

SYSTEMS RESEARCH INSTITUTE  
POLISH ACADEMY OF SCIENCES

INTERNATIONAL INSTITUTE FOR APPLIED SYSTEMS ANALYSIS

CONTRACTED STUDY AGREEMENT REG /POL/1

**"CONCEPTS AND TOOLS FOR STRATEGIC REGIONAL  
SOCIO-ECONOMIC CHANGE POLICY"**

**STUDY REPORT**

**PART 1**

**BACKGROUND METHODOLOGIES**

**COORDINATOR, IIASA: A. KOCHETKOV  
COORDINATOR, SRI PAS: A. STRASZAK**

ZTS/ZPZC/ZTSW 1-36/85

WARSAW 1986

SYSTEMS RESEARCH INSTITUTE  
POLISH ACADEMY OF SCIENCES  
AND  
INTERNATIONAL INSTITUTE FOR APPLIED SYSTEMS ANALYSIS

CONTRACTED STUDY AGREEMENT REG/POL/1  
"CONCEPTS AND TOOLS FOR STRATEGIC REGIONAL  
SOCIO-ECONOMIC CHANGE POLICY"

STUDY REPORT  
Consisting of 3 Parts

PART 1  
BACKGROUND METHODOLOGIES

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Podr. ZTS

9. 4. 4



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This report presents the main portion of results obtained in the research performed under the Contracted Study Agreement REG/POL/1 this agreement being between the International Institute for Applied Systems Analysis (IIASA) in Laxenburg, Austria, and the Polish Academy of Sciences, Warsaw. Contents of the research effort was defined by Prof. Andrei Kochetkov from IIASA, and the in-house work has been directed by Prof. Andrzej Straszak of the Systems Research Institute, Polish Academy of Sciences. According to the Agreement the research has been carried out under the heading of "Concepts and Tools for Strategic Regional Socio-Economic Change Policy".

The present volume(Part 1)contains methodological background papers, reflecting primarily the methodological work done within the project.

## INTRODUCTION

by Andrzej Straszak

The present Report, together with the previously prepared documentation of the Warsaw workshop of December 1984, summarize in a way the research work done within the framework of the contracted study REG/POL/1, focussing on the strategic aspects of regional development, involving long-term analysis and planning and related methods, technological options, inter-actor interplay assessment and the like.

In fact, almost from the beginnings of IIASA the region, being a specific socio-economic, but also economic and technological system, has been considered a proper object for international, East-West studies. Several research groups, one from the Management and Technology area, second one from the Regional Development and still another from the environment field have worked together and/or consecutively for more than ten years on matters related to this object. It was namely seen at IIASA and is increasingly better understood elsewhere that Management, Technology, Region and Environment are becoming more coupled than ever, and that they will even more be so during the next few decades when we shall be entering with an accelerating speed the New Technology Age.

The transition process, leading from the Old Technology Age to the New Technology Age, has already started, not only in Japan, but also in other parts of the world, and it will cover new geographical as well as economic and technical areas. Thus, in the nearest time period, the time scale being defined by the internal dynamics of own development processes, almost all regions in almost all countries of the world shall face the necessity of economic and technological restructuration.

This fact results from two processes having world-wide importance: globalization of economic processes and generation shift in technology.

Nowadays many regions in numerous countries of the world constitute essential elements of the world's economy, mainly through output directed not only towards own needs, but also

for satisfaction of the world economy's demand.

Nowadays many production technologies and products are related to a new generation which in principle did not appear in previous decades. Flexible manufacturing systems and the CAD/CAM systems are becoming realities in many regions of - as yet only - most developed countries, but shall soon become necessary in almost all regions of almost all countries of the world.

Introduction of electronics, application of microprocessors in an increasing number of production processes, far-reaching informatization-computerization - of services is also an easily observable phenomenon.

Globalization of economy and new technologies make new issues and new problems appear, new challenges start facing almost every region in almost every country, irrespective of the applied institutional mechanisms of economic life.

If in the '70s, as a result of several years of international research conducted at IIASA, largely founded on the "case study" approach, the concept of integrated regional development was forwarded, it was to an important degree based upon the need of internal, intra-regional rationalization of the development processes and it was not just by incidence that questions related to natural environment played an important role in this concept, while questions of economy and technological change, although taken into consideration, did not yet have the decisive importance.

When taking up again the international studies on the key questions of regional development in the middle of '80s, one differently sees the basic development questions facing nowadays or in the near future individual regions.

Professor A. Kochetkov from IIASA, who has undertaken the hard job of organizing a new phase of international systems studies in the domain of regional development problems, forwards the question of "Competitiveness" of a region as compared to other regions, and also the need of implementation of CAD/CAM systems in the regional practice. In regional circumstance CAD/CAM should be understood as computer aided design of the development strategies for a region, while computer

aided manufacturing in a region, when region is treated as a unit producing for satisfaction of needs of other regions and thereby becoming an economic unit, a firm with its all, or at least with the most important of its features.

The overall material, presented now at the end of the contracted study is composed of 4 parts. First three parts make up the present final Report, and the fourth part contains the proceedings and additional documentation of the December 1984 Warsaw workshop devoted to analysis and making of Strategic Regional Policies.

Part 1 of this Report highlights methodological aspects taken up in the study. Indeed, methodologies oriented at strategic regional problems, whether technological, economic or resource-wise, do still require further development and improvement. It is true that most of the methodological work done at IIASA preserves its validity for these problems, but nevertheless some additional studies had to be performed, referring to such areas as softer approaches and methods, involving expert assessments and non-probabilistic uncertainty, or forecasting and planning with purely economic models, oriented at such special interests as investment delays, of importance for long-term studies, or influence of tax schemes on behavior of economic agents.

It should be noted that most of the methods proposed and used are of universal value, but that also some of them were elaborated or chosen having in mind particular local conditions of the country in which the study was performed. In particular, economic reforms of the last few years in Poland found some reflection in the work done.

Part 2 of the final Report contains the description of the Polish case study. Experience of previous IIASA work within the domain has shown that performing of the case studies is a necessary ingredient of this type of research. Such a conviction finds its reflection and, simultaneously, justification, in the present report. Initially, a broader scope of cases was proposed. Out of this proposed series only the Polish case was finally performed and is presented here. It should be noted that the case study brought about clarification of a number of substantial questions pertaining to the region analysed and

its problems, provided a test bed for the methods employed and thereby yielded valuable results. Besides that, however, it could be used as a carrier for deeper discussion on the subject, since a number of local decision-makers, representatives of central institutions, planners and designers as well as external experts were convened in the course of the study, see Chapter V of Part 2.

Part 3 is devoted to presentation of some of the software elaborated in connection with the research conducted. It is namely characteristic for the modern system studies to refer to standard techniques, but also to develop tailored software, whose examples are also presented. This software was in principle developed using a variety of hardware, but it can be ultimately implemented on any existing professional microcomputer system. Some applications were in fact run on a Polish microcomputing equipment.

In addition to the three parts constituting the main body of the Report, the study material contains also, as an Addendum, documentation of the Warsaw December 1984 workshop, two volumes of "Strategic Regional Policy". This documentation contains all the papers presented, plus some of those delivered after the workshop, additional exhibits related to the papers, as well as carefully edited discussion. It should perhaps be mentioned that this workshop had a follow-up in the form of a conference in Tbilisi, Georgia, USSR, whose theme was "Time factor in regional development". This conference, chaired by A. Kochetkov, involved a number of Soviet scientists as well as some foreign ones, including those who took part in the Warsaw workshop or its preparations (R. Bolton, R. Funck, T. Kawashima, U. Loeser, J. Owsinski, A. Straszak). Organizational and financial aspects of this conference were also partly taken care of within the framework of the REG/POL/1 contracted study agreement.

When starting this research the team was fully aware that work should be done internationally and that it should go along three main lines: methodological, case-studying, and international-interdisciplinary workshops. Lessons from this contractual study show that, within the IIASA context, not only is there a possibility of reestablishing an East-West scientific



network related to the domain, but that once reestablished it can be broadened and made to work effectively, provided, however, that such scientific activity has a stable support and longer time horizon within the IIASA plans and programs. Experience shows clearly that under the auspices of IIASA seemingly national case studies gain in importance and become of international interest, as it was for the cases in Poland, FR of Germany and Japan, initially chosen to be performed. Disappearance of the subject from the IIASA plans makes furthering of such valuable studies of universal significance difficult.

Thus, although in the present IIASA plans the subject here undertaken does not appear, it should be hoped that it will come back, in view of the fact that this subject is still pressing in many countries, which found its corroboration in studies performed and in wide international contacts related to these studies.

\* \* \*

The material here presented was the subject of Seminar - - Status Report of the collaborative study. This seminar did not only serve for reviewing and assessing the work done, but also helped in shaping the contents of the volumes now presented. Appended to this Introduction a reader shall find the agenda of this seminar.

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SEMINAR - REPORT ON

STRATEGIC REGIONAL POLICY :

"CASE STUDY AND METHODOLOGICAL BACKGROUND"

within the IIASA-SRI PAS contracted agreement

REG/POL/1

WARSAW, MARCH 18, 1986

CHAIRMEN OF THE SEMINAR :

Prof. A. Straszak  
Systems Research Institute  
Polish Academy of Sciences

Prof. A. Kochetkov  
International Institute for  
Applied Systems Analysis

AGENDA

10:00 am : A.Straszak: Introductory remarks. Course of work.

CASE STUDY

10:20 am : J.Owsiński : Polish case description.

10:45 : W.Ciechanowicz : Energy-related technological alternatives for the case.

11:30 : A.Babarowski : Water balance conditions and plans for the case.

11:50 : J.Owsiński : Some conditions for technological change in agriculture.

12:20 : Coffe break

12:40 : A.Jakubowski : Methodological foundations for the case study forecasting session.

1:20 pm : A.Jakubowski/ J.Owsiński/ A.Straszak : Results of and conclusions from the cross-impact forecasting session.

2:10 : A.Straszak : Summary of the case study.

METHODOLOGICAL BACKGROUND

2:30 : J.Owsiński: Strategic analysis software: know-how and state-of-art.

2:45 : K.Cichocki and collaborators: Investment and investment financing analysis.

3:25 : A.Kałużsko: Computer model for air pollution forecasting.

3:45 : J.Kacprzyk: Strategic policy analysis via fuzzy sets.

4:05 : J.Stefański: Strategic aspect of tax regulations.

4:40 : A.Kochetkov/ A.Straszak: Final remarks.

PART 1: BACKGROUND METHODOLOGIES

SUMMARY

This volume i.e. Part 1 of the study report, contains presentations of a number of methodological approaches elaborated in connection with the project, to which this report pertains. Some of these approaches were developed especially for the purposes of the collaborative project but mostly they stem out work done anyway at the Systems Research Institute and were in these particular forms here outlined oriented and/or implemented having in mind goals of the project REG/POL/1.

A portion of methodologies presented reappears in Part 2 of the report devoted to Polish case study in strategic regional analysis and management, and some of them are documented in Part 3, Appendix to the report, containing software descriptions.

In developing methodologies and their test-cases the team tried to stick to the following principles:

- \* correspondence with the features of strategic problems, i.e. uncertainty, lack of clear problem definition, long-term dynamics etc.,
- \* correspondence with human capacities and experiences as to the questions of strategic analysis and planning,
- \* robustness of approaches,
- \* significance of test results.

In particular, attention was paid to the first two principles inasmuch as in considering strategic problems involving societal changes, technological innovations and economic trends, there is very little room for strictly defined model structures let alone parameter values.

After the general introduction into the report, outlining its foundations, goals and reach, chapter one is devoted to sys-

tematic, albeit short, presentation of an overall approach to sensu stricto strategic problems i.e. such that they are perceived as appearing over long-term horizons and having large implications. This approach is paralleled by an overview of techniques available, especially those within the Systems Research Institute. Chapter two describes a family of such techniques, based upon the cross-impact procedures, and dwells upon one of them that was used in the Polish case study, reported in Part 2. It also contains some proposals for extensions of the method. Chapter three is devoted to fuzzy-set-theoretic model of decision making, especially well suited for strategic purposes: in its functioning it is largely based upon human experience and knowledge. Subsequent chapters contain more definite applications of models, in particular those derived from econometric and control theories, as well as game theory, to analysis and planning of economic systems, on enterprise, branch and sector level, accounting for flexibility of rules, and from the substantial point of view, also for financial relations and regulations.

Thus the volume provides quite an important set of methodological papers, summarizing this aspect of work done within REG/POL/1.

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STUDY REPORT

PART 1: B

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**PION III**

PART 2: POLISH CASE STUDY REPORT

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PART 3: APPENDIX: SOFTWARE AVAILABLE

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