

PROBLEMS

**OF applied
geography**

**Polish Scientific Publishers
Państwowe Wydawnictwo Naukowe**

PROBLEMS OF APPLIED GEOGRAPHY

Proceedings of the Anglo-Polish Geographical Seminar

Application of geographical research and analysis to practical purposes is growing in scope and importance. Geographers of all countries possess already large amount of valuable experiences from different fields such as economic and physical planning, problems of air pollution in urban and industrial areas, agriculture, administrative division and others. To exchange ideas and experiences British and Polish geographers have organized a Seminar on Problems of Applied Geography, which was held in Nieborów, Poland, from September 15—18, 1959. Discussion during the Seminar turned to be so successful that its participants resolved to publish all papers gathered in one volume. These dealt with general geographical research for regional planning, with the preparation of detailed geomorphological, hydrographic and land-use surveys for use both in regional and town planning, with studies connected with rehabilitation of abandoned industrial land, with research of local climate and air pollution, with various problems of urban geography and others.

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P O L I S H A C A D E M Y O F S C I E N C E S
I N S T I T U T E O F G E O G R A P H Y

GEOGRAPHICAL STUDIES No. 25

PROBLEMS OF APPLIED GEOGRAPHY

*Proceedings of the Anglo-Polish Seminar
Nieborów, September 15—18. 1959*



WARSZAWA 1961
PAŃSTWOWE WYDAWNICTWO NAUKOWE

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Warszawa 1961

Printed in Poland

Drukarnia im. Rewolucji Październikowej — Warszawa

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FOREWORD

In September 1959, the first meeting of British and Polish geographers was organised in Poland in the form of a Seminar concerned with the problem of utilizing the results of geographical studies for practical needs connected with regional planning.

The following four subjects were discussed during the Seminar:

- (i) Geographical studies for regional planning.
- (ii) Land utilization survey as the basis for regionalization and planning of the development of agriculture.
- (iii) Studies of alterations in geographical environments resulting from economic activities.
- (iv) Research in the field of urban settlement geography as a basis for the planning of settlement.

Each of the given subjects was presented in papers prepared by the representatives of both side, and then thoroughly discussed, with emphasis on the importance of exactitude in the research methods used and on the possibility of utilizing practically the results of geographical studies. Since the papers reflected two different political orientations, each delegation represented the achievements and experiences of its own. The general conclusions reached may be of common value for those interested in applied geography. The underlying aims of the Seminar were to obtain experience with a view to the further development of geography as a more exact science and, at the same time, to connect it more closely with life and society.

The results of the discussions were considered to be sufficiently useful to deserve publication in this volume. It comprises an abridged report of the Seminar and all the papers read. It also contains an informative article about land utilization in the vicinity of Nieborów.

The Seminar was the first geographical event of its kind. It was organised by the Institute of Geography of the Polish Academy of Sciences and the Institute of British Geographers, under the auspices of UNESCO and with the support of the British Council.

The organisers of the Seminar consider it their pleasant duty to express their thanks to the British geographers who took part, and especially to Professors

A. E. Smailes, M. J. Wise, S. H. Beaver and F. J. Monkhouse, who were helpful in the final preparation of the English texts of the Polish papers.

S. LESZCZYCKI

Leader of the Polish Delegation

Throughout the Seminar, and on occasions too numerous to mention in detail, the members of the British delegation were the recipients of remarkable hospitality. They wish to express their sincere gratitude for the generosity and thoughtfulness of the Polish geographers and their friends.

K. C. EDWARDS

Leader of the British Delegation

LIST OF THE PARTICIPANTS OF ANGLO-POLISH SEMINAR

GREAT BRITAIN

1. Prof. K. C. Edwards, University of Nottingham
2. Dr. H. C. K. Henderson, Birkbeck College, University of London
3. Prof. A. E. Smailes, Queen Mary College, University of London
4. Prof. M. J. Wise, London School of Economics, and Political Sciences, University of London
5. Prof. S. H. Beaver, University College of North Staffordshire
6. Prof. F. J. Monkhouse, University of Southampton
7. Mr. M. R. G. Conzen, King's College, University of Durham
8. Mr. A. A. L. Caesar, St. Catharine's College, University of Cambridge
9. Mr. R. A. French, University College, University of London
10. Dr. R. H. Osborne, University of Edinburgh
11. Dr. E. Brooks, University of Liverpool
12. Mr. G. North, University of Manchester

POLAND

1. Prof. S. Leszczycki, Institute of Geography of the Polish Academy of Sciences (P.A.N.), Warsaw University
2. Prof. J. Kostrowicki, Institute of Geography P.A.N., Warsaw University
3. Prof. K. Dziewoński, Institute of Geography P.A.N.
4. Prof. M. Kielczewska-Zaleska, Institute of Geography P.A.N., Mikołaj Kopernik University, Toruń
5. Prof. M. Klimaszewski, Institute of Geography P.A.N., Jagellonian University, Cracow
6. Prof. W. Okołowicz, Institute of Geography P.A.N., Warsaw University
7. Prof. A. Wrzosek, Jagellonian University, Cracow
8. Doc. S. Golachowski, Bolesław Bierut University, Wrocław
9. Doc. J. Paszyński, Institute of Geography P.A.N., Warsaw
10. Doc. L. Straszewicz, University of Łódź

11. Dr. Ł. Duszyńska, Maria Curie-Skłodowska University, Lublin
12. Dr. L. Kosiński, Institute of Geography P.A.N.
13. Miss S. Gilewska, Institute of Geography P.A.N.
14. Miss D. Kosmowska, Warsaw University
15. Miss J. Rakowicz, Institute of Geography P.A.N.
16. Mr. M. Rościszewski, Institute of Geography P.A.N.
17. Mr. A. Werwicki, Institute of Geography P.A.N.

THE REPORT OF THE MEETING

The Seminar was held in the Nieborów Palace from 15th to 18th September, 1959. In it participated a British delegation consisting of 12 persons led by Professor K. C. Edwards and a group of 17 Polish geographers headed by Professor S. Leszczycki. On 14th September, 1959, a day before the opening of the discussions the participants of the Seminar met in the Institute of Geography of the Polish Academy of Sciences, and addresses by Professors K. C. Edwards and S. Leszczycki opened the meeting. The guests then visited the Institute of Geography of the Polish Academy of Sciences and the Geographical Institute of the Warsaw University and became acquainted with the research work carried on in the Warsaw centres. In the afternoon, Ambassador S. Wierblowski, the President of the Polish Committee for the UNESCO, gave a reception party in the Palace of Culture and Science. Then the participants went to Nieborów by motor coach.

The Seminar was opened on 15th September, 1959, in Nieborów. In this celebration participated the Vice-Minister E. Krassowska, as the representative of the Polish Committee for the UNESCO, Lord Nathan, the President of the Royal Geographical Society, who was visiting Poland, Lady Nathan, Mr. L. P. Kirwan, the Director of the R.G.S., Mr. C. Robinson, as the representative of the British Council, Professor M. Śmiałowski, the Scientific Secretary of the III Department of the Polish Academy of Sciences and Mr. J. Zaremba, the Director of the Department of Perspective Planning of the Planning Commission at the Council of Ministers.

Introductory addresses were delivered by Professor S. Leszczycki and by Lord Nathan who presented to the Institute of Geography a Map of Great Britain known as the "Gough Map" (c. A. D. 1360, facsimile by J. S. Parsons) published by the R.G.S.

A discussion then began on the subject of the problems of applying geography to regional planning. Professor K. C. Edwards was the chairman. An opening paper entitled *Geographical Research for Regional Planning in Poland* was read by Professor K. Dziewoński. Professor M. J. Wise then spoke on *Geography and Regional Planning in Great Britain*. He was followed by Mr. A. A. L. Caesar, who read his paper on *Problems of Regional Planning in Great Britain*. This concluded the morning programme of the session. All the invited guests

participated in luncheon during which Professor S. Leszczycki, Lord Nathan and Professor K. C. Edwards proposed toasts. The afternoon session was devoted to a discussion to which the following persons contributed: Professor Monkhouse, Mr. Conzen, Dr. Osborne, Mr. North, Professor Kielczewska-Zaleska, Professor Edwards, Mr. Caesar, Professor Kostrowicki, Professor Wise, Professor Beaver. The problems of further selected areas of Great Britain, namely West Cumberland, Whitby, Central Scotland and Lancashire were also discussed, and views were exchanged regarding the role of geography and geographers in regional planning.

After dinner the participants enjoyed the film "Varsovie quand même" in an English version.

On 16th September the meeting dealt with the geography of agriculture. The session was presided over alternately by Professor M. Kielczewska-Zaleska and Professor F. J. Monkhouse. Professor J. Kostrowicki read a paper on *Polish Land Utilization Survey*. He supplemented his lecture with a large set of maps, published and in manuscript. Dr. H. C. K. Henderson then spoke on *Land Utilization Survey of Britain and the Use made of it in planning Agricultural Land*, supplementing his paper with lantern slides.

An excursion on foot to the outskirts of Nieborów followed the lunch. Professor Kostrowicki presented in the field the results of a detailed land utilization survey. The excursion was interrupted by a thunderstorm but was continued on the next day.

A lively discussion in which Professor F. J. Monkhouse, Professor K. Dziewoński, Professor M. Kielczewska-Zaleska, Mr. French, Dr. Brooks, Professor Beaver and Professor J. Kostrowicki participated, dealt with the following subjects: the spatial differentiation of the ownership structure and the role of the State in the agriculture in Poland; interrelations between researches on land utilization and studies of soils; the techniques and amount of details in various maps and the usefulness of cartographic presentations of land use.

The debates of the third day of the Conference had as the general subject the problems of modification of the geographical environment as a result of man's economic activity. The meetings were presided over in turn by Professors M. J. Wise and J. Kostrowicki. Professor M. Klimaszewski read his paper on *The Problems of the Geomorphological and Hydrographic Map on the Example of Upper Silesian Industrial District* which was illustrated with a large set of manuscript maps presented by Miss S. Gilewska.

Further papers were read by Docent J. Paszyński on *Investigation of Local Climate in the Upper Silesian Industrial District* (illustrated with maps), and by Professor S. H. Beaver on *The Reclamation of Industrial Waste-Land for Agricultural and Other Purposes* (supplemented with interesting slides).

The problem of the application in regional planning of geomorphological mapping techniques was the main subject of a discussion in which the following

members participated: Professor Edwards, Professor Beaver, Mr. North, Professor Wise, Dr. Kosiński, Professor Kielczewska-Zaleska, Professor Dziewoński and Professor Okolowicz.

An excursion to Arkadia, a romantic park of the 18th Century was organized during the interval between the morning session and the afternoon discussion. In the evening a party round the fireplace took place. It should be observed that the social occasions such as this greatly helped to cement the friendship between the English and Polish geographers.

The last day of the Conference had urban geography as the subject. Professors K. Dziewoński and A. E. Smailes presided at the meetings. The following papers were read: Dr. L. Kosiński, *Urban Geography in Poland and its Practical Application* (supplemented with a set of manuscript maps); Professor A. E. Smailes, *The Urbanisation of Britain* (illustrated with slides); Professor K. C. Edwards, *The New Towns of Britain*.

After lunch the participants enjoyed an excursion to Łowicz and Żelazowa Wola, the latter being the birthplace of Chopin. Here, an outstanding Polish chopinist, Professor J. Ekier, gave a memorable pianoforte recital.

The discussion that followed involved Professors Dziewoński and Kostrowicki, Miss Rakowicz, Mr. French, Dr. Brooks, Professor Kielczewska-Zaleska, Mr. Caesar, Professor Beaver, Mr. Werwicki and Dr. Osborne. Among other subjects, the social and economic difficulties of small towns in Poland and problems in the study of land utilization in towns were thoroughly discussed. A resolution closed the discussion and meeting. Professor K. C. Edwards, on behalf of the British delegation, expressed his thanks to the Polish organizers of the Seminar for the successful results.

The Seminar was followed by a tour throughout Poland. The British guests were accompanied by the majority of the Polish participants in the Seminar. The excursion lasted from 19th to 24th September, 1959 and its route ran as follows: Łódź—Częstochowa—Opole—Cracow—Zakopane—Warsaw.

On the first day the excursion followed the route: Łęczyca (with a stay in Tum)—Łódź. Here, the guests visited the Department of Economic Geography where they listened to a lecture on the problems of the Łódź Industrial District read by Docent L. Straszewicz, who then led an excursion around the town. In the afternoon the party left Łódź for Częstochowa where they were shown the Monastery. Dr. Braun then lectured on the problems of the development of Częstochowa.

The second day of the excursion began with a tour of Częstochowa with Dr. Braun as a guide. The next stage was Opole where the guests were welcomed by the representatives of Local Authorities, of the regional Scientific-Economic Council and the Silesian Institute. The problems of the Opole Region and the research studies carried on there were presented in a lecture by Mrs. Z. Czyżowska, the President of the Regional Planning Commission.

The excursion continued via St. Ann's Mountain and Gliwice to Katowice.

On the third day, the route of the excursion ran as follows: Chorzów—Siemianowice—Katowice; the British guests listened there to a paper on the main features of the Regional Plan of the Silesian Industrial District (G.O.P.). Continuing the tour, they visited Nowe Tychy, the Museum of Oświęcim, and then reached Cracow.

On the fourth morning, the participants visited the Geographical Institute of the Jagellonian University and the Bureau of Regional Planning for the Cracow Voivodship. A morning excursion to Nowa Huta allowed them to see the new town itself and its big steel plant, while in the afternoon the guests visited the salt mine of Wieliczka.

On the fifth day of the tour, the visitors made a whole day excursion in the Podhale Region, following the route: Nowy Targ—Chochołów—Witów—Zakopane—Nowy Targ, with a fairly long stay in Głodówka, where professor M. Klimaszewski presented the results of his recent studies on the geomorphology of the Tatra Mountains.

The sixth day of the excursion gave the guests an opportunity to visit the Wawel Castle in Cracow and the Museum of the Jagellonian University in Collegium Maius. Then they left Cracow for Kielce and Warsaw, with a short stay in Jędrzejów, where they examined a collection of ancient sun clocks and astronomic instruments belonging to the Przypkowski family, and in Chęciny.

The day before departure was spent in Warsaw. In a morning excursion Dr. L. Kosiński demonstrated the geography of the capital. Then followed a farewell lunch. In the afternoon, the Polish Geographical Society arranged a meeting with Polish geographers who had not participated in the Seminar. In the evening the British colleagues greatly enjoyed the spectacle of the "Śląsk" (Silesia) in the Congress Hall of Warsaw.

Nieborów, Sept. 18th, 1959

RESOLUTION APPROVED BY THE PARTICIPANTS
IN THE SEMINAR

The Anglo-Polish Geographical Seminar of members of the Institute of Geography of the Polish Academy of Sciences and the Institute of British Geographers assembled under the auspices of the UNESCO from 15th to 18th September, 1959 in Nieborów, Poland. After hearing and discussing a number of reports dealing with the applications of geographical research, those participating were in full agreement that:

(a) the mutual exchange of opinions and points of view in the Seminar had been invaluable to all concerned;

(b) the study of geography can contribute materially to help solve important social and economic problems and in particular has a notable part to play in planning the physical development of our countries, and its application should therefore be a leading concern for contemporary geographers;

(c) the study of the problems that had been discussed in the Seminar should be pursued further, since it is believed that their positive solution is of the greatest importance both for the development of the subject and for practical purposes;

(d) general reports on the proceedings of the Seminar should be published in Polish and British geographical journals and also transmitted to the International Geographical Union, and a collected set of the papers contributed should be published in Poland by the Institute of Geography P.A.N.;

(e) after a suitable interval a further meeting to exchange opinions and to discuss progress should be arranged to take place in Great Britain;

(f) thanks should be expressed to the UNESCO for its support of the Seminar, to the Polish Academy of Sciences for making the necessary financial provision for it to be held in Poland, and also to the British Council for helping with the travelling expenses of the British delegation.

(—) *S. LESZCZYCKI*
Director

(—) *K. C. EDWARDS*
President

(—) *JERZY KOSTROWICKI*
Vice-Director

(—) *ARTHUR E. SMAILES*
Hon. Secretary

INSTITUTE OF GEOGRAPHY
POLISH ACADEMY OF SCIENCES

INSTITUTE OF
BRITISH GEOGRAPHERS

Kazimierz Dziemoński

GEOGRAPHICAL RESEARCH FOR REGIONAL PLANNING IN POLAND

It is impossible to give a picture of the present state and development of geographical research in connection with the preparation of regional plans in Poland without discussing the development of the concept, scope and methodology of regional planning itself. Geographical research and regional planning have been inter-connected one with another; the methods and results of geographical research have exerted a considerable influence on the methods and results of planning. *Vice versa* the tasks and needs of regional planning have found their reflection in the choice of the tasks, subjects and methods of corresponding geographical studies and even in the theory of the geographical sciences themselves, above all in human geography (in the marxist terminology: of economic geography).

The above statement may serve as a basis for the division of geographical work relating to planning into main periods. This year we celebrate the thirtieth anniversary of the fruitful association of geographers with regional planners. We may divide the thirty years into the following principal periods:

- (i) The period up to the outbreak of World War II in 1939.
- (ii) The period of work under the guidance of the Central Office of Physical Planning (1945—49),
- (iii) The period of the Six-Year Plan (1950—1955), marked by the unification of regional planning with short-term economic planning.
- (iv) The period of work on the long-term, or so-called perspective, plan for the development of national economy (beginning in 1956).

At present as the result of the setting up, by the Praesidium of the Polish Academy of Sciences, of a special scientific Committee for the Physical Planning of the Country, it is generally held, that we are standing at the threshold of a new period of great development of regional planning as well as of the corresponding geographical studies.

The development of this kind of geographical research will now be presented according to the above mentioned periods.

The first important studies in the sphere of regional planning in Poland were undertaken in 1928 in Warsaw and a little later (in 1929) in Cracow. By 1939 there were already 13 centres working on regional schemes. Research work which was to serve as a scientific basis for these plans was, in the beginning, of a fragmentary character, frequently limited to the preparation of charts and maps developing and using data already included in the existing topographical maps or statistics obtained from the materials of the National Census. Only in a few cases were data collected directly in the field. As a rule, hypsometric maps, those indicating the distribution of population, industry, forests and, possibly also, natural resources were prepared on this basis. Geographers, as a group of research workers in the sphere of regional planning using specific analytical methods, made their first appearance in Cracow. As early as 1930 they undertook, under the guidance of J. Smoleński, large-scale research to supply the needs of regional planning, programming as well as organizing scientific studies and conducting in some cases independent research of certain problems in the field. W. Ormicki and S. Leszczycki were the outstanding workers of this group. Later on similar research was undertaken in other centres, carried out, among others, by B. Zaborski and F. Uhorzczak.

From the very beginning certain characteristic types of systematic studies could be noticed. These are:

(a) the collection of materials from existing studies dealing with the areas coming within the framework of the plan, together with critical appreciations of the obtained results, usually presented in the form of papers illustrated by maps, charts and diagrams;

(b) the carrying out of more detailed research into problems already studied and analysing new problems, previously omitted, and finally;

(c) the preparation of synthetic reports i.e. specific regional monographs, together with concrete conclusions, to be used as the basis for the regional scheme of development.

However, only one of those pre-war regional monographs dealing with a relatively small area was completed and published. This is S. Leszczycki's work entitled, *The Region of Podhale—geographical basis for the scheme of regional development*. This work clearly reveals all the advantages and shortcomings of the studies at that time; it may be considered the best achievement of those years. It is based on the most thorough study of the very rich literature and of the most conscientious research of the author. Leszczycki—starting from the detailed analysis of the structure of population and its future growth in an area, which from both the physical and ethnographic points of view is separate from its neighbours (i.e. there exists complete identification of the physical and administrative boundaries)—examines the values and possibilities

of the geographical environment. In this way he reaches conclusions which, on the one hand, are concerned with the future social and economic development and purposeful forms of capital investment for the given region and, on the other hand, deal with the principles of the migration policy. In the result migration forms for him part of the solution of the difficulties of providing the population of the given region with proper living conditions, while at the same time the economic side of the investment programme (the problem of whether the proposals for inclusion in the plans are economically realistic) was in a most characteristic way by passed.

Taking part in preparatory studies for regional planning gave to the geographers a new professional standing. The older outstanding scientists have played an important role in the Regional Commissions, as their chairmen, members or experts; the younger ones were employed on the staff of the planning bureaux.

Hostilities put an end to all that work done before the war and the results obtained were mostly destroyed during the war. Only those materials, which had been published, are preserved. By good luck the archives for the region of Cracow remained undestroyed.

THE FIRST POST-WAR PERIOD (1945—1949)

Studies undertaken immediately after the end of hostilities had a completely different organizational framework. The setting up of the Central Office of Physical Planning as well as of its local branches (above all on the voivodship level) allowed the development of more systematic work, proceeding simultaneously all over the country in the various voivodships. Starting work from scratch, the main emphasis was laid on the collection of pre-war data and materials and their systematic classification. The change in the state frontiers, both in east and west, made it necessary to get better acquainted with the geography of the western and northern (coastal) regions, and to combine data from various sources, frequently collected by completely different methods, in such a way as to obtain a more or less unified picture of the whole country.

At that time one of the main ideas developed was to prepare regional atlases and monographs. These were fully worked out only in a few regions. Of the regional atlases, the Cracow atlas is considered to be the best example; it was prepared in the years 1948—1949. Of the monographs a not too successful monograph of the Lublin area may be mentioned. It constitutes rather a collection of more or less independent studies than a systematically arranged entity. The idea of regional atlases as well as that of monographs were not later completely abandoned. As far as the Lublin voivodship is concerned F. Uhorczyk

continues steadfastly to this day his work on the regional atlas. Although not yet completed it is of a truly monumental character including already 200–300 various charts and maps.

Preparatory work for an atlas of the whole country was also undertaken. The basic scale of 1:1,000,000 was accepted. This atlas was to contain the full cartographic picture of the country: its geographical environment, social and economic structure, its existing investments and proposed development. Two volumes were published under the title *Studium planu krajowego (Studies for the National Plan)*. S. Z. Różycki defined then the programme of a physio-graphical part of that atlas, composed of approximately 100 maps. Although never completed, its implementation up to 1949 was sufficiently advanced to leave lasting traces in the development of physical geography of and in Poland. It will be sufficient to mention here that for the first time general survey soil maps covering the whole new area of the Polish state have been prepared by T. Mieczyski, as well as a geomorphological map by S. Z. Różycki, a number of climatological maps by R. Gumiński, W. Milata and others, together with many other maps. However, the greatest scientific achievement of the studies undertaken in connection with this atlas may be found in the two reports of E. Romer on the subject of the agricultural climatic season of the year and climatic regions. These were his last larger scientific works. Quite independently R. Gumiński presented another concept of climatic regional divisions. Research connected with the preparation of the national atlas included also studies in the field of economic geography. As an example studies in the location of industry, analysing different industries and industrial plants according to the number of employed workers, the use of raw materials by weight and value as well as of energy, and the degree of concentration of industry in the various regions of the country should be mentioned.

Following the preliminary studies and maps, more and more large-scale work was undertaken dealing with concrete specific problems of research. Special attention was given to studies of central places and their spheres of influence on different levels to form the basis for the new division of the country into basic administrative and economic regions. The first general study of this type was prepared by J. Kostrowicki; later specific problems of accessibility to the largest cities were analysed by F. Uhorczak. Part of the research into the spheres of influence of the main urban centres was carried out as an agreed collective work of all the chairs of geography at the universities. This work was coordinated by the Section of Scientific Research in the Polish Geographical Society. Later, as the result of sharp, though not always completely justified criticism of Christaller's theory, interest was shifted from the network of central places to the problems of basic factors in the development of towns and their functional structure. In this connection studies by J. Kostrowicki, K. Dziewoński, L. Kosiński and others should be noted.

A few facts should be mentioned to illustrate the special position of geographers in this period: a geographer was the head of the Central Office and five others (today professors at the universities) were heads of regional offices in Bydgoszcz, Cracow, Katowice, Lublin and Wrocław.

PERIOD OF SIX-YEAR PLAN (1950-1955)

In 1949 some fundamental changes took place in the organisation and scope of regional planning. These changes were a result of certain political decisions, connected with the introduction of economic planning on a very wide scale, the organisation of special planning offices and the inclusion of regional planning in the sphere of their activities. At the same time, the majority of specialists in regional planning came to the conclusion that regional planning should be more operative and have a larger share in the shaping of the current investment programme for the whole country. These tendencies were, without any doubt, incited by the contribution of regional planning in an exceptionally ambitious and wide programme for the industrialisation of Poland. In the result this union between economic and regional planning was not only a decision of the government but also a positive answer to the technicians' wishes. For the same reasons the scope of the planning schemes were in the next years seriously limited to problems connected with the execution of works included in the Six-Year Plan. The number and extent of plans prepared were also limited to the regions and areas of concentrated investments. All these limitations turned out to be in practice considerably larger than previously anticipated, because in the course of years a number of capital investment projects originally included in the Six-Year Plan were given up. The investment programme was simply too ambitious. On the one hand the same results were obtained with the help of reduced outlay and on the other it proved impossible to master the too extensive front of building activities. A rather difficult situation arose in which current investments in many parts of the country did not provide a proper basis for the working out of a fully fledged regional scheme. The operative economic plans did not contain sufficiently large investment programmes which would permit the preparation of such plans.

The above mentioned limitations led, however, to better methods of work, and increased the requirements as to the quality and precision of scientific research, geographical research included, connected with regional planning. In such a way the main emphasis in research was shifted from general compilations to detailed analysis, prepared in field work on large-scale maps, and from monographical studies of the various regions to studies of specific problems in those regions. Good examples of such studies include those connected with (a) the regional plan for the Industrial District of Upper Silesia including, among

others, an analysis of hard coal and zinc ore seams and the conditions of their extraction; studies of the location of towns and settlements and of housing conditions; (b) the regional plan of the central-western part of the Cracow voivodship including maps and balance sheets of mineral resources and studies related to the location of agricultural production and (c) the regional plan of the Kamienna Valley including a study of water resources and their use — past, present and future. Part of these studies was done in the planning offices; another part by various scientific institutes and bodies. In most of them geographers have played an active and important role.

Also, some studies were continued on the national scale especially on population problems. The whole theory of the functional structure of population* was then developed for use in the preparation of the directives given by regional planning offices to town planners, working on the development schemes of different towns. Those population problems were then studied and balanced for the whole country.

Another type of study has developed out of studies prepared as a basis for the economic development of different counties (powiats) and towns. Usually such studies contained a very detailed description of the present structure of economic life in the given area together with an analysis of the possibilities of development inherent in the local geographical environment and existing investments.

About 1952 there arose the problem of the planning of scientific research itself. Planning offices were declaring more and more varied problems and themes for research and scientific bodies tried to include those in their programmes of work, pledging themselves to do the necessary research. However, there arose, in practice, a considerable hiatus between the period of time in which the results of such research were needed and the date at which the completed study was handed over. On the one hand the labour-absorbing character of research was forgotten and on the other the abilities of the planning offices to lay down a long-term programme of needs in the field of research were overestimated. As a result, often at the moment when the proposed research was concluded the initiating office had already lost all interest in its results. This undoubtedly negative phenomenon has been observed also in regional planning. It discouraged many scientists, undermined acceptance of planning in scientific research and in practice forced us to a much greater care and greater caution in the field of direct intercourse between practical life and theoretical sciences.

Among the planned studies undertaken to supply the needs and wishes of regional planning offices, first place should be given to work connected with the problems of the Industrial District of Upper Silesia. When the main framework of this regional scheme was approved the Cabinet called on the Polish Academy

* Vide report by L. Kosiński on the development of urban geography.

of Sciences and other scientific institutions to carry out a number of basic studies and surveys; the lack of which impeded the solution of a number of important economic and technical problems. In the result a special committee for the organisation of this research, directed by Professor Leszczycki and attached to the Praesidium of the Polish Academy of Sciences, was set up in 1953. By now this Committee has some excellent achievements. For the first time in Poland systematic study of such subjects as the local climate, with particular emphasis on the problem of pollution of the air, the pollution of waters, the utilization of slag heaps and of derelict areas, of abandoned mines, quarries and sandpits, the structure of the population and many other problems was undertaken. So far 25 different reports have been published — some of them of great importance from the point of view of scientific research. Thus regional planning, by bringing specific problems to the attention of scientists and scientific bodies, initiated many important researches and at the same time became responsible for the practical use of the results obtained. In this case the problem of planning of scientific research has been, from the point of view of social needs, most successfully approached.

In addition to the specific studies mentioned so far, the regional monographs have been by no means neglected. In the years 1953 and 1954 the so-called geographical economic characteristics of the voivodships were prepared in the voivodship economic planning commissions, with the active participation of many of the geographers who were employed there. Despite the fact that the results are unequal in value, this work constitutes very valuable material for economic planning as well as for the knowledge of the new economic geography of present Poland.

FOURTH PERIOD (AFTER 1956)

In 1956 work on the long-term development plan of Poland's national economy was begun. This created new possibilities for a large development of regional planning. It was decided to include the regional plans in the long-term plan of economic development. In this way the regional plan is to be not only a plan for the development of a certain region but is, at the same time, part of the development plan for the entire country. Acceptance of such a principle requires, naturally, the preparation of regional plans for all the parts of the country.

According to the presently accepted methodological principles the long-term (fifteen years or more) economic plan is in contra-distinction to the short-term (annual or five-year) operative plans, not a defensive one, but lays down only the general trends of development. It does not contain direct orders for the implementation of such or other economic aims and policies, such or other investment programmes. Nevertheless, it serves as a basis for the preparation of

current, operative plans and also as a criterion for their proper elaboration and, later on, for their implementation. This is also true of regional plans, and some difficulties of those schemes, which could not previously be solved in practice, may be easily explained on the background of those new ideas.

According to another definition the long-term plan sums up present-day's knowledge and formulates present-day opinion as to the future development and structure of social and economic relations. In the case of such an approach the long-term plan is not a fixed scheme but changes with time, dependent on the state of knowledge and science, even on the evolution of opinions. Here a typical method of work is the method of successive approximations.

In such a way, with each edition of the long-term plan or regional plan we base the conclusions on already performed studies and research, while the plan itself can and should include a programme of further research. This does not signify that scientific workers should be eliminated from participation in preparing regional plans — they should take an active part as experts, summing up and interpreting the collected materials and especially scientific data. However, the research proper should be conducted separately on a basis of the long-term requirements and needs of the national economy and of planning.

Based on such methodological principles the initial concepts for the economic and social development of all the voivodships which constitute the first approximation for the regional plan were prepared in 1958. In contra-distinction to the work prepared in the years 1953–1954 the main stress was laid now on the state of the present and future development of the various regions, treating the economy of the region as a whole. Thus the plan is no longer only a loose collection of programmes for the development of various branches of economic activity, but the greatest effort was made to grasp the problem of the inter-relations between those branches. Here emphasis should be laid on the fact that, for practical reasons, it was considered necessary to plan regions constituting distinct units the administrative and economic structure; for the time being the existing voivodships were accepted as such units. In future, when the next approximations of the plan are prepared, some changes may be introduced: the plans will then be based on the future, i.e. the proposed administrative and economic units — the new or changed voivodships.

Since these initial concepts for the economic and social development of all the voivodships are constituted in the form of specific regional monographs, it may be of some interest to mention their typical arrangement. The entire report is subdivided into seven basic parts:

- (i) An evaluation of the present state of the economy of the given voivodship.
- (ii) Problems related to the present structure and level of the living conditions of the population and the likely trends of their development and improvement.
- (iii) The potential bases for the development of the regional economy.

(iv) The programme for development of the production of all goods and of those services which are supra-regional.

(v) The future growth of population and of the settlement network as well as of the more important towns.

(vi) The initial programme of basic investments in production and services as well as the conditions for their implementation — e.g. the organisation of building production.

(vii) A summing up of the principles of development.

At present discussions are taking place regarding the methods and content of all those concepts. On the one hand they revealed very considerable achievements and on the other hand the necessity for many complementary studies in the next stages of planning.

Side by side with this, on a central level, persistent efforts are continuing to prepare the directives for the long-term plan of the development of the national economy in the years 1961–1975. The short chapter, which serves as a conclusion for those general directives, is to deal with the problem of changes in the distribution of the productive forces and of the service network. There the prepared regional concepts will be utilized and, simultaneously, by summing up some elements, the most important indispensable corrections in these concepts will be defined.

LAST DEVELOPMENTS

Experience obtained so far in the work in the field of long term regional planning as well as the already mentioned methodological principles show that it is imperative to proceed simultaneously with theoretical, methodological and regional research. In order to realise these tasks for use in future regional planning the Committee for Physical Planning of the Country attached to the Praesidium of the Polish Academy of Sciences was set up in 1959 following the proposals of the Planning Commission at the Council of Ministers, Professor S. Leszczycki was appointed Chairman. There are about 50 members of the Committee, all eminent scientific workers of various specialities and interests connected with regional planning, i.e. economists, sociologists, geographers, geologists, biologists, experts in agriculture, forestry, industry, engineering, town planners and others. The work of the Committee is directed by a nine-person Praesidium. So far the Committee has appointed four commissions:

- (a) for studies of the geographical environment;
- (b) for studies of the location of production;
- (c) for studies of the structure of the population and of the settlement network;
- (d) for research into the structure of economic regions.

In the future, after the work of the commission is further advanced, another body for the preparation of the conclusions and of synthetic reports may also be organised within the framework of the Committee. Until that time the functions of such a body are to be performed by the Praesidium of the Committee. A full programme for research stretching over a period of many years is to be prepared but it was resolved to register all the studies and research projects which have already been completed or are being carried out. Such a record will not be limited to bibliographies but will also include a critical evaluation of all studies. This should give a clear picture of all the shortcomings of all the problems that have either not yet been examined or have been insufficiently examined.

On this basis a research programme to fill the existing gaps will be built up. It will also embrace problems of the theory of regional economy (i.e. of economy in space) and will present a full picture of the problems of the various regions and of the entire country. From the organisational point of view the studies themselves may be entrusted to already existing institutions or persons; they may be subsidised or completely financed by the Committee or eventually they may be executed by the Committee and its bodies. If the analysis of completed studies reveals the existence of regions particularly neglected by research workers, and provided that the formation of expeditions for research is considered purposeful, the organisation of collective research and even of research expeditions is foreseen. Until a full plan for research work has been set up, and this is considered to be the most important current task of the Committee, some current studies of the subjects, which in the preliminary discussions were considered to be the most important for the progress and development of regional planning, are being organised. To these belong, for example, the preparation of comparative material and maps regarding the progress of industrialisation and urbanisation of the country, a detailed regional cross-section of the gross output and national income together with family budgets, the examination of inter-regional economic relations on the basis of "input-output" analysis and others.

It is expected, that progress in the work of the Committee will reveal, as one of the main problems, the necessity to coordinate all types of stock-taking, statistical as well as cartographical, which are at present carried on by different institutions. An opinion will have to be formed as to the efficiency of the present organisational forms of these institutions, e.g. the Central Cartographical and Geodesic Office, the Central Statistical Office, the State Hydrological and Meteorological Institute, as well as others, and proposals will have to be prepared regarding the forms and organisation of stock-taking in the future. The Polish Academy of Sciences will then present the supreme State Authorities with those proposals.

The proposed activities of the Committee mark, on the one hand, the great significance of its work for the development of geography in Poland and, on the

other, the important place that will have to be given in its activities to geographical studies and research.

The preparation of various atlases will undoubtedly be a most important part of this work. At present a considerable number of atlases is being prepared in Poland. As a rule these are only planned, and in many cases work on them will take a number of years. The idea of such atlases was born among many specialists, not only among geographers. It suffices to mention that at present work has already started on the Historical Atlas of Poland by the Institute of History of the Polish Academy of Sciences; the Archaeological and Ethnographical Atlases by the Institute of the History of Material Culture of the Polish Academy of Sciences; the Geological Atlas by the Central Geological Office (work already well advanced); the Climatological Atlas by the State Hydrological and Meteorological Institute; the Atlas of Agriculture by the Institute of Agricultural Economy; the Atlas of Industry by the Institute of Geography of the Polish Academy of Sciences (work already advanced). There are also such atlases as the National Polish Atlas, undertaken by the Institute of Geography of the Polish Academy of Sciences linked with the work of the Committee of National Atlases of the International Geographical Union. It is expected that the Committee, being a unit made up of the most outstanding representatives of various branches of science, will play the role of a co-ordinator of all these atlases, will unify the basic maps and scales and will eliminate duplication of the work undertaken. Possibly a special studio for this purpose will be organized for the Committee within the Institute of Geography.

The next problem of particular significance for geographers dealt with in the work of the Committee is the systematic study of the geographical environment of Poland and of its regional differentiation. In addition to the need for studies to fill up the lacunae in our knowledge of problems and of regions, the main interests in this field shifted from research in large-scale problems to those of medium or small scale. As a result of the discussion which took place at the first Congress of Polish Science in 1951, Polish geographers have already started work of this kind. The detailed morphological and hydrographical maps may serve as examples. Geologists passed from maps on a 1:300,000 scale, already completed, to the preparation of geological maps on scales of 1:50,00 and 1:25,000. Pedologists are working on detailed soil maps. Maps on scale of 1:300,000 and 1:100,000 are practically finished and more detailed work is going on. There is, however, not the slightest doubt that the completion of the tasks in this field requires the co-operation of various branches of science, particularly as regards the co-ordination of cartographic methods and symbols depicting local problems, as well as the definition of mutual inter-relations between the various types of maps. Joint research groups could be particularly valuable in this regard.

The third problem interesting geographers (this time economic geographers) coming within the scope of the activities of the Committee is that related to the

theory and analysis of the distribution of production. Though the problem of theory belongs traditionally to the field of the economic sciences, nevertheless the interpretation of various phenomena making their appearance in the geography of production (industry, agriculture, forestry, transportation and so on) comes within the scope of activity of geographers in their capacity as scientists. The experiences of recent years in Poland testify to the fact that even in the sphere of pure theory the contribution of economic geographers is quite considerable, since they have a better understanding of the course of events in practical life which is necessary for the correct construction of theory corresponding to realities.

A similar aspect can be noted in the field of research in the structure and distribution of the population and of the settlement network. As a matter of fact, objections were recently raised in this case regarding geographical research and its approach. It was stated, that in geography description dominates over interpretation. Even if these charges can be justified, it should be remembered, that only a correct description may serve for the creative interpretation, description which states the problem not only qualitatively but also quantitatively.

The last problem, I want to mention, is related to the regional divisions and regional structure of the country and naturally is *par excellence* a geographical one. But here, too, co-operation with other branches of science, including economics, is very advantageous for the development of this part of geographical theory and research. Above all, this is true for the problems related to the use of statistical methods in regional research, i.e. to economic data based on gross values such as gross output and social income together with their internal divisions into basic elements in a region.

This review of changes in geographical research connected with regional planning seems to testify quite distinctly of the positive influence of this collaboration on the development of geographical sciences and at the same time of the very definite and important position won by geographers in the field of planning. The organisational principles, which have been accepted at present for those studies and which take into consideration the previous experiences, achievements and defeats, permit us to be optimistic as regards their further development.

Michael J. Wise

GEOGRAPHY AND REGIONAL PLANNING IN GREAT BRITAIN

INTRODUCTION

I know that I am speaking for the whole of the British delegation in congratulating Professor Dziewoński on his masterly exposition of the development of geographical research for regional planning in Poland. His exposition of the role of the geographer is clear and his analysis of the nature of the problems facing our Polish colleagues will greatly facilitate closer understanding between the two delegations. British geographers have not been unaware of the contributions to the theory and practice of regional planning made by their Polish colleagues, whose work has aroused much admiration in our country.

In the opening paragraphs of Professor Dziewoński's paper there is an important discussion of the tasks, subjects and methods of geographical study in relation to regional planning. He shows that in Poland the choice of geographical problems for study must reflect the demands of the regional planning problem itself. In order that we may better understand one another's work and purpose, it is important, first of all, to understand that there must exist great differences in the aims and tasks of regional planning in our two countries. It may follow that the differences in these aims will produce also differences in the kind of task selected for study by geographers, differences in the circumstances under which these tasks are carried out and differences in the techniques employed. The extent to which these differences are revealed will be, indeed, one measure of the success of this Seminar.

From Professor Dziewoński's paper it is at once clear that while there are many similarities in the planning problems of our two countries there are also many differences in planning concepts. In order to illustrate these I should like to dwell briefly on one or two of the main planning problems in Britain as they are seen through the eyes of a geographer. It may be said that the British problems, and the geographical work associated with them, gather around two main themes which may be entitled "The Use of Land" and "The Location of Employment and Population".

THE USE OF LAND

We start from a basic problem of a large, predominantly urban population living on a land limited both in total size and natural resources. In England, Wales and Scotland together there are some 56,000,000 acres (roughly 22,500,000 hectares) to serve all the needs of 50 million people. Especially in Wales and Scotland much of the land is hill or mountain moorland, of limited economic value and, if only England and Wales is taken, 37,133,000 acres (15 million hectares) have to serve 45 million people¹, considerably less than one acre (half a hectare) per person. Without further elaboration it can readily be seen that there are many competing claims on limited land and resources. In an industrialised country the fundamental claim of land for mineral extraction and industrial sites has to be recognised. Land is greatly in demand for the expansion of towns (the urban area has been calculated for 1950 at 3,602,000 acres, 1,450,000 hectares) and our modern low density housing schemes are greedy users of land. About 37,000 acres (15,000 hectares) of agricultural land are used each year for urban development. Land is needed for schools, hospitals, airfields, new roads, for recreational use. And all the time, in a country which produces less than half of its own food supply, we remember the need to preserve as much land as possible, and as much of the best land as possible, for the use of farmers, fruit growers and market gardeners.

The problem of allocating land between alternative uses was considered in an important Report published in 1942. This was the Report of the Committee on Land Utilization in Rural Areas² (commonly known as the Scott Report, after the Chairman of the Committee, Lord Justice Scott). This report, together with the Barlow Report which will be mentioned later, marks a major step forward in the development of British land-use planning. A geographer, Dr. L. Dudley Stamp, was a member of the Committee and he was able to contribute to the conclusions of the Committee from his own vast store of knowledge of the land use of Britain derived from his work as Director of the Land Utilisation Survey. Many of the conclusions of this report have since been adopted as government policy. Efforts have been made, for example, to avert the use of good land for urban use when land less productive agriculturally is available. This, as will be seen, raises the difficult question of land classification, of giving a scientific basis to the task of land allocation and of designating priorities of use. In consequence much work has been accomplished by geographers in classifying the land of Britain as a basis for differentiating between competing claims³.

Control of land use has become an important task of government. At the national government level general oversight of this problem is given by the Ministry of Housing and Local Government. This Ministry administers the provisions of Town and Country Planning Acts under which the country is

committed to a policy of planned use of land⁴. The Ministry coordinates, criticises and approves the work of local government authorities (counties and county boroughs) whose task it is to draw up detailed plans for the use of land. In connection with the work of land use survey and allocation many geographers are employed by both the Ministry and by the local planning authorities.

THE LOCATION OF EMPLOYMENT AND POPULATION

Great Britain is an urban country. Nearly 60% of the population live in urban centres of over 50,000 inhabitants and over 50% live in centres larger than 100,000. Even more to the point, nearly 40% of the population of England and Wales live in six major conurbations: 8,270,000 live in the Greater London conurbation alone. The present pattern of towns is the product of a long period development. In particular, rapid urban growth was associated with the revolutions in industry and transport of the 18th and 19th centuries and the accompanying process of regional specialisation of economic activity.

The task of adapting an older pattern of settlement, to meet changed locational requirements of industry, is an important one. The problem was highlighted in the period of the economic depressions of 1929—31 when certain areas, e.g. South Wales, West Central Scotland, the North-eastern industrial region experienced heavy and prolonged unemployment while other areas, notably Greater London and the West Midlands, suffered far less unemployment and indeed continued to increase relatively and actually as employment centres. The problem of localised unemployment lessened during the 1930's, but through the study of this problem a great interest developed in the general problem of providing a satisfactory regional balance of industry and employment. A Royal Commission was established in 1937 and the Report of this Commission, on the Distribution of the Industrial Population (commonly known as the Barlow Report, after its Chairman) was published in 1940⁵. This report is another foundation stone of modern planning policy. The report advocated the institution of measures:

- (a) to provide for a better regional distribution of industry throughout the country;
- (b) to restrict the continued drift of the industrial population to the south east of the country, especially to London;
- (c) to disperse industry and population from the congested conurbations;
- (d) to provide for the re-development of the inner areas of large cities.

A series of measures had already been initiated in 1934 to assist the development of new industries in areas worst hit by unemployment and these measures were incorporated after the war in a new system of control of the location of industry designed to put into effect the main recommendations of the Barlow

Report. The system of control has been operated chiefly by a government department, the Board of Trade, which through a system of licensing, known as the Industrial Development Certificate control, has governed the location of new factory building and extension.

It may be of interest to note some of the broad effects of this system of control upon the general regional pattern of employment. The "older" or, as they have come to be called, the "Development" Areas, have suffered from the fact that their basic industries are those, such as coal mining, iron and steel, ship-building, textiles, that developed rapidly during the 19th century in areas of least-cost locations. Many of those industries have advanced less rapidly, or have even declined, during the present century. Changes in geographical values brought about by declining natural resources and improved industrial techniques have brought about the abandonment of many parts of these areas by the original basic industries. The industrial structures have been, traditionally, narrowly based, resting upon a few industrial groups. In the face of this situation government attempts to introduce new industries have been reasonably successful. Through the system of control many firms have been induced to build new plant in a Development Area rather than, say, in London. Financial inducements have been used to assist new enterprises establishing or developing in these areas. Factories have been built with government assistance to house new industrial concerns, often in groups known as Trading Estates provided with ready equipped service installations. The government has intervened, often decisively, to promote the re-development and reorganisation of some of the older basic industries, including coal mining and iron and steel.

But despite the successes of this policy in regard to Development Areas the task remains only partly accomplished. The areas mentioned, together with others, show only low rates of increase of population and employment compared with the national average. Certain parts of them show actual declines. The social services, including for example, housing and technical education remain rather backward. The service industries are under-represented in the industrial structure. The landscapes bear very evident signs of the dereliction of the former age of heavy industry.

During the last 30 years a new pattern of industrial location with very different characteristics has been super-imposed upon the old. This new pattern has arisen from the rise of industries, often assembly industries, with changed locational demands; from the growth of market-oriented industries manufacturing consumer goods for the population which now has a higher standard of living; from the pressing need to expand export production in, say, electrical goods and vehicles; from the effects of electricity production in freeing many types of industry; from coalfield locations and from the development of road transport. Many of the developing industries have been situated in the English Plain and their rapid advancement has led to the extremely rapid growth of

population in certain heavy concentrations, notably in Greater London and in the Birmingham-Black Country Conurbation, but also in the East Midlands. These areas have increased in population at rates in excess of the national average and the great spread of the towns has provided significant problems of transport, public administration and land use.

Since the war Government policy with regard to industrial location has attempted to check the too-rapid industrial growth of these areas by restricting the issue of Industrial Development Certificates wherever possible. Nevertheless, growth has continued although at a slower rate than in the late inter-war years and seems likely to continue. In particular the Greater London problem remains unsolved. The regional plan for this area, prepared in 1944 by Sir Patrick Abercrombie, assumed that we should be able successfully to control further growth. In this we have not entirely succeeded partly through the great strength of the forces making for further growth in this highly diversified industrial region which employs about one-fifth of the employed population of the country, and partly because of the rapid growth of the "servicing" group of industries over which the Board of Trade has no control. Much has been done, for example by the building of New Towns and by schemes of re-development, to improve the physical environment but the outward growth of the urban region continues. We now possess a rapidly growing "city region" of London which extends outwards for some forty miles or more in all directions from the heart of London and in which about 12 million people live and work.

Thus it will be seen that the main problem of regional balance of employment and population still confronts us: the situation of "more" and "less" successful industrial areas remains, and in the more successful areas the great concentrations of population continue to increase in size and area. To the study of these problems, of the distribution of industry and population, of migrations of population, of the land use patterns of the conurbation, of the forces at work making for continued growth and decline, much geographical work has been applied by geographers in the universities as well as in the research departments of the relevant ministries and planning authorities.

A SUMMARY OF THE PROBLEMS

It will be seen that the basic tasks of regional planning in Great Britain are not so much concerned with tasks of development as with tasks of adjustment and reconciliation. Especially we have to modify the patterns of population and settlement developed in response to the demands of one industrial age to meet the changed requirements and living standards of our modern age of new and rapidly advancing technology.

Our problems may thus be summarised as:

(i) Ensuring the optimum use of our limited land resources, both of agricultural land and of minerals.

(ii) Re-developing selected districts of the older industrial areas by infusing new industries, improving the physical environment of those areas by reclaiming derelict land, and upgrading their social facilities and services.

(iii) Restricting the growth of certain great conurbations, especially Greater London and replanning the distribution of population and the pattern of land use to provide more attractive urban environments.

(iv) Regulating, through the application of a systematic policy of land use and industrial location control, important general trends of population movement, e.g. from country to town and away from the more remote rural and upland areas.

THE LEVELS OF PLANNING

The planning structure that has been devised to deal with these problems operates at three main levels, at each of which geographical research work plays its part by providing information on the relevant facts of distribution in a national or regional context; by recording changing conditions and, in the light of the observed facts, illuminating public policy in relation to the major problems.

(i) National Policy for land use and industrial location has, since the war, found its main roots in such documents as the Scott and Barlow Reports, to which reference has been made. It finds expression in Acts of Parliament which give the necessary powers of control and development to authorities at national and local governmental levels. There is no national overall economic policy. Although the government influences in many ways the economic life of the country and the geographical pattern that expresses this life, the economy is still basically one of private enterprise over which full control of location and development cannot and, in a majority view, should not be exerted.

(ii) Regional Policy has been framed, for many of the more important and crucial regions within the national framework. Plans for such areas as the Greater London Region, the West Midlands, South Wales⁶, etc., etc., have been prepared and put into effect. These plans interpret land use needs in the light of estimated future trends of population growth and distribution and needs for housing and the public services. They provide, where necessary, as in Greater London, for the planned dispersal of population from the congested inner areas of great cities to "new" towns or to towns capable of expansion on the fringe of the city region.

(iii) At Local Levels plans are prepared and control of development exerted by county or county borough planning authorities. The plans rest on detailed surveys of the geographical and economic characteristics of the areas and estimate and provide for the development of existing land use patterns to yield a better physical environment for the daily life of the inhabitants. Any reconciliation of the plans of neighbouring units, that is necessary, is undertaken most usually by the Ministry of Housing and Local Government.

REGIONAL PLANNING AND ECONOMIC PLANNING IN GREAT BRITAIN

Professor Dziewoński has raised the important issue of the relation of regional planning to short and long term economic planning. He has spoken of the “union” between economic and regional planning. In Great Britain there is not an “economic plan” in the sense in which this is understood in Poland. It is true, that the British Government exercises considerable control over the national economic life by both direct and indirect methods (mainly budgetary and financial). It has, as we have seen, certain responsibilities for industrial location and land use planning. Certain nationalised industries, e.g. coal mining, power supply, rail transport, do exist. Some ministries, e.g. the Ministry of Transport operate plans, for trunk roads for example, that affect regional economic conditions. There is government interest in the development and location of basic industries such as aircraft production, iron and steel and agriculture. But all this falls far short of the economic planning implied by Professor Dziewoński. Thus it must be said that in the circumstances of our own country such complete union does not exist. It is greatly to be doubted whether, in our conditions of life, it is desirable that it should do so.

For the British delegation Professor Dziewoński raises the important question, “What, under conditions of Western democratic society, should be the ideal relationship between economic planning and regional planning?”

It may be helpful to consider some of the main reasons why the complete union of the two forms of planning cannot exist.

(i) We are, economically, a well developed country. The problems is not generally one of starting new development but rather one of stimulus in one place and restriction in another—a problem of balance and control, of adjustment of old situations to new conditions.

(ii) The economy is a successful and consistently expanding one. We are fortunate that living standards are generally high. The overall aim of government economic policy is to provide, while maintaining these conditions, a policy of full employment for every person, coupled with a high standard of provision of social services. It has been called the “Welfare State”. Government policy

as such aims to interfere as little as possible with the virile forces of enterprise, and with the market forces too, applying the energy of private and company enterprise, a most important agent of production, to the service of the economy as a whole. It aims to maximise the effects of market forces while maintaining only such controls, financial and locational, as are necessary to prevent them from outrunning themselves and exerting harmful effects upon town and country. The pattern of industrial location, while under control, is still determined basically by the need of the average industrial concern to minimise its costs and maximise its profits.

(iii) In an economy such as ours we do not plan in detail on a long term basis. Of course, there is forethought, but the emphasis is on flexibility and adaptability to changing world economic conditions. The parliamentary system of budget allocations works indeed on a year to year basis and though longer term outline plans exist they may need to be adjusted yearly to meet the prevailing financial situation.

(iv) Concern is often expressed that in the amalgamation of regional planning with economic planning too little emphasis is given to planning for social needs, to the physical environment, to the appearance of town and countryside, to the needs of the individual. It is said that in the pursuit of the long term economic aim it is easy to lose sight of the need to protect and provide for the welfare of the individual.

In these terms British planning aims to produce a pattern of land use, of industry and employment, of housing, education and amenity, that, while providing an efficient basis for the working of our economic system, provides also an attractive social environment for all the people of the country.

Thus, from the British point of view, we have immediate questions for discussion between the two delegations. What are the ideal relations between the economic planning and the physical planning of a country? What balance is necessary? How is this balance altered by the difference in our national geographies? How should the balance be achieved — and how preserved?

CONCLUSION

As the first speaker for the British delegation I have tried to review briefly some of the major planning problems of our country in which geographers have been interested and towards a solution of which geographical work has made a contribution. My colleague, Mr. Caesar, will say more about the problems of the various regions of the country, in the study of which he has been actively concerned. Later my colleagues will present some of the major features of geographical work on the issues I have indicated. Thus Professor Beaver will

speak on the rehabilitation of the industrial landscape, Dr. Henderson on the problems of rural land use, Professor Smailes and Professor Edwards on the geographical contribution to urban planning.

I have tried to show that the aims of national planning in Great Britain are conditioned by our present geographical conditions, by the existing patterns of land use and by a developed pattern of location of industry and population with its characteristic economic specialisation of area. The objects and methods of national planning for town and country are conditioned also by the social conditions of our country and the particular circumstances of our own philosophy of democratic society and government.

It is not to be expected that the aims and purposes of planning in our two countries will in all respects be the same. In the light of these different aims our geographical work related to planning must inevitably show differences as well as similarities of tasks and methods. I am sure that we shall understand better the problems and results, successes and difficulties of geographical work in our two countries if, in this light, we approach one another's problems with sympathy and understanding.

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Alfred A.L. Caesar

PROBLEMS OF REGIONAL PLANNING IN GREAT BRITAIN

I have been asked to outline briefly some of the main planning problems in Great Britain and to show something of the contrasts in planning problems between regions.

Geographical values and appreciation of the changes in geographical values are of the greatest importance in planning, and they find expression on both the national and local scale. But all planning in Britain must begin with certain geographical fundamentals. Britain is a small island, with still smaller off-lying islands, which has a very dense population and an advanced industrial economy. There is therefore intense competition in the use of land. Further, unlike Poland, Britain is very irregular in shape and has a very varied relief so that local accessibility becomes an important factor in development. Many of the highland areas of northern and western Britain present a hard environment and have a limited economic potential. Their contribution to national production cannot be great and the "effective area" of Britain is much smaller than is the total area. In addition, many new forms of development are big land users and, in areas of marked relief, it frequently happens that many wouldbe users compete not only for land but for the same land. The essential contrast with Poland then lies in this intense competition in the use of land.

Some of the main planning problems may be presented by reviewing briefly five main trends of development in Britain, the first of which is the change in the national economy. Britain saw the beginnings of the industrial revolution and the nineteenth century was a period of very rapid growth of industries and industrial towns. Much of this growth occurred before the awakening of a social conscience on living conditions and before many town planning lessons had been learned, giving Britain today a legacy of unplanned towns and much housing which is not up to present-day standards and has had its economic life. But the nature of the industrial growth was a response to the world economy of the time and to Britain's position in that economy, with a world-wide market for coal, iron and steel goods, cotton textiles and other manufactures. The location of these industries within Britain is also a response

to nineteenth century conditions. The transport facilities then available, the new techniques in the metallurgical and engineering industries, the dominance of coal as a source of power and the inefficient use of coal all contributed to the growth of the coalfield industrial concentrations. With this development Britain was also becoming increasingly dependent upon imported foodstuffs and upon much larger quantities and a wider range of imported raw materials. So far as geographical patterns within the country are concerned, the ports are the sources of these materials and there grew up the secondary port concentrations of industry. London had a share in this development but also provided an incentive for much other industrial growth. It is today, as it has always been, a major industrial area of the country.

So came into being the basic pattern of industrial distribution in Britain — the pattern evident today from the map of distribution of population. But there were also differential features. The scale of industrial development generally was conditioned by large export markets but areas such as the coastal coalfields were much more dependent upon export markets than was the country as a whole. Similarly these areas specialized in a comparatively narrow range of industries and in this respect too were more susceptible to trade fluctuations.

The economy of Britain, as developed before the First World War, was bound to change gradually in time as industrialization proceeded elsewhere. But the First World War greatly accelerated the rate of change necessary. Britain was cut off from many of her suppliers and from her markets and many of her customers made alternative arrangements. War needs themselves stimulated industrial development in many countries. After the war capacity in many industries was much greater than any likely market would require, but within the country the effects were much more severe in those regions which showed the greatest dependence upon a small range of the older industries or upon export markets. The main effect in these regions was heavy and prolonged unemployment with all its concomitant social problems. Britain's "problem areas" had come into being.

The inter-war period also witnessed the rapid expansion of newer industries, among them the production of cars and aircraft, the radio and television industries and the manufacture of many new household appliances. But the location factors of these newer industries differed markedly from those of the older industries. In few of them were transport costs, of either procurement or distribution, of great significance, and the effects of the development of road transport were already evident. Although these industries were concerned with export markets, they were much less so than the older industries had been and the scale of development was determined largely by the size of the home market. The distribution pattern of the home market had a new significance. The Midlands of England and the fringes of London were most favoured areas and these were the areas of the most rapid industrial development.

During the inter-war period in Britain therefore there were areas of contraction of older industries and areas where newer industries were expanding relatively rapidly. The change in overall distribution has been defined as “the drift to the south” but this is a very poor definition. It was not in the main a movement of existing industry and it was not a problem of differential growth between north and south. The real problem lay in the new values of the centre of England, as compared with the periphery, and appreciation of these changes in geographical values is essential in the planning of Britain. The inter-war period also witnessed the first real intervention of the government in the planning of industrial distribution with the “Special Areas” legislation. This designated four areas — Industrial South Wales, Durham and Tyneside, West Cumberland, and industrial Clydeside — as “Special Areas”, areas where special provision for new industrial development would be provided and special inducements offered to firms willing to set up new factories and provide new employment in them. Here was an attempt to do something to solve the social troubles of the “problem areas”.

The second main trend in Britain has been the very rapid development of road transport. It has produced a fundamental change in space relationship. The “effective” area of Britain is small and almost any distance within that area is within the short haul of road transport. The rapid service of road transport for a great variety of goods between any two points without break of bulk provided a great facility, but it also emphasized the values of a central location in the country. It increased the size of the area which could be served from a given city and aided the commercial growth of large cities at the expense of small towns. Road transport produced changes in farming particularly with the new possibilities of marketing fresh milk from marginal hill areas not well served by railways. It also resulted in much more movement of people about the country generally. It facilitated commuting and the growth of low-density dormitories and produced an enormous increase in holiday travel by private car. This, added to the development of freight transport, required new roads and the improvement of roads and this in turn made a new demand on land.

Road transport has been the main agent in producing the third main trend—the growth of large cities. The planning problem in cities is not only that of growth of population but of the spread of a given population over a much larger area. Most British people, and perhaps the Englishman in particular, like their own small houses with enclosed gardens. It was this liking which resulted in the rash of semi-detached villas built in the nineteen thirties and the rapid spread of the residential areas of cities. The British are not generally flat-dwellers, but tastes are changing — they may have to change as the built-up areas spread further and further. But the effect was not only in residential areas. Sites alongside arterial roads on the edges of cities were of increasing value

to industry with access to city services but lower land values, and increasing provision has to be made for much development. The siting of country bus termini has become a major item in replanning the centres of cities; and the ever-increasing problem of car parks has revolutionised the ideal layouts of both central and suburban shopping centres. Britain is now at the stage when the car park should be the central feature of the shopping centre and new shopping centres may have to be on the fringes of cities as adequate land will not be available in the centres. The effects of the full development of road transport upon the ideal layout of cities has been so great that past experience of city planning is of limited value. One of the main problems of planning is getting the planners themselves to realize the magnitude of the change.

The fourth trend is a gradual depopulation occurring mainly in peripheral areas with a hard physical environment but also in some better-favoured rural areas. It is essentially a function of comparative advantages. The range of possible employments in such areas is small and any young man or woman seeking, for example, a career in one of the professions, and the standard of living which goes with it, will move out. Agriculture is now very highly mechanized and many fewer workers are needed for the same output. Moreover these areas are frequently unattractive for new development, partly as a result of relative inaccessibility, but mainly because investment in them is likely to produce a smaller return than would the same investment in a more favoured area. Such a declining population is but one expression of a society of ever-increasing complexity and the general trend of concentration of much economic activity in a small number of large urban centres. So powerful is this trend in the present century that it is almost certainly idle to attempt to prevent it. Planning should recognize it and make provision for it in the most desirable form. Meanwhile, gradual depopulation itself aggravates the difficulties of providing the services necessary for a high standard of living in out-lying areas.

The fifth trend in Britain may be summed up in the words "social changes". These have included much higher wages and purchasing power, shorter working hours and more leisure, holidays with pay which are now general and, through taxation, a great reduction in the range of personal incomes. In these respects a social revolution has occurred in Britain which is as great as that in any other part of the world but it has been managed quietly. It finds expression in planning in a number of ways and, immediately, in still greater needs for new housing, improved shopping and entertainment facilities, and still greater private car traffic. But many leisure occupations are big users of land. The provision of sports and recreation facilities is a major item of plans in Britain and this is particularly true on the coasts. The volume of movement to the coast, indeed of daily private car movement alone, will scarcely be appreciated in any other country, but it is another expression of the geography of Britain. But leisure time and travel about the country have greater implications — no one

part of the country can be planned without relation to the needs of other parts, local planning in isolation of even detailed land use now has no real meaning. Wider considerations should be paramount. On the large scale national parks have been established, on the smaller scale green belts have been delimited. Unfortunately other interest can still nibble at them.

These then are the main trends, but the Second World War produced a marked effect. In some respects it represented a temporary reversion to an earlier economy and certainly to a much lower standard of living. After the war the main trends reappeared — some with emphasis added by the years without civil development. Physical damage in many cities had been considerable, though not on the scale of some Polish cities; but housing, some industrial rebuilding, and the re-development of the older core areas of cities were now of even greater importance. Much remains to be done. The “problem areas” reasserted themselves though there has been little unemployment since the war. The Special Areas have been reconstituted as “Development Areas”, there have been some changes in boundaries and new areas have been added. With a general shortage of labour in post-war years these areas have become relatively more attractive to new industry, but the long-term problem has not yet been solved.

These main trends find differing expressions and are of varied relative importance in different regions of Britain. The north and west of Scotland, the off-lying islands, and parts of Wales show the extreme cases of the problems of the periphery and some relic economic forms. The older coalfields, such as parts of Lanarkshire, N. E. England, West Cumberland and South Wales are the problem areas of nineteenth century industrial development. Some industrial buildings are old and of specialised types which cannot be adequately adapted for new purposes, land has been rendered derelict by mining tips or subsidence, there is much sub-standard housing which has had its economic life and few good sites for new industrial development. A wider range of industries and much improved amenities are essential. Other coalfield areas and the larger port industrial areas present somewhat similar problems on a lesser scale and in all the main need is re-development. In many cities and towns of the Midlands of England provision is necessary for considerable industrial expansion with all corresponding services and living amenities. The south-west peninsula of England is a favoured area for summer holidays and has become increasingly dependent upon tourism. It is an excellent example of the need to plan a region in relation to the needs of the rest of the country, both in terms of its own facilities and of greatly improved road access to it from the main centres of population. Other features of its economy show the problems of the periphery. London and the south-east of England is a special case. London is already a vast city but provision must be made for further growth. The planning problem is the form which expansion should take. Satellite towns provide part of the solution but many difficulties have yet to be resolved. The ever-increasing volume of road

traffic is rapidly strangling the city and delays are very costly. A prohibition or restriction on road transport would be economically stupid. A major scheme of road building to meet the needs of the next century is essential whatever the cost. These then are some of the main regional planning problems, but other parts of Britain present almost equally varied if less complicated problems.

The need for planning in Britain today is mainly a function of rapid changes—of changes in the economy combined with a social revolution and a transport revolution. Rapid adjustment is essential, but it can never afford to be wasteful of land. The overall problem may be said to be a compound of great physical variety, economic complexity and a tremendous historical legacy. In the solution of that problem it is essential that there should be not only an understanding of geographical values but an accurate assessment of changes in geographical values.

Jerzy Kostromicki

POLISH LAND UTILIZATION SURVEY

THE DEVELOPMENT AND STATE OF RESEARCH

Encouraged by the splendid work of British geographers on the land utilization of Great Britain carried out under the guidance of Professor L. D. Stamp, Polish geographers, following the initiative of Professor K. Dziewoński, then Director of the Research Bureau in the Central Office of Physical Planning, made preparations in 1947 for a similar survey of Poland. After a number of trials had been carried out¹, however, it soon became obvious that Polish geography, destroyed by the war, deprived of its laboratories, scientific instruments and also to a considerable extent of its scientific personnel, was not in a position to undertake such work. In this situation the decision was adopted to prepare only a general land utilization map on the scale of 1:300,000 based on pre-war 1:100,000 topographical maps. This work proceeded for a number of years at all the Polish geographical research centres. A special committee, attached to the Polish Geographical Society, was set up for the co-ordination of the work, and later a special section of the Geographical Institute of the Polish Academy of Sciences. Professor F. Uhorczak prepared and supervised the whole work, which was completed in 1956. The result was a printed set of 5 main maps on the scale of 1:1,000,000 obtained by photographically reducing the 1:100,000 sheets. Each of these is devoted to one of the forms of land utilization (arable land, grassland, woodland, water and settlements) and there are also 17 derivative maps constituting various combinations of the above mentioned elements². However, a scientific commentary on these maps is still lacking. It may nevertheless be stated that the picture obtained in this way is very distinct and interesting. Some of the maps dealing with specific elements, such as the maps of arable land and forests, provide more or less a known picture which, however, reveals greater precision. The map of the water-courses points to the considerable differences in the density of the network of surface waters on Poland's territory which, however, cannot be explained here. Very interesting material is provided above all by the settlement map, showing the distribution of the forms of rural settlement on Polish territories,

the domination of concentrated settlements with elongated forms in the South (not only in the Carpathian Mountains) and in the Lublin upland, and so on, concentrated forms with more or less compact forms in Pomerania, the Lubusz region, and dispersed settlements in the centre of the country and in Mazury. This map requires scientific elaboration which would complement and develop Zaborski's synthesis which already is largely out of date. Very interesting also is the picture of the interrelations between the various forms of land utilization in maps which constitute a combination of the single elements. Particularly distinct, for example, are the interrelations especially characteristic of Poland—between grasslands on the one hand and the network of surface waters on the other, as well as those between arable land and settlements. In addition to the above mentioned printed maps the Institute also possesses the originals at the scale of 1:300,000 prepared for the various voivodships.

The above mentioned maps, due to their scale and to their obsolete topographical foundation, can only be of limited scientific and practical significance. They only present a historical picture and deal with the major forms of land utilization on a general scale. Nevertheless they are of use in teaching, and may serve as a basis for further more detailed studies. Somewhat similar maps had been prepared, particularly in connection with regional planning, in many centres of the country³, but these were prepared within the framework of the regional plans, and as a rule did not go beyond the delimitation of the major land use forms, outlined on the basis of topographical maps. The only existing detailed land utilization survey based on field work was prepared (as a matter of fact also in connection with physical planning) for Cracow, by the Department of Economic Geography at the Jagellonian University under the direction of Dr. K. Bromek⁴.

So the idea of a detailed land utilization survey was taken up again, and Prof. K. Dziewoński was the initiator of further attempts. In the years 1953 and 1954 attempts were made in the Warsaw centre to prepare detailed land utilization map on a scale of 1:25,000, on the basis of field work done in the Sandomierz region on a scale 1:10,000. On the basis of these experiments a preliminary guide to methods was prepared⁵ and in 1955 larger-scale work started in Mrągowo county, Olsztyn voivodship. In 1956 this work was continued in the Mrągowo region (still under the direction of K. Dziewoński) and in Bielsk Podlaski (under the direction of J. Kostrowicki). Samples of these maps were presented to the Reporting Session of the Institute of Geography of the Polish Academy of Sciences held in 1956 (K. Dziewoński) and next also at the International Geographical Seminar in Aligarh—India (K. Dziewoński) and to the meeting of Section of Agricultural Geography at the 18th International Geographical Congress in Rio de Janeiro (J. Kostrowicki)⁶. In India and in Brazil the Polish methods aroused considerable interest, proof of which was the

election of the Polish representative (J. Kostrowicki) as member of the Commission of the World Land Use Survey of the International Geographical Union.

As a result of the reorganization of the Department of Economic Geography at the Institute of Geography of the Polish Academy of Sciences (P.A.N.) work on a land utilization survey was taken over in 1956 by the newly established Section of Agricultural Geography directed by J. Kostrowicki. Work on land utilization in urban centres was conducted by the Section of the Geography of Population and Settlement, directed by K. Dziewoński.

In the following years the scope of the work was considerably extended. In the years 1956–1959 under the auspices of the Institute of Geography of the Polish Academy of Sciences surveys were made in 15 counties (powiat) covering approximately 9000 square kilometres⁷. Other organization co-operating in the work were the Department of Economic Geography of the Jagellonian University in Cracow, the universities of Toruń and Łódź, and the Higher Pedagogical School in Gdańsk⁸. Further, some land utilization surveys in urban centres were started in 1956, on a scale of 1:5,000⁹.

During this period Polish survey methods were twice presented in the U.S.S.R.—at the Geographical Institute of the Academy of Sciences, and at the Moscow University in 1958—and also in 1958 in the Institute of Geology and Geography at the Rumanian Academy of Sciences in Bucarest (J. Kostrowicki)¹⁰. Scholars and students of the Moscow University had undertaken practical field work in Poland in land utilization survey in the years 1958 and 1959, and some British (A. French) and Hungarian geographers (G. Enyedi) also took part. The experience accumulated in the 1956–1958 from various parts of Poland, each characterised by different natural conditions and by various types of farming economy, permitted the final establishment of the method of survey, as well as the classification of land use forms and the symbolism of the map. The method was presented in 1959 in detail and the special detailed instruction was published¹¹. Several studies based on the land utilization survey have now been published¹².

THE AIM AND CONCEPT OF THE SURVEY

Research connected with land utilization has two objects, scientific and practical, but it is difficult to separate them. The most general scientific aim is, above all, the study of the ways in which man's economy utilises its natural environment. This is essentially a geographical study, which can be greatly helped by land utilization survey.

The comparison of the cartographic picture of land utilization with the conditions and possibilities of the environment can reveal a lot about the level

of the development of human economy, about its intensity, and about the rational or irrational land utilization in the given technical, social and economic conditions. If we add the wealth of material and observations collected during field work which cannot find expression on the map, then the survey can serve as an important foundation for the drawing of conclusions aimed towards a more rational utilization of the geographical environment. This is its great practical significance. Obviously, research on land utilization does not touch equally all the forms of man's economic activity, though all of them find their reflection in it. It must deal more with those forms of economy which are spatially located and more directly connected with the utilization of the forces and resources of nature than with those forms located in certain points and less directly connected with nature. It is more keenly interested and penetrates deeper in geographical problems of agriculture, forestry or fishing than in those of industry, transportation or trade which require other specialized methods.

The scientific and practical significance of detailed land utilization survey finds its expression also in the fact that if the proper methods are used, they provide a good foundation for research on the geographical typology of agriculture.

Work on the geographical types of agriculture¹³ goes back to the end of the twenties and the beginning of the thirties of the present century and today is successfully practised both in the West and in the East. A great contribution in this field was made by American geographers who published in the years 1926-1943 a long series of papers on the agricultural regions of the globe, as well as by French, British, German, Swiss, Italian, Portuguese and Soviet scientists who made considerable contributions towards this trend in agricultural geography.

The majority of cases are studies based on research conducted in small areas, and by various methods which cannot be compared with each other. Agricultural geography is still in the stage of development in which, for instance botany, or rather phytosociology was years ago, in a stage where the various species or plant associations are described and distinguished by the implementation of various methods. It was only later that the period of systematization came (in phytosociology, for example, thanks to the outstanding work of the so-called French-Swiss school of J. Braun-Blanquet), where species or associations were grouped in proper units of a higher order based on uniform foundations, in the period of the scientific classification of phenomena which before were only described.

Land Utilization Survey, provided it includes the essential elements for such a classification, can become the basis for this kind of scientific geographical typology of agriculture. This can be of great scientific and practical significance.

It is precisely the elaboration of such a typology of Polish agriculture which is one of the aims of Polish research on land utilization. At present we are in the stage of describing the forms, systems and types of agricultural economy, but

this takes place already in a uniform and methodical way, based on such a uniform foundation as is provided by the land utilization survey. We have no intention of covering the whole of Poland with detailed surveying, though this could be very useful, since we have neither the man-power nor the means for it. What is involved here is rather the familiarization and study, on the basis of the proper representation, of the mechanism of activity of various types of rural economy. This knowledge will in turn permit, on the basis of a system of worked out indices, the definition of the areal extent of the various types of economy, approached as a complex result of historical processes, active in a definite geographical environment, which finds its expression in a certain definite system, direction, intensity and productivity of rural economy.

Typological research in the sphere of agriculture is also of considerable practical significance. Changes in the system and direction of agriculture, despite the fact that sometimes a number of elements undergo rapid changes, occur gradually, by a process of evolution. Thus feudal agriculture in West-European countries was slowly transformed into a mixed capitalist agriculture, as a certain type which slowly undergoes further transformations and changes. Despite a number of even revolutionary changes in social relations the types of agriculture in socialist countries change only slowly. Forty years after the Revolution many kolkhozes in the U.S.S.R. still use similar systems of farming, maintain the same or similar directions of economy and even obtain only slightly better results. In Polish agriculture also, after 15 years of planned economy, not much has changed.

The systems of rural economy used today and in the past are based on centuries-old experience of the local natural conditions, which one should not neglect, because some of its elements may turn out to be very valuable even for the future transformed, mechanized and socialized economy. This is particularly so in difficult environments where natural conditions require special ways of farming. We have in Poland a bitter experience in this regard, for example, from the Żuławy or Sudety areas where an outlandish type of rural economy, introduced after the war, yielded deplorable results and where, after years of trials and errors, one was forced to go back to the former type of farming.

The Polish land utilization survey tries to combine the scientific aim of getting acquainted with the techniques, the economy and the results of the utilization of the geographical environment with the practical purpose of defining the degree of rationality in this utilization and of drawing conclusions regarding the introduction of changes in it. The scientific and practical purpose of surveying, for the time being only as regards agriculture, is also the elaboration of the typology of this utilization, the geographical typology of agriculture. Slightly different is the case with urban land use survey. Its aims are the following: (a) to prepare the typology of land use forms in urban settlements based on social, economic and technical criteria. Such typology would permit a critical

appraisal of the real worth of zoning based on land utilization and forms of building used in urban planning; (b) to determine and check the interrelations existing between various forms of land use in urban settlements and the natural environment; (c) to collect comparative data both cartographical and statistical for the developing and deepening of the theory of urban geography particularly in the range of physiognomic research and analysis.

THE SCOPE OF RESEARCH

Land utilization is understood in the broadest sense of this concept as the utilization of a geographical environment i.e. the natural forces and resources, by all the branches of man's economy.

There are various aspects to the research work, as follows:

The natural background to land use—i.e. the geographical environment, its forces, resources and conditions, evaluated from the economic point of view—(a) the object of land utilization.

The social background to land use—i.e. who utilises and owns the land (state, co-operative or private property—large, medium, and small holdings, fragmentation of holdings, and so on)—(b) the subject of land utilization.

The actual use of the land e.g. arable, permanent grassland, forests, water, settlements i.e. (c) the form of land utilization.

The technical and organizational aspects of land use (i.e. the methods of crop-rotation, the use of fertilizers and mechanical aids to cultivation; the methods of forest exploitation—partial or clear felling etc.; the utilization of the water resources and so on) i.e. (d) the way of land utilization.

The economic aspects of land use comprising the objects of agricultural or forest production i.e. (e) the orientation or direction of land utilization and (f) the resulting amount of production i.e. the effect of land utilization.

These six categories are obviously inter-related. Natural conditions exert their influence on both the directions and the results of land utilization. Similarly, the form of land ownership exerts its influence on the economic ways and on the technical aspects of farming. And finally the ways of land utilization are interrelated with its orientation and exercise considerable influence on the results obtained.

The various categories of land utilization find their expression in the various stages of the elaboration of the basic material and only some of them can be found on the land utilization map whose capacity is, after all, limited and in our opinion should picture primarily facts rather than their interpretation. Thus the land utilization map presents the following four classes of data:

(i) The form of land utilization is shown in groups of colours, as laid down by the Land Utilization Commission of the International Geographical Union, with only a few unavoidable modifications.

(ii) The subject of land utilization is shown by property boundaries. Because of the scale of the map, and the lack of proper base maps, the boundaries of small farms within villages are not indicated.

(iii) The way of land utilization is shown with the help of corresponding black symbols.

(iv) The directions of land utilization are shown by means of suitable colour gradations within the main forms of land utilization.

As regards the remaining categories, the data collected in the field are used in the later stages of elaboration. Thus the natural conditions of any area are not indicated on the land utilization map. It is only when the stage of monographic elaboration is reached that maps of the geographic environment are prepared separately for the various fields of economy (agriculture, forestry, industry and so on).

These maps are prepared on the basis of existing data (geological, geomorphological, hydrographical, climatological, geo-botanical maps, etc.) to throw into relief certain essential elements which influence a given branch of economy. Their value and precision thus depend primarily on the availability, value and precision of the base topical maps and data.

Only to some extent they are supplemented by direct observation in the area. Indications of the intensity and productivity of rural economy have also been omitted from the land utilization map since these are items which fluctuate widely in time and space. Much of the material collected in the field is only partly utilized on the map, though it will appear in the further written elaboration of the results.

As already mentioned, the detailed character of the Polish land utilization survey makes it impossible to cover larger areas, and for this reason it is planned in the near future, using the methods already tried, to prepare a simplified general land utilization survey on the scale 1:300,000 with which the entire country could be covered.

In that case Poland would have three kinds of land utilization maps: (1) a general land utilization map at the scale 1:1,000,000 (basis 1:300,000), prepared in the office, representing the distribution of the main forms of land utilization (already published for the whole of Poland); (2) a general map at the scale 1:300,000 (basis 1:100,000), partly office work, partly based on field-work, which gives a much more detailed picture of the various forms of land utilization (for the entire country, method is to be prepared); (3) a detailed map at the scale 1:50,000 (basis 1:25,000 or 1:10,000) entirely prepared on the basis of field work, presenting an exact picture of land utilization in specially selected areas (this work, method being elaborated, is at an advanced stage).

TECHNIQUE AND METHODS OF WORK

Land utilization mapping is done in the field, mainly by special expeditions.

Before departure to the given area the basic cartographical material is prepared (working maps at the scale 1:10,000 or 1:25,000 and aerial photos), blanks, instructions, keys of symbols and material related to the examined area (statistical data, material related to forests) and other material that helps an understanding of the problems. The expeditions are made up of scientific workers of the Institute of Geography of the Polish Academy of Sciences who, as a rule do their fieldwork approximately three months in a year, or scholars from universities and frequently also senior students engaged in practical fieldwork. Such expeditions are made up of groups of 10–20 people who have a truck at their disposal, motorcycles and bicycles. In charge of the expedition as a rule, is a more experienced scientific worker of the Institute or University. Participating in the research are divided up into small groups, usually of two people (commonly the assistant and a student) and their task is to survey land utilization within one gromada (commune). The time allowed for surveying one commune varies depending on the area to be covered and the natural and economic conditions. Mountainous areas take more time than flat country, private farms more than socialized farms, covering large areas. As an average a medium-sized commune (approximately 40 square kilometres) with two people working on it takes 10–15 days. An expedition usually lives together in one building (usually the school), the groups are transported to and from the field of operations by truck. Material is obtained both by means of observation and by interviewing the population, and is also obtained from the commune and county administrative authorities (statistical data and other official data), the managements of socialized farms, the chief forest offices and so on. Material is collected and accumulated to be recorded on forms especially prepared for this purpose, with separate forms for each type of land utilization in a given economic unit (village, state farm, forestry, fishery and so on). A set of forms for one commune, together with statistical data and field sketches drawn up on the basis of a topographical map, constitutes the fundamental material on the basis of which a draft land utilization map is prepared.

The various stages in the preparation of the material may be listed as follows:

A. Preliminary assemblage.

(i) A set of basic material including filled-out forms, statistical lists and descriptions as well as field maps, for the given commune.

(ii) The land utilization map of the commune, drawn up during field work, on the basis of a topographical map, aerial photographs and filled-out forms on the scale of 1:10,000 or 1:25,000, depending on the differences of local

natural conditions (for example mountains) or economic conditions (for example suburban zones).

B. Fragmentary elaborations.

(i) Land utilization map for larger areas on a scale of 1:10,000 or 1:25,000 (to be published at 1:50,000) drawn up in the office, according to the sheets of the topographical map, on the basis of material mentioned in Point A, (i) and (ii).

(ii) Scientific report on research conducted in a given area, emphasizing the most important and most interesting scientific and practical problems of land utilization survey. This report includes a certain number of analytical maps based on the material collected during the survey.

(iii) Elaboration of particular problems, interesting from the scientific or practical point of view, on the basis of material from field survey. This work includes a number of analytical or synthetic maps which help to elucidate the given problems.

C. Full conclusions.

Monographic land utilization study, fully utilizing the material obtained as a result of field survey and also other data characterizing the natural and economic conditions of the area under investigation (as a rule a county) in order to supply answers to the questions (a) how are the natural conditions of the county under investigation utilized (the analytical part); (b) whether and to what extent could the present land utilization in the given county, in the present technical, social and economic conditions, be considered as rational (the synthetic part); (c) what could eventually be done to rationalise further the pattern and techniques of land utilization. The prepared work includes profuse cartographical material, made up of a considerable number of analytical maps, of number of synthetic maps and land utilization map (point B), (i) which serves as an annex to this work.

The last stage is but an outline plan, since so far only one county monograph has been started.

SUMMING UP

There are various differences between the Polish land utilization survey and other elaborations of this type, prepared and published at present in many countries throughout the world.

If compared with the first large-scale land utilization survey—the Land Utilization Survey in Great Britain, though based on the same principles, it differs above all because of its markedly more detailed character, particularly as regards the utilization of arable land, which is of the greatest significance in Poland. The map alone supplies a certain picture of the agricultural system

used (crop rotation) and of the agricultural economy (the share of the main groups of crops and the dominant role of some of them). Perennial crops are also treated in a more detailed way. The Polish survey also gives a more detailed picture of forest areas, particularly in relation to the types of forest as well as the age of trees and so on. But meadows and pastures which cover considerably smaller areas in Poland are treated with less precision. The Polish detailed land utilization map, on the other hand, gives no more information than the British map as regards settlement areas. These differences are the outcome of the different tasks which the Polish survey has set itself and also of the greater possibilities of introducing to practice the results of survey in a system of planned economy. The practical aim of the British survey was, above all, to draw conclusions as to the possibilities of changes between the main forms of land utilization. In Poland these forms have a more permanent character and do not require far-reaching changes. But what needs changing are the ways and the directions of land utilization and that is why particular attention was paid to this problem. The minuteness of the survey increases on the other hand the labour-absorbing character of this work which in turn limits the possibilities covering larger areas. That is why, as already mentioned before, it is planned to prepare a method of simplified surveying.

In comparison with the more general (1:200,000) Italian land utilization survey, the Polish survey is more detailed except in its indication of perennial crops, which due to the specific character of that country have been indicated with special minuteness on the Italian maps. We have not yet managed to prepare texts similar to the British or even the Italian ones, though provisions have already been made for texts which are now being prepared. Of all the maps known to me, the Polish survey, as regards its precision, comes closest to the Japanese and some Canadian maps. The distinguishing feature of the Polish survey is that it lays more stress on the system and direction of the utilization of arable land.

As regards work executed in the U.S.S.R. surveys which sometimes include particularly minute details, concentrate almost exclusively on research related to the geographic environment from the point of view of agriculture and only in regard to agricultural land. Economic problems are almost entirely omitted. Work performed for the various kolkhozes in closest co-operation with the agricultural administration yield as a practical result certain recommendation as to the ways of farming in definite conditions, varying according to the natural conditions of a given area. However, there is a lack of any kind of elaboration or scientific generalization based on this research. In comparison with Soviet work, the Polish survey is undoubtedly inferior as regards to the grasping of natural conditions of agriculture, but is superior as to the scope of the whole research work and in its scientific approach to the economic-geographical problems.

The Polish land utilization survey which delves deeply not only into the form, like the majority of surveys, but also into the technical and economic aspects of land utilization, is in general more detailed, reaches deeper than the majority of similar work performed in other countries. This detailed surveying makes it more difficult to cover larger areas, but the practical significance of the results is greater.

Any reduction of the scale of the map would be an obstacle to the fulfilment of the practical aims of the survey; any enlargement in scale, on the other hand, would hamper its scientific achievements, and would emphasise agrotechnics, at the expense of geography. In addition to this, the geological, geomorphological, hydrographical and other surveys which serve as a foundation for a comparison of the economy with the conditions of the natural environment during the stage of the elaboration of survey material, are conducted in Poland on the same scale as the land use survey.

The Polish survey tries to maintain an equilibrium between the scientific and practical aims of the work, and it thus provides the national and regional economy with much useful material. The method was carefully prepared and, as it seems, serves its purposes well in Poland's natural and economic conditions. To what extent these methods may be adopted by other countries is a subject for discussion.

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- ³ Such as: Land Utilization Maps of the Dunajec valley (1953) of the Warsaw region (1946), the Cracow voivodship (1948), the Łódź region (1949), the Goczałkowice area (1953), that of town of Świnoujście (1949) etc.
- ⁴ See K. Bromek. *The preparation of a Detailed Land Utilization Map of Cracow*. "Przegląd Geograficzny", 27, 1955, No. 3–4, pp. 589–604 (in Polish, English summary). First the map was based on A. Jahn's scheme from 1947–1948 and prepared on the scale of 1:25,000. Practical requirements (Cracow town planning) made it necessary to adopt a larger scale (1:5,000). The classification of forms of land utilization was changed and adapted to the requirements of the urban problems. The collected material served as a basis for a number of elaborations, the results of which have not yet been published.
- ⁵ K. Dziewoński, J. Kostrowicki, H. Piskorz, R. Szczęsny. *A temporary instruction of the preparation of detailed land utilization maps (draft)*. In Polish. "Dokumentacja Geograficzna" 1956, Supplement 1, p. 39 (in Polish).
- ⁶ K. Dziewoński. *The Detailed Land Use Map in Poland*, 18th International Geographical Congress, Brazil 1956. Abstracts of Papers. Rio de Janeiro 1956, pp. 150–151 (in English). K. Dziewoński. *Detailed Survey of Land Utilization in Poland*. "Przegląd Geograficzny", No. 28, 1956, Supplement pp. 26–31 (in English).
- ⁷ The following surveys were made: in 1955 — Mrągowo county, in 1956 — Mrągowo county (completed) and Bielsk Podlaski; in 1957 — Bielsk Podlaski (completed), Inowrocław

- and Wysokie Mazowieckie counties; in 1958 — Inowrocław (completed), Krosno, Pińczów, Myszków, Krapkowiec, Złotoryja, Koszalin and Kościan, as well as Gdańsk counties. In 1959 — Krosno (continued), Pińczów (completed), Cieszyn, Kartuzy and Suwałki counties.
- ⁸ These same methods were used for surveys made in 1957–1959 in the Limanowa and Olkusz counties (Cracow), in 1957 in Lipno county (Toruń), in 1959 in the Wieluń county (Łódź) and in Kartuzy (WSP Gdańsk) in 1958. The Bartoszyce county was prepared as a commissioned work (by K. Borowicz) in the years 1957–1958.
- ⁹ The following towns were studied: in 1956 — Mrągowo; in 1957 — Inowrocław and Trzcianko-Zdrój; in 1958 — Biskupiec, Bytów, Olecko, Warka; in 1959 — Mińsk Mazowiecki, Olesno, Świebodzin.
- ¹⁰ J. Kostrowicki. *Polish Research Work in Land Utilization Problems*. Izvestia Akademii Nauk SSSR, seria geograficheskaja, 1958, v. 4, pp. 131–134 (in Russian).
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- ¹² For example: W. Biegajło and J. Tobjasz. *Three-field Crop Rotation with Fallow System. The Village of Grabowiec*, “Przegląd Geograficzny”, 29, 1957, No. 1, pp. 111–142 (Polish and English Summary). W. Biegajło. *Agriculture in Suburban Zone. The Commune of Horodniany*. “Przegląd Geograficzny”, 29, 1957, No. 1, pp. 143–158 (Polish and English Summary). R. Szczęsny, H. Piskorz, J. Rakowicz. *Studies on Land Utilization in Mrągowo County* (material from research work conducted in the years 1955–1956). “Dokumentacja Geograficzna”, 1959, No. 1, p. 103 (in Polish). W. Biegajło. *Farming in Gdańsk — Żuławy. Village Radunica*. “Przegląd Geograficzny”, 31, 1959, No. 2, pp. 345–360 (Polish, English Summary). R. Szczęsny. *Farming in Lower Beskid. Village Cergowa*. “Przegląd Geograficzny”, 31, 1959, No. 3–4, pp. 629–644 (Polish, English Summary).
- ¹³ J. Kostrowicki. *Trends in the Development and the Tasks of Agricultural Geography in Poland*. “Przegląd Geograficzny”, 29, 1957, No. 1, pp. 3–19 (in Polish with English Summary).

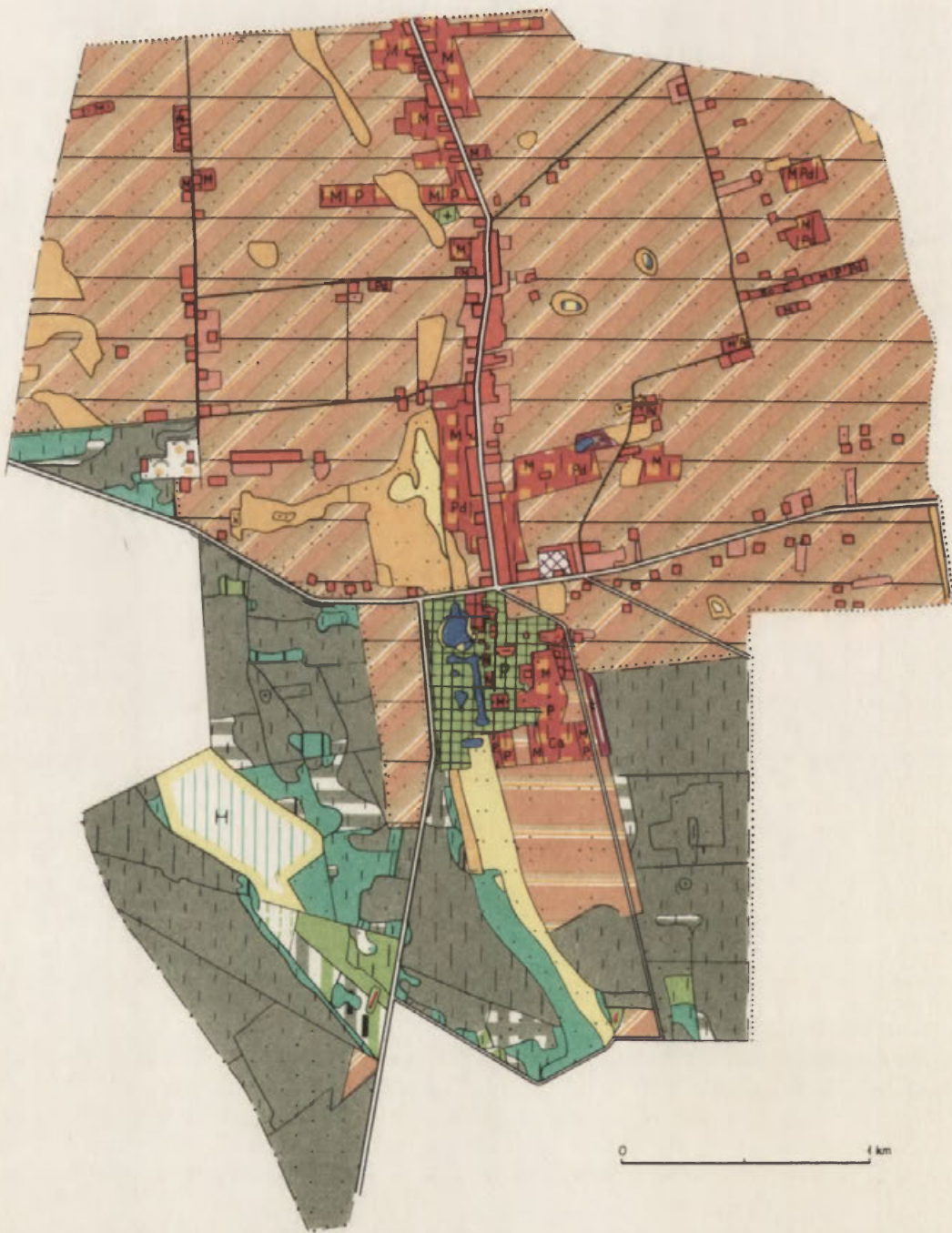
Appendix

Władysław Biegajło, Danuta Kowalczyk, Henryka Piskorz

LAND UTILIZATION IN NIEBORÓW



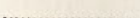
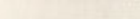

1. Object of land utilization — Conditions of the geographical environment

The village of Nieborów, the object of this report, belongs to the commune (gromada) of Nieborów situated in the eastern part of the Łowicz county (powiat).

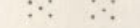



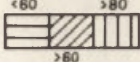


<http://rcin.org.pl>
Fig. 1. Land utilization in Nieborów



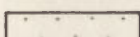
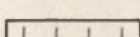
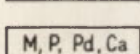


AGRARIAN STRUCTURE

-  commune boundaries
-  state farm boundaries
-  private farms boundaries
-  limits of major uses
-  fragmentation of agricultural land (farms up to 5 hectares over 25% agricultural land)




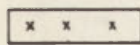
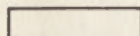
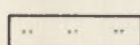
ARABLE LAND

-  five year crop rotation without fallow
-  cereal orientation with preponderance of rye
-  root crop orientation with preponderance of potatoes
-  fodder crop orientation with preponderance of annuals
-  number of animal units per 100 hectares of agricultural land



ORCHARDS AND GARDENS

-  small farmhouse gardens and orchards (together with settlements)
-  market gardens
-  orchards of non-productive age
-  orchards of productive age
-  prevailing species of fruit-trees (M-apple, P-pear, C-cherries, Pd-plum)
-  orchards with cultivation of root crops and vegetables
-  orchards with cultivation of fodder crops

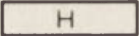
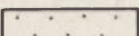
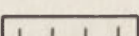
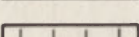
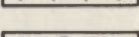
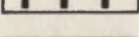

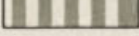




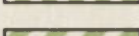
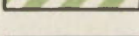

GRASS LAND

-  permanent grassland, postdeciduous, fertilized from arable land
-  permanent grassland, marshy, on peat bogs
-  reeds and other aquatic vegetation on water
-  improved entirely
-  not improved
-  meadows cutting twice yearly

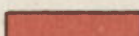
UNUSED LANDS

-  excavations
-  moving sands covered with dry grass

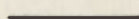
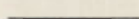
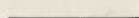
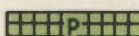


FORESTS

-  felled (halizny)
-  young
-  immature
-  mature
-  old
-  pine over 80%
-  pine over 20-80%
-  spruce over 80%
-  nurseries
-  oak over 80%
-  oak over 20-80%
-  birch over 20%
-  alder over 80%
-  alder on meadow
-  bush on moist habitat

SETTLEMENTS

-  urban workers allotments
-  large-estate builded area
-  small country houses with associated agricultural buildings (farmsteads)
-  exploitation, of mineral resources gravel, sand
-  warehouses

OTHER

-  roads hard surfaced
-  other hard roads
-  non surfaced rural roads
-  parks, green belts etc.
-  cemeteries
-  ponds

From the physiographic point of view Nieborów lies on the western borders of the Warsaw Basin which is a depression shaped in tertiary and cretaceous formations. It is filled with fluvio-glacial and fluvial deposits of the "pre"-Vistula dating from the last glaciation (Würm). Sands covering the edges of this depression lie on morainic clays originating from the Middle Poland glaciation (Riss).

The area investigated occupies a part of a larger plain which may be considered a denudated southern terrace of the Bzura river running at 90–95 metres above sea level. The area is composed mainly of sands of various depths covering boulder clay, and partly of the boulder clay itself.

The village of Nieborów belongs to the drainage basin of the Bzura river. Westwards from the river, a small natural depression runs in a longitudinal direction, now being to some extent artificially deepened. Periodically it is filled with water running northwards to the Bzura river. This stream, together with smaller canals and the stream flowing across the village of Sypień is improving the water conditions in the Nieborów and Sypień areas.

Climatically, the area discussed belongs to the Central Poland region. The vegetation period lasts here for 210 to 220 days. Slight frost days amount to 110, frosty ones from 30 to 50, while hot days amount to from 30 to 35. Slight frost appears an average half-way through October, whereas the last occurs about April 15. Precipitation amounts to 550 mm yearly and takes place on 160–180 days, snowfall on 45 to 60 days, and snow cover lasts for 35–60 days. Field work begins about 21–31-st of March.

The following soils appear in the area of the village: loose sands, feebly clayey sands and black earths.

Dry loose sands of little developed humus horizon as possessing small contents of permeable particles are of extreme dryness which is their chief feature. These are acid soils with a poorly marked podsol profile. They belong to the VI class of soils and are suited best for afforestation.

Feebly clayey sands are most frequently podsol acid soils of greater agrarian value and easy for cultivation. These are rye-potatoes soils of classes IV and V; in good atmospheric conditions—when rationally manured—these soils may bear barley and wheat.

Black earths occupy a small part of the area, being for the most part shallow and lying generally on sands, more rarely on boulder clay. They belong to class IV and even to class III.

Soils of the area discussed generally need the regulation of water conditions.

It is evident from the above brief characteristics given above that the area examined does not show any special environmental features, either positive or negative for its agricultural economy. The physical conditions of this area are

similar to those appearing in the lowlands of Central Poland. From the economic point of view these conditions may be considered average for Poland.

2. Subject of land utilization — ownership relations

In the agrarian structure of the area investigated there appear two social forms of agricultural economy:

- (i) small peasant holdings;
- (ii) state economy:
 - (a) the farm of the National Museum, Section in Nieborów,
 - (b) state forests.

Peasants' farming in the village of Nieborów comprises 841,8 hectares. There are 207 farms of various sizes. Their structure is illustrated by the following table:

SIZE OF FARMS IN THE VILLAGE OF NIEBORÓW

No.	Farm size-groups in ha	Number of farms	Percentage of the total number of farms	Surface in ha	Percentage of the total area
1.	0 - 2	54	26.0	53.15	6.8
2.	2 - 5	92	44.4	314.73	40.3
3.	5 - 10	58	28.1	374.88	48.0
4.	10 - 14	2	1.0	24.10	3.1
5.	14	1	0.5	14.32	1.8
	Total	207	100.0	781.18	100.0

The above table indicates that small farms of 2-5 hectares prevail and make up to 40 per cent of the total number of the village's farms. As regards the area occupied, farms of 5-10 hectares prevail, covering approximately 50 per cent of the area. Taking into account the local conditions of the geographical environment, it is evident that the agricultural production of farms under 5 ha is almost of a subsistence character. The farms of more than 5 ha—when properly managed supply a marketable surplus.

3. Forms of land utilization

Forms of land utilization in the village of Nieborów are illustrated by the table given below.

Among the various forms of land utilization, arable land makes up the greatest percentage (80%) the grasslands are of disproportionately low percentage (11.7%). Thus almost all plant production is concentrated on arable lands, especially as pastures cover soils of rather low fertility. Orchards cover 2.8 per cent of the total village area. Their size, however, varies; some farms have but

LAND USES IN NIEBORÓW

Form of land use	Area in ha	Percentage of the whole area
Arable land	669.86	79.6
Orchards	23.14	2.8
Meadows	18.18	2.1
Pastures	80.44	9.6
Forests	1.80	0.2
Built up area	35.54	4.2
Waste land	12.91	1.5
Total:	841.87	100.0

small home orchards, supplying only their own demand. Other farms have big market orchards which cover 30,50 or even 60 per cent of the whole farm area. In the latter case orchard production is often the main source of the farm income.

4. *Ways of utilization of arable lands*

Interviews with local farmers as well as direct field observations revealed some differentiation in the way of farming on arable lands in the village. This chiefly concerns crop rotation, cultivation and manuring of soils.



Fig. 2. Arable lands of the ancient manor estate of Nieborów divided in 1945 among peasants (photo. by J. Kostrowicki)
In the background new farmsteads

As regards crop rotation, 3-4 and 5-year rotations are in practice, the latter prevailing for the village as a whole.

Three-year rotation is in use chiefly in farms of up to 3 hectares. It is a continuation of the traditional three-field farming system. The classical form of the three-field system of farming with fallow existed in the village of Nieborów up to the end of the 19th century. In the nineties of the last century new kinds of papilionaceous plants, mainly lupin, serradella, and clover were introduced. Since that time, bare fallow has been abandoned and substituted with lupin (especially bitter one for ploughing) and serradella. In spite of the liquidation of fallows the three-field farming system existed nearly up to the First World War. Then, many-year crop rotation systems came in use and now prevail. The following arrangement is an example of the three-year rotation system, now in use:

- (a) potatoes + +*,
- (b) oats, winter wheat,
- (c) rye (with serradella).

A small number of farmers apply 4-year crop rotations with the following cultivation system:

- (a) potatoes + +,
- (b) oats, barley, winter wheat,
- (c) lupin, serradella, rye +,
- (d) rye (mineral fertilizer).

However, the dominating crop rotation is now a 5-year system. It is maintained in several variants:

- (i) (a) potatoes + +,
- (b) oats, barley,
- (c) rye (mineral fertilizer),
- (d) lupin, serradella,
- (e) rye.
- (ii) (a) potatoes + +,
- (b) oats, barley (with clover),
- (c) clover,
- (d) wheat +,
- (e) rye (mineral fertilizer).
- (iii) (a) potatoes + +,
- (b) rye, winter wheat,
- (c) rye + (lupin and serradella sown),
- (d) oats,
- (e) rye (mineral fertilizer).

Much attention is given to the cultivation and manuring of soils. This may be exemplified by post-harvest tillage, commonly practised which takes place

* + + means full manuring, + means half manuring.

immediately after the winter crops have been gathered. Then, nearly all the ploughed areas are sown with aftercrops. Mixtures of sweet lupin and serradella (for drier soils) and common vetch and field pea (for wet soils) are most frequently used as after-crops. Well grown after-crops are destined for silage, whereas weaker ones are grazed by cattle and sheep in the autumn season. Manuring with dung is intensive. The intensity depends on the amount of dung available on the particular farm. The quantity of dung used under potatoes amounts sometimes to more than 30 tons. Moreover, soils are also nourished artificially, and which is to be emphasized—the latter system is used rationally depending on the type of soil and the manure demand of a particular crops.

Potassium salt (1.5 q), sulphate of ammonia (1.5 q) and superphosphates are also used as fertilizers under potatoes. As regards wheat and rye, the mineral manuring comprises silicophosphate, superphosphate and, above all, nitro-chalk in the proportion of 1 q for 1 ha.

No fallows and uncultivated plots are to be observed and this fact indicates, the intensity of land utilization. All arable land in the village is sown.

5. *Direction of utilization of arable lands*

The direction of land utilization of arable land in the village of Nieborów is indicated by the table on the page 62.

Thus, the direction of land utilization of arable lands is cereal, root and fodder crops, with rye and potatoes prevailing, which is typical for Central Poland. Only the share of fodder crops is here greater than that commonly observed. This fits the local conditions since the soils are weak and the village lacks enough good meadows and pastures. The small percentage of arable land used for industrial crops has been caused by the fact that this cultivation absorbs much labour time and the village labour force in agriculture is weakened by the fact that nearly 100 inhabitants, mainly young men, do not work in agriculture. They are employed in Warsaw and its vicinity as well as in Łowicz. Besides, it is the farmers' opinion that fruit crops are more marketable than industrial plant crops. This is reflected in the establishment of a large number of new orchards.

6. *Results of utilization of arable land*

The yields obtained in the village of Nieborów are as follows:

rye	from 14 to	20 q per 1 ha			
wheat	„ 14 —	22 „ „ „ „			
oats	„ 12 —	20 „ „ „ „			
barley	„ 15 —	22 „ „ „ „			
potatoes	„ 100 —	200 „ „ „ „			

Considering the soil and climatic conditions of Nieborów, these crops are satisfactory.

UTILIZATION OF ARABLE LANDS IN NIEBORÓW

Crops	Hectares	Percentage
Cereals:	368.2	53.7
Wheat	30.8	4.5
Rye	260.6	38.0
Barley	20.0	2.9
Oats	55.8	8.1
Buckwheat and millet	0.6	0.1
Cereal mixture	0.4	0.1
Root crops:	151.3	21.9
Sugar beets	1.7	0.2
Mangolds	8.5	1.2
Potatoes	139.4	20.3
Vegetables	1.7	0.2
Fodder crops:	163.5	24.0
Field pea	1.8	0.3
Vetch	5.3	0.8
Mashkun and mixed corn	19.1	2.8
Sweet lupin	51.1	7.5
Clover	23.3	3.4
Lucerne	2.1	0.3
Serradella	60.8	8.9
Industrial crops:	4.3	0.7
Sugar beets	1.7	0.2
Colza, agrimony	0.3	0.1
Other oleaginous	0.3	0.1
Flax	0.2	—
Other industrial	1.5	0.3

7. Perennial crops

The development of fruit crops in the village of Nieborów should be emphasized. Eight commercial orchards with an area of 1.5 to 5 ha there are in the village. Apple trees dominate constituting about 80 per cent of all species, with pear and plum trees following. Some orchards are well managed, others (chiefly older ones) are more neglected. Lack of pastures causes the pasturage of cattle and sheep in orchards, which hampers natural growth and the productivity of the trees.

Orchards are also used for root crops (younger gardens) and for fodder crops (older gardens) cultivation.

8. *Permanent grasslands*

In distinction to the intensive economy system of utilizing arable land, the utilization of grasslands shows negligence. It is limited to sporadic nourishment of the meadow strips with mineral fertilizers. In the area of the village there are only 2 meadow strips ($\frac{1}{4}$ ha each) which are fully managed and improved. As to pastures they do not receive mineral fertilizer at all. This is, because cattle raising has been neglected up to recent times. Pig fattening dominates, as is reflected in the high percentage of potatoes sown (20 per cent).



Fig. 3. Meadow on the west of the main village (photo. by J. Kostrowicki)

Besides, pastures occupy, as a rule, areas of sandy wet marshy soils, which do not constitute good conditions for grass. Considering soil and relief conditions these pastures are of post coniferous or post deciduous dry types. In spite of this aspect, excess of water is to be noticed there during wet years and creates a need for amelioration. They were in fact ameliorated in 1934 in the village of Nieborów but now, however, they need in many places to be improved.

9. *Stock-raising*

This review of the forms of land utilization shows that the natural base for stock-raising, and especially for cattle, is very scarce. It, therefore, has to be completed with fodder crops cultivated in arable lands.

The table shows the status of stock-raising in the village of Nieborów.

STOCK-RAISING IN NIEBORÓW

Kind of animals	Quantity	Number of animals per 100 ha of agricultural land	Number of big animal units per 100 ha of agric. land
Horses	134	16.91	18.68
Cattle	362	45.70	39.52
Pigs	597	75.37	10.72
Sheep	184	23.23	1.75
Total of big animal units:			70.67

These two figures, 70.67 big animal units per 100 hectares of agricultural land, reflect also the dung force of Nieborów. There is also to be stressed the well developed state of pig fattening: 75.37 heads per 100 hectares of agricultural land.

Sheep raising was introduced during the World War II. The Merino breed prevails. In cattle raising the Black-White Lowland breed and mixed cattle are dominating. Milk production amounts to 2,000 litres monthly.

10. Forests

General data. Forests shown on the land utilization map of the vicinity of Nieborów are a part of a large forest complex extending farther southeast (formerly the Jaktorowska Primeval Forest). They remain under state administration of the Skierniewice Forestry Department.

The forests discussed belong to the natural forest region of Central Poland known in geographical terminology as the region of Mazowsze and Podlasie lowlands. Lack of spruce and beech is characteristic for this region. The forests are composed mainly of pine, oak, horn-beam, alder and ash. Larch, birch and aspen appear in mixed parts. The area of the mapped forest amounts to 389,24 hectares; this comprises 386,24 ha of forest area and 3 ha of non-forest land (agricultural and meadow allowances). These forests, for the most, were grown thirty years ago on former agricultural or meadow lands, to serve as an artificial game supporting woodland. They still play this role giving the animals perfect fodder conditions on rather fertile inter-forest meadows. Various species of animals, such as roe and fallow-deer, live there.

The woodland is little differentiated, either in species or in age. The only exception is section No. 7 of the area of 59,25 ha which has long been under forest and have a rich species structure: oak, pine, horn-beam and alder of older age classes (of more than 100 years). However, the rest of the area is covered with young age classes. Here are: immature (20-40 years) covering over 60

per cent (63.2%) of the area; young (up to 20 years), occupying scarcely 10 per cent of the area, the rest of the place being cut off areas and clearings.

Woodland on former agricultural lands. Forests on former agricultural lands are uniform in species and in age. They are, as a rule, monocultures of particular species of trees.

Pine alone (on former fields) occupies 73 per cent of the area, and alder alone (formerly meadows)—10 per cent. Other species occupy: spruce—3%, spruce with pine—1.5%, birch—0.2%, pine and oak—2.3% and oak—3%.



Fig. 4. Dry pine forest on the former agricultural land (photo. by J. Kostrowicki)
The open space in the background is the area affected by fungi and insects where these were destroyed

The floor of bushes is also poor. In pine forests there singly appears bourtree (*Sambucus nigra*) introduced there by man, and alder buckthorn (*Rhamnus frangula*). Ground cover is also poor: grasses, *Hieracium* and mosses (*Entodon Schreberi*) appear in lobes. The greater part of the area lacks any herbs. In alder forests bushes and ground cover are more plentiful. Alder buckthorn (*Rhamnus frangula*) and thick grasses or nettles regularly appear there.

Glades are a separate problem. These are meadows of post-marshy type having a relatively high level of ground water which unfortunately fluctuates in level. Crops covering these areas perish after 3–4 years of vegetation for air is not permitted into roots and the plant is stifled. Bed planting introduced on small plots gives better results. Nevertheless, afforestation of these areas

(formerly meadows) without regulating the water conditions is impossible. They serve as pasture-ground for game.

The present state of pine forest on former agricultural land is rather hopeless. It is in a slow continuous process of infection of the roots with fungus (*Trametes radiciperda*) which weakens the ability of the plants osmosis. Various insects attack the then weakened tree: larvae, living behind the bark, feed on the tree's tissue. The tree dies, the timber value of the forest decreasing. All actions aiming at stopping the expansion of the root fungus and saving the healthy trees (e.g. earthing up the centres of disease, burning out wood-roots) have failed; in future the stricken areas will be cut down. Dry trees are removed and proper sowing material is being prepared. However, Bank's pine (*Pinus banksiana*) planted in these parts is not attacked by the diseases mentioned. The tree sufficiently prepares the soil and is cut at the age of twenty years.

Forest on forest biotop. Forest covering areas previously wooded is quite different. Here pine and oak are dominant. They are perfect examples of old mature trees. Rich bushes cover the area: *Rhamnus frangula*, *Cornus sanguinea*, hazel-tree, horn-beam and lime. May-flowers, *Majanthemum bifolium*, grasses, *Corydalis*, sheep's sorrel (*Oxalis acetosella*), wild strawberry (*Fragaria vesca*), *Melampyrum*, bilberries (*Vaccinium myrtillus*) are the species of a rich and diversified ground cover. The forest is of the Central-Polish subtype of mixed forest (*Pineto-Quercetum*).

Here a systematic annual cut of selected trees is practised. Young trees develop under the roof of old ones. This is a rational economy. Thus, the area is continuously utilized and also the land is not infested with weeds, which would be inevitable in the complete cutting of the trees as the soils are rich. The fresh pine forest (*Pineto-Vaccinietum*) gives also timber of great commercial value.

Rational economy and care for future are dominant in the forest policy of the area.

11. Settlement

Up to 1934, i.e. to the regulation of lands, Nieborów was a village of medium compact building. The width of a settlement lot was from 20 to 40 metres. After the land regulation there were established two new hamlets, one on the west, the other on the east of the village. Moreover, along the high-road of Nieborów-Sochaczew there arose, after the World War II, settlements of dispersed type. These are farms established after the partition of the large manorial estate of Nieborów, as a result of the agricultural reform in 1945. The village farmsteads comprise old farmhouses, chiefly in wood, covered with thatch, and new houses largely in brick, often with cardboard roofs, or with roofs covered with tiles or iron plates.



Fig. 5. An old wooden house covered with thatch in the main village (photo. by J. Kostrowicki)



Fig. 6. A new house built with brick in the main village (photo. by J. Kostrowicki)



Fig. 7. A farmstead of the small hamlet on the west from the village established after the granting of land ownership to peasants in 1864 (photo. by J. Kostrowicki)

Conclusion

(i) In spite of weak soils the arable agricultural economy is on a relatively good level.

(ii) The economy of the grasslands is unsatisfactory since it lacks any rational cultivation. Meadows and pastures need regulation of water conditions.

(iii) In fruit culture which recently has developed in importance stress should be laid on the selection of proper kinds and species of fruit trees for their productivity and resistance against freezing. Also improvement in the cultivation of fruit trees is desirable.

(iv) As for forestland, woods planted on former agricultural lands dominate and are of feeble quality and productivity. They may be treated only as a preparatory stage in the afforestation of poor soils. In the older forest area, on the same soils, trees develop well and give wood of good quality. These form pine and oak or even oak and horn-beam types of forests. Future secondary forests, on past agricultural land, should follow the natural types of forest appropriate for the given habitat.

Harry C. K. Henderson

LAND UTILIZATION SURVEY OF BRITAIN
AND THE USE MADE OF IT
IN PLANNING AGRICULTURAL LAND

Some of the problems raised by Professor Kostrowicki do not exist for us in Britain. Firstly we have had a survey on a scale of six inches to the mile (1:10,560) for nearly a century and all field boundaries are shown. More recently, we have a map on 1:25,000 also showing field boundaries. Secondly, these maps give us good base maps, as it is usual for each field enclosed by hedges, fences or stone walls to be cultivated for a single crop each year, and we do not usually have to map strips as we have seen in Poland. The chief exception to this generalisation is found in Bedfordshire where ownership of the market gardening land is in strips precisely similar to those in Poland. Thirdly, we are interested in size of holding rather than in ownership and in general the size of holding in Britain is much larger than in Poland: the size of farm varies greatly, and those farms used for the production of grain crops are usually much larger than those devoted to milk production. Many dairy farms have only 20 hectares but arable farms are usually 100 hectares or larger.

Professor Dudley Stamp's *Land Utilization Survey of Great Britain* is well known to Polish geographers and is now an historical document as much of the record is nearly thirty years old and the Second World War has resulted in many changes in our agriculture in recent years. The amount of arable land continued to decline after the survey until in 1938 only 3.6 million hectares of England and Wales were tilled. During the war, the need for increased home production led to various government subsidies and the area increased to nearly 6 million hectares, but there has been a great decrease in recent years and by 1958 the amount was less than 4 million hectares.

In recent years, great advances have been made in ley farming. This really means a longer rotation in which several years are devoted to the growing of grass after one or two years of crop production. By this method we are reducing the amount of permanent pasture, which used to be grazed year after year but was rarely resown, and we are regularly resowing grassland at intervals

of three to seven years according to the soil conditions. Many arable dairy farms, such as Stepstones Farm at Langford near Bristol, have changed their whole system by using grasses instead of fodder crops but they regularly plough and sow fresh grasses every few years though probably only one field is ploughed in any one year.

These changes have come from the research carried out either by private means, such as individual farmers or business firms which market artificial fertilizers or by government research stations such as that at Aberystwyth, where new strains and mixtures of grasses have been developed under the initial leadership of Stapledon who was largely responsible for the improvement of our hill pastures. The adoption of new ideas rests with the individual farmer who may rent his farm from a large landowner or may own it himself. In some cases the government has stimulated acceptance of new methods or stimulated production of a particular product by offering financial benefits. There are various subsidies such as that for improving hill pasture or that granted for ploughing up land which has not been tilled for a number of years. Another scheme is to guarantee the price of a product such as milk (in recent years) or wheat (in 1932).

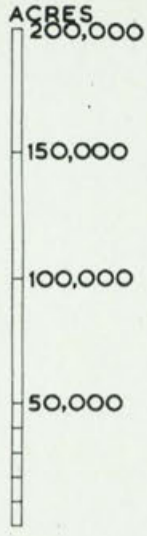
Sir George Stapledon, in the Introduction to Bulletin No. 154 of the Ministry of Agriculture, Grassland Management, writes, "With the rapid advances of science and with the farmers becoming more scientific and the scientists more practical, conditions on the farm have never been in such a state of flux as they are today". Stapledon also illustrates these changes by saying, "Perhaps most important of all is the new outlook towards soil condition and the growing knowledge of the influence of the fibrous grass root on the essential crumb structure of the soil. This knowledge raises important issues as to the substitution of ley farming for permanent grass. Bad permanent grass and bad permanent grass husbandry, at least took care of, or did not seriously dissipate, soil structure. Bad arable farming, with too little ley and too much tillage, can play havoc with soil structure". From these quotations it is clear that our farmers are more willing to accept new ideas than they used to be and that the effect of changing our methods is being carefully studied lest an apparent improvement might be only temporary and might be damaging in the long run.

A further contrast with Polish conditions is the wider variety of soils and the absence of many great areas of one soil type such as the vast extent of sandy soils in the central plains of Poland as we have seen around Nieborów.

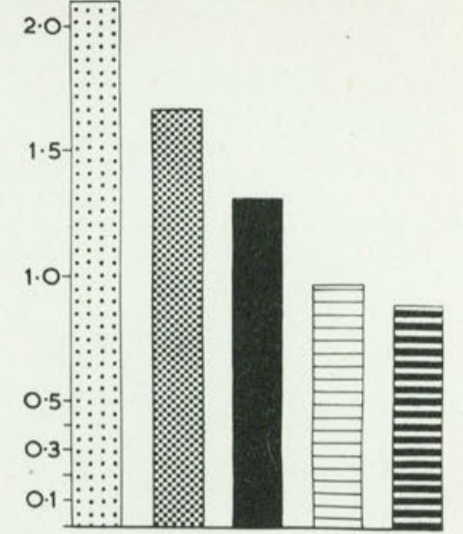
The two maps of England and Wales are designed to show the essential changes in English agriculture since 1930. It will be noticed that the total of cropped land is far greater, not only because of the increase in sown grasses but also because of a greater area growing both barley and wheat. The increase in grasses is balanced partially by a decrease in oats and root crops. It is also notable that those parts of eastern England which were widely ploughed in 1930

1930

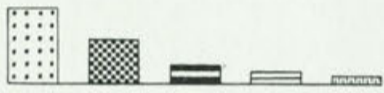
- WHEAT
- BARLEY
- OATS
- MIXED CORN
- PEAS & BEANS
- POTATOES
- ROOTS
- TURNIPS, SWEDES & MANGOLDS
- SUGAR BEET
- FRUIT
- ROTATION GRASSES



MILLION
ACRES



ENGLAND



WALES

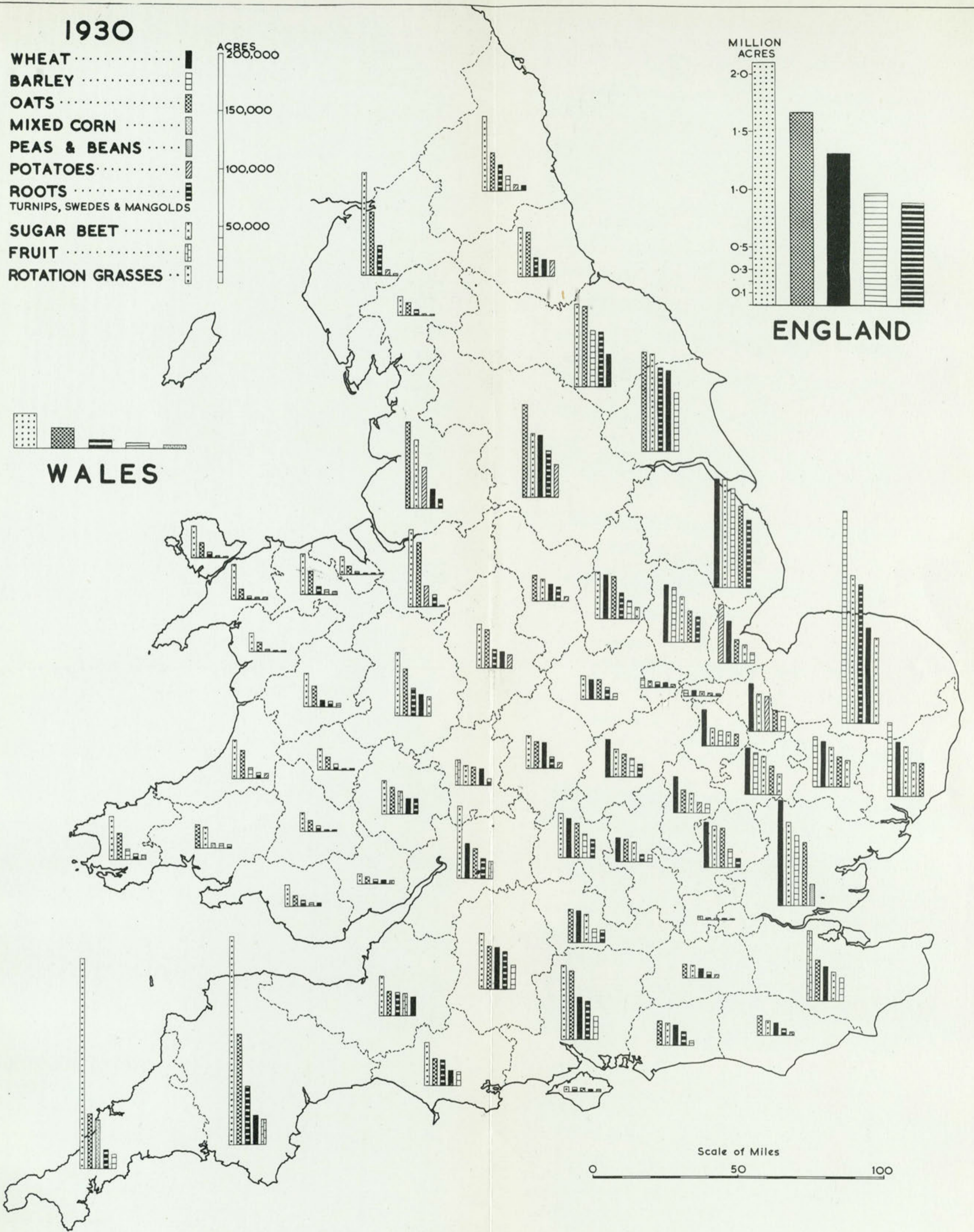
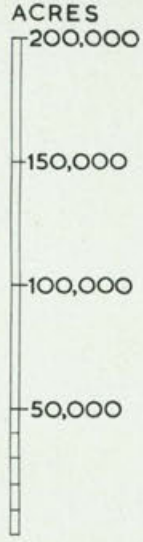


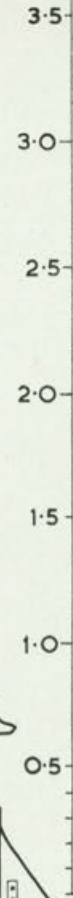
Fig. 1. Area of different crops in 1930

1957

- WHEAT
- BARLEY
- OATS
- MIXED CORN
- PEAS & BEANS
- POTATOES
- ROOTS
- TURNIPS, SWEDES & MANGOLDS
- SUGAR BEET
- FRUIT
- ROTATION GRASSES



MILLION
ACRES



ENGLAND

WALES

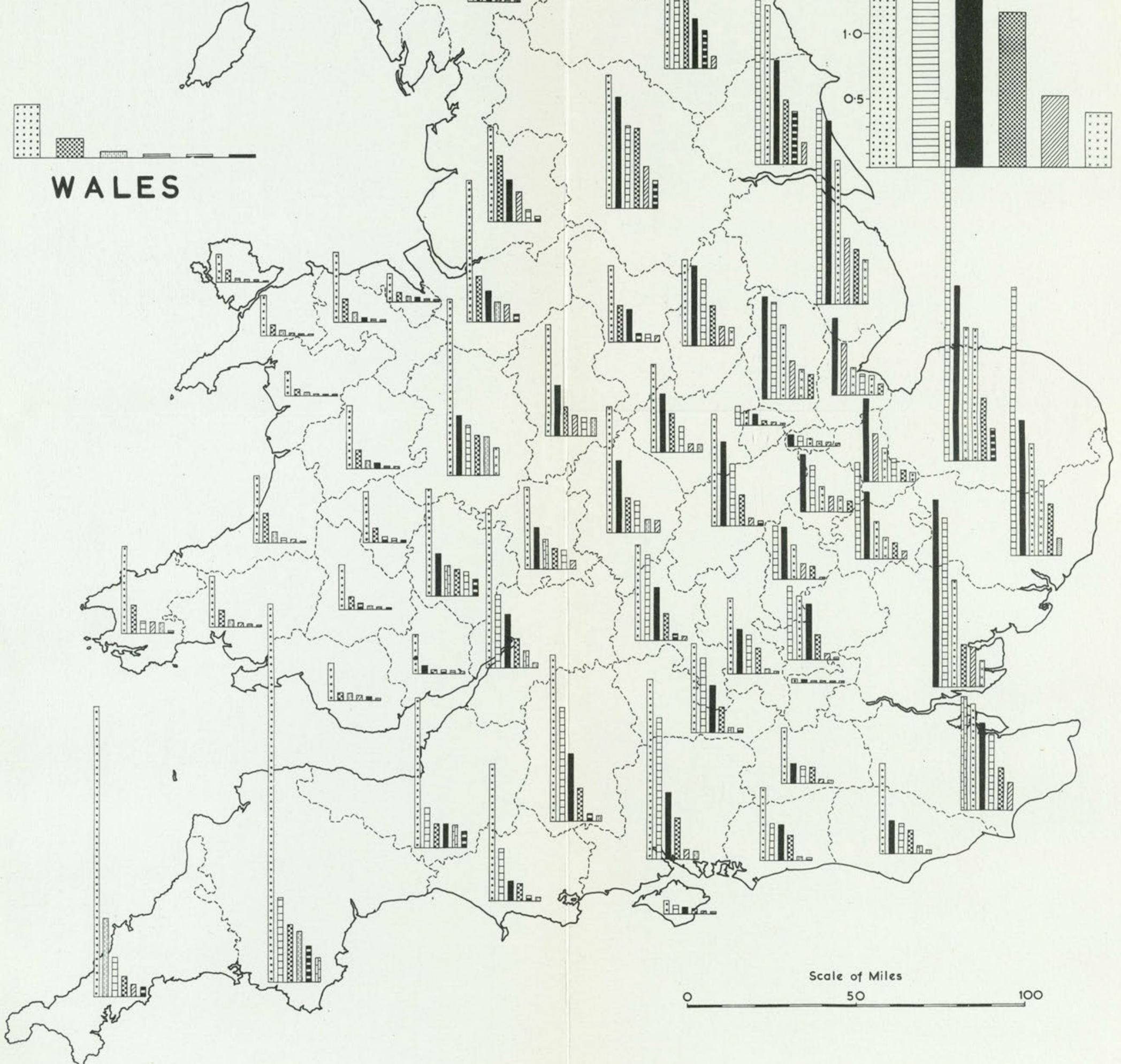


Fig. 2. Area of different crops in 1957

are also areas where the acreages have increased most. Many of our clay soils, especially in the Midlands, have a larger area under crops than in 1930 and while rotation grasses are more prominent, it is notable that other crops have also increased appreciably in this area. Local specialisation in the production of certain crops is characteristic of British agriculture and two examples are evident on the maps. Firstly, potatoes are grown in most parts of Britain but intensive production is shown round the Wash on the fen-lands and in Lancashire. Secondly, fruit growing is of outstanding importance in Kent, in south east England and Hereford and Worcester. The area with least change is Wales.

Consideration of non-agricultural uses of land results in the conclusion that much of our best land is being used for other purposes. The spread of many of our towns has taken place on the better soils as, for example, the growth of London on the Taplow Terrace both westwards into Middlesex and eastwards into Essex. This Terrace has been an area of first class agricultural land for centuries but is now almost completely built over. The spread of the several centres in the West Riding of Yorkshire has absorbed much agricultural land. These features result from the trend to provide the people with houses and gardens so that many areas have only thirty-two to forty houses per hectare, and this trend has existed for some fifty years now. Recently, the building of large blocks of flats has produced a change in some of our towns but relatively few have been built to date. This change should reduce the loss of agricultural land. A number of market gardening areas have been built over during the present century. The coastal plain of west Sussex, especially near Worthing, the sandy country to the south west of Manchester and the Lea Valley in the London area are all examples of this loss to agriculture of an intensive type.

Some of our canals and railways have fallen into disuse and it is possible that these may be used as a basis for new roads in the future but so far no such case has occurred.

Finally, during the last thirty years much work has been done on the historical aspects of our land utilization and it has been found possible to plot the arable land, grassland and woodland for the late eighteenth century, for about 1840 and for about 1875. These historical records help to emphasize the intrinsic value of certain of our soils and it is claimed that those areas which are found to be arable at all these dates should be preserved to agriculture and that building should be prohibited on them. Good soils are a national heritage and should be preserved from decimation.

Mieczysław Klimaszewski

THE PROBLEMS OF
THE GEOMORPHOLOGICAL AND HYDROGRAPHIC MAP
ON THE EXAMPLE OF
THE UPPER SILESIAN INDUSTRIAL DISTRICT

Since 1950 a detailed Geomorphological Map and Hydrographic Map have been produced in Poland. Both maps, based on intensive field research, are constructed on the scale of 1:25,000.

THE GEOMORPHOLOGICAL MAP OF POLAND

The geomorphological survey provided a record of all land forms as observed in the field, together with particulars of their dimensions, origin and age. The individual features were then indicated on a topographic map by conventional signs drawn true to scale. The content of the resulting Geomorphological Map of Poland draws attention to the chief problem of geomorphology which is to discover tendencies governing the further development of land forms, both in themselves and in relation to other elements of the geographical environment which are also subject to change. Such a map must not only present a full picture of the relief but must be constructed so that the evolution of the relief can also be clearly interpreted. Thus the principle of age and origin was introduced into the classification of land forms, for a genetic classification alone is inadequate. We cannot separate origin from age, nor process from time.

The use of a genetic and chronological classification makes it possible to gain an idea of the distribution and the natural relations between forms of varying origin and age. It also allows the history of the relief to be inferred from the map and stages in its further development to be foreseen. In the prepared list of forms investigated and mapped in the Geomorphological Survey of Poland, the forms so far observed are grouped according to the following periods of time: Palaeogene, Neogene, Pliocene and Miocene, Plei-

stocene (including glacial and interglacial) and Holocene. They are also classified according to whether they result from constructive or destructive processes, involving internal and external agents. Thus their origin may be due to any of the following kinds of action: tectonic, denudational, fluvial, fluvio-glacial, karstic, suffosional, glacial and nivation processes (including buried ice forms), aeolian, lacustrine, marine, organic and anthropogenic. On the map colours have been chosen to indicate both the origin and the geological age of particular forms. By this means the agents concerned in sculpturing the relief during a specific period can be recognised.

The Geomorphological Map also gives certain morphometric information. Since individual forms are shown true to scale, their broad dimensions can be calculated, while their absolute or relative height can be found from the contours. The height and depth of smaller forms (scarps, gorges, ravines, etc.) is indicated by thickness of line and by varying grades of broken line, while degrees of slope are shown by shades of the particular colour defining the age of the form of which the slope is an element. In this way the map reveals the appearance (morphography), the dimensions (morphometry), the origin (morphogenesis) and the age (morphochronology) of the land forms, thus combining all the data necessary for depicting the character and development of the relief. From such detailed information moreover, it is possible to distinguish morphological regions and to define the characteristics of each.

The Geomorphological Map is not only of great scientific value as a basis for the study of geomorphology itself, but at the same time it meets the requirements of those concerned with economic and social exploitation. Thus the differentiation of older and younger forms and the special attention paid to Holocene forms and their related processes, enables some idea of the distribution of forms favourable and unfavourable to various domains of human economy to be obtained. In agriculture, for example, it is not only necessary to be acquainted with the details of relief but knowledge of the present morphogenic processes revealed in such factors as gorges, ravines, "tielkes", landslides, etc. is also essential. Again, the planning of towns and other settlements, industrial projects, and communications, requires knowledge of unfavourable forms such as scarps, gorges, sink holes, alluvial fans, river terraces liable to flood, and depressions caused by mining subsidence. For the location of hydro-electric power stations and the planning of canals and irrigation channels, special knowledge of the valleys in which engineers are to work, including consideration of the morphogenic processes, is also necessary. Appreciation of the dynamic character of relief features thus assists satisfactory planning and the proper utilization of the surface in any particular area. An understanding of the processes involved in the origin and development of the young forms makes it possible to deal with unfavourable conditions and thus to obtain control over, and to transform the natural environment.

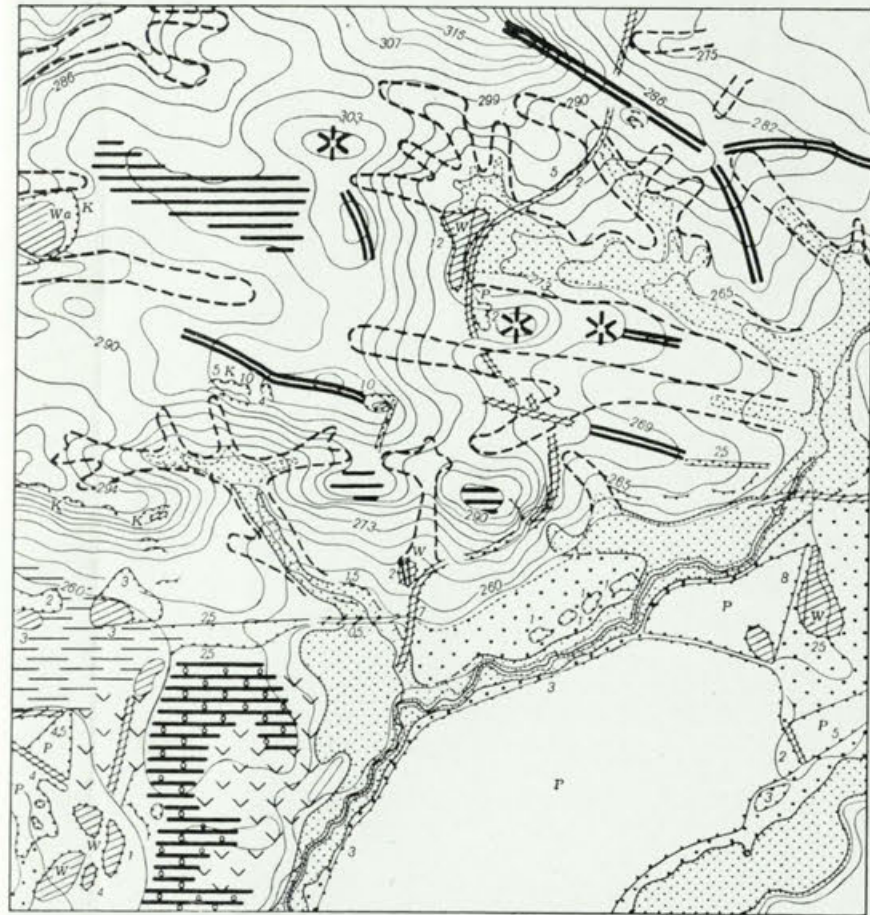


Fig. 1. The geomorphological map

LEGEND TO THE GEOMORPHOLOGICAL MAP OF THE UPPER SILESIAN INDUSTRIAL DISTRICT

TERTIAR	PLEISTOCENE	HOLOCENE

B. FORMS OF DENUDATIVE ORIGIN

I. Forms created by the destructive action of denuding factors

1. Fragments of a surface of planation (Palaeogene and Neogene epoch) with a thin cover of pleistocene sediments
2. Slopes cut out during the Tertiary epoch, remodelled later on
3. Edge between denudative surfaces of different ages
4. Denudative and erosional-denudative plains
5. Denudative outliers and Monadocks
6. Form of ridge:
broad and rounded
narrow and rounded
7. Dome-like summit
8. Passes
9. Trough-like valleys on slopes
10. Niche or rear step of a rock-slide and small land slides and slups

II. Forms created by the constructive action of denuding factors

1. Landslide tongues
2. Plains of deluvial and solifluxion accumulation

C. FORMS OF FLUVIAL ORIGIN

I. Forms created by the destructive action of flowing water with cooperation of denudative processes

1. Edges and erosional undercuts of accumulative terraces and erosional-denudative plains with relative height:
0— 3 m well preserved
badly ..
3— 6 m well ..
badly ..
6—12 m well ..
badly ..

TERTIAR	PLEISTOCENE	HOLOCENE

2. River beds eroded in alluvium
3. Bed of a blind creek
4. Trough like valleys created with the cooperation of denudative processes mainly solifluxion
5. Trough-like valleys created with the cooperation of denudative processes possessing an accumulative bottom
6. Small valleys created by periodic or perennial water with cooperation of denudative processes
 - a. ravines
 - b. troughs
 - c. gorges

II. Forms created by the accumulative action of flowing water

1. River accumulation plain
 - a. belonging to the end of the Middle-Polish Glaciation (Warta Stage)
 - b. belonging to the Glaciation
 - c. higher one and lower one
2. Alluvial fan plain

D. FORMS OF FLUVIOGLACIAL ORIGIN

I. Forms created by the constructive action of glacial waters (Middle-Polish Glaciation)

1. Kames, sandr

E. FORMS OF KARST ORIGIN

I. Forms created by the constructive action of the continental ice sheet

1. Ground moraine plain (Middle-Polish Glaciation)
2. Denuded and morain walls

J. FORMS OF AEOLIAN ORIGIN

I. Forms created by the constructive action of wind

1. Wall-dunes
2. Fields of small dunes

N. ANTHROPOGENIC FORMS

I. Forms created by the destructive action of man:

1. Quarries, clay-pits, sand-pits
 - a. productive
 - b. disused

TERTIAR	PLEISTOCENE	HOLOCENE

2. Old strip mines
 - a. fields of small shafts
 - b. bore-pits (old silver, lead and zinc mines) and old lime-pits
 - c. coal open-pits
3. Cuts of ways and railways
4. Canal cuts and regulated stream beds
5. Forms resulting from mining
 - a. flat hollows caused by mine-subsidence

II. Forms created by the constructive action of man

1. Dumps
 - a. culm, mine dumps (W)
 - b. iron and zinc slag dumps (Hc, Hz)
 - c. quarry (limestone) dumps (Wa)
 - d. dumps built of skimmings (Pf)
 - e. brick-kilns dumps (Cg)
 - f. other dumps (I)
 - g. productive (Cz)
 - h. mined (E)
 - i. covered by plants (o)
 - j. burning (o)
 - k. burnt through (P)

In some respects, however, the Geomorphological Map is too intricate to be readily understood by those directly concerned with its practical application. For this reason, special maps may be prepared from it in order to show selected distributions, e.g. land forms unfavourable to certain types of economic activity, potentiality maps, qualitative geomorphological maps. The construction of these depends on the fact that all features appearing on the Geomorphological Map are assessed on their value and utility for a given form of economy: agriculture, communications, building, meadow culture or forestry. Thus every feature is considered either favourable (plains of denudation, river terrace plains, morainic plains, gentle slopes, etc.) or unfavourable (steep slopes, ravines, dunes, tips, damaged ground, etc.) to a particular kind of economic development. Forms classified on this basis are transferred to the potentiality or improvement ("bonitative") map and shown by means of only two colours. A map of this kind depicts the economic evaluation of areas from the geomorphological point of view.

The experience gained from geomorphological mapping, thanks to the collaboration with planning and economic institutions, has made it clear that such work is of practical importance in the preparation of plans for the development of various regions in Poland. The choice of areas for regional treatment was made in agreement with the State Commission of Economic Planning and the various regional planning authorities. So far, investigations have been carried out in the basins of the Dunajec River, the Kamienna River, the Brda River, the Central Vistula, the Upper San River, the Wieprz-Krzna Canal, in the sub-Tatra region and in the Upper Silesian Industrial District. In this account it is possible to deal only with the results of the investigations carried out in the last-named region.

THE GEOMORPHOLOGICAL MAP OF THE UPPER SILESIAN INDUSTRIAL DISTRICT

The area, comprising 2,100 sq. kms., was mapped in 1955 and 1956 by scientific workers of the Section for Geomorphology and Hydrography at Cracow, which forms part of the Geographical Institute of the Polish Academy of Sciences, and by members of the Department of Physical Geography in the Jagellonian University of Cracow. The task, which was undertaken by request of the Committee for Affairs of the Upper Silesian District, occupied each worker for 36 months. The results included the production of the Geomorphological Map of the Upper Silesian Industrial District on the scale of 1:25,000, numerous longitudinal and transverse geomorphological sections and much documentary information. This material has been used in the following publications:

The Quaternary Epoch in the Silesian and Cracovian Region by M. Klimaszewski

The Boundary of the Middle Polish Glaciation in the Southern Silesian Upland by C. Karaś and L. Starkel

The Geomorphological Characteristics of the Upper Silesian Industrial District by C. Karaś-Brzozowska

The Pre-Warta Interstadial at Brzozowica near Będzin by S. Gilewska and L. Stuchlik

A Contribution to the Recognition of Karst Development in Middle Triassic Metalliferous Dolomites in the Vicinity of Zabkowice Będzińskie by S. Gilewska

Other information has been used in the preparation of theses for a master's degree.

The relief of the Upper Silesian Industrial District is varied. Its northern part belongs to the Silesian Upland and is built of Carboniferous, Permian, Triassic and Jurassic rocks. The western and southern parts belong to the Basins of Racibórz and Oświęcim, in which Miocene and Pleistocene deposits were accumulated. Distinct differences in structure and relief occur in the Upland area. In the northern part there occurs a scarpland developed in inclined strata, some of which are highly resistant, while the southern part exhibits a faulted relief. These two parts are separated by the Będzin Fault (or main fault) marked by an escarpment, which has suffered considerable deformation by erosive agents.

The relief of the Upper Silesian area dates from the Paleogene epoch. Fragments of a peneplane surface of that period are preserved in both the northern and southern parts. This Paleogene surface is characterized by karst phenomena, including deep hollows filled with bone ores and the clayey, insoluble products of the weathering of Mid-Triassic limestones and dolomites. These sediments were formed under the conditions of a subtropical climate during the Paleogene and Neogene epochs. After the Paleogene and prior to the Tortonian stage, valleys with a general north-south trend were incised into the old surface, after which the Lower—and Mid-Tortonian sea encroached upon the lower parts of those valleys and filled them with sand and clay. In the Miocene epoch, in association with the Alpine and Carpathian orogenic movements, the northern part of the Upper Silesian Industrial District was raised along the main fault. On the other hand faulting produced grabens and horsts in the southern part, giving rise to the grabens of Bytom and Klodnica, the Chrzanów Basin, the Mysłowice Basin, the Oświęcim Basin and the Racibórz Basin. These tectonic depressions have been filled with Miocene marine sediments.

During the Pliocene epoch the Triassic escarpment as well as its southern foreland was cut by deep valleys. Their depth reaches to 40 metres beneath the present valley floors. These deposits, together with their relation to the older

Pre-Pleistocene relief are revealed in the opencast coal workings at Brzozowica near Będzin.

In the Pleistocene epoch the Upper Silesian area was twice glaciated. During the Mindel glaciation the whole area was covered by Scandinavian inland ice which, from the evidence of morainic material, reached as far as the Carpathian Mountains. During the Riss glaciation the inland ice reached only to the neighbourhood of Mikołów. This is shown by a series of terminal moraines and frontal outwash plains and by a considerable dissection of the older glacial deposits in the area south of the morainic hills. After the Riss glaciation the Upper Silesian area was exposed by the removal of the Pleistocene sediments. Degradational processes modified the moraines and fluvioglacial plains, creating trough-like valleys and exhuming the older Tertiary relief, mainly under periglacial conditions during the Warta stage and the last glacial phase. This exhumation was most pronounced in the Upland area, but was less marked within the basins in which glacial and fluvioglacial deposits are large and thick. Changes in the river pattern are associated with epigenesis. River terraces are preserved in the valleys with deposits belonging to the Warta stage (terrace of a height of 5–6 m, above the present valley floor) and to the last glaciation (terrace of a height of 3 m. above the present valley floor). Planation surfaces due to solifluxion processes are related to the terraces.

In the Holocene period material derived from erosion and denudation processes is being deposited within the broad valley bottoms to form agricultural plains. New valleys are coming into existence: gorges, ravines, "tielkes", gullies, trough-like valleys and alluvial plains are being built up in front of the foothills.

In the Upper Silesian Industrial District large changes of relief are due to the destructive and constructive action of man. Tin, zinc, lead and silver ores have been exploited in this area for centuries and coal has been exploited during the past hundred years. The types of anthropogenic forms in the District are closely related to the character of mining exploitation and the geological structure. In areas consisting of productive Carboniferous rocks forms result from coal mining. Extraction without refilling (compact stowage) is the cause of various types of subsidence (troughs, depressions, sink holes) of large size with depths of up to 10 m. The largest areas of damage due to mining are to be found in the central part of the District. In areas of Triassic and Quaternary rocks other forms result from surface workings which include old opencast coal and ore mines, and stone quarries, and clay and sand pits. These are concentrated mainly in the northern part of the District.

Furthermore, spoil heaps are widespread. Their origin is connected with underground exploitation as well as the surface-working of minerals. These artificial hills reach to 40 m. in height. They are built of mine debris, metallurgical waste and the products of flotation processes (shales, sandstones,

skimmings, slag, etc.); their shapes differ (tabular or conical), while their present condition also varies. Some are still being built, others are being exploited; some are burning, others are burnt through, while some are vegetated. Other features created by man include railway embankments, roadways and dams.

The District was divided into anthropogenic regions on the basis of an analysis of the Geomorphological Map. These regions are differentiated according to the degree of transformation of the natural environment by human action. Thus there are three orders of such regions. There are four regions of the 1st order, ten regions of the 2nd order and fifty-two regions of the 3rd order. Every region has been described in detail.

Finally, a Geomorphological and Improvement ("Bonitative") Map of the Upper Silesian Industrial District on the scale 1:25,000 has been prepared by E. Jońca on the basis of the Geomorphological Map. It was constructed according to the principles described above.

This map shows the distribution of areas favourable and unfavourable to various forms of economy from a geomorphological point of view. It will be recalled that on the qualitative map there were indicated regions favourable and unfavourable to a particular type of economic activity.

These are some of the geomorphological problems in the Upper Silesian Industrial District and the attempts to provide a geomorphological map for practical application.

THE HYDROGRAPHIC MAP OF POLAND

Besides the Geomorphological Map a Hydrographic Map of Poland on the scale 1:25,000 is being prepared. An area of about 60,000 sq. kms. has so far been investigated. The map is based on a detailed hydrographical survey which includes the collection and recording on a topographical map of as much information as possible relating to water, its circulation and its relation to the geographical environment. Thus the hydrographer has to observe, measure and locate all the hydrographic phenomena required to gain a knowledge of the extent of surface supplies and underground retention as well as the details of sheet and linear flow.

The Hydrographic Map of Poland is being constructed on the scale 1:25,000 but is to be published on the scale 1:50,000. A basic topographic map is used on which lithological information is overprinted to give an idea of the permeability of the substratum and its relations to water conditions. Upon this base map the details of all the water features are shown by means of conventional signs. The Hydrographic Map portrays the distribution, location and depths of shallower reservoirs of underground water and of the direction of flow of such water; the surface outflow by way of springs, including the quantity of water issuing

from underground sources during the period of observations; the surface run-off (permanent, periodic and episodic streams); the approximate capacity of water discharge; the limit of floods; the transport of rock waste; and the impurity of streams.

The Hydrographic Map of Poland, published in sheets, is a basic analytical map. Further maps may be prepared from it to show particular aspects, e.g. maps showing the level of underground water, run-off, stream impurity, genetic types of rivers, hydrographic regions.

Even in its present incomplete form the Map has undoubtedly advanced the knowledge of hydrographic conditions in Poland. It provides a basis for further investigations on water circulation and it presents a wide range of hydrographic data in relation to other elements of the geographical environment, especially the relief and geological structure. It also raises additional problems of a hydrographic nature and in some cases partially solves them. The Map certainly provides a stimulus to geographers, encouraging them to study the complex phenomena of natural water supply and circulation.

At the same time the Hydrographic Map is of great practical value. It depicts the distribution and depth of underground reservoirs; the thickness of the zone of aeration; the distribution and character of springs, including their yield and the distribution of damp and flooded ground. It also enables a determination of water surpluses or deficiencies to be made. The Map therefore gives innumerable facts which are of particular importance to agriculture, forestry, industry and water supply. A serious shortcoming, however, is the lack of quantitative data, and it is in this direction that further investigations must be undertaken.

In view of the practical value of the Hydrographic Map to planning authorities of the Upper Silesian Industrial District the area of investigation broadly coincided with that of the geomorphological survey. The two projects were thus carried out coincidentally, i.e. in 1955 and 1956, the former by a group of specialists in hydrography.

The hydrographic problems of the Upper Silesian Industrial District are very complex. This area, which is the most highly industrialized and most densely populated in Poland, possesses very small water resources in relation to its needs.

The District lies in a watershed area, being drained in part by the upper tributaries of the Vistula and in part by the River Odra. The levels and flow of the Silesian rivers are largely governed by man. An important characteristic is the amount of impure water flowing through municipal sewers. Natural circulation of water is found only on the margins of the area, for in the central part it is disorganised by economic activities. Moreover new features in the water situation are constantly arising, due to mining subsidence and surface

mineral extraction. Thus conditions are continually changing, meanwhile the increasing rate of consumption emphasises the problem of obtaining new supplies.

The results of the hydrographic survey may thus be summarised:

(i) They give an idea of the distribution, depth, and estimated quantity of underground water. It appears, on the evidence of 200 springs and 1600 wells, that numerous subterranean reservoirs of small capacity occur in the Carboniferous and Quaternary rocks. There are abundant supplies in the Triassic rocks, but this is karst water occurring mainly at a great depth. A distinction should be made between the elevated and well drained Triassic areas and those of lower elevation where water gathers in deep crevices from which it can be pumped.

(ii) The results give an idea of the character of streams, which can be grouped as follows:

(a) Streams fed by underground water (normal circulation)

(b) Streams fed by mine water and underground water

(c) Streams fed from conduits and by mine water (causing disturbed circulation).

(iii) The hydrographic survey indicates the distribution of polluted streams and the sources of pollution, i.e. mine water, industrial water, municipal sewerage water.

(iv) On the basis of the survey, four hydrographic regions may be recognised in the Upper Silesian Industrial District. These are the following:

(a) The western region, consisting mainly of Quaternary sediments, where infiltration is shallow. The ground water surface fluctuates considerably. Supplies of ground water are plentiful though poor in the Quaternary sediments themselves. The density of the stream net is high, the streams small and slow flowing, with numerous damp areas. Water circulation is normal and only slightly disturbed by man.

(b) The northern region, built mainly of Triassic rocks, with deep infiltration. Karst stream density is low while periodic streams are numerous. Within this region two sub-regions may be distinguished, the northern, elevated area and the southern lower area. In the northern area drainage is towards the basins where ground water is near the surface, and damp ground is frequent. Streams are slow-flowing and comparatively sparse. This area is marked by natural circulation. In the southern area water accumulates underground, coming either from the northern area or from local streams losing water through fissures in the substratum over which they flow. Natural circulation is greatly disturbed, for water is drawn off from some streams to meet industrial needs, yet is added to other streams by pumping from mines. The general effect of this interference is to lower the level of the ground water.

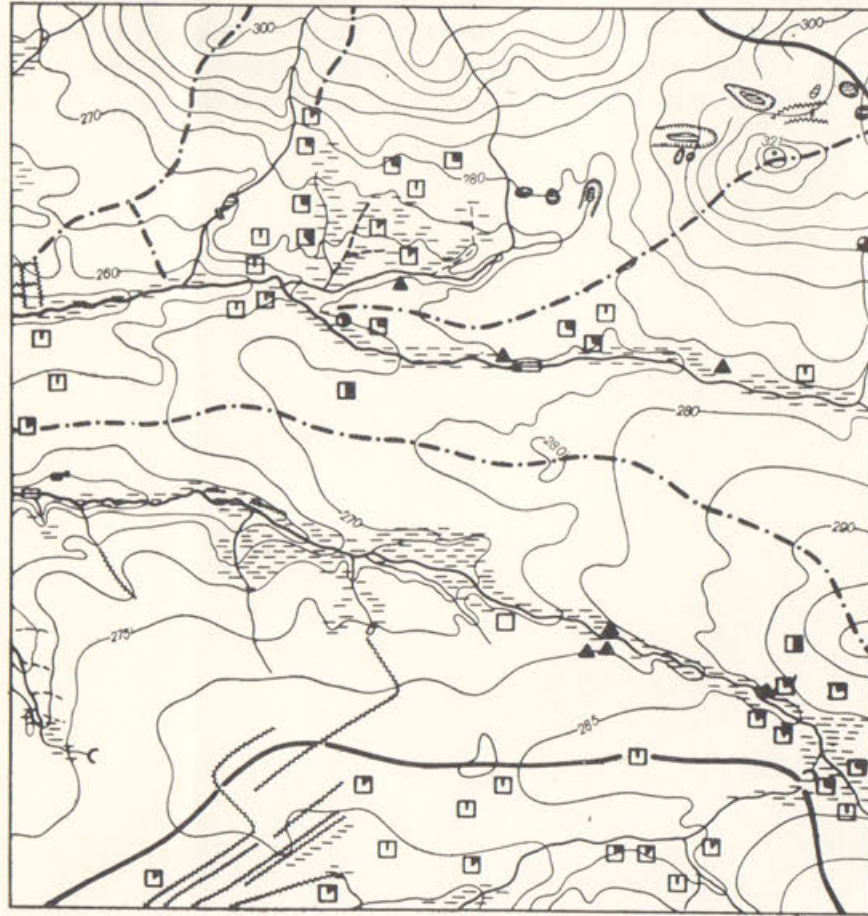


Fig. 2. The hydrographic map

LEGEND TO THE HYDROGRAPHIC MAP OF THE UPPER SILESIAN INDUSTRIAL DISTRICT

- Watershed of first order
- second order
- third order
- fourth order
- Depth to the ground water-table in wells
Up to 1 m.
- 1—2 m.
- 2—4 m.
- 4—6 m.
- 6—10 m.
- 10—15 m.
- 15—25 m.
- 25—40 m.
- Over 40 m.
- Wells in which water decayed as a result of mining
- Wells pumping water into mines
- Areas permanently waterlogged
- Area periodically waterlogged
- Peat-bog perennially waterlogged
- Peat-bog periodically waterlogged
- Moor
- Blind creek with perennial water
- Blind creek with periodical water
- Lake
- Lake closing itself by growing
- Pond constantly productive
- Pond periodically productive
- Pond closing itself by growing
- a) P. with a compact plant-cover
- b) P. with a sparse plant-cover
- Disused and dry pond
- Reservoir in hollows resultant from mine subsidence
- a) R. with living water
- b) Slime pit

- Reservoir in old strip mines
- a) R. with living water
- b) R. in old strip mines
- Industrial reservoir
- Basin
- Retentive reservoir
- Outflows of water from a collector
- Outflows of water from a mine
- Outflows of water from a foundry and other industrial institutions
- Water trickling from a waste mantle
- Boggy springs
- Springs dependent on the kind of the water bearing sediment:
- Springs flowing from compact and loose rocks
- Springs flowing from compact rocks and a waste mantle alike
- Springs enclosed
- Springs enclosed for aqueducts, industrial estates
- Spring efficiency
- Up to 0,1/1 sec.
- 0,1—0,5/1 sec.
- 0,5—1/1 sec.
- 1 —5/1 sec.
- Efficiency not measured
- Permanently flowing stream
- Periodical stream
- Ephemeral stream
- Water perishing in the river bed
- Rocky steps in the river bed
- Undermined shore
- Area flooded
- Streams sullied by industrial sewages
- Mills and mill-cannals
- Ditches draining permanently
- Ditches draining periodically
- Areas drained by ditches
- Areas drained by drain pipes
- Compact enclosure of the river bed
- Shore bands
- Step correction

- Canalized river-bed and canals
- Weir and water gate
- Admission and sewage outlet
- Collector
- Dams and dikes
- Water enclosures on streams
- Pluviometr-stations of the Polish Hydrographical and Meteorological Survey
- Watermark-stations of the Polish Hydrographical and Meteorological Survey

(c) The central region, consisting mainly of Carboniferous rocks, where infiltration is again small, the water-table shallow. Damp ground is also frequent, while the stream density is big. Normal circulation is greatly modified by human action; artificial surface storage reservoirs are numerous, water finds its way into mines from which it may be pumped out, or it may accumulate in hollows due to subsidence. Another feature is the considerable degree of stream pollution.

(d) The southern region formed of Miocene and Quaternary deposits. In the latter infiltration is shallow, the ground water reaching near to the surface. Underground supplies in sands are plentiful while on the surface the stream net is close and the streams themselves, flowing slowly, give rise to damp ground. Although circulation is only slightly disturbed, some pollution occurs.

Janusz Paszyński

INVESTIGATION OF LOCAL CLIMATE
IN THE UPPER SILESIAN INDUSTRIAL DISTRICT

In connection with the plan for developing the Upper Silesian Industrial District (known by its Polish abbreviation of G.O.P.) an investigation of the local climate in this area has been conducted for several years. The investigations are aimed, in the first place, at defining areas with the most suitable conditions for creating new housing estates. Several institutions and scientific institutes are participating in these investigations, organized and financed by the Committee on G.O.P. Affairs of the Polish Academy of Sciences. In addition, the Institute of Geography of the Polish Academy of Sciences, the Climatological Department of the University of Wrocław, the Institute of Industrial Medicine in Zabrze, and Energo-Pomiar in Gliwice should also be mentioned.

The far reaching transformation of the geographical environment made here by man has influenced climatic conditions. The intense industrialization and urbanization have resulted in tremendous pollution of the air, the water and the soil with various matter, often harmful to the plant and animal world, and specifically to man. That is why the problem of air pollution has a distinct significance in the climatology of this area.

Atmospheric pollution is not only caused by dust, but also by gaseous ingredients found in the air. It was necessary therefore to define the nature and content of these two types of pollution in the atmosphere.

The measuring of suspended dust was carried out at numerous places in the G.O.P., where the readings are in each case characteristic of a large surrounding area, by means of the Owens' dust-counter long used in climatology. It was shown that the values obtained in this way are characterized by great variations in time and space. Obviously, the weather situation, and particularly wind direction and velocity, are of decisive significance.

As an example, the results of the measurements at the Park of Culture and Rest situated between Chorzów and Katowice may be cited. When a large amount of smoke from the highly industrialized Chorzów area is blown on to this area by westerly winds, atmospheric pollution reaches a state approaching

that at Chorzów itself, in the direct neighbourhood of a large foundry. However, the atmosphere near the park is relatively pure during periods of easterly winds, and the amount of dust is then scarcely one-third of the amount noted at Chorzów. Even in this latter case, however, the atmospheric pollution is significantly greater (on an average twofold) than in areas right outside the industrial region (Fig. 1 and 2).

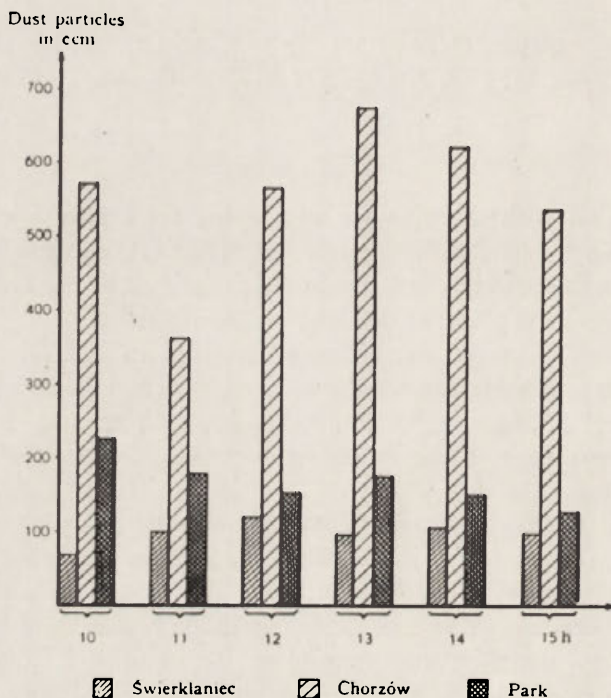


Fig. 1. Variation of suspended pollution by westerly wind

Despite great variations, it was possible to determine the areas where atmospheric pollution was always especially great, by systematically conducting every two weeks a two-day series of measurements. The vicinities of the large iron and steel works at Chorzów and Bobrek belong to such areas. At Chorzów the largest amount found was 8,180 suspended particles per 1 cm³ of air, at Bobrek, the maximum amount reached 4,100 per 1 cm³. Measurements of atmospheric pollution made during the same time in the Karkonosze Mountains showed an amount of only 20 to 50 suspended particles per 1 cm³, and even in Wrocław the atmospheric pollution observed was eight times less than at Chorzów.

The results of these investigations permit the confirmation that the concentration of suspended pollution depends not only on the location of the given place in relation to the source of the smoke, but also on the relief of the area.

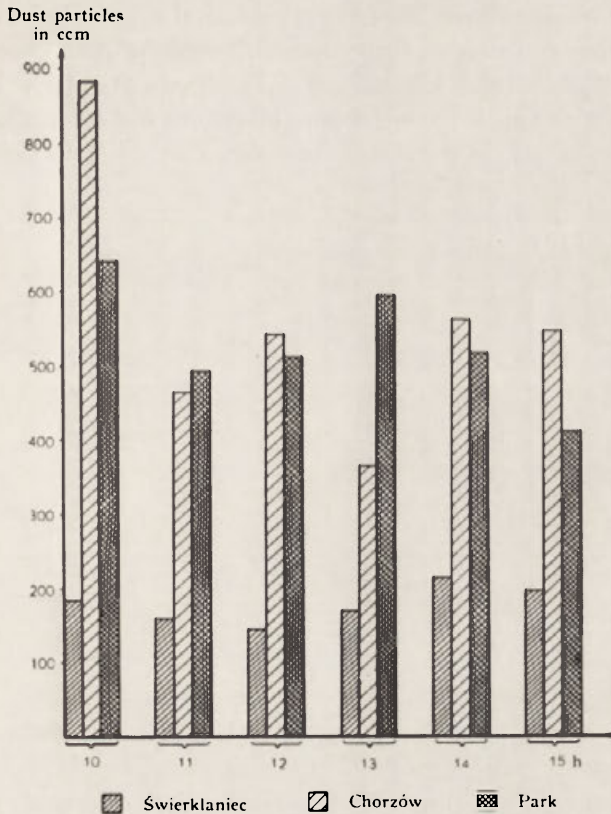


Fig. 2. Variation of suspended pollution by easterly wind

In the valleys where wind velocity is relatively low, the atmospheric pollution is in general much stronger than on higher ground. This phenomenon clearly appears, for example, in the Przemsza Valley; on the hill-slopes bordering each side of this valley, at Będzin and Grodziec, the atmospheric pollution is generally small as a result of the fresh winds (Fig. 3).

The determination of the concentration of harmful gases in the air of the G.O.P. was limited only to sulphur dioxide (SO_2), for the SO_2 concentration in the atmosphere can be considered as an index of its overall pollution. The method of investigation consisted of the collection and analysis of samples of air. Only a few localities in the G.O.P. were included in these investigations, namely Chorzów, Wełnowiec, Nowy Bytom, Dąbrowa Górnicza and Grodziec. In each of these localities, the samples were collected at a number of sites at definite time intervals (about twice monthly).

On the basis of the results obtained, it is clear that air currents greatly influence the amount of gas pollution in the layer of air near the ground. During

periods of fresh winds and resultant increased turbulence, and also during active thermal convection occurring on fine summer days, only small concentrations of SO_2 are generally observed. On the other hand, a particularly large concentration of sulphur dioxide is present during inversions and especially during fogs, when the amount of SO_2 in the atmosphere rises 5 to 6 times as compared with

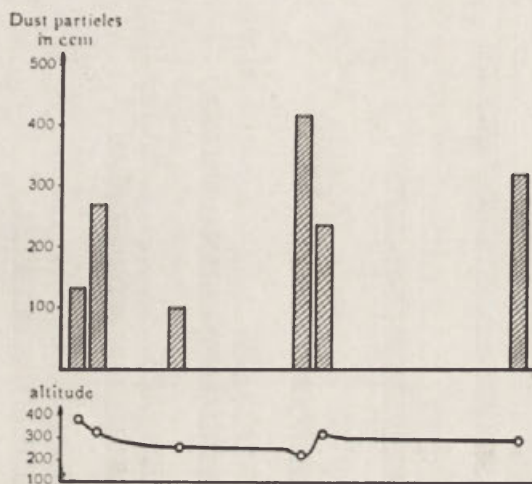


Fig. 3. Variation of suspended pollution in the Przemsza Valley

the average content. As a result, valleys and depressions commonly characterized by inversions resulting from radiation and local advection, are to a greater degree exposed to air pollution from harmful gases than are higher areas.

The largest concentrations of SO_2 were observed in the most highly industrialized localities of the G.O.P. Allowing a level of 0.25 mg/m^3 as permissible from the point of view of health, it was ascertained that in the central parts of the industrial region the annual average concentration of SO_2 exceeds this standard by about four times, and in parts of Chorzów the average concentration reached 2 mg/m^3 , or eight times more than the norm. In particular cases (during fog) the concentration of SO_2 found was twenty times greater than the permissible; a maximum value of 5.45 mg/m^3 was measured on May 19, 1956 in Chorzów. In localities on the periphery of the district, such as Grodziec, where a new large residential area is arising, the mean values are lower than the permissible limit, and only in a few entirely exceptional cases are concentrations noted which significantly exceed it.

The measurements presented here, both of suspended dust and of the concentration of SO_2 , were not carried out continually for technical and organizational reasons, but as has already been mentioned at various time-intervals (as semimonthly series). The results thus obtained, being instantaneous values, are

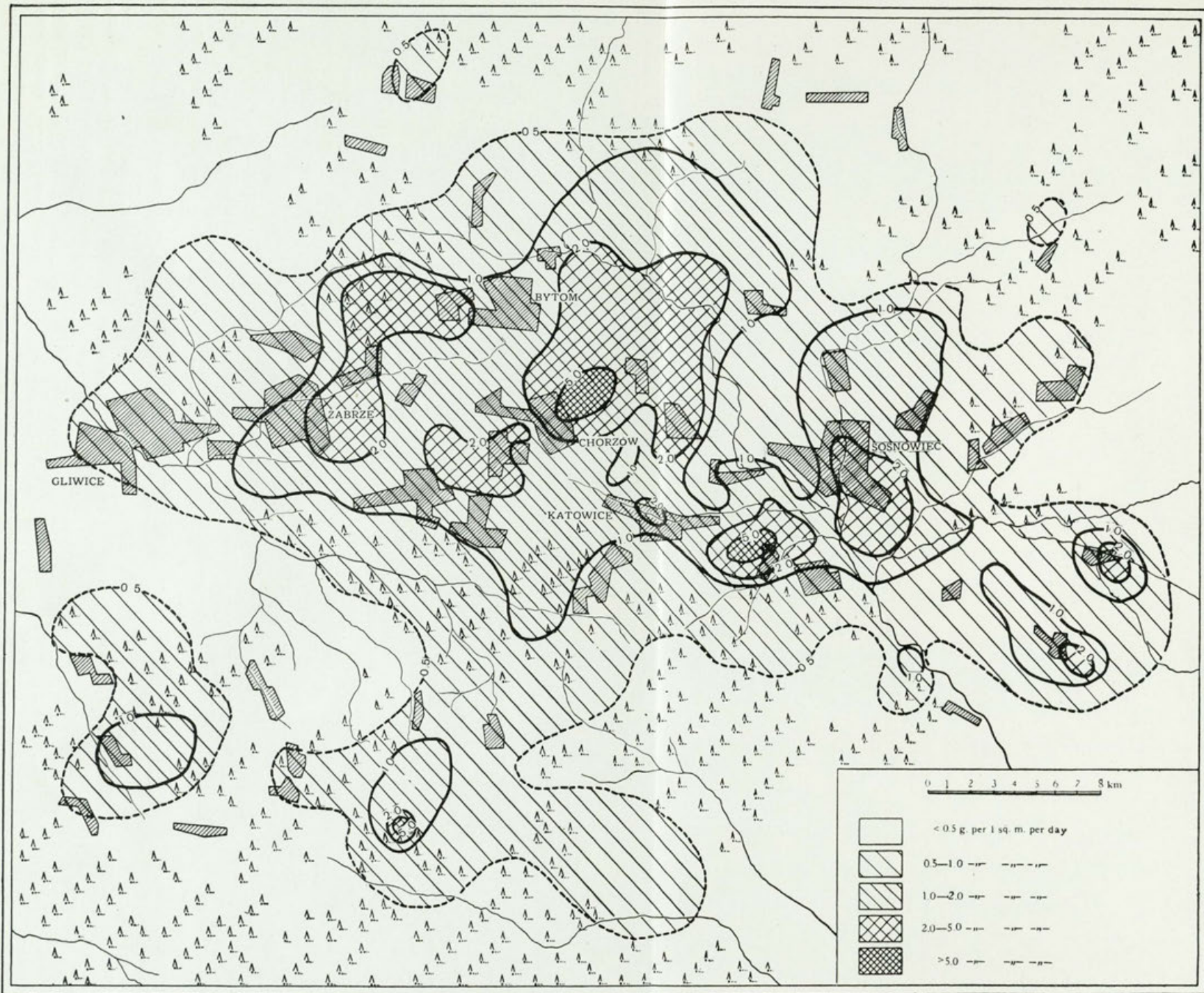


Fig. 4. Mean of distribution of deposited pollution

undoubtedly quite accidental and, therefore, can contain many errors. In addition, the fact that the measurements were made at only few points (the measurement of SO_2 for example at only 33 sites), also causes some results to be rather accidental and fragmentary. The quoted values should therefore be treated only as approximate data.

As a result of this, the necessity arose of conducting continuous measurements of air pollution, even though these might be less exact, but enabling mean values corresponding to the actual state to be obtained. In addition, these had to be carried out by simple and inexpensive methods, easy to apply on a large scale over all the area. The dust, together with atmospheric precipitation, was collected in glass gauges with a known surface area placed in over 180 sites, with a period of exposure lasting four weeks. This made possible the deduction of the daily average amount of deposited matter in grams per 1 m^2 for a designated period, such as monthly, quarterly or annually. In addition, the chemical composition of the deposit was also analysed.

The relatively large number of measuring sites enabled maps to be drawn representing the average distribution of deposited pollution over the G.O.P. area (Fig. 4). The general picture obtained thus confirmed that a considerable part of the G.O.P., mainly its central part, has a pollution higher than 1 g/m^2 per 24 hours. Over this more or less uniform background appears a series of "islands" of greater pollution around large industrial centres. Particularly marked is this pollution in the vicinity of electric power plants, where very poor quality coal gives off a large amount of ash. An example of this is the power plant at Łaziska in the southern part of the G.O.P. In its environs the average annual value observed was 7.9 g/m^2 per 24 hours, and in certain periods it rose to 25 g/m^2 per 24 hours. Again, a great pollution is noted in the direct vicinity of coal mines; this is seen clearly near Zabrze, where around the Concordia and the Zabrze-Wschód mines deposited pollution can reach an average monthly value of 12 g/m^2 per 24 hours (Fig. 5).

Large amounts of dust are deposited in Chorzów generally exceeding 5 g/m^2 per 24 hours; in some quarters of the city the average content calculated for quarterly periods reaches 30 g/m^2 per 24 hours. This occurs mainly in places where the activities of a number of different industrial plants combine each a source of intensive emission of smoke (the Kościuszko Foundry, the electric power plant and the nitrogen plant) (Fig. 6).

For comparison it is worth giving some values characterizing deposited pollution in the industrial areas of other countries. According to Liesegang, in Essen an average of 0.5 g/m^2 per 24 hours is deposited, and in the centre of Berlin 0.3 g/m^2 per 24 hours. The corresponding values are 1.0 g/m^2 per 24 hours for London and 1.3 for Birmingham. Sheleikhovskiy gives the average amount of deposited matter for Kharkow as 1.3 g/m^2 per 24 hours and for Le-

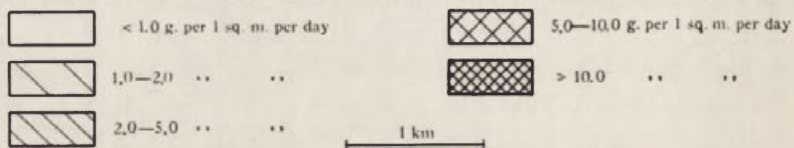
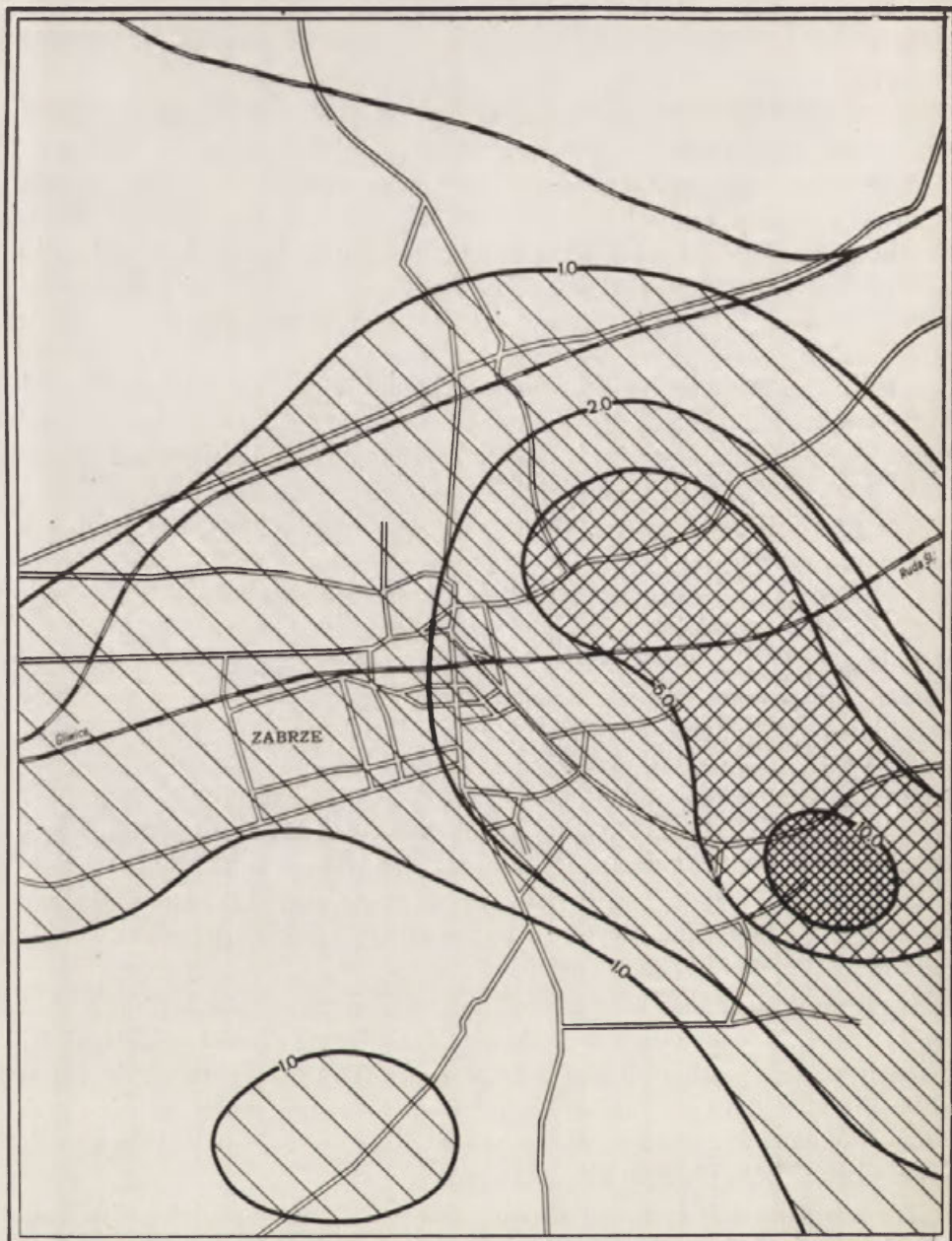


Fig. 5. Mean distribution of deposited pollution in Zabrze

ningrad as 0.8 g/m^2 per 24 hours. According to Moldau the average pollution reaches 2.0 g/m^2 per 24 hours in Pittsburgh and 1.5 g/m^2 per 24 hours in Baltimore.

The average deposited pollution in the area of the G.O.P. amounts to about 1.2 g/m^2 per 24 hours, which implies almost 3,000 tons of deposited matter on the entire territory in the course of 24 hours. Such amounts of deposited matter have already become not only a health problem, but an economic one as well, as a result of difficulties arising in cleaning city areas. Moreover the dust deposited on plants, especially on the surface of leaves, causes damage; it has been observed, for example, in Chorzów that fruit trees blossoming well in the spring

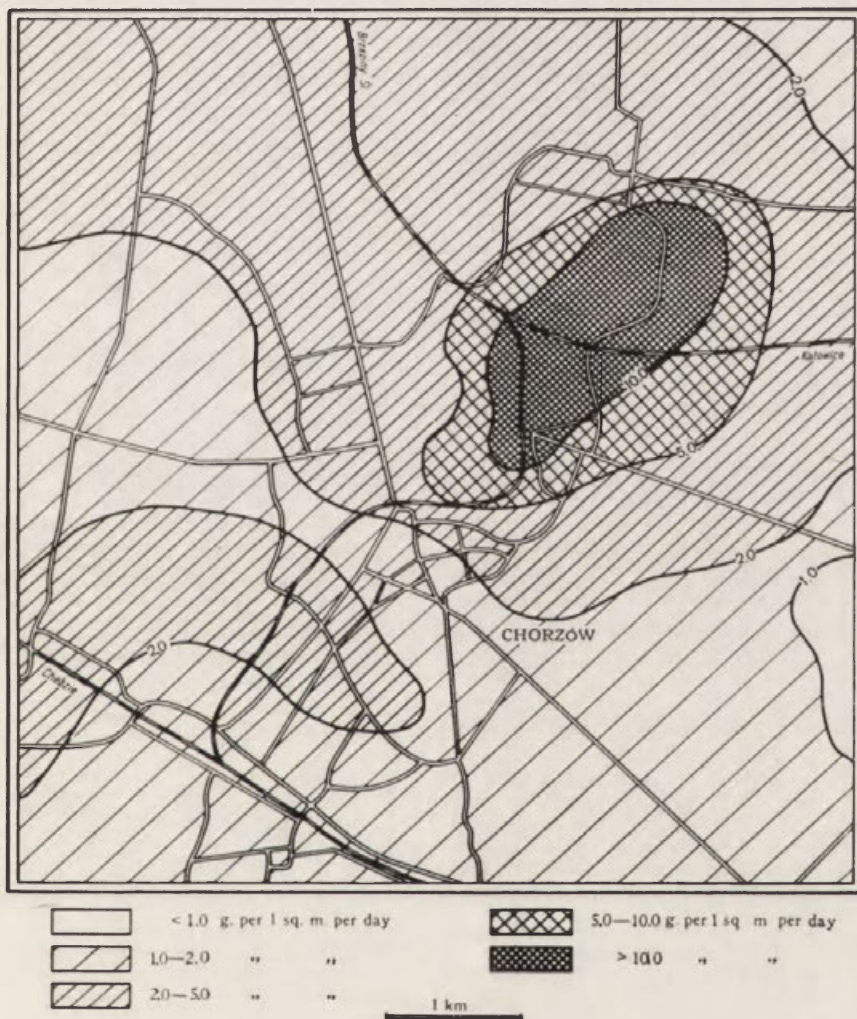


Fig. 6. Mean distribution of deposited pollution in Chorzów

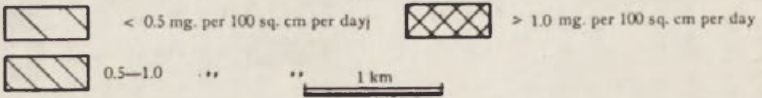
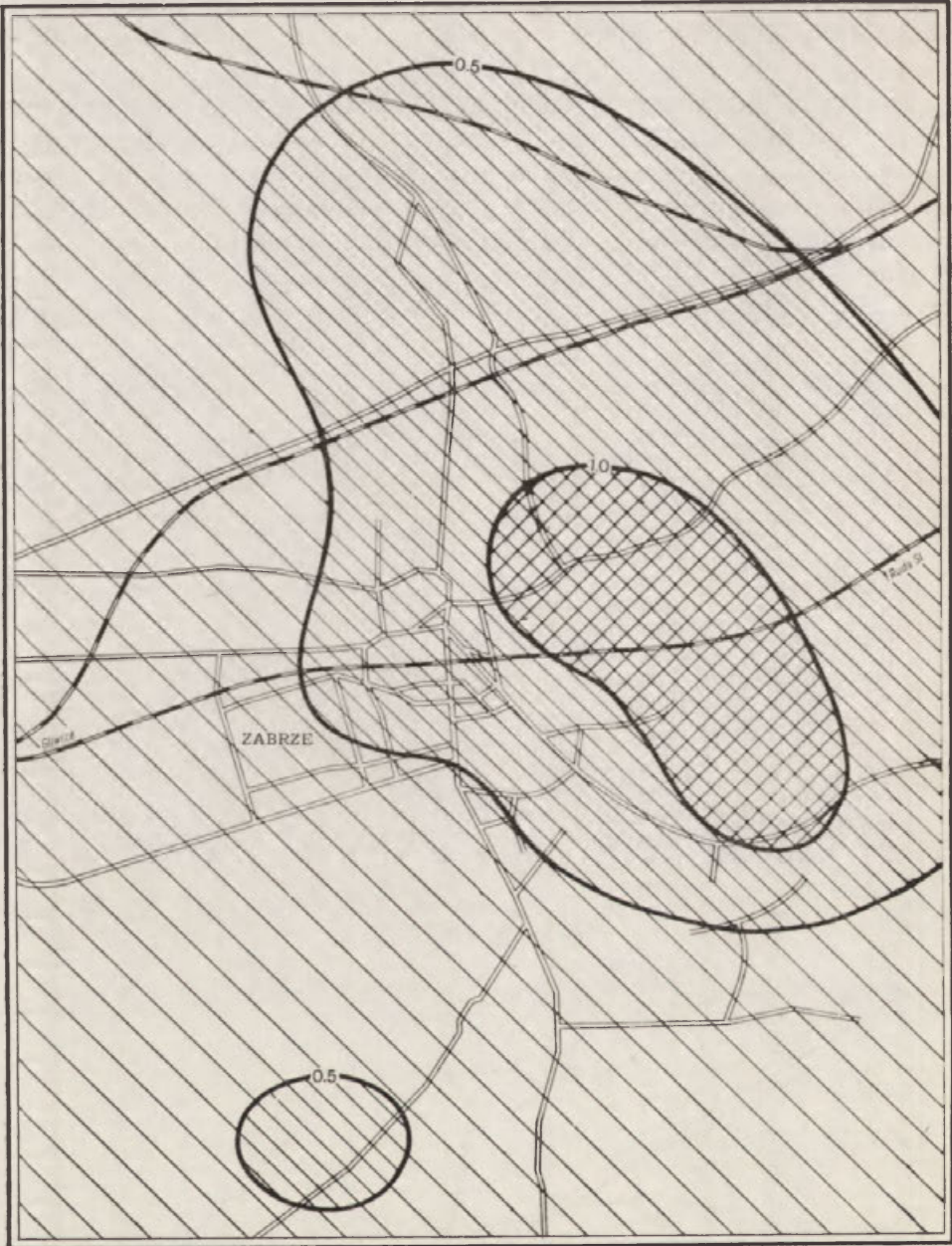


Fig. 7. Mean distribution of deposited sulphur dioxide in Zabrze

may bear no fruit later. It is possible that in addition to the direct action of the deposited matter the pollution of the air by substances harmful to living organisms plays a role. This also holds true for insects, reducing or making completely impossible the pollination of flowers. When dust pollution reaches about 2 g/m^2 per 24 hours, it has been observed that cattle become ill and their milk output diminishes, as has been the case, for example, in the vicinity of the Skaleczno power plant. In general, it can be accepted that deposited pollution of over 1 g/m^2 per 24 hours is deleterious to residents.

Special attention should be paid to pollution in the vicinity of foundries, where large amounts of different metals and their compounds deposited on the surface of the ground cause a gradual poisoning of the soil. On the other hand, these substances uniting with acid-forming (mainly sulphur) compounds reaching the soil may cause a decrease of soil acidity. This is the case, for instance, in Szopienice, where there is a large zinc plant. In some parts of this city the percentage of zinc in the general amount of deposited matter can exceed 20; in this way the quantity of zinc falling on the surface during certain months reaches about 0.5 g/m^2 per 24 hours. Well known also is the contribution of lead, copper and other metals in polluting these areas. It should be remembered, however, that the quantity of deposited matter on the earth's surface does not always correspond to the degree of the pollution of the atmosphere itself, that is the suspended matter, although on the basis of investigations carried out so far the general appearance of the spatial distribution of both these phenomena seems to be similar.

Continuous measurements of the quantity of sulphur compounds in the air have been started. One method involves the exposure of lead peroxide cylinders for a month, after which time on the basis of laboratory investigations the average amount of sulphur dioxide and sulphur trioxide in mg. per 100 cm^2 per 24 hours can be established. These kinds of investigations are at present being carried out only in the Zabrze area (Fig. 7). On their basis it can be affirmed that the greatest amounts of deposited sulphur dioxide are found in the neighbourhood of the Concordia mine, attaining an average of $1.2 \text{ mg}/100 \text{ cm}^2$ per 24 hours; on the periphery of the city it is lower than $0.3 \text{ mg}/100 \text{ cm}^2$ per 24 hours. An attempt to define the correlation between the amount of deposited matter and the amount of SO_2 , as indicated by the method, gave negative results; however, a connection undoubtedly exists.

The degree of atmospheric pollution can be defined not only by direct measurement, but also by the method of investigating the extent of its influence on various elements of the geographic environment. Thus a test of this kind has been carried out, depending on marking the extent of harmful atmospheric pollution as shown by damage to the flora. Taking into consideration coniferous species (pine and spruce), it was shown that this limit is covered approximately by an isoline indicating a deposited pollution of 0.7 g/m^2 per 24 hours (Fig. 8).

Of a somewhat similar character are investigations of solar radiation, which include the determination of the degree of air pollution on the basis of its influence on the transparency of the atmosphere. Measurements were carried out by means of Gorczyński's solarimeters. Simultaneously with these measurements at various sites of the G.O.P., others were taken at a permanent station located outside the G.O.P. area on its windward side, i.e. southwestern (in Pszczyna), and thus less endangered by atmospheric pollution.

Results in the form of the values of the intensity of direct solar radiation allowed the computation of the radiation losses in the earth's atmosphere as a result of its pollution. These losses are equal to the differences between the solar constant (the so-called intensity of radiation at the outer limits of the atmosphere) and the intensity of radiation measured at the earth's surface, also taking into consideration, of course, the scattering of radiation by molecules of air, as well as some absorption of radiation due to water vapour. The extent of the direct radiation loss caused by particles suspended in the air (that is, by aerosols), reduced to the identical optical mass, and represented in the form of a percentage relation to the solar constant, can be, as it were, an index of the degree of air pollution (Fig. 9).

It appears that in the centre of the G.O.P. the aerosols alone cause weakening of direct solar radiation by an average of $0.7 \text{ ly. min.}^{-1}$ at noon, which is about 36 per cent of the solar constant; in some cases, this weakening may reach $1.2 \text{ ly. min.}^{-1}$. In the areas situated outside the G.O.P., the reduction amounts on an average to $0.3 \text{ ly. min.}^{-1}$ or 16 per cent. For comparison, it is worth adding that in the desert area of Central Asia (in Tashkent), where natural air pollution is very great, the respective average value expressed in percentages of solar constant fluctuates in various months from 6 to 24 per cent. As a result of this state of things, the intensity of direct solar radiation in the central part of the G.O.P. (in Bytom, Chorzów and Świętochłowice) often reaches scarcely 40 per cent of the value observed at the same time in Pszczyna.

On the basis of these measurements of radiation, the numerical index of atmospheric extinction is designated in the form of the so-called turbidity factor. This is the value indicating how many times the so-called "ideal" atmosphere, that is completely pure and containing only a constant definite amount of water-vapour, would be more transparent than the "real" atmosphere in the actual conditions existing. It has been observed that the average value of the turbidity factor in Pszczyna amounts to 2.5, while in the centre of the G.O.P. it amounts to 3.5 in Chorzów, 3.7 in Bytom and 4.0 in Świętochłowice, and in the Lipiny area it exceeds even 4.1. A relatively low average value (3.2) was found in the Park of Culture and Rest between Katowice and Chorzów. At specific moments the turbidity factor in the G.O.P. may rise to 10.4 whereas in Pszczyna the observed maximum was only 4.0.

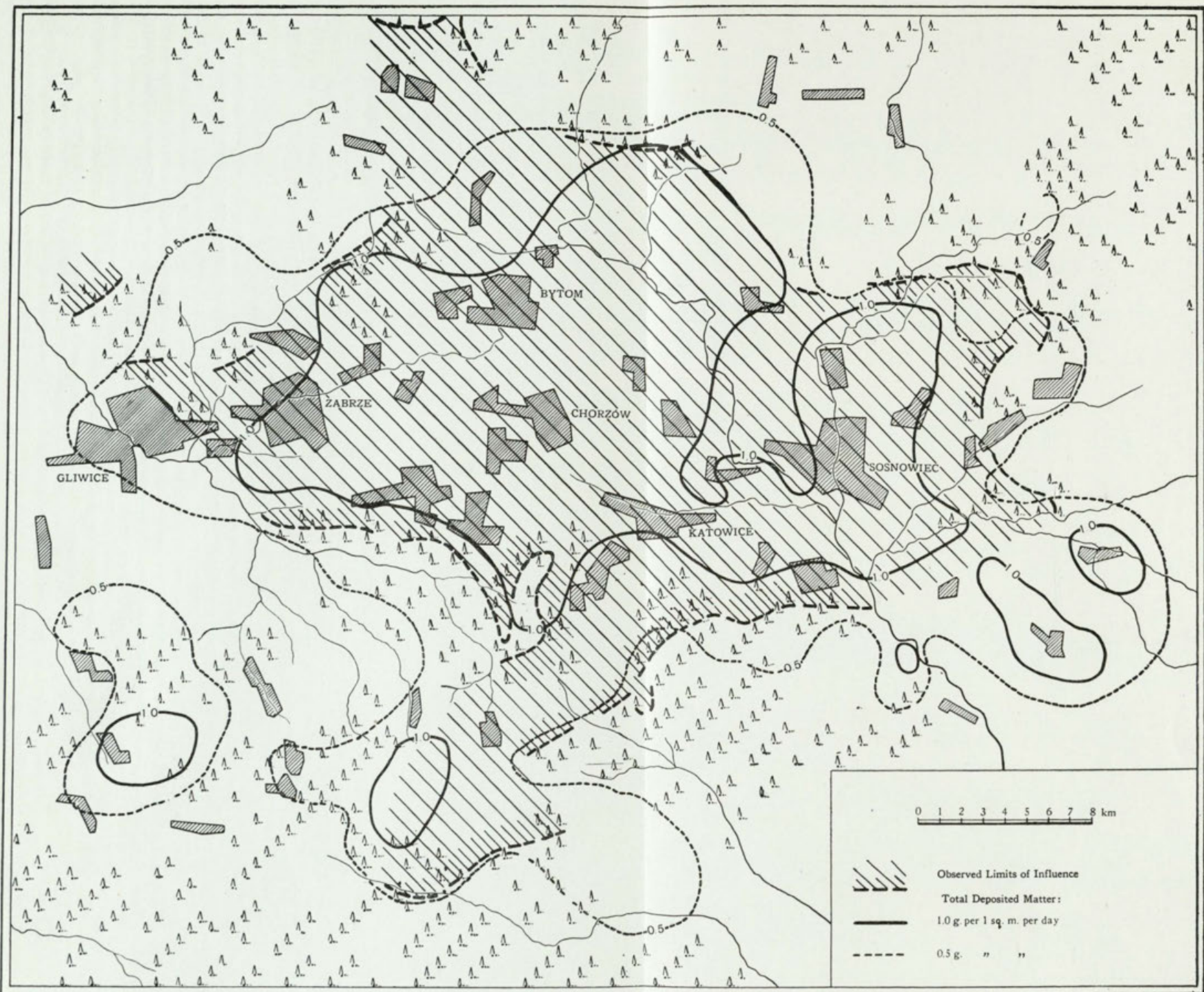


Fig. 8. Influence of air-pollution on the flora
<http://rcin.org.pl>

In defining atmospheric turbidity, the various parts of the solar spectrum are also taken into consideration, marked by the transparency of colour filter RG 2, i.e. the short-wave part for $\lambda < 630 \text{ m}\mu$ and the long-wave part (red and infra-red) for $\lambda > 630 \text{ m}\mu$. It appeared that an especially marked

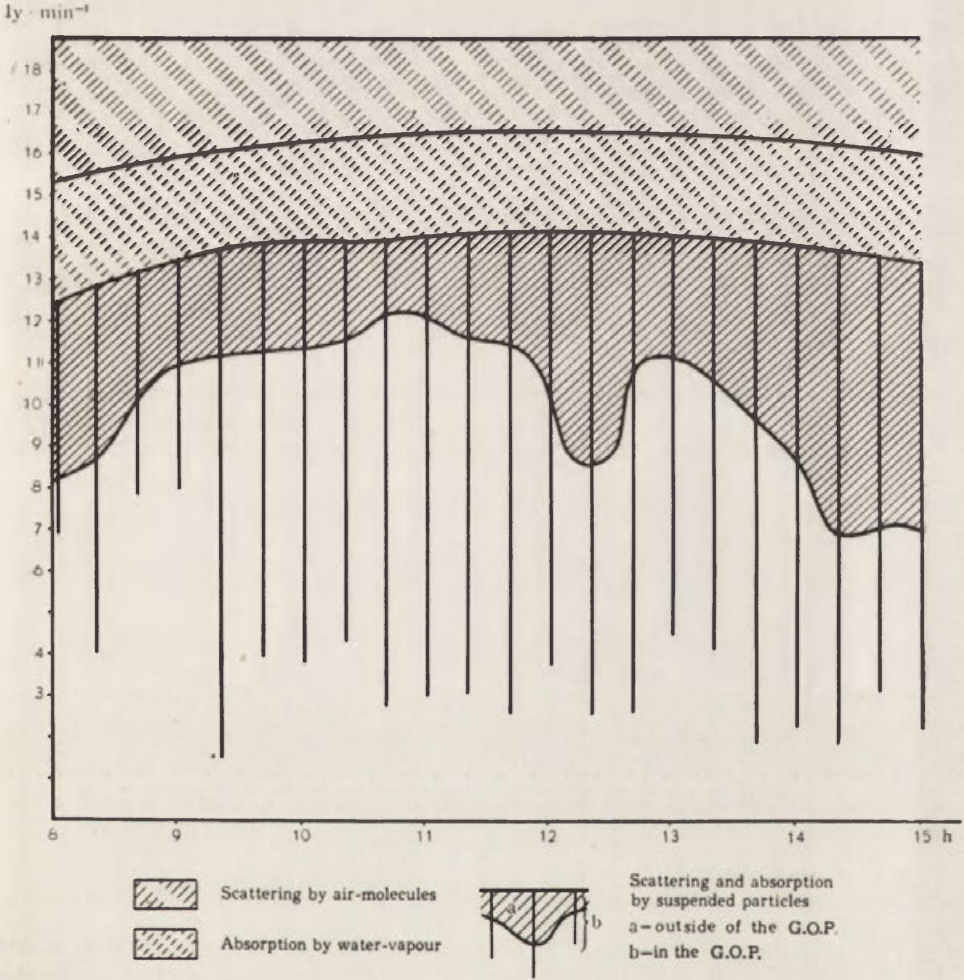


Fig. 9. Weakening of the direct solar radiation in the atmosphere

decrease of atmospheric transparency can be detected in the short-wave part of the spectrum, which also indicates the great influence of scattering and absorption by suspended pollution. In addition, very considerable variety and irregularity of the daily change of the turbidity factor was observed in districts distinguished by the least atmospheric transparency, in contradistinction to areas

outside the G.O.P. This is attested by comparing the results of observation carried out simultaneously in Chorzów or in Lipiny with those in Świerklaniec (Fig. 10).

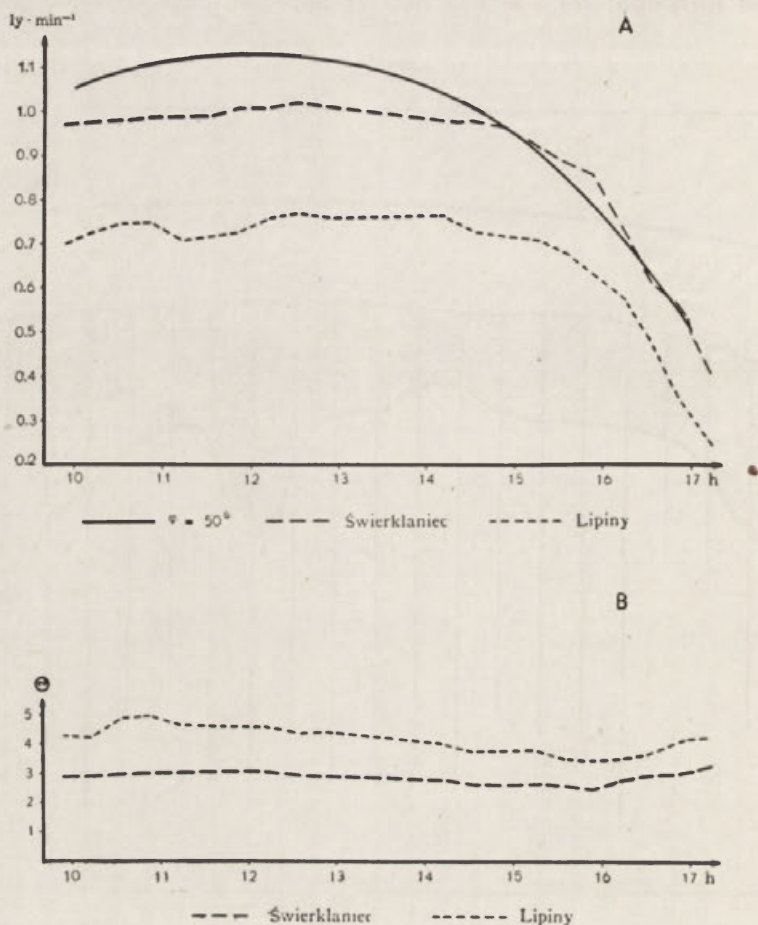


Fig. 10. Intensity of direct solar radiation (A). Turbidity factor (B)

The advantage of these kinds of investigations lies in the fact that they allow the computation of various numerical indices of atmospheric pollution. At the same time they also permit the definition of the influence of this factor on various components of the geographical environment, and so therefore its role in the environment.

From the above remarks it follows that while carrying out climatological investigations in industrial areas, it is necessary to have far-reaching co-operation between climatologists on the one hand, and public health officials and technologists on the other. Thanks to such co-operation, the investigations carried

out in the G.O.P. have not only given valuable results for such practical purposes as town-planning, but have also deepened our knowledge of general problems concerning the local climate of industrial areas.

Table of Metric and British Measurements

Deposited Matter:

1 gram/m² = 1 tonne/km² = 2.55 tons/sq. mile = 9 lb./acre

1 mg/100 cm² = 1.29 grain/sq. yd.

Suspended Matter:

1 mg/m³ = 0.0118 grain/cu. yd.

1 particle/m³ = 1 particle/1.308 cu. yd.

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Stanley H. Beaver

THE RECLAMATION OF INDUSTRIAL WASTE-LAND FOR AGRICULTURAL AND OTHER PURPOSES

Land damaged by industrial operations falls into two broad classes, each of which is capable of subdivision.

A. Land on which deposits have accumulated:

- (i) of industrial waste (iron-works slag, chemical waste, etc.),
- (ii) of mining spoil (from collieries, etc.).

B. Land damaged through the extraction of minerals:

- (i) by quarrying,
- (ii) through subsidence of the surface after underground mining.

Each of these categories will be considered in turn, with a view to discovering (a) the nature of the problems, (b) its geographical distribution within Britain, and (c) the possibilities of a solution through land reclamation for one purpose or another.

MINING SUBSIDENCE

It is obvious that when minerals are extracted from underground and little or nothing is packed back into the vacant space, the roof of the workings will collapse and the wave of subsidence will eventually reach the surface, actually over a wider area than that from which the minerals have been won. The nature and incidence of subsidence depends on the depth of the workings, the thickness of the mineral extracted, the dip of the rock, the amount of faulting present in the strata, and the nature of the strata lying between the minerals and the surface. We are not here concerned with damage to buildings. Damage to agricultural land usually involves the disturbance of the natural drainage, which may eventually lead to the formation of shallow water-filled hollows (called "flashes" in the north of England, "swags" in the Midlands). Shallow pillar-

and-stall mining sometimes results in the collapse or “crowning-in” of the surface, forming pot-holes. The worst affected areas in Britain are coalfields at low elevation above sea-level, such as South Lancashire, and the Cheshire salt-field.

The reclamation problem is a difficult one, for the “flashes” have no outlet and cannot easily be drained. In some cases it may be possible ultimately to fill up the holes e.g. in Cheshire with chemical waste, or in south Lancashire with colliery spoil.

INDUSTRIAL WASTE

This is often hard and intractable, and is sometimes chemically noxious, so that its utilization is difficult, and it forms an inhospitable environment for plants. Examples include the following:

(i) Chemical waste, particularly prevalent in the Widnes—St. Helens district of South Lancashire and on Tyneside; this is a very difficult problem indeed.

(ii) “Shraff” from the ceramic industries of the “Potteries” district of North Staffordshire; much of this waste material, consisting of old plaster casts, broken pieces of ware, etc., is now being tipped into disused clay-pits which are also common in the same district.

(iii) Blast-furnace slag; much of this is now used for road metal almost as soon as it has been produced, and there is little problem of accumulation; but considerable past accumulations exist in some areas, and the problem is particularly acute in Cumberland because of the chemical nature of the slag in this smelting district, which makes it unsuitable for road surfacing.

(iv) Power-station ash; this is produced in enormous quantities at modern thermal power stations, and its disposal presents an acute problem which is sometimes solved by mixing the ash with water and pumping it into disused gravel pits or similar excavations.

MINING SPOIL

In Britain this is largely the product of coal-mines; the spoil-heaps from old non-ferrous metal mines are now mostly overgrown and relatively inconspicuous. The problems are of two kinds:

(i) Spoil-heaps of the nineteenth century, produced by hand labour (men with wheel-barrows) from small and closely-spaced pits, as for example in the “Black Country” of South Staffordshire. This landscape of “hills-and-hollows” (the hills being colliery spoil and the hollows due to subsidence) is relatively easily reclaimed by modern machinery—the tractor-drawn scraper and the bulldozer—but in a heavily industrialised and urbanised area like the Black

Country the reclamation, which has been proceeding rapidly during the last fifteen years, has been mainly for housing and for industry, and never for agricultural purposes.

Somewhat similar conditions exist in the small Shropshire coalfield and in the older parts of some other British coalfields, but nowhere has the problem attracted so much attention as in the Black Country.

(ii) Large modern colliery spoil-heaps, of various shapes (conical, ridge, flat, etc.) produced by mechanical means (inclined tramways or overhead ropeways). Whilst these are still in active use little or nothing can be done, but when tipping ceases the problem varies with the nature of the spoil and the shape of the heap. Many of the spoil-heaps, particularly the conical ones, will have been on fire for many years, and the burnt ash or clinker, whilst providing but a poor plant environment, can be quarried economically for use in the making of paths and roads, or as hard-core for foundations. Unburnt heaps consisting largely of weathered shale may be quarried for brick-making. The most appropriate form of reclamation is usually tree-planting, either on the heap as it stands or after some re-shaping has been done (e.g. by levelling the upper part of a conical or ridge tip). Provided each tree is planted in a pocket of soil and compost, and always provided that no interference from trespassers is experienced, success is not difficult to achieve. Relatively little was done in the past, when the coal-mines were privately owned, simply because the operation was expensive and unremunerative, but the National Coal Board has made itself responsible for numerous plantings in many coalfields, notably in West and South Yorkshire and in Durham.

QUARRIES

Like all other forms of human activity, the winning of minerals takes place in an environment which has three aspects, physical, technological and economic. The physical environment comprises the geology and physical geography—the occurrence and location of the minerals in relation to the geological circumstances and to the physical form of the land surface; and in this connection it must be borne in mind that minerals can only be worked where they occur in nature, and that once worked they cannot be replaced.

The technological environment has two aspects. The first is the technical aids which are available at any given time and place for the extraction of the minerals—and here a great revolution has taken place within the last quarter of a century, with the introduction of large mechanical excavators and earth-mowing equipment. The second is the techniques which are available for the utilization of the minerals. Here again there have been many advances during the past century, notably in the iron industry, but also in such products as ce-

ment and concrete which have revolutionised building methods since the First World War.

The economic environment comprises the general national and international economic situation which affects all forms of production, minerals included, together with price-relationship between the mineral producing and mineral consuming industries, and the cost of transport which in the case of bulky mineral products may be very important in influencing the economic working of deposits.

The physical and technical factors referred to are together responsible for the "cultural landscape" of mineral working, that is the appearance of the excavations and the way in which they fit into the natural and man-made landscape in which they are set. Some temporary and perhaps permanent disfigurement is inevitable, and where agricultural land is involved, either temporary or permanent loss of productive capacity. In order to assess this problem it is necessary first to glance briefly at the physical nature of quarries.

The nature of a quarry depends on five factors, the first four of which are geological, the fifth technical. These factors are:

- (i) The thickness of the mineral deposit which is being worked.
- (ii) The thickness of the overburden which has to be removed in order to reach the desired mineral.
- (iii) The nature — lithology and structure — of the rocks comprising the overburden and the mineral beds.
- (iv) The relation of the excavation to the water-table
- (v) The nature of the mechanical appliances which are available for the operations.

The first four of these are clearly fixed and unalterable, but the fifth may change from time to time, and indeed it is the increasing mechanisation of quarrying which has created such pressing reclamation problems during the period since the First World War. It is also true, however, that many of the machines which perform the processes of excavation can be used to reclaim the land which they have devastated. Thus whereas in England and Wales at the present time some 5,000 acres (about 2,000 hectares) of agricultural land are being taken every year for the extraction of minerals, about two-thirds of this is likely to be reclaimed, either for agriculture or for building.

On the basis of the factors mentioned above, it is possible to distinguish four major types of quarries, each of which gives rise to a different set of reclamation problems.

Type 1. A relatively thin seam of mineral—up to say 15 feet (5 m.) in thickness—is worked from beneath a shallow overburden. The overburden may consist of little more than soil and subsoil grading down into the parent rock which is the mineral to be quarried; and in general the mineral will be stratified

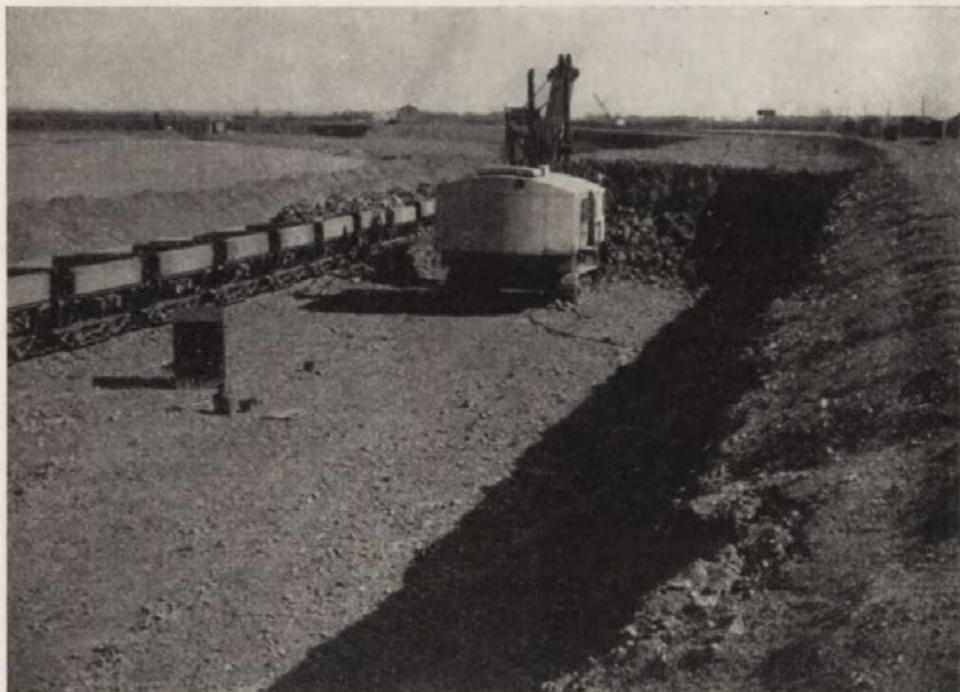


Fig. 1. A shallow ironstone quarry ("Type 1") in Oxfordshire
Agricultural restoration on the left

and more or less horizontally bedded. The excavation fails to penetrate to the level of the permanent water table and so the quarry floor is normally dry.

Such shallow pits are characteristic of certain parts of the Jurassic ironstone fields of the East Midlands (in Oxfordshire and Leicestershire, for example) and of a large part of the gravel industry, all over the country. Both overburden and mineral are normally dug mechanically by dragline excavators or face-shovels. In the past there were also many clay-pits of this type, and these, like the earlier gravel and ironstone pits, were dug by hand. Many of them have become overgrown with vegetation, or the shallow excavated areas have been turned back to cultivation.

In general, quarries of this type present the easiest reclamation problem. The landscape is altered but little; agricultural reinstatement of the worked-over land may be relatively simple, on the floor of the shallow pit, for the original soil will not have been lost, and can be replaced. Alternatively, the pit floor may be used for building purposes; or perhaps the pit may be filled with domestic refuse, upon which, with a soil cover, it may be possible to resume agricultural operations.

Type 2. In this type a relatively thin seam of mineral—say 6 to 30 feet (2 to 10 m.) again stratified and with a small or no dip—is extracted from beneath

a thick overburden, which may sometimes attain 100 feet (30 m.) in thickness. Such quarries are characteristic of a large part of the Jurassic ironstone fields of the East Midlands, and of the opencast coal industry. Excavations of this type have only become possible since the introduction of mechanical excavators. In the ironstone fields, though the first steam-shovel was introduced as long ago as 1895, there were very few until after the First World War, and not until the early 1930s was the ironstone industry completely mechanised. Opencast coal has only been won since 1941. Enormous strides have been made in the size and efficiency of excavating machinery during the last twenty years, and as remarked above, the machines which create the devastation can also be used to reclaim the land which they have damaged.

The mineral seam is usually dug by a relatively small face-shovel standing on the floor of the pit; the overburden may be removed either by a very large face-shovel, which stands on the mineral seam and casts its bucket-load into the space behind the advancing working face, or on to a transporter, or else by one or more large draglines, standing on the undisturbed ground (or in the case of very deep workings, one on top and one on a terrace half-way down) and casting their load into the worked-out ground. This mode of operation normally leads to the formation of a "hill-and-dale" surface; but certain types of "walking dragline" (so called because they can move along under their own power) can so distribute the loads which they cast that a roughly level surface can be created at once, and this has contributed in no small measure to the possibilities of reclamation. Tractor-drawn scrapers and bulldozers are used both to remove the soil before the excavation commences and also to level and re-soil the worked-out ground.

There are four main methods now in use for the after-treatment of land which has been disturbed by opencast coal and ironstone quarrying.

(i) The "hill-and-dale" may be afforested, without any levelling being done; indeed, better results are generally obtained without levelling, for the "hill-and-dale" is well drained. Considerable areas in Northamptonshire have been treated in this way, and the largest steel company in the area, Stewarts and Lloyds, of Corby, have their own tree nurseries and staff of foresters.

(ii) The "hill-and-dale" may be levelled by scrapers and bulldozers, and the former soil cover (which has been stripped and stored during the excavation of the minerals) replaced, so as to re-create agricultural land. This is, of course, an expensive operation, but it has almost always been done after opencast coal working and sometimes also in the case of ironstone working. The results have been variable; in some cases better crop production has been achieved after reclamation than before the minerals were worked, in other cases there has been much trouble from bad and irregular drainage. Much depends on the nature of the overburden which covered the mineral seam; beds of sand or of limestone may, if not too encumbered by large stones, produce quite good reclaimed agri-



Fig. 2. An "opencast" ironstone quarry ("Type 2") in Northamptonshire
Large "walking dragline" excavates overburden, creating "hill-and-dale" spoil heaps

cultural land, but beds of heavy glacial clay may be very difficult indeed to cope with.

(iii) The “hill-and-dale” may be levelled, and an attempt may be made to reinstate agriculture without any top soil replacement. The stripping and storing of soil is a very costly business, and in the case of ironstone workings (for iron ore has a much lower value per ton than coal) it is often not done. The soil is



Fig. 3. Mechanical scraper drawn by diesel-engined tractor
Used in opencast quarrying for removing soil, and for levelling and soil replacement

treated as part of the overburden and gets irretrievably lost during the process of excavation. It is not easy to cause a new soil to form but by the use of suitable crops, such as clovers and lupins (which have penetrating root systems and are also nitrogen-fixers), appropriate fertilizers, and by using sheep to graze the crops (for the small cloven hooves of the sheep help to loosen the surface whilst not treading it down too heavily, and their manure is a valuable fertilizer), it has been done in several areas within the east Midlands ironstone fields. The use of gypsum (calcium sulphate) to facilitate the formation of crumb-structure within the soil has also met with some success.

(iv) When the overburden to be removed is not more than about 35–40 feet (say 12 m.) in thickness, it is possible to use a type of “walking dragline”

which does not create "hill-and-dale" but distributes each bucketful of spoil so that a roughly level surface is formed at once, upon which the previously stripped soil can easily be replaced. In such circumstances it is possible to resume agricultural operations quite a short distance behind the working face of the quarry. Without doubt this machine has been of inestimable value during the last fifteen years, particularly in the ironstone fields.



Fig. 4. Opencast ironstone quarry ("Type 2") in Rutland
"Walking dragline" removing overburden of about 12 m. creating level surface behind quarry, instead of "hill-and-dale", with speedy agricultural restoration

It may be concluded that the problem of opencast coal and ironstone working is nothing like so serious as it was before the last war; the reason is partly our increasing ability to cope with the agricultural restoration, but very largely the availability of an increasing range of excavating and earthmoving machinery which has been developed during and since the last war. Moreover, planning legislation has made quite certain that not only the incentive but the financial means for restoration of worked-out coal and ironstone areas are available.

Type 3. In this type of quarry a very thick bed of mineral is removed, at least 30 feet (10 m.) and sometimes very much more. If the thickness is more than about 70 feet (say 20–25 m.) the quarry will usually be worked in levels or terraces, each about 70 feet in height. In these circumstances, whether or no any

appreciable thickness of overburden is removed as well, a very large hole will be created. The rock may be either stratified, as with limestone, chalk and sandstone quarries and the deeper clay and gravel pits, or it may be unstratified and of unknown or unfathomable depth, as with granite and other igneous rocks, and china clay.

The physical form of the land surface causes variation in the nature of these large excavations, and two broad groups are distinguishable, those that start from a flat surface and work downwards and outwards and those which start on a sloping surface—a scarp slope or valley side—and work horizontally into the hillside, creating a considerable gash or scar. Those that work downwards may have to face the problem of water accumulation, and continuous pumping may be necessary, whilst the quarry may fill with water when working ceases. Those that work into a hillside will generally have no water troubles, and they are easier to work because there is no uphill haulage; but they make much greater scars on the landscape and are therefore a greater offence to amenity. Damage to agricultural land will vary considerably, of course, and will in general be greater in the case of chalk and limestone quarries than with slate or granite or quartzite.

If any overburden has to be removed, it must be dumped somewhere; it may in some cases be possible to dump it in the worked-out portion of the quarry, but if for some reason (e.g. because there may be more mineral lower down, reserved for future working) it is not, a spoil heap will have to be created—and this produces similar problems to those already mentioned in the coal-mining industry.

Quarries of this type present the most intractable of the reclamation problems. There is in general little possibility of filling the enormous holes, neither is it feasible to re-establish agriculture on the floor of the worked-out quarry, and in general the scar must be left for nature to heal in course of time, by the softening of the outlines and the growth of vegetation.

Type 4. These are the so-called “wet” pits, characteristic of the modern sand and gravel industry. The excavation penetrates below the level of the water table, which is only a few feet from the surface, and the mineral is extracted partly or entirely from beneath the water. There are two main methods of working. In the first the gravel is extracted, as from a dry pit, by a dragline excavator standing on the bank of the lagoon and dumping its load into light railway wagons, or into dumpers or lorries, or on to a conveyor belt, for transfer to the washing and screening plant. The second employs a floating pontoon which carries either a bucket-dredger or a suction pump which discharges the gravel into a waiting barge which, when full, can be towed to the processing plant situated on the bank of the lagoon.

Most sand and gravel pits worked by these methods occur in the river terrace gravels, which are commonly overlain by very good arable soils, and

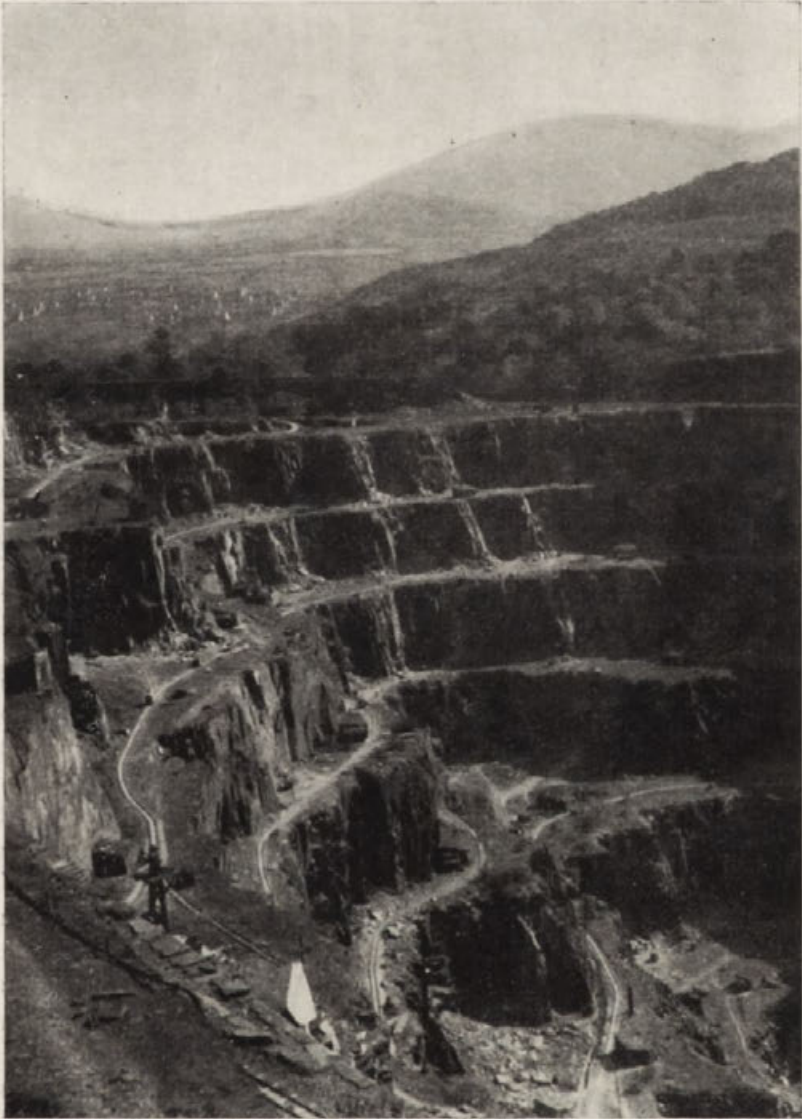


Fig. 5. Very deep slate quarry ("Type 3") in North Wales
Each quarry face is about 20 m. deep



Fig. 6. A "wet" gravel pit in Leicestershire ("Type 4")
Dragline excavator digs gravel from beneath water

there is therefore serious loss of agricultural land. This is a problem which has been rapidly increasing during the last twenty-five years, because of the enormous expansion in the demand for gravel for building and other constructional work (the output of gravel and sand in Great Britain was 2 million tons in 1922, 20 million tons in 1937, and 61 millions tons in 1958). The problem is presented in its most acute form in the Greater London area, where about one-fifth of the national output of gravel is obtained from wet pits in the Thames terrace deposits, and where competition between various forms of land-use is at its maximum. These gravel terraces have in the past been amongst London's major market-gardening areas. Quite apart from the loss of agricultural land, however, there is the problem of what to do with the lagoons when gravel working has ceased.

The most obvious thing is to do nothing, and to leave the lagoon as it is; the forces of nature will quickly heal the scar, vegetation will clothe the banks and wild-fowl may very well colonise the water. Many such lagoons in the south of England have become valuable additions to the local amenities, rather than the reverse. But much will depend on the state in which the lagoon is left by the gravel operators, and on the general situation of the lagoon in rela-



Fig. 7. Filling a disused "wet" gravel pit, ("Type 4") in Hertfordshire
The debris is dumped by lorries and bulldozed into the water

tion to other aspects of land-use and human settlement. Positive encouragement may be given to the amenity aspect by tree-planting, stocking the lagoon with fish, and so on, and what might otherwise have been a useless stretch of water is converted into a financial asset, much in demand by anglers, batchers and those interested in canoeing and sailing.

If the lagoon is to be filled, it is necessary to have available a source of suitable material. This is not difficult in the neighbourhood of large towns, where material from excavations and demolitions has to be dumped somewhere and can easily, provided it does not contain any putrescible matter which might cause pollution and smell, be tipped into a lagoon. Clearly, however, although filling with builders rubbish will dispose of the lagoon it cannot produce a surface which can be restored to agricultural use. A thick covering of soil on the levelled surface of the rubbish may enable a sward of grass to be grown, for example for playing fields, but normal agriculture is more or less out of the question. On the other hand, the filled pit, after suitable lapse of time to allow the dumped material to consolidate, can be used for building land, either for houses or for factories, and there are many examples of this after-use of gravel pits in the Greater London district.



Fig. 8. Aerial view of a "wet" gravel pit ("Type 4") in North Kent
Gravel dredged from lake-bottom. Bottom right, soil stripped from gravel bed; centre left, filling in progress;
top left, filling complete, soil being replaced

One very common filling material which is always available in the vicinity of urban areas is ordinary domestic refuse; this is commonly tipped into dry pits, but because of the danger of pollution and offensive odours derived from the decay of the vegetable matter in the refuse, it is in general prohibited from being tipped into lagoons. Provided the water can be adequately oxygenated however, there should be no difficulty, as experiments in the Greater London area have shown; and if domestic refuse could be used as a filling material it would enable many old gravel pits to be filled which might otherwise remain as lagoons for a long time. Moreover, rotted domestic refuse is a very much better soil-making material than builders' rubbish, and the possibility of agricultural use for the filled land would be open.

In conclusion, we may look at this problem of land reclamation in its national setting. In recent years in Great Britain the annual loss of agricultural land to other uses, mainly urban expansion but including mineral workings, has been about 35,000 acres (14,000 ha). The annual requirement of land for mineral working is about 5,000 acres (2,000 ha), but of this total some 3,500 acres (1,400 ha) are being restored to agriculture or put to some other profitable use, e.g. building or forestry. The whole of the opencast coal and ironstone areas, for example, will be profitably re-utilized, and so will many of the areas worked for gravel and other minerals. There remains a "hard core" of land irretrievably lost—mostly in Type 3 quarries and in wet gravel pits remote from urban areas—amounting to about 1,500 to 1,700 acres (600 to 700 ha) a year. Unfortunate as this may be, it is very small in comparison with the loss of agricultural land to urban development, and it is in any case a relatively small price to pay for the valuable minerals—chalk, limestone, granite, basalt, etc.—which have been won.

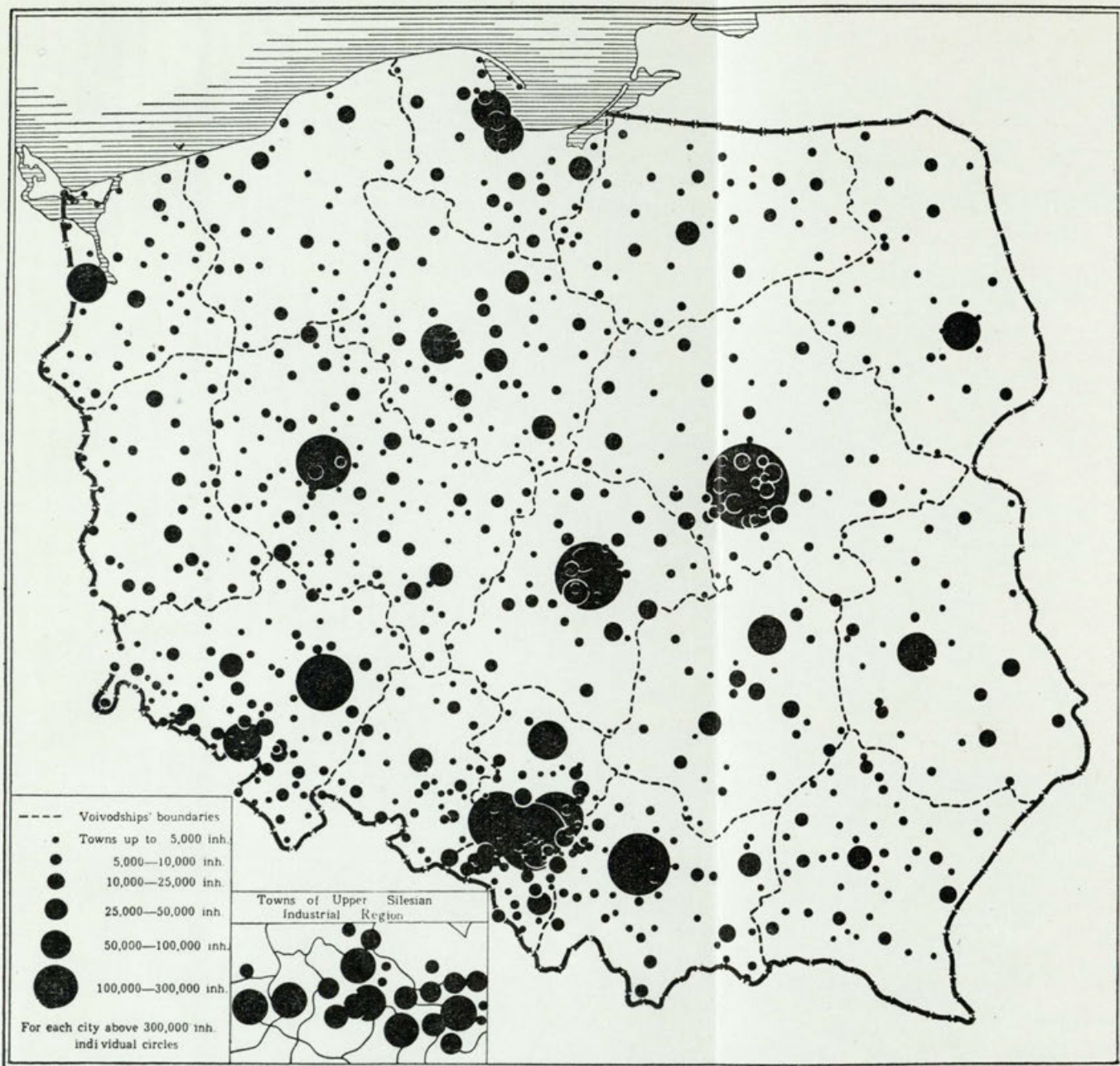


Fig. 1. Distribution of towns in Poland in 1956

Leszek Kosiński

URBAN GEOGRAPHY IN POLAND AND ITS PRACTICAL APPLICATION

Two factors have exerted a decisive influence on the post-war development of urban geography in Poland. First there was the urgent necessity that the scientists who had survived should join in the effort to restore the devastated country. Second was the change in the methodological basis of science towards a Marxist position, which found its expression especially in the greater attention paid to the economic foundations of urban development. Attention shifted from studies of the location and morphology of cities to functional studies. This functional emphasis has been of great significance for the development of urban geography in Poland since the war, though research has not been limited exclusively to functional analysis.

Before discussing recent trends, however, it is desirable to characterise briefly the towns of present-day Poland.

TOWNS IN POLAND

In Poland settlements are considered urban if they have the administrative status of towns. They are frequently fairly small centres, with only slightly developed non-agricultural functions. Besides 740 towns that included 12.9 millions or 46.4% of the national population in 1958, there existed 133 settlements that had recently become separate urban administrative units.

Analysis of Polish towns reveals severe disparities that have been emphasised by war damage and subsequent difficulties of adaptation to the conditions of the new social and political system. On the other hand heavy capital investment in towns has been accompanied by immigration into urban centres. The distribution of towns and urban population is still very uneven. In general, eastern Poland is less urbanised than the west. Most of the eastern towns are weakly industrialised local centres, but in the west industry is much more represented and specialised urban centres are more common.

DIFFERENCES IN HOUSING AND MUNICIPAL EQUIPMENT IN DIFFERENT PARTS OF POLAND

Urbanisation Municipal equipment Housing	Poland total	Selected voivodships				
		Rzeszów	Kielce	Poznań	Zielona Góra	Wrocław
Urban population 1958 ('000)	13,471	352	442	1,060	323	1,205
Percentage of urban population 1958	46.4	22	25	46	46	59
Number of towns and urban settle- ments, 1958	873	45	36	102	51	92
Percentage of specialized towns and urban settlements, 1949	24	8	14	3	22	49
Percentage of towns and settlements with piped water, 1958	65	52	36	42	76	99
Percentage of towns and settlements with main sewage systems, 1958	59	52	22	49	71	83
Percentage of flats with 1-2 rooms in towns, 1950	58.6	69.6	78.7	51.8	30.1	43.6
Percentage of flats with 3-4 rooms in towns, 1950	36.3	27.6	20.0	40.7	59.2	48.0

The roots of these differences go back to the nineteenth century when the country was partitioned among different powers and reflect their different economic systems. For all, however, Poland was a borderland that was relatively backward in its economy. During the twenty inter-war years it was impossible to eradicate the differences produced during the previous century and a half,



Fig. 2. The voivodships compared

and despite marked progress differences still persist. The recovery of territories which before 1939 had been incorporated into Germany provided additional differences.

Since the war the process of evening out these differences could not be rapid because of the physical destruction and loss of population.

WAR DAMAGE IN SOME OF POLISH CITIES

City	Percentage of 1939 residential, service and administrative buildings destroyed			Population in thousands		
	in the whole city	in midtown	in historic quarters	1939	1946	1958
Warsaw	81	95	100	1200	479	1088*
Wrocław	78	85	80	640	171	409
Poznań	45	60	70	272	268	392
Gdańsk	60	40	100	258	118	272
Szczecin	40	75	98	383	73	255
Białystok	75	95	100	107	57	116**
Elbląg	45	90	100	86	21	74
Racibórz	60	90	90	50	20	29
Koszalin	20	60	80	34	17	41
Łomża	60	80	80	27	14	20***

* In 1939 there were 376,000 Jews (31%). In January 1945 there were 162,000 inhabitants, 22,000 on the left bank of Vistula (main part of the city), and 140,000 on the right bank.

** In 1937 43% of the inhabitants were Jews.

*** In 1931 35% of the inhabitants were Jews.

The losses in population were especially marked in the towns where the proportion of Jews had been high—27·20% of Poland's urban population in 1931, but in the Lublin, Białystok and Warsaw voidvodships, reaching 43%, 39% and 35% respectively. The place of the urban population murdered or deported by the Nazis was taken mainly by the rural people who had no urban traditions. In Wrocław for example 80% in 1949 were people who had come from villages and small towns.

The crisis of small towns. Small towns after the war were faced by particular difficulties, since in many cases they had been very badly damaged and had lost their previous economic foundations in local trade and handicraft without acquiring new functions. Mistakes of policy before 1956 as well as the attraction of the big cities gave rise to emigration of population from many small towns. The crisis of small local urban centres was not entirely of post-war origin, nor was it peculiar to Poland, but it was especially acute there because of the previously important role played by such small towns. In 1957 nearly half the total number of towns in Poland had populations of less than five thousand.

After the initial period of reconstruction Poland embarked upon a programme of industrialisation. The emphasis on heavy industry favoured the larger cities where industry was already established. The smaller, specialised, towns also grew. They included industrial towns and voivodship centres with a variety of functions, but above all new administrative centres such as Koszalin and Rzeszów. There was a marked increase in the urban population, which between 1946 and 1958 increased by 6.0 millions. Indeed in the post-war years the whole natural increase of population of the countryside moved to the towns, for the number of the rural population decreased between 1946 and 1958 from 16.1 millions to 15.5 millions.

URBAN POPULATION IN POLAND

Year	Population in millions		Index of urban population in relation to pre-war years	Percentage of urban population
	total	urban		
1931 within prewar frontiers	32.1	8.7	×	27.7
1931/33 within the present frontiers	30.0	11.0	100	36.6
1946	23.9	7.5	68	31.8
1950	25.0	9.2	87	36.9
1958	29.0	13.5	123	46.4

One of the fundamental principles of Poland's economic policy is the effort to produce a more balanced economy. This is reflected in the policy of urbanisation by industrial development and extension of municipal facilities.

THE MAIN TRENDS OF RESEARCH IN URBAN GEOGRAPHY

Statistical and cartographical work is an aspect of urban geography represented in Poland by the works of A. Jelonek¹ and B. Welpa² who have dealt with changes in the number, structure and distribution of towns and have tried to explain the phenomenon in terms of functional evolution of towns and demographic processes such as the settlement of the Western Territories, the influx of people into large cities and the effects of the war. The population structure of towns has also been given attention, for example in the work carried out in the Institute of Geography of the Polish Academy of Sciences on towns of the western and northern territories.^{3,4,5} These studies deal with the population structure of towns according to territorial origin. Studies carried on with the co-operation of sociologists are used by the administrative authorities for their economic and settlement policies in these areas.

Research has also concentrated on problems of the functions of towns and their economic bases. This research, concentrating on the functional foundation of towns, is of great concern for practical planning. Three types of studies can be distinguished.

(i) The functional structure of towns. The research deals with the functional structure of the urban population without paying attention to the relationships between the town and its surrounding urban field. Functional classification of towns provided by this research is used by town planners both in assessing the existing state and in preparing estimates for the future. Here J. Kostrowicki's work anticipated the American studies by J. W. Alexander.^{6,7,8,9,10}

(ii) Bases of the economic stimulation of small towns. Analysis of the essence of the crisis of small towns was first undertaken by geographers, who tried to point to the possibilities of recovery by developing local resources that had hitherto not been used.^{11,12,13} This trend in research was especially connected with regional planning.

(iii) The functional connection between towns and their hinterlands. Since the early post-war studies dealing with the hierarchy of towns and their role as centres^{14,15,16,17}, it has become clear that the pattern of economic and social connections is not, as had been supposed, indicated by the administrative divisions and research has drawn attention to the changes that are taking place in the countryside as a result of the influence of towns.¹⁸

The historical-morphological trend, prevalent before the war, is still represented.^{19,20,21} Studies concerned with the site, plan and physiognomy of settlements, rural as well as urban, however, may not have much relation to the needs of practical living.

Studies of land utilization to establish the typology of urban areas represent a more modern approach to the examination of the spatial structure of towns. These studies, lying on the borders of geography and town planning, are only in a preliminary stage, and apart from sample studies of small towns there are no comprehensive surveys as yet.^{22,23} Since town planners need the opinions of experts, including a characterisation of the geographical environment, a new trend has come to the fore. The analysis of the totality of physical conditions in a given environment is approached from the point of view of the needs of the town planning.²⁴

The development of a science must be accompanied by the development of its rationale. Since the war a number of Polish works in urban geography throw light on the various methodological problems. The 1955 conference at Osieczna gave the general outlines for research. Professor K. Dziewoński there discussed the theoretical problems of population and settlement geography on a wide comparative basis.²⁵ Subsequently lectures on the geography of population and settlement were introduced for third year students at all Polish universities and the text book for these lectures appeared in 1959.²⁶ A general

synthetical work on population and settlement in Poland, however, is still lacking. So far there have appeared only certain attempts in this regard which it would be difficult to accept as fully satisfactory.^{27,28,29}

FUNCTIONAL STRUCTURE AS A METHOD OF RESEARCH INTO THE ECONOMIC FOUNDATIONS OF TOWNS

The term functional structure defines the division of urban population into active (basic and non-basic) and inactive members. The differentiation into basic and non-basic groups relates to their contributions to the foundation and development of the town. The basic group includes people employed in establishments and institutions whose activity reaches beyond the town and so reflects the position occupied by the town in its region. The members of the non-basic group serve the residents of the town itself, especially the basic group. The non-basic group thus has a secondary character and appears only when the proper stimuli exist.

The functional approach has been developed within the framework of economics and town planning in the West, for example by H. Hoyt and American regionalists, as well as in the East, for example by P. Lewczenko and Soviet town planners. Geographers have shown interest in it only relatively recently, but it is already yielding interesting results in geographic research. In Poland this approach was adopted by J. Kostrowicki who prepared a thesis on *Geographical Research of the Settlement Network* (1950), excerpts of which were published in 1952.⁶ In 1950 too there appeared the results of research on small Polish towns⁷ carried out by geographers for town planners.

In the West research on the functional structure of the population has been most active in the U.S.A. where it is exemplified in geography by the work of J. W. Alexander* and G. Alexandersson.** The concept has been criticised mainly on grounds of the subjective character of any division of employed people into basic and non-basic groups.***

Polish research itself has been based upon the statistical data of the 1950 census or upon field studies. In the conditions of a planned economy each establishment has its tasks laid down in advance, a fact which considerably

* J. W. Alexander. *The Economic Life of Oshkosh, Madison (Wisconsin)*. 1952;—*The Basic-Nonbasic Concept of Urban Economic Functions*. "Economic Geography", 30, 1953, No. 3, pp. 246–261. (Comp. review by L. Kosiński, "Przegląd Geograficzny", 28, 1956, No. 1, pp. 182–187).

** G. Alexandersson. *The Industrial Structure of American Cities*. London—Stockholm 1956, pp. 134. (Comp. K. Dziewowski's review, "Przegląd Geograficzny", 29, 1957, No. 4, pp. 825–827).

*** Above all quite a number of critical articles published in the "Journal of the American Institute of Planners."

facilitated the work. Part of the research, particularly that conducted in bigger cities, was done by sampling. Here we may discuss the results of an analysis conducted in 61 towns, including 45 small towns with less than 30,000 inhabitants (approximately 10% of the towns of that size in Poland), 10 medium sized towns with 30,000 to 100,000 inhabitants (approximately 20%) and 6 large cities with between 100,000 and 200,000 inhabitants (50%). In 51 of a total of 61 towns the figures illustrate the state of 1950 and in the remainder they relate to the years 1952-1954. In defining the functional structure of population the agricultural population was excluded, a procedure justified by the fact that the number of agriculturalists depended upon the position of the administrative boundaries of the towns, which frequently included purely agricultural fringe areas.

After the functional structure of the population of the various towns was established a functional classification was prepared, based on an analysis of the basic groups. In industrial towns more than half the residents worked in basic industry; in satellite towns more than half were people travelling to their work places; in multi-functional towns no group predominated to this extent.

PERCENTAGE OF TOTAL POPULATION EMPLOYED IN "BASIC" GROUP

Occupation group	Small (45)						Medium (9)		Large (6)	
	multifunctional (18)			specialized (27)**			multi-functional (5)	industrial (4)	multi-functional (2)	industrial (4)
	total (18)	powiat centres (13)	others (5)	industrial (11)	satellite (4)	satellite-industrial (3)				
Manufacturing	4.7	3.3	8.4	21.1	6.0	10.4	5.8	19.9	10.7	23.9
Building	0.9	1.0	0.5	1.1	0.7	0.1	1.5	1.3	1.4	1.4
Transport	2.4	3.2	0.5	1.7	2.5	2.5	3.7	1.4	4.4	1.0
Trade	3.7	3.8	3.7	2.4	1.0	2.2	2.1	2.1	3.4	1.0
Cultural and social services	3.2	3.4	2.7	1.4	0.9	3.9	1.2	0.7	2.1	0.6
Administration	3.8	4.7	1.4	1.4	0.5	1.1	2.8	1.8	3.8	0.5
Schools*	3.3	4.2	0.9	1.8	2.8	3.2	6.3	3.8	6.4	2.8
Others	2.0	1.1	4.0	0.5	0.5	0.2	1.4	0.9	1.0	0.3
People working outside the town	1.5	2.1	0.0	3.9	22.0	10.6	2.5	0.8	0.3	2.5
Total of basic group	25.5	26.8	22.1	35.3	36.9	34.3	27.3	32.7	33.5	34.0

* This group includes students of higher schools and half the pupils of technical schools and of those pupils of secondary schools who undoubtedly come from the hinterland.

** Including 9 towns with various special functions (e.g. health resorts a.o.).

There are some differences between small and multi-functional towns which play the role of powiat (an administrative unit corresponding to the English county) centres and the remaining small non-specialised towns. These differences

find their expression mainly in the smaller percentage of people employed in industry and the large percentage of other employment, especially in administration in the powiat towns. The structure of the basic group reflects its regional type. Towns situated in parts of the country with a more developed economy are more industrialised. Satellite towns exist only in regions with a greater concentration of urban settlements. In other non-satellite towns the percentage of people working outside is high in centres which are integral parts of larger conurbations, such as Chorzów. Employment in building is greater in towns situated in territories where there has recently been extensive capital investment outlay, and the total percentage of active people is greater in towns in the Recovered Territories because of the higher proportion of young people there.

FUNCTIONAL STRUCTURE OF POPULATION IN THE DIFFERENT TYPES OF TOWNS

Towns	Average size of the group (percentage of total population)		
	basic	non-basic	inactive
Small			
Multi-functional	25.5	13.9	60.6
Specialized			
industrial	35.3	11.8	52.9
satellite	36.9	8.4	54.7
satellite-industrial	34.3	9.9	55.8
resorts	30.8	17.7	51.5
fishing ports	32.0	13.1	54.9
Medium			
Multi-functional	27.3	15.9	56.8
Industrial	32.7	13.7	53.6
Large			
Multi-functional	33.6	14.9	51.5
Industrial	34.0	10.0	56.0

It will be noted that multi-functional towns, irrespective of their size, have a lower proportion in the basic group than do specialised towns, but generally the larger the city the more important is the basic group. In industrial towns the basic group is most prominent in small towns and least so in medium towns.

If we consider the size of the basic group as an index of the economic activity of the towns, then small satellite, industrial and industrial-satellite towns are most active. But the residents of these types of towns are at the same time most badly supplied with services, as is reflected by the very low percentage of non-basic groups.

Studies of the functional structure of towns are used by the town planners in two ways. First: knowledge of the existing state of affairs enables the planner

to assess the economic activity of the town (size of the basic group) and its distinctive character (structure of the basic group) as well as the level of services provided for the inhabitants (size and structure of the non-basic group). Obviously a statistical analysis is an insufficient basis for full evaluation and must be supplemented by an economic or social analysis, but it is nevertheless a valuable pointer, especially for the comparative study. Second: knowledge of the balance between basic and non-basic groups can be utilised as a forecast regarding the population of the town. Knowing the forecasts made in the economic plan with regard to expansion of certain main branches of the economy, and planning for the future contributions of the basic and non-basic groups, it is possible to estimate the future population according to the following formula:

$$P = \frac{B \cdot 100}{100 - (c + d)}$$

P = estimate of the total population

B = estimate of the basic population

c = estimate of the percentage of non-basic group

d = estimate of the percentage of the inactive group.

GEOGRAPHICAL RESEARCH ON ECONOMIC STIMULATION OF SMALL TOWNS

In contrast to studies of the functions of towns, research on the bases for economic stimulation of small towns lies on the borderline of geography and economics and does not belong to conventional geographical studies. Consequently it was impossible to utilize earlier work in geography and Polish achievement in this field cannot yet be compared with that of foreign countries. Geographers concentrating on problems of small towns in Poland undertook the analysis of the background of the crisis of these small towns and the formulation of a programme for their economic stimulation. On the one hand research of a general character was conducted, based on an analysis of statistical material,^{11,12} but in addition geographers embarked upon research in the field, conducted over small towns according to a concerted plan, that was performed by students for their diplomas and theses. The students were given financial assistance to stay in the area and access to source material, a fact that was of particular importance during the period when statistical data was not yet published. The completed work was eventually turned over to the planning bodies and selected studies have been published.¹³

It was clearly established that small towns developed much more slowly than large ones.

The following table shows a constant decrease in the population of small towns since 1946 in contrast with the general progress of urbanisation. It also

CHANGES OF POPULATION OF SMALL TOWNS

Year	Total population of all towns (index)	Towns and settlements with less than 5,000 inhabitants	
		total population (ind. x)	average size
1946	100	100	2470
1950	131	93	2720
1954	152	83	2770
1958	179	96	2915

indicates an insignificant increase in their average size. Nevertheless not all small towns are stagnant or declining. The crisis has above all been felt by small, non-specialized local centres that were previously centres of local trade and handicrafts. The post-war trade reform which has brought about the scattering of state or co-operative centres for purchasing agricultural produce as well as of retail shops, without reference to the existing settlement network, has also had a significant effect. In consequence of the lack of prosperity young people have left the towns affected, and sometimes municipal equipment and facilities have decayed. In many towns there is a labour surplus seeking work in agriculture and in this way a ruralisation of small towns is taking place. It should be emphasised that not only legally constituted towns are affected but likewise many settlements that were once towns, which had lost their rights in the nineteenth or twentieth centuries. The total number of small towns, together with these once urban settlements, is estimated to be about 800 with an aggregate of over two million inhabitants.

The crisis of small towns took various forms in different parts of the country and remedial measures must accordingly differ, but in all cases local resources need to be utilised. Special emphasis is placed on all those local resources whose better utilization could help to revive the economic life of the town. So it was above all the hinterland region and its resources which were analysed—not only the mineral resources but also water resources and other undeveloped possibilities of a given area. Efforts were also made to discover labour resources by drawing up records of the employment situation. Such labour resources could frequently be of a special character since they included people with certain vocational traditions, as for example craftsmen no longer practising in the traditional centres of the industry.

The majority of small towns will continue to perform the role of local centres. That is why it is of such great importance to analyse the condition of the surrounding agricultural economy and its possibilities for development, together with their possible effects for the town. Finally, in some cases, particularly in the western territories, it could be a matter of failing fully to utilize existing capital investment in the form of building of previous factories, housing, municipal facilities, etc.

The programme for economic stimulation of small towns cannot embrace all centres that have declined and lost their character and urban status. Inevitably some must relapse to the level of villages, since the transformation of social and economic systems is bound to cause changes in the settlement mesh. The economic stimulation of some of the decayed towns will make them into specialised towns (industrial, resorts, satellite town, etc.), or in others a general stimulation will enhance the status of a local centre in its region. The latter trend was associated with the administrative reforms of 1956-7 by which the number of counties (powiat) was increased, and a score of new towns were given new administrative functions and thereby also some trade and service functions since under existing conditions the trade and service network organization is also related to the county divisions.

Geographers were the first to study the problem of small towns and their works¹² attracted the attention of public opinion on this subject, and also criticised erroneous decisions of the past. The results of such research, made immediately available to the economic planning authorities, were used as a basis for action. As an example, monograph studies in most cases were related to towns that were earmarked as centres of the newly created powiats. Since the majority of graduates in geography went to work in economic planning offices, the studies they had prepared were very important element in their training for planning.

FUNCTIONAL RELATIONS BETWEEN TOWN AND REGION

Studies of the significance of towns as local centres have been renewed during the last two or three years in connection with research undertaken by the Institute of Geography on problems of the population and economy of towns in the Recovered Territories.

STRUCTURE OF POPULATION ACCORDING TO BIRTH-PLACE
(PERCENTAGE OF TOTAL POPULATION)

Towns	Total population	Native	Settlers from Central Poland	Repatriates from the USSR and others countries
Trzcіńsko-Zdrój	2,100	0	57	43
Olecko	6,490	1	80	19
Biskupiec	5,080	24	58	18
Bytów	7,980	18	66	16
Świebodzin	12,520	1	39	60
Lwówek Śląski	5,250	1	65	34
Olesno	6,940	67	26	7



Fig. 3. Situation of investigated towns and powiats in Poland

This research concentrated upon analysis of the economic bases of towns that were county centres and their ties with their hinterlands and also upon an examination of progress made in the development of urban communities. The spheres of influence of towns were examined to establish whether and to what extent their boundaries corresponded to county administrative boundaries. In selecting the towns attention was paid to obtaining data for towns with different population structures.

The analysis of the sphere of influence of institutions concentrated in the town, is a recognised method of defining its sphere of influence, but is less appropriate in conditions of a socialist economy. The more laborious process of enquiries conducted in the urban field as exemplified by the work of Smailes and Bracey in Great Britain, Tuominen in Finland, and Klöpffer and Hottes in Germany, enables more accurate results to be obtained. The first method was applied in our Polish studies in the case of Trzcíńsko-Zdrój, but for the others it was related to field studies which enabled comparison of results. On

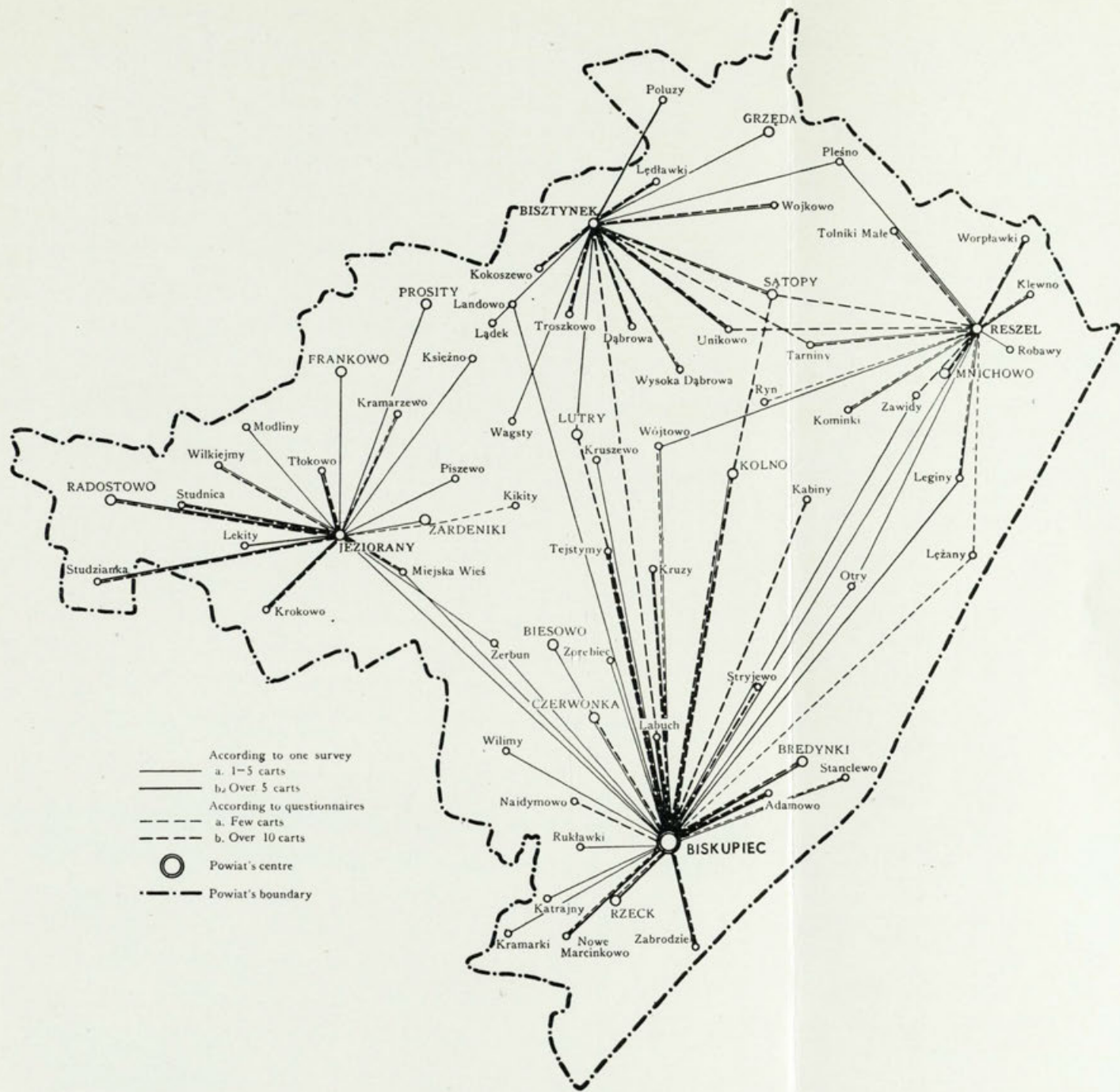
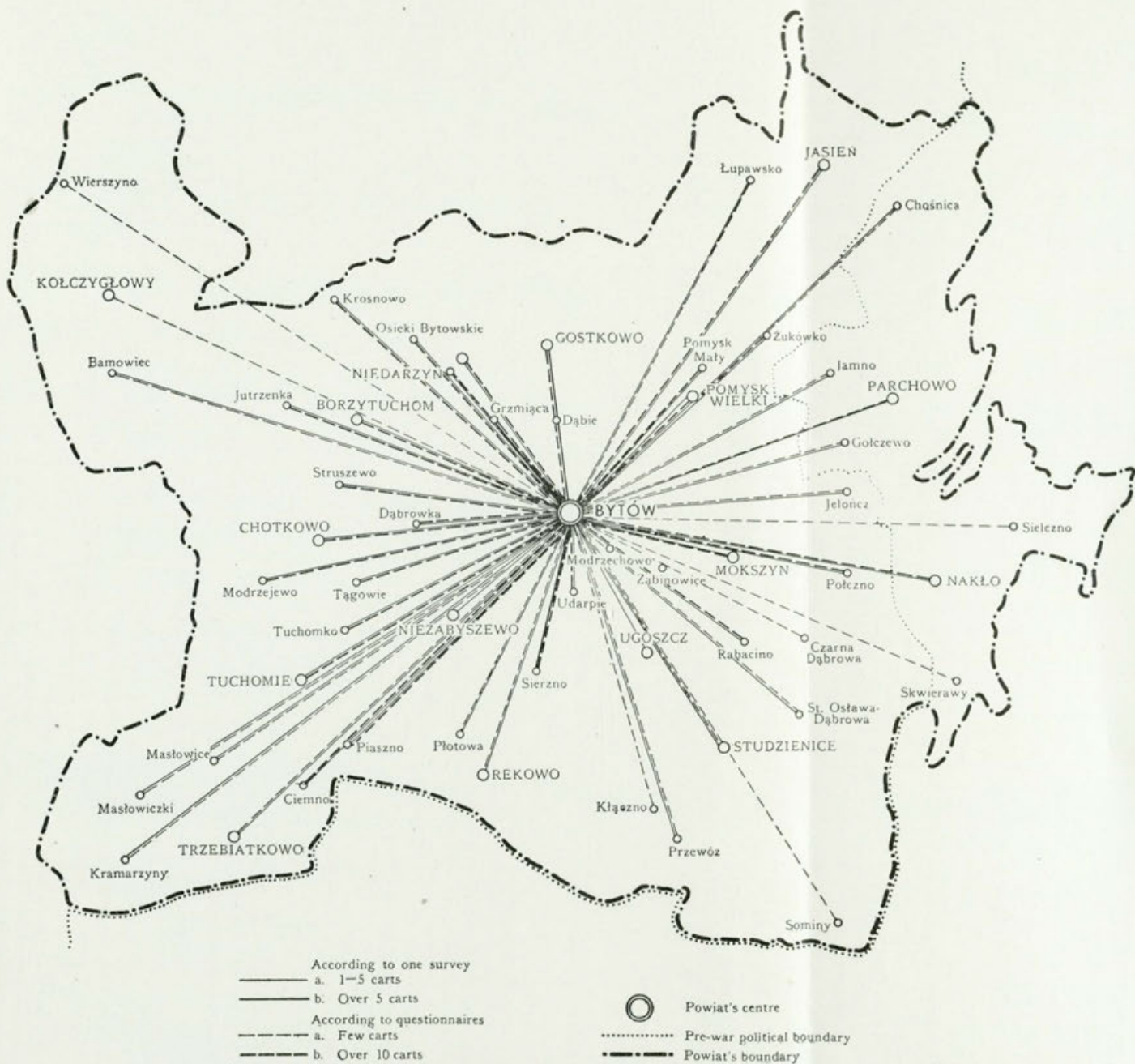


Fig. 4. Markets in powiat of Reszel



Administrative division 1958

Fig. 5. Markets in powiat of Bytów

the basis of the answers to carefully prepared questionnaires, analytical maps were constructed to show the spheres of influence of dairies, the location of milk purchasing centres, and the distribution of stores that were the branches of stores concentrated in towns, and similarly the distribution of health service centres, and finally the catchment areas of town secondary schools.

At the same time material was collected from teachers in rural schools that enabled the mapping of the flow of people going to shops and health centres and the routes along which agricultural produce moved to marked places and along which people travelled to work, thus supplementing researches conducted in the town itself.

Maps were prepared showing the extent of the immediate hinterlands of the towns as defined by trade connections, the purchase of agricultural produce, milk distribution, catchment areas of health service centres, and also the extent of the wider hinterland as expressed especially in trade relations, the influence of fairs and the influx of customers buying consumer goods.

Comparing maps that depict various types of connections, differing degrees of centralisation of functions are noticed. A major role is played by the towns where fairs are held. If there are several such towns in one powiat, the powiat type of town is less developed and the auxiliary centres are correspondingly stronger.

Non-powiat towns are much more important as local centres than large villages which are community centres. If, however, there are no other towns in a given county, villages must serve as auxiliary centres and there may be five or six such centres. The range of non-powiat towns as well as that of county towns conform to administrative boundaries. The crossing of boundaries is evident, especially in Trzcieżsko-Zdrój, a small town on the peripheries of three powiats. Some of the functions of powiat towns extend beyond the confines of the powiats themselves.

The sphere of activity of the various institutions that are provided to serve more than one powiat is much wider, e.g. the centre for the purchase of articles that are not normal agricultural produce, such as forest produce, the enterprise of irrigation and drainage works, and sometimes hospitals or first aid stations. An especially large number of institutions that serve neighbouring powiats is to be found in Olecko. People from neighbouring powiats also travel to fairs held in the town, especially if the town is not centrally situated or if the fair is of a special character, for example for horses. As a rule the catchment areas of secondary technical schools and boarding schools extend beyond the county, while that of secondary schools that give a general education is much more restricted.

Other functions of county towns are wholly limited to the area directly surrounding the town. This is evident from analysis of the inflow of farmers who supply local purchasing centres with produce and of patients visiting

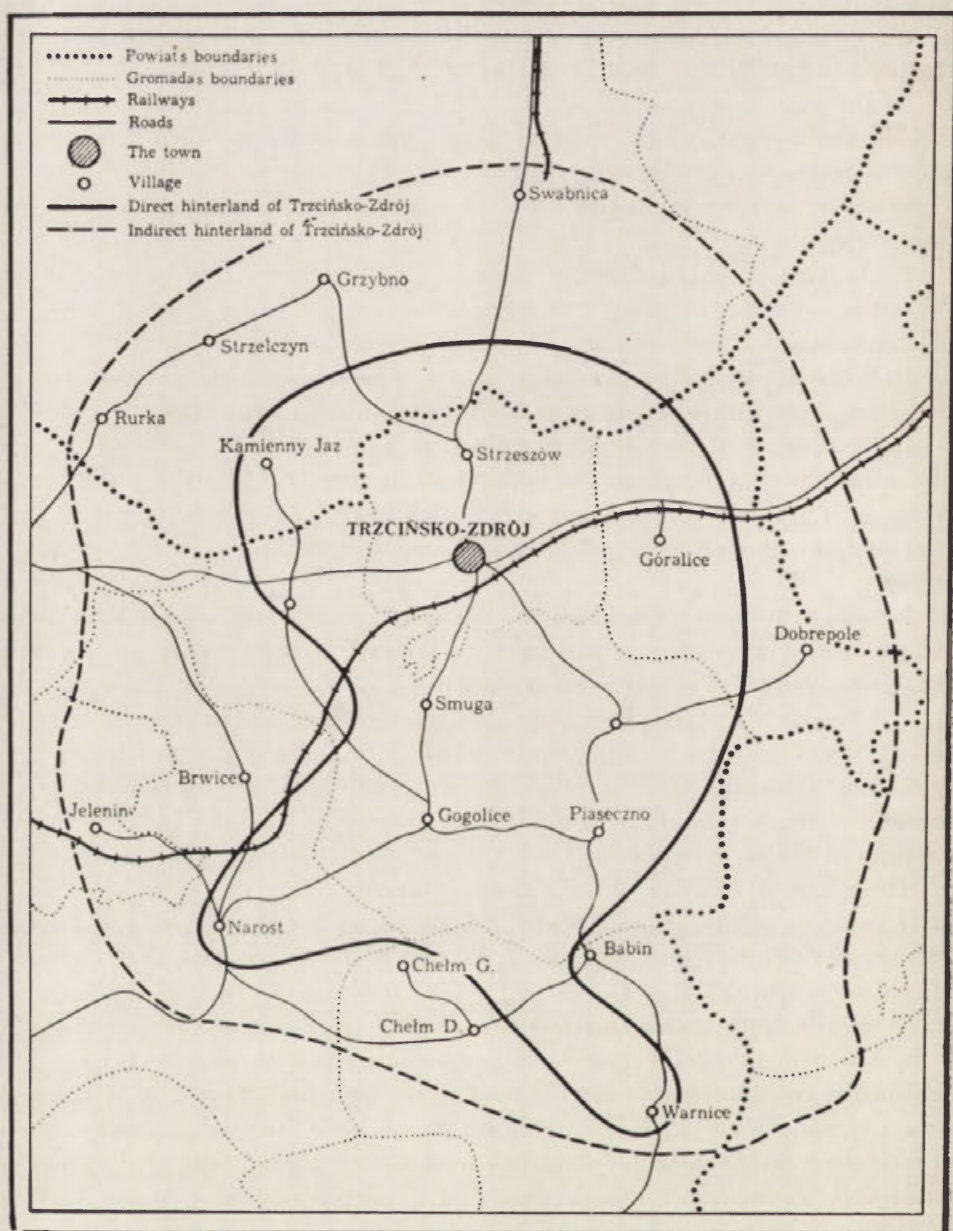


Fig. 6. Hinterland of Trzcieszko-Zdrój

health centres. Farmers also buy agricultural equipment and fertilizers locally while they seek consumer goods in the largest centre of the powiat, particularly if it is also a centre for fairs.

The development of the hinterland of a small town to reach beyond the administrative boundaries also contributes to the disappearance of the signi-

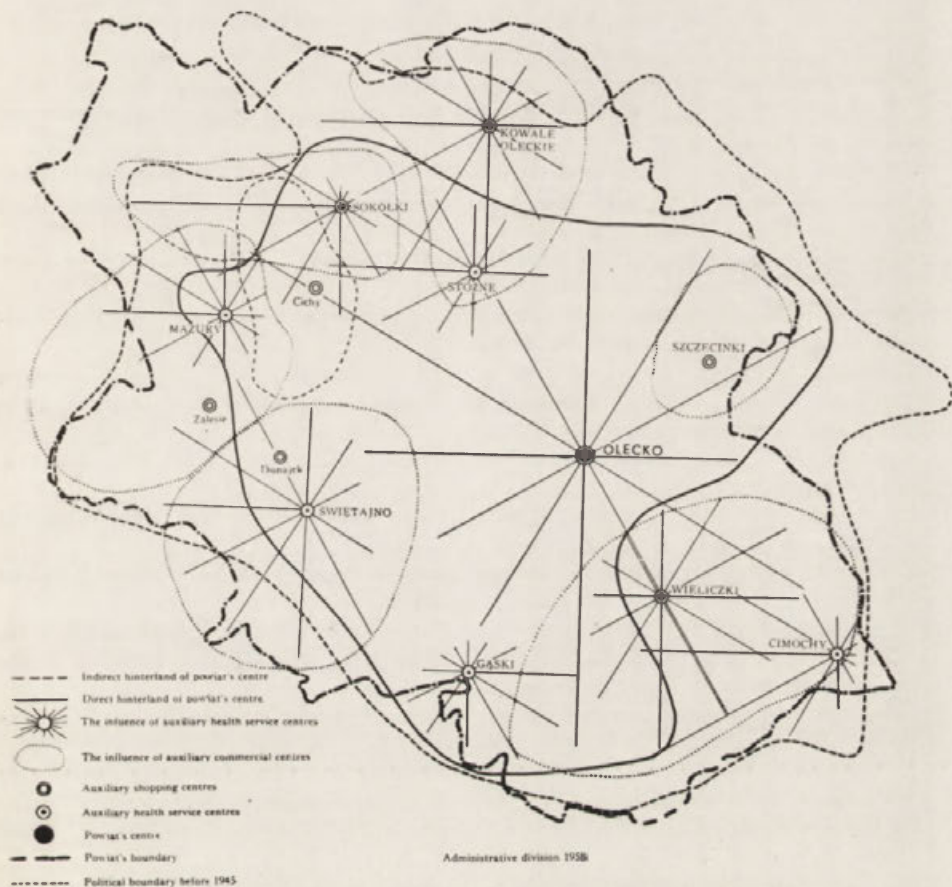


Fig. 7. Hinterlands of local centres in powiat of Olecko

ficance of the pre-1945 political frontier. This arises not only when parts of the former territories are incorporated into a county situated in the Recovered Territories, but also irrespective of the administrative pattern in journeys to work or to fairs.

The local economic planning authorities became interested in the results of research conducted by the Institute of Geography in co-operation with the Society for the Development of the Western Territories. The results will help to control and if necessary to point to desirable corrections of the trade and

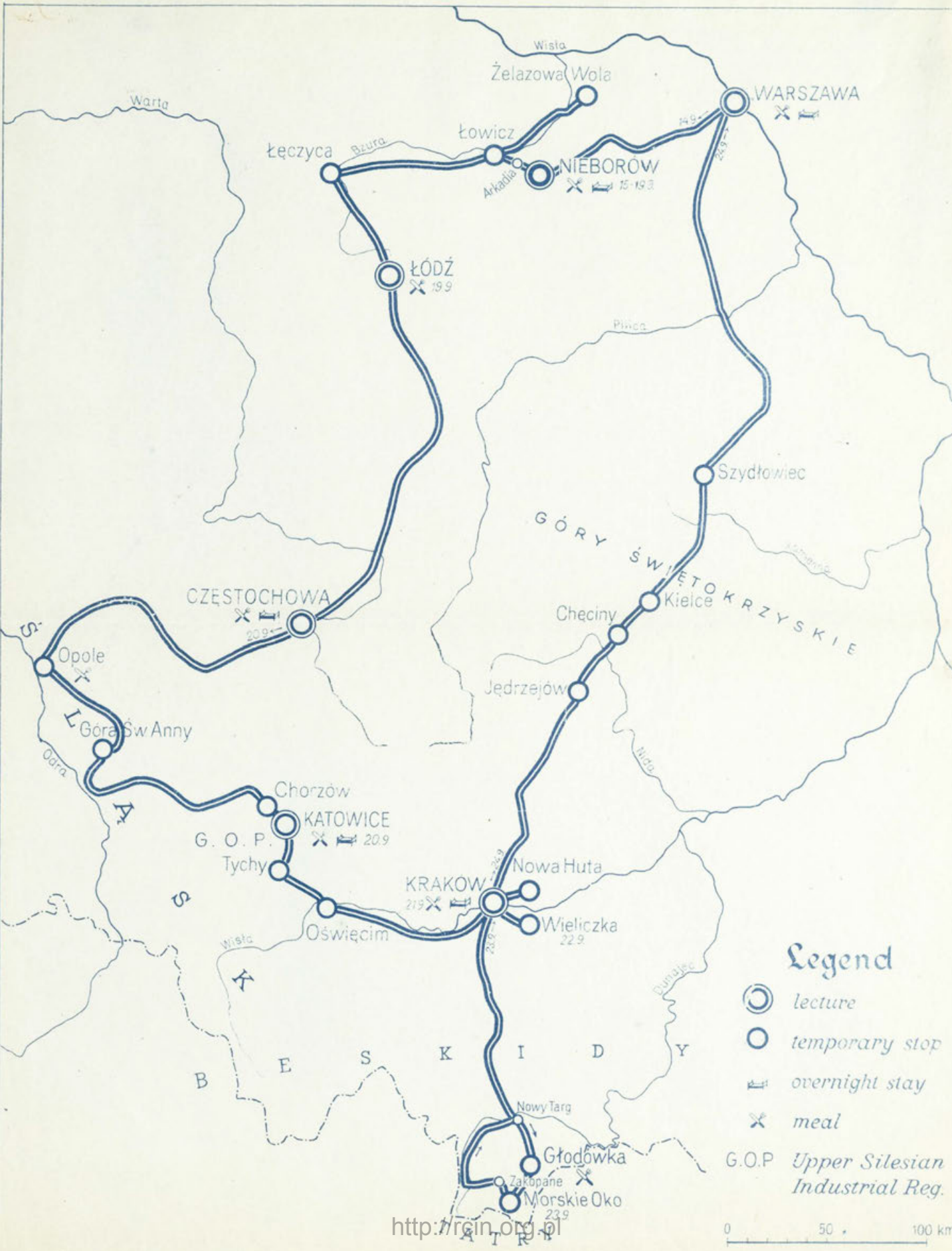
service network, as well as providing a guide for the introduction of changes in the administrative divisions. Comparable research will be continued by the planners using techniques pioneered by the Institute of Geography.

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Legend

-  lecture
-  temporary stop
-  overnight stay
-  meal
- G.O.P. *Upper Silesian Industrial Reg.*



Arthur E. Smailes

THE URBANISATION OF BRITAIN

It is common knowledge that Britain is the most urbanised country in the world. The extent to which this is so, as well as its implications for the social life of our people, are less fully appreciated. Certainly the Census provides no adequate measure of the degree of urbanisation, and in giving the figure of 19% for the rural population it exaggerates the proportion who live under conditions that would anywhere else be considered rural. This paper sets out to amplify the opening statement of bare fact, to assess more precisely the degree of urbanisation reached, and to examine its particular manifestations. Some of these are and must remain peculiar to Britain, since they are a product of its special historical development and of its unique geography. Others, however, must have significance for any country, such as Poland, that is facing a considerable further degree of urbanisation. The experience of Britain can be invaluable both in pointing to the advantages that can accrue and to the problems that will be presented, unless they can be obviated to some degree by careful and judicious planning.

At the outset it must be emphasised that the urban revolution which has either transformed or is now transforming societies the world over, although first experienced in Britain and most fully worked out there, is nevertheless a recent phenomenon. Only a hundred years ago, although Britain in mid-Victorian times presented a country in process of rapid urbanisation, as in Poland today nearly half the population still lived outside towns and a much larger proportion were country born. Since then urbanisation has proceeded so far that the vast majority of us now are townsmen, and we are all members of a thoroughly urbanised society and participants in an essentially urban culture. It is as such that we look at the heritage of our countryside, with a sentimental attachment for its landscapes and its residual population, often though not always with a genuine appreciation of its amenity value, but seldom with a real understanding of its life and problems.

Already a century ago the industrialisation that was massing more and more of the nation into towns had created a numerous class of new, specialised towns,

distinctively industrial. Industrial towns had existed before that transformation of the economy which we call the Industrial Revolution, but as with other of its salient features such as factories and capitalism, it was not the phenomenon that was new but the scale upon which it was developed. Never before had industrial towns become so typical of a society, never had they multiplied so amazingly or attained such dimensions of individual size. As time went on industrialisation spread to Europe with similar urbanising effect, although there, since its full impact came significantly later, after the provision of the railway system, factories were more usually attached to older, established towns. Coming early in Britain, the Industrial Revolution saw a transplanting of industry on a scale surpassing what happened later on the Continent when the new technology spread there; and because the industries concerned became rooted in these new centres the imprint of the special sequence of technological change still finds strong expression in the industrial and urban pattern of present day Britain.

The modern organisation of industry, however, has not been the only factor contributing to urbanisation. Equally important, though less generally recognised, has been the shift from employment in making things to that in performing services. The Machine Age has not only released a larger sector of society from food production, it has also led to a general and continuing reduction of the proportion needed for direct production of material goods. Production now employs only half the working population of Britain; the other half earn their living buying and selling goods, transferring them from one place to another, and discharging other services in professions, entertainment, and the transport of an increasingly mobile population, or in administering the greatly extended social services of our Welfare State. Since many of these services are by nature centralised, their personnel is concentrated especially in towns, which have increasingly developed as service centres. Thus, in spite of Britain's importance as a producer of manufactured goods, service occupations engage a majority of the population in most British towns.

Furthermore, specialised types of town, notably holiday resorts, have arisen to discharge particular service functions. Their origins date back before the modern period of urban growth to a time when resorts with urban characteristics were created by aristocratic patronage as centres of fashion and social life. It is since the development of modern transport, however, that they have multiplied and grown to cater for the recreation of an enlarging sector of society, provided with increased leisure and the means to enjoy it. A concomitant of the urbanisation of Great Britain, an island country with stretches of coastline within easy reach of all its major centres of population, has been the development of seaside resorts on a scale unmatched in any other country. As a class of town they are more numerous in Britain and perhaps more highly differentiated than anywhere else. In differing degrees they are residences for

retired people, dormitories for commuters who travel daily to work elsewhere, and holiday resorts for people of various social classes and income groups. An interesting analysis of the toponymy of the seaside resorts of England and Wales in terms of their origin, development, and functions and their related morphology has recently been made by Dr. J. A. Barrett.¹

Further, the modern application of large-scale organisation to some forms of primary production, notably mining and fishing, has brought about a geographical concentration of these activities, which were earlier scattered. Considerable communities now exist in the form of specialised mining and fishing towns, and these are equally distinctive in both character and appearance. Mining towns and resorts have become much the most numerous classes of highly specialised urban community represented in Britain.² Their lack of occupational balance is manifested among mining towns by excessive dependence upon a single, exclusively male-employing industry, and among resorts by emphasis upon female employment, which is subject to seasonal variation, and by under-representation of manufacturing industry.

In size, appearance, and form of administration any of the more highly specialised communities that have been created wherever a large-scale activity has become geographically concentrated so as to give a localised basis for mass employment may rank as towns, although in developed urban functions and representative urban institutions they may be remarkably deficient for their size. On the other hand, an urban culture, such as prevails in Britain today, results in the introduction of many of its features, including characteristic institutions as well as building forms, utility services and other equipment into the countryside, even where the scale of concentration is not urban by other standards. The process of urbanisation is now so advanced in Britain, and has led to such an extension of urban forms in the settlement pattern that it may well be asked in what sense the terms "village" and "rural" are still applicable? What is the distinction between town and country that has contemporary significance, and in what way can the term "urban" be restricted in its British connotation to express a really distinctive quality?

Clearly there are distinctive sociological and geographical approaches to this problem. A town may be regarded first and foremost as a community pursuing a way of life that is distinguished from that of the rural countryside; or it may be considered as part of the earth's surface differentiated from its rural surroundings by a particular type of transformation at the hands of man, and rendered distinctive in respect of land-use, buildings and other erections.

Thanks to modern communications, an overwhelming majority of the British people, whether or not they reside in the Urban Districts and Boroughs that provide the basis for the Census definition of "urban" or even in large built-up areas, share an essentially urban culture and way of life that is largely focussed upon town centres. And if we regard a rural community as one in

which the majority of members obtain their livelihood from the land, in this occupational sense there are few villages left in England. The secondary or service element accounts for as many or more than the primary or farming element in most Rural Districts, and to a greater or less degree the areas outside the Urban Districts are being colonised by an adventitious element of townfolk seeking residence in rural surroundings.³

If, however, we require of a town that it should be a socially intergrated community, considerable built-up areas fall short of townhood in the full sense. They are only pseudo-towns. Certainly the suburbia that intervenes between the localities of truly urban life and areas of rural life is a no man's land, neither town nor country. It is all too aptly dubbed Subtopia. In our modern society we look more and more to towns as workplaces and for centralised services, but modern methods of transport make these available for residents farther and farther afield. This has been responsible to a remarkable and unabating degree for urban sprawl, the creation of extensive suburban tracts of open, low density housing; and it has even begun to inject a considerable element of townfolk into more rural settings. Because of this influx, the rural population in the Census sense, that is the population resident in Rural Districts without an urban form of government, is no longer decreasing in Britain. In recent years the general emptying of the countryside that had been proceeding steadily for some decades before the First World War has been checked. But the proportion of the rural population engaged in farming continues to decline as farming becomes increasingly mechanised and more efficient. The agricultural character of the residents of the English countryside is thus becoming less and less pronounced. Apart from the urban overspill by extension of suburban areas beyond municipal boundaries, this "rural dilution" is general over most of the parishes of lowland Britain.⁴ It represents a colonisation of extra-urban areas by people whose back-ground is urban and who engage in or have just retired from urban employment and continue to share in a thoroughly urban culture which involves frequent visits to town centres to take advantage of the services provided there. The autochthonous population of the countryside are likewise drawn more and more into the orbit of towns as they too participate in these services, and the one-time vigorous social life of the village community has decayed as the attractions of nearby town centres have drained life away from the rural countryside.

From his special point of view the geographer must regard as urban a particular man-made type of landscape. Yet the distinction between town and country has become blurred as suburban housing estates have spread outwards, ribbon development has straggled along the roads, and accretions of urban forms of building have sprung up alongside old villages and hamlets between the urban nuclei. It has become wellnigh impossible to say at what point one passes from townscape to rural landscape. There is nowadays neither socially

nor physically a simple, clear-cut dichotomy of town and country. It is an urban-rural continuum that is presented, without any definite point where urban ends and rural begins. The concepts are clear only towards opposite ends of the continuum, and any line drawn for statistical or other purposes must needs be arbitrary. Since in different countries this arbitrary line is drawn differently, strict comparability of Census data is invalidated.⁵

In Britain and many other countries, including Poland, the basis of official and statistical distinction between urban and rural is entirely a matter of the form of local government. In England and Wales the population that resides in incorporated boroughs and in Urban Districts is classed as urban. In spite of considerable overspill of population and building beyond their limits, the areas of these administrative units include so much land devoted to non-urban uses that their aggregate considerably overstates the extent of the built-up area, though their total population undoubtedly understates the number of people who pursue an essentially urban way of life.

Within the urban-rural continuum there are foci where central services tend to concentrate. In a special sense these are towns distinguished from the intervening tracts where the real differences are merely in density of buildings and degree of completeness of transformation into built-up areas. It is at points of concentration of central services within the texture of settlement that we may recognise developed urban functions and the essential character of modern townhood. For England and Wales we have investigated a group of key services that hang together in association as the essential and distinguishing features of a town.⁶ The places identified on this basis of institutional equipment (Fig. 1) have been shown to agree with remarkable consistency with the nodes of the system of public bus transport services identified by Green.⁷ They include nearly 340 fully equipped towns as well as about 130 centres of clearly recognisable higher status in an urban hierarchy. These are not further differentiated on the accompanying map, but are collectively designated by special use of the term "city".

The great majority of these towns and cities, and altogether more than 70% of the population of England, are found within an axial belt that extends across England from the southeast coast and London, through the Midlands, to the industrial areas of Lancashire and Yorkshire. This belt of concentration, described by Professor E. G. R. Taylor as coffin-shaped,⁸ is more accurately presented in the form of an hour-glass with its axis through London and Manchester and its waist about Northampton. Within its northern bulb, the heart of Industrial England, there are several specially dense concentrations of industry and settlement, but also relative lacunae such as the Pennine moorlands. In the southern bulb, Metropolitan England in the narrow sense, between Greater London and the ports and resorts ranged along the coast between Ipswich and Southampton a noticeable lacuna corresponds with the central

Weald. Outside the axial belt, there are three major outlying areas of urban concentration—in Central Scotland, South Wales, and Northeast England. Together they account for another eight million people, including the great bulk of the populations of Scotland and Wales.

In explaining this pattern of urban concentration the primary importance of the distribution of the industrial population of the country, and of the ports that supply food and raw materials as well as access to overseas markets, is evident. It is a modern pattern, superimposed within the last two hundred years upon an earlier pattern that more simply and clearly reflected the distribution of farmland. In the modern urban overlay the coalfields and the coastline assume far greater significance.⁹

There are other salient geographical characteristics of the modern urbanisation of the country that deserve emphasis. First is the remarkable development of conurbations,¹⁰ vast tracts of built-up country that represent giant aggregations of people. Whether by simple outward extension, as sectors between the spreading urban tentacles have become filled in, or by the more complex coalescence of a number of originally close-set but independent nuclei as these have acquired accretions, a brick and mortar unity has been imparted to large continuous areas. The resulting more or less continuous sprawl of urban forms, with only minor enclaves of land left unappropriated for urban uses, may not be recognised by administrative unification. Extension of city boundaries has commonly lagged behind the advance of the built-up areas and, in the case of fusion of once separate nuclei, municipal pride and jealousy have often retarded the administrative recognition of the physical unity that has been produced. However obscured statistically by administrative fragmentation, the geographical reality of these conurbations is incontestable. In 1951 the Census for the first time accorded them recognition and the six largest in England and Wales were identified and dealt with in a special volume of the Census. As there defined these six conurbations (Greater London, Southeast Lancashire, West Midlands, West Yorkshire, Merseyside, and Tyneside) contained nearly seventeen million people or more than 40% of the total population of England. After growing very rapidly at the beginning of this century, their population totals, except in the case of the West Midlands, have not changed much in recent decades though the outward spread of housing has continued. In south Lancashire the attachment of Wigan to Greater Manchester and of St. Helens to Merseyside now leaves a corridor no more than five or six kilometres wide between these conurbations. The townscape has become continuous. So it has between the estuarine concentrations at the mouths of the Tyne and Wear.

South of the West Yorkshire conurbation, well established in the north of the largest coalfield of the country, other incipient concentrations of million rank are gathering round Sheffield and Nottingham in the central and southern portions of this coalfield. The triangles Sheffield—Doncaster—Barnsley and

THE URBAN HIERARCHY

- CITY
- TOWN
- SUB-TOWN

The pecked line indicates the area of maximum urban concentration

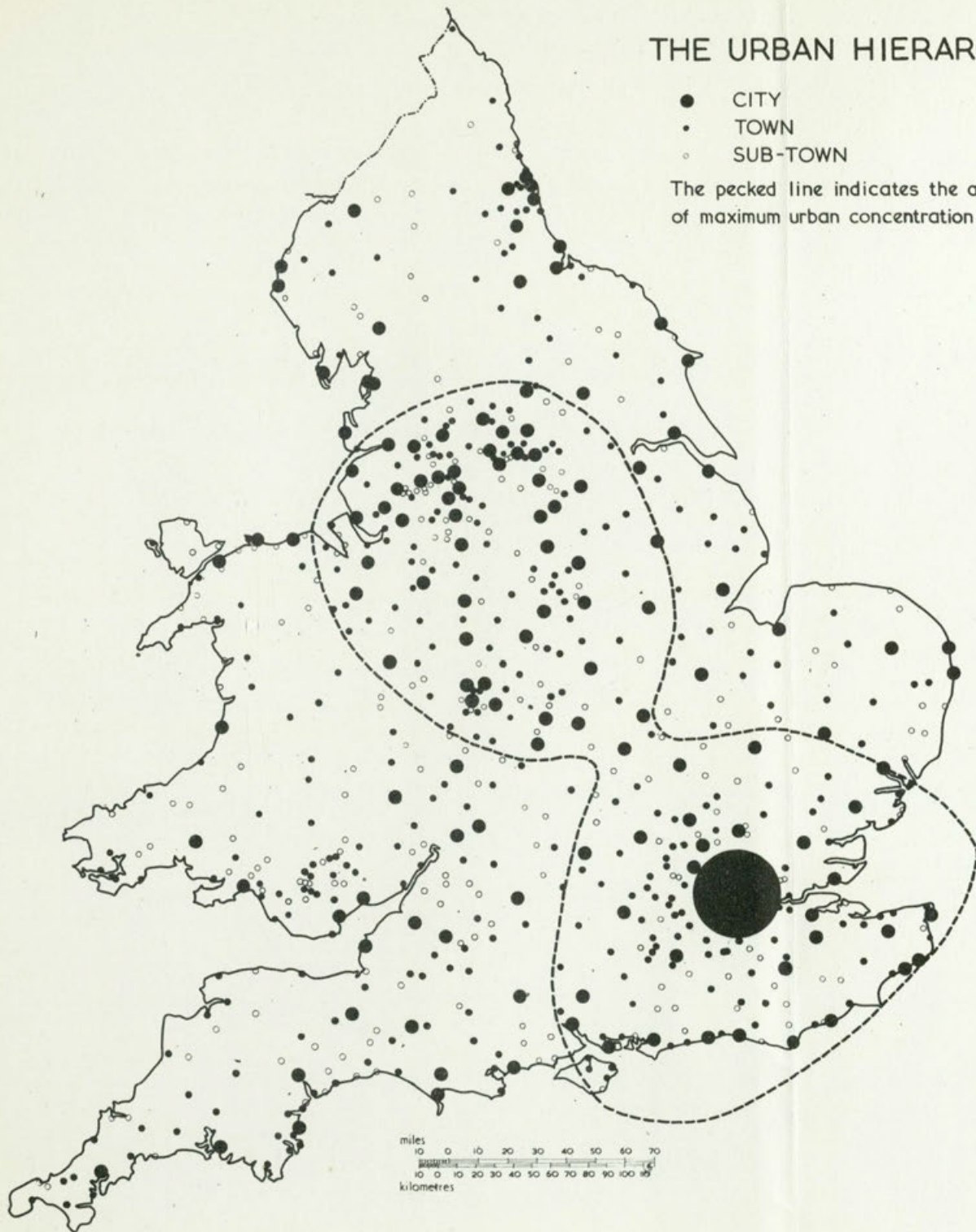


Fig. 1. The urban hierarchy

ACCESS TO URBAN SERVICES

The areas shown in black lie more than 10 miles (16km) from a CITY and more than 5 miles (8km) from a fully equipped TOWN.

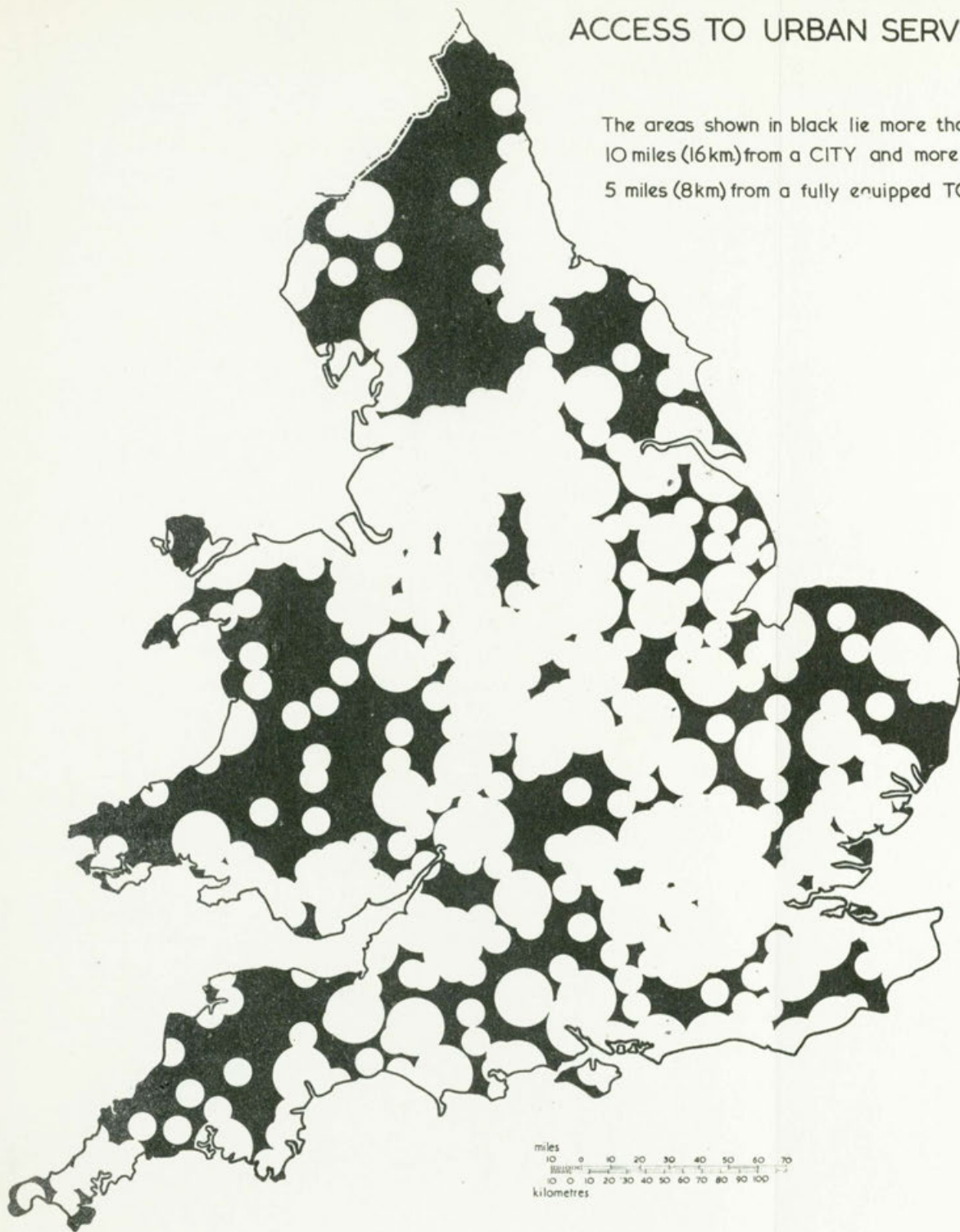


Fig. 2. Access to urban services
<http://rcin.org.pl>

Nottingham—Derby—Alfreton bid fair to become the next additions to the major conurbations.

The stringency of Fawcett's definition of a conurbation,¹¹ closely applied by the 1951 Census, underestimates both the number and size of the major aggregates of population, and Robinson has drawn attention¹² to the fact that half the population of the country are found in nine great urban tracts, which are listed below.

Outside London, which in some respects at least is the simplest in constitution, each is a complex assemblage, including one or more major city with suburban extensions, an industrial area that focuses upon but extends well beyond the leading city, and at least part of the coalfield upon which this industrial development has been based. Another eleven urban tracts in the United Kingdom have more than quarter of a million people each, and together these twenty urban aggregates contain nearly 60% of the nation. It will be noticed that all except Belfast, Bristol, and Hull lie within one or other of the major areas of concentration already referred to above.

MAJOR URBAN TRACTS

Urban Tracts	Population (millions)	Urban Tracts	Population (millions)
1. Greater London	9.71	9. Notts.-Derbyshire	
2. South Lancashire (Manchester-Liverpool)	5.01	(Nottingham)	.93
3. West Midlands (Birmingham)	2.33	10. Belfast	.51
4. West Yorkshire (Leeds-Bradford)	1.81	11. Edinburgh	.49
5. Clydeside (Glasgow)	1.76	12. Bristol	.48
6. Tyneside-Wearside (Newcastle)	1.32	13. Tees-side	.42
7. South Yorkshire (Sheffield)	1.20	14. Central Sussex coast (Brighton)	.37
8. South Wales, East (Cardiff)	1.04	15. Portsmouth	.37
	24.18	16. South Wales, West (Swansea)	.36
		17. Potteries (Stoke)	.36
		18. Coventry	.34
		19. Hull	.335
		20. Leicester	.31
			5.28

Total in urban tracts of over 1/4 million 29.5 millions.

As Robinson points out, this massing of the population means that a considerable majority of the British people live in an environment in which real countryside can be visited and enjoyed only by making the decision to devote a day to a special expedition for the purpose. This the townfolk of Britain, equipped with nearly five million private motor-cars and innumerable cycles,

do on a great scale, creating appalling traffic congestion at week-ends and at holiday seasons on the roads that radiate from the conurbations to country and seaside. This congestion, and the human slaughter and injury that accompany the mass movements on the roads, presents one of the major problems of contemporary Britain.

The concentration of people into giant cities is a striking trend of contemporary urbanisation. It reflects the modern tendency for the geographical structure of modern society to become not merely urban but metropolitan. Not only do a majority of us live in built-up tracts that individually comprise hundreds of thousands of people. Most of the remainder live within the effective spheres of influence of the great cities that are their nuclei. Practically 90% of the population of England and Wales, and only a slightly smaller proportion of the whole nation, live within easy access of one or other of the great cities for a trip of business or pleasure that can comfortably be accomplished within a day, allowing ample time in the city as well as for the journey to and fro.¹³ Metropolitan integration, by which is meant the increasing directness and immediacy of relations between the centres of great cities and the populations of their extensive hinterlands, is far advanced in Britain. It finds innumerable expressions and permeates the national life.

Of the small proportion who live outside the immediate range of great cities barely half live more than five miles (8 km.) from a well equipped town with its representative range of central services, including banks, specialised shops, cinemas, hospital and secondary grammar school. To many of these some urban facilities are still available, for towns now exercise a potent influence far beyond the range of five miles, and some urban services are provided in local centres that serve as auxiliary centres between the fully equipped towns. Only about two million people in England and Wales live at the same time more than ten miles (16 km.) from a city and more than five miles (8 km.) from a town, so as to experience the degree of weakening of urban influence and deprivation of services that this represents. Perhaps this is the most telling answer to the question: How large is the sector of the population of England and Wales that today lives under rural conditions? Figure 2 shows the areas where such a degree of rural remoteness obtains. That they are fairly extensive is of course a measure of the concentration of population. Although practically the whole nation can effectively share in urban services, there are still relatively extensive areas of sparsely peopled countryside, where scenic amenities are well preserved. The very concentration of the population elsewhere, which so greatly facilitates providing them with services, emphasises the problem of making available anything approaching a comparable standard of services to the minority who inhabit these outer fringes, in the highlands of Scotland, North England, Wales and Devon. It has been reckoned¹⁴ that Highland Britain, amounting to more than one third of the national territory, now

contains little more than 1% of the national population as permanent residents. Here are the hard cores of rural depopulation from which migration continues, aggravating the difficulties of providing services for the residual population. Yet in terms of holiday access by modern transport, except for parts of the islands and highlands of Scotland, they are not really remote areas, and they have a notable role to play for the recreation of our urban population. Their amenity value has been recognised by the designation of large portions as National Parks, wherein changes in land use and erection of structures are subject to special planning control in the interests of the whole community. Also, apart from their traditional use for livestock rearing, they are highly important in the modern economy as areas of afforestation and urban water-supply.

To sum up, we have seen that the Census figures, in reckoning only 80% of the population of the country as urban, give a less than adequate and realistic presentation of the degree of urbanisation. Although thinly spread over considerable areas of intact countryside, the proportion of the nation who now live under conditions that would in most countries be deemed rural is a mere 5%. On the other hand, a large proportion of the nation is not only urban but metropolitan in that it shares to a remarkable degree the services and life of great cities. The price paid, however, is the insulation of vast numbers of people from immediate, effortless contact with nature. Most Britons spend much of the leisure allowed them by their high standard of living in journeying to and from work and to seek the pleasures of country and seaside. A great deal of time, energy and money are expended in travelling to city centres or to countryside from homes situated in the widening tracts of Subtopia.

In the major axial belt of urban concentration in England, and elsewhere on the peripheries of the large urban tracts, large-scale encroachment upon the countryside has taken place and is continuing unabated.¹⁵ Since 1900 urban land has extended by more than 600,000 hectares in England and Wales, from less than 5¹/₂% to nearly 10% of the total area. It is expected that another 200,000 hectares will be needed for urban uses during the next twenty years. Apart from the fact that essentially horizontal extension of residential areas appears to suit the social habits and tastes of most Britishers better than "high rise" living in concentrated blocks of multi-storeyed flats, it proves a far cheaper type of housing to provide. Such municipal housing as has sprung up since the War in the form of multi-storeyed blocks of flats has depended heavily upon Government subsidy to offset the higher cost of construction and prevent its being reflected in prohibitive rents. However, the open type of residential development at from twenty to thirty houses per hectare that has eaten up agricultural land so voraciously, converting it into suburbia, has not meant a loss in food production for the nation. Quite apart from leading to more intensive use of other land near the enlarged urban markets, it has even been responsible for an increase in the food produced from the areas involved in suburban sprawl. More

food is produced from a given area of suburban land in England than from the equivalent area of farmland.¹⁶ Our spreading towns have devoured the countryside, but with a villa type of residence that uses most of the liberal allocation of house-plot space as garden, so that food production per plot is in most cases greater than it was previously as farmland. If costs of production are taken into account suburban gardens compare even more favourably with farmland, and it has been estimated that when land is saved by building houses at thirty instead of twenty per hectare the value of garden produce lost may be more than three times the value of the farm produce retained. To deplore urban sprawl on the grounds that it reduces the food production of a small and inextensible national territory is to base the argument on false premises. The transformation of the rural landscape and the irretrievable loss of its amenities are another matter. Here is the crux of the physical planning problem presented in Britain by continuing urban encroachment upon the countryside.

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Kenneth C. Edwards

THE NEW TOWNS OF BRITAIN

New Towns, built to a predetermined plan, are now a feature of many parts of the World. They have become especially numerous since the Second World War, often as a consequence of wartime destruction, shifts of population and new economic developments. In Poland, Pyskowice and Nowe Tychy are two examples in the Upper Silesian Industrial District, while Nowa Huta near Cracow is a third. The last-named, being associated with a new centre of steel production, may be compared with Volta Redonda in Brazil and Corby in England.

THE NEW TOWNS ACT, 1946

In Great Britain the new towns of the post-war period were primarily designed for the re-grouping of population from overcrowded and poorly-housed parts of the great cities. They also provided an opportunity for effecting some dispersal of industry which, for various reasons, was considered desirable. These towns were the outcome of the New Towns Act of 1946, which gave the necessary powers through the Ministry of Town and Country Planning (now Housing and Local Government) to establish them. These powers are broadly threefold: firstly they permit the "designation" of an area as the site for a New Town once it is approved by the Ministry after consultation with the local authorities concerned; secondly, they provide for the setting up of a Development Corporation responsible for the planning and building of a town; and thirdly for an advance of the necessary capital to the Development Corporation (repayable in the course of time on terms agreed to by the Treasury). Thus with an adequate state loan, the planning and initial development of a New Town rests with its Development Corporation which, it should be noted, is set up after the site is designated and is to be dissolved when the town is sufficiently well established to be handed over to a local authority of its own.

DISTRIBUTION AND TYPES OF NEW TOWNS

The general distribution of the New Towns, of which there are now fifteen, is shown on the map (Fig. 1). Eight of them are located in a ring around London, some 25–30 miles from the centre of the metropolis while the others are scattered widely in different parts of the country. It will be noticed that apart from those near London and Glasgow no new centres bearing a similar relation to the other great conurbations have so far been founded, though Manchester and Birmingham, both with little land now left within their boundaries, have large overspill populations. So far neither city has been successful in negotiating with the Ministry for a New Town, although sites have been repeatedly considered.

Apart from the London examples there is no obvious geographical grouping of the New Towns. It is useful nevertheless to classify them according to their

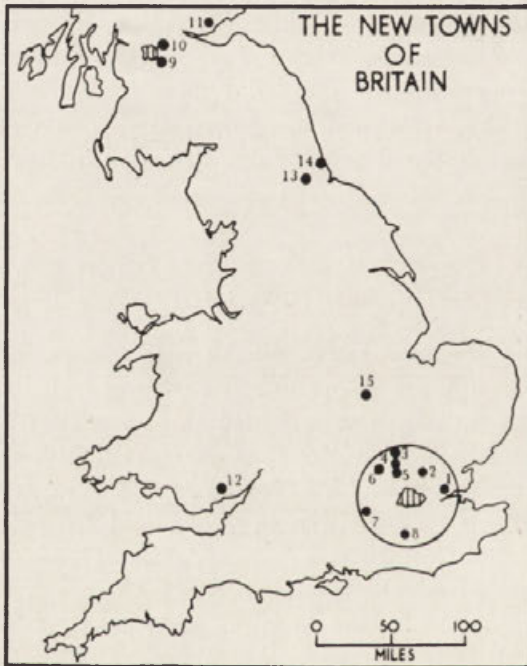


Fig. 1. The new towns of Britain

1—Basildon. 2—Harlow. 3—Stevenage. 4—Welwyn. 5—Hatfield. 6—Hempel Hempstead. 7—Bracknell. 8—Crawley. 9—East Kilbride. 10—Cumbernauld. 11—Glenrothes. 12—Cwmbran. 13—Newton Aycliffe. 14—Peterlee. 15—Corby.

particular planning objectives. On this basis three types may be recognised. Firstly, there are those which are primarily designed to relieve congestion in large urban agglomerations. Those forming the London Ring, together with East Kilbride and Cumbernauld, near Glasgow, fall into this category. They are placed,

it is hoped, at sufficient distance to discourage daily movement to and from the main city, but they are nevertheless related to the latter and are dependent upon it for certain services.

The towns of the London Ring are intended to absorb nearly half a million people from the capital. The choice of location for these was not a simple matter, for although many sites were favourable in some respects, they were unsatisfactory in others. Thus Ongar, at first regarded as a possible site, was eventually rejected on the grounds of inferior communications; Crowhurst was not chosen because of its nearness to Crawley, already acceptable as meeting the necessary requirements; White Waltham was rejected because of the high-value agricultural land in the locality. In general, sites with an existing settlement of small size were chosen, largely because they were already provided with some of the principal services such as water-supply, electricity and communications.

The second type consists of towns promoted to meet particular local needs and aims chiefly at social and economic rehabilitation. They are chosen as centres for the re-development of scattered industrial communities, particularly those situated in older mining areas where housing is often grossly below standard and where the threat of unemployment arises either from too great a dependence upon a single industry or, as in the case of mining, from approaching exhaustion of local coal reserves. Such are Cwmbran near the eastern edge of the South Wales coalfield and Newton Aycliffe and Peterlee in Co. Durham, all three being situated in Development Areas i.e. former "depressed areas". These are not primarily concerned with the problem of overspill but rather with the re-grouping of an existing population to secure a qualitative improvement in living conditions.

Cwmbran, in a mining area between Newport and Pontypool, was selected as the site of a New Town partly because redundant war-time factory buildings became available as industrial premises. Indeed several firms were already in production before the area was designated. Newton Aycliffe had a somewhat similar origin. Situated on the main railway line from London to Newcastle (some four miles north of Darlington) and close to the Great North Road, it is to become the urban centre for workers, including ex-miners, employed at a small pre-war industrial estate which was extended by the government for wartime purposes. In this instance, since the estate is jointly controlled by the Board of Trade and the North-Eastern Trading Estates Limited, the Aycliffe Development Corporation need make no separate provision for industry.

Peterlee, named after a well-known miners' leader who was also chairman of the Durham County Council, is designed to integrate the scattered and poorly housed mining population of the Easington Rural District into a planned community located near the coast. In reality this is a large re-housing project which will afford full urban facilities and scope for a wider range of employment. It is hoped too that the New Town will serve to retain the population in contrast

to the high rate of emigration, especially of women, which has hitherto characterised the mining villages of the area. Peterlee, however, is confronted with a difficult local problem, that of building a town on a site beneath which at least five seams of coal are in course of extraction. Either the risk of subsidence, requiring special measures in building, or some sterilisation of coal is inevitable and on this account lengthy negotiations with the National Coal Board caused delays in the initial stages, though more rapid progress has been made in the last year or two.

The third type of New Town is that created in response to the expansion of large-scale operations in basic industry such as coal or iron and steel production. In these cases the location of the town is determined by the presence of one or other of the natural resources concerned. Thus, in Scotland a large new colliery designed to exploit deep reserves in the Fifeshire coalfield is to be accompanied by the development of a New Town at Glenrothes. The colliery itself is to employ 2,500 men but in order to obtain a balanced community in the social and economic sense, miners and their families are to form not more than one-eighth of the town's ultimate population. Other forms of industry, however, have so far been slow to enter Glenrothes and most of the 10,000 people already living there are dependent on mining. The other example in this category is Corby in Northamptonshire.

Corby, the centre chosen by Messrs. Stewarts and Lloyds for the erection of a large steel-works and rolling mills in 1934, is situated on the main railway from London via Kettering and Nottingham to the North, in the midst of the largest area of accessible ironstone in the country. The industry brought a swift accession of workers into the district and even by 1939 the village of Corby with a population of about 1,000 had grown into a township of over 10,000. Between 1934 and 1939, Messrs. Stewarts and Lloyds built 2,300 houses (out of a total of 2,800) for their employees, together with various social and recreational facilities. At this time Corby was virtually a "company town". It was a strangely heterogeneous community too, for much of the labour was transferred from the company's works in Scotland, with a considerable influx from South Wales, Durham, the Black Country and Ireland. Later on, refugees and displaced persons from Latvia, Poland and the Ukraine also found employment.

In the post-war period, with continued expansion in the steel industry, the local authority found itself unable to fulfil adequately its vast commitments, not merely in housing, for the population had reached 17,000 but in providing the whole apparatus of a fully operative town. The case for the development of Corby as a New Town was a strong one and it was thus designated in 1950. Good progress has since been made except in the provision of alternative employment, most of the inhabitants, now totalling 33,000 being still dependent on steel. A few hundreds, chiefly females, who work in other trades, continue to travel daily to places such as Kettering, Desborough and Rothwell.

CHARACTERISTICS OF THE NEW TOWNS

While the New Towns have been promoted by a special form of statutory planning and are based on broadly similar aims, it is clear that they differ considerably one from another. In appearance, it is true, there may be resemblances due first to the application of similar principles of form and lay-out consistent with modern planning and secondly to a similar range of materials used in building. But there on the whole the similarity ends. The New Towns are by no means stereotyped and there are some obvious reasons why they differ: differences of terrain, differences in industrial structure, differences in architectural treatment and above all differences in the ideas of the Development Corporations as to the most satisfactory lines of development to be followed in each case. To mention but one example, the design of the town centre, which offers scope for imaginative architectural skill, shows marked variations, from the impressive Boulevard leading off the old High Street at Crawley, to the attractive Market Square at Corby.

It is impracticable in a short article to deal in detail with the internal structure of the New Towns. In summary, however, reference can be made to the four main elements which characterise each town. The residential parts form several distinct neighbourhood areas each with a few thousand inhabitants and equipped with schools, churches, community centre, local shopping facilities, gardens and open spaces. Factory premises are grouped (or zoned) in one or more areas according to the size of the town and the nature of the industries. Such areas must of course be located in relation to principal lines of communication. The town centre as a focus of administration, commerce, shopping and entertainment is planned as a distinct element but placed in relation to the whole. Lastly the internal road system is devised not only to serve each particular neighbourhood but to unify and give coherence to the entire town.

In the residential parts the spacing of dwellings at a comparatively low density (e.g. 12-15 to the acre) ensures the provision of gardens, ample light and fresh air and a reasonable amount of land for open spaces and playing-fields. Thus the New Towns afford not only the improved housing conditions found on the best municipal estates, but with their full urban facilities including scope for employment, they should become far more satisfying places in which to live and immeasurably more so than the drab congested city quarters which they supersede.

PROGRESS OF THE NEW TOWNS

Nearly ten years have passed since most of the New Towns were started but their rate of growth has varied widely. Their progress which in some cases has been slow, can be seen from the following table:

PARTICULARS OF NEW TOWNS

New town	Date of designation	Proposed ultimate population	Population Jan. 1st. 1959
The London Ring			
Basildon	1949	80,000	46,500
Harlow	1947	80,000	45,000
Stevenage	1946	60,000	33,500
Welwyn	1948	50,000	31,250
Hatfield	1948	25,000	17,500
Hempel Hempstead	1947	60,000	49,000
Bracknell	1949	25,000	16,000
Crawley	1947	50,000	49,000
Glasgow Overspill			
East Kilbride	1947	50,000	23,000
Cumbernauld	1955	50,000	3,500
Glenrothes*	1948	32,000	10,200
Others			
Cwmbran	1949	25,000	24,500
Newton Aycliffe	1947	20,000	10,200
Peterlee	1948	30,000	10,000
Corby	1950	40,000	31,200

* Late in 1959 it was announced that Glenrothes is also to serve as Glasgow's third overspill town.

At the beginning of 1959, about 288,000 people were living in the towns of the London Ring; but this total includes over 90,000 who were previously resident in the designated areas. Nevertheless, of the projected transfer of 436,000 people, nearly 200,000 have now moved from the capital. The number living in the other New Towns at the same date was 112,600 out of the proposed total of 257,000. It is probable however, that the ultimate figure for some of the New Towns will eventually be increased. So far, the extent to which the New Towns have contributed towards the dispersal of industry is comparatively slight. About 220 firms, chiefly concerned with light industry, together employing over 40,000 workers, have been established. These results, modest in scale and often despairingly slow in realisation, are at least encouraging. They demonstrate the practicability of creating modern towns in the form of complete and balanced communities, equipped with all the facilities required for the welfare of their inhabitants.

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of articles in English and Russian.

Subscription: yearly \$ 6.—

National Bank of Poland, Warecka 16
Account number 2-6-71.

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BIBLIOGRAFIA GEOGRAFII POLSKIEJ
(BIBLIOGRAPHY
OF POLISH GEOGRAPHY)

published for years:

1936—1944, Warszawa 1959, 315 pp. — 78 zł

1945—1951, Warszawa 1956, 219 pp. — 29 zł

1952—1953, Warszawa 1957, 99 pp. — 24 zł

1954 , Warszawa 1957, 67 pp. — 15 zł

in preparation years:

1955—1959 to be published in 1961

1960 " " " " 1962

1918—1927 " " " " 1963

Years 1923—1935 edited by W. ORMICKI
were published in „WIADOMOŚCI GEO-
GRAFICZNE” volumes: VII (1929) —
XIV (1936).

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POLSKIE
NAZEWNICTWO GEOGRAFICZNE
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(POLISH
GEOGRAPHICAL PLACE-NAMES
OF THE WORLD)

Warszawa 1959, 857 pp. — 135 zł.

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PROBLEMS OF ECONOMIC REGION

Papers of the Conference on Economic
Regionalization, held in Kazimierz
(Poland), May 29 — June 1, 1959
(in English, French, German and Russian).
To be published at the end of 1961.

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