Intelligente Transport Systemen in stedelijke distributie

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For the conservation of a good functioning inner city several municipalities introduced measures for keeping out the lorry traffic from the inner cities and separating them from the shopping public. The aim of these measures is to improve the safety and quality of life in the inner city. Time windows and vehicle restrictions are examples of these measures, which have been meanwhile introduced in more than half of the Dutch municipalities. Because of the time windows the urban logistics mainly take place in the morning (from ±6:00am to 11:00am). In most cases there is no harmonization with neighbouring municipalities/shopping areas. This results in time windows which runs parallel to each other. This, in combination with the strongly varying vehicle restrictions (requirements with regard to dimensions, weight) produces relatively more vehicle movements in the inner cities. Carriers use more smaller vehicles, because it is no longer efficient to use large combinations. In fact, these measures have an opposite effect, that costs more effort to deliver the goods at the place of destination. Also the hours of arrival of money- and value carriers become more predictable by the window, what is not desirable because of safety reasons. Furthermore the retail trade hampers the distribution process by being present only one hour before the end of the times windows (business hours ± 10.00). Often the retail trade does not have large storage spaces, which results in more frequent supply. Eventually all this leads to a higher demand for transportation in the urban logistics, resulting in a larger chance of congestion and environmental pollution in the inner cities.

In this research, the possibilities and the possible contribution of an intelligent transport system (ITS) on the reduction of the problems in the inner cities are examined. Intelligent transport systems are information- and communication technologies directed towards transport systems (passenger- and goods transport), which obtain movement information, processing and presenting them to other road users (among them, motorists, road maintenance authority and vehicle managers).

In the scenario of the urban logistics, several actors have problems and interests. By establishing measures (window times, vehicle restrictions), the municipalities try to guarantee the economic vitality of the inner city. Important aspects/indicators for the economic vitality are the quality of life and safety. The polluting concentration daily exceeds the determined marginal values for the daily average and become one disrupted by noise pollution. This causes a danger for the public health and the environment in the inner city. Also the vehicle movements cause a large danger. Regular accidents take place where passenger cars, vans and trucks are involved. In most of the cases the accidents end in material damage. Since the retail trade is availed by an attractive inner city, they welcomed the established measures. By the favourable position of the retail trade -as receiving party- they do not experience large problems. The retail trade has mainly interest in a frequent supply, large shopping flows and the coherent policy (such as park facility).

In the urban logistics the conventional carriers (own carriers and independent transport companies) and money- and value carriers are the largest problem owners. The measures, the missing uniformity in the measures -parallel time windows and the varying vehicle restrictions- and the absence of the tradesmen claims a large part of the carriers precious time and margin of profit.

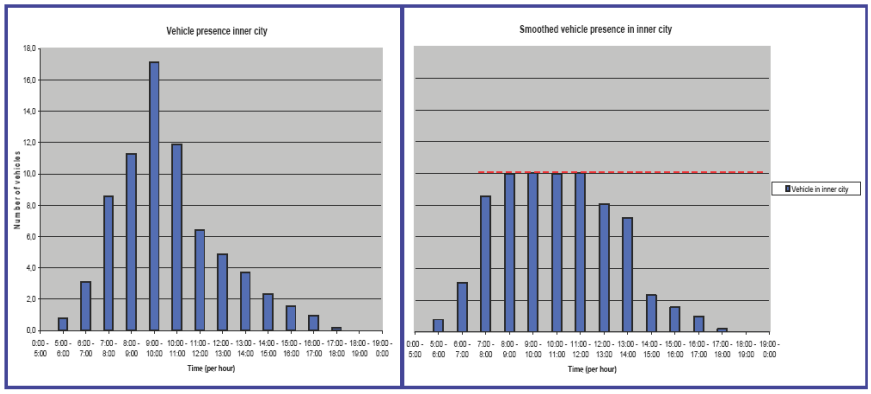
With the delays the carriers experience during there activities an expense of €1094 millions. The largest part (71%) of these delays concerns company-related delays (absence and pause retail trade, paperwork etc.). The remaining percentage (29%) is caused by movement-related delays. Especially for the money- and value transport the security plays an important role. Value transports (professionally/private) are yearly a dozens of time victim of robbery. From this point of view the time windows which makes the hours of arrival predictable are not desirable.

These problems and interests form the basic principle for the preliminary draft of an Intelligent Transport System (ITS). By expressing the indicators -for the involved actors- into criteria visualizes the design of the ITS. The ITS characterises itself by a chain of public- and private Intelligent Transport Systems, which are generally applied separately. The integration of the systems realise harmonization between the involved actors. The individual actor supplies and receives specific (route/traffic)information, whereby relevant events in the urban area becomes directly transparent and coordinated. This concerns coordinating the arrival of the carriers on the current traffic situation in the inner areas and the availability of retail trade. Is the maximum or established capacity in inner city reached, then the access of vehicles will be regulated.

To review if the design of the ITS is desirable and connects on the practice, several interviews have been taken from the involved actors. The interview proved that the municipalities do not see need for the system, unless the situation in the inner cities deteriorates or if it can bring a large improvements in the environment. Also the retail trade sees no usefulness in the ITS. Own carriers and independent transport companies see, because of the regulating functioning, the possibility to gain on time. Receiving current route- and traffic information is thereby considered as added value. Sending/receiving information -current position, hours of arrival- is not desirable for money- and value carriers because of safety reasons. The ITS is not desired from their point of view.

With these obtained user needs a definite design can be established. This definite design, called Intelligent Transport System-urban logistic or ITS-SD has been reduced to only regulating the access of vehicles, when the traffic demand passes the supply of infrastructure or an adjusted maximum. The presence of the tradesmen is for example no longer taken into account. If the established maximum is exceeded the arriving transport will be stopped temporarily by the notification of the transport. The next transport is allowed at the moment another carrier leaves the area. Meanwhile the access time will be presented to the individual carrier.
By regulating the number of vehicles by time period, the inconvenience in the urban areas will be reduced.

The eventual contribution of the ITS-SD on the reduction of the problems is made transparent by comparing the reference situation without and with implementation of ITS-SD. The reference situation describes the most important data -number of vehicles by vehicle class (<7,5 tons & >7,5 tons) and vehicle intensity- which serves as an input for the model of ITS-SD. This model describes the regulating functioning, as the number of vehicles in the inner city exceeds the established maximum. When this happens vehicles will be accessed on a later point in time (hold up).

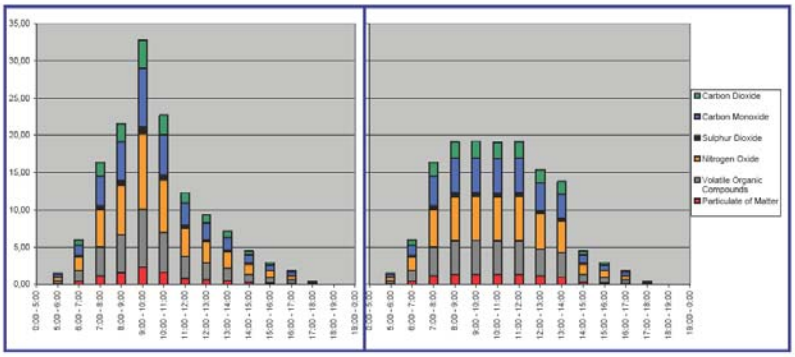


Vehicle presence in reference situation & reference situation with ITS-SD

Based on these results evolved from this model (smooth vehicle presence) the emission of several polluting substances (including CO_2, NO_2 en PM) can be calculated for the two vehicle classes. Also taken into account are the load factor and the current euro standard, which is set to new vehicles.

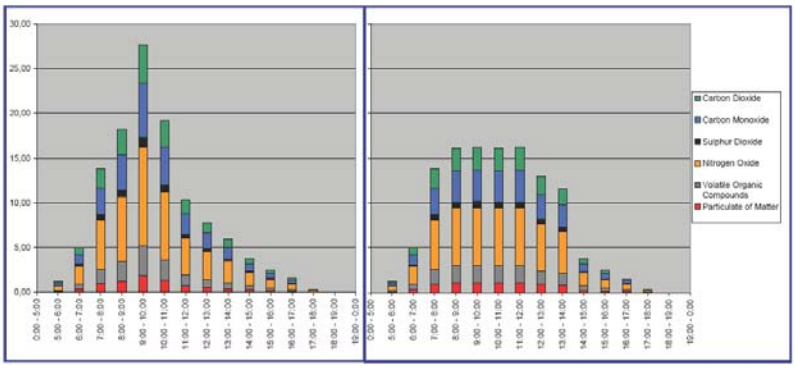
By establishing a maximum on the amount of vehicles the peak in vehicle presence and the coherent environment pollution will be smoothed in the reference situation. The regulating functioning of ITS-SD have therefore a positive impact for the period between 8.00 and 12.00, but after this period the environmental pollution in the inner city deteriorates considerably. The temporary stopped vehicles create a new problem area in the period between 12.00 and 14.00. In relation to the reference situation the concentration of several polluting substances increase substantially, which is not desirable for the shopping flows at these times.

It is remarkable that the emissions of the polluting substances for the smaller vehicles (60%) are, practically equal to polluting substances of the large vehicles (40%). With prudence can be assumed, that the established vehicle restrictions (weight, dimensions) in current situation of urban logistics have after all an unexpected positive contribution on the air quality in the inner city.



Emission small vehicles in reference situation & reference situation with ITS-SD

Details:
1. Carbon Dioxide [10^4 gram]
2. Carbon Monoxide [10^2 gram]
3. Nitrogen Oxide [10^1 gram]
4. Volatile Organic Compounds [10^1 gram]
5. Sulpher Dioxide [gram]
6. Particulate of Matter [gram]



Emission big vehicles in reference situation & reference situation with ITS-SD

Details:
1. Carbon Dioxide [10^4 gram]
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From this research the next conclusion can be drawn. Intelligent transport systems can have a substantial contribution targeting the problems in the inner city. Only there is a lack in notion and need of the municipalities and retail trade. They see no solution in the system, because of the exacting nature of the municipalities and the uncomplicated position of the retail trade. If nothing changes in the urban logistics the carriers will stay the problem owner.

At the carriers there is especially need for current travel- and route information, which provide information about the network performances and the run of freight transports in inner cities. For providing this information a sophisticated system is not necessary because of the possibilities of contemporary public - and private systems.

It is difficult to form an opinion on the actual contribution of the Intelligent Transport System on the improvement of the air quality in the inner cities. In the applied model of ITS-SD the number of vehicles remains the same over the time. By establishing a maximum on the amount of vehicles the vehicle presence shifts. This shift has an overlap with the largest shopping flows, which will cause dangerous situation for shopping public. Given the aim of the time windows, this is not desirable. The assumption can be

made that Intelligent Transport Systems will have a potential contribution to solutions to the problems in inner cities, however these should define with another approach.