering methodologies can be derived. The systems approach is a problem solving paradigm. That is to say, the systems approach considers the attributes of an entire system to achieve the objective of a system, which is to solve a problem. The systems approach allows the designer to manage, encapsulate, and anticipate complex behaviours [6]. A Systems Approach to Urban Distribution in presented on the Fig. 6.1.

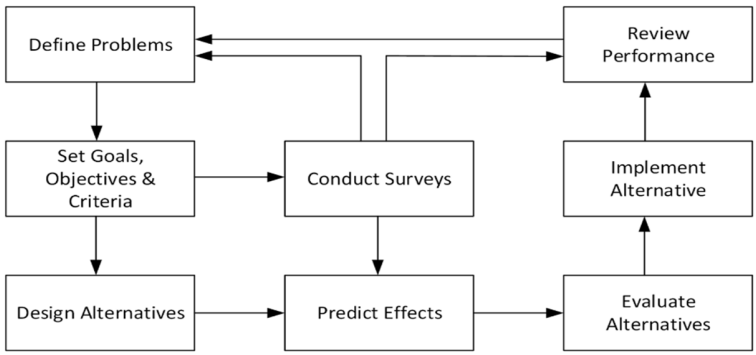

Figure 6.1 – A Systems Approach to Urban Distribution [7]

Sequence for fulfilment

1. Put the activities of urban distribution in the right order, Fig. 6.1.
2. You should apply the system approach in your city solving the problem of city logistics. Write the detail description of the system approach at each step. It is preferable using photos, video, links or other resources. Additional information: a) lectures notes; b) a useful overview is provided by J. Allen, M. Browne & T. Cherrett in their article "Survey Techniques in Urban Freight Transport Studies"; c) the case study of the MobileDock application.
3. You should present your results in the group. It is preferable use a presentation.

Questions

1. Why is it necessary to apply a system approach in city logistics issues?
2. What is a system approach in city logistics?
3. What is the most complicated activity of system approach?
4. Why is it need to review performance?
5. How can you evaluate alternatives?

Practical exercise № 7. Current trends in planning and management of public and freight transportation

The aim is to know the current trend in planning and management (strategies and policies) of public and freight transportation in own city.

The methods: descriptive analysis, active learning.

Data

Use input data (transportation areas) from exercise 2.

Theoretical base

The researcher Hans Quak distinguish three areas in which dimensions could affect the results of an initiative of UFT: the design phase, the execution phase, and the evaluation phase, Fig. 7.1.

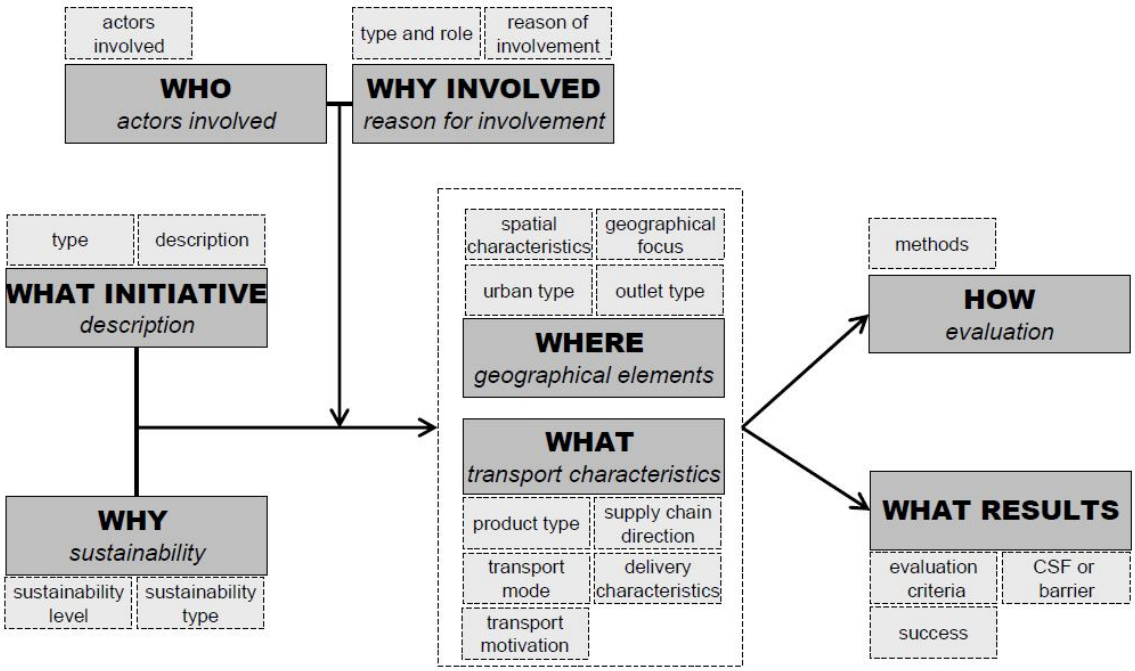

Figure 7.1 – Framework for evaluating UFTS initiatives (measures)

There is the sequence of the questions:

1. What initiative (description) is undertaken?
2. Why (objective) is this initiative undertaken?
3. Who (actors involved) is involved in the UFTS initiative?
4. Why is this actor (/ are these actors) involved in the initiative?
5. Where (geographical elements) does the initiative take place?
6. What (transport characteristics) transport operations are included in the initiative?
7. How is this initiative evaluated; what methods are used for the evaluation?

8. What results follow from the initiative?

Sequence for fulfilment

1.You have to offer, define and analyze measures (initiatives) that can be implemented in your city concerning freight transportation and public transportation, study area (according to exercise 2 and 3). The base for analysis is Fig. 7.1–7.2. Please, provide detailed description and evaluation of each option in the tables 7.1–7.2.

Table 7.1 – Evaluation of UFT measures

What	Why	Who	Where	How evaluate	What result

Table 7.2 – Evaluation of measures concerning public transportation

What	Why	Who	Where	How evaluate	What result

For instance, table 7.3.

Table 7.3 – Evaluation of UFT measures: road pricing

What	Why	Who	Where	How evaluate	What result
Congestion charge	Reduce congestion	Main actor: Local authorities Second actor: Carrier Reason for 2nd actor – legislation Who initiator Authorities researchers	City (centre)	Analysis, data collection, modelling	Transport efficiency from ecological point of view

Questions

1. Could you define possible measures for improving freight transportation that could be implemented in your city, country?
2. Could you define possible measures for improving public transportation that could be implemented in your city, country?
3. What measures the most difficult implement in your city, country?
4. Who have to be involved for regulation transport market?
5. What results can we receive after implementation possible measures?

Practical exercise № 8. Elements for analyzing transport systems. Origin-Destination matrices

The aim is to obtain skills regarding design and analysis of goods flow based on estimation of origin-destination matrices.

The methods: static simulation of transport network.

Theoretical base

The demand for freight transportation is closely connected to the production and distribution of goods, that is, to the study area's economic system and its interactions with the external economic system. A system of freight demand models can be formally expressed as:

$$d_{od}\left[K_1, K_2, \ldots\right] = d(SE, T, \beta) \qquad (8.1)$$

The relevant characteristics, $K_1, K_2, \ldots$, are normally associated with commodity type (raw materials, semi-finished products, finished products, ...), with sectors of economic activity, with characteristics of firms (e.g., firm size, logistic organization), transportation characteristics (e.g., shipping frequency, size, and value) as well as with transportation mode. The *SE* variables reflect the economics of production (value of production by sector, number, and size of production units, ...) and consumption (household consumption, imports, ...). The transportation system variables *T* are related to the attributes of the different transportation modes and services (times, costs, service reliability, ...). Vector β denotes the model parameters.

These considerations suggest that the mechanisms underlying the formation of freight transportation demand and its fulfilment by transportation services are considerably complex and interrelated. There is no single decision-maker for freight, but rather a complex and connected set of decision-makers responsible for production, logistics (storage and shipping), distribution, and marketing. The decision maker (that influences the level and composition of freight transportation demand) can be, as an example, transport and logistics operators (retailers, wholesalers and carriers).

The spatial characterization of trips is made by grouping them by place (zone or centroid) of origin and destination, and demand flows can be arranged in tables, called origin–destination matrices (O-D matrices), whose rows and columns correspond to the different origin and destination zones. Matrix entry d_{od} gives the number of trips made in the reference period from origin zone *o* to destination zone *d* (the O-D flow).

Data

Given the study area of Figure 8.1 with the economic structure reported in Table 8.1.

Study the freight transport system for the shop restocking for the following freight type: *foodstuffs, home accessories, cloths, personal product*.

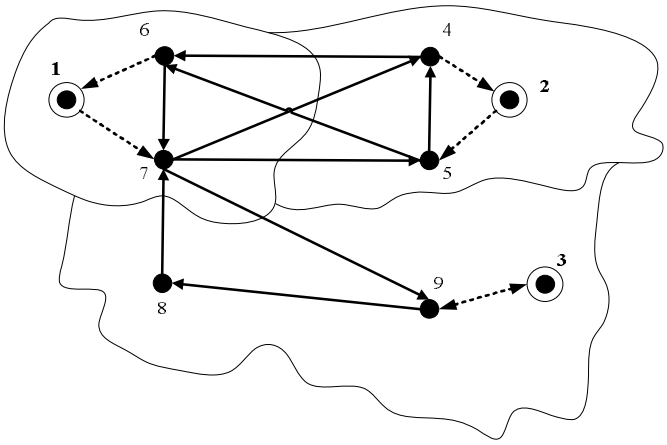

Figure 8.1 – Study area and road graph

Table 8.1 – Economic characteristics of study area

Traffic Zone	Freight type	Retail employees	Warehouse employees
1	*Foodstuffs*	$1520+10 \cdot j^*$	$416+15 \cdot i$
	Home accessories	$240+10 \cdot j$	$112+15 \cdot i$
	Cloths	$560+10 \cdot j$	$176+15 \cdot i$
	Personal products	$960+10 \cdot j$	$80+15 \cdot i$
2	*Foodstuffs*	$1968+8 \cdot j$	$320+10 \cdot i$
	Home accessories	$288+10 \cdot j$	$80+10 \cdot i$
	Cloths	$640+8 \cdot j$	$144+10 \cdot i$
	Personal products	$640+8 \cdot j$	$112+10 \cdot i$
3	*Foodstuffs*	$1200+10 \cdot j$	$384+15 \cdot i$
	Home accessories	$80+8 \cdot j$	$144+15 \cdot i$
	Cloths	$1280+10 \cdot j$	$240+15 \cdot i$
	Personal products	$800+8 \cdot j$	$144+10 \cdot i$

* j – the penultimate figure of student ticket; i – the last figure of student ticket.

Table 8.2 – Shipment size

Freight type	Shipment size [kg/delivery]
Foodstuffs	$380+3 \cdot i$
Home accessories	$150+3 \cdot i$
Cloths	$340+3 \cdot j$
Personal products	$240+3 \cdot j$

Table 8.3 – Distribution of tour for number of stops/deliveries and traffic zone of departure

	num = 1 *(round trip)*	num = 2
Zone 1	30 %	40 %

Zone 2	50 %	20 %
Zone 3	20 %	40 %

Table 8.4 – Probability to choose the subsequent delivery zone

p[d_j/d_i]	Zone 1	Zone 2	Zone 3
Zone 1	30 %	40 %	30 %
Zone 2	50 %	30 %	20 %
Zone 3	20 %	50 %	30 %

Table 8.5 – Parameters of attraction model [t/employee-day]

	Foodstuffs	*Home accessories*	*Cloth*	*Personal products*
$\square_{AD}$	0,04	$1{,}3+0{,}05 \cdot j$	$0{,}11+0{,}03 \cdot j$	$1{,}32+0{,}04 \cdot j$

Table 8.6 – Distance among zone in km

OD	Zone 1	Zone 2	Zone 3
Zone 1	8+ *i*	18+ *j*	5+ *i*
Zone 2	23+ *i*	6+ *j*	7,2+ *i*
Zone 3	4+ *i*	7,2+ *j*	4+ *i*

Sequence for fulfilment

In particular, the student estimates:

- the Origin-Destination matrices in quantity and deliveries;
- the Origin-Destination matrices in loaded vehicles for the distribution of the above identified deliveries.

For obtaining the O-D matrices (in quantity, deliveries and vehicles), let student assume:

- the restocking of economic activities in each traffic zone will be performed by sender on own account;
- the shipment size *q* is obtained using the data reported in Table 8.2;
- the deliveries are performed by light goods vehicles (less than 1,5 tons) and all before the midday;
- the delivery tours, independently than goods type, are performed with maximum two stops/deliveries and are distributed as reported in Table 8.3;
- the probability to perform delivery *(k+1)* in zone d_j, having performed the delivery *k* in zone d_i, is that reported in Table 8.4.

Estimate the average quantity of goods attracted in each traffic zone *d* ($Q_{.d}$) through the above attraction model:

$$Q_{.d} = \beta_{AD} \cdot AD_d \qquad [t / day] \tag{8.2}$$

with AD_d number of retail employees and β_{AD} model parameter as reported in Table 8.5.

For the spatial characterization (O-D matrices) of goods flows, a gravitational *acquisition model* is used. The *emission* attribute is the number or warehouse employees, while the cost attribute is the distance among zone are reported in Table 8.6. The parameters of the model referred to the two attributes are respectively equal to *1,13* and to *–0,05*.

Questions

1. What does origin-destination matrices for?
2. How to estimate origin-destination matrices in quantity?
3. How to estimate origin-destination matrices in deliveries?
4. How to estimate origin-destination matrices in loaded vehicles?
5. How is it possible to apply obtained results in practice?

Reference

1. DG MOVE. European Commission: *Study on Urban Freight Transport*. Final report. MDS Transmodal Limited in association with Centro di ricerca per il Trasporto e la Logistica (CTL), 2012.

2. Quak, H. (2008). *Sustainability of urban freight transport*. Delft, The Netherlands: Netherlands TRAIL Research School.

3. Nuzzolo, A., Comi, A., Polimeli A. (2017) *Freight origin-destination forecast handbook*. Interreg Central Europe Sulpiter.

4. Nuzzolo, A., Campagna, A., Comi, A., Polimeni A., Mezzavilla L. (2017) *Freight origin-destination forecast. Handbook. Guidelines and example of application for distribution flows*. Interreg Central Europe Sulpiter.

5. Li, J., Gillen, D., & Dahlgren, J. (1999). Benefit-Cost Evaluation of the Electronic Toll Collection System: A Comprehensive Framework and Application. *Transportation Research Record: Journal Of The Transportation Research Board*, *1659*(1), 31-38. doi: 10.3141/1659-04

6. Jackson, Scott & hitchins, derek & Eisner, Howard. (2010). *What Is the Systems Approach*? INSIGHT. INCOSE. 10.1002/inst.201013141a.

7. Sustainable Urban Freight Transport: a Global Perspective (2020). MOOC course of TU Delf. Retrieved August 1, 2020, from https://ocw.tudelft.nl/courses/sustainable-urban-freight-transport-global-perspective/

ANNEX A

Practical exercise № 2

Table A.1 – Category of stakeholders

Category of stakeholders
Supply chain stakeholders
Resource supply stakeholders
Public authorities
Other stakeholders

Table A.2 – Stakeholders

Stakeholders
Landowners
Residents
Infrastructure providers
Receivers (major retailers, shop owners, etc)
Other economic actors located in the urban area (manufacturers, service providers, etc)
Infrastructure operators (managers)
Visitors/ tourists
Transport operators (own account, third party providers)
Consumers
Local government
Shippers

Table A.3 – Main interest in context of UFT

Main interest in context of UFT
Site accessibility and on-time deliveries
Minimum inconvenience caused by UFT
Profitability of local areas
Minimum inconvenience from UFT and a wide variety of products in the shops.
Availability of a variety of goods in shops in the city centre.
Accessibility and use of infrastructure
Delivery and collection of goods at the lowest cost while meeting the needs of their customers
Cost recovery and infrastructure performance
Attractive city for inhabitants and visitors, with minimum inconvenience from freight transport
On time delivery of products, with a shot lead-time
Low cost but high quality transport operations and satisfaction of the interest of the shippers and receivers.

Виробничо-практичне видання

Методичні рекомендації
до організації самостійної роботи
та проведення практичних занять
із навчальної дисципліни

«РОЗУМНИЙ ТРАНСПОРТ І ЛОГІСТИКА ДЛЯ МІСТ»

(для студентів другого (магістерського) рівня вищої освіти денної і заочної форм навчання спеціальності 275 – Транспортні технології (за видами) освітньо-наукової програми «Розумний транспорт і логістика для міст», освітньої програми «Транспортні системи», освітньої програми «Організація перевезень і управління на транспорті», спеціальності 073 – Менеджмент освітньої програми «Логістика»)

(англ. мовою)

Укладачі: **ОЛЬХОВА** Марія Володимирівна
РОСЛАВЦЕВ Дмитро Миколайович

Відповідальний за випуск *Т. В. Луценко*

За авторською редакцією

Комп'ютерний набір і верстання *М. В. Ольхова*

План 2021, поз. 226М

Підп. до друку 04.02.2021. Формат 60 × 84/16
Друк на ризографі. Ум. друк. арк. 1,4.
Тираж 50 пр. Зам. №

Видавець і виготовлювач:
Харківський національний університет
міського господарства імені О. М. Бекетова,
вул. Маршала Бажанова, 17, Харків, 61002.
Електронна адреса: rectorat@kname.edu.ua
Свідоцтво суб'єкта видавничої справи:
ДК № 5328 від 11.04.2017.