

# TRANSPORT AND THE ENVIRONMENT - CITY LOGISTICS PIPELINE TRANSPORTATION

## DOPRAVA A ŽIVOTNÍ PROSTŘEDÍ - CITY LOGISTIKA POTRUBNÍ DOPRAVOU

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### **Abstract**

A person throughout life, go to work to earn money to meet their needs. There are few individuals who are loyal to one job in one place. Most people are migrating for work where there is more supply. A larger supply of labor in the cities and its surroundings. Cities are growing without a deeper conception of the transport supply. The biggest problem of cities is minimal temporal and spatial regulation of supply flows. Today's solution is a compromise between the requirements of time, quantity and space-saving supplies that are only minimally affected in a competitive environment. Supply routes overwhelm a large number of vehicles that have an impact on the environment. Overload roadways causing a collision between passenger and freight land transportation.

### **Abstrakt**

Člověk během života chodí do práce, aby vydělal peníze pro uspokojení svých potřeb. Je málo jedinců, kteří jsou věrní jednomu zaměstnání na jednom místě. Většina lidí se za prací stěhuje tam, kde je větší nabídka. Větší nabídka práce je ve městech a jeho nejbližším okolí. Města se rozrůstají bez hlubší koncepce dopravního zásobování. Největším problémem měst je minimální časové a prostorové usměrňování zásobovacích toků. Dnešní řešení spočívá v kompromisu mezi časovými požadavky, množstvím a prostorovými nároky zásobování, které lze jen minimálně ovlivnit při konkurenčním prostředí. Zásobovací cesty zahlcuje velké množství dopravních prostředků, které mají vliv na životní prostředí. Přetížení dopravních cest způsobuje kolize mezi osobní a nákladní pozemní dopravou.

### **Keywords**

city logistics, pipeline transport

### **Klíčová slova**

city logistika, potrubní doprava

## **INTRODUCTION**

Today's time brings a great deal of constant change. Workflows are constantly evolving and improving, and technological procedures are introduced to increase the efficiency of production, distribution, and disposal of used goods. Every business tries to use new knowledge to achieve maximum efficiency or maximum profit. This is closely connected with the use of the maximum potential of each employee and the pooling of all available production capacities under one roof, where all branches of the enterprise are in one place. The maximum utilization of the employee's potential increases the physical and psychological fatigue that the employees are resolving for as long as possible and working at the last moment before the start of their

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work. When grouping all the available capacities of a manufacturing enterprise at one place, the enterprise keeps track of good transport service. Good transport service means placing all plants in a place where road and rail transport is developed and also air and water transport within a certain distance. The most developed transport services are in cities, their neighborhood or in urban areas (where several cities are located within a few kilometers).

In order to avoid the collapse of transport services in these cities, different types of integrated transport systems and urban mass transport are being developed for the transport of employees, but the collection of material into the company and the distribution of finished products from the company is left to the company itself. This results in travel to and from traffic jams. An effective solution for the elimination of traffic collisions and smooth supply is the adoption of logistics and, in the case of urban or city logistics cities.

Logistics is a scientific discipline that focuses on planning, managing and monitoring the flow of material, people, information and energy in a given system, focusing on minimizing costs and maximizing time savings.

## **1 WHAT IS CITY LOGISTICS**

City logistics focuses on research and the subsequent solution of the logistics system of cities and their surrounding areas with a view to optimizing traffic flows of persons and goods. In passenger transport, it optimizes the flows of passengers in the catchment area of the city in the form of urban mass transport or integrated transport system. When transporting goods (supplying shops and businesses), cities themselves are making minimal efforts to solve the congestion of transport infrastructure. City Logistics offers various applications to solve the transport of goods in cities, irrespective of the size of the city's territory. The basic principle is the use of goods pooling for delivery and delivery, the finding of the most suitable type of vehicle for city driving and the subsequent optimization of each ride, where economic efficiency is achieved with the minimal environmental burden.

The logistics of the city and its catchment area are hindered by various limitations in the form of laws and decrees, the proper construction and the technical arrangement of the roads. These constraints subsequently accumulate excessively the means of transport into the traffic streams in mutually exclusive directions, which leads to constant traffic collisions. These collisions concern passenger and freight traffic in pedestrian traffic. The technical arrangement of the roads hits the impossibility of extending a narrow network of streets, especially in older urban areas. The throughput is low and is not sufficient for the current traffic. Nor will this issue be solved by various urban regulatory measures that try to separate or dampen conflicting components. Urban regulation of transport systems concerns time and space. Time control measures mainly concern freight transport, which is limited to nighttime movement and handling or is totally forbidden. Spatial regulation measures focus on setting up pedestrian zones, lane lanes for urban public transport, and construction of underground or aboveground parking spaces.

In general, good law is also good. The following are the fundamental rights of every human being living in the Czech Republic. Each person should be able to get basic necessities in their immediate vicinity in so-called walking distances. If a person is forced to make a long way to buy goods or to meet their social and health needs, he or she has the right to have a transport system that can achieve this.

In passenger transport, the definition says: "basic transport services as the general right of a citizen to establish that a citizen has the right to place his / her place of employment, pupils and

students, the place of the appropriate school, the places where the relevant health care is provided and the offices, Within the competence of which the citizen belongs, by public transport of a statutory quality " .

In freight transport, there is no definition of basic transport service, and it is also an important part of ensuring human life.

Both concepts of basic transport services by passenger and freight transport are included in the definitions of citizens' rights and freedoms in European Community Regulations (Council Regulation (EEC) No 1191/69 on action by Member States concerning public service obligations in respect of transport by rail, road and inland waterway Wording of Council Regulation 1893/91).

City logistics must be understood as a unified integrated logistics system, which includes public passenger transport, transport of goods and materials, sorting and forwarding of individual consignments and operation of the internal transport system, warehousing and follow-on sales network, transport services for small and medium-sized enterprises The input is transported to the work process, the material is weighed into the production process and the output is the production of finished products, its basic transport service in the form of distribution to the shops for goods categorized according to transport services. Representatives of every city must realize that if they want to have fully functional logistics on their territory, they must force all carriers to cooperate with clearly defined conditions where competitive struggles are forbidden. The building of functional city logistics in the city and its catchment area can not be based solely on the commercial principle of economic efficiency, as no logistics operator would be able to serve all business units regardless of the amount of profit or loss. Also, it is not possible to carry out logistics by the entrepreneurs themselves, because the reimbursement of all the costs associated with the operation of the logistics center is not in their economic power. A simple recipe for this situation is the focus on building a city supply center under the patronage of the city, with the support of a grant from the European Union. The city as a patron of the entire logistics system would ensure the running of a city center, an equitable approach for all freight carriers (small and large) and all the logistics operations in their territory according to a defined supply schedule called logistics control.

Logistics control is used to ensure and eliminate possible shortcomings in city logistics. It helps maintain the desired state by following the individual linguistic processes, applies feedback for control, and subsequently adjusts the system for further operation. It also ensures the security of the permanent control of the economy by comparing the plan with reality and highlighting the possible undesirable development of the supply situation. For a predetermined period, he monitors logistics performance and costs. Logistics control also serves as a record system. A perfect logging system is a prerequisite for successful planning and management of logistics processes. The system of records has the task of constantly monitoring and reporting all necessary data on individual costs and performance. The logging system must have firmly defined logistical processes, a logistical cost classification, and appropriate indicators.

## **2 PUBLIC LOGISTICS CENTER**

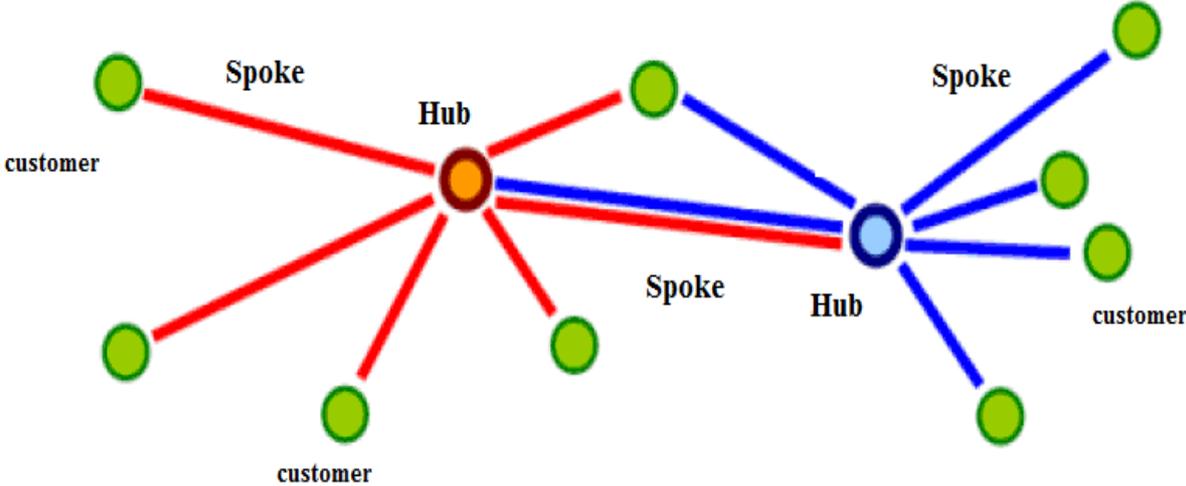
The Public Logistics Center integrates transport and freight forwarding companies, logistics service providers, customs administrations, industrial and commercial enterprises with their logistics requirements, leasing, insurance and banking companies. It uses at least two modes of transport (railway - road) to realize transport requirements. The Public Logistics Center is designed to deepen and manage mutual cooperation between business entities. The division of

technological and working processes and processes in industry and trade requires modern and constantly evolving logistics structures. Integration into a public logistics center is an opportunity for each enterprise to meet new market demands in cooperation with "competitive" partners. The public logistics center is a nodal point in which transport modes of transport mix together. It offers optimal conditions for the creation of combined transport chains (road - railway). Placement at the combined transport terminal can be achieved in the long run by increasing the performance of rail transport. The public logistics center, by effectively managing transport activities, reduces the burden on transport infrastructure and directs goods to more environmentally friendly means of transport and also adapts infrastructure to anticipated market demands. The benefits of a logistics center should not be evaluated as just one point in the region but interconnection with other public logistics centers and working together must be achieved. The cooperation of public logistics centers will thus support the efficiency of the circulation of transport units in the territory of the city, region, the republic.

**3 THE CONCEPT OF BASIC LOGISTIC SERVICEABILITY OF THE CITY AND ITS CATCHMENT AREA**

Logistics as a science branch offers two logistics solutions to city logistics solutions. The first is Hub and Spoke and the other is GATEWAY.

The Hub and Spoke logistics technology is based on the existence of a single logistics center (hub = center, core) from which the city's spokesman (spoke = line, beam) is operated. This name must be taken symbolically because the logistics center is always outside the city asymmetrically with respect to the center. This technology assumes the need to supply the city (household, small and medium-sized enterprises) with material, raw materials and goods. At the same time, it is also assumed that the generated products will be removed, taking into account the waste from production, trade and consumption of households. Conversely, large service centers are not expected to operate because they usually have their own enterprise logistics system, or their own supply logistics deal with outsourcing.



**Fig. 1** Hub and Spoke  
Source: [1]

Hub and Spoke technology operates with two traffic circuits:

- the external transport system whereby the commodities transported (usually in large grouped consignments designated to one or more recipients) enter the service area (urban agglomeration, souměstí) or, on the contrary, the consignments at the logistics center stand out,
- the internal transport circuit which ensures delivery of split shipments from the logistics center to the territory or, on the other hand, binds to the logistics center the production from the urban agglomeration, where it creates routed consignments.

External transport is provided by high-capacity transport systems, or a combination of them (multimodal transport system). The most common are rail, river or naval transport. Inland transport is limited by the state of transport infrastructure due to the mode of transport and the means of transport. Frequent road transport is carried out by vehicles with a payload of 3.5-6 tonnes.

The centerpiece of technology is a logistics center that is equipped with:

- by connecting to the transport infrastructure of the internal and external transport system,
- equipment for the handling, distribution and association of consignments,
- packaging equipment (palletizing, palletizing, etc.).

The goal of the logistics center is not to store materials and products. If materials and products are stored in the center, then in order to create a directionally consolidated consignment, or at the customer's order. This makes the logistics center different from centralized warehouses or specialized logistics companies providing logistics outsourcing.

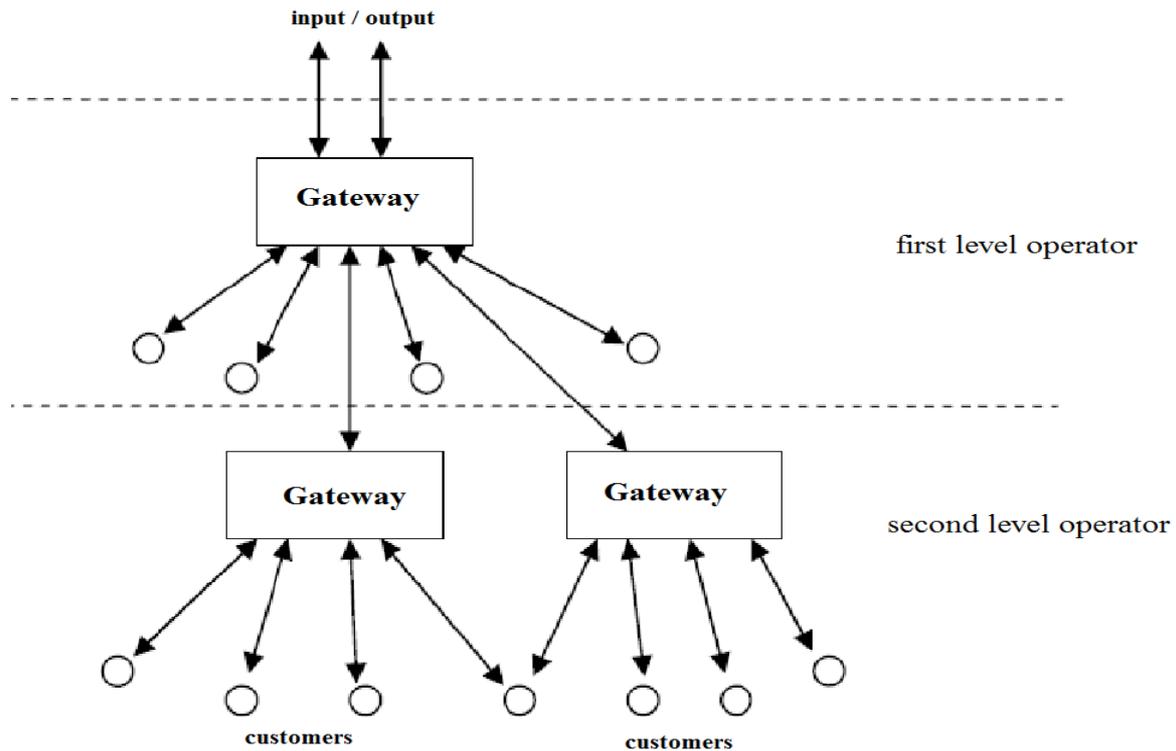
The Gateway logistics technology is suited for the logistics transport of large urban centers. On the outskirts of the city, Gateways, which are a function of logistics centers in the

Hub over Spoke technology, are built on the transport routes. Here are two situations:

- from one of the gates operated by the entire city center means that respect the defined traffic restrictions of the given urban territory (eg excluding freight transport at certain time intervals of the day, limiting the vehicle mass category, handling of pedestrian customers) so-called one-stage operation.
- if the territory of the city center is very large and the traffic constraints in different parts differ, then the variant of the so-called two-stage operation is applied.

If a large shipment, intended for multiple recipients scattered across the city, enters the gate, the sorting is done as follows:

- for a particular recipient, the classification will be made only for the circuit closest to the gateway,
- for other recipients, a directional classification is determined for second-class gateways that are appropriately spaced in the inner part of the city and then the customer service is performed. This reduces the burden on urban roads, because the interconnection between the first and the second level gates is done at a suitable time (outside the peak hours, for example by night attendants). The advantage is the possibility to use more massive means of transport, or also rail transport. The disadvantage is longer transport time.



**Fig. 2 Gateway**  
Source: [1]

There is no combination of Hub technologies over Spoke and Gateway in cities and its catchment area of the first category or of the second category. An important part of both concepts of total traffic is the connection to security information technology, which must be programmed to the right extent and accessible to customers as a parcel tracking interface. That is why it is necessary to integrate also the transport telematics systems, which are able to reduce the traffic congestion at any point (optimization of the flow of goods by the supply system) and to increase the distribution of current information on the movement and condition of the goods (elimination of supply of trades from non-public logistics warehouses serving for one enterprise).

#### 4 WHAT IS PIPELINE TRANSPORTATION

Pipeline transport is designed for the transport of liquids, gases and solid materials. The source of energy for transport is the gravitational force and the pressure differences in the pipeline and beyond. With pipeline transportation, each of us meets daily at home, for example, bathing, flushing toilet and heating the house. The water is used through the pipeline (water main) and the wastewater is also drained through the pipeline (sewerage). The heating of the house is also used for pipelines where hot steam or water is led by hot water, or gas pipelines are fed with natural gas to the gas boiler. Pipeline transport ensures the transport of raw materials both short distances (sewerage) and long distances (pipeline, gas pipeline). The transport of solid materials and goods is by pipeline transport carried out in the form of pipeline mail or as an express delivery of blood plasma in hospitals. Large-scale piping systems are today at the stage of exploring and developing the means of transport and the network in which they will move.

**Tab. 1** Benefits and disadvantages of pipeline transport

Advantages	Disadvantages
Bulk transport at 15 m / s	Relatively small transport speed
Availability of resources and outlets	Restrictions on a certain shipping relationship
Independence of natural and other conditions	Limited ability to increase permissive performance
Possibility of central control via remote control	The existence of long-term stable transport requirements is necessary
Ability to integrate into the combined transport system	High cost of pipeline system construction
High degree of mechanization and automation of transport technologies	Insufficient use means long-term returns
Possibility of interconnection and collaboration of multiple systems	The problem of construction on private land
Low noise and dustiness	
Reduced risk of contamination	
Low maintenance costs in trouble-free condition	
Organic transport	
Continuous operation - high efficiency	
Negligible losses of transported goods	
Direct, shortest direction of transport	
Simple and operative management	
Underground storage	
Low variable costs - staff salaries	
Security and reliability of the supply of goods	

Source: own

The following screenshots will show us one possible option for city pipeline delivery solutions. This is an underground pipeline project designed to solve problems with insufficient capacity of transport routes in the densely built area of Poruri in Germany. The German company CargoCap, in cooperation with the University of Bochum, addresses the problem with a special tunnel for transport units in continuous sequence. Goods transport is carried out by individually driven units called Caps. These units are designed to carry two loaded europallets at a speed of approximately 40 km / h.



**Fig 3** Motion of capsules regardless of urban traffic, Source: [2]



**Fig 4** Transport of two pallets to the customer, Source: [2]



**Fig 5** Automatic mail order sorting (trade)

Source: [2]



**Fig 6** Transport from GATEWAY (A) to Customer (B)

Source: [2]

This pipeline model outlines a possible solution to the future supply of the city, which is very environmentally friendly. Pipeline transport can solve the current malfunctions of the last article of the logistics process, where goods are distributed on the so-called last mile. The last mile is the stretch of the way the goods are delivered to the store not directly to the door of the house. The construction of pipeline transport for the needs of the city must be understood as the strategic intention of the city to take care of its inhabitants in the most efficient way for which the return on investment is not within days or months.

## CONCLUSION

One can only hope that each city will realize how important pipeline transportation is for its own development, and city logistics is an effective tool to meet its own needs. All scheduling on the supply of goods is a long-running run and can not be done through regulation, restriction or prohibition. This would put the city in a dead end and give the impression of relocating to a better and more comfortable way of life.

By understanding city logistics and putting it into a real functional unit, the city will eliminate the inefficient spatial and time flows of goods. City logistics through the above can reduce the waiting times for unloading merchandise, eliminates empty transport vehicles to a minimum, can deliver higher load and ride density with the exact amount required. Using pipeline transport and these technologies will result in the consolidation and streamlining of goods flows with minimal impact on the environment. The city's clear goal in city logistics must be to connect as many transport requirements as possible to a managed system that suits the needs of sellers (shoppers) and buyers (a person living in the city).

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