

# PŘEDPOKLADY ZAČLENĚNÍ VEŘEJNÉHO LOGISTICKÉHO CENTRA DO REGIONÁLNÍCH LOGISTICKÝCH ŘETĚZCŮ

## EXPECTATIONS FOR INTEGRATION OF PUBLIC LOGISTIC CENTRE INTO THE REGIONAL LOGISTIC FLOWS

Andrea Seidlová, David Šourek<sup>1</sup>

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*Anotace: Plánování a realizace nových logistických center jsou spojeny s problémy, které je možné eliminovat systematickým přístupem k těmto projektům. Příspěvek se zabývá plánováním veřejných logistických center na teoretické úrovni s příkladem plánovaného logistického centra v Pardubicích. Jsou zde stanoveny principy pro určování atrakčních obvodů logistických center a definovány možné logistické řetězce v návaznosti na logistické centrum. Logistické centrum může být integrováno do zásobovacích systémů firem, které sídlí v jeho atrakčním obvodu. Atrakční obvod je stanoven s ohledem na stávající dopravní síť.*

*Klíčová slova: veřejné logistické centrum, atrakční obvod, logistické řetězce*

*Summary: The planning and realization of new public logistics centers are sometimes accompanied by problems that could be reduced by systematic approach to those projects. This paper deals with theoretical planning of public logistic centers with example of logistic center in Pardubice. The goal of the paper was to determinate the attraction zone for planned logistic centre and to define possible logistic chains connected to logistic centre. Logistic centre could be integrated into the supply chains of companies, which are located in its attraction zone. The attraction zone is determinate in relation to existing traffic network.*

*Key words: public logistic center, attraction zone, logistic flows*

### 1. INTRODUCTION

The plan for building-up the public logistic centre in Pardubice arose in compliance with transport policy of the Czech Republic and European Union. The location for logistic centre is allocated in the west periphery of the city on the bank of the River Elbe. This location is also included in the land-use plan of this region. The logistic centre will be subsequently connected to railways, road transport, air transport, and water-carriage.

Conceptions and definitions, which relate to the logistic nodes, are not unified in the European conditions and they have very often different significance [2]. The conception of public logistic centre (PLC) generally represents the place, which is used for concentration of

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<sup>1</sup> Ing. Andrea Seidlová, Ph.D., Ing. David Šourek, Ph.D., Univerzita Pardubice, Dopravní fakulta Jana Pernera, Katedra technologie a řízení dopravy, Studentská 95, 532 10 Pardubice, Tel. +420 466036462, E-mail: [andrea.seidlova@upce.cz](mailto:andrea.seidlova@upce.cz), [david.sourek@upce.cz](mailto:david.sourek@upce.cz).

wide spectrum of logistic services for all who are interested in it. This facility is based on nondiscrimination principle. In this public logistic centre it is possible to provide services with minimally two kinds of transport (always with railway and road transport and depending on the local conditions also with air transport and water-carriage). The condition for building such logistic centres is existence of sufficient current and developing potential of production and utilization. The next condition is connection of this centre to transport infrastructure of several kinds of transport with sufficient capacity. The most important aspect from the point of view of public interest is perfect and most effective transport service of specific area and elimination of negative effects from road transport on living environment and health. A very important function of logistic centers is also access to logistic services for small and middle industrial enterprises.

## 2. SPECIFICATION OF PROBLEMS DURING DEVELOPMENT OF LOGISTIC CENTRE

Seeing that the development of PLC belongs to very exacting projects from economic, time, and operational view, it is necessary to attend great attention to its design. The experience with design of first PLCs has shown that the insufficiencies in design methodology can lead to serious slowdown or stopping of project realization [3].

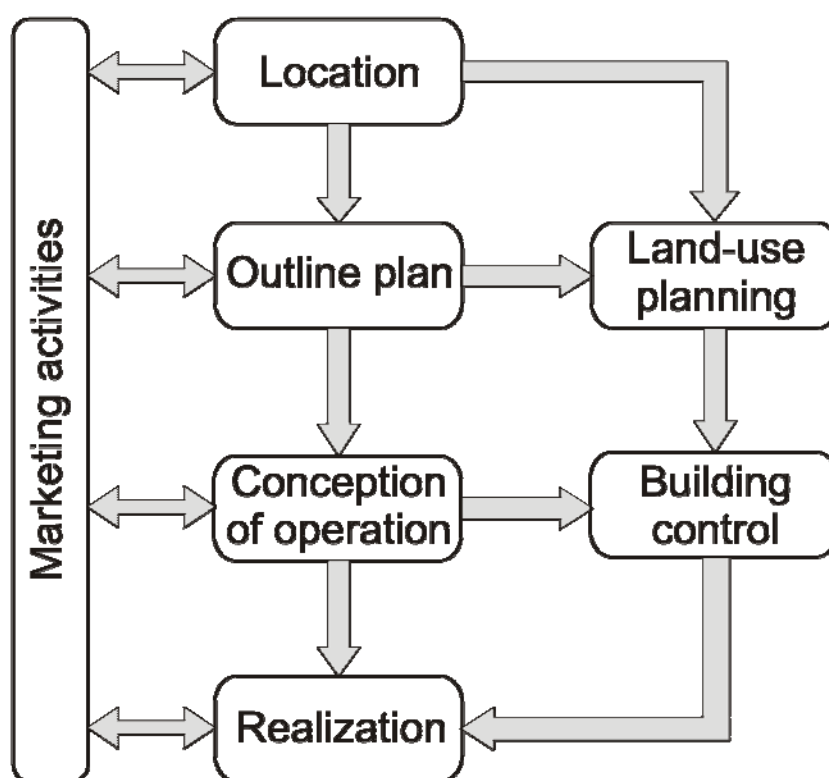
Planning of PLC is necessary to understand like complex process, which is compound from several stages (see table 1).

Table 1 - Stages of PLC

<b>Stage</b>	<b>Content</b>	<b>Possible tools</b>
Plan of location and allocation	Market analysis goods flow supply and demand of transport and logistics services Design of location placement in given area	Marketing survey Mathematic methods (location and allocation tasks)
Preliminary plan of centre	Design of structure of site	Marketing survey Economic evaluation Mathematic methods
Implementation plan	Arrangement for land-use procedure	According to legal regulations
Strategy of PLC operation and control	Design of operation technology material handling equipment storage facility	Marketing survey Economic evaluation Mathematic methods
Implementation	Construction and putting into operation	According to legal regulations

Source: Authors

Single stages of planning process can be performed in the same time (see figure 1). The problems consist in choosing of good location and estimation of area for future expansion of logistic centre. The new logistic centre needs relatively large and continuous site (till 100 ha). Size of site relate to number and structure of users. This number is very hard to estimate. It is possible to persuade the potential users only with declarable advantages from selected place and from existing infrastructure. The closeness of customers, supply of new sales markets, occasion for cooperation with other subjects, and occasion for using of information and communication systems can be very attractive for potential providers. Required eye-appeal of logistic centre is necessary to provide for potential users and for region (regional authority). Acquisition of users and operators for logistic centre is continuous process, which must be realized concurrently with planning and with operation of logistic centre.



Source: Authors

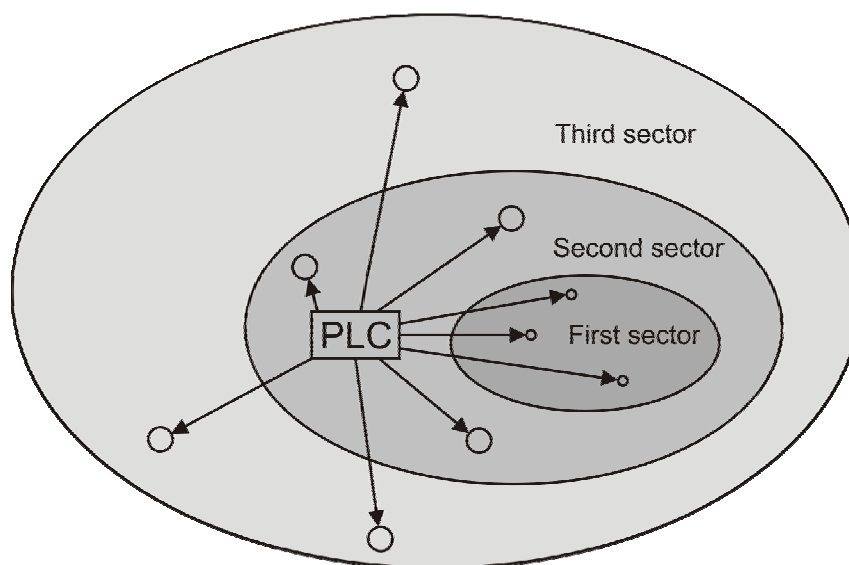
Figure 1 - Planning process of logistic centre

The preliminary plan of logistic centre is now elaborate for logistic centre in Pardubice. This plan solves the placement, structure of site and connection to existing traffic network with regard to environment protection requirements. The target selection of potential logistic centre users is one from the key tasks.

### 3. DETERMINATION OF LOGISTIC CENTRE ATTRACTION DISTRICT

#### 3.1. Problem decomposition

Logistic centre in Pardubice could be incorporated into international and regional logistic chains and it will perform a function of interface between local and distance transport. Attraction district of this type of centre can be in draft lay out into three sectors (see figure 2).



Source: Authors

Figure 2 - Attraction district and its sectors

##### 3.1.1. First sector – the city

The PLC can be effectively connected to the city logistic processes for contiguous city. The logistic centre serves in this case like “gateway”, where the good flows destined for the city centre are addressed. The supply of retailers in the urban area can be optimized by this way. The target groups of customers have their settlement within the town borders. The distance between PLC and customers are in this case till tens kilometers in the conditions of Czech Republic.

##### 3.1.2. Second sector – suburban areas and neighbouring region

The logistic centre in this level is connected into logistic chains of companies, which have their settlement in closeness to the city or in neighbouring region. The logistic centre can for example provide the supply of companies with material, distribution of completed products, assembling, and packaging. In the Czech Republic are these distances about hundreds kilometers.

##### 3.1.3. Third sector – country, continent

In this level is the logistic centre connected into long distance transport as part of domestic and international logistic chains. The other logistic centres, transfer stations and harbors distant till thousands kilometers are the destinations for transport from these centres.

Functions of logistic centre and target groups of customers are specified for each sector in the table 2.

Table 2 - Functions of logistic centre for each sector

	<b>First sector</b>	<b>Second sector</b>	<b>Third sector</b>
Target group of customers	Retailers Construction companies Waste handling provider	Industrial companies (production, processing, mining of raw materials) Construction companies Agricultural plants	Logistic centres Transfer stations Ports and harbors
Possible provided services	Supply (goods, building material) Collecting and disposal of waste Information services	Supply (raw material, finished products) Storage Packaging, sorting, segmentation Preparation for transport (creating of transport units, labeling) Transport Information services	Preparation for transport (creating of transport units, labeling) Transport Customs clearance Insurance Information services
Usable specific transport technologies	Night jump technology	JIT, Kanban, Night jump technology, combined transportation (creation of transport units)	Combined transportation
Applicable kinds of transport	Road transport Specific transport (tram, metro) Railways *)	Road transport Railways *)	Railways Water-carriage Air transport Road transport

\*) only under very specific conditions (existence of siding)

Source: Authors

### 3.2. Initial conditions

In the first realization phase of the logistic centre in Pardubice, there is assumed that the center especially aims to regional freight transportation service. The main goal today is the definition of potential users in the regional attraction zone (II. sector).

The problem has two levels:

- 1st level: The definition of relevant attraction zone as bounded area should be realized at first.
- 2nd level: The choice of potential users from the companies that operate in this area. The criteria for this choice must be defined

The definition of attraction zone on the basis of its position in transportation network is most reasonable now because the logistic center is just in the plan phase. No concrete estimations of transport volumes exist today. Following goods structure and operations are assumed:

- Reloading, warehousing and logistics services for piece goods.
- Reloading and warehousing of bulk goods.
- Reloading of containers.

### 3.3. The definition of attraction zone in transportation network

The logistics centre in Pardubice should be connected to the railway, road and waterway network. The planned locality is situated near the Elbe River and the junction railway station Pardubice. The technical solution of connection to the current road and railway network is described in the logistics centre project. The city of Pardubice is situated on the main east-west and north-south international railway corridors. The highway to capital city Prague is near the planned centre (about 10 km).

The available statistical data [1] point out that about 95% of transport volume in the Pardubice region fall on road transport and only 3.5% fall on railway transport.

So it is possible to assume that the road transport will be the main kind of transport for regional transport service.

The positions of the Pardubice logistic centre and the three nearby centers (Prague, Brno, Ostrava) are known. It could be formulated as allocation problem in transport network with discrete set of centroids. PLCs are typical hubs in the Hub&Spoke networks. In this case, the attraction zone is given by set of arcs and nodes, which should be operated from relevant centroid (see figure 3).

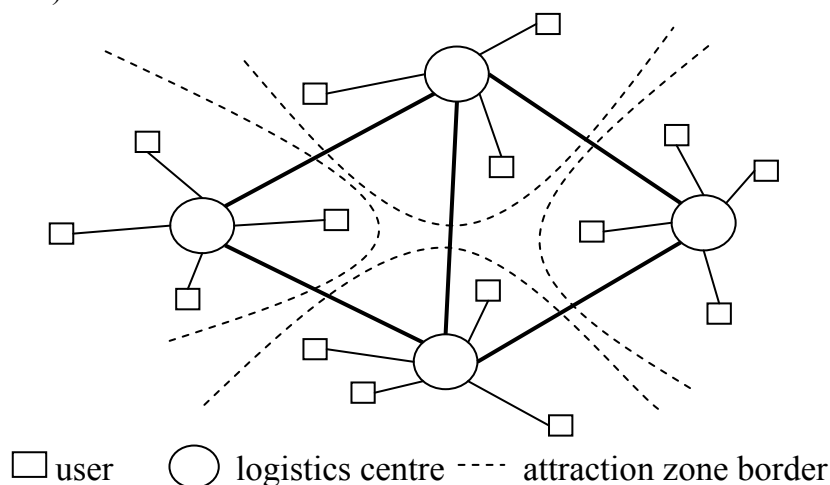


Figure 3 - Hub and spoke network chart

For the example of logistic centre, the arcs are represented by transport communications (roads and railways). The towns and municipalities with industrial importance are chosen for nodes. The main criterion for attraction zone definition is the distance between nodes and centroids. The distance matrix was constructed and each node was assigned to centroid on the basis of the distance. The logistics centre Pardubice should service the area about 10000 km<sup>2</sup>.

### 3.4. The choice of potential users

The approach to choice of potential users could be different depending on the actual plan or realization phase. The basic principle is the market research. If the logistic centre is in the plan phase or there are some areas to rent in existing centre, this research targets at offer and demand for transport and logistics services. It is always profitable to win one or more big strategic users for a new logistic centre. If there are already some operators in the logistic centre, the market research targets especially at demand depending on the offered service structure.

The choice of companies that could have interest in the logistic centre services depends primarily on its:

- branch of activity,
- markets position in the region, state and in the world,
- requirements to specific logistic services,
- requirement to use the specific kind of transport and transport services.

In the case of a big set of potential users, it is possible to use some choice methods like MCA for the narrower choice. A preliminary market research was performed for logistic centre Pardubice on the basis of diverse information sources like internet pages of different companies, statistical data and trade register.

From 2 500 companies, which operate in region Pardubice, come into question relatively small group of significant companies with prediction of strong strategic user. These companies can be divided into groups. In table 3 are defined possibilities of integration of logistic centre into companies' logistic chains.

Table 3 - Integration of logistic centre

<b>User</b>		<b>Function of logistic centre in logistic chain</b>
<b>Economic sector</b>	<b>Products</b>	
Production	Electrotechnic, electronic, component parts for automotive industry	Supply with material and components Distribution of finished products Containerization Cross-docking Storage
Mining and raw material processing	Sand, stones, gravel, cement, coal	Transfer among single kinds of transport Delivery to costumers

		Storage
Civil engineering	Construction materials (bricks, concrete panels, building blocks)	Transfer among single kinds of transport Delivery to costumers Storage

Source: Authors

#### 4. CONCLUSIONS

This paper brings the systematic view of preliminary phase of multimodal PLC building, which is applied on model example of prepared logistic centre in Pardubice in the Czech Republic. In this phase is possible to use commonly known mathematical methods as a part of suggested system procedure. These methods are easily applicable and it can help to the future operator of logistic centre with selection of potential users.

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Recenzent: Ing. Ivo Drahotský, Ph.D.  
Univerzita Pardubice, DFJP, Katedra dopravního managementu,  
marketingu a logistiky