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PAPERS
for the
8th INTERNATIONAL
CARTOGRAPHIC
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Address

The cartographers of the German Democratic Republic greet the delegates assembled in August, 1976, on the occasion of the VIIIth International Conference and the Vth General Assembly of the International Cartographic Association in the Union of Soviet Socialist Republics.

The Vth General Assembly and the VIIIth International Cartographic Conference are facing important tasks. In the whole world, there are increasing the demands to the cartographic science and the cartographic production. Also in the socialist German Democratic Republic cartography is giving indispensable fundamentals to science, economy and to education in the widest sense of the word. The contributions gathered up in this publication are to witness of how the cartographers of the German Democratic Republic are striving in selected sections to solve theoretical and practical problems of cartography.

The cartographers of the German Democratic Republic wish a full success to the meetings in the U.S.S.R., joining therewith the desire that from these conferences may result new impulses to an advancement of the cartographic science and to international co-operation.

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**The Application
of the World Map 1:2 500 000
in Making Series
of Thematic World Maps**

Contribution to the 8th International Cartographic Conference of the International Cartographic Association to be held in Moscow from 3rd to 10th August 1976

1. Introduction

As early as in 1958, when elaborating the editorial documents for making the World Map 1:2 500 000, the national Geodetic and Cartographic Services of the People's Republic of Bulgaria, the German Democratic Republic, the Polish People's Republic, the Socialist Republic of Rumania, the Czechoslovak Socialist Republic, the Union of Soviet Socialist Republics and the Hungarian People's Republic had started from the premise that the set of maps should also be used as a basic map in making thematic maps. The editors of the World Map characterized their purpose and objective as follows:

"The World Map 1:2 500 000 is a general geographic map elaborated on an uniform basis for the whole surface of the earth. It is to give a survey, true to scale, of the physico-geographic, politico-geographic and economic-geographic conditions on earth. - It may be used as a world-wide basic map in making geographic and thematic maps, as a map for scientific work as well as a general source of information." (From: "Instruktion über die inhaltliche Gestaltung der Weltkarte" - Instruction regarding the contents of the World Map).

Now, after the World Map 1:2 500 000 has been completed in its first edition within a relatively short period of time thanks to the intensive work of the cartographers of the socialist countries mentioned, the time for its concrete application to thematic mappings of the earth or its parts has come. With this set of maps the editors of the World Map are meeting multifold needs and also intend to make a contribution towards representing the earth cartographically according to uniform and latest scientific and editorial findings. The making of series of thematic World Maps in the fields of natural resources, their rational utilization, factors of the environmental conditions and environment protection as well as demographic and other socio-economic and national - economic aspects has more and more been placed into the foreground of cartographic science and technology and requires international cooperation. Since all of them have the socialist social system as their common basis, favorable conditions are existing in the socialist countries for the preparation of such series of maps. With regard to the topographic reference of the representation of the thematic contents thematic mappings require basic maps of a high quality and exactness. As to its construction, contents and technology, the World Map 1:2 500 000 largely meets the demands made on such a basic map of the whole surface of the earth.

2. Variants of basic maps

The versatility and manifoldness of thematic maps calls for basic maps with different informational densities. When making the World Map 1:2 500 000, three types of basic maps were developed in order to examine, from the very beginning, the suitability for mappings of natural-scientific findings and facts as well as for

entering societal, economic and social conditions. The full sheets of the World Map are printed in 12 colours. The following variants are intended as basic maps:

Variant 1: Basic map for thematic mappings of general contents with a maximum density of the contents

Contents:

- Black (Map frame, map names, frontiers)
- Blue (Network, hydrography without isobathic lines)
- Grey (Railways)
- Red (Roads)
- Brown (Relief without coloured contour lines)
- Violet (Border lines and administrative centres)

Variant 2: Basic map for thematic maps in the natural-scientific field

Contents:

- Blue (Network, hydrography without isobathic lines)
- Brown (Relief without coloured contour lines)
- Violet (Border lines and administrative centres)

Variant 3: Basic map for maps in the field of social sciences

Contents:

- Black (Map frame and map names, frontiers)
- Blue (Network, hydrography without isobathic lines)
- Grey (Railways)
- Red (Roads)
- Violet (Border lines and administrative centres)

The contents of these three variants is illustrated by means of the samples to be seen in the Map Exposition of the German Democratic Republic. The variants of basic maps mentioned above may be produced without additional expenditures when printing the edition of full sheets.

3. Basic maps for special units

The variants of basic maps mentioned allow for further modifications through minor changes, provided such documents are required for special thematic mappings. For instance, certain map names may be omitted by covering the inscription on variant 3. In other cases individual elements of information may be supplemented, e.g. names serving orientation may be added in variant 2.

The World Map 1:2 500 000 must not necessarily be used in the present format of the sheets, changed formats may be used as well. Designed as a map specified by geographical coordinates with connections on the margins, the desired basic map may be deduced by combining several sheets to yield large sheets of parts of them, according to the territory to be represented.

Such basic maps may be made for

- individual countries (Algeria, Mexico etc.)
- groups of states (Western Europe, Anterior Asia, Central America)
- continents (Europe, Australia, Antarctica)
- oceans and parts of the oceans (Mediterranean, North Atlantic)

Thus, basic maps may be elaborated for special units in accordance with the above mentioned variants with further modifications without making new maps, a process which would be expensive and time-consuming.

When the editors of the World Map 1:2 500 000 elaborated the projections - based on the principle that major distortions should be prevented and these distortions should be evenly distributed over the whole territory - they had planned, from the very beginning, that overlapping sheets would be prepared where conic and azimuth projections come into contact with each other. Overlapping sheets will also be required where conic projections come into contact at latitudes of 0° and 24° north and south. Here we get spacings which render the joining of the individual sheets impossible.

Overlapping sheets will only be made for landed areas to represent political and geographical units in a uniform network. The publication of these overlapping sheets is an essential support to applying the World Map for thematic mappings of certain large regions of the earth. In order to compensate for some disadvantages of marginal zones between the projections, investigations are being carried out at present with regard to transforming these zones.

4. Demands made on the contents

The contents of the World Map 1:2 500 000 is determined by regulations as to map signs and by a number of instructions. These editorial documents, which we are not going to describe in detail here, contain the parameters for the demands made on the quality of the map sheets and detailed instructions as to the generalization and representation of their contents. Generalization and representation of the contents of the map are based on latest findings and experience. Thus, the contents of the map is almost uniform and it is characterized by a high quality. When publishing the sheets, greatest topicality is achieved. The editorial and cartographical activities are controlled by these basic editorial documents which are binding upon all those who are involved in making the World Map. The uniform making of basic maps is an important prerequisite for subsequent global, thematic mappings.

The contents of the World Map - subdivided into map elements - includes all the important objects necessary in thematic mapping. The following is represented:

- Hydrography - lines of river banks and shores, water-falls, rapids, channels for drainage and irrigation, still waters, inundated areas, wells, coral-reefs as well as isobathic lines and isobathic numbers
- Relief - contour lines, spot heights, lava fields, passes, glaciers, inland ice and pack-ice borders.
(Contour lines are represented for levels of 50, 100, 200, 300, 500, 700, 1 000, 1 500, 2 000, 2 500, 3 000, 4 000, 5 000, 6 000, 7 000 and 8 000 m.)
- Soil and vegetation - Mangrove coasts, swamps, salt marshes and deserts
- Localities - the classification comprises 6 sizes: less than 10 000 inhabitants, 10 000 to 30 000, 30 000 to 100 000, 100 000 to 300 000, 300 000 to 1 000 000 and more than 1 000 000 inhabitants
- Network of Communications - Main and other railways, ferries, tunnels, motor high-ways and transit roads, main roads, side roads, navigable canals (two stages - capacity of more or less than 1 000 tons), beginning of the navigability, seaports and airports

Frontiers	- state frontiers, frontiers of colonies, trust territories, protectorates, administrative borders of the first order, borders of national parks and natural preserves
Other map signs	- historical ruins, historical walls
Map names	- comprehensive set of names for the above mentioned elements of the map, according to the type and character. Moreover, they include a margin with a network of parallels and meridians, a minute strip, an index, a political survey, a site plan and other data of the legend.

5. On the use of the World Map

In recent years several investigations were carried out in order to prepare for the utilization of the World Map for thematic mappings. These investigations were carried out by both the editors of the World Map and scientists from other disciplines. Examples for a practical utilization are the "Geomorphological Map of Europe 1:2 500 000" prepared under the guidance of Demek in the Czechoslovak Socialist Republic and elaborated within the framework of the International Geographic Union, and the "Map of the Utilization of Land in Europe 1:2 500 000" prepared by the Hungarian People's Republic. In both cases the World Map 1:2 500 000 was used as a basic map. Here, first experiences regarding its use were gathered. In 1973 a symposium was held in the German Democratic Republic at the Technical University Dresden which dealt with "Sets of Thematic World Maps based on the World Map 1:2 500 000" (1). During the symposium possibilities were discussed for applying the World Map to geosciences, environmental research and the mapping of the subjects 'population' and 'settlements'. Fundamental ideas of developing individual series of maps, e.g. geosocial, hydrological, geomorphological and demographical maps, were explained. The development trends of many geosciences indicate that the elaboration of sets of thematic World Maps at the scale 1:2 500 000 with the cognition and representation of important topical problems. For the time being, the socialist countries would make sets of thematic World Maps that serve the mapping of natural conditions, the improved utilization of natural resources and environment protection, and in this respect, may be used, above all, as tools for the protection of the atmosphere and the oceans. The gathering of information with regard to geoscientific mapping and for the acceleration of the projects would, from the very beginning, require the evaluation of orbital photos and of photos made from high above. Thus the World Map may become the carrier of new information.

There is another aspect of the utilization of the World Map that is worth mentioning: the scientific evaluation of its information content that was elaborated according to uniform principles. Hence, the maps may not only be used as a basic material for cartographic production but are, due to their enormous abundance of qualitative and quantitative information about our earth, a new source for research. This applies, in particular, to sciences dealing with questions of the relief, of hydrography, settlements and the network of communications.

6. Summary

The tasks set to seven socialist countries to make a World Map 1:2 500 000 could be concluded within a relatively short period of time. Thus, a set of maps of a hitherto unprecedented extent and of a high scientific, cultural and political value was made available. This World Map may serve now as a basis for the preparation of its application to making series of thematic World Maps. This aspect had already been taken into consideration when elaborating the basic editorial documents for making the World Map as well as three

variants of basic maps which may be further modified for special units with a minimum of additional expenditure. Thus, the contents of the World Map meets the demands made on such basic maps for global mappings or for mappings of parts of the earth's surface.

In the near future further investigations will be made into the utilization of the World Map, for which some examples were given. In order to fulfil the great tasks set in this direction, international cooperation will be indispensable. Hence, it is a task of the future to continue the investigations and efforts with regard to the application and utilization of the World Map for making series of thematic World Maps and to make full use of the possibilities created through this set of maps for achieving greater progress in cartography and international cooperation.

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On Representation
of Territorial Structure
in Generally Informing Atlases

Contribution to the 8th International Cartographic Conference of the International Cartographic Association to be held in Moscow from 3rd to 10th August 1976

The systematic education of the whole population towards an effective utilization and conservation of the resources of the biosphere becomes a more and more urgent task. For its solution, there are expected important contributions from geographers and cartographers. But these contributions cannot exhaust only in the training of specialists at colleges and universities. The solution of the task must, on the contrary, be directed in a particular measure towards the wide spreading of adequate scientific knowledge in school and towards the means of mass-information.

The influence of advancing industrialization and the urbanization of present society in the natural environments surrounding us lead to different, in most cases disadvantageous for mankind changes, which quickly increase and more and more are getting threatening dimensions. As well in literature as on the occasion of international conferences of experts there will be referred to the increasing deficit of natural resources of different kinds, as e.g. water, soil and vegetation, and thereby accentuated, that the intensive utilization of the resources of the biosphere is not in balance with the corresponding reproduction.

However, the systematical education of the whole population must at the same time be directed towards the development of abilities that help to discern complex processes. Surely, the conventional methods and basic elements are no more suitable to reflect also in future the geographic environments in an proportionate degree of abstraction.

In this connection it will be sensible to check the hitherto level of cartographical representations from the point of view of a fundamental creative doubt. At the same time, one has to put the question to oneself if we are on the right path, when we try to give a new meaning to traditional terms, conceptions and directions of our old science.

Should we not in a revolutionary way approach the solution of the task and look round what has happened in the so called fundamental sciences, as for instance mathematics, physics, chemistry, in the last years? We ought to follow these examples and to approach courageously a fundamental renewal of our science. It will lead to a replacing of our traditional terminology by fully new terms and nomenclatures which can be compared with analogic terms in neighbouring branches of science. They will correspond to the actual objects of research, ways and methods of scientific work in a greater extent. With this, we always must keep realizing that practice still is the test field for new ideas..

One thing, however, seems to me to be sure namely, that a conservative sticking to the traditional vocabulary does not help us along when developing new directions.

The cartographical problems arising with the world-wide and comparable representation of facts in generally informing atlases have, by increased more precise questioning of the users, got a higher quantitative value. Therefore, it is quite legitimate to borrow from geography, to make better visible the correlation network of the basic elements of maps. A practicable way offers itself in the cartographic representation of territorial partial structures.

As a relatively stable element of territorial structure prove to be the inhabited places. Under the aspect of the world-wide registering of this phenomenon, one of course cannot start only from the fact that the optimal regional division of labour may only be seen in connection with an appropriate far-seeing planning of the structure of settlements.

The structure of settlements as a territorial partial structure is extraordinarily complex, i. e. it reflects in a complex way a great deal of the territorial structure of social reproduction. It is not identical with this.

The structure of settlements exerts in its complexity a deciding influence on the conditions of labour and life of men. It stamps more than the other territorial partial structures the way of life of people. The territorial differentiation expressed in the structure of settlements reflects particularly clear territorial level differences, e. g. differences in the level of production, in industrialization and in technical supply.

The usual classification of inhabited places as an element of the map on the base of population statistics is becoming increasingly complicated because of the statistical registration of large units. In some regions, such a classification will not be possible for the future.

The localization of such large units in no way corresponds any more to the real distribution of population, at least the standard residential population, e. g. the large townships in Norway, in Yugoslavia among others large townships of 20 000 inhabitants. In Norway they extend over many square kilometers with small settlements the largest of which have no more than 2000 to 3000 inhabitants. The application of the usual symbols leads to absolutely wrong cartographic representations. Also from this point of view becomes clear that particularly in the scales of 1:1 000 000 and smaller the elaboration of new aspects in classification has become an urgent necessity.

The possibility of turning over the differentiated structure of settlements into a cartographical statement in the chosen examples is seen in the following classification and is fixed by adequate criteria:

Rural settlements	50 to 100 % of the employed in the primary sector
Industrial settlements	60 to 100 % of the employed in the secondary sector
Places with functions prevailing in administration, trade, traffic and service	60 to 100 % of the employed in the tertiary sector
Places with polyfunctional structure	with shares in the primary, secondary and tertiary sector of about 40 %
Recreation centres	60 to 100 % in the tertiary sector and it prevailing on the field of recreation
Dwelling-places	settlements without economic function

Moreover, the quantitative registration can be made by grouping according to the numbers of inhabitants in three groups

- less than 100 000
- 100 000 to 1 000 000 inhabitants
- more than 1 000 000 inhabitants,

with the exception of the representation of the mentioned large townships without a centre of settlement.

Resulting from the structure of settlement, for a complex treatment of the correlations with the other partial structures also other factors are of particular importance. There exist e. g. very close relations to traffic. Thus the course of routes, their density and their quality, quality and quantity of public means of conveyance will offer criteria for the differentiation of the traffic lines as element of the map.

Increasingly the proportions between public and individual traffic are winning importance for classification.

But also the characterization of conveyance of passengers' and of goods' traffic may be necessary for differentiation, according to the purpose of the map. The measure of the thematic contents will play there a deciding part. By the shift of transport in some regions of the earth to other means of conveyance becomes discernible that the inclusion of transport ought not to be limited only to the thematic special purpose map.

Criterion for the selection of traffic lines can, as far as the source material is concerned, be only the frequency of use. For the moment, as a problem will stay a classification comparable all over the world.

It is getting apparent that the informative value of the map elements applied today in general geographic maps will be no more sufficient. It is in a high measure restricted by deficiencies and unequal facts. In future, the solution of this problem can lead only by way of new principles in selection and classification from the complex point of view of territorial structure.

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Tasks in Connection with Updating the World Map 1:2.500 000

Contribution to the 8th International Cartographic Conference of the International Cartographic Association to be held in Moscow from 3rd to 10th August 1976

1. Introduction

The last sheets of the World Map 1:2 500 000 were accepted by the editing board and released for the printing of the edition in 1975, so that at the present time all map-sheets of the World Map 1:2 500 000 are printed. The preparation of the World Map 1:2 500 000, which contrary to other outline maps covers the total surface of our planet, means that a set of maps is at our disposal which as a general geographic outline map conveys a true-to-scale survey of the physical, political, economic and geographic relations of the earth. Such a set of maps will only be of lasting value if it is updated. That is why the publishers of the World Map 1:2 500 000, the Geodetic and Cartographic Services of the People's Republic of Bulgaria, the GDR, the Polish People's Republic, the Socialist Republic of Rumania, the Hungarian People's Republic, the USSR and the Czechoslovak Socialist Republic, aim at updating this set of maps in a planned and systematic way.

The publishers of the World Map knew from the beginning that the making of such a set of maps within the requested period would only be possible by help of the friendly cooperation between the Geodetic and Cartographic Services of the socialist countries involved. They also knew that the completion of the altogether 262 map-sheets was only one part of the task to be fulfilled and that great efforts had to be made to keep the set of maps up to date. Therefore the editing board has been dealing since 1968 with the theoretic foundations of updating, and some map-sheets have already been updated. This is not least an expression of the new character of the World Map 1:2 500 000 in comparison with the International World Map 1:1 000 000 (IWK) that the set of maps shall systematically be updated while one cannot speak of a systematic or planned renewal or updating of the IWK 1:1 000 000 (many sheets are 20 to 30 years old or even older).

2. Tasks in connection with the actualization

The World Map 1:2 500 000 is at the publishing date of the highest possible actuality. The fulfilment of this demand of the Instructions is, not least, ensured by the review of the original compilation copy and the proof of the map-sheets by the Geodetic Services of the countries involved as well as by the activities of the editing board and the information centres. New maps and charts are taken into consideration and integrated up to the time of the printing of the edition. But the observation of this provision of the Instructions does not alter the fact in any way that - in particular due to the rapid speed of the development of the economies in the socialist countries and to the elimination of monoculture and the mere production of raw materials as well as to the increase in population, primarily in the developing countries - changes have taken place in the political, economic and geographic fields in many regions of the earth which also affect the contents of the World Map 1:2 500 000. The changes are primarily caused by:

- the formation of independent states out of former colonial and dependent territories
- the formation of new administrative divisions within the states
- the growth and the integration of towns and villages, the development of new towns

- the construction and extension of roads, railways, tunnels, canals, ports, airports, reservoirs etc.
- the renaming of towns and villages and other geographic objects, the new spelling of geographic names as well as the determination of improved systems of transcription and transliteration.

In addition, in some countries new or improved topographic maps were published which altogether are to be considered as new starting material for the map elements "relief" and "hydrography".

Two tasks which are different in their character shall be fulfilled in view of the cartographic updating of the World Map 1:2 500 000:

1. Improvement of the contents of the World Map on the basis of improved editorial documents
2. Updating of the objects of the map contents represented on the World Map.

The editing board has been dealing with the first task since the beginning of the seventies.

Starting from studies made by the Geodetic Services of the socialist countries involved and dealing with individual elements of the map contents as well as from comments of map users, proposals concerning the improvement of the map contents were submitted and discussed by the editing board. Thus the foundations were laid which, at the present time, make the continuation of the basic editorial documents possible.

As far as the solution of the second task is concerned, two kinds of updating are differentiated:

- addenda
- correction.

We understand by "addenda" the following:

- the consideration of changes concerning political facts (frontiers, names of states) as well as the renaming of individual important objects
- the entry of important objects which have newly come into being or are under construction (railways, roads, canals, reservoirs, ports etc.)

The Instructions provide for updating to be made as "addenda" before each new print of an edition.

The "correction" of a map-sheet means:

The systematic checking of the total map contents in view of any changes which might have occurred. After the correction has been made, which is mostly connected with a partial new compilation of the contents of the map-sheet, the latter shall correspond to a new production with regard to its actuality. It is provided that in future the correction of the map-sheet will be linked with the fulfilment of the first task, i.e. the improvement of the contents of the World Map on the basis of improved editorial documents.

3. Editorial and technological work connected with updating

The updating of a set of maps largely consists of two main stages:

- the collection and analysis of the source material concerning changes
- the entry of changes into the original publishing copies of the individual map-sheets.

The source material for updating the World Map is most different. Possible are maps (also with a large scale), atlases (especially national and regional atlases), timetables (railway timetables, flight plans), statistical data (periodicals on the population etc.), geographic literature as well as reviews by the users. The procurement of the material will be organized by the information and documentation departments of the printers of the set of maps. On request the two information centres for the preparation of the World Map in Budapest and Moscow will lend the necessary support. The analysis of the source material will be made by experienced members of the staff who have cooperated as editors in making the World Map 1:2 500 000. Thus it is guaranteed from the beginning that the nature of this set of maps and top uniform quality of its contents will be maintained throughout its updating. The analysis of the material is to be considered a permanent task

and shall be made by the Geodetic and Cartographic Service which has already prepared the map-sheet for the first time.

Any changes shall be entered either in writing (in lists) or into the work map which is a transparent sheet covering the map-sheets.

The technology of the entry of changes into the original cartographic copies differs according to the extent of changes. In general, the following method has stood the test: When the map-sheet is being prepared for the first time, not only left-and-right reversed original publishing copies for the printing of the edition are made but also true-to-side original copies, the so-called original updating copies, having the same state of editing. The objects which no longer apply are deleted on the original updating copies according to the original compilation copy of the updating or according to the work map (depending on the kind of updating). The entry of any changed or new objects can, to a limited extent, also be effected in these original copies.

If there are major changes to be made, a so-called original supplement copy (by engraving or drawing on the basis of the original compilation copy of the updating) is prepared from which the left-and-right reversed original copy results for printing the edition of the updated map-sheet after a joint print down of the original updating copy and the original supplement copy has been made. From the left-and-right reversed original copy the original updating copy for the next updating period is made through a print with altered dimensions.

The quality and uniformity of the editorial preparation will remain ensured also during the updating process. When the map-sheets are updated by "Addenda", the Geodetic Service carrying through this work will be responsible for the quality. Contents and graphic lay-out will be responsibly controlled through the organization of the editorial guidance and the technological control organization of the printers. If the "Correction" kind of updation applies, the system of the review of the original compilation copy and the proof by the Geodetic Services of the countries involved as well as the release for the printing of the edition by the editing board of the World Map - as it is also applied at the time of the first preparation of the map-sheet - will become additionally effective.

4. Final remarks

In the course of about 12 years the Geodetic Services of seven socialist countries have made available to the experts a set of maps which meets the requirements with regard to an outline and basic map in particular for the making of thematic map series of the earth or large regions as well as to the preparation of atlas maps based on it. The largely uniform preparation of the entire set of maps is based on comprehensive editorial and scientific-technological preparatory work which was tackled in close fraternal cooperation between the Geodetic Services of the socialist countries. The permanent cooperation in concrete matters also led, through the exchange of experiences and mutual aid, to a harmonization of the level of the editorial and technological work in the field of cartography in the countries involved and succeeded in making this level altogether higher. It is this fact which guarantees that also in the future the World Map 1:2 500 000 can be systematically updated and improved in its contents.

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**Problems of Historic Maps
and Old Maps
in Historic Research**

Contribution to the 8th International Cartographic Conference of the International Cartographic Association to be held in Moscow from 3rd to 10th August 1976

It is necessary to distinguish well defined between historic maps and old maps, especially for historic research like Multilingual Dictionary of Technical Terms in Cartography (Wiesbaden 1973).

At present the significance of old maps - particularly maps created in the 18th or 19th century - for historic research work is still not fully notorious by historians. Many of these old maps are an important source for research work in historic economy. A difficult problem of historical research - the investigation of the distribution of historical phenomena, the concentration and so on in the inquired district - is not complicated, if these sources are in full use.

The so called "Schenksche Karte der Oberlausitz" (Schenk's map of the region of upper Lusatia) from the year 1759 may be our example. It comprises the south-east part of the GDR and contains numerous facts of historical and economical significance for instance mills, sheep-farms and so on.

Present cartographers business should be - among other tasks - the preparation (rectification, interpretation the legend and so on) of the old map for an effective utilization by historians.

It would be the necessity to transmit the interesting facts respectively phenomena from the old map to a new thematic map, which then represents two ore more classes of phenomena and their inter-relationship. (Examples will be given by slides) This isn't necessary in each case. The purpose of the map is decisive for this action. It is certainly important and indispensable here to draw a parallel between the named map and the written or printed historic sources belonging to these phenomena.

Utilization of the given facts of such an old map as source material for a modern map of economical history can also be useful for the historian in writing an economic history of a region.

The main problem of historic maps with reference to historic research is the very difficult task of generalization, especially selection, if historic phenomena are researched for making a thematic map.

By making the "Atlas zur Geschichte" in the German Democratic Republic (Gotha/Leipzig 1973/75) there have been such difficult problems. This problem of map design is chiefly caused by the different degree of historic research in the different territories respectively states, which are represented in the thematic map. The history of working-class-movement for instance plays an important roll in the historic research in the German Democratic Republic. In consequence of this fact the history of working-class-movement in the territory of GDR is better researched than in Federal Republic of Germany. For that reason, we know for example more about the number of class-strugglings, strikes and so on in the territory of GDR in the time between the two World wars than in the territory of FRG.

If the cartographer doesn't know enough about this basic problem, he may design an incorrect map of the distribution of the class-struggling within the territory of Germany during the period mentioned above. This problem must be solved by a correct generalization. It must be fairly admitted that this problem isn't easy to solve. As you know quantitative informations, for instance the number of strikes and the number of strikers, which would be needed for an objective generalization, are often missed. Mostly it is a problem of se-

lection. Only the teamwork of historian and cartographer can create in these cases a picture which is approximately identical with the true state of affairs.

On the other hand a thematic map with the complete representation of researched historic phenomena is a necessity for indication the omissions of the historic research. Such a type of thematic maps is absolutely necessary for historic research work and is one of the most important bases of historic maps (Examples will be given by slides).

It might be only possible with the help of such maps to recognize the gaps in the investigation of the considered historical situation in a district and to start new investigation just in these points.

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Development of Maps
for Directing and Planning
of the National Economy of the G.D.R.
in the Period from 1970 to 1976

Contribution to the 8th International Cartographic Conference of the International Cartographic Association to be held in Moscow from 3rd to 10th August 1976

The further intensification of national economy, the increasing specialization and concentration of production, is at the same time a problem of optimization of its territorial organization. The solution of the tasks of investigating and planning of territorial structural developments, which are getting more and more importance all over the world, especially on the field of concentration of population and industry, of intensive exploitation of natural and economic resources, can doubtlessly not be separated from keeping ready the necessary territorially relevant informations and from the adapted forms of their presentation.

For the needs of territorial directing and planning the reproduction process the map is an indispensable means of information, demonstration and working. The cartographical representation as a way of rational information is internationally quickly winning importance. In the G. D. R. too, in the most recent years "planning cartography" - this short term means development and use of maps for directing and planning the national economy - has developed very successfully. This is to be outlined in the following by some examples orientated towards contents of technology.

1. Maps for directing and planning of agriculture, forestry and food economy¹⁾

In spring 1971 the then existing central council for agricultural production and food economy of the German Democratic Republic published the "Planungsatlas Landwirtschaft und Nahrungsgüterwirtschaft DDR" (Meuer-Roubitschek 1973).

This atlas is arranged as follows: The introductory part in 4 map sheets of different scale (1:750 000, 1:2 000 000, 1:15 000 000) lays stress upon the importance and the tasks of the part of national economy comprising agriculture and food economy. It comprises besides a small scale topographic map, maps concerning the population and its need of food, the position of agriculture within the national economy of the G. D. R. as well compared with the other european countries.

The second main section of the atlas deals in 19 map sheets (before all in the scales 1:750 000 and 1:1 500 000) with the natural and economic elements of the agricultural production of the G. D. R. Here, 7 sheets are characterizing the soil as a means of production and conditions of soil fertility. Maps of the climatic factors and the water budget complete the complex of natural conditions of production. Among the economic factors especially man as productive force and the material-technical territorial structure are being treated.

In the third main section on 25 map sheets (mainly in a scale of 1:750 000, some also in 1:1 500 000) the

¹⁾ From among further planning-cartographic works are to be quoted as essential: Maps for town-planning; the "Planungsatlas Bezirk Leipzig" /Planning Atlas of the District of Leipzig, appearing in serial parts since 1971, and the "Planungskataster" /Land-Register for Planning, a large-scale map edition, worked-out by the county offices for territorial planning for the purpose of current working up, storing up, and delivery of plan and actually-on-hand information on the area using of the territory of a district (Roubitschek 1976).

principles of the structure, of the level and of the interlacing of the agricultural production and the food economy of the G. D. R. are being treated. Besides the introductory maps concerning the orientation of the gross farm production and the level as well as the structure of the market production, the other maps represent, relatively to the branch structure and the directing and planning by products, partial complexes: economy of cereals, potatoes, sugar, fruits and vegetables, milk, meat and other branches.

As the atlas is directed towards the intentions of planning beyond the firms, especially on the level of the G. D. R. as a whole and its single "Bezirke" (1st administrative unit) generally the theme concerned covers the whole territory of the G. D. R. The basic scale 1:750 000 makes possible on one hand a survey over the whole state territory, on the other hand permits still a regional differentiation down to the concrete spacial situation on the level of communities or farms.

The statement of the maps is completed by a text volume. Its task is to fit into superior connections the themes of the maps, to widen the informatory contents as well as to show relations between conditions of place and level of production, functional interweaving a. o. Especially in consideration of the aspects of development and the processes in the system of directing and planning in the text part besides the word have been used too lists and graphic-cartographic representations. If possible, the texts have been divided uniformly into three main parts: national economic importance, state of development and trends of development. The text volume comprises beyond this also an index of "Gemeinden" (communities) and "Kreise" (2nd administrative unit), where different particulars, relevant for agricultural site planning, have been compiled.

Intention and possibilities of utilization of the agricultural planning atlas can be taken in a summarized form from the prefatory note of the then G. D. R. Minister for Agriculture and Food Economy (Meuer-Roubitschek, p. 11).

"This atlas is an important instrument for the improvement of planning and directing as well as for the working out of the plan 1971-1975 for agriculture and food economy of our republic ... The planning atlas is before all to help to inform efficiently and clearly the production managers, the directions of unions of national firms and of scientific institutions and the "Bezirke" on the correlations of territorial demand, conditions and structure of productions as well as on sites and capacities of processing and storing of the agricultural products. Beyond this it will doubtlessly be of great advantage for the solution of the tasks in research and for education and continued training of scientific specialists..."

Besides the agriculture with a share of 58,1% of the whole area of the G. D. R., forestry with 27,5% is the second area utilizing branch. Its most important task is the effective utilization of the forests by securing a lasting production of raw wood. As the period within which timber may be cut will last - according to kind of tree and to place - 80 to 120 years and the utilization of the wood must be a lasting one, also for the sake of coming generations, forestry is obliged to plan the development of the wood fund for a long period. From this will derive the short-term economic measures (Kreibig 1973).

For planning and steering of the development of the wood fund the knowledge of structure and of the state of the wood funds is of great importance.

The necessary stock-takings are done by the central projecting firm of forestry of the G. D. R., "VEB Forstprojektierung Potsdam". It falls to its share to point out the social property of woodland in the shape of maps and area indexes, to investigate and map the forest sites, to analyse the state of the forest, to plan over middle periods measures for an optimum development of the forest and to control its development.

The results of the wood fund stock-taking and the middle-term planned economic measures are thus represented in the shape of explanatory texts, lists and maps. They are among other informations the base of the planning for the annual production in the national forestry firms.

The map complex, published by the VEB Forstprojektierung divides into a standard program and into additional maps. Among the forest maps comprised in the standard, the special maps 1:10 000 deserve to be

particularly accentuated, because they represent the conditions of forest and site as well as single planned economic measures within the smallest economic unit, the partial area. To these maps belong the so called economic map and two maps showing sites.

Outstanding elements of information of the economic map are the main economically important kinds of wood, the planned ways of wood-cutting and the realized and planned measures against storm and fire damage. The two site maps in each case represent the results of site investigation, divided in actual and potential condition (soil forms, degree of ground water and wetness, properties of climate site groups and so on).

Outside the standard program, which comprises besides the just mentioned maps 1:10 000 basi maps of the scale 1:5 000 and survey maps 1:25 000, are published among others the following maps: survey maps on enterprises 1:50 000 and survey maps of the woodland areas of the G. D. R. 1:200 000. On demand, VEB Forstprojektierung will publish special map for the technological opening up of the woodland, maps showing smoke damages, maps for the recultivation of dumps, maps on protection from fire and storm damage, hunting-ground maps and maps of recreation centers situated close to inhabited places.

2. The application of automated proceedings for the production of thematic maps for directing and planning of the national economy

In spite of obvious progress in unification the conventional making of planning maps, as in the hitherto presented examples, is still wanting much time. For the operative directing and planning often absolutely actual informations available at short terms are needed. In the past years, therefore in greater extent efforts could be registered in different institutions to include electronic data processing and automated procedures of map production. The application of electronic data processing offers beyond the rationalization effect the possibility to get statements of higher value by derivation of secondary data, correlations and the like (Behrens-Stempell 1974).

A result of these efforts is the working out of the principles for the production of so called automated cartograms or printer maps (cf. Koch, 1974, Behrens-Bursian-Roubitschek 1972, Töpfer 1968). There is the question of one- or multi-coloured cartograms, produced by the writing mechanism of a computer, which may be designed as "statistics in area position" or as cartodiagrams or as choropleth maps.

The sections of the national economy, particularly the executive organs of territorial planning, statistics and agriculture, are utilizing up to now before all cartograms concerning "Kreise". These automated maps fulfill mostly the function of a working map needed only in one or a few copies or of an intermediate product. The saving of time is considerable, the expenses also lie below those of a conventional production. The visual quality, it is true, can scarcely satisfy higher claims. This results already from the fact, that the writing mechanisms are furnished with the normal alpha-numeric type set, that's to say are not in first-line adjusted for graphic-cartographic informations.

For solution of this problem a system of cartographical special symbols has been developed (Behrens-Koch 1976). With the 50 special symbols (sets of circular and rectangular areas, dot fields, hachure- and signature-patterns as well as single symbols) which may be used besides "conventional" ciphers and capitals, intensity of statements and aesthetic effect of the representation can be essentially increased and the decoding process may be accelerated. This effect is intensified, if for reproduction purposes the writing mechanism original is reduced in size.

In the following will be shown how by electronic data processing and new cartographic-technological developments the "maps concerning the census of population, profession, housing accommodation and buildings 1971" are produced in a relatively short time and with clear reduction of expenses in a quality satisfying the needs of the user (Krakau-Roubitschek 1975).

The results of the above mentioned census are indispensable for directing many social development processes. That is why at the turn of the years 1972/1973, when the census results were available for use, a large map work was begun. In the years 1974-76 maps concerning the following complexes have been produced:

1. Population and fitness for work: distribution, density and development of population; age structure; education level; professional disposition; commuters' movement.
2. Inhabited places and dwelling: density of inhabited places and of people; age of buildings; condition of dwelling-houses and comfort of living rooms; connection to supply network.

The maps have in most cases the scale of 1:750 000; other scales are 1: 500 000, 1:1 000 000 and 1:2 000 000. The analytical representations, mostly on the basis of communities, are completed by type maps (by communities) and diagrams (by "Kreise"). Some sheets represent the situation on the base of grids by inhabited places.

The application of electronic data processing and other modern technologies is already much facilitated by a uniformly adapted material fundament. More than 200 data on 8868 communities have therefore been stored on a magnetic tape. From this main tape according to a computing program have been produced punched tapes for a small computer. By this apparatus the frequency distributions and the groups limits have been fixed. A placed print by the automatic typewriter of the elected group numbers of the different characteristics according to communities on the organizing automate will serve so to speak as an author's original for the producing process.

As a modern technique in the producing process photosetting is used. The automatic representation of the quantity symbols by "Linotron" takes place according to 4 criteria: shape of the symbol (cities as square areas, rural places as circular areas), size of the symbol (quantities to be represented), colour (grouping by quality), topographic situation (realization according to a placing program, based on digitalization of place). The controlling punched tape in the Linotron code for conversion of the four criteria into map graphics is again produced by the small computer. Only topographical basic elements, lettering and legend are produced by conventional technology. The printing of the map is prepared by a photomechanical proof as base for the proof checking. A special proof print was not claimed. Only the print order was made in conventional form (colour offset), to secure the highest possible visual quality and utilizability. Further positive results are clear restrictions of expenses and, before all, a distinct abridgement of the producing time. In case of optimal organization from the beginning of editorial preparations to the print a time of 3 months for each sheet may be reached. This for the middle- and long-term direction and planning relatively high degree of actuality will open new fields to the utilization of maps in national economy.

Summarizing it can be stated that cartographical representation as a way of effective information has won increasing importance for direction and planning of national economy of the G. D. R.

To this particularly contributed the socialist, on national-economic centers of gravity directed common work of representatives of scientific institutions of geography and cartography, of city-building and of agriculture, forestry and food economy with organs of territorial planning and cartographic firms. As for con-

tents, from 1976 to 1980 central subjects are the development of "Land-Register for Planning", maps for protection and designing of natural environments, of the further intensification of the socialist agriculture and last not least the preparation for the cartographic utilization of the next population and building census. The effectiveness and at the same time the volume of the use of maps for directing and planning national economy in future will depend on the fact, how intensively and how soon people will succeed to integrate cartographic means of work into the directing and planning system. Deciding premises thereof are before all the definition of the want of regionally differentiated informations by the directing organs, an essentially extended investigation of sites, the unification of the reference base, the storage of data adapted to electronic processing, the development of economic planning maps, the automation of the map production and last not least the training of the users for an optimal decoding.

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Geological Maps: Possibilities for a Partial-Automatic Production

Contribution to the 8th International Cartographic Conference of the International Cartographic Association
to be held in Moscow from 3rd to 10th August 1976

1. Introduction

Owing to their high packing density and complexity of statement geological maps have always been an aid favoured for presenting and communicating informations. An increasing need of informations resulted in considerably enlarging the extent and diversity of subjects to be revealed by geological maps as constituents of geoscientific projects or reports.

The fact that geoscientific investigations become more and more complex makes increasingly necessary a full use of cartographical symbols and letterings communicating informations.

While, for the most part, geological maps are still made by classical methods, partially automated ones are already used for constructing definite types of maps and for realizing some partial processes.

2. Division of Geological Maps

The content of geological maps is so widely differentiated and specialized that an independent system of geological maps may be spoken of.

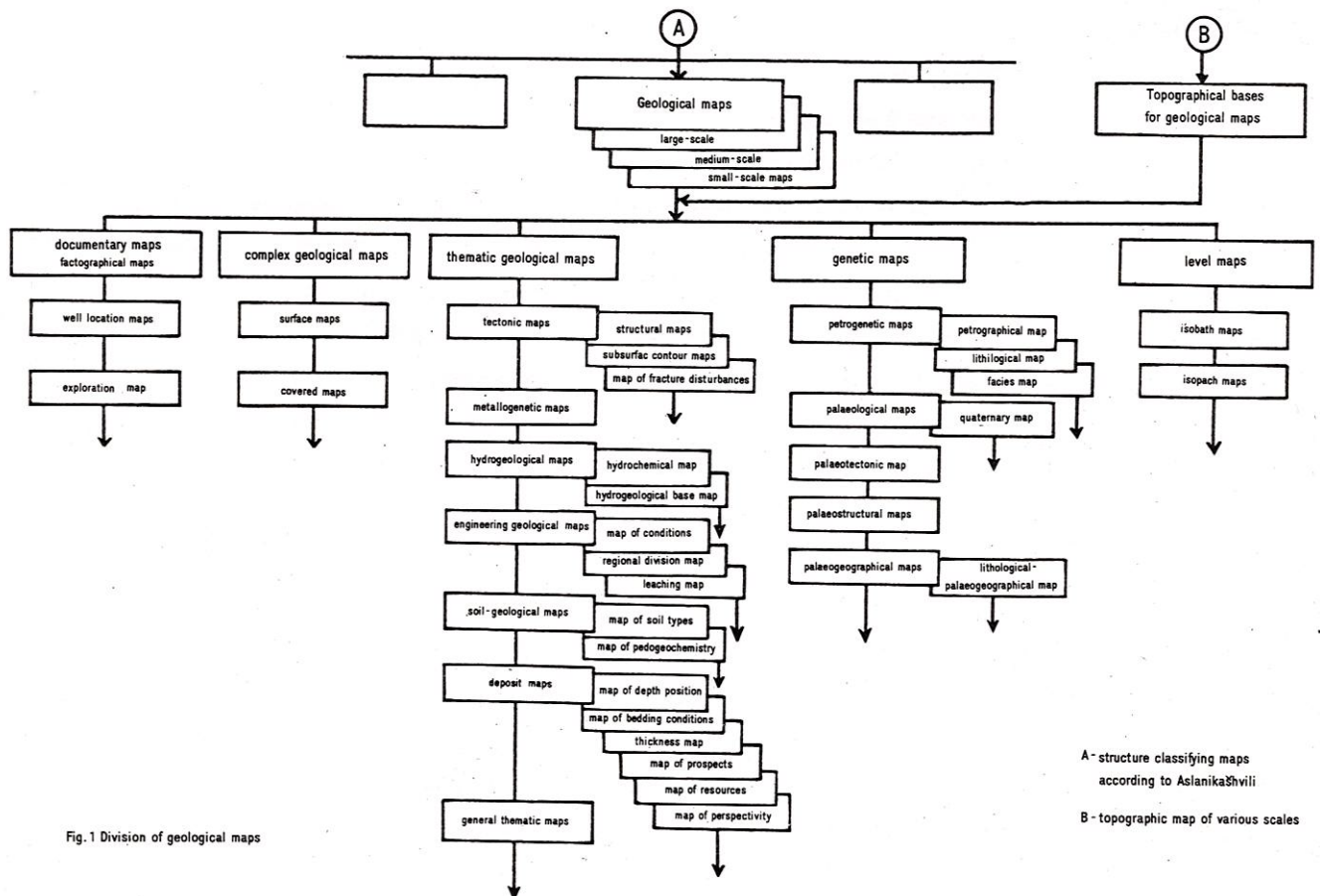


Fig.1 Division of geological maps

A - structure classifying maps according to Aslanikašvili

B - topographic map of various scales

Geological maps fit into the classification of maps according to Aslanikashvili (1). In a division developed by Zentrales Geologisches Institut (Central Geological Institute) of Berlin geological maps are classified into

- documentary maps,
- complex geological maps,
- thematic geological maps,
- genetic maps, and
- level maps.

According to the problem to be solved and facts to be represented, other geological maps may be fitted into this division. Of special interest from a cartographical point of view are the thematic geological maps

- of
- metallogeny,
 - hydrogeology,
 - engineering geology, and
 - soil geology.

3. Problems of Issuing Geological Maps

Preparatory Work

During the technological process of geological map-making an important place is occupied by preparatory work. It has proved to be necessary that cartography must exert influences already at the time of project work, at the beginning of field mapping, or when preparing compilation manuscripts.

In the geological industry of the GDR efforts have recently been increased to standardize signs, signatures and colours, and to unify technologies for geological documentation and maps. The standardization of topographical bases, editing specifications and technology is a decisive factor when making maps for operative and control purposes within a short time.

Production Process

The production process includes the following four partial processes

- survey,
- compilation,
- issuing, and
- reproduction.

The survey contains field work and geological-scientific analyses of source materials available. As the content of the map is fixed by the author, it is the cartographer's task to load the map only as far as it may be read easily and clearly during the compilation. Lines, surface colours, signatures, signature screens and letters are used as cartographical aids to represent the subject. They must be applied in such a way as to form both a scientifically exact and harmonic image of the geological formations on the map.

4. Partial-Automatic Geological Map-Making

Owing to many operations personnel, time and cost have always been necessary when editing geological maps, with great loss of time representing an important factor influencing the topicality of the map.

As conventional production is no longer sufficient for mastering such an intricate method, rationalization measures must be introduced to remedy for the permanent want of capacity in cartography, which is a result of the increasing extent and diversity of graphical documentation. The object is to rationalize cartographical processes and partial ones aimed at making maps by means of automation.

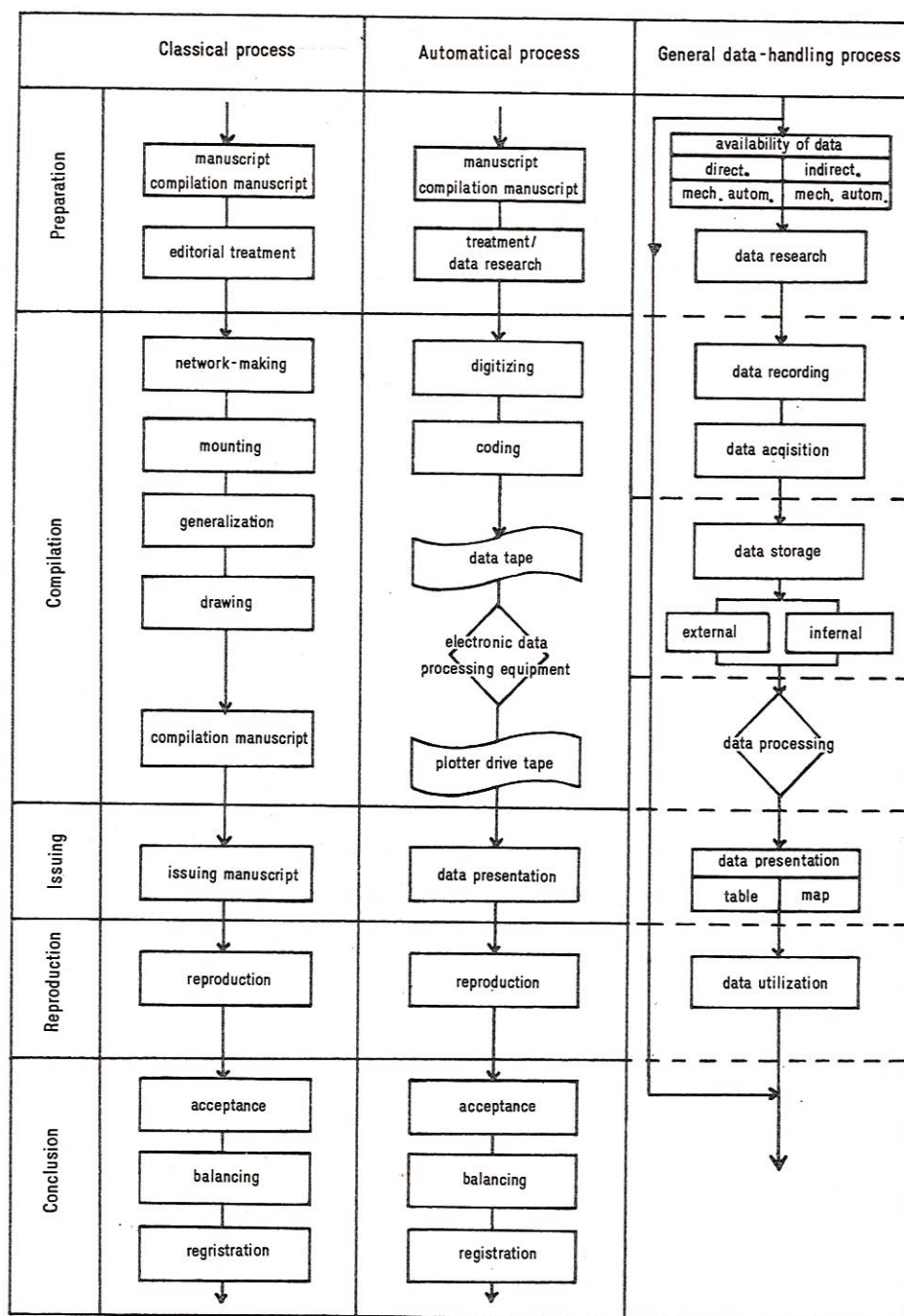


Fig. 2 Possibility of automating cartographical processes

Research and practical work was carried out within geological map-making with a view to arriving at a partial-automatic process.

A comparison made in this respect of the classical cartographical process of map-making with the general data-handling one shows that the structure of the classical process will presently be preserved, sub-processes, however, so far made by hand can be replaced by data-handling operations (Fig. 2).

Compared with the classical geological map-making the partial-automatic one includes the following sub-processes

- treatment, data research,
- data recording/data acquisition,
- data processing, and
- data presentation.

Production Processes

The automation of cartographical processes starts from the mode of making available data of the map content. In principle, geological maps and other graphical representations can be made by two different methods, viz

1. directly from numerical data (primary data), and
2. by present manuscript when converting an analog representation into numerical data (raw data) (3, 4).

The first method is more efficient. According to the presentday state of development factographical and working maps can already be made. At present, geological maps can only be made by the second method, that is to say on the basis of manuscripts (compilation manuscripts), because at the time when automatic processes are introduced suitable data storage units and corresponding algorithms are mostly not available.

Data Research

As a result of application of the theory of information the map is regarded as a source of information, that is to say as a special cartographical form. Source of the cartographical information is the cartographical presentation expressing the information in terms of the cartographical language (signs).

From it results the structural constitution of informations consisting of signs and quantities selected of them, and which are connected by pragmatic relations. Accordingly, basic elements of a map are point-shaped, areal and line-shaped objects as well as the lettering. By means of a legend, scale of values and given facts these objects can be brought into a definite shape, variation and combination. The possibility of a variable distribution of the map content is fully utilized for the purpose of automation.

During the operation devoted to "editorial treatment/data research" manuscripts prepared by the author are made ready for an automatic treatment. The basic elements of the map, i.e. the individual presentations and lines, are marked by their coding into semantic and numerical data. The detailed recording and acquisition of line data are made by determining smallest line sections (from intersection point to intersection point).

A difference must also be made between straight line and part of curve in addition to distinguishing between criteria having a thematic reference, such as

isolines,

tectonic line, and

geological line,

and criteria having a technological reference, such as

contour line of area of colour,

screened areas, or

areas of symbol screen.

In addition, order data enabling the data to be classified into a special (cartographical) system are also determined.

Owing to the firm organization of data handling both the specialized and cartographical editor are compelled to make thorough and clear fixations of the map content to be presented when making and treating the manuscript. The clear characterization of the map content requires an efficient editorial treatment. The principles of standardization already applied to the classical cartographical production exert a positive influence on the partial-automatic process.

Data Acquisition/Data Recording

Digitizing includes the two operations of data recording and data acquisition. The semantic and numerical data determined by the data research as well as the order numbers are transferred to the data tape prior

to data acquisition by the operator using an automatic typewriter. All the data are recorded by a definite system and later-on make possible a variable processing of the data tapes. They are the results of digitizing.

Data Processing

By means of a special programme the data tapes can be processed in several ways. Such a programme is adapted to the construction of the data tapes, connects the possibilities of operation between digitizer and automatic drawing machine, and considers the special problem to be solved when treating geological maps.

Data Presentation

Lines and individual signs are examined for errors prior to a presentation meeting quality requirements. The corresponding plotter drive tapes are presented at a display unit, are controlled and, if necessary, are corrected.

The presentation itself is made on various drawing bases (paper, drawing sheet, or plastic engraving material). It can also be made by means of an exposure head on film material.

At present, the processing and presentation of data make it possible to carry out the following works:

- production of geological originals (boundaries/tectonical lines),
- production of colour plates from sublines of digitized boundaries and tectonical lines, and
- production of symbol screens and nets of any kind and size.

Other works are realizable in connection with those already mentioned, and include transformations, changes of scale, sorting, interpolations and representation of cuts.

5. Estimate of the Process

The automation currently possible of the subprocesses of compilation and issuing represents a basic variant of an automatic line still requiring man's activity not only in each subprocess, but also, in part, in each phase of operation. The total process can only be automated in steps. All specialized scientists taking part in map-making must co-operate in using efficiently and perfecting the technology of automation, to be able to make standardized maps rationally by means of new technologies and equipment.

The possibility of automated geological map-making is closely connected with the question of whether the conventional geological map with its wearisome production process is the most favourable form of issuing. The result of a partial-automatic map-making is a map completely identical with the conventional one.

Results so far obtained show that a practical introduction of electronic data processing to cartography is possible in principle.

The partial automation is based on the data stock derived from the compilation manuscript where geological data are already considered apart and, according to the problem and technique of presentation, are definitely interpreted graphically. They are also determined summarily for a definite field.

This quality jump from many individual geoscientific data to a complex presentation is made without considerable influence on the part of cartography. In the production process only this basis is adapted to the new process, that is to say by means of editing specifications applied to the classical process. Thus data already interpreted are only rationally converted cartographically. The results cannot fail to correspond to the conventional map because the editorial treatment of compilation manuscripts must be adapted to the new technique, but cannot be automated itself. As the development from partial automation to automation advances, an estimate will be necessary of whether the conventional geological map will still be sufficient. As long as geological maps are treated in a partial-automatic way, the fear of so-called "computer-maps" is unfounded.

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The Training of Engineers of Cartography in the G.D.R.

Contribution to Commission I - Education - of the International Cartographic Association on the occasion of the 8th International Cartographic Conference to be held in Moscow from 3rd to 10th August 1976

Nature and Scope of the training of engineers of cartography

There are in the German Democratic Republic three categories of cartographers with the respective qualification: skilled workers, engineers and certified engineers in cartography.

Engineers of cartography have been trained ever since 1954 at the Engineering College of Geodetics and Cartography in Dresden. Candidates applying for studies at this college must have successfully completed form 10 of the polytechnical secondary school and a 2-year vocational training as skilled workers in cartography. Graduates of the extended secondary school (form 12) also must have acquired the qualification of a skilled worker in cartography before applying for engineering studies. These studies take three years, and are subdivided into six terms. Terms 1 to 5 comprise 18 weeks of lectures, seminars and exercises each. On the whole the 5-term course of basic and specialized studies consists of 3240 hours. Within the specialized studies, exercises make up about 50 per cent of the training. In the sixth term the students go in for practical training which lasts 21 weeks.

The content and form of the training of engineers of cartography are an expression of the socialist education policy as it is pursued in the GDR. They are regulated centrally and uniformly by laws and regulations. The title "Engineer" is protected by law.

The content of the education and training of the engineer of cartography

The studies at the engineering college aim at training and educating young socialist personalities capable of carrying out in practice independently and reliably engineering tasks arising in the preparation and making of maps, and of giving guidance to teams of fellow-workers.

As a medium-level technical specialist, the engineer is mainly assigned to cartographic production. His tasks arise from the degree of complexity and from the extent of cartographic compilation work. Furthermore, he has to take account in his work of the production technique, the technology of map-making and the measures for standardizing and organizing cartographic work.

The students are enabled to consciously and independently acquire ideological and technical knowledge and to transfer it to socialist practice. Great importance is being attached to personality development and to the development of certain specific characteristics such as reliability and a principled standpoint.

The training of engineers of cartography covers 24 subjects. These are subdivided into 14 subjects of basic training and 10 subjects of specialized training which, however, form a unity.

Basic training. The training is based upon the knowledge and abilities acquired during 10 years of schooling at the polytechnical secondary school and during 2 years of vocational training, and it pursues the aim to impart a thorough basic social, mathematico-scientific and technical knowledge which can be readily applied in practice. This basic knowledge is the prerequisite of a theoretically well-grounded specialized training which is closely linked with practice, and of a great versatility later in professional life.

The basic training comprises the following subjects: Marxism-Leninism, physical education, Russian, English, German, cultural theory/aesthetics, labour sciences, socialist management, mathematics, physics, chemistry, electronic data processing, information/documentation/standardization, and socialist law.

The content and scope of these basic study subjects have been attuned to the theoretical and practical training of the graduates.

Thus, in the subject of Marxism-Leninism the philosophical, epistemological as well as politico-economic foundations for a qualification as engineer are provided and, thereby, the prerequisites for the training in other subjects, e.g. cultural theory/aesthetics, labour sciences and socialist management are created.

In addition to the general elements taught in mathematics and physics, such knowledge is imparted as will be necessary in electronic data processing. Based on it, the latter subject also deals with the use of computer and mapping techniques and their utilization in cartography. The students learn how to use electronic calculator and a CARTIMAT III automatic mapping equipment. Thanks to this training in the field of electronic data processing, special prerequisites are created for the specific subjects of map-making, mathematical cartography, thematical and topographic cartography. The students also learn to assess cartographic literature in foreign languages (Russian, English) and to do subject-related work in the field of information/documentation/standardization. In lectures and exercises GDR standards such as "Set of Municipal Development Plans, Maps and Plans", "Set of Mining Plans" etc. are discussed.

Specialized training. The specialized training subjects serve the job-specific cartographic training of engineers by providing them with the knowledge of cartographic methods, procedures and techniques as employed in designing, making, duplicating and updating all types of maps, atlases and globes. The students are being enabled to do all cartographic work, including its technological and economic tasks, unaided with account being taken of the fact, that the students possess the knowledge, skills and abilities of skilled workers.

The contents of the various subjects of specialized training are based upon, and complement, each other. These subjects are: Geography I (physical geography), surveying technique, photogrammetry, map designing, mapping technique, mathematical cartography and map making. To these are added the following two obligatory choice subjects which help the students to perfect their knowledge:

- a) Topographic cartography and topography,
- or
- b) Thematical cartography and geography II
(economic geography).

For the training of engineers of cartography and their practical work the following subjects are of decisive importance: Map designing, mapping technique, map making and topographic cartography or thematical cartography. In the subject map designing the students are taught the theory and practice of the graphic design of maps so as to enable them to design and lay out maps unaided after they have become engineers. The subject mapping technique deals with cartographic and printing methods, various techniques of cartographic representation (engraving, mapping, hachure), technological processes and procedures of printing (reproduction, copying, printing) as well as equipment, machinery and materials (foil, film, paper, engraving layers etc.). The subject map making acquaints the students with the various successive processes and partial processes involved in making a map from designing to printing. Also, the intermediate products and originals obtained and used in the overall process of map making (author's original, assembly original, compilation original, publication original, printing plate copies, proof) are dealt with in detail with

regard to their contents, type and function in the production process. The economic and technological aspects of cartographic production, the elements of which had been taught in the subject labour sciences and socialist management, are dealt with more profoundly in the subject of map making.

In the obligatory choice subjects attended by the students in their fifth term, a product-related training is provided which - to a great extent - is orientated on the direct needs of topographic and thematical cartography in the GDR.

These obligatory choice subjects enable the students to settle down fairly quickly in practice. At this time the students have already concluded employment contracts with the enterprises of their future assignment, i. e. they already know their future scope of activities in practice.

Practical engineering training. The practical training is part and parcel of the specialized training and is carried out in the sixth term usually at the future place of assignment. The aims of this practical training are: a) Acquaintance with the future tasks at the place of assignment, and b) preparation of the final thesis (thesis for obtaining an engineer's diploma). A total of six weeks are scheduled for the preparation of the final thesis the topic of which is presented to the students by the engineering college after consultation of experts and specialists working in the practical field of cartography. The cooperation between the engineering college and field workers which - in the interest of the students' education and training - is maintained throughout the course of studies, is particularly close during this one term.

Assignment of engineers of cartography

The engineer of cartography is able

- to participate in making maps of all kinds and scales, to carry out complicated and responsible tasks unaided, and to complete his work in good quality and in due time;
- to carry out editorial, technological and economic tasks in the preparation, execution and after-treatment of cartographic work, and
- to provide guidance to fellow-workers in the field of production.

Therefore, the engineer of cartography can work as production engineer in various fields of activity and be employed as expert of operations scheduling, compilation cartographer, reader, editor, technical editor, technical supervisor. Typical fields of the assignment of engineers in the practice of topographic and thematical cartography are:

- execution of complicated compilation work
- participation in the development of author's originals
- making of single maps in small teams, and responsibility for their completion in due time
- ensuring the organisation of production and the optimal production flow
- updating of single maps and series of maps.

As regards the assignment of an engineer in practice, it is highly significant that he is able to introduce innovations resulting for map making from the progressive penetration of cartographic processes by mathematical techniques, from the use of recently developed methods and technologies (of the printing and electronic industries), and from the growing use of photogrammetric and digital initial data. The engineer of cartography is able to exert a direct influence on the utilization of science and technology in the sphere of cartographic production. In view of the current trends of development in map making, the proportion of engineering tasks is constantly growing, since the mechanization, partial automation and automation of car-

tographic work are gaining in importance. In line with this trend, the Engineering College of Geodetics and Cartography in Dresden educates and trains its students to become engineers of cartography.

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**On the Level
of Thematic Cartography
in the German Democratic Republic**

Contribution to Commission IV - Thematic Cartography - of the International Cartographic Association on the occasion of the 8th International Cartographic Conference to be held in Moscow from 3rd to 10th August 1976

1. General Assessment

The improvement of management and planning linked with the systematic building up of the developed socialist society of the German Democratic Republic has in recent years increasingly led to the need to use, in addition to other information media, also the thematic map as information carrier. It has been confirmed that thematic maps, in a higher degree than all other information carriers, have the advantage to visually reflect the elements and appearances of the natural environment, the locations of the national economic facts in their territorial distribution and development as well as in their interrelations in a manner to be easily understood.

The imperative necessity of using thematic maps as documentation basis and as a means of information, work and research was in particular launched by the decisions of the VIIIth Congress of the Socialist Unity Party in 1971. The required tasks concerning the systematic implementation of the socialist environmental policy were set forth in a number of laws serving the fulfilment of these decisions. These tasks include the necessary measures to protect the natural environment, the improved utilization of the resources of the GDR, the improvement and further development of the material and technological basis of the socialist national economy, the long-term planning of the social development in the territory, the regional distribution of production, the management of mineral raw materials and its deposits, the infrastructure and the structure of settlement, the master plans and the long-term traffic plans and the implementation of the housing construction programme accepted for the period from 1976 to 1990.

The social demand for thematic maps has immensely been increased in the GDR since the VIIIth Congress of the Socialist Unity Party. The cartographers of the GDR make great efforts to contribute to the fulfilment of the main task for increasing the material and cultural living standard of the people. This positive development will be enhanced and systematically continued on the basis of the decisions of the IXth Congress of the Socialist Unity Party.

2. The Making of Thematic Maps

In the GDR, an extended thematic mapping is carried out for the utilization of natural resources. The set of geological maps, the set of forestry maps, maps of the water resources as well as the mapping of the soil may be mentioned as pertinent instances. These maps are mainly produced in scales up to 1:500 000. Recently, thematic maps have become of special importance for environment protection and especially for the control of the territory in view of environmental policy. At present a draft is elaborated for the standardization of map signs for mapping the environmental conditions of the GDR. According to the extension of the GDR territory, the scale of 1:500 000 is regarded as suitable for central studies of environmental factors and of the arrangement of the natural spaces. Scales from 1:10 000 to 1:200 000 are used for maps of the smaller administrative units.

The use of maps for the management and planning of the national economy is increasingly extended. A special field of thematic cartography called "planning cartography" has developed here. As a result of these works, regional planning atlases and special atlases were made which are used, above all, in the process of decision making, in the prognostic fixation and in the optimization of the planning tasks. They contain comprehensive inventories of the natural environment, of land utilization, of the structure of settlement and the distribution of the population as well as the industrial, agricultural, social and cultural facilities. Comprehensive cartographic works are carried out in the framework of town-planning and traffic planning, too.

Greater demands upon cartography are made by the industrialized production in agriculture. The size of the enterprises or cooperative facilities, respectively, increases and the role of the management and planning of regional distribution made by central bodies in a way that exceeds the frame of one enterprise only is continually growing. Hence, special agricultural maps and location mappings are developed from different aspects.

Appropriate topographic basic maps allowing a multivalent utilization are provided for the thematic mapping of the country. Research in thematic cartography aims at good results in the field of standardization of the map contents of the topographic basic maps, of the methodological and logical further development of the cartographic means of representation and design and of the technological production process.

The technology of the cartographic production process is further developed by improving the technological chains by means of mechanization and partial automation. EDP equipment is utilized in the cartographic practice of the GDR and series of cartogram maps reflecting the results of the census of 1971 are produced. Problems of updating thematic maps are of special interest at the present time.

3. Activities in the Frame of Commission IV of the International Cartographic Association

Since the IVth General Assembly of the ICA in 1972 several activities have been carried through in the German Democratic Republic on which the following short report should be given.

- The National Committee of Geography and Cartography of the GDR - National Cartography Commission - considered the results of the IVth General Assembly of the ICA and set forth relevant measures to participate in the tasks of Commission IV.

An Expert Committee of Thematic Cartography exists in the GDR, which is attached to the Chamber of Technology, Scientific-Technological Society of Geodetics, Photogrammetry and Cartography, Cartography Section. This committee consists of experts from various fields of research and the production of thematic maps. The expert committee has also dealt with tasks of the ICA Commission IV on the basis of circulars of the President of the Commission. It has especially dealt with issues of the perspectives of representing thematic facts and with the generalization in thematic cartography.

- According to circular No. 1 of the President of the Commission IV, also the standardization of map signs for thematic maps is dealt with. The works for the group of city maps, tourist maps, traffic maps and administrative maps were finished. A relevant document "Instruction, Sign Rules, and Editorial Directions" designed for the preparation of these maps of the GDR territory is presented. It is binding upon the GDR publishing houses. The internal standardization is a prerequisite for the international standardization of map signs.

- In 1972 an expert meeting concerning the theme "Development Problems and Perspectives of Representing Thematic Facts in Maps" and in 1974 a further meeting concerning the theme "Generalization in Thematic Cartography" were held in the GDR.

The Papers read on these meetings were published in the technical journal "Vermessungstechnik" (Surveying Technique).

4. Summary

As is to be seen from these statements, a comprehensive work on thematic mapping is carried through in the German Democratic Republic. The communication and cooperation with the National and Regional Atlases Commission of the International Geographic Union (IGU) is ensured by its chairman, Prof. Dr. Dr. h. c. LEHMANN, and the rapporteur. The further aims of improving the structure of thematic maps and the optimization of their information content is guaranteed by the coordination teamwork as well as by the close cooperation of research and production, taking into account a maximum rationalization of the cartographic processes.

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