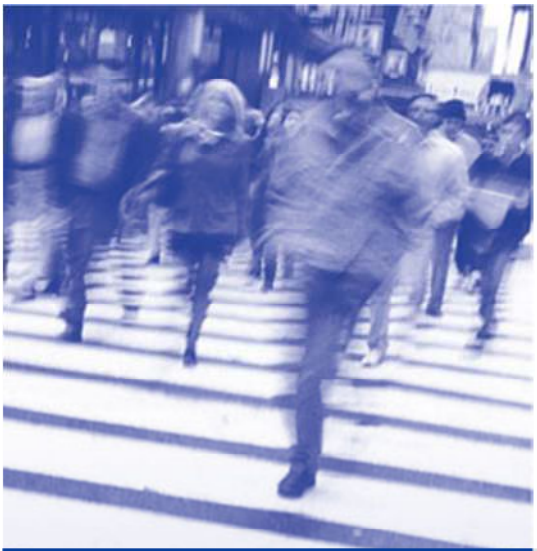

CIVITAS
Cleaner and better transport in cities

ÚSTÍ NAD LABEM

T67.1 Noise Reduction in Ústí nad Labem

March 12

THE CIVITAS INITIATIVE
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1 Introduction

1.1 Background CIVITAS

CIVITAS - cleaner and better transport in cities - stands for CIty-VITAlity-Sustainability. With the CIVITAS Initiative, the EC aims to generate a decisive breakthrough by supporting and evaluating the implementation of ambitious integrated sustainable urban transport strategies that should make a real difference for the welfare of the European citizen.

CIVITAS I started in early 2002 (within the 5th Framework Research Programme);
CIVITAS II started in early 2005 (within the 6th Framework Research Programme) and
CIVITAS PLUS started in late 2008 (within the 7th Framework Research Programme).

The objective of CIVITAS-Plus is to test and increase the understanding of the frameworks, processes and packaging required to successfully introduce bold, integrated and innovative strategies for clean and sustainable urban transport that address concerns related to energy-efficiency, transport policy and road safety, alternative fuels and the environment.

Within CIVITAS I (2002-2006) there were 19 cities clustered in 4 demonstration projects, within CIVITAS II (2005-2009) 17 cities in 4 demonstration projects, whilst within CIVITAS PLUS (2008-2012) 25 cities in 5 demonstration projects are taking part. These demonstration cities all over Europe are funded by the European Commission.

Objectives:

- to promote and implement sustainable, clean and (energy) efficient urban transport measures
- to implement integrated packages of technology and policy measures in the field of energy and transport in 8 categories of measures
- to build up critical mass and markets for innovation

Horizontal projects support the CIVITAS demonstration projects & cities by:

- Cross-site evaluation and Europe wide dissemination in co-operation with the demonstration projects
- The organisation of the annual meeting of CIVITAS Forum members
- Providing the Secretariat for the Political Advisory Committee (PAC)
- Development of policy recommendations for a long-term multiplier effect of CIVITAS

Key elements of CIVITAS:

- CIVITAS is coordinated by cities: it is a programme “of cities for cities”
- Cities are in the heart of local public private partnerships
- Political commitment is a basic requirement
- Cities are living ‘Laboratories' for learning and evaluating

1.2 Background ARCHIMEDES

ARCHIMEDES is an integrating project, bringing together 6 European cities to address problems and opportunities for creating environmentally sustainable, safe and energy efficient transport systems in medium sized urban areas.

The objective of ARCHIMEDES is to introduce innovative, integrated and ambitious strategies for clean, energy-efficient, sustainable urban transport to achieve significant impacts in the policy fields of energy, transport, and environmental sustainability. An ambitious blend of policy tools and measures will increase energy-efficiency in transport, provide safer and more convenient travel for all, using a higher share of clean engine technology and fuels, resulting in an enhanced urban environment (including reduced noise and air pollution). Visible and measurable impacts will result from significantly sized measures in specific innovation areas. Demonstrations of innovative transport technologies, policy measures and partnership working, combined with targeted research, will verify the best frameworks, processes and packaging required to successfully transfer the strategies to other cities.

1.3 Participant Cities

The ARCHIMEDES project focuses on activities in specific innovation areas of each city, known as the ARCHIMEDES corridor or zone (depending on shape and geography). These innovation areas extend to the peri-urban fringe and the administrative boundaries of regional authorities and neighbouring administrations.

The two Learning cities, to which experience and best-practice will be transferred, are Monza (Italy) and Ústí nad Labem (Czech Republic). The strategy for the project is to ensure that the tools and measures developed have the widest application throughout Europe, tested via the Learning Cities' activities and interaction with the Lead City partners.

1.3.1 Leading City Innovation Areas

The four Leading cities in the ARCHIMEDES project are:

- Aalborg (Denmark);
- Brighton & Hove (UK);
- Donostia-San Sebastián (Spain); and
- Iasi (Romania).

Together the Lead Cities in ARCHIMEDES cover different geographic parts of Europe. They have the full support of the relevant political representatives for the project, and are well able to implement the innovative range of demonstration activities.

The Lead Cities are joined in their local projects by a small number of key partners that show a high level of commitment to the project objectives of energy-efficient urban transportation. In all cases the public transport company features as a partner in the proposed project.

2 Ústí nad Labem

Ústí nad Labem is situated in the north of the Czech Republic, about 20 km from the German border. Thanks to its location in the beautiful valley of the largest Czech river Labe (Elbe) and the surrounding Central Bohemian Massive, it is sometimes called 'the Gateway to Bohemia'. Ústí is an industrial, business and cultural centre of the Ústí region.

Ústí nad Labem is an important industrial centre of north-west Bohemia. The city's population is 93859 living in an area of 93.95 km^2. The city is also home to the Jan Evangelista Purkyně University with eight faculties and large student population. The city used to be a base for a large range of heavy industry, causing damage to the natural environment. This is now a major focus for improvement and care.

The Transport Master Plan, initiated in 2007, will be the basic transport document for the development of a new urban plan in 2011. This document will characterise the development of transport in the city for the next 15 years. Therefore, the opportunity to integrate Sustainable Urban Transport Planning best practices into the Master Plan of Ústí nad Labem within the project represents an ideal match between city policy framework and the ARCHIMEDES project.

The project's main objective is to propose transport organisation of the city, depending on the urban form, transport intensity, development of public transport, and access needs.

3 Background to the Deliverable

In general, studies show that noise is currently one of the most important sources of harmful impacts on human lives, negatively influencing health of inhabitants living in cities. The amount of population of EU countries exposed to harmful noise load in the year 2000 was estimated to 100 million people. The predominant source of noise is undoubtedly motor transport, reaching approximately 60% of exposure (source: Environmental Legal Service).

The negative effect on human health is evident from both medical and statistical analysis. Initially, hearing serves as a warning system. Organism reacts to noise by alarming variety of mechanisms, such as:

- Increasing blood pressure
- Accelerating pulse
- Contracting peripheral blood vessels
- Increasing level of adrenaline
- Losing magnesium

Noise has a significant effect on the psyche of individuals and may cause fatigue, depression, resentment, aggression, reluctance, memory impairment, loss of attention and overall reduction in performance. Long-term exposure to excessive noise causes hypertension (high blood pressure), heart damage including increased risk of heart attacks, reduction of immunity of the organism, chronic fatigue and insomnia. It was shown that occurrence of civilization diseases directly increases with noisy environment. Furthermore, noise during sleep reduces its quality and depth. In the long term, it is reflected by the above-mentioned permanent fatigue.

Another obvious effect of noise is damage of hearing caused either by short-term exposure to noise exceeding 130dB (comparable to the noise of a departing plane) or by frequent exposure to noise beyond 85dB (e.g. very loud music). However, damage to hearing can be also caused by long-term exposure to noise around the 70dB level, which is the standard noise level at main city roads. Nowadays, the main cause of hearing loss is identified to be noise instead of ageing. Damage to hearing is in most cases irreversible.

Noise intensity is measured in decibels (dB). The decibel is a logarithmic unit so that an increase in noise level of 3dB of means a doubling the volume of noise, an increase by 10dB of noise means 10 times more noise and an increase by 20dB means 100 times more noise etc. Therefore, difference between 20dB and 40dB is much smaller than difference between 60dB and 80dB. To put this another way, if the noise level exceeds the legal limit by only a few decibels, numerically it may seem like only a small deviation but it in reality it is a large effect.

3.1 Summary Description of the Task

Ústí nad Labem elaborated a study to identify noise burden in the city as part of CIVITAS ARCHIMEDES task 11.2.3, Noise Reduction, which is documented in Deliverable R28.1. Based on the results, the city identified tools suitable for reducing noise from traffic on local roads by means of traffic planning and traffic management, construction and technical solutions. In accordance with traffic reduction proposals, a plan for efficient distribution of goods in the city was designed. The results of the studies will be implemented into the SUTP for Ústí nad Labem.

4 Noise Reduction in Ústí nad Labem

There are several tools, which can help to reduce noise levels caused by local traffic, such as:

Greenery - If there is enough space available, implementation of greenery is an effective tool for noise reduction. A three metre wide green belt can reduce noise by a quarter and, at the same time, it increases the aesthetic level of the environment. Optimally, the greenery should consist of a complex of wildly growing trees and bushes with grass cover. It is recommended, in order to reach the full calming effect, to implement at least 20m of a continuous green belt. Smaller size has a psychological effect rather than actually reducing the noise level.

Soundproofing walls – Such walls can be implemented only on roads with sufficient available space. They must be designed not only to reflect noise, but also to absorb it, and they must fit into the surroundings. Soundproofing walls are in the first place considered as barriers and thus must be installed sensitively.

Speed reduction – Appropriateness of implementing speed reducing measures must be assessed by experts for each location individually. If drivers are forced to slow down and switch to a lower gear, speed reduction may actually lead to an increase in noise. In case of implementing this tool, it is essential to achieve speed reduction not only theoretically, but in practice. This objective can be reached by installing speed measuring radars, which would automatically record license plates of vehicles exceeding the speed limit.

Modifications of traffic organisation – Reducing a number of traffic lanes, narrowing roads, implementing speed retarders and other traffic calming measures in the city have positive effect on the noise level.

Replacement of road surface –Noise produced by road surface is determined by its structure and by tread pattern. Low-noise road surface can reduce noise originated at a road by between a half and three-quarters compared to the standard tarmac surface. Optimal noise reduction is achieved by using silent tyres on low-noise roads. Double-layered porous surface (which may be made from recycled tyres) can result in a reduction of 12 dB compared to the regular surface. Some countries such as Denmark, Germany, Netherlands or Japan, have implemented quieter road surfaces, which satisfies demands on costs, safety and durability. However, such noise reduction is applicable only on roads, where vehicles move faster than 50 km/h. At lower speeds noise from engines is predominant. Low-noise road surface is more expensive than regular road surface, but offers savings by avoiding installation of soundproofing walls and insulations of buildings and lowering the costs for health care of inhabitants suffering from diseases triggered by noise. Implementation of low-noise road surface is appropriate for all major roads in vicinity of buildings.

The following chapters present individual noise reducing measures divided into several categories which are under consideration for inclusion in ongoing policy developments for Usti.

4.1 Transport Planning

4.1.1 Road line and transverse profile

When designing the road line, protection from noise should be taken into account. It is necessary to situate roads in sufficient distance from residential buildings. By doubling the distance between a road and a building, noise is reduced by about 4dB. Additional noise reduction can be achieved by utilising the existing terrain, both natural obstacles and existing artificial barriers. When designing roads it is necessary to specify the noise burden of all variants and their requirements for noise protection. It is desirable to locate new sources of noise to the already existing ones and to implement noise reducing measures in a complex way to all those multiple sources together.

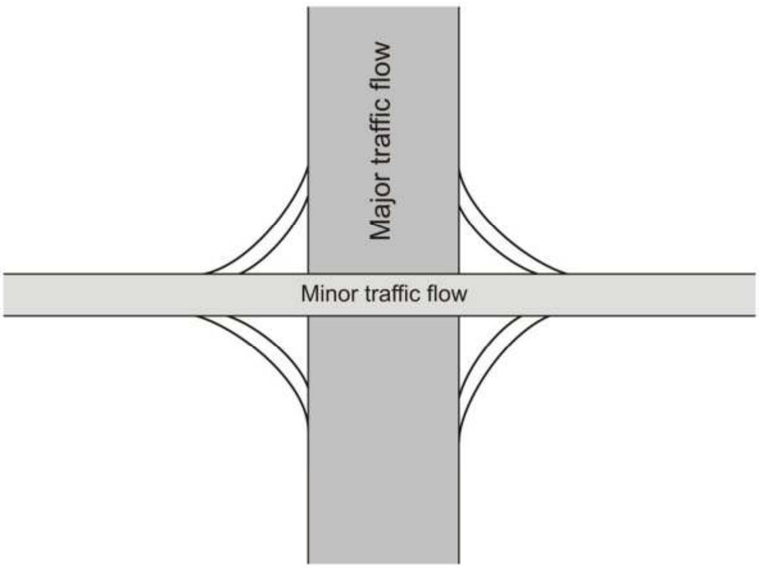
It is desirable to consider topography, height, distance from buildings, and other characteristics of the proposal in order to determine if the road line should be at ground level, below ground, or above it.

4.1.2 Intersections

Sudden and repeated increases in noise levels, caused primarily by braking and accelerating of vehicles, are extremely distracting. A road without intersections allows more fluent and less intrusive traffic, whereas intersections present additional burden.

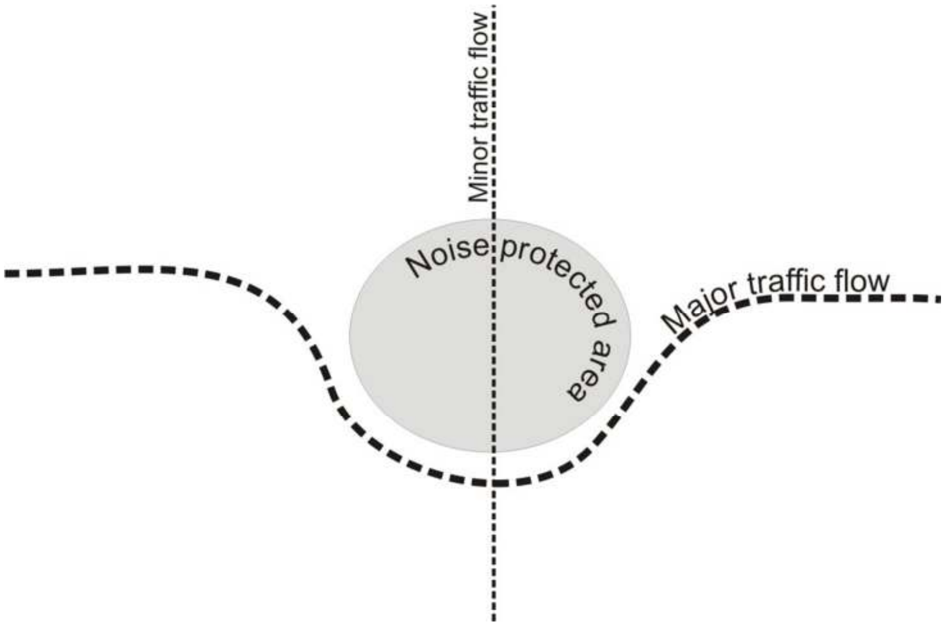
In case of multilevel intersections, it is necessary to verify where to lead the busiest traffic flow to cause the lowest possible burden. Additionally, the intersection should be constructed in such way, that low intensity traffic flows facilitate a noise barrier for the busy traffic flow.

Figure 1 – For multilevel intersections, it is necessary to verify, where the busiest traffic flow causes the lowest impact to the surroundings, and create possible noise barriers



Furthermore, low intensity traffic flow should lead through the area requiring noise protection in a shortest possible distance, while allowing the longer route to have sufficient capacity to cover the high intensity traffic flows (please, see Figure 2).

Figure 3 – Traffic flows in the area requiring noise protection



4.2 Construction Technical Measures for Roads and Buildings

4.2.1 Roads

Road surface

Road surface significantly contributes to the resulting noise burden. To minimise generation of noise during the contact of tyres with road surface, it is appropriate to:

- Decrease transverse lines and dilatations to limit sources of noise;
- Implement high quality, solid construction of the road to avoid variations, steps, waves or distortions;
- Locate utilities away from driving lanes or provide them with low-noise overpass where appropriate (e.g. on bridges).

Noise protection

Measures for noise protection include:

- Soundproofing walls or embankments;
- Location in depressions or on elevations (e.g. to increase the distance from housing);
- Partial or total coverage (i.e. tunnels).

These measures are relatively expensive, but they can be considered early on during the road design process.

4.2.2 Buildings

Measures suitable for protection of buildings against noise include:

- Closed development;
- Arrangement of buildings in parallel with roads;
- Acoustic limiting construction forms and ground plans of buildings – implement buildings with reduced reflectivity of noise;
- Noise protection on buildings – soundproofing windows, insulation.

New buildings are already implemented with regard to noise protection, the issue occurs primarily in the case of old buildings.

4.3 Traffic Management Measures

4.3.1 Speed reduction

Speed reduction is a simple low-cost measure, although it is feasible only for free-flowing traffic without frequent or permanent congestion, where driving speed exceeds 30 km/h for passenger vehicles or 50 km/h for freight vehicles. For speeds under 30 km/h for passenger vehicles and 50 km/h for freight vehicles, the noise of engines is predominant over the noise of tyres. Aerodynamic noise continuously increases with speed.

The recommended measure is:

- Speed reduction on roads near buildings (in particular, where the speed limit is high).

4.3.2 Increasing fluency of traffic, harmonisation of traffic flow

This measure is feasible mainly if there are configurable hardware resources available; otherwise, it is rather costly. Suitability of its implementation should be examined individually for each locality. It includes implementation of:

- Telematic systems;
- Green wave (to limit braking and accelerating);
- Permanent red phase with immediate insertion of the green signal (for low traffic intensities);

- Permanent green phase in the main direction, red phase on request from the other directions (for low traffic intensities in other directions)

4.3.3 Restrictive measures

This effective low-cost measure can be applied only with regard to preserving functions of the relevant locality.

Restrictive measures are:

- Restricting or prohibiting entry (within the defined time, for specific vehicles or users)
- Establishing residential or ecological zones;
- Prohibiting entry for freight transport (significantly reduces noise, however, operation of public transport limits its effects).

4.3.4 Limiting/changing transport demand

This is a complex long-term measure, which should be part of the long-term transport policy of the city.

➢ Changing the modal split in favour of non-motorized transport:

  - Promotion of public transport – convenient price, comfort, speed, PT priority at intersections;
  - Support for soft mobility - pedestrians, cyclists (construction of safe and attractive walking and cycling infrastructure).

➢ Charging entrance to the city centre – results in a lower traffic intensity and lower noise emissions;

➢ Appropriately situating parking premises (to avoid manoeuvring of vehicles);

4.4 Vehicle fleet

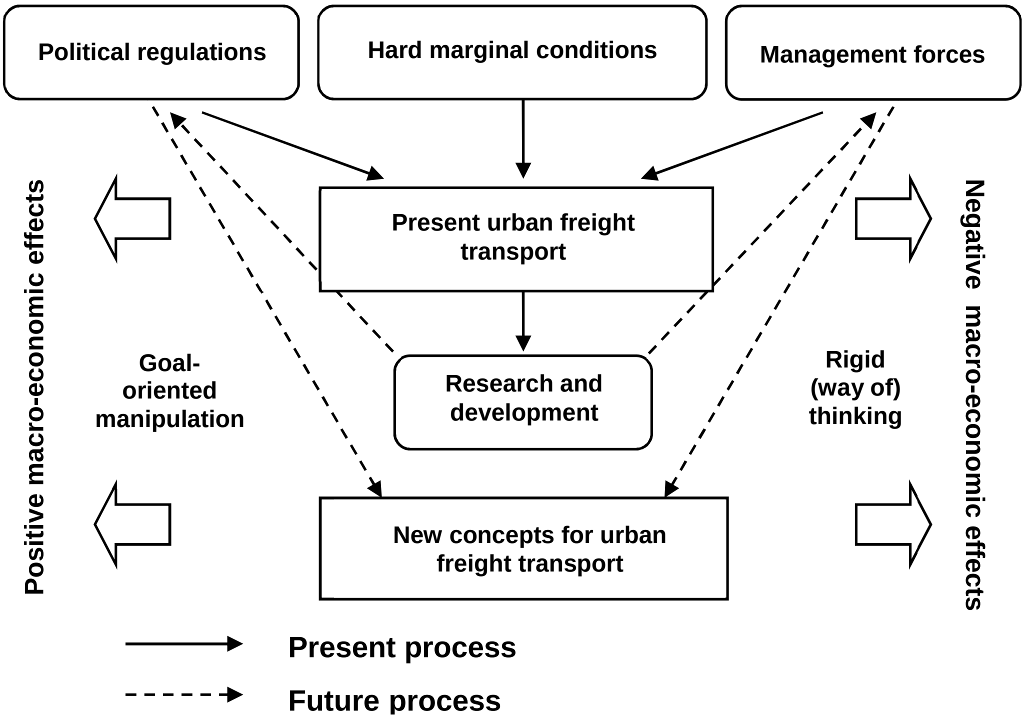
It is desirable to:

- Renew the vehicle fleet - older vehicles emit more noise;
- Introduce limits for tyre noise – tyres have relatively low durability, therefore, it can bring a relatively quick effect;
- Utilise alternative energy - hybrid or electric engines can significantly reduce noise emissions.

5 Efficient Goods Distribution in Ústí nad Labem

This chapter is based on results of European research projects dealing with issues of urban freight transport. The primarily information source is the document Urban and Freight Transport and City Logistics published on the website www.eu-portal.net.

Figure 4: Research in the field of urban freight transport



Due to large population density in urban areas and limited resources (in terms of infrastructure, environment, etc.), urban freight transport is confronted with many difficulties. Possibilities of transport infrastructure development are limited by lack of available space. Underground structures are very expensive and they are feasible only in a few cases. Furthermore, share of freight transport according to its energy consumption and pollution is higher its share of total veh/km. Another impact on the environment is noise produced by freight transport in urban areas.

5.1 Need for urban freight transport

Despite the issues described above, benefits for society resulting from restricting freight transport in urban centres are controversial. For businesses to flourish in urban areas, it is important to guarantee free and low-cost goods distribution. In comparison with out of town shopping centres, urban centres may be at a disadvantage if goods supply is too expensive. It should be considered, that one lorry delivering goods to a shop in a residential area causes less problems than 100 private cars carrying the same amount of goods from a shopping centre outside the area.

Urban freight transport is aimed primarily at goods distribution at the end of the transport chain. Currently, many deliveries in the city are relatively small consignments, which require numerous trips. But even these small deliveries are frequently made by large freight goods vehicles, travelling on important routes through the city.

It is necessary to integrate urban freight transport into the transport chain while preserving balance between requirements of urban freight transport and other components of the transport chain (satisfy needs of end users, ensure efficient transportation, comply with local infrastructure conditions, respect needs of other road users and functioning of the city). Unfortunately, the current transport arrangement take into account needs of long distance transport more than the element in the city.

It is not often possible to reconcile optimisation of traffic flow in urban centres with interests of all participating partners, who follow their own, individual goals that do not always comply with goals of the overall optimisation. Because of this, attempts to establish goods distribution centres have not been successful in most cases.

The current situation is rather suitable for establishing freight transport centres, which would concentrate businesses with intensive freight transport to well-connected industrial areas. These freight transport centres could be provided with equipment for combined transport, such as terminals with facilities.

5.2 Goods Flows and Freight Transport

5.2.1 Single step system

The goods flow between the supply point (origin) and reception point (destination) is **direct**. This system benefits from the fact that the goods flow between its origin and destination is uninterrupted. Therefore, the system does not require any additional storage or movement procedures.

Figure 5: Single step system with direct goods flow

5.2.2 Multiple steps system

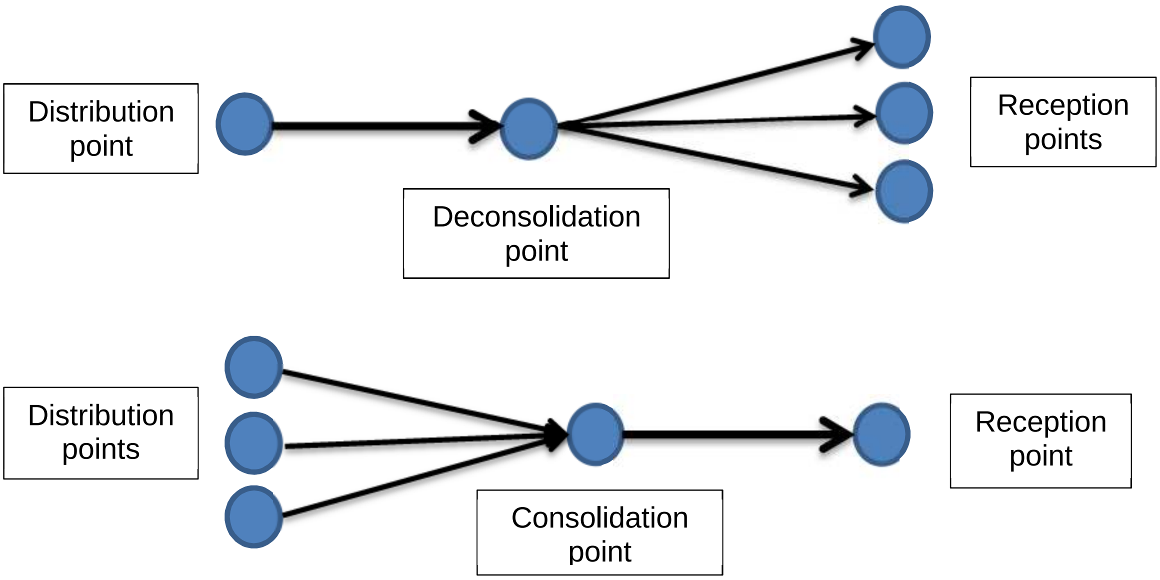
For the system of multiple steps, the goods flow between the point of supply and reception is **indirect**. The goods flow is at least once interrupted. At this point, additional procedures of distribution and consolidation are required.

This includes:

- **Distribution**: delivery of goods from traditional source (e.g. factory)
- **Consolidation**: several small deliveries are united into larger groups for onward delivery

- **Deconsolidation**: reduction of transported units (due to limited consumer demand)
- **Reception**: destination of delivery (e.g. local store)

Figure 6: Multiple steps systems with indirect goods flow

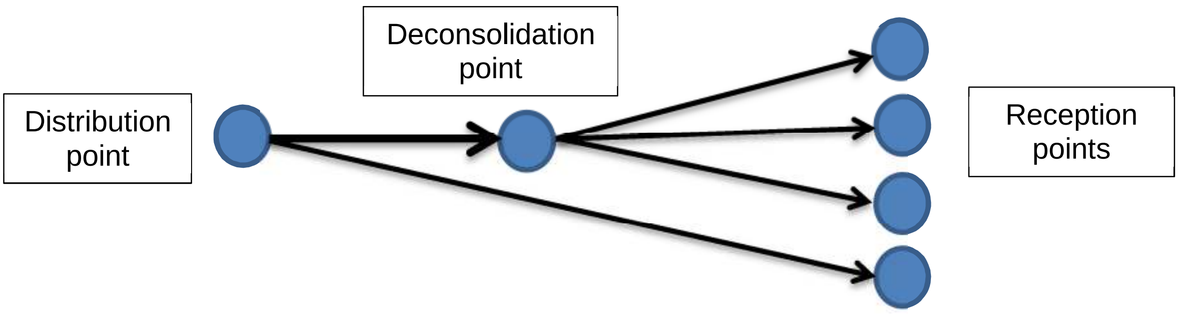


5.2.3 Combined system

For the combined system, simultaneous direct and indirect goods flows are possible.

The goods flow can be, in long distances, too slow to cover needs of reception points. Distribution points have the character of regional warehouses. The combined system is also recommended due to the fact, that economy of goods flow generally depends directly on the volume.

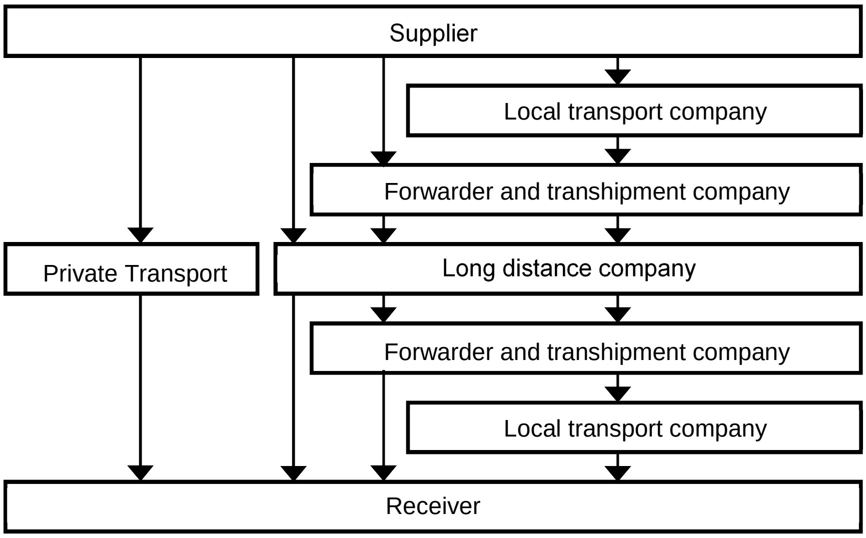
Figure 7: Combined system with direct and indirect goods flow



5.2.4 Transport process

This solution consists of establishing a **transport chain**. For freight transport, this is defined as sequence of technical and organisational interconnected events, by which goods are moved from an origin (supplier) to a destination (receiver). The transport chain is part of the goods flow and refers only to the logistical function of transport.

Figure 8: Organisational structure of a transport chain



There are two basic processes of a transport chain in freight transport:

- direct "door to door transport" with unique loading and unloading facilities
- indirect "node to node transport" with consolidation and distribution of small deliveries (cargo) at nodes, and in between transport of larger cargo units (wagon load consignment). The nodes are rationally used for further logistical tasks, such as warehousing and deconsolidation.

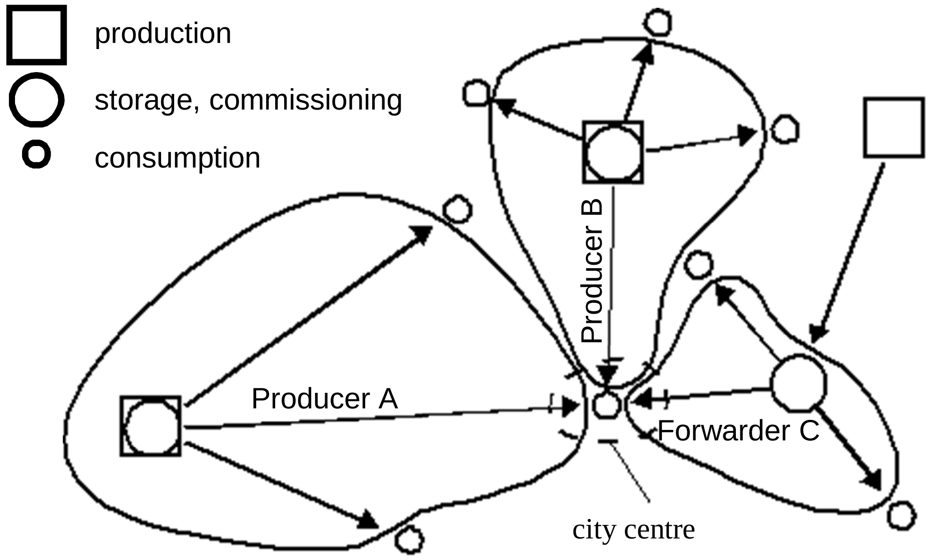
Transport chains can be built up as single step or multiple step processes with multidimensional functions. In the single-step transport chain, only a means of transport is needed between the supplier and the receiver (uninterrupted direct transport). In the multiple step transport chain, change of transport means (intermodal transport) is required between supply and reception points (interrupted combined transport).

5.3 Freight Transport in Urban Areas

5.3.1 Receivers without specific delivery logistics

Approximately 25% of receivers in European cities do not operate any organised logistical system. They receive their goods either directly from manufacturers or through of a distribution company. This leads to a greater number of suppliers providing goods to individual receivers, which, consequently, causes many trips of vehicles that are not fully loaded.

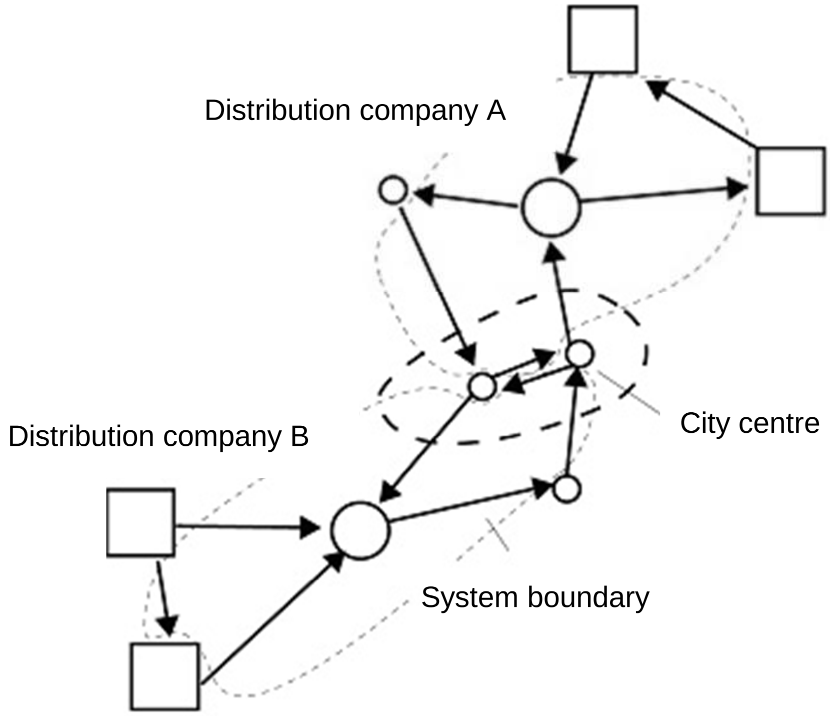
Figure 9: Transport system of receivers without coordinated logistics



5.3.2 Receivers with delivery logistics coordinated by a distribution company

The traffic flow generated by receivers without specific delivery logistics are mostly more clustered as described in the chapter above. Distribution companies often supply more receivers in the city centre with various goods (generally small parcels). Therefore, they optimise their delivery route through the city centre, which results in desired clustering of distribution traffic and decrease of performed trips.

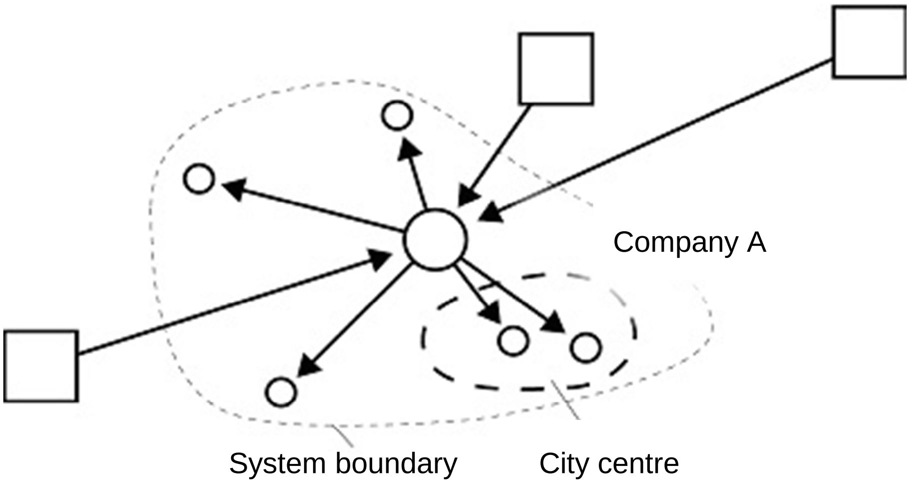
Figure 10: Receivers with coordinated logistics



5.3.3 Receivers with self-coordinated delivery logistics

Companies organising their own logistics constitute currently approximately three-quarters of receivers in European cities. These are generally retail chain stores, such as grocers and department stores. While these companies usually have more delivery points, they have their goods delivered to a central warehouse. They can thus order their goods in larger quantities and negotiate more favourable conditions with their suppliers. In these distribution centres, goods are received, stored and organised into shipments for specific delivery points. Through direct contact between a receiver and a distribution centre, the necessary goods can be dispatched precisely, which eliminates the need for further storage facilities at the delivery point. Transport from a distribution centre to a receiver can be carried out either by the company itself or through a 3rd party distribution company. Receivers are then supplied only by their own deliveries.

Figure 11: Receivers with self-coordinated logistics

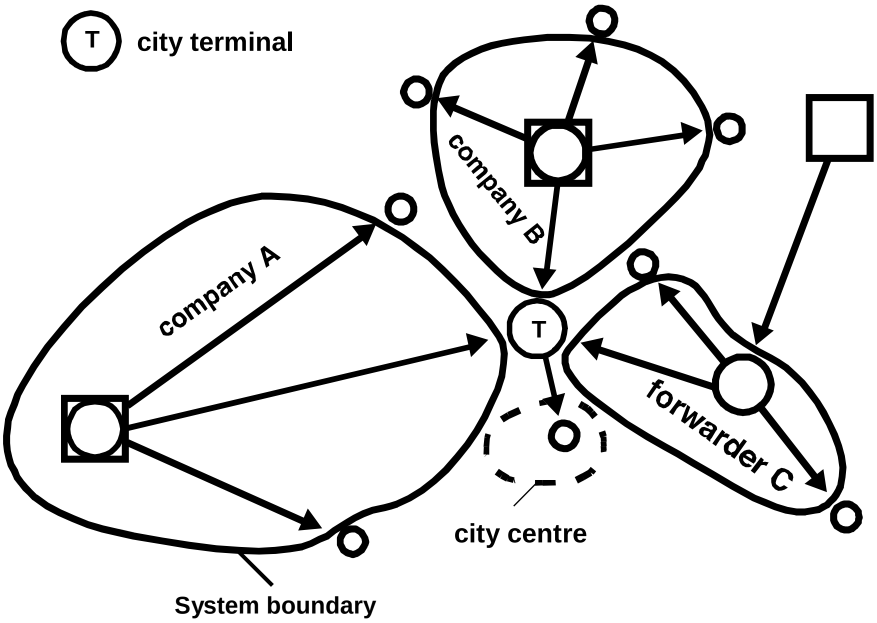


5.4 Possibilities for optimisation

5.4.1 Goods distribution centres

One way to reduce delivery vehicle numbers and achieve effective distribution is to collect delivery vehicles with a destination in the city centre at goods distribution centres (city terminals). Goods distribution centres would become a centre point of the transport chain.

Figure 12: Functioning of a goods distribution centre



It is generally foreseen that freight transport inside urban areas could be substantially reduced through goods distribution centres, which would replace receivers without co-ordinated logistics and with many trips in the city centre.

The aim of goods distribution centres is to connect all distribution companies in the region through global coordinated logistics, which requires cooperation among various interested parties. However, due to competitive relations, there is a lack of interest in cooperation. In practice, it has turned out that this system can be effectively implemented with significant positive results only in specific localities, for example automobile-free tourism locations (Braunwald, Wengen).

5.4.2 Freight villages (freight transport centres)

The issue of freight transport in urban areas does not include solely the issue of distribution in city centres itself. Goods distribution centres present a solution only for the initial part of the problem. Other difficulties include deconsolidation, warehousing, mid-length and long-distance transport, or transhipment. For this reason, a comprehensive solution for freight transport problems can be achieved by providing freight transport centres.

Freight villages (freight transport centres) are industrial zones with the best connections to the transport network, which have their registered enterprise established in freight transport and which ideally have equipment for transhipment between transport modes, i.e. distribution companies and logistics service providers.

Application of freight transport centres is based on synergies among established transport services. This enables optimal exploitation of infrastructure organisation and offering of general services cost-effectively.

The potential for savings is consequently in cost-saving transhipment at small terminals and direct delivery of goods within freight transport centres, where expensive road sections of the route are no longer necessary.

Figure 13: Operation of a freight village with transhipment services

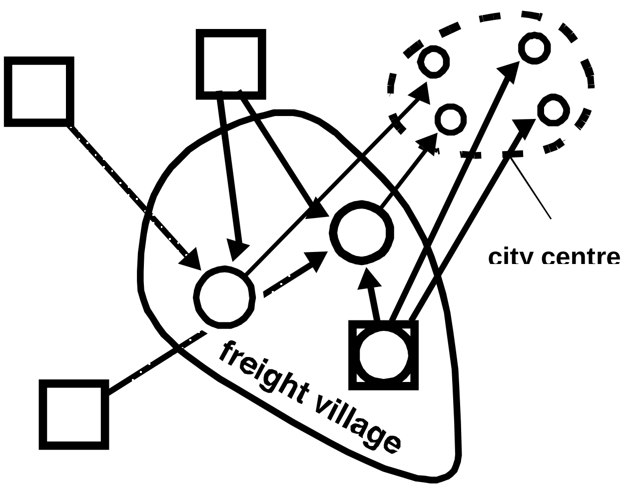


Figure 10 presents the structure of a freight village, which accommodates traffic intensive businesses like forwarders and distribution companies (circles). The goods supply from producers to freight villages is partially realised by rails.

5.5 Potential negative effects

Connecting different freight transport flows would lead to irregular distribution of adverse effects, such as pollution and congestion. This can be efficiently solved by soundproofing walls; however, it could lead to excessive concentration of emissions in urban areas. For this reason, it can be assumed that construction of freight villages will inflict negative attitude of affected population. Concentration of transport companies may also lead to overload of the road network and further congestion. This solution is suitable primarily for larger urban areas which generate enough freight traffic to justify the investment, with the freight village located away from residential areas.

6 Relationship to CIVITAS ARCHIMEDES Task 11.3.6

The subject of the task 11.3.6 (as documented in deliverable R28.1) was to analyse emission maps of road transport in Ústí nad Labem, and elaborate consequent model solutions for noise reduction, based on assessment of traffic load for individual variants modelled by the emission noise model. The work included evaluation of the efficiency of the proposed scenarios.

This section relates primarily to the two scenarios presented and analysed in deliverable R28.1 which appeared to show the greatest impact, namely:

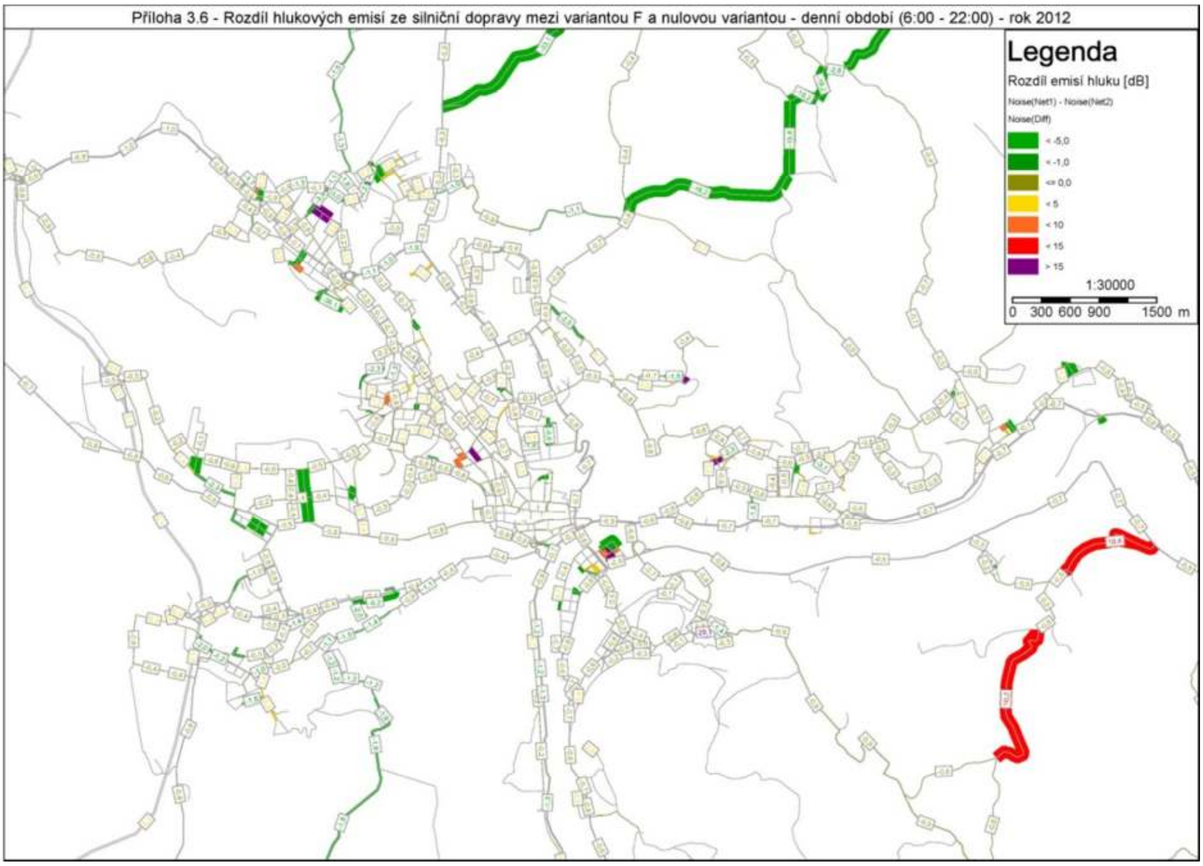
- Scenario F, which deals with uniform reduction in driving speed by 10% for all vehicles.
- Scenario G, which is considering hypothetical exclusion of freight vehicles of from the urban road network, and

6.1.1 Scenario F - Speed reduction by 10%

In the scenario F, noise emissions are reduced for most of the local roads, but only to a small extent (within 1 dB). Greater differences, both positive and negative, can be seen on the outskirts of the city or outside its territory on less congested roads, where the small absolute change of traffic intensity refers to large relative change in noise emissions. Reduction of permitted speed brings reduction in noise emission, but, at the same time, 10% decrease in speed is not sufficient to significantly reduce noise at least by 3dB.

However, speed reduction was applied generally to all roads in the territory of the city. In case of implementing speed reduction only at specific roads, traffic ought to be redirected to other roads more convenient for drivers in terms of speed and journey time, which could result in cumulative effect of emissions and thus noise reduction would be greater.

Figure 14: Difference in noise emissions between the Zero variant and the variant F, daytime period, year 2012



(for more details, please see the CIVTAS Archimedes task 11.3.6)

6.1.2 Scenario G – Total exclusion of goods vehicles over 3.5t

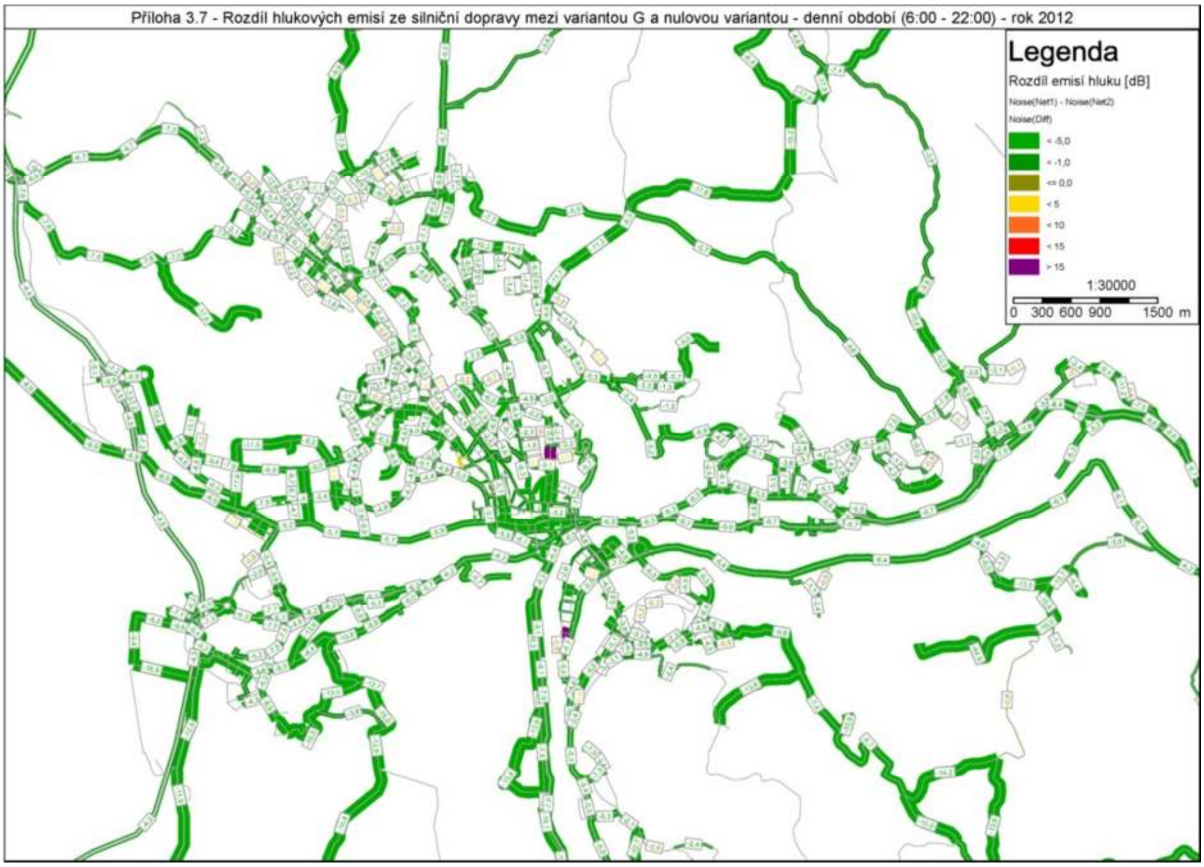
The scenario G hypothetically assumes excluding all freight vehicles with the weight above 3.5t. In practice, it would be extremely challenging and controversial to implement this solution in Ústí nad Labem, although there are other localities, which successfully implemented similar scheme, such as Zermatt in Switzerland.

For this variant, the matrix of vehicles above 3.5t has been excluded from calculations of the transport burden on individual roads. In fact, these vehicles would be in reality replaced by other vehicles up to 3.5t in order to secure supply and functions of the city.

Results of scenario G provide information on efficiency of this noise reducing measure for individual localities in the city, i.e. extent of noise emission for each specific road section. The model solution, thus, provide information on the reducing potential for individual roads. It revealed relatively significant contribution of freight transport to noise emissions, and what reduction of emissions would be achieved by its exclusion.

Decrease of noise emission is significant for the whole area and, on the vast majority of roads, it exceeds 5dB.

Figure 15: Difference in noise emission between the Zero variant and the variant G, daytime period, year 2012



(For more details, please see CIVITAS Archimedes Deliverable R28.1)

7 Implications for the City of Ústí nad Labem

It is not possible to realise absolute prohibition of entry for all freight vehicles to the city of Ústí nad Labem. The city is not primarily a touristic destination and its functioning is in the current state ensured by freight vehicles.

Restricting freight transport with its source of destination in the city is possible, but may be counterproductive:

- If the restricted city area remains attractive (i.e. economically viable for businesses), restricting freight transport would result in increase of personal vehicles substituting services of freight vehicles.
- If restrictions are not economically acceptable for businesses, demand for freight transport would be reduced but economic activities or the area would be terminated or shifted to other easily accessible locations. This may result in degradation of attractiveness of the area and gradual increase of journeys realised by personal vehicles for services and goods, which were relocated.

Therefore, it is necessary to seek a solution that will rationalise traffic in terms of optimising traffic load, minimising trips, implementing logistics arrangements, etc., which would at the same time maintain economic activities in the affected locality. Suitable tools include:

- Reasonable charging entrance to the city centre,
- Incentive promotion of ecological vehicles (via omission of fees or subsidies),
- Limiting access of vehicles above particular weight in specific localities.

After completion of the highway D8 bypassing Ústí nad Labem, transiting freight transport in the frequented corridor Prague – Dresden will be diverted completely away from the inner city, which will positively affect in particular the area between the streets Žižkova and Pražská.

In order to achieve noise emissions, it is essential to deal with environmental impacts and reduction of exhausted pollution in order to ensure quality and fluent transport, eliminating congestion, braking and subsequent acceleration. In this context, it is necessary to implement measures affecting not only freight transport, but also the predominant personal motor transport.

Establishing goods distribution centres appears to be, according to previous experience, not effective and rather complicated to implement due to negligence of local competing companies in mutual distribution logistics.

Implementation (preparation or support) of freight villages or goods distribution centres is considered as an act of support for the industry (in particular, transport industry and manufactures), but does not constitute significant reduction in freight transport in the city. This would only happen in case of consolidation and reconsolidation of goods in freight villages in order to minimise number of journeys. However, that would be confronted with the problem of additional costs for transhipment of goods. Globally, significantly increasing volume of transport is primarily determined by different production costs rather than by costs of transport. Labour costs in mass production often lead to choice of remote cheaper production localities, because these costs make up the greater part of final costs than transport costs. Freight villages or logistics parks are being gradually established in the environment of the Czech Republic with increasing demand for transport and development of production and logistics processes, and decreasing storage at producers for their direct supply (just in time). Companies involved in construction, operation and usage of logistics parks follow their purely economic objectives. As an example, combined rail/road transport will remain only a dream of ecologists until it remains economically less profitable (including flexibility and reliability) than road transport.

The solution suitable for implementation in order to minimise environmental impacts of road transport is establishment of ecological zones, as realised for example in numerous German cities. Such zones are marked by vertical traffic signs, which allow entrance only for vehicles with an ecologic mark differentiated by colour into 3 kinds fulfilling specific EU standards. Each city thus has opportunity to decide which emission category is acceptable to enter the defined urban area. This measure ensures that vehicles moving in the sensitive area meet the emission limits. Secondary, it may also reduce intensity of vehicles in the zone and, moreover, the limited vehicles will be those mostly harming the environment by emissions. Implementation of these zones is not demanding in terms of time, finances or administration. Currently, some companies in the Czech Republic, such as companies operating Technical Inspection Stations (STK), already grant ecologic marks to vehicles from German cities with the fee of 300CZK on the basis of data from their technical certificate. Generally, vehicles meeting these emission standards are mostly the newer ones, therefore, positive effect in terms of noise emissions is assumed in comparison with older vehicles due to the fact, that in low-speed urban areas, noise from engines exceeds noise emitted by traffic.

The variant F (processed within the CIVTAS ARCHIMEDES task 11.3.6) proposes flat speed reduction by 10%. Resulting noise reduction occurs on majority of roads but is not significant (under 1dB). It is concluded that speed reduction has some potential for reduction of noise emissions; however, it must be implemented by more than 10%. For freight vehicles, **it is meaningful to consider reduction of speed only at localities, where current speed limit exceeds 50km/h,** which is approximately the limit, at which noise from engines stops to dominate over noise from other traffic components (i.e. noise from tyres, aerodynamic noise).

The variant G (processed within the CIVITAS ARCHIMEDES task 11.3.6) is a purely hypothetical solution, which proposes total exclusion of freight vehicles with the weight over 3,5t. In this case, reduction of noise emissions is achieved on almost all roads of the city in relatively significant extent (reaching above 5 dB). However, such solution is not feasible in the existing situation while preserving service and supply functions of the city. In case of implementing this variant, freight vehicles would be replaced by personal vehicles producing additional noise emissions. **This solution primarily presents benefits of the variant and its potential for individual road sections in the city in terms of reduction of noise emissions by excluding freight transport.** It can be considered as an effective measure for specific carefully examined localities, where a suitable bypassing route will be identified and impacts on this alternative route will be assessed.

The characteristic feature of decibels is the fact, that values cannot be arithmetically cumulated (e.g. the sum of 50dB and 50dB is only 53dB). Reduction of energy of noise by half reduces the noise level by only 3dB. On the other hand, reduction of noise level by 30dB corresponds with energy reduction to 1/1000 of its original value. This means, that the requirement to reduce the noise level from 65dB to 35dB may require very expensive and radical measures. Even smaller noise reduction (for example by 3dB) through reduction of vehicles moving in the area requires considerable decrease in traffic intensity (by approx. 50%), which is in the urban environment often difficult to realise. Therefore, it is appropriate to seek other technical solutions preventing noise in sensitive areas.

Reduction of noise emissions in the urban environment through reduction of traffic intensity appears to be little effective, due to the fact that even small decrease in noise emissions requires significant reduction of transport intensity (as described in the previous paragraph), which is difficult to achieve on the urban road network and which is feasible only through radical measures, such as construction of bypasses and consequent transfer of traffic away from sensitive zones. Although, even such measures may only be temporary – released capacity on the original road may under certain circumstances trigger new saturation of transport after some time. Given the nature of noise and potential for its reduction in the urban environment through reduction of traffic intensity, it is recommended to seek other technical solutions, such as noise barriers, innovative insulation materials, tunnel solutions, etc. It is also needed to consider measures to control demand for individual motor transport, including reduction of parking spaces in the city centre, charging entrance to specific zones, etc.

8 Conclusion

Integration of urban logistics, i.e. supply of shops and businesses in the centre of Ústí nad Labem, is an issue with many influencing factors. Primarily, the city is a competitive environment. Due to large number of businesses (reception points for supplies) on a relatively small area in the city centre, transport performance of supply vehicles is significant. Each shop and each supplier have their own logistic organisation. It would be suitable to implement a goods distribution centre for centralised consolidation and deconsolidation of goods flows. Such centre should be located on the outskirts by a major route with sufficient capacity (ideally by a highway, railway freight terminal, water container port or freight airport), in order to avoid burden to the urban infrastructure caused by transporting goods from manufacturers/distributors by large vehicles. Supply between the goods distribution centre and the city would be performed by smaller vehicles, which would serve more recipients on a single route, which would minimise number of trips realised in the city. However, such a solution is not currently feasible due to different ways of logistic management of individual businesses and lack of will to cooperate in the market competition.

In practice, every recipient in the city addresses supply separately, either by own logistics architecture or in combination with transport carried out by distributors. This situation results in a large number of trips performed in the city often by large vehicles serving more reception points (more cities or more centres). Small operators are supplied with smaller vehicles (light trucks, vans or passenger cars), serving mostly only one recipient and thus increasing number of performed trips. Furthermore, there are traffic flows leading through the centre of Ústí nad Labem, which do not have either source or destination in the territory, nor is utility value added to these goods.

For Ústí nad Labem, it is necessary to maintain supply to businesses in the city centre. Solution for urban logistics can be only addressed through infrastructure changes and traffic organisation, together with addressing the entire problem of city motor transport. It is necessary to limit number of trips performed in the central area, excluding all unnecessary trips without its source or destination in the area, which does not bring any benefit to the territory. For this traffic load, it is necessary to provide sufficient alternative route. The optimal solution is to utilise bypasses of the city. Additionally, it is appropriate to regulate traffic in the city centre to discourage drivers from entering the area. Tools suitable for such restrictions include implementation of a system of one-way roads, speed reduction, access restriction to public transport only, etc. Another variant of this solution includes a system of tunnels and bridges proposed for the Master Plan of Ústí nad Labem, which has recently not been accepted by city authorities (currently only a theoretical solution).

These conclusions will be incorporated into the SUTP for Usti.

9 Literature

Urban freight transport and city logistics (www.eu-portal.net, 2003);

Noise in the environment (Planeta No. 2/2005);

Noise in the external environment, Legal advisor of a citizen annoyed by noise (Ekologický právní servis, 2007);

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