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AN INTRAURBAN LOCATION CHOICE FOR A SCIENCE AND TECHNOLOGY PARK IN BRATISLAVA: A FEASIBILITY STUDY

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The aim of the study is to create a methodological procedure of optimum intraurban selection of locality in the territory of Bratislava offering rational and optimum feasible location of the Science and Technology Park (STP). Method of expert assessments is chosen for comparison and choice of the most suitable locality for feasible location of STP. The result of the study is determination of order of suitability of the individual selected localities for establishment of a STP in the territory of Bratislava as a group of experts assessed them on the basis of the importance of location factors.

Key words: Science and Technology Park, location factors, optimal intraurban location, feasibility study, expert assessments, questionnaire survey, Bratislava

INTRODUCTION

The term Science and Technology Park (STP) is not very well known in Slovakia or it is often incorrectly interpreted. It is confused with the term industrial park and also the role of development of scientific knowledge is often attributed

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to the STP. Therefore, the primary aim of the paper is to provide introductory information obtained by the study of foreign literature and from consultations with managers of European STPs on this highly ambitious element of entrepreneurial activity. As the establishment of a STP is also presumed in the territory of Bratislava, the additional aim of the study is to offer methodology for an optimal intraurban choice of locality where the location of specific Bratislava STP would be rationally feasible.

SCIENCE AND TECHNOLOGY PARKS, INNOVATIVE REGIONS

The Internet site of the British Council (http://www.britishcouncil.org) reads that: "Science Parks were originally an American phenomenon dating back to the 1950's, and were devised to meet the needs of entrepreneurially-minded academics. These saw the opportunity to commercially exploit their own areas of technology, yet wanted to remain close to their academic institutions, which formed the source of further invention and of trained graduate manpower". Since the 1950's until now the significance of STPs has gradually changed. While in the first years of their existence (approximately until the end of the 1980's) the majority of STPs pursued realization of scientific research and transfer of its results into industries, the STPs of today are tools of local and regional economic development supporting the innovation process and subsequent increase of competitiveness of firms and regions. Science parks were the impetus or product of what is referred to innovative regions, which are characterized by high and above-average spatial concentration of technology-based firms (firms producing or exploiting IT prevail), and innovative activities. Maier and Tödtling (1997) mention innovative regions in the USA, quoting Silicon Valley in California and Route 128 in Boston as the text book examples.

STPs have also comparatively quickly spread in Europe and advanced Asian countries while they also initiated formation of innovative regions. The first to appear in Japan was Science City Tsukuba, which is located about 70 km to the north east of Tokyo. Tsukuba's developmental strategy centred on the relocation of a national university and a number of national research institutes from Tokyo (Bass 1998).

Maier and Tödtling (1997) present the M4-Corridor located west of London, Silicon Glen in Scotland and Sophia-Antipolis in France as examples of European innovative regions. The genesis, development and branch orientation of Sophia-Antipolis situated near Nice in the south of France was described in detail by Longhi (1999) who presented it as the product of regional policy planned and implemented by the state, The primary conception was based on the utopian vision of a City of Science and Wisdom in a rural environment by Pierre Laffitte. His basic idea was that sun and sea could attract enterprises in research and leading-edge technology, as had occurred in the US.

In the UK governments (Westhead and Batstone 1998) have encouraged property-based science park initiatives for a variety of reasons. It is widely believed that science parks encourage national and regional development, stimulate R&D and innovation in SMEs, and encourage wealth creation and business profitability and job generation. By establishing a science park, participants believe they can revitalize a local economy by creating a "sunrise future". The

Science Park movement in the UK started in 1971 with the formation of Parks at Heriot-Watt University and at Cambridge University. These 'pioneer' Science Parks were both established by their respective academic institutions. The next Science Park was not opened until 1982.

In Italy STPs are mainly regarded as regional policy instruments, capable of rejuvenating declining economic systems and favouring new development opportunities in less developed regions (Lazzeroni 1995). In recent years, this type of policy was considered a way of stimulating the modernization and development of Southern regions. This attitude ran into a comparatively sharp criticism of a group of people, who argue that the constitution of STPs cannot be successfully centrally planned and financed for areas, where necessary conditions do not exist. However, the experience of France (Sophia-Antipolis) or of Great Britain, where science parks are also located in depressed and disadvantaged areas in northern and western Britain, considerably counteracts the criticism. Lazzeroni also reports, that in Italy in some cases it was possible to talk about the STP syndrome manifested by the effort of local administrative representatives to establish STP in their territories without any feasibility study or concrete analysis of the economic situation.

The questions of establishing STPs, description of their location and their very existence or contribution from the point of view of development of regions in Slovakia was not given any attention. The only exception known to the author of this paper is the study of Matlovič (1996), who presents a brief survey of innovative regions in different parts of the world, paying special attention to the best known of them, Silicon Valley.

The survey of individual studies treating the issue of STP shows not only terminological inconsistencies, but also discrepancies in what the STP actually represents. Shearmur and Doloreux (2000) deal with definition of STP and note that: "the definition of science parks is somewhat nebulous, and several terms are used to describe them: research-and-technology parks, technopoles (in the Francophone world), Technopolis in Japan. This diverse vocabulary reflects the fact that there has been no agreement on a universal definition: the lowest common denominator seems to be that such parks gather producers of high-technology products and services, and provide the opportunity for a degree of institutional co-operation between university and industry". The majority of authors in their studies adopt the definitions of STP produced by the United Kingdom Science Park Association (UKSPA – for example Westhead and Batstone 1998, The British Council, www page), or the Association of University Related Research Parks (AURRP). The latter defines a science park as "a property-based venture which has:

- Existing or planned land and buildings designed primarily for private and public research and development facilities, high technology and science-based companies, and support services.
- A contractual and/or formal ownership or operational relationship with one or more universities or other institutions of higher education, and scientific research.
- A role in promoting research and development by the university in partnership with industry, assisting in the growth of new ventures, and promoting economic development.

- A role in aiding the transfer of technology and business skills between the university and industrial tenants."

Source: (http://www.aurrp.org/index.html – see also Shearmur and Doloreux 2000, p. 1066).

This definition includes not only the science parks per se, but also research parks, technology parks, technopoles, and innovation centres. However, as Shearmur and Doloreux (2000) assert, the precise distinctions to be made between these various concepts are difficult to ascertain. Study of the literature led both authors to the conclusion that, in fact, distinctions are not always made: some authors use different terms to define different entities, whereas others use the terms interchangeably.

Regardless of the precise definition, the claims made for science parks, particularly at the local level, are similar. They are expected to stimulate the growth of high-tech activities and to foster technology transfer between research and industry. According Massey et al. (1992, see Shearmur and Doloreux 2000) science-park objectives can be divided into three main classes: (a) economic development objectives, (b) transfer-of-technology objectives, and (c) local benefit objectives (see Tab. 1).

Tab. 1. Science park objectives

Economic development
Stimulate the formation of start-up new-technology-based firms (NTBFs)
Encourage the growth of existing NTBFs
Commercialize academic research
Foster the technologies of the future
Counter the regional imbalance of R&D capability, investment, and innovation
Attract inward investment, mobile R&D
Transfer of technology
Encourage spin-off started by academics
Encourage and facilitate links between higher education institutes and industry
Facilitate technology transfer from academic institution to firms in the park
Increase the "relevance" to industry of the research and higher education institutes
Give academic institutions access to leading-edge commercial R&D
Increase the appreciation of industry's needs by academics
Stimulate science-based technological innovation
Local benefits
Create employment and consultancy opportunities for academic staff and students
Create synergy between firms
Create new jobs for the region
Improve the performance of the local economy
Stimulate a shift in perceptions
Build confidence
Engender an entrepreneurial culture
Generate income for academic institutions
Improve the image of academic institutions in the eyes of central government

Source: Shearmur and Doloreux (2000), adapted from Massey et al. (1992)

It is generally known, that science parks provide a number of advantages and supported services, which may be appreciated by independent technology-based firms. In spite of this fact Westhead and Batstone (1998) in their study of UK parks concluded that one of the principal attractions of science parks for technology-based firms is overall image and prestige. Shearmur and Doloreux (2000) assert that many new and small technology-based firms, who did not posses complete information for an economically rational decision and wanted space in a STP were prepared to pay a "rental premium" to increase their technological and commercial reputation. They are convinced (like Lazzeroni 1995) that the "local Science Park" often becomes a region's economic development showcase, promoted and funded by local institutions because of the image it creates for the municipality. The location of a company in such STP is definitely a question of prestige. And it is the reasons why both authors believe that science parks can easily become glorified business parks, attracting firms primarily because they provide prestige real estate.

BRATISLAVA AND ITS STP – ARGUMENTATION FOR LOCATIONAL CHOICE AND CHARACTERISTICS OF A POTENTIAL STP

The project to establish a STP in the territory of Bratislava was worked out in the years 1998-1999 and financed by the PHARE Cross Border Co-operation Programme of the SR by the Dutch company Berenschott EuroManagement, which closely collaborated with the Bratislava firm Business and Innovation Centre (BIC) participating in the group European Business and Innovation Centre Network (EBN). The City Council of Bratislava, Capital of the SR and the Regional Office of Bratislava ordered it. The author of this paper worked in the project and particularly on the partial question of intraurban location choice for the Science and Technology Park.

In case of location choice of the Bratislava STP out of several heuristic procedures (Maier and Tödtling 1997) the step-by-step decision was used, that is the spatial dimension of location decision was decompose into several levels (regions, districts, precise intraurban location), while it was pondered on the location at each spatial level (it should be noted that in application of heuristic procedures to location decisions the aim is not the economically most profitable solution, but a solution which is acceptable at a reasonable cost). In spite of the fact that the decisions were actually joined, they were adopted independently.

The rationale behind the decision to establish a STP in the territory of Bratislava is obvious. Bratislava, the Capital of the Slovak Republic is also the economic, political and cultural centre of the country and with its rural hinterland it represents the administrative-territorial unit of Region of Bratislava and the core of the most important developmental area of Slovakia. The balanced regional economic structure, the highest share in GDP (around 23 %), the lowest regional unemployment rate, the highest regional concentration of university graduates and scientific potential, the highest regional concentration of producing services supporting the business sector and that of foreign finances are the assets of Bratislava. Among Bratislava's comparative advantages, apart from favourable transport accessibility, is its unique geographical and geo-political position on the frontiers with Hungary and Austria providing prerequisites for intensive cross border contacts. This extra favourable image of Bratislava, also

helped by the study of the German company Empirica, is very important from the point of view of potential investors. This company was involved with prediction of economic development in Europe with spatial implications and having compared more than 400 spatial units assessed the territory between Vienna, Győr and Bratislava as the most perspective region in Europe.

The Berenschot EuroManagement company based its reflections on the creation and location of the first STP in Slovakia on the preliminary definition, according to which *"The STP is the initiative based on development of real-estates (plots, buildings, and networks) very closely interconnected with one or more scientific and research institutions (universities, academy, research institute) in order to support commercial implementation of the results of science and research by small and medium firms."* (Berenschot EuroManagement 1998a, 1998b, 1999). The above-quoted preliminary definition gave shape to the idea of the STP in Bratislava, according to which:

- The BSTP should be a small park with an area of 8 ha with the possibility of its extension up to 20 ha.
- The BSTP should concentrate small and medium firms involved in implementation of scientific and research results with the potential of including larger firms (in the framework of the following stages or expansion) providing the synergetic effect will be guaranteed.
- The BSTP should provide its services on a commercial basis.
- The contacts with the scientific and research sphere should be ensured through the broker centre of the Technical University, Comenius University and the Slovak Academy of Sciences.

It was presumed that the positively perceived synergetic effect of networking of institutions would not only contribute to the development of the region of Bratislava, but also as a pilot project it may stimulate similar investment initiatives in other regions of Slovakia.

INTRAURBAN LOCATION CHOICE FOR THE SCIENCE AND TECHNOLOGY PARK IN BRATISLAVA – THE METHOD OF EXPERT ASSESSMENTS

The choice of the optimal locality for any object is generally a very complicated decision-making process, during which multicriterial assessment of a (theoretically) unlimited number of localities is carried out (Nijkamp and Delft 1977, Voogd 1983). In practical life the heuristic procedures (which are based on the limited number of admissible localities accompanied by the input of often irrational factors) are applied to location decisions. This is the reason why in feasibility studies the neo-classical image on economic optimality is partially pushed into the background. The choice of a locality for the establishment of a STP in the territory of Bratislava is a typical example of a feasibility study.

The City Council of Bratislava, Capital of the SR, determined, also with regard to the territorial plan of development of the city, five localities (the are a of the Slovak Academy of Sciences at Patrónka, Devínska Nová Ves, Petržalka, Pálenisko, and the Airport), where the STP might possibly be established. The Berenschott EuroManagement company added two other localities – the Industrial Park of Jarovce-Kittsee and Istrochem (Fig. 1) after negotiations with pro-

ject users. The aim of the submitted study was to produce the methodological procedure of an optimal choice of locality of the STP. The application of the methodology of selection of the most appropriate locality for STP from the *a priori* defined seven localities was accompanied by the effort to provide relevant, professional, and unambiguous information for the decision-making institutions, while the principal aim was to facilitate them the choice in the following planning process (it should also be noted that the choice and realization of project required negotiations with the representatives of the respective urban districts).

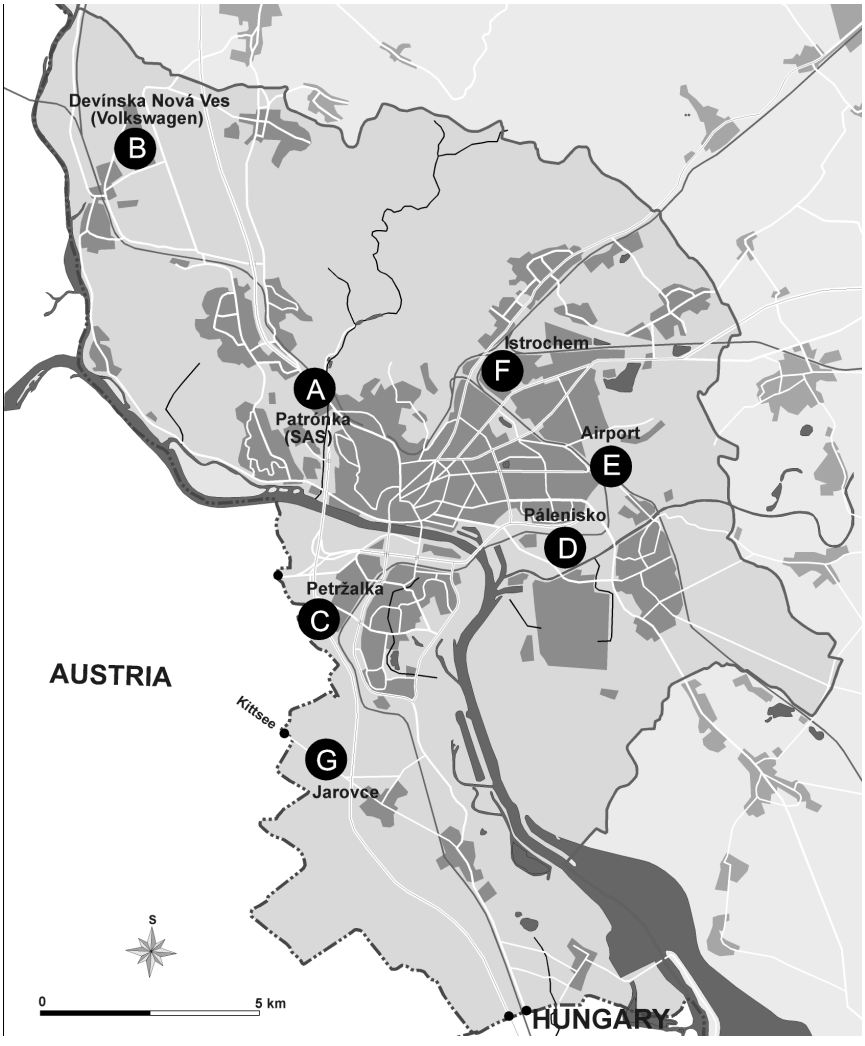

Fig. 1. Relative position of the individual potential localities for establishment of the STP in Bratislava

A. Patrónka (area of the SAS), B. Devínska Nová Ves, C. Petržalka, D. Pálenisko, E. Airport, F. Istrochem, G. Industrial Park of Jarovce-Kittsee

The views on the choice of factors, which influence or should influence the decision-making process involved with the final selection of locality, as well as their weight (the importance) considerably varied in expert community. In order to prevent authoritative attitudes and uncontrolled subjectivism in the selection, the method of expert assessment is normally applied. This method accompanied by an appropriate selection of experts from different fields of qualifications and their engagement, distinctly reduces extreme views might lead to an illogical choice of locality.

The method of expert assessment of relevant location factors was applied in order to compare and select the most suitable locality for a feasible location of a STP in the territory of Bratislava. The views of experts were obtained by questionnaire method with participation of 23 experts selected on the basis of their interest in the theoretical and methodological questions of STP location (for example workers of the Slovak Academy of Sciences, Economics University) or those which routinely deal with location decision in their work (for example workers of the City Council of Bratislava, the Capital of the SR, workers of the Regional Office of Bratislava). The inquiry realized by the face-to-face method was carried out in November-December 1998. In spite of the fact that the expert team was set on the basis of declarations (or documentation in form of the accomplished work) of their professional interest in the issue of Science and Technology Parks and/or location decisions, it was necessary to inform them in detail about the context and objectives of the inquiry, and the advantages/ disadvantages of the individual locations considered.

Obtained results

Result No. 1

In the first part of the inquiry the experts were asked to align the rate of significance for a decision on a generally feasible location of unspecified STPs to 21 individual *a priori* selected location factors. The selection of factors was made on the basic of the direct experience and recommendations of foreign STP managers who participated in the project. Extensive study and critical evaluation of theoretical and methodological or empirical literature dealing with the question of identification of relevant location factors in relation to optimal and feasible location of a STP was an equally important method of selection. Apart from the *a priori* selected location factors, each of the experts could add any factor considered by him relevant from the point of view of spatial location of STP. This possibility was used by only one of them.

Experts used a five point scoring system while ascribing the degree of importance of the individual location factors to a feasible location of the STP:

5. extremely important factor
4. important factor
3. medium important factor
2. below-average important factor
1. factor with minimum effect for the location decision

The set and variability of the obtained answers was characterized by the following statistics: arithmetical mean, standard deviation, coefficient of variance, and median (Tab. 2). Arithmetical means were considered average, general im-

portance of the individual location factors, which were used in the subsequent procedure as the fixed weights of importance linked to the particular localities of Bratislava (see the result No. 3).

The reached results show that all *a priori* selected location factors which influence the selection of STP location are at least moderately important in spatial decision-making process. A distinctly dominant position characterizes the factor "property/legal aspects in relation to the possibilities of acquiring plots for the STP". This location factor was ascribed the highest importance by experts, which proves that they were conscious of the natural differentiation of space in relation to this factor on the one side and also the necessity of solving the basic problem in order to be able to trigger off the investments into the STP. The lowest value of the coefficient of variance reveals that there was agreement among the experts as far as importance of this factor in the selection of a locality is concerned. It is obvious that from the point of view of the future successful operation of the STP, the importance of this sector is secondary, or insignificant.

One of the decisive factors for the successful operation of a STP is the geographical proximity of facilities, which generate conditions favourable to the development of innovative, economically efficient productions (proximity of research and scientific or educational institutions or stable economic entities with proper scientific and research base). It was a surprise then, that these conditions ranked as low as the 14^{th} most important factor in the assessment of the Bratislava experts, that is in the second half of the list of individual factors influencing feasibility of a STP. A still greater surprise was the kind of underestimation of the support expected from local authorities, their engagement and manifested interest in the project. This factor ranked as the 12^{th} most important (in the specific case of Bratislava this factor, as the following negotiations concerning establishment of STP showed, became one of the most important). The greater part of experts realized this, although they did not attribute it extreme importance. Generally, the experts evaluated both factors as important rather then moderately important from the point of view of selection of the future location of the STP.

On average, the lowest weight was given (also probably owing to the larger share of representation of technocrats among the experts) to the factor "landscape-aesthetic attractiveness of locality" which was simultaneously characterized by the most variable answers as it was perceived by the expert group as a factor of medium importance. Results documenting the unbalanced set of aligned assessments prove that extensive discussions might have taken place concerning the importance of this factor in the particular group of experts.

It is presumed that the results were determined to a large extent by the selection of experts and averaging sometimes questionably and extreme assessments of individual factors by a heterogeneous group of experts which were contradicted by the great majority of conclusions of theoretical studies dedicated to relevance of spatially differentiated location factors considered in the location of a STP. This was also confirmed by the computed high values of the coefficient of variation (standard deviation/mean × 100 %), which unusually clearly prove the extreme lack of unanimity of opinion concerning the importance of the selected (above all environmental) location factors.

Tab. 2. Final rank and summary statistics of point evaluation of the chosen location factors from the point of view of their general meaning for (feasible) location of a STP (according to the 23 experts' opinions)

Factor	Mean from <1, 5>	Standard deviation	Coefficient of variation	Median
Property/legal aspects regarding the possibilities of acquiring plots for the STP	4.54	0.56	12.3	5
Decisions of the state and local government bodies concerning strategic development of the city and the territorial plan of development	4.46	0.87	19.5	5
Transport communications and accessibility	4.33	0.63	14.5	4
Strategic interests of investors	4.25	0.76	17.9	4
Investment demand of construction of the complete technical infrastructure	4.18	0.77	18.4	5
Existing structure of economic base (share of activities exacting in terms of qualified labour and high value added level)	4.04	1.11	27.5	4
Prerequisites of more intensive cross-frontier co-operation	4.04	0.90	22.3	4
Perspectives of improved environmental quality (for instance, construction of green relaxation zones)	3.95	1.14	28.9	3
Interest of potential clients in joining a STP in the particular locality (results of inquiry)	3.95	0.89	22.5	5
Existing technical infrastructure in the territory	3.93	0.57	14.5	4
Genius loci - (atmosphere in the locality supporting establishment of STP)	3.91	1.06	27.1	3
Support of the local authorities, their engagement and manifested interest in establishment of a STP	3.85	0.80	20.8	4
Industrial orientation of the Park determined in advance (for instance concentration of mechanical engineering industry, chemical industry, information technologies, biotechnologies, etc.)	3.78	1.00	26.5	4
Conditions for development of innovative, economically efficient productions (proximity of research/educational and scientific institutions or stable economic entities with own research/ scientific base	3.74	0.75	20.1	4
Existing infrastructure of entrepreneurial environment (banks, above-standard services, etc.)	3.59	1.02	28.4	4
Existing age, occupational, and educational structure of local population	3.52	1.08	30.7	3
Impact on labour market, quantitative and qualitative employment in the locality	3.35	0.92	27.5	4
Existing environmental quality (air pollution, presence of dump sites, noise, social-pathological environment)	3.32	1.14	34.3	4
Influence on development of education	3.30	0.96	29.1	3
Possibilities of territorial development (taking into account spatial limits, regulations of construction, altitude zoning and other limitations)	3.17	0.86	27.2	4
Landscape/aesthetic attractiveness of the locality	3.04	1.13	37.2	3

Result No. 2

The following task for experts consisted of making pair comparisons between 7 selected localities and of producing an order by their suitability for the establishment of a STP taking into consideration each of the *a priori* set 21 lo-

cation factors. They were supposed to express their logic by aligning numbers to the individual localities with number 7 aligned to the most suitable locality for the STP and number 1 aligned to the least suitable locality from the point of view of the studied location factor. The task was an extra demanding one for the experts, because they had to apply as many as 21 comparisons for each factors (number of comparisons = $n(n\text{-}1)/2$, where n is number of localities), which means that they had to make 441 comparisons (21 location factors × 21 partial pair comparisons). In spite of intensive co-operation with a trained surveyor the group of expert did not achieve the 100 % feasibility of the task. All relevant assessments were computer processed in order to express the mean order of localities by taking into consideration the individual factors. Table 3 presents the results.

The experts were able to discern most precisely the most advantageous location of the STP (as proved by the largest difference between the maximum and minimum average value) by considering the factor "Prerequisites of development of innovative and economically efficient productions (proximity of research and scientific-educational institutions or stable economic entities with proper research scientific base)" – difference of 4.79 positions of locality ranking (theoretical maximum = 6 positions), or the factor "Prerequisites for intensification of cross border co-operation" – difference of 4.55 positions (theoretical maximum = 6 positions). The results were influenced above all by unanimous assessment of the most advantageous localities (that is a distinctly prevailing alignment of value 7 to the most advantageous localities), which were:

- The area of the SAS at Patrónka, taking into consideration the first factor,
- Jarovce taking into consideration the second factor.

From the point of view of the maximum attainable value (7), that is if all the experts assessed the given locality from the point of view of evaluated factor as the most advantageous one for location of STP) the average values 6.95 and 6.50 in the analysed matrix are at positions 1st and 4th. Above all, the almost unanimous assessment of Area of SAS at Patrónka by the group of experts as the place with the best prerequisites for innovative, economically efficient production is interesting. The difference compared to the second highest evaluated locality (Devínska Nová Ves) is extreme (1.84 positions – but it is not the maximum difference of locality order from the point of view of all judged factors. Maximum difference has been achieved by assessment the location factor "investment demands of complete technical infrastructure" Between the best evaluated locality (Area of the SAS, Patrónka) and the second best locality (Airport) the difference was 2.16 positions.

The choice of the least advantageous locality was not so univocal in spite of the fact that the locality Istrochem reached the second lowest value (1.95) after taking into account the factor "Prerequisites for intensification of cross border co-operation". The average value of the order 2.16 for the locality "Airport" taking into consideration the factor" Prerequisites for development of innovative and economically efficient productions (proximity of research and scientific-educational institutions or stable economic entities with proper research scientific base)" documents best this difference in opinion. The lowest value (1.37), which comes closest to the minimum attainable value (1), that is if all

Tab. 3. Mean order of localities by the individual location factors (according to the 23 experts' opinion)

Locality/Factor	A	B	C	D	E	F	G	Difference between the max. and min. values
Decisions of the state and local government bodies on strategic development of the city and the territorial plan of development	6.00	5.00	3.10	4.00	3.19	2.71	4.00	3.29
Support from local authorities, their engagement and manifested interest in establishment of the STP	5.57	5.43	3.35	3.70	2.75	3.10	4.24	2.82
Impact on labour the market, qualitative and quantitative employment in the area of the locality	3.76	4.86	5.48	3.43	2.52	3.24	4.71	2.96
Existing age, occupational, and educational structure of local population	5.72	5.11	5.67	2.61	2.22	2.89	3.72	3.50
Existing structure of economic base	5.82	5.59	3.06	2.71	2.94	4.76	2.88	3.11
Transport accessibility and connections	5.71	4.19	4.29	3.62	3.29	3.29	3.62	2.42
Prerequisites for development of innovative and economically efficient production	6.95	5.11	3.68	3.05	2.16	4.42	2.63	4.79
Impact on development of education	6.00	4.84	5.00	2.89	2.32	3.79	3.16	3.68
Genius loci - (atmosphere in locality supporting establishment of a STP)	6.74	5.00	3.79	2.84	3.00	3.42	3.21	3.74
Existing technical infrastructure in the territory	6.65	4.85	3.35	2.60	3.50	4.80	2.25	4.40
Existing infrastructure promoting entrepreneurial environment in the territory	5.65	4.53	4.29	3.24	3.76	4.41	2.12	3.53
Possibilities for territorial development	3.32	5.42	4.84	3.84	3.11	2.21	5.21	3.21
Landscape-aesthetic attractiveness of the locality	5.65	5.50	3.90	2.40	4.00	2.15	4.40	3.50
Existing environmental quality	5.58	5.53	4.26	2.63	3.32	1.37	5.32	4.21
Impact on improvement of environmental quality	4.05	4.42	4.89	4.42	2.79	3.58	3.84	2.10
Property/legal aspect in relation to possibility of acquiring plots for a STP	5.53	5.53	3.00	3.21	3.11	4.32	3.32	2.53
Investment demands of complete technical infrastructure	6.63	4.21	3.21	2.89	3.68	4.47	2.68	3.95
Prerequisites for intensification of cross border cooperation	3.48	4.45	5.20	2.75	4.15	1.95	6.50	4.55
Strategic interests of foreign investors	4.17	4.89	3.89	3.53	3.89	2.37	5.42	3.05
Interest of potential clients in joining a STP in a particular locality (results of inquiry)	5.67	5.33	4.00	2.58	4.25	2.67	3.50	3.09
Industrial orientation of the park determined in advance	6.00	6.33	3.00	2.83	2.00	4.92	2.92	4.33

Explanation of symbols denoting localities in the table:
A – Patrónka (Area of the SAS), B – Devínska Nová Ves, C – Petržalka, D – Pálenisko, E – Airport, F – Istrochem, G – Jarovce–Kittsee Industrial Park
Explanation of numerical values:
the highest value – the most suitable locality for feasible location of the STP, the lowest value – the least suitable locality for feasible location of the STP

the experts assessed the particular locality from the point of view of the assessed factor as the least suitable for the location of the STP was reached by the locality Istrochem after taking into consideration the factor "Existing environmental quality (air pollution, presence of dump sites, noise, social-pathological environment)". This result confirmed the generally known objectively existing deteriorated environmental quality in the environs of Istrochem and its prevailingly negative perception by experts and the public.

The largest heterogeneity and discrepancies in assessment of the individual localities by the experts (difference of 2.10 positions with theoretical maximum of 6 positions) was reached while considering the factor „Impact on improvement of environmental quality, for instance by establishing green relaxation zones". On the one side the result can be interpreted as the manifestation of the hardly imaginable impact of STP construction as improvement of the environmental quality i.e. complicated pair comparison of little differentiated potential localities and the result of positive effect on all localities considered, from which the localities with a higher concentration of population are more favourably evaluated, on the other.

It is certainly interesting that the factor "Transport accessibility and connections" received the second largest heterogeneity of answers (difference of 2.42 positions) in the assessments of the experts. This result is probably connected with different application of local, regional, supraregional or global points of view of the transport connections and accessibility of the individual analysed localities in Bratislava by the experts.

In order to enhance the readability of Tab. 3 its modified and simplified form (Tab. 3A) is presented. Its aim is to provide unambiguous order of suitability of the individual localities for establishment of the STP taking into account all 21 factors and the assessments of all 23 experts. Table 3A shows the dominant preference of the locality of the Area of the SAS at Patrónka for establishment of the STP. Experts ascribed it the first position in as many as 15 cases (considering 15 location factors). Out of the total of 21 considered factors this value represents the share of 71 %.

The locality of Devínska Nová Ves was evaluated by expert group as the best considering 3 location factors and second to the most advantageous considering 13 location factors.

The locality of Jarovce is among the localities, which, considering one of the factors, appeared the most advantageous place for location of a STP with the best prerequisites for cross boundary co-operation. The experts also presume that Jarovce would be most advantageous from the point of view of the strategic interests of foreign investors.

Two highest evaluations were also adjudicated to the locality of Petržalka. It is interesting that in both cases the location of a STP in the territory of Petržalka was interpreted as one of the ways of improving its environment (the highest evaluation according to the factor „Impact on improvement of environmental quality, for instance by establishing green relaxation zones") or at least as a partial solution to the lack of jobs and qualitative improvement of work opportunities in its territory (the highest evaluation according to the factor "Impact on labour market, qualitative and quantitative employment in the area of locality").

None of the factors considered influenced the average assessments of experts to such an extent as to adjudicate the highest position to other assessed localities (Pálenisko, Airport, Istrochem). The opposite rather happened. The Airport was evaluated by the experts, after taking into account as many as 8 factors, as the least suitable for location of a STP, the localities of Istrochem and Pálenisko obtained such evaluation according to 7 factors and 3 factors, respectively (see Tab. 3A). Considering the individual location factors, the experts did not ascribe the attribute of the least suitable for a STP to only 2 localities: Area of the

SAS at Patrónka and Devínska Nová Ves. Jarovce was assessed as the least suitable locality considering 3 location factors and Petržalka obtained such an evaluation considering only one factor, which was the location factor of "Property/legal aspect in relation to the possibility of acquiring plots for a STP", considered by experts as the most valuable one.

Tab. 3A. Modified and simplified average order of localities taking into account the individual location factors (according to the 23 experts' opinions)

Locality / Factor	A	B	C	D	E	F	G
Decisions of the state and local government bodies on strategic development of the city and the territorial plan of development	7	6	2	5-4	3	1	5-4
Support from local authorities, their engagement and manifested interest in establishment of the STP	7	6	4	3	1	2	5
Impact on the labour market, qualitative and quantitative employment in the area of the locality	4	6	7	3	1	2	5
Existing age, occupational, and educational structure of local population	7	5	6	2	1	3	4
Existing structure of economic base	7	6	4	1	3	5	2
Transport accessibility and connections	7	5	6	4-3	2-1	2-1	4-3
Prerequisites for development of innovative and economically efficient production	7	6	4	3	1	5	2
Impact on development of education	7	5	6	2	1	4	3
Genius loci - (atmosphere in locality supporting establishment of a STP)	7	6	5	1	2	4	3
Existing technical infrastructure in the territory	7	6	3	2	4	5	1
Existing infrastructure promoting entrepreneurial environment in the territory	7	6	4	2	3	5	1
Possibilities for territorial development	3	7	5	4	2	1	6
Landscape-aesthetic attractiveness of the locality	7	6	3	2	4	1	5
Existing environmental quality	7	6	4	2	3	1	5
Impact on improvement of environmental quality	4	6-5	7	6-5	1	2	3
Property/legal aspect in relation to possibility of acquiring plots for a STP	7-6	7-6	1	3	2	5	4
Investment demands of complete technical infrastructure	7	5	3	2	4	6	1
Prerequisites for intensification of cross border cooperation	3	5	6	2	4	1	7
Strategic interests of foreign investors	5	6	4-3	2	4-3	1	7
Interest of potential clients in joining a STP in a particular locality (results of inquiry)	7	6	4	1	5	2	3
Industrial orientation of the park determined in advance	6	7	4	2	1	5	3

Explanation of symbols denoting localities in the table:
A – Patrónka (Area of the SAS), B – Devínska Nová Ves, C – Petržalka, D – Pálenisko, E – Airport, F – Istrochem, G – Jarovce–Kittsee Industrial Park
Explanation of numerical values:
the highest value – the most suitable locality for feasible location of the STP, the lowest value – the least suitable locality for feasible location of the STP

Result No. 3

The opinion of 23 experts regarding the relevance of location factors and pair comparisons of the selected 7 localities in Bratislava regarding their suitability for establishment of a STP on the basis of location factors were applied to final computation of the suitability of the individual localities for (feasible) location of a STP in the territory of Bratislava.

The following equation was used for computation of suitability of locality for the establishment of a STP:

Level of suitability of a locality t for the establishment of a $STP = \sum_{i=1}^{21} v_i * p_{it}$,

where:

v_i = average weight of location factors i (i = 1, ..., 21) from interval <1, 5>

p_{it} = aligned average suitability order of locality t for location of a STP considering i-th location factor from interval <1, 7>.

The results of the calculations are numerical values for the suitability of the individual localities for feasible location of a STP. The highest numerical value characterizes the most suitable locality and the lowest denotes the least suitable locality for the location of a STP (Tab. 4).

According to the opinions of the experts, the order according to suitability of localities for the location of a feasible STP in the territory of Bratislava is as follows (Tab. 4):

1st position = Locality A – Patrónka (area of the SAS)
2nd position = Locality B – Devínska Nová Ves
3rd position = Locality C – Petržalka
4th position = Locality G – Industrial Park Jarovce-Kittsee
5th position = Locality F – Istrochem
6th position = Locality E – Airport
7th position = Locality D – Pálenisko

In order to determine the significance and order of importance of the individual location factors, while forming a favourable image of each of the localities selected for establishment of a STP in a simple way, it is desirable to transform table 4 into a simpler form (Tab. 4A). Numerical value 1 means that the considered and studied location factor influences most positively a favourable assessment of locality. The positive effect decreases with the increasing numerical value. Alignment of value 21 to some of the location factors means that its share in the creation of positive image is the least (in many cases it is perceived as significantly negative for the particular locality).

The highest shares in positive image of the most suitable locality (expressed by product of importance × suitability of the locality from the point of view of the particular factor) for establishment of a STP in Bratislava from the point of view of the studied location factors and according to the opinion of experts, that is the Area of the SAS at Patrónka were of:

1. Investment demands of complete technical infrastructure,

Tab. 4. Final expression of importance of the individual location factors for different localities and the resulting computation of the locality's suitability for feasible location of a STP (according to the 23 experts' opinions)

Locality / Factor	A	B	C	D	E	F	G
Decisions of the state and local government bodies on strategic development of the city and the territorial plan of development	26.74	22.28	13.79	17.83	14.22	12.10	17.83
Support from local authorities, their engagement and manifested interest in establishment of the STP	21.44	20.89	12.89	14.24	10.58	11.93	16.31
Impact on the labour market, qualitative and quantitative employment in the area of the locality	12.59	16.26	18.33	11.48	8.45	10.84	15.78
Existing age, occupational, and educational structure of local population	20.15	18.00	19.96	9.20	7.83	10.17	13.11
Existing structure of economic base	23.55	22.60	12.37	10.94	11.89	19.27	11.65
Transport accessibility and connections	24.72	18.13	18.54	15.66	14.21	14.21	15.66
Prerequisites for development of innovative and economically efficient production	25.98	19.09	13.78	11.41	8.07	16.53	9.84
Impact on development of education	19.83	16.00	16.52	9.57	7.65	12.52	10.43
Genius loci – (atmosphere in locality supporting establishment of a STP)	26.36	19.57	14.83	11.12	11.74	13.39	12.56
Existing technical infrastructure in the territory	26.17	19.08	1318	10.23	13.77	18.89	8.85
Existing infrastructure promoting entrepreneurial environment in the territory	20.26	16.25	15.40	11.60	13.50	15.82	7.60
Possibilities for territorial development	10.52	17.21	15.37	12.19	9.86	7.02	16.54
Landscape-aesthetic attractiveness of the locality	17.20	16.74	11.87	7.30	12.17	6.54	13.39
Existing environmental quality	18.51	18.34	14.15	8.73	11.00	4.54	17.64
Impact on improvement of environmental quality	16.03	17.48	19.36	17.48	11.03	14.15	15.19
Property/legal aspect in relation to possibility of acquiring plots for STP	25.11	25.11	13.63	14.59	14.11	19.61	15.07
Investment demands of complete technical infrastructure	27.71	17.59	13.41	12.09	15.39	18.69	11.21
Prerequisites for intensification of cross border cooperation	14.06	18.00	21.03	11.12	16.78	7.89	26.29
Strategic interests of foreign investors	17.71	20.80	16.55	14.99	16.55	10.07	23.04
Interest of potential clients in joining a STP in the particular locality (results of inquiry)	22.36	21.05	15.78	10.19	16.77	10.52	13.81
Industrial orientation of the park determined in advance	22.67	23.93	11.33	10.70	7.56	18.57	11.02
Resulting level of suitability of the particular locality for (feasible) location of STP	439.60	404.40	322.10	252.70	253.10	273.30	302.80

Explanation of symbols denoting localities in the table:
A – Patrónka (Area of the SAS), B – Devínska Nová Ves, C – Petržalka, D – Pálenisko, E – Airport, F – Istrochem, G – Jarovce–Kittsee Industrial Park
Explanation of numerical values:
the highest value – the most suitable locality for feasible location of a STP, the lowest value – the least suitable locality for feasible location of a STP

2. Decisions of the state and local government bodies on strategic development of the city and the territorial plan of development.

   The experts indirectly assessed existing technical infrastructure in the terri-

tory, which substantially reduces the financial expenditure connected with the establishment of a STP as the most important comparative advantage of the Area of the SAS at Patrónka.

Tab. 4A. Importance of the individual location factors ascribed to them (theoretically combined) by experts for the individual localities

Locality / Factor	A	B	C	D	E	F	G
Decisions of the state and local government bodies on strategic development of the city and the territorial plan of development	2	4	13	1	5	12	3
Support from local authorities, their engagement and manifested interest in establishment of the STP	11	6	18	6	15	13	6
Impact on the labour market, qualitative and quantitative employment in the area of the locality	20	19	5	10	17	14	7
Existing age, occupational, and educational structure of local population	13	13	2	19	19	16	13
Existing structure of economic base	8	3	19	14	11	2	15
Transport accessibility and connections	7	12	4	3	6	8	8
Prerequisites for development of innovative and economically efficient production	5	9	14	11	18	6	19
Impact on development of education	14	21	7	18	20	11	18
Genius loci - (atmosphere in locality supporting establishment of a STP)	3	8	11	12	12	10	14
Existing technical infrastructure in the territory	4	10	17	16	8	3	20
Existing infrastructure promoting entrepreneurial environment in the territory	12	20	9	9	9	7	21
Possibilities for territorial development	21	17	10	7	16	19	5
Landscape-aesthetic attractiveness of the locality	17	18	20	21	10	20	12
Existing environmental quality	15	11	12	20	14	21	4
Impact on improvement of environmental quality	18	16	3	2	13	9	9
Property/legal aspect in relation to possibility of acquiring plots for STP	6	1	15	5	7	1	10
Investment demands of complete technical infrastructure	1	15	16	8	4	4	16
Prerequisites for intensification of cross border cooperation	19	14	1	13	1	18	1
Strategic interests of foreign investors	16	7	6	4	3	17	2
Interest of potential clients in joining a STP in the particular locality (results of inquiry)	10	5	8	17	2	15	11
Industrial orientation of the park determined in advance	9	2	21	15	21	5	17
Order of locality from the point of view of its suitability for location of STP	1	2	3	6	7	5	4

Explanation of symbols denoting localities in the table:
A – Patrónka (Area of the SAS), B – Devínska Nová Ves, C – Petržalka, D – Pálenisko, E – Airport, F – Istrochem, G – Jarovce–Kittsee Industrial Park
Explanation of numerical values:
1 – factor with the most positive influence on the favourable assessment of locality,
21 – factor with the most negative influence on the favourable assessment of locality

This same locality was least favoured when considering the following factors:

1. Possibilities of territorial development (considering spatial limits, regulations concerning construction, altitude zoning and other limitations), and

2. Impact on labour market, qualitative and quantitative employment in the area of locality.

Devínska Nová Ves has been chosen as the second most suitable locality for establishment of a STP in the territory of Bratislava. The experts associated the following assets with this locality:
1. Property/legal aspect in relation to possibility of acquiring plots for a STP,
2. In the case of factor "Industrial orientation of the park determined in advance", particularly orientation to car industry, since it is the location of Volkswagen Bratislava, the biggest and continuously expanding machinery factory in Slovakia, it undoubtedly has conditions for the creation of mutual intensive links between the car factory and the STP.

This same locality was least favoured when considering the following factors:
1. Impact on development of education,
2. Existing infrastructure promoting entrepreneurial environment in the territory (banks, above standard services, etc.).

Locality Petržalka has been assessed as the third most suitable locality for establishment of a STP in the territory of Bratislava, with important difference in values compared to the first two above-mentioned localities. The following factors contributed to its positive image:
1. Prerequisites for intensification of cross border co-operation,
2. Existing infrastructure promoting entrepreneurial environment in the territory (banks, above standard services, etc.).

The following factors contributed the least number of points to the overall sum of points evaluating the locality of Petržalka:
1. Industrial orientation of the park determined in advance (for instance focusing on mechanical engineering, chemical industry, information technologies, biotechnologies, and the like),
2. Landscape-aesthetic attractiveness of the locality.

The experts assessed the locality Industrial Park of Jarovce-Kittsee as the 4th most suitable one for establishment of a STP and the following factors contributed most to a positive evaluation:
1. Prerequisites for intensification of cross border co-operation,
2. Strategic interests of foreign investors.

The factors, which least contributed to the positive evaluation of the locality Industrial Park of Jarovce-Kittsee were:
1. Existing infrastructure promoting entrepreneurial environment in the territory (banks, above standard services, etc.),
2. Existing technical infrastructure in the territory.

The locality Istrochem obtained the 5th position in ranking of the most suitable localities for establishment of a STP. It obtained positive evaluation of the following factors:

1. Property/legal aspect in relation to the possibility of acquiring plots for a STP,
2. Existing structure of economic base (share of activities exacting in terms of employment qualified labour and with a high level of value added).

The locality Istrochem was least favoured by evaluation of the following factors:

1. Existing environmental quality (air pollution, presence of dump sites, noise level, social-pathological environment),
2. Landscape-aesthetic attractiveness of the locality.

According to opinion of 23 experts, the worst conditions for the (feasible) location of a STP in the territory of Bratislava out of the 7 evaluated localities are those of locality Pálenisko with minimal numerical difference from the second least favourable perceived locality which is the Airport.

The most important positive features of the comprehensive evaluation of the locality Pálenisko from the point of view of establishment of a STP are:

1. Decision of the state and local government bodies on strategic development of the city and territorial plan of development,
2. Effect on improvement of environmental quality (for instance by building green relaxation zones).

The following factors least contributed to overall evaluation of the locality Pálenisko:

1. Landscape aesthetic attractiveness of the locality,
2. Existing environmental quality (air pollution, presence of dump sites, noise level, and social-pathological environment).

The last but one position was adjudicated to the locality Airport. According to the opinion of the experts the most important positive factors were:

1. Prerequisites for intensification of cross border co-operation,
2. Interest of potential clients in joining a STP in the given locality (it must be confirmed by results of inquiry among the firms and companies of Bratislava).

The overall evaluation of Airport was least favoured by considering the following factors:

1. Industrial orientation of the park determined in advance (for instance focusing to mechanical engineering, chemical industry, information technologies, biotechnologies, and the like),
2. Impact on development of education.

INSTEAD OF A CONCLUSION

In spite of the fact that establishment of a STP has been discussed not only in Bratislava, but also in Žilina, it has to be stated that this business activity still does not exist in Slovakia. The author read the most recent news about the potential establishment of a STP in the territory of Slovakia in the daily *Bratislavské noviny* from 18.10.2001, which published the following:

The huge area of faculty hospital in locality Rázsochy of Lamač, now under construction has swallowed about 800 million crowns so far, but its completion is still out of sight. However, a bold project counting on using not only this construction but also its wide environs as a science and technological park was born. The misery of the health-care sector is generally known and it also led the competent bodies to decision not to finish the hospital and to seek alternative way of using the unfinished structures. "Vienna will also support transformation of the faculty hospital in to a science and technological park with supraregional significance", said the mayor of the urban district of Lamač, Ľubomír Plai. "If some international organization seated in Rázsochy, it would take some burden off from Vienna, which has a lot of them. Rebuilding the structure for the new purpose relies on expert analyses considering all the conditions, which must be fulfilled in order to reach functionality of the science and technological park. The opinion of the architect, who designed the building, is also positive", added Ľ. Plai. "Every delay of a solution only increases the cost. In the sense of a project, a STP should create conditions for the location of companies oriented to top technologies, development of new products with high added value VAT and realization of mental work in the area of information technologies, biotechnologies, electrical engineering, medical technology, and their exports facilitated by establishing new business entities. The STP complex should also include a congress centre, hotels, restaurants, and cultural, commercial and sport facilities".

The short notice clearly suggests that the reached partial result concerning the optimal location of STP in Bratislava was not realized. The cause of the failure can be attributed to the unsuccessful negotiations between the representatives of the Slovak Academy of Sciences and the company, which was the potential establisher of the STP in Bratislava. The above-quoted notice also highlights the extreme importance of the location factor "support of local authorities, their engagement and manifested interest in establishment of a STP", which modifies all the neo-classical normative ideas on optimal location during the preparation phase. The interest of urban district Lamač to enter the competition for a prestigious business activity may eventually be the decisive factor in selection of a location for a STP.

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Vladimír S z é k e l y

VÝBER REALIZOVATEĽNEJ OPTIMÁLNEJ LOKÁCIE PRE VEDECKO-TECHNOLOGICKÝ PARK NA ÚZEMÍ BRATISLAVY

Pre porovnanie a výber najvhodnejšej lokality pre realizovateľné umiestnenie VTP-u sme použili metódu expertných hodnotení. Experti sa mali vyjadriť k významu jednotlivých relevantných lokačných faktorov z hľadiska optimálneho umiestnenia VTP-u, a to ako vo všeobecnosti, tak aj pri konkrétnej párovej komparácii 7 vytypovaných lokalít. Názory expertov sme získali dotazníkovou metódou. Získané výsledky sa využili pri finálnom výpočte vhodnosti jednotlivých lokalít pre (reálne uskutočniteľné) umiestnenie VTP-u na území Bratislavy.

Pre výpočet vhodnosti lokality pre zriadenie VTP sme použili nasledujúci matematický vzťah:

Úroveň vhodnosti lokality *t* pre zriadenie $VTP = \sum_{i=1}^{21} v_i * p_{it}$,

kde

v_i je priemerná váha lokačného faktora *i* (*i* = 1, 2, ..., 21) z intervalu <1, 5>,

p_{it} je priradené priemerné poradie vhodnosti lokality *t* pre umiestnenie VTP-u zohľadnením *i*-teho lokačného faktora, ktoré je z intervalu <1, 7>.

Výsledkom výpočtov sú numerické hodnoty vhodnosti jednotlivých lokalít pre (reálne uskutočniteľné) umiestnenie VTP-u, pre ktoré platí, že najvyššia numerická hodnota charakterizuje najvhodnejšiu lokalitu a najnižšia numerická hodnota charakterizuje najmenej vhodnú lokalitu pre reálne uskutočniteľné umiestnenie VTP-u (tab. 4). Najvhodnejšou lokalitou pre zriadenie VTP-u v Bratislave sa z hľadiska sledovaných lokačných faktorov a podľa názorov vybranej skupiny expertov stal areál SAV na Patrónke. Záverom konštatujeme, že nielen v Bratislave, ale aj na území celého Slovenska VTP ako významná podnikateľská aktivita ešte v súčasnosti neexistuje.