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# INTEGRATED LANDSCAPE RESEARCH

*A. Hynek*

Department of Geography, Faculty of Science, J. E. Purkyně University, Brno, Kotlářská 2, Czechoslovakia

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## SUMMARY

Growing problems of social and natural interaction in scientific technical revolution are a challenge to management of mentioned interaction. Responsible management asks for social objectives, needs, information on natural and socioeconomic potential, state and prognosis of human — nature interaction. Integrated landscape research concerns not only an interdisciplinary cooperation in study of society — nature, or man — land interaction, but first of all, connection of management and information systems for landscape management in the framework of socieconomic management. The base condition is preffering social objectives and nature protection strategy.

Geography emphasizes integrity of process and space, cross time section in landscape research, evolution, generating forms of processes in management organization. It portrays landscape sphere on tops, chores and planetary levels the landscape itself is a matter of choric dimension: topochores and microchores integrity having scalar, gradient, vector, and mosaic structure. Obligatory recommended boxes and modelling methods could be added by identification, recognition pattern, information retreival and conflict situations solving.

The questions of organization and management are in the centre of interest: organization systems, goal seeking, organizational development, problems and tasks solving, situational approach, management by objectives, innovations, computers using for data processing and presentation, and information transformation to management. All the mentioned ones are determined by social relations.

Information system on landscape includes knowledge and understanding invariants, evolution, and dynamics of tops, topochores, and their anthropic use. Management system is intended for using this information in problems solving, planning, prognosis in landscape as a territorial system in relation to social demands and rational natural potential use. An integrated system, and research, too, means organization and management in landscape. An information system is subordinated to management one.

For decision — making processes at all the management levels concerning spatial organization of socioeconomic activities is needed a relevant information base including information on nature, society and their interaction in the environment. Geography provides from the vast data arrays using the cartographical presentation and computer processing purposive information system for management organization with respect not only to social needs but land protection, too.

## INTRODUCTION

If the development of geography led from the century of natural science (19th) above all to its differentiation to a number of single disciplines in keeping with deepening knowledge on nature and society, then problems of social and natural interaction in connections with great development of production forces and need of social responsibility evoke geography integration. It is connected with the feature of modern science in which not only differentiation but also integration in dialectical unity finds its place. Tendency to convergence in geography was stressed at the end of the 1960s by E. Mazúr (1968).

In Czechoslovak physical geography integration tendency began to appear in the half of the 1960s and gradually, owing to M. Lukniš, P. Plesník, Ľ. Mičian,

J. Drdoš, E. Mazúr, J. Krcho, J. Demek, M. Nosek, and others, led first of all to specification of the object of physical geography, with the projection to general geography, to landscape study. Positive influence was realized by connection of landscape study and systems theory — J. Demek (1974), applying cybernetic — systems approach — J. Krcho (1968), developing complex physical geography: M. Lukniš, P. Plesnik, Ľ. Mičian, and case studies — complex landscape research all above mentioned geographers participated in. It aimed mainly at landscape synthesis, understanding landscape as a territorial system, also including socioeconomic components at cultural landscapes.

Significant progress was made in application of landscape research by the department of ecological syntheses in landscape ÚEBE Bratislava with leader — M. Ružička. He managed five symposia and in the last — the 5th — he presented with his collaborators: L. Miklós, F. Žigrai, a series of contributions to landscape ecology, biological planning of landscape (1979). Their research is based on geoecological survey, studying landscape components (analysis), landscape integrative units (synthesis) and evaluation according to social activities with the aim of reaching optimal land use. The problems already solved give the evidence of the effeciency of such an approach for practice.

We can follow a tendency to cooperation of social, natural, and other disciplines in landscape research and land use problems solving. An examples of joining ecology and technical approaches is an ecoengineering orientation proposed by V. Vaníček (1977) having even social, cultural and economic base.

Theory, methodology, and practice of integrated landscape research was in the centre of interest of J. Drdoš (1972a, b) in relation with similar trend abroad, e.g. in Soviet, German, French geography and others. Even in British geography recently sounds landscape topic leaving old physiography behind (V. Gardiner and K. J. Gregory, 1977). J. Drdoš (1972a) means under integrated landscape research a complex research of mutual relations between the landscape components and their spatial structures on tops and chores levels. He approaches landscape from the position of physical geography, it means he surveys it as a natural complex — integrated set of natural elements anthropically influenced holding landscape as a general term of united geography.

Applying the analytic approach concerning the relations between landscape complex components, and synthetic one, he reaches definition of landscape units with homogenous and heterogeneous structures on tops level (J. Drdoš, 1972b). The results achieved by J. Drdoš in integrated landscape research, both his own ones and those gained by team-work, e.g. in the Liptov area, the High Tatras, Bratislava area (the quantitative analysis was being solved by M. Kozová, 1976, physicogeographical regionalization by J. Oťahel, 1978) have shown his approach to be rightful and efficient. The advanced outline of biological landscape planning based on integrated landscape research tending to management was provided by L. Miklós (1978).

Geography Department, Faculty of Science, J. E. Purkyně University in Brno, has been engaged in landscape research since 1973 when the survey of the Znojmo area was started under guidance of Professor M. Nosek. Since 1975 in has been keeping on the Rosice—Oslavany area. Taking part in this activity and following progress made in landscape research I would like to offer a version of integrated landscape one. My thanks go to J. Drdoš, P. Trnka, M. Minxová, Ľ. Mičian, J. Hanák, A. J. Fedina, B. A. Kennedy, M. Konečný, K. Rais, V. Račanský; all the mistakes being mine, though.

## SOCIAL CONTEXT OF INTEGRATED LANDSCAPE RESEARCH

In "The Directions for Economic and Social Development of ČSSR in 1976—1980" is formulated the basic objective pursued by the Communist Party of Czechoslovakia: to ensure in keeping with deepening the socialist way of life, satisfying the growing material and cultural needs of inhabitants and further establishment of their life and social security based on permament development and high effecciency of social production and all the work quality. A proper emphasis is laid on growing effectivity of national economy management hardly possible without application scientific and technology development results.

Growing complexity of production causes not only outstanding changes in society but also in man — land interaction. Then next media means is added after means of production and energy supplies — information systems. There is a necessity of qualified control, management of social and natural processes including their interaction. The current scientific technical revolution is noted also for mechanized information processes and introducing management systems in all the spheres of social life.

The basic initial point for understanding and control of social and interaction is K. Marx's conception of labour process as a relation between society and nature, coherence between labour and control, production and cognition, transforming nature and society. The relevant condition in social development is shared by many sided control and management of nature's changes caused by strengthened anthropic pressure. A decisive role is played by social relations, growing importance of human factor in reaching optimum unity of society and nature. Only the society removing labour exploitation and enthroning a new type of social relations — socialist and communist — can obviate natural resources use. It is contradiction to capitalism where private profit is derived not only from labour but nature exploitation, though through labour, too.

Therefore in socialist society a scientific method of controlled social processes — a socioeconomic management — is being developed. Its important part is also social planning in area management. To be effective it needs, among others, functioning information resources. One of alternatives, according to M. Illner (1973), ensuring their institutionalization and standardization may be building up territorial information system. Its sense, meaning, is in data acuqisition, processing and storage for social planning. It is needs determinating man's activity goals on changing environment. V. I. Lenin underlined the fact that man controls, rules the nature creating various labour means but at the same time is in nature's subordination particulating objectives of this activity. Deeper impacts on nature do not mean growing remotoness of man though this relation is more and more intermediated but in a specific way ever more depends on it, above all in being to overcome, the point of starting nature's degradation. And mankind has need to know the nature and the place in substance — energy flows for optimal linking up. With regard to natural processes integrity the cognition them must be complex, integrated from the standpoint of both social objectives and retaining natural structures, invariants.

Greater importance is given to problems of organization systems management, always more complex both inside and outside in relation to environment. And landscape is an important part of human environment, in cultural landscape with intersection of natural and social processes united into interactive and integrative system. Landscape is a synergetic and synchronic integrity of space and process

with distinctive topochoric pattern units and socio spatial organized process man — land interaction, social and cultural processes interaction and integrity in their development, history, and dynamics.

After bearing understading landscape as a system, the interest of science and praxis, too, is moving to heuristic concepts of management and organization. Organizational system, after E. E. Dudnikov, S. V. Chainiš and D. T. Jamkov (1979) is noted for a goal seeking, social activity processes managed by the objectives, their improvement. Organization is a rational implement for reaching the aims, system of communication, decisioning. A stimulating role is played by social demands accelerating information processes, social contacts.

According J. G. Miller in B. Z. Milněr, J. A. Čižov (1978, 107) and other authors, organization differs from other living systems by existence of relatively self-contained objectives and behaviour at organization subsystems, multiscale structure of decision mechanism — a subsystem having key role in organization. It has five main elements: structure, process, subsystems, relationshios and subprocesses. The task of information processes is relevant for conflict solving. The central theme of management is interaction and integration.

## INTEGRATED LANDSCAPE RESEARCH: 'A RELEVANCE

Landscape research is inteded for its evaluating, for realization of various social needs. The aimed program follows the purpose of components, processes, structures, etc. from the view of their possible man's use. The value of landscape consists in its potential: material and energetic processes existing independently on man. Neverthelless, they can be used only under certain social relations, by a socially determined activity of man. Values and evaluation are reflection of social being, they share in forming the active relation of a man to nature being presumption and one of the means its control. Cognition, evaluation, and praxis are in narrow connection. The value is a human relation to the object and consists in its relevance for a man. It originates in objective material social activity. Therefore even landscape evaluation has a natural and social context.

In landscape use management we find out the meaning of natural processes, first of all biotic ones, finding the optimum of social production, natural invariants and landscape perception not only for the present but also for the future — a prognosis. P. Hagget (1973) mentioned the use of forecasting models in geography. Evaluation asks for criteria in accordance with above mentioned concent of optimalization, demanded aims, clear theoretical base, data set requirements, acquisition, storing, processing, interpretation, and information output for the needs of management, decisioning.

We distinguish, after D. G. Robinson, J. F. Wager, I. C. Laurie, A. L. Traill, (eds. 1976) landscape quality as a measure of degree of excellence of the landscape in aesthetic, ecological, locational or other terms and values refers to the worth of the landscape in terms of human need or utility. Quality expresses reality substance, the value — its relevance. K. Marx (in K. Marx, B. Engels, 1966, 405) affirms that the general term value' is a consequence of people's relation to things appearing in external world satisfying the social needs.

The study of cultural landscape is in geography supported by cooperation of physical and socioeconomic geography. In any case relation to a man must not be omitted. Unity of abiotic and biotic components in landscape causes the necessity of its integrated study. Man — land interaction in landscape is the next stage of

integrity the research has to reflect. And at last, landscape processes control, social objectives coherence and potential, prospect, planning, synthesis, space and process integrity are relevant reason for integrated landscape research.

Soviet geographers (in Geoforum 1976, 347) underline the geography meaning having the leading role in research of Earth natural recources use, their protection, optimalization and purposive environment transformation. They emphasize integrated, complex approach to natural and social phenomena asking for problems solving, environmental monitoring, geographical forecasting, new resources exploration, their recycling use, natural hazards study, improving an effectivity of regional planning, natural — technical systems survey.

Similarly J. A. Dawson and J. C. Doornkamp, (eds. 1973) in their choice of essays which concern man and his environment aim to applicate in geography man's environment evaluation including rural landscape and urban land evaluation, land use planning, manpower planning, marketing, politics, pollution, health, recreation, and conservation. According to R. Whyte (1976, 11) geography have progressed from the study of individual phenomena of nature (climate, landforms, waters, soils, plant cover and animal world) to a synoptic consideration of natural phenomena and to a functional investigation of the predominant interrelations between the individual elements in nature. It accords with geolecogy drawn earlier by C. Troll, the Australian approach to landscape research, e.g. C. S. Christian, G. A. Stewart, (in B. Whyte, 1976).

The more advanced landscape research starting with V. V. Dokučajev and represented by a number of 'landscape schools' in the U. S. S. R. (Sočava, Isačenko, Milkov, Solncev, Gvozděckij, Preobraženskij etc.) after D. L. Armand (1975, 4) geography is developing problems solving: anthropogenetic landscape study, e.g. urban area organization, natural resources evaluation, environmental protection preventing the pollution, human ecology, recreational pattern etc. Good deal has been done for landscape study application in social objectives including man — land interaction.

In our geography E. Mazúr (1978, 214) considers its contribution to scientific landscape organization, its rational potential use and preserving deliberated human environment applying the regionalization and synthesis trends. And he is even more precise: landscape synthesis, regional delimitation, systematics, special thematic problems, applied topics as geographical data bank, landscape potential and its use, location, forecasting, cartographical presentation of geographical reality.

## INTEGRATED LANDSCAPE RESEARCH: MANAGEMENT AND INFORMATION SYSTEMS INTEGRATION

Even when investigating landscape the cognition process proceeds from object identification over system delimination on the object following portraying certain its attributes towards structure, organization. There are two sources of tasks:

— cognitive processes as a synthesis of models of external world, environment

— management processes associated with purposive behaviour, transformation of the environment including decision-making processes, choice and influence on controlled object.

Following L. A. Rastrigin and V. A. Markov (1976, 219) we explicate the task as a situation actively influenced by a subject for changing it, reaching certain goals, raising comfort by means of changing given situation.

We are interested first of all in systems with control, frequent dependent variables.

V. S. Tjuchtin (1974, 192) deliminates a management system as an object with these items: scheme, information, coordinates and function. A scheme is the inner structure of a system, skeleton. Information is the structure of inner system elements interaction in a certain cross section in temporal sense. Structural changes are stored in memory blocks. Coordinates reflect elements pattern of system states depending on outer operations, inner construction and state. The principle of system consists in forming such an acting upon object reflecting a certain structure, program, subordinating attributes, variables of controlled system to some aim and criterion.

The information approach to controlled systems means inquiry into principles, schemes, methods of generating, transmission, storage and transformation of signals and messages abstracted from substance, technological aspect, structural analysis of reflection processes making possible exact depiction of the skeleton and activity of controlled systems.

Increasing interest in information problems is connected with tendency to synthesis in scientific technological revolution. It is evoked by needs of practice and immanent science logic consistent with complicated man's constructed systems having realized information flows using computers. Information process includes generating and transmission of information, but itself is not a management system. B. V. Birjukov (1974, 23) gives differences between material processes as material objects, and information processes. The former ones constitute transmission and transformed substance, matter and energy in space temporal course. They are information sources, carriers and consumers. The latter ones include: information source, generating signals carrying certain message, message coding for a given linked channel transmission, its transmission through linked channel, noise often occurs, message decoding, various operations of its processing message transmission to user.

When creating information system for management one we proceed from the whole situation analysis, formulating and solving problems to searching algorithms for solving a certain mathematical model folowed up with drawing a development diagram, block, scheme, and a proper programming for processing data in computer. Information, itself, is regarded as a basis for decision-making processes, and operations are being sought for controlling the system. The matter is giving fitting information to a decider for accomplishing choiced goals, alternatives statement of the problems solving ways, understanding wider context of system and its environment, risks judging, cost-benefit ratio, aims, acceptance the whole problem as a system.

Using systems analysis methods we can create the information systems in phases: unifying relevant data, their structuring, arrangement by certain system model, intrrelationships, linkage of information, management and decisions, analysis of genesis, development, dynamics, behaviour of system, its forecast development. structure, states, as possible numeric description of object states, optimum processing, transmission, storage und using data.

It is necessary to keep certain procedures recommended by computer constructors for analysis of information systems: preliminary paper identifying activities and analysis of possible solutions for realizations, system analysis of problem, goals specification, purpose, functions and activity processes, data set evidence, problem specification, system design, project, proposal with evaluating alternatives, modularities, processing and distribution data in computer, testing the data organization. More details e.g. in J. Habr and J. Vepřek (1973).

In integrated information system is an information one built subordinately to management system, controlled system and environment. Data input into information

system contains attributes: identification, name, formal description — length and sort of signs, matter description — content definition, topic recognition, spatial and time specification, source, use — purpose, when and where, importance, output form from a computer. The importance of information systems consists in their output intended for the system of management guaranteering certain aims, behaviour, responses of processes. Data and information are in system coordination. Their above mentioned analysis turns into synthesis — system proposal for reaching the objectives and functions in limits of certain criteria. The proper task of synthesis, by K. Ctibor (1978, 117) is algorithmization of information processes, data base structuring and information technology. Algorithmization includes description of relations among the data and in technic sense is interpreted as programmes structure. Data base structure requires integrity, spot, selectivity, flexibility, cost and time minimalization, reliability.

Excessively sophisticated, abstract, or trivial systems concepts not solving human problems are in 'postsystems' period substituted by other approaches. More real situational approach stresses situations models and problems solving, linkage of controlled and uncontrolled variables. In the same way organizational projects and management systems better close to specific situations including even links with environment are accepted. There are more frequent terms, constructs as goal seeking, task, situation, function, interaction, interface, integrity, organizational task with objectives, management and technical means technology, man in organization, organizational structure — differentiation and integration, communicational system, activities. Generally, role of heuristics is emphasized, links among operations and strategies towards synthetic information — intelligence.

Organization is also understood as an adaptive dynamic system (W. Bennis, 1966, in Milněr, Čižov, 1978, 75). Interlinks between organization and management serve as a challenge to developing comparative approaches, case studies, and their results comparison, study the same case by different methods. Another management method is management by objectives including in the fore goals, aims, objectives, tasks, purposes, demanded results, intentions. Required information is sought for them and effective management, too, not excluding interactions with environment. For top coordination of operational tasks in solving strategic demands is used organizational form known as project management. Very high social, economic, technical, etc. processes dynamics led or caused the birth of organizational development conception which is to ensure permanent innovation process through human potential use accepting above mentioned approaches, organization and management. We may follow shift in the 1970s from the terms 'system', 'structure' to 'organization' and 'management' the former ones being included in the latter ones.

Remarkable attention is given in conceptual management to science technology innovations. Their interpretation is in fact wider spectrum where B. Z. Milněr and A. J. Čižov (1978, 292) put: creative process, original solution, little narrower matter than invention as specialists activity, working up a new idea for problem solving realized with economic or social new result, a change passing in reality, introducing something new, a specific case processual change in organization, successful introducing new means or results in practical situation, qualitatively new result, idea, activity, arts creation perceived as new by those who introduce it.

Marx-Leninist evaluation of management theories and practice in capitalist society is based on double character of management there. One side is its function objectively necessary in any social production process. The other side is a superimposed

oversight conditioned by exploitative social labour process misapproapriating means of production, and labour itself. V. I. Lenin underlined in Taylor's system scientific knowledge in concrete production organization problems solution, and those aspects caused by strengthening capitalist exploitatation of workers (in B. Z. Milněr, J. A. Čižov, 1978). A decisive role even in management is played by social relations.

Information system means a sequence: information — decision-action, dealing. Firstly it anticipates objectives, information system tasks limited in content by analysis of decisioning, management and subordinated to obejctives. It goes on filtering unessential information though passing the information modifying decision. One of the persumptions data use is a common information basis the structure of which is responsive information network structure. It reflects the anatomy of managed object, all activities and processes. And at last, information needs are changing and there is a reason for changing in choice of approach systems integration. Not only system changes are the matter but even user's activity — methods, procedures, operations regime.

Projecting information system must fulfil two conditions:

— objectives integration, information needs research, delimitations of key segments, valves, sections, decisions in all the functional subsystems from the standpoint of common organization aims (links matrix)

— information base integration, centralized, coordinated though compromised, unified, complete.

Using computer asks for common programming language, standardization, programmes documentation, systems flexibility. Model image of information system, though changing, goes through from the concepts to implementation.

J. T. Coppock (1972, 1974) asking geographers to contribute towards the solution of environmnetal problems, research in resource management, quotes J. W. Birch's five conditions for ecologically responsible, economically and socially responsive management of natural resources:

— an understanding of the structure and functioning of resource-using systems

— an ability to specify and evaluate alternative resource adjustments

— an appreciation of the gap between scientific appraisal of these adjustments and decision-maker's perception of them

— an understanding of the objective of resource management, as seen by users

— the ability to develop computable models so that solutions could be tested in advance and subsequently monitored.

Such a trend in geography correlates with above mentioned trends in organization and management. From understanding organization as a structure we pass to understanding organization as a process in context with management, decision-making processes. They include series of linked steps: objectives recognition precedents, potentiality, social attitudes, etc., social needs estimation for future, alternative solutions formulation, strategy choice, its implementation, monitoring (by M. M. Krejsberg, 1974, 190).

## INTEGRATED LANDSCAPE RESEARCH: AN ANALYSIS

### Landscape sphere

Agreeing with F. N. Milkov (1970) we distinguish in accordance with interaction of three basic contrast spheres: litosphere, atmosphere and hydrosphere five variants

of landscape sphere: terrestrial (dry land), hydroterrestrial (shallow water), aquatic (pelagic photic ocean layer), subaquatic (sea bottom), glacial (polar icecaps, glaciers).

Landscape sphere as a whole and its five variants belong to highest hierarchy level — planetary, global. The lower level is occupied by landscapes as choric units. The lowest level of landscape sphere, its elementary units — taxons called tops, are on tops level. Designation of chores and tops accords with the meaning of the original Greek words for area context (chores) and place context (tops). Investigating the tops we prefer interlinks among components as soil, water, air, rocks, etc. — synergetic process. In the case of chores tops are not being omitted but the centre of interest is cognitioning horizontal links among tops — synchoric process. Landscape research is organized synoptically: in cross time section synergetic and synchoric analysis is provided. But landscape identification includes responses of former processes kept in soil, landforms, etc. Landscape evolution, history of human interventions, hazards, situations, dynamics are taken account of.

Sometimes, e.g. L'. Mičian (1975) regional level is added, inside choric one. But the term region is in geography used in nontaxonomic sense, as a general one. Regionalization is possible in wider scale, on every level of landscape sphere.

Terrestrial variant of landscape sphere is the best known, explored and used by man, preferred as human environment. Mostly only this variant is considered landscape though occupying only 26,1 % Earth surface.

Four stages can be distinguished in landscape sphere evolution with revolutionary transitions: abiotic, biotic, anthropic and noospheric. Quite different atmosphere was starting stage, then litosphere and liquid sphere changing in biotic stage into oxygen atmosphere, hydrosphere, different earth crust, and soils appreaed. Anthropic phase is relatively short but with accelerating man's impact upon natural landscape, mass natural resources use with perturbations, degradations of nature. Therefore nous level is expected in hope of creating real cultural landscape, not only by name. The idea of harmony society and nature without damages in both the sides was developed by Le Roy and V. I. Vernadskij.

Landscape is a significant part of human environment with intersection of abiotic, biotic and social processes. Many human generations stored labour in it. Not only substancies and energy are important for man but also scenic heritage (J. T. Turner, 1980) environmental perception of landscape (A. Hynek, J. Hynková, 1979).

## Space and process integrity

Without denying lots of authors contributions to landscape research, it is worth consideration to return to the beginings of integrated landscape research inchoate idea formulated by V. V. Dokučajev in 1900 (in A. G. Isačenko, 1971, 245) surveying soil as an autonomous natural body (a founder of modern pedology) in relation to factors acting upon it. He recommended to study their interlinks, complex relationships together with soil. He called attention to the fact that excessive natural sciences differentiation is leaving out of account the genetic, everlasting and always lawful linkage existing among forces, bodies and phenomena, between living and lifeless nature. Just studying these mutual, lawful links in nature was for him the essence of science, its highest spell. K. Marx qualified natural science relevance as spiritual potency of production (by Philosophical Vocabulary, ed. M. M. Rozental, 1974, 428).

It is the above mentioned Marx's statement giving the meaning to natural science and offering geography the notion as discipline inquiring spaces of natural and social

processes creating them, and their interaction based on active role of society in production process with all its attributes. If we regard this process as a system, then O. Dollfus and F. D. Dastes (1975, 83) comprehended geographical structure as a space organized by system.

Invariants, mechanisms, changes sequence, connectivity with form, genesis and responses appear in process. V. B. Sočava (1978) finds a key conception for geography, but not only one, in human ecology. He regards natural complexes as functioning integral mechanisms — systems, interactive natural regimes and their anthropic modifications.

A. A. Grigorjev (1948) calls integration of single natural regimes as physicogeographical process. Natural complexes as landscapes or landscape segments have spatial display being object attribute. Space, after B. T. Asheim (1979) is an object attribute totally integrating space and object. There are parallel synchronic natural processes (spaces), social processes (spaces) and their intersect processes (spaces).

## Spatial units

If taking into account the requirement of nontriviality, empirical and theoretical levels connectivity, and reaching practical results, problems solving, then a relevant output of geographically orientated landscape research is an information on space and process integrity in landscape. It serves as one of the kinds of information for decision-making processes in controlling the interaction of man and land.

Both the space and process attributes, variables, are linked on territorial carrier of information as space temporal units. They reflect not only spatial differentiation but spatial integration, too. They are generated in intersection of natural and social processes, interlinking the components and complex units as tops and chores as complex hierarchy of flow patterns keeping them in dynamics — invariant state. Vertical flows and horizontal ones are in landscape set up like vectors.

Therefore also in landscape research we try to connect study of vertical structures and their changes. The fact that it is a subject's activity does not follow not objective but subjective existence of landscape units. A. J. Fedina (1973) said correctly that objective existence of physicogeographical complexes is the reason for their objective identification.

Fundamental importance for cognition of landscape spatial organization has delimitation of elementary unit with relatively homogeneous structure not excluding secondary landscape structure (the term of M. Ružička, 1965) or land units of cultural landscape (F. Žigrai, 1972). Above mentioned synoptic synergico-synchoric approach respecting the lowest components classification taxons (soils, rocks, etc.) including human intervention in nature. Nevertheless only those social processes having direct impact on nature are accepted, and perception of landscape, too. Apart from various names in the U.S.S.R, German Democratic republic etc., and other landscape schools its identification has not only theoretical but also practical importance. They are used, perceived, protected, damaged, but ignorated, too, by man. In spite of prevailing landscape continuity they are in many cases very distinct maintaining relative autonomy. We can identify them even upon human impact in cultural forests, fields, urban areas with different levels of anthropic modifications. For example large fields sown with cultivated plants show differences in photosynthesis caused by different processes according to tops mosaics in their extent. A question remains: is in any case land resources use management effective ecologically and economically?

Now we can offer taxonomy of spatial units of landscape based on natural complexes starting with point as an instrumental one or observable unit signicant for evidence of variables vector. After tops discussed above the topochores follow as transitive units between tops and chores levels. They are elementary heterogeneous units. It is different from the taxonomy of V. B. Sočava who is putting them much higher. They correspond to nanochores of G.D.R. landscapelogists. Next ones are microchores divided into two sublevels: mono- and poly- depending on their degree of complexity, diversity. And examples of next chores:

— monomezochore (the Dyjsko-svratecký graben)
— polymezochore (moravian lowlands)
— monomacrochore (the Czech highland)
— polymacrochore (central european highlands)
— megachore (the Carpathians).

Tops investigation prefers synergetic links among landscape components while topochores one though based on tops recognition prefers elementary level of synchoric context. Reflecting synchoric context realized by flows of matter and energy, mostly one-way direction caused by moving water, air, rocks, we can distinguish four kinds of topochores:

— scalars, with the minimal horizontal tops variability
— gradients, with gradual surface changes on slopes as catenas
— vectors, as linear oriented tops on slopes, frequently with branches, chains of linear tops
— mosaics, with responses of former processes, varied sets of tops.

We must not forget that all the types of topochores are elements of microchores. They are not only spatially individual units but structurally repeatable — modal.

Human spatial organization though in some cases similar by form of natural processes is generally different having nodes, peripheries, concentricity of spatial behaviour. Nevertheless topochores serve as operational units in land use.

## Landscape research in geography

The term 'land' and 'landscape' one may be used as synonymous themselves and with the environment. R. O. Whyte (1976, 1—2) identifies, from the point of view of land use following concepts:

land as space, three-dimensional, unchangeable and fixed quantity; land as nature, defined in terms of natural or man-made ecosystems influenced by natural processes; land as a gene resource; land as a production factor, together with labour and capital; land as a consumer good or commodity as a support for highways, buildings, etc.; land as a source of pleasure and recreation; land as location, in modern economy and politics; land as property, exerting so powerful an influence upon man's attitudes and actions; and finally, the related legal and economic connotations of land as capital.

It is necessary to stress in given concepts the role of social relations, they are not a hidden dimension.

Geography is interested in locational problems, space structures and processes generating them. Spatial organization amounts network links — stucture, on the one hand, and movement in this network — the process, on the other. Interaction between process and structure is the basis of any locational problem. Spatial process represents a mechanism producing spatial structure determined by inner relative location. Man's decision is influenced by relative space understood as dimensional

distance, it is in relation to dimensions, dependence on process, motion in invariant network.

Landscape is an integrity of processes and space having temporal attributes. D. Harvey (1969) argued for examining interactions between temporal process and spatial form. B. J. L. Berry (1973, 8—9) goes a step further asking for geography dealing with the antecedents and consequences of environmental and locational decision-making in which man is the prime actor. The central importance is given to purposive behaviour in spatial process realized by man, who is continuous decision-maker. The totality of decision-making process is offerred by R. Prentice (1975):

— the delimitation of goals and their specification as objectives

— the recognition of a problem, the recognition that objectives are bot being attained

— the search for possible strategies to solve this problem

— the prediction of the consequences of these strategies in relation to the predicted strategies of the environment (the set of opponents)

— the evaluation of the strategies discovered in the context of the extent to which the anticipated consequences obtain the objectives

— the selection of a strategy on the basis of the evaluation

— the implementation of the strategy, and the monitoring of the consequences of the intervention.

Inquiry into landscape structure and processes is based on synergetic and synchoric links among components and spatial units. Accepting the MAB (1972) methodology of modelling approaches we collect data as variables and properties — state, driving and output ones. They concern components: landforms, soils, etc. We relate them with spatial units preferring elementary ones. Progress in this study was done by V. B. Sočava, V. A. Snytko, V. A. Krauklis, A. D. Armand, K. N. Djakonov, A. J. Retějum, J. G. Simonov and others.

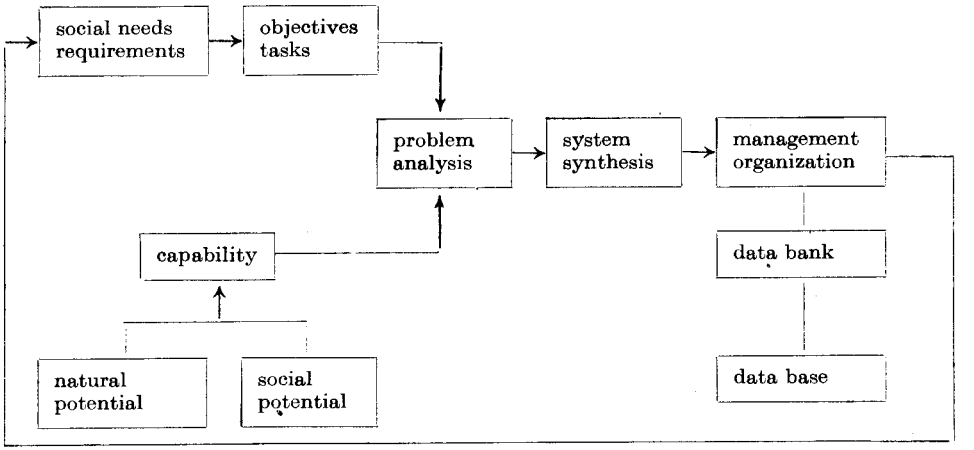
Landscape research methods mentioned in Czech geography by J. Demek (1974): systems theory, boxes, have to be followed by next ones. We have in mind identification, serving for catching object mechanism, its cause effect structure, model synthesis relevant for management, controlled processes. The second is recognition pattern consists in finding function, decisive rule recognizing a pattern using invariant properties for given situation. There are two alternatives: be to in the set of environment state situation or to be in some system. It is suitable for photointerpretation (air, satellite) and mapping in terrain landscape survey. Retreival information is the communication of constraint in variety, the most adequate description for choice of optimal variety of management. In the last case cross-time sections are expected in the year seasons, changing land use, natural hazards situations etc., shortly: quasimonitoring.

For solving problems in man — land interactions is a contribution of conflict theory, theory of games, decisioning, dealing with situations of participants having contradictory interests. A practical solution was done by P. Gould (1963).

Vast massives of data gained in landscape research can be stored and processed using the computers. As an output in the form of computer maps provides not only the state of land but data from the survey are produced by computer in the form of interpretative maps. J. S. Bibby (1980) offered a solution of soil research and land use capability on interpretative maps. The similar experiments were realized in our Geography Department since 1978.

In our research based on study tops and topochores we have chosen instead of obligatory squares hexagons whose configurations more closed reflect choric structures and processes, in spite of other problems using them. The area of elementary hexagon: 1 cm² accords with elementary areas usually chosen. Standard grid cells were tested on various scales from 1 : 5,000 (landscape perception in urban landscape of Boskovice town), 1 : 10,000 — natural complexes of landscape in the Dyje river gap of Znojmo area, 1 : 25,000 — topochores of the Dyje river part of Znojmo area and natural complexes with their land use in the Brno city transitional ring.

In conclusion we offer a model of integrated landscape research:

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