PROCEDURES FOR CONTINUING METROPOLITAN PLANNING

FINAL RESEARCH REPORT

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Metropolitan Plan Evaluation Methodology - Phase III

PROCEDURES FOR CONTINUING METROPOLITAN PLANNING

by

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16. Abstract

The continuing metropolitan planning process consists of a complex of activities involving elected and appointed decision makers, private citizens, and technical staff. The demands on these participants are enormous in terms of time, energy and intellectual ability. Past research has sought to expand the information available to this planning process; however, little effort has been directed to the problem of managing the process itself, such as procedures to enable participants to cope with this increased flow of information.

Two procedures are proposed in response to the above problem, the planning process diagram and the planning situation chart. These procedures represent the continuing planning process using concepts drawn from artificial and natural language. Part One of the report describes the authors' definition and perspective on the continuing planning process. Part Two describes the two representations, or language systems. Part Three demonstrates the use of the languages in a prototype planning process drawn from a watershed planning program of the Southeastern Wisconsin Regional Planning Commission.

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PREFACE

This report marks the conclusion of the third phase of the Metropolitan Plan Evaluation Project. Findings of both phases two and three are summarized here. More detailed and technical results have been reported previously.

The planning procedures described in this report were invented by Dr. Chris McDonald during a five year period of residence at the University of Pennsylvania. Dr. McDonald has now returned to Great Britain, and is further developing these concepts at the Institute for Transport Studies, University of Leeds, under a grant from the British Social Science Research Council.

The demonstration case study reported here in Part Three was made possible through the cooperation of the Southeastern Wisconsin Regional Planning Commission. We are especially grateful to Dr. Kurt W. Bauer, Executive Director, for his encouragement and penetrating criticisms of our work, and to William D. McElwee, Chief Planner, Natural Resources and Environmental Design Division, for his patience and care in answering our most detailed questions. Although the findings reported to date fall short of our initial expectations, we hope this situation may be corrected in the future.

Finally, I would like to express my gratitude to the Federal Highway Administration for its financial support of this research during the past six years. A special note of thanks is due Will Terry Moore for his guidance, encouragement, and especially for his insightful comments on our work.

This final report was compiled from a series of reports and papers written by Dr. McDonald. The concepts, opinions, findings and conclusions expressed in this summary report, as well as other products of this research, are the authors' views, and should not be attributed to either the Federal Highway Administration or the Southeastern Wisconsin Regional Planning Commission. Errors of interpretation and omissions are my responsibility.

I am grateful for the support of the British Science Research Council during 1972-73, when part of this report was prepared. The final manuscript was typed by Ms. Dorothy Yacek, and the figures were prepared by Mr. Godwin Odumah. I am grateful to them for their expertise and care.

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Philadelphia, January 1974

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PART ONE

PERSPECTIVES AND PROBLEMS WITH CONTINUING PLANNING

CHAPTER 1

SUMMARY AND BACKGROUND

Summary of Research and Demonstration Findings

Following the completion of the review monograph, Metropolitan Plan Making, we turned our attention to research on how to improve the plan making process, especially in the continuing program context. One part of our research concerned how to improve the use of predictive models in plan making. Our findings were published in the literature [Boyce (1970, 1971), Boyce, Farhi and McDonald (1972)], as well as reported to the Federal Highway Administration [Boyce, McDonald and Farhi (1971, Part One) and Farhi (1971)].

Another part of the research dealt with methods for describing, analyzing, coordinating and eventually for managing the plan making process and especially its decision making components. This research was reported initially in Boyce, McDonald and Farhi (1971, Part Two) and in Boyce and McDonald (1972). In addition several papers have been presented at professional meetings. This report summarizes the research and demonstration findings on the second part of the research. The report is intentionally brief as other more technical results were reported previously.

In our view, the continuing planning process is a complex of activities involving (a) elected and appointed decision makers, (b) private citizens, firms and institutions and (c) technical staff. The demands on the principal participants in the process are enormous, not only in terms of time and energy, but also in intellectual ability. Most research in the planning field has

sought to expand the quantity and quality of information available to this process, normally to reduce uncertainty about the future. Little research effort has been directed toward managing the process itself; in particular, procedures enabling decision makers and their staff to cope with this increased flow of information are extremely crude.

Two procedures are proposed in this report in response to this general problem. These procedures seek to represent the continuing planning process using concepts drawn from artificial and natural language. Using these representations of the planning process, some of its richness and complexity can be captured and analyzed, thereby better enabling decision makers to deal with it.

One language, the planning process diagram, portrays the dialogue among participants in the process over time. The dialogue is defined as consisting of two elements, statements from one individual or group to another, and procedures performed in preparation for making a statement. Statements are considered to be instantaneous, whereas procedures (i.e., analyses, forecasts, negotiations, etc.) require time to execute. The process diagram, then, permits one to describe and analyze the dialogue among participants through time. As experience with such dialogues develops, it may be feasible to predict their outcome and eventually to manage their course and direction.

However, as the process diagram does not portray the content of the dialogue, it is not sufficient. For this purpose, a second language, the planning situation chart depicting the status of the planning situation at a point in time is defined. This language consists of a table for recording five types of statements concerning performance characteristics or variables in the planning process. These statement types are empirical (did, does), projected (would), hypothetical (could), preference (should), and political

(will). Such a situation chart may contain a data bank, trend state forecast, alternative plans, set of criteria and a plan. A series of such charts compiled over time portrays the evolution of the continuing planning process.

These representations of the process, although interesting in concept, are more convincing if applied to an actual planning program. As an initial test of their ability to capture the essence of a planning program, a demonstration case study was prepared. A watershed planning program of the Southeastern Wisconsin Regional Planning Commission was selected for this purpose. The unusually explicit and overt planning process in Southeastern Wisconsin made it well-suited for this case study. The watershed program was chosen because it was the most interesting and complex program in progress at the time the case study was undertaken.

Those aspects of the case study emphasized in this report concern the use of conditional decision statements in the plan making process. Such decisions can be used very effectively to build up a more comprehensive set of decisions in the traditional sense. Conditional decisions are decisions made

... subject to approval of a third party;

... provisional upon the implications of related plan elements;

... assuming funds are forthcoming;

... given that other factors are not permitted to deteriorate;

... depending upon what happens in the interim;

... in case certain information is confirmed as being correct.

Conditional decision statements are clearly an important construct in plan making; however, their use has not been widely recognized to date. If these languages are successful in depicting and clarifying the role of conditional statements, then it would seem they have already made an important contribution. Rather than try to judge this issue, we leave it to the reader to draw

his own conclusions after reading this summary report, and especially the case study in Part Three.

Overview of the Report

This summary report consists of three parts. Part One seeks to motivate the problem of continuing planning, set out requirements for dealing with it, and provide background for the case study. Part Two introduces the languages; Part Three presents selected elements of the case study.

Two general strategies might be followed in introducing concepts and ideas that are sufficiently different as to not be readily understood on first reading. One strategy is to boldly present the innovations, and then to explain and justify them. This strategy was followed in An Interim Report on Procedures for Continuing Metropolitan Planning. A second strategy is to justify and explain the innovation first, in the sense of stating desiderata and requirements for it. This procedure is followed here in Part One. For this reason, some of the material, especially Chapter 3, may be usefully reviewed again after reading Parts Two and Three. The remainder of Chapter 1 reviews some conclusions from earlier papers and reports. Chapter 2 outlines some early views about the continuing program concept around 1970-71, and serves to introduce the Southeastern Wisconsin Regional Planning Commission to readers unfamiliar with its programs. The remainder of Chapter 2 and Chapter 3 prepare the reader for the two planning languages.

In Part Two, the planning process diagram is considered first in Chapter 4, followed by the planning situation chart in Chapter 5. Chapter 6 considers the relationship between the two languages and presents some additional justification for them.

Part Three presents selected elements of the case study based on the Milwaukee River Watershed Planning Program. In order to simplify the case study slightly, and to make some points a little more vividly, a somewhat fictitious version is presented. Chapter 7 provides introduction and background. Chapter 8 focuses on conditional decision making, and Chapter 9 provides a summary of the process and a before-and-after comparison of the planning situation. The languages are used throughout the case study in presenting, analyzing and evaluating the plan making process.

Legacy of Land Use and Transportation Programs

From the standpoint of plan making procedures, the metropolitan land use and transportation programs during the period 1959-1968 are noteworthy for their use of alternative plans. Each program was structured on the concept of preparation and evaluation of sets of alternative plans. This procedural approach was generally employed for two reasons. First, examination of different development options was believed to lead to a more desirable plan. Second, it was assumed that significant advantages, especially efficiency, were inherent in certain combinations of land use patterns and transportation systems. Alternatives were used in attempting to identify these advantages.

It is now widely accepted that on the whole these programs failed in achieving these rather ambitious objectives. The reasons for their shortcomings, as well as successes enjoyed by certain programs, have been described in detail in Metropolitan Plan Making. Briefly, the principal reasons are:

1. Methods for preparing alternatives, in particular computer models of urban development, were substantially more difficult to implement than expected;

2. Alternatives were not very different, given the number and range of policies and assumptions tested;

3. Evaluation of alternatives was less than successful because the alternatives evaluated were so similar, and because the methods used were not generally suited to evaluating comprehensive alternatives with diverse and sometimes conflicting objectives.

The above conclusions led to a number of recommendations with respect to the plan making process. In particular, continuing planning is seen as a a cyclic learning dialogue in which flexible and partial alternatives are used to explore and understand the effects and implications of diverse objectives, assumptions, plans and policies. In contrast with the classical theory of rational decision making, the new process begins with a tentative and incomplete set of objectives, and does not presuppose the ability or expediency of their full prespecification by decision makers. A disaggregative approach to evaluation of alternatives replaces a preoccupation with overall rankings and the attainment of a single index for choice. This emphasis on disaggregation responds to the difficulty of quantifying and weighting many vital attributes. But it also reflects the importance of different distributional effects on different interest groups, and disaggregated information on the effective participation of such groups.

Moreover, the recommended process provides mechanisms which allow the methodical examination of a comprehensive system little by little from different perspectives over time, while providing those feedbacks which guarantee not only consistency between the parts, but the attainment of the best or most satisfactory state of integration possible. A continuous process of reexamination of this type is the only realistic approach to comprehensive planning, in the context of problems as complex as those of a metropolitan region, and of manpower resources and technical capabilities as limited as those which are likely to be available for the task in the foreseeable future.

Problems with the Synoptic Ideal Planning Process

Despite the problems and shortcomings of the classical rational planning process, as implied above and widely discussed in the planning literature, this theory continues to persist as the synoptic ideal that all planning processes should seek to achieve. To the contrary, the viewpoint here is that metropolitan plan making processes are in major conflict with this theory, and that efforts to emulate it may seriously jeopardize the success of plan making and implementation. The notions sketched at the end of the above section are an initial step towards specifying an alternate approach; more thorough attempts have been published elsewhere, as noted at the outset of this chapter.

A short recap of this issue may be useful in understanding the larger framework of this research. The assumptions of the classical theory are as follows:

1. A well-defined problem requiring a solution exists.
2. The objectives of the decision makers are known.
3. There exists a well-defined set of all possible alternatives.
4. There exists a well-defined outcome corresponding to each alternative.
5. The decision makers as a group have a preference function defined on the outcomes for determining a preferred ordering of the outcomes and therefore the alternatives.

Given these assumptions, rational decision makers can proceed to reach a decision regarding their problem as follows:

1. They consider what alternatives are feasible, given the conditions of the problem and the objectives they seek to attain.
2. They evaluate all of the consequences that would follow from the adoption of each alternative.

3. They select that alternative whose consequences are most preferred in terms of their objectives.

In comparing this synoptic ideal with planning programs in practice, only a few indicative remarks are offered, but the reader is encouraged to fill in the details, if necessary from the references cited above. These remarks follow in the same order as the above assumptions:

1. Planning problems are usually not well-specified; rather symptoms of unsatisfactory conditions are present.

2. The objectives of the decision makers are often not known in advance of plan preparation and evaluation; moreover, conflicts among the objectives or among the decision makers may exist. In contrast, the synoptic ideal presumes a concept of "the public interest" in which all decision makers agree.

3. Operational methods for identifying the set of all feasible alternative solutions to a problem, or for searching the space of all alternatives, are essentially nonexistent for complex planning problems such as metropolitan planning.

4. Operational methods for predicting the outcome of implementing an alternative (e.g. urban development models and travel forecasting models) do exist but often they are not applied so as to reveal the presumed differences in the alternatives.

5. A common preference function implies known objectives and weights, agreed upon by the group of decision makers; this concept contrasts sharply with the usual experience of conflicting objectives, debate and eventual compromise, or domination by the majority party, found in most urban decision processes.

The above comments apply to the assumptions of the rational theory. Now consider some similar comments on the three step process itself:

1. The complexity of land use-transportation alternatives and the difficulty of their preparation makes the step of defining the possible alternatives extremely difficult. Unlike the theoretical view that all alternatives are known and straightforward to understand, metropolitan development alternatives are difficult to specify and elaborate, and nearly impossible to comprehend fully in any meaningful sense.

2. Testing of individual alternatives and comparison of several is, if anything, more difficult than elaboration because of the need to confront ill-defined objectives and to make clear differences in alternatives that tend to be smaller than the forecasting error of models in use.

3. The alternatives and choices to be exercised at the metropolitan level tend to be so complex that "selection" of one alternative is a rather poor notion of the decision making process. If selection is pursued, the underlying problems that the plan is attempting to solve tend to become obscured by discussion of metropolitan form and structure, which are not necessarily determinants of the problems at hand. This is particularly disturbing in that no planning program to date has succeeded in identifying significant advantages to be obtained from one form of development over another.

That the mechanistic view of decision making found in the classical approach needs to be replaced by a more open, learning-oriented, bargaining process almost seems too obvious to reiterate. Still, planners' thinking is so conditioned by the rational theory that they seem to repeat the errors of past programs in spite of themselves. What seems to be needed is a new frame of reference for planners to respond to. The procedures proposed in Part Two seek to provide an innovative, fresh approach into just this problem.

CHAPTER 2

APPROACHES TO CONTINUING PLANNING

Status of Continuing Metropolitan Planning

Enigma of Continuing Planning

Land use and transportation programs, their experiences and problems, are useful background for a study of the continuing planning process. But now it is necessary to be more specific about this process and its status in its early stages of development. Continuing metropolitan planning process: What events are involved here, and what sort of entity do they add up to? Are there any examples of this phenomenon to be seen? What does, or should, such a process constitute? And what aspects of it will we be examining?

Considering the frequency with which the name, or its variants, is used, good answers to these questions are surprisingly elusive. To establish a sound basis for our answers to these questions, a brief review of early concepts and practices in use in planning agencies was made. The findings are outlined briefly here.

The two most pertinent perspectives on this score are those of Federal agencies, as embodied in their legislative requirements and administrative regulations, and regional agencies who profess to have designed or embarked upon a continuing program phase. It was necessary to examine both perspectives in order to judge the status of continuing programs. Let us deal with the two sets of findings in turn.

Federal Requirements for Continuing Planning

So far as Federal requirements are concerned, the principal sources were the relevant instructional, policy and procedure, and advisory memoranda and

guidelines issued by the Federal Highway Administration (1967, 1968) and the U.S. Department of Housing and Urban Development (1969a, 1969b). Inadequate as these may appear, at that time they did tend to represent the clearest levels of definition yet attained.

The key terminology in the FHWA material is continuing, comprehensive and cooperative so far as aims go, the ten elements so far as scope is concerned, and surveillance, reappraisal, service, procedural development, and annual reporting, where the technical means are at issue. The technical means are of some significance here. Reappraisal is broken down further into three levels of routine review, major review, and plan reevaluation. These terms are illustrative of the degrees of specificity provided in these documents; the reader familiar with their contents may recall a mixture of general and detailed language. As an illustration, it was specified that the transportation plan should undergo major review at least every five years, and that the target year should be pushed forward five years at that time. Most planners could, even if they wanted to, find little fault in the general idea that something must be done to update transportation plans at intervals defined by some clear criteria. But what does it mean to push forward a target year?

Is a target year that well-defined and accepted an entity? What is its function? Isn't the concept of a target year under attack? Doesn't the notion of a single point in time on which all plans are evaluated smack of a one-shot approach? Can it be pushed, without taking quite a number of other things with it? Is this a matter of a flick of the wrist, or a score of man-months?

The point, of course, is not only to question the general notion, but to stress resource constraints and underlying complexities, and to claim as concretely as possible that there is something lacking in the realism and sophis-

tication of such specifications. A subsidiary point to be made clear is that this lack includes technical shortcomings.

Notionally obvious and desirable as it may seem, the process of pushing forward a target year is by no means a straightfoward, established, accepted technical procedure. Nor is the Federal Highway Administration to be blamed for this situation; indeed, there is no assertion here that it is improper for them to advance nebulous requirements, for the latter may have a developmental function. Moreover, let it be absolutely clear, we do not claim to have the procedure of pushing target dates, or an alternative procedure, any better formulated. The argument, taking the target date merely as an example, is simply that the continuing, comprehensive, cooperative program requirements were nebulous at that early juncture.

It is one thing to state these aspirations. It is quite another to evolve the capability to achieve them. And it is yet another to do so cheaply, regularly and reliably. In progressing from aspiration to performance, the superficiality of one's initial statements is revealed. With respect to the continuing process, the Federal requirements were largely at the stage of aspiration when our research was begun. They provided a rough notion of what was wanted from the process, but very little guidance of how to get it. They spoke in such terms as operational procedures and working arrangements, close coordination and interrelated action programs, participation and representation, continuous evaluation and continuous refinement, programming and implementation; but few procedures were provided for implementing these impressive requirements.

Blunt as it may sound, that is the crucial message of this chapter. One intends to progress as far beyond the aspirational stage as possible; but let it be very explicit; in this matter, that is where one is beginning. With

such requirements as their start, the next question, then, is how were metropolitan planning agencies progressing?

Agency Experiences with the Continuing Program

With respect to agency experiences. we initially felt the necessity to update and extend our intensive reviews of one-shot or inaugural studies in Metropolitan Plan Making to cover continuing program activities more specifically. As in our previous round of review work, we relied primarily upon an examination of study documentation, augmented by agency visits and interviews. However, in this case the task was at the outset pursued in a rather more exploratory fashion. With the exception of the activities of the Southeastern Wisconsin Regional Planning Commission (SEWRPC), which are described in some detail in the next section, these preliminary results were not found to be too fruitful. Ambitious review work was hence curtailed in favor of a more detached rethinking of the problems.

In short, the verdict on agency activities through 1970 was that there had yet been little success in implementing a continuing phase of metropolitan land use and transportation planning. With the exception of Southeastern Wisconsin, in our view the single, most advanced agency, no emergent processes were identified which met the more positive meanings one is inclined to associate with FHWA's image of reappraisal as a systematic sequence of activities, or HUD's aspirations for a systematic continuing and comprehensive process. This interpretation of the situation was less a conclusion that the continuing program had broken down, than a judgement that it had not yet really gotten off the ground. The majority of agencies had so far encountered considerable difficulty in pursuing activities which resembled much more than a conventional series of fairly ad hoc studies. Since it was hardly the time to give up on continuing programs, the important question was: Why had this effort been delayed?

Was it simply because most agencies had so many loose ends to tie up from their initial land use and transportation planning programs, that they needed a few years before they would be ready to do justice to a continuing phase? Was it primarily a matter of those two critical constraints: the size and continuity of staffing, and the size and continuity of funds? Or was it more the quality and capabilities of staff, constraints upon the omniscience and organizational skills of the directors, or the political environment of the agency as a whole?

On the other hand, was the failing because of the nebulous requirements of the FHWA and HUD directives, as discussed above? Or was it more a function of the confusing and demanding multiplicity of requirements, from different Federal agencies and offices? Was it just that the requirements were never properly enforced? And if they weren't, was this mere contingency; was it due to inadequate deadlines and sanctions; or was it that enforcement would have been unreasonable in the circumstances? Had the agencies, beset by more urgent and short-term pressures, really had the chance to consider what to make of the continuing program challenge?

Necessarily, there were gross limitations in the relevant information available to us and our interpretations were therefore somewhat speculative. And, not surprisingly, it was apparent that many of the above explanations were in some way responsible for the overall deficiency. Prospective improvements would have to tackle them all. Yet upon reflection as to what happened in particular agencies, when these difficulties were not quite so pressing, we were not convinced that the problem was all that prosaic.

Instead, we argued that a much more tangible and much more credible picture was needed as to the overall nature of the continuing process one is aiming at: not merely in terms of sharpening the nebulous advantages and attri-

butes cited from Federal requirements, but in terms of describing the interrelated sets of events which would satisfy such aspirations. And, in addition to clearer images of this end result, the agencies were in need of a firm grasp upon the sort of mechanism which could produce an interrelated set of events. Moreover, they needed some hints as to how to go about assembling it.

Southeastern Wisconsin's Continuing Program Experience

Contrasting with the negative experience of many agencies with the early years of the continuing program was the relative success of Southeastern Wisconsin with six years of continuing program completed by the end of 1972. This section provides an overview of this activity and seeks to portray some of the underlying philosophy and approach of this agency that appear to contribute to its successful operation. In addition, this section introduces the Southeastern Wisconsin Regional Planning Commission and provides a framework for the testing studies reported in Part Three. Additional background and analysis of the Commission's activities may be found in Metropolitan Plan Making, pp. 293-336.

No better summary statement of the overall approach and conception of regional planning in Southeastern Wisconsin exists than those found in the Commission's review of its first decade in the 1970 Tenth Annual Report (SEWRPC, 1971). There, the Commission's functions are defined as (a) areawide inventory; (b) plan design; and (c) plan implementation or promotion of intergovernmental cooperation and coordination. Extracts describing these functions and accomplishments through 1970 are shown as Figures 2-1, 2-2 and 2-3.

Within this framework of overall Commission activities, the organization and status of the continuing program in Southeastern Wisconsin can be examined. Planning for land use and transportation in the region began with the regional

Figure 2-1

Areawide Inventory: Description and Accomplishments

Description

"A great deal can be achieved with respect to guiding areawide development along better lines simply through the task of collecting, analyzing, and disseminating basic planning and engineering data on a continuing, uniform, areawide basis.

"Experience within the Region to date has shown that, if the areawide inventory function is properly carried out, the resulting information will be used and acted upon by federal, state and local units and agencies of government and by private investors. If the data so used have also been used as a primary input into the preparation of regional plan elements, their utilization in arriving at public and private development decisions on a day-to-day basis will tend to contribute toward implementation of the regional plan elements.

"At the time of the creation of the Regional Planning Commission, there was an almost total lack of the kinds of definitive data required to make sound, areawide development decisions. For example, although there are 43 perennial streams within the 12 major watersheds of the Region, there were only two continuous recording streamflow gaging stations in operation within the Region. Yet without long-term data from such stations, it is impossible to make sound decisions concerning such matters as the location of sewage treatment plants, the level of sewage treatment to be provided, the existence and nature of flood hazards, or the delineation of floodplains. Similarly, definitive data on the woodlands and wetlands of the Region, on existing land use, on soils, on travel habits and patterns, and on water quality were almost totally lacking on an areawide basis. The Region had not even been mapped to modern National Map Accuracy Standards. The areawide inventory function, then, was a most important one for the Commission to perform. That function is, of course, ongoing and requires continuing effort in order to maintain current a useful, areawide planning and engineering data bank."

Accomplishments

1. data base for local and areawide planning (1961-1963)
2. aerial photography (1963, 1967 and 1970)
3. regional soil survey (1963-1965)
4. stream gauging program (1963-1970)
5. stream water quality monitoring program (1965-1970)
6. potential park and open-space site inventory (1964)
7. existing outdoor recreation and historic site inventories (1964, 1967)
8. origin-destination survey (1963)
9. transportation facilities and service levels (1963-1970)
10. land use inventories (1963, 1967 and 1970)
11. water law inventory (1965)
12. planning law inventory (1966)
13. flood hazard mapping (1966-1970)
14. census coordination (1963-1970)
15. financial resources (1963-1970)
16. community plans and zoning (1964-1970)
17. historic land subdivision activity (1968-1969)
18. flood damages, hydraulic and hydrologic inventories and ground water data (1963-1970)
19. detailed planning base maps and survey control (1960-1970)

Figure 2-2

Plan Design: Description and Accomplishments

Description

"The Commission function of plan design consists of the preparation of a framework of long-range plans for the physical development of the Region, with such plans being limited to those functional elements having areawide significance. To this end the Commission is charged by law with the function and duty of making and adopting a master plan for the physical development of the Region. The permissible scope and content of this plan, as outlined in the enabling legislation, extend to all phases of regional development, implicitly emphasizing, however, the preparation of alternative spatial designs for the use of land and for supporting transportation and utility facilities.

"In its 10-year existence, the Commission has taken this responsibility very seriously and has set about making and adopting such a master or comprehensive plan for the development of the Region. The scope and complexity of areawide development problems prohibit the making and adopting of an entire comprehensive development plan at one point in time. The Commission has, therefore, set forth a rational process of preparing a series of integrated plan elements based primarily upon an underlying and very basic regional land use plan. It is extremely important to note that the literal interpretation given by the Commission to the statutory language related to the making and formal adoption of a master development plan is, for all intents and purposes, unprecedented with respect to metropolitan agencies throughout the United States. The Commission believes the importance of securing agreement upon areawide development plans and the formal adoption of such plans not only by the Commission but also by constituent county and local units of government and state agencies cannot be overemphasized.

"The Commission has placed a great emphasis upon the development of a comprehensive plan for the physical development of the Region in the belief that such a plan is essential if land use development is to be properly coordinated with the development of supporting transportation, utility, and community facility systems; if the development of each of these individual functional systems is to be coordinated with the development of the others; if serious and costly environmental and developmental problems are to be minimized; and if a more healthful, attractive, and efficient regional settlement pattern is to be evolved. Under the Commission's approach, the preparation, adoption, and use of the comprehensive plan is considered to be the primary objective of the planning process; and all planning and plan implementation techniques are based upon, or related to, the comprehensive plan. It should be noted in this respect that the validity of the concept of the comprehensive plan has been questioned in recent years and its application in fact opposed by some segments of the planning profession. The Commission believes, however, that the comprehensive plan remains a viable and valid concept, a concept essential to coping with the developmental and environmental problems generated by areawide urbanization. The comprehensive plan not only provides the necessary framework for coordinating and guiding growth and development within a multi-jurisdictional urbanizing region having essentially a single community of interest but provides the best conceptual basis available for the application of systems engineering skills to the growing problems of such a region. This is because systems engineering must basically focus upon a design of physical systems. It seeks to achieve good design by setting good objectives; determining the ability of alternative plans to meet these objectives through quantitative analyses; cultivating interdisciplinary team activity; and seeking to consider all of the relationships involved both within the system being designed and between the system and its environment."

Accomplishments

1. comprehensive plan for the Root River watershed (1966-1970)
2. regional land use and transportation plans (1963-1966)
3. comprehensive plan for the Fox River watershed (1966-1970)
4. Milwaukee jurisdictional highway system plan (1967-1970)
5. plan elements begun during 1960-1970
   a. comprehensive plan for the Milwaukee River watershed
   b. regional library facilities and services plan
   c. regional sanitary sewerage system plan
   d. regional airport system plan
   e. regional housing study
6. comprehensive plan for the Kenosha Planning District (1964-1966)
7. comprehensive plan for the Racine Planning District (1969-1971)

Figure 2-3

Implementation: Description and Accomplishments

Description

"The Commission in seeking implementation of its adopted plans provides a center for the coordination of the many planning and plan implementation activities carried out on a day-to-day basis by the various levels and agencies of government operating within the Region. This function is, of course, ongoing and requires a continuing work effort. Because of the adoption of five plan elements during the latter half of the 10-year life of the Commission, this function received increasing emphasis as the decade neared conclusion.

"One of the most important and time-consuming activities of the Commission relating to plan implementation is the extension of planning and engineering data developed under the regional and subregional planning programs to the federal and state agencies; to the constituent local units and agencies of government; and to private agencies and individuals. This function includes such widely diverse activities as: the application of the Commission traffic flow simulation model to the making of traffic assignments in conjunction with the design of proposed state and local arterial street and highway improvement projects; the preparation of population forecasts for subareas of the Region for local units of government, school districts, and private market research agencies; the provision of interpretive soils data to land developers, builders, public works contractors, local units of government, and to prospective building site or home purchasers; the provision of detailed flood hazard data and the application of the Commission's flood flow simulation model to the analysis of proposed changes in stream channel capacities and of proposed changes in the limits of floodways and floodplains; to the state regulatory agency and to local units of government; and the provision of horizontal and vertical control survey data to public and private engineers and to land surveyors. These activities serve to keep the Commission and its staff in daily contact with the public and private decisionmakers in the Region and assure that the data upon which the regional plans are based are made fully available for use in the making of day-to-day development decisions."

Accomplishments

1. preparation and dissemination of planning and engineering data, forecasts, plans and policies to local governments, private firms and individuals (1960-1970)
2. community assistance program of technical and educational services to local government and citizen groups (1960-1970)
3. preparation of six planning and development guides (1963-1969)
4. planning conferences (1961-1970)
5. Public information: newsletter, press releases and presentations (1961-1970)
6. documentation
   a. 14 planning reports totaling 4,366 pages
   b. 6 planning guides totaling 838 pages
   c. 8 technical reports totaling 564 pages
   d. 12 planning program prospectuses totaling 568 pages
   e. 10 annual reports

Related Implementation Activities

1. advisory committees (20)
2. federal grant review (1964-1970)
3. continuing transportation planning process (1965-1970)
4. interagency soils agreement (1965-1970)

land use - transportation study in January 1963. The completion of this study with the adoption of the land use and transportation plans by the Commission essentially marks the beginning of the continuing program in Southeastern Wisconsin. As with all Commission planning programs, a prospectus for the first continuing program was prepared and approved in October 1965 by the Commission to guide the conduct of this planning effort. The first continuing study became fully operational in 1967 and was completed in December 1969.

In 1970, the Commission began its second continuing program, a five year effort extending over the period January 1970 to December 1974, again conducted in accordance with a study prospectus. This second continuing program "provides for a major reappraisal of the adopted regional land use and transportation plans upon completion of certain major surveillance activities, including reinventories of land use and travel within the region."

The continuing program has five objectives summarized here as follows:

1. To meet the planning requirements of the 1962 Federal Aid Highway Act and 1964 Federal Urban Mass Transportation Act so as to continue to qualify the constituent state and local units of government for federal aid for highway and transit facilities, and to assist the Commission in meeting the areawide planning and grant review requirements of the federal government.

2. To update and revise the basic planning and engineering data collected in, and the forecasts prepared during, the initial land-use-transportation study.

3. To periodically update and revise the plans prepared under the initial study in light of changing conditions in the region.

4. To provide for the continued integration of land use and transportation planning in the region with other elements of comprehensive regional planning.

5. To continue to convert the plans prepared under the initial study, and as maintained current under the continuing program, into action programs for plan implementation.

The Annual Report of the Commission documents activities conducted under the continuing land use-transportation program, as well as fulfilling various

other purposes and requirements. It is instructive to describe here in some detail the contents of the 1970 Annual Report under the continuing program heading. These contents are rather typical of the Commission's annual reports issued since the adoption of the land use and transportation plans.

Altogether, 64 pages of the 176 page 8½" x 11" double column report is devoted to the continuing program. Following a three page introduction, summarized above, the report is organized according to the surveillance, reappraisal, service and plan implementation, procedural development and documentation headings set out by the FHWA procedures.

The surveillance section consists of 28 pages, 5 figures, 13 tables and 5 maps. Data collection and analysis activities are described and trends in development are identified. The principal activities occurring in 1970 were base mapping and aerial photography, inventories of transportation facilities, automobile availability, motor truck availability, existing land use, population and economic factors and trends, special-purpose districts, as well as data conversion, filing and retrieval. The surveillance section concludes with 9 significant findings related to population growth, auto availability, transit and highway usage, highway congestion and travel times, employment growth and conversion of rural land to urban uses.

The reappraisal section consists of 12 pages, 8 figures and 3 tables. The principal content of this section is a comparison of current trends with the forecasts that were the basis for the land use and transportation plans. These comparisons have been made in each annual report since adoption of the plans for variables such as vehicle miles of travel, miles of congested highway, mass transit utilization, total auto availability, persons per auto, motor truck availability, population, and employment. As about one-fourth of the 27 year forecast period, 1963-1990, had elapsed by 1970, these comparisons

provide very useful insights into the status of the region vis-a-vis the plans. Five significant findings of the reappraisal activity are noted in the conclusion to this section of the report.

The service and plan implementation section of the report consists of 20 pages, 2 tables and 6 maps. Following a short section summarizing the actions of local governments to adopt the plan during 1970, an extremely detailed review of the status of plan implementation is conducted, under the following functional headings:

1. major public outdoor recreational areas: site-by-site report on status of 12 areas recommended in the plan for acquisition and development
2. local park and outdoor recreational areas
3. major retail and service centers: site-by-site report on status of 10 new centers recommended in the plan for development
4. major industrial centers: site-by-site report of status of 6 new centers recommended in the plan for development
5. water and sewerage facilities
6. land use control ordinances
7. freeways and standard arterials
8. county jurisdictional highway system plans
9. mass transit
10. services to federal, state and local units of government.

The plan implementation section concludes with eight significant findings as to the progress of plan implementation in the region.

The procedural development and documentation sections of the continuing program review are brief, as most of the activities performed under these functions were reported in the above sections. Activities regarding model development and testing are described, and a list of reports relating specifically to the continuing program are provided.

As has already been shown in the excerpts from the 1970 Annual Report, the Commission, partly in response to its enabling legislation, ascribes an unusually strong role to plan adoption. Clearly, there are many advantages to this procedure for a strictly advisory agency such as the Commission. For example, with respect to the regional transportation plan, each of the principal agencies charged with construction of highway and transit facilities in the region has adopted this plan as a matter of policy. Moreover, the Commission has for many purposes assumed the role of the technical planning staff of these agencies, in particular the Wisconsin Department of Transportation, the various county highway departments and the Milwaukee County Expressway and Transportation Commission. This philosophy of plan adoption has resulted in the Commission being in an unusually strong position for coordinating the implementation of these plans. Moreover, the confidence of both state and local transportation agencies in the high quality of the Commission's technical studies is unusual in U.S. metropolitan regions, and is clearly one major reason for the success of the continuing program in Southeastern Wisconsin.

Given this strong role of plan adoption, the question of plan refinement and updating must be very carefully considered indeed. As indicated above, a great deal of commitment was obtained for the 1990 land use and transportation plans during 1966 from both state agencies and local governments. In view of the effort and resources expended in obtaining such a commitment, the question of refining and updating these plans is approached very cautiously in Southeastern Wisconsin so as not to disrupt unnecessarily commitments already obtained.

The regional transportation plan itself provided for its refinement through the preparation of county jurisdictional highway system plans, but

in the larger framework of the regional land use and transportation plans, and for the same design year. When adopted by the Commission, these refined plans serve "to amend the previously adopted regional transportation plan." In a similar manner, adoption of other systems or subregional plans, such as the watershed plans, serves to amend the 1990 land use plan. In this manner, these regional plans are not static, but are gradually refined through completion of the various elements of the comprehensive plan.

The question of updating these plans is only now being considered in Southeastern Wisconsin as a part of the continuing program activities. In principle, the Commission believes that plans should be updated when conditions warrant, not on a routine basis. Conditions that might result in a decision to update are:

1. significant departure of development trends from the forecasts upon which the plan is based;
2. improved or new technology not anticipated in the plan;
3. other significant departures from assumptions underlying the plan.

In the words of the 1970 Annual Report,

> "When these major surveillance activities are completed in early 1973, it is proposed that a careful analysis be made of the reinventory findings and the implications of these analyses with respect to the continued validity of the adopted plans, the regional development objectives upon which the plans are based, and the policies and programs for plan implementation. If necessary, revisions in both the adopted regional land use and transportation plans will be made. The analysis would also examine the need to set a new plan design year beyond the present design year of 1990."

Thus, a decision to update the plan does not necessarily imply a new design year. Such problems are approached by the Commission not on a routine basis with preestablished views, but as important procedural questions to be decided on the basis of available information and policy considerations.

The third aspect of the Commission's work that merits emphasis here is the importance of surveillance, and more generally the assembly of technical

data and maps. The view of the Commission is well-stated in the Study Design for the Continuing Land Use-Transportation Study, 1970-1974, (SEWRPC, 1969):

> "The surveillance function will continue to be emphasized, not only because of its fundamental importance to any sound continuing planning operation but also because of its extreme importance to a planning function which is entirely advisory. If state, county, and local officials and private developers are to be expected to continue to seek the advice of the Regional Planning Commission on development decisions prior to making these decisions, then the Commission must continue to have a better fund of knowledge about factors affecting development than any other agency operating in the same geographic area. The initial regional land use-transportation study provided the Commission with just such a fund of knowledge. The continuing land use-transportation study must maintain the position of that fund of knowledge."

Also in this Study Design the need for a new origin-destination survey was documented very thoroughly emphasizing the importance of collection and analysis of data prior to commitment of staff resources to plan revision.

Issues for Continuing Programs

Drawing on the above description and interpretation of Southeastern Wisconsin's approach, we now attempt a more generalized definition and discussion of the structural issues of continuing programs. The following sections use examples to illustrate several general problems of continuing programs. Monitoring, comprehensiveness and integration are examined in this context, followed by a discussion of ways to improve the continuing planning process.

Monitoring as a Structural Issue

The idea of monitoring plans and forecasts, or comparing their intentions and expectations against emergent facts, is hardly new. Indeed, so sensible and so straightforward does it sound, that monitoring is referred to widely in the planning literature. Yet, to our knowledge up to 1970, few metropolitan land use and transportation planning programs have actually established practices in a sustained, systematic and efficient manner. Periodic data collection, it should be noted, does not in itself constitute a monitoring practice.

For example, in 1965 Southeastern Wisconsin, using a very thorough procedure, prepared a regional population forecast which was taken as a control figure in each of its alternative plans (SEWRPC, 1966). A plan was adopted in 1966; in each succeeding year the population forecast was compared with current estimates, and an explicit reappriasal made. The surveillance procedures combined estimates from building and demolition data with independent information from other agencies, and are probably as sound as any practicably feasible.

Each year, this check of original forecasts against current estimates was reassuring, implying no need to reexamine plans and policies. In 1970 however, with the release of preliminary Census results, another comparison became possible, and suggested that either the forecasts and surveillance data were overestimating regional population by 6 or 7 percent, with a discrepancy as high as 11 percent in Milwaukee County, or the Census estimates were low because of undercounting. Census underestimates as high as 15 percent were found in the 1960 Census, and may have occurred in 1970 as well. While the immediate need was for more intensive analysis, this apparent discrepancy could have had significant implications for the agency's work program (SEWRPC, 1970, p. 24).

Given this outline of the situation, several questions can be asked. If this is how good the forecasting and estimating abilities are for a regional population total over five years, then how reliable are forecasts for 1980 and 1990? If the argument is that such accuracy isn't crucial, that these discrepancies are precisely the justification for monitoring, then the question arises as to how much accuracy can reasonably be achieved with monitoring itself. In particular, are there situations in the absence of continuous and accurate primary source data, in which monitoring is just busy-work? Is it better to conserve resources for less continuous, but more decisive, reappraisal? Put crudely, how continuous should continuing planning be?

Furthermore, when monitoring is successful, as it eventually was in this case, what should happen next? Does one necessarily leave this question until the results are in? Indeed, should strategies for contingencies like this not be part-and-parcel of the plan itself? Moreover, if forecasting reliability continues to be recalcitrant, maybe it is better to deemphasize forecasting altogether, and to spend far more resources perfecting policy statements of the form: "We will try policy x_1; but if, by 1975, the value of y is still less than z, then we will probably try policy x_2". Such strategies, of course, are of wider applicability than this; for example, experience shows that the planner would be wise to caution himself with the question: "What if we could predict no significant differences between alternatives," long before the juncture when it tends to crop up of its own accord. And assuming one wished to develop such contingency planning as a rigorous and systematic capability, what models and procedures would then be needed?

How, finally, do comments such as these relate to the need to formalize planning procedures? What this example indicates, perhaps, is that as much effort ought to be spent in structuring the monitoring process, as in perfecting forecasting techniques themselves. What it also suggests is that one's attention ought not to be usurped from the logical structure of possible events, and possible response strategies, by virtue of the clarity of definition which forecast statistics may appear to give a situation. Neither of these propositions, it should be noticed, denies forecasting its place. What they do indicate is that certain aspects of the application of forecasting methods could benefit from a parallel degree of structuring and definition.

Comprehensiveness and Integration as Examples

If it is valid to raise the question of how continuous "continuing planning" ought to be, it is also appropriate to ask how comprehensive

"comprehensive planning" ought to be. Comprehensiveness, of course, is in general defensible not for the glow it may bring to the planner's heart, but for the benefits which the integration of decision making in two or more regions or sectors of activity may yield society. If the comprehensiveness in question involves no such integration, if the integration produces no such benefits, or if the benefits are outweighed by concomitant detractions, then better plan the pieces separately.

For many concrete instances of the practical complexities involved here, the reader is invited to consult "comprehensiveness" and "integration" in the index of Metropolitan Plan Making. Here we only summarize a few of the considerations. First, under what conditions might a less-than-comprehensive approach be valid? The theorist in his answer to this question tends to stress the real-world interdependencies of a problem situation. Depending on his background, he may say that the comprehensive planning of A and B is only necessary when variations in A can be shown to be causally related with those in B. Or he might refine his comments to account for the fact that it is neither the existence nor the size of interdependencies, but the question of whether their neglect could lead to significant opportunity costs, which is ultimately crucial.

The practitioner's answer, on the other hand, might give these real-world interdependencies little emphasis at all. Instead, he may be far more concerned with the political, organizational, and human limitations upon our capabilities to plan comprehensively, even for those circumstances where the need is obvious. Depending on his experiences, he may stress one dimension of these limitations or another; some will see the dangers or impossibilities of doing all that planning under a single institutional umbrella, for instance; others will be more concerned with the difficulties of accomplishing it in a reasonable period of time.

And even when comprehensiveness is deemed to be essential, there are numerous queries outstanding as to how it may be best achieved. From a theoretical point of view, it is important to know at what stages of the planning process (e.g., analysis, design, evaluation) integration takes place, or the effects of integration are considered. It is similarly important to know in what respects a plan is integrated: not merely with regard to different systems (e.g., highway and transit integration, or land use and transportation integration), but also with regard to different relationships between them (e.g., land use and transportation integration where the criteria is for transportation to best serve a predetermined land use plan, as opposed to land use and transportation integration where the criteria is to explore joint variations sympathetic to the transit component of the plan).

Again, even when he too is determined to be comprehensive, the practitioner's concerns might be quite different. For him, the theoretical ideal may be a long way off. His worries may be less a matter of which plan elements could interact with which, and more a matter of which participants will interact with which. His energies may be fully occupied arranging and sustaining interface and feedback mechanisms, to attain a rough degree of coordination rather than a fine degree of integration. And there is no need to be cynical about his task for there are many reasons besides crass uncooperation to make the attainment of comprehensiveness a formidable challenge.

In the longer term, too, there are questions about how to achieve comprehensiveness, if comprehensiveness is warranted. Should an agency, for example, attempt to deal with a comprehensive gamut of issues, systems or perspectives from the outset, gradually planning for them and their interactions less and less superficially over time? Or, at the other extreme, should an agency add new plan elements one by one, only after it has

established a satisfactory capability of integrative planning for all the functions already under its auspices? And are there other options? Such issues as these are vital continuing program issues. But how can they be debated clearly and intelligently, when the structure of planning situations is so ill-described that clear definitions of "comprehensiveness" are unavailable; or when the structure of the planning process is left to such intuitive devices that its capacity for "comprehensiveness" is hardly raised?

Structural Devices and Their Proper Balance

The problem of how much integration there should be, and what form it should take, is a continuing problem which concerns more than the plans themselves. It occurs also over study management, with respect to the effective allocation of professional resources. One planning agency, for example, has consciously set out to develop a "project approach" to staff assignments: a management scheme which attempts to reconcile individual initiative and expertise with positive team direction.

Another recurrent integrative theme is that of the regional data bank or information center. In this case, the perennial spate of abandoned propositions appears to have already led many agencies away from the concept of a fully comprehensive and centralized system. In its place is an emphasis upon the gradual extension of (a) formal cooperative arrangements for data assembly, processing, and sharing; and (b) formal agreements on the standarization of definitions, and the compatibility of data management systems.

But a more general question is latent in these examples; the common dilemma of just how much structure there ought to be in a process of this sort. The other horn of this dilemma is the inflexibility which, at least traditionally, tends to be associated with highly structured processes. To bring us back full circle, this dilemma is also manifest in the perplexing

question of how specific the advice and requirements of Federal agencies should be. The principles involved here will be discussed at some length later in subsequent chapters. Suffice it to say that this is not merely a question of leaving flexibility for regional and local agencies to adapt Federal guidelines to their peculiar situation and resources, but also of the ability of Federal agencies to adequately specify the options which are acceptable in various circumstances.

What one is able to achieve here is a function of the detail with which one can spell out conditions under which particular elements or procedures are possible, fundable, advisable, mandatory, and so forth. And this, in turn, is a function of how much of this need be spelt out in advance, and how much can be properly settled on the spot. But until advice and requirements can be thus qualified, they tend to be unnecessarily constraining. Yet, until advice and requirements can be spelt out in considerable detail, they tend to be unhelpfully vague.

Preconceptions about a Desirable Structure

That, then, concludes our miscellaneous examples of continuing program problems: a list which has been indicative rather than exhaustive. Also, we suspect some major issues have yet to be discovered, let alone resolved. But whatever the eventual balance, an immediate need prevails for a much more explicit picture or representation of various possible ideal processes which the agencies ought to be aiming at.

What is the nature of this structure? What possible manifestations can the process take? Is it essentially a political process or technical process? Or, more realistically, in what respects and to what extent is it each of those; and can their relationship usefully be defined in much more concrete and explicit terms?

If one is attempting to improve or lubricate this process through formalization and systematization, which of its manifestations ought one to work on? FHWA memoranda, for instance, lay considerable stress upon interagency organizational arrangements, in conjunction with their "cooperative" requirement. But ideally, that should be just one facet of a larger system of complementary organizational, procedural and informational ramifications. Can these all be represented, examined and synthesized in an integrated manner and in specific enough terms to be more than a vague aspiration? And if so, how?

In summary, then, this is the level at which we decided to attack the continuing program problem. While agency funding, staffing and political difficulties loomed large, there was also a need for some clearer conceptual framework against which the technical problems of design and implementation of the process could be thought through. Moreover, to provide the rudiments of such a framework was within the orbit of our brief and capabilities. To do much about constraints on funding, staffing, political and legislative conditions, apart from taking account of their likely slow amelioration, was definitely not.

We have also hopefully begun to orient the reader towards our concerns with the underlying complexities of applying and using planning tools and models. This is a far more positive matter than simply the selection of appropriate models, and their correct and useful application in particular situations. We expect the suggestions provided herein will be of interest to both optimists and pessimists with regard to the practical potential of mathematical modeling in three ways:

1. by making the planning process itself more amenable to the employment of existing forecasting models, and other analytic and evaluative methods;

2. by systematizing and improving the performance of the process in circumstances where existing models and methods are inapplicable, or beyond the reach of available resources;

3. by yielding fresh insights into the characteristics of practical planning techniques, which should eventually be reflected back in the design of new and improved models and evaluative methods.

The manner in which these aspirations are attacked is a little unconventional, and the reader deserves to be forewarned. The problem has been approached in the beginning, not as a problem of quantification, nor as a problem of theory, but as a problem of postulating formal representations for the continuing process. The role of these representations is seen to be the injection of a modicum of realism, and a perspective of totality, into the work of those more intensively concerned with theory and empiricism. They are aimed at sharpening the pragmatic senses of the modeler, to enable him to pay as careful and overt attention to purpose as he does to truth. In short, they will try to help create a technology of his science.

The emphasis, then, is upon formal representation. We are going to advance two languages: one for a planning situation, and the other for the planning process. Their validity, whether tied to the assumptions with which we begin, or the consistency with which we proceed, must for the moment be justified by their appeal to the planner. Our empiricism has been principally that of intuition and experience, and our theory, likewise, of intuition inspired by whatever rationality appeared appropriate.

We will not entirely stop at the representational task; but will also attempt to demonstrate how our representations may be used as a take-off point for the development of procedural systems of more immediate applicability. Many of the examples to be articulated should suggest methods which agencies will readily be able to adapt to their specific needs. A few may even involve strategies and procedures which are directly pertinent to resolving contemporary agency problems.

There is also a wider hope that the mode of formalization adopted, invoking the unusual representational principles and heuristic strategies it does, may be found to have a significance for planners of a somewhat independent stature, and one which extends beyond the continuing program issue. But, nevertheless, the importance of these representations is primarily conceptual.

By virtue of our innovative approach, much of the material in Parts Two and Three is initially likely to seem strange to the reader. In order to increase the chances of communication, we have opted for a bold and straightforward treatment of these languages in Part Two, preceded by Chapter 3 on needs and justification of the approach.

In summary, what we offer the reader in Part Two as a whole is the beginnings of a formal picture of an ideal continuing planning process and the apparatus needed to produce it. In fact, since a number of aspects of our prototype still need to be firmed up, the product at this stage is more in terms of images and examples than of definite specifications. Perhaps one of the most useful contributions is in providing a clearer terminology with which the alternate emphases of continuing planning may be discussed, and in identifying many of the considerations which should be brought to bear in these discussions.

CHAPTER 3

NEED FOR APPROPRIATE REPRESENTATIONS OF PLANNING

Representation as a Worthwhile Initial Step

Now let us make a straightforward point, one which was implicit in Chapter 2, but is important enough to single out and state more boldly. When one begins research in a relatively fresh field, or begins anew where earlier efforts failed to make great headway, various initial approaches are open. Such a choice was considered at the outset of this research on the continuing program problem. One of the approaches taken, as the most promising first step, was to provide a formal descriptive representation of the problem.

Without implying this to be the only valid starting point, for it would be healthy to have other teams working from different perspectives, the reasons for this emphasis may be instructive here. How is formal descriptive representation different from other types of formal representation? Why give it such priority? And what other emphases is it likely to lead on to, in succeeding steps?

By an emphasis upon formal descriptive representation, we have in mind any approach which attempts to begin by assembling a faithful picture of the phenomenon under investigation. This is independent of whether, or to what degree, such a picture is based upon theoretical or empirical considerations; in the present case it was a mix of both. It must also be independent of any strong and narrow presuppositions as to how the problem is to be defined, and eventually resolved. All one must be guided by are a series of rather broad criteria, e.g., "much richer", "more disaggregate", "widely comprehensible", which reflect the negative lessons of previous comparable endeavors.

Such an approach, with its "back-to-square-one" connotations, may appear inherently drastic; and it may indeed be so. But this appearance is misleading in circumstances like the present, where it is doubtful that anyone has ever had the opportunity to expend much time and energy in square-one before. Given (a) some of the rather iconoclastic findings of the review phase reported in Metropolitan Plan Making; (b) the rather unusual nature of the accompanying aspirations for a cyclic process; and (c) the rather basic, yet ill-defined, structural issues for continuing programs, outlined in Chapter 2, then, a square-one approach becomes a more natural first step. Indeed approaches which omit square-one may be the drastic ones.

Requirements for a New Representational System

Before examining in detail the pragmatic need for a new language system, it may be useful to summarize the system we have in mind in terms of the basic needs or requirements it seeks to fulfill. These requirements may be summarized as follows:

1. the need for explicit representation of the multiplicity of factors and relationships which may be involved in any moderately complex planning problem, especially for those more synthetic stages of the planning process where strong simplifying assumptions may be inappropriate;

2. the need to accommodate this multiplicity of factors and relationships in a way which is fairly general and relatively neutral, but which still organizes them in as well-structured, fully-integrated, and powerful as possible a way for problem-solving purposes;

3. the need, consistent with the above, for some common, general framework which promises to be conceptually and operationally sympathetic to both a detailed and extensive formal treatment of a planning situation, and to the formal examination of various parts at various levels of aggregation;

4. the need, in elaboration of this, for some overall conceptual framework which is in essence abstract, flexible and open-ended enough to permit later refinement to suit individual conditions: i.e., while not in itself necessarily providing direct insights or solutions to

particular planning problems, it should provide a language within which a variety of more concrete and specific approaches may be articulated;

5. the need for the language system to be very widely comprehensible, communicable and credible: that it be based upon bold enough concepts to grasp, simple enough formalizations to remember and manipulate, convincing enough assumptions to become widely acceptable; and that it exhibit problem-solving prospects of clear and common enough relevance to encourage a degree of standardization during its refinement;

6. the related need for some formal means of incorporating, interchanging and accounting for information of all types: numeric and non-numeric, mathematical and verbal, tabular and graphic, measured and intuitive, within the same planning procedures;

7. the parallel desire to employ languages which are sympathetic to the expression, use and development of a heuristic rationale: approaches involving purposeful approximation; permitting, where necessary, rules-of-thumb and hunches; and content with a fair prospect of useful hints toward improvement, in lieu of proofs or answers;

8. the more specific need, with respect to problem-orientation, for some model within which the multiplicity of factors and relationships, mentioned above, may readily be subjected to techniques and strategies of systematic examination, with regard to: (a) the implications of particular items for the overall consistency and acceptability, of the whole; and (b) the implications of interrelated changes in the state or value of items, relative to the issues at hand;

9. the particular need to have some firmer and more well-defined way of describing plans and alternative plans, and such plan characteristics as comprehensiveness, generality, consistency, and tentativeness; and of relating these to the plan making process, and to specific decisions of adoption or implementation;

10. the similar desire to be able to describe various aspects of the planning process -- generation, elaboration, technical evaluation, political evaluation, etc. -- and various types of planning process, in terms of some well-defined, standard elements: having meaningful distinctions; lending themselves to measures of overtness, responsiveness, and the like; and encouraging consistent usage;

11. the related need for a better-defined and more disaggregate model of planning as a participatory process: an explicit representation of the values associated with each proposal and its repercussions; of the people and groups associated with the values; of the powers and responsibilities associated with the people and groups; and of the types of message they can usefully pass to one another;

12. the requirement that this model of the planning process be suited to the expression of cyclic approaches, whereby a plan can be successively supplemented and revised in respects which are relevant to prevailing needs and realizations, and with whatever degree of comprehensiveness and integration happens to be adequate for immediate and foreseeable purposes;

13. and finally, the need for a representation which would encourage the development of a rich stock of strategies and procedures for problem resolution, so that successive cycles of learning could be used to reflect different perspectives, thereby breaking the problem down through a manageable and intelligible series of checks and balances.

These are the basic needs and requirments our proposed representations of planning seek to fulfill. Now, let's examine in more detail why these needs are important from a pragmatic viewpoint, first in terms of professional capabilities, and then in terms of other participants in the planning process.

Pragmatic Attitude toward Professional Capabilities

Limitations of the Individual Human Being

Here we are concerned with the capabilities of the professional as an individual; in a subsequent section we examine how deficiencies may be compensated for, or compounded, when the individual is related to some organizational framework. The limitations of the individual planner will be expressed in terms of the bounds, unreliability and transience of human mental powers, in comparison with the magnitude of the challenge he faces.

The argument is that, while it is essential to utilize the planners' capabilities to the full, it is equally essential to acknowledge his limitations, to safeguard against these, to check for their transgression, and to correct for the latter where possible. To do otherwise is to pretend, for planners, capabilities which they do not possess; this leads not only to an inefficient use of those capabilities they do have, but also to a danger of the resulting decisions being accorded more credence and less examination than they might otherwise.

It should be noted that the type of limitations referred to here are more a function of the relative difficulty of the planner's task, than of his relative skills and effort in approaching it. In that they reflect not personal weaknesses, but general weaknesses of mankind, they imply no criticism of the planner; we thus feel no need to right the proverbial balance by dwelling on his strengths.

Overall Availability of Skills

First, the education, training, and upgrading of members of planning professions, whether it be through formal study or informal experience, only improves at a certain rate. Variations on this theme would highlight instead the number of qualified professionals turned out, or the standard of those attracted to the profession. Some would even link improvement with a particular capability: an understanding of analytic tools, or a level of political sophistication, for example.

But the basic argument that the amount of expertise available, of one sort or another, is far short of what many would desire, and that this situation will not be remedied overnight, is commonplace. It is also common to innumerable other fields of human endeavor.

Capacity Constraints of the Human Mind

Secondly, there are straightforward capacity constraints of the unaided human mind in the storage and processing of information. One obtains impressions of problems of mental capacity, and memory span in examining the number and structure of alternative plans or policies which the thorough professional will choose to handle at any point in time. Whatever their exact level of configuration, we would submit that there exist strong bounds which defy the aspirations of any one man, even the most intelligent and well-educated, to perceive, think and argue soundly about all aspects and policies of a metropolitan region.

Rather, an honest planner is capable of dealing carefully with only one or a few parts in full detail; or of dealing carefully with a more comprehensive range of parts from one or a few restricted perspectives; or of a little of both. And outside such areas, apart from the possibility of some expertise in interfacing with other participants in a planning process, the planner can hardly claim more capability than the enlightened layman, and often exhibits less. This, of course, would be fine if the problems and possibilities of the world were divided so as to neatly correspond to the individual planners' capabilities. But the contemporary world turns up patterns of interdependence complex and far reaching enough to thwart such hopes.

Constraints upon Sustained Performance

Third, there are limitations upon man's ability and willingness to repeat his most sophisticated mental processes upon demand, and as systematically and reliably as one would wish. Some people can perform simple mental operations continuously. Others will perform astounding feats occasionally. Still others will perform moderately difficult tasks with a moderate frequency. Few, if any, can perform highly diverse and sophisticated mental exercises regularly or continually. And even with the simpler operations, few would guarantee that each repetition was as exhaustive and as accurate as the others.

Care must be taken to assess these performance factors realistically, and to assign the available brainpower in the best possible way. And part of that assignment, one would suspect, ought to be devoted to a pursuit of ways of augmenting and supplementing the basic mental capabilities of the individual, so that the effort needed for repetitive thought and argument is reduced; and scarce mental resources are preserved for those perceptive and creative elements of the task to which they are uniquely suited.

Transience of Personal Resources

Fourth, the individual human is a transient being. Most obviously, his life itself is transient. Not only can he produce, mentally, at a limited rate, but he can do this for a limited time. Then his function is eliminated, or he is replaced by someone different: sometimes better, sometimes worse, but usually different.

As is well-known in the business and political world, any organization which fails to prepare for this transition, whether by making it smooth, or by making the most of it, is not doing itself justice at one of the most critical junctures of its development. Furthermore, the transition is not limited to death or retirement; indeed, in the planning field it tends to come at an alarming frequency, sometimes every few years or so, as the individual moves on in person to another agency, or as his personal interests and preoccupations change.

The question is whether, regardless of the emphasis a new man may be chosen for, or the direction he may feel it appropriate to take, we can do better in transferring to him an understanding, or at least a ready reference base, of recent history of the local planning dialogue, and of the current status of the planning situation. At present, only parts of this information can be conveniently found in shelves of reports, files of correspondence, and banks of data. As these are likely to be incomplete or unmanageable to work with, in practice an understanding is often gleaned mainly from verbal briefings. We would question how sufficient and efficient such a mechanism is, if one is aiming at an explicit, responsive, and sophisticated continuing process.

Limitations of Perspective and Objectivity

Fifth, associated with all the above, are the obvious limitations to any individual's appreciation of lifestyles, other than the one he has experienced

himself; and the obvious limitation to any aspirations he may have to be neutral and objective, or to act in some overall public interest. Planners are human in both respects.

Pragmatic Attitude toward Nonprofessional Capabilities

Designing a Process Sympathetic to Lay Resources

An even more perplexing set of limitations, from the viewpoint of the capacity of the individual, concerns the various decision makers and other nonprofessionals who contribute toward public policy making. The planning process itself must be tailored so as to enable these people to relate in the most meaningful possible way. And at the level of individual capabilities, this means that: (a) languages of interaction must be readily comprehensible; (b) limited time spent in interaction must be geared very directly to the concerns of each particular individual; and (c) organizational and procedural ramifications of participation be widely understood and sympathetic to nonprofessional schedules - i.e., that participation be made as easy as possible, at least for the serious participant.

Principles Underlying Effective Participation

Here we retain our interest in the capabilities of a single individual, but focus attention on the nonplanners who participate at various junctures in the planning dialogue. They include elected representatives in local government, appointed officials such as the chairman of the planning commission, professionals in other public services (police, teachers, doctors, etc.), and the ordinary lay public. Their limitations with respect to absorbing, analyzing, and critiquing planning propositions are generally far more confining than those of the professional planner, simply because they have a far smaller proportion of their time and mental resources to spend on planning issues.

It is essential that these nonprofessionals participate, or be adequately represented, in the planning dialogue, whenever it impinges upon their special interests, knowledge, or responsibilities. However, this alone is an optimistic demand upon their resources and their capabilities. It is thus equally essential to make it easy for them to restrict their attention to those substantive questions, and junctures of the planning process, in which their participation is most vital. Only then can they do their concerns, and the process, justice.

There is thus a need to spell out carefully just which interests, what knowledge, which responsibilities, and so on, are associated with each potential participant. The participants themselves, of course, have inputs in this regard. And there is a further need to embody these details in a system where the possibility of appropriate consequential messages is systematically raised, whenever the planning process is likely or ready to engage issues directly relevant to anyone's concerns. Moreover, as already indicated, there is a need to support the participant, by making available for his consideration alternative prototypes of statements, and of chains of dialogue, which he or the planners might find useful to pursue.

Need to Interface with Comprehensible Languages

However, there is another consideration with respect to the capabilities of the individual participant which figures strongly in our representations, but which we have hardly spoken of so far. This is the need to interface with him in languages he can comprehend. In brief, the pragmatic argument is this. So many essential participants in the planning process are so far from being able to wrestle with mathematical symbolisms and technical terminology that the principal languages of analysis and communication must for a long time rely on representations akin to natural verbal and diagrammatic languages.

To the extent that mathematical assumptions and arguments are instrumental to the contribution of certain participants, and to the extent that these constructs ought to be susceptible to a wider social sanction than can be offered by mathematical professionals, then they must be translated into equivalent verbal (or quasi-verbal) expressions. Parenthetically, it does not follow that the latter will be expressions of a natural language: they will often constitute more formal and well-defined statements in an artificial language. Indeed, the question will sometimes arise as to whether there would not be advantages in carrying out the original mathematical operations of an activity entirely in the quasi-verbal representation.

Problem Solving Potential of Representations

The above sections have presented various arguments for the need for new representations of the planning process. These arguments have been oriented mainly toward pragmatic needs in order to motivate the reader for the languages in Part Two. A brief indication of the direction of development beyond this volume may also be helpful in understanding our proposals, and the benefits which we believe they offer to the planner.

Let us first address ourselves to the question of feasibility. Where should these representational concepts be taken if one wishes to produce some sort of workable capability in the short to medium term? Or conversely, given a few years, and reasonable developmental resources, in what form could this framework be expected to be manifest, and how would the resultant procedures work? This is crucial question, since the directions one could take are many, yet the directions one should take, on account of limited resources, are relatively few.

Our major points here are straightforward. Yet we cannot stress them too firmly for much of the skepticism which our work could encounter is likely to be based on premises contrary to these. In brief, we would contend that:

1. Planning and policy making should be technological, as distinct from scientific, in nature; and the primary criterion for acceptability of methods should be usefulness and improvement, as contrasted with elegance, parsimony, precision, optimality, and the like. At this juncture, for pragmatic reasons, quite partial, imperfect and approximate approaches producing suggestions, hints, and guidelines, as opposed to answers, are often the capability to aim for.

2. One of the essential ingredients of most scientific and technological endeavors of comparable scale to metropolitan planning, is the availability of suitable formal languages. And one of the greatest shortcomings complex planning operations have to face, in this respect, is the absence of explicit representations of a qualitative or logical richness adequate to express the elaborate phenomena and subtle strategies encountered in the real world, or appropriate for the more synthetic and creative stages of decision making.

3. However, it would be a grave mistake, in attempting to overcome this weakness, to aspire to representational systems which were fully-defined and deterministic, and would yield outputs, amounting to answers, in a fully-mechanistic fashion, given a single set of inputs. For this would demand the formalization of all sorts of perceptive and logical tasks of which the human being is eminently capable, and add an overwhelming and unnecessary level of sophistication to the basic challenge. The aim should be to aid and systematize the process of human problem solving, rather than replace it.

What aspects of problem solving do these representations seek to elucidate more effectively? As a conclusion to this chapter, we will simply list some of the main ways in which we believe they could offer help:

1. in designing improved planning processes, with respect to their combined organizational, procedural and information

2. in enabling more willing, positive and meaningful participation, on the part of both public and professionals, by providing a detailed and credible picture of the division of planning capabilities, responsibilities and powers, and the manner in which these need to be invoked over time;

3. in enhancing the quality and sophistication of both public and professional participation, by providing the rudiments of a common, standard, comprehensible and appropriate language system for all involved.

4. in conserving scarce staff resources, mitigating some of the negative effects of their transcience, and encouraging greater comparability of study efforts, by virtue of the same element of standardization of linguistic and procedural conventions;

5. in suggesting a formal representation for a plan, as a list of statements of a certain prototypical structure, which is concrete and explicit, which is able to accommodate sophisticated ideas (such as plan generality, flexibility and comprehensiveness), which is sympathetic to further theoretical refinement;

6. in establishing a basis for dealing with values, objectives, criteria and standards in the planning process which is more clearly defined and enables the expression of these things in a manner which may well be far more faithful to reality (e.g. as a conditional logic rather than a simple weighting system);

7. in offering languages which are versatile enough to begin to formalize the application of conventional mathematical models, and thereby aid processes of problem recognition, conceptualization and simplification, and the proper design and application of the models themselves;

8. in dealing with qualitative information of a planning situation in an explicit, formal and systematic manner, and in a common framework with quantitative information or numerical data;

9. in beginning to address the formalization of synthetic and creative (as opposed to analytic) stages of the planning process, by accepting the employment of interactive aids, and of a rich heuristic logic, whereby it should eventually be possible to circumvent combinatorial and other problems, which are inherent in more traditional and less technological approaches.

PART TWO

PRINCIPLES OF THE LANGUAGE SYSTEM

CHAPTER 4

PATTERNS OF STATEMENTS BETWEEN PARTICIPANTS OVER TIME: THE PLANNING PROCESS DIAGRAM

Introduction to Part Two

The three chapters comprising Part Two provide a concise, introductory statement of the languages, or representations, proposed for the continuing planning process. Chapter 4 introduces a language for representing statements of participants in the planning process over time, the planning process diagram. Chapter 5 proposes a second language for representing various types of statements invoked by these participants, the planning situation chart. Chapter 6 examines the interrelationships between the two languages, and shows how one language may be used to generate the other.

Both languages are graphical, as indicated by their names - diagram and chart. Numerous figures serve to illustrate the concepts embodied in the two languages. In some cases, these figures also serve to introduce the substantive basis for Part Three, Southeastern Wisconsin's Milwaukee River Watershed Planning Program.

This introduction is also a suitable place to define a few linguistic terms which are used sparingly in Parts Two and Three. Two terms which are important for this work and which may be somewhat familiar to most readers are syntax and semantics. The syntax of a language concerns the formal relations between the signs, symbols or expressions in abstraction from their meaning or interpretation. In each language, the syntax consists of two sublanguages

1. format sublanguage - the framework or layout of the language;
2. narrative sublanguage - the signs, symbols or expressions which are written into the format sublanguage.

In addition to these two sublanguages, syntax includes the rules for writing the narrative sublanguages onto the format sublanguages.

The semantics of a language concerns the meaning, or relationship of meanings, of a set of signs, symbols or expressions, especially cognitive meaning. Thus semantics involves the interpretations that may be ascribed to the languages as a result of various types of patterns displayed.

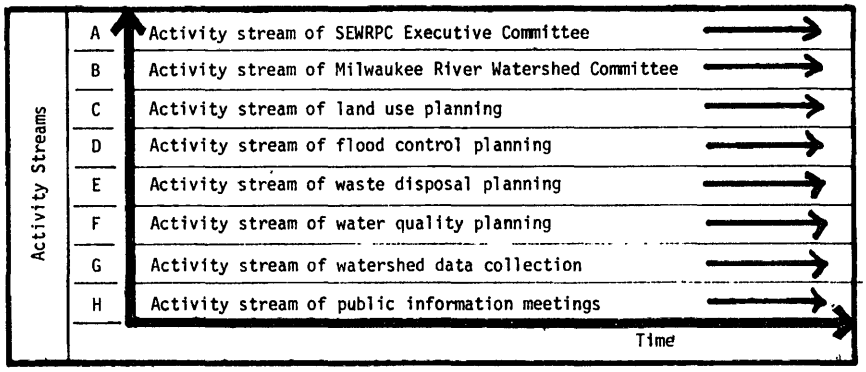
We now turn to the first of the two languages, the planning process diagram. The presentation of the language here is intentionally concise and stripped of most technical details. Additional results may be found in McDonald and Boyce (1971b) "Prototypical Forms of Dialogue for Metropolitan Planning." Likewise, a much more detailed development of the planning situation chart presented here as Chapter 5 may be found in McDonald and Boyce (1971a) "Tabular Form as a Language for the Planner." Finally, the interrelationship between the two languages, the subject of Chapter 6, is developed in more detail in McDonald and Boyce (1972) "Concatenation, Tabular Scans and Cyclic Processes." These papers, and several other closely related papers are collectively published as Boyce and McDonald (1972) The Refinement of Procedures for Continuing Metropolitan Planning.

A Dialogue of Consequential Statements

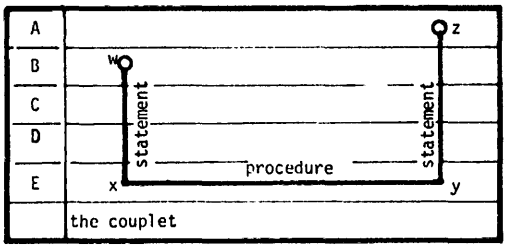
The continuing planning process is an ongoing dialogue between a variety of political, professional, institutional and public interests. Such a dialogue may be formally represented by a diagram. In Figure 4-1a, the horizontal axis is a time axis, and each of the horizontal streams arrayed along the

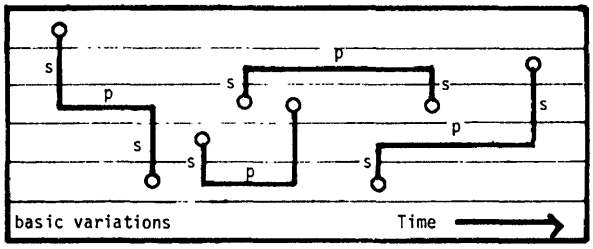
Figure 4-1

(a) Concept of an Activity Stream

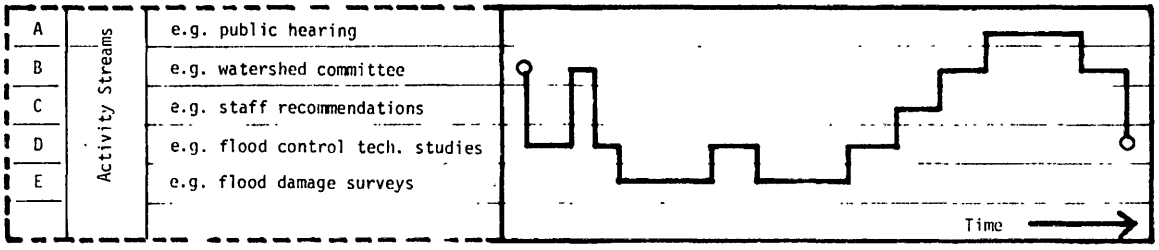


(b) Concept of a Couplet

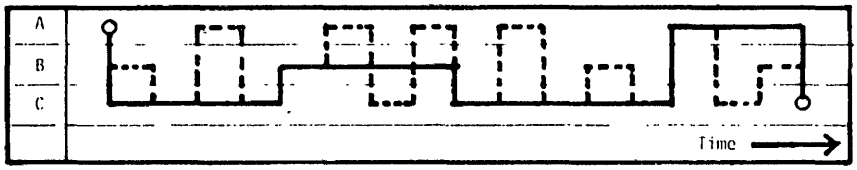




(c) Planning Process as a Dialogue



(d) Consequential Messages



vertical axis (A, B, C, etc.) is reserved for some general activity (e.g. public information meeting, watershed survey, committee meeting) which is a potential contributor to the overall process. These are known as activity streams, and constitute the format sublanguage of the planning process diagram.

Specific contributions to the dialogue are expressed in the form of couplets of vertical and horizontal links as in Figure 4-1b. Link w-x represents a statement, or consequential message, from activity stream B to activity stream E. Link x-y denotes a subsequent procedure within activity stream E. In Figure 4-1b this is followed by link y-z, a second statement, from stream E to stream A. Also shown are simple variations of this basic statement-procedure-statement sequence. As used here, statement and procedure should initially be considered to be quite abstract concepts, and together constitute the narrative sublanguage.

Chains of dialogue are built up from the basic statement-procedure-statement couplet as shown in Figure 4-1c. For example, stream B might be the activity of specifying alternative flood control plans for elaboration; link w-x a data input statement to predicting flood damage (activity stream E); link x-y a predictive model run based on that input statement; and link y-z and output statement predicting consequences, directed to evaluation stream A. Or the whole couplet might be concerned with something far less technical: a statement of final alternatives from the watershed committee, their discussion at a public information meeting, and a statement of feedback to the committee members, for instance.

However, abstract as they may be, the significance of the statement and procedure concepts is also usefully bounded in several respects. First, it is the statement, rather than the procedure, which will be emphasized here.

This is partly because we feel the need for more explicit consideration of the information and assumptions from which a planning process could begin, and the conclusions and decision to which it could lead, in conjunction with work program design and revision. When the focus is upon a sequence of activities alone, there is a tendency not to give very thorough advance consideration to these inputs and outputs. The fact that the latter are partly a function of study findings does not prevent prior identification of certain limits and expectations.

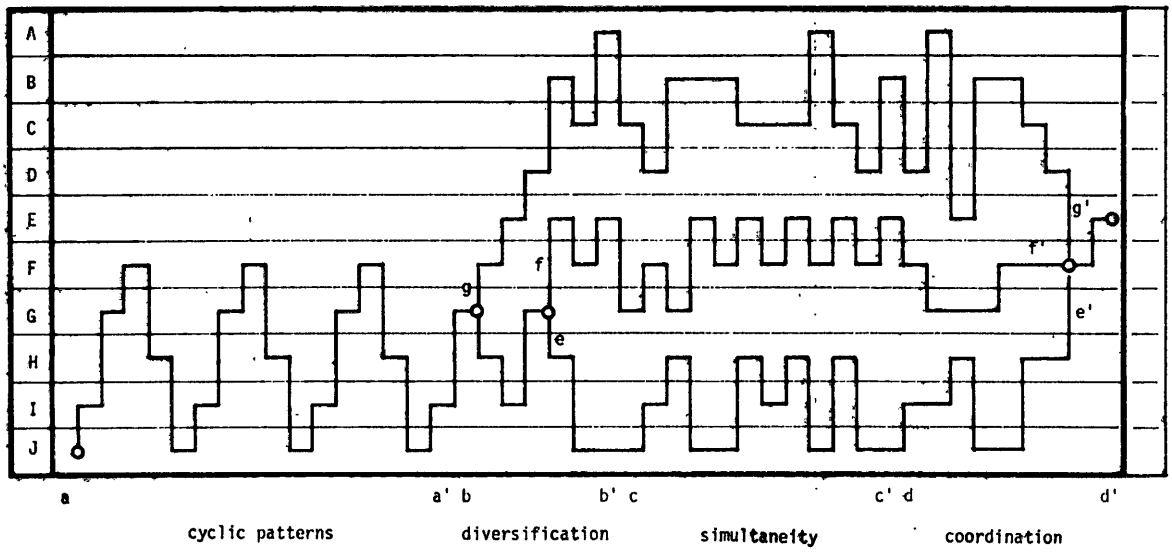
Secondly, there is a strong presumption that one will be dealing not with all statements which occur in the planning process, but with those which summarize the consequential messages and reasoning involved; see Figure 4-1d. Thirdly, there is the belief that these consequential statements can be dealt with as formal entities. That is to say, they will be given a formal symbolic expression which is somewhat more well-defined in meaning, and more standardized and restrictive in style, than that typical of natural language statements. The vertical statement link utilized in Figure 4-1b is just one such symbolic expression.

Properties of the Planning Process Diagram

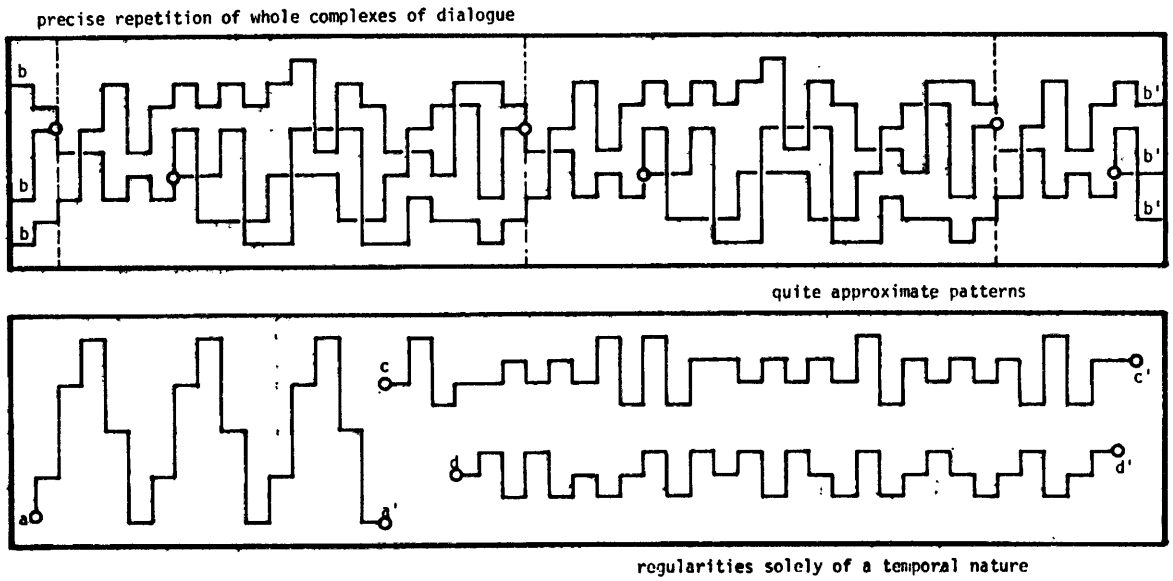
Complex dialogues, such as the one depicted in Figure 4-2a, may be built up from these basic couplets. This enables many interesting features of the planning process to be highlighted: such as cyclical patterns to the dialogue (a-a'), its diversification to embrace the concerns of many different activity streams (b-b'), or its capacity to accommodate (c-c'), or coordinate (d-d'), a number of simultaneous chains of dialogue. Figure 4-2a may be looked upon as a formal model written in a two dimensional diagrammatic language which we call the planning process diagram.

Figure 4-2

(a) More Complex Dialogues



(b) Various Cyclic Patterns



Now, briefly consider some properties of the planning process diagram. Note the planning dialogue is depicted in a carefully constrained manner in our model: procedures are considered to take time, whereas statements are considered to be relatively instantaneous. Moreover, the two are for the most part linked together in very simple chains of alternating statement-procedure-statement couplets. The ability of a dialogue to branch, i.e. a single procedure to lead to two or more simultaneous statements, or vice versa, is assumed to be invoked infrequently, in comparison with this more linear, or more strictly sequential, progression. However, branching mechanisms are certainly required, and the planning process diagram can also be used to represent these vividly.

Many of these constraints are eventually traceable to constraints upon the continuity of performance and information handling capabilities of the individuals with which an organization is composed. For instance, careful human reasoning takes time; and, for the individual at least, it is itself sequentially constrained. Similarly, the individual cannot generally do justice to two messages at once: if a decision process is to be thoughtful, statements must not be issued simultaneously by participants in any single dialogue.

From considerations such as these, one may postulate a necessity for much of the planning process to consist of simple, and relatively independent, statement-procedure-statement chains. For example, suppose chain e-e' in Figure 4-2a represents committee deliberations between five persons, F, G, H, I and J. Then, for an orderly, rational discussion: (a) the issues can only be taken up one after another; and (b) assumptions may have to be made about the progress of the other chains of dialogue, f-f' and g-g'.

Some empirical support for our choice of constraints is offered by the fold-out diagrams of Metropolitan Plan Making. Certain attributes of the processes depicted there suggest that consequential statements are indeed transmitted in a negligible time, relative to that taken by procedures; and that branching occurs infrequently, relative to the occurrence of strict sequentiality. In fact, it was partly work on those diagrams which motivated our more formal, abstract language. But, although this evidence may be more persuasive than that currently advanced for rival paradigms of planning, it is necessarily inconclusive. To the extent that existence of the attributes in question is substantiated, one still needs deeper understanding to be assured that they are beneficial to the planning process.

Another property of the diagram chosen for emphasis here is cyclic patterns in a dialogue. Reproduced as chain a-a' of Figure 4-2b are the intuitively attractive cyclic patterns of chain a-a' of Figure 4-2a. What these depict is the regular and exact repetition of a particular sequence of dialogue, involving a particular sequence of participants. However, the term cyclic is used in a more general sense to describe any of the great variety of recurrent, patterned phenomena indicated elsewhere in Figure 4-2b.

Some of these cyclic phenomena are more demanding than a-a' in that they require the precise repetition of whole complexes of dialogue (e.g., b-b'). Yet many are rather more mundane. For example they may allow quite approximate patterns (c-c'). Or they may recognize regularities which are solely of a temporal nature (d-d'). Indeed, cyclic patterns are possible in aspects of the dialogue which are not even explicit in this diagram, such as the sequence in which various classes of statement are used.

Hopefully, these quick illustrations lend some credibility to our diagrams. We are persuaded that, taken together, practical constraints such as

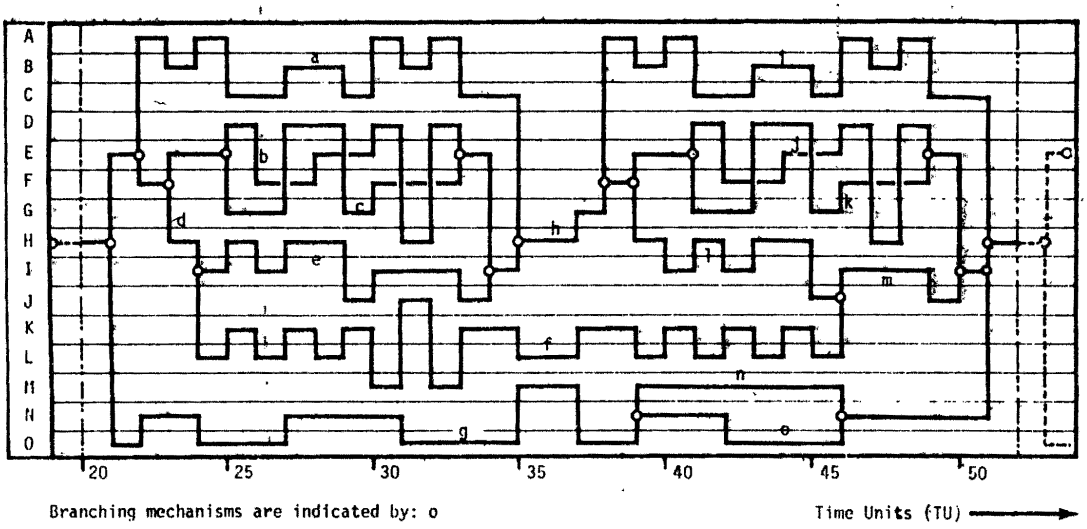
these have a powerful influence in shaping the rational decision process for an area as complex as metropolitan planning. Moreover, to the extent that any constraints are binding, we would take the normative stance that they should have a powerful influence. Models of the planning process which ignore them are inconsistent with the sort of careful reasoning which we are seeking here.

Finally, once the dialogue language is found agreeable in principle, what potential does it open in terms of models of particular planning processes? The best glimpse of that potential is probably obtained by inspection of some of the parameters which may be defined upon the statements, chains of statements, and activity streams. Figure 4-3 is provided for that purpose. Although presenting only quite straightforward indices, many of these are immediately attractive as measures of different planning capabilities.

Two particular strengths of the planning process diagram are apparent in these measures. The first is its explicit time dimension: the diagram disciplines one to record when a statement was, is, could, or should be made. The second is the explicit activity stream dimension: the diagram disciplines one to ask by whom (or under which auspices) the statement is issued, and to whom it is directed. However, one serious weakness of the diagram used by itself is also evident. Only if the measures are able to refer to classes of statement, to indicate which are commands to do what, for example, do we have a really convincing model of a planning dialogue. This dimension of the continuing process is represented in the planning situation chart, the subject of Chapter 5.

Figure 4-3

Some Parameters Defined Upon a Planning Dialogue



The following pertain to the major cycle between time 20 TU and time 52 TU. A chain is considered to be any strictly sequential dialogue containing at least one statement-procedure-statement couplet.

Total number of activity streams participating in dialogue	=	15
Total number of chains	=	15
Mean length of a chain	=	9.06 TU
Total number of statements in chains	=	102
Mean number of statements in a chain	=	6.8
Periodicity of statements in average chain	=	1.56 TU
Mean number of activity streams participating in a chain	=	3.6
Maximum number of activity streams participating in any chain (in chains a, f and i)	=	5
Number of chains in which the average activity stream participates	=	3.5
Maximum number of chains in which any activity stream participates (stream H)	=	9
Proportion of time for which the average activity stream is empty	=	68%
Minimum mean periodicity of statements between any pair of activity streams (K and L)	=	2.29 TU
Maximum number of statements passing in any single TU period (at time 46)	=	7
Mean number of parallel chains in any single TU period	=	4.8
Ratio of mean number of parallel chains to total number of activity streams	=	0.32
Proportion of total time for which number of parallel procedures is above mean	=	62%
Mean periodicity at which branching mechanisms are invoked	=	1.77 TU
Maximum number of branching mechanisms invoked at any one time	=	2
Proportion of statements interlocking between chains b and c, or j and k	=	33%

Role and Potential of the Planning Process Diagram

Purpose of the Planning Process Diagram

Given this brief overview of our language, it is possible to outline the reasons for its introduction. The principal aim of the planning process diagram is to provide a formal and explicit representation for the procedural aspects of continuing planning, with a view to postulating more efficient and effective ways of pursuing patterns of dialogue over time, within and between participant groups. This may be elaborated into three more detailed purposes, although a full appreciation of these must await our discussion of links between the process diagram and the planning situation chart:

1. to describe various aspects of the planning process such as generation, elaboration, technical evaluation, political evaluation, etc., and various types of planning process, in terms of common, standard elements: having clear and relevant distinctions; lending themselves to measures of overtness and responsiveness; and encouraging consistent usage;

2. to provide a better-defined and more disaggregate model of planning as a participatory process: an explicit representation of the values associated with each proposal and its repercussions; of the people and groups associated with the values; of the powers and responsibilities associated with the people and groups; and of the types of message they can usefully pass to one another;

3. to offer a model of the planning process suited to the expression of cyclic learning approaches: a manageable and intelligible series of checks and balances, whereby plans and problems may be subjected to successive cycles of examination, augmentation and revision, from diverse perspectives.

Of these various functions and notions, we can most usefully expand upon the procedural and participatory aspects of planning at this juncture.

Procedural Solutions to Organizational Constraints

The planning process diagram presupposes a concern for procedural questions: the patterns in which planning dialogue is distributed over time. This emphasis arises from highly pragmatic considerations. Essentially, we

would contend that the formalization of this temporal aspect of planning, is the only practical way to overcome many limitations upon the capabilities of participants in the process, and of the organizations they create. And much of our concern, in this, is directed at limitations of the professional planner and official planning agencies.

In brief, the argument is as follows. There are crucial practical constraints upon human capabilities: on the overall availability of skills; on the capacity of the individual human mind; on sustained performance at peak capacity; and due to the transience of human lives and energies. One of the time-honored methods of overcoming these constraints is to interface or integrate the efforts of an individual with those of others into an organization. Yet organizations have their capacity constraints in turn. For a start, the most rigorous interpersonal discourse is restricted to a strictly sequential form: all participants must consider every statement; yet any single participant can only issue or receive statements one at a time. But the capacity of this form is so constraining that rigor must be compromised, to a degree, and the planning task be subdivided, so as to enable different groups of people to pursue simultaneous chains of dialogue. These need not be completely independent, but the branching and coordinative mechanisms through which they are integrated, are associated with yet further capacity constraints.

The above limitations all pertain to the capacity of the decision making apparatus at a point in time. Once one accepts in principle that problems may be and indeed, complex problems must be, broken down and tackled over time, then management or procedural (rather than organizational) capabilities are also involved. These, of course, have their limitations, too. But we would contend that their potential for improvement via systematization is relatively unexploited. The circumvention of organizational limitations

through procedural devices, is judged to be the most promising single technical way of improving the planning process in the foreseeable future. And it is because the repetition and development of sophisticated procedures is dependent upon their explicit and preservable nature, that the time dimension figures so clearly in our formalizations.

Consequential Messages of Participation

The issue of participation is closely linked to organizational and individual limitations. But here it is their objectivity, rather than their overall capacity, which is of concern; and it is the nonprofessional contribution which is paramount. The constraints upon the layman are far more confining than those upon the professional, if for no other factor than the far smaller proportion of his time which he can spend on planning issues. The dialogue has to be made sympathetic to such constraints, by ensuring that:

1. limited time spent on interaction is geared directly and specifically to the concerns of particular individuals and interest groups;
2. languages of interaction are readily comprehensible.

These two key principles for effective participation are addressed by our total chart-plus-diagram system.

The specific contribution of the planning process diagram rests in its ability to portray patterns in which statements can usefully be made between various participants at various stages in the dialogue. It can be used to provide planners with suggestions for sequences of information, which are within the rights, preoccupations, responsibilities and capacities of various interest groups to receive.

The public and their spokesmen could likewise be prompted as to the type of response statement which would be helpful or salutary to the planners, at various junctures of the process. Quantitative increases in participation

will remain vacuous, until such qualitative details are worked through. Moreover, the latter must then be embodied in some practicable form: which means, in this area, statements which can be shared by diverse participants; and symbolisms akin to those of natural verbal and diagrammatic languages.

Recap of the Planning Process Diagram

The principal aim of the planning process diagram is to provide a formal and explicit representation for the procedural aspects of continuing planning. The basic syntax of the planning process diagram is:

1. a format sublanguage of horizontal activity streams;
2. a narrative sublanguage of:
   a. vertical "statement" links,
   b. horizontal "procedure" links,
   arranged predominantly in alternating, nonbranching chains;
3. rules for writing the narrative sublanguage onto the format sublanguage.

The semantic interpretations which may be associated with this basic syntax fall into several major classes:

1. meaningful parameters which may be defined upon dialogue generated directly from the basic syntax as in Figure 4-3;
2. interpretations which may be associated with various patterned phenomena occurring in a single, strictly sequential, chain;
3. interpretations which may be associated with various patterned phenomena occurring in a set of chains.

CHAPTER 5

PATTERNS OF DATA, TRENDS, ALTERNATIVES, CRITERIA AND PLANS: THE PLANNING SITUATION CHART

Classes of Statement Used in Planning

Performance Characteristic Statement

Our concept of the continuing planning process introduced in Chapter 4 is now extended by considering the form and content of the type of statements comprising actual planning dialogues. Careful examination of actual planning activities has led us to specify prototypical types of statement which are used again and again in similar contexts. Examples of such statements are:

DEVELOPMENT OF XXX DEPENDS UPON PRIOR DEVELOPMENT OF XXX;

XXX IS AN/A INSIG/SIG-NIFICANT DEPARTURE FROM THE PLAN;

GROUP XXX IS/ARE OPPOSED TO ALTERNATIVE XXX BECAUSE OF XXX:

WOULD A HIGHER/LOWER VALUE OF XXX BE CONSISTENT WITH XXX:

IF XXX ARE XXX LARGE/SMALL, THERE CAN BE NO MORE/LESS THAN XXX OF THEM;

PUBLIC HEARINGS MUST BE HELD BY XXX ON OR BEFORE XXX.

In the planning process diagram, statements used in a planning dialogue are classified mainly as to the time of issuance and the source, including various characteristics of the source. In addition, such statements can be classified by grammatical mode (command, question, etc.), the stages of the planning process to which they relate, the real world attributes or systems with which they are concerned, and so forth. The suitability of a statement from one class as a response to a preceding statement from another class will be a function of such factors. The extraction and classification of prototypical statements hence provide a structured data base of potential use in building chains of planning dialogue.

One class of statements of central importance to planning is that typified by the following examples drawn from the Milwaukee River Watershed Study:

1959-60 FLOOD LOSSES	WERE ESTIMATED AT $345,000 IN 1960 DOLLARS
SURFACE WATER RUNOFF	DOES AVERAGE APPROXIMATELY 6.9 INCHES ANNUALLY
FLOOD DAMAGE RISK	WOULD BY 1990 AVERAGE $160,000 PER ANNUM
DEMAND FOR RECREATION	WOULD DOUBLE IN WATERSHED DURING 1967-90
UPSTREAM RESERVOIR	COULD ELIMINATE EFFECTS OF 100-YEAR FLOOD EVENT
LOWER RIVER EVACUATION	COULD EVENTUALLY DISPLACE 246 STRUCTURES
85 PERCENT OF PHOSPHORUS	SHOULD BE REMOVED AT MAJOR TREATMENT PLANTS
LAKES OF UNDER 50 ACRES	SHOULD BE LIMITED TO BOATS WITHOUT MOTORS
100 YEAR RECURRENCE	WILL BE DESIGN FLOOD FOR USE IN WATERSHED STUDY
UPSTREAM RESERVOIR SITE	WILL BE PROTECTED FROM INTENSIVE URBAN DEVELOPMENT

These are all statements in which some entity or characteristic (surface water runoff, demand for recreation, lakes under 50 acres) is associated with some state or value describing its past, present or future performance. These are defined to be performance characteristic statements.

Subclasses of Performance Characteristics

The statements in the above list of examples are standardized with the characteristic clause on the left, and the performance clause on the right. This format can be generalized if we agree to express all performance characteristic statements in the prototypical sentential form:

CHARACTERISTIC-X IS-ASSOCIATED-WITH PERFORMANCE-X'

Consideration of the normative, temporal, or conditional nature of particular realizations of this statement, yields such subclasses as:

1. empirical statements or indicators,

   CHARACTERISTIC-X DOES-or-did-HAVE PERFORMANCE-X'

2. projected statements or forecasts,

   CHARACTERISTIC-X WOULD-given-present-policies-HAVE PERFORMANCE-X'

3. hypothetical statements or conditional predictions,

   CHARACTERISTIC-X COULD-given-policy-zzz-HAVE PERFORMANCE-X'

4. preference or normative statements,

   CHARACTERISTIC-X SHOULD-preferably-HAVE PERFORMANCE-X'

5. political or decision statements,

   CHARACTERISTIC-X WILL-by-fiat-or-agreement-HAVE PERFORMANCE-X'

More refined classifications are, of course, conceivable.

Composition of a Planning Situation

An individual performance characteristic statement,

CHARACTERISTIC-X IS-ASSOCIATED-WITH PERFORMANCE-X',

may be considered to describe the state or quality of some aspect of the real world. A long list of such performance characteristic statements may be considered to describe the overall state of some microcosm of the real world. Let us consider briefly the composition of such a list:

1. If the individual statements are empirical performance characteristic statements, CHAR-X DOES-HAVE PERF-X', the list may be seen to constitute a data bank;

2. If the individual statements are projected performance characteristic statements, CHAR-X WOULD-HAVE PERF-X', the list may be seen to constitute a preplanning or trend state;

3. If the individual statements are hypothetical performance characteristic statements, CHAR-X COULD-HAVE PERF-X', the list may be seen to constitute one or more options or alternative plans;

4. If the individual statements are preference performance characteristic statements, CHAR-X SHOULD-HAVE PERF-X', the list may be seen to constitute a set of criteria and standards, or more generally a set of objectives;

5. Finally, if the individual statements are political performance characteristic statements, CHAR-X WILL-HAVE PERF-X', then the list may be seen to constitute an agreed state, a policy, or a plan.

Such a list of prototypical performance characteristic statements forms a vital component of our representation for a planning situation at a point in time.

Planning Situations as Charts of Statements

The planning process may now be viewed as an ongoing dialogues about the values and composition of a set of performance characteristics. In that the functional form of a performance characteristic can accommodate empirical, projected, hypothetical, preference, and political varieties of statement, the dialogue is evidently capable of embracing a great many stages of the planning process. Data banks, trend state, alternative plans, a set of criteria, and the plan itself can all be spoken about in a very detailed and specific manner within the same conceptual framework. What we require is a language, or representational framework, for manipulating such statements. The language proposed is indeed familiar to planners and decision makers; it is essentially based on tables, that is, on tabular form.

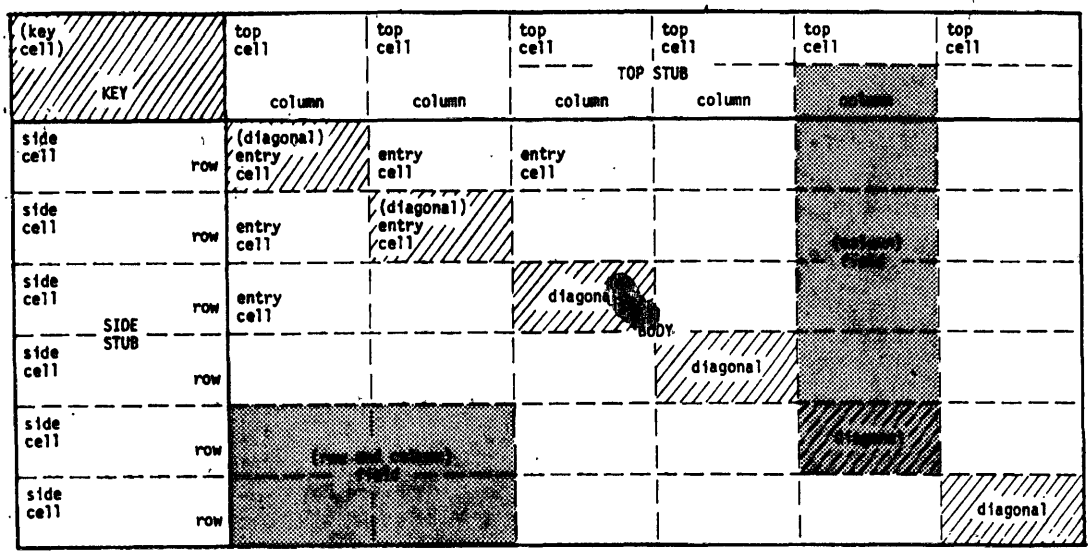
Components of a Rectilinear Table

Precisely which kind of tabular form are we interested in? A bounded, uniform rectilinear framework, or format sublanguage, is most familiar to planners, and that is the framework adopted here as shown in Figure 5-1a. We also tend toward a regular use of explicit labelling panels or stubs at the top and side, as also shown in Figure 5-1a.

The outstanding natural advantage of this language, is that the information assigned to any particular cell or field is associated by juxtaposition with other information in the table as shown in Figure 5-1b. It is a skeletal format in which one can carry out certain operations with symbolic information. If its potential is to be exploited, the contents and organization of

Figure 5-1

(a) Some Components of Tabular Form



(b) Associative Powers of Tabular Form

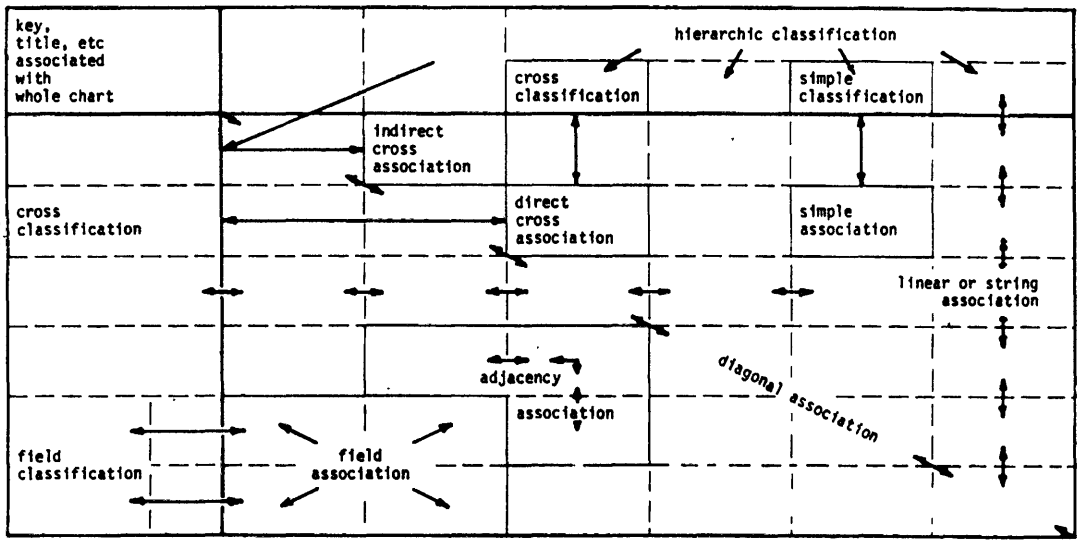
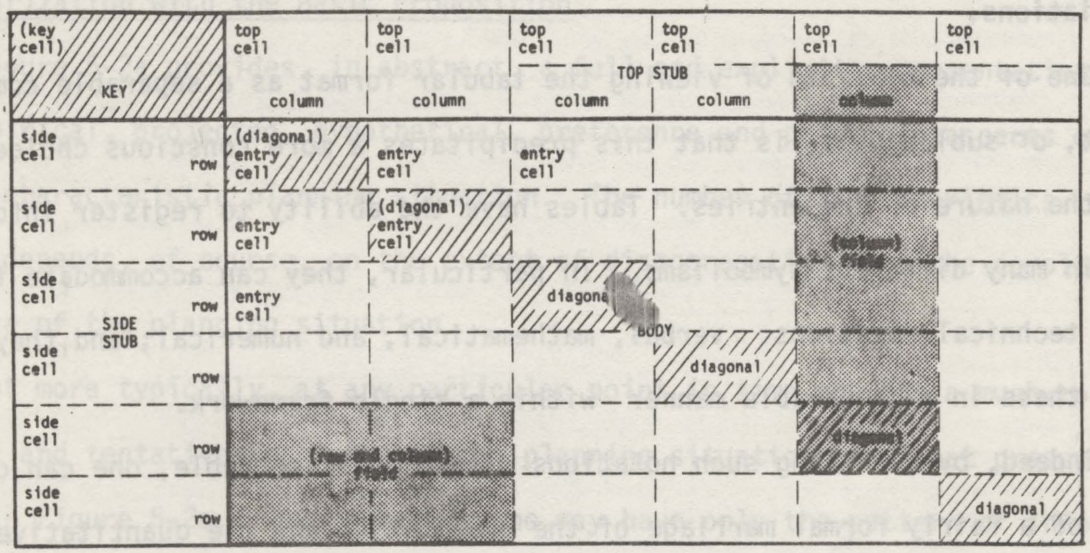
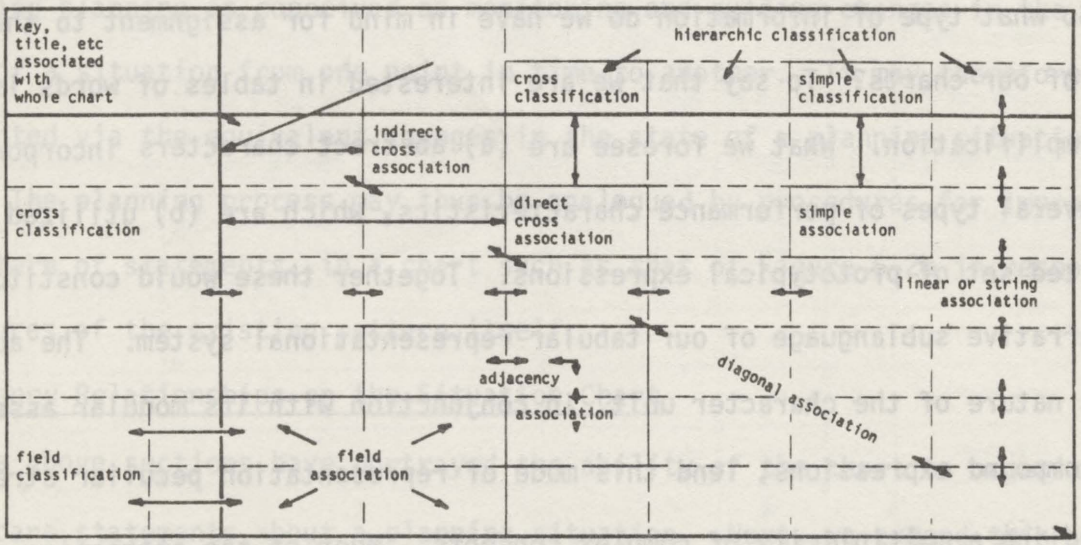


Figure 5-1

(a) Some Components of Tabular Form



(b) Associative Powers of Tabular Form



the chart must be defined such that there is some meaningful and useful conceptual interpretation to these associations; and the operation of the chart must be such that there is some procedural parallel to that of making the associations.

One of the benefits of viewing the tabular format as a separable component, or sublanguage, is that this precipitates a more conscious choice over the nature of the entries. Tables have the ability to register information in many different symbolisms. In particular, they can accommodate three major technical notations: verbal, mathematical, and numerical; and they can treat these in a comparable manner within a single framework.

Indeed, by combining such notations within the same table, one can conceive of a fairly formal marriage of the qualitative and the quantitative. An obvious potential here is the explicit relation of numerical values attributable to a set of variables, to possible changes in the composition of the set and the definition of its members. In such a composite table, it need not be just a pattern of numerical values which is up for examination, but also an integrated pattern of qualitative and quantitative attributes.

Tables of Words

So what type of information do we have in mind for assignment to the cells of our charts? To say that we are interested in tables of words is an oversimplification. What we foresee are (a) abstract characters incorporating the several types of performance characteristics, which are (b) utilized in a limited set of prototypical expressions. Together these would constitute the narrative sublanguage of our tabular representational system. The abstract nature of the character unit, in conjunction with its modular assembly into compound expressions, lend this mode of representation peculiar strengths in handling a multiplicity of complex concepts. Much of the attraction of our

tables, then, is derived from their employment of these quasi-verbal expressions, with their capacity to accommodate great richness, in a tabular organization with a capacity for disciplining its manipulation.

Familiarization with the Basic Proposition

Figure 5-2a provides, in abstract, a full and explicit representation for the empirical, projected, hypothetical, preference and political aspects of a nine-characteristic planning situation. The number of characteristics (rows) depends, of course, on the extent of disaggregation, and the complexity and size of the planning situation.

But more typically, at any particular point in time one has a much more partial and tentative knowledge of the planning situation than that presupposed in Figure 5-2a. For instance, one may have only the pattern of information shown in Figure 5-2b: the missing elements being unobtainable, inconceivable, irrelevant, or whatever. Furthermore, even the statements at hand, or the statements realized in the chart of Figure 5-2b, may involve numerous types of uncertainty and inconsistency.

Thus a chart such as Figure 5-2b depicts a transient situation; while a time-series of such charts depicts an evolving situation. The challenge of continuing planning is conceived as monitoring and guiding changes in the status of a situation from one point in time to another. It may therefore be represented via the equivalent changes in the state of a planning situation chart. The planning process may thus be analogued by procedures for improving the pattern of statements, in a chart such as that of Figure 5-2b in response to features of the existing pattern itself.

Consistency Relationships on the Situation Chart

The above sections have portrayed the ability of the chart to organize and compare statements about a planning situation. Next, we extend this

Figure 5-2

(a) Performance Characteristics in a Planning Situation Chart

	empirical	projected	hypothetical	preference	political
CHARACTERISTIC-X_1	DOES -HAVE PERF-X_1^1	WOULD -HAVE PERF-X_1^1	COULD -HAVE PERF-X_1^1	SHOULD-HAVE PERF-X_1^1	WILL -HAVE PERF-X_1^1
CHARACTERISTIC-X_2	DOES -HAVE PERF-X_2^1	WOULD -HAVE PERF-X_2^1	COULD -HAVE PERF-X_2^1	SHOULD-HAVE PERF-X_2^1	WILL -HAVE PERF-X_2^1
CHARACTERISTIC-X_3	DOES -HAVE PERF-X_3^1	WOULD -HAVE PERF-X_3^1	COULD -HAVE PERF-X_3^1	SHOULD-HAVE PERF-X_3^1	WILL -HAVE PERF-X_3^1
CHARACTERISTIC-X_4	DOES -HAVE PERF-X_4^1	WOULD -HAVE PERF-X_4^1	COULD -HAVE PERF-X_4^1	SHOULD-HAVE PERF-X_4^1	WILL -HAVE PERF-X_4^1
CHARACTERISTIC-X_5	DOES -HAVE PERF-X_5^1	WOULD -HAVE PERF-X_5^1	COULD -HAVE PERF-X_5^1	SHOULD-HAVE PERF-X_5^1	WILL -HAVE PERF-X_5^1
CHARACTERISTIC-X_6	DOES -HAVE PERF-X_6^1	WOULD -HAVE PERF-X_6^1	COULD -HAVE PERF-X_6^1	SHOULD-HAVE PERF-X_6^1	WILL -HAVE PERF-X_6^1
CHARACTERISTIC-X_7	DOES -HAVE PERF-X_7^1	WOULD -HAVE PERF-X_7^1	COULD -HAVE PERF-X_7^1	SHOULD-HAVE PERF-X_7^1	WILL -HAVE PERF-X_7^1
CHARACTERISTIC-X_8	DOES -HAVE PERF-X_8^1	WOULD -HAVE PERF-X_8^1	COULD -HAVE PERF-X_8^1	SHOULD-HAVE PERF-X_8^1	WILL -HAVE PERF-X_8^1
CHARACTERISTIC-X_9	DOES -HAVE PERF-X_9^1	WOULD -HAVE PERF-X_9^1	COULD -HAVE PERF-X_9^1	SHOULD-HAVE PERF-X_9^1	WILL -HAVE PERF-X_9^1

(b) Representation of Logical Patterns in a Planning Situation

	empirical	projected	hypothetical	preference	political
CHARACTERISTIC-X_1					
CHARACTERISTIC-X_2	DOES -HAVE PERF-X_2^1	WOULD -HAVE PERF-X_2^1			
CHARACTERISTIC-X_3	DOES -HAVE PERF-X_3^1			SHOULD-HAVE PERF-X_3^1	WILL -HAVE PERF-X_3^1
CHARACTERISTIC-X_4	DOES -HAVE PERF-X_4^1			SHOULD-HAVE PERF-X_4^1	
CHARACTERISTIC-X_5	DOES -HAVE PERF-X_5^1	WOULD -HAVE PERF-X_5^1	COULD -HAVE PERF-X_5^1	SHOULD-HAVE PERF-X_5^1	WILL -HAVE PERF-X_5^1
CHARACTERISTIC-X_6		WOULD -HAVE PERF-X_6^1			
CHARACTERISTIC-X_7	DOES -HAVE PERF-X_7^1				
CHARACTERISTIC-X_8	DOES -HAVE PERF-X_8^1	WOULD -HAVE PERF-X_8^1		SHOULD-HAVE PERF-X_8^1	

framework to the derivation of consistency relationships among statements.

For our purposes, consistency relationships take the general form:

IF (CHARACTERISTIC-X_1 IS-ASSOCIATED-WITH PERFORMANCE-X_1'),
THEN (CHARACTERISTIC-X_2 IS-ASSOCIATED-WITH PERFORMANCE-X_2').

Such statements may be arranged in the planning situation chart, as shown in Figure 5-3a, to specify three separate consistency statements. In this case, the statements are read row-wise since each consistency statement involves the same variable. If a statement involved two different variables, or characteristics, then the statement would be arranged column-wise.

Shading is used to denote the conditional component of each statement; if multiple conditions or implications occur, such as in the third row of Figure 5-3a, they are designated IF...AND-IF...THEN, or IF... THEN...AND-THEN.

Consistency relationships can also be used to portray simultaneously certain aspects of mathematical models and everyday argument as shown in Figure 5-3b. In this chart, the three central columns which are read column-wise, portray a model structure. Taken in conjunction with the input and output columns, the chart portrays a model application.

The model of Figure 5-3b is comprised of two empirical or observed relationships and one derived relationship, the latter being redundant, in the application shown. In other circumstances, however, relationships 1 and 2 could instead take on a more theoretical, and even hypothetical, status. Furthermore, the general nature of a consistency statement makes it possible to view the testing or "validation" of such a theory, within the same framework as a model application.

Figure 5-3

(a) Consistency Statements in a Planning Situation

		consistency characteristic statements					
CHARACTERISTIC-X_I		IF [redacted]			THEN	CHAR X_I IS ASSOC WITH PERF X_I'''	
CHARACTERISTIC-X_{II}		IF [redacted]	THEN	CHAR X_{III} IS ASSOC WITH PERF X_{II}''	AND THEN	CHAR X_{II} IS ASSOC WITH PERF X_{II}'''	
CHARACTERISTIC-X_{III}		IF [redacted]	[redacted]		THEN	CHAR X_{III} IS ASSOC WITH PERF X_{III}'	

(b) Consistency Statements Interpreted as a Simple Chain Model

	input performance characteristic statements	model relationships consistency characteristic statements			output performance characteristic statements
		relationship - 1 empirical/ observed	relationship - 2 empirical/ observed	relationship - 3 theoretical/ derived	
CHARACTERISTIC-X_I	CHAR X_I IS ASSOC WITH PERF X_I'	IF [redacted]		IF [redacted]	
CHARACTERISTIC-X_{II}		THEN CHAR X_{II} IS ASSOC WITH PERF X_{II}'	IF [redacted]		CHAR X_{II} IS ASSOC WITH PERF X_{II}'
CHARACTERISTIC-X_{III}			THEN CHAR X_{III} IS ASSOC WITH PERF X_{III}'	THEN CHAR X_{III} IS ASSOC WITH PERF X_{III}'	CHAR X_{III} IS ASSOC WITH PERF X_{III}'

Figure 5-3

(a) Consistency Statements in a Planning Situation

			consistency characteristic statements								
CHARACTERISTIC-X_I			IF					THEN	CHAR X_I IS ASSOC WITH	PERF X'''_I	
CHARACTERISTIC-X_{II}			IF			THEN	CHAR X_{III} IS ASSOC WITH	PERF X''_{II}	AND THEN	CHAR X_{II} IS ASSOC WITH	PERF X'''_{II}
CHARACTERISTIC-X_{III}			IF						THEN	CHAR X_{III} IS ASSOC WITH	PERF X'''_{III}

(b) Consistency Statements Interpreted as a Simple Chain Model

	input performance characteristic statements		model relationships consistency characteristic statements						output performance characteristic statements	
			relationship - 1 empirical/ observed		relationship - 2 empirical/ observed		relationship - 3 theoretical/ derived			
CHARACTERISTIC-X_I		CHAR X_I IS ASSOC WITH PERF X'_I	IF				IF			
CHARACTERISTIC-X_{II}			THEN	CHAR X_{II} IS ASSOC WITH PERF X'_{II}	IF					CHAR X_{II} IS ASSOC WITH PERF X'_{II}
CHARACTERISTIC-X_{III}					THEN	CHAR X_{III} IS ASSOC WITH PERF X'_{III}	THEN	CHAR X_{III} IS ASSOC WITH PERF X'_{III}		CHAR X_{III} IS ASSOC WITH PERF X'_{III}

Using the Chart in Plan Making

To Handle Multiple Condition Structures

One of the most straightforward applications of the situation chart is likely to be in the handling of rich conditional structures in day-to-day reasoning. Figure 5-4a provides an example of such a structure. Such a systematic and explicit approach could bring dividends, even with fairly simple sets of conditions. However, such conditions can easily become forgotten or misplaced leading to oversimplification and false argument. The situation chart is also suited to handling more sophisticated forms of implications, facilitating familiar constructs such as necessary and sufficient conditions, either-or expressions and negation, or converse and probabilistic implications.

But the greatest potential for such structures is in the recognition and formalization of classes or implication: such as legal rules, scientific rules, organizational rules and rules of policy and practice, which can be reapplied from one situation to another. In the short term, these could enhance the planner's perception of problem structures and solution options in a quite casual manner. In the long run, however, they could be embodied within partially-automated procedures, which enabled the systematic search for corresponding patterns of conditions in an extensive data base of statements.

To Handle Strategic Rules

The potential of the planning situation chart to systematize arguments is not restricted to the traditional realms of mathematical modeling and formal logic. Consistency relationships of the ungrammatical but obvious form may, for instance, be incorporated:

IF (CHARACTERISTIC-X_I IS-ASSOCIATED-WITH PERFORMANCE-X_I),

THEN (CHARACTERISTIC-X_{II} TRY-ASSOCIATING-WITH PERFORMANCE-X_{II}).

Figure 5-4

(a) Typical Mixed Structure of Multiple Conditions and Implications

	input performance characteristic statements	model relationships consistency characteristic statements			output performance characteristic statements
		relationship - 1 empirical/ observed	relationship - 2 empirical/ observed	relationship - 3 empirical/ observed	
CHARACTERISTIC-X_1	CHAR X_1 IS ASSOC WITH PERF X'_{1n}				
CHARACTERISTIC-X_2	CHAR X_2 IS ASSOC WITH PERF X'_{2n}				
CHARACTERISTIC-X_3		THEN CHAR X_3 IS ASSOC WITH PERF X'_{31}		THEN CHAR X_3 IS ASSOC WITH PERF X'_{33}	CHAR X_3 IS ASSOC WITH PERF X'_{3n}
CHARACTERISTIC-X_4	CHAR X_4 IS ASSOC WITH PERF X'_{4n}				
CHARACTERISTIC-X_5	CHAR X_5 IS ASSOC WITH PERF X'_{5n}				
CHARACTERISTIC-X_6	CHAR X_6 IS ASSOC WITH PERF X'_{6n}		AND THEN CHAR X_6 IS ASSOC WITH PERF X'_{62}		CHAR X_6 IS ASSOC WITH PERF X'_{6n}
CHARACTERISTIC-X_7	CHAR X_7 IS ASSOC WITH PERF X'_{7n}				
CHARACTERISTIC-X_8	CHAR X_8 IS ASSOC WITH PERF X'_{8n}				
CHARACTERISTIC-X_9			AND THEN CHAR X_9 IS ASSOC WITH PERF X'_{92}		CHAR X_9 IS ASSOC WITH PERF X'_{9n}

(b) General Specification for Three Types of Heuristic Strategy

	input performnce charctrstc statements	strategic relationships -- consistency characteristic statements									output performnce charctrstc statements
		relationship - type A			relationship - type B			relationship - type C			
		problem	analysis	strategy	problem	analysis	strategy	problem	analysis	strategy	
CHAR-X_1											
CHAR-X_{11} (-IDNTCL-) (PERF-X_{11})										TN PERF-X''_{11} CD-BCOME INDPNDT?	
CHAR-X_{12} (-IDNTCL-) (PERF-X_{12})				TN PERF-X'_{12} COULD-BE CHANGED?			TN PERF-X''_{12} COULD-BE INCRESD?				
CHAR-X_2											
CHAR-X_{21} (-IDNTCL-) (PERF-X_{21})										TN PERF-X''_{21} CD-BCOME INDPNDT?	
CHAR-X_{22} (-IDNTCL-) (PERF-X_{22})				TN PERF-X'_{22} COULD-BE CHANGED?			TN PERF-X''_{22} COULD-BE INCRESD?				
CHAR-X_3											
CHAR-X_{31} (-IDNTCL-) (PERF-X_{31})										TN PERF-X''_{31} CD-BCOME INDPNDT?	
CHAR-X_{32} (-IDNTCL-) (PERF-X_{32})				TN PERF-X'_{32} COULD-BE CHANGED?			TN PERF-X''_{32} COULD-BE INCRESD?				

Figure 5-4

(a) Typical Mixed Structure of Multiple Conditions and Implications

	input performance characteristic statements	model relationships consistency characteristic statements			output performance characteristic statements
		relationship - 1 empirical/ observed	relationship - 2 empirical/ observed	relationship - 3 empirical/ observed	
CHARACTERISTIC-X_1	CHAR X_1 IS ASSOC WITH PERF X'_{1n}				
CHARACTERISTIC-X_2	CHAR X_2 IS ASSOC WITH PERF X'_{2n}				
CHARACTERISTIC-X_3		THEN CHAR X_3 IS ASSOC WITH PERF X'_{31}		THEN CHAR X_3 IS ASSOC WITH PERF X'_{33}	CHAR X_3 IS ASSOC WITH PERF X'_{3n}
CHARACTERISTIC-X_4	CHAR X_4 IS ASSOC WITH PERF X'_{4n}				
CHARACTERISTIC-X_5	CHAR X_5 IS ASSOC WITH PERF X'_{5n}				
CHARACTERISTIC-X_6	CHAR X_6 IS ASSOC WITH PERF X'_{6n}		AND THEN CHAR X_6 IS ASSOC WITH PERF X'_{62}		CHAR X_6 IS ASSOC WITH PERF X'_{6n}
CHARACTERISTIC-X_7	CHAR X_7 IS ASSOC WITH PERF X'_{7n}				
CHARACTERISTIC-X_8	CHAR X_8 IS ASSOC WITH PERF X'_{8n}				
CHARACTERISTIC-X_9			AND THEN CHAR X_9 IS ASSOC WITH PERF X'_{92}		CHAR X_9 IS ASSOC WITH PERF X'_{9n}

(b) General Specification for Three Types of Heuristic Strategy

	input performnce charctrstc statements	strategic relationships -- consistency characteristic statements									output performnce charctrstc statements
		relationship - type A			relationship - type B			relationship - type C			
		problem	analysis	strategy	problem	analysis	strategy	problem	analysis	strategy	
CHAR-X_1											
CHAR-X_{11} (-IDNTCL-) (PERF-X_{11})										TN PERF-X'_{11} CD-BCOME INDPNDT?	
CHAR-X_{12} (-IDNTCL-) (PERF-X_{12})				TN PERF-X'_{12} COULD-BE CHANGED?			TN PERF-X'_{12} COULD-BE INCRESD?				
CHAR-X_2											
CHAR-X_{21} (-IDNTCL-) (PERF-X_{21})										TN PERF-X'_{21} CD-BCOME INDPNDT?	
CHAR-X_{22} (-IDNTCL-) (PERF-X_{22})				TN PERF-X'_{22} COULD-BE CHANGED?			TN PERF-X'_{22} COULD-BE INCRESD?				
CHAR-X_3											
CHAR-X_{31} (-IDNTCL-) (PERF-X_{31})										TN PERF-X'_{31} CD-BCOME INDPNDT?	
CHAR-X_{32} (-IDNTCL-) (PERF-X_{32})				TN PERF-X'_{32} COULD-BE CHANGED?			TN PERF-X'_{32} COULD-BE INCRESD?				

These are tantamount to rules of change or strategies. And the action suggested need not have guaranteed success to warrant the employment of such rules. Indeed, it is much more realistic to anticipate a heuristic (approximate but purposeful) approach to strategies of change for complex social systems.

Figure 5-4b represents a situation involving three types of heuristic argument, each being applied three times (i.e. recursively) to CHARACTERISTIC-X_1, to CHARACTERISTIC-X_2, and to CHARACTERISTIC-X_3, and to their associated performance values. Taking Relationship A, as an example, we find a compound consistency statement in which the three columns constitute a problem component, an analysis component, and a strategy component. Another key departure from our abstract charts, is that more specific classes of CHARACTERISTIC, of ASSOCIATION and of PERFORMANCE are now named.

Thus, the type A relationships consist of a two-part "problem" condition:

IF (CHARACTERISTIC-X_1 IS-ASSOCIATED-WITH PERFORMANCE-X_{11}),

AND IF (PERFORMANCE -X_{11} IS-NOT SATISFACTORY)...

a single-condition "analysis" (i.e. cause, of, or approach to, problem)...

AND IF (PERFORMANCE -X_{11} DEPENDS-UPON PERFORMANCE-X_{12})...

and a single-implication "strategy":

THEN (PERFORMANCE -X_{12} COULD-BE? CHANGED).

The gist of this strategy is thus the simple one of searching for mechanisms of indirect control. Relationship B is somewhat similar, but concerns itself with the direction of control; while relationship C suggests a natural strategy, that of severing the connection, when one variable acts as a binding constraint upon another.

Conditional Decision Making in Practice

In Figure 5-5, we begin to pull together our discussions by combining the model relationship (consistency characteristic) version of our chart, with the more basic planning situation (performance characteristic version). This is tantamount to viewing models, or more generally arguments, within the context of a wider decision process.

The central panel of Figure 5-5 consists of a model application following our normal specifications, but with three classes of statement (empirical, projected and hypothetical) spelled out fully. A and B are thus compound relationships. The regular performance characteristic field to the top left, specifies the actual planning situation at time T_1. The other performance characteristic field, on the bottom right, is a later realization of the planning situation chart at time T_2. To be faithful to our definitions, the latter is best treated as the left-hand panel of another chart.

A distinction is made in the composite chart between the input and output statements, which help specify an experimental model application, and the fields of performance characteristic statements, which describe the status of successive "real-world" planning situations. And the reasons for this are indicated by the relative parsimony accorded the experimental situation: fewer characteristics, fewer classes of performance, and a single pair of relationships. This contrast is usually faithful to reality: not only for the extreme case of much mathematical modeling, but also when sequential verbal reasoning is employed, in situations of any complexity and uncertainty. It is this discrepancy in richness, between typical planning situations and our problem solving capabilities, which gives rise to the important phenomenon of conditional decision making.

Figure 5-5

Experimenting with Simple Relationships in a Complex Situation

situation chart for time T_1	real-world situation: performance characteristic statements					experimental situation: input statements			experimental situation: relationship - A					
	empiricl-1	projectd-2	hypthtcl-3	prefernc-4	politicl-5	empiricl-1	projectd-2	hypthtcl-3	empiricl-1		projectd-2		hypthtcl-3	
CHAR-X_1	CHAR-X_1 DOES-PERF-X'_{11}	CHAR-X_1 WOULD-PERF-X'_{12}	CHAR-X_1 COULD-PERF-X'_{13}	CHAR-X_1 SHOULD-PERF-X'_{14}	CHAR-X_1 WILL-PERF-X'_{15}	CHAR-X_1 DOES-PERF-X^{I}_{11}	CHAR-X_1 WOULD-PERF-X^{I}_{12}	CHAR-X_1 COULD-PERF-X^{I}_{13}	& IF TN	CHAR-X_1 DOES-PERF-X^{II}_{11}	& IF TN	CHAR-X_1 WOULD-PERF-X^{II}_{12}	& IF TN	CHAR-X_1 COULD-PERF-X^{II}_{13}
CHAR-X_2	CHAR-X_2 DOES-PERF-X'_{21}	CHAR-X_2 WOULD-PERF-X'_{22}	CHAR-X_2 COULD-PERF-X'_{23}	CHAR-X_2 SHOULD-PERF-X'_{24}	CHAR-X_2 WILL-PERF-X'_{25}	CHAR-X_2 DOES-PERF-X^{I}_{21}	CHAR-X_2 WOULD-PERF-X^{I}_{22}	CHAR-X_2 COULD-PERF-X^{I}_{23}						
CHAR-X_3	CHAR-X_3 DOES-PERF-X'_{31}	CHAR-X_3 WOULD-PERF-X'_{32}	CHAR-X_3 COULD-PERF-X'_{33}	CHAR-X_3 SHOULD-PERF-X'_{34}	CHAR-X_3 WILL-PERF-X'_{35}									
CHAR-X_4	CHAR-X_4 DOES-PERF-X'_{41}	CHAR-X_4 WOULD-PERF-X'_{42}	CHAR-X_4 COULD-PERF-X'_{43}	CHAR-X_4 SHOULD-PERF-X'_{44}	CHAR-X_4 WILL-PERF-X'_{45}	CHAR-X_4 DOES-PERF-X^{I}_{41}	CHAR-X_4 WOULD-PERF-X^{I}_{42}	CHAR-X_4 COULD-PERF-X^{I}_{43}	& IF TN	CHAR-X_4 DOES-PERF-X^{II}_{41}	& IF TN	CHAR-X_4 WOULD-PERF-X^{II}_{42}	& IF TN	CHAR-X_4 COULD-PERF-X^{II}_{43}
CHAR-X_5	CHAR-X_5 DOES-PERF-X'_{51}	CHAR-X_5 WOULD-PERF-X'_{52}	CHAR-X_5 COULD-PERF-X'_{53}	CHAR-X_5 SHOULD-PERF-X'_{54}	CHAR-X_5 WILL-PERF-X'_{55}	CHAR-X_5 DOES-PERF-X^{I}_{51}	CHAR-X_5 WOULD-PERF-X^{I}_{52}	CHAR-X_5 COULD-PERF-X^{I}_{53}						
CHAR-X_6	CHAR-X_6 DOES-PERF-X_{61}	CHAR-X_6 WOULD-PERF-X'_{62}	CHAR-X_6 COULD-PERF-X'_{63}	CHAR-X_6 SHOULD-PERF-X'_{64}	CHAR-X_6 WILL-PERF-X'_{65}									
CHAR-X_7	CHAR-X_7 DOES-PERF-X'_{71}	CHAR-X_7 WOULD-PERF-X'_{72}	CHAR-X_7 COULD-PERF-X'_{73}	CHAR-X_7 SHOULD-PERF-X'_{74}	CHAR-X_7 WILL-PERF-X'_{75}	CHAR-X_7 DOES-PERF-X^{I}_{71}	CHAR-X_7 WOULD-PERF-X^{I}_{72}	CHAR-X_7 COULD-PERF-X^{I}_{73}	& IF TN	CHAR-X_7 DOES-PERF-X^{II}_{71}	& IF TN	CHAR-X_7 WOULD-PERF-X^{II}_{72}	& IF TN	CHAR-X_7 COULD-PERF-X^{II}_{73}
CHAR-X_8	CHAR-X_8 DOES-PERF-X'_{81}	CHAR-X_8 WOULD-PERF-X'_{82}	CHAR-X_8 COULD-PERF-X'_{83}	CHAR-X_8 SHOULD-PERF-X'_{84}	CHAR-X_8 WILL-PERF-X'_{85}	CHAR-X_8 DOES-PERF-X^{I}_{81}	CHAR-X_8 WOULD-PERF-X^{I}_{82}	CHAR-X_8 COULD-PERF-X^{I}_{83}						
CHAR-X_9	CHAR-X_9 DOES-PERF-X'_{91}	CHAR-X_9 WOULD-PERF-X'_{92}	CHAR-X_9 COULD-PERF-X'_{93}	CHAR-X_9 SHOULD-PERF-X'_{94}	CHAR-X_9 WILL-PERF-X'_{95}									

continues...

model relationships: relationship - B						experimental situation: output statements			situation chart for time T_2	real-world situation: performance characteristic statements				
empiricl-1		projectd-2		hypthtcl-3		empiricl-1	projectd-2	hypthtcl-3		empiricl-1	projectd-2	hypthtcl-3	prefernc-4	politicl-5
& IF TN	CHAR-X_1 DOES-PERF-X^{II}_{11}	& IF TN	CHAR-X_1 WOULD-PERF-X^{II}_{12}	& IF TN	CHAR-X_1 COULD-PERF-X^{II}_{13}	CHAR-X_1 DOES-PERF-X^{II}_{11}	CHAR-X_1 WOULD-PERF-X^{II}_{12}	CHAR-X_1 COULD-PERF-X^{II}_{13}	CHAR-X_1	CHAR-X_1 DOES-PERF-X'_{11}	CHAR-X_1 WOULD-PERF-X'_{12}	CHAR-X_1 COULD-PERF-X'_{13}	CHAR-X_1 SHOULD-PERF-X'_{14}	CHAR-X_1 WILL-PERF-X'_{15}
						CHAR-X_2 DOES-PERF-X^{II}_{21}	CHAR-X_2 WOULD-PERF-X^{II}_{22}	CHAR-X_2 COULD-PERF-X^{II}_{23}	CHAR-X_2	CHAR-X_2 DOES-PERF-X'_{21}	CHAR-X_2 WOULD-PERF-X'_{22}	CHAR-X_2 COULD-PERF-X'_{23}	CHAR-X_2 SHOULD-PERF-X'_{24}	CHAR-X_2 WILL-PERF-X'_{25}
									CHAR-X_3	CHAR-X_3 DOES-PERF-X'_{31}	CHAR-X_3 WOULD-PERF-X'_{32}	CHAR-X_3 COULD-PERF-X'_{33}	CHAR-X_3 SHOULD-PERF-X'_{34}	CHAR-X_3 WILL-PERF-X'_{35}
& IF TN	CHAR-X_4 DOES-PERF-X^{II}_{41}	& IF TN	CHAR-X_4 WOULD-PERF-X^{II}_{42}	& IF TN	CHAR-X_4 COULD-PERF-X^{II}_{43}	CHAR-X_4 DOES-PERF-X^{II}_{41}	CHAR-X_4 WOULD-PERF-X^{II}_{42}	CHAR-X_4 COULD-PERF-X^{II}_{43}	CHAR-X_4	CHAR-X_4 DOES-PERF-X'_{41}	CHAR-X_4 WOULD-PERF-X'_{42}	CHAR-X_4 COULD-PERF-X'_{43}	CHAR-X_4 SHOULD-PERF-X'_{44}	CHAR-X_4 WILL-PERF-X'_{45}
						CHAR-X_5 DOES-PERF-X^{II}_{51}	CHAR-X_5 WOULD-PERF-X^{II}_{52}	CHAR-X_5 COULD-PERF-X^{II}_{53}	CHAR-X_5	CHAR-X_5 DOES-PERF-X'_{51}	CHAR-X_5 WOULD-PERF-X'_{52}	CHAR-X_5 COULD-PERF-X'_{53}	CHAR-X_5 SHOULD-PERF-X'_{54}	CHAR-X_5 WILL-PERF-X'_{55}
									CHAR-X_6	CHAR-X_6 DOES-PERF-X'_{61}	CHAR-X_6 WOULD-PERF-X'_{62}	CHAR-X_6 COULD-PERF-X'_{63}	CHAR-X_6 SHOULD-PERF-X'_{64}	CHAR-X_6 WILL-PERF-X'_{65}
& IF TN	CHAR-X_7 DOES-PERF-X^{II}_{71}	& IF TN	CHAR-X_7 WOULD-PERF-X^{II}_{72}	& IF TN	CHAR-X_7 COULD-PERF-X^{II}_{73}	CHAR-X_7 DOES-PERF-X^{II}_{71}	CHAR-X_7 WOULD-PERF-X^{II}_{72}	CHAR-X_7 COULD-PERF-X^{II}_{73}	CHAR-X_7	CHAR-X_7 DOES-PERF-X'_{71}	CHAR-X_7 WOULD-PERF-X'_{72}	CHAR-X_7 COULD-PERF-X'_{73}	CHAR-X_7 SHOULD-PERF-X'_{74}	CHAR-X_7 WILL-PERF-X'_{75}
						CHAR-X_8 DOES-PERF-X^{II}_{81}	CHAR-X_8 WOULD-PERF-X^{II}_{82}	CHAR-X_8 COULD-PERF-X^{II}_{83}	CHAR-X_8	CHAR-X_8 DOES-PERF-X'_{81}	CHAR-X_8 WOULD-PERF-X'_{82}	CHAR-X_8 COULD-PERF-X'_{83}	CHAR-X_8 SHOULD-PERF-X'_{84}	CHAR-X_8 WILL-PERF-X'_{85}
									CHAR-X_9	CHAR-X_9 DOES-PERF-X'_{91}	CHAR-X_9 WOULD-PERF-X'_{92}	CHAR-X_9 COULD-PERF-X'_{93}	CHAR-X_9 SHOULD-PERF-X'_{94}	CHAR-X_9 WILL-PERF-X'_{95}

...continued

In planning practice, this phenomenon is manifested in the prolifieration of decisions made:

1. subject to the approval of some third party;
2. provided funds are forthcoming from such-and-such a source;
3. depending upon what happens in the interim;
4. assuming that the information is correct.

Conditional decision structures are thus embodied clearly in conditional decision statements; indeed, without such statements, sophisticated planning dialogue would be nigh impossible.

Our IF.../THEN... statements can here be taken as a general surrogate for conditions like those listed above: the reader should have little difficulty in making the necessary transformations. Such assumptions are essential to any reasoning process which tackles complex problems, by breaking them down, and subjecting them to specialized perspectives, over time. Straightforward bargaining, for example, will often involve an understanding that the value of some variables be held constant, while trade-offs are explored on others. At any particular point in time it is operating in terms of imaginary situations: with a clear enough structure to be comprehensible or analytically tractable; yet pertinent enough to the actual problem to provide practical insights and indicative data. Only over time does agreement emerge in all its detail; and even then, there is a sense in which the bargain is rarely sealed for good.

Figure 5-5, then, is indicative of this concept, and of what its formalization would entail. Limitations upon the instantaneous problem-solving capabilities of humans and their organizations demand procedural solutions. Decision making must take place in a cyclic manner over time. Any model application, any meeting or debate, constitutes an "experimental" exposure of the total planning situation. It abstracts a purer or more specialized microcosm,

subject to more careful examination. And it outputs conclusions, which may contribute to an updating of the real-world planning situation before the next cycle of examinations.

Parenthetically, the improvement of planning is then dependent not only upon the quality of one's descriptions of the state of the world, or the validity of one's model relationships, but upon the choice of an appropriate sequence of analytic and interactive experiments. This choice is crucial, for it can structure or sabotage the learning process. Moreover, it is value-laden, and has to become part of the planning dialogue itself.

Such a view of planning has profound repercussions. No attempt would be made to issue or adopt a single comprehensive plan of up-to-the-minute decisions at a given point in time. The only comparable thing in existence, in the new scheme of things (and this at every point in time), would be the planning situation chart itself. And the list of "political" statements, registering current intentions on that chart, would be only one of several such lists which are vital to the planning situation. Indeed, a fully-fledged chart would also embody information on (a) experimental relationships relevant to the problem situation, and (b) information on procedural rules and strategies.

Recap of the Planning Situation Chart

The principal aim of the planning situation chart is to provide a formal and explicit representation of a complex of issues at a point in time. This representation must: (a) accommodate a rich set of relevant factors, including qualitative, normative and approximate information; (b) be amenable to elaboration, and to the integration of more specific languages for any sub-situation; and, (c) be conducive to systematic evaluation with the aid of heuristic resolution procedures.

The basic syntax of the planning situation chart is:

1. a format sublanguage of tabular form having:
   a. a side stub for registering expressions classifying rows;
   b. a top stub for registering expressions classifying columns;
   c. entry cells for registering expressions which are appropriate in light of the respective statements in the top and side stubs;
2. a narrative sublanguage of expressions consisting of:
   a. the sequential deposition of strings of digital (alphanumeric) characters, from a finite alphabet or code set,
   b. "terms" (words and phrases) from a finite dictionary, in turn arranged into,
   c. expressions of some prototypical "sentential" form, from a limited set of such forms;
3. rules for writing the narrative sublanguage onto (or manipulating the narrative sublanguage within) the format sublanguage.

Note that there is nothing to exclude the dictionary mentioned in (2), and the rules mentioned in (3), from themselves being specified by alphanumeric expressions in the cells of some tabular form.

The semantic interpretations which may be associated with this basic syntax fall into the following classes:

1. vast variety of "primitive" concepts which may be signified by the basic terms in (2b);
2. vast variety of statements of "specific" meaning which may be generated by arranging these "primitive" concepts in the prototypical forms of (2c);
3. limited number of statements of "generalized" meaning, which may be associated with these prototypical forms;
4. corresponding classificatory concepts which the "generalized" statements imply for respective sets of "specific" statements;
5. parallel interpretations to (3) and (4) involving the statement components in any row or column of a tabular form;
6. cross-classificatory concepts which may be associated with any entry cell due to the coincidence of the top stub and side stub interpretations listed in (5);

7. interpretations which may be associated with various patterned syntactic phenomena in the occurrence of expressions in the top stub, side stub, rows, columns, and entry cells of a planning situation chart;

8. parallel interpretations which may be associated with various patterned semantic phenomena in the occurrence of statements in top stub, side stub, rows, columns, and entry cells of a planning situation chart;

9. meaningful parameters which may be defined upon any planning situation generated from the basic syntax.

CHAPTER 6

INTERRELATIONSHIPS BETWEEN PROCESS AND SITUATION: NEED FOR BOTH PERSPECTIVES IN CONTINUING PLANNING

Recapitulation of Essential Assets of System

The principal aim of the combined linguistic system is to provide a formal and explicit representation of (a) a complex of issues at a point in time, and (b) plausible patterns of dialogue about those issues over a period of time. These languages are intended to enhance the quality of decisions about the planning strategy or process to be pursued, appropriate to an evolving situation.

The basic syntax of the combined linguistic system is:

1. a planning situation chart having
   a. a format sublanguage with the syntax specified in Chapter 5
   b. a narrative sublanguage with the syntax specified in Chapter 5
   c. rules for writing and interpreting the above sublanguage.
2. a planning process diagram having
   a. a format sublanguage with the syntax specified in Chapter 4
   b. a narrative sublanguage with the syntax specified in Chapter 4
   c. rules for writing and interpreting the above sublanguages.
3. Rules for mapping relevant aspects of the output syntax, generated by the situation chart in terms of their equivalent symbolisms of the process diagram, as described in the next section.

The semantic interpretations associated with this basic syntax fall into three main classes:

1. Interpretations of the role of the combined system as a totality.

   Such a viewpoint might see the new representational system as a good replacement (at least, for many purposes) for conventional "generation-elaboration-evaluation" paradigms of plan making. Instead of presenting a simple picture of the nature: "These are the elements of plan making; this is the sequence for carrying them out," the combined system presents linguistic tools, and a linguistic

framework, whereby a very rich set of relevant considerations may be integrated with a fair degree of formality.

2. Interpretations emphasizing the role of the situation chart

   Such a perspective might stress the notion that a limited number of fairly simple faceted statements could, through the medium of the chart, be concatenated together recursively to produce output streams of dialogue of sentential form. This viewpoint would highlight the richness and versatility inherent in the "generating" part of the combined system, and the highly structured, synthetic and systematic modes of information handling it lends itself to. It would also be careful to establish the fact that all these properties lend a strong substantive potential to the total system, and enable it to embrace the logic of plans and planning, in a more explicit manner.

3. Interpretations emphasizing the role of the process diagram

   Such a perspective might stress the importance of modeling the process as a dialogue in which participatory, procedural, and informational factors are represented so explicitly (via "activity stream", "time" and "statement" dimensions). Or it could stress the power of the constraints upon "simultaneity of reasoning", and "divisibility of personal resources", implicit in the chosen syntax; and dwell on the potential for building a whole theory of organizations on their basis. Or it could stress the suitability of the system as a framework for developing a cyclic form of process in which partial decisions are made over time, and for handling the feedbacks within such a process in a somewhat more systematic manner.

Recursive Generation Symbiosis

Before proceeding further in examining various interrelations between chart and diagram, we pause to illustrate one way in which the two languages may be formally linked. In essence what we propose is a certain type of planning situation chart to generate the planning process diagram, i.e., a sequence of planning activities. This chart can be descriptive, but its more powerful application is to be found in using it to specify what planning activities should be undertaken. Now, let's examine the basis for this generator.

Tables and charts incorporating rules are common to various decision making activities. For example, statisticians have their statistical decision

rules; bankers may utilize a chart of decision rules in considering a loan application. But one particular species of chart is of special interest in our context: namely, the table of rules which is a recursive generator for some process or procedure. That is to say, it is a table upon which a limited number of logical or mechanical operations are performed again and again. The results of each of these operations may be considered to be successive items in an output stream of information. And this stream represents -- indeed, may be plotted as -- a continuing process, or some aspect of such a process. The basic principle is illustrated, using a table of numbers, in Figure 6-1.

In such a system, if the generating language happened to be descriptive of a planning situation, the output language might provide a convenient description of a planning process. Since we portray the planning situation by a chart of statements and statement components, the operations would have to involve the manipulation and interpretation of these statements. The proposition, then, is that one may operate upon the situation chart, so as to chain the statements together in appropriate combinations, the output forming a stream of planning dialogue.

Moreover, if the same operations were simultaneously to produce a succession of modifications to the chart, this would result in a whole series of charts, or in evolving situation. Since performance characteristic statements are such a key component, in our representations of the latter, the challenge of specifying appropriate procedures may now be stated as that of...

> "...generating streams of activities, and chains of dialogue, to improve the values and composition of a set of performance characteristics, in a logical, efficient and integrated order, and in a manner responsive to an evolving planning situation."

We will now introduce one principle by which these connections may be formalized using Figure 6-2 to demonstrate our approach. The rules and conventions

Figure 6-1

Rules to Generate an Output Stream

I	CONSIDER ANY TWO-DIGIT NUMBER SET TWO IMAGINARY TIME INDEXES SUCH THAT T(old) = T(new) = 0 PLOT THE NUMBER ON ORDINATE OF GRAPH BELOW, BEGINNING AT ABSCISSA T(old) DEPENDING ON CONDITIONS IN II, PERFORM OPERATION STATED IN III THEN PROCEED TO IV Note: > Indicates greater than; < Indicates less than + Indicates addition; - Indicates subtraction																		
II	IF FIRST DIGIT IS:	0		1		2		3		4		5		6		7		8		9	
	AND LAST DIGIT IS:	< 3	> 6	< 3	> 6	< 3	> 6	< 3	> 6	< 3	> 6	< 3	> 6	< 3	> 6	< 3	> 6	< 3	> 6	< 3	> 6
III	THEN DO THIS:	+ 3	+ 6	+ 3	+ 6	+ 3	- 6	+ 3	- 6	+ 3	- 6	+ 3	- 6	+ 3	- 6	+ 3	- 6	- 3	- 6	- 3	- 6
	OTHERWISE DO THIS:	+5		+5		+5		+5		+5		-5		-5		-5		-5		-5	
IV	AND IN ANY CASE: UPDATE INDEX T(new) SUCH THAT T(new) = T(old) + 1 STOP PLOTTING THE NUMBER BEGUN AT T(old) AT ABSCISSA T(new) BEGIN PLOTTING NEW NUMBER RESULTING FROM III AT ABSCISSA T(new) UPDATE INDEX T(old) SUCH THAT T(old) = T(new) REPEAT STEPS II, III AND IV WITH NEW NUMBER FROM III																		

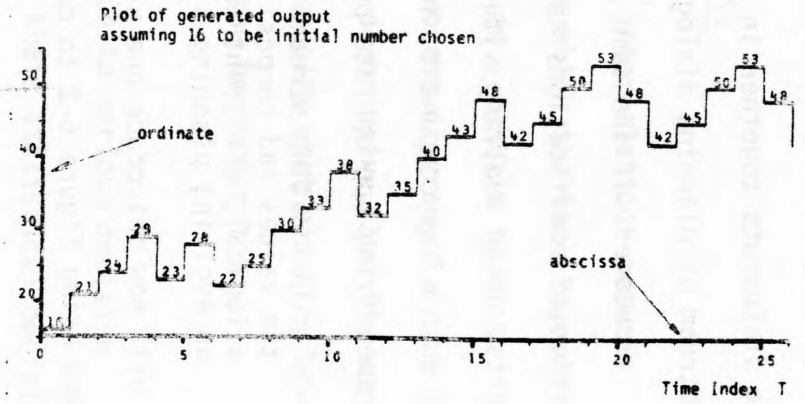


Figure 6-2

Linear Concatenation

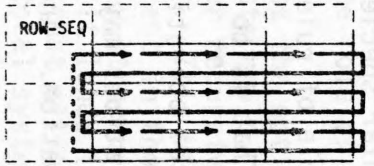
(a)

CON-CAT	( ).Sc¹	( ).Sc²	( ).Sc³
Sr¹.( )			
Sr².( )			
Sr³.( )			

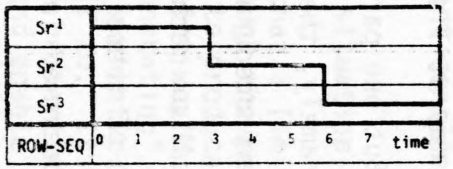
(b)

ROW-SEQ	( ).Sc¹	( ).Sc²	( ).Sc³
Sr¹.( )	Sr¹.Sc²	Sr¹.Sc³	Sr².Sc¹
Sr².( )	Sr².Sc²	Sr².Sc³	Sr³.Sc¹
Sr³.( )	Sr³.Sc²	Sr³.Sc³	Sr¹.Sc¹

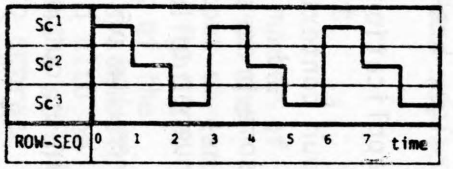
(c)



(d)



(e)



governing the systematic chaining of concatenation of statements, have a rather subtle embodiment here. However, their effects are coordinated in a very strong and natural way via vivid patterns for scanning tabular form. The overall result is a recursive generation capability which is both highly versatile, and highly structured.

For convenience, we work in terms of a 3 × 3 example, in charts (a) and (b) of Figure 6-2. Instead of the numbers of Figure 6-1, we now need to deal with words, phrases and expressions, or in general, statements. Rather than referring to specific cases initially, we choose to denote a statement by the symbol S; or by (Sr^I, Sr^2, Sr^3) and (Sc^1, Sc^2, Sc^3), for row-statements and column-statements, respectively.

Charts like those of (a) and (b) are called concatenators. CON-CAT just specifies the general form; ROW-SEQ, however, specifies a row-by-row, sequential scan. That is, once one has performed the concatenation $Sr^1.Sc^1$, which is intuitively associated with its top, left-hand cell, one is directed to perform the concatenation $Sr^1.Sc^2$, which is explicitly associated with the same cell. But $Sr^1.Sc^2$ is in turn intuitively associated with the next cell in the same row which specifies yet another concatenation, $Sr^1.Sc^3$. By following this logic through, the reader will find that ROW-SEQ specifies the scanning pattern of that name, as illustrated in (c).

But a further step is also possible: from the scanning pattern in (c), to the linear cyclic processes shown in (d) and (e). In a nutshell, the latter diagrams portray a plot of the points in time (vertical links) at which the scan moves from row to row (d), and from column to column (e). There is an assumption here that each concatenation is associated with an equal, unitary period of time: relaxing this would alter the shape of the plots, but not the principle.

Now, it so happens that there are many other "linear" scans for tabular forms: row, column, diagonal and radial patterns, with sequential, parallel and zig-zag versions of each. And, although we do not show them here, in every case there corresponds a concatenator, akin to that of Figure 6-2 (b); and a pair of cyclic process plots, like those of Figure 6-2 (d and e).

Figure 6-3 offers two specific realizations of the 3 × 3 ROW-SEQ pattern, introduced in Figure 6-2, to help flavor the above account. Chart (a) and diagrams (b) and (c) provide a concatenator, and related process diagrams, for the generation, elaboration and evaluation of plans for industry, housing and shopping. Chart (d), and diagrams (e) and (f), define the equivalent dialogue over the amount, composition and timing of development at regional, local and project scales. The potential of the representational mode is perhaps best grasped by considering the various units of government and private interests, and the various professional specialties, whose involvement is implied at different stages of these processes.

Clearly, there are numerous alternative possibilities for the sequencing of the activities; Figure 6-3 only illustrates the principle. No claim is made that ROW-SEQ is the best, or even a reasonable, way to go about these particular tasks. The contention is only that if the situation contains procedural rules with a structure equivalent to these concatenators, then (other things being equal) these forms of process will result. Conversely, if a process of these forms is deemed desirable, then some structure of procedural rules corresponding to that of the concatenators, must be established and/or activited.

Figures 6-4 and 6-5 illustrate two more hypothetical recursive generators. Figure 6-4 shows a column sequential scan applied to generation, elaboration and evaluation of plans for industry, housing and shopping. Figure 6-5 shows

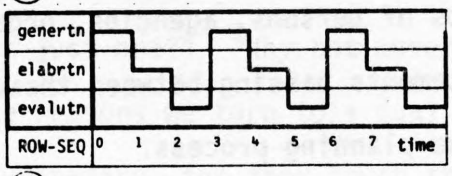
Figure 6-3

Structuring the Planning Process

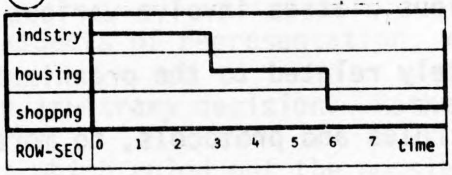
(a)

ROW-SEQ	genertn	elabrtn	evalutn
indstry	elb.ind	evl.ind	gen.hsg
housing	elb.hsg	evl.hsg	gen.shp
shoppng	elb.shp	evl.shp	gen.ind

(b)



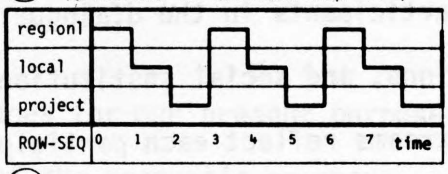
(c)



(d)

ROW-SEQ	regionl	local	project
amount	loc.amt	prj.amt	reg.cmp
compstn	loc.cmp	prj.cmp	reg.tmg
timing	loc.tmg	prj.tmg	reg.amt

(e)



(f)

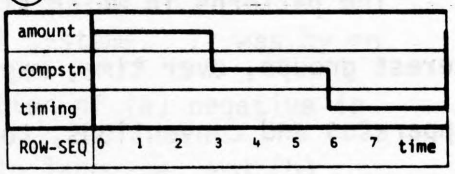
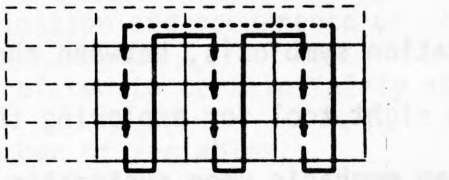


Figure 6-4

Pattern for Generation, Elaboration and Evaluation of Plans

LIN-CAT	genertn	elabrtn	evalutn
indstry	gen.hsg	elb.hsg	evl.hsg
housing	gen.shp	elb.shp	evl.shp
shoppng	elb.ind	evl.ind	gen.ind



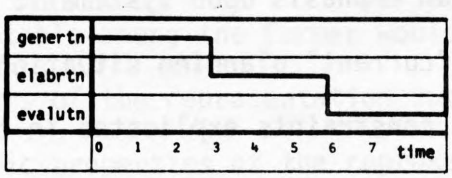
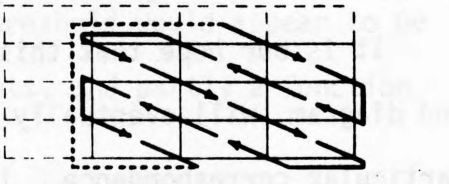
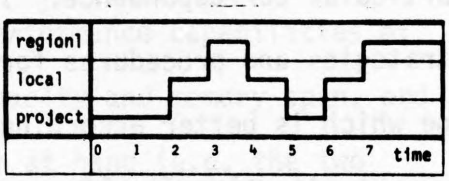


Figure 6-5

Pattern for Amount, Composition and Timing of Development

LIN-CAT	regionl	local	project
amount	loc.cmp	reg.amt	prj.cmp
compstn	reg.tmg	prj.tmg	loc.amt
timing	prj.amt	reg.cmp	loc.tmg





a diagonal zig-zag scan for the amount, composition and timing of regional, local and project scale planning. These chains may be arranged in different patterns, which constitute a set of prototypes for the planning process; each tends to be associated with peculiar resource requirements and problem-solving capabilities. More specifically, the activity streams can be linked to participants in the dialogue: persons, groups of persons, agencies, organizations, and social institutions. And the statements passing between these streams reflect each participant's role in the planning process.

The patterns in which statements of various classes involve various interest groups, over time, may thus be intimately related to the organizational apparatus and conventions, to administrative rules and protocols, to moral norms and legal requirements, to channels of communication, to the disposition of power, and to similar constraints upon participation. But these important constraints are surely part and parcel of a planning situation (alongside data, preferences, models and strategies), at any point in time. Can they not also be embodied in the situation chart, as procedural rules: both in explicit statement form; and, less directly, in the arrangement of entries in the rows and columns? And cannot these rules also be invoked recursively, as appropriate, to guide the generation of an output stream of dialogue?

It is our hope that this recursive generation symbiosis, between chart and diagram, will eventually provide just the right tool for exploring this particular correspondence. It should enable an emphasis upon systematic strategies and procedures for transforming a "current" planning situation into one which is better according to criteria and constraints explicated in the current situation itself.

Advantages of Interlocking Languages

The reader's appreciation of this whole business of recursive generation, will probably be assisted if we step back for a moment, and ask at a fairly basic level what we are trying to achieve with it. To answer such a question, we can profitably turn to a few others first: "Why have two languages?" "Why not just one?" "Why not more?"

The reasons we turn to a dual system of languages for our present purpose are illuminating, for they touch the very essence of the pragmatic or operational aspects of representation, via formal symbol systems. It was by no means an arbitrary decision. Rather it was a function of (a) negative influences which ruled out the possibility of a single language, and (b) positive influences which suggested the utility of bringing this particular pair of languages together, in this particular way.

Negative Influences

Let us begin with the negative factor. One particularly critical parameter in constructing a symbolic language is the threshold point at which the number of dimensions under consideration becomes too great for ease and reliability in writing, scanning, manipulation, or interpretation of the language. The definition and occurrence of this particular threshold would appear to be partly related to certain fairly absolute constraints, and partly a function of a number of variables.

Notable among the former would be the basic performance capabilities of the users of the representation such as channel capacity and memory span, and the basic properties of the representational medium at hand (e.g. the two dimensions of a paper surface, and the dot-and-line form of easy stylus strokes). It would appear that the information bearing capacity of each of

these (the "user" and the "medium") is relatively invariant.

The dimensional threshold of any symbolic form, in any particular syntactic and semantic context, and any particular mode of use, is in effect a complex derivation of such basic capabilities and properties. Consideration of the information bearing powers of the various components of our two languages should be evidence enough of the difficulty of attributing fixed capacity limits, to these richer and more sophisticated symbol systems. The only meaningful invariances are likely to be those measured for a very simple, isolated, well-defined symbolic form, in a given and well-specified mode of use, and under carefully controlled conditions.

Consideration of the equivalent information-bearing powers, under various modes of use, should reinforce this argument. The same symbolism, in the same syntactic context, may be interpreted quickly and connotatively one minute, and in a deliberate and rigorous manner the next, by the very same person. However, to emphasize the sensitivity of capacity constraints to such factors, is merely to indicate that they are elusive to measurement. The thresholds are definitely there, and that is the point of immediate importance.

Thus, under the mode of use we envisage, it does not seem feasible to us to handle everything within a single explicit language. Ideally one would wish to provide the user with a unitary mode of representation, embracing and integrating all the information of both situation chart and process diagram. Unfortunately, we cannot find any single representation capable of handling that dimensionality at once, which does not lead to an unacceptable level of error and confusion in writing, scanning, manipulation or interpretation. While we do not know exactly where the threshold lies, we feel fairly confident that such a demand is beyond it.

Positive Influences

We thus have to break the problem down, as usefully as possible, into separate modes of representation for separable aspects of the real world. But there are also more positive reasons for doing so, or more positive ways of looking at the above necessity. For if one relaxes the requirement that all aspects of the microcosm of concern be represented at once, then one has a greater freedom of choice, among available symbolic forms, in analoguing various aspects of the semantic.

That is to say, one can reject and reinterpret some symbolisms from one's basic stock, in separate syntactic systems, without much fear of ambiguity or contradiction. And one can switch others for fresh symbolic elements, more suited to the perspective at hand. Taken to its limits, this positive assertion would be that the separate languages are essential to capture separate classes of phenomena. Each takes advantage of the natural expressiveness of a particular type of linear symbolism (links and characters), deployed in a particular type of diagrammatic format.

Thus the sentential matrix language has a tremendous potential for dealing formally with categorical entities, with interactive relationships, with consistency checks, with aggregative structures, and with the systematic scanning and manipulation of lists and arrays. And on such grounds it is an ideal representation for "...a complex of issues at a point in time," inasmuch as the latter is a separable phenomenon. Similarly, the linear cyclic process language has a fine connotative attraction for the analoguing of a time-related sequence of procedures and events, and the patterns in which this sequence distributes itself between a number of established reference groups. On such grounds it is an ideal representation for "...the procedural aspects of continuing planning," again, inasmuch as these are separable.

However, one also needs to recognize the disadvantages which are attendant upon this solution to the "dimensionality" problem. Such disadvantages are derived from (a) the lack of formal and explicit representation of the links between the two phenomena, and (b) the lack of that discipline which their immediate juxtaposition, in a single ink-on-paper symbolism, would lend to the perception or formulation of such links. For one has the disconcerting worry that these separate languages, or the expressions one is writing in them, may be incompatible in various ways. One also has to acknowledge that one's feeling for the whole is at least a stage less thorough and articulate.

To avoid such worries, there are a number of possible compromises between full-integration and full-autonomy. One such compromise is to maintain a requirement that certain critical attributes be common to each language. In our case, it is mainly semantic concepts, such as the "statement", which are common; in other systems it could be syntactic elements as well. Furthermore, translations and transformations from one language to another may be pursued with a certain degree of formality. These are the sort of pragmatic considerations underlying the recursive generation of the process diagram from the situation chart which was summarized in the above section.

Contrasting Attributes of Chart and Diagram

Given those basic principles underlying the need for dual languages, it is possible to discern a peculiar function for each of our current languages, vis-a-vis the other, in the total system. For while both languages are very general, relative to most other conceivable representations for a planning situation or planning process, the situation chart is a more general language then the process diagram. Similarly, while both languages are potentially very rich, by absolute standards, the situation chart has a much richer potential than the process diagram.

Although these pronouncements could stand further justification (e.g. how does one obtain common enough measures of richness to compare the two?), we will choose to ignore such questions, rather than digress. Instead we will clarify the sources of generality and richness to which we refer, and proceed to view their practical significance. The two attributes are intimately related, but let us take them in succession.

Generality

To say that the planning situation chart is more general than the planning process diagram, or the diagram more specific than the chart, is to make an observation about the size of the real world microcosm which each of them is capable of portraying, and the exhaustiveness of the viewpoints from which they can portray it. The process diagram is less universal since its effective dimensionality is less, and since it invokes quite definite and specific assumptions about the phenomena it depicts (e.g. the "instantaneity of statements relative to procedures" and "infrequency of branching relative to that of strict sequentiality" constraints). The situation chart, in comparison, makes few assumptions about the nature of the phenomena it is to accommodate, apart from the weak ones that (a) its great dimensionality will be sympathetic to the great complexity envisaged; and (b) its versatile set of information structures, will enable or encourage useful dialogue about the microcosm of concern.

So we have, in the process diagram, a representation which is concerned with a more specific viewpoint, on a more limited set of entities, properties and relationships, than the situation chart. Moreover, in our particular case, the entities, properties and relationships portrayed in the process diagram, and even the viewpoint from which they are seen, are a subset of the phenomena and perspectives represented, albeit less vividly, in the situation chart

itself. The process diagram is a bolder and more parsimonious representation of a certain subsituation from an evolving chart. Accompanying the parsimony of the diagram, of course, are all advantages (e.g., of rigor), and all the disadvantages (e.g., of oversimplification), which have been alluded to earlier.

In practical terms, the most important implication is that the planning process diagram is only one of many "relatively more parsimonious and specific" languages, which could be generated recursively from the planning situation chart, under the conditions specified above. The process diagram is simply the one such representation which best happens to highlight certain substantive factors of special relevance to our immediate discussions. Against that, it has to be admitted that a "recursive generation" relationship does seem especially apt, as an analogue of some of the corresponding real world linkages, between the chart and this particular diagram.

One pertinent operational advantage of the relationship between the chart and this diagram is worth outlining here. As a result of the clear principle that the chart should represent a planning situation at a point in time, whereas the diagram should represent a planning process over time, an emphasis upon the chart as the principal working tool in the two-language relationship ensues. That is to say, it is the chart which presents the decision making situation to the language user, in a form most faithful, immediate and relevant to his own decision making position and perspective, at any point in time.

The chart, in effect, poses the practical question of "Where does one go from here?" In manipulation and concatenation of statements on the chart, one explores and examines various strategies. And in interpreting the output, one aspect of which would be the planning process plot, one is led to revise and evaluate those strategies. Thus, the two languages are ultimately used in

close conjunction. And in that potentially useful variations in strategy could first be recognized through the process diagram, and then fed back in the form of modifications and additions to fields of the situation chart, the generative process need not be all one-way. We have merely formalized it in one direction. But the operational advantages of having one of the languages which focuses positively upon the action-oriented "Where does one go from here?" type of question, is not thereby to be denied.

Richness

Another practical advantage of this generative relationship, in the case of our particular dual-language system, has to do with the fact that one is mapping between representational modes of a quite different richness. We stress once again the interdependence of the richness and generality attributes in the representational system under review. The relative parsimony of the process diagram has already been related to its specificity of concern, and to its analytical vis-a-vis synthetic role. Such parsimony is, in an approximate sense, the converse of richness, as specificity is of generality.

But we would like to be a little more precise about this second distinction between the languages. For, relative to the fewer dimensions it portrays, the planning process diagram is (potentially) tremendously rich. That is to say, it is rich within fairly tight and well-specified bounds. On the other hand, the planning situation chart is rich in a much less constrained and more comprehensive manner. Its associative information structures, and character-based narrative component, are extremely versatile in representing qualitatively diverse phenomena. They are rather weaker in dealing rigorously with a set of distinctive features, produced by the interaction of a handful of primitive variables, operators, and axioms.

Note that we do not deny that a certain type and degree of richness, impressive in its own right, can be attained by a real world system which is subject to the latter constraints; or an axiomatic logical system which analogues it, or a parsimonious symbolic system which analogues that, in turn. But we do deny that a richness of that type is to be found moderating the phenomena encountered in metropolitan planning today, except perhaps in a historical and evolutionary sense. Lack of the simple equilibria pervading much of physical science, the powerful reproductive constraints pervading much of biological science, and the tangibility and predictability of systems with unsophisticated mechanisms of control, or an undeveloped consciousness, are among the support for such a thesis.

Such considerations, of course, are fundamental. These are really the source of our philosophical parting-of-the-ways with classical scientific methodology, in favor of an emphasis upon a technological outlook. For, were an axiomatic richness practicably tenable, the simple paradign of "technology as the application of scientific findings" would find it easier to prevail. Technology, however, in a context such as ours is far more than that. Scientific findings are but an input, and where science cannot yet tackle the richness of reality in a manner faithful enough to provide much of that input, other facets of technology must become more critical.

But all this is a little incidental to our present motives, in drawing the reader's attention to the contrasting richness of the chart and diagram. We have introduced the wider arguments in order to stress the importance of this contrast. On any reasonable common measure, and a "purely" syntactic measure might be necessary, we would expect the situation chart to perform richer overall. On certain more specialist measures, and possibly needing more forthright semantic specification, the process diagram would be better.

However, we have both chart and diagram because we see both forms of richness as having complementary functions, in any technological activity such as metropolitan planning. In very simple terms, the richness of the situation chart is most suited to synthetic roles; whereas the parsimony of the process diagram, and other representations derived from the chart in a similar manner, is most suited to analytic roles. And it would be our contention that the effective technologist has to pursue both these roles; indeed, he sometimes has to switch very frequently to and fro between these modus operandi, and with considerable care. One of the beauties of the recursive generation symbiosis is that it demonstrates a way in which this mapping, at least from rich to parsimonious may be formalized.

Status of the System and Possible Extensions

In reaction to the modeling efforts of the last decade, the inspiration for our languages was grounded in practicability, and usefulness has been at the forefront of our minds. Now that we have reached the end of the presentation of our languages, and the reader has a fuller picture of the sort of considerations which have motivated us, it is legitimate to apply the usefulness criterion once more. Given that our new representations and procedures are here presented near the first stage of their evolution before examining their testing in Part Three, the most constructive way to pose the question is in two parts. How useful are our representations and procedures in their present stage? What refinements and extensions would be most promising and plausible, and how useful would our propositions then become?

Having posed this clear distinction between attained and anticipated usefulness, let us rephrase the issue in a sequence of questions which better captures the points we have to make. For whom is this usefulness intended; or

against which goals is it to be judged? What type or degree of usefulness is a reasonable expectation from any attempt to address these goals? And when, or at what stage, can the fruits of such work reasonably be expected to be evident?

With regard to goals, two aspects of our orientation are worth reiterating:

1. a concern with decisions which are important enough to make a formal input worthwhile, and sufficiently long-range, or sufficiently recurrent, to make the development of new representations and procedures feasible;

2. a concern to develop concepts, representations, and procedures, which are intrinsically eminently practicable; that is, to accept the cost, reliability, transferability, comprehensibility, and similar pragmatic attributes, of plans and the planning process itself, as vital and primary criteria.

It is the compromise implicit in these two requirements which provides our answer to the question, "Are the two languages intended to be practicable in the sense of immediately useful?" Point (1) implies that our recommendations are neither claimed nor intended to provide instant or short-term solutions to the dilemmas facing metropolitan planning; they assume too drastic a reappraisal, and too lengthy a developmental phase, for that. On the other hand, point (2) implies that the new propositions are thought to provide a basis for immediate re-orientation, which is justified on account of a great practical potential in the medium term; they purposely steer clear of theoretical finesse which promises nothing but long-range returns. It is against this deliberate balance that we would prefer to have the usefulness of the languages judged.

In the short run, then, the usefulness of our representations is primarily a conceptual one; but we believe that it will lead on rather easily to an operational usefulness in the medium run. Moreover, it seems not unnatural

to us that one should have to retreat to new abstractions, when faced with an impasse as formidable as that in metropolitan planning. And it seems important to us that the value of the motivation provided by fresh conceptualizations should be recognized. It seems that many methods and models, especially in their early days, are of more practical importance for the informal uses and insights they lead to, rather than for those aspects of them which the theoretician finds delightful.

Indeed, many conventional methods and models ultimately seem to be defended not on the ground of their predictive capabilities, but on the grounds that: "...at least one learns a lot from them in trying to make them operational;" or "...at least they force one to think in a clearer and more disciplined manner." However, one has surely then to ask whether such functions may not be served in a more direct, efficient and effective way. It is our contention that they often can, and this is the sort of spirit in which our languages are immediately offered. It does not, of course, exclude development of more formal and mechanistic uses within the same framework. Indeed, one wishes to encourage them too.

However, those are justifications for what has already been attained and reported. That stage is more or less over now. Representations have hopefully been produced which will be useful in their own right for a variety of formal and informal purposes, many of which cannot be foreseen. On hunches as to where flexibility was needed, the same representations will also hopefully facilitate detailing and refinement, and lead to specialist developments for different purposes. At the same time, such elaboration will be a means of testing the conceptual framework itself, thereby gradually making it a firmer and more convincing proposition.

We have necessarily in our ongoing research restricted attention to the intensive elaboration of only one or two branches of the language system. Our immediate results in this regard fulfill largely a testing and demonstration role, and are presented in Part Three. Thereafter, we have in mind the specification of a new representational system for one particular area of substantive interest. Parallel efforts to flesh out other branches of the system, into more concrete and operational capabilities, would of course be welcome.

Furthermore, not all associated developments need be in the nature of detailing and refinement. Such an expectation is merely inherited from our observations that:

1. the planning process diagram is only one possible relatively-more-parsimonious-and-specific language, which could be generated recursively from the planning situation chart.

In fact, a number of other potentials exist:

2. relatively-richer languages could be generated recursively from special parsimonious versions of the chart;

3. information in the planning situation chart may be rearranged so as to give the chart important capabilities other than that of recursive generation;

4. other relatively-more-specific languages may be related to the planning situation chart by other means than recursive generation;

5. moreover, languages which are formally related to the planning situation chart need not necessarily be more specific; they may be more general, have similar specificity, or lead to no meaningful comparison in that regard.

PART THREE

PROTOTYPICAL DEMONSTRATION OF THE PLANNING LANGUAGES

CHAPTER 7

DEFINITION OF THE DEMONSTRATION PLAN MAKING PROCESS

Introduction to Part Three

In Part Three, selected examples from a larger demonstration case study are presented. These examples show in a more convincing way than the hypothetical illustrations of Part Two how the two planning languages can be used to represent, and eventually facilitate, clarify and direct the plan making process.

Part Three consists of three short chapters. Chapter 7 defines the demonstration plan making process, and the particular problem selected for detailed examination, namely conditional decision making. In Chapter 8, the two languages are used to portray and analyze a series of decision points in the plan making process. In Chapter 9, the diagrams and chart are used to show how the planning situation evolved through the series of decisions taken. A brief conclusion summarizes the principal findings of the study at this juncture.

Demonstration Problem Situation

For the purpose of demonstrating the use of the languages, a substantial case study of a planning program of the Southeastern Wisconsin Regional Planning Commission was undertaken in 1971. The Southeastern Wisconsin Commission kindly agreed to permit its programs to be used as the basis for this demonstration of the planning languages. The timing of the case study

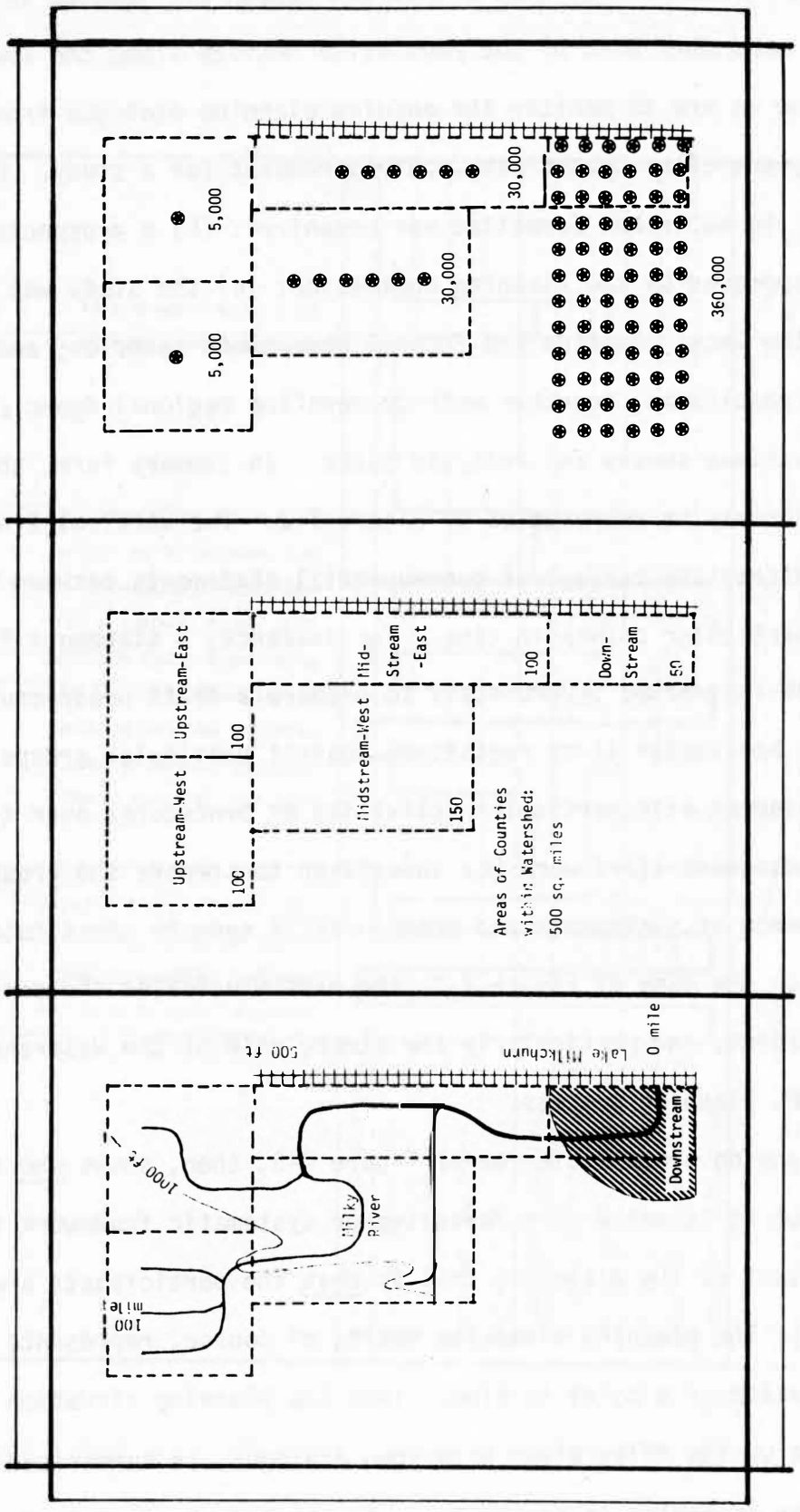
essentially required that a major planning program for the Milwaukee River Watershed be chosen for the demonstration of the languages. Of the various planning programs underway at that time, only the watershed program provided the richness and complexity of issues typically encountered in metropolitan land use and transportation planning. Moreover, as the principal decision making concerning the watershed plan was to occur in 1971, the study could more readily monitor this process; see SEWRPC (1970a, 1971a) for details.

Rather than pretend to explain the actual Milwaukee River Watershed Study in adequate detail, let us construct a prototypical problem situation based on the actual study. This procedure also permits the actual study to be somewhat simplified in places so as to enable us to demonstrate more vividly the planning languages. In order to remind the reader continuously that this example is only a construction based on an actual planning program, the names of places and individuals are suitably modified.

The Milky River and its tributaries, constituting some 250 miles of perennial stream length, drain 500 square miles of Southeastern Dairyland into Lake Milkchurn, one of a chain of great lakes; see Figure 7-1a. The Downstream metropolitan area, having a population approaching one million, has grown up around the confluence of the Milky River and several other rivers at the Lake. Problems of flooding and pollution are particularly pressing for Downstream residents, and early in 1965 they requested that the Southeastern Dairyland Regional Planning Commision (SEDRPC) undertake a comprehensive watershed planning program. The Commission accordingly set up a Milky River Watershed Committee (MRWC), including representatives from all five counties in the Watershed: Downstream, Midstream-East, Midstream-West, Upstream-East and Upstream-West. The areas of each County within the watershed are shown in Figure 7-1b, and their corresponding 1967 populations in Figure 7-1c.

Figure 7-1

Milky River Watershed



(a) Milky River and Tributaries (b) Watershed Counties (c) Watershed Population

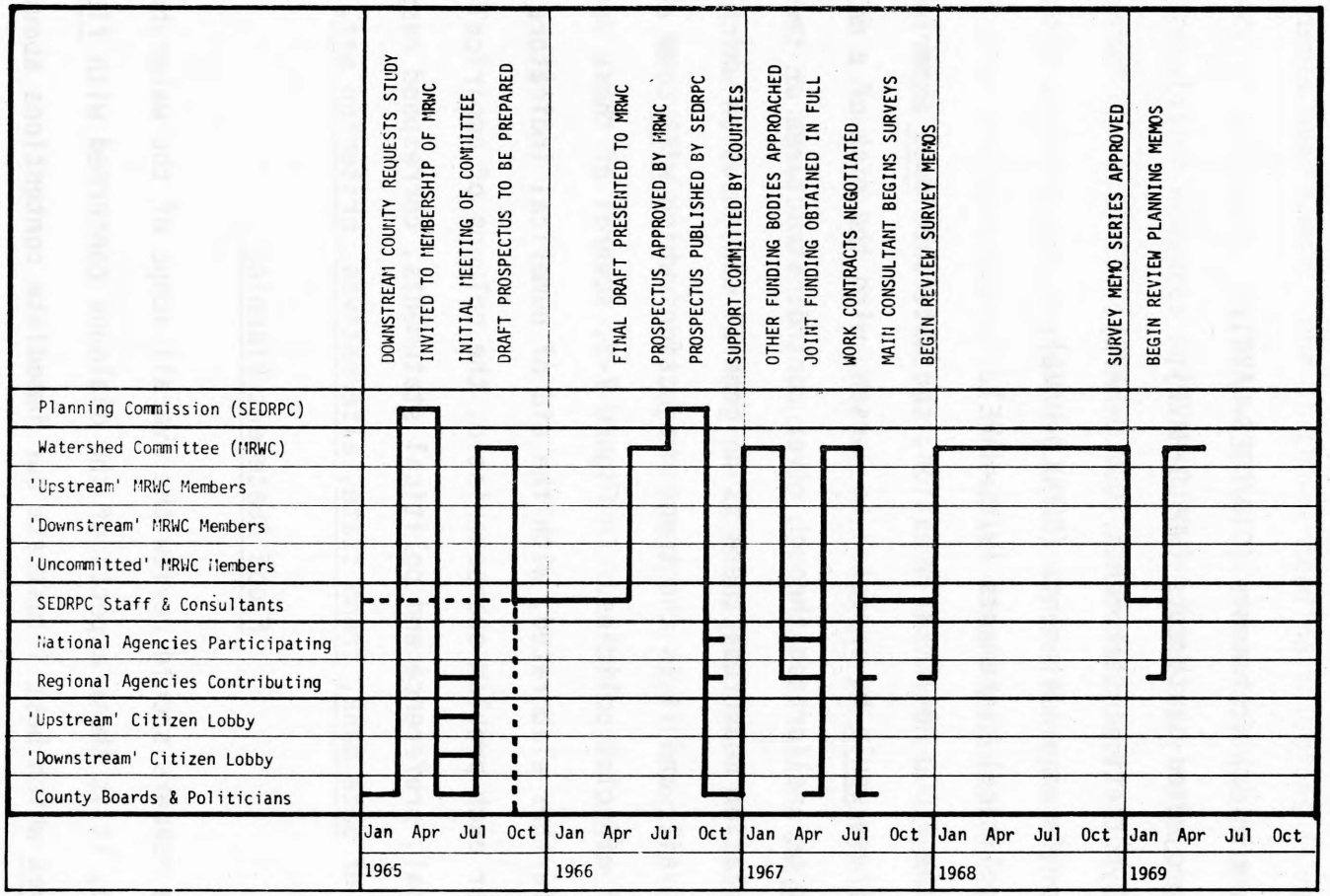
Clearly, while most of the land and stream length are located in the upper and middle watershed most of the population resides along the lower reaches.

Suppose we are to monitor the ensuing planning dialogue from early 1969, some four years after Downstream County's request for a study. During that period (a) the Watershed Committee was organized; (b) a prospectus was produced and approved by the Planning Commission; (c) the study was jointly funded by the local counties and federal government agencies; and (d) SEDRPC staff and consultants, together with cooperating regional agencies, began to report on various survey and analysis tasks. In summary form, the process up to that point may be represented by Figure 7-2. The vertical lines in this diagram indicate the passage of consequential statements between participant groups at particular points in time. For instance, a statement from MRWC in October 1965 instructed SEDRPC staff to prepare a draft prospectus for the study. The horizontal lines registered against particular groups indicate their involvement with particular activities or procedures over time. For example, subsequent staff work was undertaken to prepare the prospectus draft. Such a sequence of statements and procedures is seen to constitute a chain of dialogue. In the case of Figure 7-2, the plot elucidates the context for staff activities, and particularly the strong role of the Watershed Committee in the SEDRPC planning process.

The planning process diagram of Figure 7-2, then, shows <u>who</u> is involved, and <u>when</u>; but it is not a very revealing or systematic framework to account for the content of the dialogue, that is <u>what</u> the participants are saying to one another. The planning situation chart, of course, represents the content of the situation at a point in time. Thus the planning situation in 1969, when we take up the Milky River Watershed dialogue, is summarized by the set of statements assembled in Figure 7-3. In the left hand stub of this chart

Figure 7-2

Planning Process Diagram for the Milky River Watershed Study, 1965 - 1969



are listed seven characteristics which were identified in the MRWC study prospectus as embracing the interrelated problems of the watershed. For each of these characteristics, five basic types of performance statement may be registered:

1. empirical statements (DID/DOES-HAVE);
2. projected statements (WOULD-HAVE);
3. hypothetical statements (COULD-HAVE);
4. preference statements (SHOULD-HAVE);
5. political statements (WILL-HAVE).

Thus, on the FLOOD ABATEMENT question, the watershed does experience regular damages; these would be expected to worsen, with the risk of a major disaster; they could be ameliorated through river control structures or through floodplain regulation measures; there is no general consensus on which policy should prevail; and it is the trend projections which will come about, in the absence of official policies. In Figure 7-3, several of these verbal descriptors are further elaborated, with the aid of numerical indicators. When this is done for each problem characteristic, the columns of empirical, projected, hypothetical, preference and political statements, correspond respectively to summaries of data bank, trend state, alternatives, criterion set, and plan.

Flood Abatement Planning

While readers should review the overall scope of the watershed study at this stage, it is those aspects of the dialogue concerned with flood control alternatives which best illustrate our immediate contentions about conditional decision making, and we will deal with the other six elements only inasmuch as they impinge on flood abatement. Figure 7-4 thus abstracts, reorganizes and

supplements the information of Figure 7-3, to provide a situation chart which emphasizes and contrasts the attributes of the two main alternatives for flood control on the Milky River, and the conflicting interests of the upstream and downstream residents over these. One of the contending solutions is structural (a dam and reservoir upstream), while the other is nonstructural (floodplain evacuation and regulation measures downstream); but both have major implications for watershed characteristics other than flood abatement.

Although both upstream and downstream interests can express a clear-cut preference, the pros and cons appear to be rather finely balanced from a perspective such as MRWC's which must attempt to judge and mediate between them. Given the SEDRPC's role, which is solely advisory to the five county governments, and given its modus operandi, which is to pursue as overt, objective and explicit a process as possible, then how does it proceed? In Chapter 8, we will examine the need for conditional statements in the dialogue, and observe the evolution of the Figure 7-4 situation under their influence.

Figure 7-3

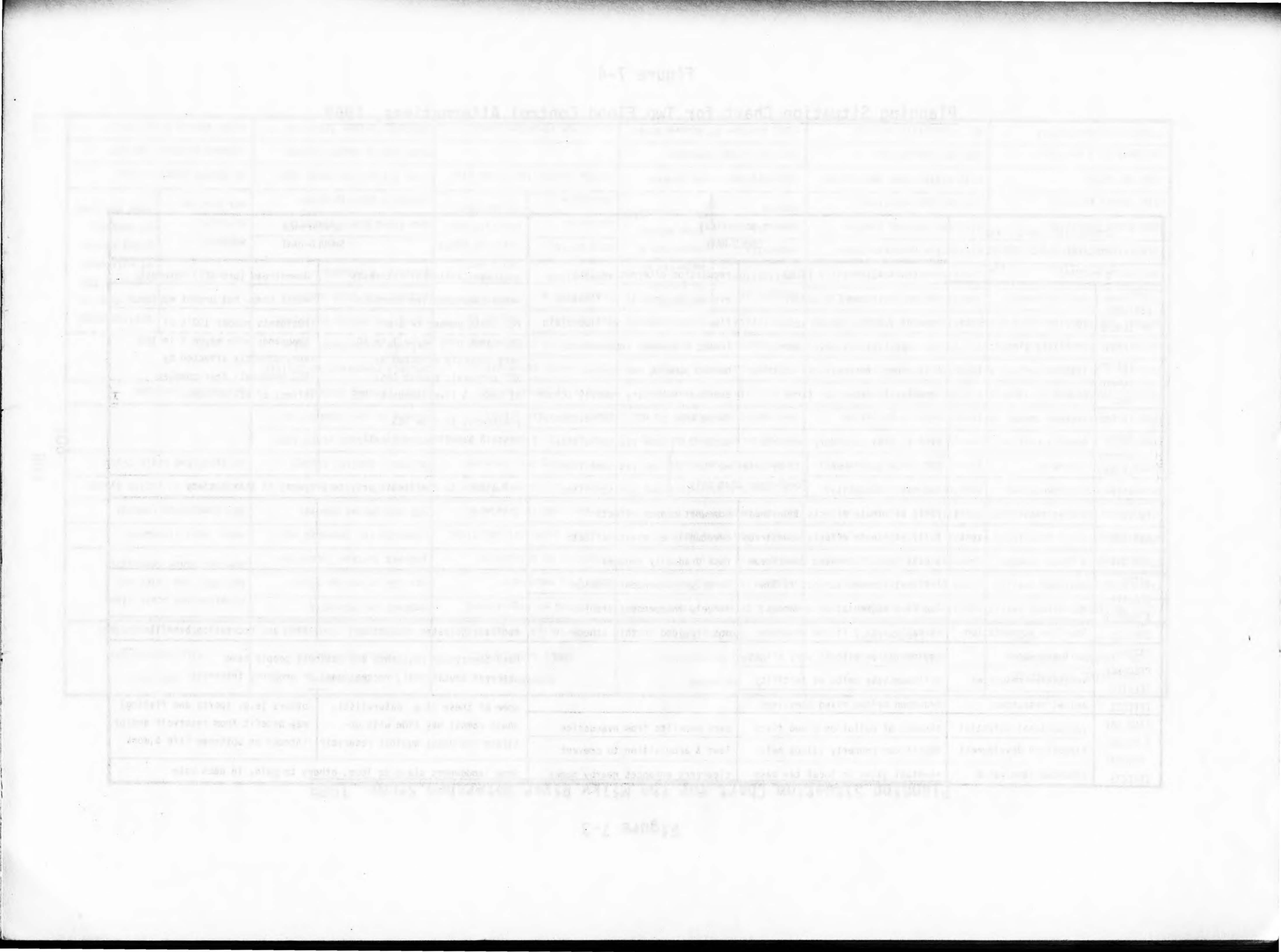
Planning Situation Chart for the Milky River Watershed Study, 1969

INDICATIVE INFORMATION ON OVERALL WATERSHED SITUATION - 1969	empirical DOES or DID have/is (in/by 1967)	projected WOULD have/be/etc. (in/by 1990)	hypothetical COULD have/be/etc. (principal proposals)	preference SHOULD have/be/etc. (apparent consensus)	political WILL have/be/etc. (officially adopted)
FLOOD ABATEMENT	regular flood damages	worse & disaster risk	structures or regulations	depends on interests	no watershed scale plans but MRWC has ruled out various other proposals
flood flow conditions	given by simulation model	substantially as 1967	modify by reservoir	use 100 yr design flood	
flood damage risk	averages $120,000 per annum	annual risk 35% up	eliminate by evacuation	prevent further incursion	
WATER QUALITY	severe pollution throughout	worsen with development	disputed technical solutions	adequate for intended use	meet legal standards
up & midstream pollution	25% effluent in low flow	45% effluent in low flow	improved public treatment	90% phosphorus removal	85% phosphorus removal
downstream pollution	combined sewers overflow	continue but unpredictable	separate or store & treat	storage for 2 inch storn	extensions to public system
WATER SUPPLY	ground and surface sources	demand more than double	find minimum cost sources	maintain quality supply	no watershed scale plans
from wells & pumps	serves most of area	pollution and unreliability	find quality & quantity limits	maintain ground water level	
from Lake Milkchurn	serves most of pollution	dependable quantities	reach new urban growth	extend to new communities	
RESOURCE MANAGEMENT	erosion & exploitation	worsen with urban demands	improve by conservation	wiser farming methods	government programs
minerals & drainage	siltation & rapid run-off	chemical pollutant threat	soil & water conservation	protect regenerative ability	
agriculture & vegetation	suffers in urban transition	more recreational pressures	preserve all prime areas	balance urban/rural roles	
NATURAL HABITAT	quantity & quality decline	deteriorate	zoning laws	contain & remedy pressures	environmental corridors to conserve 23% of watershed along rivers in adopted land use plan
fish, game & wildlife	source as habitat eroded	dangers of destruction	protection & acquisition	protect via land controls	
woodland & wetland	conversion to croplands			preserve & enhance	
RECREATIONAL NEEDS	attractive upstream areas	intensify	more parks		adopted parkways not binding
open space provision	pleasure driving popular	demand to double	parkways	use flood plain potential	
water based activity	limited opportunities		reservoir	suitable quality water	
		environmental corridors to protect majority of resources & give access for recreation	degree of provision depends on 10% - 40% level of public acquisitions in corridor		
LAND USE NEEDS	rise faster than population	uncontrolled trend growth	refine controlled trend plan	wise allocation among uses	as SEDRPC adopted plan
residential & services	430,000 population	20% pollution increase		more public sewer & water	compact economic growth
floodplain development	40% floodplain settled	take another 10 square miles	establish stronger controls	prevent further incursion	state zoning only limits

Figure 7-4

Planning Situation Chart for Two Flood Control Alternatives, 1969

COMPARATIVE DATA FOR PRINCIPAL FLOOD CONTROL ALTERNATIVES - 1969		hypothetical COULD-HAVE			preference SHOULD-HAVE	
		reservoir alternative (RES)		regulation alternative (REG)	upstream (anti-RES) interests	downstream (pro-RES) interests
MAIN FEATURES OF SCHEME (regulation scheme data is for downstream of dam only)	basic elements	dam on Midstream E/W border		evacuation from 10 yr floodway	wants comprehensive approach	wants comp. but urgent approach
	complementary elements	impound 9,000 - 10,000 acres		flood proof in 100 yr floodplain	residents number tens of thousands with maybe 1 in 10 very directly affected by RES proposal; oppose loss of homes & livelihoods to RES	residents number 100's of thousands with maybe 1 in 100 very directly affected by REG proposal; fear complex effect of REG on homes
	ancillary elements	40% shoreline for development		levees & channel improvements		
	interim/partial action	little need for measures upstream		needed pending dam anyhow		
	community impacts	immediately drown out farms		eventual voluntary removal scheme		
	average annual costs			twice that of RES (1965 estimate)	precedents to view RES costs & benefits skeptically	
	benefit-cost ratio	over 1, plus secondary benefits		about 0.5, some reaches viable		
	financing	100% from government?	to be detailed for preferred plan only	not yet specified		
	implementation	new basin authority?		not yet specified	reluctance to confiscate private property in this society	
FLOOD ABATEMENT EFFECTS	100 yr recurrence event	fully eliminate effects downstream		somewhat reduce effects		
	10 yr recurrence event	fully eliminate effects downstream		eventually eliminate effects		
	$ flood damages	annual risk eliminated downstream		risk gradually reduced		
WATER QUALITY & SUPPLY EFFECTS	upstream quality	influent streams subject to law		largely independent problem		
	downstream quality	low flow augmentation enhances		largely independent problem		
	low flow augmentation	normally with 3 ft max drawdown		not provided in this scheme	mudflats threaten recreation	fish and recreation benefits
NATURAL RESOURCE RELATED EFFECTS	soil and water	sedimentation effects very slight			many downstream residents and business people have upstream educational, recreational or property interests:	
	vegetation resources	soils on site below av fertility				
	animal resources	drawdown brings mixed blessings			some of these (e.g. naturalists, youth camps) may side with upstream residents against reservoir	others (e.g. sports and fishing) may benefit from reservoir and/or intrude on upstream life & work
LAND USE & RECREATIONAL EFFECTS	recreational potential	threats of pollution & mud flats		park benefits from evacuation		
	floodplain development	downstream property values held		laws & acquisition to prevent		
	enhanced land value	eventual gains to local tax base		clearance enhances nearby homes	some landowners stand to lose, others to gain, in each case	



CHAPTER 8

USING THE LANGUAGES IN CONDITIONAL DECISION MAKING

Overview

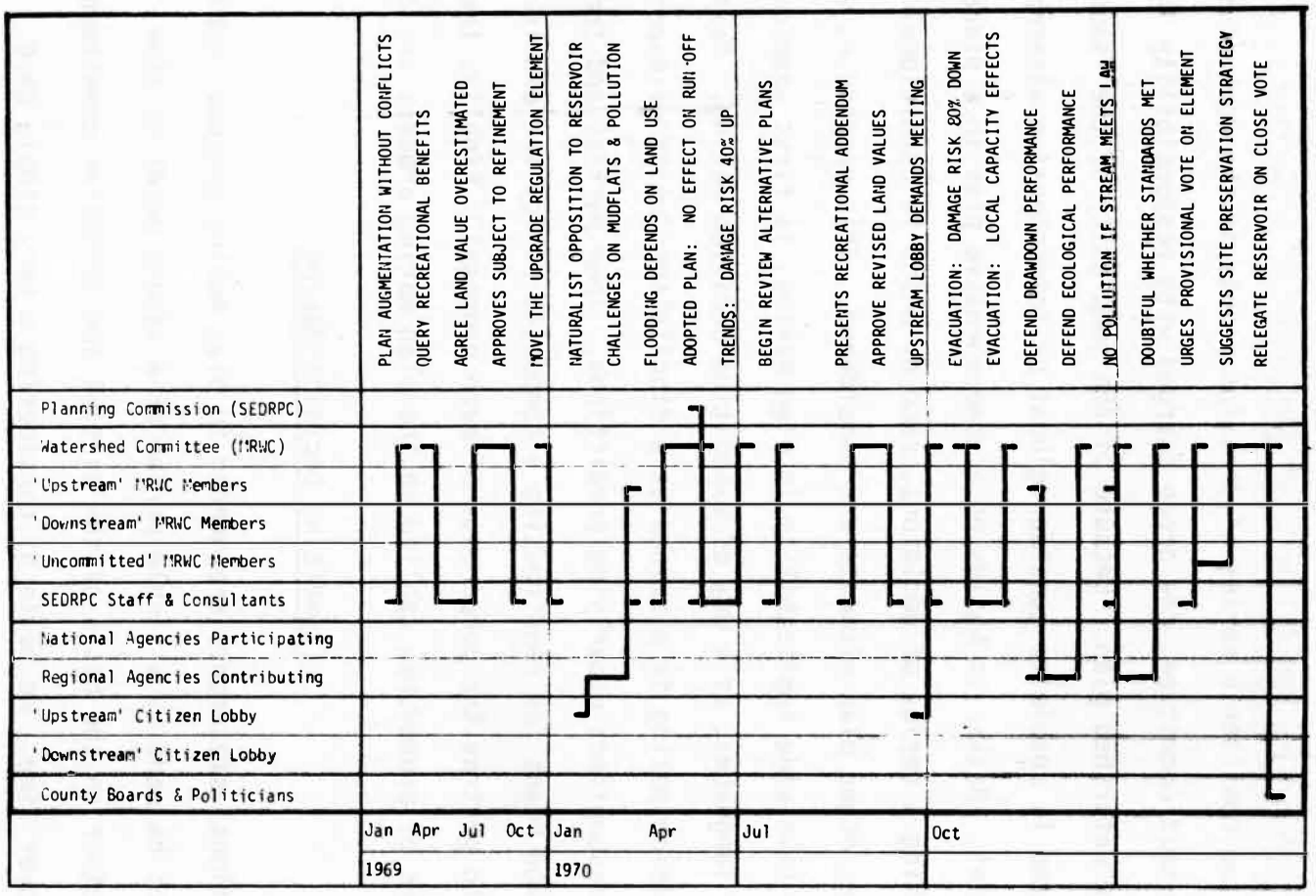
Next, we consider a series of decision points in the work of the Milky River Watershed Committee, the group charged with responsibility for preparation of the watershed plan. Because of the complexity of the issues involved, the Committee is unable to consider global or comprehensive alternatives at any one point. Rather it builds up a comprehensive plan in a piecewise fashion making a series of decisions, each of which is conditional and subject to review as other plan elements are considered. This procedure, which appears to have wide applicability in plan making, is first examined with the aid of the languages, as a way of expediting decision making. Next, conditional decision making is examined as a discliplined means of exposing and reviewing assumptions underlying predictions. Then partial and tentative decisions and means for constructing a composite policy are examined using the languages to portray the components of each proposal. Finally, the policy implications of procedures applied in the plan making process are considered.

Expediting Decision Making

Conditional statements are needed in plan making because complex decisions cannot be made by a single person at a single point in time, but must be put together on the basis of the partial and tentative commitment of many interests over time. We begin by considering a very simple case: conditional agreement which has no significant factual or strategic motivation, but allows work to proceed in parallel on several related fronts. Let us refer to the continuation of the dialogue, as plotted in Figure 8-1, for this and the next

Figure 8-1

Milky River Watershed Plan Making Dialogue, 1969 - 1970



few examples. Among the planning memoranda presented to MRWC was one assessing the benefits attributable to the reservoir scheme, as a result of the enhanced value of adjacent land for recreational purposes. During review of this memorandum at a meeting of the Watershed Committee in July 1969, such benefits were questioned, since they were based on the difference in sales data for comparable land in its raw agricultural state, and in its ready-for-development state with road layouts and utility services. It was readily agreed that this implied an overestimate equivalent to the cost of the basic services, and that the estimates could be refined by deriving this cost for a hypothetical recreational development. But, and this is the crucial procedural lesson, should the additional study delay approval of the entire planning memorandum? This delay was avoided by the device of a motion that:

> "... the planning memorandum be approved in principle, subject to revision of specific values based upon a hypothetical development study."

At the same time as it lent affirmation to the main methods and conclusions of the memo, this conditional approval relieved pressure upon the SEDRPC staff to produce refined values until it was convenient or critical to do so. Thus, the relevant addendum was not presented for MRWC approval until October 1970; see Figure 8-1.

In the planning situation chart, Figure 8-2, this conditional decision structure is represented by the sequence of changes shown in a, b and c, as summarized in the thumbnail process diagram, d. Clearly, had the situation chart already contained statements concerning the benefit-cost ratio of the reservoir, or the proportion of its benefits due to recreation, such figures would have had to change too. Simple though this procedural device may be, it has clear distinctions from a straightforward referral-back, as in Figure 8-3a, or from a conditional variant that:

Figure 8-2

Situation Chart and Process Diagram Showing a Conditional Decision Structure

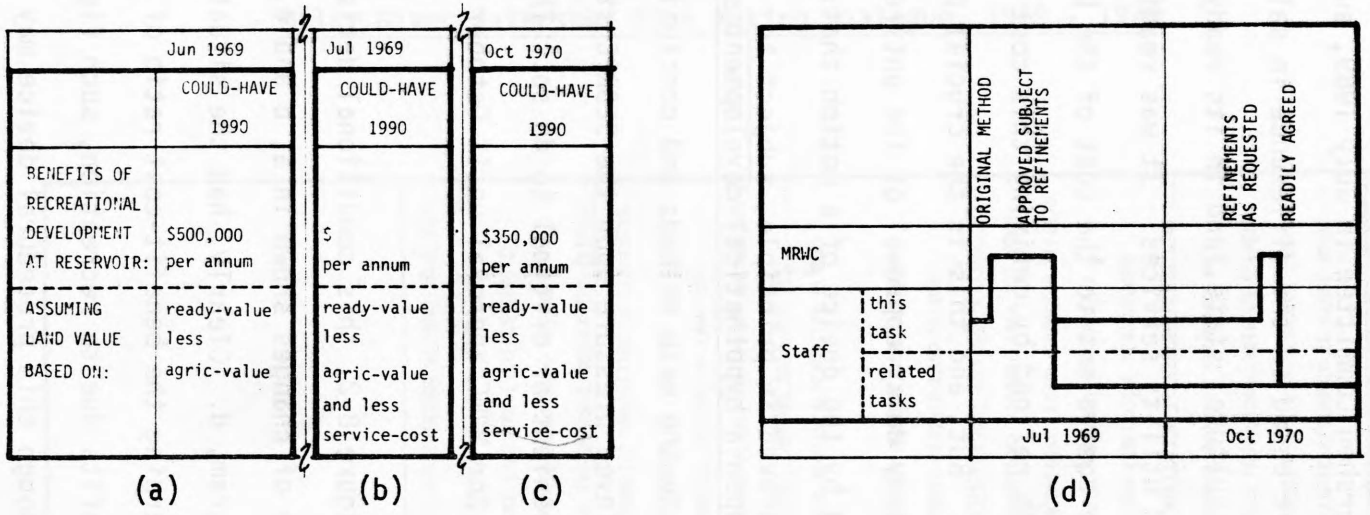
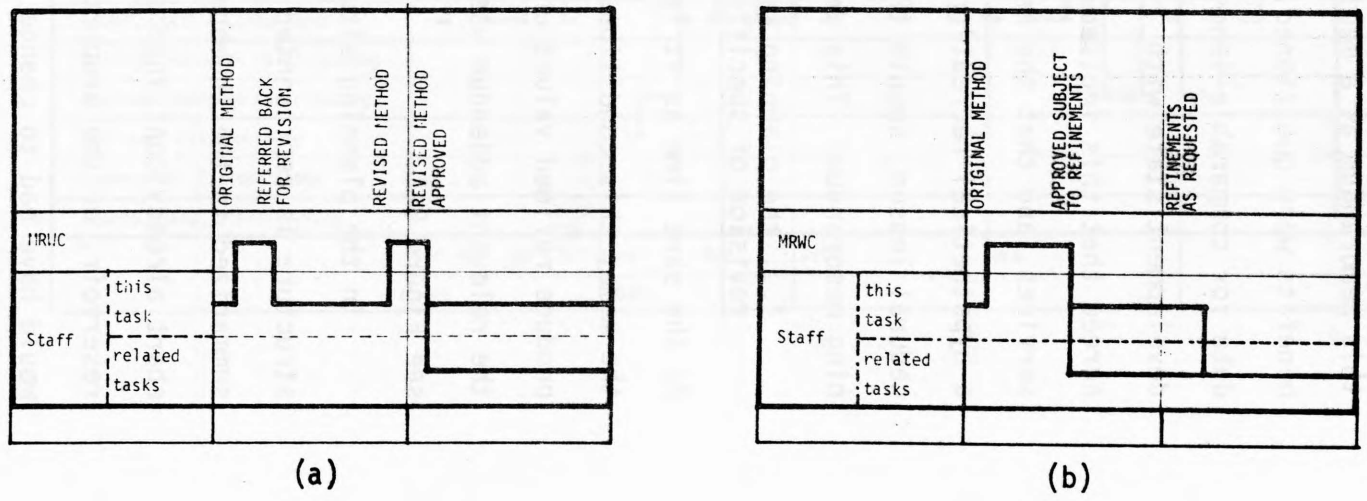


Figure 8-3

Process Diagrams for Alternate Decision Sequences



"... the planning memorandum be approved, subject to staff discretion in setting final values based upon a hypothetical development study,"

as in Figure 8-3b. The device used in Figure 8-2d is a compromise between those of Figures 8-3a and b, in that it allows work to proceed on related tasks, while actively retaining the Watershed Committee's sanction over the requested refinement. Choice between these three devices could depend upon how definitively MRWC was able to specify its desired refinements in July 1969.

Assumptions Underlying Predictions

It is commonplace to remark how planning predictions tend to be conditional upon questionable assumptions; unfortunately, such remarks are usually aimed at the demolition of predictive approaches or of particular predictions, rather than the construction of a disciplined means of exposing and reviewing assumptions. In the Milky River Watershed Study, persistent attempts were made to bring crucial assumptions to the attention of the Watershed Committee. In these examples now considered, the prediction in question is dependent upon the implementation of related plan elements, and the device used to articulate that dependence is again a conditional statement. We will see how explicit conditions of this nature may be taken up at suitable junctures, for technical analysis or orderly debate, often leading to alternative predictions. The dialogue takes its starting point from the situation charts, Figures 7-3 and 7-4; it is registered in the process diagram of Figure 8-1; and is abstracted in thumbnail charts and diagrams below.

The example of Figure 8-4 concerns the dependence of flood forecasts upon land use development. This was stressed by the SEDRPC consultants during review of their flood simulation work at an MRWC meeting in April 1970; and

Figure 8-4

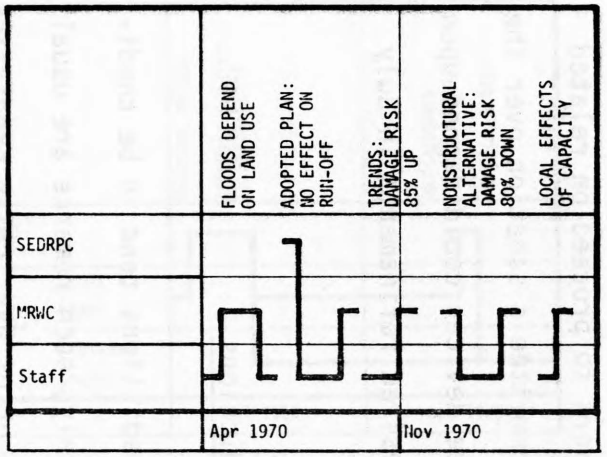
Dependence of Flood Forecasts on Land Use Development

Apr, May 1970		
	WOULD-HAVE 1990	WILL-HAVE 1990
PEAK FLOOD DISCHARGE		no effect from run-off
$ FLOOD DAMAGES	annual risk 35% up	annual risk as 1967
FLOODPLAIN LAND USE	uncontrolled trends	controlled trends

(a)

Nov 1970
COULD-HAVE 1970
local effects from storage
annual risk 80% down
flood proof & removal

(b)



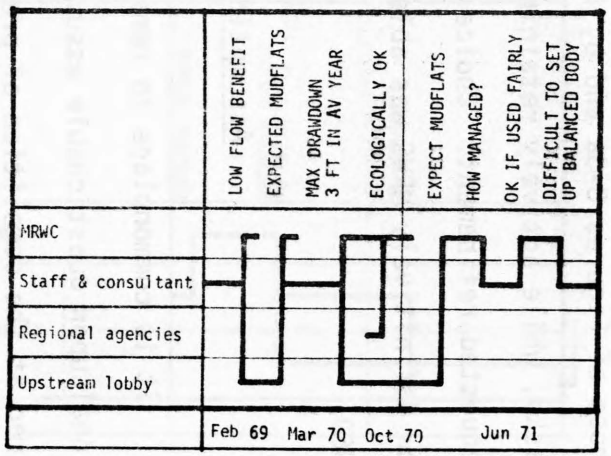
(c)

Figure 8-5

Predicted Effect of Reservoir Drawdowns for Low-Flow Augmentation

Feb 1969	Mar, Oct 1970	Jun 1971
COULD-HAVE	COULD-HAVE	COULD-HAVE
RESERVOIR WATER LEVEL FLUCTUATIONS: low flow augmentation with little drawdown	recreation unworkable due to mud flats	still maintain nuisance drawdowns avoidable
RESERVOIR MANAGEMENT & WATER ALLOCATIONS: provided reasonable operational philosophies followed		but difficult to establish balanced body & fair allocations

(a) (b) (c)



(d)

reinforced by Mr. W, one of the more technical 'downstream' representatives, who spoke of:

> "... the importance of following some kind of a long-range land use plan if the flood flows and flood discharges for the various recurrence intervals are to remain as indicated..."

The immediate concern was thus for the effects of urbanization upon flood flows, due to increased run-off, reduced floodplain storage, etc., though their implications for water quality were also discussed. At a meeting the following month, the effects of land use changes upon monetary flood damages, due to increased occupation of the floodplain, were also outlined. This link was also to be repeated in December 1970, in explaining the role of an unplanned land use alternative (uncontrolled trends) in estimating flood control benefits.

As indicated in Figure 8-4a, some data became available for both flood flows and flood damages at this juncture. Flood flow simulations, based upon the adopted 'controlled trends' land use plan, found that urbanization would in fact have negligible effects upon the run-off component. Flood damages, attributed to a simulation under 'uncontrolled trend' conditions, led to a forecast increase in average annual risk about 35 percent over the 1967 figure. Since the controlled trends plan would not permit further floodprone development, and the general effects of urbanization on runoff were negligible, the implication was that flood damage risks under controlled trend conditions would remain at the 1967 level. One function of the watershed study was to suggest refinements to the regional land use plan which would further reduce flood damages, and these came before MRWC in November 1970 in the guise of a nonstructural flood control alternative; see Figure 8-4b. This program for floodproofing and removal of residential and commercial structures within the floodplain offered to reduce the annual damage risks 80 percent

from the 1967 figure. It was accompanied by a study to show typical effects of structures and fills upon floodway capacity, and hence upon flood flows and flood stages (or heights): these effects could arise in conjunction with the nonstructural alternative, but are essentially local in nature.

Figure 8-5 summarizes a parallel example of conditional predictions for the reservoir alternative, namely drawdowns due to low-flow augmentation of the river in dry summer months. This would (a) bring benefits to fish life and recreation downstream, (b) enhance water quality through dilution and flushing, and (c) serve as a source of water supply. But the consultants' claim, in February 1969, that the water level changes which low-flow augmentation required at this reservoir site would not be sufficient to disrupt other reservoir uses, were challenged in correspondence by a local university professor in March 1970. He suggested that the resulting shallow areas of the reservoir would have a mixed attraction for wildlife, while the exposure of mud-flats would make it unsuitable for recreation. This matter was therefore closely questioned when the flood control alternatives came up for committee review in October and November 1970. Mr. W, a member with business interests downstream and property interests near the reservoir anticipated downstream pressures for low-flow augmentation, and was anxious to know what policies were to be assumed or recommended for the rate of augmentation. The consultants admitted there were infinite possibilities, but maintained that reasonable policies would require only a small drawdown, in comparison with those typical of power and water supply reservoirs. An ecologist was called in from the cooperating Dairyland Department of Natural Resources, who testified that the shallow areas would provide valuable waterfowl and fish habitat, especially because of the ability to control water levels during the spawning season.

During the public hearings in June 1971 on the alternatives and MRWC recommendations, low-flow augmentation emerged as a central issue in opposition to the reservoir. The most popular critique was on a technical point: many citizens found it difficult to accept that a maximum drawdown of about three feet every ten years would not create "vast gooey mud-flats". Given the importance of recreation in justifying the reservoir, it seems unfortunate that the accompanying 7 percent reduction in its 10,400 acre surface area was not translated into more specific information on location, width, and nature of impacts. Instead, the response was to admit some mud-flat problems in the shallow upper reaches of the reservoir; but to claim that they could be avoided in the lower reaches, where the recreational development would be located through pregrading and sand laying during construction. But the most influential critique was on a managerial point: whether one could be sure that the agency operating the dam would allocate water to users in a fair manner, restricting the drawdown to three feet maximum except in extremely dry years. It was left to Watershed Study staff and Committee members to answer this more probabilistic and less dramatic objection, both at the hearings and in committee. The composite conclusion which prevailed toward the end of the study, may be summarized in the staff's professional statement that:

> "If the reservoir were properly managed, the drawdowns and exposed shorelines would be acceptable"

and the Committee's more pragmatic observation that:

> "To be assured that whoever is in charge of the reservoir would carry out the noble purposes the engineers have in mind, without favoring one purpose as against the other, would require the creation of a new body with balanced interests."

The Committee clearly had doubts about the short-term feasibility of the latter.

The second example of conditional predictions about the reservoir arose over its water quality prospects, and is illustrated by Figure 8-6. The principal concern was again whether the reservoir's performance would be good enough for recreational purposes; one of the first sceptics was again Prof. W., who in March 1970 stressed the need for detailed evaluations, on the basis of experience elsewhere. Evaluations in keeping with the general rigor and sophistication of the Planning Commission's work were already underway, however; and provisional conclusions were presented to MRWC in October and November 1970. In effect, they stated that:

> "The water quality of the reservoir would be satisfactory, if regional water quality standards were met"

that is, if the water quality element of the comprehensive watershed plan, as specified in the respective political statements in Figure 7-3 were implemented. In elaboration of this assumption, the consultants and cooperating regional agencies dismissed the likelihood of problems with aeration at the reservoir itself, or with nutrients from soils at the reservoir site. The major potential source of pollution would be from the influent streams; and the mandatory water quality standards were to take care of that.

However, Mr. K, Chief Sanitary Engineer from the Dairyland Department of Natural Resources, an influential member of the Watershed Committee, was known to be pessimistic about the pollution abatement recommendations being fully implemented. These doubts apparently led him to vote against the reservoir, possibly influencing other members to do likewise, in a key preliminary ballot in November 1970. By the time the public hearings were due the next summer, arguments invalidating the assumption were well established. The Executive Director of SEDRPC, in answer to a question, saw reservoir water quality as an area requiring the exercise of great judgment. The technical excellence of

Figure 8-6

Predicted Effect of Reservoir Water Quality on Wildlife and Recreation

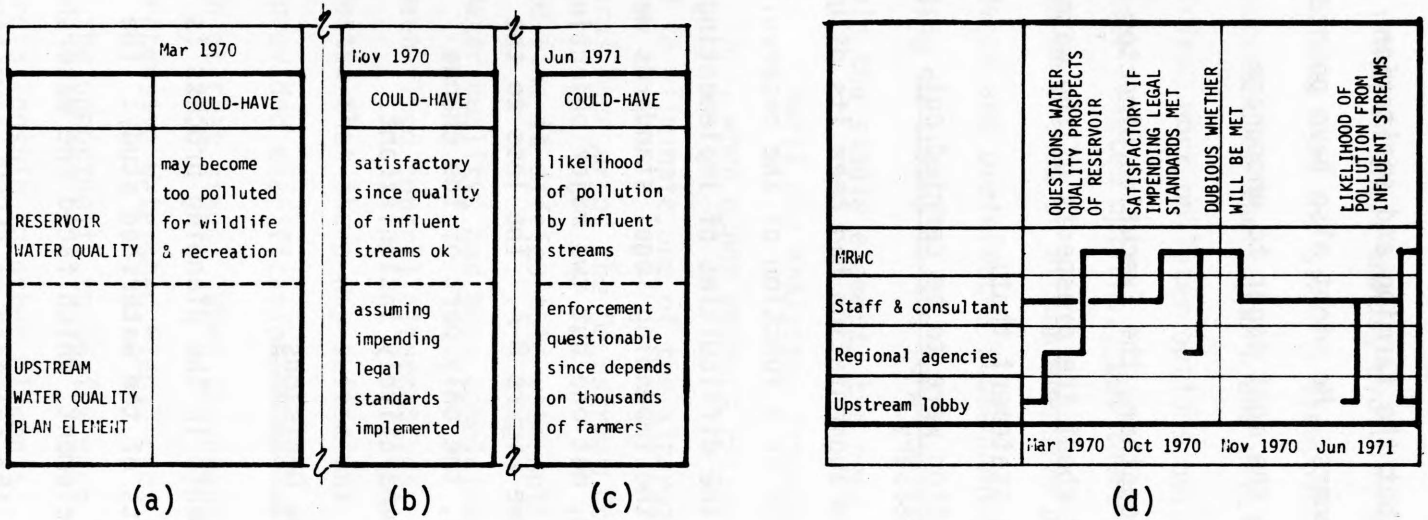


Figure 8-7

Combined Situation Chart for Flow Augmentation and Water Quality

	DOES	COULD	COULD
RECREATIONAL BENEFITS	depend on water level and quality	not high	very high
AUGMENTATION BENEFITS	depend on water quality downstream	will apply	no need
RESERVOIR WATER LEVEL	depend on low flow augmentation	mudflats	stable
RESERVOIR WATER QUALITY	depend on water quality upstream	polluted	adequate
WATER QUALITY PLAN ELEMENT	depend on meeting legal standards	not met	fully met

the particular solution had to be weighted against the possibility, given their form and system of government, that it would be carried out totally. The difficulty, he said, was that implementation in this case involved not just a handful of public treatment plants, but the farming and sanitation practices of hundreds of individual land owners. He might also have pointed out that these upstream landowners were not the most eager to encourage a reservoir.

Finally, bringing these two examples together, the Executive Director as much as acknowledged a parallel wishfulness about the prospects of the water quality element downstream, by the crowning statement that:

> "If the pollution abatement recommendation were to be carried out, low-flow augmentation would not be necessary."

In other words, the prime reason for low-flow augmentation had been its dilution and flushing function; and its inclusion as a function of the reservoir had all along implied staff recognition of the difficulties of implementing the water quality element. Conversely, if the impending legal standards were eventually met both upstream and downstream, not one but two major objections to the reservoir would have been removed; see Figure 8-7. The loss to the scheme of the low-flow augmentation benefits, the only part of the change quantifiable in monetary terms, would be comparatively insignificant.

Partial and Tentative Decisions

The next example of conditional statements in the planning process is concerned with one of the key decision points of the watershed study: the provisional choice of a flood control plan element, which faced the Watershed Committee in November 1970. Briefly, it is the practice of SEDRPC committees to make a choice between alternative plan elements as soon as the review of

the chapter draft, or section draft, presenting them has been completed. Some of the advantages of this are obvious. It is efficient from the committee's viewpoint, in that it brings members to a decision while the relevant factors are fresh in their minds, avoiding additional, repetitive meetings. And it is efficient from the staff's viewpoint, in that it enables them to concentrate resources upon the support and detailing of an ever-smaller set of favored policies, work on later options being eased by the knowledge of decisions on earlier related options. But there are also clear disadvantages. Early decisions on pieces of a comprehensive plan must be made in ignorance of the evidence and preferences subsequently associated with related elements, leading in theory to the foreclosure of better policy combinations. And, even within the single element, the need for more time to consider available evidence or await new analyses, frequently is felt in practice.

Thus, when other members raised a motion at the MRWC meeting in November 1970 to eliminate one of the alternatives from further consideration, the General Manager of the Downstream County Park Commission indicated that he would find it difficult to vote until the other plan elements, such as that on water quality, had been completed, and recommended delaying the selection between flood control alternatives. In response, SEDRPC's Executive Director suggested that there was sufficient information for their immediate purposes, and provided clarification of the role and status intended for a decision taken at that stage. When the chapter embodying such decisions, "Recommended Comprehensive Watershed Plan," came before the Committee, they would, he said, have the opportunity to review each favored plan element again, and examine its relationship to other elements...

> "If any serious conflicts exist between any one plan element and the other elements of the recommended plan, the Committee could at that time substitute a more compatible plan element."

Thus MRWC members were appraised of the partial and tentative nature of decisions at that stage, being provisional upon their own reconsideration on at least one specific score; see Figure 8-8. We will later see how all MRWC decisions are provisional upon the reconsideration of others, in a much more general sense.

However, it is far from easy to convey this tentative nature of decisions, and the need for a cyclic process of reworking and gradually firming policies, to more casual observers from outside the Committee. Laymen generally have relatively narrow interests in a study, and are all too ready to let other elements be subservient to that which most concerns them: herein lies one of the great difficulties of widespread participation in plan making. The watershed planning program yielded a keen example at this stage. Press reporters closely followed the workings of the Watershed Committee and, detecting that staff and consultants favored the reservoir alternative, wrote articles in advance of the October and November 1970 meetings which were open to the interpretation that the Committee itself was about to recommend the reservoir. At that stage, in fact, MRWC had only just begun consideration of the flood control alternatives. Encouraged by a few key lobbyists, scores of citizens from the site of the potential reservoir turned up at the two committee meetings, with a view to persuading MRWC to eliminate this option. Although, following standard SEDRPC practice, extensive public hearings were planned before the Committee came to its final recommendations, the press and reservoir opponents tended to treat these committee meetings as if they provided a last stand against overpowering odds, on the one hand, or an opportunity to throw out the proposition once and for all, on the other. While the Committee persisted in its normal modus operandi, permitting the visitors to do little more than 'breathe down their necks' at this juncture, it did mean that they

Figure 8-8

Use of Languages to Represent Timing and Provisional Nature of Decisions

	Oct 1970
	SHOULD-HAVE (citizens)
TIMING, NATURE & INTENT OF VOTE	immediate & final vote to eliminate reservoir
APPARENT REASONS FOR ABOVE POSITION	substitute public voice for supposed commitment of MRWC

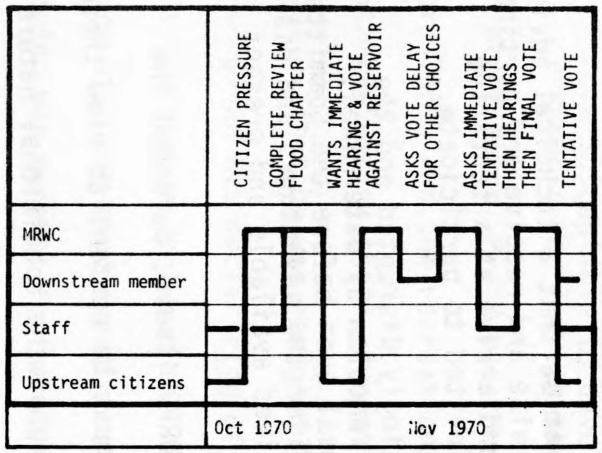
(a)

	Nov 1970
	SHOULD-HAVE (member)
TIMING, NATURE & INTENT OF VOTE	delay vote until other plan elements are chosen
APPARENT REASONS FOR ABOVE POSITION	dependency on related elements & more time to consider

(b)

	Nov 1970	
	WILL-HAVE (staff & committee)	
TIMING, NATURE & INTENT OF VOTE	immediate but tentative vote to provide focus	final vote after public hearings on all elements
APPARENT REASONS FOR ABOVE POSITION	expedites staff work & more effective hearings	incorporate hearings & reconcile conflicting elements

(c)



(d)

Figure 8-9

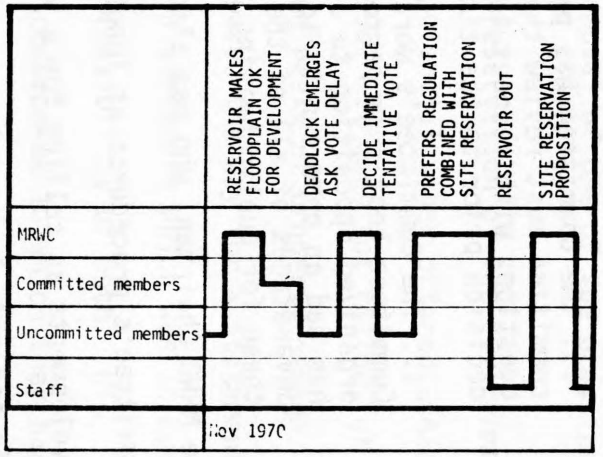
Specification of a Composite Alternative

	Nov 1970	
	COULD-HAVE reservoir	COULD-HAVE regulation
FLOOD CONTROL ELEMENT	prevent floodplain inundation	prevent floodplain development
DECISIVE ATTRIBUTES FOR FLOODPLAIN PROTECTION ELEMENTS	lower floor risk means floodplain increasingly development susceptible	protects natural resources & recreational potential of corridor

(a)

Nov 1970	
SHOULD-HAVE Mr. V	
floodplain regulation measures	reservoir site reservation
uncertain success	floodplain protection
firm compromise flexibility to switch pressures to implement	

(b)



(c)

were forced to take their provisional decision under the pressure of a very one-sided set of public interests:

> "... the Committee has proceeded on the premise that a technical advisory committee must review the staff reports, raise and resolve any pertinent questions with respect to those reports, and arrive at a tentative decision prior to the time the public is invited to participate...
>
> "... The Committee's work is being increasingly disrupted and the Committee kept from performing its proper function by determined, organized opposition to one possible proposal even before the Committee has had an opportunity to objectively consider the advantages and disadvanatages of all of the various alternatives available and present these for public hearing."

The MRWC Chairman, who was also Secretary of SEDRPC itself, defended the committee's procedures at length. But here we must be content to view these developments as calling for a wider understanding of the conditional nature of fair and orderly decision making, and a key stage in the unfolding of the Milky River Watershed planning program.

Constructing a Composite Policy

The scene was thus set for a key preliminary decision between the two alternatives and, incidentally, for one of the most astute and constructive conditional statements yet discovered. This came from Mr. V, president of an old established consulting engineering firm in Downstream, and a resident and landowner in the lower floodprone end of Midstream-East. Mr. V has been a regular attendee at MRWC meetings since the Committee's inception, showing an early interest in the protection of the floodplain from further development, but so far apparently reserving his position on the reservoir issue. He was a man who spoke relatively little, but when he chose, he did with great consequence. In the discussion on flood control alternatives which preceded the November 1970 vote, Mr. V voiced a subtle objection to the reservoir which at the same time announced his leanings on that score, and explained his real

interest in floodplain protection. In short,

> "If the reservoir were built, the downstream flood plains would become more susceptible to development, due to removal of one of the pressing arguments for leaving them in their natural state."

In other words, Mr. V was more concerned with preservation of the environmental corridors, and the recreational and aesthetic potentials they offered, than with preventing their inundation; see Figure 8-9a. It does not follow, of course, that he was resigned to the accompanying risks of property damage.

Given his declaration of interest, Mr. V paved the way for a statement of his preferences between the two alternatives: a statement which was to confirm his open mindedness about the virtues and feasibility of both. His timing was superb; for he offered both sides a compromise to which they had little grounds for objection, at just the moment when committed members were reaching a point of deadlock, and uncommitted members were experiencing the sort of urge to delay selection which was described above. Mr. V's preference statement took a conditional form (Figure 8-9b):

> "... favoring the floodplain regulation alternative, provided this was accompanied by the protection of the reservoir site against urbanization, so that this alternative would be available for reconsideration by future generations..."

The subsequent vote went marginally in favor of the floodplain regulation alternative. However, it was followed up smartly by a proposition from SEDRPC staff that they should explore the possibility of including a reservoir land reservation rider, a proposition from which nobody could find sufficient reason to demur.

This combination open-option strategy had many attractions, apart from encouraging an early decision, and firm policies for the immediate future. Not least, it provided a hedge against the implementation uncertainties of floodproofing and evacuation; and against the possibility of environmental

objectors to the reservoir, at some future date, finding their match in citizen groups who had suffered disastrous floods and pollution. While the combination policy would change the status quo, it preserves the balance of interests: any tendency for downstream residents to usurp the regulation policies in order to force its construction, will quickly be exposed by upstream groups, who would have a continuing interest in strict enforcement of the regulations. And coincidentally, the site protection policy would further reinforce Mr. V's floodplain preservation ends in the reservoir area.

Policy Implications of Procedures

Following this expression of preference by MRWC, staff work on the flood control element focussed upon further detailing of the floodplain regulation measures, particularly with regard to their financing and administration as shown in Figure 8-10. Although it is SEDRPC practice to make a comparative evaluation of economic costs and benefits for all alternatives (including trend projections), an analysis of implementation responsibilities and expenditures by governmental agency is made for the preferred alternative only, albeit before a final decision. The main advantage of this, in short, is that it avoids the early introduction of a heavy conservative weighting against alternatives which are superior on a region-wide basis. The main disadvantage is that it does not permit a proper comparative evaluation of the distributional effects of all alternatives. Anyway, this standard procedure had been outlined to the Committee at an early juncture of its work (December 1968); and staff accordingly began the analysis for the regulation measures, but not the reservoir.

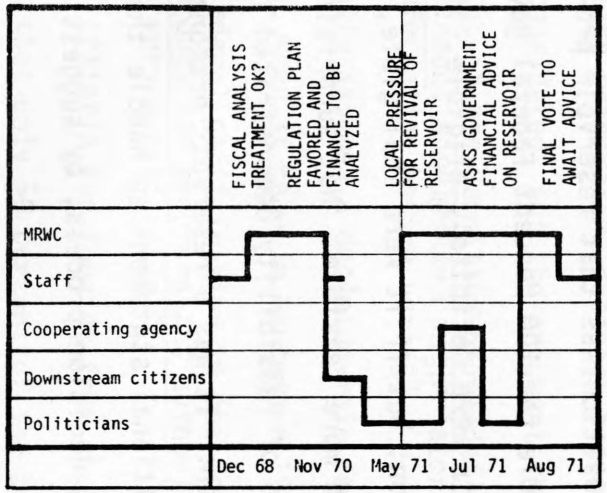
Due partly to the closeness of the preliminary vote and the introduction of the site reservation rider, but mainly to the peculiar nature of potential

Figure 8-10

Financing and Administration of Floodplain Regulation

	Dec 1970		Jun, Jul 1971
	COULD-HAVE reservoir	WILL-HAVE regulation	COULD-HAVE reservoir
FINANCIAL & ADMINISTRATIVE ARRANGEMENTS	0% or 100% government funds possible	evaluations forthcoming before votes	comprehensive authority funding eligibility advice forthcoming before vote
CONSEQUENT IMPLEMENTATION FEASIBILITY	either fairly high or fairly low	moderately difficult to fully implement	funding eligibility status influential for MRWC & recent downstream campaign
COMPARATIVE EVALUATION	no comparative distributions evaluated before voting		risk of departure from independent explicit process

(a) (b)



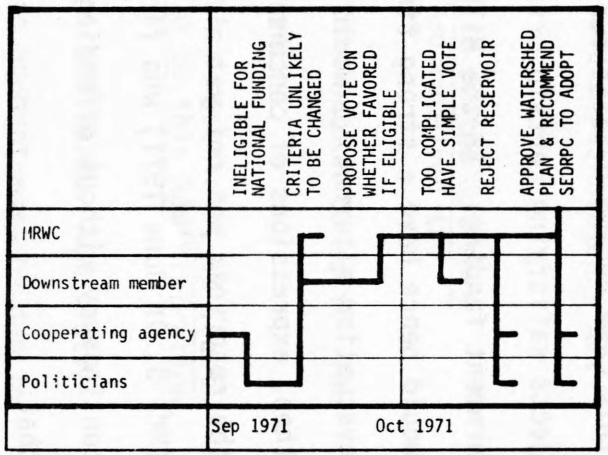
(c)

Figure 8-11

Final Alternatives Considered by MRWC

	Sep 1971	Oct 1971	Oct 1971
	COULD-HAVE reservoir	SHOULD-HAVE Mr. G	SHOULD-HAVE MRWC
FINANCIAL & ADMINISTRATIVE FEASIBILITY	eligibility for national funds very questionable	assume national funds become available	complicated assumptions would be too confusing to SEDRPC and the public
GOVERNMENT CRITERIA	limits benefits of recreation	assume all benefits counted	
PROSPECTS OF CHANGE	apparently little chance	assume law did change	
MRWC VOTE ON RESERVOIR	highly influenced by eligibility	test preferences independently	proceed direct to simple vote

(a) (b)



(c)

funding for a reservoir scheme, the weakness of SEDRPC's standard procedure in this case became evident during 1971. The position was that reservoir projects satisfying certain criteria were eligible for 100 percent Federal government funding. If the Milky River reservoir were definitely eligible, it would hence have a strong financial attraction; but if it were ineligible, the evacuation alternative would probably be much more feasible. Not surprisingly, then, expressions of concern on this question of feasibility demonstrated that the reservoir was not yet a 'dead' proposition. It was a reservoir proponent (Mr. G, in June 1971) who first found a conditional statement to handle the contingency without offending the Committee's decision process, by suggesting that:

> "...enabling legislation be sought to create a comprehensive river basin authority to design, construct, maintain and operate the reservoir <u>should it ever be reinstituted as a recommended watershed plan element</u>."

But it was a reservoir opponent, an important political figure, who in July 1971 persuaded the Federal Waterways and Harbor Administration to have its Southeastern Dairyland office review the MRWC findings, and provide an advisory opinion on funding eligibility. It was opportune for Representative R to take this initiative, since downstream citizen groups had by then begun to mobilize in support of the reservoir and had just made a strong showing at the public hearing. This threatened an awkward controversy within his own constituency; and an outside opinion on feasibility, which appeared likely to be negative anyhow, would be a welcome neutralizing factor.

Since this advisory opinion was not requested by MRWC, and awaiting it would involve several months' delay in their final vote on the flood control alternatives and comprehensive plan, an intense procedural debate ensued within the Watershed Committee. Quite apart from questions of strategy for reservoir proponents and opponents, there were questions of principle notably

concerning the independence and integrity of the Commission's own overt, explicit and painstaking decision procedures. Each procedural contingency has to be considered, but the argument that:

> "... if the Committee proceeded without the benefit of the advisory opinion, some members might later wish that they had received the information before voting"

apparently assumed a decisive role in the eventual determination to wait. The opinion, when it came in September 1971, was conditional:

> "Federal participation in the construction of such a reservoir, at least through the programs and authorities now available to this Administration, is very questionable."

The key criteria for funding from the Federal Waterways and Harbor Administration is that only 50 percent of the benefits taken into account must be due to recreation or to fish and wildlife enhancement. But there is some flexibility as to which costs and benefits one interprets as attributable to a reservoir project, as opposed to separate recreational projects, so that the calculation and response could not be straightforward. To help crystallize the firm rejection he had expected, Representative R forwarded this verdict to MRWC with a covering note to the effect that:

> "I have checked with other members of Congress, and there is no prospect that the 1965 law which now bars this reservoir will be changed."

The stage was thus set for a final vote; see Figure 8-11.

Despite clear indications that the final MRWC vote would confirm the non-structural flood control recommendation, Mr. G was still anxious to build contingency statements into the record which would be potentially useful to interests wishing to revive the reservoir proposal. Just before the crucial motion he raised the ingenious possibility of vote on:

> "... whether or not the reservoir would have been included in the plan if Federal funding had been available for its construction."

He explained his belief that the Watershed Committee's decision should make it clear as to which plan they judged best, independent of a fiscal constraint which might be relaxed in the future. This suggestion failed to gain support, not so much from trust of Representative R's assurances on the unlikelihood of legislative change, but due to the view that:

> "... such a vote, taken at this point in the proceedings, would not be germaine and would be very confusing to SEDRPC and the general public."

In other words, while there was nothing theoretically wrong with considering Mr. G's proposition -- indeed it would be very meaningful to those who had closely followed the MRWC dialogue -- there were reservations about its comprehensibility to others. Such reservations are surely legitimate. There is a limitation upon the level of sophistication at which various essential participants are free or able to follow a decision process; and a point at which the precision of the dialogue must be sacrificed to accommodate their needs.

CHAPTER 9

COMPARING PLANNING SITUATIONS: PRE-CONSENSUS AND POST-ADOPTION

Concluding the Process - Plan Adoption

Approval of the comprehensive plan by the Watershed Committee, despite the effort it had taken, was to be only the first in a series of steps to establish the plan politically and legally. The recommended plan had then to be transmitted to the Regional Planning Commission, which formally adopted it in March 1972, but only after lively meetings in which attempts were made to delay a decision, to reinstate the reservoir alternative, and to relax the public land and floodprone property acquisition measures. Conditional statements continued to figure critically in these arguments; and each move met at least a symbolic minimum success, while not significantly upsetting MRWC's intent. Subsequent to SEDRPC adoption, the plan was sent to the five watershed counties and numerous other agencies and local units of government, for their adoption or endorsement. Although strictly an advisory document, and hence open to partial or conditional acceptance by these bodies, its general technical and logical solidity, and the degrees of consensus and commitment which has been built around it over the years, left such exceptions in a weak exposed position. But we must close our detailed treatment of the continuous dialogue on flood control at MRWC's plan approval meeting.

Reviewing the Continuing Process with Diagram and Chart

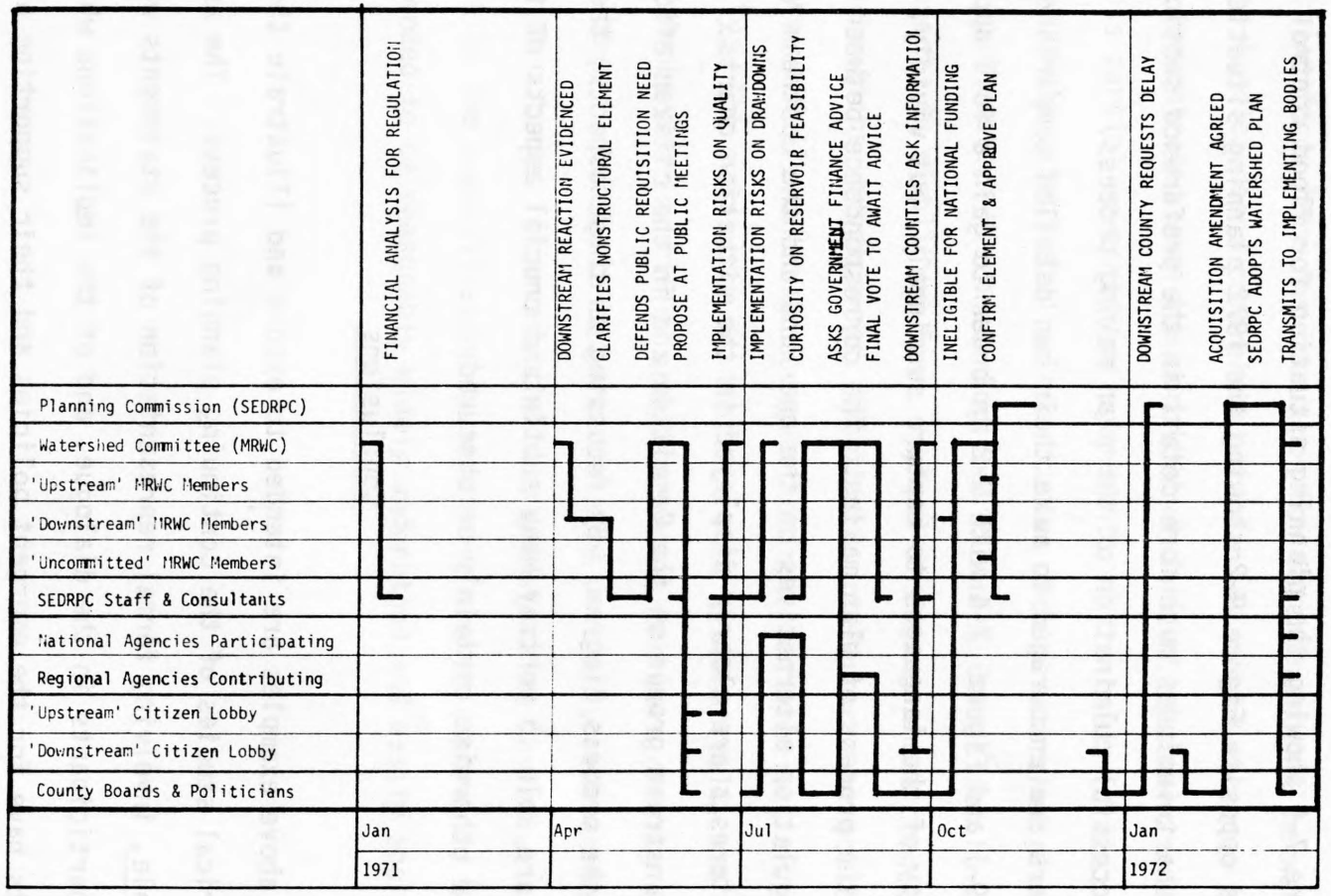
Figure 8-1 is reproduced opposite Figure 9-1 to facilitate review of the plan making activity during the 1970-1972 period. The difference in the types of participants is clearly displayed here: 1970 and early 1971 was an extensive period of committee-staff interaction; 1972 is characterized by extensive

Figure 8-1

Milky River Watershed Plan Making Dialogue, 1969 - 1970

Figure 9-1

Milky River Watershed Plan Making Dialogue, 1971 - 1972



consultation with federal and regional agencies, citizen lobbies and county and local elected officials. Only in 1972 does the Regional Planning Commission itself become involved as the approved plan is forwarded for adoption.

Figure 7-4 showing the planning situation for flood control in 1969 is reproduced opposite Figure 9-2 showing the 1972 planning situation. Naturally, the 1972 chart includes much more detail in the preference section as a result of the successful culmination of the plan making process.

Readers are encouraged to make their own detailed comparisons of Figure 8-1 with 9-1 and Figure 7-4 with 9-2 in order to gain a full appreciation of the ability of the languages to capture succinctly, but vividly, the attributes of the process of plan making. The correspondence between the reservoir versus regulation alternatives on the one hand and the upstream versus downstream interests are clearly displayed in the situation charts. The upstream versus downstream groups on the Committee and in the citizen efforts are also shown in the process diagram. By focussing on these aspects, the charts and diagrams are able to portray many subtle and crucial aspects of the process that would otherwise certainly be obscured.

Conclusions

The above examples are intended to expose and illustrate the findings of our empirical studies of the continuing planning process. The approach is micro scale, involving formal representation of the statements which pass between participants in the dialogue, and of the implications which these statements have for the emergent policies and their supporting assumptions. The approach is also structural, in that its main concern is for the logical composition of the policy set, and the logical evolution of the underlying alternatives and criteria, rather than their quantitative values. And the

approach is consciously pragmatic, pushing toward workable tools for the improvement of planning, in realistically rich situations, and in the not-too-distant future.

Our particular focus here has been upon how interdependence between decisions may be handled, as a comprehensive plan is pieced together over time. We have concentrated upon the conditional form of statement which is needed to express partial or tentative agreement, if the basis of that agreement is to be properly established. Case studies from a watershed planning program of the Southeastern Wisconsin Regional Planning Commission have enabled us to present, in simplified form, typical instances where conditions attached to observations, predictions, hypotheses, preferences or policies at one juncture, are usefully taken up for questioning, confirmation, or elaboration subsequently. The suggestion is that the more systematically and explicitly such conditions are identified and documented, the more orderly and objective the dialogue is likely to be, and the more precisely responsive to complex problem structures. However, the case examples also remind us that there is a limit to the sophistication to which one should aspire, if one's methods are intended to be reasonably widely understood and easily applied.

Figure 7-4

Planning Situation Chart for Two Flood Control Alternatives, 1969

COMPARATIVE DATA FOR PRINCIPAL FLOOD CONTROL ALTERNATIVES - 1969		hypothetical COULD-HAVE			preference SHOULD-HAVE	
		reservoir alternative (RES)		regulation alternative (REG)	upstream (anti-RES) interests	downstream (pro-RES) interests
MAIN FEATURES OF SCHEME (regulation scheme data is for downstream of dam only)	basic elements	dam on Midstream E/W border		evacuation from 10 yr floodway	wants comprehensive approach	wants comp. but urgent approach
	complementary elements	impound 9,000 - 10,000 acres		flood proof in 100 yr floodplain	residents number tens of thousands with maybe 1 in 10 very directly affected by RES proposal; oppose loss of homes & livelihoods to RES	residents number 100's of thousands with maybe 1 in 100 very directly affected by REG proposal; fear complex effect of REG on homes
	ancillary elements	40% shoreline for development		levees & channel improvements		
	interim/partial action	little need for measures upstream		needed pending dam anyhow		
	community impacts	immediately drown out farms		eventual voluntary removal scheme		
	average annual costs			twice that of RES (1965 estimate)	precedents to view RES costs & benefits skeptically	
	benefit-cost ratio	over 1, plus secondary benefits		about 0.5, some reaches viable		
	financing	100 from government?	to be detailed for preferred plan only	not yet specified		
	implementation	new basin authority?		not yet specified	reluctance to confiscate private property in this society	
FLOOD ABATEMENT EFFECTS	100 yr recurrence event	fully eliminate effects downstream		somewhat reduce effects		
	10 yr recurrence event	fully eliminate effects downstream		eventually eliminate effects		
	$ flood damages	annual risk eliminated downstream		risk gradually reduced		
WATER QUALITY & SUPPLY EFFECTS	upstream quality	influent streams subject to law		largely independent problem		
	downstream quality	low flow augmentation enhances		largely independent problem		
	low flow augmentation	normally with 3 ft max drawdown		not provided in this scheme	mudflats threaten recreation	fish and recreation benefits
NATURAL RESOURCE RELATED EFFECTS	soil and water	sedimentation effects very slight			many downstream residents and business people have upstream educational, recreational or property interests:	
	vegetation resources	soils on site below av fertility				
	animal resources	drawdown brings mixed blessings			some of these (e.g. naturalists, youth camps) may side with upstream residents against reservoir	others (e.g. sports and fishing) may benefit from reservoir and/or intrude on upstream life & work
LAND USE & RECREATIONAL EFFECTS	recreational potential	threats of pollution & mud flats		park benefits from evacuation		
	floodplain development	downstream property values held		laws & acquisition to prevent		
	enhanced land value	eventual gains to local tax base		clearance enhances nearby homes	some landowners stand to lose, others to gain, in each case	

Figure 9-2

Planning Situation Chart for Two Flood Control Alternatives, 1972

COMPARATIVE DATA FOR PRINCIPAL FLOOD CONTROL ALTERNATIVES - 1972		hypothetical COULD-HAVE		preference SHOULD-HAVE		
		reservoir alternative (RES)	regulation alternative (RES)	upstream (anti-RES) interests	downstream (pro-RES) interests	
MAIN FEATURES OF SCHEME (regulation scheme data is for downstream of dam only)	basic elements	dam on Midstream E/W border	voluntary removal from floodplain	RES unjust, upstream folk have long respected & zoned floodplains, REG would force downstreamers to, why must upstream suffer their mistakes	only RES economically viable & multipurpose, municipalities sanctioning floodplain building must now support/compensate	
	complementary elements	10,400 acres at 14 ft av depth	another 500 homes floodproofed			
	ancillary elements	possible power plant cooling water	limits rebuilding after floods			
	interim/partial action	protect site from urbanization	needed pending dam anyhow		reserve RES site as future option	
	community impacts	immediately displace 200 homes	eventually displace 200 homes	farmers lose livelihoods to RES	REG bound to hit property values	
	average annual costs	$2.5 mill, 40% recreational facility	$0.5 mill, 80% property acquisition	both reduce local tax base & extravagant for flood prevention		
	benefit-cost ratio	1.5, 90% recreational benefits	0.5, 90% flood control benefits	recreation omitted for REG, augmentation & local income for RES		
	financing	ineligible for 100% government funds	by counties with government aid	REG imposed by law, not finance	RES finance constraints may change	
	implementation	institutional structure unavailable	local regulation & county acquisition	doubts about equitable operation	meet challenge as elsewhere	
FLOOD ABATEMENT EFFECTS	100 yr recurrence event	stored in 12000 acre by 8 ft rise	alleviates to extent implemented	occasional floods act of God, permanent flood act of selfish vicious man, use floodlands not RES as nature intended	RES effective for flood control, RES ok for unimproved areas but do-nothing approach here, willing to live with minor floods	
	10 yr recurrence event	fully eliminated downstream only	extendible throughout watershed			
	$ flood damages	negligible risks remain upstream	80% down, & eligible for insurance			
WATER QUALITY & SUPPLY EFFECTS	upstream quality	doubts about influent streams	largely independent problem	want proof of unpolluted RES	impose farm conservation practices	
	downstream quality	doubts bring augmentation need	largely independent problem	impose legal abatement measures	benefit from augmentation	
	low flow augmentation	drawdown depends on management	not provided in this scheme	flush from lake cheaper than RES	stable-level/augmentation conflict	
NATURAL RESOURCE RELATED EFFECTS	soil and water	prime wetland 10%, woods 5% of site	no reduction in educational, aesthetic, & wildlife values	downstreamers to sacrifice farmlands which feed them for easy pleasures	growing opposition to all reservoirs from public and environmental lobby	RES to improve opportunity for most citizens to experience nature
	vegetation resources					
	animal resources	$850,000 p.a. fish	wildlife benefits in rougher areas			
LAND USE & RECREATIONAL EFFECTS	recreational potential	some pollution & mudflat risks	minor recreational benefits	object to tourists in backyard	RES improves upstream and down	
	floodplain development	open downstream to development	flexibility to designate floodway	stop fast profits	floods help preserve	REG boosts value
	enhanced land value	$100,000 per annum due to recreation	$5,000 p.a. for nearby property	uncertainty threatens past & future property investments		

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