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Implementation Analysis of Park & Ride System and Opinions of Local Residents

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Abstract: **The intensity of traffic flow in Riga has been gradually increasing over the last few years and various options have been examined in order to reduce it. One of the most popular solutions abroad is introduction of P&R systems. This comparatively small research contains explanation and analyses the current situation connected implementing of P&R system in Riga. One of the main goals of the research is to find out the level of public awareness and the drivers' attitude to P&R, as well as to estimate the number of potential users of such system. Another important goal of the research is to carry out an economical analysis of the P&R system implementation in Latvia. For the scope of this research, the analysis has been done by calculating the costs incurred by using or not using the P&R system. At this stage, the calculation is partly based on the currently correct assumptions.**

Key words: **Park & Ride, Park & Ride system, P&R, incentive parking**

1. Introduction

While studying the situation in Latvia prior to the implementation of a P&R system, I found several astonishing facts. For example, it is intended to introduce a P&R system, but no analysis of the traffic flow has been carried out in order to determine the most efficient location of the P&R parking lot and the number of parking spaces needed. Similarly, there has been no resident survey conducted to show whether vehicle drivers living in Riga are informed about the P&R system and its benefits, are willing to use it and whether they have a correct understanding of P&R.

For me, these questions related to the research of the P&R system were and still are important; therefore I decided to try finding the answers with the help of a resident survey. One of the main tasks of P&R is to provide a vehicle parking outside the city centre and special public transport connecting it to the main central areas. Therefore, the goal of the questionnaire was to survey people living outside the city whose everyday life comprises work or studies in Riga and who drive there by their own car [1 - 9].

2. Research methodology

The questionnaire was anonymous, but the respondents were required to note whether they live in Riga or outside the city and whether they go to Riga every day by car or public transport. This information was necessary in order to understand and acknowledge the potential users of the P&R system. The questionnaire consisted of 6 questions, one of which had several sub-questions. When answering the questions, the respondents had to choose between “Yes” and “No”. In the question with sub-questions, the respondents had to evaluate all five provided considerations and to assess them on a scale from 1 to 5, where 1 is “It does not motivate me” and 5 is “It motivates me”. In the sub-question “Other considerations”, the respondents could express their opinion on what would motivate them to use a P&R system. Questionnaires were filled in by 180 respondents.

The number of the respondents is, of course, low, and the survey results cannot be regarded as fully statistically correct. However, they represent the general tendency and the opinions of some of the stakeholders, taking into account that the majority of the respondents use a private car daily and live outside Riga.

3. Questions and answers

Before implementing any important system, it is necessary to study its long-term feasibility and stability, mainly in order to avoid unnecessary financial investments. It has been noted that in many countries of the world, P&R systems have been successfully operating for many years by now and that the residents are content with their performance. But is familiarity with foreign experience a good enough reason to implement such a system in Riga? Probably, not. Each country and each city has its own peculiarities. It can be stated for sure that a system which functions successfully, for example, in London can turn out to be a complete disaster in Riga. The potential users of the P&R system are drivers living in the vicinity of Riga or a little farther. The long-term success of the system depends on the specifics of its implementation and use, as well as on the drivers' willingness to use this system. P&R is a product in its essence and its “flavour” should be good enough and complete, so that drivers would want to use it always and continuously. Since potential users of the P&R system are vehicle drivers and since their willingness to use the system determines its sustainability, it would be important to assess their level of awareness and their attitude to this system.

In order to carry out the economic analysis for the implementation of a P&R system in Riga, it is necessary to fulfil several tasks, including a study on the situation in Latvia and on the awareness about implementation of a P&R system in Riga, as well as to find out opinions of the stakeholders. It is also necessary to analyse implementation of the system in

connection with the project "Driving into the pay zone of the city of Riga". The questions of the survey were formulated by keeping in mind the fact that future clients of the P&R system will be residents of the nearby areas and that their attitude will determine the success or failure of this system.

3.1. Question one:

Have you heard about the P&R system and do you know what this system offers to drivers?

Responses to this question are shown in Figure 1. As seen, quite many people (23%) are not informed about the P&R system and, therefore, do not know what benefits this system offers to drivers. The first P&R system will be implemented in Riga in the next few years, and the lack of public awareness may contribute to non-productivity of the system. I believe that further surveys should be carried out and that mass media should provide the residents with correct information about P&R. It must also be noted that increase of the public awareness and co-operation between the system creators and public (potential users of P&R) is one of the stages in the system planning. Since P&R is intended for drivers, they should participate in the system planning in order to help creating the "product" feasible to both parties — the organizers and the users.

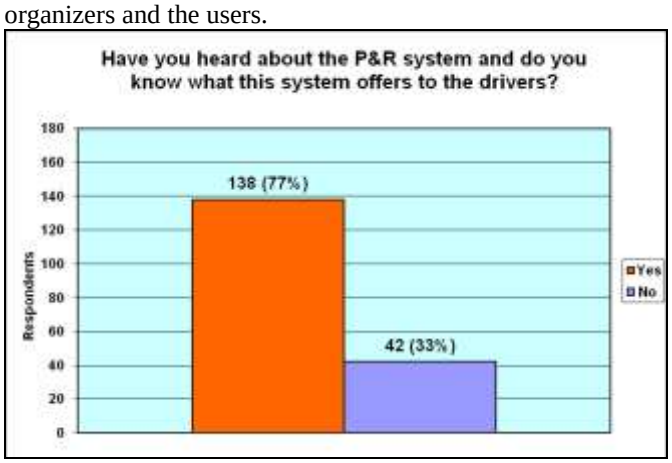

Fig. 1. Public awareness about P&R

3.2. Question two:

Would you agree to use P&R daily and use public transport to get to the centre of Riga or areas close to the centre?

Figure 2 shows that only 58%, i.e. only 104 of 180 respondents would agree to use P&R daily. There can be several reasons for rejecting P&R and one of these reasons is certainly connected with the previous question — people are not informed well enough.

There can also be other reasons, for example:

-Drivers do not want to leave their comfortable cars at a parking and change for public transport;

-The destination is not in the centre of Riga and can be conveniently reached by car;

-Driver's job involves frequent trips in a private/company's vehicle, and the P&R transport cannot provide for such requirements;

-Drivers believe that public transport in Riga is not convenient and fast enough (a valid opinion, because the plan is to connect the P&R system to the existing public transport);

-Basically, people living outside Riga and going there for work daily are not concerned either about air pollution, or traffic jams. Drivers selfishly think only about their own comfort, the time spent in traffic jams and fuel consumption.

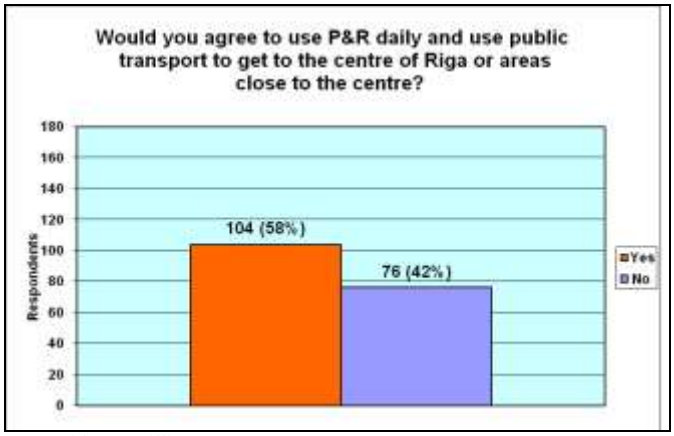

Fig. 2. Residents' willingness to use P&R.

3.3. Question three:

What would motivate you to use P&R more? Evaluate all five options given below on a scale from 1 to 5 (1 = "It does not motivate me" and 5 = "It motivates me"):

1) If there is a fee for entering the centre of Riga (an area much larger than Old Riga) in a private vehicle;
2) Since it is difficult to find a place for parking in the centre, there will be special public transport connecting P&R with the city centre, having no unnecessary stops and going almost as quickly as private cars;
3) If the fare price in the public transport serving the P&R system is lower than that in the regular public transport of Riga;
4) Awareness that using P&R helps alleviate traffic jams in the centre of Riga, improves air quality, and decreases pollution;
5) Other considerations.

As seen in Figure 3, most of the drivers could be motivated by introduction of a pay zone — this option has been evaluated with 5 points most often. This must be due to unwillingness to pay for entering the pay zone, because that would make the trip from home to the intended destination more expensive. On the one hand, introduction of such fee would theoretically mean that drivers are forced to use the P&R system, but, on the other hand, the centre of Riga has its limits regarding the traffic flow, and, if the drivers are not interested in alleviating traffic jams in the centre and in

improving the quality of air, this problem must be considered by the parties introducing the P&R system. If there is no natural co-operation between drivers and P&R organizers, it is necessary to create artificial conditions that would motivate the drivers to use P&R and think about the traffic and environmental problems in Riga.

One point has been most often given to the fourth consideration (by 57 of 180 respondents, i.e. 29%) — "Awareness that using P&R helps alleviate traffic jams in the centre of Riga, improve air quality, and decrease pollution". It is evident that most drivers are not affected by the notion of increasing environmental problems and pollution. Perhaps, this can be explained by the fact that only the residents of Riga are worried about the increase of pollution in the city, since they spend all their time there — living, working, studying. People, who come to Riga only for work or studies, are not concerned about the pollution, because they spend only a part of their time there. Environmental problems and air pollution are global problems, and people often avoid thinking about them and changing their behaviour, because they believe that one person's actions cannot change the world.

Responses to the second and third sub-question are average; there are no significant increases or decreases. Several people would be motivated by improvement of the public transport quality and speed, as well as a reduced fare price. These drivers could be the same who gave a positive answer to the second question. Approximately the same number of respondents were indifferent to public transport as such; therefore any improvements regarding the quality or speed of service would not motivate them to leave their cars and change for public transport.

Several respondents have answered to the fifth sub-question as well and expressed their opinions on what would encourage or demotivate them to use the P&R system:

-I would use P&R, if public transport were free and ran regularly (intervals no longer than 10 min, around the clock);

-I would use P&R, if public transport to the city centre were for free;

-I would use P&R, if the daily fee for parking in the P&R lot were lower than in the city centre;

-I believe that P&R is not relevant to such a small city as Riga, besides it has several drawbacks to be considered — at least, one should think about the people living in the centre. I lived in Old Riga myself and I don't think that I should pay LVL 5 per hour or LVL 60 per month in order to be allowed to drive up to my house, so that I can carry the countryside goodies up to my flat. I also don't think that people will find this mode of transport attractive, if they have to stagger from the centre shops to public transport hauling full shopping bags and then being brought to their cars with the speed of light;

-I mean there is no normal public transport in Riga at the moment. For example, I would gladly go by train, but it runs only once an hour or even once in 1.5 hours. If trains ran every 20 minutes, I could park my car at the nearest and most convenient train station;

-I would use P&R, if the public transport serving P&R were not stuffed, if it were possible to sit down comfortably, and if it were more comfortable than the regular public transport of Riga;

-I would use P&R, if the drivers parking their cars in the P&R lot were offered free public transport, and if it were scientifically well-founded, not only by me, and if such action would earn the driver some kind of discount or special activities. Since I daily bring a sports bag and a laptop case with me and I buy food, it would be very inconvenient for me to use public transport. I think an underground parking should be considered, as well as development of high quality services (gyms, swimming pools for active recreation, spa centres and professional beauty parlours, brand shops) outside the city centre.

The assessment of public opinion has shown that in general the attitude towards introduction of P&R system in Riga is positive. It is evident that people would like to use P&R, if good public transport service (which is also one of the main principles of a successful P&R system) and some discounts or special offers were provided. Such attitude is completely reasonable, because, in order to give up the comfort provided by a personal car, one has to receive something equal and financially beneficial in exchange.

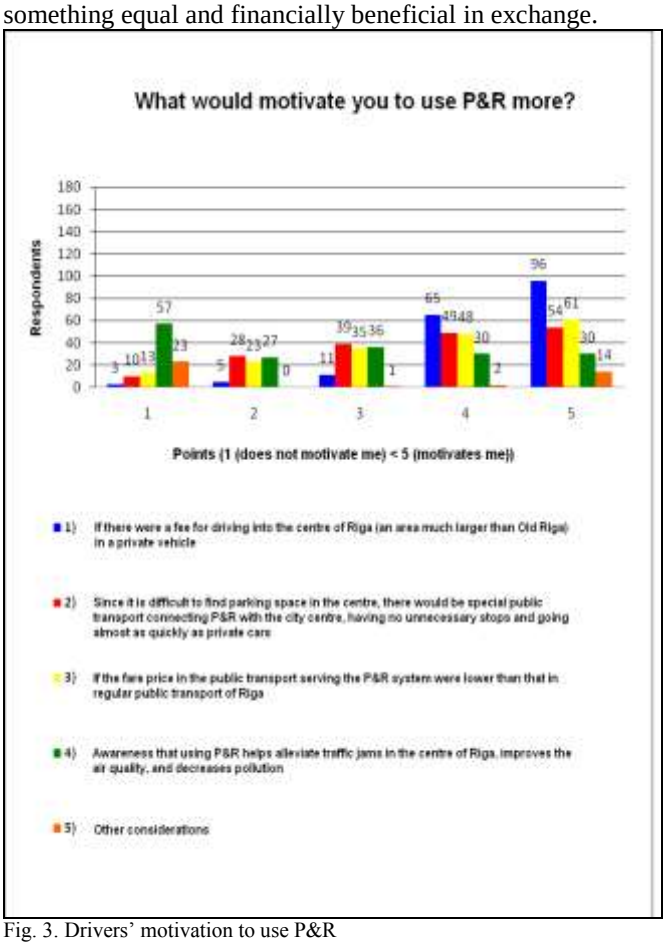

Fig. 3. Drivers' motivation to use P&R

3.4. Question four:

Do you think P&R is suitable for Riga and able to prevent traffic jams in the city?

Responses to the fourth question show the residents' opinion on the suitability of a P&R system for Riga. 72% of respondents think it is suitable, while 28% think it is not. The reasons for this can be different — the insufficient awareness about the system as a whole, unwillingness to use P&R, etc.

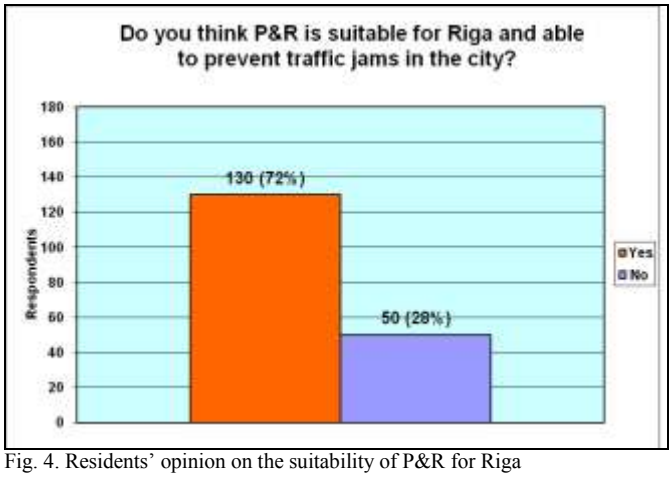

Fig. 4. Residents' opinion on the suitability of P&R for Riga

3.5. Question five:

Do you live in Riga?

Figure 5 shows that the majority of respondents do not live in Riga, which is good, since it improves the credibility of the survey results. It is useful to analyse this question together with the fourth consideration in the third question — those who do not live in Riga are not concerned about exhausts and air pollution in Riga and are not ready to help improving the situation.

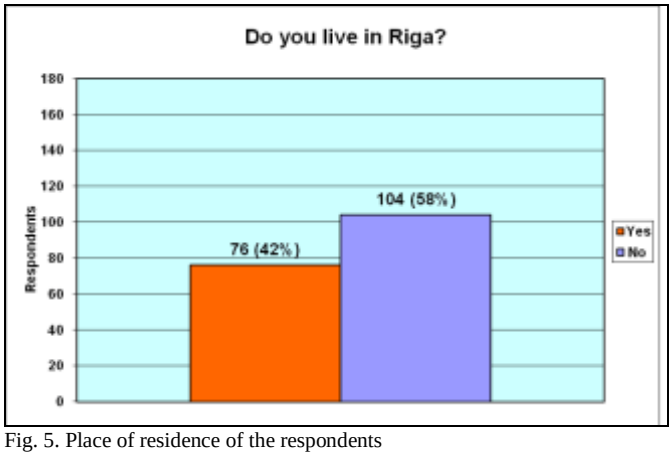

Fig. 5. Place of residence of the respondents

3.6. Question six:

What type of transport do you use daily to get to the desired destination?

- private car;
- public transport;
- bicycle;
- other.

Figure 6 shows the answers to Question 6. It appears that the majority of respondents use cars every day. And, according to personal observations, in most cases the driver is alone in his car. As a result, the traffic space in the streets of Riga is used irrationally. If at least two or three persons would share a car, the traffic jams would decrease by half at least. There are many reasons why people prefer personal vehicles to public transport. The main reasons are: being accustomed to the comfort provided by a private vehicle; the cumbersome public transport which is always stuffed during the rush hour; selfishness and unwillingness to help solving environmental problems and lessen air pollution in Riga.

In order to ensure the success of P&R, it is necessary to substantially improve public transport and let the drivers understand that the use of public transport not only lessens traffic jams, but also improves the air quality in the city. This problem must be solved collectively and every person's participation is needed.

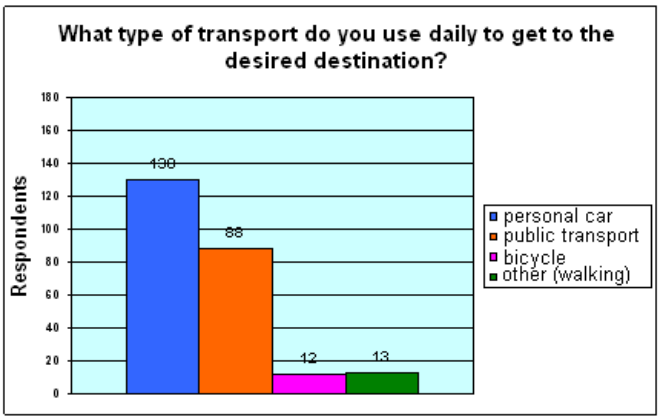

Fig. 6. Residents' daily mode of transport

4. ECONOMIC ANALYSIS

The calculations have been made by using "Metodiskie norādījumi autoceļu projektu izdevumu/ieguvumu ekonomiskai novērtēšanai" ("Methodic Guidelines for Economic Evaluation of Costs and Benefits of Road Projects"). [5]

The analysis models a possible future situation, if a P&R system is introduced in Riga alongside with a pay zone.

Calculation of the design and implementation costs of a P&R system, which helps estimating when the system will pay off, is not within the scope of this research. The main accent is put on the individual benefits or expenses of the drivers, which depend on their choice of action. The choice is between using P&R or paying for entering the pay zone and buying a ticket for parking one's car in the city centre.

In order to carry out the financial efficiency analysis of the P&R system, two types of benefits can be discerned. One benefit is time, and the other is fuel consumption and run.

In order to convince the drivers to use the P&R system, both benefits must be present, i.e. less time spent on the trip,

due to the decreased traffic jams, and less fuel consumed, due to a shorter distance and less traffic jams.

The analysis shows which drivers will benefit more — those who use the P&R system, or those who do not.

It must be noted that the calculation is approximate, because it is based on assumptions (taking into account foreign experience and the current costs in Riga) and the responses of 180 persons, which is actually only a small part of those who live or work in Riga. However, it is sufficient to see the difference in the costs of using and not using the P&R system.

4.1. Source data for the analysis:

The analysis has been done by modelling a situation where the P&R parking lot is situated in Jugla, because the second heaviest traffic flow comes from the Bergi direction (the heaviest traffic comes from the direction of Jūrmala).

1. According to the data available on the Latvijas Valsts Ceļi homepage, the average yearly day and night intensity of all traffic coming to Jugla in 2009 was 20 419 vehicles a day, including 2542 heavy transport vehicles a day. Therefore, it can be calculated that the average yearly day and night intensity of passenger vehicles coming to Jugla in 2009 is 17 877 cars a day.

2. According to the survey data, 104 out of 180 respondents (58%) live outside Riga and are willing to use a P&R system. The analysis equates that 58% of the intensity of the total car traffic coming to Jugla amounts to 10 369 cars a day — this number is the basis for all calculations.

Assumptions:

– The main users of P&R are drivers of private cars;

– All cars coming to Riga through Bergi go towards the centre (the Freedom Monument) and, therefore, the traffic intensity at all stages of the calculation is the same;

– It is assumed in the calculations that the P&R system is used 6 days a week, i.e. 313 days a year;

– The P&R system provides passenger transportation in special, comfortable buses with seats for every passenger (60 seats in total). The bus runs along Brīvības Street from Jugla to the Freedom Monument. It runs without unnecessary stops and quickly takes the passengers to their destination;

– The fee for entering the pay zone is EUR 1 (LVL 0.71), the same as in the majority of the European cities that have already introduced a pay zone;

– Drivers who do not use P&R go to the centre in their private vehicle and leave it there in a parking lot. The current price of monthly parking is around LVL 60 and a day parking costs around LVL 5. The calculation uses the monthly parking prices.

– In most cases, there is only one person in a car. However, to take into consideration the cases when there are two or more persons in a car, the value used for the calculations is 1.3 persons in a car;

– P&R is linked to e-ticket, which is convenient and multifunctional. The fare price in the P&R bus is equivalent to the price of a monthly ticket for a specific bus route for all days of the month. The price of the monthly ticket is LVL 15.60;

– The daily fee for leaving a car in the P&R parking lot is LVL 1.5, which is the average daily fee in European cities.

4.2. Essence of calculation:

The general traffic intensity equals to 100%.

58% (10 369 cars a day) of the intensity:

1. Drive as in the current situation (do not use the P&R system) in the general traffic flow — these drivers pay for entering the pay zone and use a monthly parking ticket for parking their car in the centre; they also pay for the added distance, fuel consumption and the time spent on the trip and in traffic jams.

2. Drive as in the new situation — these drivers use P&R, where the only costs are the parking fee and the public transport fare.

42% (7508 cars a day) of the intensity:

1. Drive as in the current situation (do not use the P&R system) in the general traffic flow — these drivers pay for entering the pay zone and use a monthly parking ticket for parking their car in the centre; they also pay for the added distance, fuel consumption and the time spent on the trip and in traffic jams.

2. Drive as in the new situation — when 58 % (10 369 cars a day) of the drivers use the P&R bus, their costs are the pay zone entering fee and a monthly fee for parking in the centre, as well as the costs of vehicle run and the time spent on the trip and in traffic jams, which have decreased because 58% of the cars (10 369 cars a day) use P&R.

5. Calculation results

The main results of the analysis — the vehicle run and time expenses in relation to using or not using the P&R system — are shown in Figures 7 and 8.

The numbered horizontal bars in Figure 7 represent:

1. Monthly expenses (LVL) of one vehicle from 58% while driving in the existent traffic flow (100%);
2. Monthly expenses (LVL) of one vehicle from 58% while using P&R;
3. Monthly expenses (LVL) of one vehicle from 42% while driving in the existent traffic flow (100%);
4. Monthly expenses (LVL) of one vehicle from 42% while 58% use P&R.

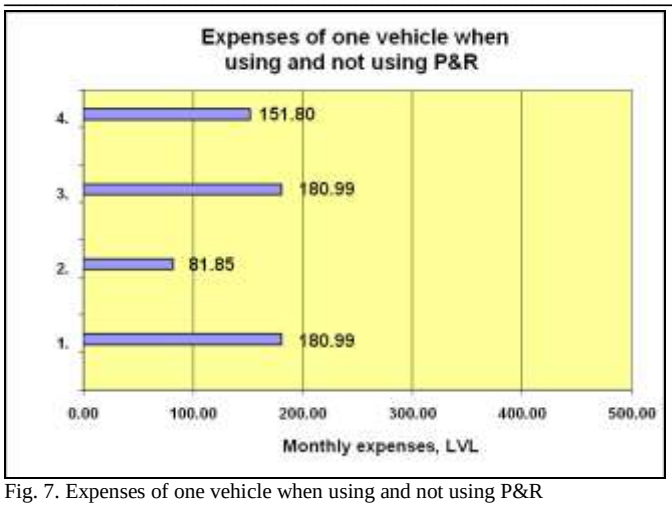

Fig. 7. Expenses of one vehicle when using and not using P&R

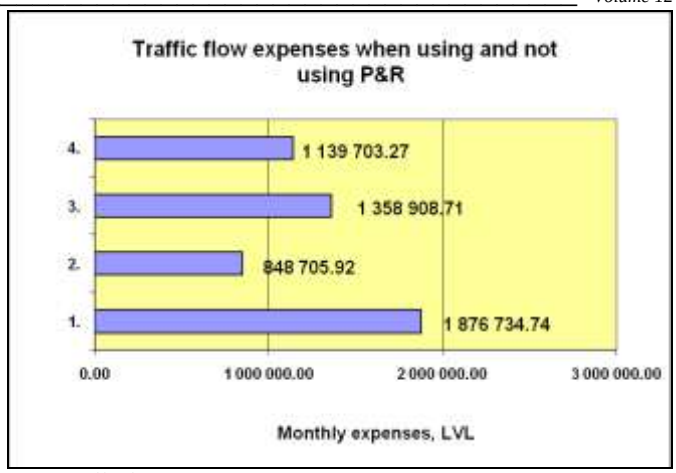

Fig.8. Traffic flow expenses when using and not using P&R

The results summarized in Figure 7 allow to conclude that the use of P&R is definitely favourable, because the expenses of one vehicle using P&R can decrease by 45%, i.e. the expenses are LVL 982.20 a year or LVL 81.85 a month, instead of LVL 2171.94 and LVL 180.99 respectively.

The first and the fifth column (from the left) displays the costs of a vehicle using the current situation, ignoring P&R and paying both the pay zone entrance fee (LVL 0.71) and a monthly parking ticket (LVL 60.00) for leaving the car in the parking lot.

Both columns show the largest expenses, namely LVL 2171.94 a year and LVL 80.99 a month. The costs represented in the seventh column (from the left) are a little lower, which can be explained by the fact that some drivers have decided to use P&R, and the rest of the traffic flow becomes less congested, traffic jams are relieved and, therefore, the time consumption and costs are decreased.

It may be said that this group of drivers who do not want to use P&R benefit too, on the expense of the P&R users. However, it can be dangerous to develop such thinking, because if there are no P&R users, there will be no advantages. Financially, the biggest winners still are the users of P&R.

The numbered horizontal bars in Figure 8 represent:

1. Monthly expenses (LVL) of 58% of ALL traffic (10 369 cars a day) not using P&R;
2. Monthly expenses (LVL) of 58% of ALL traffic (10 369 cars a day) using P&R;
3. Monthly expenses (LVL) of 42% of ALL traffic (7508 cars a day) using P&R;
4. Monthly expenses (LVL) of 42% of ALL traffic, if 58% of the flow use P&R.

Figure 8 is basically analogous to Figure 7, but it represents the summed expenses of all drivers. Whereas the expenses per one car remain unchanged under specific assumptions, the expenses of the whole traffic flow are dependent on the number of participants.

The opinion of the residents of the nearby areas — the potential users of P&R — is very important, and it is equally important to be sure that the public is well-informed about the system. I believe that before implementing the P&R system in Riga, a massive public survey and research should be carried out in order to obtain the more precise data than in the analysis described above. Drivers should be informed about the results of the survey, because they might have never considered how many resources are spent in traffic jams and what could be the benefits for them, as well as for others, if they use the P&R system.

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Elīza Šuvarikova. Iedzīvotāju viedokļi Latvijā un Park & Ride sistēmas ieviešanas analīze
Park & Ride (turpmāk tekstā P&R) sistēma galvenokārt ir izskatīta kā atbilde uz sastrēgumiem pilsētas ielās. Jēdziens P&R nozīmē no pilsētas centra attāli esošu auto novietošanas vietu, kuru apkalpo transporta līdzekļu vadītājiem ērts sabiedriskais transports, kas nogādā pasažierus uz galvenajām pilsētas centra zonām.
Sabiedriskais transports parasti ir speciāli P&R autobusi, vilcieni vai tramvaji, kas ir labi aprīkoti un ērti, kā arī kursē pietiekami bieži, lai nogādātu P&R lietotājus uz nozīmīgākajām pilsētas centra zonām, kam pamatā P&R arī ir paredzēts. P&R sistēmas potenciālais lietotājs var būt jebkurš transporta līdzekļa vadītājs, kurš apmierināts ar P&R sistēmu, to iesaka citiem un tādā veidā popularizē sistēmu un tās ērtumu, ieguvumus to lietojot. P&R, kas balstītas uz sistēmas lietotāju pārvadāšanu ar autobusu, parasti, līdz svarīgākajām pilsētas zonām, kursē bez liekām pieturām. Savukārt sistēmas, kas balstītas uz pasažieru pārvadājumiem ar vilcienu vai tramvaju, parasti tiek izveidotas esošu sabiedriskā transporta pieturvietu tuvumā, vai arī tiek ieviestas jaunas pieturas gadījumā, ja pie esošām pieturvietām nav brīvu zemes gabalu P&R sistēmas izbūvei. P&R sistēma galvenokārt ir izplatīta tajās pilsētās un lielpilsētās, kurās ir novērojama sastrēgumu problēma un transportlīdzekļu radītais gaisa piesārņojums. P&R stratēģija tiek balstīta uz 6 galvenajiem faktoriem – atrašanās vietu, pieprasījumu, sistēmas novietojumu, aprīkojumu, video novērošanu un vadību un kontroli. Šie 6 galvenie faktori, viens otru papildinot, veicina efektīvas P&R sistēmas attīstību. Ja P&R stāvvietā tiek novietoti tikai pāris transportlīdzekļi, tad tas nozīmē, ka pilsētas centrs tiek atslogots no šiem pāris transportlīdzekļiem un tiek dota iespēja jauniem zemes izmantošanas veidiem.
Ņemot vērā, ka pēdējo gadu laikā transporta plūsmas intensitāte Rīgā pakāpeniski pieaug, tiek meklēti dažādi risinājumi satiksmes reducēšanai pilsētas ielās. Izvērtējot ārvalstu pieredzi, viens no visbiežāk pielietotajiem variantiem ir P&R stāvvietu ierīkošana. Salīdzinoši nelielajā pētījumā tiek izklāstīta un analizēta situācija, kas saistīta ar P&R sistēmas ieviešanu Rīgā. Pētījuma viens no galvenajiem mērķiem ir noskaidrot iedzīvotāju informētības līmeni un attieksmi pret P&R, kā arī izzināt potenciālo sistēmas lietotāju skaitu. Ne mazāk svarīgs mērķis ir veikt P&R sistēmas ieviešanas Latvijā ekonomisko analīzi, kas pētījuma ietvaros sastāv no izmaksu, kādas rodas lietojot vai nelietojot P&R, aprēķina. Aprēķins šajā stadijā pa daļai tiek balstīts uz šobrīd funkcionējošiem pieņēmumiem.

Элиза Шуварикова. Осуществление анализа системы Park & Ride и мнения жителей Латвии.
Система Park & Ride (далее в тексте - P&R) в первую очередь воспринимается как ответ на заторы на улицах города. Понятие P&R относится к отдаленному от центра города месту стоянки автомобилей, которое обслуживает привлекательный для водителей общественный транспорт, доставляющий пассажиров в главные зоны городских центров. Общественный транспорт, как правило, это специальные P&R автобусы, поезда и трамваи, которые хорошо оборудованы и удобны, и которые курсируют достаточно часто, чтобы доставлять пользователей P&R к важнейшим зонам городских центров, для чего в сущности P&R и предназначен. Потенциальным пользователем системы P&R может быть любой водитель транспортного средства, который удовлетворен системой P&R, рекомендует ее другим, тем самым популяризируя систему и ее удобство, выгоду от ее использования. P&R, которая основана на перевозке пользователей системы на автобусе до важнейших городских зон обычно, курсирует без лишних остановок. В свою очередь системы, которые основаны на перевозке пассажиров с помощью поездов или трамваев, обычно создаются вблизи существующих остановок общественного транспорта, или планируются новые остановки в случае, когда около существующих остановок нет свободных земельных участков для строительства системы P&R. Системы P&R в основном распространены в тех городах и мегаполисах, в которых наблюдается проблема заторов и загрязнение воздуха транспортными средствами. Стратегия P&R основана на 6-ти главных факторах - место нахождения, спрос, расположение системы, оборудование, видео наблюдение, управление и контроль. Эти шесть ключевых факторов, дополняя друг друга, способствуют эффективному развитию системы P&R. Если на стоянке P&R размещены только пару транспортных средств, то это уже означает, что городской центр разгружен от этих транспортных средств, создавая возможность для новых видов использования земли. Учитывая тот факт, что в последние годы интенсивность дорожного движения в городе Риге постепенно растет, ищутся различные решения для снижения трафика на улицах города. При оценке опыта зарубежных стран, одним из наиболее применяемых вариантов является устройство стоянок P&R. В сравнительно небольшом исследовании изложена и анализирована ситуация, связанная с внедрением системы P&R в городе Рига. Одной из главных целей исследования является определение уровня информированности населения и отношения к P&R, а также выявление количества потенциальных пользователей системы. Не менее важной целью является экономический анализ внедрения системы P&R в Латвии, который в рамках исследования состоит из расчета стоимости использования или не использования P&R. Расчет на данном этапе частично основан на функционирующих в настоящее время предположениях.