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OPTIMAL DISLOCATION OF BRANCH OFFICES FROM VIEW OF TRANSPORT AVAILABILITY

Bohdan Linda, Jana Kubanová

Abstract:

The paper deals with creation of the model for optimal dislocation of branch offices of public administration and with the creation of their attraction verges.

Key words:

municipalities with extended duties, branch offices of public administration, transport availability

Introduction

Public administration reform was in the Czech Republic since the beginning of the reform period, it is since the year 1990, focused above all to rebuilding till contemporary existing system of public administration, with expressive stress to decentralization, namely above all in the local level, where were already in November 1990 reconstructed self-governing autonomous municipalities. New constitution was admitted in autumn 1992 with the context of finishing the common federative state of Czech and Slovak Federative Republic. This situation required changes in the area of state administration at all levels. Changes were implemented only in necessary structural range at central level, especially by establishment of new ministries and other central public administration bodies of the Czech Republic, that were existing to this time only at the level of federal public administration. However required functional changes and total modernization of the central public administration in the first reform period were not being implemented. Added stage of decentralization of public administration, namely formation of superior territorial autonomous units, supposed by new constitution of the Czech Republic was put off as well, in default of political will both in government coalition, and in parliament during 1992-1997.

Territorial public administration includes both territorial state administration, and territorial local government. Territorial self-administration is practiced, according the Constitution of the Czech Republic, in territorial autonomous units, namely in municipalities that are the primary territorial autonomous units, and in regions, that are the superior territorial autonomous units. The regions formation however supposed abolishment of district authorities. In order to cancel the district authorities they have to be substituted by self-governments branch offices in which the basic agenda of state administration that is in their competence is provided. So-called municipalities with extended sphere of authority were proposed for placing of these branch offices. They represent a new type of municipality, which will execute the majority of public administration in transferred competence, it means majority of administrative agenda for citizens.

The first act about municipalities was adopted in 1990 and self-governing municipalities started to function since the first free elections into council municipalities in November 1990. The establishment of regions was expected for several years, because of the constitutional act about its establishment came through stormy political suit in the Parliament and was accepted only on 3rd December 1997. Since 1st January 2001 13 regions came into operation (with the exception of 14th region – capital Prague that is at the same time

municipality I., II. and III. category) like superior territorial self-governing units. After transitional period of the years 2001 – 2002 when simultaneously functioned districts and regions, district authorities finished their activity up to 31.12.2002 and they were replaced by municipalities with extended action that assumed roughly 80% of their activities.

The essential aim of taking place reform of territorial public administration is its decentralization and deconcentration. In this context the transposition of competences that were so far practiced by the state administration bodies (it is, above all by district authorities) was shifted to self-administration, whether into independent or transferred action.

Following criterions were chosen for activities transmission - better accessibility for citizens, number of inhabitants of the administrative verge c. 15 000, transmission of first-instance decision making to the lowest possible level of public administration, frequency of issued first-instance decisions in separate segments of public administration, effectiveness, quality and economy of public administration service in relevant stage, demandingness of transferred activities to competence of the authority staff.

The municipalities with extended duties will practice public administration in transferred duties in their administrative verge. Following needed agenda that are most frequently exploited by citizen are primarily in the centre of discussion

- inhabitants evidence,
- travelling and personal document issuing, driving licenses, technical certificates, motor vehicles evidence,
- trading certificate,
- social benefits payments,
- sociable legal protection of children,
- care of old and handicapped citizens,
- water legal management, area of waste economy and environmental protection,
- public administration of forests, hunting and fishery,
- field of transport and road economy.

Criterion function

As it has already been noted above, certain criterions for determination of municipalities with extended duties were identified. The most considerable, from view of citizen, is criterion of its availability. It means, that citizen evaluates dislocation of these municipalities first of all according to fact how „comfortably" can get from his dwelling place *j* into place of „authority“ and back. Under notions „comfortable" in this context inhabitant generally understands rapidity, or in other words time availability of the branch office of public administration.

Now, let we take a closer glance to notion of time availability, as it can be understood. If the citizen doesn't own some means of transport, he is entirely dependent on means of public transport and he is interested, how quickly it is possible to get there and back by these. Such time availability is dependent on existing lines of public transportation, on a number of connections in these lines and on their timetables. These circumstances however relatively quickly changes and that is why it is impossible, according to their instantaneous state, to

create from the view of time availability the optimal choice of municipalities into which activities will be transferred.

That is why it is necessary to work with any medium time availability TS_{ij} , it is with average time, in which citizen can get by standard public means of transport from the place i into places j . On the other hand citizens, using means of individual transport are interested in the shortest distance on „reasonable“ ways (it is roads guaranteeing certain transport comfort). If we multiply this distance by average travelling speed, we get again the time availability TI_{ij} .

At creation of some mathematical model we however need only one time availability T_{ij} , that we get as weighted average $T_{ij} = fv_{ij} TS_{ij} + fi_{ij} TI_{ij}$, where fv_{ij} is proportionate part of citizens, who at travel from point j into point i use public and fi_{ij} individual transport. It is evident, that the accurate calculation T_{ij} is very complicated and for its calculation we'd have to use graphic timetable of all means of transport in our republic. This problem, even if difficult, would be mastered. The greater problem is, as has already been noted above, that the conditions for operation of public transport relatively quickly changes – this depends above all on economic situation of the state, financial situation of a transport firm, Czech railways and on many individual transporters, who in heavy expectable way rise and lapse.

The structure of the branch offices can't be changed in the dependence on this situation. There is no criterion of this way constructed time availability for their dislocation acceptable. Generally however holds, that a time distance is proportional to the kilometrical distance, so that criterion of time availability can be replaced by criterion of distance. The criterion function, based on distance, is more suitable for our purpose, because it is dependent on traffic infrastructure, that doesn't admit so fast changes, like the public mass transportation. The competence of this consideration can be supported with a fact of ever-growing motorization and related displacement of the gravity centre of transport into individual area. Similar studies from countries with advanced motorization support these conclusions, like for example Germany and others. Janáček, Janáčková dealt with solution of the problem of time availability in [5]. They successfully tested the BBDual algorithms in tasks with great extend.

Mathematical model

Let's mark n number of all municipalities in the Czech Republic and m number of municipalities, fulfilling conditions for placing of a branch office of public administration (in our case deals with municipalities with extended duties). Further h will denote the number of municipalities with extended duties. For distance municipalities i and j we use common notation d_{ij} and number of inhabitants of any municipality j requiring services in the municipality with extended duties i mark f_{ij} . Let us express by the help of variable y_{ij} , having values 0 and 1, the fact, whether the municipality j locate into attraction verge of municipality with extended competence i (below attraction verge of municipality i we understand set of all municipalities j , whose inhabitants will use branch offices in the municipality i for operation of public administration).

The value 1 is reached in case, when municipality j will be inserted into attraction verge of municipality i and value 0 in case that it will not be inserted. The analogical bivalent variable x_i denotes the fact, whether a branch office is placed in municipality i . Value 1 means that branch office of public administration will be placed in this municipality, value 0

means that it will not. Mark further $c_{ij}=f_{ij}d_{ij}$. Then the mathematical model of this exercise of optimal dislocation of branch offices of public administration can be written in the form of:

$$\text{Minimize} \quad \sum_{i=1}^m \sum_{j=1}^n c_{ij} y_{ij} \quad (1)$$

$$\text{Under conditions} \quad \sum_{i=1}^m x_i \leq h \quad (2)$$

$$\sum_{i=1}^m y_{ij} = 1 \quad \text{for } j = 1, \dots, n \quad (3)$$

$$y_{ij} \leq x_i \quad \text{for } i = 1, \dots, m, j = 1, \dots, n \quad (4)$$

$$x_i, y_{ij} \in \{0, 1\} \quad \text{for } i = 1, \dots, m, j = 1, \dots, n \quad (5)$$

Condition (2) means that the number of municipalities in which some branch office will be located doesn't overrun given number h . Condition (3) guarantees that every municipality is allocated only to one branch office. Possibilities of addition of municipality to the place, in which any branch office won't be, obstruct the condition (4). With solution of this model, dealt for example in Janáček [4], where he shows even experience with time demandingness of the solution. Result of the solution of this model is the determination of municipalities with extended duties and their attraction verges. The costs needed for building up the branch office in the municipality can be involved into this model. It can help to further objectification of dislocation of branch offices. In addition, this model gives chances for checking of rightness of border regions, it is of proper dislocation (from standpoint of their availability) of municipalities, lying in boundary-line of several regions.

The B-B dual algorithms developed by Janáček [6] based on Erlenkotter's method [3] was used for solution of the above mentioned model.

Results

To be able to compare results and reality, the „personkilometers“ were considered as the criterion of the traffic availability, at commuting to the municipalities with extended duties.

Several alternatives were calculated and compared with following results:

1st alternative. The value of the criterion function 48 022 391 personkilometers was calculated at contemporary branch offices organization and at their attraction districts.

2nd alternative. The new attraction areas, at present conservation of the contemporary branch offices, were calculated according to the model (1) - (5).

The value of the criterion function is 43 551 852 personkilometers, which presents savings of 9.3 %.

3rd alternative. Both dislocation of the branch offices, and even attraction areas were optimised in this variant. The value of the criterion function is 41 854 381 personkilometers, which presents savings of 12,8 %. 28 changeovers occurred in the list of the branch offices.

The existing number of the branch offices, it means 205, was kept in all variants.

Optimization can be however performed with arbitrary numbers of the branch offices.

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