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MAIN TENDENCIES IN DEVELOPMENT OF SZEGED

GY. KRAJKÓ

At the turn of the century, Szeged was the second most populous Hungarian town. Its development was promoted by favourable features: it was a railway junction, there was a possibility for transport by water, it was a centre for the emerging light and food industries, it possessed an extensive sphere of attraction, and it was a market centre. The dynamic growth of the town is reflected in the change in the number of the population: between 1880 and 1910 (in the area corresponding to the town boundaries in 1970) the population increased from 49 000 to 79 000, i.e. a rise of 30 000.

The floods in 1879 had destroyed the town practically completely. The period of reconstruction coincided with an acceleration of the urbanization process. This permitted the development of an ordered, aesthetic town plan, with a structure of avenues perpendicular to ring-roads, on the example of Budapest. This period saw the completion of the merging of the various parts of the town, and the formation of an areally uniform closed settlement (Fig. 1).

The situation of Szeged was modified very unfavourably by the new national boundaries following the First World War. The town lost a significant proportion of its area of attraction, and its transport geographical location became disadvantageous. Between the two World Wars, there was no industrial development throughout the entire country, while the stagnation in agriculture curbed further expansion of the food industry in the town. Between 1910 and 1950 the increase in the number of the population slowed down: during these 40 years it rose by only 10 000, from 79 000 to 89 000. The town displayed progress only in the fields of culture and public health.

The stagnation not only slowed down the growth of the population, but also exerted adverse influence on the communal investments and on the development of the town's infrastructure.

The urbanization of Szeged after the Second World War was far from being unambiguous and contradiction-free. The process can be broken down into several stages, this being attributable primarily to the nature and dynamism of the industrial development. Accordingly, a somewhat more detailed treatment of the industry of the town is justified.

Szeged is an important industrial centre, and gives close to 2% of the industrial production of the country. For some products the proportion is very high: e.g. it gives more than 50% of the Hungarian production of mineral oil, natural gas, red pepper, salami, hempyarn and textile fabric. Some 15% of the national production of block board, fruit and vegetable preserves and cotton fabric originates from Szeged.

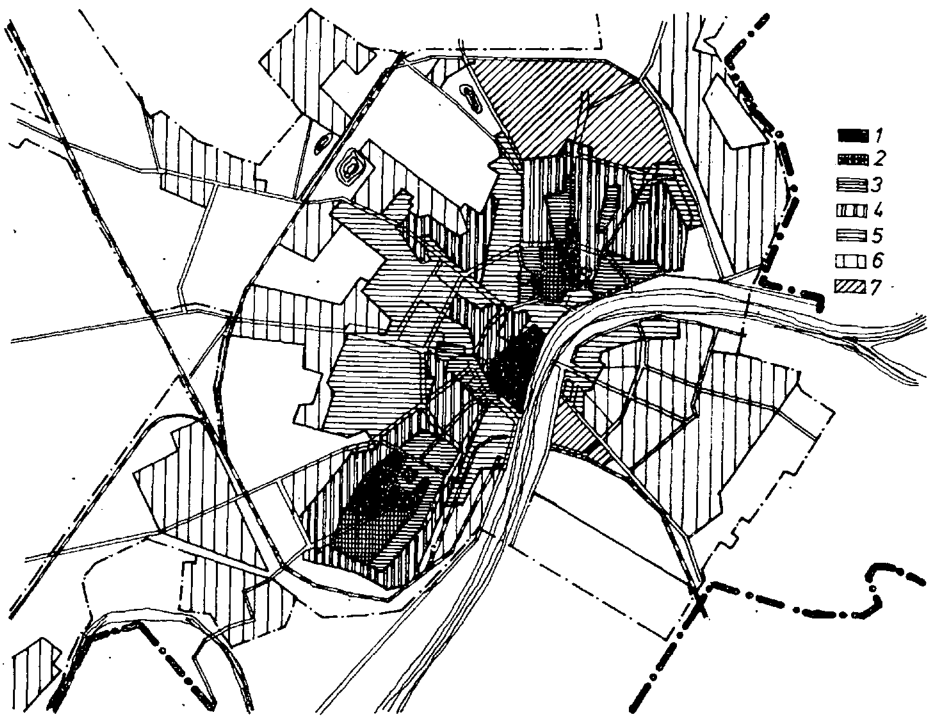

Fig. 1. The map of the history of settling of Szeged
1: 13th—15th c. 2: 15th—16th c.
3: 16th—17th c. 4: 18th c.
5: 19th 6: 19th—20th c.
7: 20th c.

In 1949 the industry employed, 8500 workers, 1,1% of the national industrial labour force. The number of industrial workers per 1000 inhabitants (98) slightly exceeded the national average. In the first half of the 1950's, the rapid increase in industrial production was achieved mainly by the better utilization of the existing equipment, the doubling of the number of workers, and the enchancement of the working intensity. Industrial investment was slight. Szeged received practically nothing from the building programme of the first fiveyear plan, and this subsequently influenced the development of the town.

In this period, in contrast with the other regional centres, Szeged was in a disadvantageous situation. The explanation of this is as follows:

a) In accordance with the principles of the economic policy then prevailing in the country, all the resources were concentrated on the development of heavy industry, and mainly the basic materials industry, and since Szeged was a centre of light industry and the food industry and did not possess mineral raw materials it was bypassed by the first phase of industrialization.

b) The new national boundary resulting from the First World War deprived the town of its favourable transport location and a significant part of its area of attraction. The transit traffic stopped completely.

c) The then strained political relations with Yugoslavia impeded the development not only of the industry, but also of the town.

d) The necessary agricultural raw materials for a major development of the food industry were not available.

Besides the unfavourable conditions, Szeged did possess some advantageous features, e.g. its ample labour force, its position as the largest cultural centre after Budapest, this comparatively easily soluble industrial water supply, etc., but it could not make appropriate use of these.

The urbanization of Szeged in the 1950's was very slow. For example, the communal investments in 1955 did not attain even 3% of those in 1975.

A new stage in the development of Szeged began in 1958—1960. From this period on there have been substantial modifications in the above-listed disadvantageous conditions.

a) There have been changes in the economic policies of the country: emphasis has been laid on the labour-consuming branches and on the more pronounced development of the provincial areas, in agreement with the rational regional location of industry.

b) Normalization of relations with Yugoslavia permitted a considerable increase of the town's tourist and transit traffic.

c) The socialist reorganization and development of agriculture has provided raw material for the constant expansion of the food industry.

d) Transfer of the county seat to Szeged increased its function, and its sphere of attraction expanded in area.

e) Importance has been assumed by the factors influencing the establishment of industry in the town: e.g. the labour force, specialist training, industrial water supply, the possibilities of cooperation, cultural background, etc.

f) The development of the town received a new impetus from the middle of the 1960's, with the discovery of the hydrocarbon fields.

With this favourable change in the conditions, the more rapid development of the industry of Szeged became possible: between 1960 and 1970 the number of persons employed in industry rose by 70%, from 21 600 to 33 800, while productivity increased roughly thresfold. A number of new plants were established: e.g. a cable factory, a rubber factory a textile mill, a milk plant, etc. Hydrocarbon mining has appeared as a new branch of industry. The dynamic extensive industrialization drew first on the manpower reserves of the town, and later on those of the surrounding district, and since 1970 an ever increasing labour shortage has been experienced. In the 1970's the number of industrial workers has not changed substantially, but industrial production has risen as a consequence of higher productivity. Thus, the conditions of extensive industrial development have disappeared and the period of such development came to an end at the beginning of this decade: in accordance with the national tendency, the increase of the population of the town leads mainly to a rise in the number of those employed in the tertiary sector.

As regards the supply and sphere of attraction of the working force of the town, the changes in the number of commuters are of great importance (Table 1).

Disregarding the agglomeration belt joined to Szeged in 1973, between 1960 and 1975 the number of commuting workers increased fourfold, from 3755 to 13 550. The extent of the change differs from belt to belt. The increase has been the largest in the outer belt, where the number of workers commuting to Szeged increased almost ninefold in the given period. In parallel with this there has been an expansion in the area of attraction of the labour force of the town (Fig. 2). In

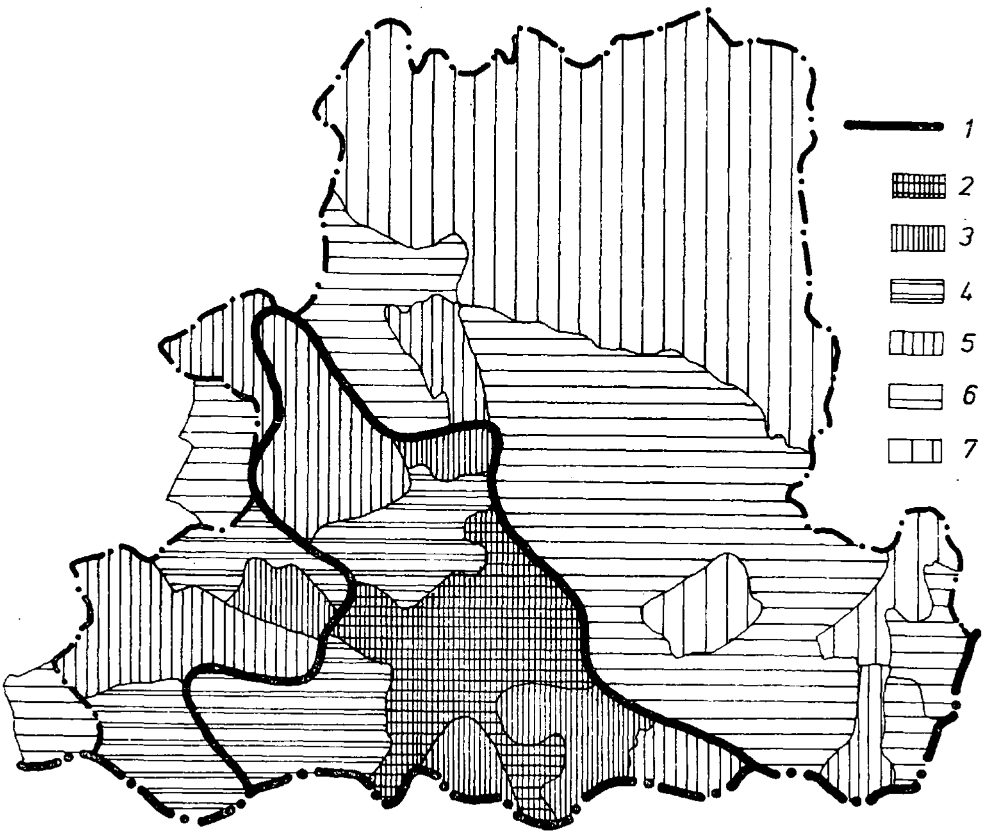

Fig. 2. Manpower attraction region in 1960.
1: the boundary of the attraction region in 1960.
Percentage of employees working in Szeged:
2: Szeged 3: 30–< 4: 20—30 5: 10—20
6: 2—10 7: 2–>

1968 72% of the commuters lived within the 30-minute travelling zone, and only 15% travelled for more than 1 hour. In 1975 35% of the commuters lived within the 30-minute travelling time, and nearly 22% were forced to travel for more than 1 hour. In recent years there has been a rapid increase in the number of settlements from which more than 30 people commute to work. The number of settlements connected to Szeged in this way was 19 in 1960, 28 in 1964 and 45 in 1975. In cor-

Table 1. *Increase in number and proportion of commuters*

	1960			1964				1968 (Szeged)				1975		
	Together with agglomeration belt													
	abs. no.	%	%	abs. no.	%	%	Incre-ase 1960—64	abs. no.	%	%	Incre-ase 1964—68	abs. no.	%	Incre-ase 1968—75
Joined to Szeged in 1973 agglomeration belt	4763	56.0		5 437	50.9		14.0	6 800	46.3		25.1			
Inner belt	1733	20.3	46.1	2 411	21.6	45.9	39.2	2 900	20.0	37.6	20.0	3 984	29.4	37.4
Towns	783	9.2	20.9	800	7.5	15.3	2.2	1 040	7.1	13.5	30.0	1 070	7.9	2.9
Outer belt	700	8.2	18.6	1 450	14.5	27.6	107.0	1 960	13.6	25.5	32.5	6 003	44.3	206.2
Other areas	534	6.3	14.4	587	5.5	11.2	9.9	1 800	12.4	23.4	206.6	2 493	18.4	38.5
Total	8518	100.0		10 685	100.0		24.4	14 500	100.0		35.6			
Total without agglomeration belt	3755		100.0	5 248		100.0		7 700		100.0		13 550	100.0	75.9

Table 2. *Numbers of those employed in the various industrial branches*

Branch	Szeged 1975	Szeged 1975 (1949)	National		Employees per 1000 inhabitants	Employees per 1000 inhabitants nationally	Proportion of Szeged to the national figure 1975	Proportion of Szeged to the national figure (1949)
Heavy industry	11.280	32.8 (9)	1 020.404	58.4	70	100	0.7	(0.23)
Light industry	15.694	45.6 (76)	456.310	24.2	90	40	2.25	(4.8)
Others	1.636	4.8	71.243	4.1	30	10	1.0	—
Food industry	5.774	16.8	196.521	11.2	30	20	1.5	(1.6)
Total	34.384	100%	1 744.478	100%	200	170	—	—

relation with this there has been an increase in the average distance travelled by the commuters. In 1960 it was 12,9 km, in 1968 17 km, and in 1975 23,8 km. 44% of the commuting labour force originates from the outer belt.

A substantial rise in the number of commuters is not expected in the future, and it would not be reasonable either, for there is no further available labour force in the nearer settlements, while daily commuting from the more distant settlements would be irrational.

As regards its rate and means, the industrial development of the town in the past 30 years has been intermittent: this is particularly obvious in the individual branches. Up to 1960 the structure of the industry did not change appreciably. During the following 15 years, however, the proviously one-sided structure (in which the light and food industries predominated) underwent a transformation and became essentially more balanced as a consequence of the extremely fast development of the heavy industry. In 1960 the proportion of those employed in heavy industry was only 13,2%: in contrast, in 1975 it had advanced to second place with nearly 33%, while the technical indices showed that it had become the most important branch. The number of those, employed in the food industry changed at the same rate as that for the whole of industry, and therefore its proportion remained unchanged.

The development of light industry lagged behind the national rate: thus, not only did it decline in importance compared to the other branches of industry in the town, but during a quarter of a century the proportion of those employed in this branch relative to the population and to the national average fell from 4,8 to 2,2. (Table 2.)

In the following decade the structure of the industry will be modified to a slight extent: it may be expected that heavy industry will increase its proportion a little.

In spite of the change that has occurred in the industrial structure, Szeged is still a light-industrial centre, and it can be ascribed to this that more than half of those employed in industry, are females.

With regard to the regional location of industry, an addition to the historical inheritance the effect of the main transport routes in manifested (Fig. 3). The river has attracted comparatively few plants (a swmill, a ship-repair yard, the New Szeged hemp works, the salami factory, etc. are located beside it). The western industrial belt was attracted and developed by the combination of the railway and the main road. Exploitation of the hydrocarbon field covers the area to the north of the town and has resulted in an independent industrial zone here.

The less transport-dependent plants are situated in a scattered manner, incorporated into the housing belt.

The outlined spatiality is not advantageous in every respect.

a) The main wind direction is NW, and thus pollution of the housing belt is fairly strong.

b) The industrial zone limits the possibility of expansion of the housing belt in the W and N directions.

c) Most of the large companies have grown from relatively small plants, and since they are interspersed in the housing belt there is not appropriate area for their expansion. Further, the unfavourable features of the sites, which did not show up initially, are nowadays increasingly more sharply defined. Resiting of the plants is one of the serious and expensive problems of the future development of the town.

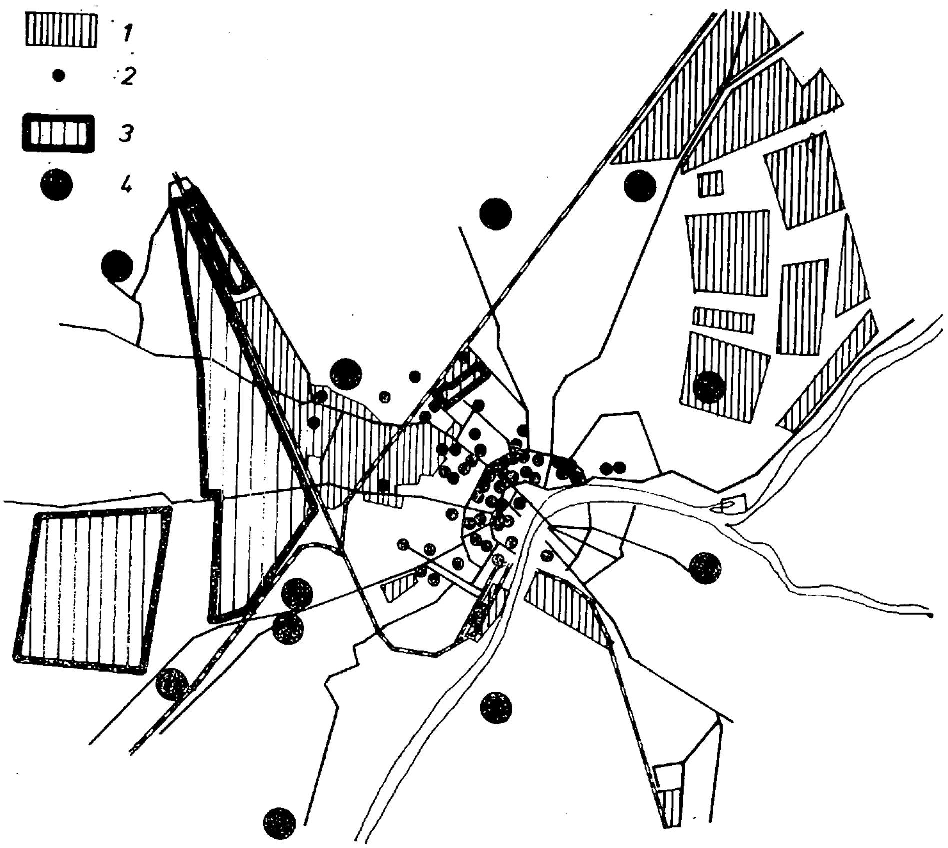

Fig. 3. Szeged and her environment
1: connected industrial region
2: factories having interfering effect
3: suitable territory for location of industry
4: centre of the agricultural unit

d) The S and SE parts of the town are not very suitable for industrial settlements. With the building of the new bridge, the housing belt of the New Szeged part can be expanded considerably, but because of the absence of a railway bridge it is not practical to locate plants here. Thus, a free area suitable for industrial settlements is primarily to be found W of the town.

The changes in the population of the town, similarly to the development of the industry (but not in parallel with the latter), were again intermittent (Fig. 4). Up to 1956 the natural increase in population was relatively high, but as a consequence of the slow development of the town immigration was low. In the following period, lasting up to the 1970's, the natural increase was very low (the average for the decade did not reach 0,2%), but the immigration rose markedly. (The increase in migration was a national tendency, and was connected with the socialist reorgani-

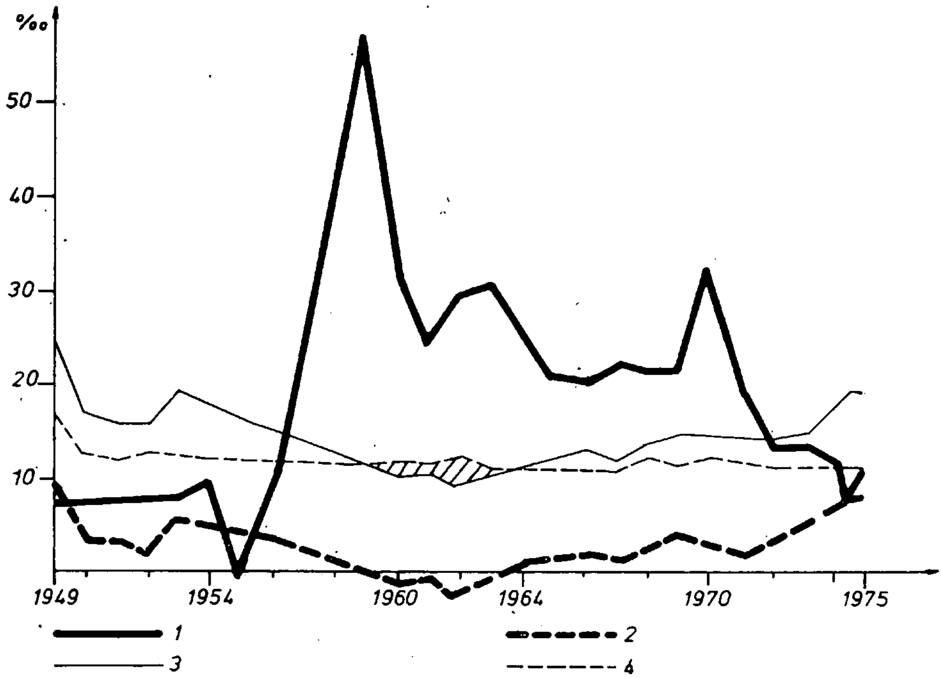

Fig. 4. The most important demographic indexes of Szeged
1: the difference of migration
2: natural distribution
3: birth rate
4: still-birth rate

zation of agriculture.) Nowadays the increase in the population of the town has become balanced and proportionate: as a result of the natural increase (0,8%) and immigration, the annual increase is 2000—2500. In 1977 the population of Szeged (together with the 5 village settlements joined to it in 1973) numbers 171 000 and by 1990 it will reach 200 000.

The periodicity observed in the rise of the population of the town followed the development of the industry with a phase delay. This correlation also occurs in several other towns of the South Hungarian Plain.

From the 1960's, immigration towards Szeged affected the surrounding settlements too to an ever greater extent. The immigration frequently proceeds in two stages. People first migrate into the surrounding settlements, and then move into the town later. In the present phase of the extensive urbanization the development of the agglomeration belt is forming with an externap inflow. The population of the settlements surrounding the town is increasing, and the housing function too is beginning to be fulfilled. The rate of growth of the agglomeration nucleus is determined by the number of houses constructed.

In 1973 a significant part of the agglomeration belt (the 5 settlements Tápé, Szőreg, Kiskundorozsma, Algyő and Gyálarét) was incorporated into Szeged.

At present the agglomeration belt is undergoing formation with the accumulation of new settlements, and some 12 villages are connected to the town in this was (Fig. 5).

In the past decade Szeged has developed more rapidly than the other regional centres, but despite this, with the exceptions of education and health, the indices of the infrastructure of the town show a more unfavourable picture, i.e. the 40-year

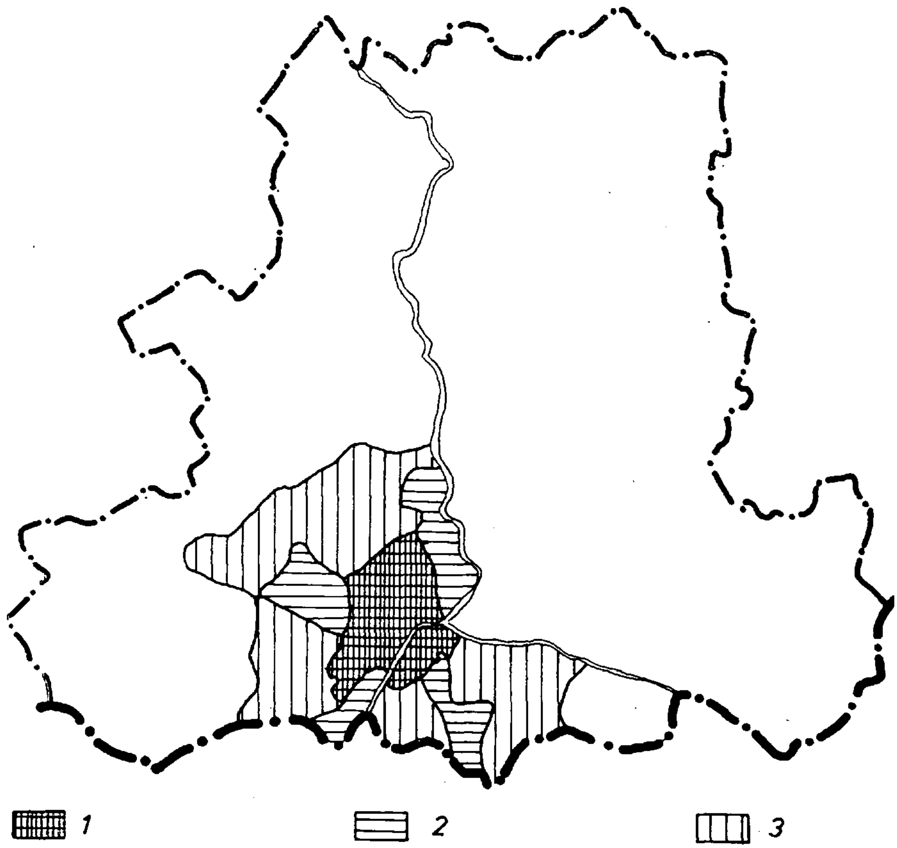

Fig. 5. The agglomeration-area of Szeged
1: the boundary of Szeged in 1973.
2: the agglomeration area joining with Szeged
3: the actual agglomeration

lag has by no means been made up for. Of the 5 regional centres, Szeged occupies 4th place as regards the level of housing and communal provision, transport, trade and sports facilities (1st place in the fields of health, education and public instruction).

The most important trends of the development of the town are as follows:

1. The establishment of larger industrial plants in the near furure is not practical: the development can be solved by the enhancement of productivity and by the expansion of the already existing plants. In accordance with the principle of selective industrial development, in the less efficient plants the production profile must be changed or production must be halted.

2. It is necessary to develop the service network more rapidly than hitherto.

3. An important task is the strengthening and further extension of the non-producting functions of the town. Szeged is a cultural, educational and health centre. It has won recognition, even internationally, as a consequence of its clinics, its universities, the Biological Research Centre and the Open-Air Theatre. The development of these institutions is a permanent task. The town has fallen behind appreciably as regards sports facilities and the construction of a lido utilizing the favourable given features. Great attention is devoted to the creation of the conditions necessary for the further increase of the tourist trade.

4. It is not only the number of inhabitants that makes a settlement a town: urbanization assumes communal provision at an appropriate level. In the past decade the level of such provision has improved substantially: in spite of this, of the regional centres Szeged is in last place because of the rapid rise in the population, the joining of the agglomeration belt to the town, and the insufficient investments in the preceding period. Compared to the increases in the number and demands of the population, a lag can also be observed in the expansion of the network of shops.

5. In the development of the town, it must be taken into consideration that, as a consequence of the town's role as a regional centre, it possesses a widespread region of attraction and the provision of the population of this region must be satisfied from several aspects (supply of goods, education, public healtsh, etc.): secondly, in accordance with the strivings towards decentralization, Szeged must be developed to become one of the counter-poles of Budapest.

SOME QUESTIONS OF THE REGIONAL DEVELOPMENT OF THE HUNGARIAN FOOD INDUSTRY

MRS. J. PALOTÁS-ABONYI

At the present time it is becoming increasingly recognized that the food industry plays an important role in the national economy, and hence economic and political interests are attached to its dynamic development. The increase of the degree of "hardness" of the foodstuffs market runs in parallel with the rise in importance of the complete, high-standard satisfying of the foodstuffs demands of the population, and the increase of Hungarian food exports to both capitalist and socialist countries.

Due to the restriction of the production factors, in the present stage of development of the Hungarian national economy attention is turning to the revelation of the reserves. Interest is therefore becoming focused on the logical regional location of the productive forces, and the rational macro and microstructures of the various spheres of the economic life.

In the new situation arising with the completion of the extensive developmental phase, efficiency is playing an increasing role in the making of decisions. Simultaneously with the transformation of the internal conditions of economic growth, the situation is also changing in the field of international economic connections. There is an upswing in the division of labour among the socialist countries, which has characteristic regional projections from a Hungarian aspect too. Accordingly, extra attention is due to the various forms of the division of labour, and particularly to the questions of specialization, concentration and complexity.

Basic information that can be utilized for analysis of the state of the production structure and for determination of the trends of future develoment is provided by an analysis of the processes occurring in the past and by the revelation of the trends of development, the main criteria and the regularities manifested. A review of the processes of the past is indispensable, therefore, to establish the conceptions for the future.

Development in time of food-industrial productive forces

At the end of the Second World War, the regional distribution of the food industry was essentially more uniform than that in other industrial groups, but nevertheless it displayed a great areal disproportion. It was especially unhealthy that Budapest participated to an extent of almost 50% in the overall productive value of the food industry, but the distribution of the remainder within the country was also unfavourable.

Since the Second World. War, the production volume of the food industry has roughly quadrupled, while the number of newly created working places has doubled, and the regional disproportions in the food-industrial productive forces decreased; in the selection of the sites for new establishments there has been a greater accommodation to the demands of the consumer market, and in the branches with a raw material orientation to the occurrence of the raw material. Further important tasks after the war were the reduction of the overdimensioned branches left from the past, the development of capacities corresponding to the realistic needs by a decrease of the narrow cross-sections, the application of up-to-date technology, and the attainment of economical production and of competitiveness on the world market as regards both quality and price. In Hungary in a characteristic way the concentration and the decentralization proceeded in parallel. While on one hand there was an increase in site dispersion, on the other an enchancement occurred in the extent of concentration with the establishment of large base plants on a high international level.

In a review of the dynamic and multidirectional changes that have taken place in the field of the regional development of the Hungarian food industry, our possibilities are limited by the restricted amount of data available and by the varied branch system. In our view, however, even so the events can be realistically reflected by a presentation of the changes apparent in the field of the live and dead work ensuring the food-insutrial production. Accordingly, in the account of the development we shall concentrate in the following on the changes in the number of those employed in the food industry, and on the investments in the industrial main group.

The main tendency of the development in time and area of the food-industrial labour force after the war was primarily that the participation of Budapest decreased considerably, that of the industrially developed counties increased to a lesser extent, and that of the industrially more backward counties increased to a greater extent. Consequently, at a county level there has been a tendency towards an evening-out of the number of employees in the food industry (1). However, the general tendency emerging in the course of this development was manifested in modified forms as regards the individual counties. The increases in the working force in the industrial groups in the extensive stage of development of the Hungarian economy pregnantly reflect the differing dynamics in the regional units as regards the branchwise differentiated development.

In connection with the distribution of those employed, noteworthy differences are to be observed between the industrial structures of the industrially developed counties, Budapest, the industrially underdeveloped counties and the country as a whole. While the proportion of industrial workers employed in the food industry in Budapest is 6,7%, the corresponding figure for the industrially developed counties combined is 9,7%, for the country as a whole is 10,8%, and for the industrially more backward areas is 16,9%. This appreciable scatter arises primarily from the fact that in the economically, and in most cases simultaneously industrially developed counties the raw-material oriented branches of the food industry and agriculture are of lower importance.

A very interesting and varied picture is exhibited by the regional differences in the number of those employed in the food industry per 1000 inhabitants. One reason why it is important to examine this question is that the outlined regional differentiation, besides the food-industrial branches more or less situated in proportion to the population, points to the nature of the regional distribution of the processing capacity based on the raw material (for understandable reasons the value of the index displays a rising tendency).

Although the high value of the number of food-industrial employees referred to the number of inhabitants stands out in those counties in which the processed agricultural products contribute on a large scale to satisfying the home demand, while an appreciable quantity is produced for export too, it must nevertheless be noted that the regional location of the processing capacity is still not rational everywhere, and the average transport distance in the raw-material demanding branches too is still unjustifiably high (2, 3).

In the extensive stage of the development the main source of growth was the inclusion of a new labour force into the production, which created an investment need. In the intensive development stage, enhancement of the productivity became the main source of growth; the lasting elevation of this is similarly based mainly on technical develompent achieved via investments. For this reason, in an examination of the regional development of the food-industrial productive forces the questions of the volume, rate and distribution of investment deserve particular attention (4).

It may be stated that from 1955 till the present day the distribution of industrial investments between the heavy, light and food industries has shown a heterogeneous picture. The distribution within the industrial main groups as regards investments in the food industry moves in a wide interval from county to county. (Whereas the total food-industrial investment of Komárom County comprises only 2,9% of the overall industrial investment, in Bács-Kiskun County the figure is 29,6%.)

In general, the outstanding counties in the field of accumulated food-industrial investments are among the industrially underdeveloped counties. The food-industrial investment is outstandingly high in the cases of Bács-Kiskun, Békés, Hajdú-Bihar, Szabolcs-Szatmár, Tolna, Szolnok and Vas Counties. At the same time, these counties are highly or moderately-highly developed in the field of agricultural production (5).

In the period in question the scatter of the food-industrial investments from county to county was very high, and the data show that the situation has not become more balanced since 1955.

To summarize, in connection with the regional differentiation of investments in the food industry it can be stated that:

— the proportion of the accumulated investment of the food industry within industry as a whole was outsanding in the industrially underdeveloped and agriculturally moderately highly or highly developed counties;

— the investment policy has displayed a sharp disproportion in that the level of development of the food industry from county to county has tended to even out.

Specialization and concentration

Solution of the involved task of the logical regional location of the industrite productive forces demands a complex, multi-featured, deep examination. With regard to the complexity of this group of problems, it is necessary to deal with hal determination of the levels of development of the productive and the non-productive spheres at several points of time, with the measure of the dynamics of the development, and with the degree and variation of the specialization and the concentration (6).

From a study of the specialization and concentration, a result may primarily be excepted if the question is approached from such an aspect that we can give an answer to the rate of development of the differentiation between the counties, and to the nature of its connection with the level and rate of development of the food industry; if, with the help of this, we can disclose the unutilized reserves; and if we can denote those regions the specialization of which would be most desirable in the interest of accelerating the economic growth.

Of the various approaches to specialization (company, plant, branch, sectoral, etc.), we shall deal merely with questions of the regional division of labour.

If a comparison is made of the food-industrial branch specialization index values for the counties for 1963 and 1970, it is observed that in that period the lower limit moved lower, and the higher limit higher. The increase in the extent of specialization from county to county shows that there was an increase in the differences manifested in the field of the internal, branch specialization of the individual regional units.

It must also be pointed out here, however, that in the above period the county average of the specialization index values decreased to a small extent. This decrease arose from the fact that the development of the Hungarian food industry was characterized by a striving for the performance of multidirectional activity, and hence at a county level too the enhancement of the extremely desirable specialization is still awaited. In determination of the tendency of regional development and in the ensuring of the available material and technical facilities, therefore, extra attention must be focused on those branches in which a faster rate development is necessary, and for this the raw material is given as regards the agriculture, and and the demand and labour force are given as regards the consumer market. In our opinion, a marked change in a favourable direction will occur when the industrial-like production fortunately becoming more widespread in agriculture (separately regionally too) gains ground, this is followed by the regional location of the processing capacity (in the raw-material oriented branches), and if the integration of the main elements of the food economy (turnover of agriculture, the food industry and foodstuffs) becomes more intense than at present.

It is interesting that a parabolic regression exists between the specialization of an internal branch in the food industry and the main factor determining the developmental level of the food industry (measured by factor analysis); this expresses the fact that the value of the branch specialization index of the food industry is high in those counties where the developmental level of the food industry is very low (Nógrád, Veszprém, Somogy and Komárom Counties), or very high (Bács-Kiskun, Békés, Pest and Szabolcs-Szatmár Counties((7).

The regional concentration of the food industry has decreased from 1963 to the present day, but to a substantially lower extent than that of industry as a whole. Consequently, its lag with respect to the concentration of industry has become smaller.

To summarize, in connection with the regional concentration and specialization of the food industry it may be stated that the values of the intensity indices calculated for the areas and populations of the counties have risen because of the dynamic development of the industrial main group, while at the same time the branch specialization of the food industry decreased in the period in question. Encouraging signs are emerging, however, with regard to the fact that the change will take a favourable direction. In his address at the 3rd congress of agricultural cooperatives, JÁNOS KÁDÁR emphasized the following points in this respect as regards agriculture: "The main task is for the cooperatives to survey their characteristics thoroughly, and to develop their long-range profiles, by utilizing their forces in the most reasonable way. In place of the plant amalgamations, in the future the specialization of the production, should continue, the cooperation between the cooperatives should be extended, and the striving should be enchanced for the development of common undertakings and associations of the cooperatives, the state farms and the food-industrial companies."

Economic development strategy and structure policy

The currently accelerated world-economic changes motivate the development of a structure policy accommodating to the new situation. With the narrowing of the production factors in the altered world-economic situation the economic growth is connected in a characteristic way to the structure change, as it were forming the resultant of it. Perfection of a structure designed to increase productivity demands very great circumspection.

Since the labour force is the main deficiency factor, it is justified to examine the manpower-management from several aspects (in order to reveal the reserves), as the developmental sources are barely available, and rational manpower-management arises as a necessity.

Marxism—Leninism teaches that the main productive force is live work. Thus, the carrier of the development of any national economy is man himself, with his knowledge, his productive experience and his productive activity. Accordingly, in the selection of the labour force from the two circumstances of the productive force special attention should be paid to the level of training of the employees, and to the proportion of skilled workers. A regional analysis of the differentiation of the employees, with regard to sex and branch would be of interest. In the absence of the relevant (appropriately broken down) complete data, however, we can rely only on the national data.

Although the skilled worker demands of the individual industrial branches are different, it appears that the large difference observed as regards the food industry and industry is not justified. (Of the workers employed in the food industry, 30,7% are unskilled and 34,0% are skilled, whereas for industry as a whole the corresponding figures are 13,7% and 46,6%, respectively.)

With the completion of the period of a "labour force abundance", one of the key questions to the further development of the Hungarian national economy will be not only the increase of the technical and technological level in the interest of more efficient management, but also the improvement of the quality of the labour force. (It is undoubted that the changes in the proportions of skilled and semiskilled workers in the food industry during the past decade have been positive, but in the future there will be a need for even faster progressive changes.)

In order to satisfy the ever increasing demands made of it, the food industry requires a labour force of increasingly higher and appropriately differentiated special training. As a result of the development of thechnology, the needs of the industrial main group with regard to a speciality structure are modified and in addition the contents of the individual professions become more up-to-date. In this field there are still unexploited reserves, the revelation and utilization of which are justified (when the further expansion of the number of workers is strongly limited); it is necessary, therefore, that the question of the improvement in quality of the labour force be followed with special attention.

In the development of the food industry we must strive to attain the first-quality technical and technological level of our products (or at least a certain group of these). This necessitates the modernization of the existing plants and the establishment of new ones outstanding with their favourable technical parameters and of a quality corresponding to the demands of the present age. The economical operation of these naturally requires a logical concentration. Although the need for concentration arises in a particular way in the field of the food industry, we nevertheless consider that the counter-arguments are outweighed both by the advantages originating from the increase in productivity, and by the attainment of a higher-level technology.

In connection with enhancement of the concentration of the production, the question arises of the consideration of the resulting transport costs. It is beyond doubt that enhancement of the concentration entails a greater volume of the raw material to be processed, but this is not accompanied by a linear proportional increase in the average transport distance. In a favourable case it is just at this time that a many-fold advantage may be enjoyed from the still insufficiently manifested specialization in the field of agriculture.

The effective development of the food industry (promoting economic growth) requires a modification of the structure of the individual regional units (economic areas) which results in a decrease in the structural disproportionateness of the region. Nowadays, when the postwar rapid industrialization facilitates the creation of a modern structure extending to every part of the producing and non-producing spheres even in the individual economic areas, the dynamic development of the food economy and the infrastructure too come into the foreground (8). Those marked differences which developed between the levels and rates of development of industry and agriculture can not be maintained in the long run, for these two important areas of the Hungarian national economy are characterized by a mutual interdependence, in which the attribution of the primary role can be considered from various aspects.

It is a very complicated and involved question to decide what the structure of the industry or agriculture is that corresponds to the optimum growth of the national economy (what the optimum structure is, the establishment of which is necessary for the efficient development of agriculture, and what intensity of characteristically non-agricultural cooperation and development is demanded).

On the above basis, a special role must be attributed to the harmony of the food-economic vertical structure. In spite of the comparatively dynamic and structurally favourable tendency of the food-industrial development, it has still not proved possible to create the desired harmony. On one hand the food-industrial capacities even today are characterized by their strainted nature, while on the other hand the lack of exploitation of the capacity increases the overheads. Accordingly, to a greater extent than the other two industrial main groups, the food industry requires the development of a flexible product structure also suitable for the carrying-out of several-directional activity in the interest of efficient management.

The other very important problem, the solution of which will promote the development of the food economy too (and within this the food industry), is the dynamic develompent of the infrastructure. Within the system of distribution of the goods scantily available following the war, a disproportion arose between the producing and the non-producing spheres. However, the relevant examinations draw our attention to the fact that the further undisturbed functioning of the economy is also endangered in part by this disproportionateness, by the lack of appropriate replacement and renovation of the worn-out infrastructural reserves resulting from this, and by the partial satisfying of newer demands arising in the course of the development. The prolonged lag of the infrastructural supply compared to the level of development of the producing sphere becomes a barrier to development in the long run, and leads to a drop in efficiency. Further, since the backward regions in the infrastructural field are in fact mainly just those counties which play a more important role as regards agriculture and the food industry, the actuality of the question is particularly justified. At the same time, the importance of this group of problems is further increased by the fact that the infrastructure does not exclusively ensure the conditions of production, but also plays a very important role in determining the living standard of the population, which again draws attention to the need to decrease the unjustified and unhealthy regional differentiation.

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SOME NEW ELEMENTS OF GRAPHICAL PLOTTING

MRS. J. PALOTÁS-ABONYI

The sciencies dealing with research into the tendencies and regularities of socio-economic phenomena frequently employ the possibilities offered by graphical plotting. Of these sciences, the ones making most frequent use of the rich possibilities of graphical plotting are economic geography and regional statistics.

The plotting methods of use in regional research are systematized by numerous handbooks, textbooks and various other publications. Their possible incorrect application is criticized, and they are enriched with new aspects.

These publications arouse interest in specialist circles primarily for the reason that, as the spate of information influencing mankind increases, there is a parallel increase in the role and importance of graphical plotting, not only in communication, but also in scientific research.

In the application of graphical plotting, however, it must never be forgotten that the procedure employed is not an end, but merely a means, with the aid of which understanding can be promoted.

Graphical plotting may further research-analytical work; it facilitates orientation in the sphere of phenomena that can be grasped only with difficulty or not at all by direct observation; it is one of the means of transmitting ideas; and with its application it is possible to emphasize the rate and regional differentiation of development, as well as the nature (direction) and extent of the correlation between the phenomena.

With regard to all this, it is by no means irrelevant which, or which combination, of the broad range of graphical plotting methods is employed.

As the subjects of the sciences dealing with regional questions change, and as their research methods develop, there is a corresponding rise in the demand for new, up-to-date plotting methods. In the age of the scientific-technical revolution, when the use of computers is extremely widespread, the modernization of the plotting methods is not simply a question of demand: as a consequence of interaction, the possibility for development is also given.

Below we wish to enrich the plotting methods (that have been developing so rapidly in recent years) whit some new elements.

Above all we shall touch upon the question of the plotting of stochastic connections (probability connections), of which there are a large number even in the sphere of the system of connections of socio-economic phenomena.

For the plotting of the correlation connection it is possible to use a characteristic (not too well known) means of plotting. The essence of this is that a scale corresponding to the number of the correlation coefficient is given on the horizontal axis, while the perpendicular axis shows a scale ranging from +1 to −1, upwards and downwards from the horizontal axis. Following this, the "r" value is measured as the perpendicular amplitude on the horizontal axis, and conneeted with a wawe line. From the 26-element sample in Table 1 the following correlation matrix was obtained:

$$R = \begin{bmatrix} 1 & 0{,}6563 & 0{,}2776 \\ 0{,}6563 & 1 & -0{,}3730 \\ 0{,}2776 & -0{,}3730 & 1 \end{bmatrix}$$

On the basis of the above description, the curved line correlation to be seen in Fig. 1 can be used for illustration of this.

Table 1.

Floodwave peaking at Budapest		Rainfall (mm)	Water level at Budapest at beginning of rainfall (cm)
Date	Water level (cm)		
14.8.1896	590	58	405
20.8.1896	660	52	450
8.8.1897	780	133	350
22.9.1899	770	179	285
15.7.1903	710	98	330
20.7.1906	640	72	400
2.5.1907	670	72	550
29.6.1907	520	43	480
21.7.1907	660	62	450
31.5.1912	690	67	610
27.7.1912	500	64	380
4.8.1912	460	33	460
16.9.1912	610	57	425
21.9.1912	710	62	560
14.7.1914	620	54	420
24.7.1914	660	48	620
1.7.1918	620	86	390
15.8.1918	590	74	350
26.6.1926	740	95	570
1.7.1926	730	44	710
17.7.1926	720	53	700
6.8.1926	720	77	580
14.8.1926	640	46	700
18.7.1954	805	123	560
26.6.1955	510	26	370
16.7.1955	673	62	430

In recent time there has been a rapid spreading of one of the very widely applicable methods of multivariant statistical analysis, factor analysis. It has found application in the sciences dealing with regional questions since 1960. The most widespread area of application of the factor model is the determination of the level of development, and the construction of development sequences and groups. It is a charac-

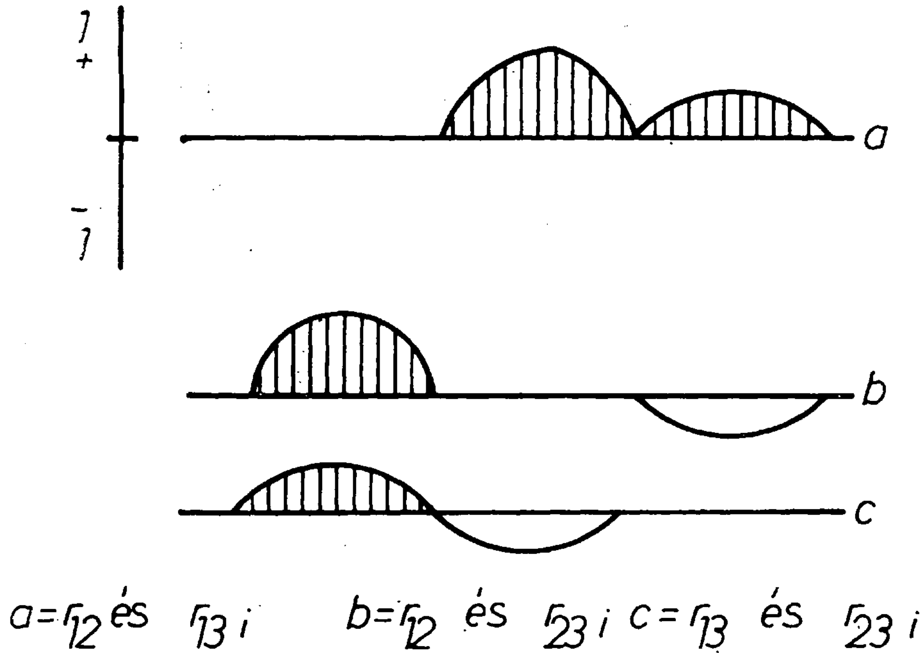

Fig. 1. Curved line correlation

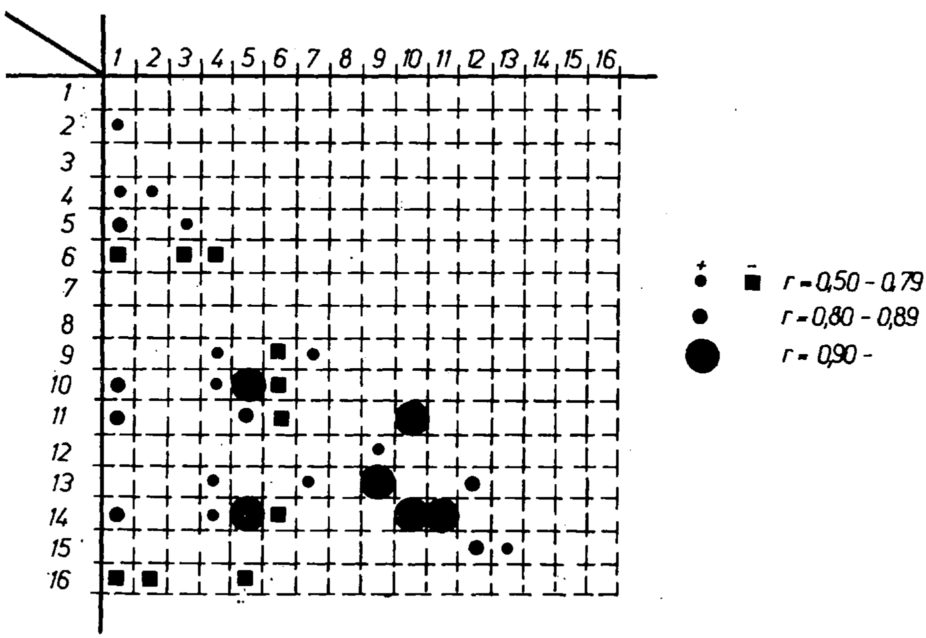

Fig. 2. Correlation matrix of indices expressing the level of development of the food industry

Table 2.

index / index	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.	1.000															
2.	0.609	1.000														
3.	0.196	−0.070	1.000													
4.	0.754	0.606	0.421	1.000												
5.	0.831	0.478	0.560	0.280	1.000											
6.	−0.722	−0.396	−0.111	−0.524	−0.780	1.000										
7.	0.172	0.273	−0.176	0.402	0.266	−0.122	1.000									
8.	−0.218	−0.037	−0.006	−0.117	−0.261	−0.023	−0.299	1.000								
9.	0.467	0.438	−0.065	0.703	0.448	−0.526	0.639	−0.215	1.000							
10.	0.861	0.465	0.078	0.519	0.930	−0.781	0.069	−0.133	0.431	1.000						
11.	0.840	0.415	0.014	0.496	0.869	−0.725	0.052	−0.188	0.432	0.972	1.000					
12.	−0.042	−0.038	−0.299	0.202	0.098	−0.109	0.407	−0.349	0.634	0.064	0.125	1.000				
13.	0.430	0.332	−0.202	0.627	0.397	−0.422	0.581	−0.266	0.952	0.423	0.469	0.760	1.000			
14.	0.886	0.452	0.049	0.516	0.901	−0.772	0.059	−0.170	0.393	0.984	0.971	0.028	0.395	1.000		
15.	−0.106	−0.040	−0.037	0.070	0.132	−0.188	0.156	−0.306	0.464	0.125	0.175	0.776	0.502	0.111	1.000	
16.	−0.610	−0.554	−0.225	−0.473	−0.512	0.421	−0.303	−0.090	−0.135	−0.417	−0.353	0.392	0.018	−0.422	0.422	1.000

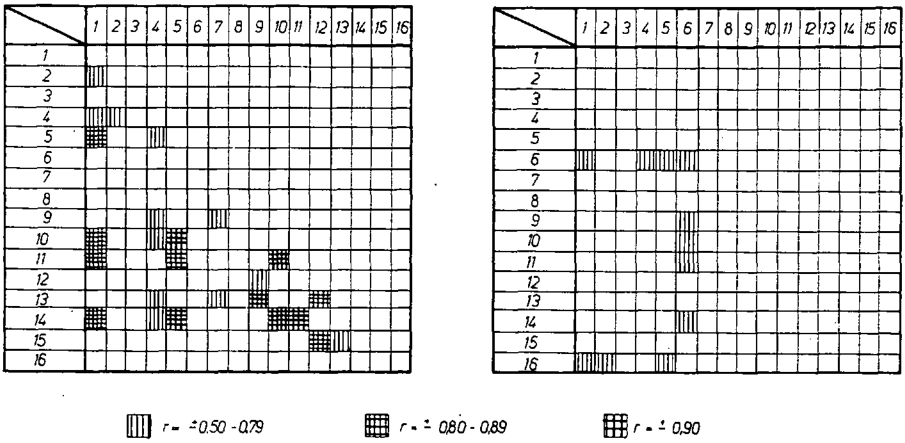

Fig. 3. Correlation coefficients in the + and − directions of the indices expressing the level of development of the food industry

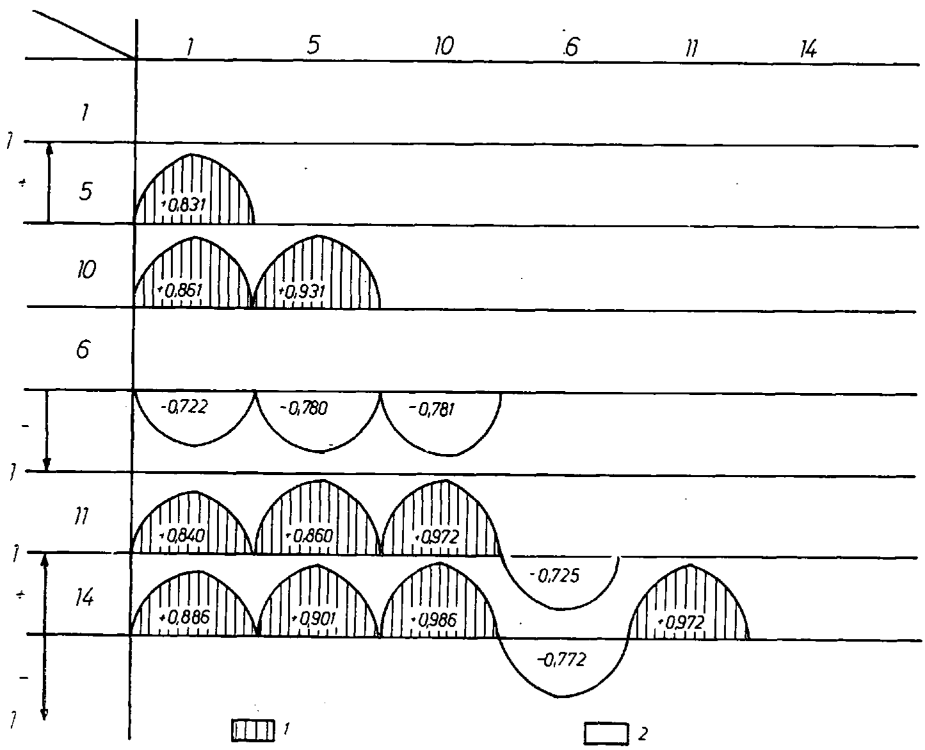

Fig. 4. Curved line correlations of the variables combined in factor K_1
1 = +correlation coefficient
2 = −correlation coefficient

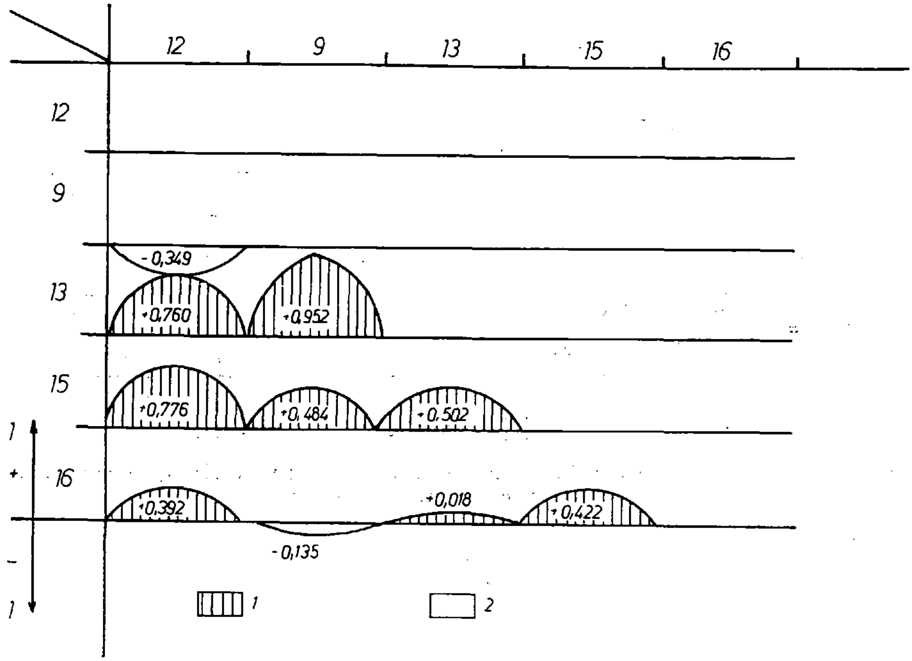

Fig. 5. Curved line correlations of the variables combined in factor K_2
1 = + correlation coefficient
2 = − correlation coefficient

teristic of the method that it also provides a possibility for the revelation of causal correlations. Calculations of such a nature are based on more or fewer natural (or result) indices. In the course of the calculations we form the correlation matrix of the variables (indices) included in the examination. In Fig. 2 we have attempted to illustrate the paired correlation connection of every index with every other index.* (The Figure can be evaluated with ease of the correlation coefficients are characterized on the basis of the closeness of the connection.) The areas of the circles express the closeness of the connection, and their colours or shading the direction of the connection. (Table 2.) In a coloured Figure the positive "r" values may be shown in red and the negative ones in blue, for instance, to facilitate differentiation. Since the Table summarizing the correlation matrix plays a determining role in the subsequent examinations, its plotting is justified among others because of the confirmation of the correctness of the index system, in addition to the greater ease of survey and evaluation.

The above correlation matrix also be plotted in such a way that the correlation coefficients in the + and − directions are separated from one another, and in each

* The Figure illustrates the correlation matrix obtained on the basis of a 16-index system, necessary for determination of the level of development of the food industry in the different counties.

lattice the differences are denoted by shading merely on the basis of the closeness of the connection (Fig. 3).

A very important step in the course of the factor-analytical examination is the investigation of the correlations between the original variables and the factors. In the factor structure this is performed by forming the factor weights. Since the factors are characterised primarily by those variables which are connected to the factors with large factor weights, this means that the factor in question explains the majority of the scatter of the original variable. The curve line correlations of the variables combined in the first factor (named the first factor and denoted by K_1) are shown in Fig. 4, and the corresponding ones relating to factor K_2 in Fig. 5.

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HUNGARY'S RURAL INDUSTRY

GY. BARTA

Even in the period preceding World War Two, the Hungarian industry was characterized by high concentration, mainly as a result of the fact that capitalist industrialization started in Hungary later than in the more developed western European countries. In spite of this, however, handicraft also played an important role in industrial production. Besides the large industrial factories there were a lot of medium-sized and small plants as well. By way of illustration, in 1938 two thirds of the entire industrial output were produced in factories employing less than 500 workers.

After 1945, industrial concentration continued to increase. In the course of the nationalizations a great number of small plants were wound up, amalgamated or joined with larger enterprises. Industrial development affected first of all the heavy industry, considering that due of its technological pecularities, it requires the creation of primarily large industrial factories. At the same time traditional rural handicraft was gradually degressing. A sudden suppression of some rural industrial-likes services (privately owned small repairing and servicing shops employing only one or two) by means of imposing disadvantageous taxes upon them also contributed to shrivelling rural industrial activities.

1962—64 were the years of fundamental changes in organisation. During this period the number of the state-owned industrial enterprises diminished by one third, the average labour force, however, almost doubled.

Although in the early sixties similar reorganization, amalgamations and fusions have also been carried out in all other European socialist countries, such a high industrial concentration has nowhere been created.

It is for instance characteristic that while in Hungary over one third of the workers are engaged in industrial en erprises employing more than 5000 workers, the same figure in the Soviet Union accounts for only 22 per cent, and in the majority of the CMEA countries — for only 16 per cent.

In accordance with this, on the international level the Hungarian share of those working at industrial enterprises employing less than 100 workers belongs to one of the lowest. This only applies to the figures of the state-owned and cooperation industries, considering that present paper doesn't deal with private-owned small-scale industries, nor does it with industrial activities of farming plants.

Technical progress generally requires industrial concentration, despite the fact that in many countries the ration of small plants doesn't indicate any major decrease. (For example in the USA the ration of small plants employing less than

Table 1. *Industrial settlement structure by number of persons employed**

Country	Ratio of industrial settlements employing persons				
	below 50	51—100	101—500	501—1000	1000 and more
Hungary	5.1	5.3	21.7	16.9	51.0
GFR	9.6	8.7	28.7	12.3	39.8
USA	14.1	10.2	31.3	12.8	31.6
France	23.4	12.8	32.3	11.0	20.6
Japan	31.2	13.5	26.1	9.4	19.8
Sweden	22.0	12.8	33.7	13.0	18.5

* *Source*: Az ipar nemzetközi összehasonlításban. (Industry in international comparison.) Hungarian Central Statistical Office. Statisztikai Időszaki Közlemények. (Statistical Periodical Proceedings.)

100 persons didn't decrease during the past fifty years. On the contrary, the number of employees has almost doubed.)

Concentration mainly characterizes heavy industry throughout the world. It is, however, very interesting that in Hungary, contrary to the general tendencies, considerable concentration has taken place in light and food industries. The reason is, that heavy industry was highly concentrated even in the period preceeding World War Two.

Table 2. *Extent of concentration in some industrial branches; rate of industrial settlements employing more than 1000 persons*

Country	Engineering industry	Chemical industry	Textile industry	Food processing industry
Hungary	64.5	55.7	71.0	31.6
GFR	69.2	47.4	18.2	11.9
France	30.9	24.1	10.3	2.2
Japan	28.2	35.4	9.9	3.8
United Kingdom	50.1	45.2	10.7	30.9

** *Source:* as above.

But the industrial concentration indexes are a little bit misleading as the major part of our large factories are not actually large.

The index numbers often indicate only formal amalgamation of several smaller industrial establishments, while in part of these combined plants technology of production, equipment, organization and management have remained on the former low level, so it does not allow the utilization of large scale production advantages.

But considering this phenomenon, too, one has to say, that the Hungarian industry is over concentrated. The low ratio of small and medium-size plants reduces the efficiency of large-scale production and contributes to the formation of permanent shortage in number and variaty of goods in population supply.

The territorial centralization industry has further increased the high organizational and productional concentration of industry. The heredity of capitalist Hungary, that is high industrial development in Central and Northern Transdanubian, in the capital and in the Northern Hungarian Central Mountains country, but simultaneously economic backwardness in the Great Hungarian Plain and Southern Transdanubian, could not be essentially changed by developing socialist industry in Hungary. The reason was primarily that the one-sided development of heavy industry in the postwar period continued to depend on the coal bases situated in the above mentioned industrialized areas.

The first major efforts aiming at the elimination of the disadvantages deriving from the lack of small and medium-sized plants, regional differences in industrial development, and one-sided industrial developing were taken only in the sixties.

The share of light industrial investments had been raised, even full- scale reconstructions of several branches, for instance that of the textile industry have begun. Industrialization of Great Plain had started. Its main objective was to ensure industrial jobs on the spot for those coming from agriculture. Therefore branches, requiring manpower, rather than equipment — namely engineering, light and food industry — characterizes industrial location in the Great Plain.

A selective industrial development in the capital also contributed to changing Hungary's regional industrial structure, as a great number of plants had been removed from the capital to rural areas. Intensive development in rural areas and moderate industrial development in the capital resulted that the share of the industrial production of Budapest reduced from 39 per cent to 32 per cent between 1960—1970. The number of industrial workers decreased by about 100 000 between 1963—1975.

Structural changes in energetics took place in the late sixties, early, seventies and it also had profound regional effects. In the beginning of 60-s Hungary met 75% of her energy requirement of coal. In the late sixties and mostly in 1971—1972, a number of coal uneconomical mines have been closed, especially in Nógrád and Borsod counties, in order to make coal mining more economical. The employment of nearly 20 000 miners could partially be solved by locating new industrial plants.

The economic reform of 1968 also had a favourable effect on the industrial development of areas still having free labour force. The economic reform ensured greater independence for the enterprises. For instance, they themselves were allowed to dispose on a considerable part of their development fund created from their own profits. In many cases these enterprises spent a part of their production investments on establishing new industrial plants in the country-side in smaller settlements, as locally they could hardly find any surplus labour. The number of small plants settled in rural areas suddenly increased in 1968.

The period of the fifth five-year plan (1976—1980) indicates changes in the development of rural industry. Industrial and local plans need more concentrated investments. The number of new industrial plants will decrease and this might result the stagnation or at least the decrease of rural industry. The concentration of industrial development has been required by the labour shortage. Growing number of small plants in rural areas, also contributed to absorbing mobile labour force. But it also lead to squandering investments goods. A number of small industrial plants has been established in old buildings having been created for other purposes, by means of minimal investments, making use of out-of-date equipments, worn out partly or entirely in the large factories. In addition, there were only unskilled, unexperienced labour forces available.

As a result in some labour productivity has not reached the required standards in some small rural plants.

Of course, all this does not characterize rural industry as a whole. The overwhelming majority of rural industrial establishments has succeded in achieving results close to the national average, even if their circumstances were disadvantageous. There is no doubt, that the location of these new industrial plants affected favourably the labour and living conditions of the local population.

Present situation of rural industry

More than 20% of the whole industrial workers are employed in rural industrial plants. This rate and its importance will even be greater if we calculate the auxiliary industrial activities of agrarian cooperatives.

One has to mention as well, that another 20—25% of industrial workers commuting daily (weekly or monthly) to the industrial plants of towns. In the early seventies in about 400 of a total of 3000 Hungarian villages, more than 50 per cent of all active earners were employed in the industry.

Branch-structure of rural industry is similar to that of the whole industry's. In the combined index numbers characterizing the division of branches, there is only a minimal difference between the proportions of heavy, light and food industries in the villages and on the national level, respectively.

Table 3. *Structure of industrial branches on the basis of the share of employees in rural industries and on the national level (in per cent)*

	In rural industries	On the national level
Mining industry	14	8
Electric power industry	1	2
Metallurgy	2	6
Engineering industry	31	31
Building material ind.	8	5
Chemical industry	4	6
Heavy industry	60	58
Light industry	25	27
Food industry	9	11

In the branch structure of different industrial groups there is already some difference between rural and national patterns. Typical of rural industry is the high share of mining and building material industries. The proportion of food industry within rural industries is, surprisingly low. In this case the figures are slightly distorting, as auxiliary industrial activities are mostly of a food-industrial character, but we did not take them into consideration.

After all of dominating branches rural industries are those, processing row materials available on the site.

Rural industry's fixed assets and the share of their machines and equipments, also amount to about one fifth of all the industrial fixed assets and machineries of the country as a whole.

But this only applies to gross valuation, because net values (reduced by the amortizations) are lagging behind the national level. Rural machinary is older than the country average.

Approximately 45 per cent of those, employed in rural industry are women. It is not surprising that the share of women earners in rural industry is slightly superior to the national average (43 per cent), being at the same time the overwhelming majority of the commuters — men.

No data are available concerning production value of rural industry. Production data have been registered only in regard to the industrial enterprises as a whole, without detailing for industrial settlements. Most part rural industry doesn't consist of independent plants, so the rural share of production value would by no means reflect the reality.

Productivity represents the crucial point of rural industrial production, of removing plants to rural areas. We have no comprehensive knowledge of rural industry's productivity. But representative observations indicate that the productivity of rural industry is below the national level. There are various reasons for this unfavourable phenomenon. Out of date real estates and machineries, unskilled labour force have already been mentioned above.

Fluctuation of labour in rural plants is on a smaller scale than in urban ones. Fewer opportunities for choice between places of work compel the workers to greater compliance.

But from the point of view of the factory the effect of this positive phenomenon is sacarcely to be felt because of the introduction of the new child-care allowance system. In new plants, employing mainly women, the share of those receiving the three-year child-care allowance (Which in case of three children's birth can be extended until 9 years) not seldom accounts for 20—40 per cent of the total number of the employees. Their proportion is still steadily growing.

At urban plants the number of women being on child-care allowance is lower, and many of them return before their three-year time has expired. The division of the workers by age and sex is more balanced at urban plants, and there are also more opportunities for accomodating the children in enfant's nursery.

The central plants themselves often contribute to the formation of lower productivity levels by having their rural plants make all the underpaid working processes which require less quality work.

Lower productivity, unskilled labour force, shorter period spent in industrial work must turn up, in a lower wage level of rural industrial workers. In 1975 the rate of this lag behind national and urban industrial levels, amounted to 8—10 per cent.

Regional differences of rural industry

Rate of the rural industrial workers is extremely different in each county. In scarceley achieves 8 per cent in Győr-Sopron and Csongrád counties, as against more than 60—70 per cent in Pest or Tolna counties. Obviously, this depends not only on the spread of rural industry, but also on the economic structure of the county, the sizes of the urban industry and the settlement network.

The rate of labour force employed in rural industry shows, however, smaller fluctuations among the counties. Their rate ranges from 34 to 58 per cent.

In the rural industry there is a close relationship between the employees division by sex and the level of wages. In counties with high wage level (Veszprém, Fejér, Heves, Borsod-Abaúj-Zemplén, Nógrád) the rate of employed women is the lowest. The reason is either the fact that in view of the higher wages of the men there is no need for women's salaries (in the above-mentioned counties mining and heavy industries are prevailing), or wage level is higher in consequence of the smaller retarding effect of lower woman wages.

In extreme cases the wage level differences among the counties make up more than 30 per cent.

Particular natural and economic endowments of these regions also manifest themselves in the regional differences of the branch structure.

In the region of Transdanubia and Northern Central Mountains as well as in Baranya county — where the Hungarian coal minig is being carried on —, or in South-West Transdanubian and Csongrád county — that is in the areas of the Hungarian oil production —, 20—40 per cent of the total industrial earners are engaged in mining. Construction industry, also linked up with its deposits, especially in the Transdanubian counties. In the main agricultural areas (the Great Hungarian Plain, the Plain in North-West Hungary) the rate of the food processing industry is above the national average.

Engineering industry represents considerable proportion in all counties. First of all, highly-fabricated engineering branches having only loose connection with the sites have been located in the backward areas. In beforehand expressively agricultural areas the rate of persons employed in engineering industry has increased up to 25—45 per cent. (In Békés county 29 per cent, in Hajdú-Bihar county 44 per cent, in Somogy county 38 per cent, in Szabolcs-Szatmár county 24 per cent.)

Development of light industry has been relegated to the background in the regions where mining and heavy industry are dominating. This does not mean only proportional industry are dominating. This does not mean only proportional differences, but also absolute lags behind the other counties. (In these counties the ratio of persons employed in light industry accunts only to 7—8 per cent.) One-sided industrial structure offers less opportunities for the employment of women.

Means of rural industrial location

Up to now branch or regional development policies did not prefer directly rural industrial development. The introduction of auxiliary industrial activities of farming cooperatives constitutes a marginal case. But its immediate goal was to strenghten farming cooperatives economically. The sphere of the auxiliary activities had to be limited later in order to concentrate the efforts on agricultural production. As a result of the modified taxation system introduced in the early seventies, farming cooperatives have become interested chiefly in food processing.

With the introduction of the economic reform, the decision-making functions of the enterprises have been broadened in the field of investments, too. Now the enterprise itself decides how to use its profits and a part of the amortization. About 60 per cent of the national investments are financed by enterprise investment funds. It is the framework that virtually serves the purposes of creating and developing rural industrial establisments.

Regional regulators and other official prescriptions are important means of realizing regional objectives.

A Central Fund for Regional Development was created in 1971 for the development of backward regions. This fund is expected to solve three major regional problems. In the course of the capital's selective industrial development a number of industrial plants are being removed to rural areas. The costs of creating new rural industrial palnts are being covered partly by the capital's Fund for Industrial Removing. Between 1971 and 1975 this Fund of about 800 million forints accounted for some 13—15 per cent of all investments in rural areas.

The fund creater for developing backward areas accounts for nearly 25 per cent of the Central Fund for Regional Development. Support is being given for industrial development of the Great Hungarian Plain and south-west Transdanubia from this Fund.

The fund for reducing coal mining served the transformation of the economic structure of the areas concerned.

Between 1971—1975 supports were granted to nearly 200 investments from the Central Fund for Regional Development. Close on 30 per cent of the full amount of these 200 investments were covered by this supports. About 60—70 thousand new working possibilities were created by these investments. A great number of them has broadened urban labour opportunities but about 50 of the 200 new plants were located in small towns and villages.

The Regional Development Fund amounts to not more than 1 per cent of all industrial investments, but it oriented 4—5 per cent of all the industrial investments to the desirable areas. In the areas assigned for industrial development, even where the investments are supported from the Central Fund for Regional Development, advantageous credits can be used. For instance, the enterprises removed from Budapest to rural areas covered 24 per cent of the expenses from bank credits. Abovementioned advantages mean that banks are setting lower requirements to the enterprises.

Local councils, also can ensure considerable support to the location of industrial plants. Industrial enterprises are obliged to pay 6 per cent of their profits, and farming cooperatives — 1 per cent of their gross income to the territorially competent county council. These councils are entitled to promote the faster development of the enterprise by temporarily exemption from their financial commitments. County councils prefer granting preferential credits from their own industrial development fund to the enterprises.

Official regulations for implementing regional objectives are mainly of an administrative, and only to a lesser extent economic. It was in 1973 that a National Plant Location Authority*** was set up in order to help the enterprises in the location of new industrial plants. Considering that the Plant Location Authority has no own financial resource and that the enterprises are not obliged to accept its recommendations, for the time being the Authority is hardly able to fulfil its task of orientating the location of new industrial plants.

*** It provides settlement alternatives for the location of the enterprises, according to the objectives of the regional development.

THE NECESSITY AND DUTY OF THE CO-ORDINATED UTILIZATION OF ENVIRONMENTAL RESOURCES IN THE REGION OF BÉKÉSCSABA—GYULA—BÉKÉS

J. TÓTH — J. RAKONCZAI

Introduction

The increasing utilization of the natural resources and it's growing influence on the environment are the regular outcome of the development of productive forces. The problems, originated from these above mentioned facts, make the suitable economy of environmental resources urgent and important in every respect.

The exploration of the degree of the environmental impairment, the prevention, the concrete pointing of the duty of environmental protection, and the recording of the possibility of regional-sectional co-ordination, make the accurate examination of characteristic territories necessary at the first time. The experiences, given by the examinations of properly chosen and complexly explored characteristic territories, lead us to the establishment of unified norms and to creation of the possibility of governmental regulation.

Whereas the natural environment is indivisible, the duties of the economy of environmental resources cannot be solved effectively without international co-ordination. It is reflected in our low of environmental protection, the second low of 1976, which adopts a resolution of Stockholm Conference, saying that — in agreement with the United Nations Charter and the international low — every state has her own right to utilize her resources, but is responsible for all kinds of activities, controlled by herself, to avoid any kinds of soiling in other countries or territories outside her national border. As in case of several sciences, a very profitable co-operation would come into existance between the socialist countries in the field of economy of environmental resources from research to the solution of problems. The exchange of the experiences and the mutual exploitation of them would play the most important role at an early stage of co-operation.

This purpose is served by the reconciliation of research of KGST-countries (Council of Mutual Economical Aid), by indication and examination of the characteristic territories and by the regular arrangement of scientific conferences.

Hungary has been taking part in research from the very beginning so the scientists of KGST-countries could observe the works going on in a characteristic territory near Tatabánya. (S. KATONA—L. RÉTVÁRI 1977.) The question of the utilization of environmental resources is raised up in different relations and by dissimilar possibilities of solution in major part of Hungary. We try to summarize the problems of economy of environmental resources of a territory, quite particular from geological point of view, emphasizing that the detailed exploration and the concrete recording of the possibility of co-ordination, resulted from the special configuration, make further research imperative. (Fig. 1.)

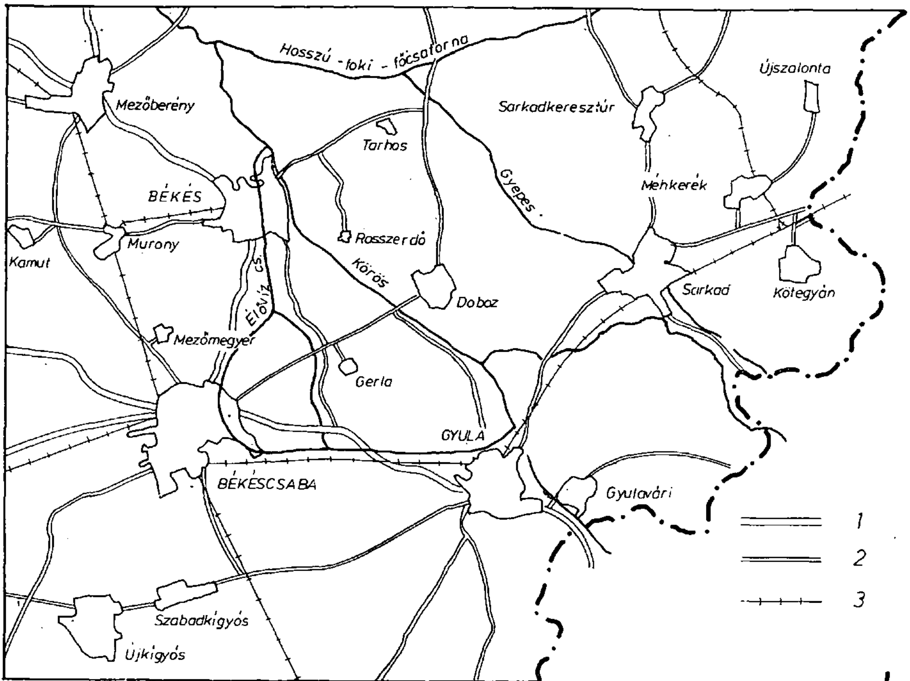

Fig. 1. The map of Közép-Békés
1. Main road, 2. Other roads, 3. Railway

A particular set of settlements and the problem of utilization of environmental resources

Both in capitalist and socialist countries the process of urbanization produced a number of settlements between the members of which the economic and other relations are mutual, specially intensive and go from strength to strength in spite of the administrative division. In consequence of this fact as well as the territorial nearness and transport, the difficulties of development of the settlements or utilization of environmental resources can be solved efficiently only by co-ordination. Some similar sets of settlements came into existence in Hungary too. (eg: Budapest agglomeration, the valley of Sajó, the coal-basin of Tata, a settling between Komárom and Esztergom, the neighbouring district of Pécs etc.) In our country as well as everywhere in the world, the most powerful process of agglomeration, and intensification of the intercentral relations of the towns concentrate on the most exposed and most developed spheres of economic growth. The above mentioned processes haven't had any importance for quite a long time because of the specific structure of the Great Hungarian Plain and its disadvantageous participation in the national regional division of labour. The only exception was Szeged and the agglomeration round her. (J. TÓTH—GY. KRAJKÓ—I. PÉNZES, 1969.)

By the end of 1970-ies it became quite obvious that in every part of the Great Hungarian Plain the process of agglomeration had already begun as aresult of the speedy development of the productive forces and the planned industrialization of the district. The professional interest was focused on Közép-Békés.* (D. BAKONYI 1973, J. TÓTH 1977.)

The set of settlements in Közép-Békés (Fig. 2.) has a number of characteristic features that basically influence the duties and the possibilities of the utilization of environmental resources. Among the characteristic features the following are emphasized:

a) Some minor settlements that intensively relate to the leading towns of the set of settlements (eg: Békéscsaba, Gyula, Békés) are situated about 10—15 km from

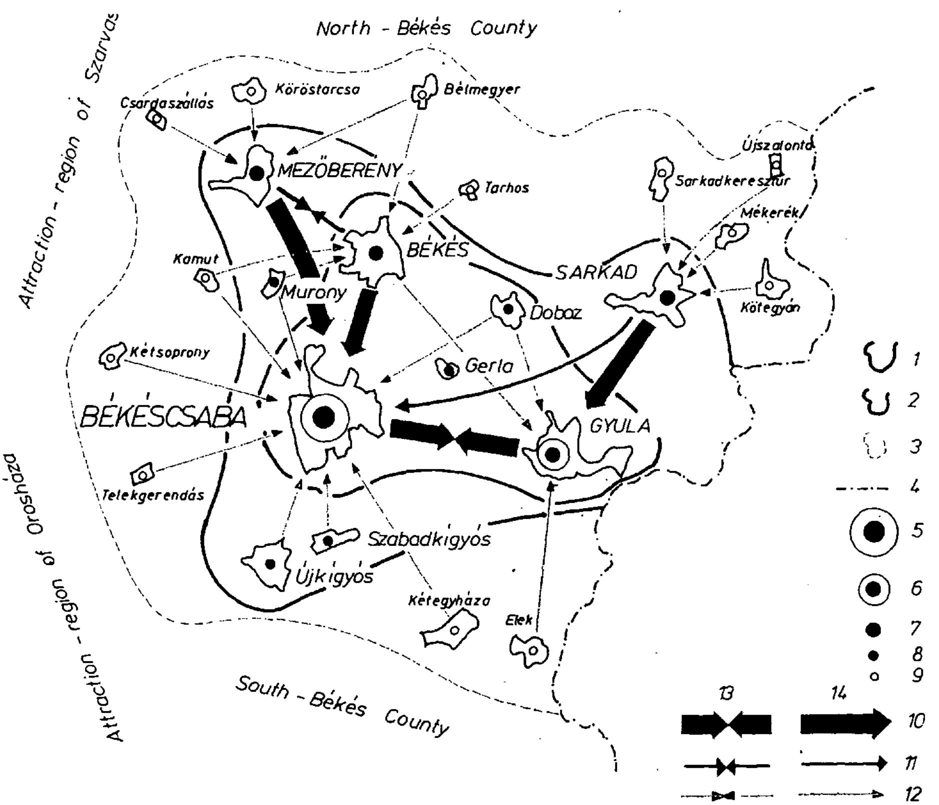

Fig. 2. Regions of towns in Közép-Békés

1. The boundary of megaregions of towns, 2. The boundary of regions of towns, 3. The boundary of the territories joining to the regions of towns, 4. Frontier, 5. Townregion-centre, 6. Townregion paracentrum, 7. "Satelite-town", 8. Sleeping towns, 9. Other settlements joining intensively to the regions of towns, 10. The relationships are intensive, 11. Middle intenzification, 12. Weak relations, 13. Balanced relations, 14. Dominant relations,

* Middle of Békés County

each other. Therefore co-ordination is necessary to solve the problem of utilization of environmental resources.

b) The members of this set of settlements were tipical agricultural towns and their economic activity endangered the environment in minimal degree. There were incoherent and low-level relations between the towns.

c) As a result of their geographical situation and economic profile, only the management of water-supply (river control), regulation of water-ways, draining etc.) made the concerted action necessary.

d) The dynamical development of last decades transformed the economic profile of settlements, industrialization came into prominence and precipitated the intensification of the intercentral relations. The relationships became more and more many-sided. These processes brought the significance of environmental protection on in the adjoining settlements.

e) On this stage of development of productive forces the significance of environment protection and the necessity of co-ordination is indisputable in the region of Közép-Békés. As a result of the particular historical past, winding up the result of environmental pollution is not so important as the prevention and planning of the environmental protection. The problem of this region — because of its particularity — may command interest wildey.

The Research-Group Hungarian Great Plain of Institute for Geography of the Hungarian Academy of Sciences, instituted in Békéscsaba in 1973, examined the problems of environmental protection of the region in question. (L. HAJNAL 1976, M. MIZÓ 1976, J. TÓTH 1976 ab, J. RAKONCZAI 1977.) By the reason of the claims of Békés County and the towns — with promotion of the Ministry of Housing and Public Construction — we start to examine the complexity of the set of towns in Közép-Békés, laying stess on solution of the problems of environmental protection. The reseaerch lasts from 1978 to 1980.

We have alreandy given account of our research in the congress of environmental protection, held by the KGST-countries in Várna this year. (J. RAKONCZAI— J. TÓTH 1977.) The conference declared Közép-Békés — as well as the characteristic territory of Tatabánya — the controll region of utilization of environmental resources.

Further on we summarize the problem of the environmental protection in Közép-Békés.

The concrete duties of utilization of environmental resources in the Közép-Békés region

1. Water-supply, pollution

The greatest problem of Közép-Békés is water. Water is associated with two things mainly: the rational utilization of environmental resources and the impeding of pollution.

The essence of problem is as follows:

A) The water-supply of the three towns is based on the usage of water of depth nearly exclusively. The geological conditions don't make the quick increase of

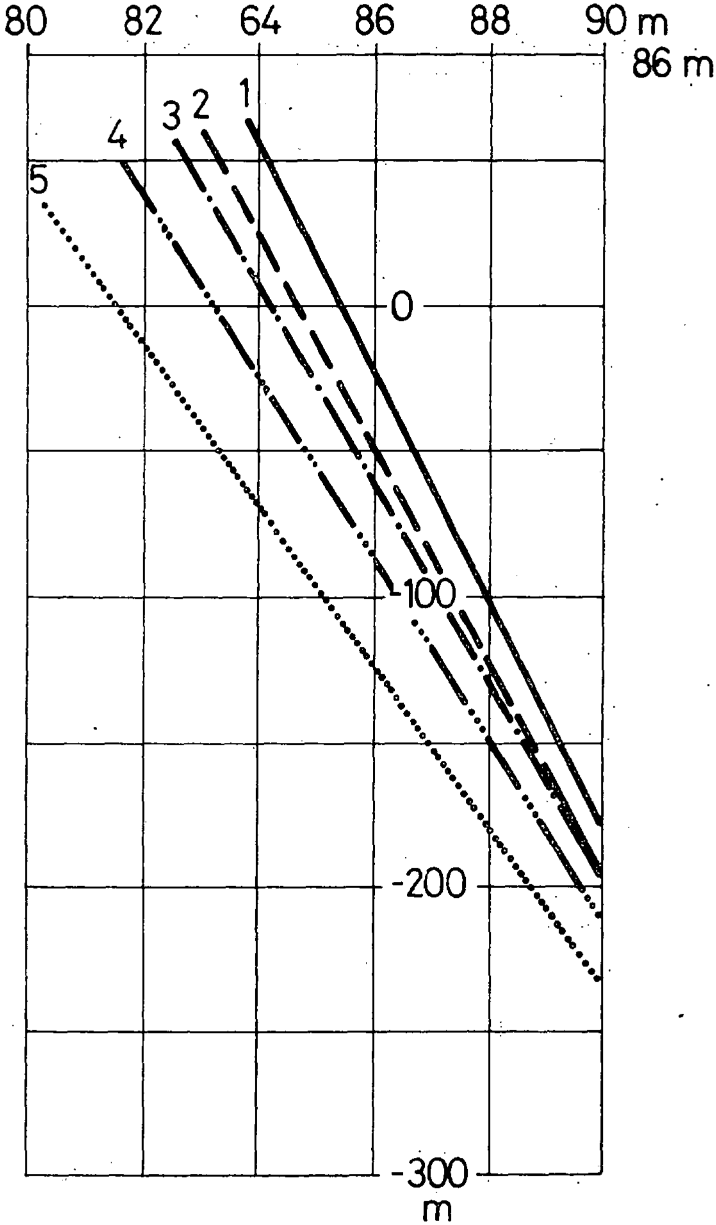

Fig. 3. The decrease of the normal level of water in artezian well in Békéscsaba
1. untill 1944. 2. 1955—1959, 3. 1960—1964, 4. 1965—1969; 5. 1970—1974.

water-supply possible. Therefore it doesn't increase so quickly as the demands of urbanization and industrialization, to be more exact, the exploitation of the subsurface water cannot be increased either some years later. (J. RAKONCZAI, 1977.) As an example we show you how the pressure of subsurface water changed in Békéscsaba, under the influence of exploitation of water. (Fig. 3.) The exploitation of water, from the rivers Fehér-Körös and Kettős-Körös, cannot be realised without injury of rivers, under the existing conditions. (When there is great claim to water in Hungary, there is scarcity of water because of the water-basins settling up in Romania.)

B) The sewage disposal of the greatly increased drainage is unsolved. The sewage flows into the Élővíz-drain. The follow is very skow in the drain, water flows into it without satisfactory cleaning, and as a result the quality of water is the worst according to the KGST standard. (L. HAJNAL 1976.) The drainage of the three towns finally flows across Békés. It pollutes the air therefore the possibility of the potential inflection is increased.

C) The sewage-system of the towns (as well as the neighbouring settlements) is very insufficient. Building up to the sewage system didn't develop together with the increasing use of water, therefore a great deal of sewage got to the subsoil water. In consequence of this the drainage gathers under the settlements endangering the stock of water of depth. Sometimes it is a very difficult problem that in case of much precipitation the sewage system proves to be too little to take it up and creates dangerous situation.

The problems — the rational utilization of environmental resources and the impeding of pollution — can be solved by great financial investment and by co-operation of the towns.

D) Drinking-water must be obtained from the ground water. To realise this decision, a regional hydrological system has to be established. Water should flow from wells situated on the alluvial fan of Maros, and should supply the three towns. The present well network system would somewhat qualify the case. Water, both for irrigation and industry, should be obtained from a planned water-basin system of river Körös. We shall describe its economic significance in part. 3.2.

E) The following problems must be solved in order to decrease the pollution of Élővíz. drain:

a) The constant flow of water must be protected in order to refine the self-purification of water and decrease the danger of sedimentation.

b) We have to increase the capacity of sewage filtering (the present system doesn't solve the cleaning perfectly) and it is necessary to develop a bilogical cleaning system beside the mechanical ones.

c) We should like to go on with our experiences, that is to irrigate with sewage water beside, of course, the permissible pollution.

F) We have to increase the development of sewage system in each settlements. We try to solve the quick drainage of inland water.

2. *Recreation areas*

Recreation areas of Közép-Békés are not well developed ones, but we entertain hopes of co-ordination of the towns. There are not enough parks in the inner belt of the towns at present, and the composition of stand is also not sufficient. The week-end recreation zone has neither great tourists' attractive force nor sufficiently developed, in spite of the fact that building this zone up is the interest of each town.

The main problem of the establishment of week-end recreation zone is water-basin which is planned to build at the meeting point of Fehér-Körös and Fekete-Körös rivers. The water-basin would give the possibility of the utilization of water. The large water surface had an influence on the small recreation region of Szanazug, therefore it comes to be more and more important from regional point of view. The overcrowding of the hot baths of Gyula decreased a bit, because of the more advantageous conditions of Szanazug swimming-bath, so there is a chance to develop aquatics and fishing.

The importance of the planned water-basin is also not negligible, it would fill a part of a water-basin and would protect the possibility of watering. By building it up, we should solve the problem of Közép-Békés. It is the interest of the county and the national economy as well. We have to call your attention to a danger in connection with the question of environmental protection. We must protect the forest of flood plain. The protection will have to be soved by the beginning of the development of recreation zone.

The manor house of Szabadkígyós and the salt desert — they were declared to be the territories of environmental protection in 1977 — could be the tourists' sights of Közép-Békés with proper development. The manor house is very easy to approach both from the direction of Békéscsaba and Gyula, which has gradually become to be more and more important from the tourism point of view. (L. MOSOLYGÓ, 1975.) The manor house that works as a school at present, is quite suitable for many-sided cultural utilization. If the county develops it will join to the tourism of Hungary.

The refloating ratio is very low therefore the expansion of the parks in the central places of the towns will not be solved satisfactorily in future. The only possibility to create a large green belt, is in the outer zone of the towns, because of the pits of brick-works, they would protect favourable conditions for rod-fishing and rowing. (Fig. 4)

3. *Other duties of environmental protection*

The other duties of environmental protection of the region are less important, because of the special geographical location of the region. Vitiation doesn't give us much trouble in Békés County, because it is located far away from the great industrial regions, which highly pollute the environment. The local industrial units nearly haven't any role in soiling, the protection against pollution can be settled by the settlements themselves. The communal vitiation decreased in a great deal because the usage of oil and gas heating was permitted. The vitiation, caused by traffic, means a great problem in future too. The ratio of roads with bituminous carpet is quite low, so the pollution is high, the great vehicular traffic of the towns (the higher per cent of it is trough traffic) vitiate the air of the much frequented parts of the town with gas injurious to health.

The tendency of development demands the common collection and placing of the rubbish of the centres of Közép-Békés and the utilization of it in a later period. The placing of rubbish is not satisfactory in either of the three towns, because it may pollute the ground water.

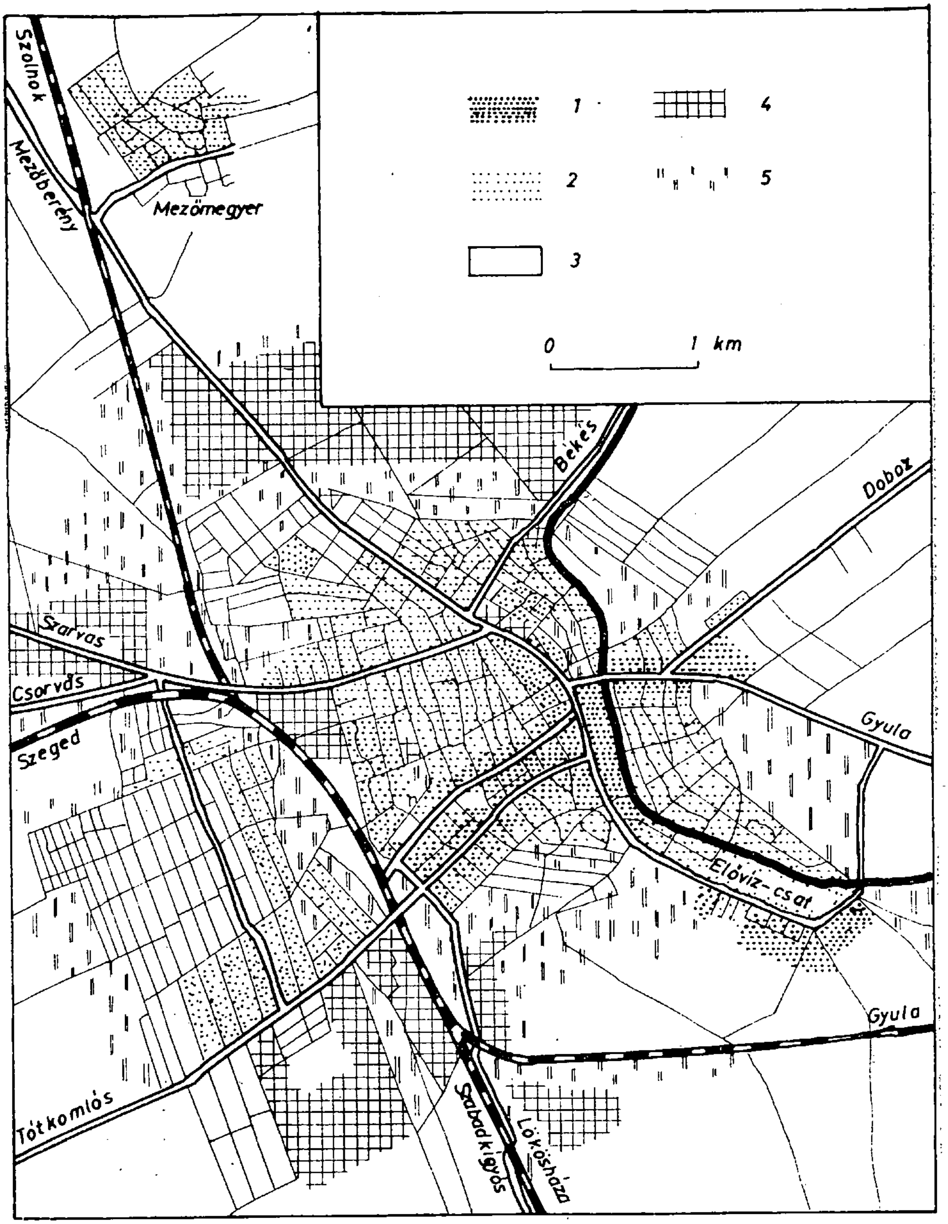

Fig. 4. The plan of land utilization of Békéscsaba
1. Residental area with storeyed houses (with public authorities in the centre of the town.), 2. Intensive residental area with ground-plot (1—3 storey), 3. One-storeyed residental area with ground-plot, 4. Industrial area, 5. Green belt wood, park.

Summary

The concrete co-ordination of the towns of Közép-Békés region begins to assert itself in the present period of development. The majority of problems are the same, settling them in the most rational way, may be realised by co-operation and concentration of finantial means. (Fig. 5.) If we take into consideration the duties of

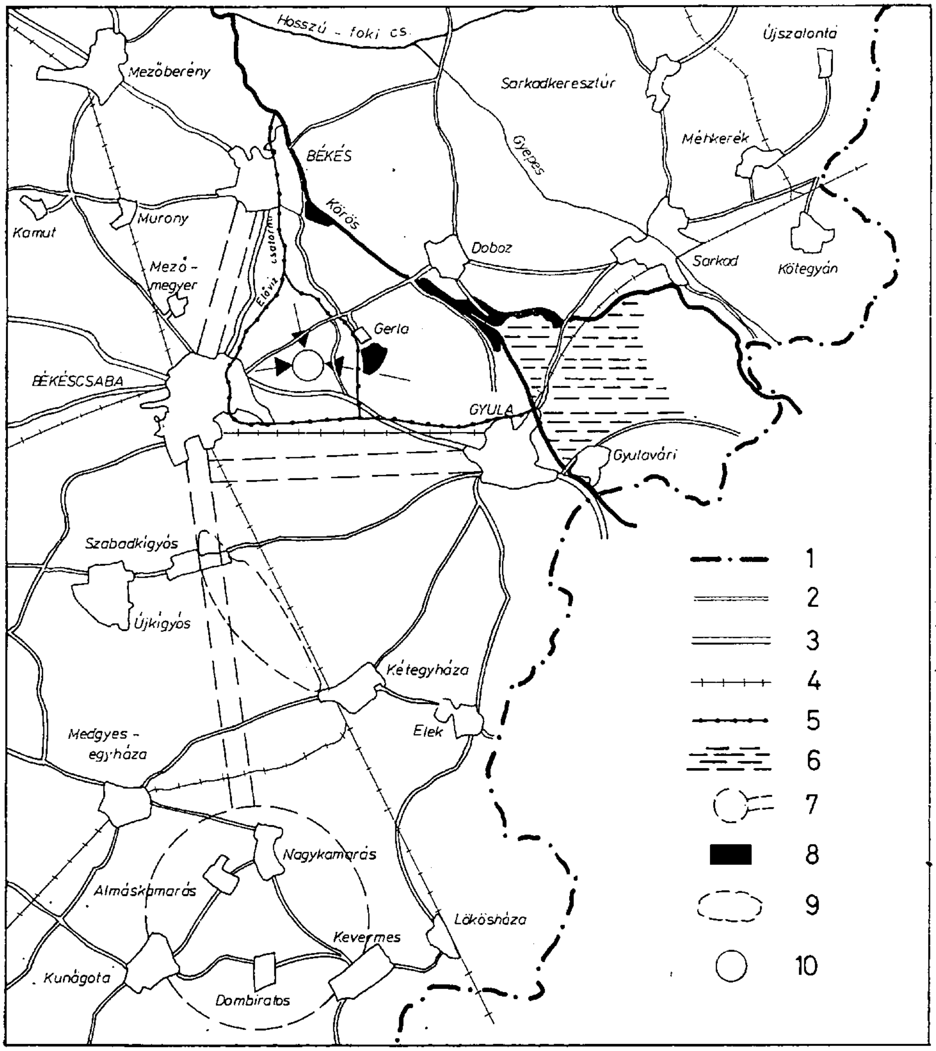

Fig. 5. Some duties of the rational utilization of environmental resources in Közép-Békés 1. Frontier, 2. Lower-class public road, 3. Main road, 4. Railway, 5. Abandonment of pollution, 6. Water-basin, 7. A regional hydrological system, 8. Recreation areas, 9. Szabadkígyós, territory of of environmental protection, 10. The sufficient solution of rabbish shot.

the environmental protection from the beginning of development, they can be perfectly and cheaply carried out.

The duties can be realised by regional co-ordination successfully. We have emphasized the problem of Közép-Békés County in our study, but at concrete realization we have to consider the important troubles of other settlements belonging to the attraction region of the towns.

The duties of environmental protection may be realised by international co-operation.

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ТАКСОНОМИЧЕСКОЕ ПОСТРОЕНИЕ ЭКОНОМИЧЕСКИХ РАЙОНОВ И ИХ СВЯЗЬ С РЕГИОНАЛЬНЫМ ПЛАНИРОВАНИЕМ

Дь. Крайко — Й. Абони

Территориальное размещение общественного производства в нашей стране, подобно другим странам, создало различные уровни экономических районов. Раскрытие взаимосвязей, существующих между экономическими районами как теоретически так практически очень важно.

Система связей между таксономическими уровнями дает возможность провести границы, следуя снизу вверх. К этому однако необходимо ясное и однозначное определение таксономических уровней, раскрытие взаимосвязей, существующих между ними, и закономерностей.

Полная разработка таксономической системы происходит в интересах прежде всего обведения границ экономических районов высшего уровня, но кроме этого полезно и с других позиций, например: дает возможность к сопоставлению с административной системой.

Для территориального планирования выгодно, если раскрыты территориальные и таксономические различия, взаимосвязи экономических и общественных процессов.

Эффект специфического территориального размещения производственных сил, оказываемое на таксономическое построение районов

При исследовании таксономической системы районов широко надо учитывать те обстоятельства и условия, которые этому процессу придают особую форму и приводят к существенным различиям между отдельными территориями. Экономический район самостоятельно, изолированно от остальных теряет смысл, свою роль может выполнить только в определенной системе — составной частью которой является — т. е. в этой системе получают его функции нужное освещение. Из этого следует, что градацию уровней нельзя проводить изолировано, нельзя установить абсолютную меру, так как не только внутренняя структура, масштабы и степень развития, но и внешние отношения, отношения к остальным районам определяют принадлежность района.

Если отдельный экономический район на макроуровне отвечает требованиям, тогда в скрытой форме носит в себе все, функции низших уровней, назависимо от того, что разделение, деление на части нами проводится или нет.

При определении уровней таксономии мы должны исходить из особого территориального размещения наших производительных сил.

а) Промышленность и транспортная сеть сильно сконцентрированы по территории. Будапешт распоряжается огромным экономическим и интеллектуальным фором перед другими центрами по стране, его притяжение таким образом распространяется на всю страну. Из централизованного характера товарооборота следует, что когда связь между мезорайонами и Центральным промышленным районом очень сильна, то между районами она очень слаба, в результате этого контакты, которые в случае Центрального промышленного района интенсивные, между собой в отдельных случаях «безличностью территорий» затрудняют обведение границ экономического района.

Из централизованного характера экономической жизни следует далее, что в нашей стране полное раскрытие таксономических уровней почти невозможно, так как в Центральном промышленном районе отдельные уровни только частично отделяются друг от друга, так как основные единицы только совместно выполняют центральную роль. Поэтому при разработке таксономических уровней целесообразно Центральный промышленный район рассматривать отдельно от других — выделив его — и считать районом единым по всем уровням.

б) В нашей стране существует несколько крупных форм экономической территориальной конструкции. Самым общим является т. н. «энергетическая ось», по которой сформировалась относительно промышленно развития зона. Параллельно ей находятся сельскохозяйственные территории. Характер «традиционального деления на зоны» уступает расположенным по главным магистралям «осям урбанизации», которые быстро индустриализуются и развиваются в результате этого. Наконец, третья форма, формирующие в балланс сильной централизованности полюсы в виде региональных центров.

Воздействие указанных элементов территориальной конструкции образуют такую силовую линию на территориальное размещение производительных сил, с тенденциями которой территориальное планирование обязательно должно считаться. Из этого следует, что система экономических районов также подлаживается к указанным процессам. Хорошим примером этого служит Альфелд.

В первой системе территориальной структуры Альфелд представляет собой сельскохозяйственную зону по сравнению с промышленной зоной. Различия все в большей мере смываются, так как промышленно менее развитые территории за последние годы быстро развивались.

Расположенные по магистралям «оси урбанизации» по Альфелд появляются только в крупных чертах, не представляют трудностей при обведении границ районов и вообще эта территориальная форма развития не противоречит формированию районов, более того они в двоем дополняют друг друга, так как оба процесса исходят из того же центра.

Децентрализация промышленности, процесс формирования нецентральных полюсов ускорили развитие Альфелд, повысили значение центров и заодно повысили их роль в формировании районов.

г) Из специфического территориального размещения производительных сил следует, что в нашей стране мало таких районов — независимо от уровней — которые развиваются уравновешенно, согласно своим территориальным условиям, соответственно принципу о комплексности. Известно, что в нашей стране имеются различные типы территориальных единиц, например: слабо развитый, односторонне развитий, очень развитий, развитый по сельскому хозяйству и т. д. С точки зрения регионального развития определение типов очень важно, поэтому при установлении уровней районов, далее при проведении границ на всех уровнях надо его учесть.

д) Территории административных единиц в нашей стране на всех таксономических уровнях отличаются существенно от экономических районов.

е) Экономика нашей страны является открытой и таким образом положение международного разделения труда в значительной степени влияет на развитие то одного, то другого района, особенно на степень специализации. Это действительно в отношении всех отраслей, т. е. уровней районов. В сельском хозяйстве например: объем выращивания овощей, фруктов, винограда, особенно в профиле подсекторов (местность между Тиссой и Дунаем, область Сабольч, Зала и т. д.) дает о себе знать. Те отрасли промышленной специализации, которые зависят от международного распределения труда, не только на уровне подсекторов, но и на высших уровнях оказывают сильное воздействие (например: алюминиевая металлургия, металлургия железа, отдельные отрасли химической промышленности и т. д.).

Определение таксономических уровней

Таксономические уровни районов нами определены по следующим факторам:

— роль территориальной единицы в данной системе районов,
— число производственных отраслей, образующих отдельную специализацию, их соотношение и функции, далее место в системе районов,
— масштабы территориальных производственных комплексов,
— соотношения и масштабы производственных, оборотных и транспортных связей,
— характер районов, адекватность и степень экономических, общественных проблем, которые на пути развития встречаются, темпы развития экономической жизни, степень ее развитости,
— подобность демографических проблем (мобильность населения и т. д.),
— районы притяжения центров, число их функций и их характер,
— воздействие природных условий на экономическую жизнь.

С учетом указанных факторов, опираясь на подробный материал исследования в нашей стране мы отличили три таксономических уровня.

1. Микрорайон: те из самых маленьких территориальных единиц географического распределения труда, которые располагают с самыми важными чертами интегрированного экономического района.

При обведении грациц микрорайонов мы опирались на исследования по экономической территориальной структуре на уровне населенных пунктов, особенно на факторы зонального территориального размещения (круг притяжения центров, транспортно-географическое положение населенных пунктов, мобильность населения, направление перевозки сельскохозяйственной продукции, виды сельскохозяйственного производства и природные факторы). Этот рабочий процесс состоялся из трех фаз:

— были определены внутренние территориальные структуры районов (с помощью сводки вышеуказанных факторов),

— были выделены те территории, которые относятся к центрам и тесно примыкают к ним, а также периферийные зоны,
— и наконец, опираясь на материалы исследования территориальной структуры населенные пункты были зачислены в микрорайоны.

Разделение на микрорайоны способствует более точному установлению границ экономических районов, служит основой к очертанию районов высшего уровня; с раскрытием экономических и общественных процессов низших уровней, с точной оценкой территориальной дифференциации служит полезным материалом для регионального развития и территориального планирования.

2. *Подрайоны:* система микрорайонов включена в мезорайоны через сеть подрайонов. Микрорайоны у подрайоны имеют ряд общих черт. Оба уровня являются объективными территориальными единицами разделения труда. Так как микрорайоны являются составными частями подрайонов, то внешние воздействия первых совпадают с последними. При очертании высших уровней мы использовали то, что районы и секторы построены друг на друга. Из высшего следует, что оба уровня распоряжаются основными чертами интегрированных районов и у каждого свой внутренний ритм жизни.

Однако, при наличии аналогий можно перечислить и ряд отличающихся черт:

— тогда, когда микрорайоны являются самыми маленькими территориальными единицами разделения труда, подрайоны более сложные, крупные по территории, представляют собой более высокий уровень в разделении труда, таким образом основные отличительные черты этих двух уровней районов различны.
— в подсекторе специализация более богата и сложна, и основана на более широкую базу, чем в микрорайоне.
— территориальные производственные комплексы в подрайонах охватывают больше отраслей и территорию большую по масштабам, чем в микрорайонах.
— внешние производственно-транспортные отношения подрайонов более широкие, часто охватывают всю страну.
— для подрайонов характерны специфические условия развития и направление развития, проблемы развития, которые не являются механической суммой аналогичных факторов, характерных для микрорайонов, а более общие и всеохватывающие.
— центры подрайонов имеют более разнообразные функции, их воздействие более интенсивное, несмотря на это необязательно охватывают всю территорию подрайона. Из этого следует, что их влияние на внутренние экономические, общественные процессы меньше, его сила, направленная на создание районов слабее, таким образом их значение при обведении границ умереннее, чем у микрорайонов. Сила центров микрорайонов, направленная на формирование районов охватывает территории меньших масштабов, однако их воздействие на установление границ районов более прямое и интенсивнее.

Почему необходимо подрайоны ввести между микро- и макрорайонами в виде обязательных звеньев?

— Между отдельными микрорайонами слишком велики различия выразимы в единицах подрайонов.
— Специфические экономические и общественные процессы, осуществляющиеся в микрорайонах, непрямо подключены к мезорайонам, а встречаются на уровне микрорайонов.
— Подрайоны еще достаточно однородны, имеют свой профиль, свое направление развития, единый ритм жизни, что в случае мезорайонов уже отсутствует.
— Внутри мезорайонов территориальные различия выражены подрайонами, в случае микрорайонов эти особенности слишком детализированы.

Очертание подрайонов с одной стороны перекрывает те различия между различными проектами районов, которые вызваны таксономическими проблемами (например: местность между Дунаем и Тиссой, Средняя область Тиссы, Юго-западная часть Задуная и т. д., т. е. вопрос их наличия), с другой стороны помогают при очертании мезорайонов, далее необходимо при установлении единства между административным делением и экономическими районами.

Значит подрайоны объективно существующие территориальные единицы, которым присущи все важнейшие черты характера интегрированного экономического района, таким образом они специализируются, являются необходимыми частями разделения труда по стране, их сердцевиной служат территориальные производственные комплексы — как самая важная сила, направленная на формирование районов —, располагают со специфическими условиями экономического и общественного развития, таким образом направление, темпы, проблемы их развития отличаются от соседних районов, далее имеют свои экономические центры, притяжением которых охвачена значительная часть их территории.

3. *Мезорайоны:* последовательность таксономических уровней, далее тесная взаимосвязь между ними дает возможность определить границы не только сверху, но снизу — от микрорайонов через подрайоны — продвигаясь снизу вверх. В конечном счете исследование микрорайонов происходит и в интересах раскрытия мезорайонов, в интересах установления точных его границ.

Группировка подрайонов в мезорайонах довольно слаба, в этом отношении существенные различия наблюдаются между промышленно развитыми и менее развитыми территориями. Примером Южной части Альфелд хорошо можно доказать его. По отношению этого мезорайона намного легче определить, что в чем отличаются друг от друга область Бэкеш и местность между Дунаем и Тиссой, и почему дают отдельные подрайоны чем то, почему вводятся в один и тот же мезорайон.

Общая закономерность таксономического строя районов — на высших уровнях влияние тех факторов, которыми выражена принадлежность к одной и той же группе слабеет и наоборот, следуя сверху вниз становится все сильнее. Значит, экономические районы высших уровней все менее однородны, чем таксономические единицы низших уровней.

Региональным планированием таксономические уровни экономических районов использованы в виде рамок, как объективные территориальные единицы, так как без наличия границ нельзя составить план. Сверх этой известной истины между этими двумя факторами существует очень тесная взаимосвязь по содержанию, по отношению которого возникает ряд принципиальных и практических вопросов. Ниже следует их более подробное изложение.

Взаимосвязь между экономическим районом и региональным развитием

В экономической политике последних лет региональное развитие было выдвинуто на первый план, как необходимое средство для планирования, развития народного хозяйства и осуществления прочих практических целей. Принципиальные и практические вопросы регионального развития согласованы с задачами исследования экономических районов по содержанию, значит из этого следует, что последний служит большим числом полезных научных материалов для регионального планирования, целью которого является региональное развитие.

Позиции, цели регионального развития по своей форме и содержанию в ряде областей соприкасаются, т. е. совпадают с исследованием районов. Основными целями регионального развития являются:

а) Рациональное территориальное размещение производительных сил по стране с учетом местных условий и особенностей. Специализация районов основывается на благоприятных местных условиях. Однако, так как они являются составными частями территориального распределения труда по стране, поэтому их развитие должно быть увязано с потребностями страны, направлением развития производительных сил. Местные условия районов изменяясь во времени влияют на общественное, экономическое развитие данной области, далее они являются относительными, поэтому их оценивать надо в сопоставлении с отличающими или аналогичными условиями остальных территорий. Значит, ни один из экономических районов не находится в том положении, чтобы можно было для него установить направление его развития принимая во внимание только его ресурсов, независимо от остальных. Направление развития экономического района можно наметить только с учетом внутреннего и международного разделения труда, и в увязке с ними. Одной из целей регионального развития является именно то, что оно обеспечило рациональное территориальное распределение производительных сил согласовав развитие, развернувшееся на местных условиях и интерес, общий для всей страны.

б) Сокращение различий, существующих между условиями развития различных экономических районов, ликвидация нарациональных территориальных диспропорций производства, решение общественных и политических противоречий, следующих из этого. Разные экономические районы располагаются различными условиями. Из этого следует, что производственную мощность страны нельзя по равному разделить. При создании рациональных территориальных пропорций речь идет не о том, чтобы независимо от местных условий постепенно ликвидировать исторически сложившиеся территориальные различия, или развитый центральный район в виде «помощи» передал определенные промышленные отрасли, а о том, чтобы стьемиться открыть и использовать в максимальной степени все природные и прочие ресурсы районов. Каждый экономический район располагается более принятными по сравнению с остальными условиями, использование которых дает возможность сократить территориальные различия без полной ликвидации их в будущем. Целью регионального развития, которое служит формированию рационального территориального разделения труда, является обеспечение экономического развития отсталых районов ускоренными темпами, таким образом, чтобы это было увязано с местными условиями и общими интересами всей страны. Это относится и к микрорайонам, так как и между ними тоже существует специфическое разделение труда по территории. Тогда, когда на высших уровнях развитие приближается к уравненному состоянию, в случае микрорайонов сокращение территориальных различий и диспропорций необязательно, обосновано, более того, в отдельных случаях различия могут повыситься. Далее, нельзя рассматривать различие в экономических уровнях с позиции только одного и нескольких отраслей, так как на уровне микрорайона глубокоспециализированное сельское хозяйство равноценно промышленности. Значит, территориальные диспропорции промышленности не вызывают обязательно диспропорциональное развитие прочих отраслей, и наоборот, на уровне микрорайонов различия в экономическом развитии не только с развитием промышленности могут быть сокращены.

в) Очень важно создать внутриотраслевую пропорцию экономического района вместе с созданием првильных пропорций по всей стране. Как выше говорилось, о степени углубления специализации нельзя решить, основываясь только на знание местных условий, так как они являются главными частями разделения труда по стране. Однако, имеется ряд таких отраслей производства, которые имеют местное значение и обогощают комплексность района. Рациональные пропорции отраслей, комплексное развитие района может быть обеспечено исключительно только в рамках регионального планорования.

Развитие одной или другой отрасли в рамках района не адекватно территориальному развитию. Региональный и отраслевой принципы иногда действуют и согласуются посредством противоречий. Отсутствие согласия между этими двумя факторами может вызвать различие аномалии. Например: в Южной части Альфелд, где преувеличенное развитие вспомогательных отраслей сельскохозяйственных кооперативов и ряда местных производственных захватывало весь запас рабочей силы и вызывало нехватку рабочей силы в промышленности. Таким оразом это затрудняет быстрое рахширение тех отраслей промышленности, которые располагают оптимальными условиями, это убыточно не только для страны, но и для района, так как именно этими отраслями промышленности могло бы быть обеспечено быстрое развитие, подъем, повышение производительности (пищевой, легкой, машиносртоительной) промышленностей. Часто встречается и противоположный этому случай, когда заботятся с выдвижением лишь некоторых отраслей, дополнительные развития отстают или вообще отсутствуют.

Выдвижение и развитие нескольких отраслей обычно влияют на остальные отрасли промышленности и сельского хозяйства, и связаны с формированием инфраструктуры территории. Рациональное использование природных и общественных ресурсов экономического района требует согласованности в развитии как отдельных отраслей так и всего района. Это можно обеспечить только с помощью регионального планирования, рамкой которого служит созданная самой жизнью территориальная единица — экономический район.

г) Развитие сети населенных пунктов в увязке с производственными силами. Это также происходит дифференцировано по населенным пунктам в зависимости от их настоящей или будущей роли в экономической и общественной жизни на основе региональных планов. Демографические исследования и исследования по географии поселений, проведенные в данном экономическом районе служат к этому необходимыми материалами. Исследование круга притяжения населенных пунктов, анализ мобильности населения и т. д. помогают не только в установлении границ районов, но в виде важных проблем по содержанию в районах, способствуют пониманию прочих проблем и явлений и заодно оказывают помощь при разработке концепции регионального развития.

д) Установление внутренних и внешних производственных контактов единицы регионального развития и обеспечение необходимой к этой транспортной сети. Это является также такой задачей, которая соприкасается с целями исследования по районам. Как в случае мезорайонов, так и в случае микрорайонов очень важно раскрыть все контакты районов. Исследование по географии транспорта оказывают помощь в организации рациональных контактов и заодно и в составлении перспективных планов.

е) Точный учет природных и общественных условий, ресурсов района. Выше уже говорилось о том, что смыслом и практической пользой регионального развития является то обстоятельство, которым каждый район, независимо от различий в уровнях, располагает.

ж) Уровни экономических районов служат объективными рамками для регионального развития (т. е. для регионального плана, который суммирует связанные с этим проблемы). В отдельных случаях региональными планами охвачено несколько микрорайонов (например: региональный план далин Дуная или Тиссы.) Это не противоречит вышему принципу, так как региональное развитие и в этом случае ,считается с различиями, и может опираться на раскрытую и сводную оценку природы и экономической географии.

Указанные моменты являются теми важнейшими областями, где исследования по экономике районов и региональное развитие соприкасаются. Таксономические уровни районов, хотя они не построены друг на друга в виде пирамиды (эта система намного сложнее), все таки раскрытие, познание самой маленькой единицы — микрорайона, помогает в построении всей системы, и как выше установили, заодно в ряде областей можно его привести в синхрон с целями регионального развития.

Региональное планирование практически может использоваться всеми тремя уровнями районов, из различных целей. По исследованиям, проведенным Кафедрой Экономической географии для территориального планирования оптимальным уровнем является мезорайон:

— соответственно отражает различия между разными областями страны, при этом слишком не раздробляет их в виде мозаиков,

— нижние уровни дают меньше возможностей к формированию внутриотраслевых пропорций районов, так как число отраслей меньше, специализация сильнее, поэтому в случае микрорайонов сопоставление слишком искажено.

— Сопоставление экономических показателей районов дает самую реальную картину на мезоуровне, в случае микрорайонов различия слишком велики, поэтому менее пригодны для сопоставления.

— Установлением территориальных контактов между отраслями не учитываются полностью границы районов, однако на мезоуровне хорошо можно суммировать.

— Выравнивание в пропорциональном территориальном размещении производственных сил происходит на уровне подсекторов и мезорайонов, эта закономерность не относится к микрорайонам.

— Развитие региональных центров зависит и от функции, и от круга притяжений, последний преувеличивает уровень подсекторов.

— Оценка экономических и природных условий регионального роста самую реальную картину рисует на уровнях подсекторов и мезорайонов. В случаях микрорайонов и административных единиц искажение сильнее.

— Развитие технической инфраструктуры наеависит от границ районов, однако оценивать его контактов с производственными отраслями, воздействие, лучше всего на уровне подсекторов и мезорайонов. На уровне подсекторов ряд таких проблем очевидны, которые на уровне мезорайонов смываются в средних показательях экономики.

— Уровень развитости, структура, природные условия и т. д. сельского хозяйства.

— Использование, переслойка, воспроизводство рабочей силы рисует более точную картину на уровне подсекторов. На уровне мезорайонов средними показателями территориальные различия прикрыты.

— Более точно можно найти подход к развитию сети населенных пунктов на уровне подсекторов и микрорайонов, таким вопросом, например является вопрос хуторов, малочисленных сел, который существует территориально очень дифференцировано.

— Условия жизни населения, обычаи, обеспечение в области просвещения и культуры и т. д. показывают существенное отклонение по территории, имеются различия и в способах решения существующих проблем. Сводка мезорайонов покрывает эти очень важные обстоятельства.

Микрорайоны главным образом помогают региональному планированию в том, что ими отражены такие экономические и общественные процессы, которые на высших уровнях трудно ощутимы, несмотря на это знать о них обязательно.

Подсуммируя можно сделать вывод, что исследование таксономического построения экономических районов и раскрытие взаимосвязей способствуют дальнейшему улучшению территориальных пропорций производственных сил, далее решению противоречий, существующихся в экономической структуре разных территорий.

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ПОПЫТКА НА ОЦЕНКУ НЕКОТОРЫХ ПРИРОДНЫХ УСЛОВИЙ С ТОЧКИ ЗРЕНИЯ ЭКОНОМИЧЕСКОЙ ГЕОГРАФИИ ПО ПРИМЕРУ МЕЗОРАЙОНА ДЭЛ-АЛЪФЕЛДА

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Под природными условиями понимаются те природные богатства окружающей среды, которые известны и используемы обществом на данном уровне производительных сил и производственных отношений. Значит, понятие природных условий исторически изменяется во своем содержании со временем. Изменение в содержании понятия происходит потому, что меняется и круг известных и используемых обществом природных богатств. Естественно, что взаимосвязь между обществом и природой зависит — как в количестве так и в качестве — и от познания и использования этих природных богатств. Вследствие развития общественных и экономических отношений и возникновения все новых и новых возможностей в науке и технике потребность в природных богатств (в том числе и в природных ресурсах) по количеству возрастает большим темпом. Имея в виду ограниченность этих природных ресурсов, вопросы о целесообразной экономии природных богатств и рациональном планировании их использования становятся все больше и больше значительными в наши дни. В процессе разумного хозяйствования основными шагами являются пересчет природных ресурсов и оценка их с экономической точки зрения. Исследование и оценка могут быть произведены с различных точек зрения. Мы попытаемся перечесть и оценить природные богатства с точки зрения экономической географии. Экономико-географический подход считается важным для того чтобы получить результаты с помощью пересчета природных богатств, которые являются существенными факторами экономического развития. Этих результатов можно достичь только в том случае, если исследования для оценки и пересчета производятся по уровням экономико-географических единиц. В целях этого и с учетом неотъемлемости экономических районов, пересчет начинается с наименьшей экономической единицы — с микрорайона —, и в порядке пересчитывающих шагов приводится к уровню народного хозяйства. Этим методом оценки «снизу вверх» обеспечивается, на самом деле, ограничение экономического характера круга действия отдельных природных ресурсов. Один из наиболее значительных факторов для планомерной экономии природных богатств представляется этим методом, по которому очевидно, что природные ресурсы с неодинаковой силой действуют на экономические единицы различного уровня и с ограниченной территорией.

Кроме количественного анализа обращается внимание и на взаимоотношение качества запасов с использованностью. Степень испоьзованности и использования природных ресурсов является решающим фактором для дальнейшего формирования экономической структуры страны.

Метод

Сущность представленного метода состоит в стандартизированной системе оценки в баллах. Ниже следует конкретизированная на отдельные природные ресурсы система оценки.

1. Полезные ископаемые, имеющиеся в микрорайоне дают возможность для оценки в баллах на основе их роли в экономических районах различного уровня. Максимальное число (10 баллов) получили те микрорайоны, которые играют значительную роль в производстве какого-либо сырья. Этот факт и в микрорайоне является важным природным условием для динамического развития хозяйства, способствующим потенциально и фактически региональному росту экономики. 7 баллов получили микрорайоны, удовлетворяющие потребностям мезорайона в данных полезных ископаемых. Микрорайоны, обеспечивающие сырьем потребности подрайона, получили 4 балла; а микрорайоны, покрывающие только свою потребность в этих полезных ископаемых, получили 1 балл.

Оценка была проведена, в частности, и для носителей энергии и строительных материалов.

2. Запасы воды и их использованность. При оценке отдельно были анализированы надземные, подземные, грунтовые, слоистые и термальные воды. На основе данных Ежедневника о запасах водного хозяйства (Визкэслетгаздалькодаши Эвкеньв) было установлено количество (запас) надземных, слоистых и грунтовых вод на 1 км^2 основных единиц[1] отдельных водохозяйственных территорий (в дальнейшем обозначается буквами ВХТ). Запасы для основных единиц ВХТ были изображены на карте, а потом по карте были определены процентные отношения территорий основных единиц, принадлежащих к категориям I, II и т. д., к территориям отдельных микрорайонов. После этого, имея в виду отношения по размеру этих территорий и запасов воды, а беря их удельный вес, можно было установить оценку этих категорий с точки зрения микрорайона.

Подобным методом был анализирован и использованность запаса воды. В этом случае оценка категории была задана удельным весом, рассчитанным по отношению степени использованности водных запасов в основных единицах к территориям микрорайона с различной использованностью запасов воды.

В первую категорию входят те микрорайоны, в которых запас воды наибольший, а в четвертую — те микрорайоны, в которых количество воды наименьшее. С точки зрения оценки использованности порядок обратный. Категории получили следующие оценки в баллах: I категория — 10 баллов, II категория — 7 баллов, III категория — 4 балла, IУ категория — 1 балл. Из-за большой дифференциации для оценки запаса грунтовой воды были установлены 5 категорий с 10, 8, 6, 4 и 2 баллами. Микрорайоны с термальной водой были категоризированы на основе вскрытого объема и температуры термальной воды (видно в таблицах 1 и 2).

Наиболее благоприятные гидрологические условия имеют те районы, в которых можно было бы использовать огромное запасы воды, но используется

[1] Основные единицы ВХТ были установлены органами водного хозяйства с учетом гидрологических и гидрогеографических особенностей. В основные единицы входят неотъемлемые территории, отличающиеся от других окружающих их единиц на основе гидрологических и гидрогеологических особенностей.

Таблица 1. *Количество воды*

Районы	Количество грунтовых вод в % территорий					Категория	Количество слоистых вод в % территорий				Категория	Количество надземных вод в % территорий				
	I.	II.	III.	IV.	V.		I.	II.	III.	IV.		I.	II.	III.	IV.	
Микрорайон Сегед	—	—	—	68	32	IV.	47	33	—	20	I.	50	—	49	1	II.
Микрорайон Сентеш	—	—	—	100	—	IV.	64	36	—	—	I.	73	—	—	27	II.
Подрайон ЧОНГРАД	—	—	—	78	22	IV.	53	34	—	13	I.	57	—	33	10	II.
Микрорайон Кишкунгалаш	—	—	—	13	87	V.	96	—	—	4	I.	34	—	23	43	I.
Микрорайон Бая	59	8	—	1	32	I.	100	—	—	—	I.	10	52	—	34	II.
Микрорайон Кечкемет	5	—	—	24	71	V.	51	—	16	33	II.	15	—	—	85	III.
Подрайон БАЧ	22	3	—	13	62	IV.	83	—	5	12	I.	19	18	8	55	II.
Микрорайон Орошгаза	—	—	—	100	—	IV.	39	—	47	14	II.	100	—	—	—	I.
Микрорайон Бекешчаба	—	—	—	62	38	IV.	—	29	64	7	III.	100	—	—	—	I.
Подрайон БЕКЕШ	—	—	—	72	28	IV.	9	22	60	9	III.	100	—	—	—	I.
Мезорайон Дэл-Альфелд	10	1	—	47	42	III.	54	15	20	11	I.	53	8	12	27	I.

Таблица 2. *Использованность воды*

Районы	Использованность грунтовых вод в % территорий				Категория	Использованность слоистых вод в % территорий				Категория	Использованность надземных вод в % территорий				Категория
	I.	II.	III.	IV.		I.	II.	III.	IV.		I.	II.	III.	IV.	
Микрорайон Сегед	32	—	—	68	III.	35	20	17	28	III.	—	—	1	99	IV.
Микрорайон Сентеш	—	—	—	100	IV.	15	48	—	37	III.	—	—	27	73	IV.
Подрайон ЧОНГРАД	22	—	—	78	IV.	28	31	11	30	III.	—	—	10	90	IV.
Микрорайон Кишкунгалаш	40	—	—	60	III.	99	—	1	—	I.	—	32	31	36	III.
Микрорайон Кечкемет	16	—	10	74	IV.	64	—	20	16	II.	—	15	47	38	III.
Микрорайон Бая	63	—	—	37	II.	100	—	—	—	I.	—	14	—	86	IV.
Подрайон БАЧ	40	—	3	57	III.	88	—	10	2	I.	—	20	26	54	III.
Микрорайон Орошгаза	—	—	—	100	IV.	48	38	14	—	II.	—	—	—	100	IV.
Микрорайон Бекешчаба	83	—	17	—	I.	87	—	—	13	I.	—	—	—	100	IV.
Подрайон БЕКЕШ	53	—	13	24	II.	79	9	3	9	II.	—	—	—	100	IV.
Мезорайон Дэл-Альфелд	30	—	5	65	III.	67	11	9	13	II.	—	9	14	77	III.

только их часть. Эти районы получили максимальную сводную оценку в баллах. В этих районах вода является динамическим фактором природы, способствующим развитию и сооружению отраслей, требующих воды. Наоборот, в районах с большим объемом воды, но с большой использованностью водных запасов, вода не является динамическим фактором, так как в них запасы воды и их использованность уравновешиваются, а сооружение новых отраслей, требующих воды, устраняет равновесие и вызывает недостаток воды, и только с большой затратой материальных средств можно их заполнять.

3. Почвенные условия оцениваются на основе качественных показателей. В целях оценки, дифференцированной по территориальным особенностям качества и продуктивности почв (используя карту исследователей *Ф. Матэ* и *Л. Сюч* Почвоведческого института АН Венгрии от 1972 г.) была составлена карта.

На карте категории изображены отношением венгерской почвы с наилучшей продуктивностью к естественной продуктивности данного вида почвы. Дифференцированность отдельных категорий (качественных классов) означает, что почва, в конечном счете, является фактором микрорайонного уровня, но можно ее оценить и с точки зрения районов высшего уровня. Оценка категорий микрорайона была определена на основе отношения территориальных участков к трем наилучшим качественным классам (I, II, III), следующим образом:

категория 1: отличная, отношение территории района к трем наилучшим качественным классам свыше 70%.

категория 2: хорошая, отношение территории района к трем наилучшим качественным классам представляет 50—70%.

категория 3: средняя, отношение территории района к трем наилучшим качественным классам — 30—50%.

категория 4: слабая, отношение территории района к трем наилучшим качественным классам ниже 30%.

Районы первой категории получили 10 баллов, районы второй категории — 7 баллов, районы третей категории — 4 балла, а районы четвертой категории — 1 балл (таблица 3).

Самые важные природные условия (ресурсы) экономических районов мезорайона Дэл-Альфелда можно характеризовать сводной оценкой в баллах. Максимальное значение оценки для одного района — 100 баллов. Соответственно этому:

— отличные природные условия имеет тот район, который получил 76—100 баллов. Эти районы характеризуются максимальными значениями оценки с точки зрения многих факторов природы, а остальные факторы оцениваются свыше среднего.

— хорошие природные условия имеют те районы, у которых сводное значение 56—75 баллов. Здесь, наряду с одними выдающимися факторами имеются природные богатства среднего значения.

— средние природные условия представляют те районы, у которых оценка

Таблица 3. *Продуктивность почвы*

Районы	I.,	II.,	III.,	IV.,	V.,	VI.,	Категория
	качественные классы в % территорий						
Микрорайон Сегед	15	5	15	25	30	10	3
Микрорайон Сентеш	—	15	50	20	—	15	2
Подрайон ЧОНГРАД	7	10	33	22	15	13	2
Микрорайон Кишкунгалаш	—	10	5	—	40	45	4
Микрорайон Бая	5	—	70	10	—	15	1
Микрорайон Кечкемет	—	3	25	8	30	34	4
Подрайон БАЧ	1	4	33	6	23	33	3
Микрорайон Орошгаза	70	10	10	6	—	4	1
Микрорайон Бекешчаба	—	20	45	10	5	20	2
Подрайон БЕКЕШ	35	15	27	8	3	12	1
Мезорайон Дэл-Альфелд	14	10	31	12	14	20	2

31—55 баллов. Здесь, в основном, природные богатства имеют среднее значение или имеются некоторые природные факторы высокого и некоторые низкого значения.

— слабые природные условия харектеризуют районы, имеющие оценку ниже 30 баллов. Здесь оценка природных факторов представляет, обычно, низкие значения в баллах, и максимум один фактор играет выдающую роль (таблица 4).

Таблица 4. *Сводные значения оценки в баллах природных условий*

Районы	Количество			Использованность			Термальные воды	Носители энергии	Строительные материалы	Почва	Всего
	грунтовых	слоистых вод	надземных	грунтовых	слоистых вод	надземных					
Микрорайон Сегед	4	10	7	4	4	1	10	10	1	4	55
Микрорайон Сентеш	4	10	7	1	4	1	10	1	1	7	46
Подрайон ЧОНГРАД	4	10	7	1	4	1	10	10	1	7	55
Микрорайон Кишкунгалаш	2	10	10	4	10	4	1	10	1	1	53
Микрорайон Бая	10	10	7	7	10	1	1	1	1	10	58
Микрорайон Кечкемет	2	7	4	1	7	4	1	1	1	1	29
Подрайон БАЧ	4	10	7	4	10	4	1	7	1	4	52
Микрорайон Орошгаза	4	7	10	1	7	1	10	7	1	10	58
Микрорайон Бекешчаба	4	4	10	10	10	1	7	4	1	7	58
Подрайон БЕКЕШ	4	4	10	7	1	1	7	7	1	10	58
Мезорайон Дэл-Альфелд	6	10	10	4	7	4	10	10	1	7	69

Анализ

а) Полезные ископаемые. В формировании настоящей геологической структуры Дэл-Альфелда решающую роль играл четвертичный период истории земли. Паннонического морем, становившись мелким внутренним озером, было наложено густое отслоение на варийскуские фундаментальные горы, разломанные и опущенные в большую глубину. В заливах непроветренного внутренного озера, отодвинувшись с севера на юг, наслаивалось значительное количество природного газа и нефти. На поверхность протекающие реки — многократно изменяя свое течение и иногда взрезываясь в нее и образуя террасы — накопили гравий в своих отложениях. Песчаные бури плейстоцена, покрывая лессом территории Дэл-Альфелда, создали отличные сорта почвы. Наносный реками песок был продут в параллельно расположенные бугоры на междуречье Дуная и Тиссы.

Выбор полезных ископаемых является чрезвычайно узким в районе Дэл-Альфелде, находятся только месторождения нефти и природного газа или нескольких видов строительного материала. Однако месторождения нефти и природного газа имеют общегосударственное значение. Подавляющее большинство дает сегедский микрорайон. Отсюда выходит почти 2/3 доля объема всей добываемой Венгрией нефти.

Добыча нефти в микрорайона Кишкунгалаше представляет около 1/10 сегедского микрорайона, все-таки характеризована высокой оценкой в баллах. Это объясняется, в первую очередь, его источниками природного газа общегосударственного значения, и еще тем, что разведочными скважинами вскрыты все новые и новые месторождения, обеспечиваюичие возможности для равномерной добычи природного газа.

В микрорайоне Орошгазе тоже добывается природный газ, но запасы и добыча ее меньше, чем в микрорайоне Кишкунгалаше, а употребляется она, в подавляющем количестве, в подрайоне Бекеше, играя значительную роль в развитии промышленности городов Орошгазы и Бекешчабы.

Значит, мезорайон Дэл-Альфелд является одним из наиболее значительных районов добычи энергии. Добываемые углеводороды кроме общегосударственного значения играют решающую роль и в развитии и в осуществлении специализации районов Дэл- Альфелда (видно на рис. 1).

Среди прочих полезных ископаемых в мезорайоне имеются торф и некоторые строительные материалы, в основном, гравий и песок. Применение строительных материалов имеет местное значение и доходит только до подрайонного уровня. Объем добычи маленький, добывается, в основном, в карьерах сельско-

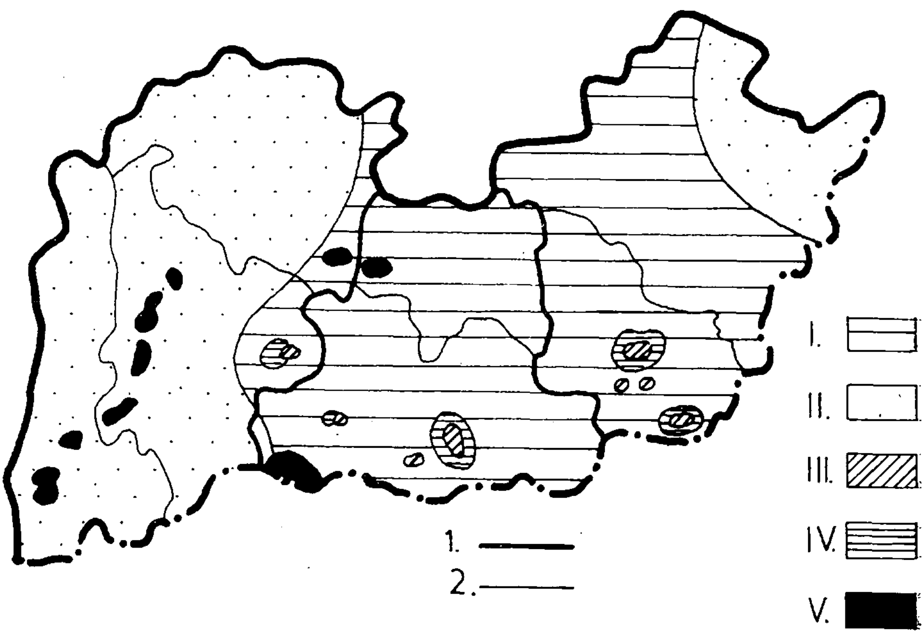

Рис. 1. Носители энергии
1 = граница подрайона 2 = граиица микрорайона
территория первого сорта для исследования
II = территория третьего сорта для исследования
III = территория, где добывается природный газ
IV = территория, где добывается нефть
V = территория, где добывается торф

хозяйственной собственности, в которых технический уровень является низким. Некоторые песчаные холмы междуречья Дуная и Тиссы покрыты песком, пригодным для стеклоделия, но его употребление в промышленности еще не претворено в жизнь, в первую очередь потому, что эти территории находятся в заповедниках (рис. 2).

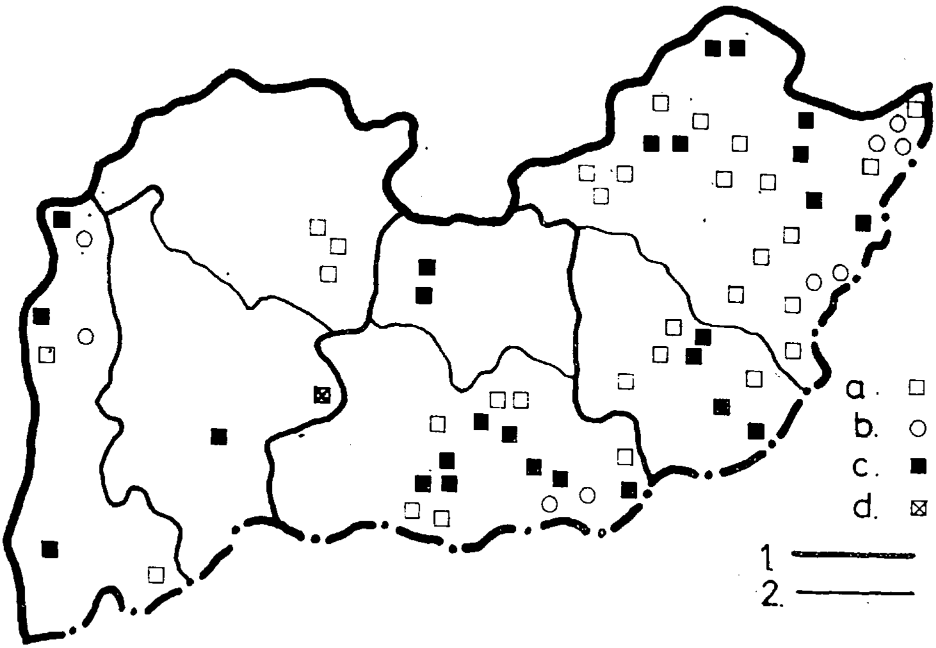

Рис. 2. Строительные материалы
1 = граница подрайона 2 = граница микрорайона
a = песок b = гравий c = глина d = известняк

б) Надземные воды. Наиболее надежным фактором водного хозяйства в этом районе является запас надземных вод. Запасами грунтовых вод покрываются только запросы отдельных семей или небольших коллективов, слоистые воды удовлетворяют запросам и большего поселения, а надземные воды обеспечивают водой промышленность, сельское хозяйство и население. В районе Дэл-Альфелде Дунай дает 85—90% запасы воды, несмотря на то, что 75% водоносности мелких вод надо задерживать для обеспечения водой соседних стран и для биологического равновесия русла, используемый запас воды Дуная несколько раз больше всей речной сети Тиссы. Неслучайно, что микрорайон Бая, вдоль Дуная, имеет наибольшие используемые запасы воды и вода является динамическим фактором природных условий, способствующая и в настоящем и в дальнейшем развитию отраслей, требующих воды, даже, наряду со строительством канала между Дунаем и Тиссой, обеспечивает водой соседние микрорайоны Кишкунгалаш и Сегед, где вследствие этого станет возможным интенсивнее укрепление садоводства.

Вопреки менее значительной водоносности мелких вод трех рек чрезвычайно большими используемыми запасами воды обладает территория между Тиссой, Марошем и Керешем, водные запасы которой повышаются объемом про-

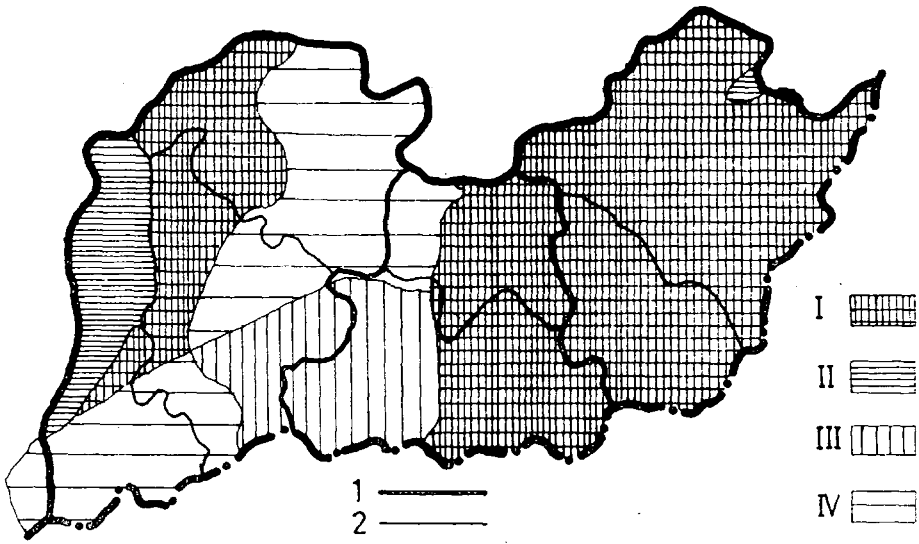

Рис. 3. Используемые запасы надземных вод (1/сек)
1 = граница подрайона 2 = граница микрорайона
I = свыше 5001 II = 2001—5000 III = 1001—2000 IV = 0—1000

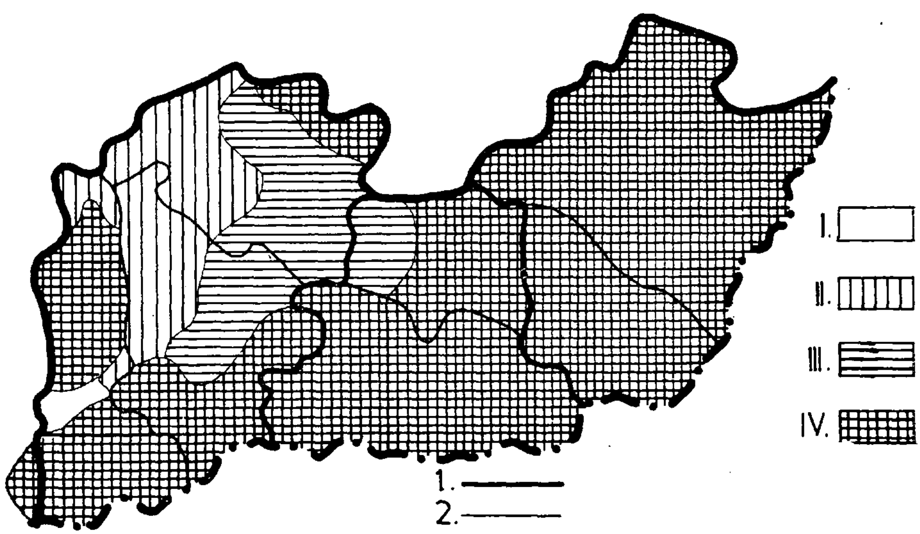

Рис. 4. Использованность надземных вод (%)
1 = граница подрайона 2 = граница микрорайона
I = 0 II = 26—50 III = 51—75 IV = 76—100

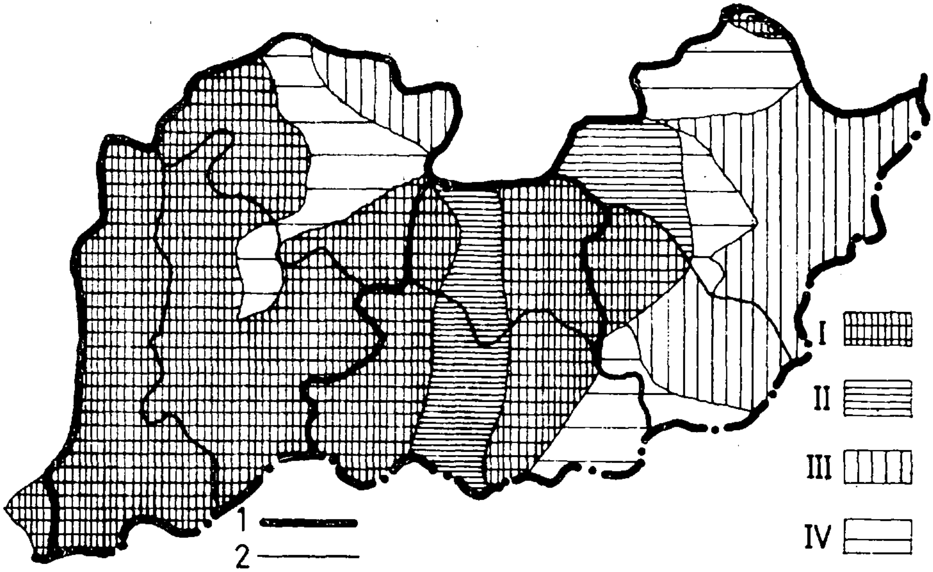

Рис. 5. Используемые запасы слоистых вод (l/сек)
1 = граница подрайона 2 = граница микрорайона
I = свыше 1501 II = 1001—1500 III = 501—1000
IV = 0—500

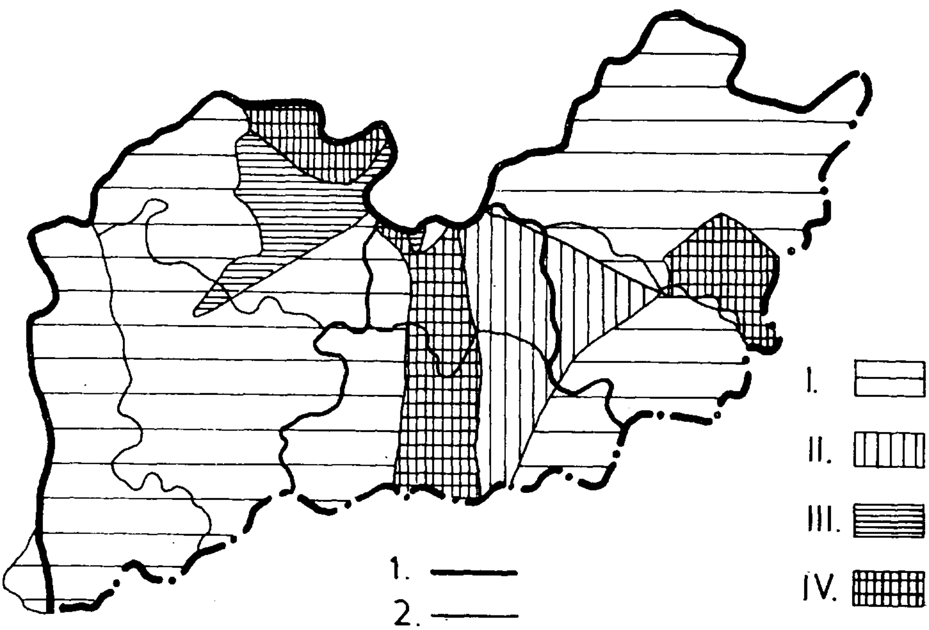

Рис. 6. Использованность слоистых вод (%)
1 = граница подрайона 2 = граница микрорайона
I = 0—25 II = 26—50 III = 51—75 IV = 76—100

веденных через нее и сохраненных в ней вод. Использованность водных запасов максимальная, сооружение новых отраслей, требующих воды, не рекомендуется (рис. 3, 4).

в) Подземные воды. Используемые слоистые воды в районе Дэл-Альфелде находятся в наносах Дуная и Мароша, или в Сегедском бассейне артезианских вод. Густые слои гравия двух наплывов обеспечивают обильный запас воды. Это объясняет высокую оценку в баллах районов вдоль Дуная и Мароша. Сегедский бассейн артезианских вод состоит из многих слоев. Добываемый объем слоистых вод покрывает водой запросы промышленности и населения города Сегеда, даже снабжает оросительной водой и некоторые крупные сельские хозяйства. Уровень использованности слоистых вод на наносных территориях является низким, пока в бассейне артезианских вод очень высок.

Песчаная почва микрорайона Кечкемета и лессовая земля Бекеш-Чанадских холмов являются плохими участками с точки зрения снабжения водой. Слоистые воды находятся в больших глубинах, а много колодцев имеет отрицательный уровень давления. Они снабжают питьевой водой сельские поселения, но в больших городах во время летних бездождьев появляется недостаток воды.

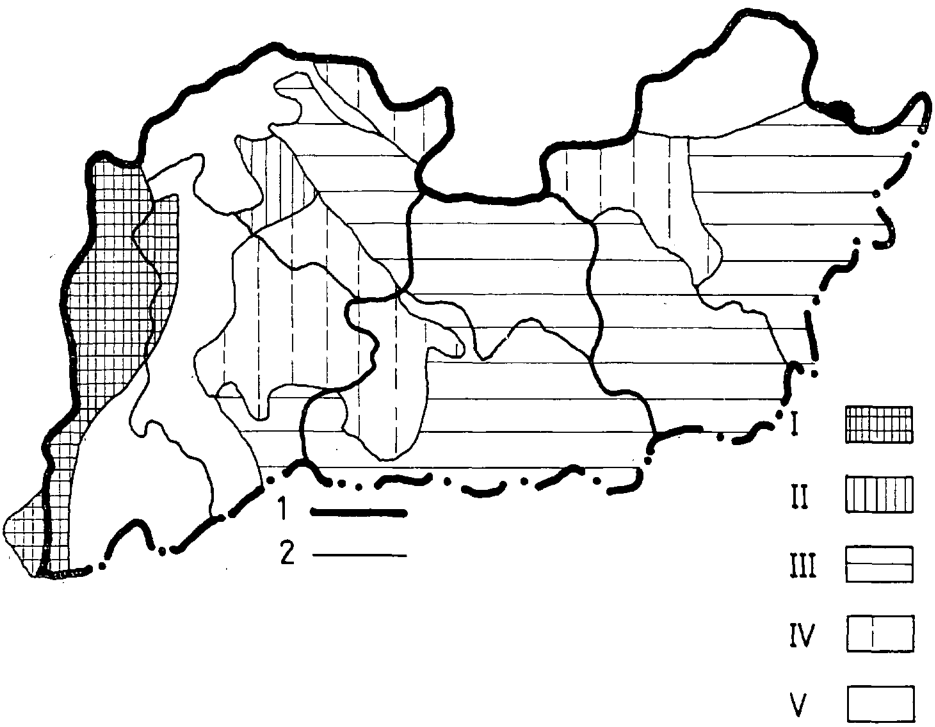

Рис. 7. Запасы грунтовых вод
1 = граница подрайона 2 = граница микрорайона
I = свыше 2501 II = 1001—2500 III = 501—1000
IV = 201—500 V = ниже 200

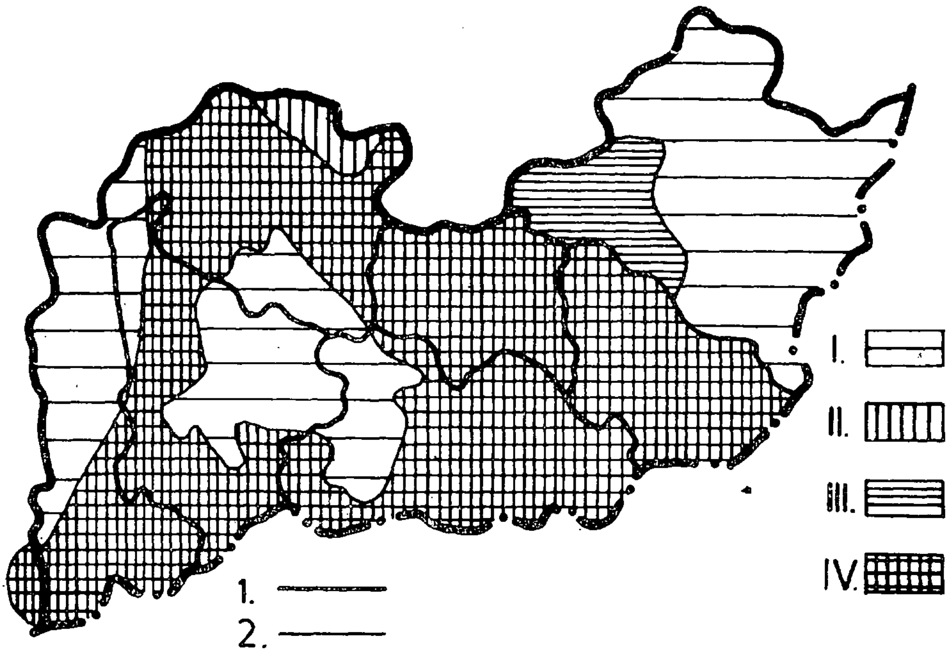

Рис. 8. Использованность запасов грунтовых вод (%)
1 = граница подрайона 2 = граница микрорайона
I = 0—25 II = 26—50 III = 51—75 IV = 76—100

В конце-концов, этот мезорайон — по сравнению с другими мезорайонами страны — хорошо снабжен слоистыми водами, и в настоящее время не нуждается в импорте питьевой воды, но, вопреки этому, целесообразно экономно хозяйствовать водными запасами (рис. 5, 6).

г) Грунтовые воды. Используемость в хозяйстве грунтовых вод значительно меньше надземных или слоистых вод. При экономическом планировании можно принимать во внимание только запасы воды гравийных террас рек и процеженных колодцев берегов. В Дэл-Альфелде только наплыв Дуная обладает более значительным запасом грунтовых вод. В более дождливое время на песчаных территориях грунтовая вода возвышается, а в бездождье понижается, вследствие этого водоносность колодцев с грунтовой водой изменчива. Уровень использованности запасов грунтовых вод высок (рис. 7, 8).

д) Термальные воды. По настоящим познаниям больше половины обильных запасов термальных вод Венгрии находится в Альфелде и пичти 2/3 алфелдского запаса имеется в Дэл-Альфелде. Это богатство термальных вод объясняется значением геотермических уровней в 10-15 м. Разведочные скважины для добычи нефти и исследования дна бассейна вскрыли многочисленные колодцы термальных вод. Использование этих запасов все еще незначительно, а энергия, полученная из термальных вод на сегодняшнем уровне техники чрезвычайно дорога, и, наверное, этим объясняется, что всего 2-3% всех имеющихся термальных вод использовано. (рис. 9)

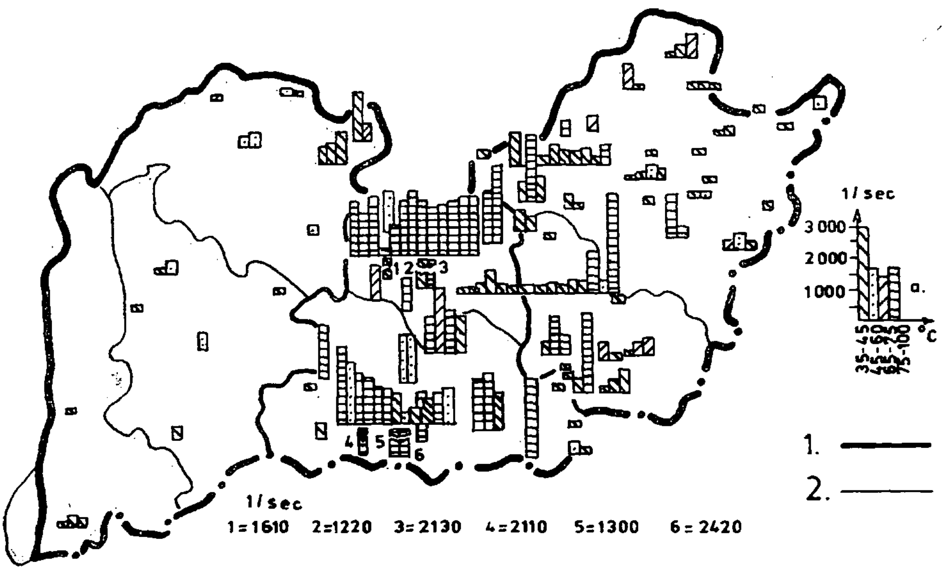

Рис. 9. Термальные воды
1 = граница подрайона 2 = граница микрорайона
а = столб : колодец

е) Почва. Почвенные условия Дэл-Альфелда очень разнообразны. Имеются одновременно почвы с наилучшей и с наихудшей продуктивностью (микрорайон Орошгаза и микрорайон Кечкемет). Качество почвы играет значительную роль в формировании уровней сельского хозяйства, но в наши дни его исключительная роль прекратилась. Почва в настоящей экономической системе считается одним фактором экономии. Благоприятные почвенные условия являются динамическими факторами, обеспечивающими специализацию и возможность для мобильности структуры производства, а неблагоприятные почвенные условия требуют «неизбежной» специализации для обеспечения соответствующих уровней хозяйствования.

Дифференцированность почв по территориям Дэл-Альфелда — из-за больших территорий с более слабыми почвами, особенно в междуречье Дуная и Тиссы в Кечкеметском, Кишкунгалашском и Сегедском микрорайонах — показывает большую долю сельскохозяйственных территорий с неблагоприятными природными условиями. Естественно, что значения оценки категорий продуктивности почв здесь самые низкие (рис. 10).

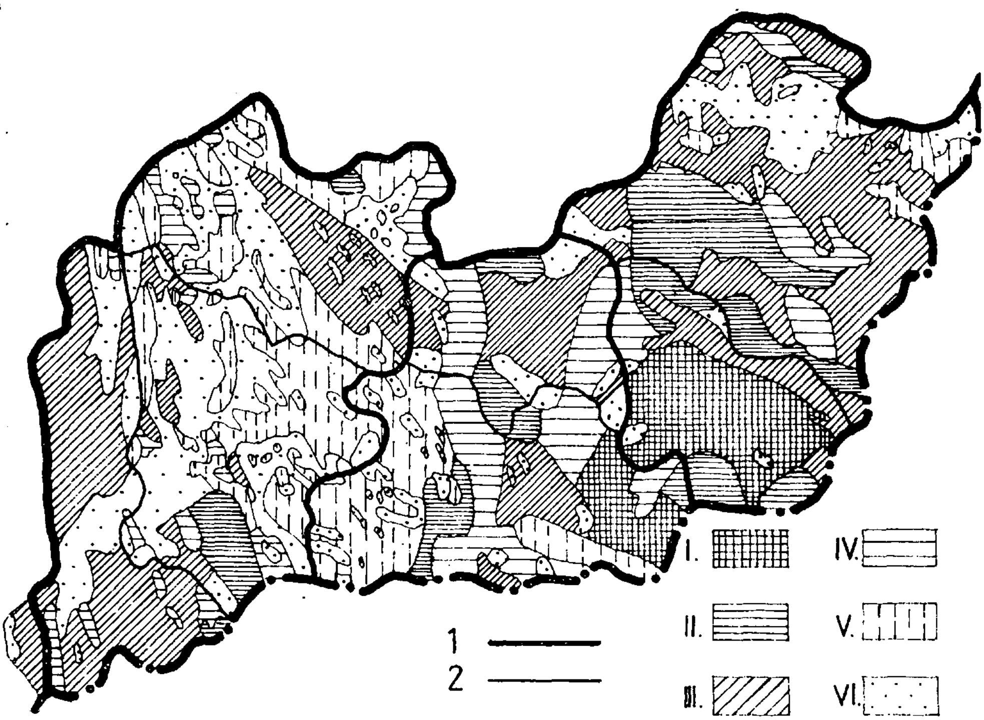

Рис. 10. Почва
1 = граница подрайона 2 = граница микрорайона
I = 90,1—100 II = 80,1—90 III = 60,1—80
IV = 40,1—60 V = 20,1—40 VI = 0,1—20

Эти разделенные категории представляют естественную продуктивность в % наиболее продуктивных сортов почвы Венгрии

Выводы

На основе таблицы 4, суммирующей результаты анализа можно обнаружить, что мезорайон Дэл-Альфелд имеет, в конце-концов, хорошие природные условия, а особенно водные запасы и носители энергии считаются значительными. Но сводное значение вскрывает в себя большие региональные различия. Наилучшими природными условиями обладают микрорайоны Бая, Бекешчаба и Орошгаза, а Кечкеметский и Сентешский микрорайоны характеризуются неблагоприятными природными условиями.

В результате нашего анализа можно установить, что пересчет и оценка — хотя некоторых элементов — природных условий с точки зрения экономико-географических районов различного уровня показывают — отдельно и сводно — типичные региональные особенности, пригодные для экономико-географического анализа и планирования.

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ПРИТЯЖЕНИЕ РАБОЧЕЙ СИЛЫ К ЦЕНТРАМ МИКРОРАЙОНА КИШКУНГАЛАША

Ф. Немет

Микрорайон Кишкунгалаш находится в мезорайоне Дэл-Альфелде в Венгрии и является одним из микрорайонов подрайона Бача. В нем имеются два центра: город Кишкунгалаш и город Кишкереш. В этой работе анализируются свойства текучести рабочей силы внутри микрорайона.

Общие тенденции притяжения рабочей силы к центрам Кишкунгалашу и Кишкерешу от 1960 по 1976 г.

Из поселений микрорайона в город Кишкунгалаш 1977 чел. (13,2% всех активных самодеятелей города), а в город Кишкереш 987 чел. (11,4% всех активных самодеятелей города) ездят на работу или ежедневно, или еженедельно, или ежемесячно.

Подавляющее большинство активных самодеятелей, занятых в городах, работает в промышленности. Вследствие значительной индустриализации и урбанизации в происшедшие 16 лет, к 1976 году доля занятых в промышленности достигла 58% в городе Кишкунгалаше, а 40% в городе Кишкереше.

Из-за интенсивной индустриализации и развития промышленности трудовые разервы, имеющиеся в этих двух городах, все меньше и меньше могли удовлетворить потребностям в рабочей силе этих городов. Вследствие этого, начиная с 1960 года постепенно увеличивается число трудящихся, ездящих на работу из отдельных поселений в города.

Увеличению числа трудящихся, ездящих на работу из отдельных поселений в города, занятых в какой-либо отрасли промышленности, в значительной степени способствовал избыток рабочей силы, освобожденный из сельского хозяйства из-за механизации крупных хозяйств, и направленный, в первую очередь, на промышленность в города. Свободная миграция рабочей силы из сельского хозяйства в промышленность в наши дни замедляется. Это происходит потому, что в сельском хозяйстве были созданы современные крупные хозяйства, работающие методами промышленного производства и обеспечивающие своим трудящимся лучшие возможности для большего заработка и для более быстрого повышения жизненного уровня.

В изменении числа трудящихся, ездящих на работи из отдельных поселений в города, значительную роль играет повышающееся поступление женщин на работу. Этот факт свидетельствует и об изменении многолетних традиций в сельских поселениях, и одновременно представляет происходящие в них общественное развитие и структурное преобразование.

Многосторонность рабочих мест в городах, и в первую очередь, обогащение рабочих мест промышленного профиля в легкой промышленности значительно облегчили пространственную мобильность женщин. В настоящее время 50% всех трудящихся, ездящих на работу из отдельных поселений в города Кишкунгалаш и Кишкереш, составляют женщины.

Развитие в транспортно-географических условиях микрорайона (уменьшение продолжительности поездки, умножение средств транспорта и т. д.), благоприятно влияло на повышение числа трудящихся, ездящих на работу из отдельных поселений в города.

Хотя мы не располагаем данными о предыдущем количестве трудящихся, на работу из отдельных поселений в города, но на основе документов, сохраняемых в отдельных городских советах и на рабочих местах, по сравнению с 1960-ыми годами можно обнаружить, что число трудящихся, ездящих на работу из отдельных поселений в город Кишкунгалаш повышалось в четыре раза, а в город Кишкереш больше двух с половиной раз.

Вследствие создания промышленных объектов в сельских поселениях и на основе развития уже существующих в них сооружений промышленного профиля немножко уменьшилось количество трудящихся, ездящих на работу из отдельных поселений в города, то есть уменьшалась тенденция миграции рабочей силы.

Потребность в рабочей силе в последние годы все больше и больше повышалась, пока число поступающих на работу с каждым годом уменьшается. Таким образом, формируемые обстоятельства рабочей силы или недостаток рабочей силы становятся усиливающими факторами для повышения числа трудящихся, ездящих на работу из отдельных поселений в города. Эта тенденция вызывает напряжения не только между центрами микрорайона и его сельскими поселениями, но и в связи с другими поселениями вне микрорайона. Эту проблему можно решить только с помощью более эффективного распределения и планирования рабочей силы.

Разделение по местам жительства и по квалификации трудящихся, ездящих на работу из одного поселения в другое или в города

На основе данных исследования, относящегося ко всем поселениям микрорайона, можно обнаружить, что из всех поселений микрорайона ежедневно ездят на работу в другое поселение или в города всего 6151 чел., в том числе 49% (2964 чел.) — в центры микрорайона (33% в город Кишкунгалаш, а 16% в город Кишкереш), 25% (1586 чел.) — в другое поселение микрорайона, а 26% (1 601 чел) — в поселения вне микрорайона, в первую очередь, в поселения комитата Бач-Кишкуна.

В процентном разделении по местам направления поездки трудящихся, ездящих ежедневно на работу из одного поселения в другое или в города, в основном совпадаются с районами притяжения рабочей силы к городам Кишкунгалашу и Кишкерешу.

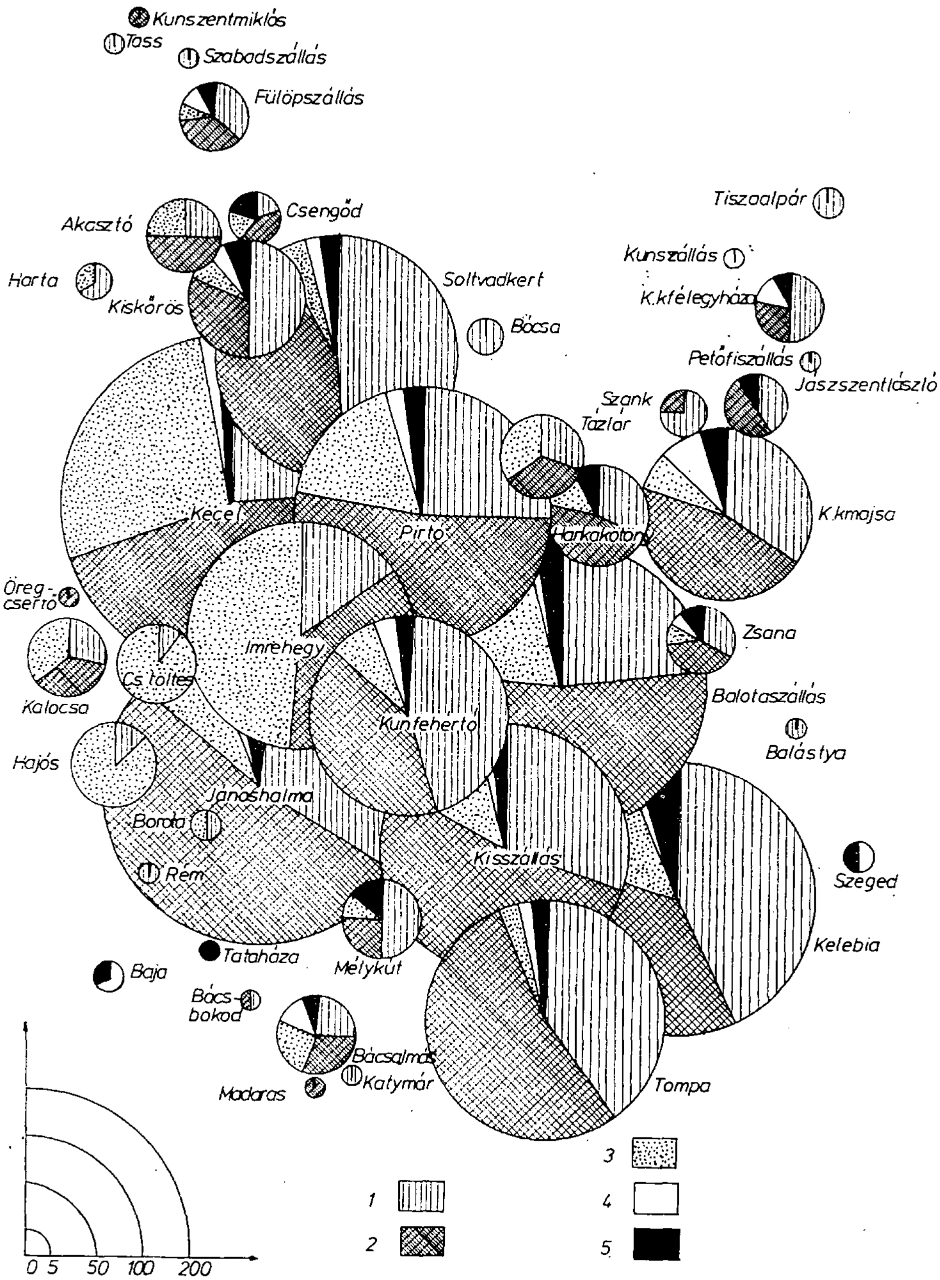

Рис. 1. Разделение по квалификации трудящихся, ездящих на работу из одних поселений в город Кишкунгалаш (1976 г.)
1 = квалифицированный рабочий
2 = обученный рабочий
3 = подсобный рабочий
4 = технический работник
5 = административный работник

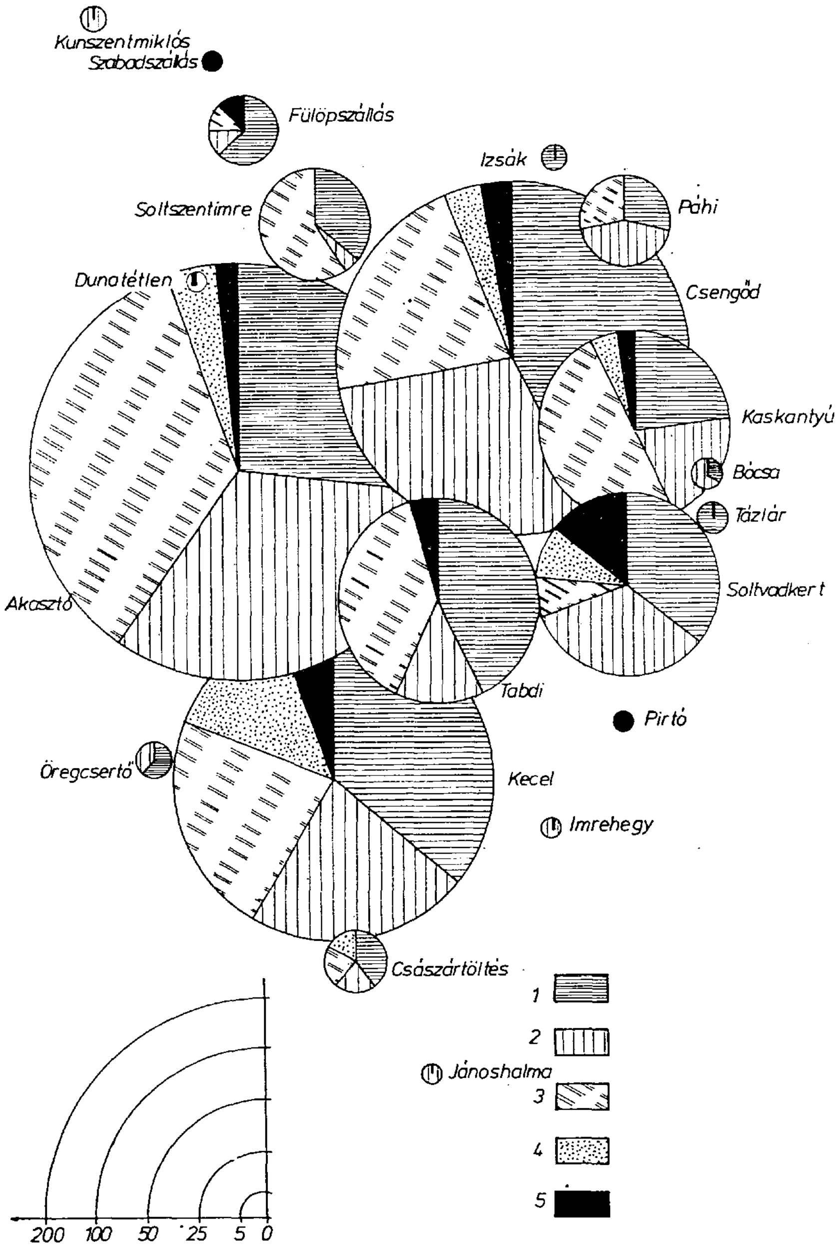

Рис. 2. Разделение по квалификации трудящихся, ездящих на работу из одних поселений в город Кишкереш (1976 г.)

1 = квалифицированный рабочий
2 = обученный рабочий
3 = подсобный рабочий
4 = технический работник
5 = административный работник

Число трудящихся, ездящих на работу из отдельных поселений в города в прямом отношении уменьшается в связи с увеличением времени и расстояния поездки.

Процентное разделение по квалификации трудящихся, ездящих на работу из отдельных поселений в центры микрорайона представлено на рис. 1 и 2.

Подавляющее большинство трудящихся, ездящих на работу из отдельных поселений в центры, работает в сфере физического труда, при этом доля и число квалифицированных и обученных рабочих играет определяющую роль. Трудящиеся без квалификации, ездящие на работу из поселений сельскохозяйственного профиля, могут работать в городах как обученные или подсобные рабочие. Последние иногда составляют большую долю, чем другие квалифицированные рабочие, ездящие на работу из отдельных поселений в города.

Работники, занятые в сфере умственного труда, ездящие на работу из отдельных поселений в города, представляют видную долю и большое количество только в притягательном районе города Кишкереша.

Нельзя обнаружить значительных связей между разделением по квалификации трудящихся, ездящих на работу из отдельных поселений в города Кишкунгалаш и Кишкереш, и продолжительностью поездки.

Район притяжения трудящихся, ездящих на работу в город Кишкунгалаш изображен на рис. 3. Разделение по расстояниям поездки трудящихся, ездящих ежедневно на работу в город Кишкунгалаш, следующее: 27,2% проезжает расстояние в километрах 10, 46,3% — в 10—20 километрах, 16,7% — в 20—30 километрах, а 9,8% — больше 30-и километров. Итак, 73,5% всех трудящихся, ездящих ежедневно на работу в город Кишкунгалаш, выходит из окрестности города на расстоянии в километрах 20, у них чистое время поездки 15—25 мин. Время поездки у трудящихся, ездящих ежедневно на работу в этот город на расстоянии больше 30-и километров, составляет час нлн два с половиной часа.

Притягательный район города Кишкереша (изображен на рис. 4) в значительной степени отличается от района притяжения к городу Кишкунгалашу. Разделение по расстоянием поездки трудящихся, ездящих ежедневно на работу в город Кишкереш, следующее: 4% проезжает расстояние в километрах 10, 6% — в 20—30 километрах, и 1,4% — больше 30-и километров, у трудящихся, ездящих ежедневно на работу на расстоянии в километрах 10, чистое время поездки составляет 10-15 мин., а у трудящихся, ездящих ежедневно на работу на расстоянии больше 30-и километров, чистое время поездки — 60 мин.

Промышленные предприятия названных городов обеспечивают прямой транспорт своим трудящимся, ездящим на работу из отдельных поселений в эти города, вследствие чего чистое время поездки в значительной степени уменьшается.

Наибольшее количество трудящихся, ездящих на работу ежедневно из отдельных поселений в города дают поселения: Акасто (34%) и Пирто (33%). Из поселения Фюлепсаллаша 25%, из поселения Шольтсентимре 22%, из поселения Чикэрии 18%, из поселения Кунбаи 17%, из поселения Кунфейерто 17%, из поселения Бачселеша 16%, из поселения Ченгеда 15% всех активных самодеятелей поселения ездят ежедневно на работу в города.

Доля трудящихся, ездящих на работу в города из других поселений микрорайона дает меньше 10-и %.

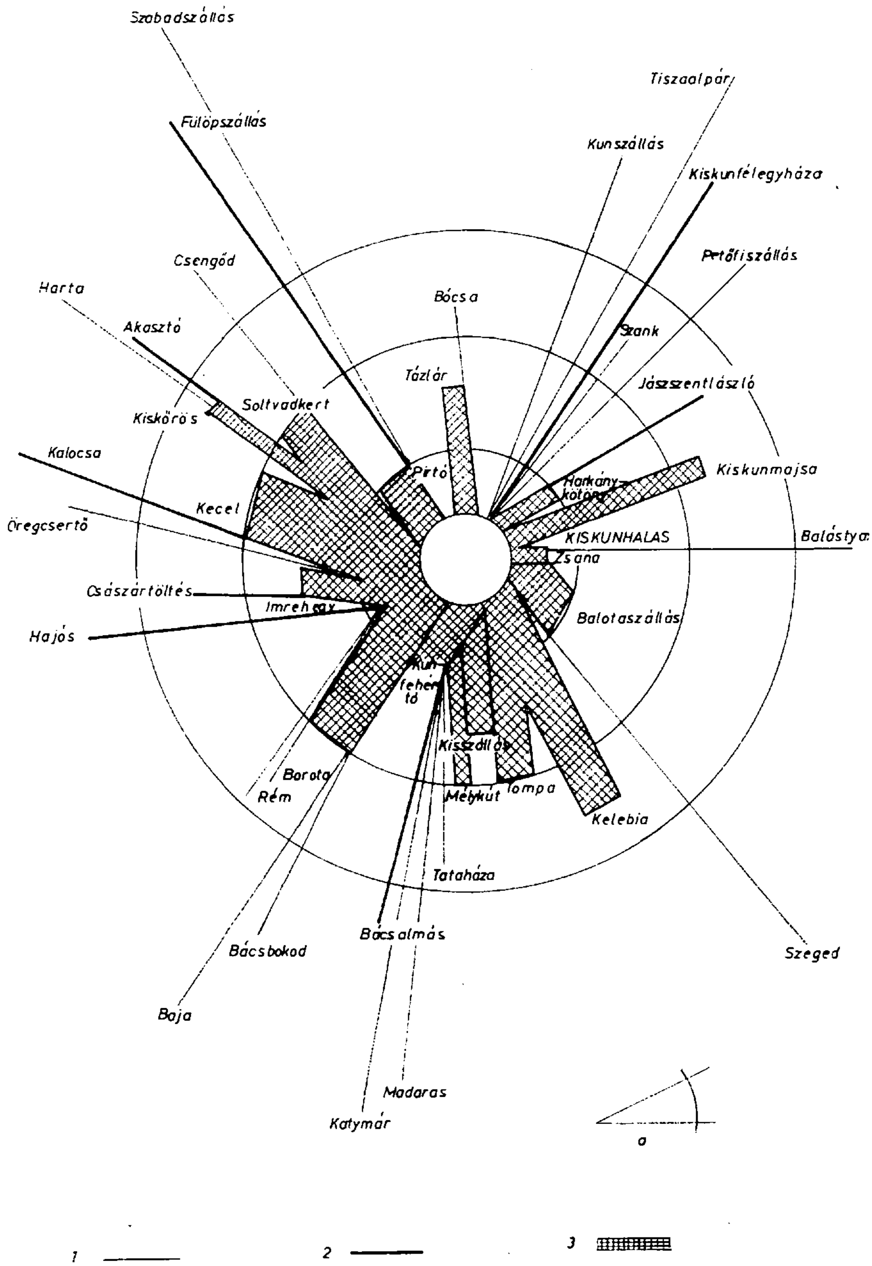

Рис. 3. Район притяжения рабочей силы к городу Кишкунгалашу (1976 г.)

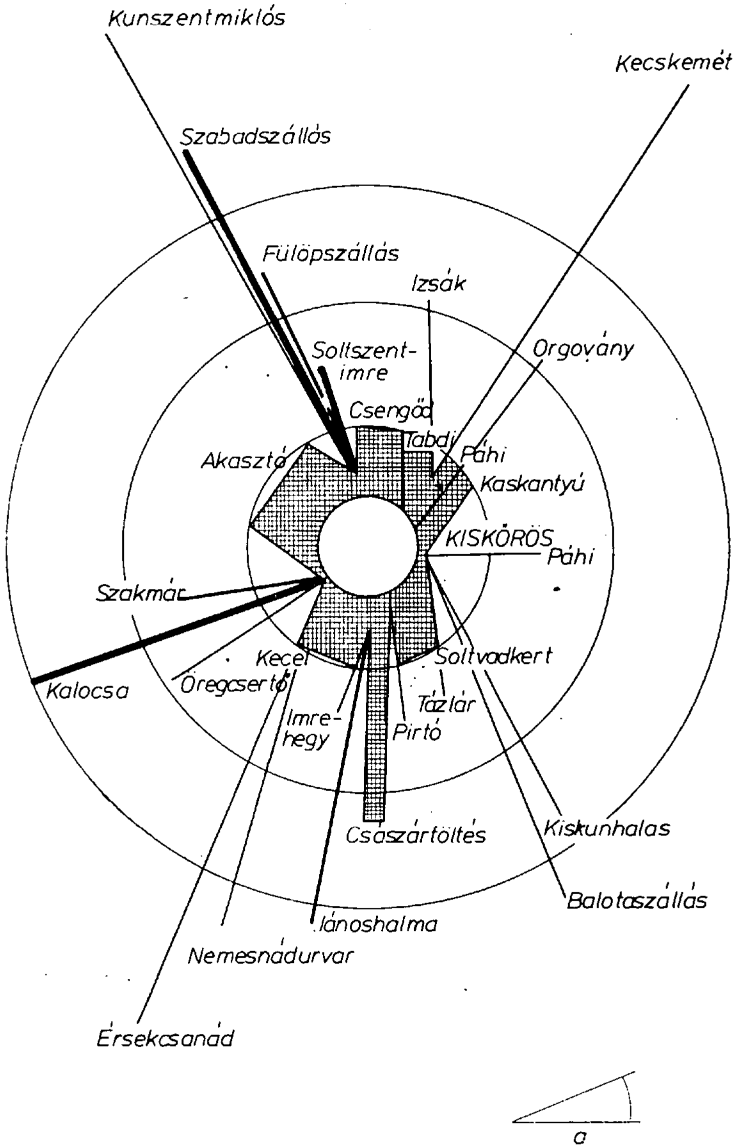

Рис. 4. Район притяжения рабочей силы к городу Кишкерешу (1976 г.)

Наименьшее число дают поселения: Мейкут (1,8%), Чойошпалош (2,2%), Санк (2,2%), Яношхалма (3%), Борота (3%), Кишкунмайша (3%).

В перечисленных поселениях нет участков работы промышленного профиля или имеются небольшие промышленные сооружения с незначительным числом рабочих.

Миграция рабочей силы, главным образом, направлена из поселений сельскохозяйственного профиля (отдача рабочей силы) в города с развитой промышленностью (прием рабочей силы).

Число трудящихся, ездящих на работу из отдельных поселений в города, в значительной степени уменьшается по мере увеличения времени и расстояния поездки, при этом появляется действие притяжения рабочей силы к другим городам-центрам вне микрорайона.

Притяжение рабочей силы к предприятиям в городах Кишкунгалаше и Кишкереше

В соответствии с анализом числа трудящихся, ездящих на работу из отдельных поселений в города микрорайона, было произведено исследование, и на основе состояния 1-го ноября 1976 г. было анализировано действие притяжения рабочей силы к рабочим местам, в первую очередь, к промышленным заводам и участкам городов Кишкунгалаша и Кишкереша. Это исследование являлось нужным и хорошо используемым методом и с точки зрения сравнения и контроля данных, полученных местными советами при предыдущем анализе, рассматривающего полный круг трудящихся, ездящих на работу в вышеупомянутые города. Этот метод дал возможность для широкого исследования притяжения рабочей силы к отдельным рабочим местам. Результаты этих двух анализов были одинаковыми в случае города Кишкунгалаша. А в случае города Кишкереша на рассмотренных рабочих местах было занято 73% всех трудящихся, ездящих на работу из отдельных поселений в этот же город. Остальное 27% трудящихся, ездящих на работу из отдельных поселений в город Кишкереш, показывает большое рассеяние, вследствие чего и учитывая нечеткость полученных данных, должно было оставлено без внимания. На основе сравнения результатов двух анализов с различными методами, можно установить, что остальное 27% трудящихся ездят на работу из отдельных поселений в город Кишкереш в государственные учреждения, в государственные, общественные и массовые организации или в различные вооруженные составы. Из 47 поселений 1977 трудящихся ездят на работу в город *Кишкунгалаш* на предприятия, заводы и другие рабочие места. Общее разделения по местам жительства задается следующим соответствием:

$$D = \frac{\text{число трудящихся, ездящих на работу из всех поселений в данный город}}{\text{число поселений, из которых трудящиеся ездят на работу в данный город}}$$

(Верешмартине, 1971 г.)

42 чел. по поселению

Из числа всех трудящихся 88% (1743 чел.) ежедневно, 8% (168 чел.) еженедельно и 4% (66 чел.) ежемесячно ездят на работу из 47 поселений в город Кишкунгалаш.

Подавляющее большинство рабочих мест, расположенных внутри границ города, т. е. помещенных, на самом деле, в жилых районах города, представляет собой предприятие или участок промышленного профиля, занимающиеся производством или обслуживанием. На 28 рассмотренных местах работы занято 98% всех трудящихся, ездящих на работу из разных поселений в город Кишкунгалаш, а остальное 2% работает в государственных учреждениях.

В городе Кишкунгалаше имеются предприятия легкопромышленного профиля, на которых занято много женщин и заводы пищепромышленного профиля, на которых число рабочих свыше обычного, например, на кишкунгалашском птицеобрабатывающем заводе заняты 1200 чел., а на трикотажной фабрике — 720 чел. Заслуживает внимания и разделение по полам трудящихся, ездящих на работу из разных поселений в город Кишкунгалаш.

Во время исследования все трудящиеся, ездящие на работу из разных поселений в этот город состояли из 42% женщин и 58% мужчин. Доля женщин, ездящих на работу из разных поселений в город Кишкунгалаш была высшей на 10% доли города Кечкемета. Ко времени окончательного пуска в ход трикотажной фабрики — к 1980 году — число рабочих на фабрике возрастет на 1200 чел. и доля женщин, ездящих на работу из соседних поселений в город Кишкунгалаш достигнет 50%.

Наибольшее количество трудящихся, ездящих на работу из разных поселений в город Кишкунгалаш, занято на местном отделении хлопчатобумажной фабрики легкопромышленного профиля, куда 25% всех рабочих фабрики ездит ежедневно на работу из 14 поселений. В состав трудящихся, ездящих на работу из различных поселений на кишкунгалашское отделение хлопчатобумажной фабрики, входят 60% квалифицированных, 33% обученных, 4% подсобных рабочих, а 3% работает в сфере умстенного труда, как технический или административный работник.

На предприятие строительной промышленности 21% и на трикотажную фабрику тоже 21% всех занятых ездит на работу из разных поселений в город Кишкунгалаш. Доля квалифицированных рабочих в строительной промышленности города дает 50%, а для обученных — 23%. На трикотажной фабрике это отношение обратное.

На местное предприятие машиностроительной фабрики ГАНЦ-МАВАГ 19% всех трудящихся ездит на работу из разных поселений в город Кишкунгалаш, а на предприятие металлургического завода — 17%. Ввиду профиля производства на эти предприятия ездят на работу из разных поселений в основном мужчины (90%).

Выделяются большей долей трудящихся, ездящих на работу из разных поселений в город Кишкунгалаш, местная дирекция путей сообщения (65%), и промышленные участки потребительского и сбытового кооператива (35%), но значительную роль играют и крупные сельские хозяйства с дополнительными промышленными отраслями, в которые ездят на работу довольно много трудящихся (от 9 до 21%).

Трудящиеся, ездящие на работу из разных поселений в город Кишкунгалаш, разделены по отраслям промышленности так, что на машиностроительстве занято 31%, в легкой промышленности — 44,3%, в пищевой промышленности — 21,4%, а в других отраслях промышленности — 3,3%

Трудящиеся, ездящие на работу из разных поселений в город Кишкунгалаш дают 40% всех рабочих, занятых на транспорте, 820 чел. только при правлении железной дорогой, эта доля представляет собой 18% всех трудящихся, ездящих на работу из разных поселений в город. Из-за благоприятных условий поездки наиболее широкую притягательную зону имеют разнообразные отделения кишкунгалашском управлении железной дорогой.

Среди рассмотренных мест работы наименьшую долю — 2% всех занятых 450 чел. — представляют трудящиеся, ездящие на работу из разных поселений в кустарный кооператив города. Здесь работают в основном женщины города Кишкунгалаша.

Исследуя число трудящихся, ездящих на работу из отдельных поселений в город Кишкунгалаш на разные предприятия, с точки зрения квалификации можно установить, что доля обученных рабочих наибольшая (43%) и предшествует доле квалифицированных (31%), достаточно большая и доля подсобных рабочих (20%), а технические и админисративые работники представляют 6%. Формирование в такой мере разделения по квалификации соответствует предоставлению рабочей силы, освобежденной из сельского хозяйства, созданию промышленных сооружений, и поступлению на работу все большего и большего количества женщин без квалификации.

Из 30-и поселений 987 трудящихся ездят на работу в город *Кишкереш* на предприятия, заводы и другие рабочие места. Общее разделения по местам жительства — 33 чел. по поселению. На 7-и промышленных предприятиях и участках города занято всего 721 чел. — 73% всех трудящихся, ездящих на работу из разных поселений в город Кишкереш.

Наибольшее количество (225 чел.) — 59% всех занятых — дают трудящиеся, ездящие на работу из разных поселений в город Кишкереш на предприятие № 4 завода сельскохозяйственных машин, в том числе мужчин — 70% из-за профиля производства. Трудящиеся, ездящие на работу из разных поселений на это предприятие разделены по квалификации на 50% подсобных, 37% квалифицированных, 6,6% обученных рабочих, а 6,4% дают работники в сфере умственного труда. Из 13 поселений на это предприятие 94% трудящихся ездят на работу ежедневно на автобусах предприятия.

На второе место по численности поступает местное отделение предприятия по торговле сельскохозяйственными продуктами, на котором занято 48% всех трудящихся, ездящих на работу из отдельных поселений в город Кишкереш, в том числе женщины дают 67%. Трудящиеся, ездящие на работу в это отделение, разделены по квалификации на 61% подсобных, 17% квалифицированных рабочих и 17% работников в сфере умственного труда.

На кишкерешский участок Калочайской консервной фабрики, обрабатывающей и черный перец, 140 трудящихся — 44% всех занятых 319 чел. — ездят ежедневно на работу из соседных поселений. На этой фабрике в основном заняты женщины (76%), в том числе женщины, ездящие из соседных поселений дают 81% и работают как обученные и подсобные рабочие.

Из 10 поселений в город Кишкереш 184 трудящихся — 29,1% всех занятых 632 чел. — ездят ежедневно на работу на завод точной механики конторских машин, изготовляющий, в первую очередь, составные части кассовых аппаратов. В состав трудящихся завода входят 49% обученных и 39,3 квалифицированных рабочих, составляющих основание коллектива. Аналогично этому разделение трудящихся, ездящих на работу из разных поселений на этот завод, следующее: 46,2% обученных, 37,5% квалифицированных рабочих, а 9% работает в сфере умственного труда, как технические и административные работники, при этом доля мужчин 64%, которая значительно отличается от доли в 27% всех мужчин, занятых на заводе.

В городе Кишкереше смещанный и строительный кооператив является одним из предприятий, на котором занято наибольшее количество рабочих — 1 082 чел. — 12,5% всех активных самодеятелей города. В этом кооперативе число трудящихся, ездящих на работу из соседних поселений является наименьшим, всего 11,4% всех рабочих кооператива, в том числе 85% квалифицированных и обученных рабочих, доля женщин и мужчин одинакова (по 50%).

В отличие от города Кишкунгалаша, огромные сельские хозяйства в городе Кишкереше не имеют допольнительных отраслей промышленного профиля, вследствие этого в них нет трудящихся, ездящих на работу из соседних поселений. В электропромышленном цехе кооператива им. Петефи заняты 22 рабочих, но только жители города Кишкереша.

Трудящиеся, ездящие на работу из разных поселений в город Кишкереш, разделены по отраслям промышленности следующим образом: на машиностроительстве занято 57%, в пищевой промышленности — 26%, а в других отраслях промышленности 17%.

Притягательная сила рабочих мест в городе Кишкереше значительно слабее чем в городе Кишкунгалаше. Об этом свидетельствует не только нижняя на 50% доля трудящихся, ездящих на работу из разных поселений в город Кишкереш, но и тот факт, что 99% трудящихся, из-за менъшего круга притяжения города, ездят ежедневно на работу, а 1% — еженедельно.

Сопоставляя с городом Кишкунгалашем разделение по квалификации трудящихся, ездящих на работу из разных поселений в город Кишкереш тоже различно: 34% квалифицированных, 28,5% подсобных, 27,3% обученных, а 9,6% технических и административных работников, доля двух последних высше на 3,6%, чем в городе Кишкунгалаше.

Разделением в такой мере по квалификации и формированием притяжения соседних сельских поселений к городу Кишкерешу (огромным числом трудящихся, ездящих на работу из северной части микрорайона) отражается отсуствие подходящих рабочих мест, т. е. недостаток занятости. В городе Кишкереше имеются раздробленные предприятия и участки с малым числом занятых, которые неспособны принимать, ни в сфере физического, ни в сфере умственного труда, рабочую силу, освобожденную из поселений сельскохозяйственного профиля.

Исследуя притяжение рабочей силы к предприятиям городов Кишкунгалаша и Кишкереша, в конце концов можно установить, что против размеров рабочих мест на них занято значителсное количество трудящихся, ездящих на работу из разных поселений. Из-за своих более давних привычек и большего круга притяжения на предприятиях города Кишкунгалаша занято большее количество трудящихся, ездящих на работу из разных поселений, чем в город Кишкереш. Предприятия обоих городов стараются сохранить своих трудящихся, ездящих на работу из соседних поселений, так как эти трудящиеся играют значительную роль в осуществлении задач и развитии этих предприятий. Это отражается следующими факторами: возрастает число предприятий, обеспечивающих своим трудящимся, ездящим на работу из соседныих поселений, средства транспотра или льготный проезд, более благоприятные рабочие и социальные условия.

Большинство трудящихся, ездящих на работу в города микрорайона в основном из поселений сельскохозяйственного профиля, имеет две специальности. Эта особенность, в первую очередь, вызывает трудности в городе Кишкереше, так как во время весенних и осенних сельскохозяйственных работ многие трудящиеся, ездящие на работу в этот город из сельских поселений, возьмут свой отпуск — иногда и продолжая его с неоплачиваемым отпуском на несколько недель.

Число трудящихся, ездящих на работу в города из разных поселений на предприятия и участки промышленного профиля, будет возрастать и в дальнейшем. Темп возрастания быстрее в городе Кишкунгалаше. А в городе Кишкереше из-за селективного развития промышленности и создания новых промышленных сооружений в городах и сельских поселениях микрорайона этот темп менее быстрый.

Круг притяжения рабочей силы для города Кишкунгалаша

Гегемонная зона окружает город со стороны Севера и Юга. На Севере 3 поселения: Пирто, Тазлар, Гаркакетень; а на Юге 5 поселений: Кунфейерто, Балотасаллаш, Жана, Кишсаллаш и Келебия. Юго-восточная сторона зоны ограничена границей комитата и границей страны (видно на рис. 5).

Расстояние этих поселений от города 10-40 километров, а чистое время поездки, соответственно этому, 15-40 мин.

В четырех поселениях имеются промышленные предприятия, в том числе наибольшей является фабрика, производящая виннокаменную кислоту в поселении Кунфейерто, на которой заняты 232 чел. В остальных трех поселениях находятся промышленные участки с 150 трудящимися в поселении Кишсаллаше, с 100 трудящимися в поселении Келебии, а с 80 трудящимися в поселении Тазларе. Население занято, в первую очередь, в сельском хозяйстве. Из этой зоны 795 чел. ездят ежедневно на работу в город Кишкунгалаш, это дает 40,2% всех трудящихся, ездящих на работу в другие поселения и города из своего места жительства, и представляет собой 8,4% всех активных самодеятелей этой зоны.

Из поселения Келебии 144 чел., из поселения Балотасаллаша 134 чел., из поселения Пирито 128 чел., из поселения Кишсаллаша 103 чел., а из всех других поселений зоны 28-88 чел. ездят на работу в город Кишкунгалаш.

Доминантовая зона тесно связана с предыдущей зоной, разделяют только три поселения (Боча, Келешхалом и Санк).

Семь поселений принадлежат к этой зоне, они расположены на расстояние в 20-30 километрах от города Кишкунгалаша и, соответственно этому, чистое время поездки 15-30 мин.

В поселениях Кишкунмайше, Кецеле, Яношхалме, Мейкуте и Томпе имеются значительные предприятия или участки промышленного профиля, но потребность рабочей силы на них меньше, чем наличие рабочей силы в разных поселениях. В поселении Шольтвадкерте промышленность незначительна, число рабочих, занятых на промышленных участках не достигает 200 чел. Из этих поселений 1—4% активных самодеятелей ездят на работу, в первую очередь, на промышленных предприятиях.

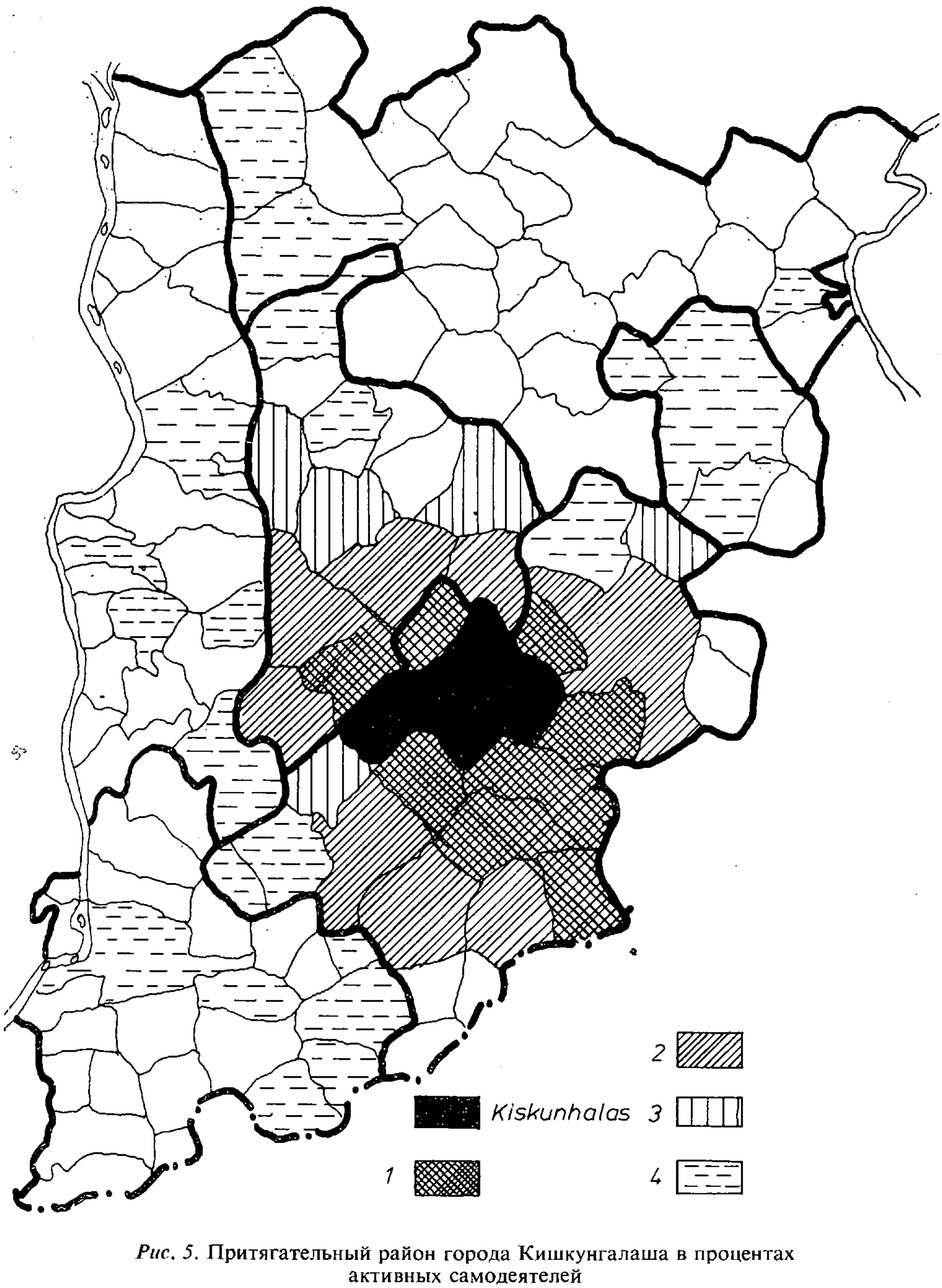

Рис. 5. Притягательный район города Кишкунгалаша в процентах активных самодеятелей

1 = город Кишкунгалаш 3 = доминантовая зона
2 = гегемонная зона 4 = периферийная зона
5 = территория вне района

Из этой зоны 744 чел. ездят ежедневно на работу в город Кишкунгалаш, это дает 42,7% всех трудящихся, ездящих на работу из данной зоны в другое поселение или город, и 2,3% всех активных самодеятелей зоны.

Число трудящихся, ездящих на работу из поселения Кецеля является наивысшим — 218 чел. — 3,6% всех активных самодеятелей этого поселения. Три поселения (Кецель, Яношхалма и Шольтвадкерт) дают 73,2% всех трудящихся, ездящих на работу из этой зоны.

Периферийная зона включает в себя 5 поселений: Кишкереш, Яссентласло, Акасто, на севере Боча, на юго-западе Келешхалом. Доля активных самодеятелей, ездящих на работу в город Кишкунгалаш не достигает 1%. В сличае поселений Акасто и Бочы притяжение сильнее к городу Кишкерешу, из поселения Келешхалма притягивается рабочая сила к поселению Яношхалму, а из поселения Яссентласло — к городу Кишкунфэледьгазе. 5 поселений этой периферийной зоны дает 5% (88 чел.) всех трудящихся, ездящих на работу из одного поселения в другое.

Отношение числа и доли трудящихся, ездящих на работу из одного поселения в другое, к числу и доле активных самодеятелей достигает лишь 0,6%. Трудящиеся ездят на работу из этих поселений на расстояние в 10-40 километрах, а чистое время поездки у них 10-35 мин.

Территория вне притягательного района. К этой территории принадлежат — во время исследования — 21 поселений, в том числе 5 поселений вне микрорайона. С этой территории 102 чел. ездят на работу в другое поселение или город, это дает 6% всех трудящихся, ездящих на работу в город Кишкунгалаш. Число трудящихся, ездящих на работу из разных поселений меняется от 1 до 18 чел., и представляет от 0,1 до 0,4% всех активных самодеятелей этих поселений. 5 поселений (Кишкунфэледьгаза, Фюлепсаллаш, Калоча, Гайош и Бачалмаш) дают 72% всех трудящихся, ездящих на работу с этой терротории.

В зависимости от расстояния в прямом отношении увеличивается доля квалифицированных и обученных рабочих, и технических работников, а, соответственному этому, доля подсобных рабочих, административных и других работников умственного труда уменьшается.

Круг притяжения города Кишкереша

Гегемонная зона окружает город со стороны Севера. В эту зону входят 4 поселения: Акасто, Ченгед, Паги, Табди (видно на рис. 6).

Эти поселения находятся на расстояние в 10 километрах от города, соответственно этому, чистое время поездки 10-15 мин.

В этих поселениях нет промышленных предприятий. Население занято в основном в сельском хозяйстве, в специальных кооперативах и на местных участках кишкерешского госхоза. Вследствие этого 571 чел. ездят ежедневно на работу из этой зоны в город Кишкереш на разные рабочие места, это число представляет 57,8% всех трудячихся, ездящих на работу из этой зоны и 10% всех активных самодеятелей района. Выделяется число трудящихся, ездящих на работу в город Кишкереш из поселения Акасто (324 чел.) и из поселения Ченгед (139 чел.), дающие 16% или 8,2% всех активных самодеятелей этих двух поселений, и составляющие 57% или 24,3% всех трудящихся, ездящих на работу из

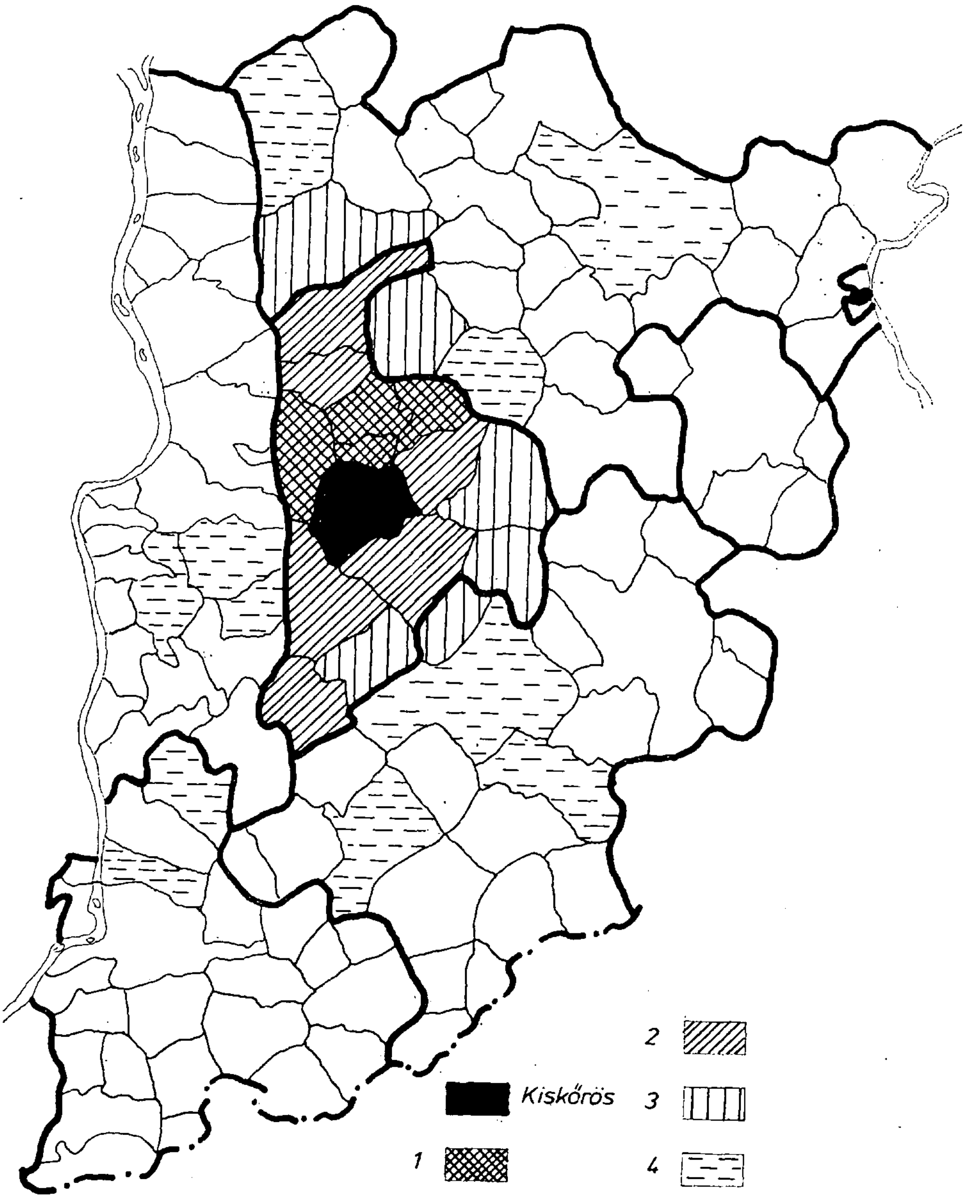

Рис. 6. Притягательный район города Кишкереша в процентах активных самодаятелей

1 = город Кишкереш 3 = доминантовая зона
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этой зоны. Из поселения Табди 8,2% вхес активных самодеятелей поселения, а из поселения Паги 3,4% всех активных самодеятелей поселения ездят на работу в город Кишкереш.

Доминантовая зона состоит из поселений Часартелтеша, Кецеля, Шольтвадкерта, Кашкантю, Шольтсентимре и Фюлепсаллаша. Из этой зоны 367 чел. ездят ежедневно на работу в город Кишкереш, это представляет 2,3% всех активных самодеятелей зоны, и 37,2% всех трудящихся, ездящих на работу из этой зоны. Для этой зоны чистое рвемя поездки максимально 40 мин. Население этой зоны занято, в первую очередь, тоже в сельском хозяйстве. Нельзя считать значительными существующих здесь нескольких промышленных предприятий и участков с трудящимися в среднем 50 чел.

Имеется более значительная промышленность в поселении Фюлепсаллаша, где доля и число трудящихся, занятых в промышленности представляет 17,6% — 300 чел., в поселении Кецеле: 15, 3% — 1 000 чел., в поселении Часартелтеше: 15% — 300 чел., а в поселении Шольтвадкерте: 9,3% — 400 чел.

Периферийная зона включает в себя 4 поселений: Имрегедь, Пирто, Тазлар, Боча в микрорайоне, а 2 поселения вне микрорайона: Ижак и Сабадсаллаш. Из этой зоны ездят на работу всего 19 чел., 2% всех трудящихся, ездящих на работу.

Отношение активных самодеятелей к трудящимся, ездящим на работу из разных поселений не достигает 1%.

Только в поселении Сабадсаллаше имеется значителъсная промышленность, где на промышленных участках занятов сего 624 чел. Находится еще промышленное сооружение с 80 трудящимися в поселении Тазларе.

Территория вне притягательного района. Из-за большего расстояния (30—60 км.) у трудящихся, ездящих на работу с этой территории в город Кишкереш, чистое время поездки час — полтора часа. Из 11 поселений всего 24 чел. ездят на работу в этот город, это представляет 3% всех трудящихся, ездящих на работу в город. Из отдельных поселений 1 или 2 чел. (0,01-0,1% всех активных самодеятелей поселений) ездят на работу в город Кишкереш.

Притяжение рабочей силы к сельским поселениям микрорайона

Проанализировав притяжение рабочей силы к центрам микрорайона Кишкунгалаша (к городам Кишкунгалашу и Кишкерешу) исследуется действие притяжения рабочей силы к сельських поселениям. Имея в виду недостаток соответствующих данных, которыми не располагала никакая организация, были исследованы все поселения микрорайона. При помощи поселковых советов были рассчитаны все трудящиеся, ездящие на работу из разных поселений в другие, и были координированы все данные этих поселковых советов во избеж ание повторений. Первое исследование поселений микрорайона можно считать точным, так как отражает условия 1-го июля 1976 г. (видно на рис. 7).

На основе исследования можно обнаружить, что является значительным число трудящихся, ездящих на работу из разных поселений и другие. Трудящиеся, в большинстве случаев, направляются на промышленные предприятия или участки, это направление может быть определено географическим расположе-

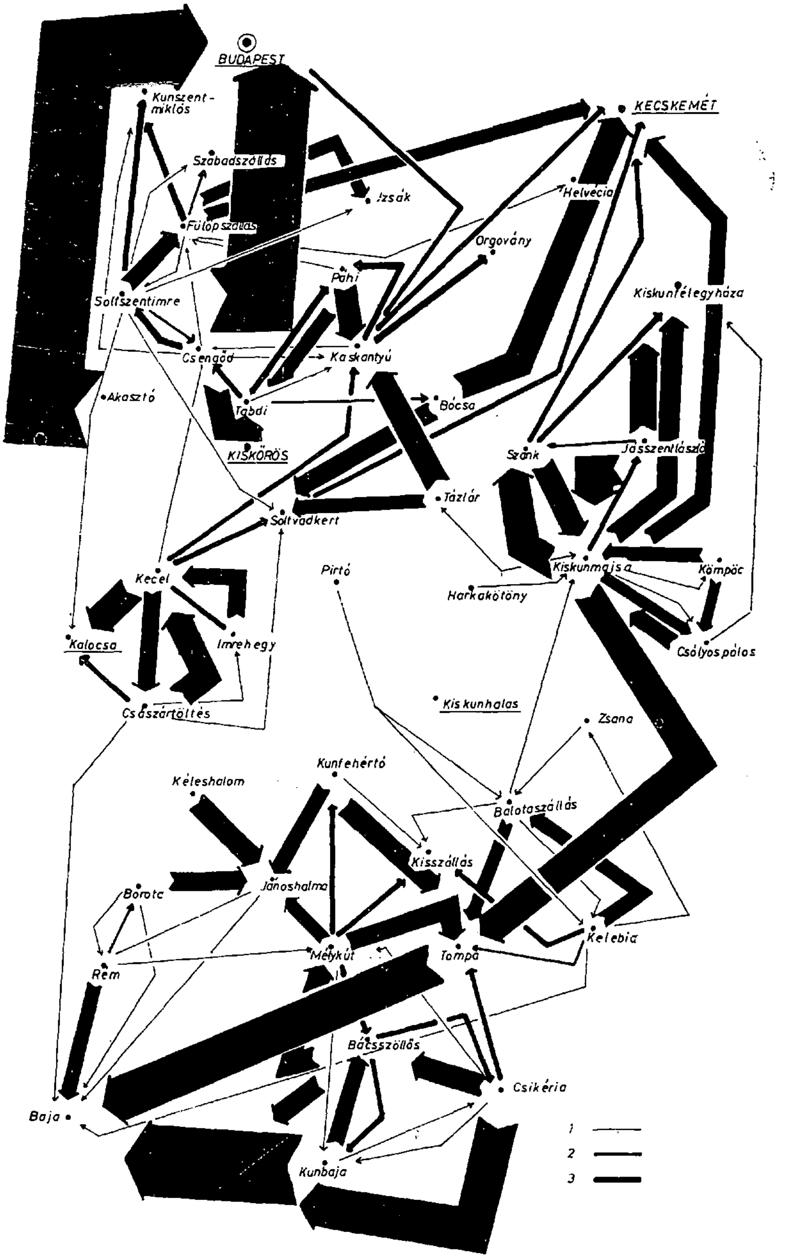


Рис. 7. Притяжение рабочей силы к сельским поселениям микрорайона (1976 г.)

нием этих промышленных сооружений. Но огромные сельские хозяйства, работающие в своих дополнительных отраслях промышленного профиля с методами современного промышленного производства тоже влияют на число трудящихся, ездящих на работу в другое поселение, и на направления их поездки.

По квалификации трудящиеся, ездящие на работу из одного поселения в другое, разделены на 32% квалифицированных, 58% обученных и подсобных рабочих, 6% технических и 4% административных работников.

Кроме городов Кишкунгалаша и Кишкереша рабочая сила притягивается к следующим поселениям микрорайона: Санку, Кишкунмайше, Яношгалме, Томпе, Кецелю, Табди, Кашкантю и Шолтвадкерту. Эти поселения развертывают небольшое притяжение, вследствие этого в эти поселения ездят на работу трудящиеся из таких других поселений, которые находятся на расстояние в 10-20 километрах. Исключением является 70 трудящихся, ездящих из поселения Кишкунмайши в поселение Томпа на работу в промышленный кооператив с разными отраслями. В случае больших расстояний мотивирующими факторами являются и лучшие возможности для заработка и более благоприятные условия труда.

Трудящиеся не притягиваются к таким поселениям (как Акасто, Тазлар, Келешхалом), в которых нет никаких промышленных или седьскохозяйственных предприятий или участков.

Исследуя число трудящихся, и направления их поездки на работу, стоит упомянуть, что в числе и по квалификации трудящихся, ездящих на работу из одного поселения в другое и из того же другого в первое, появляются тождества. Например, и бесплановое распределение рабочей силы может служить причиной этого процесса.

Значительное число трудящихся микрорайона ездят на работу и в города вне микрорайона, в первую очередь, в 5 городов: Будапешт, Кечкемет, Бая, Калоча и Кишкунфэледьгаза, которые с большой силой притягивают рабочую силу. С наибольшей интенсивностью притягиваются трудящиеся к столицу Будапешту из северной части микрорайона. Из поселений Акасто и Шольтсентимре свыше 400 чел. ездят на работу в сталицу на разные рабочие места промышленного профиля.

Из поселения Акасто 21% всех трудящихся (710 чел.) ездят на работу в Будапешт, это — 7,2% всех активных самодеятелей поселения. А из поселения Шольтсентимре 64% всех трудящихся (217 чел.) ездят на работу в сталицу, это дает 15% всех активных самодеятелей поселения. В этих двух поселениях нет рабочих мест промышленного профиля. Транспортно-географическое расположение обоих поселений содействует этому.

Другим центром притяжения рабочей силы на юго-западе является город Бая, куда 390 чел. ездят на работу из 9 поселений, в том числе и из таких поселений как Томпа, которое само развертывает притягетельное действие рабочей силы в микрорайоне.

Менее значительное притягательное действие на микрорайон развертывает город Кечкемет, куда 120 чел. ездят на работу из 6 поселений.

На западную часть микрорайона притягивающей силой воздействует город Калоча, куда 70 чел. ездят на работу из 2 поселений. А на северо-востоке из 4 поселений 120 чел. ездят в город Кишкунфэледьгаза на работу.

На основе анализа данных о микрорайоне Кишкунгалаше можно установить, что из сельских поселений всего 5068 чел. ездят ежедневно на работу в другие поселения, это дает 8% всех активных самодеятелей микрорайона. Однако, в поселения микрорайона всего 2722 чел. ездят ежедневно на работу, это — 4,2% всех активных самодеятелей микрорайона. Сводный баланс рабочей силы микрорайона отрицателен.

Анализируя причины поездки трудящихся на работу из одних поселений в другие, можно обнаружить, что на первый план выступает недостаток соответствующей занятости (в первую очередь, недостаток рабочих мест промышленного профиля), но решающую роль играют и лучшие возможности для большего заработка и более благоприятные условия работы. Считаю важной упомянуть в качестве причины и непланированную распределению рабочей силы. С помощью планирования рабочей силы можно было бы уменьшить число трудящихся, ездящих на работу с больших расстояний. Значение планирования подчеркивается и тем фактором, что в центрах микрорайона имеется недостаток рабочей силы, пока трудящиеся из соседних поселений ежедневно ездят на работу в другие поселения и города на большие расстояния (иногда в 50-100 километрах).

Селективное развитие промышленности, осуществляемое при координации комитатского совета, более концентрированный расход рабочей силы на новых промышленных предприятиях, планомерное и координированное осуществление сооружение промышленных участков уменьшают, в значительной степени, число трудящихся, ездящих на работу из одних поселений в другие.

PHYSICAL-GEOGRAPHICAL AND GEOLOGICAL ASPECTS OF THE EXPLORATION OF THE HYDROCARBON RESERVES OF THE SOUTH HUNGARIAN PLAIN

L. JAKUCS

Our age has become a revolutionary period not only of technological, industrial and social development, but also of scientific development. Our changed and still changing and developing life forms, conditions and requirements mean that new types of social demands are expected of the natural sciences, which are so closely interwoven with our everyday existence. It is understandable, therefore, if the branches of science carrying out research into the various phenomenological groups of the objective world, the changes in these, and the causes of the changes (e.g. biology, chemistry, geology, physics or geography), are no longer satisfied with their earlier content, systematization and explanations, but achieve new society-centred aims by fulfilling the planning of the optimum degree of rational utilization of the natural environment by exploring the complex interactions between the phenomena. Thus, the new type of natural sciences wish to bring about the social control and direction of natural energy previously merely acting spontaneously or just lying dormant. In this way they are striving to help mankind to become a sage ruler of the world (in the noble sense) and a responsible director of events.

Many geological sciences are known to be attempting to achieve the understanding of the features of the landscape, the clarification of the development of the earth's surface, and hence to explore the natural reserves hidden under the surface. In addition to geology, geophysics, geokinetics, hydrology, pedology, etc, a very significant and ever increasing role must be played by natural geography, for instance in the exploration of the hydrocarbon and thermal water reserves. The reason why this is so is primarily that, as a consequence of its methodology and the essence of its scientific content, natural geography can create a unity of view and a broad complexity in the accumulated knowledge in the geological sciences, which can not always be achieved by the individual branches themselves, remaining within the frameworks of their own fields. In other words, this means that natural geography is the science that is able to take the geophysical, geological, geokinetic, hydrological, pedological, climatological, etc., part-results, and to view them in a constructive complexity and unified harmony, in which the various colours of the spectrum combine into a beam throwing light on new essential correlations.

In this paper, on the example of the area of South Hungary east of the River Tisza, I should like to demonstrate the extent to which natural geography in our age has assumed the stamp of modernity in the above sense, and the fact that it is no longer the old recording and descriptive discipline as many justifiably regarded it even only one or two decades ago. We have passed beyond the period of the preparation of large, descriptive, detailed geographical monographs. Our excellent predecessors prepared the detailed and supplementary geographical descriptions as reagards the regional aspects of the South Hungarian Plain, and they also explained (often amidst serious debates) the natural and anthropogenic processes resulting in the development of the present surface. Accordingly, therefore, it was necessary for us to proceed further and to seek the means of applying and utilizing the accumulated information. The earlier claim as to the revolution in geography is true only if a new classification of the available information and hence the perception of the resulting new correlations can be proved to serve practical interests, and if they truly assist in the exploration and utilization of the natural potentials.

In this concept of geography, the Department of Physical Geography of József Attila University in Szeged first attempted 10 years ago to prepare a dynamic geographical synthesis of the South Hungarian Plain from the aspect of raw material research. In the course of this large work, over the years we collected a vast mass of data, outstanding roles being played primarily by MIHÁLY ANDÓ and JÓZSEF FEHÉR; with the systematization and the overall evaluation (in close scientific cooperation with the OKGT, the National Mineral Oil and Gas Industry Trust) we wished mainly to provide information of assistance in the Hungarian hydrocarbon exploration.

Our work was made particularly significant by the fact that evaluation of the discoveries arising from the geological synthesis of the previous sporadically performed palaeogeographical investigations and hydrocarbon explorations had already provided initial encouraging results for the hydrocarbon research workers, while in addition the necessity of interscientific collaboration of a similar nature was definitely confirmed by the most recent Soviet hydrocarbon exploration experience, from an economic aspect too.

The preparatory, data-recording part of the work is documented by the presented maps. Of these, Maps 1, 2, 3, 4, 7, 8, 9, 10, 11, 12 and 13 are new and previously unpublished ones, specially prepared in our Department. At the same time, Maps 5, 6, 14, 15, 16, 17 and 18 have been taken from other sources without modification, or with only unessential modification (e.g. geology), for the sake of uniform and comparative evaluability. The maps taken from external sources (BENDEFY, DANK, Mrs. HAÁZ, URBANCSEK, etc.) were also transformed to a 1:100 000 scale and were provided with keys on a principle analogous to that of our own maps, in order to facilitate comparative examinations and measurements on them.

Before I present the essence of the dynamic physical-geographical regional analytic method, applied on a hydrocarbon basis in this case, by comparison of the meaning-contents of the 18 maps, I should like to say a few words separately about the individual maps; I should note that in the presentation I have relied strongly on the valuable results of the earlier work on research into the Hungarian Plain, primarily of my colleague MIHÁLY ANDÓ.

Map 1, a contour map of South Hungary east of the Tisza, shows the individual contours with level differences of 5 m. Within the region examined, a level difference of only about 30 m is found between the highest points above the Adriatic and the lowest points. The highest points are found in the vicinities of Kevermes and Battonya (108 m), while the lowest one is situated south of Szeged, in the southern section of the Tisza valley (78 m). The surface slopes uniformly downwards from the south-east towards the west; this is genetically connected with the fluviatile filling-up of the development and with the permanent subsidence of the

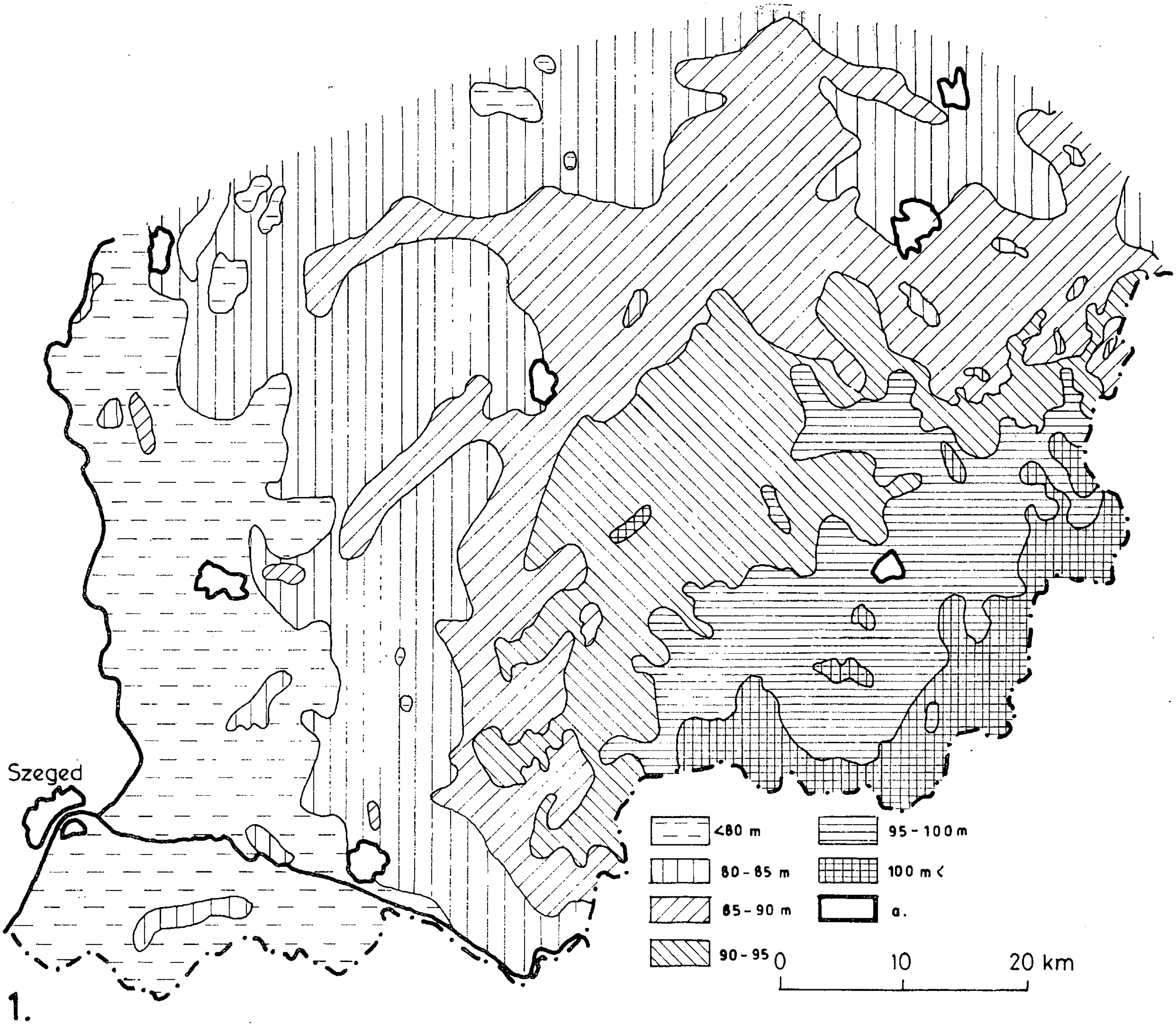


Fig. 1. Contour map of South Hungary East of the Tisza
(Prepared in the Dept. of Physical Geography, Attila József University, Szeged)
a = settlement

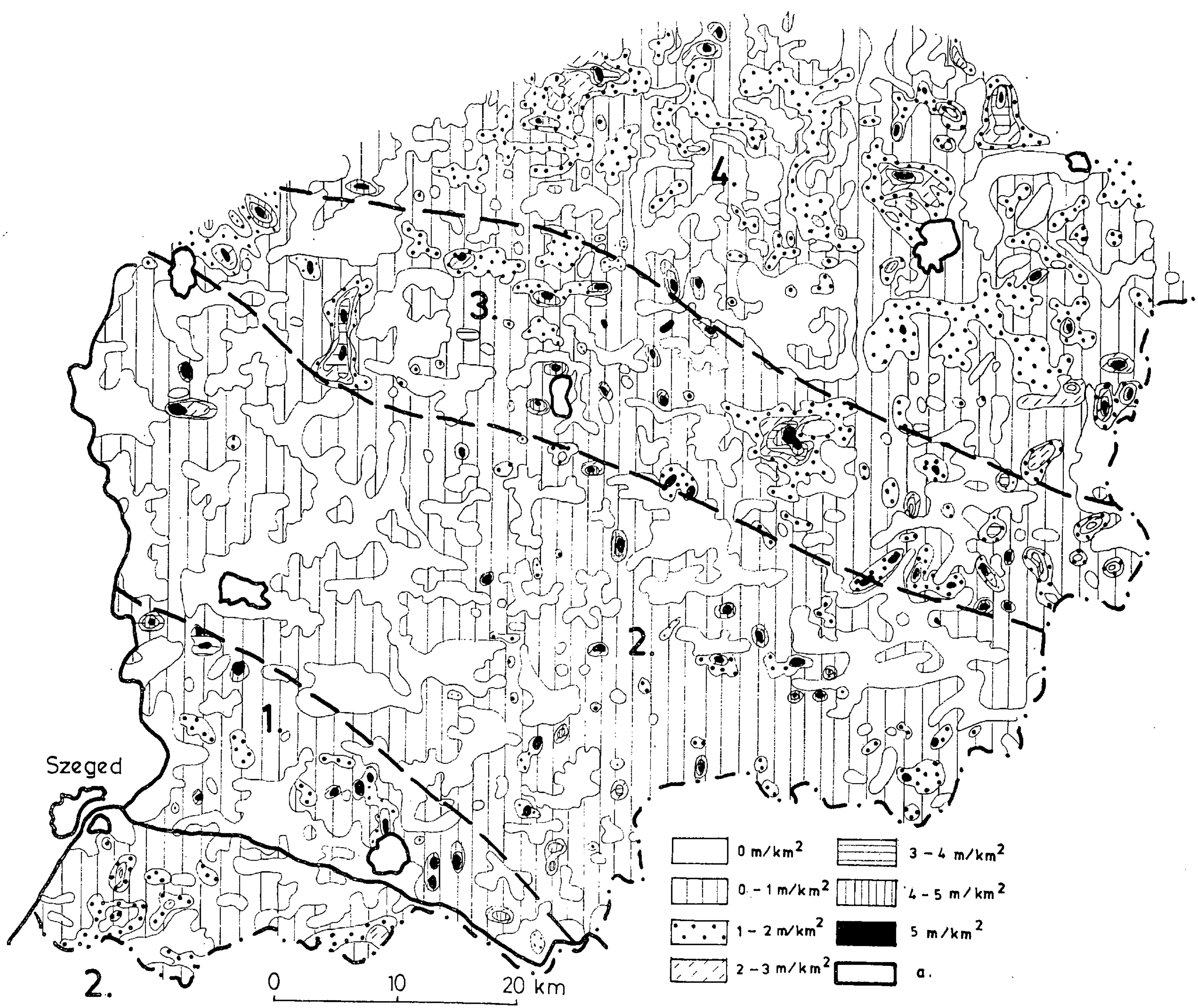


Fig. 2. Relief-Energy map of South Hungary East of the Tisza
(Prepared in the Dept. of Physical Geography, Attila József University, Szeged)
a = settlement

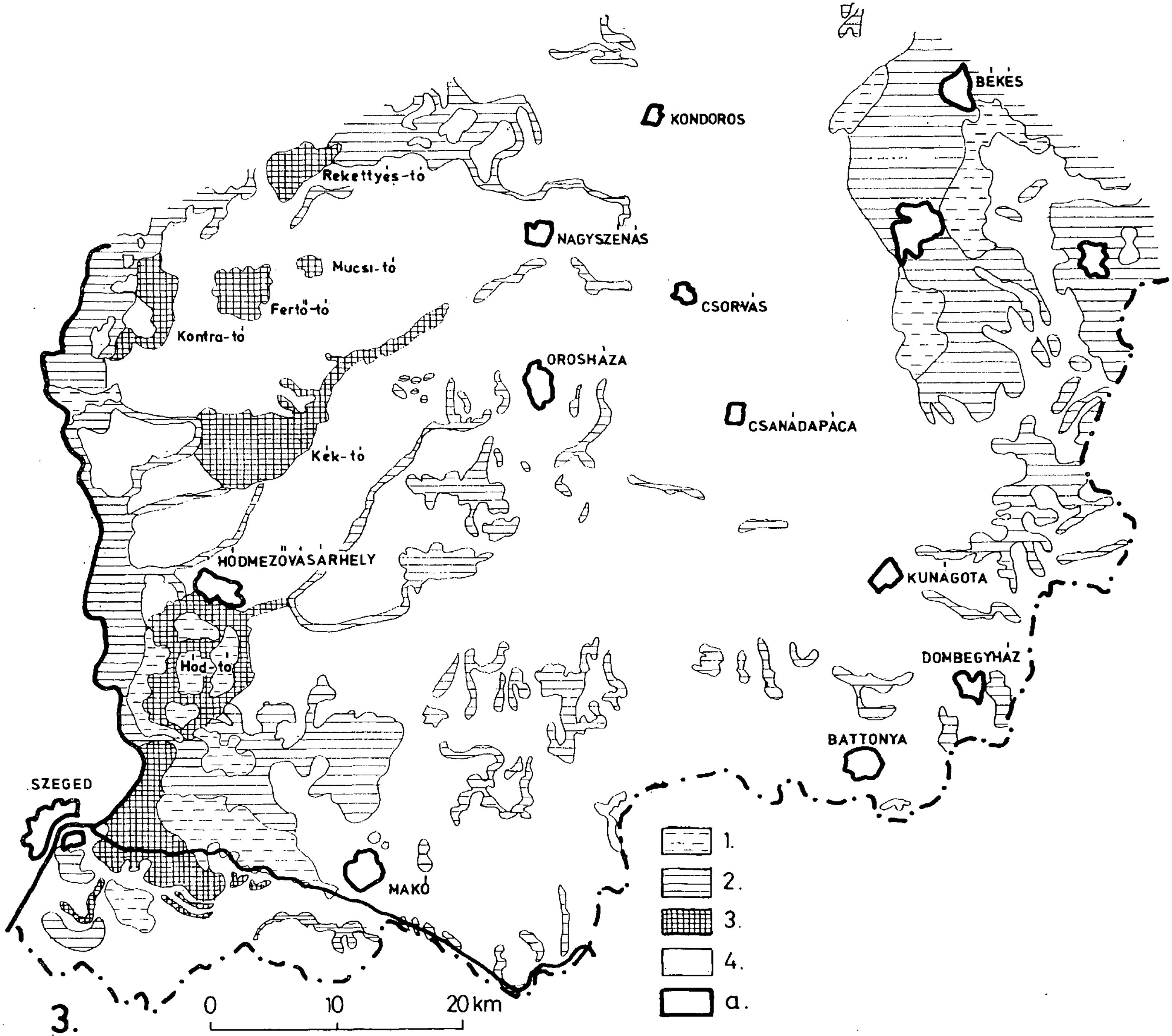


Fig. 3. Connate water map of South Hungary East of the Tisza
(Prepared in the Dept. of Physical Geography, Attila József University, Szeged)
1 = water coverage of flood plains and internal water
2 = water coverage lasting more than 6 months
3 = permanent water coverage
4 = dry terrain
5 = settlement

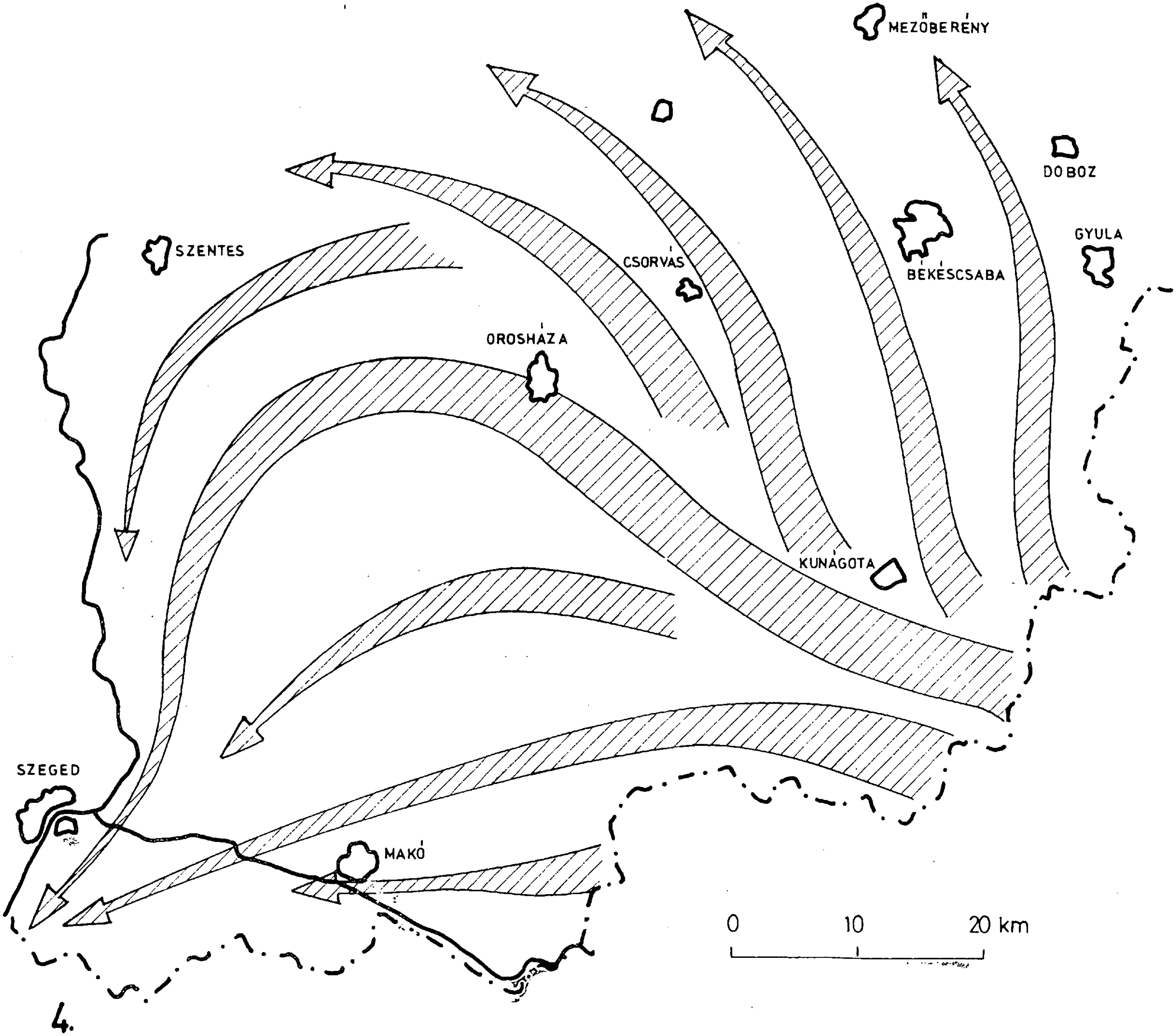


Fig. 4. Contemporary slope-tendency map of South Hungary East of the Tisza
(Prepared in the Dept. of Physical Geography, Attila József University, Szeged)

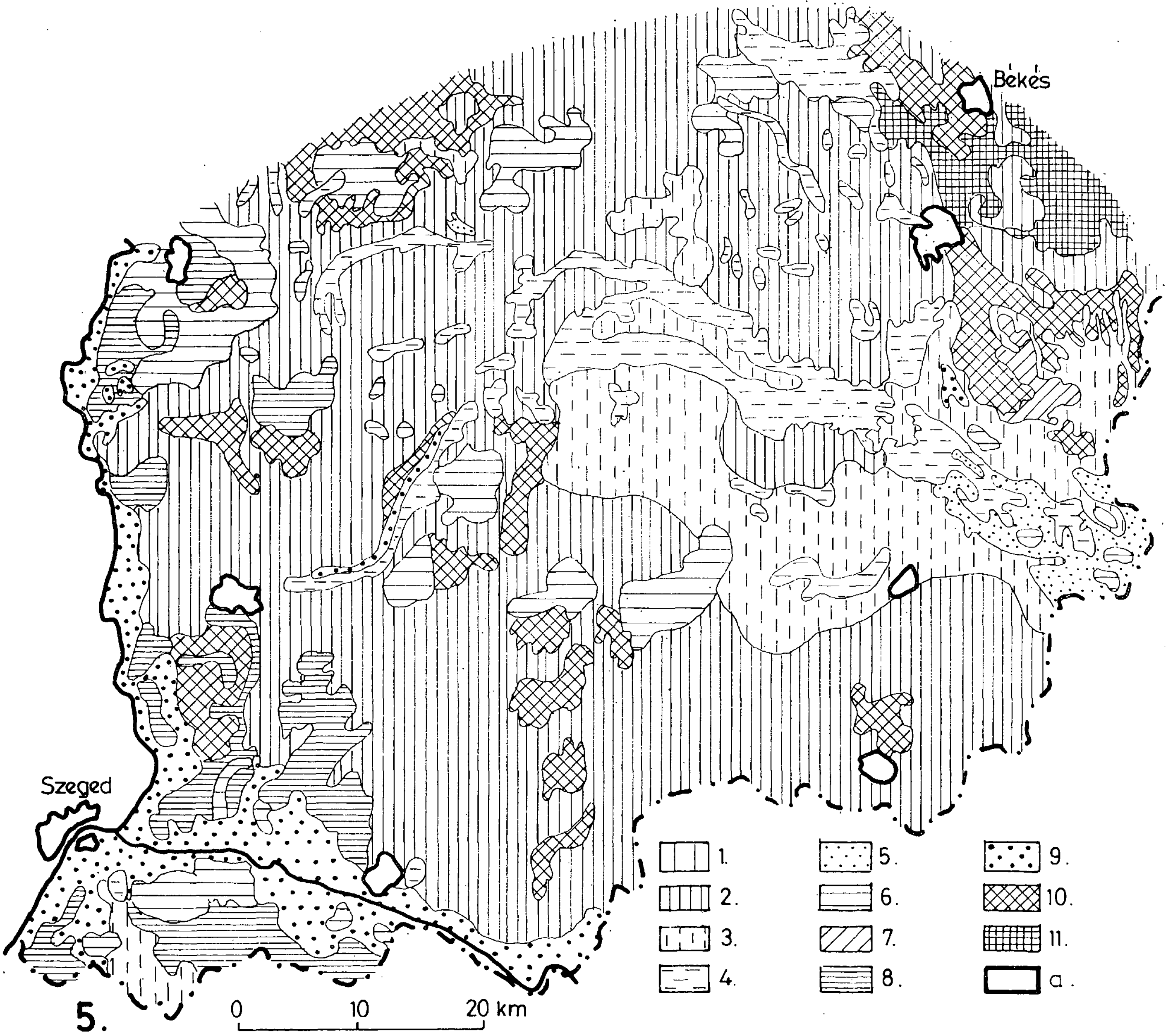


Fig. 5. Surface geological map of South Hungary East of the Tisza

1 = Typical loess
2 = Infusion loess
3 = Sandy loess
4 = Loessy sand
5 = Alluvial sand
6 = Clayey loess
} Upper Pleistocene

7 = Loessy mud
8 = Meadow clay
9 = Inundation sand
10 = Salinified alluvial sediment
11 = Brown earth
a = settlement
} Holocene

region. The smaller, more deeply-lying places compared to their environments (in the vicinities of Szabadkígyós, Orosháza, Csorvás and Nagyszénás), which are in contrast with the general east-west downwards-sloping tendency, are not indicative of the local subsidence of these areas, but are the consequences of the non-uniformity of the accumulation processes and of postgenetic factors (e.g. alkalinification, areal soil erosion, etc.). Depressions attributable to neotectonic processes in South Hungary east of the Tisza are expressed only in the form and terrain complexes of the larger regional units. Such areas with individual dynamics are signified by the subsidence area of the South Tisza valley with the Maros depression, for example, or by that of the Körös rivers, i.e. by the large depressions connected with the geokinetic processes on the western, northern and southern rim-lines of the region.

In connection with Map 2, a relief-energy map, it should be noted that the relief-energy values depicted are relative relief indices, prepared by regional interpolation of the relative level-difference indices shown at the centres of the square-kilometre network. The map reveals that, on the basis of the relief-energy types, there are 4 (comparatively well differentiable) regional units in South Hungary east of the Tisza. Proceeding from south-west to north-east, these are as follows:

1. The alluvium of the area of the influx of the Maros into the Tisza, where the relief energy is fairly variable, even in spite of the relatively level alluvial inundations. The outstanding values in this area are generally caused by positive forms, which genetically are mainly Pleistocene loess relict terrains. Even old oxbow lakes and abandoned bed sections too play a subordinate role in the areal determination of the relief-energy conditions. On 78% of this unit the relief value is 0—1 m/km^2, and only on 22% is it higher than this.

2. The zone with the lowest relief energy is a band defined by straight lines drawn between Szentes and Kevermes, and Algyő and Magyarcsanád, where the relief-energy values are 0—1 m/km^2 on 97% of the area. This zone otherwise coincides with the infusional surface of the western wing of the Maros talus, where the comparative lack of orographic forms means a reflection of the aeolian morphogenetics of the surface. The patches of small extent, but high relief energy, in the south-eastern half of the zone are caused partly by cairns, and partly by ancient river-bed and oxbow sections.

3. The morphologically most structured zone of South Hungary east of the Tisza is the band defined by the lines between Szentes and Kevermes and Nagyszénás and Elek, where the relief energy is lower than 1 m/km^2 on 76% of the area. At the same time, on the other patches the relatively high relief-energy values predominate, which are the projections of both positive and negative forms. This zone otherwise coincides with the rim-edge of the Maros talus, which is made more emphasized by the sand-band of the strata with a bank-side dune character, blown out and reaccumulated by the winds. There are also abandoned ancient river-bed sections between the sand-bands.

4. The richest band of South Hungary east of the Tisza as regards relief energy is the zone sloping down to the Körös depression, lying north-east of the line between Nagyszénás and Elek; in this, besides the surfaces with values of 0—1 m/km^2, which amount to 66%, the sites with higher relief energy also figure with relatively extensive arealities. For example, the surfaces with values of 1—2 m/km^2 comprise 26% of the entire area. This involves in part the isolated, aeolian-formed loesse, sand-dunes around Kondoros, and also the trenching lines dating from the end of

the Pleistocene and from the Old Holocene, which slope down to the Körös rivees. In the north-west half of the zone the lines of the Hajdúvölgy, Kórógy and Vekrr streams give negative forms showing up areally too.

To summarize, therefore, the relief-energy map may be evaluated so that the specific differences between the individual zone types are the consequences of the surface natural geographical processes which occurred during the Quaternary, and possibly anthropogenic effects, but not geokinetic reflections projeting out of the depths.

In connection with Map 3, showing the connate waters, it should be noted that it reflects the state prior to the river regulations and the prevention of flooding. In its construction, use was made not only of the cartographic material from the first military survey of *Emperor* JOSEF, but also of older cartographic material to be found in the archives. On the basis of the map of the connate water conditions, the area on the map can be subdivided into well-circumscribed details with characteristic zonal properties: 1. the north-south depression band of the Tisza valley; 2. the terrain of the western wing of the loess table in the South of Hungary east of the Tisza, divided by fluvial erosion and structured by smaller local depressions; 3. the floodwater-free table-land of the eastern wing of the loess table of South Hungary east of the Tisza; and 4. the depression area of the Körös rivers. The following remarks may be made in connection with the above-mentioned hydrographic regional units that can be well distinguished on the basis of the map of the connate waters:

The Tisza valley, which is becoming widely alluvialized in the southern part, at the mouth of the Maros valley, is undoubtedly conforming to the centre-line of a trough which at present too is subsiding more strongly than its environment; this is confirmed by the depressionally directed bed sections of the river valleys of the regional band adjacent to it to the east. Otherwise, the fact that even in the period before the regulation of the river, the sites with a constant water coverage did not coincide with the centrally situated flood-plain alluvium accompanying the direct channel-bed of the Tisza, but developed along a line almost parallel with the Tisza valley, 10—20 km to the east of it, is one of the dynamic natural geographical proofs of the Recent process of subsidence of the regional band. The streams with low erosional effects on the Hungarian Plain (Veker, Kórógy, Száraz, etc.) would have been unable to overdeepen their channels compared to their Tisza erosion base in continuous filling-up. In other words, this means that in the case of the constant water coverages in question, which appear to be overdeepened (Reketyés, Fertő-tó, Mucsi-tó. Kék-tó and Hód-tó), the fluvial overdeepening is only apparent; in actual fact, the process of subsidence of the terrain is reflected in those sections where the Tisza, accumulating much eluvium even on its flood plain prior to the regulations, could no longer equalize this with its continuous filling-up.

It must be noted that the reason why there is no water transport or water network on the floodwater-free table-land of the eastern wing of the loess table in South Hungary east of the Tisza, and also in the region of the "Hajdú stream table" around Kondoros, is that the area is situated relatively higher than its environment; further, because of its permeable near-surface rock facies, the lithological conditions of the development of the autochthonous water network too are unfavourable.

Finally, it should be noted that the floodwater affected area of the Körös

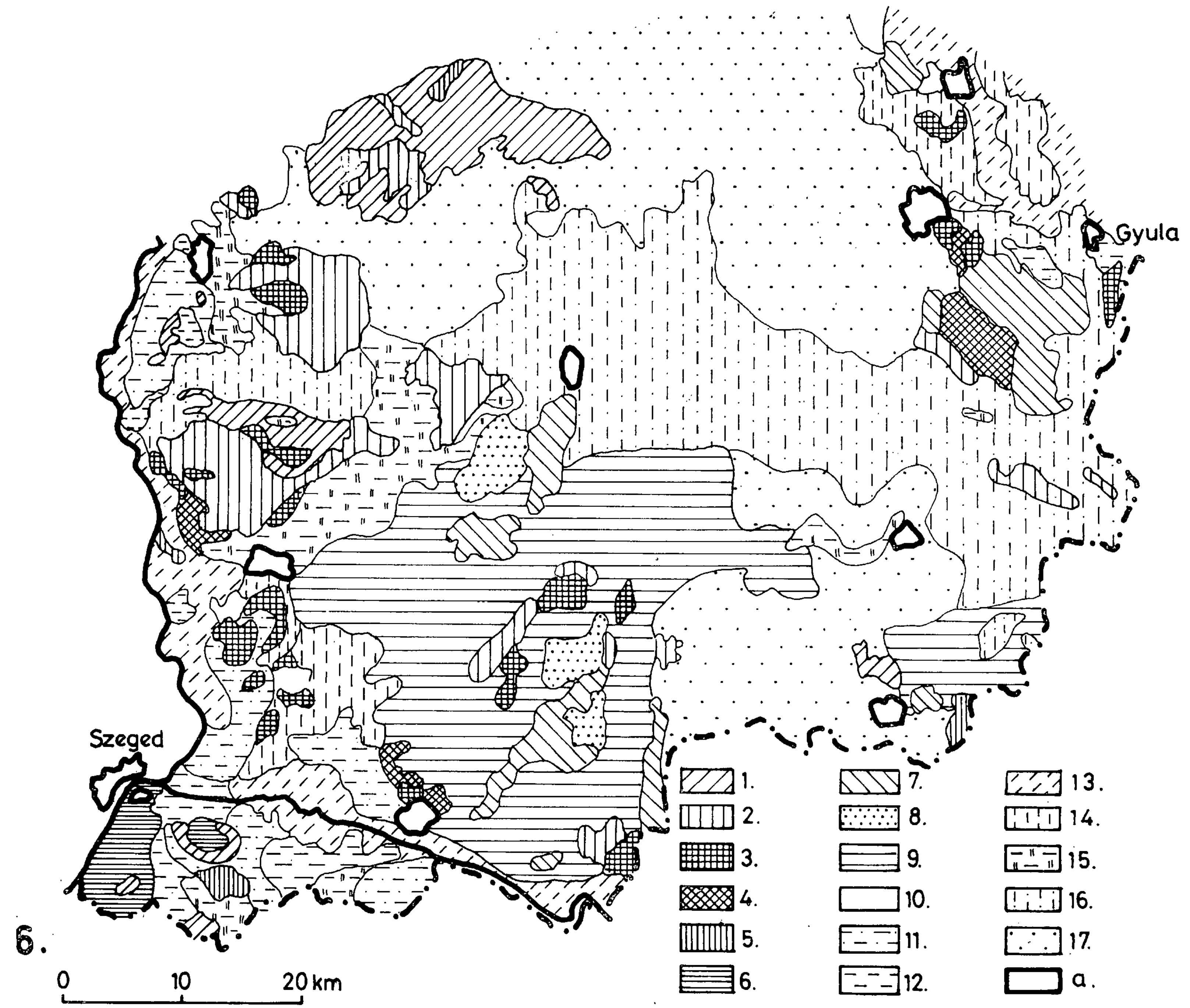
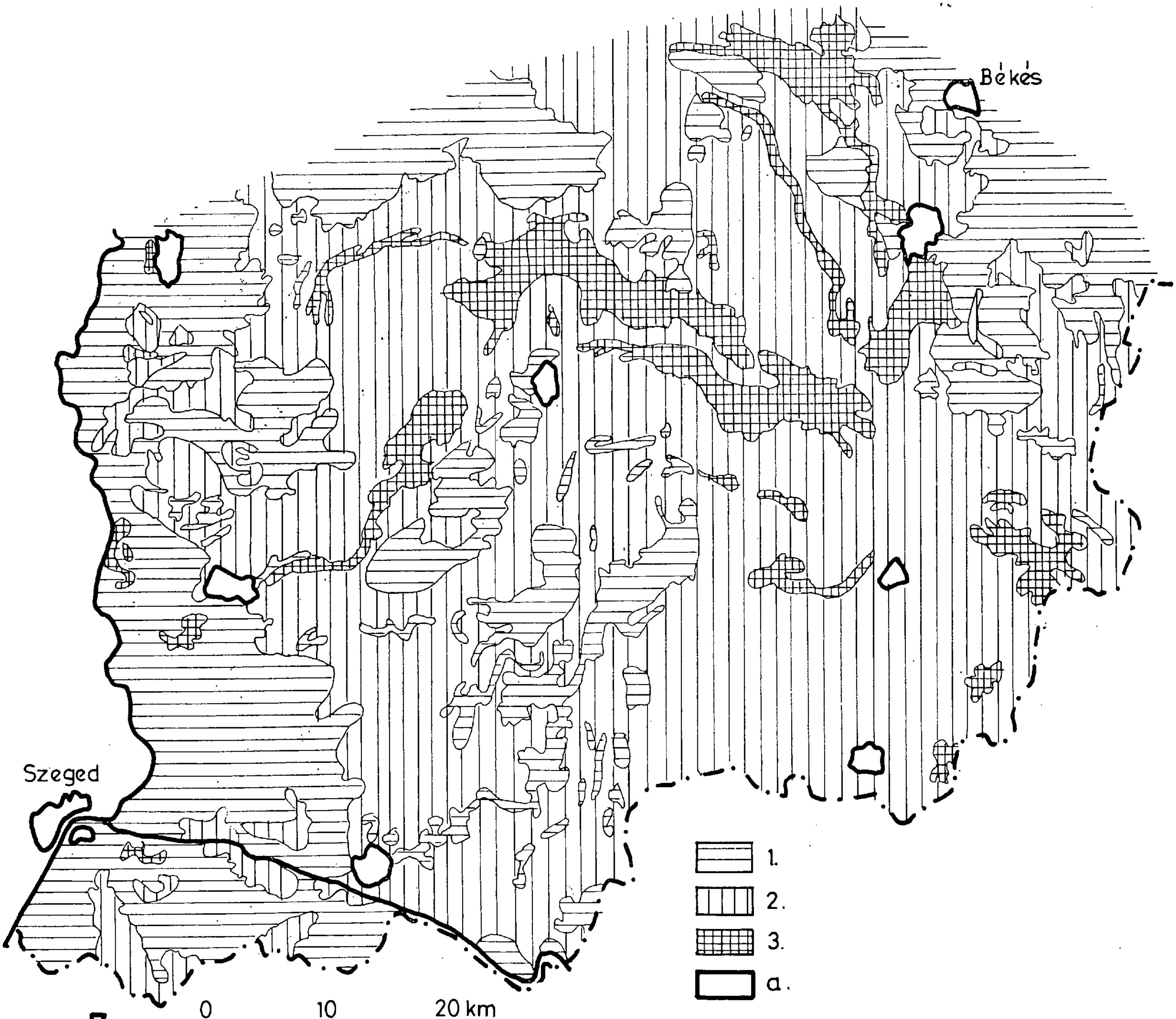


Fig. 6. Soil genetics map of South Hungary East of the Tisza
(Prepared in the Dept. of Physical Geography, Attila József University, Szeged)

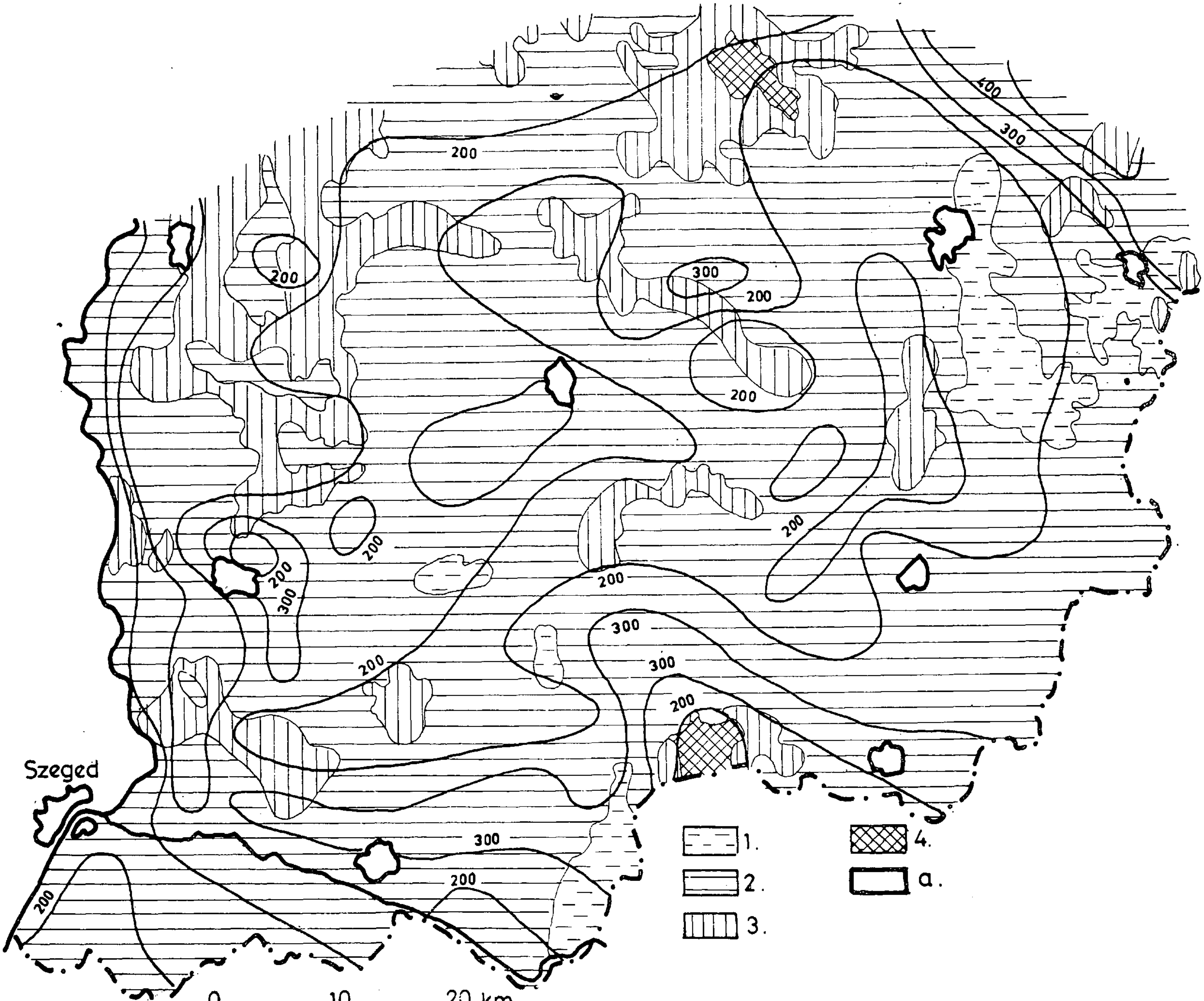
1. Alkalinified sodic soil, deep solonetz
2. Grassland soil with sodic subsoil
3. Lime-poor sodic soil, solonetz
4. Limy sodic, solonchak sodic soil
5. Meadow soil with sodic subsoil, with humic inundation
6. Alkalinified deep sodic soil, with humic inundiation
7. Grassland soil with sodic subsoil, with lime-poor sodic soil
8. Lime-poor (Solonetz)+limy sodic (solonchak) mixture
9. Grassland soil with sodic subsoil, with moderately humus-layered soil
10. Alkalinified deep solonetz, alternating with humus layers of moderate thickness
11. Meadow soil with sodic subsoil
12. Humic inundation soil
13. Young inundation soil
14. Meadow soil
15. Grassland soil with thin humus layers
16. Grassland soil with moderate humus layers
17. Grassland soil with thick humus layers

a = settlement



7.

Fig. 7. Permeability map of near-surface layers of South Hungary East of the Tisza
(Prepared in the Dept. of Physical Geography, Attila József University, Szeged)
Sediments with
1good ($K=10^{-3}-10^{-4}$ 2 = moderate ($K=10^{-4}-10^{-6}$ 3 = poor ($K10^{-6}-10^{-8}$
water permeabilities
a = settlement



8

Fig. 8. Soilwater geograpiycal map of South Hungary East of the Tisza
(Prepared in the Dept. of Physical Geography, Attila József University, Szeged)
Average subsurface depth of soilwater:
1 = 0—200 cm 3 = 400—600 cm
2 = 200—400 cm 4 = more than 600 cm
The thick" lines and the related numbers indicate the differences in the extreme fluctuations oilwattr level inCM
a = settlemen

rivers, which before the regulations was one of the most characteristic swampy regions of the country (Sárrétek), could ascribe its inundation to the fact that the area strongly and permanently subsided. This geokinetic process was particularly intensive at the end of the Pleistocene and the beginning of the Holocene, so much so that the enormous Pleistocene talus of the Körös rivers was covered completely by a lymnetic and fluvial covering-layer formed in the Holocene.

Map 4, a map of the present slope tendencies of South Hungary east of the Tisza, is a dynamic natural geographical map constructed on the basis of the relief-energy conditions, the contour map, the connate-water map, the map of the Recent river-valley network, the density map of the specific water network, and measurements relating to the regional parameters of the specific water transport; its vector lines show the main ablation directions and the proportions of their orders of magnitude.

The map clearly documents that the main ablation centre of South Hungary east of the Tisza coincides with the centre of the ancient Maros talus situated in the environment of Battonya, Kunágota and Lökösháza; otherwise, this is expressed more intensively as reagards the talus character beyond the borders of the country. It may be stated that on about 60% of the area the natural ablation not yet disturbed by anthropogenic intervention, and the accumulation connected with this, conform to the centre line of the South Tisza as an erosion base; however, the lines do not always follow the direction of greatest sloping, but much rather the routes of the ancient river valleys, the positions of which were determined by the rim-line of the ancient Maros talus, and the gradual fan-like spreading of this to the west (cf. the course of the central, longest vector line, which displays a parallel with the running-line of the present Száraz stream, as with the most important channel system of the ancient Maros).

The dip in the southern direction of the ablational force lines otherwise similarly proves the intensive permanent tendency of the South Tisza valley (Szeged basin) to subside.

The complex dynamic ablational force lines that can be constructed in the north-eastern third of the region (about 40%) show the distribution of the acting depressions. The northerly running of the lines of the eastern rim area is undoubtedly explained by the depression of the Körös (Sárrét) subsidence region. In places this effect can be observed so markedly that, even in the absence of facies-identification drilling material, it must be assumed that in the course of the Pleistocene a mixing of matter onto the talus of the Körös rivers occurred from the direction of the ancient Maros talus too.

The declination to the west of the dynamic lines in the vicinity of the northern boundary of the region already expresses the effect of the Tisza of the Pleistocene. This depression might otherwise have been the erosion base of the running-direction of the ancient Ér, Berettyó and Körös too. In this respect the measurements confirm the known connate-water river-network development conception of JÓZSEF SÜMEGHY.

Map 5, showing the surface geology of South Hungary east of the Tisza, in our view faithfully reflects of our geodynamic findings generalizable to the history of the surface development, according to which the system of the Maros talus plays a decisive role as a central filling-up area, and the zone of the subsidence regions is situated along the northern and western rim-lines of this. In the central zone the rocks are generally characterized by a higher porosity (this is the case for both the fluvial and aeolian sediments), whereas in the subsiding troughs of the rim parts, which at present too are accumulational areas in the main, the finer-compositined and structurally too more compact lymnetic and fluvial sediment facies predominate.

In Map 6, a soil-genetics map of South Hungary east of the Tisza, we find three soil regions in a genetic sense. Although two of these (the Tisza valley and the Körös region) resemble each other in many respects as far as their soil genetics are concerned, from a geographical aspect there is nevertheless an essential difference between them because of the predominance of the lymnetic or the fluviatile character. The third area (the table-land of the Békés-Csanádi loess table) has different soil features from the foregoing, being characterized by the soil varieties formed on the more porous rocks.

The soils of the Körös region primarily developed from sediments washed in from the environmental higher areas as a consequence of the close interaction of the flowing and standing waters. Extensive clay surfaces formed, which develop to have very different thicknesses and qualities in the course of the water-coverage of the terrain to various depths. In the depressions clay was generally deposited, the mother rock of which was mainly loess and red clay. The difference between thes two mother rocks is also expressed in the present soil characteristics.

In the Körös region, in addition to the clay there is also a significant occurrence of inundation soils, particularly in those parts where the rivers accumulated sediment series by continual repetition, without a longer interruption, in the meantime no swampy vegetation developing in the area. In contrast, in those places where swampy vegetation too developed, the most bound black meadow clay soil is found.

The soil conditions of the valleys of the Tisza and Maros exhibit a close connection with those of the Körös region. The correlation is particularly expressed in the fact that here too the soils are of young origin, and these developed primarily as a result of the running and standing waters. There is a difference, however, in that there is less red clay and more inundation mud in the soil-forming sediments, and because of this the soils produced here are not so bound as in the previous region. The individual types are situated regularly, parallel with the current channel of the Tisza. Thus, young inundation soils may be seen in the immediate vicinity of the river, with meadow and meadow-inundation soils farther away. In the case of these latter two soil types, clayley binding too is frequent. These soils are acidic, which is indicative of a Tisza origin.

On the Békés—Csanádi loess table-land the arable soil layer developed in the main from Pleistocene sediments (infusion loess, sandy loess, muddy loess, sand, etc.). In places, soils formed on alluvial flood plain sediments also occur, but these are restricted only to the regions of the old ox-bows.

The construction of Map 7, showing the permeability of the near-surface layers (0—10 m) of South Hungary east of the Tisza, was considered important, for in our view the nature of the region-constructing processes is reflected better and more faithfully by the petrological character of the 10 m thick near-surface complex of layers than by two-dimensional geological or pedological maps depicting merely the surface conditions. In addition, such a map is indispensable for a genetic assessment of the hydrogeographic, and particularly of the soilwater-geographic, characteristics. Our map was constructed via the processing of the material of near-surface drillings by VITUKI.

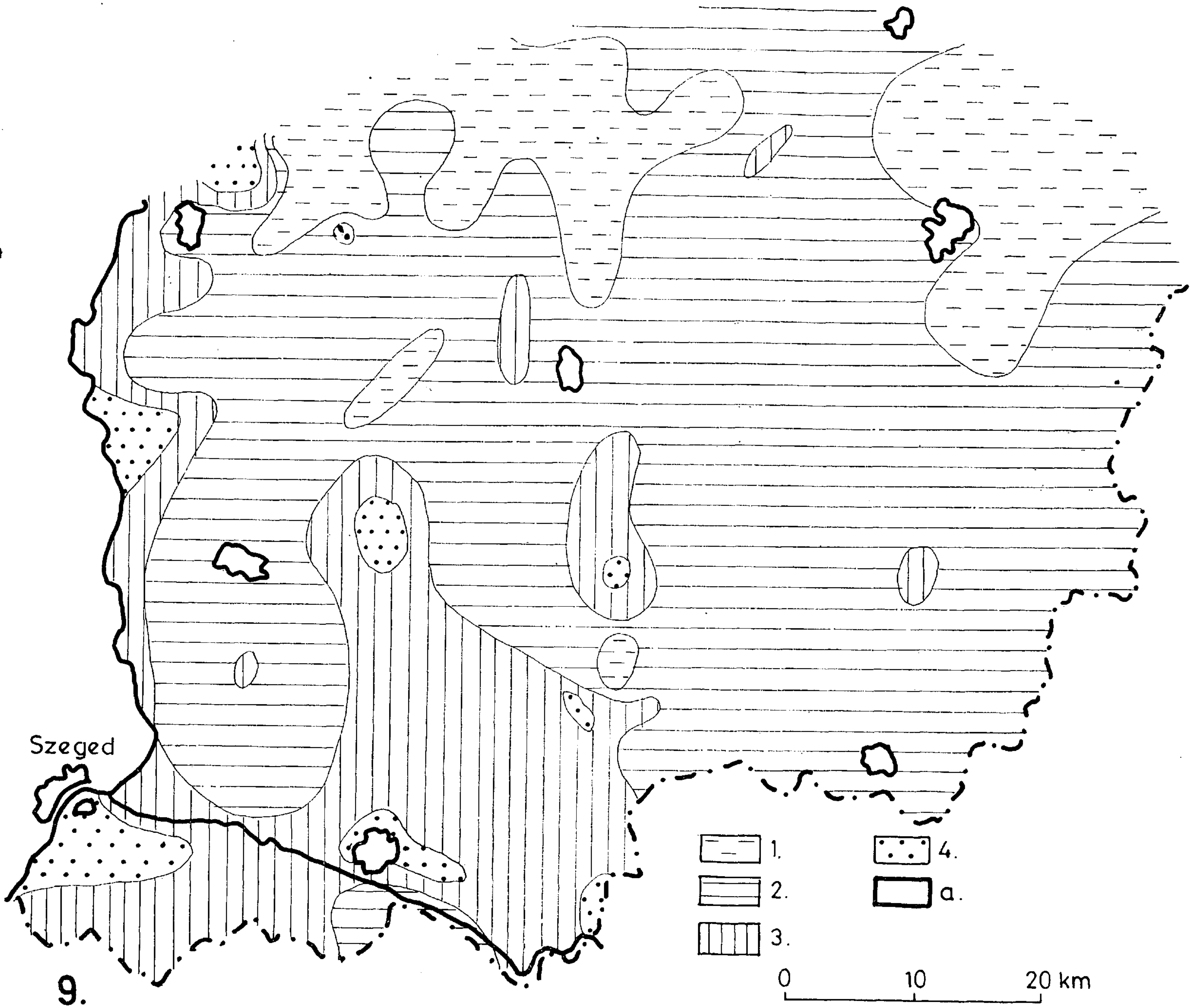
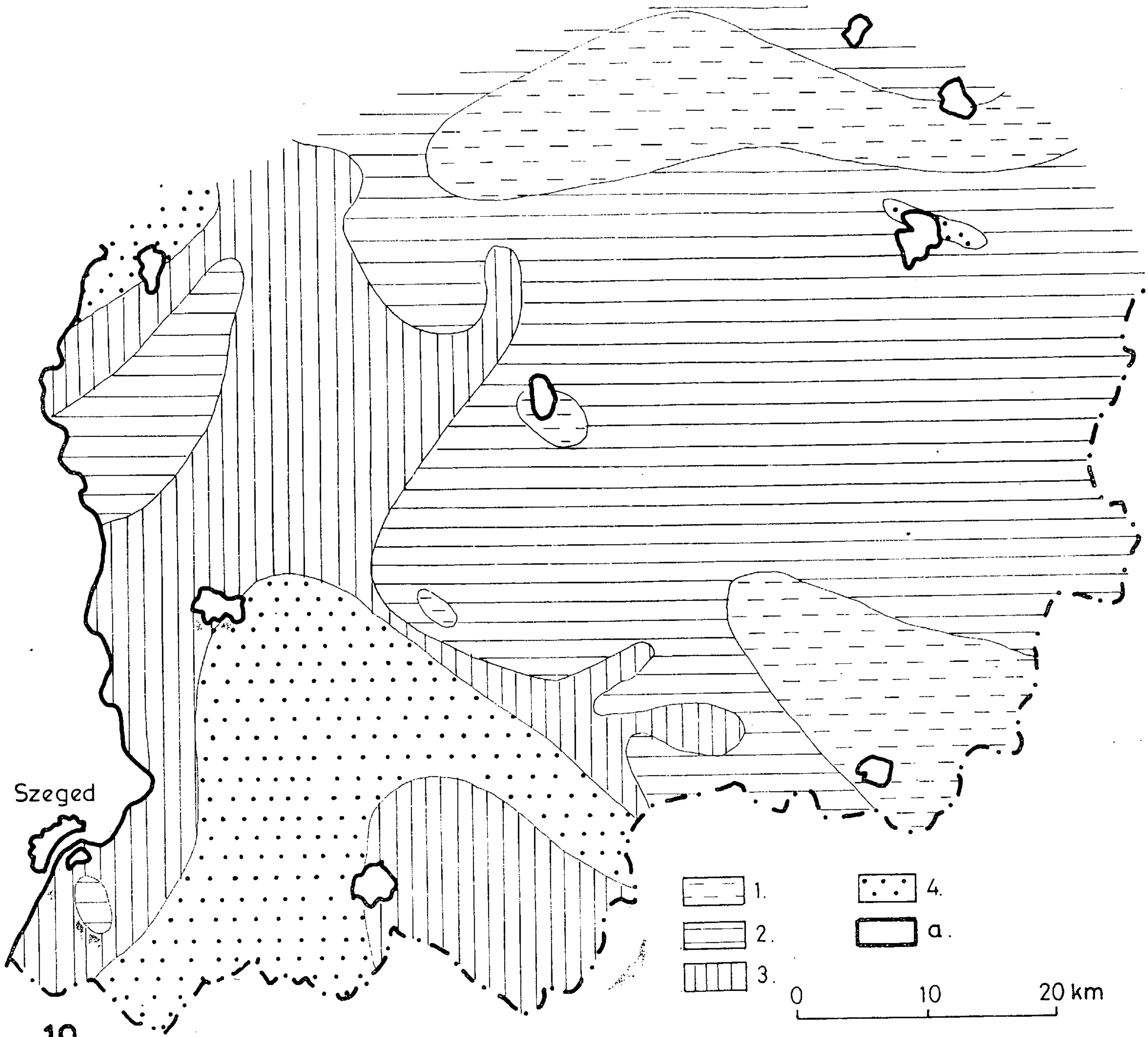
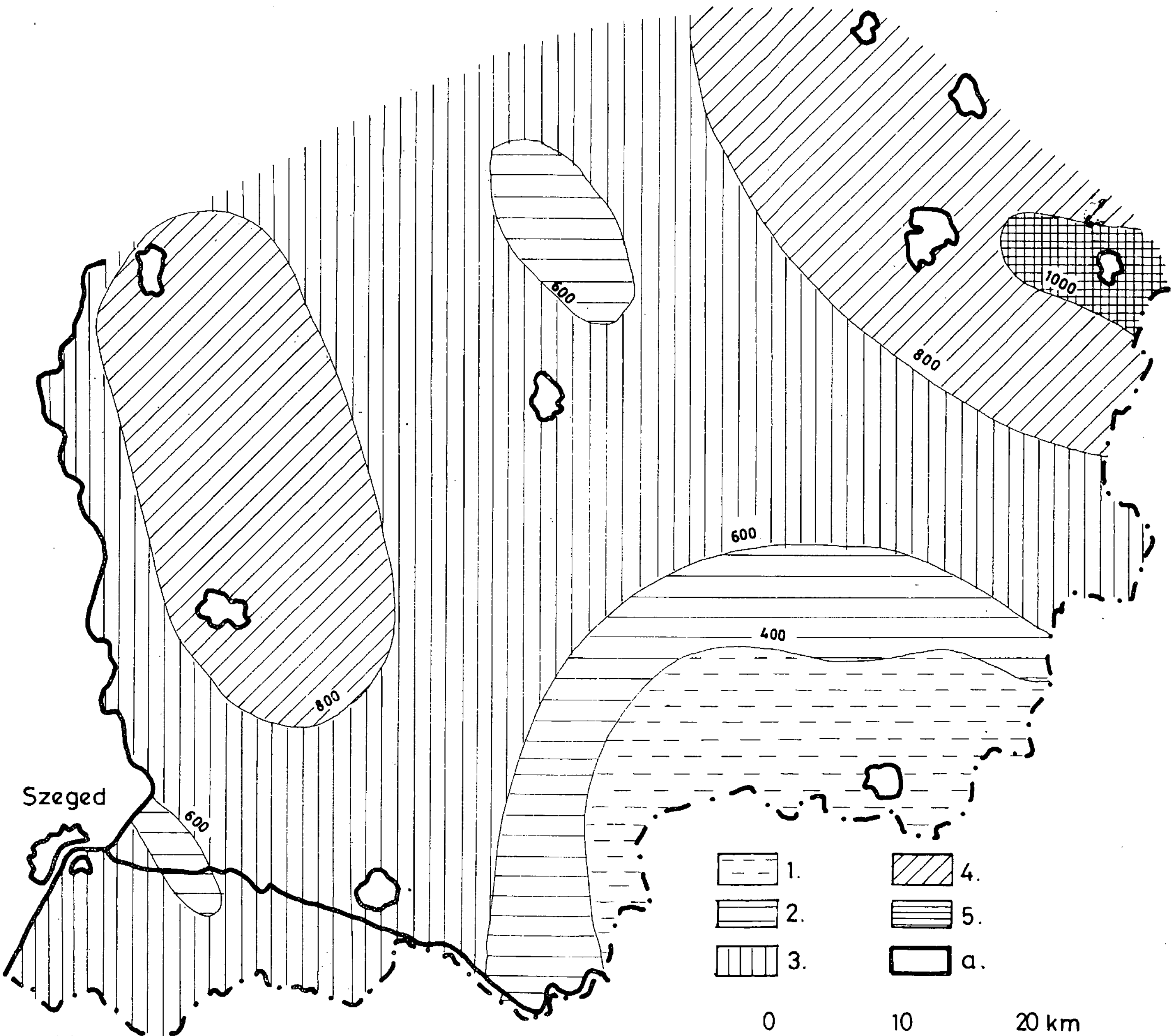


Fig. 9. Percentage sand contents of the sediments of the 200—300 m strata in South Hungary East of the Tisza (Prepared in Dept. of Physical Geography, Attila József University, Szeged)
Percentage of sand in the 200—300 m stratum:
1 = 0—25%   3 = 50— 75%
2 = 25—50%   4 = 75—100%
a = settlement



10.

Fig. 10. Percentage sand contents of the sediments of the 300—400 m strata in South Hungary East of the Tisza (Prepared in the Dept. of Physical Geography, Attila József University, Szeged)
Percentage of sand in the 300— 400 m stratum:
1 = 0—25„ 3 = 50— 75%
2 = 25—50% 4 = 75—100%
a = settlement



11.

Fig. 11. Bed-map of the levante stratum in South Hungary East of the Tisza
(Prepared in the Dept. of Physical Geography, Ettila József University, Szeged)
Depth of the Levante bed compared to the levele of the Adriatic sea:

1 = 400 m, 4 = 800—1000 m,
2 = 400—600 m, 5 = 1000 m
3 = 600—800 m, a = settlement

Analysis and comparative evaluation of the drillings and the grain-size curves led to the finding that the frequency of the sandier, coarser-grained compositions displays a linear correlation with the height of the area above sea-level. However, this correlation is manifested only statistically, for sandy facies occur in lower situations too, though these generally exhibit linear development and finer fractions.

Naturally, attention must also be paid to the circumstance that whereas the regions with a definite height above sea-level have a large areal extent, the frequency of occurrence of the sandy layer composition associated with these remains linear and is materialized only with linear statistics. This circumstance proves, therefore, that a faithful picture of the individual phases of the course of palaeographic development may be obtained only by means of a combined evaluation of the drillings and the related surface-morphological investigations.

As regards Map 8, depicting the soilwater geography of South Hungary east of the Tisza, it must be noted that this is based fundamentally on the soilwater map of KÁROLY UBELL; supplentation of this was made on the basis of the observation data of our Department, and also those of the VITUKI station-network, which were all subjected to statistical processing.

The most striking characteristic of this map is that the boundaries of the rest levels of the soilwater (denoted by dots) differ considerably from the field-boundaries of the water-level fluctuations (denoted by lines); this is a consequence of the permeability and conductivity of the near-surface layers, the flow direction and flow rate tendencies (which depend on the various soilwater level heights), and the morphological features. It is interesting to note the lateral deflection of the soilwater fluctuation contours in the region of Tótkomlós; this is related with the areality of the sand layers built up in the Maros talus, and with the abundant soilwater replacement from the direction of the Erdélyi island hills.

Map 9 gives an interpolated cartographic plotting of the percentage sand contents of the sediments of the stratum at a depth of 200—300 m. For its preparation we made use of the drilling records and descriptions of strata connected with artesian wells with a depth of at least 300 m to be found in the documentation of the Hydrological Department of the National Water Board and also in the national register of wells. These data were supplemented with the values obtained from the electrical survey profiles of hydrocarbon prospecting drillings made available by the OKGT. With regard to their sand contents, the following descriptions were applied to the various types of sediments:

sand, gravelly sand	100%
muddy sand	75%
clayey sand	60%
sandy mud	20%
sandy clay	10%
mud, muddy clay, clay	0%

It should be noted that the geological age differences were not taken into account in the construction of the map. These age boundaries have not been sufficiently well clarified in the transverse layers, while in addition the primary aim in the preparation of the map was the elucidation of the vertical movement tendencies of the area in question, which may be better reflected in the facies-differences of the sediments according to grain size than according to the geological age boundaries.

The map illustrates well that the coarser-grained sediments are situated in the western and south-western parts of the area, while the sediments have finer grains in the north and east. This can be explained in that Pleistocene deposits of fluvial origin appear in the western half of the stratum examined, whereas in the eastern half of the area we are concerned with finer-grained sediments of lacustrine origin from the end of the Tertiary. At the same time, however, this circumstance may also indicate that the main line of the present Tisza valley and particularly the district where the Naros joins the Tisza was the most strongly subsiding part of this area, even when the sediments in question accumulated.

It may be established from the map that the Maros talus, which is sharply outlined in the near-surface layers, does not appear at depths of 200—300 m. From this it becomes clear that the subsidence of this area was slow and insignificant after the development of the talus (Plio-Pleistocene).

Similarly, the rest state of the area is delineated on the region of the present depression of the Körös rivers too. From the fact that primarily lacustrine (Levante) fine-grained sediments are to be found in the levels examined in the northern and north-eastern half of South Hungary east of the Tisza, it follows that the subsidence of this area stagnated in the Levante, and the earlier-formed basin part was filled in. It must be noted that the Körös talus system, subsided and demonstrable on the basis of surface and near-surface investigations, is indicative of the renewed subsidence of this area in a relatively young age; moreover, this movement tendency, at the end of the Pleistocene or in the Old Holocene, was of high intensity.

Map 10, depicting the percentage sand contents of the strata of the levels between 300 and 400 m, was constructed in an analogous manner, and by processing of data from the same sources as for the levels between 300 and 200 m. If Maps 9 and 10 are compared, above all the great similarity is apparent: they strongly outline the considerable facies-difference between the south-western + western and the eastern + northern halves of the area. Indeed, in the 300—400 m levels the western, coarser-grained band broadens out and becomes increasingly more sandy in the southern half. At the same time, the sediments in the central area of the Maros talus are even more fine-grained than in the layers above them.

Map 11, showing the bed-relief of the Levante layer complex of South Hungary east of the Tisza, was constructed on the basis of the processing and evaluation of the layer descriptions, electrically-surveyed profiles, etc. of hydrocarbon-prospecting borings made before 1967, and provided to us by the OKGT. Our map differs appreciably from map no. 7 with the same name in the "Hydrogeological atlas of Hungary". We consider the cause of the differences to be the fact that the cartographers who prepared the map for the hydrogeological atlas were compelled to interpolate on the basis of substantially fewer data, since the material from the large number of hydrocarbon-prospecting drillings made recently in the area was naturally not available to them. Even in connection with our map, however, it should be noted that the data network on the basis of which it was prepared is not equally dense in all areas: there are some districts in South Hungary east of the Tisza where even at present we have insufficient data and hence the interpolation is still open to some question. In such districts we were forced to rely on the data of the oil-prospecting drillings that have been made, and in their absence on the more uncertainly assessable data of artesian borings. Such areas are the north-eastern quarter of South Hungary east of the Tisza, and the Hódmezővásárhely—Szentes district.

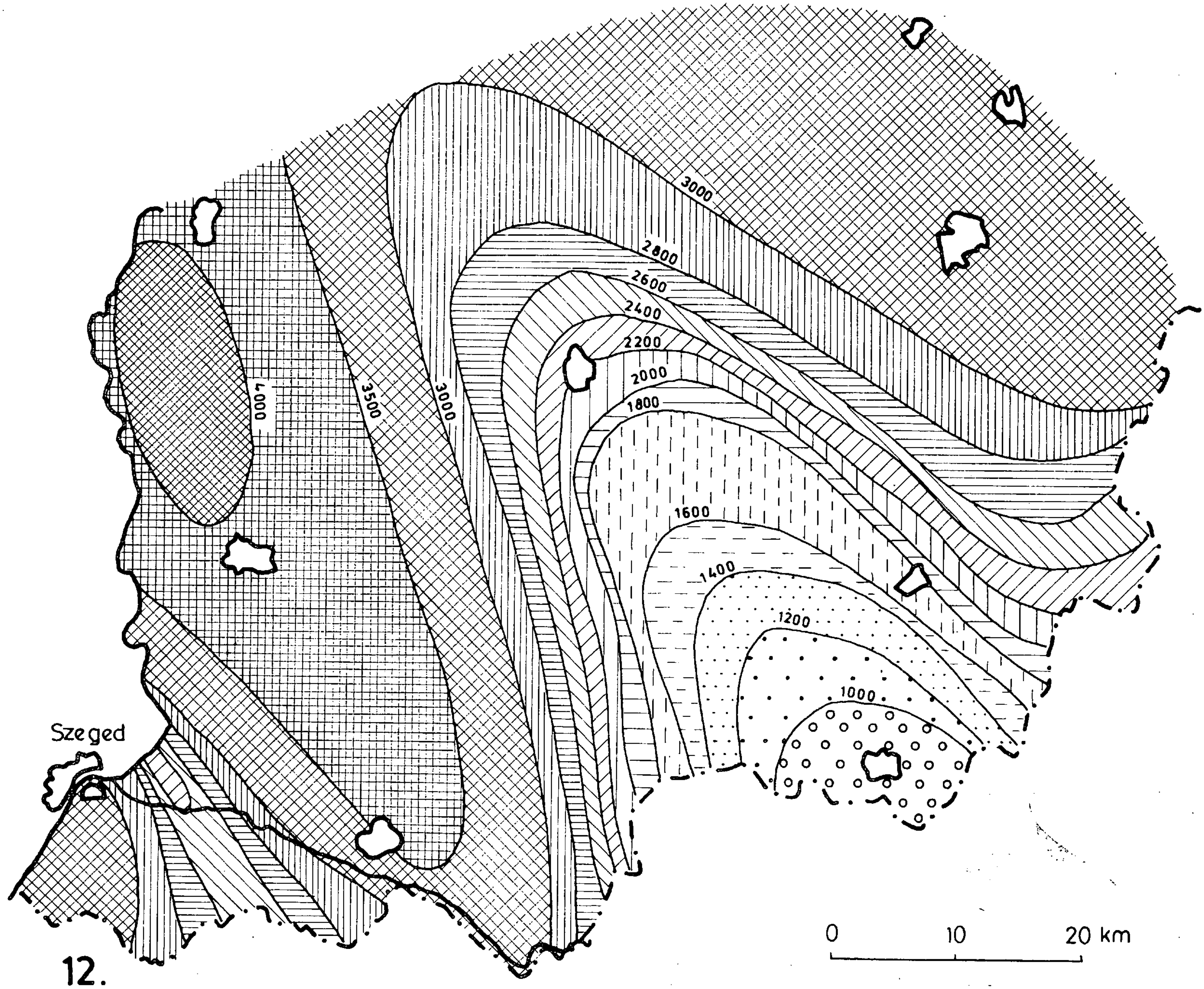


Fig. 12. Bed-map of the pannonian stratum in South Hungary East of the Tisza
(Prepared in the Dept. of Physical Geography, Attila József University, Szeged)
The numbers on the contours denote absolute bed depth in metres

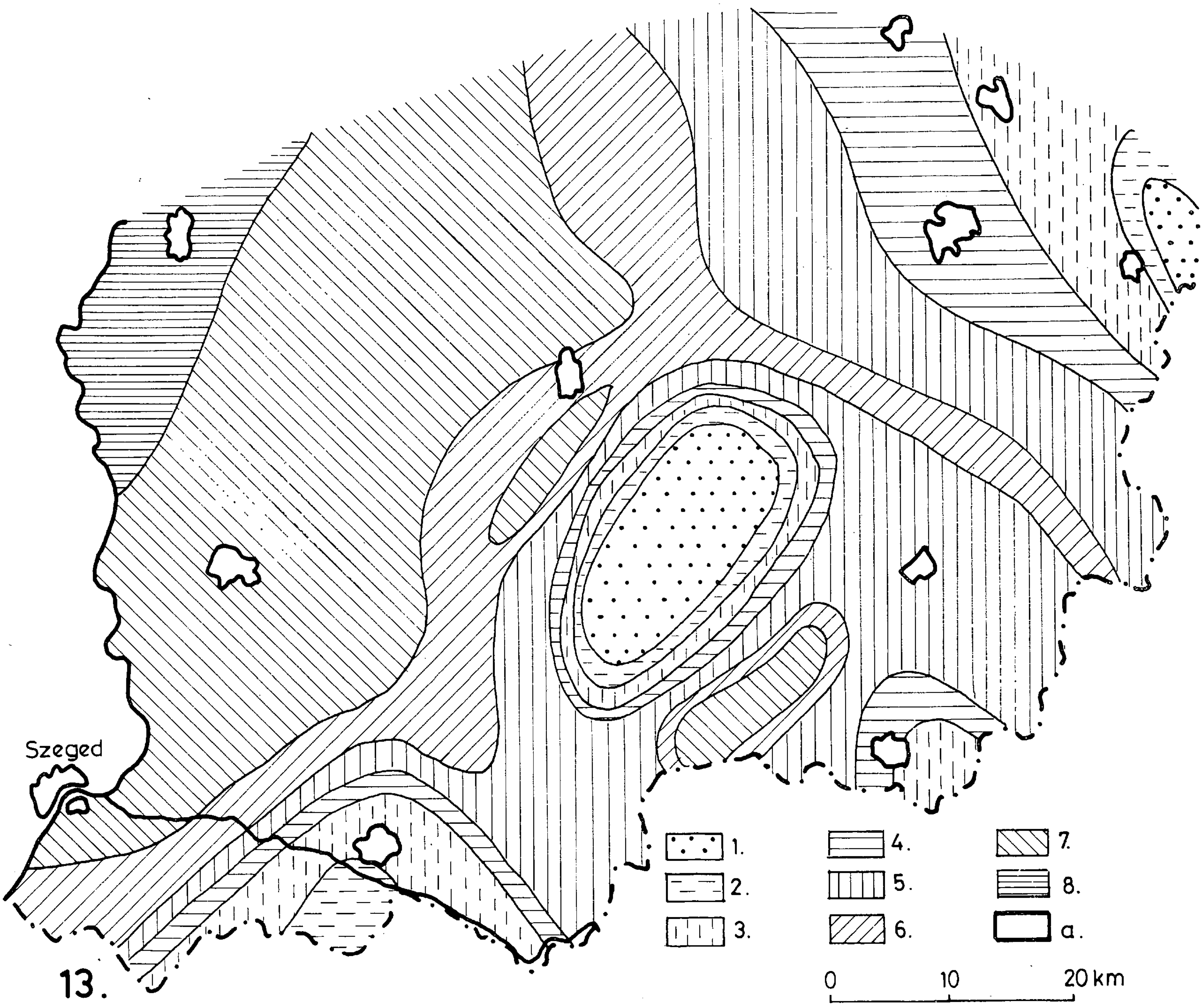


Fig. 13. Map showing thicknesses of pannonian layers with porosities above the limiting value in South Hungary East of the Tisza
(Prepared in the Dept. of Physical Geography, Attila József University, Szeged)
Total thickness of the porous Pannonian layers:
1 = 50 m, 4 = 400— 600 m, 7 = 1000—1200 m,
2 = 50—200 m, 5 = 600— 800 m, 8 = 1200 m
3 = 200—400 m, 6 = 800—1000 m, a = settlement

From a study of the map, it may be stated that the position of the Levante bed reveals two well-distinguishable basins in this area, and one table-land, rising above the general terrain. Of the basins, the western one can be denoted by the Szentes—Hódmezővásárhely axis, and the other, deeper one by the Gyula—Békéscsaba—Mezőberény axis. Besides these depressions, in the south-eastern corner of the area the Levante bed shows up a table-land rising above an absolute height of 400 m; areally this almost coincides with the extent of the later Maros talus.

As regards the relative level-difference of the order of 400—600 m, and the fairly areal and uniform facies conditions characteristic of the initial stages of the Levante, on the basis of these we may explain the differences in bed depth only by the different dynamics of sedimentation of the various parts of the area. Otherwise, in this respect the nature of the movement mechanism displays a striking parallel with the geokinetical tendencies to be observed in Maps 12 and 14.

From a study of Map 12, which shows the bed-relief of the Pannonian layer complex of South Hungary east of the Tisza, it may be established that the Pannonian bed sharply outlines a table-land tapering and becoming lower towards the north-west; the axis of this coincides with the line Battonya—Orosháza. The highest part of the table-land is situated near Battonya.

A second, but much less prominent table-land also appears east of Szeged. The highest and most central part of this lies between Szeged and Maroslele, on the bisector of the straight line joining the two places, and the table-land lies along a longitudinal axis from north-west to south-east, by and large parallel to the previously-mentioned Battonya—Orosháza table-land. Between these two anticlines, the position of the Pannonian bed indicates a trough broadening out in the north-north-west direction, the deepest central part of which lies between Hódmezővásárhely and Szentes, at an absolute depth of more than 4000 m.

The second Pannonian bed depression of South Hungary east of the Tisza is the Sárrét—Békés basin; however, in our research area this does not attain a depth greater than 3500 m, and it appears to be wider and flatter than the Szegvár depression. The deepening of this Békés depression in the Miocene was therefore of lower intensity than that of the Szegvár depression. All these very significant level differences make indisputable the selective subsidence of the area, discussed above.

In the construction of Map 13, depicting the thicknesses of the Pannonian layers with porosities above the limiting value, attention was paid to the positions of the layers of the Pannonian overlay and bed, to their depth relations, to the thermal water reserves stored in the Pannonian stratum, to the electrically-surveyed profiles of prospecting drillings, and to the water yield data of wells producing thermal water.

From this map it may be stated that during the duration of the Pannonian the most intensively subsiding part of the area was the basin of the Tisza valley; abundant thermal water-containing layers from the Pannonian are found there too, primarily in the region of Szentes—Szegvár. Apart from this extensive basin, however, there are further smaller maxima in South Hungary east of the Tisza, e.g. east of Mezőhegyes, between Orosháza and Békéssámson, and also the area between the two Körös rivers. In contrast, in the region of Kaszaper—Tótkomlós the Pannónian layers are thinner, and in addition the porosity index of the rock is lower.

Map 14, illustrating the substratum relief, was prepared by reconstructing and supplementing the map of VIKTOR DANK. It must be noted, however, that the data from some newer drillings suggest that further corrections of the map will be necessary, particularly in the southern and south-western quarter. For example, in the region of Makó the substratum is deeper, while in the region of Algyő—Deszk—Ferencszállás it is higher than indicated on the map. Disregarding these subsequent refinement details, however, the substratum relief even now clearly indicates the tendencies of the ancient geographical development, sharply emphasizing the process of the Erdélyi island hills, outlined along the Battonya—Orobháza axis, with maximum at Battonya. This is surrounded by a broad and deep, semicircular basin-trough, which can be resolved into a wider, but flatter northern part-basin, and a narrower, but deeper western part-basin. The centre of the latter is Hódmezővásárhely, and its meridional axis-line is the preformational factor of the ancient Tisza valley.

In addition to the basin-bottom large forms to be discerned from the map, there are naturally also smaller part-basins, ridges and upthrusts on the surface of the substratum. A sufficient number of data for their detailed construction are not yet available, however. Since these microstructures are scarcely likely to have had any determining significance as regards the later course of development of the ancient geographical picture, we did not make a special effort to depict them.

We shall not deal with a detailed evaluation of Map 15, a gravitational map of South Hungary east of the Tisza. To emphasize its salient features, however, it must nevertheless be pointed out that there are two larger and two smaller gravitational maxima and one more extensive gravitational minimum in the region. The maxima are as follows:

1. The district of Kiszombor—Ferencszállás in the south-western part of the region. This district, with a high positive anomaly, projects towards the north-west beyond the line of the Tisza, while in the south-east it extends to the south of Makó. Areally, it coincides with the deepest trough of the substratum. 2. The second extensive part with a positive anomaly is the regions between the Körös rivers, from Gyulavár, Kétegyháza, Békéscsaba and Doboz up to the border of the country. 3. The third area with a gravitational maximum, smaller than the first two, extends south-east of Battonya across the border of the country.

In contrast with the above three maxima, in the area of the Maros talus there is an extensive region with a negative gravitational anomaly. Within this, a number of smaller, but well-definable gravitational part-basins can be discerned. Examples may be found about 6 km north-east of Békéssámson, about 4 km south of Mezőkovácsháza, and extending from Kevermes to Dombegyháza. The most significant of them is the Békéssámson gravitational depression, centred at Kardoskút.

Because of the higher positive anomaly values, a special position is occupied within the zone with a high negative gravitational anomaly by the nucleus situated 4 km north-west of Dombegyháza; this can not be evaluated surface-morphologically. In the other parts of the region, and primarily in the northern and north-eastern parts, fields of large areality show up, which are fairly monotonous from a gravitational aspect; on the basis of these, conclusions can not be drawn as to the deep-deep-structure and areal movement tendencies there.

Map 16, a geokinetical map of South Hungary east of the Tisza, the regional units with different geokinetical characteristics can be distinguished very well. The most strongly subsiding part is the area between Hódmezővásárhely and Orosháza, from which a narrow trench extends to the south in the direction of Deszk and Új-

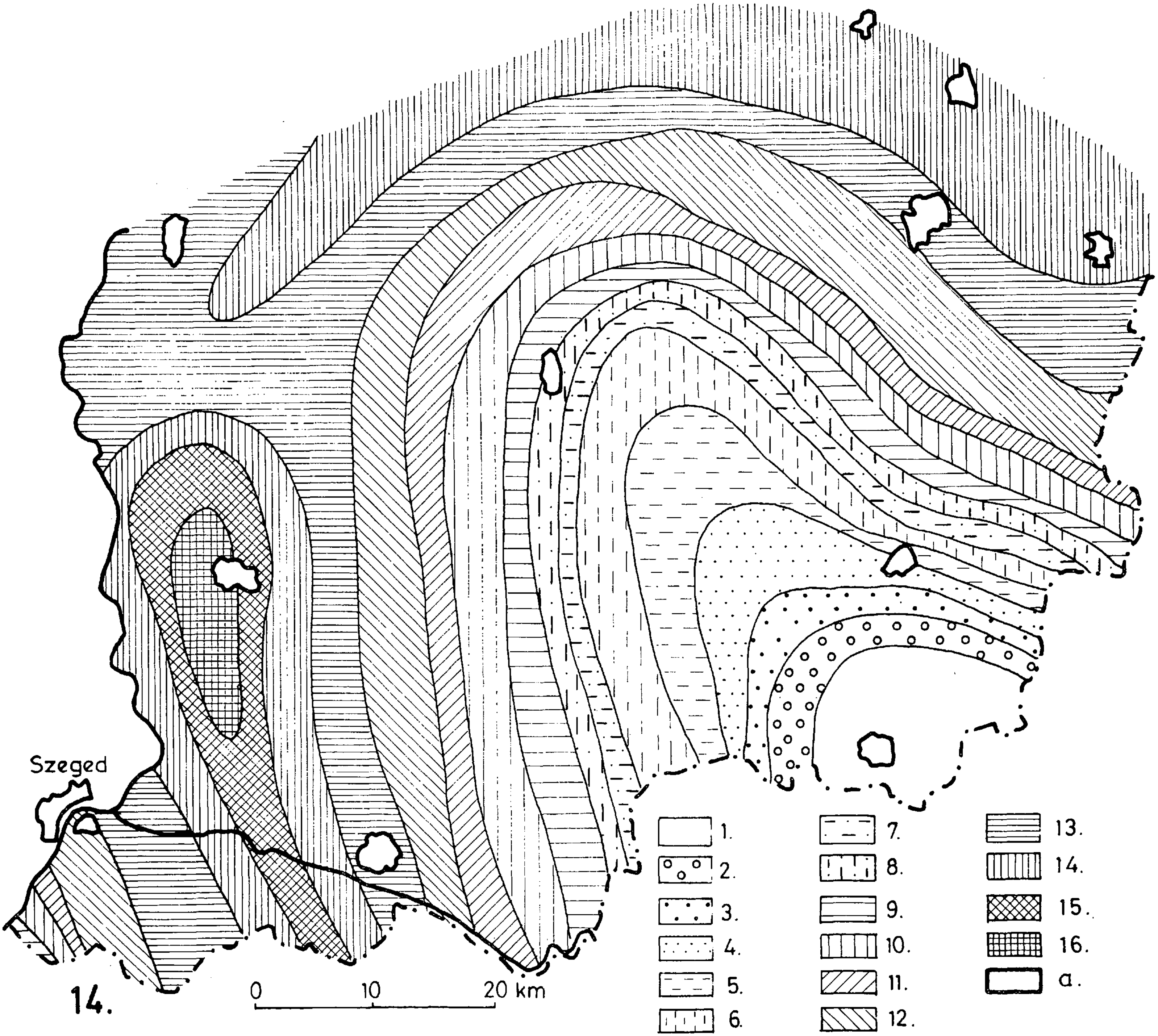


Fig. 14. Relief map of substratum in South Hungary East of the Tisza
(Prepared in the Dept. of Physical Geography, Attila József University, Szeged, on the basis of the data of V. DANK)
Depth of substratum:

1 = 1000 m,
2 = 1000—1200 m,
3 = 1200—1400 m,
4 = 1400—1600 m,
5 = 1600—1800 m,
6 = 1800—2000 m,
7 = 2000—2200 m,
8 = 2200—2400 m,
9 = 2400—2600 m,
10 = 2600—2800 m,
11 = 2800—3000 m,
12 = 3000—3200 m,
13 = 3200—3400 m,
14 = 3400—3600 m,
15 = 3600—3800 m,
16 = 3800
a = settlement

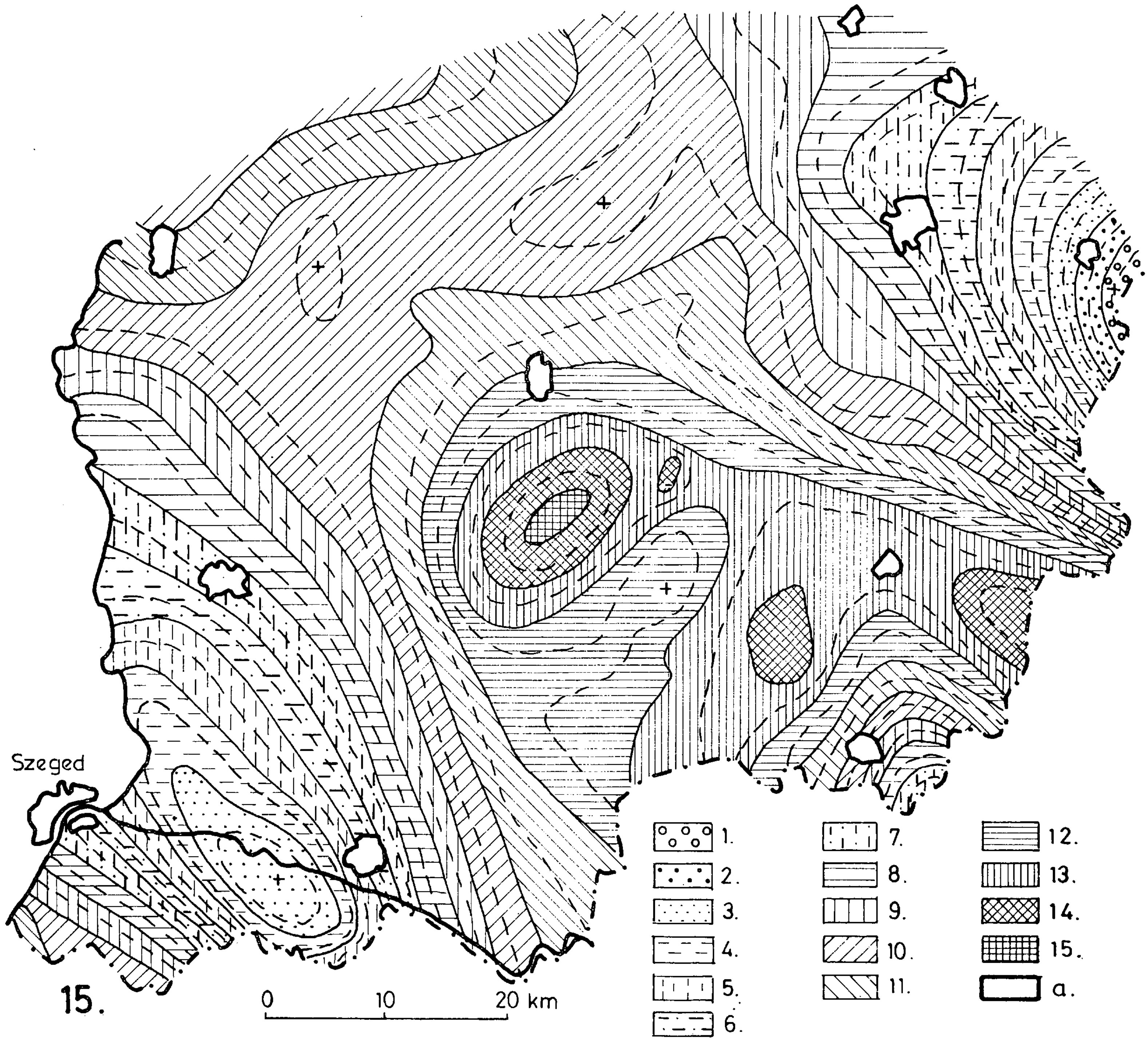


Fig. 15. Gravitational map of South Hungary East of the Tisza
(Prepared in the Dept. of Physical Geography, Attila József University, Szeged, on the basis of the map of Mrs. I. HAÁZ)
Gravitational anomaly value units:

1 = +25—+23	6 = +15—+13	11 = +7—+5
2 = +23—+21	7 = +13—+11	12 = +3—+1
3 = +21—+19	8 = +11—+ 9	13 = +1—−1
4 = +19—+17	9 = + 9—+ 7	14 = −1—−3
5 = +17—+15	10 = + 7—+ 5	15 =—3

a = settlement

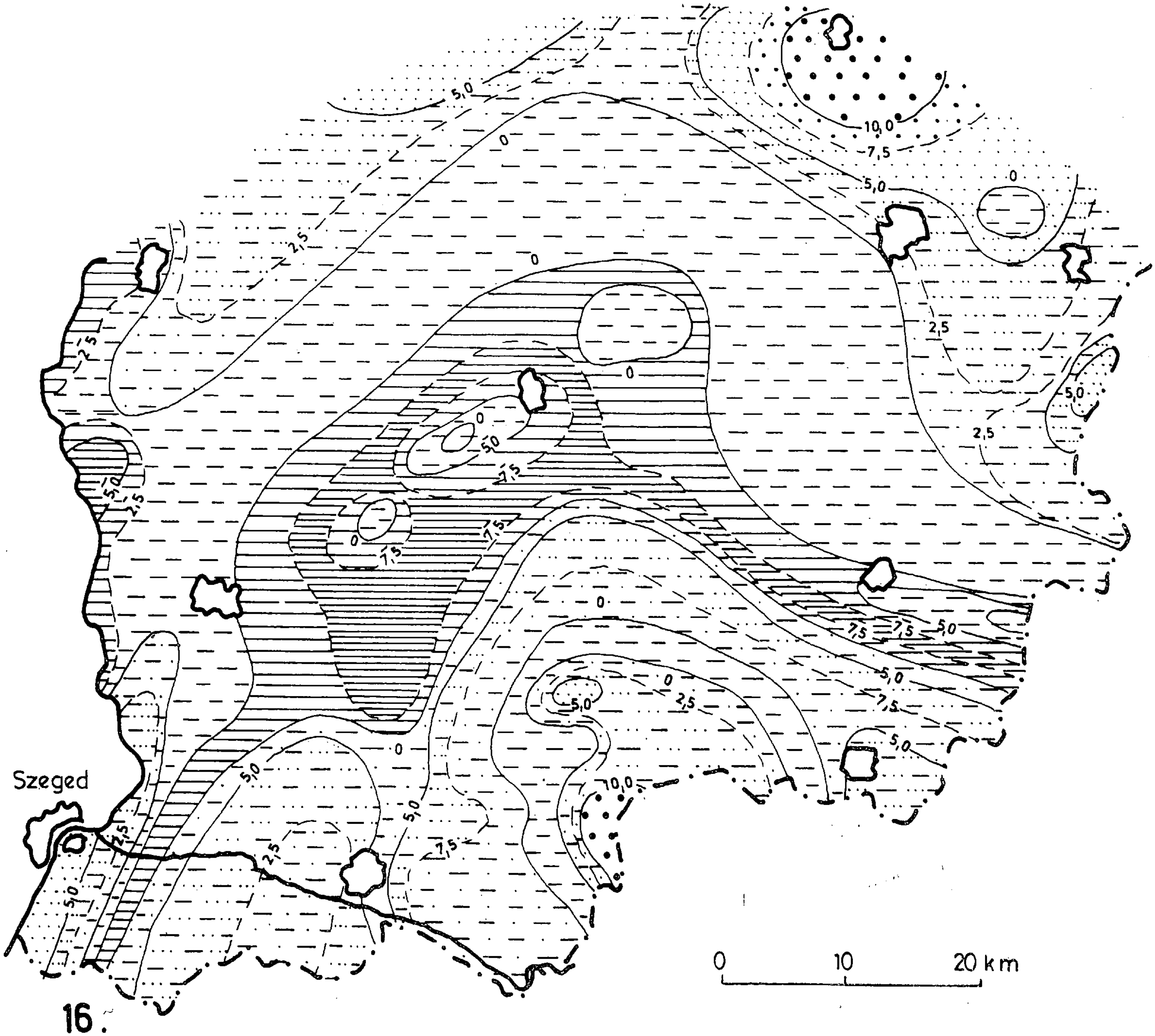


Fig. 16. Geokinetical map of South Hungary East of the Tisza
(Prepared in the Dept. of Physical Geography, Attila József University, Szeged, on the basis of the map of L. BENDEFY.) The signs and numbers on the isokinetic lines denote the direction and order of magnitude of the movement

szentiván, and another to the east towards Nagybánhegyes and Kunágota. These intensively subsiding bands are probably connected with tectonic lines and trenches. The second relatively strongly subsiding area is the section of the Tisza valley between Szentes and Mártély. At the same time, the region includes rising nuclei: the district of Szeged-Algyő, the district of Kübekháza—Maroslele—Makó, the district of Csanádpalota—Ambrózfalva—Mezőhegyes, the surroundings of Battonya, and the north-eastern maximum between the villages of Békés, Murony and Mezőberény, as well as the maximum observed in the district of Szarvas—Kunszentmárton.

However, since these geokinetical bands and nuclei are in contradiction in a number of places with the clear-cut movement-tendencies revealed by the geological, geophysical and geographical information of a different nature, the question must be raised as to whether significant and misleading sources of error are produced by pseudo-geokinetical movements (e.g. compaction of sediments, swelling of water-permeated soil layers, frost swellings, etc.) in excess of the possibilities of error permitted by the accuracy of the measurement method. The fact that the most rapidly subsiding area is on just that part of the Maros talus where the developmental thickness of the looser sediments covering the substratum too is large, is at any event food for thought.

According to Map 17, depicting the geothermal gradients of South Hungary east of the Tisza, a clear-cut correlation between the gradient value and the thermal water reserve in the layers can not be demonstrated everywhere. For instance, while it is natural, and even of necessity to be expected, that the gradient value is small in those parts where the substratum crossed by the break-lines is close to the surface (Maros talus), and at the same time the value of the gradient is large in the thickly-filled up geosynclines (the district of Szentes—Szegvár, the basin of the region between the Körös rivers, the area of Kondoros, this logical tendency is completely contradicted by the area with a low geothermal gradient index adjacent to Szeged (between Maroslele, Szőreg and Kübekháza), since in this part the thickness of the loose-structured strata is very high (cf. the substratum and Pannonian bed maps). Because of this, it is probable that it is necessary to reckon in the latter area with intensive and quite young break-systems (between Maroslele and Ószentiván) permitting the flow of the thermal water of the deeper layers to the upper layers. It may occur that these same lines may also play a role in this area in the upward migration of the hydrocarbons.

Map 18, showing the geothermal isoanomalies, was prepared on the basis of the map with the same title of L. BENDEFY. However, in addition to simple reconstruction, certain modification too was employed, for we used as reference not the national average level at a depth of 374 m, but the national zero point. Thus, with the aid of our isoanomaly lines we can read off the areal position of the 30 °C geoisotherm level directly in metres.

Evaluation shows that there are certain contradictions between the geothermal gradient map, Map 17, and Map 18 insofar as the isothermal relief units of the geothermal gradient map rea not outlined on the geothermal isoanomaly map. However, the anomaly maximum and minimum areas of the geothermal isoanomaly map do not coincide with the geological and deep-structural main kinetical areal units either. Hence, this map raises further open questions, elucidation of which would demand further detailed data collection and assessment work.

While this paper has so far involved an analysis of South Hungary east of the Tisza from some special aspect, and with the aid of objective-maps corresponding to this aspect, we must now carry out the complex evaluation of the region; that is, a study must be made of those natural geographical surface development tendencies which strengthen one another in the information of the maps prepared in accordance with the various aspects, and also those which weaken one another in their complex comparison. At the same time, the results of the comparative dynamic regional analysis must also be evaluated with regard to the aspects of hydrocarbon prospecting. Only this can describe the society-centred conception of the entire research work and also the balance of its possible economic usefulness.

In the course of the comparative evaluation of the eighteen maps, the most important and most prominent ancient geographical developmental tendency emerging is the permanent geokinetical character of certain parts of the region, lasting since the end of the Tertiary. We must see that the present tendency of the neotectonism is even today expressing the old regional charateristics of the geokinetical dynamism. In this respect me must set out from the substratum map (Map 14), which clearly outlines the thundamental regional surfac relief differences of the alaeozoic-Mesozoic and crystalline substratum.

As we pointed in the description of Map 14, it is characteristic of this region today that there is a table-land rising high in comparison to its environment and sloping from south-east to north-west (the Battonya—Pusztaföldvár block trend), and this is surrounded in a semicircle from the west and the north by a deep fairly wide depression region, the deepest parts of which are to be found deeper even than 4000 m.

Although the substratum map does not show it, because the available deep boring data were still deficient at the time of its constuction (1967), it is now known that in the south-west corner of the region, in the district of Algyő—Klárafalva, there is a second substratum uparching (block trend?), lower than the previous one, with an axis roughly parallel to the line Battonya—Pusztaföldvár. The position of this is outlined on both our Pannonian bed map and also the gravitational map (Map 15). It is to be noted in connection with this that along the axis of this substratum table-land from Algyő to Klárafalva the Pannonian lies directly on the substratum, while a few km from it to the west and (perhaps) the east there is present the deeper-levelled Miocene too, from which it follows that the table-land in question was produced by pre-Pannonian tectonics. In addition, however, it is necessary to reckon with the post-Pannonian and even the present elevation of this table-land; apart from the very high value of the positive gravitational anomaly, this is indicated by the geothermal gradient values, which here are in contradiction with the general geothermal gradient tendency in the region (see eveluation of Map 17), and by the "kinetical trench" of the geokinetical map at Deszk (see evaluation of Map 16).

Another question awaiting decision was the clarification of the tectonic nature of the movement mechanism, including now the problem of whether the movement of the substratum is that of a fracture-structured block mountain, or whether it is developing with a tendency of geosyncline and anticline formation of a flexural nature.

In this respect our view is that, although smaller parts of the larger units may have moved block-like along the fracture planes, and local trench depressions or upthrusts too may have been formed in this way, nevertheless the fundamental

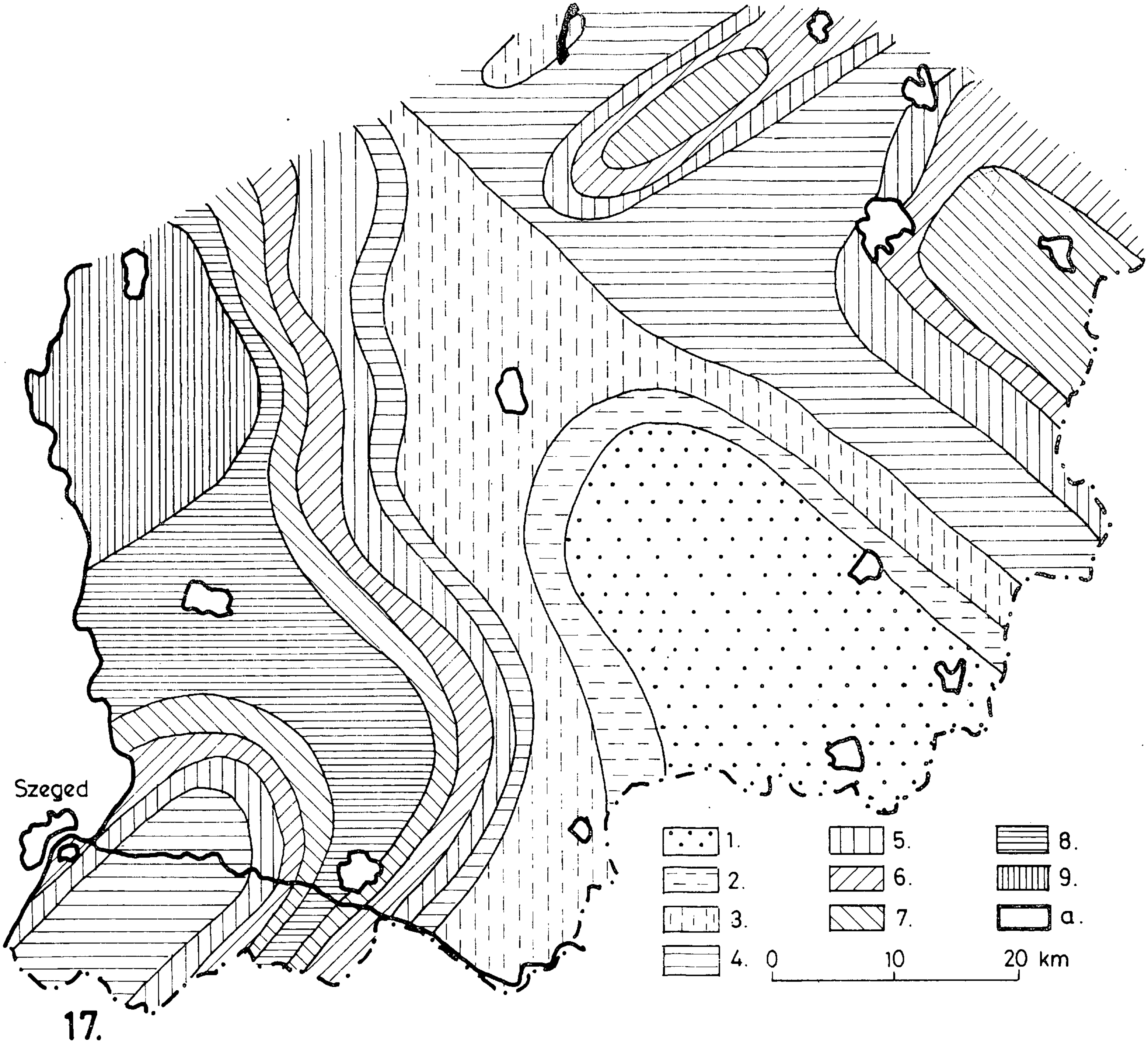


Fig. 17. Geothermal gradient map of South Hungary East of the Tisza
(Prepared in the Dept. of Physical Geography, Attila József University, Szeged, on the basis of the data of. J. URBANCSEK.)
Value of geothermal gradient (m/°C):

1 = 15,	6 = 20,
2 = 16,	7 = 21,
3 = 17,	8 = 22,
4 = 18,	9 = 23,
5 = 19,	a = settlement

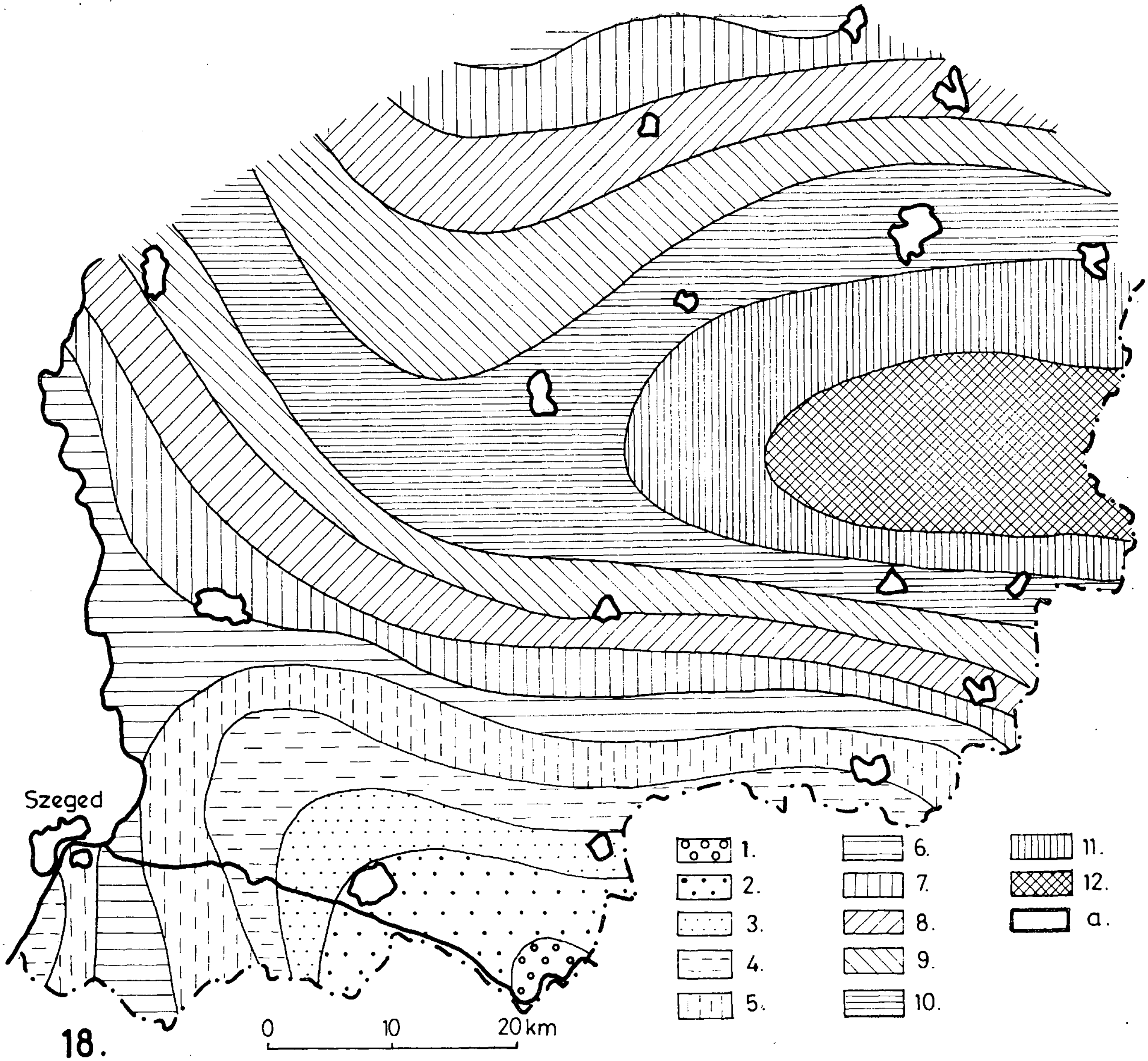


Fig. 18. Geothermal isoanomaly map of South Hungary East of the Tisza
(Prepared in the Dept. of Physical Geography, Attila József University, Szeged, on the basis of the map of L. BENDEFY)
Depth of 30 °C geothermal isoanomaly surface:

1 = 414 m,	7 = 364—369 m,
2 = 404—414 m,	8 = 354—364 m,
3 = 394—404 m,	9 = 344—354 m,
4 = 384—394 m,	10 = 334—344 m,
5 = 374—384 m,	11 = 324—334 m,
6 = 369—374 m,	12 = 324
a = settlement	

movement tendency of the region is characterized by the long-lasting subsidence of the geosynclines, and by the slower, but similarly long-lasting subsidence of the demonstrable substratum table-lands compared to these; that is, a geosyncline-like subsidence with intensities differing from place to place is characteristic a permanent manner of the entire region, so that within the whole the individual parts display increasing level differences with a folded-mountain aspect.

Comparison of the Pannonian and Levante bed maps (Maps 12 and 11) with the Pannonian porosity map (Map 13) and the sand-content maps of the upper layers (Maps 10 and 9) provides convincing evidence that the tendency of the movement has essentially not undergone any change anywhere since the end of the Tertiary; that is, nowadays too the same regional parts are the most subsiding sediment catchments, in which both the Pannonian and the Levante lacustrian layers show the thickest accumulations. (Here it must be pointed out that there is no longer such a clear-cut correlation in the Pleistocene strata; however, this does not appear as a contradiction, since the Pleistocene strata are predominantly fluvial deposits, the accumulational areal distribution of which is more strongly affected by the regularities of the running-water sediment formation of a different nature.) Otherwise, the remarks in the explanatory text to Maps 1, 3, 4 and 5, the contour map, the connate water map, the recent slope-tendency map and the surface geology map, respectively, prove the areal distribution and characteristics of these same movement feature referred to the present.

From the result of the ancient geographical investigations reported here, therefore, it follows that there are two large sediment-catchment geosynclines in South Hungary east of the Tisza:

1. One of these can be denoted by the axis line Makó—Hódmezővásárhely—Szentes. The deepest part (centre) of this is situated between Hódmezővásárhely and Szentes (see Map 12). The sediments deposited into the geosyncline become finer on proceeding from its central part in the direction of the edges, and even peter out while the layers are the coarsest-grained in the central parts of the geosyncline (see Maps 13 and 10). The more porous layers petering out towards the rim parts (particularly in the direction of the wings of the Algyő—Deszk and Battonya—Pusztaföldvár anticlines) fold up on the petering-out lens ends.

This structure ensures the possibilities of hydrocarbon accumulation and storage in the folding-up and here petering-out rim-positioned, more porous Pannonian layers of the geosyncline, assuming that the strata to be regarded as mother rock are in the central and deepest-situated part of the geosyncline.

According to our geosynclinal dynamic natural geographical conception described, the possibility of hydrocarbon occurrence may therefore be reckoned with in the south-west syncline wing (Algyő—Klárafalva—Maroslele—Ferencszállás), and also in the traps formed in the eastern syncline wing (in the vicinity of the Nagylak—Csanádpalota—Pitvaros—Tótkomlós—Kardoskút axis). If the north-east to south-west lens in the Fehértó district of Kardoskút in Map 13 is taken into consideration, which denotes a more favourable position compared to the other points of the trend from the aspect of possible storage conditions, we might perhaps think that the most favourable ancient geographical conditions of hydrocarbon occurrence within the eastern syncline wing are most probably given in the district of Békéssámson—Kardoskúti Fehértó—Kardoskút.

2. The other large sediment-catchment geosyncline of South Hungary east of the Tisza is the Körös geosyncline with Gyula—Békés axis, the central and deepest part of which is in the district of Gyula and, proceeding south-eastwards across the border from there, under Roumanian territory (see the concordant evidence of Maps 11, 12, 13, 15 and 17, and Maps 3, 5, 9 and 10). Insofar as the conditions of hydrocarbon formation were given in the Pannonian in this geosyncline, by analogy hydrocarbon occurrence is similarly to be expected in the petering-out and folding-up sediment lenses of its wings, that is in the district of Nagykamarás—Kunágota—Medgyesegyháza—Magyarbánhegyes—Csanádapáca—Pusztaföldvár).

Insofar as the north-east to south-west post-Pannonian fracture-lines structured the table-land with the Battonya—Pusztaföldvár axis (such post-Pannonian the the table-land with the Battonya—Pusztaföldvár axis (such post-Pannonian movements may be considered as possible on the basis of the gravitational map), the vicinity of the anticline axis; this means that hydrocarbons may also be hoped for along the line Battonya—Pusztaföldvár. In connection with this, however, it is our view that, although this line is undoubtedly in an arched situation, nevertheless (because of the more compact sediment structure of the layers) the storage possibilities are more unfavourable (particularly for liquid hydrocarbons) than in the north-eastern anticlinal wing, where the more porous layers of the Gyula geosyncline peter out in an upwards direction.

3. Although in the bulk of its extent it does not lie in the region of South Hungary east of the Tisza, we nevertheless consider it reasonable to mention that our investigations suggest that a third large sediment-catchment basin too may play a role in the possible hydrocarbon production of South Hungary east of the Tisza. This is the geosyncline to the south-west of Szeged, the bulk of which lies in the area between the Danube and the Tisza and is in Yugoslav territory; within the north-east petering out wing of this, in our region we may consider favourable storage possibilities perhaps along the direction-line Kübekháza—Újszentiván—Dél Szeged (see the corresponding areas of Maps 12, 15, 16 and 17). (It should be noted that since the drafting of this paper (1967), of these places Szeged—DÉL has already proved fruitful.)

On the basis of the dynamic natural geographical regional evaluation, apart from those already mentioned, other geosynclines and rim-positioned storage possibilities connected with these can not be detected in this region. Thus, the existence of the "large Békés depression between Békéscsaba and Nagyszénás", assumed by the OKGT, was not confirmed on the basis of the results of our investigations. According to our research, special arguments justifying hydrocarbon prospecting are not found for the distrinct of Szentes—Nagymágocs. (The few gas-containing artesian wells of lower depths in this part of the region can be brought into genetical correlation with the methane production of the peaty layers of the Levante lacustrian sediments here.) In contrast with this, the arguments of the dynamic natural geographical regional evaluation suggest that the areas denoted in detail above, among them the area to the east of the Battonya—Pustaföldvár block trend, can be recommended for prospecting.

As regards the large Hódmezővásárhely—Makó depression to the east of Algyő, our investigations strongly suggest that this is only a process of a larger geosyncline, the central trough of which is probably between Hódmezővásárhely and Szentes; we are of the opinion that the more favourable hydrocarbon-occurrence sites must be sought primarily not along the syncline axis between Makó and Hódmezővásárhely, but in the wings lying to the west and east of this, in the areas of the bands already named in detail above.

To close, it should again be emphasized that the task we have attempted to carry out to the best of our ability was a new one; such an evaluation of the natural geographical regional development (directed to the aspects of hydrocarbon prospecting) can in many respects be regarded as an untrodden path, not only on a Hungarian scale, but also internationally. It stands to reason, therefore, that for this reason too our overall conclusions, which are also projected to the indication of the possibilities of each hydrocarbon-storage area, can convincingly confirm the correctness of the scientific research method (and even principle) we have followed, if our conclusions (which on occasions are still of a hypothesis nature) are proved by the concrete results of later exploratory and prospecting drillings.

We very much hope that this will be the case, for in this case the economic successes may also mean the broadening of the possibilities of utilizing science. However, even now it may be considered in all probability that we are concerned with a new conception of natural geographical research and regional evaluation, presented here on a regional example, which involves many progressive criteria and up-to-date features of the further development of science.

PHYSICAL-GEOGRAPHICAL CHARACTERIZATION OF THE RUNNING WATERS OF THE SOUTH-EAST HUNGARIAN PLAIN

M. Andó

Development of the surface water courses

The development of the water network of the South-East Hungarian Plain proceeded in parallel and in close connection with the development of the surface. At the beginning of the Pleistocene certain areas of the Plain jerked down to various depths. This tectonic phenomenon at the same time also governed the then prevailing picture of the running-water network. This was the time of the separation of the Berettyó section of the Szatmár—Baja break, the Pleistocene basin between the White Körös and the rim of the Plain (the area of the later Sárrét), and the depression of the Zagyva—Tisza trench between Csongrád and Szolnok and Csongrád and Szeged (SÜMEGHY J. 1944, SOMOGYI S. 1960). For the greater part the depressions were filled up with running-water alluvium. The filling-up may have been intensive, so much so that the depressions became completely filled, and on the surface only the main water run-off and the temporarily water-storage deep lines remained. By the middle of the Pleistocene, the hydrographic picture of the Hungarian Plain had changed. The Zagyva—Tisza trench was completely filled up, and consequently the running waters originating from the Northern Hills and their alluvial slopes flowed into the deep-line of the Ér, Berettyó and Körös. The enormous depression of the Sárrét attracted all of the running waters in the area east of the Tisza. This is where the streams of the Mátra and the Bükk flowed, the Tarna, Gyöngyös, Eger, Laskó, etc. In the Pleistocene the alluvium of the waters of the Mátra and the Bükk extended across to the present left bank too of the Tisza (SÜMEGHY J. 1944, RÓNAI A. 1956, SOMOGYI S. 1961, URBANCSEK J. 1961). Naturally, the ancient channel beds and sediments came under the thick overspill cover of the Tisza in the Holocene, but even then the hydrographic picture of the old running waters was inherited in the surface microforms. For example, right up to the time of the river-regulation the floodwaters of the Tisza found their way down towards the depression of the Sárrét across the beds of the one-time branches of the Sajó and the Hernád (Kadarcs, Selypes-ér, Árkus-ér, Száraz-ér, etc.). (LÁNG S. 1944—47, PAPP A. 1956).

The trough of the Körös rivers was therefore a considerable erosion base of the running waters of the district. This phenomenon is very well reflected in the talus developments too, for these regularly flank the depression zones of the Ér and the Berettyó. The talus of the Körös and of the Maros lie on the area of the county. Since the ancient rivers filled up the deeper parts only gradually, even in the Pleistocene the run-off courses of the rivers by and large followed denoted lines.

The further subsidence of the Hungarian Plain also led to a great change in the ancient hydrographic picture of the area in the Old-Holocene. For example, the stepped down-dip which occurred on the berm levels of the rim-hills was the main agent in the development of the hydrographic picture of the county. Substantial subsidence took place particularly on the areas of the Ér-mellék, the Ecsedi-láp, the Bodrogköz, the Tokaji-kapu, the Takta-köz and the South Jászság fore-depressions. Consequently, the rivers Szamos and Kraszna now flowed into the trough of the Ecsedi-láp and not into the valley of the Ér, as previously. The running waters of the Northern Hills, flowing towards the trough of the Ér, the Berettyó and the Körös rivers, were drained off by a series of fore-depressions of the Vásárosnamény—Szolnok section of the Tisza. As a consequence of the rim subsidences, the hydrographic axis of the Hungarian Plain in the Old-Holocene became the Tisza, while the deep-line of the Ér, Berettyó and Körös (which still had a considerable run-off area in the Pleistocene) lost much of its importance.

Significant changes also occurred as regards the state of the ancient Maros river. Even in the Pleistocene, the Maros sought its way in various branches across its self-built talus, whereas in the Old-Holocene the Maros occupied its present position. One-time beds such as the Száraz-ér and Aranka, for instance, remained in a dependent situation and slowly faded away. (Fig. 1.) Especially the northern branches of the Maros (Száraz-Ér) were the water-courses which for a long time transported the water to the district between the Körös rivers. This connection remained virtually up to the present day (up to the river-regulation) (MÁRTON GY. 1914, LÁNG S. 1960, SÜMEGHY J. 1944, SOMOGYI S. 1969).

Hydrographically, two different types of terrain can be distinguished on the area of the south-eastern Hungarian Plain: the floodwater-free Pleistocene terrain comprising the "high-level" of the Békés plain, and the "low-level" Holocene terrain of the deep-lying area. Mutually different conditions can be observed between the two areas as regards the natural water-network, both systematically and on the basis of their hydrographyc natures. While the loess table-land of the Békés plain (the high level) is poor in surface waters, the low level is an area rich in waters. The scarcity of water on the table-land is mainly caused by the hydrogeological factor. The sediment on the surface (sand, loess) is a good water-conductor, and a further contributory factor is that the surface loess lies immediately above a very thick sand layer. Consequently, the impermeable layer is missing even in the deeper levels. The precipitation falling on the surface readily infiltrates into the subsoil or into the porous layer storing the groundwater, as a consequence of the nature of the surface. Hence, the surface erosion was of a low extent here, and conditions were unfavourable for the development of surface water-courses. At present the area has no natural living water-courses; by and large periodic water run-off occurs in the beds and morotvas of the old, abandoned river-beds, or in their relatively deeper-lying inclines. The directions of the periodic water-courses run out radially, corresponding to the talus nature, to the rim rivers. One such more important periodic water-course is the Száraz-Ér, the well-formed bed of which is even accompanied by an Old-Holocene terrace. On the occasion of the river-regulation the Száraz-Ér was sealed off at the withdrawal from the Maros, and it now receives only a determined water yield from the Maros via the constructed sluice system. In years with high precipitation, a considerable amount of water (8—10 m^3/sec) flows in the bed of the Száraz-Ér. Not only does it collect the local precipitation water, but it also receives a substantial groundwater replacement from the area over the border. As far as Békéssámson the Száraz-ér is generally north-west in direction, but from

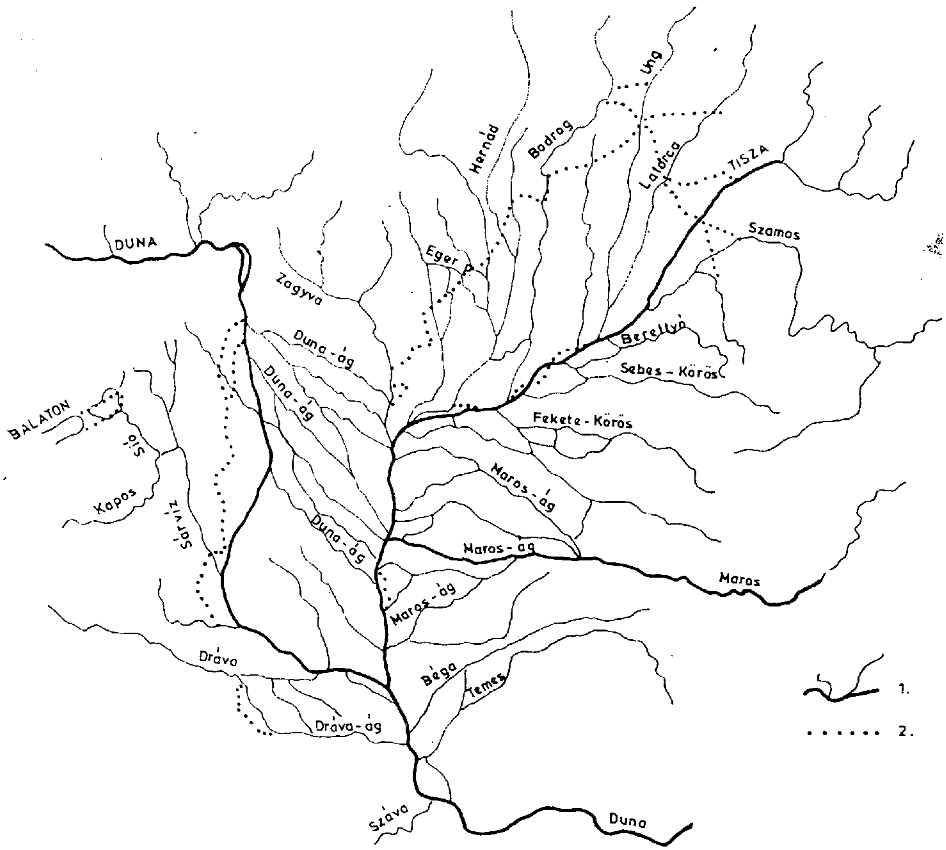


Fig. 1. The water-system of the Hungarian Plain
1: river 2: boundary

here it turns to be south-west. Numerous collecting channels empty into its fairly well-formed bed. The more notable include the Tótkomlósi-ér, the Aranyadi or the Medgyesbodzási main channels, etc. Several older Maros river branches can be found parallel to the Száraz-ér on the northern wing of the talus. These residual beds can be used as inland-water catchments, but they are also very suitable for channel development. Examples are the Kórógy-ér main channel, which leads across the Kurca into the Tisza, and the Hajdú valley stream network (Hajdú-ér, Csorvás ér, Mágócs-ér, Szénás-ér).

The hydrographyc picture of the deeper alluvial area is completely different. Here the surface is totally evened-out as a consequence of the perfect fllling-up. The uniform filling-up and the very low surface slope had the result that, prior to elimination of the floodwaters, the running waters wandered freely, virtually without beds. They developed over-formed bends, and in places river valleys of a lower-section nature, and flowed at a slow rate towards their erosion base. A further consequence of the uniform filling-up was that watersheds did not develop between the rivers, and bifurcation between rivers was frequent at times of high water-levels. On flooding of the rivers, for instance, part of the water of the Tisza flowed across the through of the Hortobágy into the Körös, or the Körös was shortened towards the Tisza via the Veker-ér and the Kurca. However, it also occurred that the northern wild-arms of the Marostoo flowed into the plain of the valley of the Körös rivers. The rivers (generally of a middle-section nature), wandering freely before the river-regulation, wore away and indented by appreciable side-erosion the margins of the flood-free surfaces, and even dismembered certain areas. As a result of the change in position of the river beds and with the over-development of the bends, many river loops arose, and therefore the district of the present rivers is full of morotvas and river bends in various stages of development. Even on the occasion of minor flooding, the more low-lying areas generally came under water. As a consequence of the extensive bends, the rivers were not capable of leading off their floodwaters. In certain regions, for example, stagnant waters and marshy areas were formed from one flooding to the next; the most extensive among these was the region of the Sárrét.

The hydrographic picture of the county changed considerably with the river-regulation and in the course of the other work transforming Nature. From the aspect of the social and economic life, the regulation was already indispensable. The numerous catastrophic floodings caused inestimable damage, not to mention the fact that the swamps and marshes were also directly harmful to the health of the human population.

Nationally, the idea of floodwater-prevention was first raised along the Körös rivers, since this area was that most endangered by flooding. The first consistent plan for the regulation of the Körös rivers was prepared in 1815. This was the plan by MÁTYÁS HUSZÁR, which later, in 1879, formed the basis for a new regulation plan. The regulation of the Körös rivers was completed by the turn of the century. The performance of work involving the movement of thirty million m^3 of ground and the cutting of 248 intersections meant that the length of the rivers was shortened from 1003 to 455 km. As a result of the transformation, the fall relations in the running-off of the rivers increased; the beds were deepened; the low-water level dropped by about 1 m; at the same time the floodwater level rose, and in parallel with this the rate of run-off of the floodwaters also increased. Nowadays, even the largest floodwave passes down in 3 days, compared with a matter of weeks before the regulation; indeed, in certain areas the effects lasted for months. In the inland-water organization which accompanied the river-regulation, about 65 pumping stations and about 6000 km of inland channels were built. The first fram to employ large-scale irrigation in Hungary was situated here (Gyoma 1858). The extensive transformation changed the hydrographic picture of the district significantly.

Hydrogeographical conditions of the surface waters

As regards numbers, the alluvial area of the south-eastern Hungarian Plain is very rich in rivers; however, this is not the case with regard to the utilizable water reserves, for a considerable proportion of the rivers have a fast course and their water-level fluctuations are extreme. (Fig. 2.)

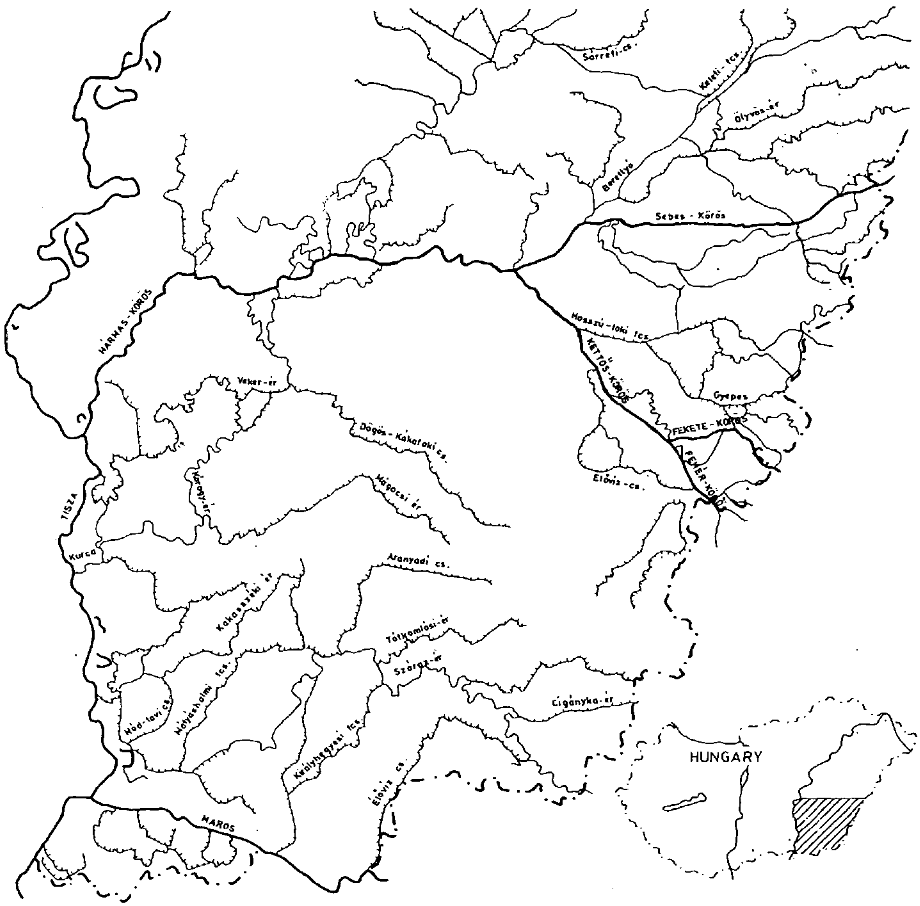


Fig. 2. The water-system of the South-East Hungarian Plain

The White Körös. This originates on the south-eastern slopes of the Bihar Hills. Its source is fed by many hill-streams. In its upper section the river falls from an average height of 1000—1200 m with the nature of a wild mountain-stream (17,5 m/km), and it contains an appreciable amount of water. The river reaches the Plain at Borosjenő in Romania, where its fall is now 0,5 m/km. At Gyula it is 0,2 m/km. From Gyula to the point where it unites with the Black Körös there is only a 5 km section, where the fall again increases, to 45 cm/km. From its source to its union with the Black Körös, the length of the river is 235,6 km. Its water-catchment area is 4275 km^2. Prior to the regulation it flowed with numerous branchings and bends, and as a result of the comparatively low fall conditions it inundated large areas with floodwater. The settlements and district of Gyula, Kétegyháza and Doboz were particularly frequently inundated by floodwater. Before the regulation, it united with the Black Körös in the vicinity of the village of Doboz (at Szanazug);

much earlier, this union took place below Békés, for the river floowed in the bed-line of the present living-water channel, crossing the settlements of Gyula, Békés-csaba and Békés. Regulation of the White Körös was considered as long ago as the 17th century, in that it would be united with the Black Körös above Borosjenő. This plan did not materialize; instead, at the beginning of the 19th century a number of channels were dug along the river (in the county of Arad) in order to accelerate its course. However, this had the result that the rapid course led to the formation of large areas inundations and extensive marshes in the lower section of the river. As the first step in the regulation, the mill-dams built into the river were removed and were transferred to a special mill-channel built for this purpose (JÓZSEF NÁDOR *channel*). Simultaneously with the removal of the dams, bed intersections were created and the river was banked up on both sides.

This river-regulation gave rise to a "state of danger" as regards the county of Békés, and hence regulation and bed-cleaning were performed in Békés too. The regulation plan of 1855 mainly extended to the ordering of that section of the White Körös in the county of Békés. This plan was not carried out in the form of the original conception, the main cause of which was the large flooding in Gyula in 1855. That section of the Körös then passing through the town was resituated outside the town, in its present linear bed. With the construction of the Gyula—Békés Körös branch, the towns of Gyula and Békéscsaba did everything to obtain living water. In 1896 a storage dam was built at Gyula. This transformation was not suitable, as the led-off water eroded the bed-sides of the post channel to such an extent that the safety of the dam and the nearby flood-defence embankments was endangered. In the 1950-s the storage dam was reorganized, and the district is now in a reliable condition.

It is characteristic of the present quantity of water in the White Körös that its water yields at high-water, at low-water and at mean-water level are 605, 0,001 and 23 m^3/sec, respectively. The considerable changes in the water yield are typical of the variations occurring in the river. Its highest water yield occurs in spring, in the period after the melting of the snow, while the lowest water yield occurs in the autumn months. In the event of extremely dry weather in summer, it can happen that the bed dries out completely between the sluice at Gyulavár and the mouth. At present the alluvial transport of the river is insignificant; it transports only a very fine white mud, which gives rise to the name White Körös.

The Black Körös. In the district of its origin it develops from three spring-streams with ample water yield. Similarly to the White Körös, in its hilly section it is fed by many hill-streams. It arrives on the Plain after leaving the Bihar Hills near Belényes. Initially it flows in a narrow valley, in a rocky gravel bed, and then on a very sloping terrain, but in friable soil, up to the influx of the Tőz side-stream. The river exhibits frequent changes in direction in this section of its course. It bends first in a south-west to west direction, and then in a north-west direction. Below Tenke the Gyepes-ér (as a residual wild-branch) branches out from it in a northern direction. This stream system may at one time have been a large living-water course; this is indicated by the large river bends and the predominantly already filled-up wide flood-areas. In the depression lying to the south of the exit of the Gyepes-ér, the Black Körös encounters numerous interlaced streams (Leveles-ér, Szartósz-ér, Tőz, etc.) before reaching the national boundary. In the county, below the village of Doboz (in the area of Szanazug) it unites with the White Körös; from here it flows under the name of the Double Körös for a distance of about 37 km towards the valley-plain of the Fast Körös. The regulation of the Black Körös was completed in 1914, with the construction of about 78 intersections, with the establishment of flood-defence embankments at a minimal distance (120 m), and with dredging and bank-protection work between Szanazug and Tamásda. In its Hungarian section the fall of the river is on average 0,1 m/km. In its upper section it is 30—40 m/km, above Belényes 3 m/km, up to Tenke 1,3 m/km, up to Talpas 0,63 m/km, and up to Tamásda 0,26 m/km. The water-catchment area of the river is 4645 km^2, almost half of which is hilly area. The length of the present river is 167,7 km, while its valley length is 145,9 km. The Black Körös is very difficult to control by bank-protection, and very intensive bend development can be observed even in its currently regulated valley plain. Consequently, many bank-defence works have been constructed (Szanazug, Remetés, Sugar Factory, Malomfok, Mélyvárd, etc.) to protect the bed-side. The amount of water in the river is somewhat more uniform than that of the White Körös; on the occasions of the individual floodings, larger quantities of water are produced here than in the White Körös. At high-water, mean-water and low-water levels, the amounts of water are 572, 29 and 0,4 m^3/sec. At low-water level in summer there is a more favourable amount of water here than in the White Körös. The low-waters are of a subsiding tendency for the entire length of the river, and the high-waters are subsiding particularly up to the region of Belényes. Before the flood-regulation, the floodwater level of the Black Körös was 3,6—4 m higher than the lowest water level, and exceeded the banks by about 1,6 m. In the region at the mouth of the river, a considerable area came under water for a long time. In the upper section of the river the flooding and the ebbing lasted for 1 and 3 days, respectively; in its middle section for 4 and 14 days; and in its lower section for 6 and 30 days. The Double Körös formed from the confluence of the Black Körös and the White Körös. Its extreme water levels and yield depend on the quantities of water in the two Körös branches. From the aspect of water management the river is not stable, but with the insertion of retaining dams this was largely eliminated. The fall of the combined rivers is very small: 0,08 m/km up to the Békés section, and even less after this. Before the regulation, this part of the county had virtually no run-off. The river meandered strongly, and its over-developed large bend wandered widely throughout the Kis-Sárrét and its district. The difference between the lowest and the highest water levels of the river was around 6 m. In this section the flooding lasted about 14 days, and the ebbing 30 days. The annually-occurring high-flooding resulted in a water-coverage of about 1,6 m on the flood-plain. Frequently, the flood-waves originating from the summer rains overtook the spring flood--water, and hence the flood-plain was under water for practically the whole year.

The regulation work totally transformed the behaviour of the river, though some problems may still be observed at present. At Szanazug the river receives the flood-waves of the White Körös and the Black Körös with a large fall. Since there is a sudden decrease in fall in the linear Doboz section, the river deposits its muddy alluvium strongly here. Elsewhere, where there are unfavourable hydrogeological features, a series of bank erosions occur. In contrast, the bed of the Triple Körös is in an equilibrium state. The low water level of the Tisza in the section of its mouth, however, means that bank erosion arises here too.

The Fast Körös. This rises from a 700 m high layer spring at Körösfő in the western part of the Erdélyi-Sziget Hills. Its total length is about 209 km, and it possesses a water-catchment area of nearly 10 000 km². Its Hungarian section is only 59 km in length, and about one-third of the water-catchment area is related to this section. Its more important tributaries are the Jád, the Sebes, the Dragán and the Berettyó, but in addition numerous brooks and streams run into its water-catchment system. It unites with the Berettyó between Szeghalom and Körösladány. From here, with its wide, extensive alluvial flood-plain, it flows between high embankments at a fast rate to join the Double Körös. It is of great importance in the life of the river that in its upper section, beyond the national boundary, the fall of its bed-bottom is 19 times that of the fall in the lower, Hungarian section.

Section riv. km	Bottom level m above Adriatic	Bottom fall cm/km	Note
0	84	—	low-fall
57	95	19.3	Hungarian section
110	148	100	high-fall
160	352	408	Romanian section
175	465	755	
209	650	545	
0—209	650—84	271	average

As a result of the high flow rate, the river transports much alluvium, but its coarser alluvium is deposited before it reaches the border section. Prior to the regulation, the orderly development of the bed was prevented by mill-dams on the Fast Körös too. These appreciable promoted rapid flooding and protracted the ebbing of the flood-waves. Its present situation was created last century with the construction of 24 intersections and the Sárrét channel. The old Sárrét section plays a very important role in the life of the river. Here a bed was not dug at the time of the regulation; only a small künnet was established, bordered on both sides by embankments. Formation of the bed was left to the river, but this did not embed itself; just the opposite, the flood-plan and the bed are filling up. Consequently, a subordinate bed has developed in this section. Even though the present rate of filling-up is somewhat lower, a significant intervention is still becoming necessary in the river branch (dredging, bank-protection, etc.).

The name Triple Körös is given to the river-valley section interspersed with many over-developed bends and split-off bed-residues in the broad flood-plain after the confluence of the Double Körös and the Fast Körös (according to MENDÖL Z.). This river bed is the jointly formed valley of the ancient Szamos, Ér and Körös. On the regulation of the Körös system, the most extensive transformation had to be accomplished in this section of the river. After the regulation the flow of the river accelerated and its slope increased. Its water reserves remain below those of the Maros, but in spite of this its economic value is more enhanced, with the installation of storage dams. The storage dam at Békésszentandrás was completed in 1942, and with this the possibility arose for the irrigation of an area of about 25 000 km². Since the Second World War, extensive development has been carried out to extend the irrigation possibilities via the total exploitation of the currently available water reserves of the Triple Körös.

The Berettyó. Before the regulation, the river disappeared completely in the swamp of the Nagy-Sárrét to the west of Bakonyszeg, while it flowed with a large bend in the pre-mounth section. (in order to separate the river from the Sárrét, a new bed was dug from Bakonyszeg to the Fast Körös between 1854 and 1865. By this means the previously 146 km long section of the river was shortened to 32 km, and its fall increased considerably too. In the section below Berettyóújfalu, the fall is 0,1—0,2 m/km. Although the shortened river lost an appreciable water-catchment area, it still possesses one of the most significant water-catchments in the water system of the Körös rivers. Since the construction of the Eastern Main Canal, the variation in the water levels has lost its natural character.

The Hortobágy-Berettyó. This flows in the north-western part of the south-east Hungarian Plain. Originally, under the name of the Hortobágy, it was a tributary of the Berettyó. Its water was collected from the periodic groundwaters of the plain of the Hortobágy and from the flood-waters of the Tisza. It was sealed off from the Tisza flood-waters in 1830, and therefore its northern bed dried up. In the framework of the present water management, a welcome expansion of the irrigation possibilities has been continuing in this area (Eastern Main Canal) since 1954.

In addition to the above-mentioned surface water courses, the interlaced, entangled bed-systems of numerous *stream and brook networks* are to be found in the area of the county. With the prevention of the flooding, however, the earlier hydrogeographical conditions of every stream, brook, rivulet, etc. altered substantially. For example, with the canalization of the region the stream and brook systems became so enmeshed that it is nowadays not possible to speak of independent water-catchment systems. In the times before the flood-water regulation, the brooks and streams possessed larger water reserves, and caused many flooding catastrophes. For purposes of elimination of floods and inland waters, the ancient water courses were canalized, and their old natural states can be perceived only in certain sections. In the parts still remaining in their natural states, inland-water reservoirs have generally been established. For example, in the system of the Körös rivers inland-water reservoirs can be observed in the line of the Szarvas dead branch, the Dögösi, Kákafoki, Cigány-ér, the Határ-ér, the Köles-Ér, the dead Fast Körös, the Élővíz channel and the Gyepes-ér, as well ast the Kórógy, the Veker, the Kurca and the Száraz-ér. The irrigation-complex system of the Körös rivers has developed in the environment of the main rivers. Only an insignificant percentage of the dug channels, however, can be employed for irrigation or for leading off inland waters. The necessity of irrigation is beyond doubt, but the fluctuating water reserves of the Körös rivers frequently cause problems from the aspect of the water supply. The only solution at present seems to be the construction of storage sluices and reservoirs. In the 1960-s it was possible to irrigate approximately 48 000 kh, of which about 22 000 kh were in fact irrigated. Besides the extreme water levels, another factor significantly influencing the solution of problem-free irrigation is the suction effect of the channels. A water loss of some 10—15% may be reckoned with. In addition, there is a very marked degree of alluvium deposition in certain irrigation channels.

The stream and brook systems are generally connected to the main rivers by artificial means. Since the embankment system created in the regulation largely eliminated; the gravitational run-off of the brooks and streams, the running-off inland waters are connected with the living rivers only via sluice or pumping systems. For certain of the larger water courses, such as the dead Fast Körös, the Száraz-ér, the Gyepes-ér, etc., a protective embankment system had to be prepared for flood-defence purposes.

Regulation of the inland waters of the area still leaves much to be desired at present. For example, in the case of normal inland-water levels, with average precipitation distribution, inland waters are still observed for periods longer than 20 days. Protracted inland water means considerable water-damage as regards agricultural production. Particularly the spring inland waters lead to severe damage, since these inland waters most frequently coincide with the high-water levels of the main rivers (e.g. the years 1861, 1888, 1895, 1910, 1916, 1917, 1920, 1932, 1940, 1942, 1953, 1956, 1967 and 1970). In order to eliminate the occurrence of these surface inundations, which can by no means be characterized by any periodicity, the further building of sluice and pumping systems is necessary, the further up-to-date construction of channels must be carried out, and the present run-off rate of the area must be increased. The density of the network of water courses and channel systems in the area of the county is changing in a varying manner. The concentration of channels is generally higher in the deeper-lying areas, since the low terrain situation and the impermeable nature of the surface layer stronngly justify this. In spite of the high channel density, however, there are still prolonged inland waters even here. In general, the specific water-network density of the terrain in the inland-water system of the Körös rivers is 1—1,5 km/km^2, while the specific water transport varies approximately in the range 20—30 l/sec. In contrast, the specific water-network density of the higher table-land parts is only 0—1,0 km/km^2, and the specific water transport is 0—20 l/sec. On the loess table-land north-east of Orosháza there is even an area which stands apart from the present inland-water system, i.e. the surface is not connected to any of the inland-water systems.

It has been mentioned previously that the density of the water network is closely correlated with the compositions of the surface and the near-surface deposits. In general, the water network is comparatively dense on the surface of a weakly-permeable or impermeable deposit, and at the same time rarer on permeable, more porous surfaces.

The distribution of the precipitation in space and time and its quantitative course can have a considerable influence on the water levels of the rivers and on the variations in their water reserves. The rivers of the county are characterized by extensive water fluctuations, and by the irregularity of the changes in the water fluctuation. This phenomenon is connected with the capricious behaviour of the precipitation in the immediate and the more distant environment. The Erdélyi-Sziget Hills rising on the rim of the Plain have an important role in the almost 22 000 km^2 water-catchment system of the Körös rivers. The water reserves of the water courses originating in the hilly and foothill forelands vary in accordance with how the precipitation conditions develop in the individual water-catchment systems. The more important water-providing areas affecting the county: the region of the Ér (90 m above sea-level), the Réz Hills (700 m), the Király Forest, the Bihar Hills (1800 m) and their western slopes. Since the main valleys of the hilly regions open in the run-off directions of the rivers, the rivers generally run west-east. In the open valley structure straight and high-fall river-valleys have formed, which rapidly carry an appreciable mass of water down onto the Plain. As a consequence of the fast run-off, the levels of the rivers vary rapidly in response to precipitation (1966 and 1970 floods).

Taking into account the annual totals of the precipitation for the water-catchment areas, the precipitation amount is already double in the higher belts of the hilly regions, i.e. the hilly regions contribute more significantly to the water turnover of the rivers. Since the amount of precipitation falling on the water-catchment area generally reflects a precipitation distribution that can be linked to certain periods and not to a definite season, the periods of flooding of the rivers do not display a close connection with the seasonal rhythm either. In general, the high water-levels of the rivers in spring are due to the snow reserves accumulating during the winter, and not to the amount of precipitation falling directly. For instance, if the melting in the hilly region proceeds quickly, the suddenly-produced appreciable quantity of water will strongly increase the reserves of the river water. Rapid thawing may sometimes be accompanied by catastrophic flooding (e.g. 1872, 1874, 1919, 1925, 1932 and 1966). Particularly noteworthy flooding was caused by the rapid snow melting in 1966. The early thaw (Feb. 7) occurred as a result of warm rain (25—35mm) falling on the hilly region. The flood-water level of the enormous masses of water rushing down rose above the defence-embankment on the Berettyó even on Feb. 9, broke through the left-hand embankment opposite Szeghalom, and inundated an area of 6000 kh. The embankment similarly burst on the White Körös on Feb. 11 at Kisjenő in Romania. This bursting led to the total inundation of the two regions between the Körös rivers, an area of about 13 000 kh. If the melting takes place over a longer time, however, then the slow and gradual water replacement does not give rise to flood danger. The flooding of the rivers in early summer is rather a consequence of a period of heavier precipitation (e.g. in 1970). In the knowledge of the annual precipitation of the water-catchments, the occurrence of early-summer flooding can usually be taken as certain. In this case the amount of water in the rivers decreases considerably as a consequence of evaporation, and therefore at times of early-summer flooding the average water reserves of the rivers are generally less than when the spring melt-waters flow down. Autumn floodings also occur on the rivers, but the probability of these are minimal and they are also insignificant as regards the quantity of water.

Apart from the precipitation factors, the temperature too plays an important role in the lives of the rivers. The water-temperatures of the larger rivers usually follow a well-developed annual course. The fluctuations of the water-temperatures of these rivers are by no means as extreme as on the dry surfaces of the district. The 24-hr daily fluctuation too can normally be observed only on the occasion of low-water. At times of extreme weather it may occur that the daily fluctuation of the water-temperature is 3—4 °C, or exceptionally 5—6 °C. The monthly temperature changes are generally reflected in the water-temperatures of the rivers. More extensive temperature changes in the lives of these river waters occur particularly in the autumn months. Freezing of the rivers can not be observed in every year, nor in the case of every river. On the basis of many years' experience (1920—1950), the frequency with which total freezing-over of the Double Körös did not take place was about 6—15%. This can not be said of the Triple Körös or the Fast Körös, where freezing-over can be taken as occurring with 100% frequency in every year. The average time for the appearance of ice on all of the rivers of the county is the middle of December. Extreme cases also occur, however, when the ice appears even at the end of October. The general freezing-over of the rivers occurs at the end of December, and has an average duration of 40 days. In the winters of the colder years the duration of freezing-over may attain even 90—100 days. The period of ice-melting on these rivers is characteristically the second half of February. At such time the ice disappears from every river, but in extreme cases the ice may melt only at the end of March and the beginning of April. As regards the thawing and the running-down of the melt-waters, the rivers are generally situated in a favourable position. However, it can occur that melting takes place earlier on the western-exposed slopes of the Erdélyi-Sziget Hills than on the deeper-lying terrain of the Plain. In this case the region between the Körös rivers is threatened by the danger of flooding.

From the aspect of everyday life, the nature and quality of the river waters is becoming a question of increasing importance. We cannot speak of extensive artificial water pollution in the area. In the future too, in the course of transformation of the landscape, the establishment of industrial settlements, urbanization, etc., it is necessary to find those protection solutions which inhibit the contamination of the natural water reserves of the rivers. According to the data of the overall plan for water management, the water concentration of the rivers of the area is less than 500 mg/l in virtually every section of the rivers of the area; with a slight deviation, the most concentrated is the Fast Körös, with a value of 500—600 mg/l. From the aspect of irrigation too the quality of the waters is perfectly acceptable. In the future too we must strive for the purity of our waters.

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NATURAL RESOURCES IN THE ECONOMIC DEVELOPMENT OF . THE SOUTH HUNGARIAN PLAIN

M. Andó

The planning and economic district of the South Hungarian Plain comprises one-fifth of the area of Hungary, and contains *18* per cent of its population. It is one of those regions in the country where the economic structure — inherited from the earlier system — is at present undergoing a transformation, and where the population is redistributing itself.

The industrial profiles, which have developed (to the greatest extent) in the South Hungarian Plain as an economic district (as regards its internal unity) are those, which depend on an agricultural raw material basis: preserving, meat, sugar, milling and textile industries. Development is currently under way in the hydrocarbon industry and in those agricultural production trends controlled by irrigation and thermal energy: grape, fruit, wheat, maize, industrial plant and vegetable production, and animal breeding.

A large contribution is being made to the transformation of the industrial structure by the free labour force, released by the mechanization of agriculture, while a contribution is also made by the economic exploitation of the natural resources. (Fig. 1.)

A significant role in the structural transformation of industry is played by the heavy industry, which is based on hydrocarbon mining. It is well known, that hydrocarbon mining on the South Hungarian Plain is a relatively young branch of industry, but it promises energy reserves of considerable magnitude. At present, this district gives more than 40 per cent of the natural gas production, and 60 per cent of the mineral oil production of the country.

The hydrocarbon mining is greatly promoted by the favourable geological characteristics. The wide variety of the geological structure of the South Hungarian Plain developed in the course of long geological ages, and this geological variety makes the area a relatively rich one. It is well known that the part-basins, with crystalline bed-rock at the different depths possess rich mineral oil and natural gas reserves, and also hot-water and medicinal-water springs with various mineral compositions. (Fig. 2—3.) It is to be expected that the ever more intensive and wideranging researches will result in the Hungarian Plain becoming of increasingly greater economic and social importance from a number of aspects.

If we examine the geology of the South Hungarian Plain, it can be stated that it is not differentiated from its environment either in structure or in form.

At a depth of about 1500—3000 m, the base is comprised of block elevations, originating from the Palaeozoic and Mesozoic; thus, one can find Palaeozoic crystalline rocks, mainly gneisses and slates (clay, mica), and also Mesozoic rocks,

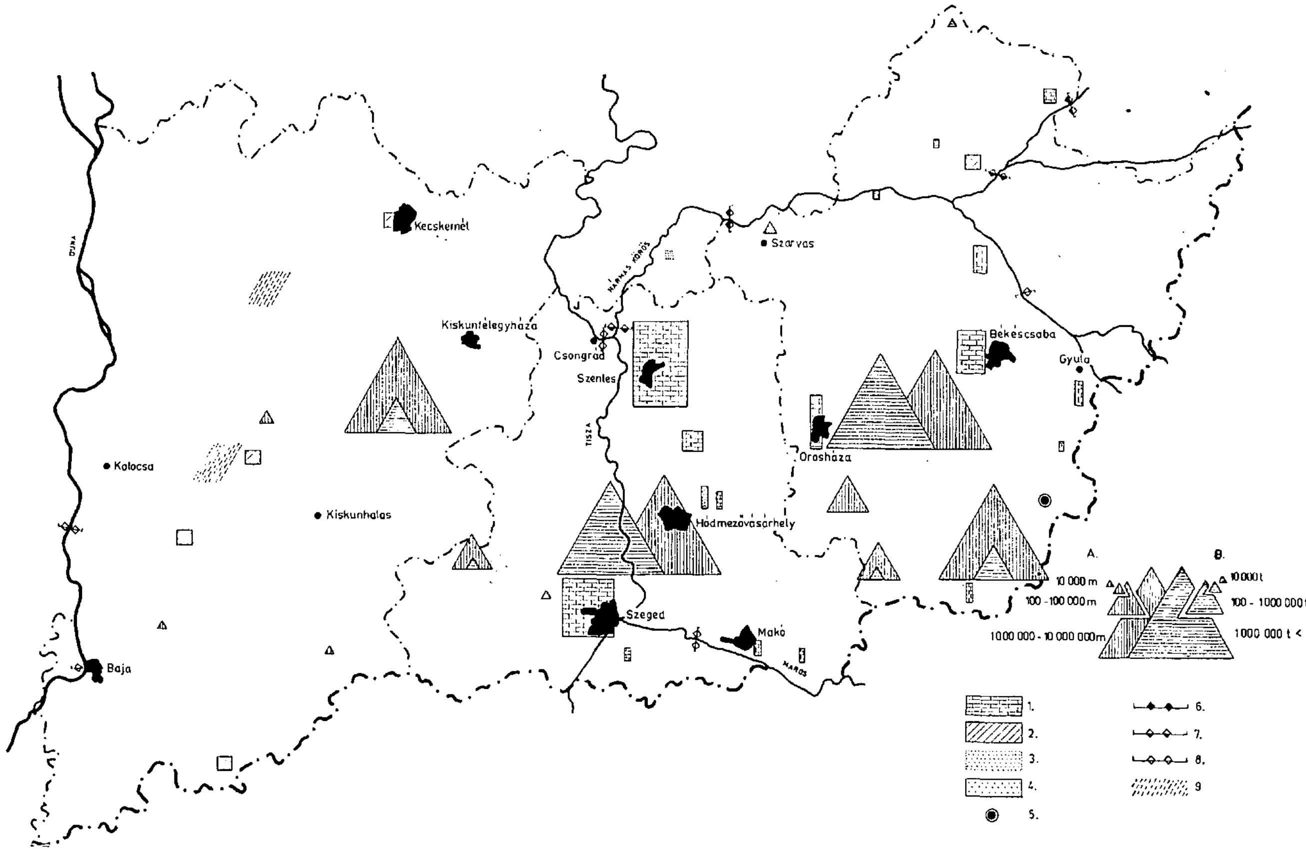

Fig. 1. Mineral stockpile of raw materials and primary energy sources. (On the basis of the atlas of South Plain Lowland.)

I. Exploitable stockpile of natural gas.
II. Exploitable stockpile of crude oil.
1. Important brick-works.
2. Working and not-working brick-works.
3. Working and not-working brick-works without calculating stockpile.
4. Fine ceramic raw material.
5. Important sand mining.
6. Existing hydroelectric power plant and river barrage.
7. Hydroelectric power plant and barrage to be established later on.
8. Hydroelectric power plant and barrage to be established later on.

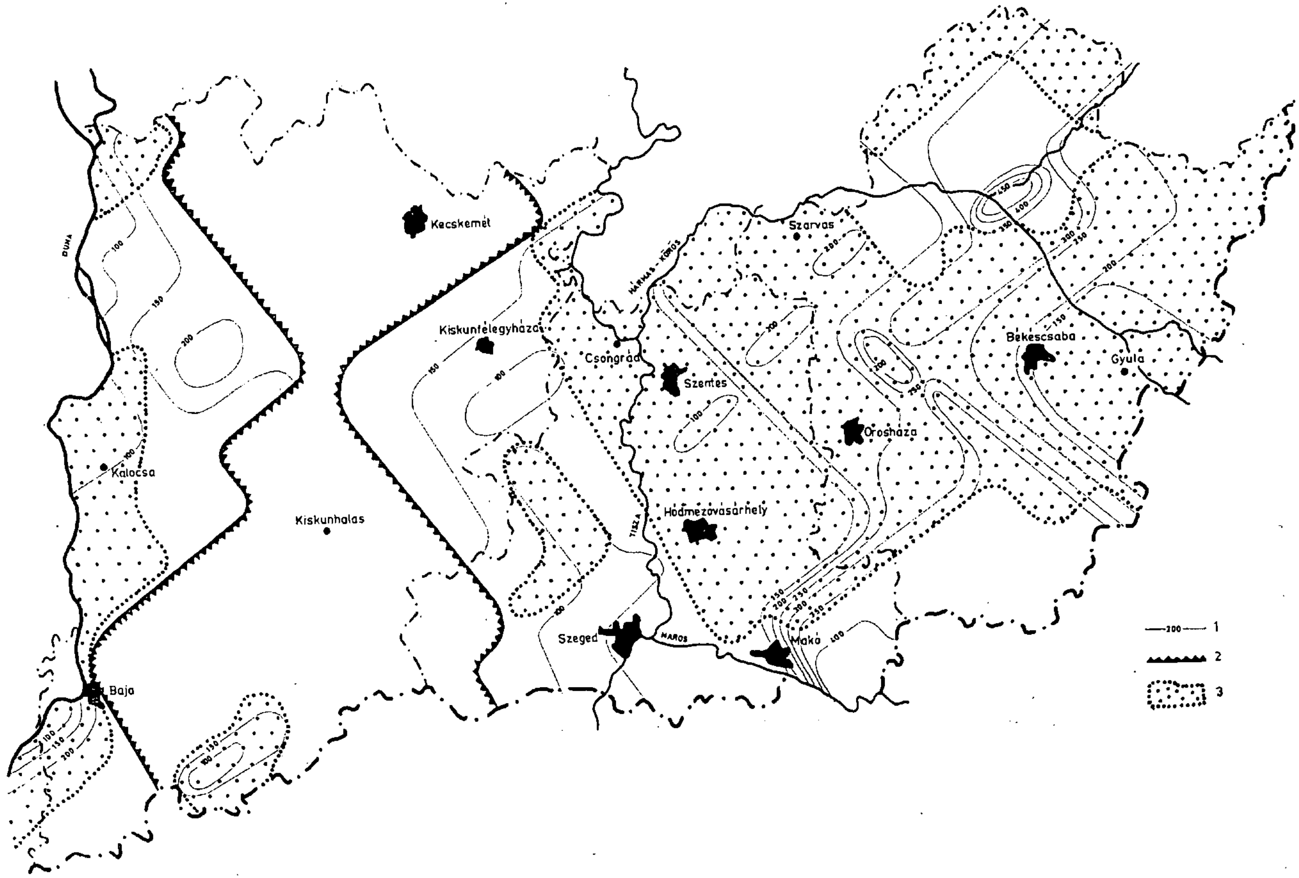

Fig. 2. Hydrostatic and under hydrostatic layer pressure and gaseous area (on the basis of the atlas of South Lowland.

1. Agnefer resulting in ground water.
2. Area having under hydrostatic layer pressure.
3. Gaseous area.

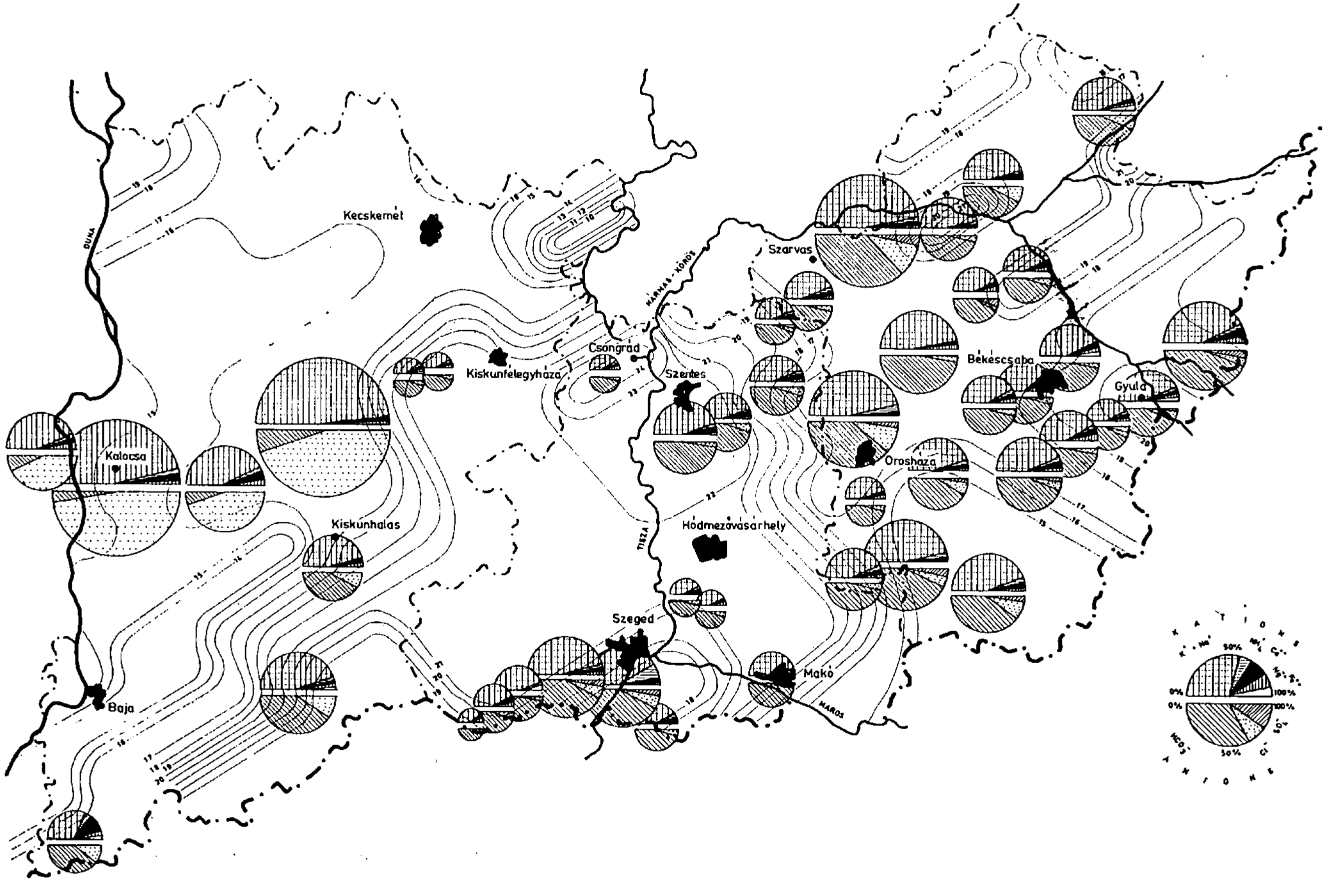

Fig. 3. Geometric gradient and its thermal chemical characteristics. (On the basis of the atlas of the South Lowland.)

for the most part dolomite, limestone, clay and marl. These mineral raw materials mean prospectively useful reserves for the economic development of the country.

The Palaeozoic and Mesozoic basal elevation, explored at the bottom of the basin consists of strongly broken-up series of blocks, among which are strata of smaller basin parts and deep trenches, Deep drillings indicate that the greater part of the Hungarian Plain was dry land in the Eocene, Oligocene and Lower Miocene, but subsidence had then already begun in the mountain zone surrounding the Hungarian Plain, at the edges of the current basin. Subsidence of the whole of the Hungarian Plain began in the Middle Miocene, but became intensive in the Pannonian stage. In the middle of the Pliocene the Pannonian Sea progressively contracted with the elevation of the basin edges.

Subsidence of the South Hungarian Plain continued even after the filling-up of the Pannonian Sea. Up to the present day a deposit several hundred metres in thickness has formed on the Pannonian layers in the unevenly subsiding part basins. The Pannonian formation and the alluvial deposit above it made possible not only the hydrocarbon mining in this region, but also the production of clay, gravel and sand.

As in the country in general, here too the occurrence of brick-clay is the most widespread in the youngest formations, and this is exploited in 17 settlements. However, considerable peat production is also carried on in the region of Kecel. The South Hungarian Plain possesses two gravel fields as well, one at Szalkszentmárton beside the Danube, and the other at Lőkösháza beside the Maros.

To summarize, the importance of the South Hungarian Plains as regards its minerals is given by its natural gas and mineral oil reserves, which are rich even on a national standard. However, the geological characteristics offer further possibilities of as yet undiscovered mineral reserves. These will depend on the development of deep-research equipment.

Another important basis of the natural resources is the arable agricultural land. This feature differs from county to county as regards the nature of the soil, and hence the structure of the agricultural production also exhibits differences. For instance, in the county of Békés ploughland plant production and animal breeding predominate, whereas in the counties of Bács-Kiskun and Csongrád grape and fruit growing and beef-fattening are the more important trends.

The nature of the arable soil has an effect on the profitability of the large farms. In both, its overall volume and its details (plant and animal products), the agricultural raw metarial production of this district is of national importance. Cereals, vegetables and fruit, including the special and varied products of the area (potatoes, paprika, onions, peaches), comprise the bulk of the foodstuffs production of the district. However, there are also considerable areas where the soil properties are unfavourable (sodic, sand, acidic), these making up nearly 50% of the total sodic areas in the country.

On the basis of the different soil properties, the district can be divided into part-areas:

a) A flat district of Great Hungarian Plain loess tables, where there is chernozem soil of excellent productivity, requiring moderately controlled cultivation, mainly liming.

b) The undulating duny area of sand ridges between the Danube and the Tisza.

This has sandy soil which is easy to cultivate, has a low humus content, retains water poorly, and gives a lower productivity than average.

c) The area of the Bácska loess ridge, which is generally flat but has sporadic, highly undulating surfaces. This has moderately bound chernozem soil of excellent productivity, with a rich humus content and a good water household.

d) The plain of the Lower Tisza valley. Its meadow inundation soil is moderately bound, has a good water household, and displays excellent productivity.

e) The plain of the Sárrét—Körös region. This has meadow clay soil with a moderytely deep groundwater level; it is difficult to cultivate, has high lime-requirements, and yields only a moderate productivity. The clay levels formed here preserve the old picture of the Hungarian Plain.

The district is rich in natural waters, the largest rivers of the country, the Danube, Tisza, Maros and Körös, flowing through it or affecting it. From the aspect of industrial settlements, these rivers possess considerable water reserves. There is a particularly high potential possibility along the Danube, but a much smaller one in the Tisza and in the Double and Triple Körös systems.

By far the greater part of the district lies in the catchment area of the Tisza. The water flows into the Danube only from the surface of the narrow western band along the Danube. The main river of the district is the Tisza, with its extremely low gradient, which meanders in its bed and flood-area protected in a number of places by wide embankments. Its highwater level rises as a result of intervention on both its Hungarian and its foreign catchment areas. The ratio of its greatest and lowest water yields at Szeged is 49:1.

An outstanding role is played in the northern part of the district by the Körös water system, which feeds a very extensive irrigation network.

The Maros is the largest of the tributaries of the Tisza. Because it has a higher gradient than the Tisza, its alluvium is a coarser, sharp-grained quartz sand, which can be used as a raw material for building.

There are no appreciable natural standing waters in the district. However there are frequent dead branches (oxbow lakes), remaining since the regulation from the one-time oxbows of the rivers (the Tisza and the Körös-es), and also sodic lakes in deflation depressions.

Considerable demands are made on the surface water reserves, not only by industry, but also by agriculture. Irrigation already featured in the development programmes of the nineteenth century. In the district of the South Hungarian Plain, irrigation of the agricultural areas is necessary because of the strongly continental-type climate and the summer droughts. The Körös valley is the area in Hungary where irrigation cultivation was practised earliest.

An intensive development of the irrigation system began following the Second World War. In this district the ratio of irrigated area to total agricultural area is the highest (10 per cent) in the county of Csongrád. This is followed in sequence by the county of Békés, and then Bács-Kiskun. In the interest of the development of the irrigation system, barrages have been and are being built on the Tisza. Barrages have so far been completed at Tiszalök and Kiskőre, while the one now under construction at Csongrád, will affect this district directly.

The possibility of exploiting the subsurface water reserves is also very good, but an important problem, awaiting solution, is the regularization and utilization of the complex inland waters. About 25 per cent of the total thermal wells of the country are to be found here, which means close to half of the thermal water yield. The degree of utilization of the thermal springs is at a very low level (excluding agricultural production). The most economic exploitation of thermal and medicinal waters is to be observed in the county of Békés.

The layers of various compositions, formed in the different geological periods, each have their own characteristic water-retaining capacities. In general, the upper layers usually give colt water; high-yield thermal wells can be bored in the deeper-lying layers, however. In this respect the South Hungarian Plain is of national importance, providing 40 per cent of the thermal water supply.

In the regional distribution of the thermal wells an outstanding position is occupied by the county of Csongrád, there one-fifth of the total number of thermal wells in the country are to be found, these yielding one-third of the total thermal water. The county of Békés has almost the same number of wells as the county of Csongrád, but they give only one-third of the thermal-water yield of the latter.

The geothermic gradient is particularly favourable in the region of Orosháza. There are frequent wells yielding water at 70—80°, and wells giving water of even higher temperature also occur (Orosháza, Békéscsaba, Szentes).

The mineral, medicinal and thermal waters of the district are used for balneological purposes, but the possibilities are far from being fully utilized. Many of the baths and lidos require modernization and expansion. Lido development is of great importance, for these constitute one of the main tourist attractions to the district.

Another of the natural resources of the South Hungarian Plain is the climate. This provides excellent possibilities for crop growing, but in addition can be classified as a medicinal climate, favourable for human health.

The entire area of the South Hungarian Plain has a warm climate where the continental effects predominate. The more northern parts have insufficient precipitation as regards the whole year, with drought-like summers; the southern and south-eastern parts have insufficient precipitation in the growing period, are moderately dry, and have hot summers. Since the area is fairly flat, its climate is relatively poor in meso- and microclimates. The local differences are primarily caused by the effects of the soil conditions on the temperature.

Over a large part of the district there are in excess of 2500 hours of sunshine annually. The annual mean temperature is 10,5—11 °C, and the annual precipitation 500—600 mm. From the aspect of agricultural production, the temperature and sunshine are favourable features, but are accompanied by the disadvantages of poor precipitation and periods of drought. The annual water-balance here is negative. The Körös region has to contend with the greatest water shortage (175 mm). The low degree of precipitation is aggravated by the poor water-households of the soils. The national economy is helping to combat the droughts with irrigation, appropriate agrotechnology, plant-breeding, and the planting of field-protecting forest strips.

This lecture has attempted to summarize the natural geographic features of the South Hungarian Plain in their main aspects.

FURTHER RESULTS OF RESEARCH CONCERNING THE GAS-CONTAINING ARTESIAN WELLS OF THE HUNGARIAN PLAIN

J. FEHÉR

In the Hungarian Plain (Alföld) together with the water of many artesian wells free-gases and gases dissolved in water come to the surface. The distribution of these gas-containing layer-water wells according to area and depth was earlier studied in the southern part of the plain (3., 4.). Later the research was extended to include the whole area of the Hungarian Plain.

The aim of the work is to give an overall and detailed picture of gas-containing artesian wells which give water and the abyssal distribution and regional areal system of gas-containing layer-waters. Thus the question of the origin of the gases which can be found in the layer-waters might be answered sooner.

Data about 36513 layer-water wells of various depths from 964 administrative units in the Hungarian Plain were gathered and processed. Areal distribution of the wells is shown on Map 1 where the different numbers indicate the number of wells in each administrative unit.*

3541, i.e. 9,7% of all the wells examined, proved to be gas-containing. The frequency of the occurrence of gas-containing wells is vastly different in each area (Map 2) is not in close correlation with the total number of wells in the areal unit concerned. From the respect of the research it is the demonstration of local differences which has a great significance. Thus gas-containing and gas-free centres can be differentiated and regional differences in the rate of gasification can also be revealed which might be useful information for practical experts, too.

Geographical distribution and local differences in the frequency of occurrence can be estimated with the help of Map 3. The frequency of gas-containing and gas-free wells in the area of each administrative unit having been counted, the ratio of gas-containing wells to the total number of wells in the area was worked out as a percentage. Thus we were able to classify the whole area of each settlement according to categories. Areas where the total number of wells was under five were declared: "uncategorizable areas".

A vertical description of the gas-containing water-layers can be given by an analysis of Map 4, 5 and 6 which demonstrate the ratio of gas-containing artesian wells of different depths (0—30 m; 30—200 m; 200—500 m) to the total number of wells in the same depth-categories as a percentage.

These maps give a far more detailed picture of the areal distribution of gas-containing wells than those published earlier by E. R. SCHMIDT (5.) and M. ER-

* An administrative unit here means both the centre and the periphery of a settlement (town or village).

DÉLYI (1.) — see the fig. 1 and fig. 2 in FEHÉR 1975. — and on the basis of the information they give, certain conclusions on the rate of gassiness can be drawn, too. The rate of gassiness of the water-yielding layers in a certain area does not depend on the absolute number of gas-containing wells to be found there; it depends rather on the numerical rate of gas-containing and gas-free wells. For example: in the areas of the settlement Kiskőrös 9 out of 1081 and in the area of the settlement Méhkerék 4 out of 11 wells give gas-containing water. Although there are more gas-containing wells in Kiskőrös, Méhkerék must be regarded as the richer area as far as gas is concerned, since there the rate of gas-containing wells is 36% and in Kiskőrös it is less than 1%.

However, final consequences must not be drawn from either the percentage rate or the relative frequency of gas-containing wells as regards general gassines. The reliability of the percentage values (depending on the total number of wells) might be different even if the numerical values of the percentage rate are the same. The reliability of the percentage values in the case of villages where there are few wells is especially doubtful since the rate of gas-containing wells could increase if more wells were drilled. Thus, in order to prove this hypothesis, the reliability of the percentage values of gas-containing wells was checked by means of calculus of probabilities in Table 1. data from some villages with the same percentage value are shown. There one can see the limiting-values of the expectable probability in the case of 95% confidence which belong to the percentage value of gas-containing wells and the intervals, too.

Table 1.

Name of the settlement	Total no. of wells	No. of gas-containing wells	Rate of gas-containing wells %	Limiting-values of probability (95 % confidence)	Interval
Zagyvarékas	11	7	64	30—91	61
Öcsöd	38	24	64	48—80	32
Fábiánsebestyén	66	42	64	51—76	25

If we look at this table we can see that the higher the total number of wells, the less the interval of diversion, so the result is more reliable. Thus the lowest and highest limiting-values of the expectable probability belonging to the percentage values of gas-containing wells in the case of a 95% confidence in each settlement were stated. Both these data and the percentage values (see Table 2) were taken into consideration when the gassiness of each areas were evaluated on the Map 7.

So thus the categories determined on the basis of the rate of gas-containing artesian wells often changed. For example: the previously mentioned settlement Méhkerék should have to be qualified "gassy" on the basis of rate (36%) but it have to be ranked only as "little gassy" on account of the less reliability of datum since the total number of wells is only 11.

Thus, according to Map 7, which was made so, Maps 1—6 also being taken

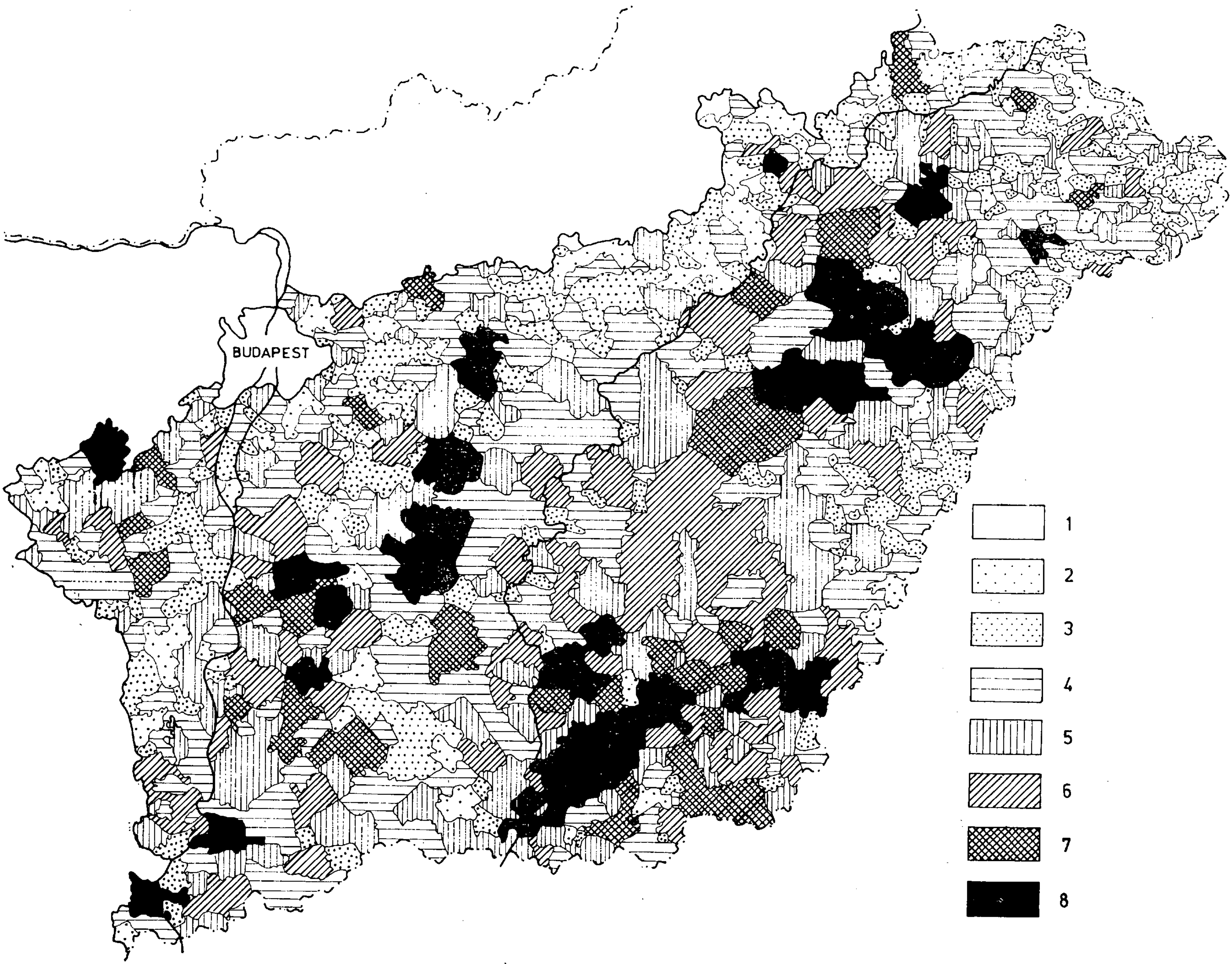

Fig. 1. Distribution of layer-water wells in administrative units in the Hungarian Plain.
1 = no layer-water wells
2 = 1—5 layer-water wells
3 = 6—10 layer-water wells
4 = 11—25 layer-water wells
5 = 26—50 layer-water wells
6 = 51—100 layer-water wells
7 = 101—200 layer-water wells
8 = 200< layer-water wells

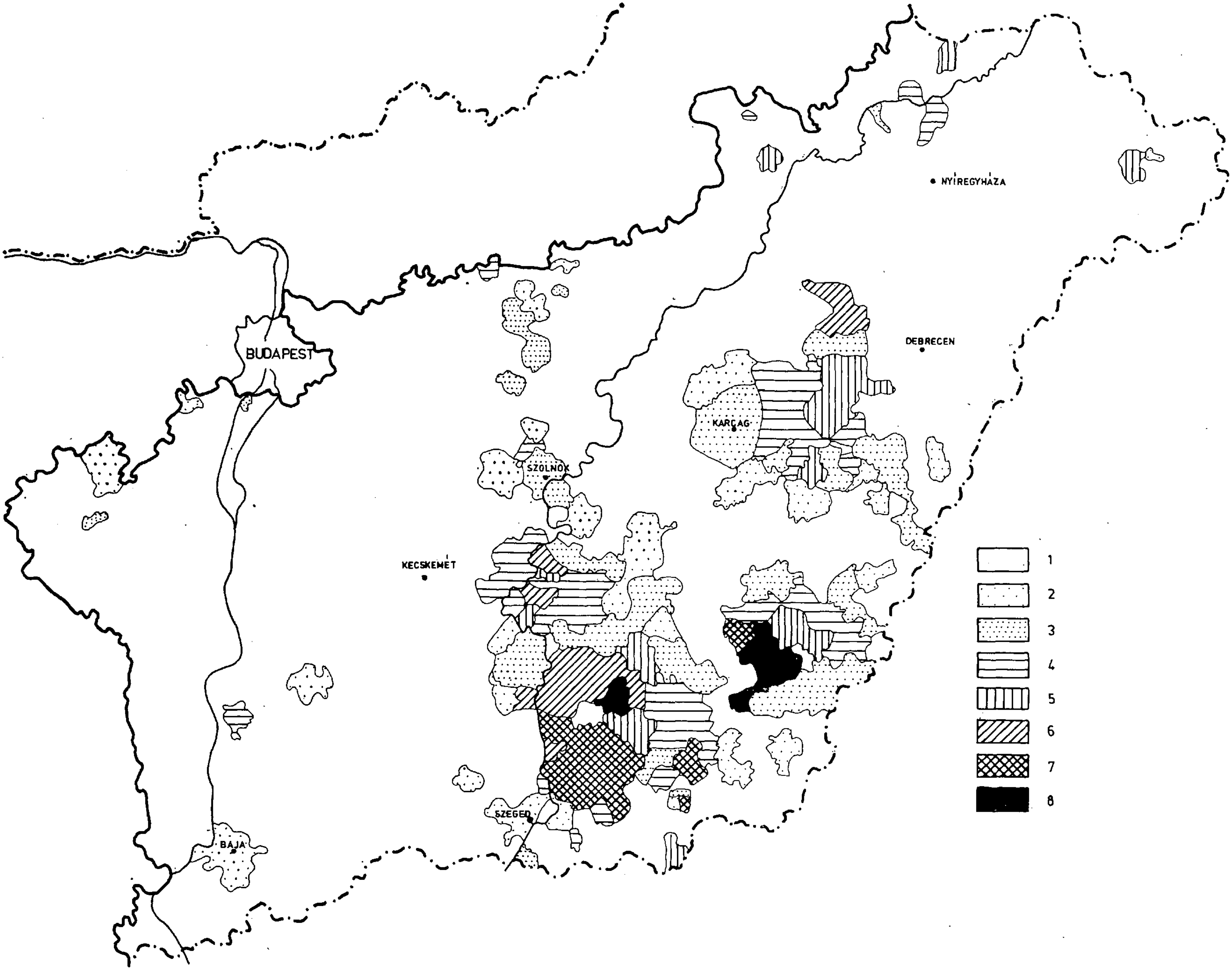

Fig. 2. Average density of the gas-containing layer-water wells in the Hungarian Plain.

1 = 0—0,05 well per km²
2 = 0,051—0,10 well per km²
3 = 0,11—0,20 well per km²
4 = 0,21—0,30 well per km²
5 = 0,31—0,50 well per km²
6 = 0,51—0,70 well per km²
7 = 0,71—1,00 well per km²
8 = 1< wells per km²

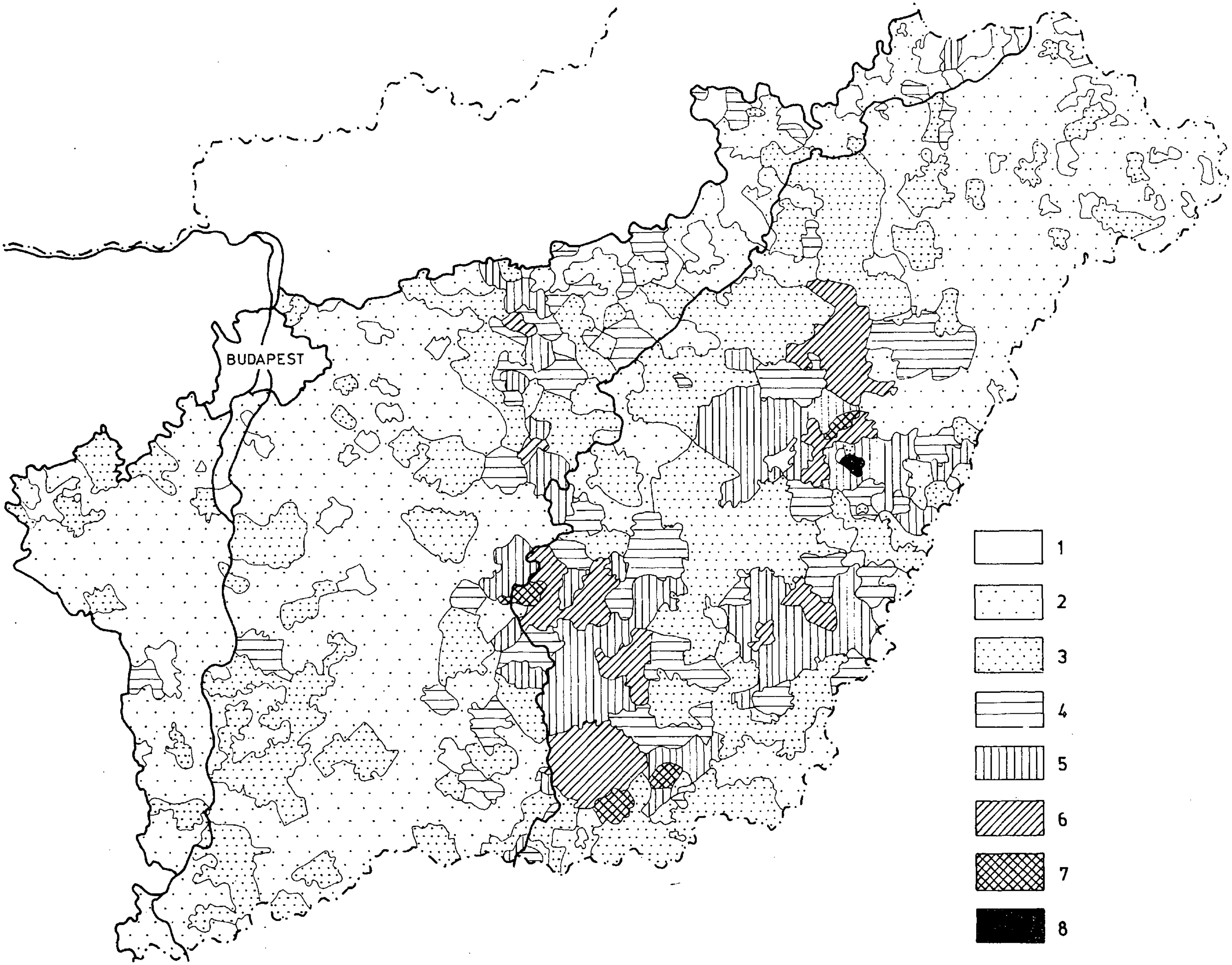

Fig. 3. Proportion of the gas-containing layer-water wells in the Hungarian Plain
1 = uncategorizable (less than five wells)
2 = proportion of gas-containing wells is 0%
3 = 1—10%, 4 = 11—25%, 5 = 26— 50%,
6 = 51—75%, 7 = 76—90%, 8 = 91—100%

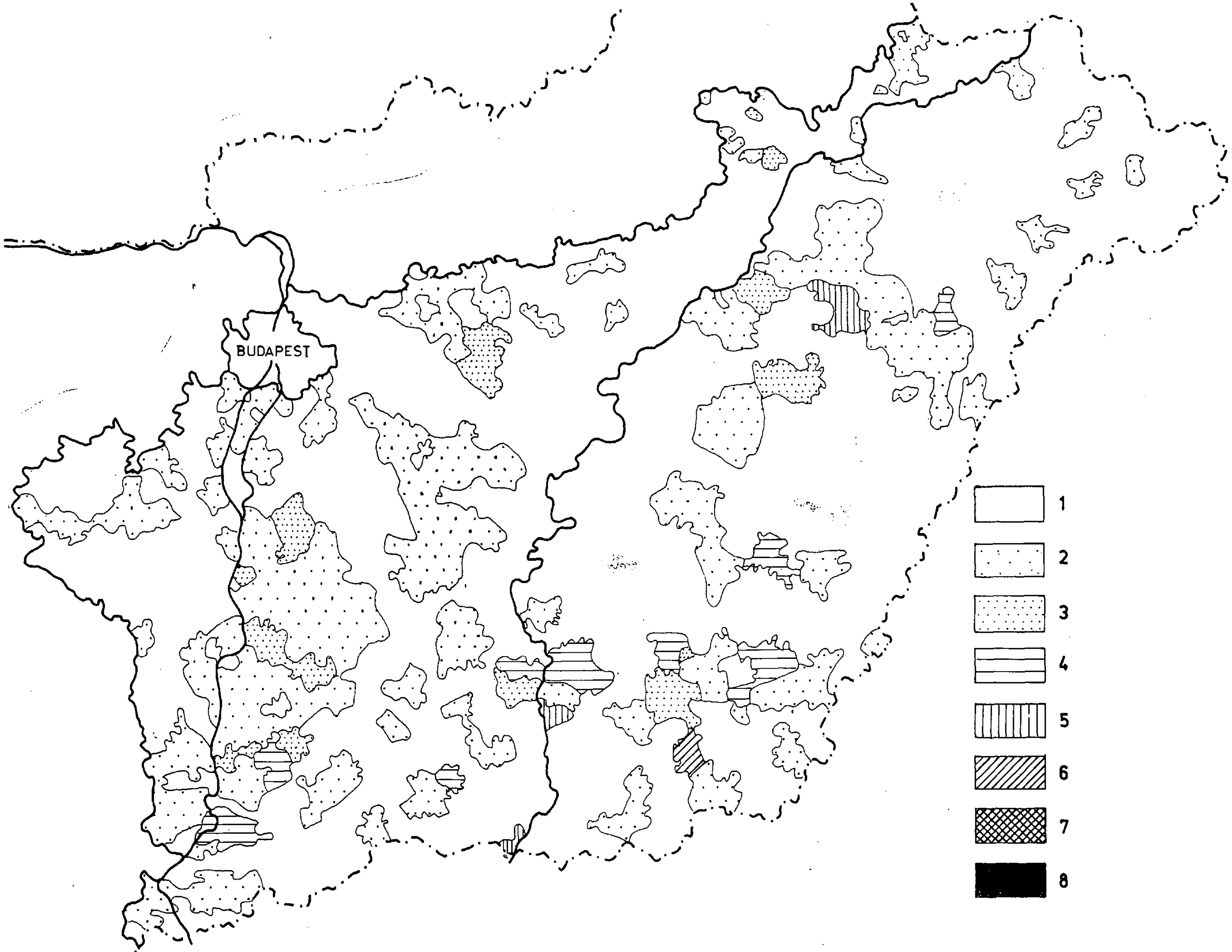

Fig. 4. Proportion of the gas-containing layer-water wells at a depth of 0—30 m in the Hungarian Plain
1 = uncategorizable (less than five wells)
2 = proportion of gas-containing wells is 0%
3 = 1—10%, 4 = 11—25%, 5 = 26—50%, 6 = 51—75%, 7 = 76—90%, 8 = 91—100%.

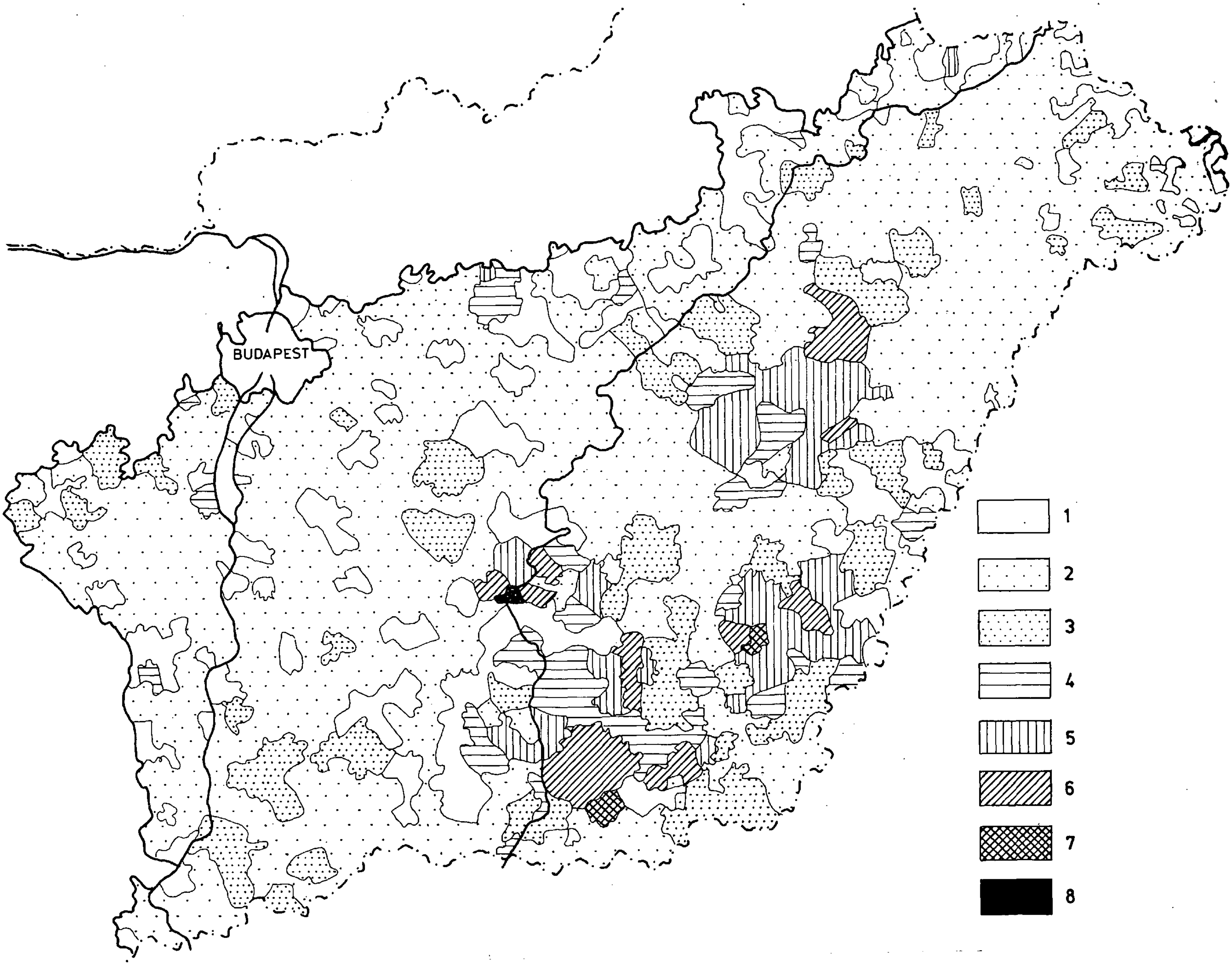

Fig. 5. Proportion of the gas-containing layer-water wells at a depth of 30—200 m in the Hungarian Plain
1 = uncategorizable (less than five wells),
2 = proportion of gas-containing wells is 0%,
3 = 1—10%, 4 = 11—25%, 5 = 26—50%, 6 = 51—75%, 7 = 76—90%, 8 = 91—100%.

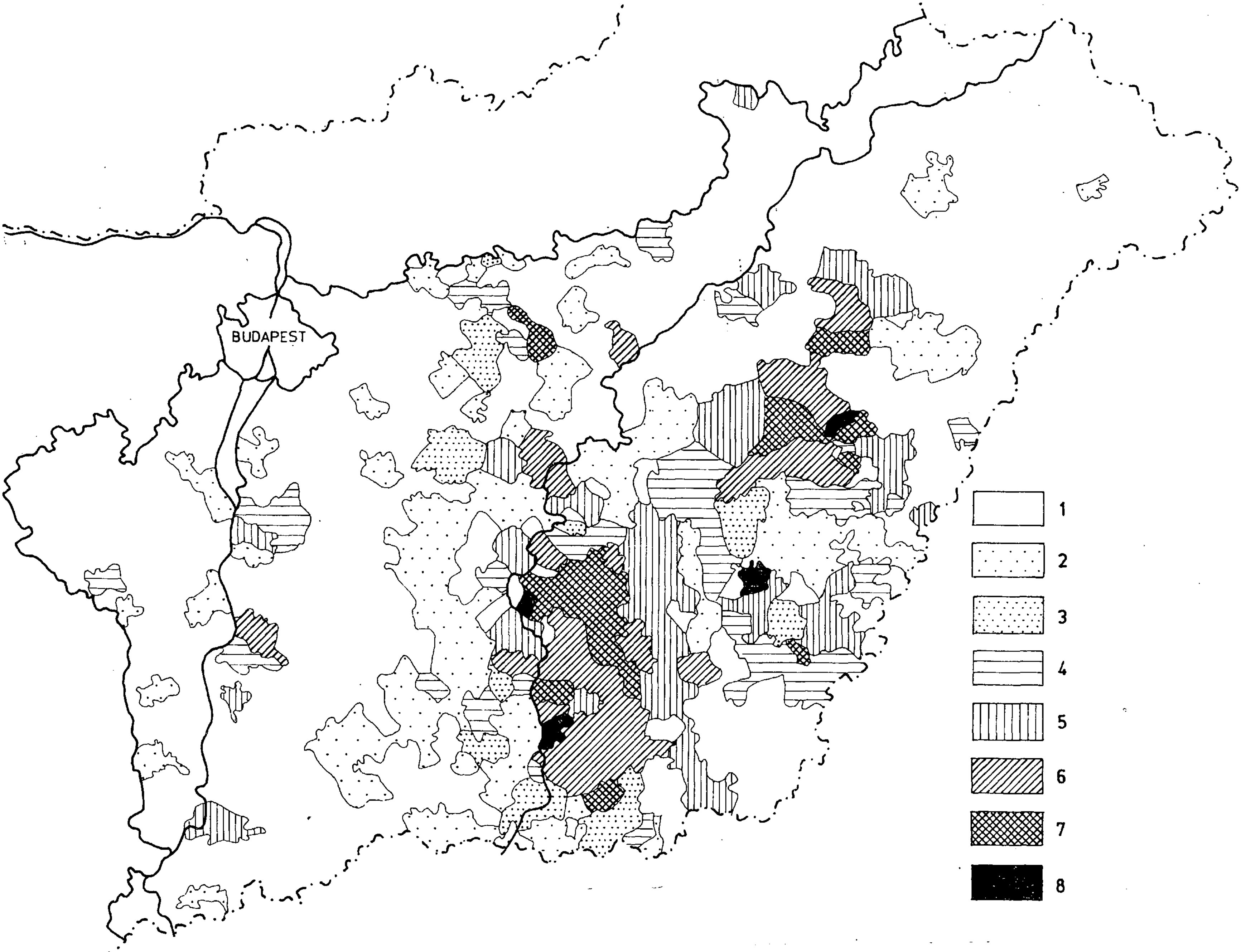

Fig. 6. Proportion of the gas-containing layer-water wells at a depth of 200—500 m in the Hungarian Plain
1 = uncategorizable (less than five wells),
2 = proportion of gas-containing wells is 0%,
3 = 1—10% 4 = 11—25%, 5 = 26—50%, 6 = 51—75%, 7 = 76—90%, 8 = 91—100%.

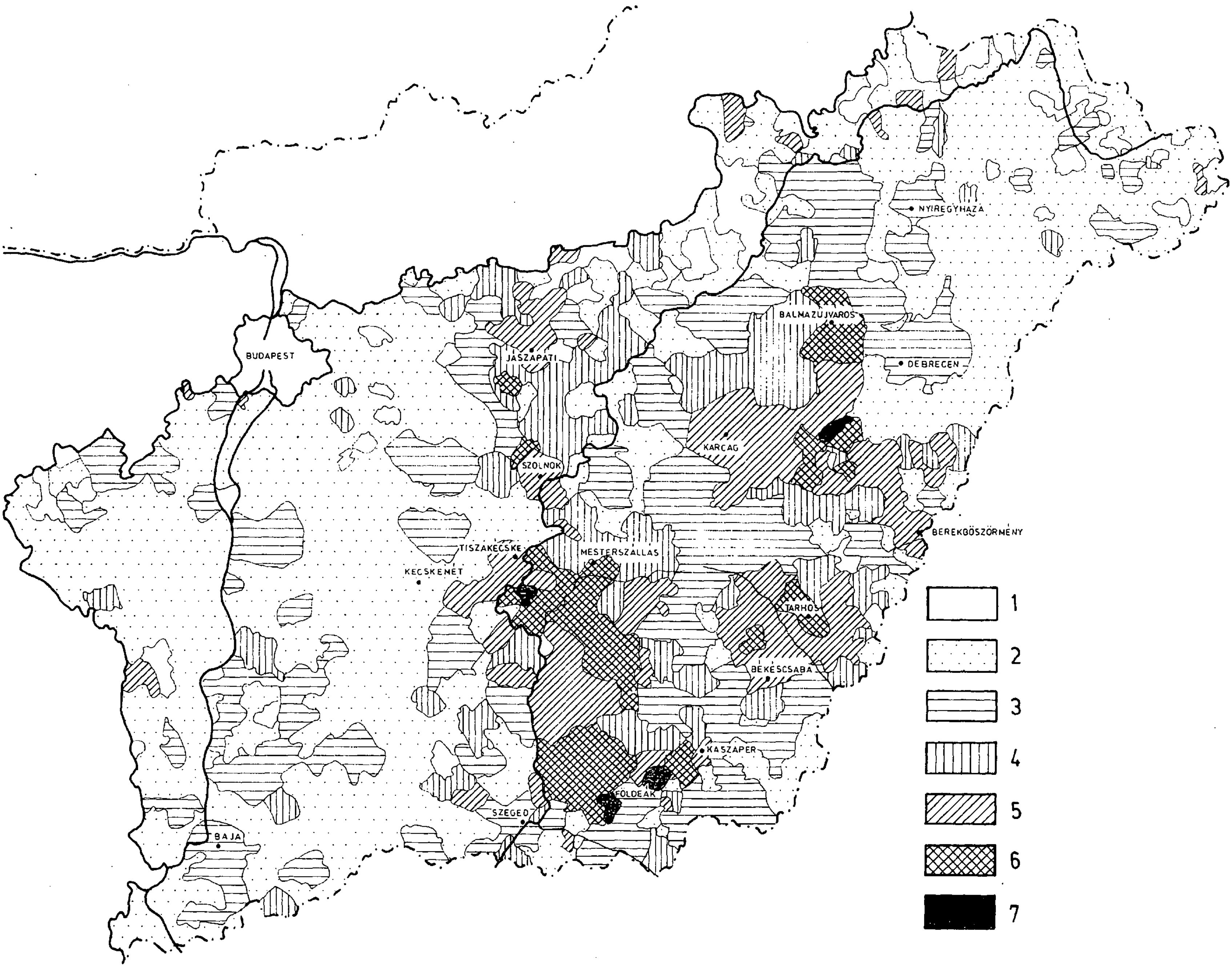

Fig. 7. Regional system of the gas-containing layer-waters in the Hungarian Plain
1 = uncategorizable (less than five wells)
2 = gas-free area
3 = hardly gassy area
4 = little gassy area
5 = gassy area
6 = very gassy area
7 = extremely gassy area

Table 2.

Rate of gas-containing artesian wells %	Estimation
0	gas-free areas
1—10	hardly gassy areas
11—25	little gassy areas
26—50	gassy areas
51—75	very gassy areas
76<	extremely gassy areas

into consideration, conclusions as regards the regional system of gas-containing layer-water wells in the Hungarian Plain can be drawn.

The less gassy areas are the sand ridge of the Danube—Tisza Midregion and the areas situated west of the Danube, furthermore the north-eastern part of the Hungarian Plain wehere the water of artesian wells are generally gas-free (0%) or only hardly gassy (1—10%).

Layer-waters most rich gas can be found in the middle of the Tiszántúl* area, in the western part of south Tiszántúl and in the north-eastern part of the south Tiszántúl area.

1. The largest gassy contiguous area is the western part of the south Tiszántúl area, i.e. the area bordered by the following settlements: Cibakháza, Szarvas, Gádoros, Nagymágocs, Hódmezővásárhely, Kaszaper, Óföldeák and Szeged. Within this area there are very gassy areas such as Cibakháza—Mesterszállás—Árpádhalom—Tiszaug; Hódmezővásárhely—Óföldeák—Mártély and Tótkomlós. The areas of Tiszakürt, Földeák and Nagykopáncs are extremely gassy.

2. One gassy area is that bordered by the settlements called Kőröstarcsa—Okány—Sarkad—Békéscsaba in the "Békés sagging" in the north-eastern part of the south Tiszántúl area. Within this, very gassy areas are Bélmegyer—Tarhos and Murony.

3. In the middle of the Tiszántúl area the centre bordered by Balmazújváros—Földes—Eszlár—Berekböszörmény—Karcag is gassy. Within this, the areas of Balmazújváros—Nagyhegyes; Báránd—Földes—Biharnagybajom and Bihartorda are very gassy. Area of Tetétlen is extremely gassy.

Apart from these three big contiguous areas there are some smaller gassy centres: west of the Tisza, such as Jászapáti—Nagyfüged is gassy, Alattyán is very gassy in the north. In the middle part: Szolnok—Szandaszőlős is gassy. The very gassy area of Zagyvarékas belongs to it. The areas of Bordány—Zsombó in the south are gassy, too.

If Map 7 is compared with the map showing hydro-dynamics, the pressure conditions of the layer-waters by hydrogeological profiles in the Hungarian Basin and the hydrodynamic gradient map of the Hungarian Basin, the following obvious coincidences and important connections can be observed:

a) Areas which have a decreasing potential the deeper we go, i.e. areas with a negative vertical hydrodynamic gradient — sandy areas like Nyírség and in the

* The Tiszántúl is the part of the Hungarian Plain, situated east of river Tisza.

area between the Danube and the Tisza — are not gassy; only a few little patches are designated as "hardly gassy" or "little gassy".

b) In areas which have an increasing potential the deeper we go, i.e. areas with a positive vertical hydrodynamic gradient, layer-waters contain gas and all the "extremely and very gassy" areas, as well as the "gassy" areas can be found here.

These observations might raise new points of view, thus the problem of the origin of the gases might be solved in the near future.

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KARSTMORPHOMETRISCHE UNTERSUCHUNGEN IM GEBIRGE AGGTELEK (NORDUNGARN)

G. MEZŐSI — I. BÁRÁNY — I. TÓTH

Die Untersuchung der Karstkorrosion im Mikro- und Mesoraum lieferte auch bisher eine Reihe neuer Ergebnisse JAKUCS, 1971; BÁRÁNY—MEZŐSI, 1977/a, 1977/b. Die Lösung der inhaltlich neuartigen Aufgaben (z.B. Beziehung der Wirkungskomponenten, der Faktoren der Karstkorrosion) erfordert auch methodisch neue Mittel. Jedes von ihnen hat die grundlegende Aufgabe, das Relief genau zu vermessen, es quantitativ und morphometrisch zu analysieren, zu qualifizieren. Für die morphometrische Beschreibung der Karstformen ist aber das frühere, von HORTON, STRAHLER usw. ausgearbeitete System nicht mehr geeignet, dies letztere gründet sich nämlich auf der nach Ordnung durchgeführten Klassifizierung der Wasserabflüsse eines gegebenen Gebietes. Einerseits wegen des spärlichen Wassernetzes der Karstgebiete auf der Oberfläche, andererseits wegen der Unbestimmbarkeit der Ordnungszahlen, der Wasserlaufdichte der Wassersysteme unter der Oberfläche (bisher gibt es sehr wenig Angaben darüber) und wegen ihrer anderen Spezifika dürfen die morphometrischen Verhältnisse des Karstes auf die obenerwähnte Weise nicht untersucht werden. Die Verfahren mußten den Bedürfnissen nach verändert werden (WILLIAMS, 1966, 1972; LA VALLE, 1967, 1968). Bei der morphometrischen Analysierung, insbesondere im Falle von Kleinformen, ist die Geländeuntersuchung sehr wichtig. (Die genaue Bestimmung der Wasserschlinger, Dolinen und deren genetischer Typen kann nur mit großem Fehlerprozent aufgrund der topologischen Karte durchgeführt werden). Unsere Untersuchungen wurden im Gebiet des Gebirges Aggtelek in Nordungarn vorgenommen. Im Mittelpunkt unserer Arbeit stand die quantitative Analyse der geschlossenen Depressionen. Die für die Erklärung der allgemeinen karstgenetischen Fragen geeigneten Methoden werden von uns nur skizzenhaft behandelt (Abb. 1.).

Der morphometrischen Analysierung eines Gebietes geht die geologische Vermessung voran. Wir geben genau die Größe des Karstgebietes (A_1) an und bestimmen die Stelle der Wasserschlinger. Aufgrund der in die Wasserschlinger einmündenden Bächer (L_1) im Karstgebiet nach Ordnung von Strahler werden auch die Wasserschlinger und die Wasserspeicherbecken nach Ordnung Klassifiziert (S_1, S_2 usw.). So bekommen wir eine Serie von Becken (Abb. 2.) verschiedener Ordnung, dem Karstrand angepaßt. Den Wasserschlingern schließt sich so ein nicht karsthaltiger Wasserspeicher verschiedenen Gebietes an. Diese nicht karsthaltigen Wasserspeicher haben eine entscheidende Rolle besonders für die allogene Erosionskarstenwicklung (JAKUCS, 1971). Nachdem die morphometrischen Eigenschaften dieser Wasserspeichergebiete zu vermessen sind, ergibt sich also die Möglichkeit auch für die quantitative Berechnung der hier ablaufenden Karstdenudation. Die

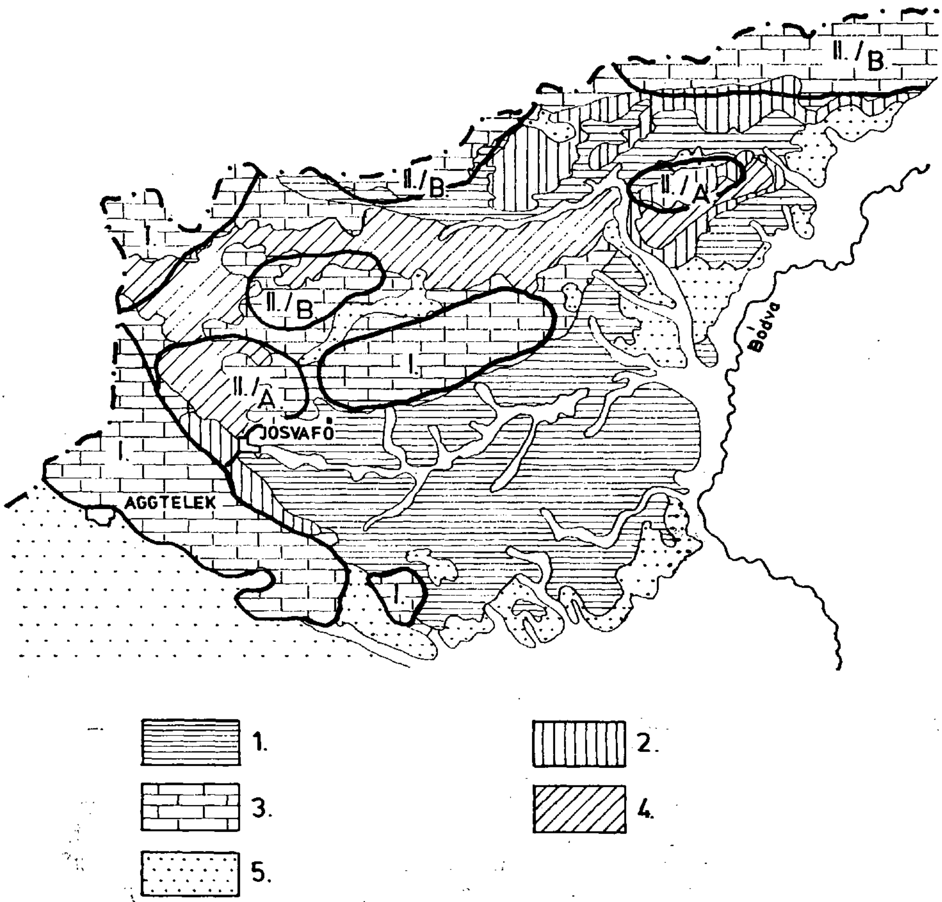

Abb. 1. Geologische Skizze des Gebirges Aggtelek und line Dolinentypen
1 — Unteretrias (campili) Kalkstein, Tonschiefer
2 — Unteranisus (Gutenstein) Kalkstein, Dolomit
3 — Kalkstein Wetterstein
4 — Dolomit Wetterstein
5 — Pliozänablagerungen
I — Reihedolinen
II — Plateaudolinen
a) Dolomittyp
b) Kalksteintyp

Klassifizierung der Wasserschlinger nach Ordnung ermöglich auch die Bestimmung der Ordnungszahlen der allogenen Höhlen, die sich genetisch an sie knüpfen. Die Annäherung der Ordnung der allogenen Höhlen solcher Richtung beseitigt auch die in Einführung angegebenen Probleme.

Die Trockentäler, die dem System von HORTON—STRAHLER nach natürlichere Bestandteile eines Karstgebietes wären, sind dafür nicht geeignet wegen der

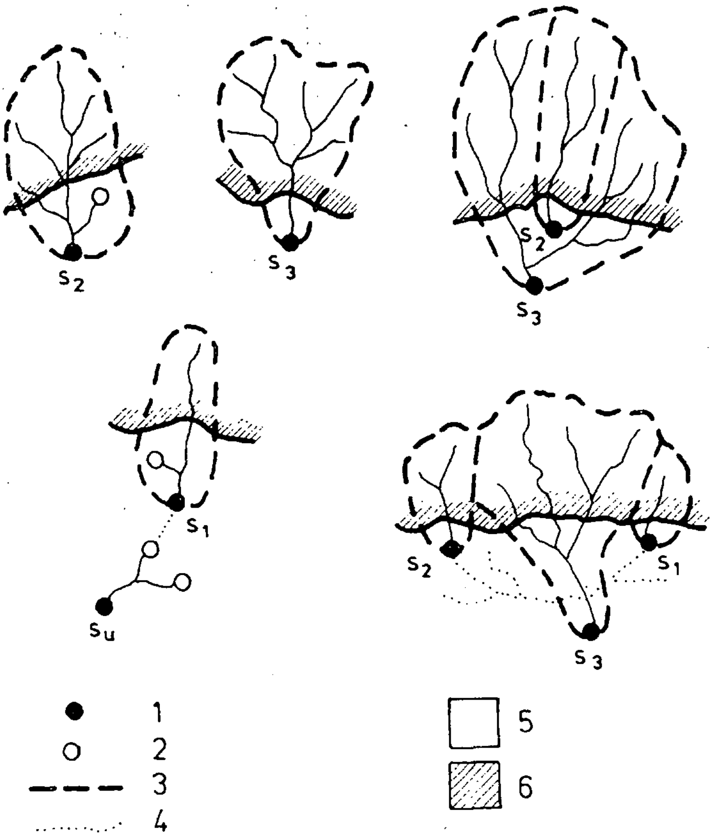

Abb. 2. Klassifizierung der an den Karstrand anpassenden Wasserschlinger nach Ordnung (WILLIAMS, nach 1975)
1 — Wasserschlinger
2 — Quelle
3 — Wasserscheide
4 — Trockental
5 — Kalkstein
6 — Nicht karsthaltiges Gestein

bedeutenden genetischen, morphologischen usw. Unterschiede. (Bei dem autogenen Karst werden sie für die Bestimmung der Ordnung der sich an sie knüpfenden Wasserschlinger verwendet.)

Die erkannten Zusammenhänge über die Ordnung des Wasserlaufes sind für die Ordnung der Wasserschlinger analogisch zutreffend, d.h.: zwischen der Ordnungszahl und dem durchschnittlichen Gebiet der Wasserschlinger, sowie zwischen der mittleren Distanz voneinander (L_{su}) bei den Wasserschlingern gleicher Ordnung besteht eine exponentiale Beziehung (WILLIAMS, 1966). Die Klassifizierung nach der Ordnung durchgeführt, stellen wir die Stelle (K_r) jeder Karstquelle in unserem Gebiet, fest deren absolute Größe (H_r) und die Distanz von der nächstgelegenen Quelle (L_r). Der Zusammenhang unter diesen Parametern wird von uns auf Abb. 3. im Falle eines Karstes eine Art allogenen Typs dargestellt.

Diese Kennziffer verwendend stellen wir einige Parameter des Karstwasserspeichers vor, die wir bei der vergleichenden morphogenetischen Untersuchung, bei der Typisierung der Karstgebiete gebrauchen können (WILLIAMS, 1975). Die Wasserschlingerdichte wird mit dem Wert $D_s = \frac{\Sigma S}{A_1}$ (wobei ΣS die Zahl der Wasserschlinger, A_1 die Größe des untersuchten Gebietes ist) angegeben. Nach La VALLE (1967) bestätigt die Verringerung der Zahl der Wasserschlinger, die auf ein Einheitsgebiet fallen, der Entwicklungsstand des Gebietes. Auf gleiche Weise wird auch die Zahl der Quellen, die auf ein Einheitsgebiet fallen, von uns angegeben ($D_r = \frac{\Sigma K_r}{A_1}$, wobei ΣK_r auf die Zahl der Quellen hinweist). Der Quotient der Wasserschlinger Quellen $\left(R = \frac{\Sigma S}{\Sigma K_r}\right)$ weist auf die Größe der Ausdehnung des Stromes unter der Oberfläche hin. Wir stellten die Gesetzmäßigkeit fest, daß der Wert R im Falle des autogenen Karstes (**A**-Typ) kleiner ist als 1, im Falle des allogenen Erosionstyps (**B**-Typ) aber größer oder gleich 1 ist. Das ist damit zu erklären, daß das Erosionskanalnetz des Typs **B** nicht nur durch die Wasserschlinger der Konvergenzzone ernährt wird, sondern auch durch andere Wasserschlinger des Karstraumes. Zugleich werden alle Karstquellen in der Divergenzzone nur im Fall einer größeren Wassermenge mobilisiert. Die Kompliziertheit und Entwicklung des Wasserlaufnetzes unter der Erdoberfläche kann so charakterisiert werden, daß die geradlinige Distanz des Wasserschlingers und der nächstgelegenen Quelle oder des Flußbettes (oder ihr Durchschnitt) ins Verhältnis zur wirklichen Länge gestellt wird $\left(\text{d.h.: } F = \frac{L}{L_u}\right)$.

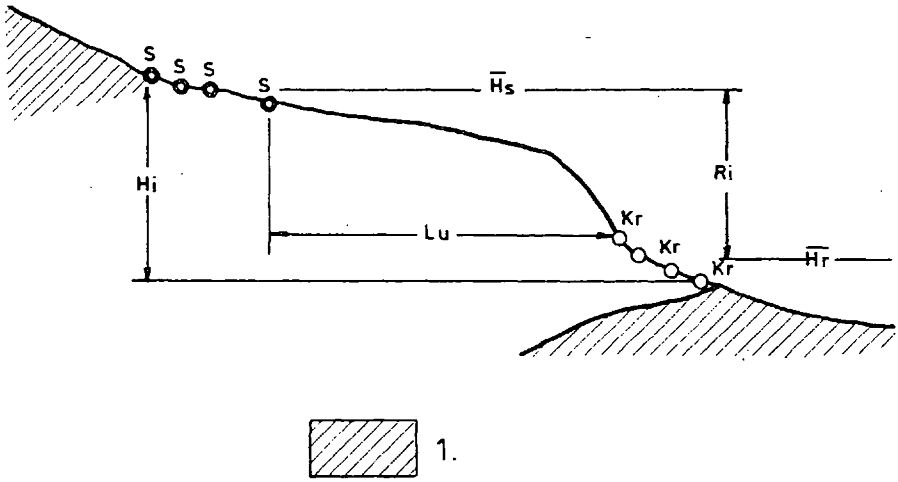

Abb. 3. Einige allgemeine karstmorphometrische Parameter (nach WILLIAMS, 1975)
1 — Nicht karsthaltiges Gestein

Der Unterschied der durchschnittlichen Höhe bei den Wasserschlingern und bei den Quellen ist das relative Karstrelief ($R_i = H_s - H_r$). Das bedeutet das hydrostatische Gleichgewichtsniveau (Grenze der Einsickerungszone), das letztens durch H_r (absolute Höhe) bestimmt ist und nach der Entwicklung unter der Oberfläche, Struktur, Litologie verändert wird. Wenn wir über weitere hydrologische Angaben verfügen, so können wir auch weitere Parameter verwenden. Die Kennziffer werden immer vom Untersuchungsziel und Charakter der Oberfläche bestimmt. Es muß aber darauf geachtet werden, daß sie gut definiert sein und die quantitative Erfassung der Beziehungen ermöglichen sollen.

Unter den Mikro- und Mesoformen der Karstgebiete ist die Doline allgemeiner Ausbreitung zweifellos die am besten charakteristische Eigenartigkeit. Viele Verfasser werteten von verschiedenen Gesichtspunkten aus die Dolinen. WILLIAMS und LA VALLE arbeiteten die wichtigsten Grundlagen für deren morphometrische Charakterisierung aus, aber auch sie verwendeten ihre Ergebnisse zur Lösung der genetischen Fragen nicht. Die morphometrische Charakterisierung der übrigen, von uns jetzt nicht dargelegten Mikro- und Mesoformen — wie z.B. die Karr, Wasserschlinger, Karstschlote usw. — wird noch zur Lösung zahlreicher genetischer Fragen beitragen können.

Die bei der genauen Vermessung der Dolinen erzielten Ergebnisse wurden von uns zwei Gesichstpunkten aus gebraucht. Einerseits zur Anfertigung eines Modells für Dolinenentwicklung zur Untersuchung der charakteristischen Eigenschaften der einzelnen Dolinen, andererseits zur Differenzierung von Dolinentypen. Es war eine schwere Aufgabe, die in die Analyse einbezogenen Dolinen zu umgrenzen, denn das anschließende Wasserspeichergebiet, aus welchem entstandener Niederschlag an der Entwicklung der Doline teilnimmt, kann nicht in jedem Fall mit der Doline in genetischem Sinn identifiziert werden. So haben wir das zu vermessende Gebiet der Dolinen — wegen praktischer Gründe — in jedem Fall bei der zutreffen proportionellen Winkelwertverringerung der Hangneigungen in verschiedenen Richtungen angegeben (Abb. 4.).

Zuerst untersuchten wir das Verhältnis der Verlängerung bei den Dolinen (Verhältnis des größten und kleinsten Durchmessers) und deren Orientierung (Azimut der längeren Achse der Doline) (Abb. 4.). Die Orientierung spiegelt das Verhältnis der Entwicklung der Depression zu den strukturellen Richtungen ab. Etwa 78% der Dolinen (64 St.) im untersuchten Gebiet (bei Abweichung von 5°) entspricht den im gegebenen Gebiet vermessenen Tektonik-, Bruchs- und Spalterichtungen. Beherrschend sind die Richtungen NNO-SSW, O-W und die bei der geologischen Entwicklung mehrmals erneuerte Richtung N-S. Nach Ergebnissen der Regressionsanalyse von LA VALLE (1967) bestehen die zwei wesentlichsten Faktoren für Orientierung der Dolinen: die Sauberkeit des Kalksteins, genauer handelt es sich um das durchschnittliche Prozent des unlösbaren Restes und der Prozentsatz des durch Wasserabflüsse unter der Oberfläche entwässerten Gebietes. (Die eintachen Korrelationskoeffiziente betragen $-0{,}66$ und $+0{,}25$.) Das Verhältnis und das Maß tür Verlängerung der Dolinen hängen von der Veränderung der geologischen, hydrologischen und lokalen Elemente der Landschaft ab. Für die Verlängerung hat die strukturelle Präformation zweifellos die wichtigste Rolle. (Nach LA VALLE ist ihr Korrelationsverhältnis 0,92). Darunter verstehen wir, daß sich der längere Durchmesser der Depressionen paralell mit den Brüchen oder Spalten anordnet. Die wirksamste Einsickerung verursacht eine Zeitlang wirksamere Korrosion bzw. inten-

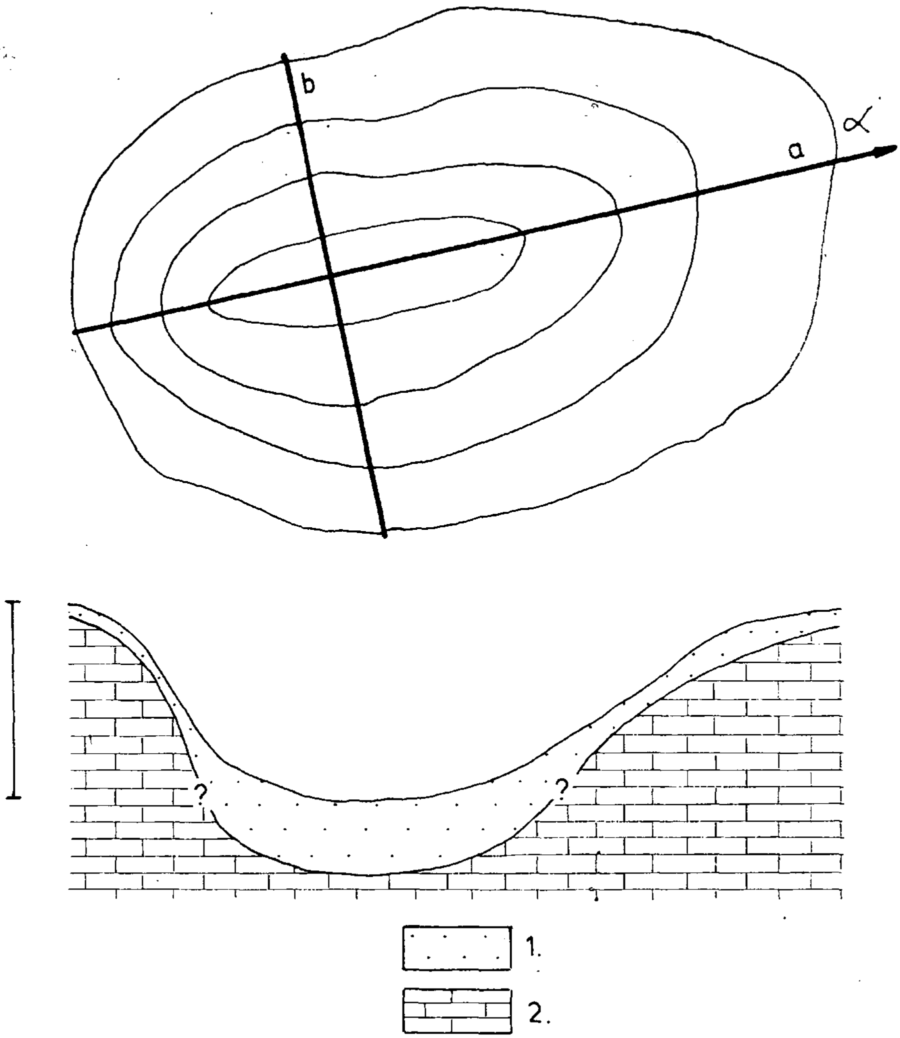

Abb. 4. Charakteristische morphometrische Kennziffer der Dolinen. — Orientierung (Azimut),
a) Großachse
b) Kleinachse
h) Tiefe
1 — Witterungsdecke
2 — Karsthaltiges Gestein $\frac{a}{b}$
Verlängerungsverhältnis
Reliefverhältnis $\left(\frac{2h}{a+b}\right)$

sivere Karstentwicklung (MELTON 1934; SCHEIDEGGER, 1961). Wir sind aber überhaupt nicht einverstanden mit dem Standpunkt von LA VALLE (1967), der meint, die Rolle der Klimafaktoren sei nicht significant. Nach unseren früheren, eingehenden Untersuchungen in solche Richtung entwickeln sich verschiedenartige Feuchtigkeitsverhältnisse, Temperaturen und demgemäß Ökologieverhältnisse auf den verschiedenen Expositionen der Doline und dementsprechend muß man auch in den einzelnen Expositinonen mit Karstkorrosion verschiedenen Wirkungsgrades rechnen. Das wird auch durch die von uns gewonnenen Werte für die Verlängerungsverhältnisse unterstützt, indem wir auch bei den tektonisch stark präformierten Dolinen der Hangneigung in nördlichen und westlichen Expositionen treffen. Diese Wirkungen in unserem Gebiet nach Angaben zu analysieren ist eine sehr schwere Aufgabe, weil diese Wirkung einerseits das Verhältnis vermindert (z.B. im Fall der N-S Orinetierung), andererseits aber es vergrößert (bei der O-W Orientierung). Wir stellten fest, daß die Uvala in unserem Gebiet durch ein Verlängerungsverhältnis größer als 1,75 characterisiert sind, Ausnahme können eventuell die zirkulären Uvala, entwickelt an der Kreuzung der Bruchs- bzw. Spaltenlinien, bilden. Nach KIKNADZE (1972) können auch andere lithologische Faktoren (z.B. die Schichtung usw.) in der Orientierung und Verlängerung der Dolinen eine wichtige Rolle spielen. Im Gebirge Aggtelek bemerkten wir auch den Zusammenfall der Dolinen, Dolinenreihen und Gesteinsgrenzen (z.B. Grenze der Kalksteine Gutenstein und Wetterstein) bzw. der Faziesgrenzen (SCHOLTZ, 1972). Von der Wahrheit unserer erwähnten These wurden wir auch durch die Untersuchung der Hangneigungsverhältnisse im Inneren der Doline überzeugt.

Das Reliefverhältnis der Dolinen kann mit einem Tiefe durchschnittlicher Durchmesser-Quotienten gemessen werden, wie es schon auch von CVIJIC durchgeführt wurde. JENNINGS (1971) erhielt im Mustergebiet von Neuseeland bei morphometrischer Analyse von 94 Dolinen den Korrelationswert 0,84. Unsere Untersuchungen weisen darauf hin, daß die Beziehung solchen Charakters in diesem Fall gerade die Details mit wichtigem genetischem Gehalt "verschwinden" läßt. Wir bekamen zum Ergebnis, daß das Reliefverhältnis der tektonisch gerichteten Reihedolinen kleiner ist (im allgemeinen ein Wert unter 0,1) als das der "plateaugelegenen", oder der tektonisch nicht gerichteten "angeordneten" Dolinen (Werte über 0,1). Der hier vorkommende scheinbare Widerspruch — mann könnte hier erwarten, daß tiefere Dolinen im Gebiet mit tektonischer Wirkung größeren Umfangs vorkommen — scheint für uns folgenderweise gelöst zu werden. Die Reihedolinen der gemäßigten Zone — tektonisch präformierte Spalten, oder sie können frühere Flußtäler einnehmen — sind wirksamerer Entwicklung (intensivere Einsickerung usw.), als die einzelnen Plateaudolinen. Mit der Zeit aber hinderte eventuell auch hemmte die von den Seiten abgewaschene lehmige Witterungsdecke ihren Vertiefungsprozeß, ihre Ränder wurden allmählich niedriger, sind selten zu Uvala geschmolzen. Die Plateaudolinen dagegen konnten wegen ihrer verhältnismäßig langsamen Entwicklung ihr größeres Reliefverhältnis für längere Zeit bewahren.

Im weiteren möchten wir darlegen, wie weit die Veränderung der zur Karstierung vorhandenen Oberfläche auf die Entwicklung der Doline zurückwirkt. Das ist natürlich nur bei den durch Lösung entstandenen Dolinen möglich, denn die Einsturzdolinen oder die Abgrunddolinen weisen auf die Auflösung des Gleichgewichts der Kraftwirkungen im Höhlengewölbe, aber die Lösungsdolinen entwickeln sich unter gemeinsamer Wirkung der Klima-, Pflanzen- und Bodenfaktoren. (Diese beiden letzten Typen gestalten sich unserer Meinung nach nicht durch die Entwicklung der für die Dolinen charakteristischen Wirkungsfaktoren aus). Wir verwendeten die folgende Methode: nehmen wir die Oberfläche der Doline als Kugelkappe (Abb. 5.)! Demzufolge können wir die Oberfläche für die Korrosion mit der folgenden Formel bezeichnen: $A=\pi/2Q^2+m^2)$, wo Q den mittleren Durchmesser der Doline, m die durchschnittliche Tiefe bezeichnet.

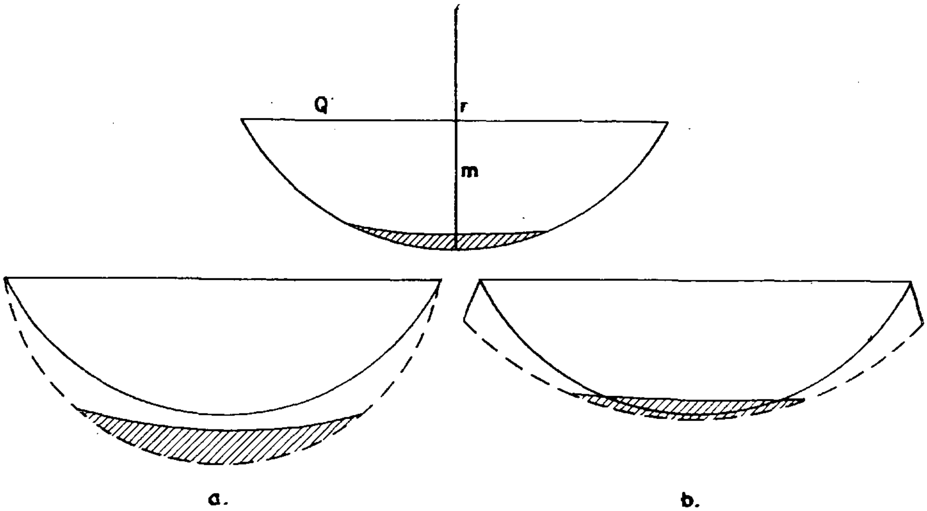

Abb. 5. Entwicklungsrichtungen der Dolinen unter gemäßigten, mediterranen *(b)* und tropischen *(a)* Verhältnissen.

Die Veränderung der Oberflächengröße der Dolinen muß in erster Erfassung in zwei Gebieten behandelt werden: *a)* kontinental, mediterran und *b)* tropisch, subtropisch (Temperatur pro Jahr über 17—18 °C, Niederschlag pro Jahr über 1200 mm). Es ist bekannt, daß die Lösungswirkung im Inneren der Dolinen nicht überall von gleicher Intensität ist. ZÁMBÓ (1971) und BÁRÁNY (1975) wiesen bei ihren Untersuchungen darauf hin, daß ein enger Zusammenhang zwischen der Bodenmächtigkeit und der größe der Karstkorrosion besteht. Dieser Faktor ist besonders wichtig in den tropischen Gebieten. Solange der Boden nicht großer Mächtigkeit die Karstkorrosion indirekt fördert, verhindert der Boden sehr großer Mächtigkeit (hauptsächlich auf dem Grund der Dolinen zusammengewaschen) stark wegen der Impermeabilität des Rotlehms. Da wird die Lösung am Rande der Doline am wirksamsten sein. So geht die Entwicklung der Dolinen in den kontinentalen Gebieten vielmehr zur Erweiterung als zur Vertiefung, während die absolute Höhe der Oberfläche bzw. des Sattels unter den Dolinen vermindert wird (Abb. 5/b.). In den Tropen kann die wesentlich größere areale Erosion auf dem Grund der Dolinen bedeutende Menge von Boden zusammentragen, das fördert die intensive Vertiefung (Korrosionsvergrößerung), d.h. die Vergrößerung der Reliefenergie (Abb. 5/a).

Gehen wir vom Ausmaß einer Doline mit mittlerem Durchmesser 100 m, durchschnittliche Tiefe 15 m aus. Ihre Oberfläche ist etwa 7400 m². Charakteristisch ist für die Tropen, daß schon eine Vertiefung von etwa 2—2,5 m eine Vergrößerung von 500 m² ergibt, was sich dann in Wirkungen weiterringelt. Dieser Prozeß dauert solange, bis die Oberfläche bis zur Erosionsbase denudiert und die Landschaft durch den Kegel- und Turmkarst und durch die unter ihnen gelegenen Ebenen geprägt wird. In den kontinentalen Gebieten gibt es zwei Möglichkeiten, in Betracht genommen, daß einerseits eine dicke, lehmige Schicht auf dem Grund der Doline oft die Vertiefung stört, andererseits das ziemlich stabile Verhältnis des Durchmessers der Tiefe (das bedeutet ungefähr eine Erweiterung von 10 m). Die Größe des Karstgebietes kann zwischen 6700 und 7700 m² verändert werden und das bedeutet in einem Fall (unter 7400) die Konservierung der Form, um anderen Fall aber die langsame Vergrößerung (über 7400).

Zur Differenzierung der Dolinentypen ist es am zweckmäßigsten zuerst die Anzahl der Dolinen und deren Zusammensetzung festzustellen. In unserem Gebiet (Abb. 1.) differenzierte JAKUCS (1964) 3 Dolinentypen vor allem auf orographischer Grundlage. Diese 3 Gruppen wurden vom morphometrischen Gesichtspunkt aus aufgrund der folgenden 3 Kennziffer untersucht:

1. Zahl der Dolinen auf 1 km² — Dolinendichte.
2. Prozentsatz des Gesamtgebietes der Dolinen, verglichen mit der Größe der gegebenen Karstoberfläche (Der von WILLIAMS verwendete Pittingindex (index of pitting) ist dessen reziprok).
3. Das durchschnittliche Gebiet der Dolinen.

Tabelle 1.

	I. Typ der Reihedolinen	II. Typ der „Plateaudolinen" a) dolomitisch	II. Typ der „Plateaudolinen" b) kalksteinig
Dolinendichte St/km²	11—13	32—36	7—9
Gesamtflache der dolinen in % der Karstoberflache	23	32	31
Durchschnittliche Flache der Dolinen/km²	0,01	0,002	0,016

Unsere Ergebnisse sind auf Tabelle 1. zusammengefaßt. Beim ersten Typ fanden wir den Parameter "Das durchschnittliche Gebiet der Dolinen" nicht für charakteristisch wegen des häufigen Vorkommens der Uvala. Wenn wir nur die Dolinen in Betracht nehmen, so ist der Durchschnittswert 0,01.

Auf morphometrischer Grundlage können also diese 3 Gruppen gut differenziert werden. Auf Grund der Resultate der quantitativen Untersuchung war es begründet, die genetischen Typen zu verändern. Eine Grundlage dafür ist die relative Übereinstimmung der morphometrischen Parameter bei den Typen *II/A* und *II/B*. Der Typ I. ist ein Typ der am allogenen Karst entwickelten Reihendolinen. Die anderen zwei Gruppen können als genetisch gleicher Plateautyp betrachtet werden, beide entwickelten sich entscheidend am autogenen Karst. Ihre Unterschiede am Ausmaß sind durch lithologische Gründe gut zu erklären, der *Typ II/A* entwickelte sich vor allem auf Dolomit, bis der *Typ II/B* auf Kalkstein (Abb. 1.).

In unserer Arbeit gaben wir einige einleitende Ergebnisse der quantitativen Karstuntersuchung im Mikro-und Mesoraum in Ungarn bekannt. Unsere Untersuchungen werden in 2 Richtungen weiter durchgeführt. Einerseits in Richtung der vergleichenden Analyse der verschiedenen Karstgebiete aufgrund der Ergebnisse der ausführlichen Geländeaufnahmen, andererseits wünschen wir die Wirkungsintensität der einzelnen Karstkorrosionsfaktoren quantitativ zu bestimmen.

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