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INFORMATION SYSTEMS FOR REGIONAL DEVELOPMENT

(Introduction to a Study)

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## I. Introduction

1.1. It is widely recognized that the lack of systematic, reliable data is one of the main difficulties in the elaboration of development plans in under-developed areas, and, because of the need for more detailed information, and less possibilities for obtaining aggregate estimates through sample surveys, the problem is even greater for regional than for national planning. There are also difficulties in the efficient exchange of information, due to ineffective systems and facilities for communication in the implementation of plans and control. The need for research in this field is reflected in the inclusion of a study on information systems for regional development in Programme IV of the United Nations Research Institute for Social Development. <sup>1/</sup>

1.2. In a recent paper by Dr. Kuklinski, he suggested the following three possible approaches to a study on information systems for regional development: <sup>2/</sup>

- a) The need for statistical data and other types of information in connexion with the preparation and implementation of regional development policies and plans;
- b) The system of interregional and regional policy-making and planning to be regarded as a system of transmission and exchange of information;
- c) The role of information exchange and human communication in development, studied at the regional level.

1.3. These three approaches are interdependent in a way that a) is the most general and includes b), which, in turn, is more general than, and includes a). Therefore, both a) and b) can be regarded as aspects and

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<sup>1/</sup> United Nations Research Institute for Social Development, Programme of Research on Regional Development, Geneva, October 1967.

<sup>2/</sup> A.R. Kuklinski: Framework for Research on Comprehensive Regional Development, Geneva, November 1967.

sub-aspects of c). Which of the approaches to take for a study of this kind would depend mainly on

- the stage of economic and social development
- the economic and social system, i.e. whether the economy is based on central planning or relies on market mechanism
- the actual regional development problems
- the main approaches to regional policy and planning. <sup>3/</sup>

1.4. Even if planning is not a necessary condition for development, the majority of the less advanced countries regard planning as a deliberate co-ordinated intervention in the process of economic and social development as a prime means in their efforts to speed up the development process. It would therefore seem appropriate for a study on information systems for regional development to take as a point of departure the need for, and the role of, information and information systems in regional planning, as seen from the point of view of the planning bodies.

1.5. The purpose of this paper is to provide a background for discussion on how such a study should be outlined. It begins with a preliminary discussion of terms and concepts in order to obtain a suitable basic framework (sections 2-3), and goes on to analyze some of the main problems of information and information systems in relation to the preparation and implementation of regional plans (sections 4-5). In the last section, some of the practical questions in connexion with the study are discussed.

## 2. Terms and Concepts

2.1. The field of information, communication and information systems are strongly interdisciplinary in character and, therefore, raise difficult

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<sup>3/</sup> A survey of such approaches is given in A.R. Kuklinski op.cit.

problems of terminology and conceptualization. Without going into the semantics and the philosophical problems in defining a concept such as information, the following paragraphs explain the meaning attached to the various terms and concepts used. These are limited with a view to what seems useful in the present context and, therefore, do not claim any general validity.

2.2. Planning is an activity that applies to most types of socio-economic operators and, for that reason, it is useful to adopt a concept of planning with a relatively wide applicability. The term planning will therefore be used to mean coordination of present and future decisions and actions in order to achieve predetermined goals. <sup>4/</sup> The purpose of planning is to provide a rational basis for present decisions regarding alternative feasible actions. Planning is, by its very nature, inextricably connected to decision-making. On the other hand, planning is not necessary for all kinds of decisions. <sup>5/</sup>

2.3. Regarding the concept of information, the basic point of departure is that information is something that is necessary in decision-making. Decision-making is then regarded as a process which transforms input-information in order to make definite choices, and transmits output-information related to these choices to some other agents which implement the decisions by actions. The fact that information is always information about something, i.e. that it refers to something external to itself, might seem obvious, but should nevertheless not be overlooked. The reference provides a useful possibility for classification and analysis of information. <sup>6/</sup>

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4/ Cf. I. Sverrnildson: Planning in a Market Economy, Weltwirtschaftliches Archiv, 1965. See also, J. Tinbergen: Central Planning, Chapter 2, New Haven, 1964.

5/ Cf. J. Tinbergen, op.cit.

6/ F. Mæklup: The Production and Distribution of Knowledge in the United States, Princeton, 1962, (see particularly Chapter 1).

2.4. A distinction should be made between at least two broad categories of information with respect to reference. First, there is the general body of knowledge, insight and know-how (methods, techniques, etc.), which form the basic foundation of reality-orientation, problem analysis and decision-making. This category is characterized by its general reference, i.e. it does not refer to any actual cases and circumstances, but to some abstract and general principles. It is expedient to refer to this category as knowledge and/or know-how. The other category of information is distinguished from the first by its reference to actual and, as a rule, concrete and observable facts about actual conditions and circumstances. This category can be called data. In the same way as general knowledge and know-how form the basic foundation for decision-making, such data are also necessary input in the decision-process in order to arrive at a definite decision. The distinction between knowledge/know-how and data has no absolute validity - it is closely related to the point of view from which the observation is made. For example, a certain production technique would be called know-how seen from the point of view of a farmer, while the fact that this technique is applied would be data, seen from the point of view of a planner.

2.5. For both categories of information, it is necessary to distinguish between stocks and flows. To the stock of knowledge and know-how possessed by a particular decision unit, there are corresponding flows of information referring to new and additional knowledge, new methods, etc. Even if there also occur some outflows, the inflows are the more significant. Knowledge and know-how can be increased either by invention, of which research is a example, or by reception of information transmitted, as in training, education, etc. Diffusion of innovations is closely connected to the patterns of human communication and is a typical case of an increase in the stock of know-how. <sup>7/</sup>

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<sup>7/</sup> Cf. T. Hägerstrand: Aspects of the Spatial Structures of Social Communication and the Diffusion of Information, Regional Science Association, Papers XVI, 1965.

Concerning the second type of information - data - a similar distinction is useful and necessary. Facts about the reality can be stored and form stocks, but since actual circumstances, particularly regarding society, often change, the flows of data are the most important, at least in decision-making. On the other hand, sufficient stocks of data are often a pre-condition for empirical research, which, as pointed out above, is one of the most important ways to increase the stock of knowledge. Therefore, it is equally important to store data in a convenient way as it is to provide adequate flows of data.

2.6. The exchange of information of both categories is closely related to the pattern of human communication. Societies might be regarded as a complex system of decision-units in functional interaction with each other. Interaction always appears as forms of human communication. Communication in the sense of information exchange takes place through various communication channels. Communication channels might be described by their technical and organizational features. Communication is a necessary but not a sufficient condition for practical interaction by different basic decision-units or operators in the socio-economic system. This means that economic, social and cultural interaction can be studied as functions of, among other things, communication. A description of interaction within a socio-economic system, with particular reference to mutual interdependent decision processes and the exchange of information through communication channels, can be called a communication description. The term communication system then refers to the interaction system as such, described with a particular view to the patterns of communication. <sup>8/</sup>

2.7. The term information system should not be confused with the wider concept of a communication system, as outlined above. The term information system should simply be used to mean an organization designed and operated

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<sup>8/</sup> Cf. C. Cherry: On Human Communication, Cambridge, Mass. 1957.

for the purpose of collecting, processing and transmitting information. Information systems in this sense can be established by various functional units both in the private and public sector. Examples are statistical offices, intelligence services, etc. The characteristic feature of an information system is that it is operated in close connexion with decision units, but is not involved in the decision process.

### 3. Regional Development Planning

3.1. The term regional development is used here to mean the factual process of economic growth and related interdependent structural change in the economic, social and cultural sub-systems that occur in an area within a country during a period of time and which lift the regional society to a higher stage of development. <sup>9/</sup> By adopting a concept of development that refers to the factual process, and in itself does not include planning, the function of planning is more evident.

3.2. Regional development planning means deliberate collective intervention in the development process within an area, aiming at speeding up and guiding the process in desirable directions according to predetermined goals. Due to the fact that development consists of interrelated changes in the various sub-systems of a regional society, regional development planning must be comprehensive and of a long-term nature. <sup>10/</sup> However, comprehensive does not mean that the plan aims at influencing everything, but that particular attention is given to the interrelations between the different sub-systems and to the problems of functional and spatial integration. <sup>11/</sup>

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<sup>9/</sup> Cf. J.G.M. Hilhorst: Regional Development Theory, An Attempt to Synthesise, The Hague, 1967.

<sup>10/</sup> Cf. F.B. Gillie: Basic Thinking in Regional Planning, The Hague, 1967.

<sup>11/</sup> Cf. A.R. Kuklinski, op.cit.



Regional planning should not be associated only with planning within specific delineated regions, but also with the overall spatial transformation of the national socio-economic system. <sup>12/</sup> The latter, which might be called inter-regional planning, will usually be a part of the national development policy and, therefore, a task for the national authorities. The planning concentrated upon the development and the modernization of the socio-economic and spatial structure of individual regions might be called intraregional. The intra-regional planning thus involves a stronger participation of regional authorities.

3.3. In an analysis of the need for and the role of information and information systems in planning, it is useful - even if planning is considered as a continuous process - to draw a distinction between the preparation of a plan and the implementation of it. <sup>13/</sup> The preparation of a plan can be regarded as the processing of various input-data referring to the socio-economic reality in order to arrive at a set of specific recommendations for decisions and actions which, in the form of output information, can be transmitted to the agents responsible for executing the actions. Depending on the social and economic system, the type of planning, etc., adequate systems for information transmission might be different for these two phases of planning.

#### 4. Information Systems for Preparation of Regional Development Plans

4.1. As a point of departure, let it be assumed that a regional planning body exists and that it possesses some basic knowledge about, (a) the working

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<sup>12/</sup> Cf. A.R. Kuklinski, op.cit. This point of view is also strongly stressed in J. Friedmann: Regional Development Policy: A Case Study of Venezuela, Cambridge, Mass. 1966.

<sup>13/</sup> A similar distinction is introduced by R. Frisch in: Preface to the Oslo Channel Model: A Survey of Types of Economic Forecasting and Programming, in R.G. Geary (Ed.) "Europe's Future in Figures", Amsterdam, 1962.

of the regional socio-economic system within the national system, and (b) planning methods and techniques. Apart from providing rational bases for decisions and actions, the purpose of planning is also to increase the stock of knowledge and insight in the regional economy and to improve planning methods. Planning always involves a learning process, formalized in research work. <sup>14/</sup> Both the direct planning work and the research must be based on information about the factual conditions and circumstances, i.e. data. The crucial questions regarding the provision of data are:

- ✓ - What type of data are required?
- What type of basic data should be collected?
- ✓ - How should the data collection be organized?
- What are the costs and benefits of collecting and processing data?
- How much resources should be spent on information systems?

4.2. The type of data needed can only be determined by a specification of the decision problems involved in the preparation of the plans. The type of decision problems, and, hence, the need for data will depend mainly on,

- (a) the overall economic and social system;
- (b) the main approaches to regional planning;
- (c) the real problems to be solved;
- (d) the functions and roles of the bodies for regional planning, as defined in the legal and institutional framework;
- (e) the methods and techniques applied in the planning analysis and decision problems.

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<sup>14/</sup> Cf. A. Papandreou: The Political Element in Development, Stockholm, 1966.

One possible method of analysing the demand for data in the preparation of a regional development plan could be to make a typology of the various cases to be found in each of the points (a) - (c) above. A recent investigation of the need for statistical data for regional planning in Sweden was based on this approach. <sup>15/</sup> The investigation was naturally limited to the Swedish conditions, systems and planning problems, and encompassed only statistical data. A more general study, such as the one discussed here, must be more comprehensive and include also data other than those which can be expressed in statistical terms.

...4.3. Regional development planning must be comprehensive in scope and give explicit attention to the interrelations between the various functional sub-systems and aspects of the regional society. Even if the aspects are strongly interrelated, it is often useful and necessary to breakdown the general development goals and planning processes to a set of interrelated sub-goals and sub-planning processes. Such a breakdown will also be helpful for an analysis of the data requirements. Such aspects for which data must be collected are:

- Economic growth and changes in the resource allocation, production techniques, income patterns, economic institutions and related economic planning;
- Social modernization, changes in social organization and mobility patterns, and related social planning;
- Cultural growth, changes in values, behaviour, etc. and related planning for education and cultural development;
- Changes in the settlement patterns, particularly the gradual shift from rural to urban settlements and related physical planning.

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<sup>15/</sup> Statistikberhov och Statistikproduksjon for regionala utredningar, Stockholm, 1966.

In order to determine the demand for data in a careful way, attention must be given to an adequate specification of the various decision problems involved in the planning and research processes, seen in close relation to the methods and techniques applied. The decision problems involved in the preparation of plans can often be usefully classified in four sub-groups:

- diagnosis of the planning "area";
- formulation of targets and evaluation principles;
- identification of feasible actions;
- evaluation of feasible actions.

4.4. The data needed as input in the various planning models and techniques are, as a rule, aggregates of different types. This raises the question of what kind of basic data should be collected in order to obtain reliable aggregates. This is partly a problem of statistical methods and also a problem of supply of basic data, i.e. data referring to the basic decision units in the socio-economic reality. One particularly important question with respect to basic data for regional planning is, to what kind of geographical or space unit the data should refer. There are a lot of disadvantages connected with the usual system of referring basic data to administrative units, for example, local municipalities. The only way to treat the geographical dimensions in the same "neutral" way as the time-dimension seems to be the application of the coordinate method. The coordinate method means that all relevant data are identified according to their coordinates in the national grid system. The advantages of the coordinate identification of data are many. First of all, the data are referred to a stable system, which does not change; secondly, the data can be aggregated in a variety of ways according to the problems analyzed. Another important aspect is that this system is well suited for automatic

data processing. In Sweden, a Royal Commission has suggested to the government that this system should be introduced, and with a precision of ten metres.<sup>16/</sup> The coordinate method has also been applied in resource inventories and planning in Africa.<sup>17/</sup> The coordinate method seems to be a very promising system for organizing data for regional planning. The possible advantages, disadvantages and problems in connexion with the introduction of this system into the less developed countries should therefore be given attention in the study.

4.5. The answer to the question about how data collecting and processing for regional development planning should be organized, i.e., what type of information system should be established for this purpose, depends to a large extent on the quality and organization of the national information system. The problem of data for regional planning is partly a problem of suitable organization of the data collected and processed for the national system, since, in fact, all data must be referring to certain geographical areas. However, it is also a problem of rational organization for collecting additional data. A national data system serves a large variety of purposes and can be regarded as consisting of a set of more or less integrated sub-systems. As a rule, a central bureau of statistics forms the main part of a national data system, together with bureaus for other non-statistical data, such as for national resource surveys, etc. A data system for regional planning should, whenever possible, and as a prime goal, be integrated into the national system as one sub-system alongside various

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<sup>16/</sup> S.O.U. 1966:63. Fastighetsregistrering. See also T. Hägerstrand: Methods and New Techniques of Urban and Regional Research, E.C.E. Geneva, December 1967.

<sup>17/</sup> Stanford Research Institute: Tanzania-Zambia Highway Study, Stanford, Calif., 1966. See also R.S. Cannel: Inventory Techniques for Development Planning, Paper presented at the Conference of African Planners, Addis Ababa, December 1967.

sectoral sub-systems. This is the intention, for example, in Sweden and Poland. <sup>18/</sup> Regarding the statistical data in the national system, the model framework of national accounts and national budgeting serve as frameworks through which the definitions and classifications embodied ensure a consistent design and promote international comparability. <sup>19/</sup> Such well established models for accounting and budgeting have not yet been developed in the field of regional planning and it does not seem likely that they will be in the near future. Nevertheless, in the efforts at developing suitable data systems for regional planning, benefits can be drawn from the experiences in the national systems, especially with respect to coordination of data, control for consistency and reliability, and presentation. The problems related to the organization of a data system and its integration in the national system should be carefully analyzed in the study discussed here, and particular attention should be given to the applicability of the systems used in the advanced countries in the less advanced ones. <sup>20/</sup>

4.6. The three interrelated questions of,

- the cost of collecting and processing data
- the returns on the resources spent for this purpose
- how much should be spent

should be given considerable attention in the study. These problems are perhaps more difficult as they involve complex problems of measurement of quantity and quality of data, as well as costs and benefits. <sup>21/</sup> The

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<sup>18/</sup> Cf. T. Hägerstrand, 1967. op.cit., and W. Kawalec: Regional Statistics for Planning Requirements, Paper presented at the Conference of European Statisticians, Statistical Commission and Economic Commission for Europe, Prague, 1967.

<sup>19/</sup> Cf. I. Ohlson: National Accounts as an Instrument for Co-ordinating Economic Statistics, The Review of Income and Wealth, No.4, 1966.

<sup>20/</sup> Compare: The Feasibility of Socio-Economic Data Collection on the Local and Regional Levels in Africa for Systematic Project Identification, Paper presented at the Conference of African Planners, Addis Ababa, December 1967.

<sup>21/</sup> For an analysis of a very simple case, see G.J. Stigler: The Economics of Information, The Journal of Political Economy, 1961.

problems are nevertheless of extreme importance, particularly because, if a data system is to provide reliable data, it must be operated by fairly skilled labour, with relatively high opportunity costs. An evaluation of the costs and benefits of a data system cannot, however, be done separately; it is necessary to see the data system in close connexion with its purpose, i.e. the regional planning and the efficiency of the entire planning process. On the other hand, as a rule, planning can be based on different methods, with different claims to data. It is therefore necessary also to compare the efficiency of different methods with different claims to data so as to obtain a rational internal adjustment in the planning process between planning efficiency and data costs. Another important aspect in connexion with establishing a data system is that the system should have a relatively high level of generality so that the expansion of the amount of data within the system does not call for a change in the basic system as such.

#### 5. Information Systems for Implementation of Regional Development Plans

5.1. Communication of information is a necessary and indispensable element in the implementation of plans in general. Information either about the planning decisions, or derived from them, must be transmitted to the agents responsible for executing the actions, or to the various basic decision units in the socio-economic system, so as to induce change in their actions. Furthermore, information about the execution and about the effects of various incentives used to induce change must be transmitted back to the planning bodies for reasons of control. Preparation and implementation of plans can thus be regarded as circulation of information. <sup>22/</sup> Therefore, the success of development planning greatly depends on the efficiency of the communication in the phases of implementation and control.

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<sup>22/</sup> Cf. A. R. Kuklinski, op.cit. p.11, and the reference in footnote 18.

5.2. Regional planning in the less developed countries must be directed towards the inducing of change in the economic, social and cultural sub-structures of the regional societies. Of particular importance would be changes that would help to extend the degree of spatial integration of economic, social and cultural activities, both within the various local communities within the regions, and between the various regions within the national space. <sup>23/</sup> Regional policy and planning can therefore be viewed as planning for innovations, aiming at progressive integration of the national economic, social and cultural space. Both the spread of innovations and spatial integration of human activities are closely related to, and can be regarded as functions of, communication. <sup>24/</sup> Communication patterns and communication facilities therefore play an essential role in the development process, and, in particular, regional planning must give much attention to the interrelations between change and improvements in the communication systems and structural changes. These have two significant aspects. First, the role of communication for the pattern of interactions and integration must be taken into account in the planning. Secondly, the implementation and control of the development plan must be based on deliberate use of communication channels for the transmission of information related to the planning decisions.

5.3. The problem of information circulation and deliberate use of communication channels in the implementation of regional development plans is a very complex and difficult one which, up to now, has been given little attention in planning literature. The main sub-questions are:

- what information should be transmitted?
- how should the information be transmitted? (system)
- what are the costs and efficiency of different channels?

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<sup>23/</sup> J. Friedmann, 1966, op.cit.

<sup>24/</sup> Cf. T. Hägerstrand, 1965, op.cit.



The answers to these questions will naturally depend on the economic and political systems, and the stage of development, especially of the communication facilities.

5.4. With regard to the first question, the point is that different kinds of information often require different channels; or, to put it another way, a certain channel need not be equally efficient for all kinds of information. The choice of channels therefore depends on what type of information is to be transmitted. For example, information which, from the point of view of the receivers, is data might be transmitted more easily through spontaneous channels, such as interpersonal contact, than information in the sense of know-how. <sup>25/</sup> This problem is closely related to the distinction between planning for innovations, and indicative planning. Planning for innovation is a deliberate attempt to increase the stock of knowledge and know-how, while indicative planning means a deliberate spread of data to which the basic decision units can adjust.

5.5. The choice of channels depends on what kind of information is to be transmitted and also on the economic and social systems, and the set of feasible channels. A distinction can be made between at least four types of channels:

- interpersonal spontaneous contacts in connexion with commercial activities, etc.
- contacts within the framework of an organization
- mass media (newspapers, radio, television, etc.)
- extension services.

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<sup>25/</sup> Cf. E.A. Wilkening: Roles of Communicating Agents in the Technological Change in Agriculture, Social Forces, 1956.

If efficient communications are to be obtained, the choice of channels must be based on a careful appraisal of the decision problem and situation, as seen from the point of view of the receivers. <sup>26/</sup>

5.5. The cost and efficiency of the various feasible channels are important questions for the less developed countries with a scarcity of skilled labour. For example, extension services are often regarded as expensive but efficient, while interpersonal contacts cost little but their effects are also very small and slow.

5.6. The problems related to the role and use of information and communication in the implementation of regional development plans in less developed countries, as briefly pointed out above, seems a promising field of research to be studied in the project. The existing theories of diffusion of innovations <sup>27/</sup> could be a useful point of departure but, however, these theories are mainly of a descriptive character. It is therefore necessary to reformulate them in order to obtain a more instrumental tool in the same way as it is done, for example, in the field of market communication. <sup>28/</sup> The latter theories are usually based on the general theories of human communication, <sup>29/</sup> and they could be helpful in clarifying the problems involved in the deliberate use of communication in implementation of development plans.

## 6. Final Remarks

6.1. The aim of this paper has been to give a survey of problems connected with the question of information systems for regional development in less developed countries so as to provide an introduction and a background

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<sup>26/</sup> This is clearly demonstrated in Per Mathisen: Klient-modeller og avgjorelsesformer i et distriktstiltak Tidsskrift for Samfunnsforskning, 1967.

<sup>27/</sup> A survey of such theories is given in E.M. Rogers: Diffusion of Innovation, Glencoe, Ill., 1963. See also T. Hägerstrand, 1965, op.cit.

<sup>28/</sup> Cf. E. Canoe: Marketing Communications: A Behavioral Approach to Men, Message and Media, New York, 1965.

<sup>29/</sup> Cf. R. Kramer: Information und Kommunikation, Berlin, 1965.

to a systematic study of the questions. The discussion in the paper is limited to questions of information systems as seen from the point of view of national and regional planning for regional development. The broader complex of problems related to the role of information exchange and human communication for regional development is therefore mentioned only in its relation to planning. The survey of problems of information systems discussed in the paper divide into two groups - those related to the preparation of regional development plans and those related to implementation of such plans and control. The aim has been to point out the main problems, and the discussion has therefore deliberately been laid on a general level, without going into problems related to economic and social systems, etc.

6.2. The purpose of the study should be to contribute to the practical methodology of regional development planning with respect to design and use of information systems. Due to the large variety of economic and social systems, stages of development, approaches to regional planning, etc. to be found in the developing countries, it would hardly be possible to draw any final and definite conclusions. The study should, however, aim at providing a systematic framework and some principal guidelines on how more detailed and practical analysis could be conducted, taking the actual systems and conditions into account.

6.3. The study should be mainly based on a set of case studies. However, since any case study, aiming at providing material from which more general conclusions can be drawn, and at contributing to the accumulation of insight and know-how in a particular field, must be based on a suitable theoretical framework, the study should give some attention to the theoretical problems of information systems. The theoretical analysis should be an attempt to benefit from theories and methods developed in other fields, for example, in

economics, sociology, social anthropology, planning, statistics, information, communication, and general system-theory. However, stress should be laid first of all on the applied aspects of the theories, and the ultimate goal should be to make a useful synthesis of them for the present purpose.

6.4. In the choice of countries for case studies, attention should be given to three or four at different stages of development and with some differences in their economic and political systems, but having in common deliberate efforts in regional development planning, based on systematic methods. Possible countries are for example Sweden, Libya, Japan, Poland and Chile.

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INFORMATION SYSTEMS FOR REGIONAL DEVELOPMENT CONTROL  
(Framework for a research project)

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## 1. Introduction <sup>1/</sup>

1.1. It is widely recognized that lack of suitable statistics computed on the basis of systematically collected basic data, and other types of information with reference to geographical sub-areas within a country are major obstacles to the efficient preparation and implementation of regional development efforts. The necessity of an extended information base for planning at the local and regional levels is strongly felt both in the developing <sup>2/</sup> and in the more advanced countries. <sup>3/</sup> Closely related to the lack of regional statistics are the difficulties involved in establishing an efficient system for collecting and communicating basic data from the local level to the planning agencies. Corresponding problems of communication and information exchange are also hampering the implementation and review of regional development plans and projects. The need for research in the field of information acquisition and communication, with particular reference to regional development, is reflected in the inclusion of a study on information systems for regional development in Programme IV of the United Nations Research Institute for Social Development. <sup>4/</sup>

1.2. The project has been designed with a particular view to the conditions and needs of developing countries embarking on regional planning as part of their development efforts. The aim of the study - which will comprise case-studies of countries with different economic systems and stages of development - is to analyze questions related to how information systems for regional development control should be designed, established, operated and expanded. The purpose of the paper is to give a survey of the analytical approach and conceptual framework which, at this initial stage of the project, has been found useful, and of some of the basic problems which will be dealt with. As indicated by the table of contents, the paper is divided into nine sections.

## 2. The system approach

2.1. The title of the project indicates that, although the questions related to production of regional statistics, the application of social accounts at the regional level, and the use of comprehensive data banks are among those to be analyzed, main concern will be given to how these elements should be brought together as parts of interrelated information systems within a framework for regional development control. The study will take the strategy for regional development as established by a directing and control sector, i.e. the government, as a focus for the analysis. Consideration will be given to the control process in its entirety, involving the preparation of regional development plans and programmes, their implementation through executive actions and review, and the feedback mechanisms necessary for adaption and adjustments. Regional development will be seen as a particular sub-set of processes taking place in a controlled system; while the preparation and implementation of regional development efforts will be seen as a particular sub-set of processes taking place within a controlling system. The controlling system will be conventionally defined as including the governmental administration at the central and regional levels, and the controlled system as the rest of society.

2.2. The term system will be used in the general meaning of a set of objects with relationships between the objects and their attributes. <sup>6/</sup> The objects which constitute the elementary parts of a system will be called the system's elements. By constructing proper sub-sets of the elements, sub-systems are obtained. Such sub-systems will be referred to as component parts of the system. A component part will be comprised of one or more elements. Thus, a system can be defined as a whole, consisting of component parts. The merit of this definition is that it stresses that a system is something more than the sum of the parts, and that attention is focussed more on the interrelationships forming the behaviour of the whole than the properties of the individual parts. Since a component part is defined as a sub-system of the system of elements, it has relations with other sub-systems. It therefore follows that any system subject to influence from its environment is a sub-system of some larger system, and that every component part can be potentially regarded as a system. Consequently, the environment of a system will be defined as the part of the world whose state affects the state or behaviour of the system. <sup>6/</sup> A system that is related to its environment will be referred to as open. In any analysis of a real world system where "all influence all" it is necessary to delimit the object of study by drawing a boundary line around the theoretical system to be studied. When the real world system is seen as an open system, this boundary line can only be drawn in an arbitrary way, depending on the particular analytical purpose. The boundary which delimits the total system to be studied will be referred to as the outer boundary. In an analogous way, the inner boundaries delimit the elements, and the intermediary boundaries the component parts.

2.3. The term information system will be used to mean an auxiliary system for a larger system (of which it is a sub-system) containing components for collecting, storing, communicating, processing and displaying information. <sup>7/</sup> The auxiliary character of information systems indicates their functional role, namely, to provide adequate information for use in description, analyses and decision-making in the various component parts of the larger system. Information systems cannot be analyzed on their own, they must always be seen in relation to the larger system which they serve. As pointed out by Langefors, the need for efficient information systems usually arises in connexion with control of systems whose state, and/or environment change during time, either in order to obtain fast adjustments to uncontrollable changes, or to induce desirable changes. The problems of how to control a particular dynamic system belong to the theory of control in general and, in particular, to the theory of control of the type of system in question. The information system theory is a tool to study the information requirements as established by the particular theory of control, and the economic and technical aspects of collecting, storing, processing, communicating and displaying this information.

2.4. In any study of information systems, at least three types of systems must be distinguished: First, the system to be controlled; second, the controlling system; and third, the information systems which serve the



first two internally and provide the links between them. These systems can be divided into a set of subsystems. For example, the regional development administration can be regarded as a subsystem within the total controlling system, and the regions as subsystems of the controlled system. In development control, the controlling system will usually be subject to influence and control from the controlled system. The denomination of the administration as the controlling system is thus only a practical convention and should not veil the vital linkages provided by the political process, as indicated in Fig. 1 below.

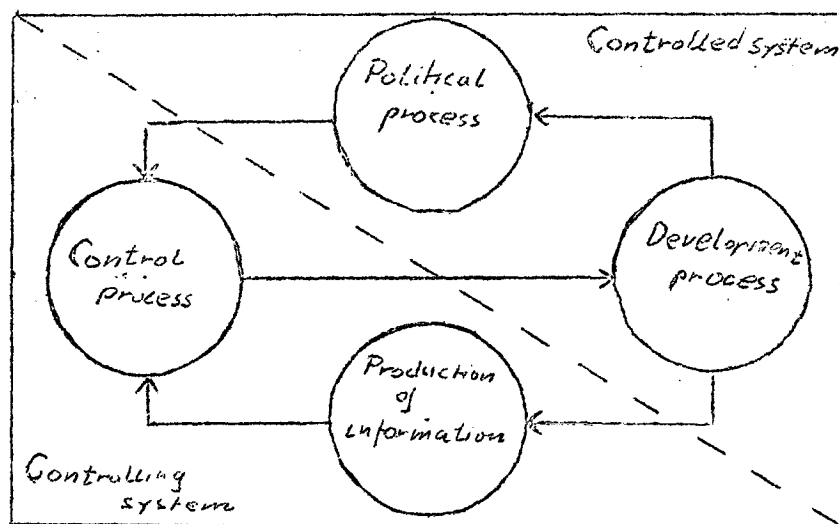


Fig. 1

In the figure, the controlling system is located in the lower left and the controlled system in the upper right. The control process is directed towards the development process taking place in the controlled system. It is based on two types of input information; one with sources in the political process, and one with sources in the production of statistics and other types of information. The last two processes can therefore be seen as taking place in intermediary components within the information system which links the controlling and the controlled systems together in a continuous information exchange circuit. 8/

2.5. The point of departure of the study is that regional development can be seen as a particular set of processes within the controlled system and that these are subject to control by a particular subsystem of the controlling system, denominated as the regional development administration. In order to carry out the control processes, the regional development administration must make use of information systems, both to obtain adequate information about the processes and structure of the subsystems, i.e. the regions to control, as well as for transmitting the control impulses to the controlled system, and for efficient distribution of information between the component parts of the administration.

2.6. However, before elaborating further on this approach, some remarks are necessary to indicate the meaning attached to the term regional development. For the purpose of the study, it is useful to adopt a concept of

region related to the administrative subdivision of the national space in order to coincide with the institutional set-up, i.e. planning or programming regions, which, in turn, are assumed to be tied to the polarized structure of the economic and socio-cultural space reflecting the spatial patterns of human interactions. <sup>9/</sup> The term regional development is used to mean the increase in welfare of the people of a region, expressed by such indicators as income per head, its distribution among the population, the availability of social services and institutions, the rate of unemployment and the anticipated economic growth. <sup>10/</sup> A distinction should be made between interregional and intraregional development. The first term refers to the development and spatial transformation of the national economic and socio-cultural structure in general, i.e. the balance between the regions; while the second refers to the development within a particular region, including its internal spatial transformation. Although it is here assumed that there is a certain division of the national space into regions, the terms interregional and intraregional development can be used without reference to such subdivisions, referring to the process of spatial transformation and reorganization of the national economic and socio-cultural structures in general, focussing attention on spatial interdependence and imbalance, and the internal structure of problem areas respectively. <sup>11/</sup>

### 3. A framework for regional development control

3.1. As stated in the previous section, the information systems to be considered in this study are those serving as auxiliary subsystems for the regional development administration, providing links for information exchange with the controlled system, with other subsystems of the governmental administration, and between internal component parts. The analyses of these information systems must aim at clarifying their functional roles in the control processes, assessing their efficiency, and suggesting improvements. However, this can only be done with reference to some type of strategy for regional development control employed by the controlling system. Due to the complex and long-term character of the regional development process and the comprehensiveness of the development objectives, a control strategy for regional development must be rather complex and involve a large set of elements and feedbacks in a continuous setting. In order to obtain a common frame of reference throughout the study, a relatively general framework for regional development control involving only the most essential elements and feedbacks is developed and shown in fig. 2. <sup>12/</sup> The framework is deliberately made so general that it can apply both to control of the interregional development and for individual regions. <sup>13/</sup>

3.2. Starting with the last box in the figure and following the lines to the first two, experience with control attempts and research gives rise to a set of theories and a body of empirical facts about regional development. The theories contribute to insight in the process of regional development and the nature of the problems which arise, and to a systematic organization of the empirical facts referring to the previous development and the actual state of the regions concerned. The basic point of view in the control approach referred to here is the splitting up of the framework



considerations. The chosen strategy will serve as a basis for the design of a suitable administrative machinery for implementing the strategy. This administrative machinery must, in turn, fit into the structure of the general system for planning and administration in the country in which it will be a subsystem. 17/

3.4. The various elements in the upper chain will, as shown by the dotted lines in fig.2, provide guidelines to and be mutually coordinated with the corresponding elements of the lower chain. The relevant theories here are theories for regional development control which serve as a basis for formulation of operational models 18/ which must be quantified on the basis of empirical facts referring to the actual state of the regional economy and social situation. Such control models are of a more short-term nature even though they should be related to the growth models. Their essential task is to serve as a basis for the planning of the year-to-year actions, projects and interventions. 19/ They must therefore be detailed enough to identify the set of actual control instruments to be used and the constraints to be taken into account. By combining the operational control model with the short-term objectives and the guidelines derived from the long-term strategy, an operational plan for actual control measures and projects to be undertaken can be established. The plan must also suggest what means and tools to be employed by the regional development administration for the implementation. The means and tools must be selected among the large set of those that are constitutionally and politically acceptable. The operational control plan ends up in a set of procedures for implementation involving the concrete actions to be taken, and the review of them. 20/

3.5. The effects of the control measures must be assessed against control criteria, established by the control theories and the short and long term goals. Furthermore, the confrontation of the operational control plan with the factual process of regional development, gives rise to experiences about the factual process of regional development, the quality of the plan and the realism of the long-term strategy, the adequacy of the institutional machinery, the wisdom of the objectives and goals, as well as the efficiency of the means and the reliability of the theories and models upon which the control strategy and operational plan were based. Thus, the control framework includes a set of feedback mechanisms: Firstly, the actual events encountered in the control processes and characteristic features of the factual development are recorded in the files of empirical facts; secondly, the experiences might give rise to adjustments of the institutional machinery and to improvements in the set of means and tools; thirdly, the implementation procedures might be changed; finally, the long and short term goals and aims might be revised, the theories and models developed further to take into account additional factors, and provisions made to collect more and additional empirical information. The confrontation of the plan with the factual development will normally also induce research resulting in a continuous improvement of the various elements in the control framework. Thus, the regional development control can be viewed as a learning process, where relevant information and model sophistication emerge through the actions and feedbacks built into the control framework. 21/

#### 4. Tasks and elements of information systems

4.1. As indicated in fig. 2, the regional development administration is the focus of the control framework in view of its functional tasks as the controlling system for the processes in question. When the controlling system is taken as a "black box" i.e. attention is focused on the controlling system's relations with its environment and not on its internal behaviour, it can be recognized that the controlling system must have access to and employ two different categories of information. <sup>22/</sup> The first category, which can be referred to as system information, includes the three following sub-categories:

- a) Information about the nature of the processes to be controlled, i.e. about the relevant dynamic properties of the controlled system, including the opportunities for control;
- b) Goals and objectives to pursue;
- c) Methods and techniques to employ in the control process, i.e. identification of constraints and instrument variables.

The characteristic feature of the system information is that it can be stored and used repeatedly in the control processes. System information is a stock concept, and the stock of such information can be increased and improved by research. Subcategory a) is contained in the theories of regional growth and development control. Subcategory b), which has less "stock" character than a), is supplied by the short and long-term goal setting processes. Subcategory c) is contained in the models for regional growth and control. The second category of information involved in the control process can be called operative information and includes two sub-categories:

- a) Information about the trends and the actual state of the controlled system with respect to the processes in question;
- b) Control and directing impulses to undertake the control measures.

As opposed to the system information, the operative information is principally a flow concept, and at least some parts of it must be renewed for each control operation. In the control framework outlined in fig. 2, the sub-category a) is contained in the empirical facts about trends of regional development and the state of the regional economy, and sub-category b) in the implementation procedures and the directives for action.

4.2. To think of the controlling system as a "black box" in a study of information systems for regional development control would veil some of the most vital aspects. In order to identify the internal flows of information that can be decisive for the efficiency of the control efforts, the "black box" must be opened and the organizational structure of the institutional machinery surveyed. The various elements of the control framework are usually reflected in the division of the controlling system in a set of

component parts responsible for different tasks in the control process. The organizational structure can be described with respect to its authority structure, that is the allocation of tasks among the various components, and the corresponding authority and responsibility relations. However, from an information system point of view, more attention should be given to the information structure, that is the distribution of information processing activities, the type of information received, stored and processed, and the pattern of communication linkages between the various component parts. <sup>23/</sup> The entire control process can be seen as a sequence of description, learning and decision-processes performed by different component parts of the controlling system connected together by flows of information.

4.3. The controlling system is assumed to contain a central directing component, the prime task of which, besides the chief responsibility for performing the control process, is to manage the working of the controlling system including the design and control of the information systems involved. Following Prince, <sup>24/</sup> the point of departure for identifying the information systems is the functionally delineated component parts of the controlling system, so that each component part is assigned an information system. The controlling system therefore contains (an arbitrary) set of overlapping information systems, linked together through the decision-making components and common communication channels. The task of the information systems is to provide their components with the information necessary and to transmit their output information to the appropriate receivers.

4.4. An information system can be described with reference to:

- a) The properties of the component it serves;
- b) The types of information required;
- c) The sources of information;
- d) The channels through which the information is transmitted;
- e) The processing made in order to transmit and present the information;
- f) The ways and means of information storage;
- g) The receivers of the information referring to the output of the decision process.

4.5. The components of the controlling systems, which are the focus of the various information systems, should be classified according to their functional task. The main functional tasks involved in regional development control are description of trends of regional development and state of the regional economy, construction and quantification of operational models, specification of goals and objectives, identification of feasible strategies and actions, selection of strategies to follow and actions to take, presentation of plans, choice of means and tools, formulation of implementation procedures, execution and review. An important characteristic of decision problems involved in the control process is their time frame, that is the frequency with which the decision problem is raised. <sup>25/</sup> The usual distinction is here between decisions with short, medium and long-term effects and repercussions.

4.6. The types of information required are discussed in more detail in the next section. Three distinctions are important here, first between the various types of information references, i.e. to empirical facts, to directives, to forecasts etc., secondly, between various syntactical representations, and finally, between different degrees of routinization and structuring. The information system for a component part will normally encompass a set of sources corresponding to the various types of information. Important distinctions here are between sources in other components of the controlling system in question, in other controlling systems - that is in other parts of the administration and governmental activities - and sources in the controlled system. Another important distinction is between local and distant sources. Local sources are sources located in the direct neighbourhood spatially and/or functionally, while distant sources are located farther away. While information usually can be obtained easily and at little cost from local sources, more distant information can often be obtained only at a relatively high cost. Apart from accessibility, availability is an important feature of a source. Often information can be obtained, but due to the low availability, it may involve high processing costs. 26/

4.7. The channels through which information is transmitted from the sources to the receivers can be characterized by their organizational features, and by the means by which information is communicated. Among the organizational features, a distinction will be made between channels with respect to: a) location of the sources; b) their formal versus informal characters; and c) whether they are horizontal or vertical in relation to the organizational structure of the controlling system. When viewing the channels from the point of view of a particular component, a distinction will also be made between in-channels and out-channels. Two components linked together by one or a set of communication channels will be said to form a communication system.27/ The communication system can have one channel through which information is transmitted in only one direction, or in both directions through one or more channels. Thus, an information system consists usually of a set of communication systems. With respect to the means by which information is communicated, a particular distinction will be made between direct messages in which the message is received in the same form as it is sent, and indirect messages where some processing and transformation of the message takes place in an intermediary component. 28/ Finally, the channels can be characterized by their length, capacity, degree of routinization and permanent use, their efficiency, reliability, and the cost of transmitting information through them.

4.8. In order to make efficient use of a communication channel and/or to present information in a suitable form to a decision-making component, it is frequently necessary to process the information in various ways. The communication system therefore often contains some intermediary elements for processing. While the channels transmit flows of information in the form of messages, the information storages are means for accumulating stocks of information. These stocks contain information capital which contribute to the decision-processes by making required flows of information available. Some types of information, particularly numerical, are easy to

store and retrieve, while others, particularly those of a semantical nature, raise much more difficult problems. The means for storage, the organization of the stores and the techniques for retrieval are important characteristics of an information system. The information system for a particular component includes also out-channels for transmitting information referring to the actual decisions to some receivers. When viewed from the point of view of the receiving components, such channels are in-channels, and therefore they can be said to belong to both information systems. In some cases, particularly when such a channel is a one-way channel, it will be regarded as belonging to the component that makes use of it for its own specific purpose. This is the case with many channels between the controlling and the controlled systems. The location of the receivers and the nature of the out-channels are therefore important characteristics of an information system.

4.9. To sum up, the information structure of a regional development administration involves a large amount of communication systems, which together form the communication network of the administration as a controlling system. The communication network, which is subject to control and directing, is structured into a set of interrelated information systems belonging to each component part of the controlling system, with focus on their information processing activities such as description, research and decision-making. The design of a communication network and information systems for regional development control must be mutually coordinated with the allocation of functional tasks, and the authority and responsibility relations within the regional development administration, so as to obtain efficient control in accordance with criteria suggested by the relevant control theories.

## 5. A model of decision-making and determination of information requirements

5.1. Even though the theories of regional development control suggest guidelines for efficient organization of the administration for regional development control with respect to the authority and the information structure, an analysis of the information systems must have a point of departure also in the nature of the decision-making processes involved. The specific information requirements for a given decision-process must be derived from the properties of the decision problem and methods of decision-making in question. However, in all decision-making there are some common features which allow for analysis within a common class of models, such as in the case of production processes and production-models. The basic elements of a simple model for decision-making, which will serve as a frame of reference for determination of information requirements throughout the study, are summarized in the following paragraphs.

5.2. Decision-making can be viewed as a process where some information - to be called the input information - is transformed into some new information - the output information - which is transmitted either to a connected executive unit within the same component for implementation by actions, or to another component for further transforming, leading to actions at a



later stage. The decision-making components will be seen largely as "black boxes", the internal behaviour of which will not be discussed in this study. In some cases, however, particularly for implementation components, it is useful to see the decision-making components as consisting of two elements; one for decision-making and one for execution. The characteristic features of a decision-process, besides consisting of information processing, are the selection of one or a set of alternatives for one or a set of decision variables among a larger set, implying a commitment to actions.<sup>29/</sup> The decision-making component acquires the necessary information from the sources of its information system. A vital distinction here is between the information which is to be processed and transformed in the decision-process and the information which contains the methods, rules and criteria to employ in the processing of the first type in order to arrive at the decision. The first type will be referred to as the decision-base and the second the decision-function.<sup>30/</sup>

5.3. The decision-base encompasses all the necessary information to be processed and can be divided into the following groups:

- a) Information about the actual state of the part of the controlled system in question;
- b) Information about the set of feasible alternative decisions;
- c) Information about the objectives to pursue.

The characteristic feature of the decision-base is that it contains operative information and therefore a new and up-to-date one must be provided for every decision-process to be undertaken. The decision-base is a flow concept and the information is received in a set of messages which are more or less continuously transmitted from the appropriate sources through the communication channels and, hence, puts a frequent demand on the communication capacity. As opposed to the decision base, the decision-function is a stock concept, i.e. it can be stored and used repeatedly in many decision processes of the same structure. The methods, rules and criteria, in accordance with which the decision process is carried out, are derived from what has been referred to in the previous section as system information. However, due to the nonmechanic character of development control, and the instability in the formulating of goals and objectives, reflected in frequent revision and changes, information about goals and objectives has been transferred to the category of operative information and it is included in the decision base. A precise formulation of a decision function will often consist of rules for optimization under given constraints. In accordance with the "black box" assumption, a decision process can be described in terms of its decision function and its decision base, and it is assumed that once these are given, decisions can be derived at.<sup>31/</sup>

5.4. However, the decision-making behaviour of a component is not necessarily limited to a choice between alternatives according to a given decision function, but may also include the choice of the latter. From

a control point of view, there is a significant difference between the components formulating their own decision functions and components that have their decision functions supplied by a superior component. Although the most superior components of the controlling system appear to fall into the first group, the distinction usually follows the border between the controlled and the controlling system. The decision-making behaviour of an independent component can be divided into two stages: First, the formulation of appropriate decision functions, and, secondly, the performance of the decisions according to these functions. Even though there is little difference between the two stages - the first also involves decision problems which must be resolved according to some rules and criteria - the distinction between the two stages is well apt to elucidate the internal structure of the decision process and the different role played by the two different types of information. 32/

5.5. Independent components formulate their decision functions with reference to a model or image of the component and its relations to the environment containing the relevant system information. However, the available operational information to form the decision base has also a substantial influence on the decision function arrived at, since there is no reason to formulate decision functions to which the derived decision base cannot be obtained. From a control point of view, the behaviour of an independent component can be influenced by a) provision of more adequate information about the present and anticipated stage of the environment to be put into a given decision function; b) change in the substantial content of the provided information, e.g. information about new incentives; c) possible revision of the decision functions to utilize better the extended information to serve as decision bases; d) possible revision of the decision-functions through information which improves the components' model of itself and its environment; and e) by direct training and education. 33/ There is reason to expect that the two first ways are more efficient in the short-term, but that the three last are the more important for long-term development. There is also reason to expect that the diffusion of the various types of information to the elements of the controlled system are most efficiently done through different types of channels. 33a/

5.6. Turning then to the components belonging to the controlling system, which have their decision functions supplied from superior components, the behaviour of these can be much more efficiently influenced. The design of the internal information systems of the controlling system is a problem of allocating decision functions to the various subordinate components, distributing them through suitable channels, and design a set of information systems to serve the components with the derived decision bases. For this purpose, the central control component requires system information not only about all relevant aspects of the controlled system with respect to the processes to be controlled but also about the basic features of the controlling system itself. 34/ In the internal information systems of the controlling system, one can distinguish between the communication systems for transmitting decision functions and those for transmitting decision bases. The information system of the central control component will consist largely of in-channels for transmission of system information and review, and out-

channels for transmission of decision functions to the subordinate components of the controlling system.

5.7. The significance of an efficient distribution of decision functions stems from the fact that development control requires a high degree of coordinated decisions and actions. The coordination can be achieved by establishing consistent rules and criteria for the decision-making behaviour of the decentralized control components. Such decision functions can be used repeatedly and thus diminish considerably the communication requirements and the necessity for direct central coordination. The coordination can be obtained by the use of local information as decision bases for the decentralized components responsible for implementing the control measures. An efficient distribution of decision functions appears to be one answer to a decentralized system of development control. <sup>35/</sup> In most information system analyses up to now, attention has been mainly focused on the supply and distribution of the type of information here referred to as decision base. This is not satisfactory, firstly, because no complete determination of information requirements can be obtained without reference to explicit decision functions; secondly, because the prospects for more efficient development control through improving the working of the controlling system can only be assessed by taking both the controlled and the controlling systems as a reference base; and thirdly, the distinction between decision bases and decision functions appears to be the key for designing the communication channels necessary for efficient decentralized control. <sup>36/</sup>

## 6. The role of planning in information systems

6.1. As indicated by the control framework, planning is an indispensable element of development control. For the sake of clarification, a distinction will be drawn between the aims of planning, which are to achieve the development objectives as these emerge from the goal-setting process, and the purpose of planning, which is to coordinate the efforts to achieve these objectives. In the field of regional development, the aims of planning will usually be concerned with resource mobilization and spatial allocation changes in settlement patterns etc. The purpose of planning is to formulate guidelines and rules for coordination of present and future actions in order to achieve the aims in an efficient (or optimal) way. <sup>37/</sup> Thus, planning provides a rational basis for decisions about present actions by supplying some of the necessary input information to the decision process. The need for preparing decisions by planning arises when there are a) strong simultaneous indirect effects, i.e. effects and repercussions outside the project or sector concerned, and b) strong repercussions of the action(s) over time in a way that either limit future freedom of actions or influence the effects of future actions. Hence, planning is a process which involves a conception of a sequence of actions in related fields and over a series of future periods. <sup>38/</sup> Since the purpose of planning is mainly to provide the basis for decisions about immediate actions, a plan does not exclude flexibility of action. A plan may, and indeed should, be critically

reviewed during time in order to take into account the genuine uncertainty that is always attached to the future, the prospects of utilizing new information and experiences, and to allow for changes in goals. Under conditions of great uncertainty, the flexibility of actions may be explicitly built into the plan by anticipating alternative series of future events so that the decision-maker can adjust his actions to the events that actually occur.

6.2. It is useful also to draw a distinction between balance planning and structural planning, which, to some extent, goes across the distinction between strategical and operational planning. The term balance planning means planning for coordination of actions with relatively short-term effects but with strong simultaneous indirect effects and repercussions for actions in other sectors. Balance planning will usually be concerned with short-term resource utilization and adjustments to variations and random disturbances occurring in the actual processes of the controlled system or in its environment within a given internal and environmental structure. <sup>39/</sup> The typical case at the national level is planning of anticyclical interventions. <sup>40/</sup> Balance planning is necessarily associated with operational planning. The need for guidelines from a long-term strategy arises when possible long-term effects are to be taken into account, and/or when there are formulated long-term development goals for these variables. <sup>41/</sup> The term structural planning will be used to mean planning for coordination of actions with long-term repercussions and implications, inducing structural changes in the controlled system. Structural planning is particularly concerned with the sectorial and spatial allocation of fixed capital formation and other development expenditures, aiming mainly at inducing and directing structural changes in the controlled system, and adjusting ~~to~~ structural changes that are beyond control. <sup>42/</sup> Also, the structural plan must be implemented through operational short-term planning in order to take into account the short-term effects of their implementation. For these actions, the operational planning must, however, be based on guidelines from a long-term development strategy.

6.3. Planning, like decision-making, consists of processing some input information which is transformed into some different output information. However, as opposed to decision-making, planning is of a preparatory character and therefore does not imply, to the same degree, a commitment to actions. While decision-making usually is of a discrete character, it is more convenient to see planning as a continuous process. Planning is a typical problem solving activity and it is not likely to be as well structured as most decision processes. Furthermore, the output of a planning process is more compound than the output of a decision process. While the latter contains information referring to one or a set of well defined actions to be taken, the former may involve more than one type of information. When viewing a planning from the standpoint of an information system, it is useful to describe it with reference to the types of input-information required, the nature of the processing performed and the types of output-information. Bearing in mind that the purpose of planning is to provide a rational basis for decision-making, the following survey starts with the

output-information from operational planning. This appears to fall into three groups: 43/

- a) Recommendations for decisions about actions to be taken;
- b) decision functions to be used by components responsible for implementing control actions, for example, project selection and execution;
- c) forecasts of variables entering decision bases.

The aim of the planning process is that output shall be consistent, reflecting the coordination between decisions to be taken by the central control components, by decentralized components responsible for implementation of control measures, and by elements of the controlled system. How the various types of output information should be allocated should, in principle, be determined on the basis of the control model. 44/ In order to obtain flexibility, the output-information can be given in alternatives.

6.4. The planning process can be conveniently subdivided into a set of subprocesses linked together by flows of information. In fig.3, which is intended to give a picture of the process and its environment, a distinction has been made between model building, forecasting, specification of goals, selection of output and presentation. The element of the controlling system that performs the planning processes is assumed to be located in the central control unit. The planning process is supplied with input-information about a) the trends and state of the development process from information collecting agencies, e.g. C.B.S.; b) development objectives and goals which in the raw are supplied from the political process; and c) guidelines for selection of actions and forecasts from the long-term strategy. In fig.3, all input-information is marked with small dotted lines. The figure shows a situation where the factual development is influenced by four types of planned actions. The decision process (D4) is the simplest one based on input-information from the planning process recommending a certain action, as indicated by the box (P.a.). The next two decision processes are more complex, being based on input-information including both decision functions (D'f3) and (D'f2) and part of the decision bases (forecasts) provided by the planning process and the rest of the decision base provided by local sources in the controlled system. The last decision process (D1) is based on decision functions formulated independently, and on the decision base consisting partly in forecasts supplied by the planning unit, and partly on information from local sources in the controlled system. Finally, a line is also indicated directly from the planning unit to the controlled system supplying forecasts and other information to the components of this. In the figure, the output-information is indicated by unbroken lines. In addition to the feedbacks through the collecting of empirical facts, and the expression of preferences and goals through the political system, the figure also indicates two other sets of feedback linkages. First, from the executive units of the controlling system performing the processes D1 - D4 back to the planning unit, and secondly, from the units of the controlled system to these executive components.

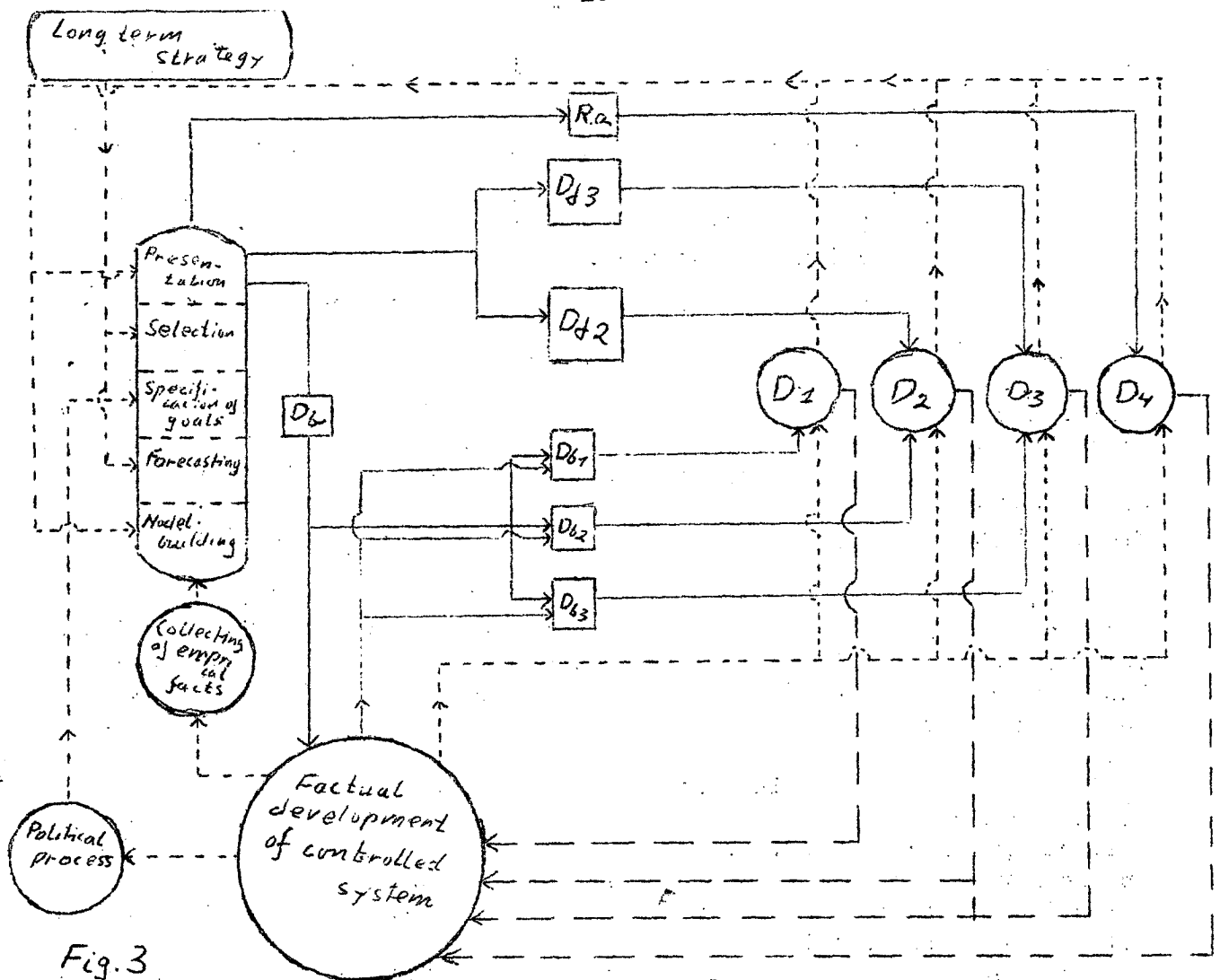


Fig.3

6.5. Apart from the flows of information concerned with review of executed actions, fig.3 identifies all major type information flows and information systems involved in the preparation and implementation of operational plans. In order to obtain efficient control, all the communication channels must be carefully chosen and streamlined. Due to historical reasons, the nature of the problems and to the achievement of economic theory, the institutional machinery for short-term balance planning, and for collecting and processing the information necessary for performing these planning processes are relatively well developed in most countries. Focus of the information system for balance planning at the national level is usually national budgeting models and national accounting frameworks. As in the case of similar planning routines for balance adjustments at the enterprise level, <sup>45/</sup> there seems to be good prospects to "automatize" information collecting and integrate the various information systems and decision processes involved in the preparation and implementation of balance planning both at the national and regional levels. <sup>46/</sup> Structural planning poses more problems than balance planning with respect to identification of information requirements and to establishing efficient information systems,

i.e. to identify sources and channels and to process and present information in an adequate way for decision-making. This is due to the fact that the forces behind structural changes are difficult to identify because their manifestation in actual changes may take place with certain time lags. Furthermore, structural changes tend to present themselves in "new" and unique forms, and do not lend themselves easily to interpretation by means of established theoretical frameworks. On the whole, structural changes involve fundamental uncertainty and show a highly compound and complex character, which make the prospects for automatization of information collecting and integration of the information systems involved in structural planning much less than in the case of balance planning. <sup>47/</sup> However, planning for controlling, generating and adjusting to structural change is a most vital aspect of regional development control. Much attention must therefore be given to the determination of information requirements, identification of sources and the design of the information system for this purpose. The information system for the preparation of structural plans may be linked to the information system for operational planning through common use of some sources and, particularly, through the use of the executive components of the latter as sources for information about emerging structural problems, and otherwise as agents for collecting information to be stored and used in structural planning.

## 7. Information requirements for formulating regional development strategies and operational plans

7.1. The information requirements for formulating regional development strategies depend on what substantial tasks the regional development administration have been assigned within the total institutional machinery for development control. These tasks will vary between countries according to different development problems, political and economic systems, and their approach to regional development. One extreme is where regional development administration is set up on an ad hoc basis to deal with particular problem regions, e.g. underdeveloped, frontier, depressed or congested. The other extreme is where the regional development administration is completely integrated in an overall national development administration. <sup>48/</sup> When regional development is an integral part of the national development efforts, it would seem useful to distinguish between interregional and intraregional strategies and plans. The planning of a strategy for interregional development control is usually a task for the national planning institution, and the strategy a part of the overall national development strategy. <sup>49/</sup> The focus of interregional planning is on interregional processes such as movement of factors of production and goods, development of the main transportation network, economic and social balance between regions, development of the national growth poles and the creating of interregional linkages etc. In this connexion, the distinction introduced by Tinbergen et al between international, national, regional and local sectors with reference to the transportability of goods, and between spatially shiftable and nonshiftable production processes <sup>50/</sup> provides a useful point of departure for determining which processes and activities should be controlled at the national level within the context of a strategy for interregional development, and which at the regional level within the strategy for intraregional development.

7.2. The common feature to most intraregional development strategies is the concern with mobilization of resources and spatial coordination of development efforts within the context of structural planning. In its broadest sense, it aims at inducing changes and improvements in the economic as well as the social structures of the regions. <sup>51/</sup> Its purpose is to provide guidelines and forecasts for operational planning mainly for the regions, but also at the national and local levels. Thus, intraregional planning is essentially of a coordinative character. Vertically, the task is to coordinate and reconcile macro and sectorial planning with planning at the local level, e.g. community development and enterprise planning. The regional level appears to offer the best conditions for such coordination, in addition to opportunities for integrating the vertical considerations with the horizontal, which deals with a) coordination of development among sectors at the regional level, b) identification, appraisal and selection of projects to "fill up" the regional development strategy, and c) translation of the regional development strategy into physical categories, i.e. physical planning.

7.3. The principal information requirements for planning of intraregional development strategy are shown in fig.4, which also indicates the corresponding sources.

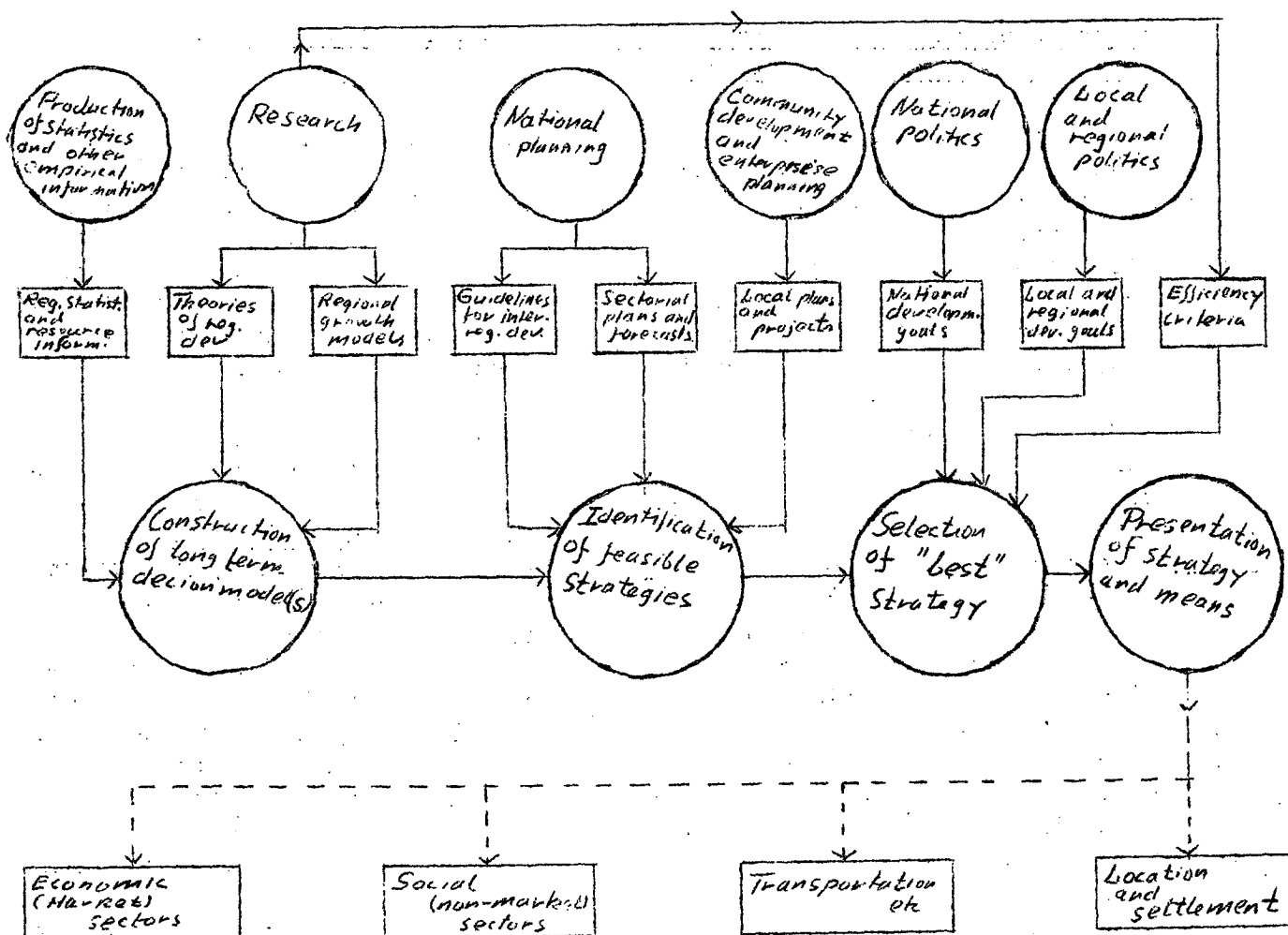


Fig 4



The figure indicates the requirements and sources only; all feedback linkages are omitted. The strategy is assumed to emerge from a planning process consisting of a sequence of four subprocesses, starting with construction of operational decision models, followed by identification of feasible strategies and selection of "best" strategy, and finally, ending in the presentation. Nine different classes of information are necessary as input into the various stages of the process. The corresponding sources are processes within intermediary components of the communication systems linking the planning component to other components of the planning machinery and to the controlled system. For the construction of operational growth decision models, there are three types of input information necessary: theories of regional growth and theoretical models for decision-making and forecasting are assumed to be provided by research activities; while regional statistics and other types of regional information, particularly resource information, are assumed to be provided by special information producing agencies such as central bureaus of statistics etc. Identification of feasible strategies is mainly based on the decision models, combined with the guidelines for interregional development and the sectoral plans and forecasts elaborated in the process of national planning, and with the funds of local projects and plans supplied from the local level. The selection of the best strategies and related forecasts is done among the feasible ones with reference to national development goals supplied from the national political process, and local development goals supplied from the local and regional political processes, in accordance with efficiency criteria established by the control theory and provided by the research activities.

7.4. In order to carry out the planning process in an efficient way, two-way communication channels between the planning unit and the sources must be established. The regional planning component must be able to formulate its requirements for information in a specific way and to obtain the information required from the sources. It is perhaps at this point that the most difficult problems in the design of an information system for long-term regional development planning are to be found. The difficulties involved in obtaining the right type of regional statistics is demonstrated by, among others, Kawalec. <sup>52/</sup> Friedmann and Stöhr have recently discussed the difficult relations between regional science as a field of research and regional planning. <sup>53/</sup> Few countries can argue that they have managed to solve this problem of research policy. The channels to national and local planning and to the corresponding political goal-setting processes have to be dealt with within the context of the information structure of the total development administration. This broad field raises a variety of interesting research problems of which only a few can be taken up in this study. <sup>54/</sup> Turning back to the research activities, it is clear that the requirements of regional statistics and similar types of information about spatial structures and processes of the controlled system cannot be determined by the needs of the planning process alone. Also, the needs of the research processes must be taken into account. While the information requirements for planning can be fairly specific, and the costs and benefits of providing them can be reasonably well assessed, this is not possible to the same extent with research requirements. The most common way to solve this problem is to leave it to the research institutes to conduct their own surveys and collect the information needed. A more efficient way - which computer

facilities make possible at present - is to keep basic information collected by the information producing agencies available in a way that allows for flexible retrieval for research purposes.

7.5. In order to determine the requirements for regional statistics for the purpose of formulating inter- and intraregional development strategies, the following questions must be answered:

- a) What information is needed?
  - i) at the central level?
  - ii) at the regional level?
- b) To which areal units should the information refer?
- c) How often should the information be given?

The questions can only be answered with reference to the models and methods to be employed in the planning process. Simple models for broad planning and forecasting have relatively small information requirements, while more refined models for detailed planning and forecasting require comparatively more information. <sup>55/</sup> The particular needs of regional planning are, first, information characterizing areas as opposed to sectors, and secondly, information about flows of factors of production and goods between areal units. While there is little information in most countries about flows of people, funds and goods, there is often a large amount of information about areal units collected in censuses of people, establishments, agriculture etc. The difficulty is, however, that these types of information are usually collected with a view to national and sectorial planning and administrative purposes and rarely take into account the needs of regional planning. <sup>56/</sup> It is therefore extremely important to formulate the requirements for information from the point of view of regional planning as explicitly as possible, taking the actual conditions and substantial problems of regional development and the methods of planning as points of departure. In the first phase, the available information will have an influence on the choice of models and methods. When the information supply is very scattered and the institutional machinery for information collecting and production is not very developed, naturally, simple models will be chosen which, in the first stage, can be utilized with a relatively modest information supply. However, it is important that the planning of the expansion of information production with a view to future demand is based on corresponding plans for the extension in depth and width of the planning models and methods. In order to give a good overview of the total requirements, it can be organized in a matrix, having the variables for which information is required horizontally and the variables and processes to be forecasted and planned for vertically. In a recent study of statistical requirements for regional planning and investigation in Sweden, in all 124 variables were included for which information was required in order to make regional forecasts and plans for twenty-six key variables.

7.6. Not all information and statistics need to or indeed should be communicated to the central level. In accordance with the decision of labour between central planning having the responsibility for interregional

processes and balance, and the regional planning having the responsibility for the intraregional development, there should be a similar division of labour between central and regional units of the information producing agencies. A guideline to the solution of these interdependent problems is to coordinate the delineation of regions and the division of labour between central and regional components in spatial planning and information production in a way that would make external effects as small as possible, i.e. that the effects of particular plans and decisions are felt primarily within the regions in which they are implemented. <sup>57/</sup> Since regional planning is concerned largely with the same phenomena as national and sectorial planning, but dealing with the particular spatial aspects of them, it is clear that it is the reference to areal units that are the chief characteristics of information requirements. This means that the requirements can be met partly by breaking-down the regular information to relatively small areal units which, in turn, form a flexible set of building blocks for production of information for larger units. <sup>58/</sup> This can be done fairly easily for information about stocks but raises much more difficult problems in the case of information about flows. The basic administrative units can, if they are homogeneous and comparable in size, serve as such building blocks. One reason for this is that a variety of planning and decision processes already take place at this level. Since these units are usually subordinate to the regional authorities, they can furthermore be efficiently utilized as information sources. The need for information for planning within and across the borders for such units can be partly covered by information referred to census or enumeration districts and partly by coordinate fixed basic data, i.e. information referring to the basic elements involved in the development process.

7.7. The most important aspect of the question about the frequency with which the various classes of information should be given is the distribution between current/yearly production, sample surveys and censuses. The time frame of the planning and decision processes, which are rooted in the changeability of the spatial processes and structure, play a decisive role here. Since the formulation of regional development strategy is concerned with the long-term aspects, i.e. structures and processes which change slowly, it can be based on information with longer intervals than information for operational short-term planning in which the yearly budgeting cycles and the production cycles in many trades determine the time frame. On the other hand, in order to assess the trends of slow changing processes, and for the reason of control and review, it is useful to have time series for some few key variables with intervals of not too long. This is particularly necessary for patterns of flows of factors of production and of goods between regions. The production structure in the information producing agencies is also an important factor in the answer to this question. Recently, there has been a trend towards separating the collecting of basic information and the computing of statistics in the direction of conducting the collecting as a continuous process and leaving the computing of multipurpose statistics to the benefit of computing specially designed statistics on the basis of requests. <sup>59/</sup>

7.8. The information requirements for formulating the operational short-term regional plan are, in general, of the same type as for formulating the regional development strategy. While the strategy mainly concentrates on the development of the "new" economy within the context of structural planning, the operational planning must give attention also to the "old" economy and particularly to the links between the new and the old. This will also be reflected in the information system for operational planning having particular communication systems for information related to a) mobilization of resources, allocation of investments, appraisal of projects, and capital budgeting; b) utilization of resources, production control, inducement of innovations and recurrent budgeting; <sup>60/</sup> and c) labour market policy and other adjustments in the old economy to the gradual emergence of the new.

## 8. Sources of information and production of regional statistics

8.1. In most countries, the production of statistics is the task of a central bureau of statistics. The CBS can be viewed as a particular component part of the total controlling system, having the special task to collect, store, process and communicate statistical information to the other component parts of the controlling system and to the elements of the controlled system. <sup>61/</sup> The CBS has its own information system, with corresponding communication systems to the sources and to the receivers. The traditional production process in a CBS is characterized by discontinuity and a low level of integration. The production of the various types of statistics are planned, the basic information collected and the statistics computed, to a large extent, independently of each other. By means of modern computer facilities, and due to impulses from the theory of information systems, there is at present good prospects for operating the information systems of a CBS in a more efficient and integrated way. <sup>62/</sup> It would seem advisable for the less developed countries to utilize these opportunities when they expand their statistical services. Therefore, this study of information systems for regional development takes as a point of departure a skeleton of such modern systems in which the production of regional statistics can be integrated with the production of other statistics.

8.2. The term statistical information is used here to mean information related to two or more statistical units presented in the form of aggregate measures such as averages etc. Statistical units mean the basic units from which information is collected and they are usually defined in accordance with the basic decision-making elements of the controlled and controlling systems. In order to distinguish between information related to groups of statistical units and to individual units, the first category is being called statistical information and the second, data information or only data. The supply of statistical information from CBS takes place by presenting the results from statistical computations. In a model framework presented by S. Nordbotten <sup>63/</sup> the following variables and relations to describe the production and supply of statistics are used:

$$(1) \quad I = f(S, m)$$

where I is the supply of statistics per unit of time, S the stock of computed

statistics, and  $m$  a presentation factor indicating the utilization of  $S$  for publications. The stock of computed statistics  $S$  might be called the capital of statistics because it is involved in description research, planning and decision processes in the same way as physical capital in physical production, and can be used repeatedly. Increase in the capital of statistics, i.e. investing in statistics, takes place through the computation of existing statistics and of data, and is denoted by

$$(2) \frac{dS}{dt} = f(S, D, v, u)$$

where  $D$  is the stock of data, which might be called data capital, and  $v$  and  $u$  are factors indicating the utilization of the capital of statistics and the capital of data respectively. Finally, investment in data capital is defined as

$$(3) \frac{dD}{dt} = h(\text{reporting, collecting})$$

8.3. The essential difference between the traditional way of producing statistics and the way outlined above is the utilization of the capital of statistics and data capital. Traditionally, collected data were processed once in order to arrive at a multipurpose statistical product which was stored and presented to the users but was rarely involved in further processing. In the modern way, the data capital and capital of statistics are kept available in conveniently organized stores for further computations. By arranging the stock of statistics and data in a way that make them reusable, the need for multipurpose processing is considerably diminished, and the CBS can give more attention to the production of "tailor-made" products for special requests. Furthermore, in such a system, old data and statistics can be linked to new ones to strengthen the dynamic character of the statistical information system. In this system, the collecting of data can be done continuously and separated from the computation and presentation of statistics. Production of statistics can then be seen as establishing and maintaining data capital and capital of statistics, the service of which can be called upon by different users as required. <sup>64/</sup> It is evident that the efficiency of such a system depends mainly on two factors: First, the capacity of the computer facilities available and, secondly, on the ability of the CBS to establish and maintain efficient communication systems to the sources of data as well as the receivers of statistics.

8.4. The capital of statistics and the data capital must be organized in a way that makes them readily available for use. Each datum in the data capital is identified by three characteristics: a) the statistical unit to which it refers; b) the variable characteristic of the unit which is observed; c) the point or period of time of observation. Each item within the capital of statistics is identified in the same way. The conditions for efficient organization of the stocks are therefore that each unit in the mass to which the data capital refers is assigned a permanent identification number and a standard code for every variable to be observed. Within the capital of statistics, the national accounting framework can provide such identifiers and codes, which make the statistical information consistent and comparable

over time, and allow for easy computation. <sup>65/</sup> In organizing regional statistics, regional accounts can serve the same function. The design of regional accounts geared to the actual problems regional development control appears to be somewhat more difficult than the design of national accounts, where the short-term anticyclical control provides a focus of decision problems. <sup>66/</sup> However, in order to facilitate the production of regional statistics, regional accounts can at least serve the purpose of,

- a) establishing a set of standard definitions and classifications;
- b) providing corresponding sets of codes and identifiers for technical integration and coordination in the production of regional statistics;
- c) making opportunities for indirect estimation of variables that are difficult to observe directly;
- d) facilitating control for quality and reliability;
- e) being a useful framework for presentation.

The significance of these technical purposes are in themselves reason for giving much attention to organizing regional statistics within an accounting framework. Even though only part of the content of the accounting framework can be filled with statistics at the time, the framework will ensure consistency in the adding of new statistics to old ones.

8.5. From the technical point of view, it is furthermore desirable for the regional accounts to be consistent with and integrated in the system of national accounts. This would provide links between the national and regional figures and allow for cross-checking and comparability. <sup>67/</sup> The point of departure for the design of regional accounts should nevertheless be their functional role in the process of regional development control. <sup>68/</sup> Due to the peculiar characteristics of regional economies as opposed to national, and to the corresponding difference in control problems, there might, however, be conflicts between the considerations of functional design and of consistency with the national accounts. <sup>69/</sup> Two points seem to be important here. First, regional accounts must give due attention to the openness and interdependencies of regional economies, as reflected in the movement of labour, capital and goods between regions, and spatial division of labour respectively. For this reason, it seems necessary to operate both interregional flow accounts and intraregional accounts of stocks and intersectorial flows. <sup>70/</sup> Secondly, regional accounts must be geared to the need of long-term strategical planning as opposed to the short-term anticyclical planning, which is the problem-focus of the present standard national accounts. Since the SNA framework is not geared to development problems, the reconciliation of regional accounts and national accounts appear to require considerable changes in the present SNA framework. <sup>71/</sup>

8.6. In such a system, the production of regional statistics can be broadly divided into two phases - the input of information to the data capital and the retrieval of data for computation, either for regular publications or for particular requests. Much attention must therefore be paid to the

technical organization of the data capital. <sup>72/</sup> This can be done in data banks consisting of registers and files (archives). A register is a list of statistical units within a mass which provides a cross-reference between external and internal identifiers. The establishment of a register must be based on specific definitions of the units and the mass. The external identifier is used to find the unit when information should be collected from the unit, and it will usually be a name and address. The internal identifier goes with the data in and out of the data capital a number of times, and usually consists of a number in order to occupy the minimum of space. The establishment of registers requires that definitions of births, deaths and migration of units have to be given.

8.7. The data referring to the statistical units in a register are stored in data files, which are the concrete counterparts to data capital. The files may be ordered by units, by time or by variables, depending on the requirements for further computations. It might be useful to divide the files in two - one active file containing the most recent observations and one historic file containing the historical observations. <sup>73/</sup> The internal identifiers of the units provide the links between the various files and between the registers and serve as integration keys. A set of registers and files between which integrated computation can take place will be called data file system. Such a system may consist of a limited set of basic registers and files and a larger set of sub-registers and sub-files for the purpose of giving more detailed information. <sup>74/</sup> The need for sub-registers and sub-files stems from the fact that, since the files contain individual observations, they will include a large amount of data. The sub-registers can be individually integrated either directly or via the basic registers. The registers of units and data files are used for computation of regular statistics which, in turn, are kept in statistical files in which the statistics are identified by permanent statistical identifiers for relevant groups, standard codes for variables and a time specification. The fundamental merit of basing the computation of statistics on data files is that when each file is up-dated, the computation of statistics can utilize all the files together, which allows for great flexibility and for computation of statistics which otherwise would not be possible.

8.8. The main questions to be answered in establishing a data file system are:

- what basic registers to establish?
- how to keep the registers up-to-date?
- what variables should be observed and how?
- how often should the variables be observed?
- how should the registers and files be integrated?
- where should the registers and files be located?

The answer to the first question depends on which level of units is to be covered. In Sweden, the proposals for a system to serve the needs of sectorial, regional and local planning have suggested three basic registers, namely, for population, for establishments and for land properties. <sup>75/</sup>

Each individual, establishment and land property are assigned an internal and an external identifier. Since every individual and enterprise can be ascribed to a land property for resident and location, all data in this system referring to individuals and enterprises can be position registered. The introduction of land property numbers gives the opportunity to describe geographical positions in a specific way and to treat the spatial dimension with equally neutral measures as the time dimension through assigning each land property its geographical coordinate. <sup>76/</sup> The use of coordinate registration must be based on a uniform geographical coordinate system. A Royal Committee on Land Registration has proposed that at least two thirds of Sweden should be covered with suitable maps and the land properties registered by coordinates by 1970. <sup>77/</sup> The fundamental merit of position registering of data by means of geographical coordinates is that it allows for computing statistics for areas and regions that can be chosen independently of administrative borders for the particular purpose. Another point of importance is that the coordinates are fixed and stable over time and hence not affected by changes in borders of administrative areas. <sup>78/</sup> When the statistical units are position registered by geographical coordinates, there are very good opportunities to satisfy the particular need for regional statistics in a flexible way. In fact the problem of regional statistics boils down to be that of ensuring that the desired variables are observed.

8.9. Keeping the registers up to date raises very difficult problems of reporting and communication. The best prospects for keeping a register up to date seems to be when the registers are used for administrative purposes, i.e. registers for administrative decision-making concerning individual units such as school enrollment, tax assessment etc. If many administrative bodies use the same registers, the routines for reporting and communicating births, deaths and migration of units can be the task of a central register body, e.g. the CBS, which can serve all the users of the register. When a register is used for administrative purposes, a lot of observations resulting from the administrative processes can be transferred to the data files and thus contribute to keeping the files up to date. However, a precondition for this is that all administrative bodies use the same classifications and standard codes. In this way, a lot of basic data can be acquired without a direct collection and used for computation of statistics. <sup>79/</sup> In establishing a data file system, much attention should therefore be given to the prospects of using administrative processes as sources for data collection. In particular, this seems to offer a good opportunity to countries with less developed machinery for collecting data. <sup>80/</sup> When registers are established and kept up to date, they furthermore provide excellent opportunities for sample surveys and collecting of data which would not be possible to get through administrative processes.

8.10. The answers to the questions about which variables to observe and how often the file for a particular variable should be up dated must be determined by the need of the various information processes in which the data serve either directly or through the computation of statistics. The regional development administration must present its requirements together with the other users. The many priority problems that crop up in this connexion can only be settled in relation to the actual need of a particular



country or area. With respect to the problems about how to undertake observations and collect data, the framework outlined above also provides opportunities to utilize observations by means of remote sensing. This technique is still in its first phase of development, but it would seem to be a very useful way of collecting areal information, which may be particularly suitable for countries with less developed machinery for ordinary data collection. <sup>81/</sup> Finally, where should the registers and files be located - centrally or regionally? This question, of course, can only be answered specifically with reference to the actual conditions in the various countries. In a developed country with well developed communication facilities, uniform administrative processes throughout the country and access to modern and large data processing equipment, e.g. on line, time sharing, multi-programming, and real time, central location of basic registers and files seems to offer the best prospect for efficient integration and utilization. <sup>82/</sup> In larger countries and developing countries not fulfilling the above conditions, the particular need of regional planning and control appear to be best served by a higher degree of decentralization of subregisters and subfiles. Registers and files of data and statistics, which primarily serve the particular purpose of intraregional development control, could be decentralized. However, it is of extreme importance that the working of the decentralized components of the statistical information system are supervised by the central component in order to ensure a consistent design of definitions and classifications and technical opportunities for combining data from different data centres. <sup>83/</sup>

8.11. In establishing a statistical information system centred around a system of integrated registers and files of data and statistics, two points should be given much attention. First of all, that the system should be as flexible as possible with respect to use, i.e. that integration opportunities should be given either directly or indirectly between all the files and registers. Secondly, that systems should be as flexible as possible with respect to further development. This means that it should be based on a conceptual framework of definitions, classifications and standard codes referring to a flexible overall system for national and regional social accounts, and for the organization of the data files. Such a basic framework, which would ensure consistency and comparability over time, should be provided from the beginning, even though only a limited part of the information content can be filled in the first stage. However, the collection of data and computation of statistics can then be expanded over time within an overall information framework without demanding changes in the structure of the framework.

## 9. The empirical investigations

9.1. The ultimate aim of the project discussed in this paper is to contribute to the efficiency of regional development control by trying to arrive at some normative conclusions about how information systems necessary for regional development control should be designed, established, operated and expanded. Such conclusions cannot be drawn with any general validity. To a large extent, they will be conditioned to the particular institutional system and substantial problems of development in the various countries

concerned. Nevertheless, the study is based on the assumption that some common broad similarities and "rules" exist for information systems for the particular purpose of regional development control, and that these can be brought out in a set of country case studies conducted with a common approach and frame of reference. It is also hoped that the study will have some value as a pilot project and contribute to the development of the practical methodology for investigations upon which information systems for regional development can be designed and improved. However, there is a long way to go before such normative conclusions can be drawn, and the present stage of the project will be mainly concerned with accomplishing two initial tasks: the development of tools for precise description of the object of the study, and the application of these tools to describe

- a) regional development as a controlled process;
- b) the tasks and elements of information systems as auxiliary systems for regional development administration;
- c) the types and organization of information handled by the information systems;
- d) the relations between the various information systems involved.

In the choice of countries for a set of case studies, it would seem necessary to distinguish between countries according to i) degree of development, i.e. advanced versus developing; ii) social and economic systems, i.e. countries with mixed economies versus countries with centrally planned economies; iii) approach to regional development control, i.e. countries with an ad hoc approach mainly concerned with resolving problems, in particular problem regions versus countries where regional development control is an integral part of the national development effort. Even though the three classifications are by no means dichotomies, they are useful in pointing out the most common and interesting cases. The study will not cover all combinations by case studies, but it is intended to include at least six countries. 84/

9.2. The descriptive phase of the study will aim at describing the actual tasks and institutional structure of the regional development organization within the complete administrative systems of the countries. Particular attention will be given to the relationships between the long-term strategical planning, the short-term operational planning, and the organization for the execution and review of actions and projects. The description of the institutional machinery, the planning problems and the methods actually used will reveal the information requirements at the various organizational levels. The next stage will be the identification of the major information systems, the appropriate sources for information and of the channels through which information is obtained and transmitted. The distinction between the various classes of information mentioned in sections 4-5 will be applied, and the various components of the regional development administration necessary for performing the planning, decision-making, execution and review processes will be surveyed. It will not be possible to do this in great detail in view of the vast amount of decisions and information exchange involved. The aim is delimited to describing the

basic structure of and interrelations existing between the more significant information systems actually used in the control and directing of regional development in the countries studied. Particular attention will also be paid to the use of regional accounts and data banks, and administrative processes as sources of data for the processing of statistics.

9.3. The descriptive phase will provide a basis for the two final phases, viz. the positive and the normative. The positive phase will aim at "explaining" some properties of the information systems found, and differences between corresponding information systems in different countries by reference to variations in basic characteristics, for example, i) overall system of economic planning and management; ii) problems of and approach to regional development; iii) structure of the administrative system; iv) methods and techniques used in planning and decision-making etc. The importance of positive analysis is that it might reveal stable patterns of the behaviour of decision-makers, technical relationships and characteristic features common to information systems for different decision problems and in different environmental conditions. <sup>85/</sup> Since information systems are auxiliary systems and subject to control, care should be taken not to over generalize and view the relationships found as being of a completely predictable character. Some positive analysis will nevertheless be indispensable for understanding the structures, interrelations and functioning of the information systems in question, and to identify constraints to be taken into account in the normative analysis.

9.4. Even though it is hoped that the conclusions will also be of some general value, the normative analysis will be geared to the conditions and needs of the developing countries. The aims are to draw conclusions about how information systems necessary for regional development control in less developed countries should be designed and operated so as to obtain efficient control and rapid development. This phase of the project will therefore be concerned with questions relating to

- a) place and functional role of the regional development administration within the total development administration;
- b) the allocation of planning, decision and implementation tasks to the various components of the regional development administration, and the relations between central and decentralized components;
- c) the provision of adequate information to these components;
- d) the accessibility of information sources and the availability and utilization of information;
- e) the efficiency of the channels through which information is acquired;
- f) how the information can be organized with respect to content by means of accounting frameworks;
- g) the collecting and registering of basic data for production of regional statistics, and the use of integrated data files;

- h) the use of administrative processes as sources for basic data;
- i) the opportunities to utilize remote sensing in data collection;
- j) the choice of areal units for presentation of regional statistics and the frequency of presentation;
- k) the choice of appropriate channels for directing and control of the development of the controlled system;
- l) the integration of information systems.

9.5. The crucial problem of the study will be to demonstrate the benefits that can be gained from basing regional development control on carefully designed information systems. This question is inextricably tied to the goals of development control and to criteria for efficiency as established by the theory of control, i.e. theory of regional development strategy and operational planning. A distinction should be made here between at least three types of benefits to be gained:

- a) improved efficiency in the planning work and in the management of the regional development administration;
- b) improved efficiency in the control efforts due to the provision of more and better information with given methods of control;
- c) improved efficiency in the development control due to improved methods of control resulting from improved information systems.

If there benefits were to be measured and compared to the costs in a normal cost-benefit analysis, a great number of intricate problems would emerge with respect to quantification, measurement and evaluation, which at the present stage seem beyond the scope of a comprehensive study like the one discussed here. <sup>86/</sup> On the other hand, it is hoped that the benefits to be gained and some of the costs involved can be demonstrated in a way that is satisfactory from a practical point of view. The methods of demonstrating probable benefits and costs would seem also to be a valuable tool and perhaps less difficult to apply in priority making in connexion with extending the information content in a given information system, with establishing additional information systems and in similar problems.

9.6. The project is divided into four phases but the work on it will proceed without keeping too rigidly to the initial scheme, and the approach and way of work will take into account that the project is designed to serve a practical purpose. Concepts, theories and knowledge from all the relevant fields will be brought together in order to elucidate and analyse problems rather than to contribute to the advancement of any particular discipline. In the same way as regional science tries to bridge the gap between a number of basic disciplines, this project can be seen as an attempt to bridge part of the gap between regional science and regional development efforts.

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ALGUNOS PRINCIPIOS DE DESARROLLO REGIONAL

Estas notas preliminares tienen por objeto servir de punto de partida y marco de referencia para una discusión interna en ODEPLAN tendiente a formular las bases del desarrollo global y regional en el decenio 1970 - 1980.

Antes de definir y comentar algunos criterios básicos que pueden orientar una estrategia de desarrollo regional para Chile, es útil dejar establecido algunas hipótesis y definiciones de importancia en este contexto.

En primer término, estas notas se refieren al desarrollo regional enfocado desde un punto de vista nacional y en consecuencia algunos de los <sup>los</sup>principales enunciados más adelante podrían no ser válidos o no tener igual relevancia cuando la situación analizada corresponde a una región en particular.

En segundo término, conviene adoptar de partida una definición de los términos planificación regional y desarrollo regional, definición que no está exenta de arbitrariedad, pero que permite razonar sobre una base común. En lo posible, ambas definiciones corresponden a adaptaciones de los mismo conceptos

utilizados tradicionalmente en niveles más generales.

Por planificación regional entenderemos simplemente una técnica para racionalizar el proceso de toma de decisiones en un contexto de desarrollo regional.

Por desarrollo regional entenderemos un proceso de crecimiento secular del producto (o ingreso) per cápita sujeto a dos restricciones: i) que sea simultáneo en todas las regiones del país; ii) que su resultado sea una disminución de los desequilibrios inter-regionales del país (cualquiera sea la forma en que éstos se midan).

Con algo de pretención o ambición podemos indicar en seguida un conjunto de "principios" básicos del desarrollo regional.

1.- El desarrollo regional es un proceso de largo plazo.

La cuestión temporal es, en este contexto, un problema de la mayor importancia como lo han reconocido algunos de los más importantes especialistas en la materia.

La planificación del desarrollo regional sólo adquiere sentido si la estructura espacial actual del país se juzga negativamente. Por múltiples razones que no es del caso analizar acá, modificar esta estructura requiere de un plazo mayor que el necesario para lograr objetivos similares en otros ámbitos de acción.

Por otro lado, el conflicto entre los objetivos (o las metas) globales y regionales no es absoluto irreal y resulta evidente que el objetivo de un desarrollo geográficamente más armónico implica un costo que en el corto plazo puede medirse a través de la reducción de la tasa global de crecimiento. Por lo tanto, es el largo plazo la dimensión temporal dentro de la cual es posible conciliar ambos tipos de objetivos y ello implica que es irreal (o ineficiente) esperar resultados espectaculares en el desarrollo regional de corto plazo. Incluso, como ha sido probado, el objetivo de disminuir las diferencias inter-regionales lleva aparejado el hecho de aumentar las diferencias intra-regionales y este problema sólo alcanza una solución en el largo plazo.

Todas estas consideraciones hacen pensar que la planificación regional está más ligada al proceso de "reordenamiento del territorio" que a puras consideraciones económicas.

## 2.- El conjunto de regiones forma un sistema.

Que un conjunto no es necesariamente un sistema, pero que un sistema es necesariamente un conjunto, es algo más que un mero juego de palabras en el campo del desarrollo regional nacional.

En general los planificadores regionales, agobiados por la presión de los problemas de corto plazo y limitados en su pensamiento por la ausencia de métodos adecuados, suelen olvidar que las regiones que conforman un país componen un sistema orgánico con relaciones funcionales definidas entre sus elementos. El descuido de estas características esenciales del desarrollo regional es la causa principal de no pocos de los problemas de consistencia y de coordinación que se observan a menudo en la práctica, en este orden de cosas.

Ciertamente que sería un avance de no poca importancia el que los planificadores regionales tuvieran presente en cada momento que las medidas propuestas para una región no son en absoluto independientes de las que - consistentemente- debieran proponerse para otras regiones y que los resultados que se obtienen en una región están condicionados o condicionan los resultados en cualquiera otra región del sistema.

Por cierto que el reconocimiento explícito de este fenómeno de interdependencia plantea presiones de envergadura sobre i) el desarrollo metodológico; ii) el sistema de información.

No obstante, aún cuando estos dos aspectos se <sup>/no</sup> en cuentren tan desarrollados como para permitir operar eficientemente sobre el sistema regional, es siempre preferible reconocer y tomar en cuenta la interdependencia que ignorarla.

Por otro lado, el hecho de constituir el conjunto de regiones un sistema, implica la necesidad de controlar más estrechamente y desde el nivel central, las distintas "estrategias" regionales y en lo posible, garantizar su simultaneidad.

3.- El desarrollo regional se fundamenta en los recursos naturales.

Una de las mayores contribuciones que puede hacer la "teoría regional" al proceso de racionalización del cambio consiste en la identificación y valoración de los recursos naturales regionales.

La explotación racional e intensiva de los recursos naturales por las propias regiones debe constituir el punto de partida en cualquier programa de desarrollo regional y un esquema de esta naturaleza debiera contribuir significativamente a romper la estructura dual del territorio y a eliminar la explotación monopólica (e imperialista) por parte de las regiones más desarrolladas del país.

Ciertamente que debe reconocerse que este principio no tiene igual importancia en todas las regiones, dada la heterogeneidad en la distribución espacial de los recursos naturales; por otro lado, resulta altamente interesante en el caso chileno si se tiene en cuenta la relativa especificidad de los recursos naturales en cada región del territorio.

En nuestro país es de la mayor importancia introducir cambios tendientes a explotar racionalmente y a conservar y renovar los recursos naturales (avance del desierto, tala de bosques, erosión, etc.) y para ello resulta más adecuado el nivel de acción regional.

Desde otro punto de vista, la filosofía de este principio radica en el viejo proverbio: "ayúdame que yo te ayudaré", es decir, la idea de que el desarrollo regional se "hace" en la región y no se "impone" desde la capital.

4.- La industrialización, desde el punto de vista regional, es un instrumento compensa<sup>ORIG</sup>tivo.

La aceptación del principio anterior lleva consigo la aceptación del hecho que el desarrollo industrial no es una política eficaz para todas las regiones.



Es claro que en este punto debe hacerse una distinción importante. La explotación de los recursos naturales desemboca en alguna medida en la fase industrial. Por lo tanto, al hablar de industrialización debe entenderse que el proceso se refiere a actividades manufactureras no directamente vinculadas a los recursos naturales, en términos de localización. Por lo demás, el desarrollo tecnológico y de los transportes tiende cada vez más a independizar la localización industrial de las materias primas.

Considerar la industrialización como un instrumento compensatorio del desarrollo regional es la única forma de resolver el conflicto que en determinadas etapas del desarrollo industrial se presenta en términos de concentración vs. dispersión industrial.

Es un hecho que la etapa de desarrollo industrial que vive el país obliga a la creación de industrias de alta tecnología, de grandes escalas de producción y de competencia supra-nacional y este tipo de industrias requieren de una concentración urbana e industrial que sólo se da en dos o tres puntos del territorio.

En consecuencia, la valoración de los recursos naturales regionales debe permitir evaluar el potencial de crecimiento de cada región. Si este potencial se juzga satisfactorio, de acuerdo a la definición de desarrollo regional y de acuerdo al rol que la región debiera tener dentro del sistema inter-regional, no debiera alentarse la industrialización de esa región y ella sólo debiera llevarse adelante si i) el desarrollo de los recursos naturales no permite aumentar adecuadamente el producto per cápita y/o ii) la región debe jugar un papel de tal importancia (Bío-Bío por ejemplo) que no baste el crecimiento vía recursos naturales.

5.- El desarrollo regional debe ser un desarrollo "asociado".

La socialización y la participación son dos de los signos más notorios del tiempo actual. Mal podrían los planificadores, que al igual que Jano miran con una cara hacia el futuro, desconocer esta tendencia hacia alguna forma no determinada de participación.

Precisamente por el hecho de que la manera de participar no está precisada, hemos preferido emplear el término más genérico de Asociación.

La idea central que envuelve este principio también está vinculada al proverbio citado anteriormente. Por otro lado, como ha sido expuesto por otras personas, el conflicto social existente desde hace largo tiempo en Chile sólo puede resolverse en un nuevo esquema de colaboración social (esto envuelve un juicio político).

Parece particularmente cierto que el éxito de un programa de desarrollo regional está directamente vinculado al grado en que la comunidad regional se identifica y "asocia" al esfuerzo que implica este desarrollo. Por cierto, los sociólogos estarían dispuestos a reconocer que esta asociación es más importante (y felizmente más fácil de lograr) cuanto menor es el tamaño del espacio sobre el cual se aplica el programa.

En concreto, este principio implica la necesidad de asociar directa y materialmente a la comunidad regional al esfuerzo y también a los frutos del desarrollo regional.

El modo preciso de hacerlo no está definido, pero es probable que vía participación financiera (Fondo de Capitalización, CAR, etc.) y vía participación administrativa y de propiedad (Corporaciones Regionales, Consejos Regionales de Desarrollo) se encuentre el camino apropiado.

En cualquier caso, pueden hacerse distintos ensayos en diferentes regiones; no tendría por qué existir una solución única a través de todo el país.

6.- El desarrollo regional es un proceso comprehensivo.

El término "comprehensive" se utiliza acá para de-  
notar la coexistencia de los aspectos puramente económicos  
del desarrollo y los aspectos sociales de éste.

En otras palabras, el objetivo general de "integración" que se adscribe frecuentemente al desarrollo regional, no puede alcanzarse si no se concede importancia y consideración explícita a los problemas de distribución de ingreso y acceso a la cultura y al poder al nivel regional.

Tampoco en este caso se conoce un mecanismo definido para actuar sobre estos problemas (salvo el caso de la distribución del ingreso), pero también es claro que hay una tendencia creciente en todo el mundo por despojar al proceso de desarrollo económico de las excesivas connotaciones tecnológicas que lo han acompañado usualmente.

## 7.- Concentración dispersa del desarrollo regional.

Los principios enunciados anteriormente conducen en forma lógica a una determinación de prioridades regionales que envuelve una estrategia definida en términos nacionales y esta estrategia significa concentrar el esfuerzo de desarrollo en algunos puntos claves del territorio que cumplan la doble función de desconcentrar la actividad económica y descentralizar el proceso de toma de decisiones. Ello implica la definición cuidadosa de los polos de desarrollo y muy especialmente, la definición de sus funciones y en consecuencia de su equipamiento.

La idea subyacente en este principio es que una vez definidos los polos (con una adecuada ubicación geográfica) el espacio comprendido entre dos polos puede desarrollarse mediante el simple y mecanicista proceso de la interacción de los polos.

Es conjunto de principios del desarrollo regional, que no son en modo alguno exhaustivos y que se presentan en forma tentativa, podrían servir de punto de partida para una discusión de mayor profundidad tendiente a determinar en la forma más eficiente posible la estrategia nacional de desarrollo regional.

