WHAT WAY DETERMINE THE CORRECT ALLOCATION AND LAYOUT FOR THE NEEDS OF PARKING FREIGHT DESIGN IN CONCRETE REGION

Martin Straka
TU of Košice, Faculty BERG, Logistics Institute of Industry and Transport, Park Komenského 14, 043 84 Košice, Slovakia, martin.straka@tuke.sk
Michal Balog
TU of Košice, Faculty of Manufacturing Technologies, Department of Manufacturing Management, Bayerova 1, 080 01 Prešov, Slovakia, michal.balog@tuke.sk

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Abstract: In terms of building a network parking strategies for freight transport may be considered two variants: a building (completing) car parks on abandoned of border crossings, respectively building a whole new network of parks. Creating a network of parks for freight is in the interest of the Slovak Republic as well as the European Union. The subsequent optimization is dependent on the quality of road infrastructure and the traffic intensity in the monitored sections. It is therefore important selection of suitable candidates, administrators and their subsequent assessment of the appropriateness and services provided in selected locations. Identification of parking in the SR enables to choose the effective solution for intelligent networking and secure parking.

1 Introduction

The correct position of the car park, firm, machinery, warehouse in area has a great effect on transport cost, the time it takes for the distribution and to all activities associated with the distribution. Allocation and layout are dependent on a number of factors to be taken into account at choosing a site. In terms of solutions, it is appropriate to use a number of approaches that could complement each other. To determine the location of car parks network can be applied methods as a method of A. Weber, Launhardt´s method or multicriteria decision making approach (System Block Criteria Decision - SB method) which in its solution considering other possible factors such as traffic, which may influence the decision about the location [1]. Assuming that the optimal distance of car parks is increasing with the quality of road infrastructure (sections of motorways, highways and I. class roads) is necessary to the evaluation of locations to apply the results of the qualitative analysis, as well as the prospect of building elements of the road network. Truck driver has a tendency in any situation to achieve maximum range of during limited hours under the current of level of traffic laws and road infrastructure. An important parameter of the entire network of car parks is evenness of coverage of the whole territory of the Slovak Republic with the capacitance variation of the intensity of traffic in specific area [2].

Slovak Republic is a part of the Schengen area since 2007, resulting is many abandoned border crossings and their related parking. For this reason, as one of the variants was investigated possibility of using the surplus assets today, for this is difficult to find application.

In terms of strategy of building a network of Intelligent Safety Parking (IBP) for trucks may be considered two options [1]:

- building (complete) parking on abandoned border crossings,
- developing a completely new network of parks.

When choosing the strategy of building an Intelligent Parking System network (IPS) for trucks can be guided by four variants and their combinations:

- reconstruction of the parking lots of abandoned border crossings,
- developing a completely new network of parks,
- use of parking areas at fuel stations and roadhouses,
- use of parking areas of road freight business (National Bus Transportation - NAD).

2 Analysis of the elements of the concrete region for the needs of allocation and layout

The Trans European Road Network (TERN) of the Slovak Republic is represented by the best road system that the state provides, it is motorway network and additional network, which consists of highways and roads, some stretches of I. class. TERN road network of the Slovak Republic provides the fastest connection to the transit traffic in the east - west and north - south. The road network of the Slovak Republic is shown in Figure 1. TERN road network structure clearly defines the allocation for building intelligent network parks [1], [2], [3].

Among the studied site of the former border crossing, and the national parks network TERN be classified Vyšný

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Komárnik, Stará Ľubovňa, Trstená, Skalité, Makov, Trenčín, Rajka, Šahy, Zvolen, Milhosť, Berg, Sekule, Závod, Malacky, Zlaté Piesky, Stupava, Lamač, Triblavina, Čataj, Zeleneč, Červeník Piešťany, Hrádok, Beckov, Kostolná, Zamarovce, Dubnica n/V, Prejta, Ivachnová, Dechtáre, Čemice, Velínok, Hybe, Petrovany, Janovík.

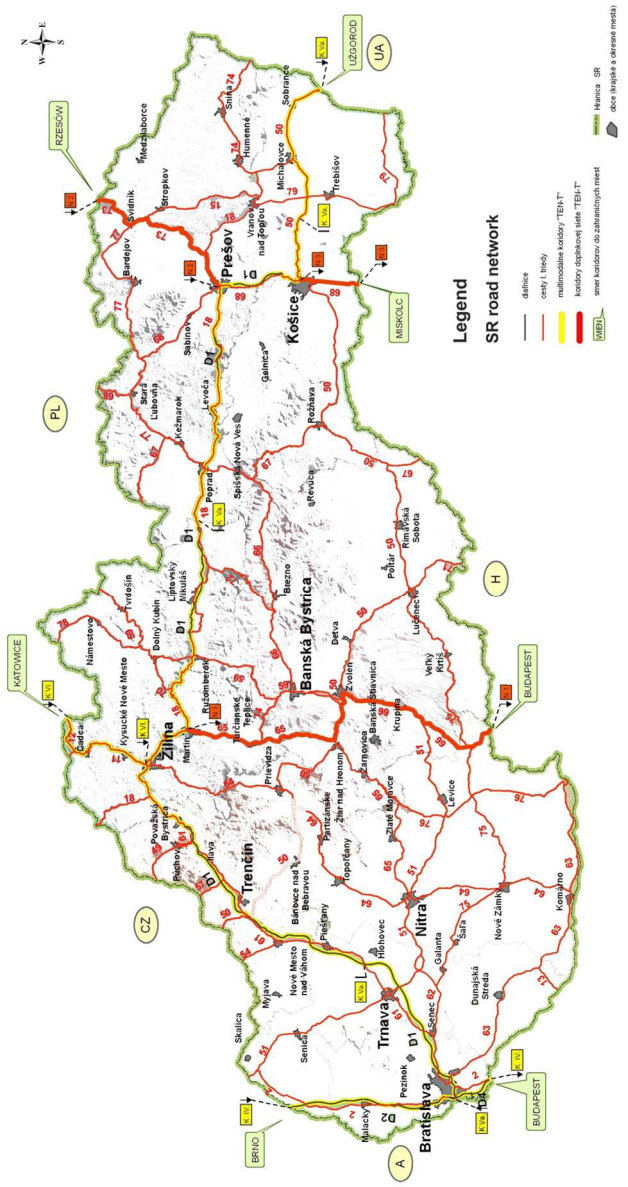

Figure 1 TERN road network of the Slovak Republic (source: Slovak Road Administration)

The intensity of road transport within the territory of the Slovak Republic is regularly monitored by a nationwide road traffic census since 1958. Cycle of adding is five-year national surveys since 1980 in years ending in 0 and 5. The last nationwide road traffic census survey was executed in 2010 for highways, roads I. and II. Class III and selected roads classes [2].

Figure 2 shows the progress of the intensity of road transport on main transport corridors of the Slovak Republic, while road traffic intensity is expressed by thick lines depicting the road network. When the line is thicker, then is higher the intensity of road traffic. Figure 2 shows that the traffic intensity increases moving from east to west of the Republic. On the basis of traffic levels in recent years can be assumed that the requirements for the capacity of the individual parks will be higher in the west - east.

Analysis of available information, such as www.truckinform.eu where the road freight transport in the SR is listed the six high-capacity car park (Bratislava 2, Rožňava, Košice, ...). It was found that there are at least four parking spaces; respectively companies listed on the web site services do not offer parking.

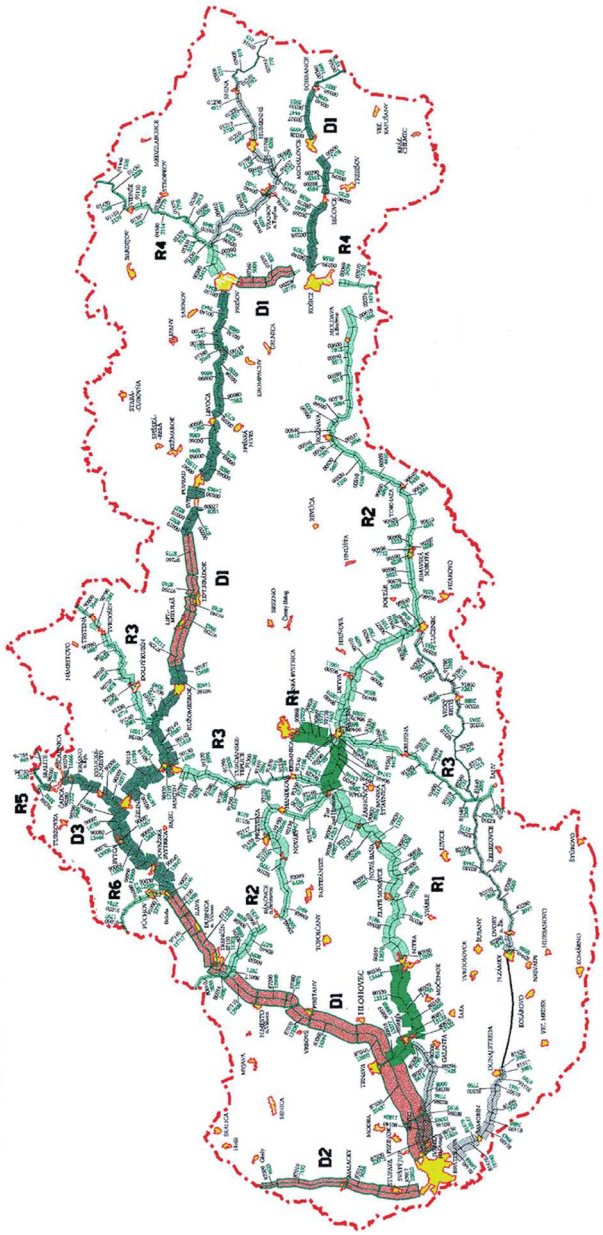

Figure 2 The schema course of the intensity of traffic on major road routes SR

Additional parking, but are very limited, offering parking areas and parking for highways and expressways. Services within these parks offer a particular food, sanitary facilities and the ability to refuel, have less opportunity and the possibility of rest. The current state of large-scale parking in SR is non-systematic points in their building and the low level of service. A survey of the SR is resulting that the establishment and development of high-capacity of car park is based on the personal initiative of several business entities, taking into account the wider road network structure of SR, its needs and without taking into account the Trans European Road Network (TERN) to European standards. Unsystematic construction of car parks with the risk of loss of profitability for entrepreneurs and thus risk extinction of such parks [1].

3 Define of the allocation and layout for parking of freight transport in concrete region

In terms of network design for freight car parks is important to define the distance between parking lots; with great influence in this direction has a position and size of the country. It is important for the allocation of parking areas to take into account the position relative to surrounding states, respectively high-capacity car parks in neighbouring countries.

Slovak Republic in terms of transit has an important position in Central Europe and also in terms of transit between Western and Eastern Europe. SR is one of the smaller countries of Europe. The largest direct distance in the direction east - west (Záhorská Ves - Nová Sedlica) is 429 km. The largest direct distance in the direction north - south (Skalité - Obid, a road connection about 250 km) is 196.7 km.

The assessment of landscape parameters, it is clear that it is important to systematically build parking lots to the small area to avoid unnecessary congestion and the possibility of unused capacity [3].

In terms of building a network of parks in general seems appropriate to divide the parking areas on two levels. I. level is represented by parking lots that would provide all the standards of modern parks. II. level is represented by parking lots that would provide basic services for drivers and transport.

Benefit of completion of the existing car parks at border crossings is saving considerable funds for landscaping, the existence of utilities, the existence of social facilities and the possibility of building for the needs, rest, food, medical assistance, service and ensuring security services.

The disadvantage of such a system may in some cases: obsolete sanitary facilities, inadequate parking situation in terms of location and in terms of spatial options for further completion.

An analysis of traffic intensity at each border crossing that border crossings with the highest intensity in Poland are: Vyšný Komárnik – Barwinek, Trstená - Chyžné, with Czech Republic: Mosty u Jablunkova - Svrčinovec, Makov - H. Bečva, Drietoma - Starý Hrozenkov, Brodské - Břeclav, with Austria: Bratislava - Petržalka - Berg, Jarovce - Kittsee, with Hungary: Čunovo – Rajka, Rusovce – Rajka, Šahy - Parassapuszta, Milhosť – Tornyosnémeti, with Ukraine: Vyšné Nemecké - Užhorod.

In terms of prospective analysis of the use of parking spaces at gas stations and motels focuses on the TERN network. In these cases the guarded area, where certain services, such as options, restrooms, snack bar, respectively restaurants, without accommodation.

Other options available parking and parking areas are at gas stations, Shell, OMV, Avanti, Agip and Slovnaft and roadhouses, where parking capacity is quite limited, ranging approximately from 20 to 50 such trucks for example Zamarovce pri Trenčíne, Janovík, Biele Studničky, roadhouse Halier, Dechtáre, Cieľ, Čataj, Budča and more.

In an analysis of the current state to privatization for trucks has been made a survey in enterprises of the former freight car transport (NAD), which are now privately owned. The analysis shows that the parking capacity is not currently used, respectively, companies do not offer such services, though, as they have adequate facilities, as well as services. One of the few companies that offer a lot to guard the trucks is NAD Trnava.

In terms of future developments in the field of road haulage parking is possible to reach the current businesses and offer them the opportunity to enter a network of car parks within the EU.

The analysis of free parking areas after the former state enterprise bus was contacted current owners of road haulage firms and bus companies Slovakia. The above analysis shows that free parking space in most regional and district towns, namely: Bratislava, Košice, Poprad, Svit, Humenné, Michalovce, Vranov nad Topľou, Sobrance, Dunajska Streda, Nové Zámkye, Trnava, Banská Bystrica, Trenčín, Liptovský Mikuláš, Žilina, Považská Bystrica, Zvolen, Lučenec, Prievidza, Detva, Svidník, Rožňava, Stropkov, Rimavská Sobota, Senica, Stará Ľubovňa.

In terms of economy and the possibility of building intelligent parking system for trucks in the Slovak Republic are rated as the best network following parks:

- a network of parking areas at border crossings,
- a network of parking spaces for car traffic of freight operators and Slovakia bus.

After Slovakia's entry into the joint space and termination of Schengen crossings remained at the entrance to the Slovak Republic a number of unused buildings that have sanitary facilities, unused office and industrial space, utilities and appropriate adaptations to

the areas for parking trucks. These sites can be used just to build a smart parking system with a network service.

In terms of uniformity of coverage of the Slovak Republic parking spaces, a network of suitable parking areas at border crossing added to the site within the territory (Figure 3).

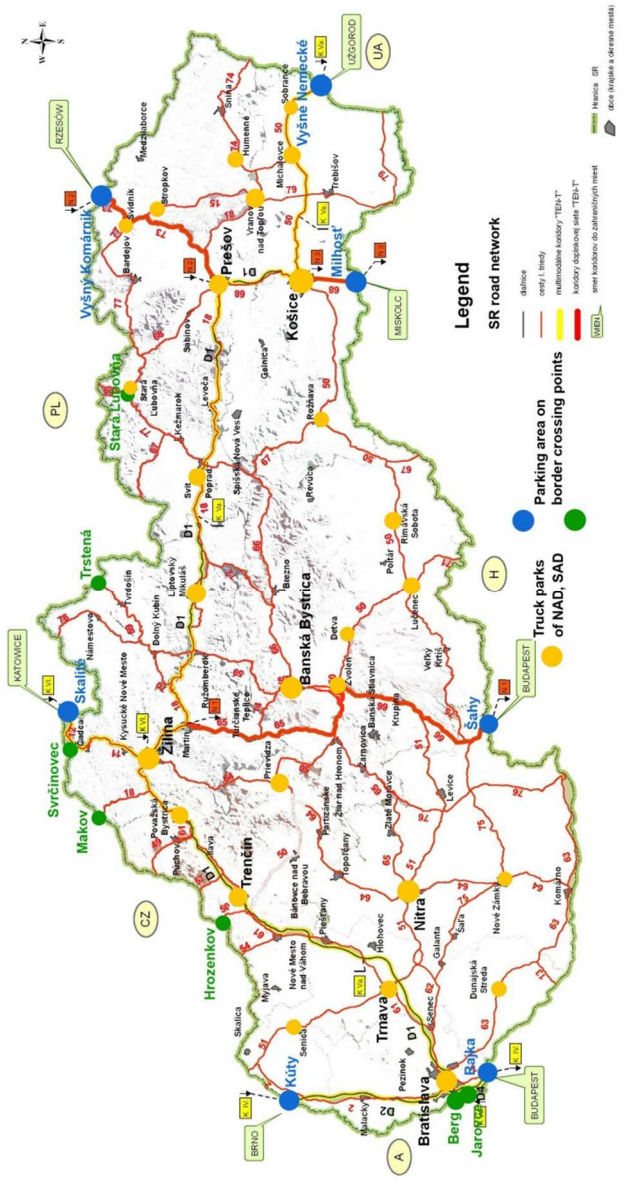

Figure 3 Network of car parks at border crossing points and parking areas of NAD, SAD [2]

Another possibility to extend the parking system for trucks is to use parking spaces that are owned by the current operators of freight by road (NAD) and respectively Slovak Bus Transport (SAD) (Figure 3).

Some of the interviewed companies have also now offer a variety of services for trucks and are willing to extend its range of services required, to meet the requirements of intelligent parking.

As the best variant appears at present is a combination of both systems networks (Figure 3) the need for proper analysis, assessment and selection of allocated points and their inclusion in group I. parking category II. categories, respectively their exclusion from the system by the non-defined criteria.

In terms of the global assessment of the structure of the road network and international transport routes for heavy goods vehicles is necessary to consider with the existence of suitable parking spaces that are allocated on the border crossing points to neighbouring countries and operators parking areas the current road freight transport operators (NAD), respectively. Slovak Bus Transport (SAD) (Figure 3) [3].

The positions of the of abandoned border crossing points are largely equipped with suitable parking areas, built social network, they are suitable for security of car parks and there are built network engineering. The problem of these sites is the property of the corresponding object relations and the necessity for further investment to adapt of these places for the needs of standard level of trucks car parks [3], [4].

Another option is the use of existing private parking areas within the existing of carriage of goods transport operators (NAD), respectively Slovak Bus Transport (SAD). Some private car parks satisfy the requirements for operating within an international network of car parks and are willing to expand their services according to the requirements and needs of the EU. Private operators expect financial participation by the state, respectively EU to build these parking spaces [2].

Because network structure of car parks for trucks (NV) contains in terms of allocation of car parks positions a few points [5], is in terms of its final realization suitable to define of building in stages (Figure 4).

In the 1st stage is necessary to build a car parks NV position in locations Prešov, Žilina, Zvolen and Bratislava, the site is meant wider environment destination depends on the connection to the road infrastructure and construction possibilities in the defined area.

In the 2nd stage is necessary to build a car parks position of NV in locations Košice, Nitra and Trenčín.

In the last 3rd stage it is necessary build a car parks position of NV in locations Strážske, Poprad, Lučenec and Trnava.

The resulting solution since the 1st stages of building car parks for positions trucks (NV) satisfies logic, logistics and quality requirements for car parks for layout positions. Each subsequent stage of building car parks improves the quality of services provided and defined network.

Truck parks on border crossings, currently owned by the National Highway Company (NDS) are for implementing a whole is not very difficult but morally and physically worn out and in terms of implementation are also consuming for investment [3], [6].

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Car parks privately owned are in terms of using immediately available and classifiable into the network structure car parks of NV. In terms of capacity, the car parks offer a view of the capacity requirements of the market, is in all cases the necessary investment in the capacity and technical completion [7], [8]. The current owners of car parks for in this regard expect support from either the state or the EU. The only drawback is parking agreement between the owner and the state.

Economically and time least favourable in terms building a network is to build a car parks of NV in localities of existing industrial parks, in addition to set-aside from land resources and any engineering networks there is nothing. In these cases, the State, respectively EU will have to invest a considerable financial volume [9], [10].

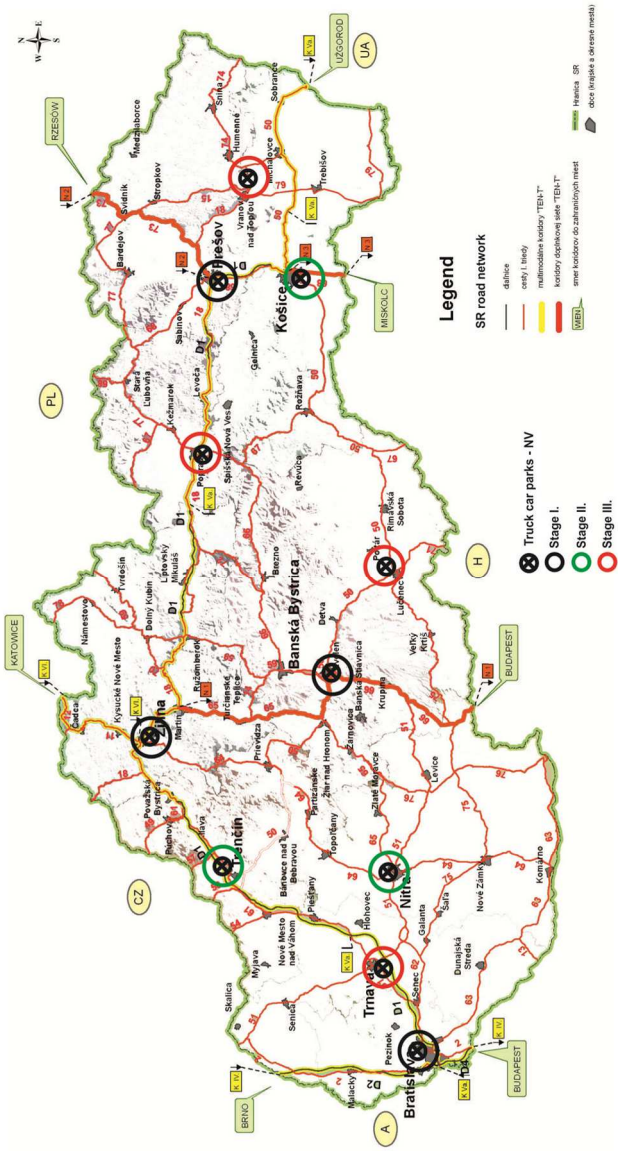

Figure 4 The final proposal of the car parks layout for NV according to construction phases [3]

Although these mentioned aspects show the correctness of phased building a network parks NV in Slovakia. In the 1st stage of building positions Bratislava, Žilina, Zvolen a Prešov can be used car parks at border crossing points and car parks in privately owned of NAD and SAD, which already exist and in the current economic situation are this approach advantageous and real for state [11], [12], [13].

4 Project of the car parking network building

In the pilot project was selected four suitable locations Prešov, Žilina, Zvolen and Bratislava. In the individual locations have been defined appropriate business entities which have adequate capacity, technical safety and services (Figure 4).

In location Prešov was selected, as the appropriate subjects following companies: SAD Prešov, a.s., Košická 2, 080 01 Prešov and Marian Troliga - MT, Košická 20, 080 01 Prešov.

In location Žilina was selected, as the appropriate subjects following companies: NDZ, s.r.o. Žilina, Košická 2, 010 01 Žilina and VALIN, s.r.o., Pri Celulózke 1376, 010 01 Žilina.

In location Zvolen was selected, as the appropriate subjects following companies: SAD Zvolen a.s., Balkán 53, 960 01 Zvolen a D.K.C., s.r.o., Balkán 53, 960 01 Zvolen.

In location Bratislava was selected, as the appropriate subjects following companies: NAD 820 Bratislava, a.s., Rožňavská 2, 821 01 Bratislava 2 a Slovak Lines a.s., Mlinské nivy 31, 821 09 Bratislava.

In the locality of Prešov was negotiated with two firms which have adequate space for the creation of smart parking area their position on the road network, capacity possibilities, services rendered and the possibilities for their future completion. Companies which was addressing are SAD Prešov, a.s., Košická 2, 080 01 Prešov, www.sad-po.sk and Truck Centrum Marián Troliga – MT, Košická 20, 080 01 Prešov, www.mttroliga.sk.

Companies are positionally near each other but SAD Prešov, a.s. has limited access from the street Košická, which leads directly to the highway D1. Within the arrival is built railway underpass, which limits and prevents in crossing of higher freight vehicles. The railway underpass can be bypass but with complications towards the city centre across the street Budovateľská.

Access to Truck Center MT - Troliga is directly from the street Košická without restrictions.

In terms of capacity, both companies have roughly similar capacity for parking of 60 parking places. Within the SAD is also necessary to allow for priority parking their buses, which significantly reduces the capacity of parking.

For the above reasons, it was at negotiations continued only with company Truck Center MT - Troliga, which is

from the possible development and allocation of smart parking area in the locality Prešov more favourable.

In the locality of Žilina was negotiated with two firms which have adequate space for the creation of smart parking area their position on the road network, capacity possibilities, services rendered and the possibilities for their future completion. Companies which was addressing are NDŽ, s.r.o. Žilina, Košická 2, 010 01 Žilina, www.ndz.sk a VALIN, s.r.o., Pri Celulózke 1376, 010 01 Žilina, www.valin.sk.

Companies are positionally near each other but NDŽ, s.r.o. Žilina spite of initial promise of participation in the project for the delay in the solution (interruption of the project in 2011), dealt with their economic situation renting of parking space to other businesses. Consequently, the company currently not have adequate facilities and project resigned.

As another business entity which is willing to work on a pilot project is the company VALIN, s.r.o. Žilina. In terms of capacity the company has 35 parking spaces for freight. Allocation VALIN, s.r.o. Žilina is an advantageous to way I. class I/18 with direct connection to the highway D1. VALIN, s.r.o. Žilina is interested in the future development of activities related to the provision of parking services. It is the reason the inclusion of this company in the pilot project.

In the locality of Zvolen was negotiated with two firms which have adequate space for the creation of smart parking area their position on the road network, capacity possibilities, services rendered and the possibilities for their future completion. Companies which was addressing are Prvá dopravno-mechanizačná spoločnosť, s.r.o., T.G. Masaryka 3425 – Bariny, 960 02 Zvolen, www.1dms.sk a D.K.C., s.r.o., Balkán 53, 960 01 Zvolen, www.dkc.sk.

Companies are positionally located advantageously to the main motorways. Even 1.DMS, s.r.o. Zvolen and also D.K.C., s.r.o. Zvolen are favourable entrance and exit to the way of international importance E77 with direct connection to the R1 expressway.

In terms of firm capacity DMS, s.r.o. Zvolen has about 30 parking spaces D.K.C., s.r.o. Zvolen has about 60 parking spaces.

The fact that both companies are willing to participate on a pilot project of smart parking areas are conveniently located to transport infrastructure and provide quality services for freight transport also capacitive differences in the number of parking spaces is recommended both companies in the area include to the pilot project.

In the locality of Bratislava was negotiated with two firms which have adequate space for the creation of smart parking area their position on the road network, capacity possibilities, services rendered and the possibilities for their future completion. Companies which was addressing are NAD 820 Bratislava, a.s., Rožňavská 2, 821 01 Bratislava 2, www.nad820.sk and KAISER Spedition, Hraničná 22, 821 05 Bratislava, www.kaiser.sk.

Companies are positionally located advantageously to the main motorways. KAISER Spedition has favourable entrance ande exit from highway D1 and near of company is airport M.R. Štefánika. NAD 820 has good entrance and exit to road I. class č. 61 too with direct connection to the highway D1.

In terms of firm capacity NAD 820 has about 150 parking places. Company KAISER Spedition has about 80 parking places.

The fact that both companies are willing to participate on a pilot project of smart parking areas are conveniently located to transport infrastructure and provide quality services for freight transport also capacitive differences in the number of parking spaces is recommended both companies in the area include to the pilot project.

5 Summary

Based on the results of the survey of truck car parking operators is possible to state the following facts:

- The pilot project addressed all companies are entrepreneurially run and hence also the capital-able and depends only on a specific business plan and return of funds.
- Each of the addressed companies expect support from the Department of Transportation in the form of subsidy for the construction, completion, respectively modification of administered space to the desired level for the needs of smart parking.
- A common feature of the selected companies is that they all need to build, respectively upgraded electronic security systems, lighting, security and fencing of company area and build a public Internet connection in what respect they expect contribution from the state.

From the side of business entities is preparing of parking areas, respectively provision of services (washing trucks, tires service, sale of spare parts, etc.) explicitly understood as investment of business entity without the assistance of the state.

From the side of the state all interviewed companies expect financial support especially during start-up service of smart parking place to achievement of its profitability.

In the current state are companies capable of operation of truck car parks but not in full equipment to the requirements of intelligent parking. The subsequent development of the market will support the business plan and convinces of suitability of investing in this services sector. On the basis of last year car parks traffic will be possible more specific of need of real support - subsidy from the state for companies which realize this service.

Mechanism for financial support truck car parks must be built on parity represented by the state and by business subjects because of commitment and verifiability as by the state, as well as by the business entities. As follows the state also business entities will be interested in the development of car parks and profitability of funds expended [3], [14], [15].

On the basis of requirements of a specific business entity on maintenance and services development, respectively technical assessment of parking place, a fund manager as a representative of the state for the recovery and operation of truck car parks verify its legitimacy. In the case of requirements legitimacy state by parity share 50% financial resources will contribute to the specific purpose and implementation of requirements. Business subject will contribute in the same parity share 50% for the implementation of requirements from its own resources. Support from the state is non-refundable contribution to the traffic of truck car parks.

After the realization of the investment project will check quality implementation and correctness of funds expended by representative of the state. In case of deficiencies business subject gets space to correct errors in the realization, which will be made only at his expense.

Conclusion

For the solution of car parks layout in SR was applied several approaches, which are based on the graphic, as well as the expert and analytical approaches. In the solution was the first time used SB method that appropriately combines graphical display with multicriteria decision. By SB method was developed variant of solutions which meets the minimum, expanded and the maximalist the number of elements in a network of smart truck car parks NV.

Project in the field of information services for freight drivers and made the current state of focus, mainly on the analysis of the state parks in Slovakia, the allocation within the SR, its current status and potential uses for the purpose of building a network of smart parking, defining elements of the logistics chain, analysis of information support and supply chain elements to create basic information and communication structure between the elements of defined supply chain.

The information gathered on the state parks and information support services and distribution processes within the SR that building parking is unsystematic and is based mainly on individual initiative of several business entities, following the broader structure of the European road network.

Because the output of the application is several approaches to solving layout of car parks and is more variants, this reason it is necessary to decide which variant is the most decisive by set of criteria. The solution is the maximum of car parks network, which the best takes into account the defined criteria. Number of car parks in the proposed network in terms of its construction, allows introducing an element of stage. The advantage is gradual release of financial resources in time.

The next step after the implementation of the pilot project will be the completion of a network of smart car parks to the total appearance according to previous proposal. Linked to this is addressing other business subjects (owners of suitable parking places), respectively tender announcement to car parks lease at border crossings, which are owned by municipalities and the state and their completing to required level.

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