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## THE ARGUMENTATION FOR THE IMPLEMENTATION OF URBAN CONSOLIDATION CENTER FOR THE OLD TOWN IN GDAŃSK AS AN INDICATION OF SUSTAINABLE URBAN FREIGHT LOGISTICS

### Abstract

Distribution of goods in urban areas is one of the most important factors affecting the operation of the region but the management of these services is often overlooked by transport policy makers in Polish cities. Historical buildings create additional difficulties because they make the infrastructure development impossible. It is estimated that in large European cities approximately 25% of CO<sub>2</sub> emissions, 30% of nitrogen oxides and 50% of particulates from transport are emitted by trucks and vans. The doctoral thesis presents methods used to optimize distribution processes in cities with historic buildings in Europe and around the world. It also presents the results of a research carried out in the Old Town of Gdańsk and proposes a method to optimize distribution processes for the area, which was the main objective of the work. The hypothesis of the trial has been formulated as follows: locating Urban Consolidation Center not far away from the center of the City of Gdańsk would bring tangible benefits for the city and all users of the urban space. The study used a method of analysis and criticism of literature; detailed study of a particular case and the method of observation. According to the design model, the proposed solution will bring tangible benefits to all users of space – residents, businesses and city authorities. The results of tests carried out on account of this thesis were provided to the city authorities.

**Keywords:** urban consolidation center, city logistics, urban freight, sustainable mobility, smart mobility, city mobility, urban mobility, last mile logistics, old town, Gdańsk, historical city, historical cities, smart freight solutions

## Introduction

According to the United Nations, by 2050 the number of people living in cities will have increased from 3.9 billion to 6.3 billion, which will constitute 67% of the world population. Public spaces constitute a special challenge when it comes to freight transport – both in terms of logistics and in terms of influence on the environment (emission of harmful substances, noise, accidents, congestion, area exploitation). Each day in every city we can observe the flow of tangible resources, which constitutes a significant part of city traffic. These transfers are accompanied by logistic activities – loading, unloading, warehousing, packing and that creates demand for additional space. All these factors influence problems connected with transport system in public spaces, such as:

- congestion,
- environment pollution,
- decreased safety,
- energy consumption,
- inefficient infrastructure.

Historical cities seem to be in a more difficult situation. While creating conditions for development, we have to respect the cultural heritage which at the same time creates some spatial limitations. Moreover, transport affects the buildings as it creates ground vibrations. These in turn lead to quicker ground concentration which results in building subsidence, destruction of elevation or even destruction of load-bearing walls. The civilization progress must take the historical landscape into consideration.

City logistics is supposed to be conducive to sustainable development. Assumptions of that type of logistics combine different aims of all the users of public space – city council, residents, tourists and businesses. City logistics is supposed to provide better service and greater safety, with lower costs and smaller impact on the environment. City councils strive to provide greater safety and reduce the pollution, residents and tourists want a safe and friendly life space, the business sphere aims at obtaining profit and retaining good reputation.

### **1. Making urban freight logistics more sustainable – historical towns of the world examples**

Historical towns have different ways of dealing with the organization of distribution processes – Gotheborg and Tel Aviv use solutions called Freight quality partnership. Regular meetings of workgroups made up of representatives of all the public space users allow for all the parties to realize the needs of others, which helps to come up with conciliatory solutions. In Barcelona and New York time access restrictions have been introduced. These measures impose restrictions on the times when freight activity can take place. The intent is to reduce freight traffic during peak hours in historical urban areas.

In London and Bilbao there are parking restrictions. The main types of parking regulation measures are: loading and parking restrictions, vehicle parking reservation systems, timesharing of parking spaces, loading/unloading areas. Another idea is to implement environmental restrictions, like in London, Gotheborg, Oslo, Berlin, Mediolan, Stockholm. These kinds of measures are aimed at preserving the liveability of city centers by trying to reduce the negative externalities produced by freight vehicles, both in terms of emissions and noise. The most popular measures are: emission standard and engine related restrictions, low/zero emission zones. Most historical cities in Europe have implemented size or load access restrictions. There are restrictions that prevent vehicles of a certain weight or size from using a particular area. Interesting examples have been implemented in Madrid where companies that use electric vehicles for deliveries are subsidized, and in Genova where tradeable permits and mobility credits have been implemented (Stefanelli, 2016).

## **2. The Old Town in Gdańsk – overview of the current situation**

The Old Town is the main tourist attraction of Gdańsk so the space has to be functional. This is an area with dozens of eating places and each of these receives deliveries on a daily basis. Increased congestion means limited access for all users and the historical character limits the transport possibilities. Because the city receives economical and image profits due to the attractiveness of the region, it cannot allow itself for decreased functionality of the area. According to a research prepared by Deloitte and Targeo, in 2015 an average inhabitant incurred a cost of 5 hours per month due to congestion, which was 2.223 PLN nominally.

The author of this article conducted two research studies in the Old Town. The first one was under the auspices of the President of Gdańsk and took place at the turn of 2012 and 2013. The research consisted in directly contacting the tenants in Old Town as well as suppliers to that area. After collecting the results, it turned out that in all the examined companies there was an organizational chaos, there was no person responsible for deliveries and the deliveries were cumulated in peak hours. As far as the suppliers were concerned, the Old Town was not their final destination, but only one of the points on their everyday route which resulted in their being usually late and in constant hurry. They would park in random places, also those prohibited ones. Despite all that, nobody was willing to introduce any changes. This can be attributed to a specific kind of mentality and lack of awareness regarding the importance of logistic activities when it comes to functioning, comfort and the income of the examined entities.

In July 2013 during a meeting organized by the President of Gdańsk, with the participation of the representatives of the Road Authorities, Urban and Architecture Department and Municipal Police, the author presented the results of the research studies. 6 months later, in February 2014, the Restricted Access Area was established in the area of Old Town (Figure1).



Figure 1. Restricted Access Area

Source: (Naskręt, 2014)

The regulation read as follows: “In connection with the approved project of traffic organization in the Old Town which introduces traffic ban in places marked with the B-1 sign »no traffic in both directions« and refers to streets between the following streets: Ogarna, Podgarbary, Wełniarska, Teatralna, Latarniana, Szeroka, Old Motława river (excluding Ogarna, Szeroka and Teatralna streets), and also in connection with the fact that the traffic ban does not apply to vehicles with the Old Town Identifier, taxis, public buses, bikes, official police cars, Municipal Police official cars, ambulances, hotel guests (with a printed valid booking), vehicles with the R Identifier, owners of valid Municipal Police subscriptions, Regulations are introduced regarding the issuing and using of Old Town Identifiers which entitle their owners to enter the Restricted Access Area in the Old Town, which constitutes Appendix no 1 of this regulation”. In the aforementioned Appendix we can find information that the Identifier is issued by the Director of the Road Authorities in Gdańsk for a period defined in the identifier. It can be issued for vehicles of: residents, owners of place, tenants, cultural and educational institutions, health services with their seat in the Old Town (official cars only), municipal services, performing municipal services, press, radio and television (official cars only), supply vehicles from 1st May to 30th September from 10 p.m. to 11 a.m., from 1st October to 30th April from 5 p.m. to 11 a.m, courier and post companies, other entities for which access is indispensable and will be substantiated properly. Identifiers for the above mentioned entities are issued for vehicles with permissible gross weight of up to 3.5 tons.

At the turn of 2014 and 2015 the research was repeated and no changes were observed, which means that the President's regulation was completely ignored. Delivery vehicles entered the zone during day and in peak hours at times when the regulation prohibits them to do so. Moreover, the municipal services did not execute the regulation in any way.

### 3. Optimising the distribution processes in Gdańsk

The tangible shift of delivery hours would allow to avoid increased traffic in peak hours and would facilitate the unloading and loading processes. If the suppliers were forced to obey the law, this would require reorganization of the delivery process. It seems reasonable that while making a regulation the City Council should help the suppliers in solving the problem and adjusting to new solutions, which would be beneficial for all the space users. According to the Author, consolidation of deliveries to the Old Town in a dedicated logistic centre and synchronized management of the deliveries is a tangible solution to implement. The point being to replace a few or a dozen of delivery vehicles going to one recipient (each with freight from a different supplier) with one delivery car. The freight is preped in the logistic centre located in the city, but out of the city centre. Figure 2 presents the scheme of Urban Consolidation Center functioning.

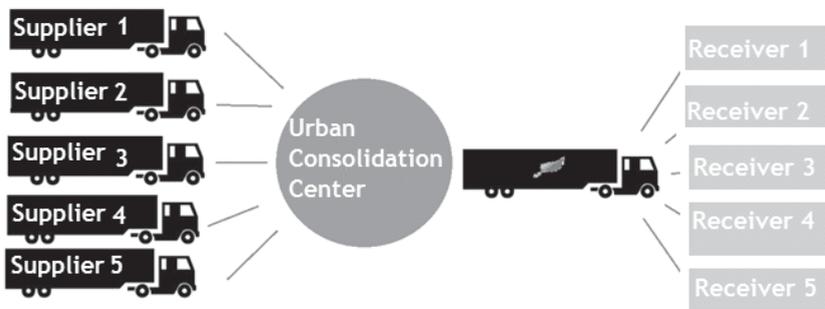


Figure 2. Urban Consolidation Center, UCC  
Source: (own illustration)

In a document *Strategy of Transport and Mobility of the Metropolitan Area Gdańsk – Gdynia – Sopot until 2030*, created by the association of the 3 cities' councils, the possibility to create such a center has been taken into consideration. It shows the councils' awareness of state-of-the-art urban logistics solutions, as well as the awareness of the necessity to take such actions. Location of such a center should be characterized by two types of access: external – referring to access for suppliers who most frequently use trucks with high load capacity, and internal – referring to easy reaching the destination from the consolidation center. It has been assumed that the consolidation center should be located approximately within 15 km from the serviced area, with the maximum use of the highest category roads. The strategy

enumerates four possible locations of the Urban Consolidation Center, one of them being Pomeranian Logistic Center (PLC) at the back of the Deepwater Container Terminal in Gdańsk (Figure 3 and 4).

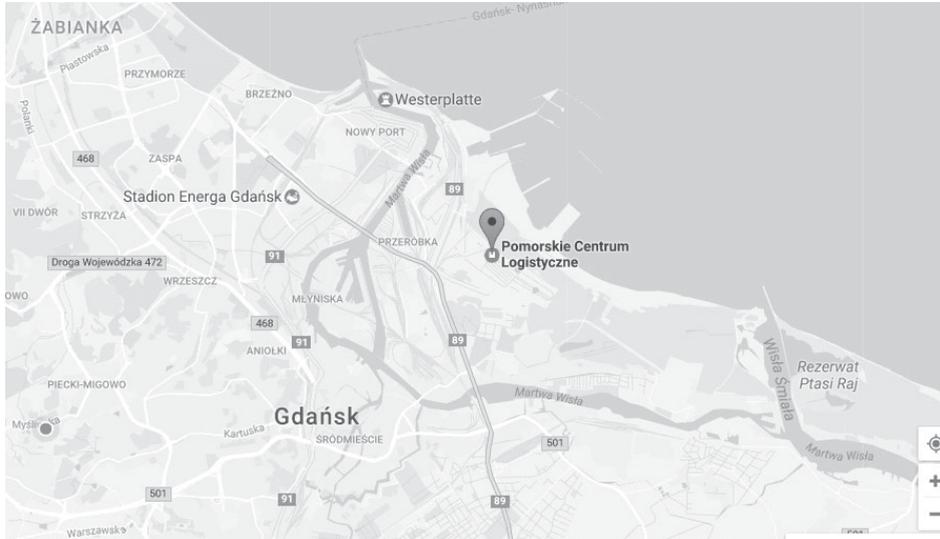


Figure 3. Pomeranian Logistic Center location  
Source: (Google Maps)



Figure 4. DCT and Pomeranian Logistic Center – visualisation  
Source: (Kosior, 2015)

To picture the profitability of the enterprise, some simplified assumptions have been made. In the Old Town there are around 100 eating places (restaurants, cafes, pubs, confectioneries) and groceries. Each of these points receives deliveries independently, a couple of times each week.

If we assume that restaurant A receives 2 load units 3 times a week, from a warehouse in Pruszcz Gdański located 18 km away and that the transport rate for

1 kilometer is 6.5 PLN, then the weekly cost of deliveries is 351 PLN and the monthly cost is 1404 PLN. If we additionally assume that shop B receives 3 load units 3 times a week from a warehouse in Żukowo, located 22 km away from the Old Town, and the transport rate for 1 kilometer is 6.5 PLN, then the weekly cost of deliveries is 429 PLN and the monthly cost is 1716 PLN.

If the UCC was located in PLC, then the distance from PLC to the Old Town would be 8 km. With an average rate of 6.5 PLN per km, the cost of one transport would be 52 PLN. Assuming that every day in the early hours (before peak hours) and late in the evening (after peak hours) 2 full load trucks would enter the area, the receivers would incur a cost of 208 PLN per day. However, that cost would be divided among all 100 tenants so each of them would pay 2.08 PLN. On a monthly basis that would be 62.4 PLN per tenant. This amount needs to be increased by the cost of maintaining the warehouse in PLC. According to the average for cities, which is 18 PLN/m<sup>2</sup>, that would make 9000 PLN a month, even if the warehouse was 500 m<sup>2</sup>. However, this amount should also be divided among 100 users, so each of them would incur a monthly cost of 90 PLN. If we add the cost of the delivery from UCC to the Old Town to the cost of the warehouse maintenance, we will receive a monthly cost of 152.4 PLN per tenant.

However, it must be taken into consideration that each of the companies would have to make sure that they have a stock of products necessary each week, so a cost of deliveries from warehouses to PLC should be added. In case of company A with warehouse in Pruszcz, 4 deliveries a month with a fully loaded truck would cost 468 PLN, and company B would pay 780 PLN for 4 deliveries a month from Żukowo.

Transports from warehouses of the companies to UCC in PLC: Company A would then incur a total monthly cost of maintaining the warehouse in PLC of 620.4 PLN (468 + 152.4), and company B 932.4 PLN (780 + 152.4). This would give savings of 56% in case of company A (initial 1404 PLN–620.4 PLN) and 45% of savings in case of company B (initial 1716 PLN–932.4 PLN).

Of course the calculation is not perfect, because the vehicles hired for PLC would also have to make their way back. That is why the calculation is based on an inflated spedition rate of 6.5 PLN per 1 km. Whereas in case of dedicated transport the real amount of petrol used would be taken into account. It is also a simplification to assume a certain and fixed number of deliveries from the warehouses of particular companies to PLC, however there is no denying the fact that in each case using the UCC would be profitable. European experience shows that the savings range from 30% to 80%.

In case of undertaking the enterprise, load capacity of the delivery vehicles should be taken into consideration. These granted access to the Restricted Access Area (3.5 t) have an approximate load capacity of 1.3 tons. One of the most popular delivery vans – Peugeot Boxer L3H2, has a 3.7 m length, 1.93 m height and 1.82 m width of freight space (1.42 m between wheels housing). Such a vehicle has a capacity from 7.5 to 14 m<sup>3</sup>. Let us assume an average of 10 m<sup>3</sup>. The average storage standard for a warehouse is 360 kg/m<sup>2</sup>, although in case of the data provided by the PLC administrator it is 5 t/m<sup>2</sup>. In case of 500 m<sup>2</sup> it would be 2500 tons. Height of the warehouse is 10 m, so the capacity of the warehouse is 5000 m<sup>3</sup>.

If once a week each of the 100 tenants delivered a fully loaded vehicle of 10 m<sup>3</sup> capacity, on a monthly basis that would amount to 4000 m<sup>3</sup> (400 × 10 m<sup>3</sup>). Thus, excluding rotation, the freight from all the entities would get into the warehouse. If we calculate the weight, 400 × 1.3 tons will amount to 600 tons. Thus, excluding daily rotation, the warehouse in PLC would allow for such a weight.

These economical advantages are indispensable to convince the entrepreneurs to change their concept of distribution. However, for the city council and the society, the environmental and social advantages are of greatest importance. Due to lack of unified emission calculator, many transport and logistics companies establish their own emission calculators based on the transport network and take into consideration CO<sub>2</sub> emission per package, both during transport and loading. However, what is also important is the decrease of external costs, not only the emission of harmful substances, but also decrease in the number of accidents, increased safety and decreased noise. In European countries in which urban consolidation centres are common, they are usually serviced by electric cars. In Poland however, due to the fact that we mainly obtain energy from carbon, this idea has no justification.

## Conclusions

To sum up, Poland is one of the few countries in Europe, in which the issue of rational and optimal freight distribution is underappreciated. Deliveries in Gdańsk are not managed effectively and the regulations aiming at their organization are not obeyed. Locating a universal consolidation and distribution center in the close vicinity of Old Town which would be based on the assumption of “cooperation on the road, competition on the shelf”, would bring tangible economic profits to the entrepreneurs, as well as social and environmental benefits to the city and all the space users. Creating the urban consolidation center is a way to optimize the distribution processes.

Deliveries will take place in particular hours, so the freight is going to be delivered on time. The city will get rid of a significant number of vehicles, especially the delivery ones – heavier, emitting harmful substances to the atmosphere, which have a detrimental effect on the historical buildings. It will also contribute to a higher comfort of living of the residents who will move around in safer space and breathe fresher air. This will also encourage a large number of tourists to visit Gdańsk. Entrepreneurs will be able to manage their businesses more effectively thanks to timely deliveries, they will improve stock planning which in turn will allow for savings. Getting extra time also translates into tangible profits. All that will bring advantages to the city council which will manage a revitalised city, at the same time a city that is safer and less congested with cars. The air in Gdańsk is going to be fresher and the receipts to the city budget are going to be higher.

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