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EFFECTS OF INDUSTRIALIZATION ON THE ECONOMIC AND SOCIAL CHANGES IN VILLAGE AREAS ON THE SOUTH HUNGARIAN PLAIN

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As a consequence of the rapid industrial development in the past few decades, the South Hungarian Plain, which accounts for nearly 20% of the area of the country and 14% of the population, has undergone a radical economic and social transformation, affecting both the town and the village settlements. The dynamic change to be observed in the village settlements is naturally inseparable from the other factors acting on the process: the reorganization of agriculture on socialist lines, the use of modern technological, methods the development of transport, and the tremendous increases in the specialist knowledge and cultural level of those working in agriculture are not only consequences, but also causative factors of the process of transformation.

The economic and social transformation of the village areas is proceeding in a regionally differentiated manner, depending on the strengths of the local effects and the economic centres. In the following we wish to deal with the effect-connections originating from the industrial development of the economic centres.

Some aspects of the industrial development of the South Hungarian Plain

Before the Second World War, the industry on the South Hungarian Plain was undeveloped and strongly decentralized; each town possessed a few smaller food-industry (mainly milling, meat, sugar or preserving) or light-industry (hemp, textile, shoe or wood) works, which were generally located with regard to the raw material and the cheap labour force. A larger industrial centre could not develop. Only Szeged comprised a more significant industrial focus.

At the turn of the century, Szeged was the second most highly-populated Hungarian town. Its development was promoted by certain favourable features: it was a railway junction, it had the possibility for water-transport, it was a centre for the emerging light and food industries, it possessed a wide-ranging sphere of attraction, and it was a marketing centre. As regards the population and the number of industrial workers, it stood out from among the other settlements of the South Hungarian Plain: in 1941, 9% of the inhabitants of the region and 25% of the industrial workers were concentrated in the town.

Up to the end of the Second World War, the industrial development of the area was extremely slow; it is true, however, that the situation was similar in the whole country, and thus there was no significant difference in tendency.

In the nineteen-fifties, the industrial development of the country as a whole was extremely fast, but the South Hungarian Plain continued to remain in a disadvantageous situation because of a number of unfavourable factors:

a) The main directive of the first 5-year plan prescribed the development of heavy industry, and within this, the mining, the basic materials, the machine and

the chemical industries. The realization of this was connected to areas possessing energy and raw-material sources, and consequently the decentralization of industry materialized in the relation of Budapest and some areas possessing raw materials (Borsod and Central Transdanubia).

b) The agricultural raw material necessary for the major development of the food industry of the South Hungarian Plain was not available.

c) In this period, unlike the other regional centres, Szeged was in a disadvantageous position. The new national boundary created as a result of the Firs World War deprived the town of its favourable transport situation and of a considerable proportion of its area of attraction. The transit traffic fell off appreciably. The then strained political relations with Yugoslavia slowed down the development not only of the industry, but of the town too.

Of the conditions for industrialization, the South Hungarian Plain possessed primarily a labour force, which proved insufficient for the establishment of more significant objects. The rate of industrial development of the area was below the national development of the area was below the national average, and consequently the difference compared to the industrially more developed regions did not decrease, but rather became even more marked. The migration away of the labour force continued at an enhanced rate, and became a tendency the effects of which are still felt even nowadays in the reproduction of the population, in the development of the towns, in the lag in communal investments, and in other areas.

The situation of the South Hungarian Plain progressively improved from 1957, and in the following decade became favourable. The industrial development of the region is favourably influenced by the following national and local tendencies:

a) At the beginning of the nineteen-sixties the aims of the economic policy were modified. In place of the one-sided development of heavy industry, the light and food industries and the labour-demanding branches of heavy industry came into the foreground. Besides the concentrated industrial investments, great care was devoted to the development of local industry. The less industrialized areas received support centrally too. This tendency brought the South Hungarian Plain into a favourable position; the labour force became one of the most important industry-settlement factors, but by this time the labour force reserves of the industrially developed regions had already been exhausted.

b) The socialist reorganization of agriculture released a considerable labour force, which came forward as a primary industry-settlement factor.

c) The socialist transformation of agriculture meant a solid basis for the elevation of the technological standard, for the reorganization of the crop structure, and for the constant increase of production. This permitted an appreciable development in certain branches of the light and food industries.

d) With the improvement of international relations, there was a considerable increase in the transit and tourist traffic on the South Hungarian Plain.

e) With the discovery of the hydrocarbon fields, the energy supply improved significantly, and this gave a further impulse to the industrial development.

f) The situation of Szeged was modified, and, as a regional centre, its high rate of development influences the entire area.

The changed conditions led to an acceleration of the industrial development of the region, and in the past 15 years the rate has exceeded the national average.

The purposeful policy of industrializing the region has brought spectcular results. In 1963 the five industrially most developed counties (together with Budapest) employed 70% of the industrial workers of the country; in 1969 the corresponding proportion was 62.5%, and in 1976 56%.

The economic indices for the South Hungarian Plain point to an even faster development than in the other less industrialized areas. The achieved investment increased six-fold between 1960 and 1976, and its national proportion from 8.1% to 10.8%. The increase of the industrial investment was even more marked than this. There were corresponding changes in the number and proportion of industrial workers, and the technical indices too were modified. In the above period, the number of those working in industry rose from 120,000 to 195,000, and the overall value of the fixed stock from 8.6 milliard Ft to 38.8 milliard Ft. The national proportion of the South Hungarian Plain changed considerably; for example, in the overall value fixed stock it rose from 4.5% to 8.2%.

In the past 15 years, the branch of industry that has developed most dynamically in the region is heavy industry, and consequently the proportions of the branches have changed. In 1963 heavy industry employed 22% of the industrial workers, and in 1976 37.7%. The change was primarily brought about by the exploitation of mineral oil and natural gas. The South Hungarian Plain yields 84.7% of the mineral oil and natural gas production of the country. In addition to the development of mining, numerous heavy-industrial plants too have been created.

Correlations of industrial development and urbanization

The close connection of industrial development and urbanization is well known, but it is worth turning to some characteristic features in the case of the South Hungarian Plain.

The rate and manner of industrial development varied, depending on the size of the towns:

a) The rate of increase of the number of those employed in industry is inversely proportional to the size of the town. The correlation coefficient between the two factors has a value $r=-0.61$; i.e. the change in industrial occupation was influenced by the number of the inhabitants in 37% of the cases. In the upper category the rate of increase is 1.5 times, while in the lower category it is more than 3 times.

b) The driving force increase is directly proportional to the size of the town; the correlation coefficient between the town; the correlation coefficient between the two factors has a value of $r=0.74$. The connection can therefore be said to be a close one. The driving force per employed person has increased by a factor of three in Szeged, while it has remained unchanged in the small towns.

c) Correlations can also be demonstrated between the size of the town and the electrical energy utilization per worker, and the size of the town and the increase in the overall value of the fixed stock ($r=0.58$ and 0.34, respectively), but these correlations are somewhat weaker than that for the driving force.

The rate and manners of industrial development of the towns and the increases in the populations were visibly different in the towns of different sizes (Table 1). The increase in population was the most intensive in Szeged. However, the number of those employed in industry varied to the lowest extent in Szeged too; indeed, in the nineteen-seventies a decrease can be observed in every respect. (The strong fall

Table 1. Increases of the number employed in industry and the driving force in the urban settlements of the South Hungarian Plain, with the towns classified according to size

Population group (1000 inhab.)	Year	Population	%	Number employed in industry	%	Number of industrial workers per 1000 inhab.	%	Driving force per workers	%
100–180 –	1960	98,942		32,225		230		1,2	
	1965	113,594	114.8	29,534	127,1	266	115.6	1.7	145.9
	1969	118,490	104.3	34,230	115,9	288	108.3	2.6	150.3
	1976	170,355	143.8	33,715	98,5	198	68.8	3.7	142.3
Total (1960–76)			172.2		145.2		86.1		308.3
50–100	1960	170,546		24,313		143		1,4	
	1965	177,813	104.2	32,898	135,3	185	129.3	1.8	123.8
	1969	185,689	104.4	44,220	134.4	238.	128.6	2.1	115.3
	1976	208,329	112.2	48,683	110,1	234	98.3	2.0	95.2
Total (1960–76)			122.2		200.2		163.6		142.9
30–40	1960	157,330		15,205		96		1,3	
	1965	159,281	101.2	22,200	146,0	139	144,8	1,7	131,2
	1969	164,422	103,2	31,255	140,7	190	136,7	2,3	137.7
	1976	171,074	104.1	36,592	117,1	214	112,6	2.5	108.7
Total (1960–76)			108.7		240.7		222.9		192.3
16–30	1960	104.098		10.068		96		1,3	
	1965	106,536	102.3	16,426	163'7	154	160,4	1,5	105,7
	1969	110,526	103.7	22,668	138.0	205	133.1	1.4	9 5.9
	1976	149,130	134.9	31,232	137,8	209	102.0	1.3	92.9
Total (1960–76)			143.3		310.2		217.7		100.0

in the number of industrial workers per 1000 inhabitants is due primarily to the integration of 5 village settlements into Szeged.) The machine capacity has increased more than three-fold. It follows clearly from the data that the nature of the industrial development in Szeged underwent a change at the beginning of the decade, passing over from the extensive to the intensive stage. (The increase of production is achieved by the elevation of the productivity.) The further increase in the urban population in recent years was brought about primarily by the development not of industry, but of the tertiary branches. Szeged has developed more rapidly than the other regional centres, but in spite of this the indices of the infrastructure of the town (with the exceptions of education and health) show a more unfavourable picture; i.e. the lag dating from forty years ago has by no means been made up for as yet. Of the 5 similar large towns, Szeged is in first place in the fields of health, education and adult education, but in fourth place as regards housing and communal facilities, transport, trade and sports facilities.

In the category of towns with a population of between 50,000 and 100,000, the increase in the number of inhabitants has accelerated in recent years; the number of those employed in industry has also increased, but its proportion has decreased, indicating that in these towns too the tertiary sector has come into the foreground.

In the category of settlements with a population of 30,000—40,000, the increase in the number of inhabitants is slow; the number employed in industry has increased appreciably, and the industrial development has remained unchangingly extensive in nature. The significant change of the driving force is not characteristic of every settlement, since the considerable increase can be attributed to the Glass Works in Orosháza.

In the lowest category, the population per settlement has not altered essentially; at the same time, the number of those employed in industry has increased dynamically; the driving force per worker has remained unchanged for 15 years. The extensive nature of the industrial development is obvious here too.

The changes in the proportion of the urban population on the South Hungarian Plain followed the stages of development of industry. Up to 1965 the rate of increase remained below the national average; it then accelerated and overtook the other regions. Nowadays the tempo has become more uniform, and essentially conforms to the national tendency (Fig. 1).

The differences to be found in the rate and the nature of the industrialization, depending on the size of the town, are supplemented by the differences in the demographic indices (Table 2).

In the nineteen-sixties, the birth rate in Szeged was extremely low; the death rate exceeded it by 0.11%. The situation has progressively improved, and nowadays the natural population increase in Szeged stands out from among those of the town of the South Hungarian Plain; it exceeds the national average. A substantial improvement has similarly occurred in the medium-sized towns. Apart from minor fluctuations, the demographic indices of the smaller towns have shown an unvaryingly unfavourable picture in the past 15 years: in addition to the low birth rate, the death rate is very high (appreciably exceeding the national average).

The demographic situation of the towns is also connected with the historical course of industrial development. In the nineteen-fifties, the slow industrial growth could not keep pace with the released labour force, and there was a significant migration away from not only the village settlements, but the towns too. The

Table 2. Demographic indices of towns of the South Hungarian Plain

Population group (1000 inhab.)	Population total (1000 inhab.)			Birth statistics						Death statistics					
				1960		1969		1976		1960		1969		1976	
	1960	1969	1976	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
100–180	99	118	170	1014	10.2	1684	14.2	3071	18.1	1122	11.3	1345	11.3	1972	11.6
50–100	171	186	208	2261	13.2	2827	14.2	3903	18.8	1812	10.6	2103	11.3	2461	11.8
30–40	157	164	171	1904	12.1	2274	13.8	2793	16.3	1970	12.5	1997	12.1	2302	13.5
16–30	104	11	149	1353	12.9	1503	13.5	2619	17.6	1242	11.9	1522	13.7	2221	14.9
Total	531	579	698	6532	12.3	8288	14.3	12386	17.7	6146	11.6	6976	12.0	8956	12.8

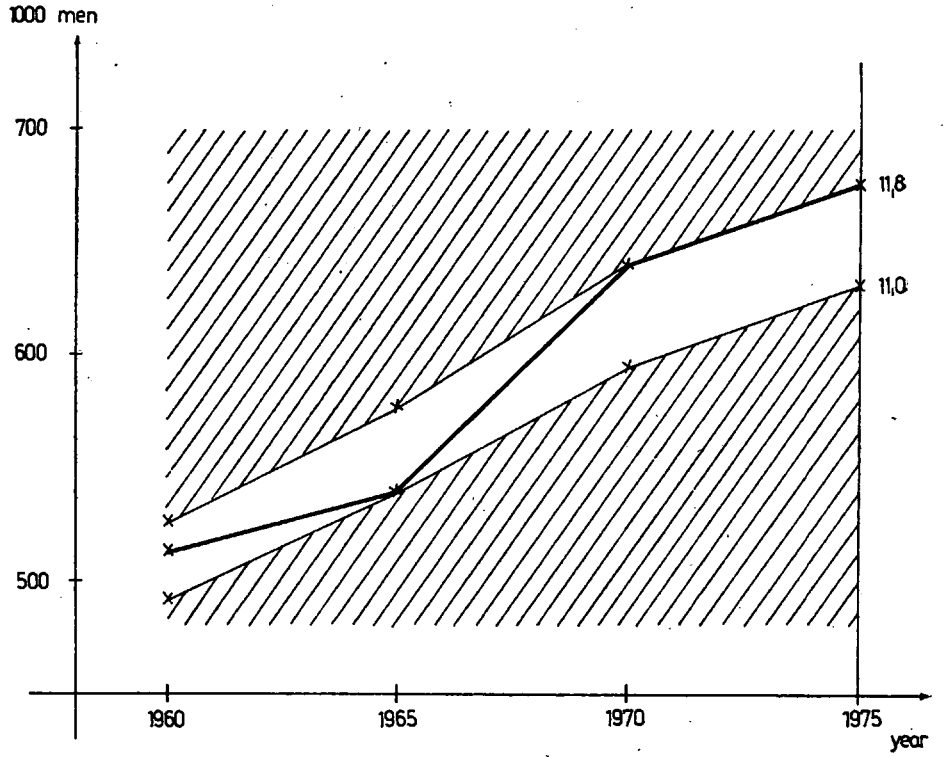

Fig. 1. Number and national rate of the urban population of the South Hungarian Plain

development of industry primarily occurred in the larger towns, and this soon showed up in the rapid increase of the immigration into these towns. The plants in the smaller towns could not even fully employ the internal labour force reserves, and therefore their ability to absorb the population was slight in the nineteen-sixties. This role has begun to grow stronger in recent years, but it has not been able to change the distortions appearing in the reproduction of the population. As a consequence of the migration away, the proportion of elderly people is very high. This has the effect that the death rates is unfavourable, and the natural growth is slight. The development of the smaller towns continues to be very slow, and there is practically no change in the number of the inhabitants. This supports the principle that development of industry is in itself not enough for urbanization; in addition, there is a need for the development ofthe tertiary branches and the infrastructure, and also the strengthening of the urban functions. In the larger towns the unity is beginning to materialize and, after the industrialization, this will give new impetus to their development.

The differences outlined in the urbanization process are not only important as regrads the towns themselves; they also have an effect on the surrounding settlements. Those economic centres the industrial development of which began earlier and was more intensive, are the richer in function, and have more intensive, are the richer in

function, and have stronger effects radiating out to the surrounding settlements. The general developmental scheme is the same everywhere. In the nineteen-fifties, the towns initially utilized their own internal labour force reserves, their ability to absorb the population was slight, and the proportion of those commuting from the surrounding settlements was relatively low. Subsequently, as a result of the rapid industrialization, the number of commuters quickly increased and the commuting area progressively expanded. This phenomenon can be observed extremely well in the case of Szeged (Fig. 2). Between 1960 and 1975 the number of commuters increased four-fold. In 1968 72% of the commuters lived within 20 minutes' travelling distance and only 15% of them travelled for more than 1 hour. In 1975 35% of the commuters lived within 30 minutes' travelling time, and nearly 22% of them were forced to travel for more than 1 hour. In the past decade there has been a rapid increase in the number of settlements from which more than 30 people commute to Szeged to work. In 1960 19 settlements were connceted to the town in this way, compared to 45 in 1975. In this connection, the average travelling distance of the commuters has increased too: in 1960 it was 13 km, and in 1975 24 km.

The commuting area expands until it attains the rational limit; the spheres of attraction of the individual towns overlap one another, and the number of commuters subsequently rises only moderately. The industry concentrated in the towns, however, can be developed further by expansion and by elevation of the productivity.

The outlined process may be found in each of the towns on the South Hungarian Plain, but there is a sequence with a phase shift in time, depending on the size of the town. In a study of the effects of the economic centres on the country settlements, attention must definitely be paid to these differences.

Determination of traffic-geographical situation of settlements

The effects of the economic centres on the surrounding settlements are extremely diverse: they affect the migration of the population, the composition of the occupations of the population, the decrease in the agricultural population, the structure of agriculture, the morphological transformation of the settlements, etc. In brief, therefore, they act on the process of transformation of the country settlement. In general, the proportion of commuters from settlements close to the towns and in a favourable situation as regards transport is very high, while the proportion of agricultural workers is low; the transformation of such villages is in a more advanced stage than for peripheral settlements. It must be emphasized that this is only one variant of the effect-connections. In addition it is necessary to reckon with a number of other factors which influence the development of the regional differences, e.g. the sizes of the village settlements, their functional connection, the degree of development of the local industry, the structure and developmental level of agriculture, the proportion of the peripheral population, etc. From the economic areal structure, therefore, we wish to deal only with the effect of one factor: the state of the transport conditions of the settlements.

By the traffic-geographical state of the settlements we understand the connection to the economic centres and the ease of access to the centres. For determination of these, the following factors were taken into consideration:

a = density of road traffic,
b = density of bus traffic to the centres,
c = proportion of the population commuting as workers from the settlement,
x = time necessary to reach the centres, taking the most favourable solution as regards the vehicles running according to time-table.

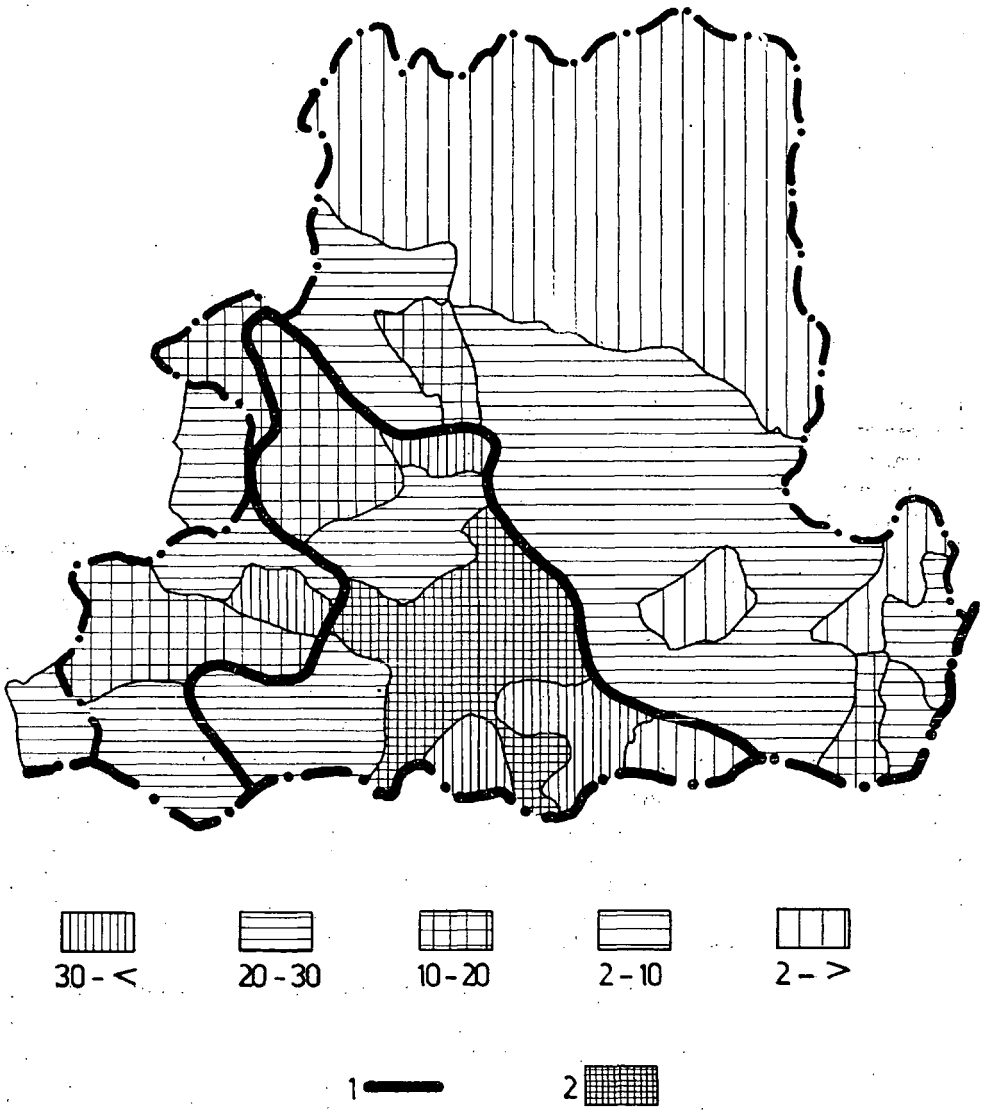

Fig. 2. Manpower attraction of Szeged, 1975.
(Percentage of employees working in Szeged)
1: the boundary of the attraction region in 1960
2: Szeged

In accordance with the above factors, the settlements were classified in 4 categories, and the factors were then used to determine the transport state from the following formula:

$$\mathbf{K} = \frac{a+b+c}{x}$$

where **K** is the state of the transport.

With the aid of the indices, the settlements may be categorized as follows:

Serial number	Situation of settlement	Points obtained
1	unfavourable situation	0–2
2	less unfavourable	2–4
3	medium	4–6
4	favourable	6–8
5	very favourable	more than 8
6	centres	

The Figure prepared with the outlined method gives a very good reflection of the belt of settlements with favourable transport characteristics, situated closely around the centres, together with the other extereme, the villages in an unfavourable peripheral position. The majority of the country settlements on the South Hungarian Plain can be classified here. The difference between the centres is also striking. This is understandable, since the more complete and stronger a centre's economic and social influence, the larger the number of settlements it connects to itself (Fig. 3).

These numerical values of the traffic-geographical situation may be utilized for purposes of further research; e.g. a close correlation may be found on comparison with the stratification of the population and with the migrant-accommodation.

Correlation between the mobility of the population and the transport-geographical situation

The rapid industrial development of the towns has significantly increased the proportion of workers commuting from the villages. The extent of the change is strongly differentiated regionally and according to the settlement type (Fig. 4). It is quite natural that the proportion of commuters from settlements possessing favourable transport conditions and in the vicinity of the towns should be very high. The commuter belts which have developed around the larger centres (Szeged, Kecskemét and Békéscsaba) are generally much more extensive than those around the smaller towns.

The tabulated data clearly show the correlation between the proportion of commuters and the transport-geographical situation of the settlement (Table 3). At the same time, it must be stressed that other arrangement principles too prove effectual; mainly in recent times there has been a significant increase in the labour force attraction of the lower-order centres, and as regards the village settlements the number of those commuting from one to another is appreciable.

The proportion of workers commuting systematially is one of the most important indices of the village settlements, since it reflects the state of the village,

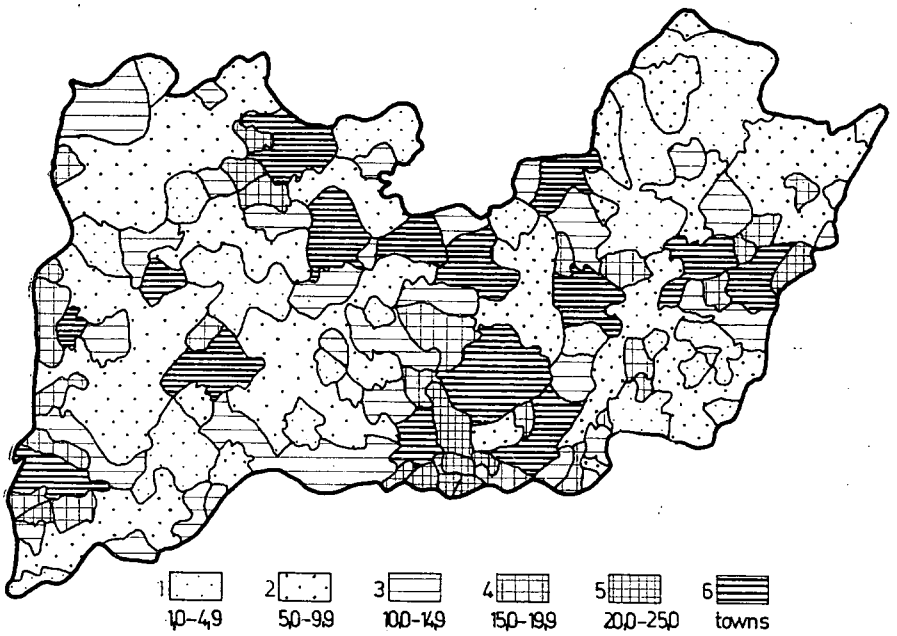

Fig. 3. The rate of outgoers at a rate percent of the population of the South Hungarian Plain in 1970.

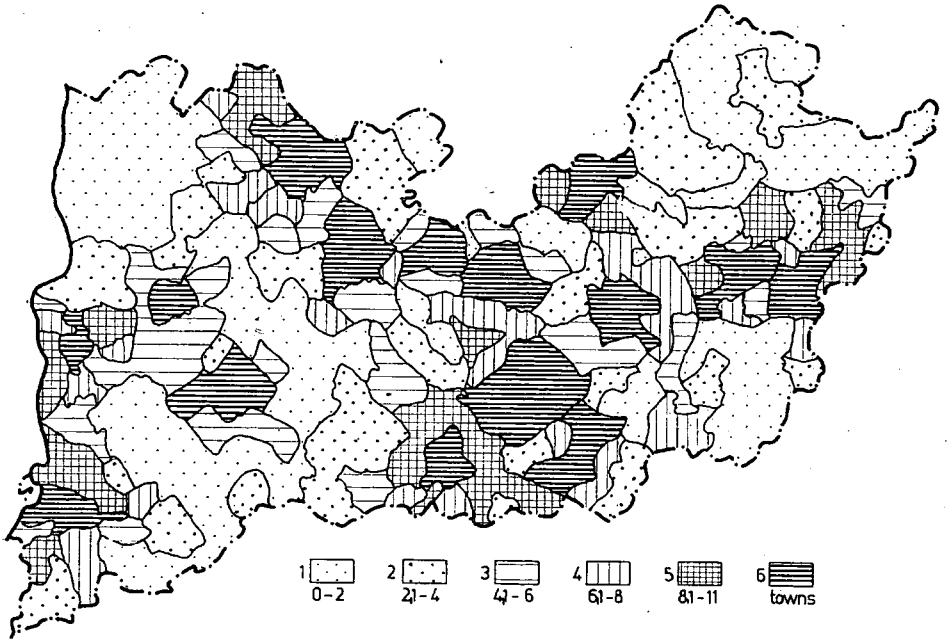

Fig. 4. The traffic-geographical situation of the settlements
1: very disadvantageous 2: disadvantageous 3: middling 4: advantageous 5: very advantageous

Table 3. Number of commuteers and their proportion compared to the population (1970), according to the traffic-geographical situation of settlements

Category	Number of settlements	Number of commuters	
		No.	Proportion % of population
1	80	18,393	6.9
2	60	16,991	7.9
3	37	11,845	9.2
4	34	12.950	12.1
5	24	13,941	13.9
6	16	16,668	2.6
Total	251	90,788	6.2

influences the extent of its tranformation, and has effects on both the migration of the population and the occupational stratification. It follows from this that these factors are in synchrony with one another.

Table 4. Migration balance 1949–1959; 1960–1969
(according to traffic-geographical situation of settlements)

Category	Number of settlements	1949—1959		1960—1969	
		number	as % of pop.	number	as % of pop.
1	80	−47,468	−16.0	−49,657	−18.8
2	60	−34,651	−14.5	−37,931	−17.6
3	37	−18,089	−13.2	−18,607	−14.5
4	34	−17,064	−15.0	−15,186	−14.2
5	24	−10,529	−10.0	−9,154	−9.2
6	16	12,319	2.1	42,750	6.7
Total	251	−115,382	−7.8	−87,785	−6.0

Besides numerous other factors, the transport-geographical situation is an essential motive in the development of the migration (Table 4). The value of the correlation between the two factors varies depending on the micro-region:

Region	"r" values of the transport and migration indices
Szentes	0.95
Békéscsaba	0.65,
Szeged	0.63
Kecskemét	0.46
Orosháza	0.45
Baja	0.44
Kiskunhalas	0.44

It emerges from the correlation values that there is a close correlation between the two factors, and that this varies from region to region. The tendency shows up clearly that the larger the economic centre and the more complete its function, the stronger its regional eradiation and the more markedly its effect is manifested, particularly on the near-lying settlements. It also follows from this that the effects of the local factors are essentially more expressed in the settlements located farther from the centres, i.e. the effects of the local factors are inversely proportional to the transport-geographical situation.

The proportion of the population commuting systematically and the correlation between the transport-geographical situation and the migrants are of importance from several aspects:

a) The rapid increase in the number of commuters indicates that the urbanization of the towns on the South Hungrina Plain could not keep pace with the increase in the number of work-places. The contradiction may be solved by incresing the communal investments. The increase in the population of the towns also depends on this in practice. This means that nowadays the growth of the urban population may be regulated not by further industrial installations, but mainly by the tempo of building accomodation.

b) In contrast with the industrial regions, a significant proportion of the commuters comprise an unskilled labour force; they lead a "double life", in that, depending on the agricultural work and the pay, they frequently change their working-place. This makes the labour force supply of the factories uncertain, and understandably hampers the factories' efforts for stability in the interest of the constancy of production. Settling of the workers in the vicinity of their working-place facilitates this striving, and at the same time enhances the growth of the urban population and the development of the agglomeration ring.

c) The rapid increase in the number of the population commuting regularly has also contributed to an accelerated change in the village way of life which had developed over the centuries. The attitudes and life-rhitms of the workers in the factories are no longer the same as those of the one-teme agricultural labourers. Decisive contributions to the process of transformation were naturally made by the creation of collective frams and the mechanization of agriculture, but the effects of the two factors overlap.

d) The extent of migration has decreased appreciably in recent years. This tendency can be observed primarily in the settlements with favourable transport situations, lying close to the towns, and in the lower-order centres possessing local industry.

e) The differentiating effect of the transport-geographical situation on the regional distribution of migration was comparatively slight between 1949 and 1959, showing up only in the immediate vicinity of the towns. It became much stronger in the following decade, demonstrating the increase in the attracting force of the centres.

f) The proportion of commuters in time is developing in just the opposite way to the above-outlined tendency. The regional differences are disappearing, since the commuter area is extending increasingly outwards and the local effects too are becoming stronger.

As regards the regional proportions of the agricultural workers, there is similarly a striking difference between the settlements with a favourable transport-geographical situation, lying close to the towns, and the villages remote from the industrial centres.

(Table 5). This is understandable, since, mainly in the past decade, the closeness of the towns has had a strong influence on the occupational stratification of the population.

District	Correlation coefficient "r"	Measure of determination, %
Szentes	−0.59	35
Békéscsaba	−0.50	25
Orosháza	−0.50	25
Szeged	−0.49	24
Kecskemét	−0.48	23
Baja	−0.44	20
Kiskunhalas	−0.40	16

It emerges from the data that the difference between the microregions is slight, and further that the effects of the centres are expressed primarily in the close-lying settlements. This is supported by Table 6, from which it is clear that the differences between the settlements from category to category is relatively slight; the proportion of the agricultural population is lower only in the settlements with favourable transport-geographical characteristics. Thus, the effects of the other factors, such as the structure and standard of the agriculture, the sizes and hierarchical situations of the settlements, the local industry, etc., are manifested more strongly far from the urban centres.

Table 5. Number and proportion of agricultural population 1960–1970 (according to traffic-geographical situation of settlements)

Category	Number of settl.	1960		1970		1960—1970	
		Number	as % of pop.	Number	as % of pop.	Number	as % of pop.
1	80	215613	72.7	170994	64.2	−44619	−16.8
2	60	164625	69.0	142687	66.3	−21938	−10.2
3	37	101779	74.3	81057	63.0	−20722	−16.1
4	34	82236	72.4	66508	62.0	−15728	−14.7
5	24	65415	62.3	53369	53.4	−12046	−12.1
6	16	179982	30.7	161084	25.3	−18898	−3.0
Total	251	809650	54.8	675699	46.4	−133951	−9.2

There are no essential regional differences in the individual elements of the infrastructure(the standards of water, electricity and gas supply are not influenced appreciably by the transport-geographical situation (Table 6).

There is likewise little regional difference in the proportions of new buildings, but the effects of the towns can be measured in the fact that the rate of houses building has decreased to a considerable extent in the settlements located in an unfavourable situation (Table 7.)

Table 6. Numbers of concumers of mains gas and bottled gas per 100 inhabitants, numbers of consumers of household electrical energy per 100 inhabitants, and number of houses conneted to mains water per 100 inhabitants in 1975

Category	Number of settl.	Number of mains and bottles gas consumers per 100 inhab.	Number of household electrical energy consumers per 100 inhab.	Number of houses connected to mains water per 100 inhabitants
1	80	20.3	26.77	9.51
2	60	18.9	26.4	11.2
3	37	22.3	23 3	9.5
4	34	20.1	27.9	13.0
5	24	22.8	28.9	14.5
6	16	28.3	31.6	21.5

Table 7. Proportion of men buildings as a percentage of the total buildings (1945–59, 1960–69)

Category	1045—59	1960—69
1	19.2	11.5
2	21.2	13.0
3	18.8	14.3
4	19.2	12.9
5	14.4	13.3
6	8.0	18.1

Some characteristic features of the settlement hierarchy of the South Hungarian Plain

The previously-outlined processes exerted a very great effect on the whole of the settlement network, but particularly on the development of the village settlements. The village system, which had earlier been "motionless" for centuries, having practically no horizontal and vertical connections, was characterized by the settlement-hierarchy homogenety. The social and economic environment of the present age now permits the commencement of hierarchic differentiation of the rural settlements. Since the settlements are the frameworks of social reproduction, an important question of the long-range economic policy in Hungary (which practises a planned economy) is the influencing of the changes in the settlement network. In essence, this aim is served by the National Settlement-Network Development Conception, accepted in 1971. The governmental decision outlined the desirable changes in urbanization up to the end of this century, defined the principles of development of the settlement network, and (on the basis of the then prevailing situation and the desired development) created a hierarchic system of the settlements, in which the higher-grade and middle-grade centres were denoted. "Classification" of the village settlements, which constitute the overwhelming majority of all the settlements, was performed within regional frameworks, however: it came into the sphere of activity of the country councils (although the Town-planning Scientific and Design Institute prepared a proposal with regard to the status of every village settlement, the county councils

deviated considerably from this, with or without reason). Finally, the hierarchic classification of the village settlements was achieved with unjustifiably large differences. However, in our view the denotation of the sphere of activity of the lower-grade centres is a very important, integral question in the establishment of hierarchic sequence, and not only because the vast majority of the settlements are involved. Another, perhaps more important reason is that the actual functional strengthening of these centres is one of the basic conditions for the development of the village areas. The lower-grade centres may be those settlements which have the nature of village centres, which may perform the regional organizing and supplying functions of their environments. The possibilities for this, however, are not the same everywhere. In connection with the role of the lower-grade centres in the future, it is absolutely necessary to take certain characteristic features into consideration:

a) The number of lower-grade centres is unjustifiably high (nearly 50% of the village settlements).

b) The function of the lower-grade centres is different in the regions characterized by extensive villages with large numbers of inhabitants (e.g. the Hungarian Plain) from that in regions with small villages (e.g. South Transdanubia). We consider that on the Hungarian Plain, where two or three settlements with populations of 5000—6000 are often situated in the immediate vicinity of one among them according to any aspect can not function as a centre, but rather means only a supply level.

c) At present, scarcely any financial assistance (at most only in connection with a few branches) is provided from central or county sources for the development of the lower-grade centres. From their own resources, however, they are unable to solv the development of their central functions.

The changes that have occurred in the 6 years since the creation of the hierarchic sequence do indicate certain developmental tendencies, but far-reaching conclusions must be treated with cautin, because of the strong regional differentiation of the processes. We have carried out an analysis for the period btween 1960 and 1977. One attempts was made to reveal the characteristic correlations of the variations in the elements examined so that these projected the categories of the current hierarchic sequence back over the past decade, and an evaluation was also made from settlement to settlement.

It is generally characteristic of the settlement network on the South Hungarian Plain that the number of settlements taken in the settlement-scientific sense is several times higher than the number of settlements taken in the administrative sense. Even today, this area of the country is characterized by a large number of peripheral inhabited places. The number of settlements taken in the administrative sense (251) is 7.9% of the number of settlements in the country. The number of settlements per 100 km^2 (1.4) is substantially lower than the national average (3.4), and thus, besides the large number of peripheral inhabited places (or rather just in connection with this), the fact that on average the settlements are larger in area is typical of the South Hungarian Plain.

The overwhelming majority of the settlements (93.6%) are village settlements. In 1977 the number of towns was 16. The geographical appearance of the settlement netwrok is uneven, thereby reflecting the contradictions of the historical development. It is characteristic that settlements with the legal status of towns have not yet emerged in the north-western and north-eastern parts of the region.

In spite of the fact that the decisive majority of the settlements are village settlements, on the basis of the positions in the various levels of the hierarchic sequence (in comparison with the national ratios) we may speak of the comparatively high level of the settlement hierarchy on the South Hungarian Pélain. This is indicated by the high proportion of higher-grade centres, and the low proportions of the other settlements:

	number of settlement		propn. of S. Hung. Plain %	propn. of individual levels, %	
	nationally	S. Hung. Plain		from total	from S. Hung. Plain
National centre	1	—	—	0.03	—
Accentuated higher-grade centre	5	1	20.0	0.16	0.4
Higher-grade centre	7	2	28.6	0.2	0.8
Partial higher-grade centre	11	2	18.2	0.3	0.8
Middle-grade centre	65	12	18.5	2.1	4.8
Partial middle-grade centre	41	6	14.6	1.3	2.4
Accentuated lower-grade centre	154	21	13.6	4.8	8.4
Lower-grade centre	527	65	12.3	16.5	25.9
Partial lower-grade centre	303	28	9.2	9.5	11.1
Budapest agglomeration	44	—	—	1.4	—
Other settlement	2025	114	5.6	63.7	45.4
Total	3183	251	7.9	100.0	100.0

The geographical locations of the designated middle-grade centres give the impression that an attempts was made as it were to replace the functional deficiencies of the settlement network with the designations (Kunszentmiklós, Szeghalom, Mezőkovácsháza, Kistelek, Bácsalmás). It is questionable whether each of these fills, or is at all able to fill, the role of a middle-grade centre. From our studies now is progress we hope to obtain answers to some of the questions in this field. However, our examinations have already confirmed that not all of the accentuated lower-grade centres fill this role functionally. The classification of the lower-grade and the partial lower-grade centres reflects serious unfounded situations (e.g. the area of Baja). It appears that the classification was not preceded by a comprehensive investigation; the main aspect was almost exclusively the number of the population and the proportion of the peripheral population. The merely demographic indices in themselves do not even confirm the suitability for filling the central roles at the lowest level (Fig. 5).

If the present structure of the settlement network is analyzed, other, very characteristic features too may be discerned. Some of these are products of the changes in the recent period (formation of the Szeged agglomeration, development of the central Békés urban region), while others have been characteristic for a longer time (pairs of towns competing with each other).

a) The Szeged agglomeration is the result of the very rapid and extensive development of the central functions of Szeged. However; the agglomeration is not free of stresses. These stresses mainly arise from the fact that settlements with different degrees of development (even in relation to the agglomerated settlements) are living

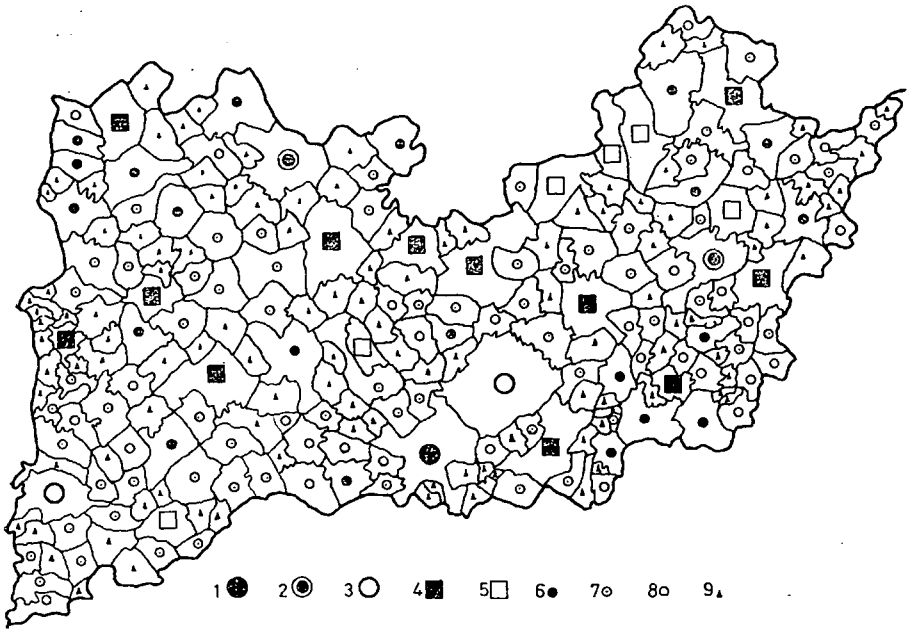

Fig. 5. The hierarchal order of the settlements of South Hungarian Plain
1: accentuated higher-grade centre 2: higher-grade centre 3: partial higher-grade centre 4: middle-grade centre 5: partial middle-grade centre 6: accentuated lower-grade centre 7: lower-grade contre 8: partial lower-grade centre 9: other settlement

in a functional unit. It is charateristic that the agglomeration is growing in area more rapidly than can be followed by the internal levelling-out.

b) The geographical closeness of Békéscsaba, Békés and Gyula, and the rapid strengthening of the urban functions, are leading to the emegence of a new phenomenon in Hungarian settlement development; the development of an urban region. Their effects on the village development in the central Békés region can already be felt today (changes indicative of the beginning of agglomeration can be observed). In the long range, the development of the urban region will lead to certain consequences as regards the administration (and clearly the hierarchy).

c) A typical example of a pair of towns in competition with each other on the South Hungarian Plain is the realtion between Szentes and Csongrád. Our attraction studies show that Szentes is the stronger and more dynamically developing town; indeed, even the ring of villages surrounding Csongrád is becoming more strongly connected to Szentes.

d) Earlier (and frequently even today too), Szeged and Hódmezővásárhely were classified as a pair of towns in rivalry with each other. While Hódmezővásárhely occupied the function of the country town, there was some truth in this. Nowadays, however, the difference in rank is well-founded even as regards content. Indeed, as a consequence of the effect of Szeged strengthening in its tendency, in essence Hódmezőváráshely now no longer fills the role even of a partial higher-grade centre. In the future, it is to be expected that this ability will decrease still further.

Some characteristic effects of urbanization on the South Hungarian Plain on the village settlements

As outlined earlier, socialist industrialization began an intensive process of urbanization, as a consequence of which the rate of increase of the urban population accelerated, particularly at the end of the nineteen-sixties. The population growth was caused primarily by the considerable immigration. The possibility for this was created by the socialist reorganization of agriculture. The attraction of the urban industry exerted two substantial effects on the labour force released from agriculture:

— it enhanced the areal mobility of the population;
— restratification of occupations became widespread.

Between 1960 and 1977, after a longish period of decrease the change in the population of the South Hungrian Plain exhibited an increasing tendency:

	1960	1970	1977
Accentuated higher-grade centre	122,958	123,883	173,347
Higher-grade centre	118,488	138,136	156,826
Partial higher-grade centre	83,736	98,242	92,948
Middle-grade centre	251,540	260,055	272,243
Partial middle-grade centre	79,674	75,954	77,824
Accentuated lower-grade centre	203,099	186,417	181,600
Lower-grade centre	308,424	276,707	263,775
Partial lower-grade centre	88,696	77,436	69,886
Other settlements	229,845	196,159	173,858
Total	1,486,460	1,423,989	1,462,307

However, this trend in the change of the number of the population conceals considerable differences as regards both the town — village and the individual hierarchic levels, and even within these.

In the period in question the rate of growth of the urban population was less than the national average (but did not differ from it in its tendency). On the basis of the change in the number of inhabitants, Békés county can be characterized with the most dynamic urban development, but the leading role of Csongrád county (in absolute numbers) continues to be clear. For completeness, it must be mentioned that one settlement both in Békés and Bács counties obtained the rank of town in this period (Békés and Kiskőrös). The changes in the proportions of the urban population are well illustrated by the following table:

Year	National	South Hungarian Plain	Csongrád county	Békés county	Bács-Kiskun county
1960	41.5	35.2	53.9	22.8	29.0
1970	45.2	40.6	58.4	30.1	33.3
1972	48.2	42.6	59.8	32.3	35.9
1976	50.8	48.8	67.6	39.0	39.7

The process of urbanization appears even more intensive if we consider the changes in the populations of the settlement belonging to the individual hierarchic levels. From the middle-grade centres "upwards" the growth seems to be a tendency. The positive turn (in the direction of growth) is noteworthy in the changes in population of the partial middle-grade centres. Although the tendency of the population to decrease is unchanged in the "lower" levels, this by no means indicates homogeneity. Indeed, a very intensive differentiation can be observed in the change of the population among the lower-grade centres. A definite *population growth* is characteristic of the accentuated lower-grade centres Solt, Kiskunmajsa, Sarkad and Medgyesegyháza, and the lower-grade centres Újkígyós and Fábiánsebestyén. The *population decrease is strongly moderated* in the accentuated lower-grade centres Mórahalom, Mindszer, Kecel, Tiszakécske and Mezőhegyes, the lower-grade centres Császártöltés, Harta, Miske, Kelebia, Körösladány, Békésszentandrás, Köröstarcsa, Kiszombor, Pitvaros, Földeák, Szank and Bácsbokod, and the partial lower-grade centre Nemesnádudvar. The process of *population decrease has stopped* in the accentuated lower-grade centres Dunavecs, Iszák and Kerekegyháza, the lower-grade centres Murony, Vaskút, Jakabszállás and Csorvás, and the partial lower-grade centre Tass.

In the period 1960–1970, the population decrease or increase on the South Hungarian Plain too was given by the migration difference. After 1970, to population-increasing effect of the natural multiplication became stronger in the "higher" levels in the demographic process, and the immigration moderated. In the "lower" levels, however, the negative migration balance is unchangingly strong (Tables 8 and 9). It is interesting that, upwards from the middle-grade centres, the value of the migration balance on the South Hungarian Plain is lower than the national value, while in the lower categories it exceeds the national average and in its tendency too is in cotrast to the national trend.

If the migration is examined in the town — village aspect, it is seen to be confirmed that the increase in the urban population resulting from the migration balance on the South Hungarian Plain attains the national degree. In the case of the villages, on the other hand, the value of the negative migration balance is substantially in excess of this. If it is added to this that our examinations with respect to the purpose of the migration show that accommodation exchange within the district has strengthened in the past 7 years among those migrating (the proportion of those exchanging accommodation within the district as a percentage of all those moving house has been steadily above 60%, whereas in the nineteen-sixties it was less than 50%), then it may be stated that the population-retaining ability of the South Hungarian Plain (in the village settlements too) has strengthened.

In the period in question, the values of the natural multiplication too show a low-level tendency to increase at a very slow rate. On all levels, the values are essentially lower than the national values. In fact, the population-increasing effect of the natural multiplication appears only in the accentuated higher-grade and the higher-grade centres. A striking exception is the low value of the partial higher-grade centre. This originates exclusively from the very low natural multiplication value for Hódmezővásárhely (at the same time, the migration balance is rather moving in the negative direction). This phenomenon, with a character of demographic erosion, is virtually unique among such high-level settlements. All this to some extent explains our earlier-mentioned doubts as to the sphere of activity.

Table 8. Migratory ballance per 1000 inhabitant

	1972		1973		1974		1975		1976	
	country	South Great Plain	country	South Great Plain	country	South Great Plain	country	South Great Plain	country	South Great Plain
State-centre	6.0	—	3.3	—	2.4	—	4.9	—	3.7	—
Accentuated higher-grade centre	11.0	14.0	8.7	9.2	10.9	7.8	10.2	10.5	11.8	11.0
Higher-grade centre	15.8	7.8	15.9	7.5	16.3	11.5	20.5	18.9	16.8	7.8
Partial higher-grade centre	14.3	8.5	12.7	2.3	15.0	7.0	17.1	1.4	15.6	6.7
Middle-grade centre	6.5	4.8	6.2	4.1	7.5	5.1	10.8	7.5	8.4	2.7
Partial middle-grade centre	3.0	1.3	2.9	0.5	1.6	−0,3	3.8	1.6	1.2	7.0
Accentuated lower-grade centre	−4.3	−6.5	−2.8	−1.6	−3.4	−5.9	−6.1	−7.6	−6.2	−8.4
Lower-grade centre	−7.4	−7.8	−6.3	−5.6	−7.1	−6.2	−9.3	−6.1	−8.9	−6.1
Partial lower-grade centre	−11.5	−11.4	−10.5	−9.2	−11.1	−14.1	−12.9	−14.5	−12.2	−12.8
The agglomeration of Budapest	18.8	—	12.1	—	15.3	—	14.3	—	11.0	—
Other settlement	−17.7	−16.6	−15.1	−21.6	−16.3	−18.6	−21.2	−27.5	−16.9	−20.8
Towns	8.8	7.3	7.1	5.8	7.6	8.1	9.9	10.6	8.6	6.7
Villages	−8.1	−8.7	−7.0	−8.0	−7.6	−9.3	−9.9	−11.9	−8.8	−9.2

Table 9. Migratory ballance per 1000 inhabitant

	1972			1973			1974			1975			1976		
	Bács-Kiskun	Békés	Csongrád	Bács-Kiskun	Békés	Csongrád	Bács-Kiskun	Békés	Csongrád	Bács-Kiskun	Békés	Csongrád	Bács-Kiskun	Békés	Csongrád
Accentuated higher-grade centre	—	—	14.0	—	—	9.2	—	—	7.8	—	—	10,5	—	—	11,0
Higher-grade centre	12.8	2.8	—	7.6	7.4	—	14.3	8.7	—	25.1	12.7	—	1.8	13.8	—
Partial higher-grade centre	8.5	—	0.0	6.8	—	2.2	9.4	—	4.7	3.1	—	0.3	15.0	—	−1.6
Middle-grade centre	4.3	9.0	1.1	3.6	6.3	2.5	4.4	8.4	2.6	10.0	9.3	3.2	6.3	4.3	−2.4
Partial middle-grade centre	−6.4	−0,3	10.7	−6.7	2.0	6.1	−9.9	5.5	3.4	0.9	2.1	2.0	− 1.4	4.1	18.3
Accentuated lower-grade centre	−3.1	−14.6	−2.0	−0.3	−3.9	−0.6	−1.7	−8.9	−7.5	−5.4	−10.2	−7.4	−2.0	−9.7	−13.7
Lower-grade centre	−9.6	−8.1	−5.7	−5.8	−8.0	−3.0	−3.6	−10.0	−5.2	−9.1	−7,8	−3.9	−6.1	−7.2	−4.9
Partial lower-grade centre	−9.8	−16.2	−8.4	−4.3	−12.3	−11.0	−6.9	−20.5	−13.0	−7.9	−16.4	−19.3	−8.5	−17.7	−12.2
Other settlement	−12.3	−27.9	−9.6	−16.3	−34.3	−14.2	−18.1	−27.1	−10.7	−24.0	−38.8	−19.7	−18.4	−33.6	−10.5
Total	−2.0	−6.1	1.7	−2.3	−3.8	1.3	−1.1	−3.9	1.3	−1.3	−3.9	0.9	−2.6	−3.7	1.1
Towns	8.6	6.0	7.2	5.8	6.5	5.3	9.5	9.7	5.3	15.2	10.1	6.6	5.8	9.2	5.2
Villages	−7.9	−11.8	−6.5	−7.4	−10.1	−6.6	−7.8	−12.3	−7.8	−12.1	−12.8	−10.9	−8.2	−12.1	−7.4

When the natural multiplication is analyzed, another surprising phenomenon can be observed among the settlements without a sphere of activity. The natural multiplication in these settlements is more intensive than in the lower-grade centres (Tables 10 and 11). It must be added, however, that the negative migration balance is substantially higher in the other settlements.

From the changes in the migration and the natural multiplication between 1972 and 1976, it may be stated that the very characteristic process for the past decade had scarcely weakened: the sources of the population growth are unchangingly to be founs among the settlements without a central role, and the partial lower-grade centres

Urban attractions

Our attraction studies (performed for every town on the South Hungarian Plain*) served the purpose of revealing the characters and extents of the areal eradiations of the towns. We were also interested in what levels of the settlement hierarchy are concealed by the urban attraction areas (of different strengths). This can throw light on many important questions of the current situation, and is also a significant factor as regards the further development of the settlements involved. Our investigation (in 1976—77) was of a complex nature. The strength types *(hegemonic, dominant, transitional, outer belt)* of the attraction spheres were determined on the basis of several factors: labour force, free market, educational, public health and cultural attractions. The individual factors were categorized on the basis of the strength of the attraction. The complex (general) attraction areas were defined on the basis of the developed categories after summation of the individual factors. The results obtained will not be evaluated in detail here (they may form the theme of an independent study); primarily the features of the hegemonic attraction areas are of importance for us now (at least 75% of the attraction connections are realized in the town in question), since the spatial extents of the hegemonic attraction areas (Fig. 6) reveal very interesting correlations:

a) Very large areas are omitted from the hegemonic attractions (well illustrating the deficiencies of the spatial arrangement of the town network). At the same time, for the same reasons, the dominant attraction areas repeatedly cover one another.

b) Three accentuated lower-grade centres (Tótkomlós, Mindszent and Kerekegyháza) are to be found in a hegemonic attraction area. It follows from this that, in all probability, the strengthening of the regional organizing functions of these three settlements is very limited.

Our investigations prove that the attraction of the settlements belonging to the hegemonic belts is strengthening. In addition to the fact that the connections with the towns of the settlements on the borders of the dominant and the transitional belts, but rather in the transitional and outer belts, are not strengthening, in some cases even the direction of the regional connections has been modified and (as will be demonstrated later) they are connected to the village settlements with a strengthening regional organizing role. This change is extremely well illustrated by the developments in the main trends of the *labour force commuter migration.* The changes in the extent of commuting at the settlement level can be brought into correlation with the change in

* In the defining of the sphere of attraction of the Békéscsaba—Békés—Gyula urban region we have relied on the research results of J. Tóth et al.

Table 10. The natural increase and decrease per 1000 inhabitant

	1972		1973		1974		1975		1976	
	country	South Great Plain	country	Souht Great Plain	country	South Great Plain	country	South Great Plain	country	South Great Plain
State-centre	−0,7	—	−0.8	—	1.9	—	2.6	—	1.5	—
Accentuated higher-grade centre	4.8	2.0	5.1	3.5	8.0	6.4	9.1	8.0	7.8	6.3
Higher-grade centre	6.2	4.7	6.5	4.8	10.5	8.6	10.7	9.2	9.8	8.1
Partial higher-grade centre	5.3	0.3	6.0	0.6	9.6	3.1	10.3	3.2	9.7	2.3
Middle-grade centre	4.9	1.5	4.8	1.1	7.8	4.5	8.4	5.0	7.1	3.1
Partial middle-grade centre	4.7	−0.9	5.0	0.4	7.8	2.5	7.9	3.1	6.4	1.7
Accentuated lower-grade centre	4.6	1.2	4.2	0.8	6.7	3.0	6.0	2.7	5.4	1.1
Lower-grade centre	3.7	0.3	3.3	0.4	5.5	2.2	5.1	1.6	4.1	1.4
Partial lower-grade centre	1.6	−0.8	1.7	−0.2	2.9	1.1	3.1	2.4	2.6	1.6
The agglomeration of Budapest	7.8	—	7.2	—	10.9	—	11.1	—	9.3	—
Other settlement	3.1	2.0	2.4	0.7	4.2	3.7	3.7	3.0	3.1	3.0
Total	3.3	1.4	3.2	1.5	5.8	4.1	6.0	4.4	5.0	3.4
Towns	2.8	2.2	2.9	2.3	6.0	5.5	7.3	6.4	5.6	4.8
Villages	3.8	1.0	3.4	0.6	5.6	2.6	5.3	2.5	4.5	1.9

Table 11. The natural increase and decrease per 1000 inhabitant

	1972			1973			1974			1975			1976		
	Bács-Kiskun	Békés	Csongrád	Bács-Kiskun	Békés	Csongrád	Bács-Kiskun	Békés	Csongrád	Bács-Kiskun	Békés	Csongrád	Bács-Kiskun	Békés	Csongrád
Accentuated higher-grade centre	—	—	2.0	—	—	3.5	—	—	6.4	—	—	8.0	—	—	6.4
Higher-grade centre	6.2	3.3	—	6.7	3.0	—	8.7	8.6	—	10.0	8.4	—	9.5	6.7	—
Partial higher-grade centre	0.7	—	−0.1	0.9	—	0.4	2.5	—	3.8	3.9	—	2.5	2.1	—	2.5
Middle-grade centre	3.4	1.1	0.0	3.1	−0.3	0.7	6.5	4.5	2.5	7.3	5.5	2.1	5.1	3.0	1.2
Partial middle-grade centre	−1.9	0.0	−0.8	1.2	0.6	−0.7	4.9	2.8	−0.1	5.1	4.3	−0.1	3.1	2.1	−0.2
Accentuated lower-grade centre	2.1	1.1	0.5	1.6	1.2	−0.5	2.4	4.8	1.7	2.3	4.4	1.3	2.6	1.2	−0.5
Lower-grade centre	−0.1	0.9	0.2	0.7	0.6	−0.1	2.5	3.2	0.9	1.8	3.2	−0.1	1.5	2.1	0.6
Partial lower-grade centre	−2,3	2.6	−2.8	−1.6	2.7	−1.6	0.5	4.3	−1.4	2.0	3.9	1.3	0.4	3.9	0.4
Other settlement	0.3	2.8	2.9	0.1	0.1	−1.0	1.9	6.3	2.8	1.7	4.0	3.3	2.4	4.8	1.8
Total	1.9	1.5	0.9	2.0	1.2	1.2	4.0	4.8	3.6	4.4	4.8	4.1	3.9	3.2	3.1
Towns	4.4	1.2	1.0	4.1	0.5	2.2	6.6	5.0	4.9	8.0	5.8	5.4	6.4	3.7	4.3
Villages	0.5	1.6	0.8	0.8	1.6	−0.7	2.4	4.6	1.0	2.0	4.2	1.2	2.2	2.8	0.7

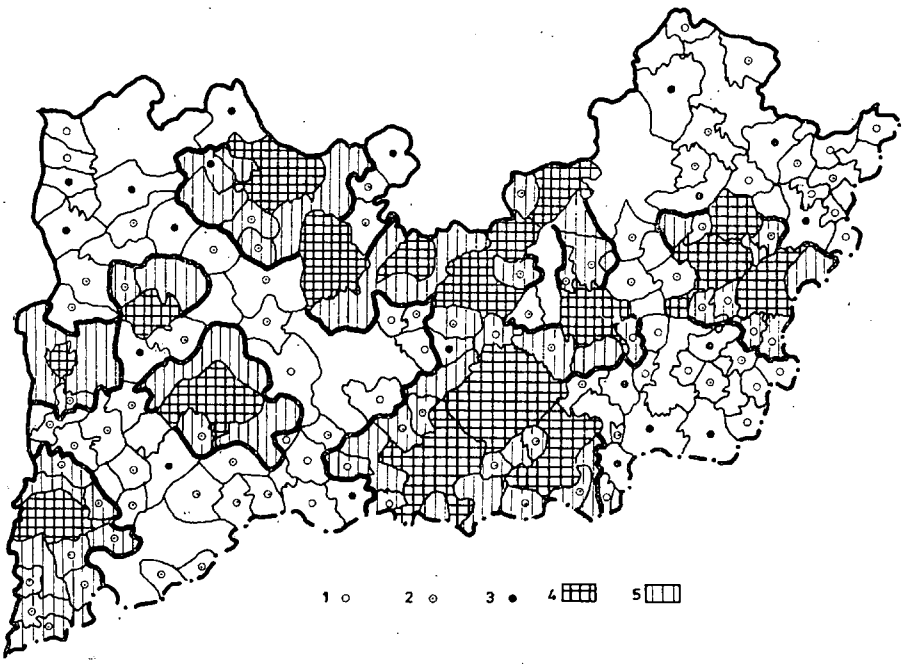

Fig. 6. The hegemon attraction regions of the towns
1: partial lower-grade centre 2: lower-grade centre 3: accentuated lower-grade centre 4: town 5: hegemon attraction region

the economic functions of the settlement in question. These changes occur in manners differentiated not only by the individual hierarchic levels, but also areally, and thus the variations in the movement of the labour force can be used to distinguish characteristic types among the lower-grade centres too. The typization was carried out on the basis of the data at a settlement level for the years 1960, 1970 5nd 1977:

1. *Labour force releasing:* the proportion of commuters (compared to the active wage-earners) has shown an increasing tendency since 1960, exceeding 30% in 1977.
2. *Transitional* (with a labour force realasing character): the proportion of commuters has shown an increasing tendency, but did not exceed 30% in 1977 (between 25% and 30%).
3. *Transitional* (with a labour force retaining character): the rate of increase of the proportion of commuters has slowed down, being 20–25% in 1977.
4. *Labour force retaining:* the proportion of commuters shows a decreasing tendency, already being below 20% in 1977.
5. *Labour force attracting:* the proportion of commuters shows a strongly decreasing tendency, being below 15% in 1977, while the number of those commuting in to work exceeded 200.

The bulk of the settlements belonging to the first type are to be found in the immediate vicinity of middle-grade centres or centres at a higher level than this. On the

basis of the tendency to date, it may be expected that there will not be a substantial decrease in the future either in the number of settlements with a labour force releasing character. The large labour force releasing character of the North Békés region is of interest, indicating among others the deficiencies of the economic structure. In contrast with this, as it were, the lack of the first type points to the strengthening of the local economic functions in the northern part of Bács county.

During the past 17 years, the strengthening of the local employment of the labour force has become a characteristic process in those settlements of the South Hungarian Plain which play the role of lower-grade centres. This is indicated by the difference in the proportions of the two transitional types in comparison to one another, and also by the fairly high number of settlements classified into the labour force retaining type. A very important new phenomenon in the development of the village regions is the occurrence of fact attracting the labour force (16 settlements, i.e. 14% of the lower-grade centres, can be characterized with a more significant labour force attraction). Besides the settlement development, the development of the economic areal structure of the South Hungarian Plain is also indicated by the fact that these facts (with one exception) were formed in the counties of Bács and Békés. As regards the future, the strengthening of the sphere of activity in this direction is particularly noteworthy for Dunavecse, Izsák, Kecel, Kiskunmajsa, Mezőberény and perhaps Tótkomlós (Fig. 7).

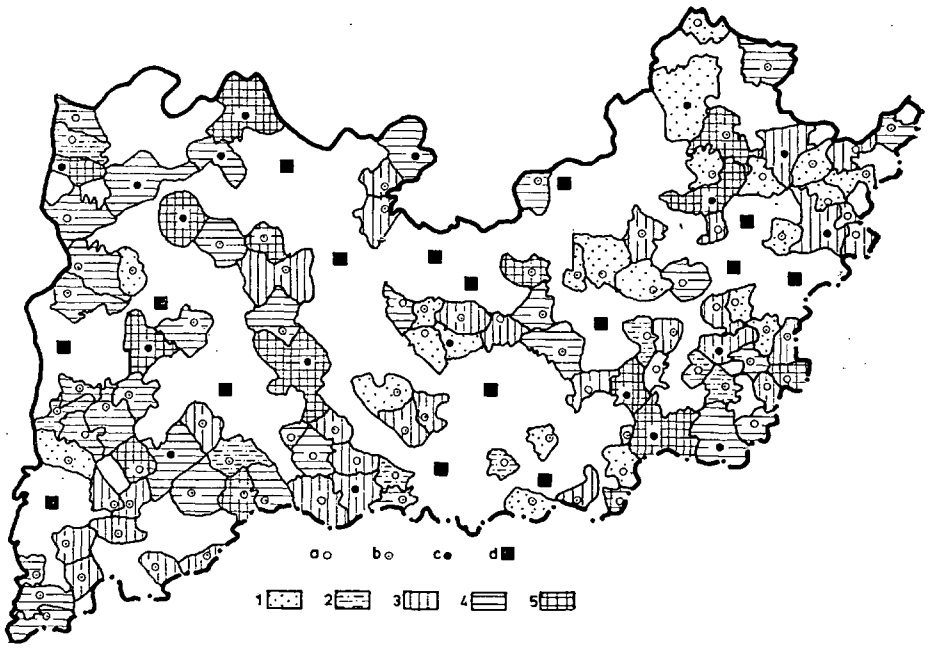

Fig. 7. Types of the migration of labourforce
a: partial lower-grade centre b: lower-grade centre c:accentuated lower-grade centre d: town 1: labourforce realising 2: transitional (with a labourforce realising character) 3: transitional (with a labourforce retaining character) 4: labourforce retaining 5: labourforce attrcating

If the data on the commuter migration of the labour force for only one year (1977) are examined, a more static picture is obtained, but as regards its essence this is not in contradiction with the foregoing:

a) The labour force attraction is most characteristic of the accentuated lower-grade centres.

b) There is a high proportion (above 40%) of labour force release only in one accentuated lower-grade centre.

c) The bulk of the settlements studied are characterized by a medium proportion (15—30%) of commuting and a low extent (fewer than 100 individuals) of labour force attraction (we shall return to this question later).

Occupational restratification

One of the most striking effects exerted on the village regions by the main economic and social processes (listed in the introduction) characteristic of our socialist development can be followed via the changes in the occupational structure. It is well known that the restratification accelerated particularly after the socialist reorganization of agriculture. The generalization and strengthening of the socialist agricultural collectives broke up the rigid agricultural-occupational framework of the "family farms" typical of the earlier village-occupational structure. This was paralleled by an explosion-like increase in the labour force demands of industry.

The change in the village occupational structure during the past 15 years on the South Hungarian Plain occurred in at least two stages; it is perhaps difficult to differentiate concretely between these in time, but they can be well distinguished as regards their tendencies. The first stage is characteristic of the nineteen-sixties. The restratification was not then accompanied by a change in the workplace and branch structure of the village (commuting and migration away increased rapidly). The second stage emerged at the beginning of the nineteen-seventies, and its complete development is typical of the present day: changes are taking place in the economic-branch structures of the village settlements (mainly those with the role of accentuated and lower-grade centres) and this is giving local possibilities of work for a wider scale of the occupational structure (the industrial nature of the agricultural work is strengthening, as is the village industry, and the development of the tertiary branches) This process is proved by the development of the above-mentioned fact attracting the labour force.

The changes in the occupational structure in the village and urban settlements on the South Hungarian Plain proceeded in the same way as the national trend. The proportion of agricultural workers decreased both in total and in all types of settle- and in parallel with this the proportion of industrial workers increased (Table 12.).

It appears from the data that a definite process is involved here, which is unambiguous at every level. On the basis of our examinations, however, it seems advisable to exercise care in dealing with generalizations. It is not a question that there are contradictory tendencies here. Between 1970 and 1977 the main tendency of the occupational restratification of the settlements fulfilling the role of lower-grade centres does not differ overal from the national tendency:

Data for 1977	Agri-culture	Industry	Building ind.	Trans-port	Trade	Supply	Others
Accentuated lower-grade centre	44,2	29,0	6,3	3,6	6,6	4,9	5,3
Lower-grade centre	58,4	17,7	6,6	3,6	7,1	7,4	4,0
Partial lower-grade centre	58,6	19,6	6,9	3,7	3,5	4,0	4,5

The reason why conclusions should be drawn with care is rather the large regional differentiation of the process of restratification. Accordingly, we tried to obtain a picture of the change and the regional differences on the basis not of a static condition, but of the characteristics of the process of restratification. Characteristic types can be recognized in the changes of the occupational structure over more than 15 years, particularly if the changes in the occupational structure are brought into correlation in certain cases with the spatial mobility of the labour force. In this way the following types can be distinguished:

1. *Agricultural* (stagnating): The proportion of agricultural workers did not change essentially between 1960 and 1977. Even in 1977 it was above 70%. The proportion of commuters does not attain 10% of the active wage-earners.
2. *Agricultural* (mobile): The proportion of agricultural workers did not change substantially. Even in 1977 it was above 70%. The proportion of commuters is increasing, however, exceeding 10% in 1977.
3. *Agricultural* (industrializing): The proportion of agricultural workers is showing a decreasing tendency. In 1977 it was 50–70%. The proportion of industrial workers is showing an increasing tendency. In 1977 it was already 20–25%.
4. *Transitional* (agricultural, industrial): The proportion of agricultural workers is showing a decreasing tendency. In 1977 it was 40–45%. The proportion of industrial workers is showing an increasing tendency. In 1977 it was 26–35%.
5. *Transitional* (differentiating): The proportion of agricultural workers is showing a decreasing tendency. In 1977 it was 40–55%. The proportion of the branches outside industry is increasing. In 1977 it exceeded 30%.
6. *Industrial:* The proportion of agricultural workers is showing a decreasing tendency. In 1977 it was below 40%. The proportion of industrial workers is increasing strongly. In 1977 it exceeded 40%.

The geographical locations of the types well indicate the regionally differentiated process of restratification (Fig. 8). The number of settlements belong in the first type is negligibly low (seven); it is to be noted that none of them are accentuated lower-grade centres. They are situated peripherally. However, the number of settlements classified in the second type is fairly high. It is characteristic that these are partially situated peripherally, and partially belong to urban spheres of attraction. The industrializing character is a definite developmental trend. This is also indicated by the fact that the industrializing lower-grade centres approximately coincide with the settlements attracting the labour force, while at the same time a fair proportion of them may be characterized by a significant number of commuters too. A new phenomenon of the village regions can be discerned in this: in addition to the commuting in the village — town direction, attention must also be paid to the "cross-commuting" between the lower-grade centres.

Table 12. Change in the occupational structure
(as percentages of the active wage-earners)

	1960						1970					
	Agri-cul-ture	Industry	Building ind.	Trans-port	Trade	Other	Agri-cul-ture	Industry	Building ind.	Trasn-port	Trade	Other
Accentuated higher-grade centre	33.6	27.2	8.4	8.6	3.7	18.5	26.7	38.3	6.5	8.6	5.7	14.2
Higher-grade centre	33.2	25.1	5.3	7.8	7.6	21.0	24.4	35.8	7.6	7.2	7.8	17.0
Partial higher-grade centre	28.8	26.2	6.4	6.3	6.6	25.7	25.5	35.9	8.5	8.1	6.5	14.1
Middle-grade centre	49.0	15.5	6.4	6.0	5.1	18.0	40.6	25.5	7.0	6.5	6.4	13.9
Partial middle-grade centre	55.3	12.1	10.0	5.3	5.1	12.2	44.0	20.6	11.5	6.2	5.9	11.7
Accentuated lower-grade centre	65.4	12.4	7.1	3.9	3.2	7.5	54.0	20.7	7.2	4.7	4.4	8.9
Lower-grade centre	75.1	7.7	5.4	3.4	3.2	5.2	67.5	12.5	5.5	4.1	4.2	8.0
Partial lower-grade centre	76.1	7.4	5.1	3.1	2.4	5.9	68.6	11.7	5.4	4.0	2.7	7.4
Other settlement	78.1	5.7	4.1	2.5	2.1	7.5	73.0	9.5	4.3	3.5	2.5	7.2
Total	53.3	15.5	6.5	4.5	4.6	15.6	46.9	22.4	7,0	5,8	6.5	11 .4

It is noteworthy that the accentuated lower-grade centres can essentially be characterized by the two transitional types (which is indicative of the development or the tertiary branches).

The number of lower-grade centres classified as industrial on the basis of the change in the occupational structure is fairly high. In some places this means an actual industrial function too (Nagylak, Csanádpalota, Mezőberény, Sarkad and Dunavecse), while elsewhere the high proportion of industrial workers does not mean their local employment. The proportion of commuters is very high in these settlements.

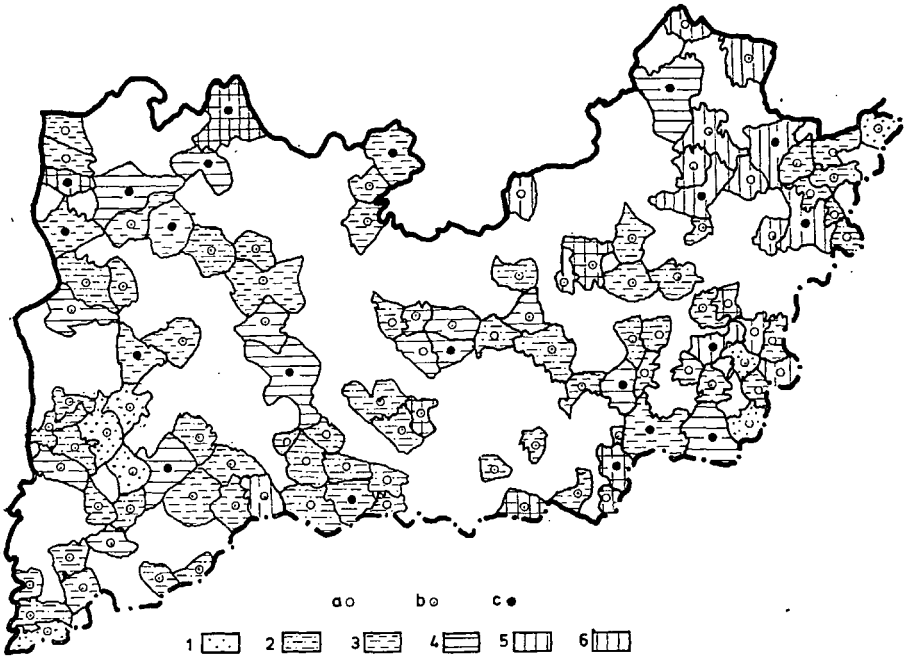

Fig. 8. Changing of the occupational structure
a: partial lower-grade centre b: lower-grade centre c: accentuated lower-grade centre
1: agricultural (stagnating) 2: agricultural (mobile) 3: agricultural (industrialising) 4: transitional (agricultural, industrial) 5: transitional (differentiating) 6: industrial

The spatial dimensions and characteristics of the changing of the occupational structure may be illustrated even better if the above types are projected back to the state in 1960, with the modification that thus a static condition is recorded (Fig. 9). It follows from this that it is advisable to make slight amendments in the nomenclature of the types; retaining the above percentage characteristics, it is perhaps more correct to speak of: 1. *Agricultural* (exclusively); 2. *Agricultural* (varying); 3. *Agricultural* (industrializing); and 4. *Industrial* types.

On comparison of the two analyses, or even only the two maps, the greatest transormation of the occupational restratification structure is definitely outlined in Bács county; more exactly, it occurred in the agricultural areas with unfavourable natural properties.

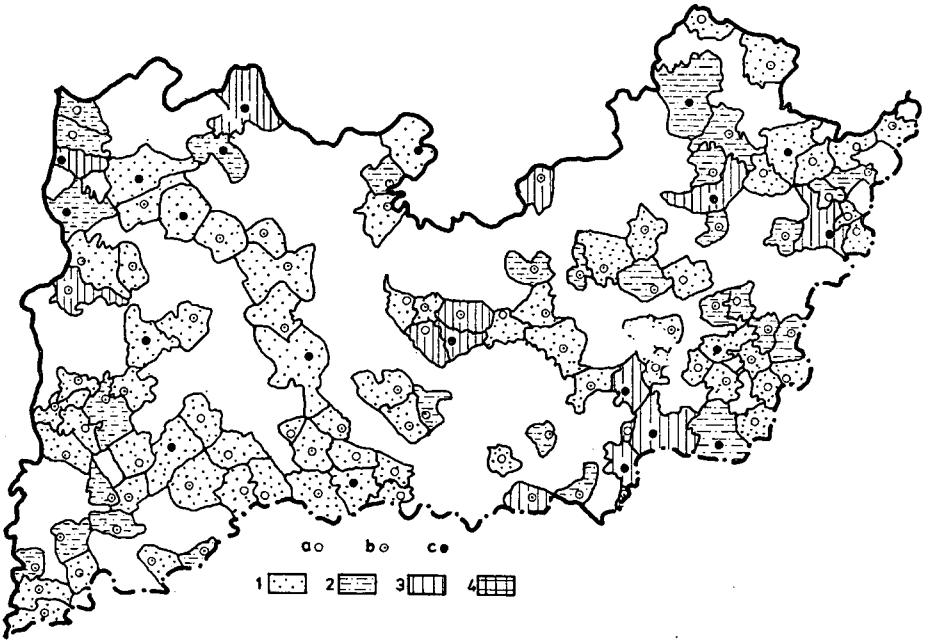

Fig. 9. The occupational structure in 1960.
a: partial lower-grade centre b: lower-grade centre c: accentuated lower-grade centree

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REGIONAL SYSTEMS OF INFRASTRUCTURE

MRS. J. ABONYI

Regional hierarchy of infrastructural systems

It is an up-to-date task to examine the development of infrastucture from many aspects; regional aspects must play on important part in the course of the examination. Since many elements of infrastructure are restricted to a certain region, their regional effects are peculiar. The back or backwardness of infrastructure emerges as a complex regional problem; at the same time decisions concerning regional development have consequences arising from questions of the development of infrastructure. This is the reason why it is understandable that experts who deal with such regional problems are interested in this spatial approach.

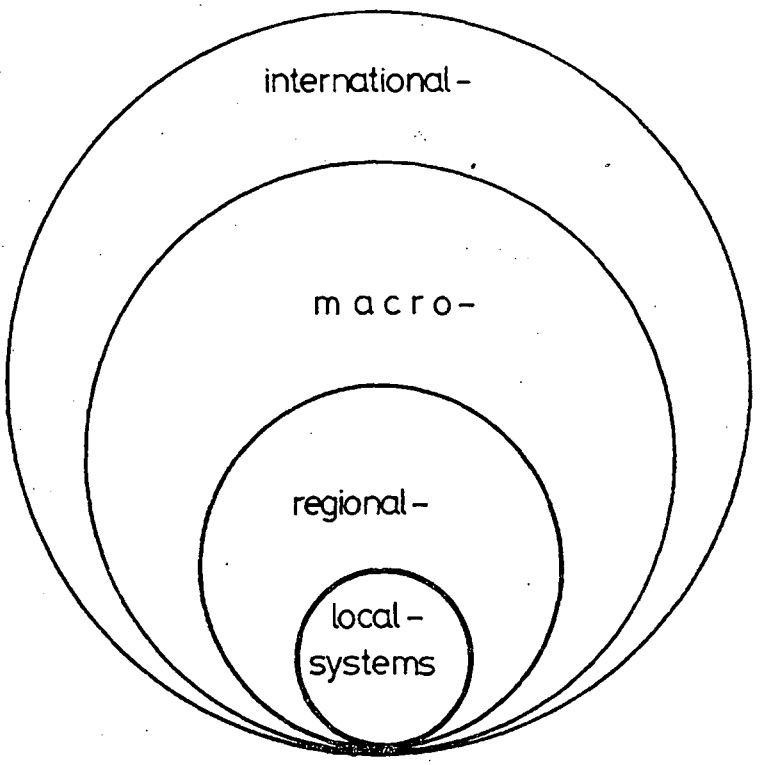
Since infrastructure has a peculiar role in the location and activity of certain branches of the productive sphere as well as in the direct supply of the population the entirety of elements which belong to this phenomenon is sometimes called infrastructural background. This infrastructural background — which has a complex existence in a certain regional unit is expected (in its development-level and structure alike) to correspond with the regional structure as a whole and to guarantee the continual increase of the standard of living of the population who live in the given region.

Different branches of infrastructure serve to fulfil national, regional, urban and local claims. (see fig.) Thus *national* (macro), *regional* and *local* (eg. urban) systems can be distinguished. The latter consists of further so-called sub-systems. Such a subsystem is, for example, the infrastructural supply of one district of a town. These regional systems of the infrastructure can be characterized by a manifold and complicated network of activities on each level of the hierarchy.

The evaluation of the accomplishment-level of the regional system of the infrastructure must be carried out from the point of view of regional effectiveness. At he same time mention must be made of the fact that a reliable, exact demonstration of the state of this effectiveness is very difficult even in the case of some given fields of the productive sphere— the difficulties multiply when assessing the capacity of the infrastructure.

There are branches of infrastructure the effectiveness of which occur only on a marco level. These are mainly the linear infrastructural branches, such as transmission lines, waterways, public roads, railway lines, pipelines etc. Other occur on a regional level. At the same time there are some elements of infrastructure (nurseries nursery school, primary and secondary school, local public transport, museums, libraries, aircleaning devices etc.) which are important on a settlement level. Unity is built up by a closer circle of the above factors in the complex supply of one district of a town.

TERRITORIAL SYSTEMS OF INFRASTRUCTURE



In accordance with the above-mentioned characteristics it is understood that while analysing the effect of the infrastructure on the development of the producing sphere a macro and a micro-economical form of the infrastructure must be distinguished.

A peculiar form of the former are the international infrastructural systems.

International systems of infrastructure

(The role of infrastructure in the Socialist International Economic Integration)

The level of the infrastructural supply in a given country has a direct and an indirect effect on the situation of international division of labour. Elements of infrastructure (such as transport-network, international communication and information systems etc.) have a direct effect on international relationships since they provide the conditions for the establishment and development of manifold international relationships, and further, elements which form part of international trade and cooperation as infrastructural products or services such as the export-import of energy water, products of intellectual life (licences, know-how) etc. Indirect effect must be understood as an element which provides harmony in the cooperation of the elements of certain people's economies which then has a favourable effect on the economies as well as on the economic growht of the whole socialist integration.

V. I. LENIN emphasized even in his early works that a complex approach of the elements of the productive and non-productive spheres is an important factor — within a country — in the reasonable regional location of the forces of labour. Nowadays this statement is extended to the whole of the socialist countries by the Complex Program which says that *"COMECON-countries declare that the up-to-dateness of the tasks resulting from the great structural changes in the spheres of production and consumption, the level achieved in the forces of labour, the aggravation of the effectiveness of social production and the increase of the welfare of the population, the character of the socialist production and the demands of class-struggle make it extremely important that economic, technical-scientific co-operation among the member countries should continually be deepened and perfected, socialist economic integration should be developed..."**

The direct effect of the infrastructure on the development of integration is evident in the development of transport-infrastructure of integration importance. This has special importance in regions near the border. The significance of a deep and perfect cooperation — every transport-branch is included — is of great importance, too, as regards the whole territory of the country. The fact that this was recognised is proved by a statement in the Complex Program when it states that *"mutual and manifold consultations should be held about main trends in transport-policy; longterm plans for the development of transport reffering to certain problems should be co-ordinated"***

The Complex Program declares, that a 10–20 year prognosis should be worked out for the expected volume of passengers and goods in international traffic, for the technical development of transport vehicles and devices, for the rationalization of transport technology, for the development of the network of the main international lines of transport, for the demands and sully of technical devices, energy and materials of transport. It also emphasizes that in the field of railway transport complex resolutions must be worked out and realized, which would help the development of the permeability of the main international railway lines, would increase the transport-capacity, would aggravate and improve the processing capacity of the present

* Complex Program of the economic integration of COMECON-countries (Kossuth Könyvkiadó, 1971. p. 6.)

** Complex Program of the economic integration of COMECON-countries (Kossuth Könyvkiadó, 1971. p. 105.)

devices at border stations where products are or are not to be re-packed, would modernize complete the stock of railway-carriages and would improve international passenger transport.

According to the Complex Program, co-operation in navigation also has an important role. In order to improve the co-operation it suggests that cargo space could be used mutually in the case of foreign trade transport and service-stations in the member countries should be located to fulfil the demands. It emphasizes that it is really important to increase the volume of goods transported on the riverDanube. It denotes special importance to the development of pipelines in the COMECON countries.

Another important field in the development of infrastructure which results in the increase in the integration of the socialist countries is energy economy. As concerns this matter, the 25th assembly of COMECON declared that

"...the main tendencies of the long-term development of the energy-system of the COMECON-countries should be revised and propositions should be worked out for the extension and deepening of this kind of co-operation. On this basis ... the propositions of the ivolved COMECON-countries for a possible development of new inter-systematic connections should be examined..."

*"Propositions should be worked out in order that the COMECON-countries can make hard efforts to create productional and systematic conditions for the industrial development and effective exploitation of atomic energy in the people's economies."**

An important field in international co-operation is water-economy.

Despite the rational and favourable aims enumerated above, mention must be made that *"in the system of COMECON-countries no theoretical evaluations has taken place concerning practical decisions in connection with regional economic integration. Thus an important condition in the direction of this new and useful way of regional economic investigation would be the organization of mutual scientific investigations, regular meetings and conferences; and further to unite the hard efforts of scientists who deal with regional investigations in order to study the problems of regional integration."** Only in this way is it possible — through co-ordination — to approach the planning of economic systems and infrastructural branches gradually and mutually.

Industrial parks

It is known that productional infrastructure has the most obvious effect on the location and development of industry which has made it necessary to investigate the question of industrial parks.

The main source of the industry-locating effect of the infrastructure is the fact that up-to-date industry cannot exist without water — drainage — gas and electricity supply. Besides, the conditions for the transport of basic and secondary materials, the half-ready and finished products and of course, people are required. Thus it is understandable why infrastructural basis is called "the indispensable basis" of the location

* Complex program of economic integration of COMECON-countries (Kossuth Könyvkiadó 1971. p. 77.)

* I. M. PAVLOV: Methodical problems of studying the regional aspect of the economic integration of COMECON-countries. From the lecture given at the 4th conference of scientists dealing with regional problems of socialist countries. Székesfehérvár, 1974.

of industry in technical literature. The above enumerated factors provide necessary but not completely satisfactory gramels for undisturbed industrial activity. Other kinds of demands of those who work in industry should also be fulfilled — if possible locally — these demands are: trade, education, lodging and communal helath etc.

Although it is bourgeois technical literature that has the priority of using the phenomenon "industrial park" and the first indusrtial parks came into existence under capitalist conditions (a method for regulating private capital) these days the are becoming more and more popular in socialist countries, too. Hungary cannot boast of providing sufficient execution in this field since even on a socialist scale — apart from the Soviet Union — the phenomenon has already been introduced in Czechoslovakia and in the German Democratic Republic. Even if it was a bit late — with the significance recognised (its role in urging the pace of development in a given region; orientating the regional location of forces of production) investigations in connection with this phenomenon had started and after a theoretical conclusion practical realization began in Hungary, too.

Industrial parks mean a widely applied industryorganizing and locating factor. They came into existence in the United States and in the economically developed West European countries. Indisividual capitalists or a company of shareholders bought pieces of land and made them capable suitable for the sitting of industrial plants. In these areas they had the ground arranged, built up various networks (roads, railway lines, drainage etc.) and sometimes industrial buildings were built in advance. The workshops which were equipped by external means of operation were made into separate sites and were sold or let to industrial entrepreneurs. Thus it was possible that the single expenditure of the investment of developing the infrastructure and building the workshops could be changed into expenditures of operation.

Since, generally, when an industrial park is being established it is not known what kind of workshop or factory will operate there, the time of location and the character of the industrial companies could vary. But the time of the actual location — owing to the previous development of infrastructural objects could be extremely short.

By a closer examination of the advantages of industrial parks which were not introduced in the above definition, the following can be enumerated:

— savings in expenditure in the course of the investment
— the start of productive activity at the factory in a shorter period of time
— favourable operation expenditures
— supporting success of the aims of regional and industrial development as well as those of the conception of settlement-development
— the development of backward areas; rational utilization of labour resources
— the improvement of the economic structure of regions
— rational increase of regional industrial concentration
— the success of aims of different types of towndevelopment and town-arrangement
— decrease in the size of land that is necessary for productive activity
— better utilization of planning and realizing capacities.*

* BARTKE: Some international experiences in regional industry-locating. January 1968. OT. Tervgazdasági Intézet.

On the basis of the above there is no doubt that they have a favourable effect on the social-economic development of Hungary. This is why their application in this country became well-known for theoretical and practical experts alike. It is enough if mention is made of the theoretical works referring to Záhony, Szeghalom, Baja, Cegléd, Pécs etc. as a result of extremely prudent planning and analysis. With our extensive sources beceming gradually used up, practical propagation of industrial parks is kow in spite of the fact that their reason for existence is recognised. It is true that the way of industrial development is mainly the increase of effectiveness therefore the necessity of newly developed industrial work-places decreases. However, this must not mean that the knowledge about the advantages of the establishment of industrial parks should not change our minds. The advantages of establishing industrial parks do not only mean the enjoyment of new working places, but lie also in the course of selective industrial development and establishing new premises. Without overamphasizing the role of industrial parks in the course of industrial development, their favourable effect on economic development must be recognised and they should be used as a sort of means — together with other means — to promote a constant, dynamic economic growth in our country.

CONNECTION BETWEEN URBANIZATION AND THE CHANGE IN LAND-UTILIZATION IN TOWNS IN THE HUNGARIAN PLAIN IN THE PERIOD OF CAPITALISM

J. TÓTH—L. MOSOLYGÓ

Preface

The number of population in towns, especially the non-agricultural population concentration — as consumer market — can have a considerable effect on agriculture. It does not only effect the quantity of production but also — especially in capitalistic circumstances — it can determine its structure. The kind of agriculture which produces market-sensitive primeurs and is located around towns is called "town-supplying type" in the technical literature (M. FLESZAR, 1974).

The effect of the town as a market on the regional location of agricultural production was first studied by J. H. V. THÜNEN in the circumstances of classical capitalism (CS. KOVÁCS, 1962). The factor that THÜNEN thought was of basic importance in the location of the agriculture, i.e. distance lost its importance because transport became up-to-date. The extremely intensive agricultural production around big cities in capitalist countries today is explained by the competition in urban land-utilization T. BERNÁT-GY. ENYEDI, 1977). However, it is true in both cases that the effect of the towns is in proportion with the number of population they concentrate and is in close connection with the structure of their population. Thus there is connection between the type of agriculture around the towns and the development of the towns.

The aim of the present paper is to approach the connection between the development of towns in Alföld and the agricultural structure of towns in Alföld by examining land-utilization of their border (administrative region). As for the developm-ent of the towns the results of our former examinations were taken into consideration, while data for land-utilization were provided by the general agricultural census in 1895 and 1935.[1] The region of the towns which are investigated is the same as that of the towns which were recognized as towns legally and administratively then. For the sake of comparison the investigation was extended to Budapest and also to settlements in its centre of attraction. Those settlements were independent then.

Population relations in Alföld in the Period of Capitalism

The situation in Alföld at the beginning of capitalistic industrialization — as a result of its role in the regional division of labour and the peculiar Hungarian way of development — did not become spectacularly and definitely unfavourable. Capitalistic industrialization in Hungary started by the development and reinforcement of

[1] Country-wide data refer to the whole area of Hungary, in 1895 without Fiume and Croatia-Slavonia.

food-industry which was based on agriculture. The situation and population of Alföld was effected favourable by the fact that the development of the railway-network improved the transport-geographical situation of the region remarkably and made it possible that agricultural products could be transported to the industrially higher developed regions of the Austro-Hungarian Dual Monarchy in favourable conditions.

As a result of the above factors in the first period of capitalistic development — this period is between 1869 and 1920 according to census data — in a period when the population in Alföld was a part of Historical Hungary — the number of population increased by nearly one million and in 1920 was about one and a half times more than in 1869. The density of population increased above 72. It was this period during which the rapid development of the capital started thus forming a Central District. (Population in the Central District increased by 185%). Besides the Central District (Budapest and Pest county today) the population-increase of Alföld is the most dynamic of all economic macro-regions. As an effect of this it occurs in 1920 for the first time that more people lived in Alföld than in Trans-Danubia (despite the fact that in the population-increase of Budapest migration from Alföld had an important role). Although Alföld was also seriously affected by the great emigration wave around the turn of the century, as a whole, a relatively smaller number of people emigrated from Alföld than from other parts of Historical Hungary. The negative effect of emigration was compensated by an internal migration movement the direction of which was from the pheripheries towards the centre of the country and had an effect on Alföld, too.

Population in the period of capitalism was of extensive character in Alföld, too. Birth rates and rates of mortality were high alive with a relatively high multiplication on the whole (10/mille annually). According to the above demographic data the age-distribution of the population indicates a young structure: more than one third of the population are under the age of 15. Thus, although the rate of old people – above 60 – is only 6–8% the age-distribution – besides the social-economic situation – is also important to be mentioned when stating that only 45% of the population work for a living. In the northeastern part of Alföld the rate of natural multiplication was higher and the structure of the population showed a more extreme picture than in the southern parts.

In spite of the fact that in Alföld – especially in towns – industrial workshops were built in some parts as an effect of capitalistic industrialization and the development of the railway network which bought basic changes in the transport-geographical situation meant a considerable development, the economic profile of Alföld was always determined by agriculture. According to this the structure of the population changed very slowly. Even at the end of the period three quarters of the population were employed in agriculture; the proportion of industry was hardly more than 10%. Living in separate cottages – especially in the sandy region between the rivers Danube and Tisza increased till the first world war – on the whole the population on the periphery increased. The educational level of the population changed very slowly, too. The rate of illiteracy was high, the factors of school-education low. In Alföld, the rate of those who worked in the tertier sector was low, the number of the intelligentia was small. Certain illnesses were common resulting from the underdevelopment of public health services the level of which was even under the average in Alföld. Of all the illnesses tuberculosis and infant mortality were the most common.

On the whole, the period that lasted till the end of World War I. can be characterized by the fact that – in comparison with other parts of the country – Alföld prevented the population – concentrating effect of Budapest which was then on the way to becoming a metropolis in a very favourable position since there were favourable conditions in Alföld for agriculture and capitalist processing and distribution based on it. However the number of elements which indicate the increasing under-development of Alföld increased, too.

The second period of the capitalist development which took place between 1920 – the date of another census – and 1949 – the year of a census which reflects the consequences of World War II. can be characterized by a slow development which took place in a different size country. Within the new borders of the country the economic-geographical position of Alföld changed, too. This change was basicly unfavourable and was demonstrated by several factors. Traditional regional connections in production ceased owing to the new borders and hostile relationships between Hungary and the neighbouring countries and were forced an orbit the centre of which was Budapest. The significance of the industrialized Central Region relatively grows in the smaller size country; population concentration in Budapest increases at the expense of Alföld, Northern Hungary and Trans-Danubia. Economic growth of the country slowed down, agriculture, together with the industry based on it underwent a serious crisis. The development of agriculture was very retarded in consequence of the out-of-date semi-feudal social-economic relations and the structure of the estate-system which reflected these relations. This retarded development can be traced in connection with population in Alföld.

Between the two World Wars the relatively fast population-increase in the Central Region was parallel with that of the other economic macro-regions which was below average. By the rapid development and functional reformation of the formed peripheries the agglomeration ring around Budapest develops, the administrative recognation of which was carried out only after the liberation. In the rapid growth of the agglomeration region the contribution of the immigrants from Alföld is considerable. The dynamism of the population-increase of Alföld is below the average but it hardly below the rate of Northern Hungary and considerably above the rate of Trans-Danubia. In consequence of this, the importance of the population in Alföld is remarkably greater in proportion with the gross population of the whole country than that of Trans-Danubia. The relative number of the density of population is higher, too.

In Alföld the population-increase was relatively slow even in the regional centres like Debrecen and Szeged; it was quite slow in the case of the so-called agricultural towns. These towns – mainly because of the lack of up-to-date industry – were unable to become urbanized centres for their own environment: local centres of population-concentration were not powerful enough in Alföld. The density of population was more or less even; the rates did not reflect different levels of industrialization – they rather referred to different possibilities of agricultural production. In the course of the period no considerable changes took place as far as the structure of employment of the population was concerned. The percentage of agrarian population was dominant (60%). The rate of industrial population was between 10–20% – a more considerable industrial population-concentration can be demonstrated only in a region near Budapest and in the biggest towns in Alföld.

General Characteristics in Land-Utilization in Towns in Alföld

According to data in 1895 the structure of land-utilization in towns in Alföld was remarkably different from that of the national average (Table 1).
The very high rate of arable land is a striking 61,6%. Of course, the intensity of the utilization of arable land is different from time to time. Since the end of the 19th century e. g. Szeged and Kalocsa red peppers have been grown in arable land I. PÉNZES 1967). In respect of the urban agriculture field-grown vegetables were more important. Field-growing of vegetables started in the 1890-ies. According to scattered data from 1895 vegetables were grown in 32 thousand acres of arable land in Hungary (A. VÖRÖS, 1978). That was only 0,1% of all the arable land then. Taking into consideration every town the proportion of gardens is below the national average.

As for vineyards, the picture is more favourable. In 1895 in the towns in Alföld the proportion of vineyards of all the arable land is twice as much as the national average (2,4%). The low rate of pastures and the high rate of grazing land is the consequence of natural conditions. Towns in Alföld – similarly to the whole Alföld – were verly poorly forrested. The rate of waste-land is below the national average (4,8%), but no consequences can be drown from the data from 1895 since the majority of the area that was not cultivated does not indicate the existence or the rate of infrastructure. It was a really uncultivated area.

As it has already been metioned, urban (townsupplying) agriculture shows highly intensive characteristics. Land-utilization is peculiar, too. The rate of arable land and of less intensive branches is low; the rate of non-cultivated areas and of the intensive branches is high. According to the obtainable data, towns in Alföld do not show characteristic features of urban land-utilization.

The fact that the structure of land-utilization in the case of towns in Alföld is hardly different from that of the national average is the consequence of peculiar historical, social-economic conditions. In Hungary the Industrial Revolution which started late came to an end with contradictory, heterogeneous results (I. T. BERENDGY. RÁNKI, 1972). As a result of this as well as the unfavourable starting conditions – economic life of the country remained on a low level despite the considerable dynamism of capitalist economy. A natural consequence of this was a very slow

Table 1. The structure of agricultural land-utilization in 1895 (%)

	Hungary	Towns in Alföld	Budapest
Arable land	42.8	61.6	55.3
Garden	1.3	0.6	8.4
Vineyard	1.0	2.4	3.0
Pasture	10.2	7.6	10.3
Grazing land	13.0	19.0	5.9
Forest	26.6	4.2	11.3
Reeds	0.3	0.4	0.3
FANET*	4.8	4.2	5.5
Total	100.0	100.0	100.0

* Field out of cultivation

growth of urbanization. The situation in Alföld was especially unfavourable from this respect. As a result of agricultural development the population in the agricultural towns in Alföld was increasing till the turn of the last century but at the given economic development they became over-stocked (Z. ZOLTÁN, 1972). Before the liberation, towns in Alföld could not play an important role in the population-concentration (I. TÓTH 1975, L. TÁNCZOS–SZABÓ, 1975, J. TÓTH, 1977). In some cases if peasants bought an estate outside the town, they had to move outside the town, too. (Z. DÖVÉNYI–J. TÓTH, 1978).

In towns in Alföld consumer-concentrations which could have made agricultural activity around these towns a peculiar type urban agriculture, did not develop. Et the turn of the century the effect of non-agricultural population-concentration is demonstrated by Budapest which was developing at a very rapid then (see Table 1.). The rate of arable land is higher than the national average in 1895, the proportion of gardens is six times, and that of the most intensive branch, vine, is three times as much as the national average. The above-than average proportion of waste-land might refer to a more developed network of infrastructure.

Between the two world wars the pace of economic development showed down as a result of the changed internal and external situation. Despite the development in some branches the economic backwardness of the country became more serious (I. T. BEREND–GY. RÁNKI 1972). The development of towns in Alföld which were excluded of industrialization became very slow. (J. MAJOR 1974, J. TÓTH 1976, J. TÓTH–I. SIMON 1976).

According to data from 1935 the structure of land-utilization in towns in Alföld did not change in comparison with the national average (see Table 2.).

Table 2. The structure of agricultural land-utilization in 1935 (%)

	Hungary	Towns in Alföld	Budapest
Arable land	60.7	65.7	20.4
Garden	1.4	0.9	17.0
Vineyard	2.2	3.1	3.0
Pasture	6.9	6.3	7.0
Grazing land	10.6	13.4	1.8
Forest	11.9	4.2	11.4
Reeds	0.3	0.3	0.0
FANET	6.0	6.1	39.4
Total	100.0	100.0	100.0

The proportion of arable land was still higher, the proportion of garden was lower; the proportion of tax-free area which was just above the average indicate a low level of infrastructure.

The structure of land-utilization in Budapest was definitely urban type. The proportion of arable land decreased to 20,4%, that of the gardens increased to 17%, the rate of pasture went down below the national average. A pecularly urban structure is indicated by the high proportion of the areas which were stopped being cultivated. These areas were almost 50% of the total in 1935. The great population-con-

centration of Budapest did not effected the agricultural structure of the settlements which were then separate administrative unite but which were situated in the region of attractivity of Budapest. As far as the distribution of the branches of cultivation are concerned, the proportion of gardens is striking in these settlements(Budafok 34,2%, Kispest 29,6%, Pesterzsébet 23,2% etc.).

Regional Differences in Land-Utilization in Towns in Alföld

Regional order of land-utilization which developed by 1895 in towns in Alföld did not undergo a considerable change by 1935. This is why it was posible to analyse the regional characteristics of the structure of the branches of cultivation according to data from 1935. By analysing the arable land of the important braches of cultivation it is obvious that certain towns in the Trans–Tisza area can be characterized as having the greatest proportion (see fig. 1.). Thus the percentage rate is above 80% in the case

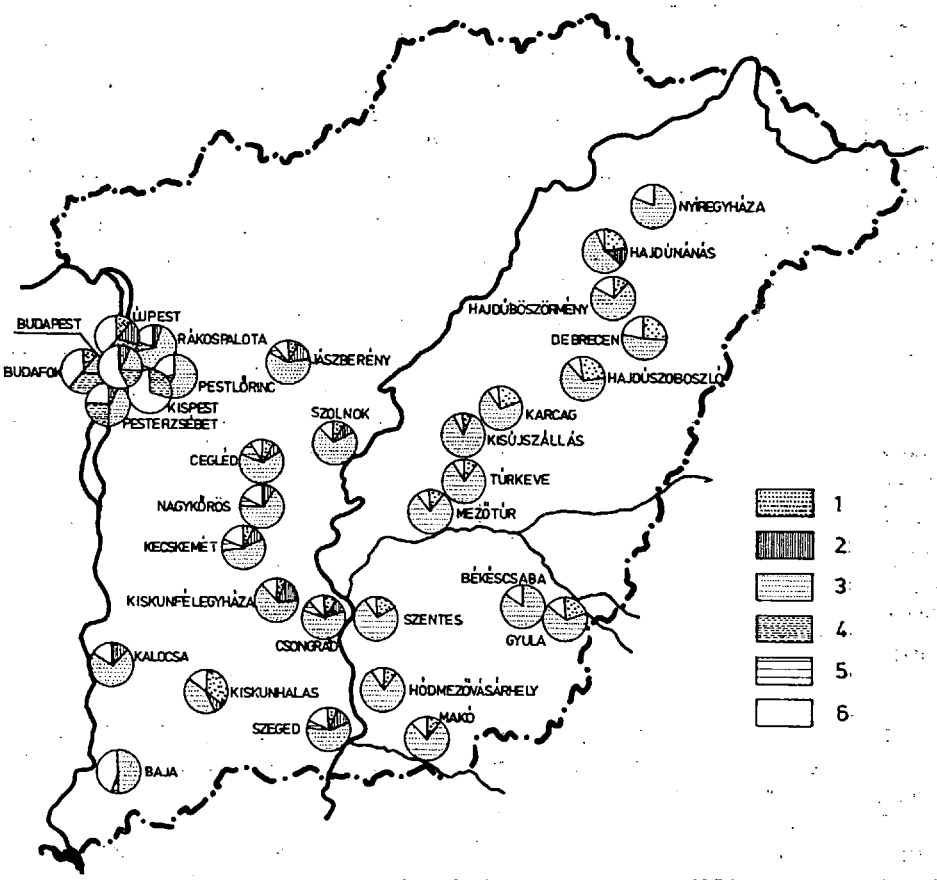


Fig. 1. The structure of branches of cultivation in towns in Alföld in 1935.
(in % above 5%)
1: Grazing land 2: Pasture 3: Arable land 4: Garden 5: Vineyard 6: Miscellaneous

of Békéscsaba, Hódmezővásárhely, Kisújszállás, Turkeve and Nyíregyháza. In the case of towns situated between the rivers Danube and Tisza the rate of arable land does not increase above 80% and has a less important role in the structure of land-utilization in the case of towns in Hajdúság, too.

In the regional development of the cultivation branches – besides the effect of natural (soil-) conditions – the regional characteristics of social-political conditions had a considerable role. The transformation of Hungarian agriculture into capitalist development was a process full of contradictory elements which took place in the "Prussian way" i. e. with huge size feudal estates. In the restrictive circumstances of this kind of agriculture based on real elements of the "American way" of capitalist agrarien development occured only in some towns in Alföld in which certain precedents – some of them dating back from Turkisch times – prohibited the development of system of real estates (A. VÖRÖS, 1976).

The more favourable estate-structure had an effect on the structure of cultivation. Together with the diminishing of the size of estate, the intensity of cultivation increased. In 1913 only 34,1% of all the arable land belonged to landowners with a bigger size estate than 10 acres (L. FÜR 1976). Of the most intensive braches of cultivation i. e. gardening and vine-growing – the proportion of real estates below 100 acres was above 80%.

From a social point of view small estates were of basic importance in the development of the famous garden – culture in between the rivers Tisza and Danube. The proportion of the branches of the highest intensity was the highest in thus area – apart from Budapest and the settlements around it. This proportion is of a smaller value in the case of towns in the Trans–Tisza area. In the case of towns in Nagykunság the proportion of gardens and vineyards was not even 1%. The high proportion of the intensive branches in the area between Danube and Tisza and in near Budapest was of a different character, i. e. in the former it was vine, in the later it was garden that dominated. The high proportion of vine was not caused by local market, but rather the peculiar natural conditions and the system of estates since filoxera had a devastating effect in the whole of Hungary in the second half of the last century. The devastation was the most serious in the traditional vine-growing areas in "Hegyalja" which caused a shift in vine-growing and an extreme development of vine-growing in sandy areas (L. FÜR 1976). In the development of the garden-culture in the area between the rivers Danube and Tisza – besides exportinterest – local market (mostof all Kecskemét, Cegléd, Nagykörös) but especially the fact that Budapest was so near had a very important role (I. ASZTALOS–B. SÁRFALVI 1960).

The proportion of branches of low intensity (pasture and grazing land) is high in the case of towns in Hajdúság and in the case of certain towns in the area between the rivers Danube and Tisza. Since these were forced branches of cultivation, their high proportion is the result of the peculiar soil-conditions.

Analysing the structure of land-utilization in towns of Alföld it is obvious that it was not determined by the peculiar claims of urban population-concentration but rather of the whole agriculture in Hungary. Budapest was the only urban market in the new territory of Hungary after the first World War (P. GUNST 1976). Even between the two world wars the majority of the population in towns in Alföld were employed in agriculture (J. MAJOR 1974). The low level of urbanization, the extemely slow pace of social regroupment did not make the development of a non-agricul-

tural population-concentration in towns possible, which, if it had development, would have had peculiar urban claims towards agricultural activity.

In order to give a compound characterization of the structure of land-utilization in towns in Alföld an attempt of classifying was made. In the classification the proportion of arable land, garden, vineyard, pasture and grazing land was taken into consideration since the other cultivation branches do not express the real direction of cultivation. On the basis of the branch of the greatest proportion the structure of land utilization in the case of the majority of towns in Alföld can be characterized as "arable land type". Besides this, vine has a considerable size proportion in the area the rivers Danube and Tisza and grazing land in the case of towns in Hajdúság. Therefore – as a second characteristic feature – the cultivation branch which deviates in a positive direction – as far as its proportion rate is concerned – the graetest extent from the average of towns in Alföld. Thus seven types can be distinguished which indicate special branches of land-utilization (fig. 2.). With Budapest and the neigh-

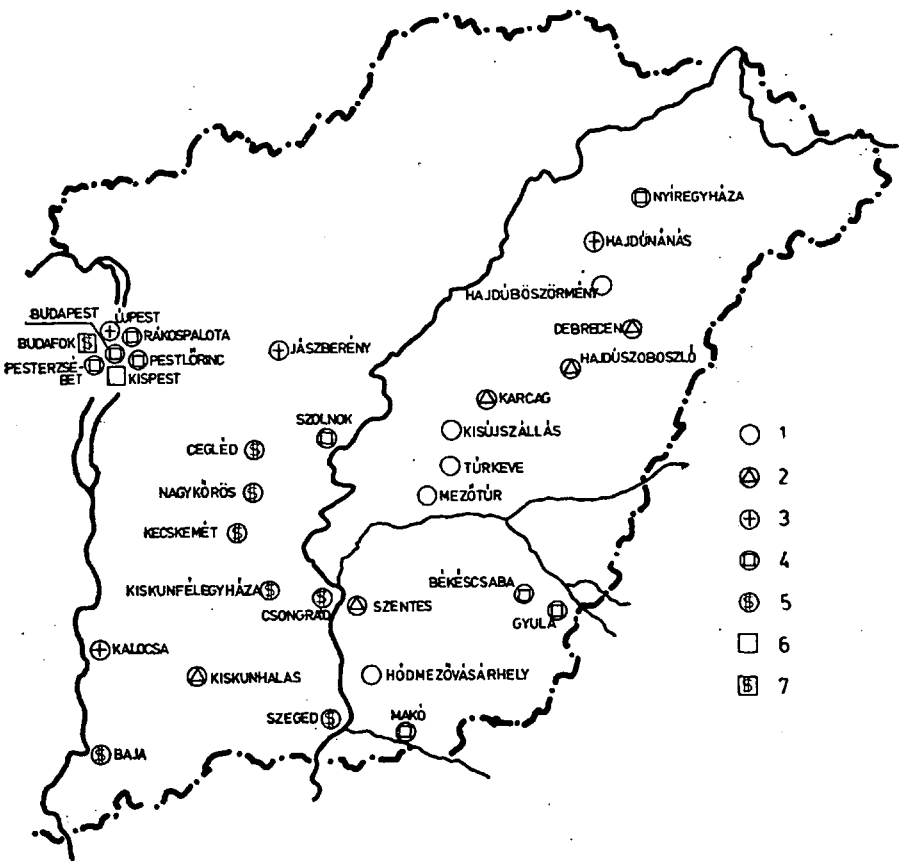


Fig. 2. Types of the structure of branches of cultivation in towns in Alföld (1935)
1: Arable land 2: Arable land—grazing land 3: Arable land—pasture 4: Arable land—garden 5: Arable land—vineyard 6: Garden 7: Garden—vineyard

bouring settlements also taken into consideration 9 towns out of 32 can be called of "arable land-garden" – type. Since classifying always means abstraction it muts be understood, that within the class there are considerable differences in the case of the structure of land-utilization in towns. For example the rate of garden is 1,8% in the case of Békéscsaba, while it is 15,2% in the case of Pestlőrinc. At the same time there is doubt that however small the proportion-number is – garden means specialization in the case of Békéscsaba.

Seven towns in the area between the rivers Danube and Tisza shows an arable land – vineyard type structure of land-utilization. The specialization for growing vine began in the area when efforts were made to bind sand down and the significance of vine-growing increased at the time of the phyloxera-epidemic at the end of the 19th century.

Arable land-grazing land and arable land-pasture types can be found in regions where – besides soil which can be cultivated – there is a great proportion of poor quality soil, too. A land -utilization structure of "purely arable type" can be found in Trans–Tisza region; purely garden and garden-vineyard type can be found in the environment of Budapest.

Summary

Since the development of an urban-type (townsupplying) agriculture is in connection with the concentration of non-agricultural population, a connection between the development of towns and the structure of agriculture near the towns can always be indicated. The towns in Alföld did not play a considerable role in the population-concentration before the liberation so the structure of land-utilization in these towns could not reflect the effect of urban market. The close connection between the development of towns and the structure of land-utilization is evident in the case of towns in Alföld, too – these two factors indicate the economic backwardness of Hungary. An urban type structure of land-utilization in the period of capitalist development was demonstrated by Budapest which had the greatest concentration of population as well as by towns in the environment of Budapest. The beginnings of an urban type structure of land-utilization might be indicated in the case of a number of towns in Trans–Danubia and in the north of Hungary.

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РОЛЬ ИНФРАСТРУКТУРЫ В ТЕРРИТОРИАЛЬНОМ РАЗВИТИИ

ДЬ. КРАЙКО—ЙОЛАН П. АБОНИ

В настоящем периоде развития народного хозяйства Венгрии происходилось значительное изменение во внешних внутренних условиях экономического подъема. Закончившись экстенсивный этап экономического развития на первый план выдвигалось повышение эффективности, поличаемое в первую очередь из выявления внутренних ресурсов. Важным средством повышения эффективности народнохозяйственного уровня является преобразование — рационализация — структуры разных уровней. К этой тематике принадлежат сложные чрезвычайно разветвленные вопросы, из числа которых собираемся рассматривать только главные черты территориальных и временных изменений в макроструктуре.

Анализ производится с той точки зрения, чтобы ответить на вопрос, какие отношения создались между промышленностью и инфраструктурой, или сельским хозяйством и инфраструкторой в процессе развития после освобождения страны.

Прежде всего необходимо определить принятое нами понятие инфраструктуры, так как оно и по содержанию и по комплексу является и сегодня изменяющейся категорией, даже и в отдельных странах имеются значительные разницы в понимании этого термина между специалистами. Уточнение целесообразно и потому, что употребленные определения приближаются к понятию с разных сторон. В большинстве определений содержится то, что инфраструктура есть совокупность оборудований, устройств, сооружений и обстановок, далее и их действия, обеспечивающих соответствующее функционирование данной области народного хозяйства.

В течение работы принято нами следующее определение: под инфраструктурой понимается совокупность общественных и экономических деятельностей, в первую очередь, система условий в общем, вне предприятий, в окружающей среде, необходимых для общественного процесса воспроизводства, именно, система общих необходимых социальных, экономических и существующих в данном состоянии природных условий. Активизировавшись эти условия проявляются в форме коммунальных обслуживаний, или в форме обслуживаний, обеспеченных предприятиями, учреждениями и организациями соответствующего характера (МАТЬЯШ ТИМАР).

Рассмотрение связи инфраструктуры с главными отраслями производительной сферы является чрезвычайно актуальным в настоящее время не только потому, что влияние инфраструктуры на размещение и развитие промышленности, и на развитие сельского хозяйства станет все больше и больше извест-

ным, но и потому, что динамическое развитие инфраструктуры, в первую очередь производительной, является крайней необходимостью для следования желаемому темпу экономического развития. Настоящее быстрое развитие инфраструктуры обосновалось и тем, что после освобождения страны в экстенсивном периоде инфраструктурное развитие было подчинено в некоторой степени потребностям в капитале производительной сферы. Имея в виду, что отставание в уровне развития инфраструктуры от целого комплекса хозяйства в течение долговременного периода могло тормозить эффективность, в настоящее время наиболее важными вопросами являются: оценка территориального базиса инфраструктуры, выявление ее ресурсов и рассмотрение многостороннего влияния инфраструктуры, в том числе диалектического взаимоотношения между инфраструктурой и размещением промышленности или развитием сельского хозяйства.

Венгрия — как большинство социалистических стран — принадлежит к типу «последующего развития» по инфраструктуре, это значит, что развитие промышленности значительно превышает развития инфраструктуры (и во время предшествует ему).

В дальнейшем конкретно анализируются наиболее важные черты в соотношении между развитием инфраструктуры и развитием производительной сферы на основе некоторых характерных показателей.

Считаем целесообразным приближение к этому вопросу со стороны живой работы (таблица I).

Таблица 1
Некоторые характерные показатели развития первичного, вторичного и третичного секторов

Год	Число занятых в секторах на тысячу активных самодеятелей			Число занятых в секторах на тысячу жителей		
	первичном	вторичном	третичном	первичном	вторичном	третичном
1950	224.6	519.8	255.6	99.3	229.7	113.0
1955	297.6	436.8	265.6	136.2	199.9	121.6
1960	340.3	389.1	270.6	161.7	185.0	128.6
1965	402.8	297.3	299.9	184.7	136.3	137.5
1970	431.9	263.7	304.4	208.4	127.2	146.9
1975	439.2	227.5	333.4	212.5	110.1	161.3
1976	435.1	223.1	341.7	209.6	107.5	164.6
1977	429,1	218,9	352,0	205,3	104,7	168,4

Как видно из первой таблицы число занятых в сельском хозяйстве на тысячу активных самодеятелей с 1950 года непрерывно — хотя в меняющемся темпе — понижается. В этот же период соответствующий показатель промышленности и строительной промышленности повышался до 1976 года, а потом понизился. Здесь надо упомянуть, что в последние годы (в годы между экстенсивным и интенсивным этапами) этот показатель характеризуется более медленным темпом роста. Число занятых в третичных отраслях на тысячу активных самодеятелей постоянно повышалось, степень роста выделилась в первые годы 60-х годов и

после 1975 года. Более быстрый рост в последний период обусловился меньшим размером релятивной занятости в сельском хозяйстве и в промышленности.

На рисунке 2 показано отражение числа занятых на тысячу жителей по вышеупомянутым отраслям. Разница — по понятным причинам — минимальна.

Далее рассмотрено отношение между числом занятых в промышленности и в сельском хозяйстве на тысячу активных самодеятелей и соответствующим показателем третичного сектора во время трех переписей населения (в 1949 г., в 1960 г. и в 1970 г.). Результаты представлены на рисунке 3. Рисунок характеристически показывает, что корреляционное значение между относительными числами промышленности и третичного сектора понизилось от 1949 года до 1970 года. Темп понижения от 1949 года до 1960 меньше ($r = +0{,}69$ и $r = +0{,}52$), чем

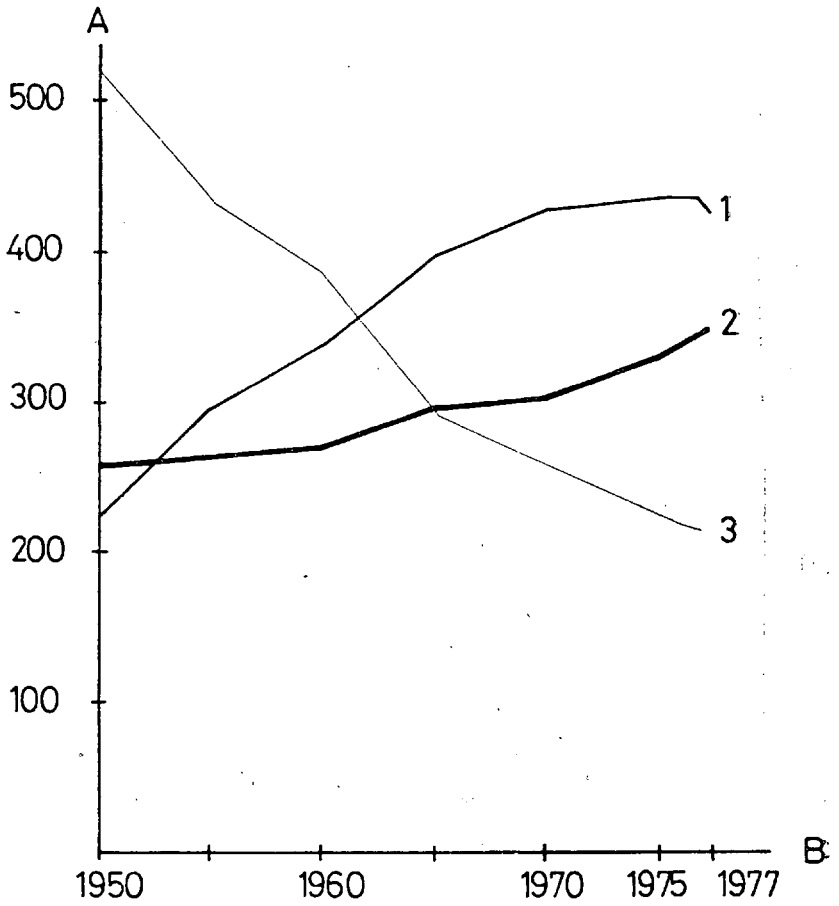

Рис. 1. Изменение числа занятых в промышленности и строительной промышленности, в сельском хозяйстве и в третичных отраслях на тысячу активных самодеятелей

A: лицо B: годы
1: промышленность и строительная промышленность
2: третичные отрасли 3: селское хозяйство

от 1960 года до 1970 года ($r = +0{,}52$ и $r = -0{,}26$). Это явление связано, в первую очередь, с реализацией решения партии и правительства, направленных на территориальную децентрализацию промышленности, на развитие промышленности вне столицы.

Отношение между показателями сельского хозяйства и третичного сектора тоже имеет снижающуюся тенденцию, на основе этого можно обнаружить, что

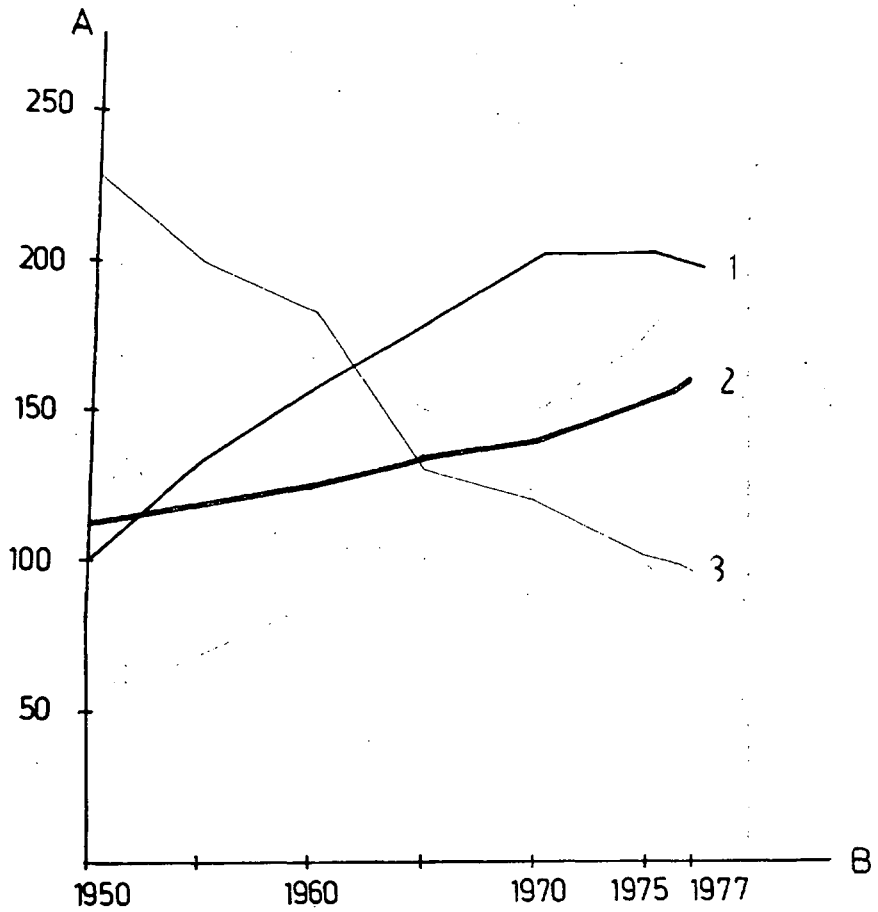

Рис. 2. Изменение числа занятых в промышленности и строительной промышленности, в сельском хозяйстве и в третичных отраслях на тысячи жителей

A: лицо B: годы
1: промышленность и строительная промышленность
2: третичные отрасли 3: сельское хозяйство

темп изменения от 1960 года до 1970 года был значительно быстрее (значение было в 1949 г. —0,83, в 1960 г. —0,69, а в 1970 г. +0,13).

Показатели числа занятых в промышленности, в сельском хозяйстве и в третичном секторе на тысячу активных самодеятелей в 19 комитатах следующие:

Таблица 2

На тысячу активных самодеятелей число занятых в	в 1949 г.	в 1960 г.	в 1970 г.
промышленности	72.1	99.8	82.4
сельском хозяйстве	94.8	119.0	76.5
третичных отраслях	32.4	26.3	22.1

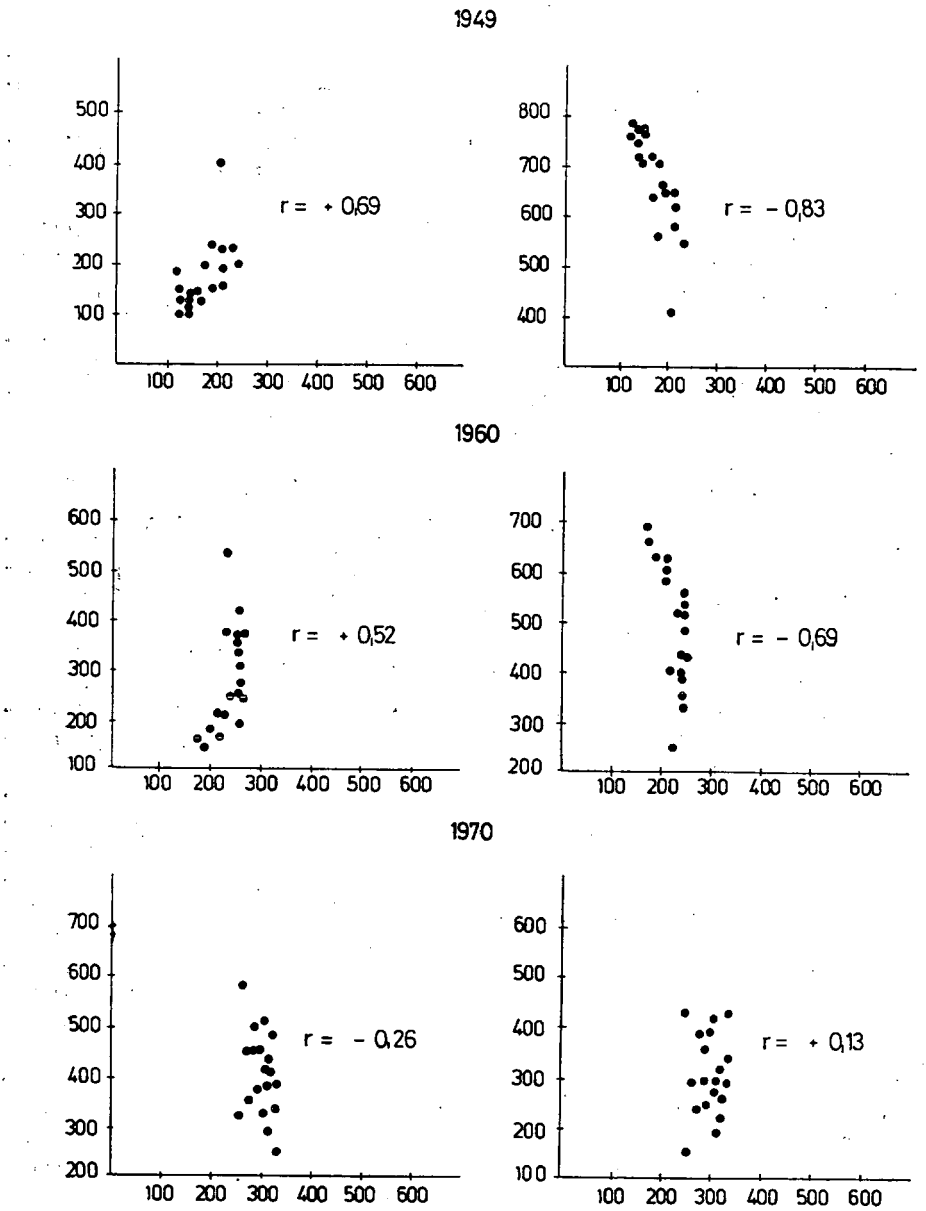

Рис. 3. Отношение главных отраслей производительной сферы к третичному сектору по числу занятых на тысячу активных самодеятелей

На основе данных таблицы 2 хорошо видно, что значения «б» показывают понижающуюся тенденцию в рассмотренный период. С расширением горизонта времени размер понижения все еще усиливается. Заметим, что в то же время показатели как и промышленности, так и сельского хозяйства представляют возрастающую дифференциацию по территориям, которые к 1970 году взяли направление на нивеллирование. Понижение территориальной дифференции между комитатами по доле занятых в третичном секторе внутри количества активных самодеятелей объясняется общественными и экономическими причинами. Общественные причины имеют связь с особенностями социальной инфраструктуры, влияющими в первую очередь, на жизненный уровень, а экономические причины связываются с вопросами планомерного и пропорционального развития и политики территориального развития. Но косвенным путем элементы социальной инфраструктуры тоже играют роль в развитии хозяйства благодаря рабочей силе.

Известно, что в реализации постепенного приближения дифференцированного уровня жизни населения различных территорий выделенную роль принадлежит инфраструктуре. В осуществлении этой значительной цели вместо видимой ведущей роли социальной инфрассруктуры приоритет имеет производитель мой ведущей роли социальной инфраструктуры приоритет имеет производительная инфраструктура. Первичность технической инфраструктуры основывается, в первую очередь, на особенностях развития производительных сил. Этим объясняется и тот факт, если соотношения гетерогенных элементов собирательной категории инфраструктуры рассматриваются отдельно в связи с ее уровнем экономического развития (или с экономическим подъемом), тогда более тесную связь показывают элементы производительной инфраструктуры.

Развитие инфраструктуры в соответствии с другими отраслями целесообразно рассматривать с точки зрения мертвой работы на основании инвестиционной деятельности. Известно, что инфраструктура Венгрии до освобождения была очень отсталой. В динамической инвестиционной деятельности после освобождения страны инфраструктура в течение времени получила изменяющееся значение.

Во время восстановления страны сразу после освобождения и в периоде обоснования социалистической индустриализации сравнительно большую роль играли и инфраструктурные инвестиции.

Позже (с первой пятилетки) для нашей инвестиционной деятельности характерным было стремление преобразовать аграрно-индустриальное хозяйство в индустриально-аграрное государство. Эта цель влияла отрицательно на развитие инфраструктуры, требуемое значительного капиталовложения, так как развитие инфраструктуры было подчинено потребностям в капитале производительных отраслей. В общем можно сказать, что в процессе инвестиций более значительная роль третичного сектора осуществлялась за счет сельского хозяйства и обратно. Например, с конца 1950-х годов, окончившись социалистическое преобразование сельского хозяйства, роль сельскохозяйственных инвестиций возросла внутри инвестиций в социалистическом секторе, а инфраструктура снова отодвинулась на второе место. Позже (в середине 60-х годов) всесторонняя «жажда к инвестициям» провела к напряжениям. Пока, например, до 1969 года инвестиции в промышленности представили 40—46 %, потом эта доля понизилась под 40 %. В то же время инфраструктурные инвестиции развивались

динамичнее обычного. Но большой подъем не мог уравновешивать бывшие диссонансы в профиле инфраструктуры. Положение стало более трудным и сложным вследствие возрастающейся разницы между инфраструктурным обслуживанием и потребностью в нем общества.

В периоде 1971—1075 гг. внутри накопленных инвестиций, реализованных в социалистическом секторе к инфраструктуре принадлежило 44 % подразделение которого по классическим инфраструктурным отраслям показано в следующей таблице:

Таблица 3

Название	%
Производительная инфраструктура	55,0
Электроэнергетическая связь	6,4
Водное хозяйство	11,6
Торговля	8,4
Транспорт — связи сообщения	28,6
Непроизводительная инфраструктура	45,0
Медицинское и социальное обслуживание	3,2
Личные обслуживания и жилищное хозяйство	27,5
Административные и другие обслуживания	6,3
Культурные обслуживания	8,0

Развитие единой системы инфраструктуры Венгрии отстается от капиталистических стран подобного уровня экономического развития в производительных инфраструктурных отраслях. Так как достаточного капитала для соответствующего развития инфраструктурных отраслей у нас нет в распоряжении, нам надо установить порядок в их рахвитии. В установлении этого порядка надо принимать во внимание эффективность и еще много других (например социальных и т. д.) позиций. Характерной чертой для инфраструктурных инвестиций является тот факт, что их действие проявляется часто многократно косвенным путем и значительно отставая по фазе от стадии инвестиций. Таким образом нетрудно осознавать, что определение меры инфраструктурных инвестиций в общем и целом, или во внутренних отношениях требует предусмотрительности и осторожности.

Разницы между уровнями развития в инфраструктуре, промышленности и сельском хозяйстве обращают наше внимание на неотложность необходимости подъема некоторых областей для устранения дифференциаций в темпе развития. Срочность инфраструктурного развития подчеркивается и тем, что в рационализации территориального размещения производительных сил инфраструктура играет возрастающуюся роль из-за своего ориентирующего влияния. (Именно потому, что в периоде интенсивного развития народного хозяйства взаимные отношения между производительной и непроизводительной сферами станут более глубокими и многочисленными).

В связи с этой темой считается необходимым анализировать и тот факт, какие изменения происходили в процессе развития в дифференциации по коми-

татам уровня развития отдельных отраслей производительной сферы и инфраструктуры. Результаты исследований показали, что развитие главных отраслей производительной сферы стремится к нивеллированию, пока развитие инфраструктуры — несмотря на различный темп развития отдельных территорий — не уравновешивается.

В дальнейшем схематически излагаем еще отношение инфраструктуры к целому комплексу промышленности. В первом случае опираемся на исправленный показатель удельного значения национального дохода, производственного промышленностью, а в последнем на значения порядка релятивного развития по естественной показательной системе.

Корреляционная связь между фактором и переменной результата является несколько сильнее среднего ($Щ+0{,}55$). Вышеупомянутое отношение поддерживает наше предыдущее установление, что развитие области по инфраструктурному обслуживанию притягивают к себе промышленность, а наоборот, отставание в развитии инфратруктуры тормозит подъем промышленности. Одновременно получились унтересные результаты при сравнении сельского хозяйства и инфаструктуры, ввиду чего можно установить, что соотношение между ними является слабо отрицательным. Такое условие вредно влияет на дальнейшее развитие сельского хозяйства и пищевого снабжения, ведь наше сельское хозяйство попало в такое положение, когда потребности в нем других сфер, и особенно производительных инфраструктурных систем все еще повышаются. Так как инфраструктурное обслуживание сельскохозяйственно развитых в настоящее время территорий значительно слабее (крайнее значение представляет комитат Бекеш), таким образом здесь оказывают наиболее замедлительное влияние диссонансы в профиле инфраструктуры.

Имея в виду этого, нельзя не подчеркнуть необходимость предусматрительного развития инфраструктуры.

Естественно. что системы, принадлежащиеся к понятию производительной или социальной инфраструктур, воздействуют на подъем эффективности производства в неодинаковой степени. Наиболее тесную связь можно обнаружить между промышлесностью и инфраструктурной системой транспорта. Одновременно отметим, что между сельским хозяйством и транспортом имеется слабо отрицательная связь. Необычайно слабую связь имеет и промышленность, и сельское хозяйство с торговой обеспеченностью.

Интенсивность вышеупомянутых связей в процессе развития естественно показывает и еще будет показывать различные значения из-за дифференцированного по территориям и отраслям темпа развития. Несмотря на это, мы считаем необходимым следование этой тенденции во время планирования в целях подъема эффективности в народном хозяйстве. Это особенно целесообразно в настоящее время потому, что «в периоде интенсивного развития, когда нет возможностей для быстрого увеличения количества живой работы, и поэтому соответствующее повышение национального дохода зависит от подъема производительности труда и эффективности общественного капитала. В это время усиленно выдвигается на первый план развитие инфраструктуры, непроизводительных областей в целях расширения комплексного процесса воспроизводства» (РЕЖЕ НЕРШ). Так и понятно, что среди экономистов, статистиков и географов все больше и больше станет популярным подробнее анализировать проблематику инфраструктуры.

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ПРОЦЕСС УРБАНИЗАЦИИ В ВЕНГРИИ В 1950—75 ГГ.

КЛАРА БАНК—Й. РУДЛ

После освобождения нашей страны глубокие изменения в общественной и экономической жизни значительно ускорили некоторые из существующих и наблюдаемых раньше процессов. Индустриализацией страны и пополнением производства в соответствии с новой структурой производства была перераспределена главная производительная сила — человек, т. е. население. Венгрия в процессе социалистической индустриализации все больше стала индустриально-аграрной страной. Крупная промышленность обеспечивала работой не только трудящихся, занятых вне сельского хозяйства, но и в результате формирующего крупного сельского хозяйства занимала рабочую силу, освобожденную от сельского хозяйства. Различные, необходимые для промышленного производства, отрасли несельскохозяйственного профиля доставали рабочую силу из сельского хозяйства. Вследствие этого произошло быстрое перерасслоение по профессии. Однако перераспределение рабочей силы представило не только перерасслоение по профессии, но и изменение места жительства, т. е. миграцию населения. Новой структурой производства было вызвано и перераспределение рабочей силы по территориям.

Промышленность, и главным образом крупная промышленность, формировалась, в большинстве случаев, в городах, осуществляющих для своей окресности функции высшего порядка, и, таким образом, эти города играли большую роль в быстрой концентрации населения. Темп роста населения городов из-за переселения намного превышает их естественный прирост.

Население переселяется в города, в се большие и большие города. Урбанизация — процесс концентрации населения в города является следствием перераспределения населения и общей закономерностью разделения общественного труда.

Естественно, что урбанизация является более сложным процессом; кроме перераспределения по профессии и переселения населения в города она представляет, далее, распространение городского образа и темпа жизни, повышения уровня обслуживаний и коммунальных услуг и т. д.

Ввиду разницы в темпе исторического развития отдельных областей Венгрии между этими территориями возникли значительные разнообразия в структуре, в результате чего процесс и уровень их урбанизации резко отличаются друг от друга и во времени и в пространстве.

Венгерские представители географии населения и поселений много работали в целях пояснения особенностей процесса урбанизации в нашей стране. В своих работах они определяли сущность процесса и анализировали разницы,

существующие как на уровнях, так и в динамизме процесса урбанизации. Первым (в 1964 г., 1965 г.) Б. ШАРФАЛЬВИ исследовал процесс перераспределения сельскохозяйственного населения, он определил и факты, вызывающие переселение населения. Надо подчеркнуть важность книги Э. ЛЕТРИХА о «Процессе урбанизации в Венгрии», в которой автор на основе профессиональной структуры населения разделяет поселения страны на главные типа и внутри них на 10 подтипов. На основании соотношения между их порядками и частоты их нахождения он определил территориальные типы урбанизации по комитатам. Ф. БОРОШ способствует пониманию территориальных разниц раскрывая исторические предпосылки. В своих новых работах (с 1961 г.) он занимается анализом функций промышленности городов, а в работе, опубликованной в 1968 г., он представляет некоторые новые элементы городской сети. В совместной работе Й. КОРОДИ и ДЬ. КЕСЕГФАЛЬВИ, анализируя настоящую структуру городской сети, изображают проблемы и перспективные планы развития городов. Й. ТОТ (в 1969 г., 1977 г.) кроме анализа процесса урбанизации территории Дэл-Алфельда исследует и темп роста населения в центрах поселковой иерархии. В его работах значительное место занимает анализ функции городов (в 1971 г.) и представление процесса агломерации (в 1969 г.). Работы П. БЕЛУСКИ (в 1965 г. 1966 г.) обогатили литературу о географии поселений раскрывая центральный круг ролей поселений, проводя границы притягательных к центрам районов. Кроме исследования городских проблем он занимается также и настоящими вопросами сельских поселений и хутров. Надо особенно отметить творчество Т. МЕНДЕЛА, основателя венгерской социалистической науки о географии поселений, выясняющего основные понятия географии поселений. Хотя в его работах точки зрения морфологии занимают значительное место, он обращает внимание на «энергетические тенденции» формирования городов.

Естественно, что мы не стараемся на всеохватывающее представление нашей литературы о географии поселений и называем только значительные исследователи процесса урбанизации. Можно было бы упомянуть некоторые работы авторов Ф. ЭРДЕИ, Й. КОЛЬТА, Э. В. ТАЙТИ, результаты исследования которых мы принимали во внимание в течение составления этого доклада.

Нами был рассмотрен и анализирован огромный набор статистических данных о процессе урбанизации в 1960—70 гг., представленный в прилагаемых таблицах. Данные за 1950-ые годы неоднозначны, неполные и неупотребляемые из-за отсутствия статистических данных о ряде поселений. Данные от переписи населения в 1949 г. трудодоступны и обрабатывать их до сих пор не удалось. Статистические ежегодники от 1975 г. предоставляют больше информации по территориям, хотя и здесь проблематичными являются данные о ряде населений территориям, хотя и здесь проблематичными являются данные о ряде населений, поэтому по теме агломерации и городов у нас нет данных от 1975 г. (Данные городов, принятых в юридическом смысле, естественно известрны, но данные поселений, общепринятых в качестве города на основе общего — не юридического — понятия города, неизвестны). Оценка процессов от 1949 г. до 1960 г. проведена на основе данных специальной литературы.

Наша работа затруднялась и тем, что определение принадлежности к агломерации и понятия городов в течение обработки данных изменилось.

Процесс концентрации населения

Настоящая структура населения по профессии и уровень концентрации создались в результате сравнительно коротко-временного исторического развития. Во время турецкого ига населения оккупированных территорий переселилось в большие поселения, но и здесь продолжало заниматься сельским хозяйством. Однако эта концентрация населения не являлась прочной. После прекращения постоянной турецкой угрозы население, занятое в сельском хозяйстве выходило из больших поселений на годные для обработки земли. Таким образом создалась особая венгерская система хуторов, происходило рассеивание населения по Большой венгерской низменности. На других территориях страны тоже доминировало сельскохозяйственное население. О перерасслоении по профессии, о концентрации населения в общем и целом нельзя говорить до Компромисса (1867 г.)

Во время Габсбургского режима Венгрия осталась аграрной страной, главной базой для снабжения продовольствием все больше и больше индустриализированной империи. Конъюнктура пшениц и технических культур привела к росту населения на некоторых сельскохозяйственных территориях, главным образом на малонаселенной Большой венгерской низменности.

После Компромисса немного оживалась деятельность промышленности. Кроме традиционного капиталовложения в пищевую промышленность австрийский капитал создавал несколько заводов тяжелой промышленности. Отечественный капитал начал развивать промышленность Будапешта (он хотел создать «антипод» Вены). Число населения скачкообразно повышалось: пока в 1869г. 300 тыс.чел., в 1890 г. уже 560 тыс. чел., в 1900 г. 861 тыс.чел., а в 1910 г. 1110 тыс.чел. жили в столице. В это время началось быстрое повышение числа населения в некоторых провинциальных городах (например в Мишкольце и Пече) число их населения удваивалось благодаря увеличению числа рабочих мест в промышленности.

Между двумя мировым войнами доля городского населения повышалась значительно медленнее, чем раньше. Население притягивалось только к Будапешта и двум вышеупомянутым городам Мишкольцу и Печу, далее к горному делу Задунайского среднегорья. В столице в 1941 г. жили 1712 тыс.чел., число населения к концу второй мировой войны понижалось до 1590 тыс. чел. Город Мишкольц вошел в состав городов с 100 тыс. чел., а в городе Пече число населения приблизилось к 100 тыс.чел. Естественно, что число населения в других больбольших городах тоже повышалось, но это повышение происходило из-за естественного прироста населения, а не из-за миграции (переселения) населения в города, и таким образом, темп повышения отстался от предыдущего.

Трудный период мировой войны не способствовал развитию городов. Рост населения городов и в абсолютных величинах меньше, а с точки зрения долей рост населения стал в селах быстрее. Число населения понизилось и в больших городах, менее опустоященных войной. Население было децентрализировано войной. Число населения понизилось и в столице на 122 тыс.чел., а в остальных городах приблизительно на 100 тыс.чел., однако число населения в селах повышалось примерно на 113 тыс.чел.

В первой половине XX в. наша экономическая жизнь начала иметь некоторый индустриализированный характер, но уровень индустриализации остался

все еще низким. Увеличение числа рабочих мест отставала от темпа роста населения, несмотря на то, что число трудящихся, занятых в торговле и в транспорте значительно повышалось.

Направление и размер миграции во время социалистической индустриализации в 1949—60 гг.

В начале социалистической индустриализации число населения Венгрии было 9293 тыс.чел., которое по 1960 г. повышалось до 9961 тыс.чел. Размер повышения за 10 лет оказался 7,1 %. Ежегодное среднее повышение в 7,1 % является небольшим. Быстрота естественного роста населения, вызванная государственным вмещательством в середине 1950-х годов (в 1954 г. 1955 г.) сперва успокоилась, а с 1960 г. упала. Низшую точку представил 1962 год, а с 1974 г. естественный рост населения снова повышается. Естественным ростом населения в 1949—60 гг. вызывалось бы наибольшее повышение числа населения в комитате Саьолбч-Сатмаре, но «наиболее плодовитый» комитат страны не мог его удержать. Из-за низкого уровня местной потрености в рабочей числе его население переселилось в другие комитаты, главным образом, в поселения северной промышленной области. (Доля трудящихся, ежедельно ездящих из одного поселения в другое и сегодня очень высокая в этом комитате). Размер его реального роста населения в промышленных комитатах свыше всевенгерского среднего, это может означать большую долю молодежи. Три комитата Дэл-Алфёльда характеризуются низким уровнем естественного роста населения и отрицательной тенденций миграции, таким образом, размер реального роста населения был тоже отрицателен. Кроме упомянутых еще два комитата сельскохозяйственного профиля (Тольна и Ваш) имеют отрицательное значение реального роста населения, однако в индустриализированных комитатах (Фейер, Комаром, Боршод-Абауй-Земплен, Веспрем и Пешт) число населения повышается быстрым темпом.

Реальный рост населения в больших городах в рассмотренный нами период являлся значительным. Выделяются в размерах 31,9 % и 29,8 % города Мишкольц и Печ. Рост населения в столице уже замедляется (13,5 %), в том числе естественный рост населения Будапешта представляет 10—15 %, а остальную долю дает разница в миграции. Города Дебрецен и Сегед еще не имеют значительную промышленность, и таким образом, размер роста населения предстаавляет в них 17 % или 14,2 %. Медленный темп роста населения города Сегеда вызвана и политическими факторами.

По Б. ШАРФАЛЬВИ (в 1964 г.) в периоде от 1949 г. по 1960 г. 491 тыс.чел. переселились из поселений сельскохозяйственного профиля, пока число населения в поселениях и городах промышленного профиля увеличивалось на 331 тыс. чел., в том числе рост населения Будапешта из-за переселения представляет 130 тыс.чел. Разница а 160 тыс.чел. между перечисленными величинами дает число эмигрирующих в данный период.

Следующей характерной чертой перерасслоения по профессии является тот факт, что пока в 1949 г. почти на всей территории Алфельда (венгерской низменности) — включая и поселения, имеющие ранг города и за исключением только двух-трех выдающихся городов — доля самодеятелей, занятых вне сельского

хозяйства не достигла 20 %, то в 1960 г. доля самодеятелей, занятых в сельском хозяйстве понизилась до 50—70 %, а только в меньших территориях (на востоке Шомодя, на юге Залы, на востоке Сабольча, на юге Бекеша и в комитате Бач-Кишкуне) осталась эта доля больше. Еще значительнее был рост населения несельскохозяйственного профиля в сельскохозяйственных районах примыкающих к большим городам и промышленным краям. На таких территориях максимально 50 % населения прожили на сельское хозяйство.

В следующей таблице Б. ШАРФАЛЬВИ (в 1964 г.) представляет концентрацию населения из-за перерасслоения. Из этого очеводно, как притягивали к себе многонеселенные поселения население сел. Совместная доля Будапешта и городов с населением в 50—100 тыс. чел. в данный период повышалась на 2,5 %. Число маленьких сел и их населения одновременно понижалось.

Концентрация населения в 1930—60 гг.

	1930		1941		1949		1960	
	1	2	1	2	1	2	1	2
под 1000	1705	10,9	1537	9,5	1516	9,6	1407	8,0
1000—5000	1400	34,2	1473	33,3	1511	34,8	1581	34,1
5000—10 000	161	12,4	151	11,0	152	11,4	169	11,0
10 000—20 000	66	10,0	78	11,0	62	9,0	70	9,4
20 000—50 000	37	14,2	40	15,0	32	10,5	35	10,3
50 000—100 000	5	3,8	5	3,7	5	3,6	7	5,1
100 000—150 000	2	2,7	3	4,0	3	3,9	3	4,0
Будапешт	1	11,8	1	12,5	1	17,2	1	18,1
Всего	3417	100,	3288	100,0	3282	100,	3273	100,0

1 = число поселений
2 = отношение числа населения поселений к числу населения страны в процентах (%)

После освобождения страны быстрое развитие промышленности обеспечивало возможность работать для большинства трудящихся, освобожденных от сельского хозяйства, которые раньше влачили жалкое существование как безземельные крепостные или батрака при имени. Аграр-пролетариат, преобразованный в промышленного рабочего переселился в более индустраилизированные комитаты и большие города. Интересно, что крестьянство, имеющее земельную собственность, обеспечивающую свое существование, начало мигрировать в промышленность только в конце данного периода в результате организации крупного сельского хозяйства. Индустриализация и общий экономический подъем вызвали мобилизацию населения и региональную дифференциацию, усиливающуюся до небывалой степени.

Кроме вышеупомянутых количественных изменений надо вспомнить о некоторых качественных преобразованиях. Подавляющее большинство мигрирующих выходило из молодого возраста. На принимающей переселяющих территории население молодело и увеличивалась доля активных самодеятелей. Население на выпускающей переселяющих территории старело, а число иждивенцев повышалось.

Большую часть мигрирующих представляют мужчины. Таким образом, комитаты сельскохозяйственного профиля вследствие быстрого уменьшения мужской и молодой рабочей силы вынуждены были занять женскую рабочую сул мужской и молодой рабочей силы вынуждены были занять женскую рабочую силу без квалификации.

Территориальные разницы в числе населения от 1960 г. по 1970 г.

Число населения Венгрии в 1961 г. превышало 10 мил.чел. а в данный период увеличивалось всего на 361 тыс.чел. (3,6 %). Миграция в этот период не касалась числа населения страны, повышение которого происходило в общем и целом из-за естественного роста населения. Венгрия являлась одной из стран Европы, где размер роста населения был наинизшим. Детальность в стране колебалась по европейскому уровню (10—11 %), и к этому примыкалась чрезвычайно низкая доля рождаемости. Низшую точку представил 1962 г. (12,9%), в этом году естественный рост населения страны дал всего 2,1‰.

Смотря извне картина населения в целом не изменилась, но внутри в значительной мере продолжались перерасслоение населения и связанная с ним концентрация, начинающаяся с освобождения.

Данный период с точки зрения внутреннего перерасслоения разделяется на две части. В конце 50-х годов замедлялась сильно централизованная экстенсивная индустриализация, иногда превышающая экономической силы страны, но ее действие, охватывало и начало 60-х годов. В эти годы продолжалось интенсивное территориальное перерасслоение, начинающееся с 1949 г. Перерасслоение ускорилось огромным количеством рабочей силы, освобожденной в результате социалистической перестройки сельского хозяйства. В начале 50-х годов продолжалась текучесть рабочей силы между территориями промышленного и сельскохозяйственного профиля.

Процесс горизонтального перерасслоения территориии в общем замедляется с 1964 г. Сильно централизованная индустриализация заменяется политикой децентрализации территориального развития, предоставляющей промышленность провинциальным городам и краям, до сих пор незначительное пищепромышленное производство пополняется. Благодаря этому все еще большое количество сельскохозяйственной рабочей силы могло найти работу в том же районе где свое местожительство.

Такой двойственности не видно при рассмотрении комитатских разнообразий. Во всяком случае можно установить, что 2 3 миграции населения в периоде от 1960 г. до 1970 г. происходили в первой половине десятилетия.

Однако и во второй половине 60-х годов столица Будапешт, большие города и промышленные края все еще получили смену рабочей силы от других комитатов. В конце десятилетия, и главным образом в наши дни население концентрируется большими городами, имеющими больше функций и центрам, обеспечивающими лучшие бытовые условия. Сельское хозяйство, как форма деятельности, все больше и больше станет доходным. Темп миграции све больше и больше снижается. Перерасслоение по профессии является уже минимальным. В общем население меняет свое местожительство в селах на местожительство в поселениях, где находится свое рабочее место.

Интересным является, что в настоящее время концентрация населения станет основой для сооружения промышленности и может изменить структуру производства данной территории. Заметим, например, необходимость сооружить легкую промышленность для активизирующейся жензкой рабочей силы на территориях тяжелой промышленности).

Характерно для значительных изменений в первой половине десятилетия, что до 1960 г. реальный рост населения был отрицательным всего в 4 комитатах, пока в периоде от 1960 г. до 1970 г. число населения понизилась уже в 8 комитатах от 1960 до 1963 г. число населения понизилось в 12 комитатах . В комитатах Алфельда (венгерской низменности) — за исключением Сабольч-Сатмара, где благоприятен естественный рост населения и Гайду-Бигара, где кроме значительно естественного роста населения город Дебрецен играет концентрирующую роль — и в комитатах Задунайского края сельскохозяйственного профиля число населения понизилась к концу десятилетия. На Большой венгерской низменности сохранилось еще значительное количество сельскохозяйственной рабочей силы, которое не могло быть занято промышленностью, сооруженной в комитатских центрах. Такое же положение создавалось и в 3 Задунайских комитатах.

Процесс замедления в 1970—75 гг. может документироваться комитатскими данными роста населения за 1975 г., в силу этого число населения ни в одном комитате не понизилось в данном периоде. Число населения городов в то же время повышалось приблизительно на 400 тыс.чел., а число населения сел понижалась примерно на 140 тыс.чел. от 1960 по 1970 г. число городского населения увеличивалось приблизительно на 700 тыс.чел., а число сельского населения уменьшалось на 330 тыс.чел. Территория комитатов в данном десятилетии не изменилась, таким образом, данные о населенности точно отражают колебание числа населения. Тот факт, что вышеупомянутые комитаты с уменьшающимся числом населения являются территориями с наименьшей населенностью, представляет собой результат долговременного процесса. Среднее комитата Чонграда поднимается только значением города Сегеда, где живет 1/4 населения комитата.

Перерасслоение по профессии замедлялось к середине данного десятилетия, в комитатах сельскохозяйственного профиля повышение числа трудящихся, занятых вне сельского хозяйства, свыше 10 %, а в индустриализированных комитатах Комароме и Пеште почти не встретится смены сельскохозяйственной рабочей силы. Доля самодеятелей, занятых вне сельского хозяйства, за исключением Гахду-Бихара, превышает 50 %.

Интересно сопоставить данные в двух колонках таблицы 1б о долях трудящихся, занятых вне сельского хозяйства, и городского населения — степени урбанизации. Доля трудящихся, занятых не в сельском хозяйстве, за исключением комитата Пешта, везде свыше городского населения комитата на 20—25 %.

Из этого можно выводить следующее:

— это среднее населения, ведущего двойственную жизнь (их главное занятие в промышленности, но дома занимаются и сельским хозяйством)
— это число трудящихся, ездящих на работу из одного поселения в другое (принципиально в ближайшем будущем их число бидет повышать количество городского населения).

Интересно положение комитата Пешта. В результате большого количества сельскохозяйственного населения в зоне, примыкающейся к столице и обеспечивающей обслуживание города, составная часть городского населения свыше трудящихся, занятых вне сельского хозяйства. (Рис. 1.)

Некоторые характерные черты для повышения числа населения городов в Венгрии)от 1960 г. до 1970 г.)

Понятие города, определенное комитетом координации международного исследования, не совпадает с юридическим понятием города в нашей стране.

По определению комитета под городом понимается такое поселение, в котором:

а) число населения больше 3000 чел.

б) несельскохозяйственное население свыше 75 % населения поселения, т. е. самодеятели, занятие вне сельского хозяйства свыше 75 %.

Имея в виду такое определение, в Большой Венгерской Низменности (Алфельде) почти не имелись города кроме Сегеда, Кечкемета, Бекешчабы и Дебрецена. Это определение, заданное только количественными признаками, является неполным. В первую очередь, действие концентрации населения вызывается не числом населения отдельного поселения, а количественном функций центра. Поэтому с разрешения комитета координации, мы принесли к городам все поселения, юридически принятые городами в Венгрии (Кроме числа населения поселения венгерское юридическое понятие города принимает во внимание и число функций поселения и инфраструктурную обеспеченность).

Согласно вышесказанному в 1970 г. Венгрия имела 217 городов (и юридически приняты 75). Число населения в данный период повышалось на 350 тыс. чел. Это повышение происходило потому, что число городского населения увеличивалось на 708 тыс.чел., а число сельского населения уменьшалось на 350 тыс.чел. Доля городского населения приросла на 4,1 %.

В каждом комитате повышалась доля городского населения. В том числе Будапешт имеет 26,5 %, поселения с населением свыше 100 тыс.чел. представляют 23,5 %, а поселения с населением свыше 50 тыс.чел. дают 15,5 %. Число населения Будапешта повышалось в таком быстром темпе несмотря на то, что переселение в столицу ограничено даже десятки лет. Совместное повышение числа населения вышеупомянутых трех категорий дает 2 3 роста населения поселений страны.

Рост городского населения и в дальнейшем являлся быстрым, а действие концентрации населения сельских городков из-за их особых функций малозначительно. В комитате Пеште, имеющем городское населения в 89,2 %, эта доля почти не может повыщаться.

В 1970 г. доля городского населения была 44,2 %. Это, по отношению в европейским странам низкое значение разнообразно по отдельным территориям. Там где перерасслоение населения по профессии было быстрым, и число городского населения повышалась. В более индустриализированных зонах больше и число городов. Например, в комитате Пеште 41, Боршоде 20, Веспреме 20, Комароме 9 городов имеют население меньше 10 тыс.чел. В комитатах Дэл-

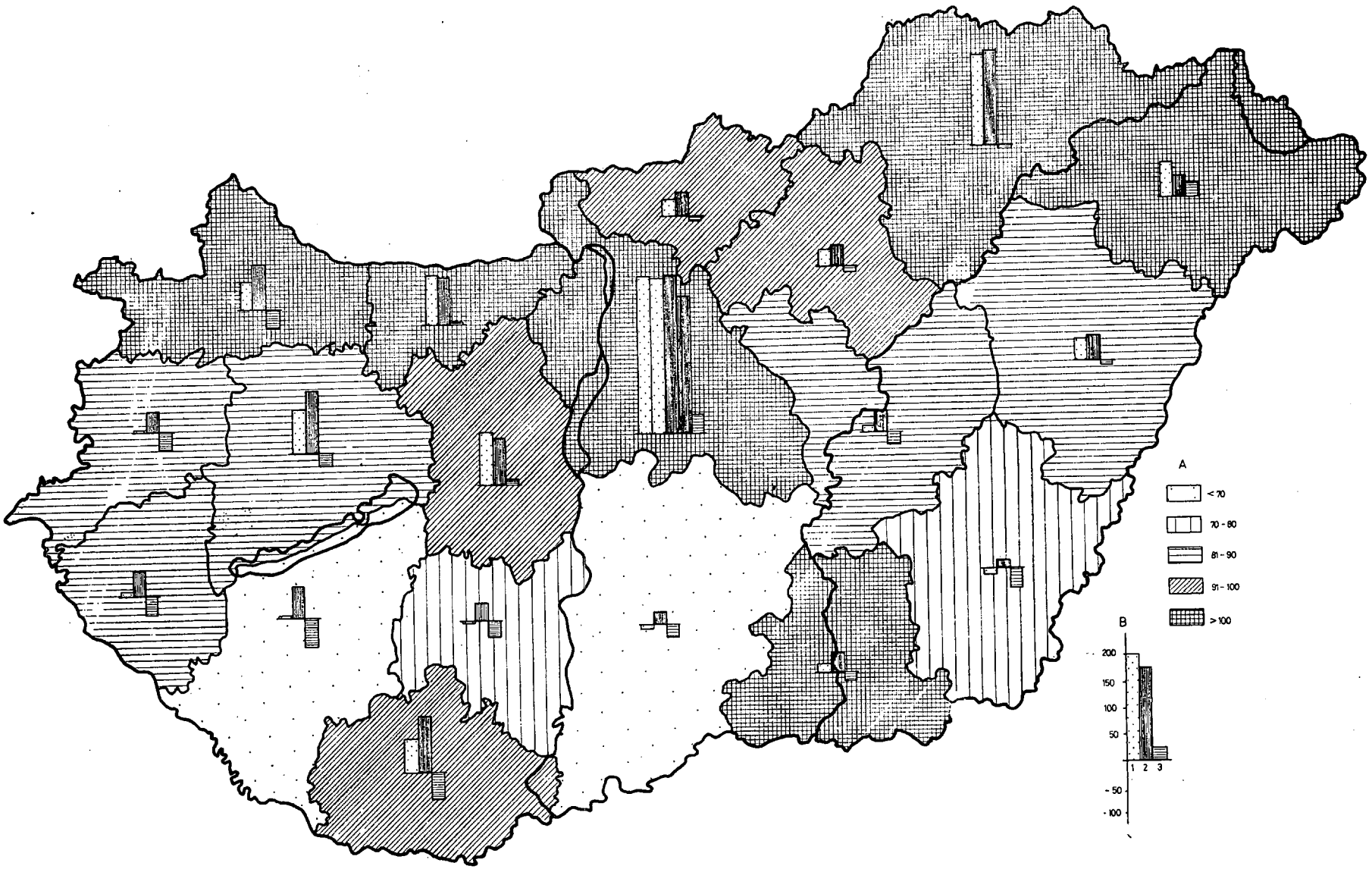

Рис. 1. Изменение числа населения с 1950 до 1975 гг, и плотность населения в 1975-ом году

A: плотность населения (лицо км)
B: изменение числа населения (1000 лицо)
1: область (итого) 2: городы (итого)
3: села (итиго)

Алфельда (на юге венгерской низменности) таких городов нет, даже, как уже упомянулось, по определению понятия города, кроме городов Сегеда, Кечкемета и Бекешчабы, на этой территории не имелись бы другие города в результате большой доли самодеятелей, занятых в селском хозяйстве. Уровень урбанизации комитатов Сабольча, Тольны, Шомодя и Залы значительно ниже среднего страны. Вследствие физических особенностей эти территории имеют неразвитию сеть сообщения, замкнутые поселения в виде деревень, и до освобождения страны были наиболее отсталыми и бедными, поэтому здесь не могла создаваться более плотная городская сеть, комитаты Сабольч, Тольна и Шомодь создаваться более плотная городская сеть, комитаты Сабольч, Тольна и Шомодь и в настоящее время наименее индустриализированы.

Города, находящиеся на разных уровнях иерархии поселения по-разному повысели число их населения. Несмотря на Будапешт имеет место та тенденция, по которой рост населения центров низшего уровня представляет и низшую долю. Пока в темпе роста трех уровней городов, осуществляющих центральные функции высшего уровня, нет большой разницы, то в темпе роста центров высшего и среднего, далее среднего и частично среднего уровня формировались значительные различия.

Изменение числа населения центров по уровням

Иерархические уровни центров	Число центров	Число населения (тыс. чел.)		Рост %
		1960 г.	1970 г.	
I. Столица	1	1804.6	1940.2	7.5
1. выделенине центры высокого уровня	5	571,7	691,9	21,0
2. центры высокого уровня	7	381,1	460,3	20,8
3. центры частичного высокого уровня	11	388,0	461,8	19,0
II. центры высокого уровня совместно (1+2+3)	23	1340,8	1614,0	20,4
4. центры среднего уровня	65	1078,2	1166,7	8,2
5. центры частично среднего уровня	38	467,3	481,7	3,1
III. центры среднего уровня совместно (4+5)	103	1545,5	1648,4	6,7
IV. провинциальные центры совместно (II+III)	126	2886,3	3262,4	13,0
Всего (I+IV)	127	4690,8	5202,6	11,0

Рост населения Будапешта представляет 7,5 % — это невысокая доля. Имея в виду абсолютные величины рост столицы свыше любого поселения. Прирост населения кольца агломерации значительно быстрее этого. Так как переселение в столицу с дольгих времен ограничено, мигрирующая в Будапешт главным образом из сел рабочая сила переселяется в поселения агломерации с развитой сетью сообщения, где она продолжает вести садоводство и овощеводство, снабжающие домашнее хозяйство продуктами.

Выделенные центры высокого уровня всегда являлись главными центрами для развития промышленности. Они представляют собой центры районов с населением в 1—1,5 мил.чел., и являются наиболее важными факторами в разгрузке столицы. Их рост наиболее высок (21 %) по отношению к другим уровням. В них естественный рост населения представляет 4,5 %, разница в миграции почти учетверенна (16,5 %). Большую разницу можно найти только в случае городов Дебрецена и Сегеда. Для города Дебрецена характерны больший естественный рост и меньшая положительная разница в миграции. Наоборот, в случае города Сегеда, несмотря на маленький естественный рост с 1950-х г., а благодаря большой доле миграции, число населения Сегеда повышалось до уровня выделенных центров высокого уровня. Коэффициент ранга выделенных центров высокого уровня 1.0 (Й. ТОТ 1973 г.), показывающий их «порядковый номер» в данный период не изменился.

Центры высокого уровня являются городами с населением в 60—80 тыс. чел. Они представляют собой развитые комитатские центры. Значительную роль в их росте играет миграция (15,6 %), но их естественный рост (5,2 %) свыше выделенных центров высокого уровня. Их реальный рост отличается всего в 0,2 % от предыдущих. Здесь находятся поселения, значительно отличающиеся от среднего. По сравнению с особенно динамическим развитием (26,2 % и 27,8 %) городов Сольнока и Сэкешфейервара, имеющие благоприятное местоположение с точки зрения географии транспорта, а в двух центрах Альфельда (венгерской низменности) в городах Бекешчабе и Кечкемете темп роста всего 10,5 % и 16,7 % Их коэффициент ранга 1,03.

В центры частично высокого уровня входят города с населением в 30—60 тыс.чел. Их число 11. В том числе 6 являются комитатскими центрами, а остальные тоже играют соответствующую этому роль. Их естественный рост занимает место шежду значениями предыдущих двух групп (4,8 %), но для них разница в миграции меньше (14,2 %). Здесь все еще значительно разнообразие. Когда в городах Дунауйвароше, Веспреме и Залаэгерсеге число населения повышалось в значительной степени (42,7 %, 38,1 % и 33,1 %), тогда в городах Шопроне, Надьканиже, Байе повышение было 9,3 %, 11,7 % и 13,6 %, а Годмезевашархей является единственным большим городом в стране, где число населения убывалось. Причины убывания: индустриализация началась только с 1960-х годов, естественный рост населения в городе низок, разница в миграции отрицательна. Хотя число населения на территории города повышалось, но он не мог возместить ущерб, нанесенный ликвидацией хутров. Коэффициент ранга этой категории 1,17, это объясняется значительными разницами в последовательности поселений почти одинакового порядка.

Центры среднего уровня являются поселениями, имеющими характер уездных городов. В них число населения в 10—30 тыс.чел. (например, в городе Ленти 7 тыс. чел., в городе Цегледе 38 тыс.чел.), доля естественного прироста (4,2 %) и разница в миграции (4 %) опчти одинаковы. Число таких городов — 65, однако в росте населения центральных поселений их доля всего 17,3 %. Из 65 центров среднего уровня в 15 поселениях число населения понизилось. Для сельских городков Алфельда (венгерской низменности) характерны незначительный естественный рост населения и отрицательная разница в миграции. В 5 поселениях естественный рост имеет отрицательное значение, а в 26 поселениях отрицательна разница в миграции. Совместно появляются эти отрицательные фак-

торы только в двух поселениях Мако и Чонграде. Размер понижения наиболее значителен в поселениях Мезетуре и Карцаге (7,1 % и 5,4 %), которые считаются городами только юридически, так как в них число самодеятелей, занятых в сельском хозяйстве свыше 50 %. Среди 50 городов, в которых число населения повышалось тоже имеются большие различия. Например, в городе Ленинвароше число населения повышалось на 21,9 %, а в городе Казинцбарцике на 70,1 %. Вследствие более медленного темпа роста центры среднего уровня теряли свои позиции в порядке городов с точки зрения числа населения. Их коэффициент ранга 0,99.

Центры частично среднего уровня выполняют функции уездной территории не в целом. В этой группе находятся и города и села. В городах рост неодинаков. Число населения в поселении Туркеве в данный период нопижалось на 8,6 %, однако, в промышленном районе Задунайского края в городе Оросляне на 39,2 %, в городе Балатонфюред на 25,2 % повышалось число населения. Но в общем и целом эта группа развивалась наиболее медленно.

Рост городов с населением свыше 50 тыс.чел. имеет значение в 12 %. Этот факт объясняется тем, что не все густонаселенные поселения выполняют центральные функции и не всегда занимают первые места в иерархии поселений, например, города Годмезевашархей и Цеглед. В стране были быстрее развиты центры, выполняющие функции высокого порядка, в них и число населения повышалось быстрее. Кажется, что данные поселений с населением ниже 10 тыс. чел. противоречат вышесказанному. Центры частично среднего уровня должны были бы развиваться принципиально быстрее малонаселенных поселений. Но в этом нет противоречий, так как большинство городков с населением ниже 10 тыс.чел. принадлежит к зоне агломерации с быстрым ростом населения.

Агломерации

По определению под городской агломерацией понимается территория, на которой:

1. число населения центрального поселения свыше 100 тыс.чел. (Из-за агломерации Дьера нам надо было принять во внимание и другое условие, на основе которого мы считаем агломерацией и ту территорию, где число населения центра свыше 80 тыс.чел., а число населения агломерации свыше 100 тыс. чел.)
2. В состав агломерации входят все поселения, в которых:

а) населенность свыше 200 чел. в км^2,

б) доля несельскохозяйственных трудящихся свыше 75 %, и 25 % всех активных самодеятелей ежедневно ездят на работу в центр.

3. Существует территориальное единство поселений.

В нашей стране агломерации создавались вогкруг столицы и выделенных центров высокого уровня. В ближайшем будущем можно формировать кольцо агломерации поселений и для некоторых больших городов. (Например, в 1977 г. число населения в городе Сэкешфейерваре было 98 тыс.чел., в городе Сомбатхейе 79 тыс.чел., в городе Бекешчабе 64 тыс.чел., в городе Ниредьхазе 95 тыс.

чел. Соседние поселения Бекешчаба, Дьюла и Бекеш совместно имеют 115 тыс. жит.)

Но определение в агломерации не во всем совпадает с соотношениями поселковой системы вокруг больших городов. В некоторых случаях можно найти поселения, органически принадлежащие к большим городам, которые по определению не входят в состав агломерации. Заметим, например, что по определению в агломерацию Будапешта не входят некоторые поселения в острове Чепеля и в острове Сентэндре, но нам известно, что они тесно принадлежат к столице на основе своих производственных отношений (главным образом из-за садоводства, снабжающего продуктами столицу). Но такое же положение находится и в других агломерациях. На основе не столько экономического сколько функционального контакта, по-моему, город Казинцбарцика считается частью агломерации Мишкольца, и только в фрезультате маленькой доли маятниково миграции не причисляют его к агломерации. Несельскохозяйственные трудящиеся соседних поселений заняты в химической промышленности.

Сравнительно мало таких поселений в зоне агломерации, которые входили в нее на основе своей населенности. Плотность населения лишь в некоторых больших городах на окраине агломерации превышает критического предела например города Хатван, Вац, Комло), но в данный период нельзя их считатсь (например города Хатван, Вац, Комло), но в данный период нельзя их считата «блуждающими городами», так как рост населения в них отстается от роста центра и некоторых поселений на кольце агломерации с развитой сетью транспорта. После переполнения центра и кольца на окраине Будапешта предполага емо на рубеже столетия поселения могут превращаться в блуждающие города.

Число поселений стало значительно большим когда мы считали главным фактором для определения принадлежности к агломерации вместе с населенностью и долю мятниковой миграции свыше 26 %. Согласно этому почти вся территория комитата Пешта — за исключением некоторых южных поселений садоводства и овощеводства — принадлежалась бы к агломерации Будапешта. Таким же образом создавалась широкое кольцо вокруг городов Мишкольца и Печа, или Дьера. Анализируя с точки зрения маятниковой миграции агломерации городов Сегеда и Дебрецена как только превышают настоя щую агломерацию. Главной составной частью дифференциации был состав по профессии. А сели причислять к агломерации только те поселения, в которых маятниковая миграция свыше 28 %, и доля несельскохозяйственных трудящихся свыше 75 %, то таких поселений значительно меньше. Очевидно, что в поселениях промышленных районов все еще осталось много трудящихся, занятых в сельском хозяйстве. Обычно ежедневно ездят с места жительства на место молодые, а старые работают в сельском хозяйстве.

Когда в некоторых областях страны число населения уменьшалось, тогда в агломерациях рост населения значительным был. Имея а виду абсолютные величины число населения в агломерациях увеличивалось на 372 тыс.чел., причем на других территориях вне агломераций число населения уменьшалось на 11 тыс.чел. Такой же быстрый темп роста как для агломераций характерен только для нескольких городов с населением свыше 50 тыс.леч. Среди агломераций тоже существуют значительные разницы. Агломерация Будапешта может расти с помощью новых заселений во все убывающейся степени. Очень быстрый в периоде от 1949 г. до 1960 г. темп развитии агломерации Мишкольца, благодаря

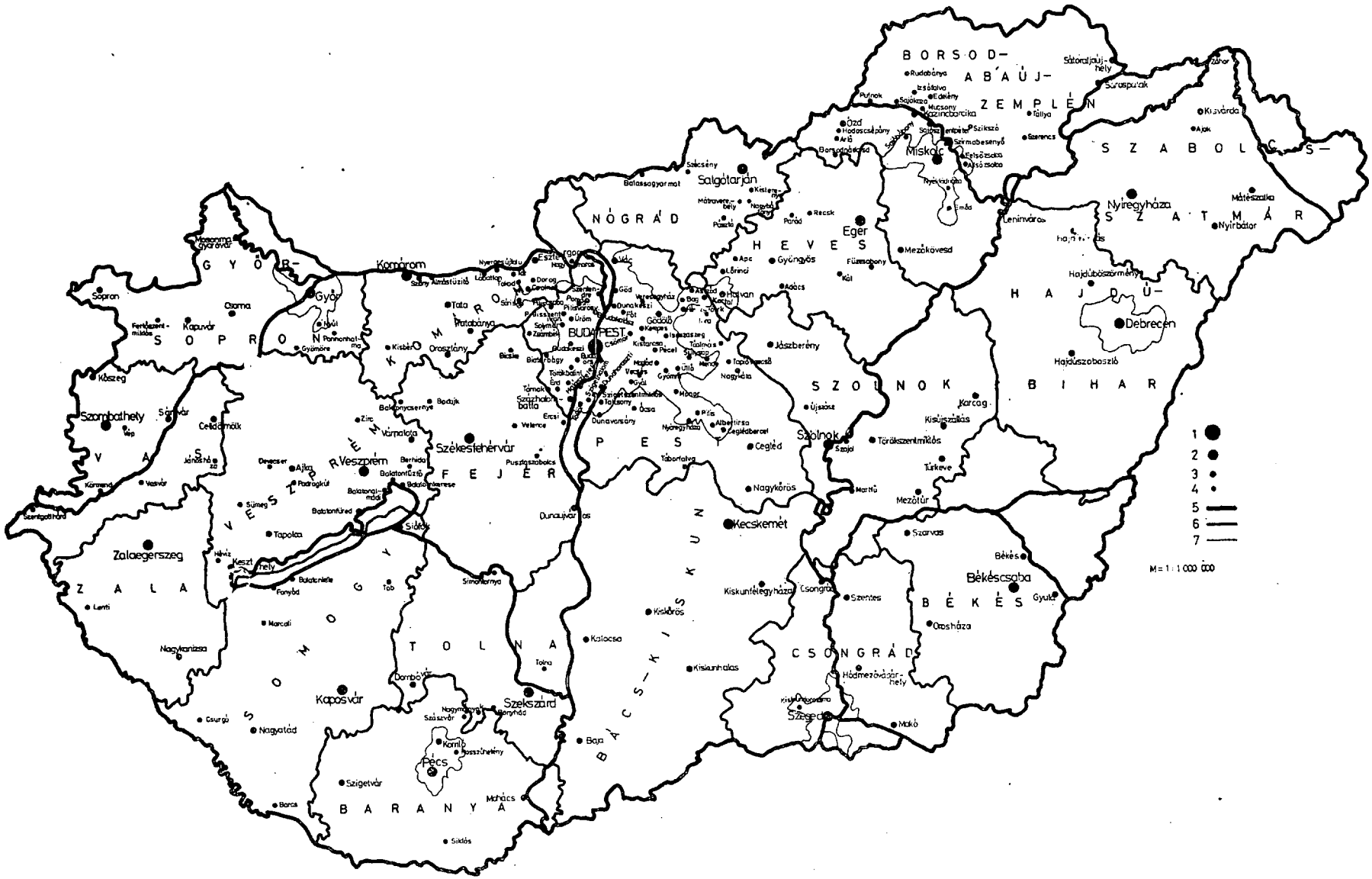

Рис. 2. Города и агломерации Венгрии

1: Будапешт 2: 50 000 л. 3: 10 000—50 000 л.
4: 10 000 л. 5: граница страны 6: граница области
7: граница агломерации

прекращению концентрирующего рабочую силу капиталовложения в крупную промышленность, стал значительно замедляться. Города Сегед и Дебрецен начали развиваться в результате политики децентрализации развития промышленности в 1960-х городах. Рост города Сегеда, главного центра на юге венгерской низменности начался с нормализации венгерско-югославских взаимоотношений в первые годы 1960-х годов, а он продолжал развиваться в середине 60-х из-за вскрытия нефтеносных полей. Развитие города Печа все еще идет большом темпом, в начале периода добыча урановых руд сюда концентрировал огромное число населения. В начале данного периода в городе Дьере население было 80 тыс. чел. Перерасслоению по профессии соседних сельскохозяйственных областей намного способствовала многоотраслевая промышленность города. До 1970 г. прирост населения в городе был меньше, но в настоящее время агломерация Дьера развивается наиболее динамично в стране в результате быстрого развития тяжелопромышленных заводов, имеющих хорошие отношения в кооперации.

Со времени проведения новой системы экономики все еще усилывается тенденция медленной концентрации, заменяющей по основным законам системы децентрализацию. В процессе концентрации в некоторых маленьких поселениях ликвидируюся заводы без соответственных производственных фондов и возможностей координации. Так как поселения агломераций имеют более благоприятные условия, чем маленькие города, они продолжают играть значительную роль в разгрузке столицы. Оба фактора входят в перспективные планы и обеспечивают решение некоторых важных задач.

Среди агломераций страны только на уровне агломерации Будапешта можно обнаружить более замедленный рост населения городского центра, чем рост населения на кольце агломерации, здесь возможности развития города ограничены в настоящее время.

Рост остальных городов

В остальных городах вне агломераций число населения увеличивалось примерно на 330 тыс.чел. Как уже упомяли при анализе центральных поселений, в результате большей доли миграции, рост населения быстрее. Установлено и то, что согласно уменьшению числа городского населения понижается и доля миграции. Рост городов с одинаковым числом населения и почти одинаковым естественным приростом населения определяется разницей в миграции.

Города с населением свыше 50 тыс.чел. формировались в таких районах, где влияние центров агломерации оказалось меньшим, время достижения 60—90 мин. Такая зона осуществлялась около Будапешта на расстоянии 60—100 км, деляющая расстояние между Будапештом и провинциальным агломерациям (например города Сэкешфейервар, Татабаня, Кечкемет, Сольнок и др.). Такие же поселения появились в результате отсутствия выделенных центров высокого уровня в сильно централизованной городской сети (например города Сомбатхей, Бекешчаба, Капошвар, ожидаемо в этот состав входят и города Надьканижа и Залаэгерсег).

Число населения в городах с населением всыше 50 тыс. чел. повышалось свыше 100 тыс.чел. — это соответствует доле свыше 20 %. Быстрее всего росло

население в городах Сольноке, Капошваре и Сэкешфейерваре. Все три города являются индустриализированными в быстром темпе комитатским городами, находящимися в узлах коммуникаций. Имея самую большую сеть хуторов город Годмезевашархей, как уже упомянулось, не мог возместить ущерб для роста населения, нанесенный ему постепенной ликвидацией хуторов и вызванный утратой функции комитатского города (с 1962 г. центром комитата является город Сегед).

Города с населением 30—50 тыс.чел. обычно создавались в зоне вышеупомянутых городов и агломераций со временем достижения 30—60 мин. Хотя число населения городов повышалось, но его отношение к числу городского населения страны не изменилось. Когда города по оси индустриализованных районов развиваются быстрее среднего страны, тогда в сельских городках венгерской низменности число населения трудно повышается, даже в поселении Гайдубесермене число населения уменьшалось примерно на 5,5 тыс.чел.

Города с населением ниже 30 тыс.чел., находящиеся вне агломераций, выполняют функции уездного города. Число городского населения повышалось, в первую очередь, в горнопромышленных районах и комитатах, имеющих мало городов (например комитаты Шомодь и Тольна). Несколько сравнительно густонаселенных пунктов в малонаселенных районах поселковой сети юридически получили ранг города, хотя по определению понятия города они не являются городами. Поэтому в ряде других комитатов выделяются с населением 10—30 тыс.чел. поселения комитата Сольнока. Число их населения в общем увеличивалось на 10 %, их отношение к числу населения страны не изменилось.

Мало городов с населением меньше 10 тыс.чел., находящихся вне агломераций. За редками исключениями, только для поселений в промышленных районах характерна доля несельскохозяйственного населения свыше 75 %. В общем эти поселения юридически не считаются городами, поэтому на венгерской низменности их число всего 2. Рост таких поселений по отношению к поселениям такого же порядка в агломерациях медленнее. Их доля значительна только в комитатах Боршод-Абауй-Земплене и Комароме. В общем они выполняют роль уездного города низкого уровня, их рост не форсируется и поэтому является спонтанным (естественно имеются исключения, например города Сасхаломбата, Загонь и др.). На юге венгерской низменности таких поселений нет, а комитаты Гайдубихар и Сабольч-Сатмар имеют по одному. В поселении Теглаш вооружен завод машин для домашнего хозяйства, а поселение Захонь является перегрузовочной железнодорожной станцией для товаров из Советского Союза, и таким образом доля трудящихся, занятых не в сельском хозяйстве свыше 75 %. (Рис. 2., 3.)

Наши сельские поселения

Быстрым темпом индустриализации с 1949 г. вызвано уменьшение в таком же темпе роста населения. Пока между двумя мировыми войнами увеличивалось число населения сел, обеспечивающих солидное существование, тогда в текущем периоде после войны осуществлялось беспримерное убывание в числе сельского населения. В результате перерасслоения по профессии трудовые резервы сельского хозяйства прекратились, даже на некоторых территориях появился

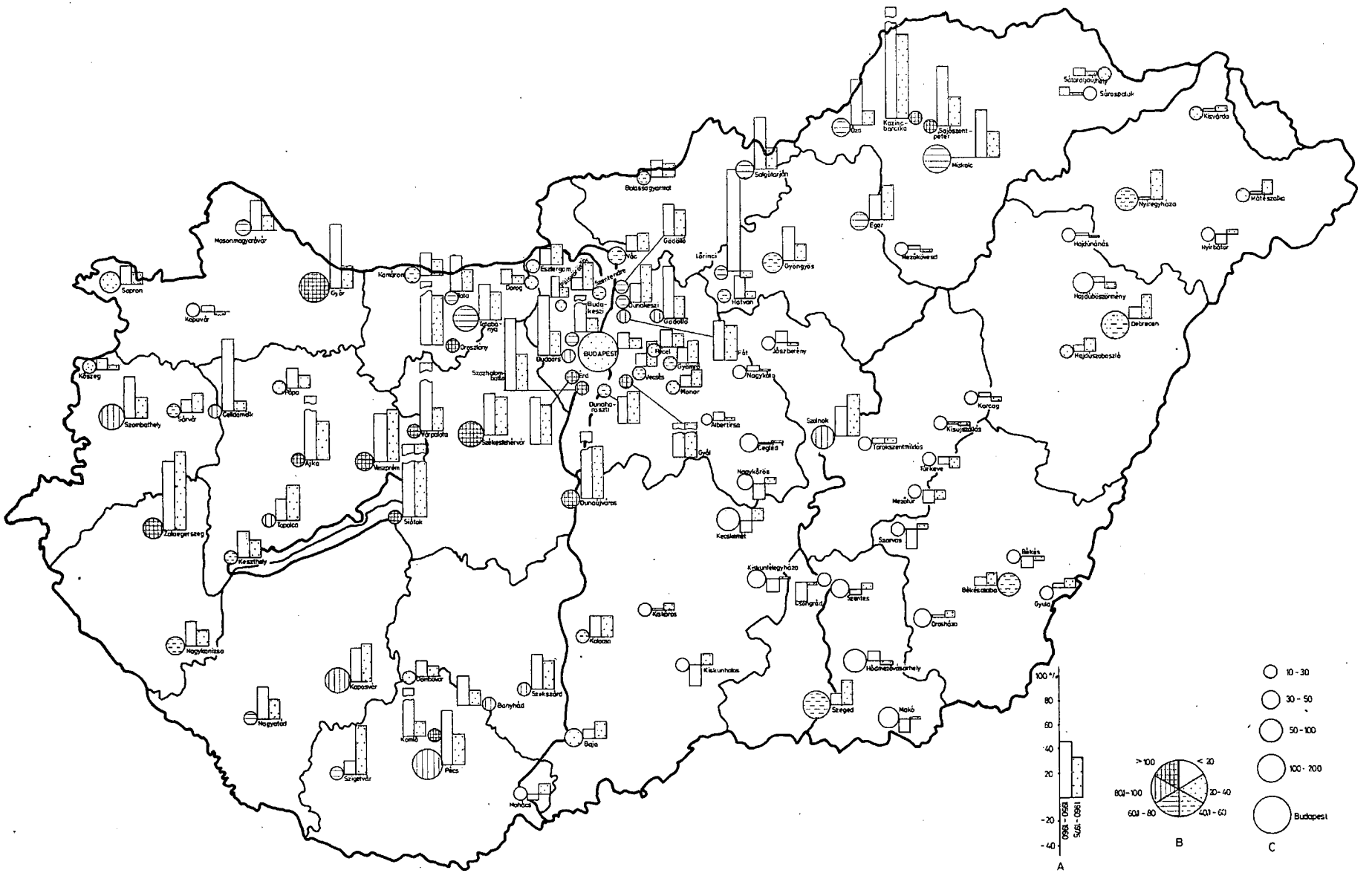

Рис. 3. Увеличение городов, в которых население более чем 10 000 лица
(1950—1975 гг, О)

A: увеличение числа населения с 1950 до 1960 г
B: увеличения числа населения с 1960 до 1975 г
C: число населения городов (1000 лицо, 1975 г)

недостаток рабочей силы. (В последнее время наблюдается некоторое устремление обратно, главным образом специалисты ремонта мигрируются в сельское хозяйство). Темп убывания неодинаков по всей стране. В комитатах на юге Задунайского края (в Зале и Баране), имеющих много маленьких деревень, некоторые из них опустели из-за неразвитой сети транспорта, и бывшие их жители переселились, в первую очередь, в города или в сравнительно густонаселенные поселения с развитой связью сообщения. Вообще нельзя сказать, что число во всех деревнях уменьшалось. На территории венгерской низменности существовала общирная сеть хуторов, в большинстве случаев бывшие центры хуторов были преобразованы в современные благоустроенные деревни с помощью искуственного воздействия. Рост населения на территории деревни обеспечивается распространенной сетью их хуторов, но в результате более быстрого убывания в окраине деревни, число их населения уменьшается.

С конца 1960-х годов темп миграции из деревни замедляется. Причинами являются: сельскохозяйственные территории страны уже имеют избыток рабочей силы, сельскохозяйственные кооперативы укреплялись, и сельскохозяйственное производство стало экономическим. В сельскохозяйственных кооперативах годови доход достигает, даже во многих случаях превышает заработка за год трудящихся в промышленности. Можно сказать, что в настоящее время население мигрирует только из тех сельскохозяйственных кооперативов с нагоными неблагоприятными физическими данными, которые плохо хозяйствуют. Общеизвестно, что лишь незначительная доля молодых стремятся к сельскому хозяйству, эта доля увеличивается на несколько процентов только в комитатах венгерской низменности типично сельскохозяйственного профиля. Это незначительно количество вмигрирующей рабочей силы занимается центрами.

Установлено, что сельскохозяйственные доходы увеличиваются вследствие улучшения хозяйства. Это содействует дальнейшему возникновению городских характеристик на территориях деревни. Вместо домов с глинобитными стенами под камышом или соломенной крышей везде появились кирпичные дома под черепичной крышей. Во всех деревнях есть электричество и увеличивается число благоустроенных деревень. Выросли магазины и детские сады. В 50-х годах существовала значительная разница в уровне урбанизации между деревнями промышленных районов и сельскохозяйственных территорий. Уровень дохода сельских жителей в промышленных районах, ведущих двойственную жизнь, значительно превышал размера дохода сельских жителей на сельскохозяйственныхтериториях. В настоящее время разница между ними все больше и больше понижается. На венгерской низменности сегодня только в хуторах можно видеть саманные дома.

На уровень убранизации в деревнях влияет и их положение по географии транспорта. Те деревни, которые находятся вдоль главных путей сообщения (артерий) или в узлах сети путей сообщения, станут более урбанизованными. Число их населения свыше соседних деревень, и выполняют несколько функций низкого уровня. Несколько лет назад все поселения получил подъездный путь, искоренивший их замкнутость и способствующий транспотру и сообщению. Автобусная линия замедляет или прекращает убывание их населения.

Суммируя можно сказать: Венгрия — среднеурбанизованная по отношению к Европе страна. Сильно централизованная городская сеть создавалась в процессе долговременного исторического развития. Провинциальные агломерации

формировались на достижемом в 90—180 мин. расстоянии от Будапешта. Вместе с предыдущими и большие города с населением свыше 50 тыс.чел. в 60—90 минутной зоне играли ведущую роль в индустриализации и повышении производства. Производительные силы концентрированы. Они развиваются как центры высокого уровня в интересах разгрузики столицы и соответственно целям регионального территориального развития. Городки в приблизительно 30—60 минутной зоне вокруг больших городов играют иже менее значительную роль в концентрации населения и производительных сил, их влияние воспринимается только позже. Большое количество мигрирующей из деревни рабочей силы потребовало осуществление интенсивного сельского хозяйства и целесообразного расхода рабочей силы. В результате укрепления производства в крупных сельских хозяйствах доход трудящихся достиг или в некоторых случаях повысел уровня заработка трудящихся в промышленности. Таким образом, урбанизация в деревнях начинается. В наши дни в результате децентрализации и уравновешенности развития промышленности миграция между комитатами пректарилась, несельскохозяйственные трудящиеся, ежедневно ездящие на работу из деревни в город, главным образом молодые, притягиваются к городским условиям жизни. Огромные центры — за исключением Будапешта — могут их принять.

Основной причиной урбанизации являлась быстрая индустриализация после освобождения страны, которая вызывала перерасслоение по профессии. Промышленность концентрировала в города освобожденное из сельского хозяйства население, становящееся трудящимся в промышленности. Уже упомянулось, какую роль играли в территориальной дифференциации населения концентрация от 1949 г. до 1960 г., и децентрализация от 1960 г. до 1970 г. промышленности. Вместо спонтанных процессов первого этапа экономического развития с 1960-х годов мы планомерно стараемся влиять на движение по территориям населения, на заселение и переселение в надежное направление в зависимости от желаемого развития промышленного и сельскохозяйственного производства. Основной задачей дальнейшего развития городской сети считается выяснение ролей в региональной системе городской сети. Нам надо рационализовать односторонне развитую систему городской сети, стараясь понижать чрезмерную роль и притягательное рабочую силу действие столицы и повышать значение больших городов. В будущем развивая обрабатывающую промышленность и опираясь на систему больших городов — Ниредьхаза, Дебрецен, Сольнок, Кечкемет, Сэкешфейервар, Дьер и Сомбатхей — может создаваться новая промышленная ось.

В правлении и регулировании миграции населения, вызванной процессом урбанизации, в дальнейшем важную роль должны играть и центры среднего уровня. В этих городах или поселениях городского характера надо концентрировать предприятия обслуживания среднего уровня, с этим ограничивая миграцию в большие города, имеющие меньше возможностей раширения. Из этих поселений приходится формировать центры, обеспечивающие работой население их притягательных зон. В соответствии с интересами перспективных планов структура поселений страны считает удобными для выполнения функций среднего порядка 107 поселений, в том числе юридически 56 являются городами, а 51 — селами. Среди них 68 поселений уже соответствуют требованиям функции среднего порядка, а остальные выполняют функции частично среднего уровня. (Й. КОРОДИ и ДЬ. КЕСЕГФАЛЬВИ, 1971 г.)

На дальнейшее развитие городской сети в Венгрии влияют различные факторы, но во все время основное значение имеет развитие производственных и индустриализация. Естественно, нельзя забывать о деревнях, надо развивать деревни, выполняющие централные функции.

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ОСОБЕННОСТИ ЦИРКУЛЯЦИИ КАРСТОВЫХ ВОД В ИЗВЕСТНЯКОВЫХ ГОРАХ КРЫМА И БОЛЬШОГО КАВКАЗА

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В начале нынешнего столетия, как известно, среди европейских исследователей карста происходила дискуссия о характере циркуляции подземных вод в карстовых массивах (КРУБЕР, 1913; ГВОЗДЕЦКИЙ, 1954). На основании детальной проработки материала этой дискуссии и изучения карстовой области *Горного Крыма* А. А. Крубер пришел к заключению о том, что в районах как глубокого, так и, тем боле,, мелкого карста грунтовые воды, на существования которых настаивал А. ГРУНД, «или существуют в нормальном виде, или имеется тенденция к нормальному развитию грунтовых вод», которая, однако, встречает препятствие со стороны ряда факторов (КРУБЕР, 1915, с. 194). Наблюдения, проведенные в карсте Горного Крыма, по мнению А. А. КРУБЕРА, «в общем согласуются с теорией грунтовых вод» (там же, с. 193).

Новые исследования карста Горного Крыма показали, что единый уровень карстовых вод там отсутствует, зона полного насыщения (постоянного) распространена спорадически, широко развиты зоны аэрации и сезонных колебаний карстовых вод в *изолированных подземных водотоках,* существование которых доказано. Сплошное прокартстовывание верхнеюрских известников крымской Яйлы до водоупора является исключением из общего правила. «В разбитой на блоки моноклинально залегающей карбонатной толще не существует в настоящее время и не существовало на протяжении плиоцена—антропогена (т. е. четвертичного периода. — Н. Г.) ни повсеместного обводнения, ни единого уровня карстовых вод». Обводненные участки и наиболее интенсивное развитие глубинного закарстовывания локализуются в трещинных зонах вдоль крупных разрывных нарушений. Фрагментарно распространенным «водам зоны полного насыщения свойствен застойный режим», и в то же время в зонах аэрации и сезонных колебаний карстовых вод «в изолированных водотоках» происходит «активная циркуляция подземных вод» (ДУБЛЯНСКИЙ, 1968, с. 294—295).

Для *Большого Кавказа* характерен исключительно широкий (5—6 км) вертикальный диапазон развития карста. В ряде известняковых высокогорных районов карст развит на высотах до 3000 м и более (максимальная 3646 м). В то же время в краевых прогибах на юге Западного и Восточного Предкавказья карбонатные толщи закарстованы на значительной глубине, на больших отрицательных абсолютных отметках, а в Абхазии у Гарг и Гантиади выбирают источники пресной воды из карстовых каналов на дне Черного моря, причем, по данным И. М. БУАЧИДЗЕ и А. М. МЕЛИВЫ (1967), разгрузка карстовых вод выявлена на глубине до 400 м. Более того, буровыми скважинами на берегу моря в Гаргах

«обнаружены карстовые пустоты на глубинах в 1000—2300 м, т. е. ниже большей части дна Черноморской впадины (МАРУАШВИЛИ, 1972, с. 60).

Гидрогеологические и гидрологические особенности кавказского карста весьма характерны и неодинаковы в разных районах. На северном склоне Большого Кавказа в его западной и центральной частях, подземные воды двигаются по наклону слоев Северо-Кавказной моноклинали и выходят под напором в районе лакколитов Минераловодской группы Предкавказья, а также и в пределах самого Большого Кавказа, иногда в виде мощных восходящих источников, каким является озеро Цериккёль в долине Черека, имеющее при небольшой площади (235 на 125 м) 258 м глубины.

На южном склоне Большого Кавказа в складчатых структурах создается сложная система артезианских бассейнов, тоже с выходами напорных вод в долинах в виде восходящих источников, таких как Голубое озеро в долине р. Бзыби или озеро Харис-Твали в Шаорской котловине, теперь затопленное в связи с созданием Шаорского водохранилища. Карстовой источник Мчишта у подножья Бзыбского хребта в Абхазии характеризуется среднемноголетним расходом около 10 куб.м сек, а по максимальному расходу (свыше 200 куб.м сек) не имеет равных в мире. На Кавказе много исчезающих под землю и пещерных рек источников воклюзского типа. Пещерные реки особенно характерны для южного склона Большого Кавказа, однако исчезающие реки и ручьи часто всречаются и на северном склоне, в полосе Северо-Кавсказской моноклинали и соответствующих ей куэст. О наличии обособленных водотоков с движением воды под напором свидетельствуют субмаринные источники возле Гарг и Гантиади. Эти субмаринные источники хорошо заметны при спокойной воде в море. По данным И. М. БУАЧИДЗЕ и А. М. МЕЛИВЫ (1967), выходы пресной воды на дне моря в этом районе выявлены в 24 пунктах.

Подземные карстовые реки южного склона западной половины Боьшого Кавказа зачастую имеют значительное падение русла и большую вертикальную составляюшую. Они играют огромную роль в разработке пещер и карстовых пропастей. На Бзыбском хребте обнаружена глубочайшая на Кавказе и вторая по глубине в СССР (около 700 м) карстовая пропасть Снежная. В глубине этой огромной, сложной по конфигурации полости обнаружен ручей с крутым падением русла, названный Водопадным. «Ручей с расходом воды 30—50 л сек устремляется вниз бесчисленными уступами и водопадами. Самый крупный водопад имеет высоту 8 м». Глубже этот ручей в виде водопада впадает в крупную реку, которая, имея расход 300—500 л/сек (во время дождей расход во много раз возрастает), «уступами устремляется вниз» (ГАЛАКТИОНОВ и др., 1974, с. 59). Дальнейший путь вниз по реке преграждает завал.

В Западной Грузии давно было известно исчезновенение реки Ткибулы и появление ее вновь на поверхность под названием реки Дзеврулы (ЩИКУН, 1926). При создании Ткибульской ГЭС подземное русло было осушено и полость этого русла превратилась в пещеру-пропасть 1800 м длиной и 290 м глубиной, с резко выраженной «каскадностью» (ТИНТИЛОЗОВ, 1976). Расход воды, когда воды, когда полость была обводенной, достигал 25,8 куб.м/сек (ВЛАДИМИРОВ, 1959).

Для карстовых районов Большого Кавказа, особенно его южного склона, характерна разреженность гидрогравфической сети, резко выделяющая их среди

территорий с накарстующимися породами (ШУКИН, 1926; ВЛАДИМИРОВ, 1964). Для районов Западной Грузии с классически выраженной карстовой гидрографией Л. А. ВЛАДИМИРОВ (1964) установил высокую долю подземных карстовых вод в питании рек: до 85 % в бассейне рек Дидичала-Херга в Шаорской котловине (ныне затопленной водами одноименного водохранилища). Обнаружен подземный водообмен между соседними речными бассейнами (например, от р. Келасури в сторону р. Беслетки в районе г. Сухуми).

На основании изучения карста Большого Кавказа автор настоящего сообщения пришел к выводу о существовании двух типов подземных рек в известняковом карсте (включая карст в известковых конгломератах). Одни дренируют карстовые воды подобно поверхностным рекам в закарстованных толщах горных пород. Другие не связаны с грунтовыми карстовыми водами и являются в полном смысле «обособленными водотоками». Однако, таковые встречаются и среди поверхностных рек карстовых областей. «Висячим» поверхностным водотоком, протекающим выше гидрогеологической зоны полного насыщения, является, например, река Келасури в окрестностях г. Сухуми. Значительно ниже ее русла опускаются заполненные воздухом полости известной Келасурской пещеры (ГВОЗДЕЦКИЙ, 1954; МАРУАШВИЛИ, 1972). Можно говорить пох этому об определенной аналогии подземных и поверхностных рек карстовых областей в отношении к карстовым водам.

Народнохозяйственное значение карстовых вод Горного Крыма определяется прежде всего их ролью в питании рек предгорного и Степного Крыма и особенно в водоснабжении курортов Южного Берега. Для целей водоснабжения созданы водохранилища в истоках Бельбека, каптированы карстовые источники на этом участке северного склона Яйлы и поперек этой горной гряды пробит Ялтинский гидротоннель, направивший воду к Ялте, т. е. в зону кутортов Южного Берега. Карстовые воды активизируют оползневые процессы на южнобережных сконах. Рациональное использование крымской Яйлы в хозяйственных целях, в том числе и для водоснабжения, невозможно без улучшения условий водонакопления и водоохраны, что связано с рядом мелиоративных мероприятий, организация которых должна быть проведена на научной физико-географической основе (ИВАНОВ, 1964).

Велика роль в водоснабжении также и карстовых вод Большого Кавказа, в частности курортов Кавказских Минеральных Вод — района лакколитов, Ессентуков, Кисловодска, городов и курортов Черноморского побережья. Существенна роль карстовых вод в происхождении и режиме минеральных источноков — Кавказских Минеральных Вод, сульфидных вод курорта Сочи-Мацеста (ГВОЗДЕЦКИЙ, 1964; ОВЧИННИКОВ, 1956). На реках Кавказа во многих карстовых районах осуществлялось и осуществляется гидроэнергетическое строительство (РионГЭС, Ткибульская и Шаорская ГЭС, ИнгурГЭС, ряд объектов на северном склоне Большого Кавказа). Для сооружения ГЭС местного значения в Западной Грузии используются не только реки, но и высокодебитные карстовые источники. На базе воклюзских источников р. Черной (Мчишта) в Абхазии создано Чернореченское форелевое хозяйство.

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DETECTION OF ASTROBLEMES WITH THE AID OF SATELLITE PHOTOGRAPHS

L. JAKUCS

The discoveries made in the course of satellite research in connection with the Moon and the inner planets of the solar system bear witness to the fact that the effects of the impacts of comsic bodies (impact genetics) must be regarded as much more general in the forming of the surfaces of the planets than considered by traditional geology. It has been proved that on the surfaces of the Moon, Mercury, Mars and Phobos all of the other surface-forming factors are greatly outweighed by the astroblemes, i. e. the "star-wounds" created by the impacts of cosmic boides, mainly in the form of circular or nearly circular crater-like formations of various sizes.

While our knowledge was confined to the craters of the Moon and was obtained merely by means of telescopic examinations from the Earth, science tended to interret these as the results of volcanic phenomena. However, even then this assumption was not a problem-free one, because of the unusually large dimensions of most of the craters on the Moon. Since then, closer examinations made on the surface of the Moon have disproved the volcain crater theory (now maintained only by journalists), and it has become clear that the impact energies of meteorites and other cosmic masses must the surfaces water and an appreciable atmosphere.

It is obvious that laws which hold for the solar system in its entirety must also hold for the individual parts of the system, including the Earth. Thus, it would not be correct to eliminate research into the effects of cosmic impacts in drawing conclusions as to the development of the surface of the Earth.

The atmosphere and water cover of the Earth provide practically no defence against the impact of meteorites of larger mass, and even small planet-like foreign bodies; they merely "plane away" the resulting larger or smaller impact damage to the crust (destroying them, filling them in, and covering them with sediment formations). If these planation processes did not act on the Earth, then lts surface would be characterized by the cosmic "bomb-craters" formed in such a confused pattern on the Moon, or on Mercury, since these forms have of necessity occurred on the Earth too during the long history of the development of its crust. Hence, the research of astroblemes, partly denuded, partly filled with younger formations or buried by thick covering layers, and even possibly deformed structurally in the orogenetic belts, is today naturally a primary task of the realistic geosciences. One of the far from negligible factors in this is that the ever increasing number of observations indicate that the occurrence of raw materials of mining importnace may be characteristic in the impact areas.

However, the traditional geological research methods were earlier not suitable for the detection of these crater formations, often with gigantic dimensions, on the

surface of the Earth. Topographical maps did not help towards this either, as the relief elements of the impact formation did not remain on the surface throughout long geological periods. At the same time, the form to be viewed overall was generally so unusually large that the distance available to the observer was not suffic cient for the system of interrelated signs to be recognized. The spreading of "aerogeology", involving the use of aeroplanes, did yield certain initial results, with the suggestion of the meteoric origin of a number of craters a few hundred metres or even 1–2 km in diameter (the recognition of the Barringer meteor-crater in Arizona, the casting of doubt on the volcanic origin of certain Jurassic–Shale Mountain maar lakes, etc.). However, the decisive discoveries and the recognition of the correlation were permitted only by the synoptic views provided from satellite heights.

The number of formations with impact genetics recognized on the surface of the Earth, including those ranging in size from a few kilometres right up to the giant craters with diameters of several hundred kilometres, has already attained several hundred. These are partially or completely broken down, buried or deformed, but they can always be identified with certainty from the cosmic photographs. At times they are indicated merely by elliptical or ring-shaped layer formations or soil or vegetation changes, since the geosurface forms not renewed by the actual geological and physical geographical processes are very rapidly destroyed in a geological sense. However, if their positions can be successfully located with the aid of the space photographs, detailed on-site research in most ceases (sometimes simply by means of deep drillings) provides other mineralogical, petrological, geological and ge physical proof too of the impact origin of the discerned structure.

In the following we present synoptic pictures of some of the larger terrestrial astroblemes, taken from the photographic material of the satellites APOLLO–9 and LANDSAT I. It must be noted that the existence of these structures was earlier either unknown to science, or (as in the case of the Great Slave Lake) the solution regarding the genesis of the basin was sought in terms of traditional geological factors.

In Fig. 1 we may see the Richat Creater discovered in the West African Mauritania, in a photograph taken from APOLLO–9. The elliptical crater basin in the centre of the picture is 55 km in diameter, and as regards its development and form structure it is completely analogous to the Aristarchus Crater on the Moon. In area A–3 on the photograph a second, much smaller crater may also be seen; this was proba bly formed simultaneously with the Richat structure. The energy arising on the impact of the cosmic mass broke up the horizontally situated rock layers of the Richat depression in such a way that an elliptical structure resulted: if we proceed in any direction from the impact centre towards the rim of the giant crater, the arc-like cuestas of ever younger rock layers follow one another. The outward-sloping declivities of the mountain ring on the rim of the formation consist of dispersed material, amd thus their structures comprise loose debris. On these slopes a weakly developed erosion valley network has been incised, but similar ones could not develop in the inner "rock-amhitheatre" of the crater.

From the above geomorphological facts we may attempt to draw conclusions as to the relative age of the astrobleme. The developed erosion valley network of the the denuded rock desert clearly discernible in the more distant periphery of the crater was formed under subtropical climatic conditions at the end of the Tertiary and at the beginning of the Quaternary. In these valley formations the crater definitely displays younger genetics, since it does not act preformatively or divertingly on the seen valley

Fig. 1. APOLLO—9 satellite photograph of the 55-km diameter Richat Crater to be found in Mauritania in West Africa. This is one of the youngest giant meteorite craters on Earth. A second, much smaller crater is also visible in field A—3; this was probably formed in an analogous manner and synchronously with the Richat structure. It is worthwhile to observe its elliptical layer cuestas, which are situated increasingly higher and are geologically younger on progressing outwards from within the "rock amphitheatre ; the now completely inactive valley systems developed in the bed mountain; and the extending sand desert covering the lower half of the picture. The relation of these difierent soil types to one another permit the chronological fixing of the impact.

systems, and there are practically no water course traces in its interior. Its development may therefore at any event be placed at after the desertification or at the initial period of this, i. e. at the end of the Pleistocene or at the beginning og the Holocene. The presence of the peripheral wadis, on the other hand, justifies that we go back in time at least to the beginning of the Holocene as regards the occurrence of the impact structure.

The sand mass covering the lower half of the picture is undoubtedly the youngest (extending) formation of the area; it nicely illustrates the currently advancing tendency of the sand desert. The photograph depicts very well how the sand cover is gaining ground at the expense of the valleys and the Richat Crater, and then later the bare rock desert interspersed by the valleys.

In the LANDSAT–I photograph in Fig. 2 we see the double, regular circular basin of the Clearwater Lakes in North Quebec, in the vicinity of the Hudson Bay. The literature previously classified these lakes as being of volcanic origin. One of the reasons why this is improbable is that the lake basins were formed in pre-Cambrian

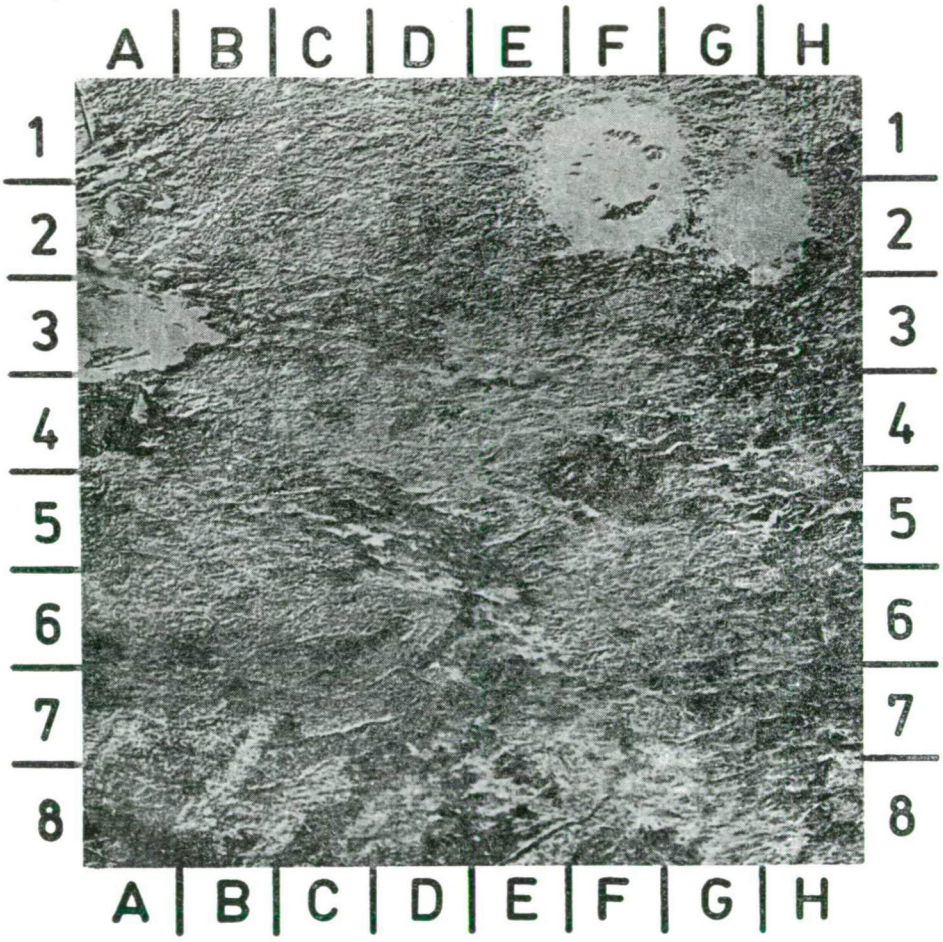

Fig. 2. The regular, circular crater basins of the Clearwater Lakes in North Quebec have now been proved to have an impact origin. The western lake basin is 30 km in diameter and possesses a ring-shaped island, while there is a central unde rwater rock cliff in the middle of the basin of the 20-km eastern lake. Numerous double-ringed meteor craters with central cliffs and with analogous genetics and morphologies are known on the Moon.

granite, and no traces at all of Recent volvanic activity occur even in the distant periphery.

Otherwise, it is certainly not chance that most of the meteorite craters on Earth may be found on the surface of the ancient Canadian apron. The cause of this is that even today the surface here consists of an ancient crust which for long periods in the history of the Earth was an uncovered and continental terrian; indeed, even that thin, loose covering layer which had been deposited on it in the course of the Pleistocene. Hence, on the ancient surface of the Canadian apron all those impact forms were able to integrate which formed on it from the geological antiquity right up to the present day, and which are buried at varioys depths in layers of various ages at other places where deposits accumulated on one another in these same periods.

The western Clearwater Lake is about 30 km in diameter, and also includes a ring-shaped island; the material of this reminiscent of strongly debris-like volcanic agglomeration, but the debris of the granite of the table is also represented in its rock material. The earlier explanations attempted to interpret this phenomenon in a fairly forced way, by the collapsing-in of a volcanic caldera. Today the genetics are no longer in doubt: numerous double-ringed impact craters similar to this are known on the Moon, without the least trace of volcanism. And even if volcanic material can actually be detected in the inside of the crater, in this case too it can only be a question of post-genetic volcanism caused by the crater formation.

The bed morphology of the eastern Clearwater Lake, with a diameter of about 20 km, is also of interest. At the centre of the steep-sided circular basin (this is not seen because of the water and ice cover) a strongly crushed underwater cliff is to be found, the rock material of which is foreign to the region; in every respect, this cliff is analogous to the well-known central cliffs of large meteor craters on the Moon, Mercury and Mars. Its material may possibly be the remnants of the mass itself which impacted and underwent destruction.

It has not yet proved possible to determine the age of the Clearwater Lakes. The inland ice cover of the Pleistocene was active above lake basins that had shore-lines of the lakes, but even more so by the phenomenon clearly to be seen in the photograph,that the surface of the cyclic island corolla of the western lake basin also displays itself the traces of glacial exaration. The impact therefore occurred before the Quaternary. To date, however, no other age-indicating datum or sediment has emerged from the depths of the lakes, and thus, as regards the time of the formation, the possibilities remain open from the beginning of the ancient period right up to the end of the Tertiary.

Similarly in Canada, in Central Eastern Quebec, we find the ring-shaped basin (66 km in diameter) of the Manicouagan Lake, the LANDSAT photograph of which is shown in Fig. 3. In the knowledge of the analogies with the lunar craters, we must consider that this structure too exhibits impact genetics, not only because there are no volcanic craters with such a large diameter on Earth, but also because its dimensions correspond perfectly to the average diameters of the meteor craters on the Moon and Mars.

The bedrock of the island occupying the centere of the corolla-shaped lake basin is the same as the pre-Cambrian crystalline rock that is characteristic everywhere in the entire region. Mesozoic vulcanites and sediments are also to be found on the surface of the island, however, which indicates that the crater already existed in the geohistorical middle age and functioned at that time as a local sediment-collecting

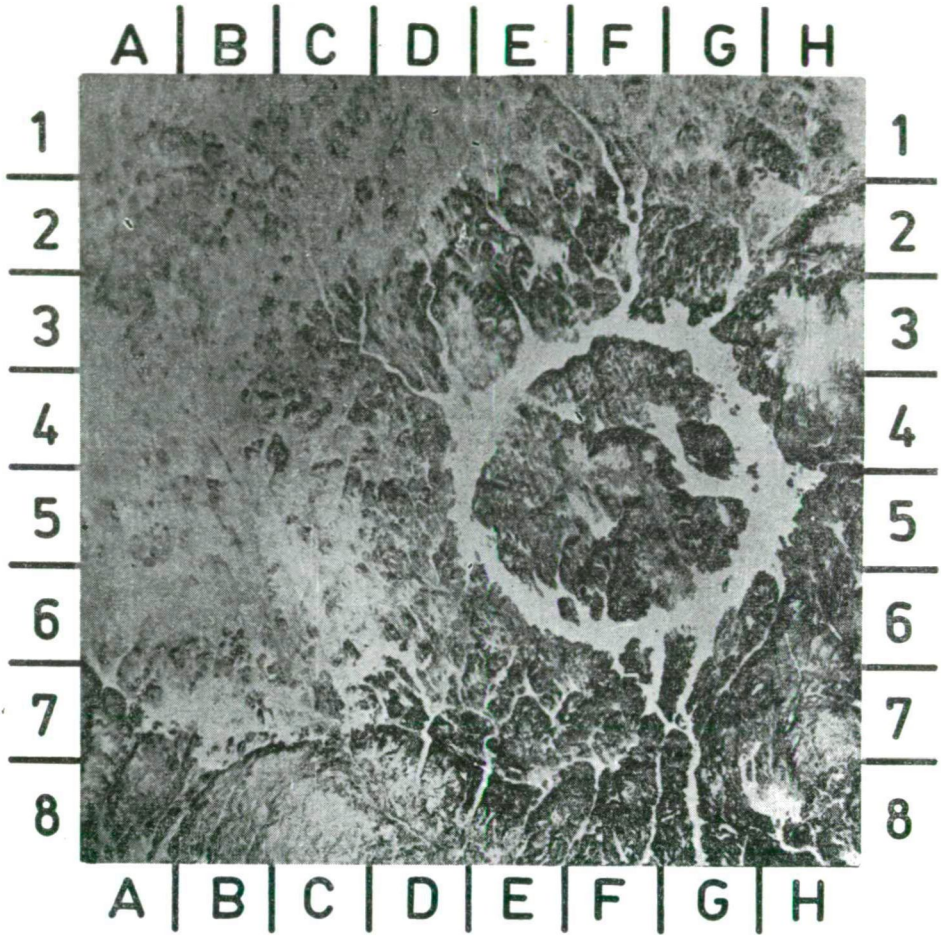

Fig. 3. A LANDSAT photograph of the Manicousagan Lake in Central Eastern Quebec. The ring-shaped basin, with a diameter of 66 km, is one of the most ancient giant meteor craters on the Canadian apron. The large island standing out at the centre of the structure was elevated in the course of post-genetic isostatic movements of the crust under the crater, also inducing weak volcanism; in the Mesozoic, however, the entire structure still functioned as a local sediment-collecting basin. The water level of the lake has now been raised; a hydroelectric power plant is operating in fild G—8.

basin. The later relative elevation of its central part presumably occurred because of isostatic reasons, for the mass loss of the crust thinning caused by maes impacts not breaking through the crust results in significant negative gravitational anomalies in the area of the crater.

Such an ancient origin of the Manicouagan Lake is otherwise also proved by the orientation of the valley systems incised into the crystalline bed mountain. The crater lake appears to be of importance in determining the directions of even the oldest waters courses, and its presence must therefore be reckoned with from the beginning of

the denudation cycle of the table. On the basis of a number of morphological characteristics, it is almost certain that in this case we are concerned at any event with a much older formation than the previously considered Clearwater Lakes.

It should be mentioned that in all three crater lake satellite photographs the lake surface (differently from normal) is quite light. The reason for this phenomenon is that the lakes are frozen over, as ice (unlike water) does not absorb the light rays an therefore reflects white. Otherwise, the Manicougan Lake is operated as an artificially built-up water strogare, with the aid of the dam system perceptible in area G-8 of the satellite picture.

In the following photographs we shall be considering areas where the meteoric crater formation itself can no longer be seen, but the impact genetics are nevertheless strongly suggested indirectly. In the first case we shall examine the traces of the old cosmic impacts on a denudation terrain consisting of old rocks and not covered young deposits, while the second case involves an accumulation area covered by young sediments.

Figure 4 is a satellite photograph of a detail of the South African Transvaal. The picture clearly shows the arc-like chains built up from the alternations of the volcanic and sedimentary rock provinces of the Transvaal Mountain system, and also (in CD–12) the elliptical formation, consisting of alkaline granites, of the Pilanesberg intrusion. J. Grootenboer and R. B. Hargraves, who have been carrying out research of a geological nature in this area, have described the traces of several extremely large-scale cosmic impacts in the region of the mountain system (e.g. the huge Vredefort concameration lying to the south of the limits of the photograph). Of these, however, the form element to be seen in the satellite picture gives cause for a characteristic interpreation, since we are concerned here essentially with a basin-like elliptical granite formation, which encompasses antecedent basic and ultrabasic rocks.

When the geological formation sequence and correlations are examined, the synchronism of the occurrences of the various formations can definitely be excluded, even from the satellite picture. It is not even probable that the granite formation already existed in the activization period of the volcanism,for in this case the spatial arrangement of the vulcanites would conform to the limiting contours of the rock mass. Even on the plication of the mountain structure visible in the picture, however, the granite was not in its present position. This circumstance is proved among others by the fact that its presence does not induce any dislocation at all in the plication traverse lines of the mountain structure. The granite of the Pilanesberg must therefore be regarded as post-orogenetic in the genetic sense that the impacting mass not only gave rise to a crater basin, but also promoted the isostatic penetration of the granitic magma by means of the produced deep-acting crust fractures and significant local negative gravitational anomaly.

A very close analysis of the satellite photograph, however, also raises the possibility that in the case examinded it is perhaps not a question of an intrusion, but simply that the granite present in the bed mountain position is merely exposed by the impact crater basin, as a concequence of the mechanical removal of the younger formations on it. At any rate, a fact giving much food for thought and supporting this latter conception is that on the granite block itself, and on its entire surface too, it is possible to observe certain inner cyclic formations; these are usually signs counted as primary form characteristics of impact crater formation, in the cases of both terrestrial and lunar astroblemes.

Fig. 4. A LANDSAT photograph of the Pilanesberg structure (in DC—12) in the South African Transvaal mountain system. The circular alkaline granite basin, which also exhibits a certain ring-shaped structure in its surface relief, is in stratifaction discordance with the mountain contours in its environment (which consist mainly of vulcanites and sedimentary, carbonate rocks); it is therefore a post-orogenic formation. There are two possible altrnatives for its formation: (a) The impact crater formation, with deep-acting crust rupture, and the resulting large negative gravitational anomaly promoted the isostatic intrusion of the granitic magma. (b) The granite lying in the bed mountain position was simply only laid bare by the crater basin, by means of the mechanical removal of the younger formations on it.

In the LANDSAT picture to be seen in Fig. 5 we may examine the remnants and traces of the Brazilian Araguainha meteorite crater. This interesting buried structure has been known for only a few years. It is to be found on the 17th degree of latitude South and the 53rd degree of longitude West, and has a diameter of 40 km. Its name originates from a town of the same name built on the banks of the Araguainha, one of the largerst tributaries of the Amazon. The area is part of the "Campos", or under

a different name the tropical savannah, which is covered by grass and shrubs, and in isolated places by woods.

The present relief has retained nothing of the one-time crater. Merely a small cone-like elevation stands out at the geometric centre of a large circular structure perceptible only from the satellite photograph. This hill was earlier condidered to be an old small volcano, for rock fragments suggestive of volcanic activity were found in its environment. In 1973, however, the American researcher Dietz also found pre-

Fig. 5. A LANDSAT-I photograph of the traces visible on the surface of the Araguainha Crater in Brazil. The buried structure, outlined mainly by the different vegetation types and the different soil natures, lies about 650 km west of the state of Mato Grosso, on the 17th degree of latitude South and the 53rd degree of longitude West. Similar structures have also been detected elsewhere in the prehistoric wildrenesses of Brazil with the aid of satellite photographs. The impact origin of the Araguainha Crater has since been successfully confirmed by means of deep drillings and mineralogical-petrological analyses.

Cambrian rock fragnents, sandstone and shale in addition to the volcanic material in the soil of the region. His findings were later confirmed by the microscopic petrographic analyses of B. M. FRENCH, and it thus became indisputable that the rock fragments in question originate from the bedrock under the thick soil layer covering the area. The two dark-coloured ring-bands to be seen in the picture give rise to the impression that the Araguainha structure might be a double-ringed astrobleme, whereas in reality it is not this; the centric circles merely disclose the differences in vegetation, depending on the differences in the nature of the soil, in the otherwise plain terrain.

The satellite photograph of the north-eastern arm of the Canadian Great Slave Lake (see Fig. 6) is extremely interesting and promises to give rise to much discussion in the future. The earlier mosaic-geological maps and aerial photographs did not reveal such substantial large-structural features as stand out on the present synoptic photographs, and which appear to be genetic characteristics of fundamental importance.

One such noteworthy circumstance is the fact (not interpretable via traditional geological arguments) that the archaic rock-structural outlines, well prepared by the ice and typical of the surface structure of the entire region, vary in the northerm and mainly the western immediate shore-contour of the lake basin, and the semicircular lake basin is delineated by a uniform, narrow, contact rock-band with a resistance to abrasion different from that of its environment. The most striking feature in this fact is that the closely-fitting shore chain consists of the same proterozic plicated crystalline rocks as the areas more distant from the lake basin, and the glacial exaration has nevertheless behaved selectively in favour of the shore band. All this can only be explained in that the rocks of the shore contour were made more resistant to abrasion by some process: a process (possibly syngenetic) connected with the formation of the lake basin.

The second noteworthy circumstance is the huge lineament well visible in the picture, which can be followed in a straight line from mosaic H-1 of the picture to the edge B-8, and which is part of one of the largest structural forms ot the Canadian apron, the McDonald break-system. It can clearly be assessed that the break resulted not only in a vertical movement, but also in a very significant horizontal table separation, in the course of which the eastern half of the already existing lake basin was forced tectonically away from the western semi-basin. That is, the straight eastern shore of the examined area of the Great Slave Lake is not syngenetic with the lake basin itself, but is the block-rim of a later plate-tectonic movement foreign to the process deepening the basin.

The third very thought-provoking phenomenon is the concordance in from of the shore-arc of the lake basin and the traverse directions of the island-arcs in the lake. This can be interpreted most simply in that the island-arcs earlier formed part of the semicircular shore, and then broke away from this and (on the action of the horizontal block movements along the McDonald break-system) occupied their position at the centre of the present lake (remaining somewhat behind the crust section moving away in the north-eastern direction). That the relative movement of the provinces along the break (forming the left and right halves of the picture) did in fact take place in the directions indicated by the arrows is clearly proved by the scissor-like opening of the line of the north-western lake shore and the island-arcs.

Fig. 6. A LANDSAT photograph of the north-eastern arm of the Great Slave Lake in North West Canada. The lake basin is genetically the smaller half of a bisected giant meteor crater (its original diameter was about 210 km). The missing part of the basin was shifted tectonically along the McDonald break-system which cuts across the photograph in the SW-NE direction; it now lies a position about 180—200 km to the south, and as the southern bight of the central depression of the Great Slave Lake it has been filled in by the talus of the inflowing Slave Rivere. Much geomorphological and geological evidence has been established as to the abovfl-outlined genetics of the lake structure. This evidence is described in detail in the text.

However, we wish to point out another circumstance too: besides the apparent petrographic identity, the rock material of the large-arc island bands has developed the same high resistance to abrasions as the crystalline rocks of the western shore of the lake basin. This too strengthens the conclusion that the island-arc could at one time have been the shore contour of the lake basin.

Finally, it should be noted that the McDonald break-system consists of a cluster of several straight break-planes running parallel to one another. This is well visible

in the photograph, e.g. in fields H-12 and BC-8. It stands to reason, therefore, that the narrow concordant island and peninsular bands connected with the eastern shore line of the lake basin and partially merging into this are the rippling products of the friction belt between the main break-planes, and can be regarded as quasi-"macroscopic friction breccias".

On the basis of the given arguments, the north-eastern arm of the Great Slave Lake is regarded as a semi-basin with impact genetics. The formation of the originally naturally circular giant crater preceded one of the final periods of activity of the McDonald break-line passing through it, in which the crust tables including the crater basin underwent a significant shift in plane compered to one another. This movement resulted in the breaking away from each other of the two semi-basins of the lake, and in their separation along the break. Although the "half-lake" to be seen in the picture remained geomorphologically in the course of the subsequent geological periods, it shifted about 180–200 km in position, in a north-eastern direction, compared to the eastern half of the crater basin. Since then, the eastern semi-basin of the crater has become filled in, since the Slave River has deposited its enormous lacunian alluvial delta in it.

Even in spite of the fairly deformed and broken-up state of the astroblene, we assume that the age of the cosmic impact giving rise to it is not too ancient. At any event, at the bottom of the basin there are only Quaternary lacunian sediments and quite young (probably similarly Quaternary or Ternary-end) vulcanites, in a horizontal stratification, while immediately below them the drilling samples show the crystalline and metamorphous bed mountain of the Canadian apron. It is very probable, therefore, that the horizontal crust shifts in accordance with the McDonald break-line are plate-tectonic symptoms, occurring in a quite young stage, and possibly still active at present.

HYDROLOGICAL FACTORS OF THE FLOOD AT SZEGED IN 1879

M. ANDÓ–I. VÁGÁS

For a hydrologist, a geographer and other persons who show interest in this theme, it is interesting to recall the hydrological data of the flood of the river Tisza which ruined Szeged and compare it with further changes which have taken place and have been averted since then.

Today, we should regard a flood like that in 1879 as natural and could avert it, without using any special means, with our modern defensive preparedness. However, we are helped in this by drawing a lesson from the flood catastrophe at Szeged in 1879.

A hundred years ago the technical possibilities of defence and of the hydrological science were incomparably more modest than the up-to-date ones. In 1879, the large dam-system of the Tisza – the great creation of I. SZÉCHENYI and P. VÁSÁRHELYI – has just been completed.

The height-and width-measurements of dams did not prove to be suitable even to give protection against the previous high floods, not to speak of the following man and animal living work. The movement of earth masses and transport with machines did not exist then. The main water-gauges, known today already existed a hundred years ago, as well. But there were no long observational series and no data from the older times when damming effects could not be felt, as yet.

For informing about floods they had no developed telecommunicationnal system except telegraphic connection. Telephone and radio were unkown, yet.

Hydrological science had neither a suitable theory nor practical experience of the fact how high the water level can be. First of all, not for the level be properly measured, but because they had no sure water-level or water-output data to compare them with. As far as we now know, cybernetics, discovered in the second half of the XXth century, is also a technical parameter which can be transformed into power, energy and money. We also know that the possible shortcomings of our infornations can-be balanced with a greater security than it seems to be necessary, Neither the government of our state in the autocratical period between 1849 and 1867, nor that in the time of the Compromise between 1867 and 1879, which had much more economic possibilities, could see the fact. Consequently entirely till the flood catastrophe at Szeged came, there was no central and financial power, to prevent the newer and newer records of the Tisza by heightening and widening dams most of which had grave destructions. They were unable to do the earthwork of dams and heightening and widening them with the lack of informations. So the catastrophe must have come inevitably.

Before summarizing the events in 1879, we may be interested in what could be seen in the first days of 1879 by an engineer knowing the hydrological data of this time about the Tisza or by an engieer standing at the present-day level of theory and knowing the data having existed then.

The known maximum water-level of the Tisza at Szeged preceding the XXth century was 630 centimeters measured in the course of the flood in 1772. (As related to 74,34 m above the level of Adriatic which is joint 0 of the presentday gauge.)

It was only exceeded, with 672 centimeters, on 29th of May in 1845 for the first time. This was soon approached by the 662 centimeters high culmination on 23th of May in 1853 and moreover it was soon still higher on 16th of April in 1855 culminating with 691 cm. The period of the Tisza's ancient and so-called natural water-level changes should be ended with that because of the fact that even in 1855 there was already no quite sure condition free from interferences. There is no datum for the ancient period to show that the water-level had ever exceeded 700 centimeters.

After this, the transitional period of "Tisza Regulation" and came the HWL oversteppings became more and more frequent. On 6th of May in 1867, the culmination of water-level was already 722 cm high, and there was another culmination, too with 670 cm on 7th of May in 1860.

The data of culminations were the following ones;

on	17th	of May	1868	697 cm
on	20th	of May	1870	646 cm
on	24th	of January	1871	680 cm
on	11th	of April	1872	649 cm
on	4th	of June	1848	696 cm

but it was higher than 600 cm nearly every year which actually happened only now and then before 1855.

These levels had not reached that of 1867. And it also happened, not so long after that the HWL became 786 cm on 6th of April in 1876 and 795 dm on 26th of May in 1877 preceding by 24 days the recent one with a 790 cm – high culmination. The record stood near 800 cm so that another 720 cm – high culmination followed the previous ones on 27th of April in 1878.

All these showed that the growth of flood-levels continued and the bulk of the culminations would not have been ended, yet. In Szeged, where the 500 cm-high water-level could be regarded as are, should have been taken precautions against a 700 but even a 800 cm-high water-level. Nobody could know whether it could be enough or not. If nothing else but this was known by the experts and leaders of Szeged, they should have tried everything for preveting the danger.

Unfortunately, the government then belitted the danger. Perhaps, with the present-day theoratically advenced statistical methods, more threating conditions woulds have been seen, though not without any data.

Now, comming to the point of describing the flood in February 1879, it should be established that it was much better than the previous months and the fore-flood-waves of December and January caused a lasting high level in the bed of the Tisza. (Fig. 1.)

However, it became evident in the forthcoming one hundred years that there could be much more lasting and violent precipitations and much higher floods. As to

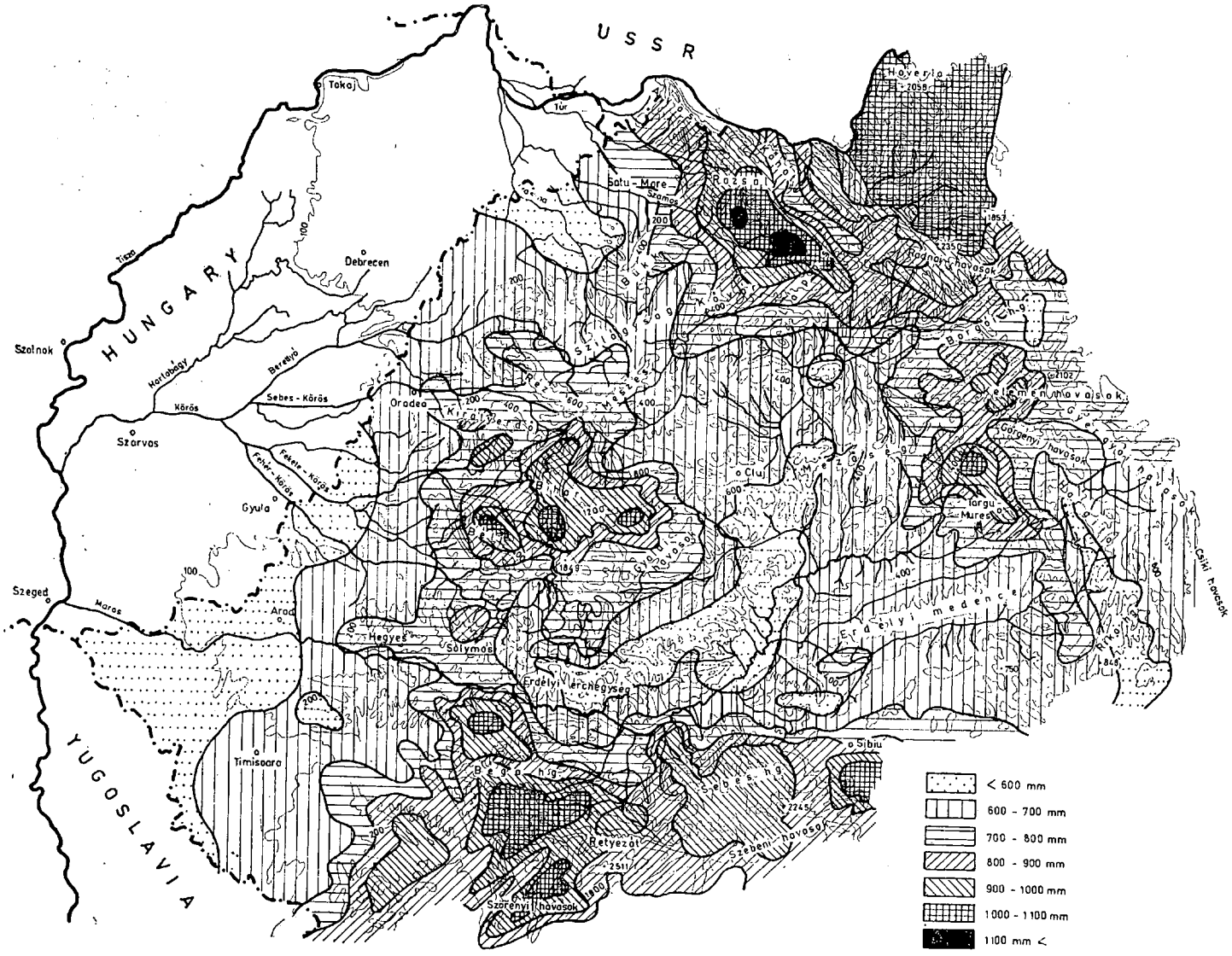

Fig. 1. The annual change in moisture at the mountain-river-system of the Tisza's left-syde affluents on the basis of moisture having changed for Forty years

HW levels, betwen 1876 and 1975 the culmination at Szeged in 1879 proved to be only the twelfth one. It should not be neglected either, but seen with our eyes, cannot be told to be extreme, at all, taking into consideration the state of dams.

The cause of that the fore-flood-wave could start from the Upper–Tisza and its subsidiary streams could be the snow persumably thawed in consequence of the rise in temperature and rainfalls. It is sure that there was a large enough rainfall about 20th of December 1878. (Fig. 2.) The fore-flood-wave came from two branches; of which the first culminated with 860 cm at Vásárosnamény on 24st of December 1878 and the second one with 676 cm on 6th of January 1879. The further top-levels of culminations did not prove to be too high. The culminations of the water-level at Tokaj were 598 cm on 29th of December and 558 cm on 21st of January. The two branches of the flood had already joined at Szolnok and here the culmination was only on 18th of January with 697 cm. The Tisza culminated on 21th of January at Szeged with 658 cm.. It was typical, that the culminations of Szamos at Csenger (664 cm and 585 cm on 24th of December and 3rd of January) as well as those of Bodrog at Sárospatak) 452 cm and 526 cm on 30th of December and 10th of January) can be said comparatively high, but the river Kőrös had no culmination and the that of the Maros with 253 cm on 20th of January had taken place with a very reduced degree. Further troubles were caused not by the fore-flood – waves but by the fact that later the Tisza got so much water – supply till. March which did not let go the water-level under 540 cm. This prevoius fullness of the river-bed was the foundation of the water-level of a newer and higher flood in the middle of February. The main-flood which obviously carried further molten ice, culminated with 785 cm on 15th of February 1879 at Vásárosnaményi one day later than the culmination of the Szamos at Csenger with 649 cm.

We can come to the conclusion that too much water could not start from precipitation but it was rather melte -snow. The dates of culminations mentioned above preceded the dates of the falling precipitations, The rains about 20th of February in the watershed area of the Maros could only be enough to heighten the water-level of the Tisza by their quantities. (Fig. 3.)

The flood started from Vásárosnamény, culminated at Tokaj with 735 cm on 20th of Gebruary. Meanwhille the Bodrog culminated at Sárospatak (625 cm)on 22nd of February, the Sajó also did it at Felsőzsolca (470 cm) on 20th of February. The water in the two rivers mentioned above was too high to see it even with our eyes. As a rule, the result of that the Bodrog and the Sajó bring comparatively much water into the Mid–Tisza is that the movement of culmination slows down very much and the flood stars to be held up. Now, this happened this way; it stayed 14 days between Tokaj and Szolnok. The culmination at Szolnok took place only on 6 th of March with a rather low (763 cm) water-level. On the other hand, a day before this day the dam had already broken through at Peteres, above Szeged. How could it happen that it neither reached Szolnok nor culminated at Csongrád, as yet (here the culminations was on 6th of March with 805 cm). Has Szeged got into a close danger? We can explain it only with taking the flood of the Maros originating from the precipitation which falled down about 20th of February and culminated at Makó with 420 cm on 3rd of March. The 420 cm in Makó also ment about a 900 m /s water output. Then could not come more than 2000 m /s can be made probable or, rather from the quantity of water, lesser by 8–10% than this one, the 1/3 part was originated from the Maros! Beside this the Kőrös was also filled with much water. Its culmination was at Gyoma

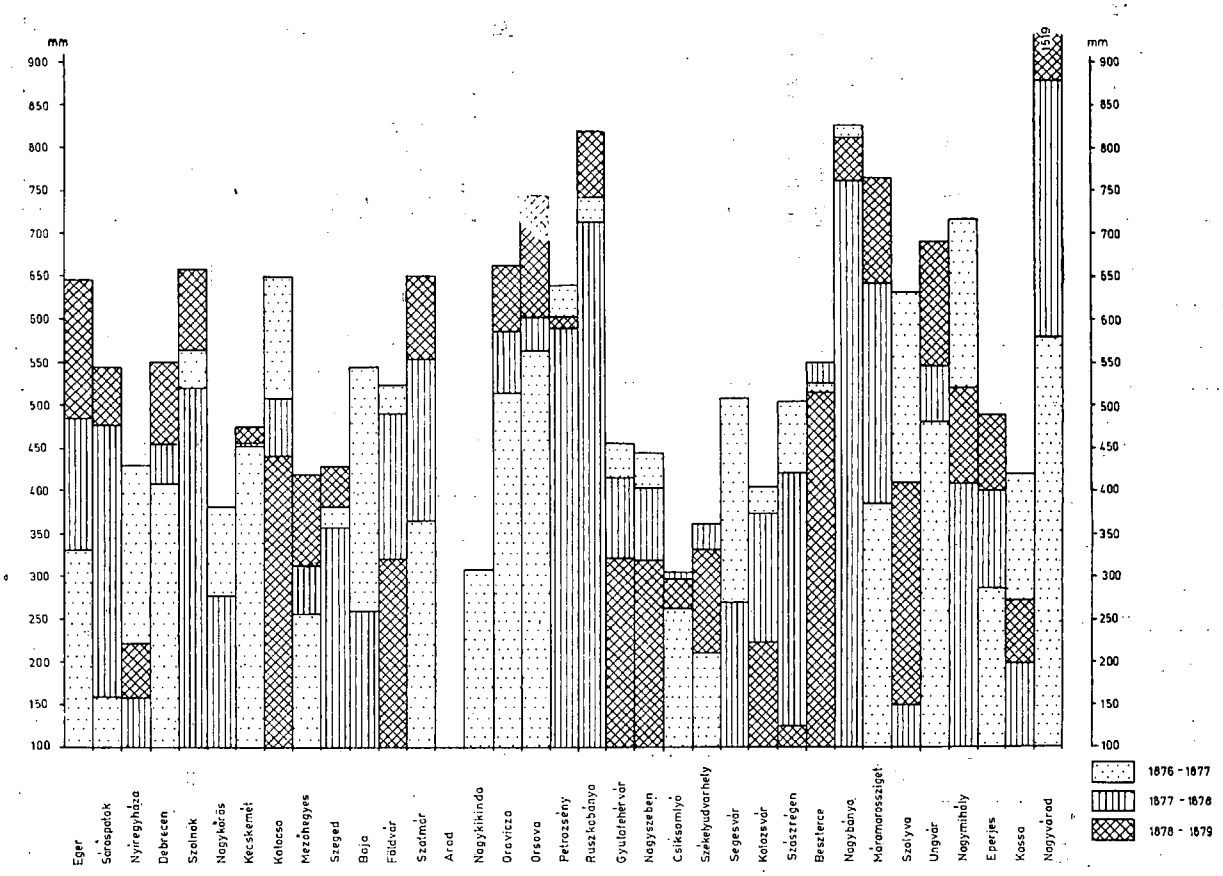

Fig. 2. Change in moisture in the Carpatian basis in the winterterm caused by the great flood at Szeged in 1879.
(Change in moisture in the decisive winter-term as compared to the quantity of moisture in the precending years.)

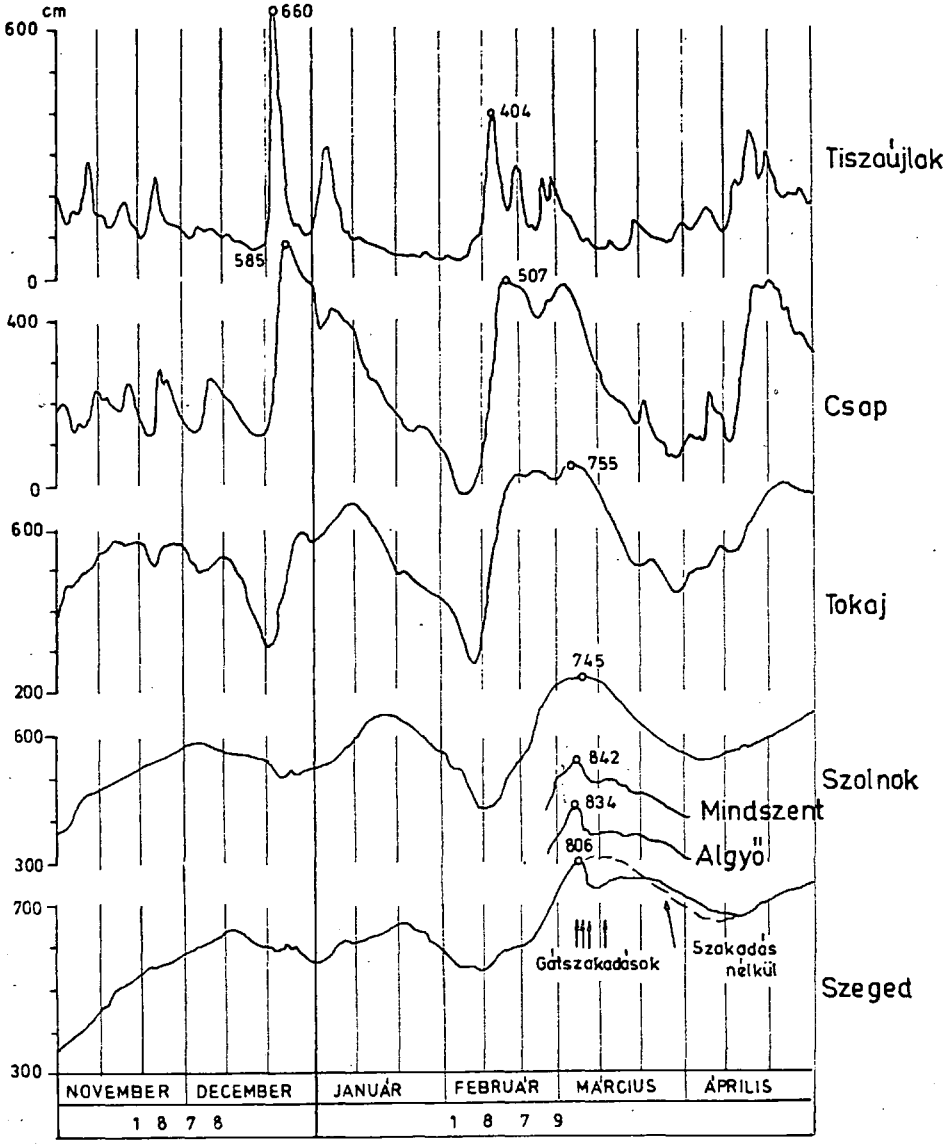

Fig. 3. Change in water-levels at the Upper-Tisza and in its affluents in the winter of 1878—79. (According to W. LÁSZLÓFFY)

on 2nd of March with 681 cm and this water reached Szeged about 5th of March. (Fig. 4.)

The Maros joining with the water of the Kőrös produced the dangerous situation before the culminated water could reach there. It was shown by the very fact that after the owerflow at Petres the overflow of the water became static. There were other

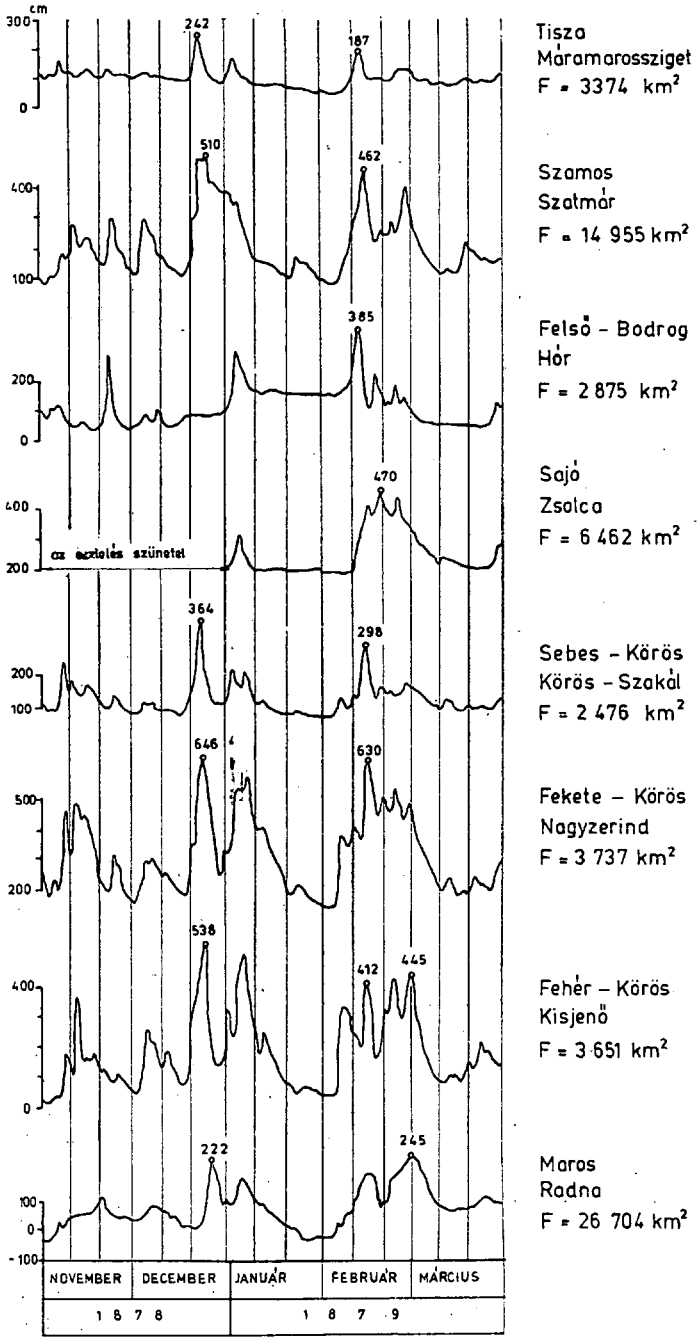

Fig. 4. Water-level changes in the Tisza, packing place in the preceding period of the "great flood" in 1879.

culminations at Mindszent on 12th of March and at Szeged on 15th of March (with 777 cm at Szeged).

The flood coming from the Mid–Tisza had only just then reached the Lower–Tisza. Of course, it is probable that the overflow of the water at Szeged perhaps retarded the date of a newer culmination but if the water-level of the Tisza could rise despite its overflow at Szeged, it is sure, that the flood which was necessary for it already arrived at Szeged from the Mid–Tisza after the catastrophe at Szeged.

Let's wonder about the fact many other important things to be described this thing which seemed to be a matter of secondary importance would not have been enough in themselves to cause the flood catastrophe ot the Tisza at Szeged in 1879 without the simultaneous floods of its "sleeping partners" ,the Kőrös but especially the Maros. Everything happened in this way later on, too. At each culmination when the water-level of the Tisza reached special heights at Szeged, like in; 1895, 1912, 1932 and 1970, too, the high flood of the Tisza was added to that one of the Maros nearly at the very same time.

According to the estimations of Lászlóffy Woldemár, 200–350 m^3/s water poured out to the flood area throughout the bursting of the dam, and later on it could also be 400–450 m^3/s for the time being. Thus together 85–100 million m^3 water should have poured out to the inundation area. The water at Szeged returned to its bed only after 180 days. As far as we know , there were other four bursts at the banks of the Tisza, 17 in the river-system of the Bodrog, 26 on the White–Kőrös, 23 on the Black–Kőrös, 2 on the Twofold–Kőrös, 17 on the Speedy–Kőrös and 5 on the Berettyó. We can admit that the specialists of that age were right, attributing the bursts of the dam and especially the catastrophe at Szeged to the unsatisfactory sizes of dams and to their bad construction. The top of the dams were 2–2,5 m wide in some places. It is evident, the basic part of the dam could not have been too wide because of the fact that the height of the dam was also minimum. As constructional faults were also added to this, damming-system of that time had not been suitable for its aim.

A source of further troubles was that there was no second systematically built defensive line behind the main defensive line which bursted at Petres. The cross-dams were not built out properly, then the railway-bank of Hódmezővásárhely–Szeged which incorrectly was built not for the aim of flood control did not prove to be suitable for retarding the higher water. For filling of this task, the round-dam of Szeged was built all around the town during the time of reconstruction. The effectiveness of the flood-control proves that it has not got any flood-loads since the time when the round-dam was built.

During the following years of 1879 and the safety which was given by the defensive dams perhaps occured at the first time in 1970 that a second flood could also reach the town. The Tisza constantly hides such treats, that there are culminations by 3–4 meters higher above certain points of the town here and there, if we don't keep our flood-defence on the level of this age. We are not allowed to forget even if the Tisza – as it has already happened two times since 1879-does not exceed the 700 cm during a period of 15–20 years.

Let's outline the changes of the HWL's (HWL=highest water-level, record water-level) on the water-gauge in Szeged. Beside the breach in the dam on 5th of March in 1879 the maximum of the flood reached as much as 806 cm, which – as it is known – led the flood destroying the town. Only just following the rebuilding the

food reached the newer, HWL with 845 cm on 15th of April in 1881 and its further growth by 2 cm already led to 748 cm on 18th of April in 1888.

It happened as that a further rise of the water-level, calmed down for a longer time just after 12th of April in 1895 with its 884 cm. Namely, a repeated growth of it was only on 12th of May 1919 (916 cm), on 15th of April in 1932 (923 cm) and the very last time on 2nd of June in 7970. The growth of level of HWL's is natural even for the fact that we register data to this line only in case of a fresher recocd.

The upper limit, which can be expressed with numerical values, should not be interpreted. Well, it cannot be drawn up meteorologically or in physical way. Statistics as science suggests that following one record-level after the other will gradually get rarer in the caurse of times, but it theoretically never ends.

Today, we don't think the water level of 1020–1040 cm heights to be unreachable at Szeged to parry of which we have all the possible means. The only necessary thing for it is, that the heavy spring-or late-spring rains will be kept back in following down the watershed area on the way to the subsidiary streams, to prevent that the culminating floods – especially those of the Tisza and the Maros – meet at the mouth of the river more exactly then ever before.

After all, we can find out of the estimation of the hydrological data with both the metods of that times and today in the period preceding 1879 that the ensuing of the flood- catastrophe at Szeged was presumable. It was foreseen with more less accuracy by the specialists. They called the attention of the responsible leaders of the country in advence for it.

FURTHER DATA CONCERNING THE MORPHOGENETICAL EVALUATION OF KARST DOLINES IN BÜKK

ILONA BÁRÁNY–G. MEZŐSI

In the case of the greater number of karst dolines in the Bükk region of Hungary the vegetal covering varies. Some are tree-covered, some are covered by mixed vegetation, but most are grass-covered. In the case of the latter, elements of undergrowth are often involved in the association of highland meagre lawn and limestone rock-lawn. Their presence in the alien environment suggests that earlier (perhaps some centuries ago) these dolines were covered by forest. The change in the vegetal picture has affected and is affecting the courses of relief-development.

As an effect of tree-planting or re-afforestation the microclimate of the dolines changes, physical, chemical and biological courses are modified in the soil: thus, as a compound effect of all this, the rate of karst corrosion occurring in the soil is modified, too. It is obvious that anthropogen interference upsets the natural balance; it might induce positive or negative reactions. Forestries in Bükk tend to plant the open, grassy areas, without, however, obtaining uniformly satisfactory results since the soil and climate vary in the micro-areas. It is the same in the case of dolines, too, since on slopes of different character conditions also differ. While in former studies (BÁRÁNY, 1975, BÁRÁNY–KAJDÓCSY, 1976, BÁRÁNY–MEZŐSI, 1977) this problem was examined from the point of view of the development of the dolines, in the present paper the study will be extended – in close connection with the former studies – to the possibilities of afforestation.

The Bükk dolines which have been examined hitherto are to be found in the Great Bükk Plateau at an altitude of 700 m above sea-level (average altitude). This time a synthesis of 30 dolines was carried out in the Little Bükk Plateau (average altitude: 450 m above sea-level) where there are a great number of dolines relative to the size of the area. In order to analyse the connection between moisture and bacteria-population 2 out of the 10 "Soros"-dolines were chosen. The "Soros"-dolines are situated south of Varbó (see fig. 1.). One of them, called hereafter S–2 doline, is one of a doline compound, the greatest relative height-difference being 10 m. This doline was chosen because it seemed to the least distrubed by human interference of the "Soros"-series of dolines, although young pines were found on the entire area of the southern slope in strip cultivation. On the other slopes and at the bottom of the doline natural soft-stemmed vegetation was dominant. In the middle of the northern slope (at the 6 m level) a few natural groups of bushes were found. The whole of the western slope was scattered with bed-rock and bushes could be found on the brim of the doline. The doline is oval, lying north-west to south-east.

The relative depth of the other doline, called hereafter S–4, is 14 m. It is also oval, lying north-west to southeast. The entire doline is covered by pine-woods in

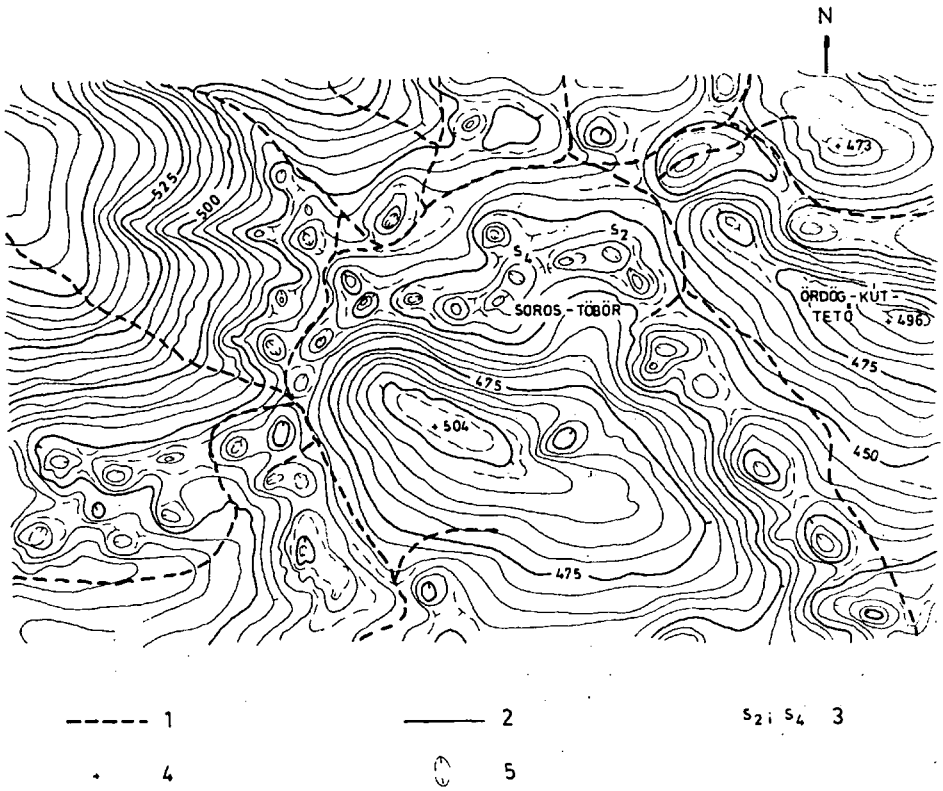

Fig. 1. Geographical situation of the examined dolines
1 = contour line, 2 = path, 3 = examined dolines, 4 = point of altitude, 5 = sink-hole.

strip cultivation. On the western slope at the 4m level a steep rock wall emerges for some metres. On the less steep parts, as well as on the eastern, southern and northern slopes, a fragment of long-stemmed association is mixed with the young pine trees.

The soil samples which were to be examined for moisture and bacteria-count – in accordance with previous experiences (BÁRÁNY–MEZŐSI, 1978) – were collected from the slopes of the four cardinal points at 3m grade differences and were transported for analysis to the laboratory with the air removed. At the same time as the samples were taken the temperature of the soil was taken at the two depths at which the samples were taken (4 and 30 cm) at the 6 m level on all four slopes. We have a double aim in analysing the data. On the one hand we should like to enlarge on the results we have previously achieved in the field of differences in denudation. On the other hand, by revealing the expositive differences in soil-moisture and bacteria-count as well as those of soil-temperature, we should like to evaluate the modifications, differences which result from different ecological relations. Obtaining data proved to be difficult in some cases because of the rocky surface, so the data do not form a complete series.

Connection between soil moisture and bacteria count

It has been documented by previous data that the connection between soil-moisture and bacteria count is in close correlation at a depth of 30 cm. The closeness of the connection of the two factors – as was described in a previous paper (BÁRÁNY–MZŐSI, 1977) – changes at a depth of 5 cm as a function of the soil-temperature. By analysing the data of the S-2 and S-4 dolines our former statements referring to exposures will be reinforced; on the other hand we should like to describe the changes which result from different ecological conditions and the modiffcation which result from the changes.

Moisture-content (expressed as a percentage of the weight of dry soil) and the relevant bacteria-count (at a value of 10^6/gram) are shown on a mirror diagram (see figs. 2,3).

The temperature of the soil at the time of taking the samples (in the morning of 13 July, 1977), the highest being on the western slope (eastern exposure) was: 16.8 °C at a depth of 5 cm, 15.1 °C at a depth of 30 cm; the values for the eastern slope were 15,1 °C and 14.7 °C; the northern slope 16.2 °C and 14.9 °C, on the southern slope, 16.3 °C and 13.3 °C .The value of soil-moisture in the case of both dolines at a depth of 5 cm is higher on the southern slope (northern exposure) and on the western slope (eastern exposure) than on the other two slopes. As can be seen, the bacteria count is very high, too, at his depth. At a depth of 30 cm the bacteria count is higher on these two slopes, too, however it should be mentioned that here the accidental high values are more frequent than on the other two slopes. Soilmoisture has the same values on the eastern and northern slopes at depths of 5 and 30 cm. The soil was moister at a depth of 5 cm than at a depth of 30 cm. As is the case with the western slope of the S-4 doline (eastern exposure) the value of soil-moisture increases to half-way up the southern slope of the S-2 doline (northern exposure). After that point the moisture decreases. In accordance with prevrious experiences w th tree-covered dolines, iso-humid lines divide the doline into two parts in a north-west to south-east direction, thus emphasizing the continental character of the eastern and northern slopes. A significant connection was found between moisture and bacteria count ($r = +0.71 \pm 0.05$) at a depth of 5 cm in the case of the S-2 doline. The same connection cannot de demonstrated mathematically at a depth of 30 cm. A slight, but significant, connection was found at a depth of 30 cm in the case of dolines which had been disturbed by young trees. The development of a mutual connection was disturbed by the breaking up of the soil and the immediate effect of shade in the part near the surface (at a depth of 5 cm).

Exposure differences in soil temperature

Vegetation which covers the surface of the dolines and the quantitative and qualitative characteristics of bacteria population in the root-zone are in close connection with the climatic conditions of the micro-region. The ecological factor which defines biogen activity primarly, the temperature of the soil which varies on a wide scale in slopes of different exposure, have a decisive effect on the development of the dolines. In a previous analysis (BÁRÁNY–KAJDÓCSY, 1975), attempts were made to demonstrate the exposition tendencies of soil-temperature. Wagner (WAGNER–

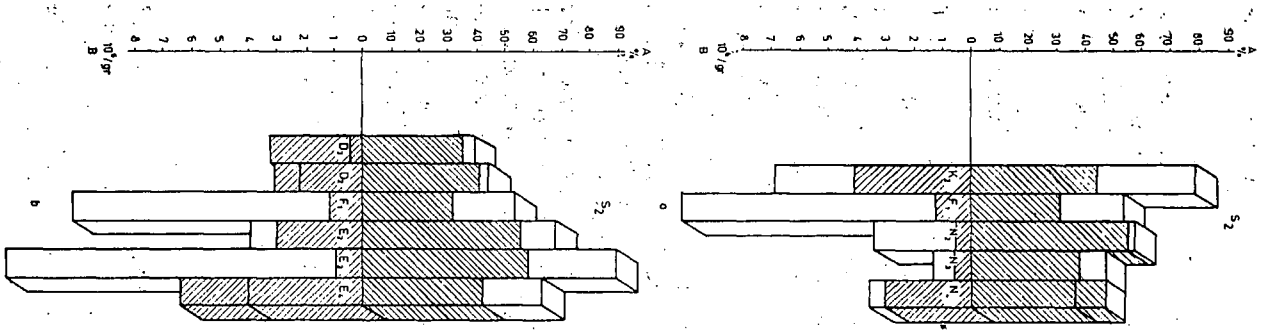

Fig. 2. Distribution of moisture and bacteria count along the E—W (a) and N—S (b) lines at every 3 metres in the S—2 doline

F_1=bottom of the doline, N_2, N_3, K_2, etc. in the W and E exposures, E_2, E_3, D_2, D_3, N and S exposures data gained at every 3 metres, in both causes measured from "O". If the lined part means covers the blank part, the letter is separated by an inner dividing line. The lined part means a depth of 30 cm, the blank part means a depth of 5 cm. A=soil moisture (dry weight %) B=the aerob vateria count (10^6/gr.).

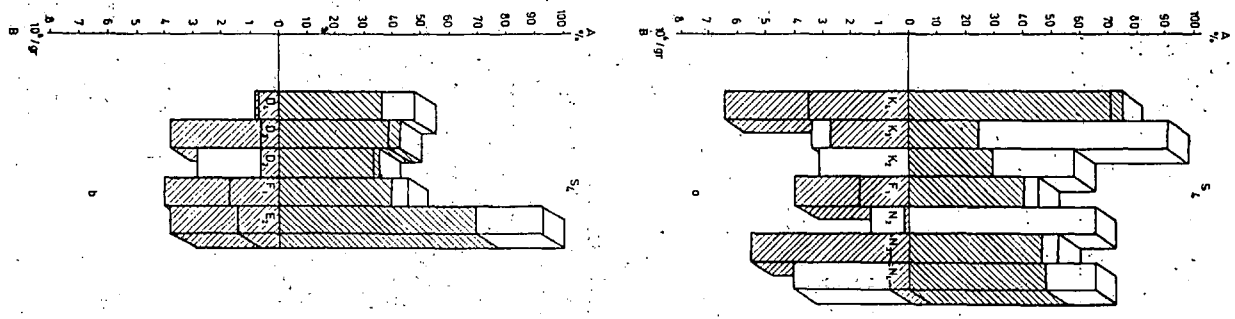

Fig. 3. Distribution of moisture and bacteria count along the E—W (a) and the N—S (b) line of the S—4 doline at every 3 metres.

F_1=bottom of the doline N_2, N_3, K_2, K_3, etc. are data obtained on the W and E exposure, E_2, E_3. D_2, D_3, N and S exposures at every 3 metres. The lined part means a depth of 30 cm, the blank part means a depth of 5 cm. A=soil moisture (dry weight %) B=aerob bacteria count (10^6/gr))

TAKÁCS, 1976), while examining the zones of soil temperature, used the term "inversion layer". This is the layer in which be convergence and divergence levels of thermal conduction occur daily and which, on the basis of former investigations carried out in Bükk, go down to about a depth of 30 cm. By examining the situation of the cold and warm levels in this layer, useful information was obtained concerning the process of thermal economy of the soil. On the basis of isoplates it was stated that the movement of of the cold and warm levels takes place at a different pace at different exposures. For a further detailed analysis of the phenomenon the average soil temperature isoplates on 5 bright August days were drawn describing the slopes at the four cardinal points (see figs. 4–7).

On the northern slope (souther exposure) where an isoplate of 8 °C and 21 °C demonstrates the extent of extremity, the sinking of the warm and cold levels can be denoted as steady. This means that the thermal supply coming from a deeper layer during the night and from the surface during the day is of about the same value. The convergence and divergence levels deviate at a very small rate with depth in this case since the rate of the movement of heat changes at a depth of 14–15 cm which is the level of the inflexion point as has already been mathematically demonstrated. The cold level descends more rapidly, the warm level more slowly beyond this depth (see fig. 4.)

On the eastern slope (western exposure) the 11 °C and 16.5 °C isoplates demonstrate an extremity which is considerably less than the one described above. According to this, isoplates are not so frequent. While the tendency is the same as far as the sinking of the cold level is concerned, the movement of the warm level occurs at a slower rate. It is on this slope that the diversion of the inversion level is most evident. This proves that in the majority of the vertical levels heat-distribution is equal. Emission starts later in the afternoon and the quantity of heat gained during the period of illumination inhibits the lowering of the warm level (see fig. 5).

Extremity is least on the southern slope (northern exposure), the lowest rate isoplate being 10.5 °C, the highest 14.5 °C. The cold level sinks very slowly to a depth of 5 cm, then it goes down all of a sudden. The warm level never descends to a depth lower than 10 cm during the day. This demonstrates that here there is heat emission from the deeper layers of the soil during the day, too. This is due to the fact that the illumination of the surface is relatively less than that of the other exposures (see fig. 6).

On the western slope (eastern exposure) the cold level gradually descends; similar to the southern slope it reaches a depth of 30 cm, this being the slowest as a result of an emission of heat from the deeper layers of soil up till 4p.m. – as is the case with the southern slope. The line of the warm level is similar to that of the northern slopes, the values being nearly the same, too, so the direction and size of the courses of heat-exchange are more or less the same (see fig. 7.).

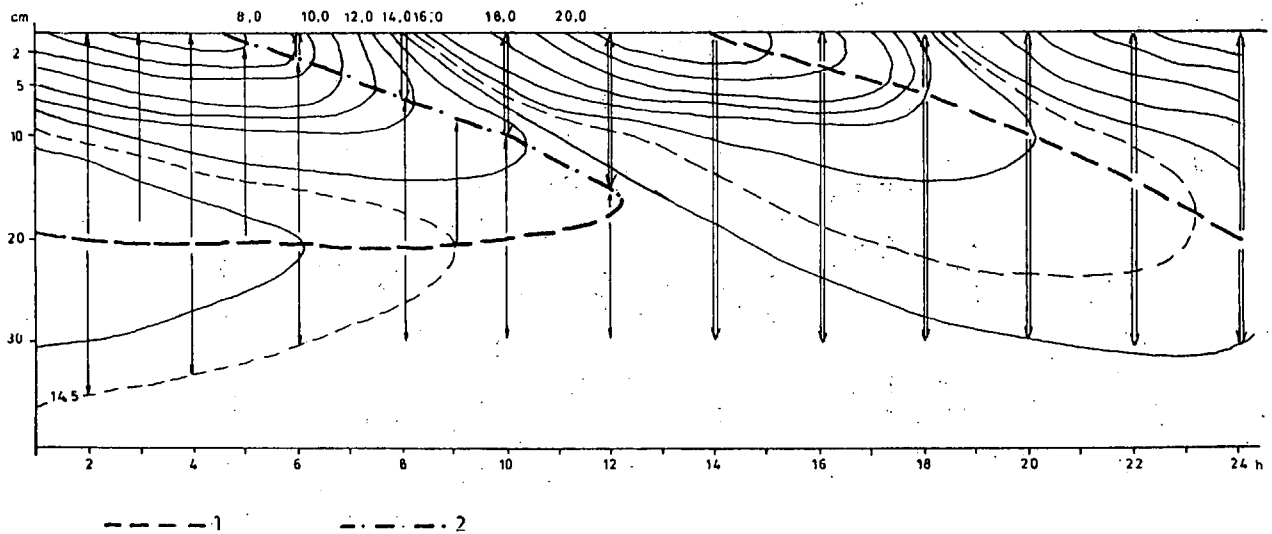

Fig. 4. Average temperature isoplates on the northern (I) slopes of a Bükk doline (southern exposure)
1. divergence line (warm level) 2. convergence line (cold level)

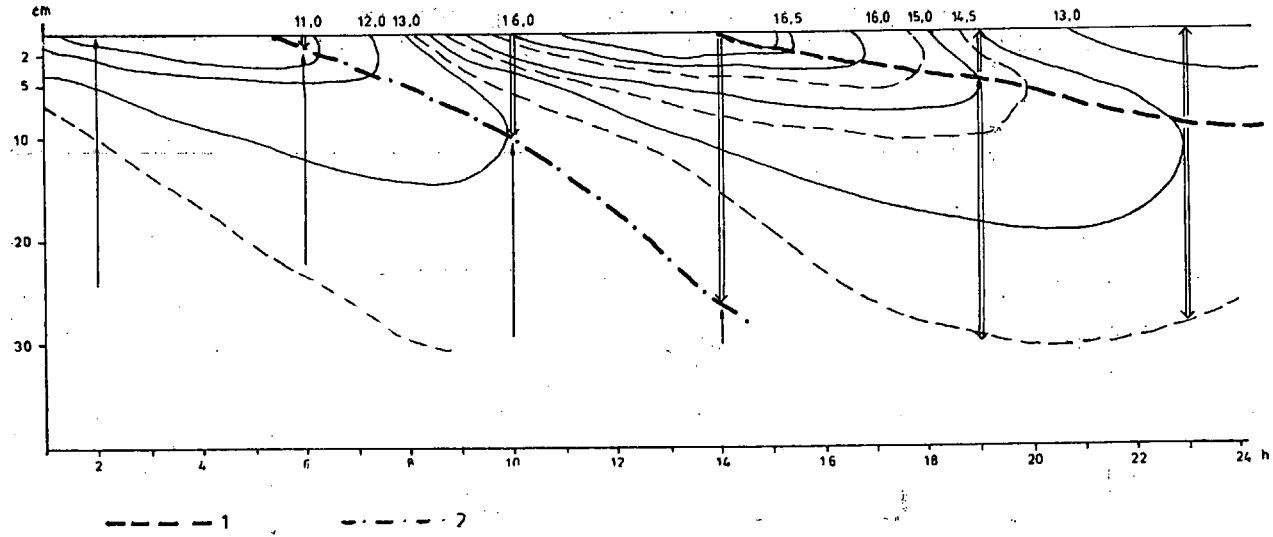

Fig. 5. Average temperature isoplates on the eastern (II) slopes of a Bükk doline (western exposure)
1. divergence line (warm level) 2. convergence line (cold level)

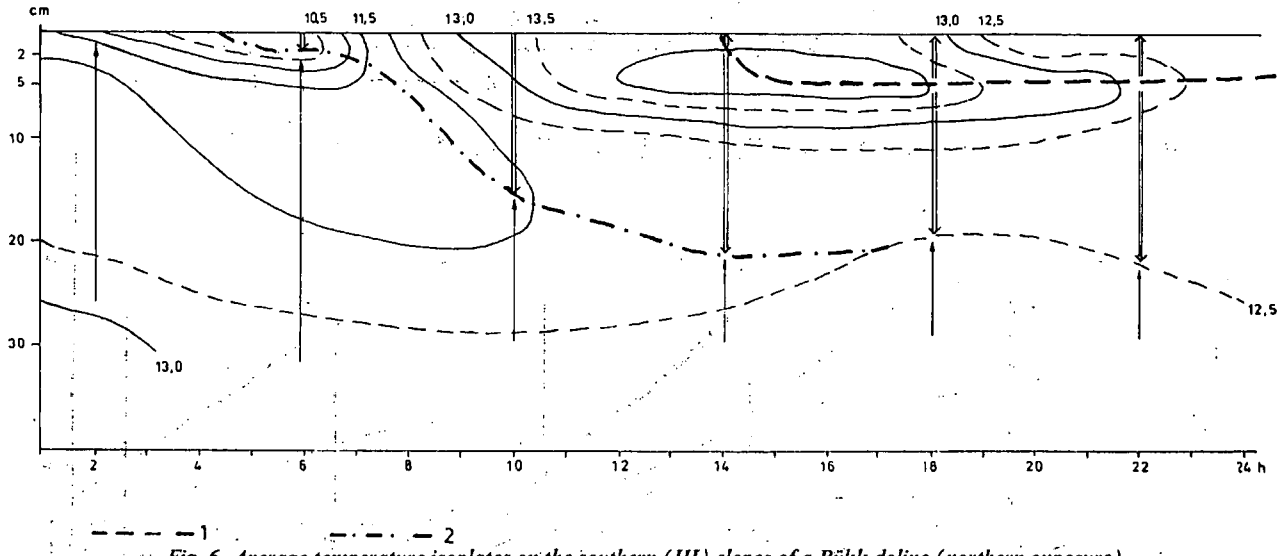

Fig. 6. Average temperature isoplates on the southern (III) slopes of a Bükk doline (northern exposure)
1. divergence line (warm level) 2. convergence line (cold level).

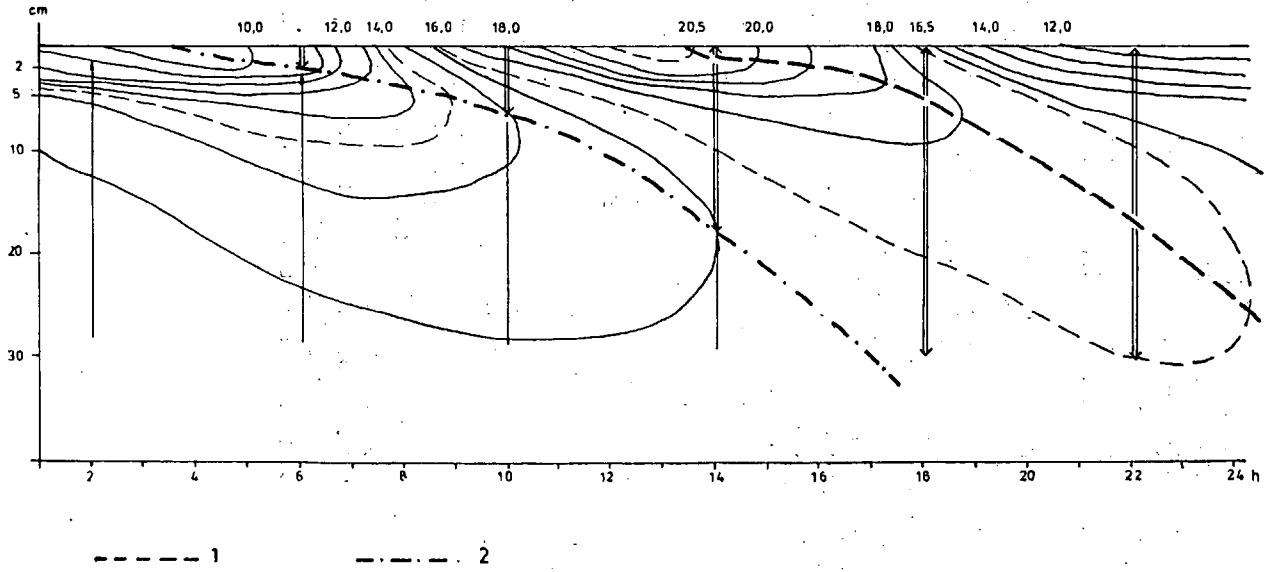

Fig. 7. Average temperature isoplates on the western (IV) slopes of a Bükk doline (eastern exposure)
1. divergence line (warm level) 2. convergence line (cold level)

Summary of the results

A summarizing statement can be made to the effect that the significant connection between soil moisture and bacteria count which was demonstrated at a depth of 5 cm is a characteristic feature of a doline with an undisturbed surface (natural vegetation and soil-bed). In the case of a doline with a distrurbed natural balance this connection can be demonstrated only at a deeper, i.e. 30 cm, level since the abovementioned connection does exist at the 5 cm level, but cannot always be demonstrated.

While an examination according to the different exposures is carried out, the characteristic features of the soiltemperature must be registered sinc e, if the moisture and bacteria count only are taken into consideration, many connections are eccisental. In the case of the dolines which were examined by us the increase in the bacteria count could be demonstrated at a depth of 30 cm on the southern slope (northern exposure) if the moisture conditions were favourable. On the other hand at a depth of 5 cm the high value of moisture together with the low temperature did not result in a high bacteria count. This is in connection with the fact that the daily inversion level hardly descended to a depth of 5 cm. On the northern slope (southern exposure) the greater temperature extremes and the lower level of moisture-value resulting from this decreased the bacteria count especially at a depth of 5 cm. At a depth of 30 cm the bacteria count was higher which is due to the constantly favourable soil temperature during the day. On the western slope (eastern exposure) soil moisture was quite high; as a result of this, the bacteria count was high in the nondisturbed dolines. The same phenomenon could not be observed in the tree-covered dolines. This is caused by the activity of the warm level which becomes dominant in the daily temperature owing to the different slope-angle. This latter shows characteristics similar to those of the northern slope. On the eastern slope (western exposure) the bacteria population is not more favourable in spite of afforestation than on the northern slope, which fact is in connection with the lower value of soil moisture.

On the basis of examining the temperature moisture and bacteria, planting with young pine trees, taking into consideration the effect of exposure, seems to be favourable on the southern and western slopes since, as a result of the compound effect of the less extreme micro-climate, the soilecological conditions are favourable here. At the same time mention must be made of the fact that the steeper development of the western slope (which can be observed in most cases) somehow contradits the above statement. Thus a ground examination must be carried out before afforestation takes place.

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