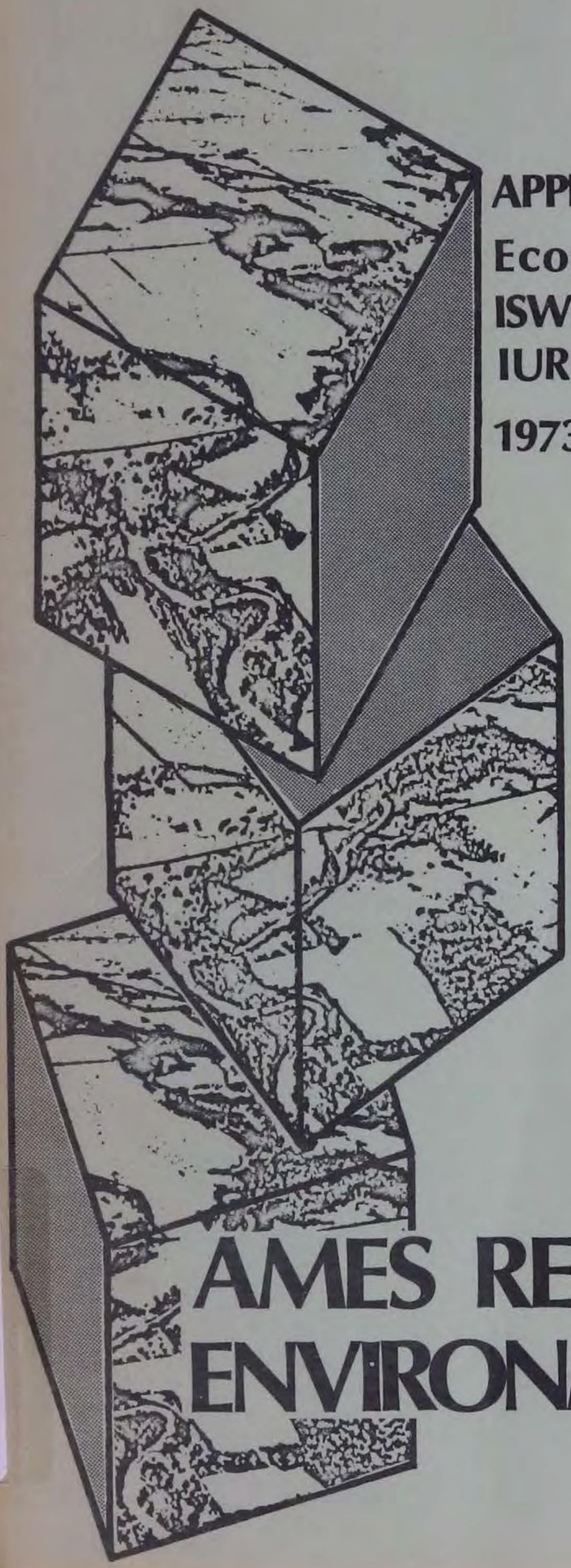

APPENDIX 2

Economic and Social Impact

ISWRRI-60-A2

IURR-FRS-9-A2

1973

AMES RESERVOIR ENVIRONMENTAL STUDY

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AMES
RESERVOIR
ENVIRONMENTAL
STUDY

APPENDIX 2

ECONOMIC AND SOCIAL IMPACT

By

Institute of Urban and Regional Research,
University of Iowa, Iowa City
in cooperation with the
Iowa State Water Resources Research Institute,
Iowa State University, Ames, Iowa

Prepared for

U. S. Army
Corps of Engineers
Rock Island District
Contract DACW25-72-C-0033

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Iowa State University:
ISWRRI Completion Report
No. 60-A2

University of Iowa
Institute of Urban and Regional Research
Final Report Series 9-A2

An environmental resources review study of the proposed Ames Reservoir, Skunk River, Iowa -- social and economic impacts of the reservoir and alternatives.

1973

Ames Reservoir Environmental Study

Appendix 2

Economic and Social Impact

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Appendix 2

Economic and Social Impacts

GENERAL ACKNOWLEDGMENTS

Appendix 2 contains the results of studies of the economic and social impacts of the Ames Reservoir. The studies were conducted by faculty and research graduate assistants of the Institute of Urban and Regional Research, University of Iowa, assisted by faculty in related areas at Iowa State University, and Professor Daniel W. Bromley, Department of Agricultural Economics, University of Wisconsin, Madison.

The Rock Island District, U.S. Army Corps of Engineers, supported the environmental review study through a research contract, DACW 25-72-0033. The purpose of the project review is to provide a comprehensive and authoritative basis for preparation of an adequate environmental impact statement by the Corps of Engineers in compliance with the National Environmental Policy Act of 1969, PL 91-190. The specific objective of the appendix 2 studies is to review, study, and report on the economic and social effects, and related problems as they relate to the reservoir project and alternatives.

This appendix documents the methodology and results of economic and social impact analyses for the Ames Reservoir Review Study. Economic analysis is considered integrally with all other impacts within the study, reflecting a conviction that environmental impact statements should explicitly highlight tradeoffs between environmental and economic interests. Social impacts are considered in the broadest interpretation of environment, whereby effects upon human resources are as pertinent to project evaluation as effects

upon physical resources.

The studies made as a part of this appendix report have received administrative support from several groups at the University of Iowa and Iowa State University. This research was conducted at the University of Iowa by the Institute of Urban and Regional Research, with the assistance of the Institute of Hydraulic Research, and the Department of Civil Engineering and Economics. Assistance of Iowa State University -- the Iowa State Water Resources Research Institute, the Engineering Research Institute, College of Engineering, and the Office of the Vice-President for Research -- is gratefully acknowledged.

Part III of Appendix 2 -- Public Response to Planned Environmental Changes -- was conducted by the Department of Sociology, Iowa State University. Part III was funded in part by a grant from the U. S. Department of Interior, Office of Water Resources Research, under Public Law 88-379, and made available through the Iowa State Water Resources Research Institute as Project B-020-1A. Funding also was provided by the Iowa Agricultural Experiment Station, by the Graduate College at Iowa State University, and by the U.S. Army Corps of Engineers under a contract to Iowa State University (Contract DACW25-72-0033).

Dr. F. E. Horton directed the research until July 15, 1972, when he became Dean for Advanced Studies. Subsequently, Dr. Kenneth J. Dueker became Director of the Institute of Urban and Regional Research and supervised these research activities. Dr. Joseph S. Drake, Assistant Professor of Urban

and Regional Planning, conducted the research activities in Part 1, Economic Impacts, and Dr. John F. Hultquist conducted the research in Part 11, Social Impacts, with assistance of the Iowa State Statistical Laboratory. The following students participated in the study as research assistants: Michael Hailperin, Alan Holst, John Johnson, James Malloy, John Milligan and Lane Palmer.

The District Engineer, Rock Island District, Corps of Engineers appointed the following staff personnel as a coordinating team for the review study: Robert Hurlbutt, Contract Administrator; Don Johnson, Resources Management; Dave Haumersen, Resources Management; Sam Doak, General Engineering; and Ray Stearns, Planning and Reports (and Economics). These individuals provided additional project data on request and coordinated in several meetings for discussion of criteria and methods of analysis. At Iowa State, Dr. Gordon L. Bultena and Dr. David L. Rogers coordinated the sociology studies. Dr. John F. Timmons and Mr. Herbert Schellenberg assisted in reviewing the economic analyses and related environmental impact study, in cooperation with Dr. Dueker of the University of Iowa study group and Dr. Daniel Bromley, economics consultant for the project.

PART I

ECONOMIC CONSIDERATIONS

AMES RESERVOIR ENVIRONMENTAL STUDY

Appendix 2. Economic and Social Impact

Part 1 -- Economic Considerations

Chapter 1

THE STUDY CONTEXT

Contribution to the
Ames Reservoir Environmental Resources Review Study

Sponsored by
US Army Corps of Engineers Contract DACW25-72-0033

by

Joseph S. Drake

1973

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Given the somewhat bewildering complexity of the entire Review Study, it is essential to establish at the outset certain key perspectives toward the overall impact analysis and toward the proper role of economic analysis therein. To provide these perspectives, the first three chapters of Part I describe the overall study context and the role of project objectives, the state-of-the-art and emerging directives in water-resources development, and comprehensive taxonomical paradigms for organizing the impact analysis, respectively. Given these perspectives, the remaining chapters of Part I focus more specifically on economic considerations.

This first chapter, which describes the study context, addresses two basic matters: the institutional setting for the study and the role of project objectives therein. Delineation of the institutional setting includes a brief review of key issues pertaining to environmental impact statements and related implications to the scope of this study. That discussion particularly asserts the proper role of economic analysis in environmental impact statements, and defines the organization of remaining chapters (and interfaces with Appendix 6) in terms of three fundamental elements of project evaluation methodology.

The role and scope of project objectives for this study are then defined in reference to classical and emerging motives for government intervention. The relevance of such objectives to water-resources

projects generally and to the Skunk River situation specifically is discussed and, in view of certain arbitrary interpretations thereof, is deemphasized in favor of a broader charge to conduct comprehensive impact analysis which transcends excessive preoccupation with such objectives.

The Institutional Setting

Environmental Impact Statements: Criticisms and Rejoinders

Since the National Environmental Protection Act of 1969 was passed, the environmental impact statements which have been prepared in response to section 102(2) of that legislation have come under rather harsh criticism. One of the most paramount criticisms is that such statements generally give a very unbalanced analysis to alternatives. The project alternative which an agency advocates in the first place, which indeed triggers the very need for an environmental impact document, typically receives the overwhelming attention of such statements. Thus environmental impact statements, by and large, are preoccupied with the analysis of environmental impacts of that one advocated alternative.

Quite apart from other criticisms of such impact analysis per se, this preoccupation goes against the explicit stipulations of section 102(2) for the identification and analysis of various alternatives to the advocated project. Moreover, if such alternatives are to be taken seriously then they too demand an analysis of environmental impacts on the same order,

perhaps, as that given to the advocated alternative. Although such criticism usually seems unappreciative of agency budget constraints which preclude elaborate, comprehensive and balanced analysis of many alternatives, it nevertheless calls to question the vulnerability of the EIS to becoming a token matter of procedure in implementing an advocated alternative. Clearly, the possibility of such criticism has affected the scope of this study of the proposed Ames Reservoir, in the sense that alternatives to the originally advocated project have been given substantial attention in terms of environmental impact analysis.

Yet another criticism of environmental impact statements is that they address too parochial an interpretation of "environmental." Those statements typically restrict themselves to a project's potential impacts relating to physical resources only. Again, such criticism usually fails to acknowledge the eminent logic of giving physical impacts the brunt of attention; after all, the pressures which led to passage of the Act were similarly preoccupied. Nevertheless it is appropriate to give attention to impact upon human resources as well, thereby broadening the interpretation of "environmental" to its fuller meaning to society. This study of the Ames Reservoir has responded to this point as well, and Parts II and III of this appendix are concerned exclusively with these social impacts.

This part (Part I) of the appendix is concerned with economic impacts; yet, again, most environmental impact statements tacitly avoid any substantive analysis of economic considerations. Instead, the economic aspects of an advocated project are left to prior documentation with the implicit

assumption that economic-environmental evaluations can be made under such piecemeal provision of impact data.

The Proper Role of Economic Analysis in Environmental Impact Statements

One reason for incorporating economic analysis into this study of the Ames Reservoir is largely circumstantial. Since the Design Memorandum and supplementary documents have been prepared, various parameters that were used in the Corps' economic analysis have changed in value. To its credit, the Corps has perceived the need for updating those parameter values and, more importantly, the need to integrate these economic reconsiderations into the entire Environmental Resources Review. In itself, this provision represents a significant facilitation of economic-environmental evaluation for the reservoir configuration which the Corps has advocated.

Of even greater significance, a second reason for incorporating economic analysis into this study follows directly from the aforementioned commitment to give substantive attention to alternative configurations. The ultimate spirit of NEPA's provisions for environmental impact statements, broadly interpreted, demands explicit identification of economic-environmental tradeoffs which are elicited by various project alternatives (Jaffe and Tribe, 1971, p. 672):

> The 102 statement may be the only instrument for public evaluation of any trade-off between probable environmental costs and other public benefits.

Frankly, pre-NEPA planning processes and post-NEPA modifications to such processes have failed to dwell on this clarification of tradeoffs. Given

recent trends toward more participatory, less "insulated" planning, the explicit identification of tradeoffs is emerging as perhaps the most overriding function of technical project planning. Accordingly, this study makes a particular point of incorporating not only the (updated) economic analysis of the originally advocated reservoir configuration, nor only the analysis of environmental impacts for alternative configurations, but also the economic analysis of those alternatives.

Fundamental Elements of Project Evaluation Methodology

The entire problem of project and inter-project evaluation, given the specification of alternative project configurations, includes three distinct elements:

(i) identification of relevant impacts;

(ii) measurement of the likely intensities of those impacts for each alternative; and

(iii) valuation of those (usually incommensurate) impacts.

The first element essentially defines those evaluation criteria which are relevant to inter-project comparisons in any particular context and, for problems of any complexity, must include deliberate taxonomical design for organizational purposes. These considerations eventually lead to the definition of specific operational measures which, within prevailing data constraints, shall be applied to each alternative through appropriate

technical analysis. As such, this identification of relevant impacts stands independent of the alternatives that might be fashioned; it constitutes a template by which all alternatives should be analyzed.

The second element, which calls for specific (quantitative or other) measurement of these impacts, clearly is alternative-specific. Different project configurations will have different values for these various impact measures and, indeed, should be deliberately fashioned to elicit substantial variation in those values. Through such a methodology, inherent phenomenological tradeoffs can be rendered explicit. For example, in the case of the Ames Reservoir, this study has chosen to fashion and analyze alternatives which favor the flood-control purpose, the recreation purpose, and considerations of maximum environmental protection, respectively. Some of these criteria can be pursued only at the expense of others; hence the need for clarifying tradeoffs, by virtue of a meaningful and balanced study of distinct alternatives.

The third element, in one form or another, seeks to integrate all impact information on all alternatives into a ranking of preferences for each alternative. Classically, the planning methodology employed in water-resources development and various other governmental functions has reduced a project's vector of impact information to a single, scalar figure-of-merit. Benefit-cost calculations (be they in ratio or differential form) have been promulgated and institutionalized for this purpose, on the assumption that all relevant impacts are economic in character and therefore may be "weighted" by reference to market or near-market pricing mechanisms. However, as more and more attention is being directed to non-economic impacts,

this assumption inevitably is becoming less applicable; hence the valuation (or "weighting") element must interpret the economist's theory of choice more broadly. In effect, while sensitively-applied benefit-cost calculations still have their place, the problem of ranking alternatives in the context of incommensurate impacts is no longer amenable to such a technical solution. The appropriate "weights" for various impacts is moreso becoming a matter for resolution through the broader political process, especially in light of emerging pressures for greater citizen participation.

Organization of Part I

While these observations set the tenor for the technical analysis reported in subsequent chapters, they also permit a clear definition of the interface between Part I of this appendix and the considerations of project evaluation in Appendix 6. Specifically, the economic considerations reported throughout this appendix dwell largely on the first element of project evaluation methodology, i.e., the identification (and classification) of relevant impacts. Application of these concepts to particular alternatives regarding the Ames Reservoir, in terms of specific impact values for each alternative and ultimate determination of preferential ranking, generally is reserved for the discussion in Appendix 6.*

As suggested above, the emergence of non-economic criteria to a highly relevant role does not preclude the utilization of benefit-cost calculations. Such traditional measures of aggregate economic efficiency

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*This organizational arrangement applies to all direct, purposeful project benefits. Indirect economic impacts (chapter 5) and social impacts (Part II) are considered for specific alternatives within this appendix.

still hold the advantage, by reference to legitimate pricing mechanisms, of collapsing information on economic impacts into a scalar figure-of-merit for that particular class of impacts. Moreover, whether economic or not, any transitive (i.e., logically consistent) vector of relative "weights" for those impacts must stand independent of particular alternatives; i.e., the same weights -- be they explicit or implicit, objective or subjective, technical or political -- must be applied to each alternative. Therefore, to the extent that technical determination of parameters for economic valuation remains as legitimate as ever, this appendix also focuses on the determination of those parameter values in the specific context of the Ames Reservoir.

To wit, this Part I on Economic Considerations is organized as follows. Chapter 2 reviews the state-of-the-art and emerging directives pertaining to project evaluation methodology in water-resources development. Chapter 3 addresses the matter of identifying relevant impacts, with particular attention given to alternative taxonomical schemes for classifying those effects. Chapter 4 reports the particular parameter values adopted in the study vis-à-vis direct economic impacts, and documents the technical rationales underlying those determinations. Chapter 5 documents the analysis of indirect economic impacts, and chapter 6 summarizes Part I.

The remainder of this chapter purports to cast more definitive perspective on the general problem of impact analysis, by articulating

the apparent objectives of the Ames Reservoir in the broader context of multi-objective planning. The role of economic efficiency versus various other motives for public projects is clarified, thereby setting the scope and foundation for subsequent deliberations throughout the remaining chapters.

Project Objectives

In broadest perspective, public projects may have any of various objectives which reflect distinct types of underlying motives. As a universal precept in a capitalistic/democratic political economy, all of these underlying motives reflect divergences -- be they extant or incipient -- between prevailing social values and the values evidenced by the system of private exchange. Due to technological constraints, imperfect perceptions, unwillingness to seek voluntary compensations, and patterns of power distribution, that system of private exchange produces results which may be incongruent with social values. Accordingly, government is prompted to intervene through a variety of instruments (e.g., investment, regulation, promotion, fiscal controls, research and planning) where such divergences are judged to be intolerable.

Classical Motives for Public Enterprise

Although a review of the justifications for government intervention is hardly appropriate to this document, at least a cursory account of distinct interventional motives is necessary to establish proper perspective toward

this entire study. Four classic motives are the following (McKean, 1968):

(i) reallocation of resources;

(ii) redistribution of wealth;

(iii) preservation of individual liberty; and

(iv) maintenance of economic and social stability.

The resource-reallocation motive reflects technological conditions of production (e.g., excess capital thresholds and decreasing-cost structures) and/or the prevalence of externalities which preclude the private sector's provision of output levels consistent with the marginal conditions of the perfectly competitive model. The wealth-distribution motive reflects conditions of inequity among various groups of society; interpreted in terms of geographical incidence, this motive often is labeled as "regional development" (especially in water-resources development contexts). For the purposes of this discussion, the latter two motives are self-explanatory.

In water-resources development as with many other functions of public enterprise, the traditional motive for projects has been the desire for more efficient resource allocation (i.e., the pursuit of economic efficiency or maximization of national income) with the desire for regional redistribution prevailing in some instances. Granted, it may be argued that the entire process of project evaluation -- from initial identification to ultimate Congressional authorization and appropriation -- consciously seeks some notion of equitable geographic distribution. In discussing the reasons for

appropriation of funds for the Glen Elder Dam project, Senator Proxmire observed (Haveman, 1965, p. vii):

> One (reason) is the artificial yardstick used in measuring the cost of public works projects in relationship to their benefits. But perhaps more important is the 'you scratch my back, I'll scratch yours' type of political logrolling which is so much a part of the legislative process, whether local or national.

However, the intrinsic reason for the totality of government involvement in water-resource development is indeed the resource-reallocation motive above all, given the capital-intensive character of most technological solutions and the frequently "collective" nature of related benefits.

Emerging Motives

In recent years, cause has emerged to distinguish three additional motives for public enterprise, two dealing further with substance and the other with the style of such intervention. Though technically a concern for externalities and therefore an element of the resource-reallocation motive, the securement of environmental quality has become a motive, and objective, in its own right. In this context it is interesting to note that Senate Document No. 97, as early as 1962, recognized this objective as germane to water-resources development by stipulating that "full consideration shall be given to each of the following objectives and reasoned choices made between them when they conflict" (Water Resources Council, 1962):

(i) National economic development, and development of each region within the country...

(ii) proper stewardship in the long-term interest of the Nation's natural bounty...

(iii) well-being of all the people...

While the responsiveness of water-resources planning to this charge during the 1960's may be seriously questioned, the National Environmental Protection Act of 1969 for all practical purposes has distinguished the securement of environmental quality as a paramount constraint (where standards of environmental quality have been advanced, at least) if not an integral objective of public-works planning generally.

A second motive which, like environmental concerns, was cited in Senate Document No. 97 and reaffirmed in recent years, is "social well-being of people." This concern was recently articulated by the Federal Water Resources Council (WRC, 1969). As the Council itself indicated, however, much of the purpose underlying this declaration was merely an amplification of the "regional development" objective to consider the incidence of distributional patterns upon people of varying socioeconomic circumstances instead of geographic areas alone. Hence it stands redundant to the wealth-redistribution motive discussed earlier and to a broadly interpreted motive for environmental quality (i.e., including human as well as physical resources).

The third motive which has emerged recently, and which pertains more so to the style rather than the substance of public-works planning, is the desire for citizen participation. Understandably, the responses of agencies to the mutually reinforcing pressures for environmental sensitivity and citizen participation have construed participatory processes as an intermediate procedural matter in the broader pursuit of economic efficiency. However, amidst the allegations of "tokenism" which this behavior has triggered, there is growing expression among planners that meaningful citizen participation be reinterpreted as an objective in its own right.

Project Objectives for the Ames Reservoir Study

If these recent events are to be given due consideration, then the relevant objectives in contemporary water-resources planning generally would include the following:

(i) optimal resource allocation (national income)

(ii) equitable wealth distribution (by region and by personal socioeconomic status)

(iii) securement of environmental quality (including physical and human resources)

(iv) effective citizen participation.

The first objective embraces all of the purposeful benefits of a project (e.g., flood control, irrigation, water supply, hydroelectric power, recreation) as conventionally interpreted in economic terms, and stands

as a nearly universal motive in water-resources development. The second objective, traditionally interpreted in geographic terms, has been exercised relatively infrequently; indeed, recently published recommendations of the Water Resources Council stipulate that agencies shall not be permitted to declare the regional development objective without prior Congressional approval (WRC, 1970). The third objective has gained paramount concern by virtue of the National Environmental Protection Act of 1969, but lacks clear interpretation regarding the role of "spillover" environmental impacts versus the traditional beneficial uses of projects for enhancement of water quality and of fish and wildlife propagation (see below). The fourth objective lacks general recognition in any formal sense; its declaration here merely anticipates emerging pressures for a particular style of planning.

The environmental quality objective, taken in the context of NEPA requirements for environmental impact statements, has triggered rather ambiguous interpretations. The ambiguity stems from confusion between certain purposeful aims of various projects which pursue environmental quality, and consideration of environmental impacts which are more of a "side effect" of public projects. For example, prior to the recent popularization of articulating environmental quality as an explicit element of multi-objective planning, water-quality benefits of reservoir low-flow augmentation have been construed as a consideration within the national income objective; economic values have been inferred, e.g., in reference to alternative

costs for comparable effluent treatment. Meanwhile, other disciplines of public planning which are not so concerned with the economic development of natural resources show some signs of interpreting an environmental quality objective in terms of minimizing the negative environmental externalities of a proposed project. It is especially unclear in water-resources planning whether this objective embraces purposeful environmental enhancement, concomitant environmental degradation, or both.

The position adopted in this study finds little value in propagating such pedantry. Rather, the overriding concern is to ensure consideration of all relevant impacts of proposed projects, whether those impacts are intended or concomitant in nature. If interpreted judiciously and without excessive preoccupation over "intended" effects, the definition of broad objectives can be a useful aid in organizing a comprehensive impact analysis:

> ...water resource evaluation reports should be prepared using certain goals as indications of the kinds of effects of water projects which should be illuminated and displayed. Water planners should do their best to catalog the effects of proposed projects in the areas represented by these goals. However, these goals should not be construed as initial planning objectives in the sense that such objectives express the specific things which the proposed projects are intended to accomplish. Rather, they should be construed as a broad categorization of the system of accounts and informational displays within which the various effects of a

project are to be investigated and described in order that the more specific project objectives may be evaluated at the field level and elsewhere for their consistency with many other kinds of public and private interests. All of this has the purpose of helping different people formulate their own opinions and objectives so that they may instruct their political representatives accordingly.

Given this, the crucial element in comprehensive multi-objective planning is the generation and elucidation of the many kinds of impacts which attend specific water resource projects. Only then can those who stand to be affected by alternative plans react intelligently. (Bromley, et. al., 1971, p. 11)*

In this spirit the Ames Reservoir Review Study views national economic development and securement of environmental quality as the two paramount objectives underlying all aspects of project evaluation in this context. The national income objective is interpreted in traditional terms to include all potential "beneficial uses" (and related costs) of the proposed reservoir or various alternatives, including flood control, recreation, water supply, water quality, and fish and wildlife enhancement.** Securement of environmental quality, broadly interpreted,

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*The paper cited here interprets the objectives identified in recent water-resources literature as "goals," arguing that "objectives" should have greater specificity. The point, however, remains independent of nomenclature.

**"Water quality" here refers to downstream benefits provided by reservoir storage and eventual low-flow augmentation. Other considerations of water quality, such as the equilibrium quality within the reservoir itself, are considered as environmental impacts (see chapter 3).

The water-supply purpose was included in the basis for initial reservoir authorization, but was withdrawn in later studies. This purpose is introduced for reevaluation in this study.

is viewed here as a companion (though inherently conflicting) objective to the national income concern; it embraces all other effects upon the physical and human resources in the study area. By all interpretive precedents, declaration of the "regional development" objective for this study is not warranted; however, the distributional incidence of economic and environmental impacts should be noted wherever possible. The matter of effective citizen participation, finally, will not be treated here as a formal planning objective; however, its underlying implications to the eventual process of environmental (and economic) impact review will be given deliberate consideration in Appendix 6.

The two objectives of national income and environmental quality are declared here without strict adherence to formal theoretical structures which are often discussed in defining objectives. For example, such formal structures distinguish between two basic forms for expressing objectives, namely, as "criteria" or as "standards." Criteria refer to intended effects which are to be maximized or minimized, whereas standards specify constraints which particular effects shall not exceed or fall short of. There is some appeal to this author, at least, in interpreting the objectives for this study as a matter of maximizing national income subject to environmental impact constraints. However, such a formulation is moot since standards for many of the environmental impacts encountered in this project are undefined at this writing. Hence the two-dimensional definition of project

objectives for this study is advanced mainly to give basic structure to the identification, classification, and analysis of all relevant impacts.

As a brief postscript, it might be noted that the comparatively "loose" concern for defining project objectives in this study is reinforced by prevailing institutional constraints which preclude global optimization in terms of such generalized objectives:

> In addition, it does not seem necessary or even possible for a water resource agency to formulate an environmental quality plan, or a plan for achieving regional development, or a plan for maximizing personal well-being, or even a plan for achieving national economic development. Given the limited range of constituencies, the professional specialization, and the narrowly-defined missions of such agencies, it is scarcely possible that they could do so. It seems only realistic to suggest that water agencies prepare plans to solve the kinds of problems which they are politically, legislatively and technically equipped to solve and that the evaluation process reveal the additional effects which such plans in combination with other programs might be expected to produce in other areas of concern. Organizations responsible for economic development, environmental resource management, and other types of planning can then use such information to determine how consistent and complementary the proposed water resource developments are with the plans which they prepare. Inconsistencies can be identified and remedied through adjustments in the plans of the several organizations; for instance, this might be accomplished through the Water Resources Council, the Office of Management and Budget, or through regional development commissions. (Bromley, et. al., 1971, p. 10)

Our view does not reject these notions of objectives, but recognizes value in their definition only insofar as they may facilitate rather than hinder the identification of all relevant impacts, whether intended or concomitant.

Summary

To summarize, this study engages in a comprehensive impact analysis of the proposed Ames Reservoir and various alternatives. In reference to the emerging professional vernacular, this engagement may be interpreted as a multi-objective approach wherein the objectives of national economic development and environmental quality (including physical and human resources) are considered integrally. However, the study views such definition of project objectives with some caution, since a preoccupation therewith might inhibit examination of important "unintended externalities."

In response to growing criticisms of environmental impact statements, the study purports to implement this approach in a manner which -- by giving balanced technical analysis to a range of judiciously fashioned alternatives -- will facilitate the explicit identification of tradeoffs between economic and environmental impacts. Moreover, given the incommensurate nature of those impacts, the need to account for the distributional incidence of those impacts, and the obvious pressures for manageable citizen involvement, the study also offers suggestive procedures for translating such tradeoff information into an appropriate forum for public participation (see Appendix 6). However, the crucial element in this entire approach is

the identification, classification, and analysis of the many impacts which might be realized from the proposed reservoir or various alternatives.

Given the following chapter's delineation of the state-of-the-art and emerging methodological context of project evaluation, chapter 3 then addresses this "crucial element" by developing appropriate taxonomical constructs for comprehensive impact analysis. Chapters 4 and 5 then proceed with specific methodological considerations for the analysis/valuation of direct and indirect economic effects, respectively. Finally, chapter 6 summarizes Part I.

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AMES RESERVOIR ENVIRONMENTAL STUDY

Appendix 2. Economic and Social Impact

Part 1 -- Economic Considerations

Chapter 2

EVALUATION OF WATER RESOURCES DEVELOPMENT PROJECTS: THE STATE-OF-THE-ART AND EMERGING DIRECTIVES

Contribution to the
Ames Reservoir Environmental Resources Review Study

Sponsored by
US Army Corps of Engineers Contract DACW25-72-0033

by

Daniel Bromley

1973

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Chapter 2

EVALUATION OF WATER RESOURCES DEVELOPMENT PROJECTS: THE STATE-OF-THE-ART AND EMERGING DIRECTIVES

Daniel Bromley

It is the intent of this chapter to trace, very briefly, the historical development of the literature on the economic evaluation of water resource projects, to discuss where that literature stands at this time, and to detail some interpretations on how the process might be improved. This chapter is organized into three sections corresponding to the above three objectives.

A Historical Perspective

The Flood Control Act of 1936 was the first serious effort to introduce systematic evaluation into the process of considering water resource investments. Up until that time, their justification had been largely a matter of casual judgment on the part of agency planners. The act declared that henceforth projects would be considered justified only if: "...the benefits to whomsoever they may accrue are in excess of the estimated costs." As with most legislation, the intent here was to establish some general guidelines that would be given specificity by the executive branch agencies. The several agencies involved in the water development field -- at that time the Corps of Engineers and the Bureau of Reclamation -- proceeded to interpret this charge to suit their specific program. By 1950, there were demands for uniformity across agencies and an interagency committee was appointed to accomplish this. Its report --

entitled Proposed Practices for Economic Analysis of River Basin Projects--dubbed the "Green Book" for the color of its cover, called for the identification of beneficial or adverse effects of water resource projects in monetary (tangible) and nonmonetary (intangible) terms. However, the Office of Management and Budget (formerly the Bureau of the Budget) considered the tangible project effects to be the most worthy, and insisted that a benefit-cost ratio in excess of unity be a necessary condition for project justification. Although regional development was clearly the objective of the Reclamation Program of 1902, and the Tennessee Valley Act of 1933, it became a subordinate rationale for public water resource investment. The Federal Inter-Agency Committee never adopted the report of its Subcommittee on Benefits and Costs, nor did any of its successor committees. However, the report prompted the Bureau of the Budget to issue its own "rebuttal"--Budget Circular A-47. This document insisted that benefits and costs for each project purpose were to be specified as accurately as possible, and where they could not be articulated in monetary terms, their relative significance was to be indicated in as precise quantitative terms as possible.

As a result of this interchange between the two branches of the federal government, and because of the benefit-cost ratio issue, dissatisfaction arose within the legislative branch, and apparently reached a peak about 1956 when concern was expressed for liberalizing the criteria in several ways--mainly by lengthening the period of project life (from

50 to 100 years), recognizing secondary benefits, and computing benefits for fish and wildlife enhacement. Finally, in May of 1962, Senate Document 97 replaced Budget Circular A-47 as the "accepted guide." The Document was really an interdepartmental agreement approved by President Kennedy, but it was never officially approved by the Congress. However, Senator Clinton Anderson--Chairman of the Senate Committee on Interior and Insular Affairs--managed to get it published as a Senate Document. This explains the belief by some that it is of legislative origin.

According to the Document, there were to be three objectives for the planning and evaluation of water resource projects: (1) national economic development; (2) environmental preservation; and (3) social well-being. When there was conflict between two of them, "reasoned choice" was to prevail. However, in contrast to Budget Circular A-47, there was no requirement that a benefit-cost ratio for the tangible (monetary) aspects exceed unity. But, neither did it preclude the Bureau of the Budget from adopting such a criterion as an administrative standard.

Project Evaluation Today

Since the summer of 1969, the issue of proper planning and evaluation for water resource projects has been the center of considerable agency and academic discussion. It was at this time that a report of a special task force of the Water Resources Council--a report prompted by Presidential pressure for a higher discount rate for federal projects, and Congressional

reaction to this demand by insisting on more "expansive" evaluation criteria--was published. Following the lead taken by Senate Document 97, this report, entitled Procedures for Evaluation of Water and Related Land Resource Projects, proposed that there be four "objectives" to guide the planning and evaluation process. These four were: (1) national economic development; (2) regional development; (3) environmental quality; and (4) social well-being. Each "objective" was, in actuality, an "account" where beneficial and adverse effects were to be tallied. The accounts were said to be nonmutually exclusive, yet for a project to be justified it was necessary for the beneficial effects to each objective to exceed--or at least equal--the adverse effects to each objective. The Task Force Report was given considerable publicity and reaction to it was sought from the public, as well as from academics involved in traditional benefit-cost research. The reaction was very mixed. Some of the formal comments made in response to this initial report have been published by the Water Resources Council as: A Summary Analysis of Nineteen Tests of Proposed Evaluation Procedures on Selected Water and Land Resource Projects (Water Resources Council, 1970). Approximately $2\frac{1}{2}$ years after the Task Force Report was made public, the Water Resources Council published--in the Federal Register--its Proposed Principles and Standards for Planning Water and Related Land Resources (Water Resources Council, 1971). Perhaps the most significant change from the earlier document was the dropping of the "social well-being" objective, although the later document also did a much better job of defining

a set of regions for project evaluation so that regional effects that are beneficial do not become confused with beneficial effects for the nation as a whole. Additionally, agencies are not permitted to "use" the regional development objective without prior approval by the Congress. Thus, what the Council is left with--reportedly at the insistence of the Office of Management and Budget--is really a "two-account" format instead of the "four-account" approach initially proposed by its Special Task Force.

The guidelines now proposed in the Principles and Standards assert that the paramount task of the water resource planner is to formulate courses of action that effectively contribute to the multiobjectives--national economic development, and environmental quality. Additionally, the nonmutually exclusive nature of the accounts is preserved, as is the requirement that the beneficial aspects of each account equal or exceed the adverse effects of each account for a project to be considered justified. Finally, while the Council admits that a discount rate of 10 percent would closely approximate the current opportunity cost capital, it is argued that the political process has given tacit approval to a subsidy for water resource projects, and one way to implement this mandate--thought it admittedly biases projects towards capital intensity-- is to use a lower rate for discounting future benefits and costs. The preferred rate is 7 percent.

The fate of the Proposed Principles and Standards is uncertain at this time, so it is impossible to say when or if the suggested changes will ever become adopted--formally or otherwise. But the tenor of the

proposed changes is troublesome to some who have been involved in the development of planning and evaluation guidelines and those aspects will be discussed below. Before turning to that, however, it is necessary to briefly discuss another significant factor in the evaluation and planning of future water resource developments--the recently-released recommendations of the National Water Commission. The Commission was established by legislative act which was signed into law on September 26, 1968. In Section 3(a) of the Act is stated that:

> The Commission shall (1) review present and anticipated national water resource problems, making such projections of water requirements as may be necessary and identifying alternative ways of meeting these requirements--giving consideration, among other things, to conservation and more efficient use of existing supplies, increased usability by reduction of pollution, innovations to encourage the highest economic use of water, interbasin transfers, and technological advances including, but not limited to, desalting, weather modification, and waste water purification and reuse; (2) consider economic and social consequences of water resource development, including, for example, the impact of water resource development on regional economic growth, on institutional arrangements, and on esthetic values affecting the quality of life of the American people; and (3) advise on such specific water resource matters as may be referred to it by the President and the Water Resources Council (National Water Commission, 1969, p. 2).

The Commission released drafts of its final report early in the Fall of 1972, and the Water Resources Council has recently published a compendium of the 290 recommendations in the proposed report of the Commission (Water Resources Council, 1972). In this list of Commission recommendations, the ones of most direct relevance to the Ames Reservoir Project have been selected and reproduced here. The number in parentheses at the right corresponds

to the number assigned by the Water Resources Council in their compendium.

1. That the people of the United States treat their flood plain lands as an especially important resource that should be so managed that it makes the maximum possible contribution to national welfare, keeping in mind (a) that the material wealth of a nation is not enhanced by development of any tract of land subject to flood overflow unless the net value of the resulting production exceeds the costs of development, plus the flood losses (or the cost of preventing such losses) and (b) that any nonmaterial values sacrificed through development must also be counted as a cost. (40)

2. That in formulating plans for flood loss reduction full and equitable consideration be given to all practicable alternative measures for achieving that goal, with a view to finding the "best" combination of such measures, and that the evaluation principles recommended in Chapter 10 of this report be utilized to determine that combination. (41)

3. That the present trend toward greater use of flood plain regulation as a means of reducing future flood damages, or of reducing future costs for protective measures, be given full support by the Federal Government through the strengthening of the programs by which it assists and encourages the States and local governmental entities to achieve wise use of flood plain lands; more specifically by:

   (a) The enactment of legislation authorizing the Water Resources Council to make Federal grants to the States to be used for mapping flood plains, determining flood hazards, making flood plain management plans, establishing State standards for flood plain regulation activities, and assisting local governmental entities in carrying out flood plain management programs; these grants not to exceed 50 percent of the amount expended by the States for such purposes. (42)

   (b) Amending Section 206 of the Flood Control Act of 1960 to require that reports prepared thereunder provide, in addition to flood hazard information, (1) a comparison of the cost of creating values

by further development of the flood plain lands with the cost of creating these same values by available alternative measures (such as development of nearby uplands), and (2) a delineation of those flood plain areas that could be of greater value to the Nation if used for open spaces (such as city parks). (43)

(c) Removing present legislative limitations upon the amounts that can be appropriated for flood plain management studies in any one year. (44)

(d) Increasing the funds available for carrying out the cooperative flood plain mapping program of the U.S. Geological Survey, the National Oceanic and Atmospheric Administration, and the Corps of Engineers. (45)

4. That the flood forecasting program of the Federal Government be substantially strengthened by organizational changes and more adequate funding, and that communities subject to flash floods install automatic warning devices. (50)

5. That hereafter no Federal funds be made available for the construction of any engineering work to provide flood protection, whether it is to be constructed as a Federal project or by a non-Federal entity with Federal assistance unless:

(a) The share of the cost to be borne by non-Federal interests is in accord with the benefits-received principle of cost sharing advocated in Chapter 14 of this report. (53)

(b) The Federal agency proposing the work, or a Federal contribution thereto, has demonstrated, by an evaluation in consonance with the principles recommended in Chapter 10 of this Report, that the sum of all beneficial effects would exceed the sum of all costs, with due consideration being given both economic and noneconomic benefits and costs. (54)

(c) The State, or a responsible local governmental entity, agrees to regulate the use of flood plain lands to the extent necessary to ensure against any further developments that would, (1) make necessary the installation of additional protective works or (2) (55)

be subject to substantial damage in the event of a flood exceeding the magnitude of the design flood.

6. That there be developed, and enacted into law, a national policy clearly delineating the role to be played by the Federal Government in the provision of water for municipal and industrial use, and that this policy provide:

(a) That the primary responsibility for the provision of municipal and industrial water supplies shall remain with non-Federal public entities and private enterprise. (57)

(b) That any programs through which subsidies may be made available to non-Federal public entities to assist them in meeting needs for municipal water supplies shall be so administered that the amount of subsidy provided any applicant is the minimum necessary to enable it to meet a real and important need, the cost of which would exceed the repayment ability of those benefited. (58)

(c) That no subsidy shall be made available for the provision of industrial water. (59)

(d) That agencies of the Executive Branch shall encourage cities and other non-Federal public entities to operate their water systems on a utility basis, the revenues of which are sufficient to cover all costs. (60)

7. Water supply projects should not be authorized by the Congress until evaluations are made with respect to the efficiency of use of presently developed supplies in proposed project areas, and until a report is made on the prospects and desirability of satisfying existing shortages in any particular area by water-savings practices in lieu of further project development. (166)

8. Insofar as administratively feasible, the users of project services should bear appropriate shares of development and operating costs through systems of pricing or beneficiary charges (e.g., special assessments, taxes, fees, etc.). These project services include municipal, industrial, and irrigation water supplies, hydroelectric power, navigation, wastewater collection and treatment, protection from floods and other hazards, and various types of outdoor recreation.

The Commission's principles on cost-sharing with respect to specific project services are as follows:

(a) Municipal Water Supply - The Commission supports the continuing trend toward the establishment of water supply and waste treatment financing on a self-supporting utility basis using pricing and beneficiary charges. Costs of Federal reservoir capacity for municipal and industrial water supply should be completely recovered, with interest at prevailing rates at the time of construction. A period of deferred payment, with interest, should be provided when storage capacity is unutilized up to ten years. (266)

(b) Water-Based Recreation - User charges should be assessed against all identifiable recreation users of Federal water projects where revenues can be expected to exceed significantly the costs of collection. The goal should be to recover operation, maintenance and replacement costs of recreation facilities. Recreation user charge revenues should be made available to the Federal management agency to cover operation and maintenance costs. Expenditure of such funds should be subject to the customary executive and congressional budget review. (270)

(c) Municipal Waste Collection and Treatment - Municipal waste collection and treatment should be supported on a utility basis through user charges. However, the Commission believes that the massive investment programs now required to catch up with generations of waste treatment neglect cannot realistically be financed entirely from user charges. Federal financial grants, restricted to waste treatment plants and interceptor sewers, will be necessary for ten years to catch up with the backlog of needed construction. During this interim period of Federal financial subsidy, the present policy requiring industrial users to pay construction costs and operation and maintenance costs proportional to their contribution to the waste loads generated should be strictly enforced. (271)

(d) Flood Control, Drainage and Shoreline Protection - Present Federal cost-sharing policies have encouraged unwise development of flood plains and coastal areas. Large Federal cost shares for flood control, drainage (272)

and shoreline protection projects have encouraged unwise economic developments in areas prone to periodic flooding and hurricane hazards. Large windfall gains have accrued to land owners, and valuable open space and wetland areas have been destroyed. Beneficiary charges should provide full repayment of the costs of protecting lands through Federal and federally assisted flood control, drainage and shoreline protection projects. Repayment arrangements should involve state governments because of their critical role in determining proper land use. Where practicable, flood control, drainage or shoreline protection districts should be used as a means of financing repayment through assessments upon lands benefited by the projects.

9. Low flow augmentation has been an issue over the years because the beneficiaries are difficult to identify in a precise way and because release of stored water serves a number of purposes simultaneously. For example, low flow augmentation benefits water supply, costs of which should be fully reimbursed. It benefits navigation which should be paid for by user fees. (275) It enhances fish and wildlife which in many cases should be paid for by the states involved. It also provides esthetic benefits which are of substantial regional or national value but not easily quantified or assigned to specific beneficiaries. Where practical, costs for low flow augmentation should be allocated and paid for in accordance with distribution of benefits. Remaining unallocated costs should be assigned to water quality and shared between Federal and non-Federal entities in the same proportion as grants-in-aid for waste treatment facilities. The cost share proportions, however, should be adjusted periodically to reflect changes in the grant programs for waste treatment.

10. While water resources projects have had very significant impacts on regional economic development and population distribution in the past, their role has now greatly diminished. (5)

11. Under certain conditions, water development may be helpful as one of several ingredients necessary to encourage regional economic development and population growth. However, water developments differ widely in the extent of effects induced. (6) Congress, in making judgments as to whether water developments should be used to aid regional growth, should require evaluation of certain critical growth factors in order to enhance the effectiveness

of developments and reduce offsetting losses in other regions. These factors include: market demands, availability of substitutes for water services, competitive advantage of the region, and the potential for capitalizing on growth opportunities.

12. Federal water programs can be easily adjusted to support whatever population distribution policy the Nation adopts. However, water programs are not, in and of themselves, adequate to effectuate a national policy concerning where people will live. Water programs should continue to accommodate future population growth and economic well-being by responding to, rather than trying to influence, the pattern of population distribution. (7)

13. The National Water Commission recommends that recreation at Federal reservoirs should be elevated to a high priority program, not only in law and policy pronouncements, but also in coordinated planning, construction, operation, land acquisition, personnel, and funding. Construction agencies should be assigned and assume the additional role of effective recreation-resource management agencies. The possibility of multiple-purpose water development projects with recreation as the dominant purpose should be recognized. Allowable values for recreation benefits should be updated. Recreation needs should be considered as well as water needs in determining permissible drawdowns during peak recreation seasons. The Commission supports and endorses the recommendations of the Outdoor Recreation Resources Review Commission relating to Federal impoundments as still appropriate and recommends their full implementation by both executive and legislative branches of the Federal Government. Such recommendations would guarantee outdoor recreation full consideration in the planning, design, construction and operation of Federal, multipurpose water resource developments and provide for acquisition of adequate shoreline lands for public access and use. (76)

14. PL 89-72 should be amended to permit Federal assumption of the cost of constructing and operating recreational facilities, including roads, necessary to develop full recreational opportunities foreseeable under a 10-year program at existing reservoirs, those under construction, and those to be constructed in the future. Recreation admission and user fees should be charged wherever practicable and coordinated between agencies. In addition

to the criteria already enacted into law with respect to admission and recreation use fees, consideration should be given to: (a) fees charged for nearby comparable private facilities operated for comparable periods, and (b) that portion of O&M costs attributable to the specialized facility for which a user fee is assessed with the objective of having the fee equal the O&M cost for that particular facility. Where recreation admission and user fees do not offset full recreation operation and maintenance costs at Federal reservoirs, consideration should be given to making up the deficit by other alternatives such as excise taxes on water-related recreation equipment, or charging the other direct beneficiaries of Federal impoundments such as electric power or water consumers. (82)

15. Water for fish, wildlife, and esthetics cannot now be satisfactorily determined directly by economic evaluation. However, they can be indirectly valued by considering the economic values of uses in the hydrologic system with and without these uses. These "with and without" values should be determined so that informed judgments can be made on balancing of all uses within the hydrologic system. (4)

16. That the Congress enact legislation requiring non-Federal interests to assume an appropriate share of the cost of Federal waterway projects, and further that such legislation require: (a) that carriers using any Federal waterway be required to pay a user charge such that the total collections on all Federal waterways would be sufficient to cover Federal expenditures for operation and maintenance of the entire system; (b) that within the bounds of administrative practicability the user charges for individual waterways or classes of waterways, reflect differences in the cost of operating and maintaining them; (c) that the amounts collected increase progressively over a ten-year period at such a rate that by the end of that period they will be sufficient to recover annually the entire cost of operating and maintaining the Federal inland waterway system; and (d) that as a condition for Federal participation in any future waterway project a responsible non-Federal entity, or entities, be required to enter into an agreement to reimburse the Federal Treasury, over a specified period of years, in annual amounts sufficient to cover the entire construction cost, plus interest thereon, unless the Congress determines that a particular waterway will result in national defense benefits sufficient to justify assumption of a part of the cost by the Federal Government. (27)

17. There is adequate productive capacity in the Nation's agriculture to meet food and fiber demand under various alternative futures at least until the year 2000. There consequently is no need in the next 30 years for federally subsidized water resource development programs to increase the agricultural land base of the country. On the contrary, such measures as irrigation and drainage of new land, protection of existing and potential cropland from floods, and providing supplemental irrigation water for existing croplands have added to the excess productive capacity of agriculture and have thereby contributed to the high costs of crop support and land retirement programs. (30)

18. The adoption of the Commission's recommendations on cost-sharing (Chapter 14), which would require beneficiaries to repay the full costs of irrigation, drainage, and flood control projects, and the recommendations on project evaluation as a basis for decision making (Chapter 10C), which would require that consideration be given to both the positive and negative effects of proposed projects on all regions, would serve to limit public support for unnecessary projects. (31)

19. If the demand for such high-value, specialty crops as fruits, nuts, and vegetables should increase so as to require the use of additional land, the demand can be met by the private sector without Federal subsidy or by shifting land presently in use for production of low-value crops to production of high-value crops. (32)

20. Each water agency should each year formulate a five-year program including a continuation of existing projects and new construction projects for submission to the Office of Management and Budget. The President should formulate and recommend to the Congress five-year national budget allocations for the total Federal water program. In his budget recommendations to Congress, the President should emphasize regions as well as individual water projects and organizational accounts. (214)

21. As provided in the Water Resources Planning Act, the Water Resources Council (WRC) with the approval of the President should:

    (a) Direct Federal water resources planning agencies to adopt procedures and issue appropriate directives

and guidelines to field entities to provide opportunities for broad public participation in water planning activities from the inception of the planning process on. (201)

(b) Monitor public participation in interagency planning by reviewing the adequacy of provisions for public participation. (202)

22. As a prerequisite to project authorization, Congress should require Federal water resource agencies to report to it on public participation with respect to particular projects, showing compliance with agency public participation procedures, describing the questions considered and the viewpoints expressed, and providing supporting information for the decisions reached on controverted points. (203)

23. Water resources planning agencies should structure their planning procedures so as to proceed promptly to resolution of issues and to conclusions, either to develop or not, even though consensus is impossible, by scheduling the timing of public participation and defining the issues to be addressed. (204)

24. Water resources planning agencies should help compensate for the lack of resources of some participating publics by (a) providing timely, well-publicized information with respect to (1) opportunities to participate, (2) alternative courses of action, (3) the course of action favored by the planning agency, (4) benefits and costs, and (5) other relevant factors; (b) by scheduling at least one public hearing in the area of the proposed project; and (c) by making basic data, reports and other background information readily available to the public. (205)

25. The President should approve the principles and standards of multiple-objective planning, as proposed by the Water Resources Council. (208)

26. The principles and standards which are adopted for the evaluation of Federal water resources projects should include the principle that benefits for water resources development projects be derived by applying the concept of effective economic demand. This principle and the procedures it entails for implementation should be included as an amendment to the principles and standards proposed by the Water Resources Council. (209)

Further, the information which is used in the evaluation of water resources projects should (1) reveal fully both the positive and negative effects of proposed projects upon all local interests and (2) reveal any important positive and negative effects upon other regions.

27. The discount rate for evaluation of water resources projects should be established by the Treasury Department based on the average yield rates of Treasury obligations, of longer than ten years in duration, issued during the preceding ten-year period. The discount rate should remain constant for a period of five years and then be recomputed. (210)

28. For the future the nature of the Civil Works Program of the Corps of Engineers should be modified to: (a) limit the agency to design and construct only those engineering works that cannot as efficiently be provided by states, by interstate regional commissions, or by conservancy, drainage, port, irrigation, or similar local districts; (b) increase the emphasis placed upon the nonstructural segments of its programs, such as that segment through which it provides states, municipalities and other non-Federal public entities with the information they need to make more efficient use of flood plain lands; and (c) improve the capability of the Corps of Engineers in the formulation of comprehensive regional plans under a strengthened Water Resources Planning Act. (227)

Interpretations

In the foregoing we have traced -- very briefly -- the evolution of project planning and evaluation guidelines, and have quoted extensively from the summary statement issued by the Water Resources Council of the recommendations of the National Water Commission. In this section we will attempt to draw out the central issues in the appropriate evaluation approach--both drawing on the work of the National Water Commission--as well as from our own experience in project planning and evaluation.

First, and of most relevance to the Ames Reservoir Project, the National Water Commission is recommending that the flood control strategy

of the nation be moved away from structural alternatives, and towards greater reliance upon nonstructural alternatives such as flood-plain zoning, flood insurance, and flash-flood warning systems. If there must be structures, then an "appropriate share" of the costs must be borne by local interests--based on the expected benefits. Additionally, state and local governments are expected to better regulate the use of the flood plain to prevent the circularity (discussed in Chapter 4 of this Appendix) whereby development is spurred by a structure until a point is reached where the damages that could be avoided with a structure (called benefits) are so high as to justify yet more dams. Finally, state and local governments are to regulate land use activities in those areas still susceptible to flooding--those areas not protected by the "designed-for flood" and the structure that is built for that "design flood."

The second point of relevance to the Ames Reservoir Project concerns that provision of municipal and industrial water. Basically, the Commission is arguing that non-federal entities should assume a much greater role in the supply augmentation of municipal and industrial water, and that industry should not get any water that involves a subsidy. Furthermore, it is urged that water supply projects not be authorized until there has been an evaluation of the present efficiency of water use, and until all water-saving innovations have been explored.

As indicated above in different contexts, the era of subsidizing various producer and consumer groups via water resource projects is passed--

and now those who benefit from such projects are to be expected to pay an "appropriate share" of the costs. Thus a greater concern has emerged toward the incidence pattern of project impacts for this reason alone.

In contrast to present practice, regional development effects of projects, while perhaps of interest, are not to be treated so casually as beneficial. Before this can be done, there must be studies of the supply and demand conditions for the various outputs of the project, analysis of substitutes, and the comparative advantage of the region. Until this type of analysis is conducted, regional benefits are "not legitimate."

It can be seen from the recommendations that the construction of water resource projects for the protection or enhancement of agricultural areas is subject to serious question. The productive capacity of the Nation is such that the present level of production has been said to be producible with 25 percent fewer resources than currently in agriculture. Hence, to count benefits from protection of agricultural losses in terms of conventional crop prices alone would cease to be legitimate. This point argues for an evaluation process which invites explicit political judgments as to the social worth of such economic benefits.

Another recommendation of the Commission is that recreation as a project purpose be elevated to a position of more prominance. That is, water resource projects in the past have often included recreation as "an afterthought" to help in local repayment. This has resulted in some state conservation agencies balking when it comes to bargaining over

reimbursement. If recreation were a central purpose--instead of an incidental addition-- the project could possibly better serve the recreation needs of the local area. Correspondingly, local cost sharing would then become less of a problem than it is now since the agency would be more satisfied with the nature of the project's recreation "output." Again, this point argues for more detail on the incidence of recreation benefits, and for an evaluation process which explicitly provides for local participation.

Another recommendation of the Commission was that future planning and evaluation develop better ways to clearly articulate the nature and extent of both positive and negative impacts from water resource projects not only to local people, but to those in other regions as well. Hence the concern for impact incidence is reinforced.

This is related to another recommendation of the Commission--that the agencies become serious about public participation programs. In the past, one or two public hearings has sufficed--but these have usually been after the project is basically complete, and was generally a chance for those already convinced of the "goodness" of the project to practice public speaking. As should be obvious, the local chamber of commerce does not constitute the only local interest group; it supposedly represents local business. There are others who have a right to know about project effects, and a meaningful public participation program would facilitate interaction with a broad spectrum of local interests. Finally in this regard, project planning and evaluation that is not specific with respect to groups of local people-- as well as groups of non-local people-- will not be successful in terms

of enhancing public participation. Again the joint need for incidence analysis and participatory process is apparent. More will be said on this matter in Appendix 6.

Finally, the National Water Commission has recommended that the Corps of Engineers should become a course of last resort for structures -- called in only when all other avenues have failed. Whether it be in municipal and industrial water supply, flood protection, water quality control, fish and wildlife enhancement, or hydroelectric generation, the Corps should view construction as the last alternative. On the other hand the Corps, with its staff of well-trained planners, should become more involved in comprehensive regional planning efforts that transcend water development per se. It is recognized that this position implies institutional changes which lie beyond the scope of this particular study, but the point nevertheless must be articulated here.

As the above interpretations are considered, it can be seen that their adoption would have a most dramatic impact on the operation of the major water resource development institutions as we know them today. Whether or not any of them stand a chance at becoming law is difficult to ascertain, but many of them are consistent with our judgments as to desirable changes. One aspect that was mentioned is worthy of elaboration here; that is the issue of public participation in the planning and evaluation process.

Past efforts at facilitating greater public participation have consisted largely of announcing public hearings to review a project proposal

that was basically complete. That these have not been particularly useful in the planning process seems to come as a surprise to agency personnel. A meaningful program of public participation would consist of the following aspects. It would: (1) permit the public to interact with the agency early to establish the nature of water-related problems in the watershed; (2) permit the public to participate meaningfully in defining the cause of those water-related problems identified in the first step; (3) permit public participation in the development and evaluation of alternative objectives for water development; (4) permit public participation in the development and evaluation of alternative plans to meet the objectives; and (5) employ a project impact display format that permitted each group of individuals potentially affected by the objectives, or the means to achieve those objectives, to be well informed as to the likely nature and extent of that impact.

This view then starts from the assumption that it is the job of the water resource planner to effectively interact with the public to aid in the solution of water-related problems. In the course of his work it is most imperative that careful attention be paid to the national income, the regional income, and the environmental quality implications of the various plans being given serious consideration--and that these effects be ascertained with as much accuracy as possible. But, this is far different from the position taken by the Water Resources Council in its Proposed Principles and Standards where the argument is made that it is the paramount task of the planner to formulate plans that will effectively "contribute to the attainment of the multiobjectives." More detail on this

different approach to the planning and evaluation of water resource projects is found in the document Public Water Resource Project Planning and Evaluation: Impacts, Incidence, and Institutions (Bromley, et.al., 1971). For now it is sufficient to state that the approach advocated there starts from the assumption of a need for a more meaningful public participation in the planning process, and rejects the conventional notion that the planner should use the Council's multiobjectives as guides to planning and evaluation.

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AMES RESERVOIR ENVIRONMENTAL STUDY

Appendix 2. Economic and Social Impact

Part 1 -- Economic Considerations

Chapter 3

ALTERNATIVE TAXONOMICAL CONSTRUCTS

Contribution to the
Ames Reservoir Environmental Resources Review Study

Sponsored by
US Army Corps of Engineers Contract DACW25-72-0033

by

Joseph S. Drake

1973

CONTENTS

TABLES

Chapter 3

ALTERNATIVE TAXONOMICAL CONSTRUCTS

Joseph S. Drake

Introduction

The evaluation of public works projects has become much more complicated than it was, say, during the early and mid-1960's. At that time the economic aspects of projects usually dominated, and the eventual ranking of project alternatives could be determined largely through formal technical procedures such as benefit-cost analysis. To the extent that non-economical considerations had political relevance, those considerations often were reflected implicitly by various assumptions made within such formal instruments of economic justification. Those decision-making instruments were quite insulated from the public at large, and that public -- perhaps in a mixture of apathy and implicit trust of such economic calculations -- infrequently took issue with advocated projects.

This condition of insularity, of course, no longer exists except among circles which view the plethora of recent court actions as a passing fancy and which consider such requirements as environmental impact statements as token procedures. No one can legitimately claim sufficient vision to declare that current public pressures against expeditious project construction are or are not a transient overreaction. However,

it takes little insight to realize that a preoccupation with economic objectives is unsound planning. Planning of public works projects must be comprehensive, in the true sense that a meaningful range of project alternatives is given balanced consideration and that all relevant impacts of those projects are analyzed and openly articulated. Any position to the contrary, except as it reflects institutional constraints on agency planning budgets and jurisdictions, must rest on a cynicism toward having an informed public as ultimate client.

In fullest interpretation, the charge to integrate all relevant impacts into project evaluation methodology implies bewildering complexity. Whereas procedures of benefit-cost analysis are apparently so neat, precise and deterministic, the full consideration of distributional, environmental, social, cultural and institutional impacts precipitates relative chaos in technical analysis and in any participatory evaluation forum. Typically, agency technical expertise lacks the interdisciplinary qualifications to meet this charge. Yet the usual public hearing finds interest-group conflicts confusing claims of impact intensities with what actually are value judgments or "weights." The orderly assembly of impact information is essential for objective assessment of tradeoffs to be realized. For this paramount reason, a carefully structured taxonomy for impact analysis is required for comprehensive public works planning.

Taxonomy for impact analysis may be constructed either in reference to impact mechanisms or in terms of impact incidence. A mechanism-based

classification, which would be most useful to efforts in technical analysis, distinguishes between different impacts in terms of how those impacts happen in a phenomenological cause-effect context. An incidence-based classification, which would be most useful to the ultimate (participatory) evaluation process, differentiates impacts in terms of where and upon whom they occur, i.e., among various "interest groups." For evaluation problems as complicated as that of the Ames Reservoir situation, the preferable approach utilizes both taxonomical elements: a mechanism-based classification for technical analysis, with eventual transformation into an incidence-based classification for purposes of participatory decision-making.

This chapter considers alternative taxonomical constructs for both of these purposes in the Ames Reservoir environmental review. The following four sections discuss several paradigms for mechanism-based impact classification: the apparent taxonomical structure which is evident in much of the literature on water-resources development; recent developments in environmental impact classification; another construct which interprets public works planning according to general concepts of systems analysis; and yet another construct which synthesizes various features of these other structures and incorporates general notions of welfare economics, and which is adopted for this study. Then the discussion turns to the reconstruction of impact taxonomy in terms of incidence patterns according to considerations of participatory evaluation processes. The final section summarizes the chapter.

Conventional Impact Classification in Water-Resources Development

The discipline of water-resources development has been a distinguished vanguard of public-works evaluation methodology ever since the Flood Control Act of 1936. In particular, that discipline has fostered the practical interpretation and application of welfare economics, resulting in a rich body of technical insights regarding the economic analysis of proposed projects. All companion disciplines of public planning have derived many of their respective evaluation procedures from these ongoing contributions of water-resources economists.

Notwithstanding such valuable contributions, however, in the context of contemporary planning problems it appears that the discipline's contributions to depth have seriously compromised breadth. In particular, much of the taxonomy which is evident in the water-resources literature is built upon the fundamental preoccupation with economic perspectives. This point represents a definite shortcoming insofar as the purposes of this study are concerned and, as will be discussed later in the chapter, some other areas of public planning are in a position to reciprocate now with diligent insights into non-economic considerations.

Throughout its literature, the discipline of water-resources development consistently describes the relevant effects of its projects in black-and-white terms of benefits and costs. Whereas some other disciplines prefer the more noncommital term "impacts," the immediate definition of benefits and costs may be criticized as too prejudicial for contemporary planning problems.

Such criticism notes that even the analysis of economic impact in terms of benefit-cost ratios is vulnerable to how one arbitrarily defines elements of the numerator and denominator for that calculation. Though this point is comparatively moot, it appears as a reflection of the preoccupation with economic effects.

This preoccupation is patently evident, as are its restrictions, in the basic taxonomical structure within which those benefits and costs are traditionally classified. This structure involves two divisions of benefits and two divisions of costs. So-called "tangible" and "intangible" benefits are distinguished according to whether a given benefit can or cannot (either via the marketplace or via a more elaborate deductive process) be assigned a monetary value. Costs typically are differentiated in terms of those relating to project installation (including construction, operating and maintenance elements) and "implied costs" to affected parties. All cost elements are in dollar units, whereas any non-monetary costs generally are viewed as disbenefits within the "intangible benefits" category.

Although the dichotomy of cost elements is reasonable enough, the distinction between tangible and intangible benefits (despite its longevity in the literature of water-resources development) is a misnomer as defined. The intended differentiation is between monetary and non-monetary benefits. As typically acknowledged by other planning disciplines which are more concerned with urban (social) problems, "tangible" actually means that an effect is measurable ("touchable"); yet many measurable effects of projects

cannot be readily translated into monetary terms. Notwithstanding the misnomer, the importance placed on distinguishing between monetary and nonmonetary effects stems directly from the discipline's traditional preoccupation with paradigms for economic analysis. Hence the distinction is based on a concern for the "calculability" of impacts, which relates to the ease of technical analysis rather than to more fundamental considerations of phenomenological relationships.

This preoccupation with "calculability" is further evidenced by the subdivision of tangible benefits into market-valued and nonmarket-valued effects. The former include those project outputs for which a market price exists as an adequate reference for output valuation, through either the intermediate-good (derived demand) method, inferences from price-quantity behavior, or market analogies (Bromley, et. al., 1971, p. 13). The latter include all other tangible benefits, which typically are valued either by administrative discretion or by alternative cost concepts. This distinction highlights the relative ease by which various impacts can be weighted in monetary terms, again in direct reference to benefit-cost calculations. As such, it has nothing to do with the identification and measurement of raw impact intensities, which seems a prior consideration in classifying impacts. Moreover, practical applications of this market-nonmarket distinction are prone to considerable abuse of underlying theoretical concepts.

A basic precept of diligent impact taxonomy is that identifying the phenomenological character of effects is a concern prior to addressing their

measurability and "valuability," since the former is more fundamental and universally unalterable. Moreover, identifying impacts in terms of the ease with which they fit into mechanical benefit-cost calculations carries a strong tenor of selecting impacts to serve the technique instead of vice-versa.

While the literature on water-resources planning has little additional taxonomy for other elements, it offers considerable elaboration on "tangible" benefits. The pervasive distinction throughout that amplification is one drawn between "primary" and "secondary" benefits. An accepted definition of each is as follows (James and Lee, 1971, p. 165-6):

> Primary benefits denote the value obtained from project-produced goods and services. The benefits accrue from physical effects of the project ... as contrasted with effects transmitted through market transactions.
>
> ...Secondary benefits denote value added to activities influenced by the project through economic rather than technological linkages. They result from pecuniary external effects.

Primary benefits usually are defined to include three categories of economic impacts: (a) direct benefits to user of project outputs (e.g., reduction of crop and property damages through flood control); (b) indirect benefits whereby private parties realize economic gains through technological "spillovers" (e.g., reduction in temporary losses of productive capacity or reduction in interruptions to transportation service); and (c) land-enhancement benefits (e.g., improvements in the productivity of floodplain land and property through conversion to higher use). Secondary benefits

typically are classified into "stemming from" (i.e., effects realized through forward production linkages) and "induced-by" (i.e., effects realized through backward production linkages) categories, as transmitted through market relationships.

This taxonomical structure provides a relatively unambiguous classification of economic effects, so long as the distinction between "indirect primary benefits" and "secondary benefits" is understood. Both types of impacts refer to indirect events in the sense that they are realized only through the influence of immediate effects via some organic or structural medium. The distinction merely seeks to differentiate between technological and pecuniary spillovers, since the latter allegedly constitute pure transfers of direct benefits through the price mechanism and, supposedly, should not be included in benefit-cost calculations.* In practice this distinction is not always clear.

Although the distinction between direct and indirect effects cuts across the primary-secondary dichotomy, this dichotomy is based on explicit considerations of phenomenological impact mechanisms. Again, it also reflects an underlying concern to differentiate between those effects which

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*In some instances of agency practice (e.g., the Bureau of Reclamation), estimates of direct benefits have been multiplied by an arbitrary factor to embrace such spillover effects; the practice has drawn sharp criticism by some economists (Prest and Turvey, 1965, p. 689).

enter into benefit-cost calculations and those which do not (to include secondary benefits would constitute double-counting under most circumstances). In some cases, nevertheless, the measurement of secondary benefits may be of interest for distributional concerns, particularly in view of emerging public sensitivity thereto.

While these definitions give a reasonably clear portrayal of economic aspects, and certainly are well accommodated to monetary benefit-cost calculations, they have limited transferability to non-economic considerations. For impacts relating to objectives other than that of national income, other taxonomical schemes must be defined. If possible, it would be desirable in a more comprehensive impact analysis to reconstruct a general taxonomical paradigm which embraces both economic and non-economic impacts, without unduly compromising insights into the former. In this vein the discussion now turns to other taxonomical constructs for project impact analysis.

Taxonomical Structures for Environmental Impact Analysis

Primarily in response to NEPA requirements for environmental impact statements, several efforts have recently emerged which propose taxonomical schemes for environmental effects (Sorenson, 1971). Although these developments have focused largely upon non-economic effects and offer quite detailed stratifications, their general structures are of interest to this study.

A review of this sprouting literature reveals consistent use of a basic cross-classification between sources of potentially degrading

influences (i.e., various structural and non-structural courses of action) and objects or incident parties which bear environmental impacts. To a lesser extent, attention is given to the nature of the linkage or medium, and to differentiation of incident parties or organisms in terms of relative vulnerability or immunity. Also, ongoing efforts within the disciplines of ecosystems and zoology deal in substantial detail with the complexity of interdependencies between various ecological "sectors."

For the purposes of this study, particularly the broad taxonomical paradigm of concern in this chapter, the main point of interest in this literature is the incidence dimension. The coverage of "courses of action" embraced by the literature extends far beyond the realm of water resources development, and the project alternatives considered in this study are defined quite specifically. Moreover, given the broad and balanced perspective toward economic and environmental impacts which the current discussion seeks for purposes of overall organization, elaborate detail on ecological linkages and carrying media is not essential here (such detail is introduced in other appendices as appropriate). Insight into broadly conceived classifications of the environment itself, however, is of definite interest.

For this purpose two astute paradigms are selected for specific reference here: the well-known USGS (or "Leopold") matrix, and taxonomical elements of a Regulation issued recently by the Office of the Chief of Engineers, Department of the Army. Both of these agency documents exhibit rather deliberate and exhaustive treatment of the physical environment, and both

explicitly recongize the relevance of social and cultural impacts upon human resources to environmental impact analysis.

The USGS document (Leopold, et al., 1971) is one of the most exhaustive attempts at environmental impact classification to date. It proposes a set of procedures for identifying, analyzing and evaluating environmental impacts, where those procedures focus on an "environmental impact assessment matrix." That matrix defines in great detail a cross-classification between causative actions and existing environmental conditions that might be affected. The procedures alertly distinguish between impact magnitudes or intensities and the importance or "weight" associated with each. Although the document seems to entrust excessively the determination of relative importance to technical analysis, its classification of "existing characteristics and conditions of the environment" is fairly astute and exhaustive.

This classification, which is reproduced in Table 2-3-1, identifies four major categories (plus a provision for "others") of environmental elements including physical and chemical characteristics, biological conditions, cultural factors, and ecological relationships. Physical and chemical characteristics embrace various attributes of earth, water and atmospheric resources and associated "processes." Biological conditions refer to various species of flora and fauna and associated "barriers or corridors." Cultural factors encompass a host of activities or opportunities for activity

Table 2-3-1. USGS Classification of "Existing Characteristics and Conditions of the Environment" (Leopold, et al., 1971)

A. Physical and Chemical Characteristics
  1. Earth
    a. Mineral resources
    b. Construction material
    c. Soils
    d. Land form
    e. Force fields and background radiation
    f. Unique physical features
  2. Water
    a. Surface
    b. Ocean
    c. Underground
    d. Quality
    e. Temperature
    f. Recharge
    g. Snow, ice, and permafrost
  3. Atmosphere
    a. Quality (gases, particulates)
    b. Climate (micro, macro)
    c. Temperature
  4. Processes
    a. Floods
    b. Erosion
    c. Deposition (sedimentation, precipitation)
    d. Solution
    e. Sorption (ion exchange, complexing)
    f. Compaction and settling
    g. Stability (slides, slumps)
    h. Stress-strain (earthquake)
    i. Air movements

B. Biological Conditions
  1. Flora
    a. Trees
    b. Shrubs
    c. Grass
    d. Crops
    e. Microflora

Table 2-3-1. Continued

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f. Aquatic plants
g. Endangered species
h. Barriers
i. Corridors

2. Fauna
   a. Birds
   b. Land animals including reptiles
   c. Fish and shellfish
   d. Benthic organisms
   e. Insects
   f. Microfauna
   g. Endangered species
   h. Barriers
   i. Corridors

C. Cultural Factors
1. Land Use
   a. Wilderness and open spaces
   b. Wetlands
   c. Forestry
   d. Grazing
   e. Agriculture
   f. Residential
   g. Commercial
   h. Industrial
   i. Mining and quarrying
2. Recreation
   a. Hunting
   b. Fishing
   c. Boating
   d. Swimming
   e. Camping and hiking
   f. Picnicking
   g. Resorts
3. Aesthetics and Human Interest
   a. Scenic views and vistas
   b. Wilderness qualities
   c. Open space qualities
   d. Landscape design
   e. Unique physical features
   f. Parks and reserves

Table 2-3-1. Continued

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g. Monuments
h. Rare and unique species or ecosystems
i. Historical or archaeological sites and objects
j. Presence of misfits

4. Cultural Status
   a. Cultural patterns (life style)
   b. Health and safety
   c. Employment
   d. Population density
5. Man-Made Facilities and Activities
   a. Structures
   b. Transportation network (movement, access)
   c. Utility networks
   d. Waste disposal
   e. Barriers
   f. Corridors

D. Ecological Relationships
   a. Salinization of water resources
   b. Eutrophication
   c. Disease-insect vectors
   d. Food chains
   e. Salinization of surficial material
   f. Brush encroachment
   g. Other

E. Others

involving interactions between man and nature, including the spectrum of economic and other land uses, recreation, aesthetics and human interest (including unique scenic and archaeological attributes); this category also covers socioeconomic measures of cultural status and activities involving man-made facilities and services. The final category ("ecological relationships") essentially covers all systems interactions involving elements of the natural environment noted above.

Although the various categories within this taxonomy are not mutually exclusive and therefore imply some ambiguities, the scope of the classification is quite comprehensive. In this respect it is very useful as a reference for selecting and rearranging environmental elements for the particular purposes of any specific project analysis, including this study. The main feature of the classification is that it distinguishes between intrinsic natural resources (earth, water and air) and several forms of "environmental" interaction: activities of flora/fauna organisms upon or within those intrinsic resources; activities of human organisms upon or within those intrinsic resources; interactions of human organisms with man-made facilities and services; and ecological interactions between all types of natural (physical and human) organisms.

The other document of interest to this discussion is a Regulation issued last December by the Office of the Chief of Engineers, entitled "Guidelines for Assessment of Economic, Social, and Environmental Effects of Civil Works Projects" (Department of the Army, 1972). The purpose of the regulation is defined as follows:

> ...to ensure that all significant adverse and beneficial effects of Corps of Engineers projects are fully considered in pre- and post-authorization planning. The Guidelines have been approved by the Secretary of the Army and comply with the directive of Congress contained in Section 122 of the River and Harbor and Flood Control Act of 1970, Public Law 91-611... They supplement and extend the requirements of the National Environmental Policy Act of 1969. (Department of the Army, 1972, p. 1)

Like the USGS circular (but with more substantive discussion of methodological issues), these guidelines set forth a body of procedures for identifying, analyzing and evaluating project alternatives.. The perspective of the Army document, however, represents a deliberate effort to consider economic and non-economic impacts integrally, and offers some taxonomical structure to that end.

Again akin to the USGS matrix, the two major dimensions of this structure are "causative factors" and "project effects." While causative actions are of lesser interest here as discussed earlier, one appealing feature of the Army taxonomy is that it explicitly distinguishes between project inputs (factor inputs, structural and nonstructural "systemic" inputs, and operations and maintenance inputs) and project outputs (various beneficial uses), recognizing that indirect impacts associated with project production and project consumption may be inherently very different.

Table 2-3-2 reproduces this document's taxonomy of project effects.* Though not as elaborate, it classifies impacts upon the physical environment in apparent knowledge of the USGS matrix, utilizing distinctions between natural and man-made resources, between air, water and land (earth), and ecological processes vs. more static conditions. At a broader level the taxonomy gives separate identity to social effects, and gives some stress to collective community impacts. Moreover, a distinct category for economic effects is provided for balanced integration of the impacts discussed in the previous section of this chapter; this category also includes financial implications to local governmental units. This kind of balanced perspective toward economic and non-economic impacts is more consistent with the needs of economic-environmental tradeoff analyses, rather than the traditional benefit-cost perspective discussed earlier.

This perspective is far more crucial to the Ames Reservoir review than detailed considerations of environmental and other impact classification. Nevertheless, given a paradigm which provides balanced attention to economic and non-economic effects, certain points regarding impact taxonomy may be interpreted from the two structures reviewed in this section. First, while "environment" clearly should be defined in its broadest sense, there is definite appeal in differentiating generically between physical, social and

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*Asterisks in the table denote items specifically mentioned in Section 122: "These must be identified and evaluated. If they are considered to be not significant, that should also be noted. Other effects should be identified and evaluated only if they are considered to be significant. The list...is an illustrative one. It is not to be considered complete or limiting."

Table 2-3-2. OCE Classification of "Sample Project Effects" (Department of the Army, 1972)

SOCIAL EFFECTS
- *Noise
- Population, e.g.
  - Mobility
  - Density
- *Displacement of people
- *Esthetic values
- Housing
- Archeologic remains
- Historic structures
- Transportation
- Education opportunities
- Leisure opportunities (recreation, active and passive)
- Cultural opportunities
- *Community cohesion
- *(Desirable) community growth
- Institutional relationships
- Health

ECONOMIC EFFECTS
- National economic development
- Local government finance, e.g.
  - *Tax revenues
  - *Property values
- Land use
- *Public facilities
- *Public services
- Local/regional activity, e.g.
  - *(Desirable) regional growth
  - Relocation
- Real income distribution
- *Employment/labor force
- *Business and industrial activity
- Agricultural activity
  - *Displacement of farms
  - Food supply
- National defense

ENVIRONMENTAL EFFECTS
- *Man-made resources
- *Natural resources
- Pollution aspects
- *Air
  - CO
  - Sulphur oxides
  - Hydrocarbons
  - Particulates
  - Photochemicals
- *Water
  - Pathogenic agents
  - Nutrients N and P
  - Pesticides, herbicides, rodenticides
  - Organic materials
  - Solids, dissolved and suspended
- Land
  - Soils
- Animal and plant
  - Birds
  - Mammals
  - Amphibians
  - Fish, sport and commercial
  - Shellfish
  - Insects
  - Microfauna
  - Trees, Shrubs and Plants
  - Microflora

Table 2-3-2. Continued

ENVIRONMENTAL EFFECTS (Continued)
Ecosystems
Habitats
Food chains
Productivity
Diversity
Stability
Physical and Hydrologic aspects
Erosion
Erosion and sedimentation effects
Compaction and subsidence
Slope stability
Groundwater regime alteration
Surface flow effects
Micrometeorological effects
Physiologic changes (e.g., wetlands destruction)

political side-effects. Second, the distinctions cited earlier regarding various types of interaction between intrinsic natural resources, man-made resources, and human and nonhuman organisms would appear to facilitate technical analysis. Finally, more specific elaboration of impact types can draw readily and selectively, as appropriate to this study, from the rather exhaustive lists presented in Tables 2-3-1 and 2-3-2.

The Systems Analysis Paradigm

As mentioned earlier, other planning disciplines generally have adapted concepts of economic analysis from the leading developments of water-resources economists (e.g., see Dorfman, 1965). However, a few of those disciplines have had to deal most seriously with non-economic impacts, either because their objectives are inherently non-economic or because public controversy over their non-economic side effects has forced the issue. The latter is strongly parallel to the pressures currently facing water-resources planners, wherein there is an urgent need for impact taxonomy which embraces economic and non-economic impacts integrally.

The most outstanding work in this direction has evolved in the context of urban transportation planning, which has spent the last decade immersed in public resistance to dislocation and environmental impacts. Owing largely to its everyday visibility to much of the public, urban transportation has been a focal point for the resolution of interest group conflicts through some form of tradeoff analysis. The most substantive

and comprehensive technical response to those circumstances to date was developed through research at Northwestern University (Thomas and Schofer, 1970), and was extended recently at the University of California at Los Angeles (Wachs, 1972).

The efforts at Northwestern redefined a broad cost-effectiveness paradigm for project evaluation in contexts involving a variety of incommensurate impacts. That paradigm, which supercedes yet retains more traditional concepts of benefit-cost analysis, places much greater emphasis on identifying and measuring such impacts rather than "weighting" them, on the premise that such value judgments can only be determined within the political forum. Accordingly, great attention is given to problems of organizing impact analyses and their resulting information. Impact taxonomy takes on a crucial role for purposes of that organization, and both research efforts adapt general concepts of systems analysis in this vein. The resulting construct offers straightforward transferability to other disciplines of planning which involve economic objectives and typically capital-intensive projects; hence it merits review here.

This construct centers on the definition of a "system" as a group of entities, meaningfully connected and satisfactorily bounded, which interact for a common purpose or purposes. For any given planning context, these entities represent the variety of elements which make up the particular "system" of infrastructure under consideration (e.g., an urban transportation network, a collection of health care facilities, or a river basin). Any such system has a corresponding environment, defined as that collection of

other systems, entities and activities outside the system under study (e.g., a regional or national economy); the system and its environment generally affect one another.

The system is viewed in terms of actions and reactions which involve a crossing of its boundaries, conveniently distinguished as inputs and outputs. Inputs are those resources drawn from the environment in order to manipulate or modify the system; any proposed project is a change in the system which consists of the addition of inputs into that system and which produces various outputs. Outputs are classified into performance outputs and concomitant outputs; the former are those "outflows" which are directly related to the objectives of the system, whereas the latter are consequences to the environment which are not direct contributions to attainment of system objectives. Concomitant outputs may be generated by the operation or even the mere existence of the system and, in general, may constitute either salutary or deleterious effects upon the environment. The term "concomitant" does not imply that this category is any less important in evaluation methodology than performance outputs. Many concomitant outputs of infrastructural systems are treated as externalities, in that the planner does not control them and the system user is not always called upon to compensate non-users for deleterious outputs.

Whereas system inputs and outputs represent cross-boundary exchanges of physical and non-physical elements, this paradigm gives separate definition to the consequences which flow from such inputs and

outputs. These consequences represent the results of interactions between system inputs and outputs and the environment. Project "impacts" are defined as changes in "consequence levels" which, by virtue of these interactions, are generated by and only by the project's specific changes to system inputs.

The taxonomy of Wachs (1972) defines a cross-classification of project impacts as depicted in Table 2-3-3. For each of the aforementioned phenomena (inputs, performance outputs and concomitant outputs) three levels of impacts are identified. First-order impacts embrace the most direct effects of system modification. These effects, usually the most measurable and predictable, refer to the immediate consequences associated with changes in inputs (e.g., additional factor acquisition and related resource costs), performance outputs (e.g., increases in system usage and savings in user costs), and concomitant outputs, (e.g., dislocation effects of project construction, or emission of pollutants by virtue of system operation).

Linkages between these first-order impacts and the system's environmental context give rise to second-order impacts. In response to immediate resource commitments as system inputs, for example, the local economy (an element of the system's environment) may occasion a transient and/or permanent multiplier effect.* In response to first-order performance effects, it is often observed that broader patterns of economic and social activity (elements of the system's environment) may undergo adjustments, such as the development of residential activity in the vicinity of recreation sites;

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*This phenomenon usually is an important consideration in relatively large-scale projects such as defense installations or the Hoover Dam.

Table 2-3-3. The Relationship Between Successive Orders of Infrastructural System Impacts and the Inputs and Outputs of Infrastructural Systems (Wachs, 1972)

	System Inputs	Performance Outputs	Concomitant Outputs
FIRST ORDER Impacts	Measured as direct changes in inputs or outputs, principally within the system.		
SECOND ORDER Impacts	Social, economic and environmental consequences, measured in terms of interrelationships between system and environment.		
THIRD ORDER Impacts	Structural and institutional changes occurring principally in the environment of the system; a few steps removed from the inputs and outputs themselves.		

these second-order impacts generally are proportional to the level of first-order performance impacts. Similarly, second-order concomitant effects embrace responses of the system's environment to their first-order counterparts (e.g., relocation of displaced organisms, or the effects of pollutant emissions upon the health of organisms).

Third-order impacts refer to long-run structural and institutional changes which, if not entirely attributable to a proposed project, at least may be reinforced by that project and/or the process by which it is implemented:

> The second-order impacts of changes in systems may give rise to further repercussions entirely within the physical and institutional environments of those systems, which result from but do not directly involve the performance or concomitant outputs of the system or its inputs. Thus, a third-order impact might be a change in the levels of citizen organization within a community through the creation of ... action groups or through letter-writing campaigns. Such a third-order impact might be a change of response resulting from a second-order impact which occurred as an intended or concomitant result of first-order impacts.

Patterns of incidence may be incorporated into this mechanism-based taxonomy by introducing various "activity systems." The cross-classification already draws a rather clear distinction between user and non-user impacts, where the category of "first-order performance impacts" delimits the former. First-order and second-order concomitant outputs can be further classified in terms of such incident activities as the economic system (firms), the social system (households), the ecological system (physical organisms), the cultural system (e.g., educational units), and the political system

(governmental units), all of which lie within the broad environment of the infrastructural system of immediate concern.

This taxonomical construct is appealing in its exhaustiveness and mutual exclusivity as well as its flexibility to incorporate distributional considerations. However, its somewhat oversimplified character leaves that taxonomy in want of some elaboration (e.g., to distinguish more clearly between externalities which are proportional to performance levels and those which are independent of same). Moreover, although the need to distinguish between relatively immediate and relatively remote impacts is acknowledged, the two dimensions of "impact source" and "impact order" are somewhat redundant (especially the notions of concomitant outputs and second-order impacts). To its credit, on the other hand, it gives no particular preoccupation to monetary impacts, though neither does it disavow the usefulness of benefit-cost analysis if applied in proper perspective (Thomas and Schofer, 1970, p. 52):

> What might be more useful is a technique for providing the kind of information support for the selection of alternative plans that recognizes the complex nature of these ... decisions. Such a decision-supporting framework would not attempt to make decisions, but instead would structure the information required for making a subjective but systematically enlightened choice. At the same time, however, the framework adopted for providing the decision maker with informational support must be sufficiently flexible to permit the adoption of more sophisticated techniques, such as analytic methods for realistically implementing benefit-cost analysis or ranking schemes, when such techniques are appropriate.

The foremost intention underlying this paradigm is to present impact information for a variety of alternatives to a participatory evaluation forum, through means of display which facilitate explicit assessments of tradeoffs. Thomas and Schofer give particular attention to various scenarios for implementing this intention, and their work in this context forms the basis for the broader evaluation methodology discussed in Appendix 6.

A Mechanism-Based Taxonomical Paradigm for Technical Analysis

In contrast to the economic preoccupation of conventional taxonomy in water-resources planning, this study of the Ames Reservoir requires a paradigm of impact classification which fosters as broad a perspective as the one just discussed. Although a detailed template for analyzing a project's economic impacts may be desirable under more traditional circumstances, the need here for genuine and parallel consideration of impacts upon the physical and social environment calls for an impact taxonomy which transcends strictly economic concerns. Moreover, given the complex interactions between the varied impacts of water-resources projects, a mechanism-based taxonomy is prerequisite to coherent technical analysis. Transformation of such a taxonomy into more incidence-oriented terms, though essential to a participatory evaluation process, is a comparatively straightforward matter (see the next section).

The Paradigm

The mechanism-based impact taxonomy adopted for this study, as shown in Table 2-3-4, synthesizes various features highlighted in the previous sections. Its scope clearly seeks the balanced perspective advocated by the Office of the Chief of Engineers (OCE), in the sense that the taxonomy should span both economic and environmental impacts without preoccupation toward either. Its basic structure is a cross-classification in broad terms of impact "source" and impact "order." Impact source is defined dichotomously as either production-related or consumption-related, mainly to distinguish between input-oriented and output-oriented externalities as suggested by the OCE Regulation and the systems analysis paradigm. Impact order, a concept taken directly from Wachs' construct, involves a threefold distinction between immediate or "direct" project effects, all project externalities or "indirect" effects, and long-run institutional impacts of a project and/or the project-selection process.

First-order or direct effects are defined according to traditional notions of project evaluation in water-resources development, embracing all project inputs and purposeful outputs which are conventionally included in economic benefit-cost analysis. Again in reflection of the OCE Regulation and the systems analysis paradigm, second-order or indirect project impacts are categorized into generic groupings which correspond

Table 2-3-4. Mechanism-Based Impact Taxonomy for the Ames Reservoir Environmental Review Study

CONSUMPTION-RELATED	PRODUCTION-RELATED	FIRST-ORDER	SECOND-ORDER																				THIRD-ORDER
			Indirect Project Impacts																				
		Direct Project Impacts	ECONOMIC								PHYSICAL						SOCIAL				POLITICAL				Institutional Impacts
			Technological				Pecuniary																		
			Agriculture	Farm Machinery	...	Services	Agriculture	Farm Machinery	...	Services	Landscape	Vegetation	Animal/Wildlife	Aquatic	Geological	Archaeolgical	Rural Farm	Rural Non-Farm	...	Urban	State	County	Township	Municipality	

to the various activity systems within the "environment" of the river basin system. Moreover, subclassifications within each of these categories may be defined to provide some account of impact incidence.

Rationale

The main considerations underlying this definition of taxonomical structure include: (a) a desire for an exhaustive and mutually exclusive classification; (b) the need for fundamental distinctions with respect to "how impacts happen" rather than, e.g., how easily impacts might be incorporated into benefit-cost calculations; and (c) a desire to facilitate the eventual transformation from this mechanism-based construct into an incidence-based scheme. Brief elaboration on each of these considerations is given in the following paragraphs.

Exhaustiveness and mutual exclusiveness. The concern for exhaustive and mutually exclusive classifications is a sort of "motherhood and apple pie" consideration in taxonomical design, yet it too often is taken for granted in practical contexts. Exhaustiveness is a sensitive matter in this study, given the charge of the previous chapter which asserts that the spirit of NEPA can be met only through a comprehensive impact analysis. Accordingly, our impact taxonomy avoids the parochial preoccupations discussed in earlier sections of this chapter. It seeks maximum scope by retaining the OCE Regulation's integral treatment of economic and environmental effects, by interpreting "environmental" in broadest terms of all activity systems affected

by modifications to the river basin system (per the OCE regulation and the Thomas and Schofer work), and by incorporating Wach's notion of third-order institutional impacts.

As for the "mutually exclusive" concern, although our impact taxonomy has minor ambiguities it avoids the major redundancies encountered in the water-resources literature and in Wach's construct. The water-resources literature confuses the distinction between indirect primary benefits and secondary benefits in its penchant for differentiating between numbers which belong or do not belong in benefit-cost calculations. Given our more tempered attitude toward such calculations, our taxonomy simply separates indirect from direct effects and distinguishes between technological and pecuniary economic externalities. As for Wach's construct, its dichotomy between performance outputs and concomitant outputs seems highly redundant to the direct vs. indirect distruction. Given the position in the previous chapter which deemphasizes the usual preoccupation with "intended outputs" or objectives, our taxonomy abandons any differentiation between performance and concomitant effects.

Impact mechanisms. The impact taxonomy deliberately avoids classifying project effects in terms of their appropriateness to benefit-cost calculations, dwelling instead on "how impacts happen." For this purpose, impact mechanisms are defined in terms of three factors: (a) the broad character of the "source" of causative role of the project (i.e., production-related vs. consumption-related); (b) the distinction between immediate

("direct") effects, indirect effects or externalities, and long-term institutional effects; and (c) for indirect effects, the identification of the particular activity system affected.

The dichotomy regarding impact source reflects the desirability of distinguishing, for purposes of organized technical analysis, between input-related and output-related effects. However, that distinction is redefined in more substantive terms of project "production" and "consumption" processes. This preferred dichotomy stems from the classical articulation of motives for government intervention within welfare economics (Dorfman, 1965; McKean, 1968), i.e., "production conditions" and "consumption conditions." Production-related impacts embrace those effects associated directly or indirectly with factor commitments to project installation. Consumption-related impacts refer to effects associated directly or indirectly with the performance levels of the project's purposeful outputs, and may be classified in terms of the various beneficial uses for which the project is designed. This differentiation is particularly useful to environmental impact analysis since, in general, production-related impacts are "irreversible" upon completion of project installation whereas the magnitude of consumption-related impacts may be controlled somewhat by project operation and management.

The order dimension which separates direct, indirect and long-run institutional impacts implies a distinction as to the "medium" of impact

linkages. Direct or first-order impacts accrue by way of immediate interactions of project facilities with factor sources and output users. Indirect or second-order impacts represent technological externalities (or, in the case of indirect economic effects, perhaps pecuniary externalities) resulting from interdependencies between those factor sources and/or purposeful outputs and the various activity systems in the river basin's "environment." Technological externalities occur through some form of physical medium, whereas pecuniary economic externalities occur through some form of market medium. Third-order institutional impacts occur by virtue of broader political and cultural attitudes, particularly toward the role and style of government, which may be reinforced or altered by the project and/or the project evaluation process.*

Further insight into impact mechanisms is provided by separating indirect effects in terms of the economic, physical, social, and political activity systems affected by modifications to the river basin. These categories distinguish between various behavioral units in the region, including firms, organic and man-made elements of the physical environment, households, and governmental units, respectively. Further classifications within these activity systems are provided and utilized in various chapters throughout this report, including industrial (SIC) sectors, types of physical resources,* income or occupation strata, and jurisdictional level, respectively,

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*As such, third-order impacts are relatively independent of the production-related vs. consumption-related distinction.

**The subclassification of impacts upon the physical environment extracts elements of the USGS matrix discussed earlier.

as suggested in Table 2-3-4. Note that all information of relevance to monetary benefit-cost calculations is covered by the "direct" and "technological economic" columns.

Transformability to incidence-based structure. Because the main concern underlying this mechanism-based taxonomy is to facilitate the execution, comprehension and interpretation of technical analysis, it is not appropriate for eventual presentation within a participatory evaluation forum. Its language and concepts are too technical for ready comprehension by non-professional participants; hence some kind of transformation is desired to translate the results of such impact analyses into a taxonomical arrangement which would be more meaningful within such a forum. While the following section elaborates on an appropriate, "incidence-based" scheme, it might be noted here that this concern for transformability is reflected in the aforementioned definition of activity systems and their corresponding behavioral units. For example, any entries for "indirect, technological, economic impacts upon the agricultural sector" within the mechanism-based paradigm can be included within the "farmers" interest group of the incidence-based paradigm.

Before proceeding with the definition of that paradigm, the matter of spatial stratification merits some attention here since it carries as much relevance to technical impact analysis as to participatory evaluation. The literature on water-resources project evaluation makes a strong point

regarding the need to distinguish between national and local effects in benefit-cost calculations, understandably cautioning, e.g., against counting local gains which are offset by corresponding losses to the rest of the nation. This study fully respects that point and implements it within the constraints of available data. Throughout the entire impact analysis an account of spatial incidence is maintained wherever possible, not only to guard against overstatements of beneficial or adverse effects but also to afford some insight into distributional considerations. The taxonomical paradigm defined in this section is intended to represent impacts upon the region surrounding the reservoir site, in net terms which therefore represent the national picture as well. Specific definitions of spatial areas for these purposes vary with different impacts and, rather than forcing inflexibly a uniform definition of geographic incidence strata throughout the analysis, these matters are clarified on a more ad hoc basis (see Appendix 6).

As presented here, this overall framework for identifying and classifying impacts stands as an idealized, mechanism-based paradigm. Notwithstanding the ambitious empirical efforts documented throughout this report, prevailing data constraints preclude its complete implementation. Again, illustrative application of the paradigm to particular project alternatives for the Skunk River situation is discussed in Appendix 6.

An Incidence-Based Taxonomical Paradigm for Participatory Project Evaluation

The previous section emphasizes reference to impact mechanisms as a taxonomical aid to organized technical analysis. However, for evaluation purposes this technical taxonomy must be transformed into terms which are more easily understood by various interest groups. Whereas the Corps has been concerned in the past primarily with traditional benefit-cost calculations ultimately for accountability to Congress, the pressures for more participatory process now call for explicit accountability to the general public. Accordingly, information on project impacts must be transformed into a classification which highlights the incidence of those impacts upon various potential interest groups.

Given adequate technical analysis, the transformation of impact information into an incidence-based classification for effective participatory evaluation is largely a matter of information display. Particular interest groups may be identified from past records of controversy over the Ames Reservoir and similar projects and from intuition gained by the technical analysis. At this level of public participation, moreover, a preoccupation with assigning every impact measure to one or another project objective(s) is not especially important:

> The traditional view that benefits and costs have meaning only in relation to a specified objective is perhaps best replaced by the notion that benefits and costs have meaning only in relation to specified individuals who perceive such impacts. Obviously it is impossible to be concerned with "benefits and costs" to each individual so the

problem can be altered slightly to discuss individuals in their multiple roles as taxpayers, recreationists, labor suppliers, entrepreneurs, consumers, etc. When considering location-specific impacts -- say within a project region -- it is useful to articulate project impacts by specific groups upon which these effects impinge. Hence, the information-generating system of accounts discussed above merely provides the mechanism or framework wherein specific project impacts to specific groups of individuals in specific locations may be systematically ascertained. (Bromley, et al., 1971, p. 34)

Based on available documentation of past public hearings, the experience of several case studies conducted by the University of Wisconsin (see Bromley, et al., 1971) and staff discussions, the incidence-based tableau depicted in Table 2-3-5 was adopted for this study. This tableau identifies, without any notions whatsoever of relative importance, six particular interest groups: agricultural interests, recreational interests, environmentalists, quarry operators, land developers, and governmental units. Information on all relevant impacts, within the constraints of the study's resources, should be entered within these respective incidence groupings for each of the alternatives considered. Such impact information may range in precision from quantitative monetary estimates to qualitative verbal statements. Also, for impacts such as landscape effects it would be advisable to supplement this tabular presentation with illustrative sketches. Also, specification of likely temporal and spatial incidence might be included where enlightening.

In general, not all interests may be anticipated; however, so long as the technical impact analysis itself is sufficiently thorough the emergence

Table 2-3-5. Incidence-Based Impact Taxonomy for the Ames Reservoir Environmental Review Study

PROJECT ALTERNATIVES	AGRICULTURE INTERESTS	RECREATION INTERESTS		ENVIRONMENTAL INTERESTS	MINING INTERESTS	REAL ESTATE INTERESTS	GOVERNMENTAL INTERESTS		RESIDENTS INTERESTS
		water	land				state	local	

of unanticipated interest groups within a participatory evaluation forum can be accommodated by preparing additional columns in such a matrix. Specific illustrations of these concepts for the Skunk River situation are presented in Appendix 6. In any such applications, the overriding point to bear in mind is expressed well by the Wisconsin document:

> It should be emphasized that these are intended to be merely indicative of the types of informational displays which could serve the project planning and evaluation process far better than it is now served. Field level planners should not become preoccupied with a single ratio of monetary benefits and costs. The notion of an impact matrix places the emphasis where it rightly belongs in the early stages of such complex deliberations. Here, the full range of impacts which attend all water resource projects are illustrated to <u>facilitate</u> public participation, rather than being hidden in a gross ratio. To those who would argue that the decision process then becomes very involved we can only reply that our point has been made; there are no simple or uncomplex decisions in the realm of public policy.

Summary

This chapter has addressed the overall problem of organizing the analysis of project impacts in a manner which transcends traditional economic perspectives and eventually facilitates a participatory evaluation process. The basic premise throughout is that the Corps is accountable not only to established channels of project justification, but also to the concerned public with its particular composition of interest groups.

Given the complexity introduced by the multi-objective context of the Skunk River situation, a deliberate organization of potential impacts

is essential to methodical technical analysis. This organization is provided by a flexible taxonomy based primarily on impact mechanisms or linkages. This chapter has reviewed the respective taxonomical structures found within traditional literature on economic analysis of water-resources projects, within recent literature an environmental impact assessment, and within relevant literature in companion planning disciplines (notably urban transportation). Various elements of these structures then were synthesized into a mechanism-based impact taxonomy for this study. The core of that taxonomy is a master cross-classification involving the dimensions of impact "source" and "order," which is amplified in terms of economic, social and environmental categories and subclassifications thereof.

The latter concern of the chapter provides for transformation of impact information from the mechanism-based taxonomy to an incidence-based classification, for display within a participatory evaluation forum. Emphasis is shifted away from preoccupations with technical project objectives, and toward the accommodation of potential interest groups. Given an adequate impact analysis in terms of the mechanism-based paradigm, information on incidence patterns may be generated as a direct response to the emergence of any unanticipated interest groups.

The overriding message throughout the chapter is that strictly economic calculations are no longer sufficient for comprehensive project evaluation. The conventional notion of "prices" must be extended to the generalized concept of "tradeoffs," which holds for all types of incommensurate

impacts. However, this position hardly denies the value of conducting benefit-cost calculations within this broader context since, if performed diligently, at least one can collapse the vector of economic impacts into figures-of-merit which may enhance the manageability of the entire project evaluation process.

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AMES RESERVOIR ENVIRONMENTAL STUDY

Appendix 2. Economic and Social Impact

Chapter 4

PARAMETER VALUES FOR BENEFIT-COST ANALYSIS

Contribution to the
Ames Reservoir Environmental Resources Review Study

Sponsored by
US Army Corps of Engineers Contract DACW25-72-0033

by

Daniel Bromley
Joseph S. Drake

1973

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Chapter 4

PARAMETER VALUES FOR BENEFIT-COST ANALYSIS

Daniel Bromley* and Joseph S. Drake

Introduction

As discussed in chapter I, the entire problem of project evaluation involves three distinct elements: (i) identification and classification of relevant impacts; (ii) measurement of those impacts for each alternative; and (iii) the valuation or "weighting" of those impacts. The first and third elements stand independent of particular alternatives, in the sense that the relevance and relative importance of various impacts would be the same for each alternative that receives consideration. Therefore these elements are addressed in this Appendix 2, whereas the second element is considered, for various impacts and specific alternatives, throughout this entire report. Again, Appendix 6 synthesizes all of these elements for purposes of integrated decision-making.

Having dealt with the matter of identifying and classifying relevant impacts in the previous chapter, the discussion now turns to the determination of quantitative "weights" for a subset, at least, of those impacts. This discussion acknowledges the continuing controversy among technical planners over such practices and, for the reasons cited in the next section, takes a position which supports the judicious use of dollar-valued weights

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for direct and indirect economic impacts. This chapter focuses on parameter values for direct economic effects, whereas the following chapter considers such values for indirect economic effects. Any further consideration of non-economic impacts is deferred until Part II of this appendix.

Parameter values pertaining to direct economic effects include dollar-valued weights for all avowed purposed of a given project. In the case of the Ames Reservoir, these purposes included flood protection, recreation, water supply, water quality, and fish and wildlife enhancement. With some reservation (see succeeding sections), it is assumed that the variety of impacts embraced by each of these beneficial uses are sufficiently economic in character to warrant eventual conversion into monetary units. Furthermore, another key parameter is the discount rate which, in effect, accounts for incommensurateness between different time periods. All of these valuation parameters are documented herein, with the intention of using them in later benefit-cost calculations (see chapter 6).

To wit, this chapter is organized as follows. The next section presents a general overview of the valuation problem and its central points of controversy. The subsequent three sections document the values chosen for weighting, respectively, impacts relating to flood protection, recreation, and the other beneficial uses. Then the matter of determining an appropriate discount rate is addressed, followed by summary comments. Parameter values pertaining to direct project costs are discussed in chapter 2 of Appendix 6.

The Valuation Problem: A General Overview

The determination of relative weights for various incommensurate impacts of public projects involves a virtual battery of salient technical and institutional issues. Basic principles of decision theory and welfare economics, broadly interpreted, provide a robust conceptual framework for the problem. However, total implementation of that framework is fraught with severe difficulties which leave much latitude for interpretation.

So long as one can accept such classical assumptions as collective interest maximization, transitivity, and sufficient information, theoretical precepts are not especially bewildering. At this level project evaluation takes on the complexion of a constrained extremum problem, wherein all relevant criteria may be construed as variable elements within a collective objective function (or "social welfare function") and/or within various constraints which distinguish feasible from infeasible alternatives. Symbolically, this characterization may be expressed as follows:

$$\underset{x_i}{\text{Maximize}} \quad \sum_j a_j \, y_j \, (x_i) \quad - \quad \sum_k b_k \, z_k \, (x_i) \tag{1}$$

subject to

$$x_i \gtreqless c_i \tag{2}$$

$$y_j \gtreqless d_j \tag{3}$$

$$z_k \gtreqless e_k \tag{4}$$

$$\sum_i \alpha_i x_i + \sum_j \beta_j y_j(x_i) + \sum_k \gamma_k z_k(x_i) \gtrless \delta \qquad (5)$$

where x_i represent all design variables which define any particular alternative (e.g., reservoir pool level), y_i denote all impact measures of positive utility (e.g., reductions in downstream flood damages), and z_k denote all impact measures of negative utility (e.g., project cost and environmental effects of upstream inundation). Relationships (2) through (4) constrain the design variables (e.g., through physical, technological or budgetary restrictions), the benefit variables (e.g., a minimum desired level of flood protection), and the cost or disbenefit variables (e.g., scarcity of factor inputs or standards for environmental quality), respectively.

Relationships (1) and (5) both embody essential tradeoffs. The constraint set defined by relationship (5) accounts for phenomenological interactions between all variables (e.g., losses in recreation usage which correspond to gains in flood protection, by virtue of implied fluctuations in pool level). Of primary interest to this discussion is relationship (1), the objective function, which involves tradeoffs which ultimately are value judgments as to the relative worth of each impact variable. The linear-combination formulation assumes that no project impacts will be so intense as to affect the values of the relative weights (a_j, b_k). However, as a theoretical construct it does not necessarily assume that those values are always specifiable in explicit and objective terms; determination of those values, for example, may be entrusted to pluralistic political mechanisms.

The units of the objective function, in broadest interpretation, may be "social utiles" rather than dollars.

The basis for attempting to assign values to the output of public water resource projects is found in the famous statement of the Flood Control Act of 1936 where it is asserted that a project should be considered justified if: "...the benefits to whomsoever they may accrue are in excess of the estimated costs (Flood Control Act, 1936)." Over time this has been interpreted as economic benefits and costs, with the Office of Management and Budget (formerly Bureau of the Budget) playing a significant role in this process. By focusing on economic benefits and costs, it was clear that a body of theory existed which would provide the basis for further work -- that body generally being referred to as welfare economics.

While welfare economics is somewhat well-developed conceptually, its operational aspects have drawn a rather wide range of interpretation and criticism. For problems in which all relevant impacts are clearly economic in character, for which reasonably competitive markets exist, it is generally accepted that those market prices constitute legitimate "weights." However, aside from such technological conditions of production as excessive capital thresholds and decreasing-cost structures, much of public investment is prompted by the absence of adequate market definition. Were such markets definable within the private sector, as the argument goes, there might be no reason for government intervention in the first place. This

argument typically cites the role of collective goods, and other forms of externalities, which do not afford a revenue stream to the private enterpreneur.* Such circumstances preclude straightforward reference to market prices, and must rely instead on approximative interpretations.

This problem has catalyzed a sizeable literature among economists relating to project evaluation in all types of public investment. Alternative methodologies range from recourse to "near-market" situations and alternative-cost determinations, to cumbersome experiments in utility measurement and even "administrative fiat." Elaboration of these valuation techniques is not necessary here; later sections on particular beneficial uses provide further discussion where relevant.

The basic point is that the employment of any such techniques must be executed judiciously and with explicit awareness of potentially biasing assumptions. Benefit-cost calculations constantly are criticized for forcing strict economic perspectives upon essentially non-economic impacts (certain aspects of recreation benefits are a particular case in point), for the sake of parsimony and because those calculations are "by the book." These criticisms become rather persuasive in cases where significant distributional insights are washed away by use of an aggregate and impersonal benefit-cost ratio. Moreover, it may be argued with some faith that the

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*More precisely, the costs of instrumenting an appropriate pricing mechanism (e.g., as through barrier erection) exceed the likely revenue stream such instrumentation is expected to produce.

appeal of such overall dollar indices takes attention away from less simply articulated impacts of a non-economic, often intangible, nature.

Federal water resource agencies have come to occupy an unenviable position for several reasons. On the one hand they are directed by the Office of Management and Budget to employ strict economic logic, without the empirical basis for such analyses. On the other hand, they are under pressure from legislators and lobbyists to do specific jobs for certain congressional districts. And, amidst all of this, they are repeatedly attacked by economists and planners for practically everything they do.

The position of this study vis-à-vis such criticism is that monetary benefit-cost calculations have their place in project analysis, but must be cast into proper perspective vis-à-vis other relevant impacts. In multi-objective contexts, or in any context which involves as complex a vector of impacts as this study involves, the judicious use of any scalar reduction technique can facilitate decision-making. To some extent, criticism has been misdirected toward these techniques per se rather than to their sometimes indiscriminant use.

Accordingly, this study utilizes dollar weights for selected impacts relating to the multi-purpose economic objective. However, other impacts which pertain to the environmental objective are not forced into monetary terms. It is recognized that principles of remedial cost, in theory, may be exercised to translate environmental impacts into dollar terms, for those

cases in which a restoration standard can be defined (the concept of "shadow prices" in mathematical programming theory speaks directly to this point). However, the operational state-of-the-art is not sufficiently developed to implement this methodology without risking considerable distortion.

Therefore the study is more preoccupied with developing reliable estimates of relevant impact measures "in the raw," and purports only to present both monetary and non-monetary measures with a minimum of internal value judgment. Notwithstanding the judicious conversion of beneficial-use impacts into dollar units, the overall objective function -- be it implicit -- must indeed be construed in more transcendent terms (e.g., social utiles). The point is that the determination of ultimate value judgments for all relevant impacts must be left to political mechanisms, even if such mechanisms are so limited as to include only a public hearing on the environmental impact statement.

In this spirit, as discussed in chapter 3, technical analysis should concentrate its energies on determining reliable estimates of impact intensities and, data permitting, the incidence patterns of those impacts. Value judgments on these distributional patterns especially must be entrusted to appropriate political mechanisms, with one exception. The incidence of impacts with respect to different time periods may legitimately be collapsed into scalar terms by means of an appropriate discount rate. However, even the selection of a value for this parameter is not exclusively a technical

matter. In this case, and for other parameters wherever possible, selective use of sensitivity analysis should be considered so as to provide the decision-making forum an opportunity to gauge the effects of such technical assumptions.

Given this position, the following discussion addresses various parameters in turn, including appropriate weights for selected impacts relating to flood protection, recreation and other beneficial uses, and the discount rate. Each section outlines what appears to be the conventional wisdom in these general dimensions of output from public water resource projects. It should be kept in mind that professional opinion in these areas is not at all undivided.

Flood Control Impacts

The literature on benefit-cost analysis is replete with discussions of technical methodology for computing flood-control benefits, and of the various ways that flooding is related to the computation of damages. Rather than engaging in a repetition of such conventional discussion, this section focuses on the different types of benefits alleged to arise from the provision of flood protection. Basically, these benefits fall into four categories: (1) reduction in crop damage due to flooding; (2) reduction of general property damage from flooding; (3) reduction of indirect production losses from flooding; and (4) improvements in the productivity of land and property in the floodplain. Each is given brief elaboration in the first subsection below, followed by elaboration on appropriate prices for weighting reductions in raw crop damage.

Types of Flood-Control Benefits

Reduction in crop damage from flooding. Here, a rational farmer would be willing to pay up to an amount equal to the expected value of his annual losses for the good fortune of not being flooded. Losses occur on both sides of the ledger -- crops are destroyed or damaged, and production costs are increased. To determine precisely the extent of "benefits" in this manner, then, farm budget studies would be necessary to determine net revenues with and without certain magnitudes of flooding. The difference in this figure provides a point estimate of flood control benefits from the prevention of damage to crops.

Here, the prices used and the yields assumed are to be those expected to prevail at the time costs are incurred and benefits accrued. Estimates of benefits and deferred costs should be made on the basis of "projected normal price relationships expected with a stabilized general price level and under relatively full employment conditions for the economy. Pending development of mutually acceptable long-term price projections of this type, normalized current price relationships may be used in estimating deferred project effects (Water Resources Council, 1962, p. 12)." Additionally, where there is a limited foreseeable need or demand for the products or services of the project, "...appropriate price adjustments should be made." Elaboration on crop price determinations is presented in the subsequent subsection.

Reduction of property damage from flooding. The second general category is concerned with the damage to property other than crop land. Here no production costs are involved, nor are there foregone revenues from the sale of a commodity. Instead, benefits are derived from estimates of the present value of expected property damage (annually) both with and without a flood. That is, it is the difference in the costs of restoring the property to its natural condition prior to a flood without a flood-control project, minus the costs of restoring the property to its natural condition prior to a flood with a flood-control project. The kind of property damage here considered is buildings, equipment, and general farm machinery. For urban flood damage, homes and businesses would be included. Elaboration on such property damages is given in Appendix 4 (also, see Part II of this appendix for considerations of upstream property damages).

Reduction of indirect production losses from flooding. This category, though possibly important, presents significant empirical problems in measurement. Nonetheless, it is conceptually rather straightforward. There are three possible cases which merit consideration as summarized by Haveman (1972). The first case is where a firm which comprises the only "local" supply of a commodity is destroyed -- or its production is disrupted -- by a flood. In this case, those firms linked to this firm on the input side (that is, it provides an input to them) experience economic hardship until the firm in question is able to resume production. An example of this in the Ames

Reservoir situation would be -- perhaps -- a feed milling operation located in the floodplain that provided the primary means of business for a trucking firm(s) in the general area. With the milling operation disrupted, the primary source of input (feed) for the trucking firm(s) is not available and economic losses would occur.

The second situation arises from the direct loss in productive capacity of a firm located in the floodplain and this is where labor and capital are forced to lie idle as a result of a flood. Here, the wage loss represents a real economic hardship, as does any other indirect reduction in the smooth functioning of the economy in the absence of a flood.

The third situation is that where a flood disrupts normal life such that the demand for particular goods or services is curtailed to the extent that certain businesses -- not affected directly by the flood -- experience economic hardship. In the Ames Reservoir situation it might be that the demand for certain commodities declines considerably and some businesses in Ames are adversely affected.

Under most practical circumstances, of course, it is not feasible to engage in as detailed an analysis as thse situations imply. Instead of identifying individual business establishments, which usually is precluded by data limitations, a more feasible alternative is to consider inter-industry linkages in more aggregate terms such as input-output analysis.* Chapter 5 of this appendix elaborates on such considerations.

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*A much cruder approach would be to use a set of arbitrary factors inferred from other similar projects.

Improvements in productivity of land and property in the floodplain. This area comprises the final category of flood-control benefits, and also the most controversial. Benefits arise here because the reduced incidence of flooding permits entrepreneurs to convert land from low-valued to high-valued uses. Examples would be the conversion from pasture to cultivated crops, or, from pasture to industrial or residential use. The controversy arises because of the ultimate circularity this valuation change introduces into the flood-control issue. As seen in categories 1 and 2 above, benefits from flood control are derived from the value of production and property that can be saved from flooding. Once flood protection is provided, and other (higher-valued) uses become feasible in the floodplain, the potential for flood damage has increased. After all, dams don't prevent floods, they merely reduce the frequency of small floods. Hence, the potential for damage from the major storm is increased by most flood control projects since little effort is expended to control settlement in the floodplain following the project. Thus, it is not very long until another flood-control structure is "justified" in order to protect the valuable land and buildings. Again, elaboration on these effects is presented in Appendix 4.

Determination of Crop Prices

Reduction in crop damage from flooding may be determined by superposing appropriate hydrological analysis upon the projected pattern of downstream agricultural production under "with" and "without" conditions.

Given deliberate assumptions regarding hydrological parameters and prospective crop yields, such an analysis will produce estimates of likely reductions in crop output losses. Although the security associated with increased flood protection is essentially non-exclusionary, these economic benefits to the agricultural sector are clearly marketable. Hence crop prices may be defined as "weights" which permit the translation of such benefits into monetary terms.

One major issue which hovers over such a procedure relates to those commodities whose prices are supported by governmental action. The issue revolves around the extent to which actual farm prices reflect the value of a given commodity to society. In Figure 2-4-1 the curve S_I depicts the supply of a particular commodity in Iowa at a particular point in time. S_{RR} represents the supply of that commodity for the rest of the "region" and S_{RN} represents the supply for the rest of the nation. S_S is the sum of these three supplies -- and represents the total national supply of a commodity.

Given that the demand at the national level is D, the equilibrium price in the absence of government programs would be p_e, and Q_e would be the equilibrium quantity. However, because of government programs, there is a price at the national level of p_s. At this higher price producers are willing to supply Q_S, but buyers are interested in only Q_D. The difference must be handled in some way; usually it is stored in anticipation of domestic shortages, shortages in the world market, or extraordinary deals such as the recent one with the Soviet Union for wheat.

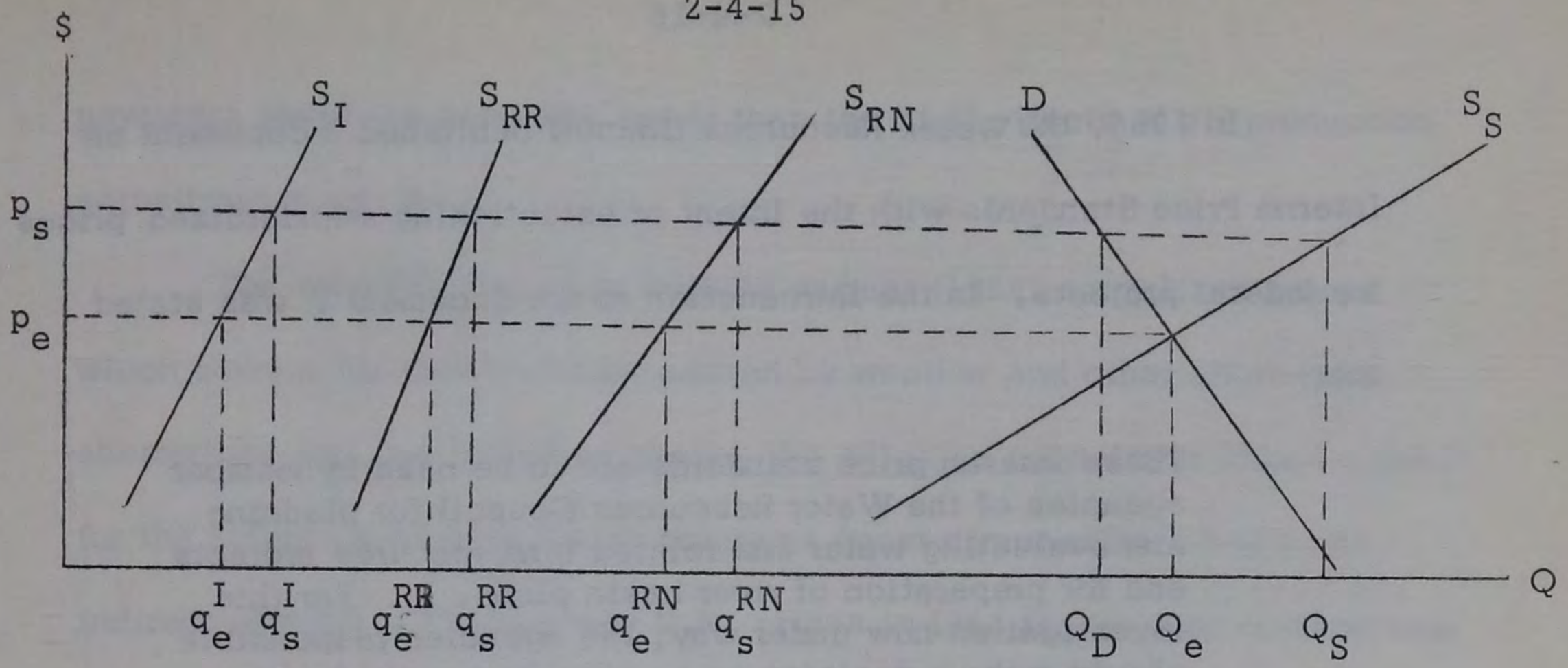

Figure 2-4-1

Another issue of some concern relates to the matter of projecting future prices. In this regard the state-of-the-art still stands substantially in respect of Senate Document 97 (Water Resources Council, 1962, p. 12):

> The prices used for project evaluation should reflect the exchange values expected to prevail at the time costs are incurred and benefits accrue. Estimates of initial project costs should be based on price relationships prevailing at the time of analysis. Estimates of benefits and deferred costs should be made on the basis of projected normal price relationships expected with a stabilized general price level and under relatively full employment conditions for the economy. Pending development of mutually acceptable long-term price projections of this type, normalized current price relationships may be used in estimating deferred project effects. When benefits are measured in terms of the cost of an alternative, the prices should be those expected to prevail at the time such costs would have been incurred. Whenever project production is expected to influence prices significantly the use of a price about midway between those expected with and without the project may be justified to reflect the public values involved. Appropriate price adjustments should be made where there is a limited foreseeable need or demand for the products or services to be provided by the project.

In 1966, the Water Resources Council published a document on Interim Price Standards with the intent of establishing standardized prices for federal projects. In the introduction to the document it was stated that:

> These interim price standards are to be used by member agencies of the Water Resources Council for planning and evaluating water and related land resource projects and for preparation of river basin plans. . . For this investigation now under way, the agencies responsible should make a decision as to whether to use the new price standards or to continue with existing procedures.

In as much as the Ames Reservoir Project was authorized in October of 1965, it might seem unreasonable to expect that post-authorization adjustments in prices should have been carried out. Nonetheless, other post-authorization changes were made in 1966 increasing the benefit-cost ratio from 1.4:1 to 1.7:1, and other changes were made in 1968. Hence, a reassessment of crop damage benefits using corrected prices would seem to be fully consistent with other post-authorization changes.

The prices depicted in the WRC publication represent

> "normalized current prices as adjusted where appropriate to minimize the influence of Government price support programs. Normalized current prices are defined as observed values for the last year of record derived from the computations of graphic readings of mathematically fitted (nonlinear) long-term trend lines (Interim Price Standards, 1966, p.2)."

To the Council, normalization consists of removing the influence of weather and other short-term abnormalities. The notion of "adjusted normalized" prices supposedly minimizes the influence of government programs. This modification accounts for most of the direct price support effects or

payments under the programs rather than the "full effects of all production adjustment programs."

The Water Council has derived current (1964) normalized prices which correct for abnormalities caused by weather and other short-term aberrations and, as indicated above, the adjusted normalized prices correct for the influence of government programs (most direct effects and some indirect effects). The average U.S. prices in 1964 for the four commodities of relevance to this study are listed in Table 2-4-1, along with the current normalized price, and the adjusted normalized price.

A more recent estimate of proper prices may be determined by correcting 1970 local (Iowa) prices for government supports, utilizing 1964 data on local-national price relationships for prorating purposes.

From 1964 data, the ratio of state to U.S. current (normalized) prices for each of the four commodities is as follows:

corn	0.96
oats	0.97
hay	0.81
soybeans	0.99

These ratios imply that, in 1964, adjusted normalized prices in the State of Iowa would have been:

corn	1.05(.96) = 1.01
oats	.60(.97) = .58
hay	22.00(.81) = 17.82
soybeans	2.45(.99) = 2.42

Table 2-4-2 lists the 1970 observed Iowa prices, the estimated national prices from the above indices, the observed national prices, and the adjusted normalized national prices from the indices.

Table 2-4-1. Average 1964 U.S. Crop Prices Determined by Water Resources Cou
(1966)

	1964 price	current normalized	adjusted normalized
corn/bu.	$1.14	$1.09	$1.05
oats/bu.	.62	.62	.60
hay/ton	23.50	22.00	22.00
soybeans/bu.	2.62	2.45	2.45

Table 2-4-2. 1970 Price Estimates

	Price-Observed Iowa (1970)	Price Estimated National (1970)	Price-Observed National (1970)	Price-Adjusted Normalized from ou Indices National (1970)
corn	1.31	1.31/(.96) = 1.36	1.36	1.36(.92) = 1.25
oats	.64	.64/(.97) = .66	.63	.66(.97) = .64
hay	20.00	20.00/(.81) =24.69	26.00	24.69(.94) =23.21
soybeans	2.80	2.80/(.99) = 2.83	2.84	2.83(.94) = 2.68

The factor used to adjust the estimated national prices for 1970 (in column 2) is taken from the Water Council's document as the ratio of 1964 national prices which have been adjusted and normalized to the observed 1964 prices. In other words, corn -- the most heavily subsidized crop -- has an adjusted value of only 92 percent of its observed price, based on 1964 calculations. Hence the last column above could be viewed as the "corrected" value of the commodities, starting from their observed Iowa price in 1970. The observed national prices could have been adjusted directly (column 3); but it was preferred to start from Iowa prices, convert them to national prices (column 2), and then adjust them. Oats and hay are the only two commodities for which there would be much difference.

These corrected national prices will differ somewhat from the Iowa price depending on several factors -- including the extent to which that particular commodity is supported via government programs. The above prices will constitute the basis for a reassessment of the crop-damage benefits from the Ames Reservoir Project.

Recreation Impacts

The weighting of recreation benefits in monetary terms draws more criticism than other beneficial uses. Although recreation technically is a separately marketable (as opposed to a "collective") good, in many instances the vast proportion of such activity takes place either without

monetary charges or through pricing instruments which depart substantially from ideal market conditions. In other instances, though the commodity may be collective in kind (e.g., various forms of entertainment), a relatively indiscriminant pricing mechanism may be administered through provision of admission barriers. Beyond these imperfections in existing "markets," use of dollar valuation also receives criticism in the sense that the intangible aesthetic rewards of recreation experiences are not adequately considered. Because of these issues the area of recreation evaluation has received an extraordinary amount of research resources over the years; yet the discipline remains far from unanimity as to what constitutes appropriate strategy.

According to Senate Document 97 (Supplement No. 1), recreation benefits are defined to include:

> The value as a result of the project of net increases in the quantity and quality of boating, swimming, camping, picnicking, winter sports, hiking, horseback riding, sightseeing, and similar outdoor activities... In the general absence of market prices, values for specific recreational activities may be derived or estimated on the basis of a simulated market giving weight to all pertinent considerations, including charges that recreationists should be willing to pay and to any actual charges being paid by users for comparable opportunities at other installations or on the basis of justifiable alternative costs. Benefits also include the intangible values of preserving areas of unique natural beauty and scenic, historical, and scientific interest (Water Resources Council, 1962, p. 10).

Approximately 15 days after the formal approval of Senate Document 97, the President requested the Secretaries of the Army, Agriculture, the Interior, and Health, Education, and Welfare to develop specific standards for the measurement of recreation and fish and wildlife benefits. The result of this undertaking is now known as Supplement #1 to Senate Document 97 (Water Resources Council, 1964). The initial work in valuation was done by Clawson who suggested that the recreational package be divided into: (1) anticipation; (2) travel to the site; (3) actual recreation; (4) return trip; and (5) recollection. Clawson was then of the opinion that a demand schedule of the traditional nature might be derived for the third aspect of that package, and in the process one has the demand for the "site itself." Once one has a demand schedule, integrating the area under that schedule will give rise to the value of the recreational resource. The ideas of Clawson and several others writing in his wake have precipitated a considerable literature on valuing recreation facilities and some of that literature is cited at the end of this chapter.

However, Supplement #1 to Senate Document 97 is a different approach than that being advocated by Clawson, and argues for the standardized pricing (valuing) of visitor days -- with some variability for the inherent "quality" of the site. Supplement #1 is predicated upon three basic concepts. First is the definition of a "recreation day." This is considered to be a standard unit of use consisting of a visit by "one individual to a recreation

development or area for recreation purposes during any reasonable portion or all of a 24-hour period (Water Resources Council, 1964)." By way of further definition, two kinds of recreation activities are defined in Supplement #1. A "general recreation activity" is said to be those:

> ...activities attracting the majority of outdoor recreationists and which, in general, require the development and maintenance of convenient access and facilities. This category includes, but is not limited to, most warm water fishing, swimming, picnicking, hiking, sightseeing, most small game hunting, nature studies (except nature photography), tent and trailer camping, marine pier and party boat fishing, water skiing, scuba diving, motor boating, sailing, and canoeing in placid waters (Water Resources Council, 1964, p. 3).

As for the second category, "specialized recreation activities" are those:

> ...for which opportunities, in general, are limited, intensity of use is low, and which often may involve a large personal expense by the user. This category includes, but is not limited to, cold water fishing for resident and migratory species, upland bird and waterfowl hunting, specialized nature photography, big game hunting, wilderness pack trips, white water boating and canoeing, and long-range cruisers in areas of outstanding scenic environment (Water Resources Council, 1964, p. 3).

Projections of anticipated use over the life of the project are to be divided into use during initial development, and use at optimum carrying capacity. For projecting this use, there are six aspects said to be important: (1) population within the zone of project influence; (2) proximity of the project to centers of population; (3) socio-economic characteristics of the population including disposable income, age, and mobility; (4) leisure

time and recreational habits that reflect changing consumer preferences as indicated by trends in total recreation demand; (5) the recreation use potential of the project area as reflected by its ability to provide for uniqueness, diversity, and access; and (6) the availability and attractiveness of existing and potential alternative recreation opportunities.

The assignment of values to the two types of recreation days is to be within the general guidelines established by Supplement #1. For a "general recreation day," these values are to range from $0.50 to $1.50 per day. For the "specialized recreation day," the appropriate range is from $2.00 to $6.00. These values ostensibly reflect the net amount recreationists would be willing to pay for the recreation opportunity. Within the two categories, values will be selected which reflect the degree of desirability of the recreation site.

The Ames Reservoir would clearly be an example of a "general recreation experience," hence justifying a price (value) range of $0.50-$1.50 based on the guidelines established in Supplement #1 to Senate Document 97. A more recent document, Proposed Principles and Standards for Planning Water and Related Land Resources argues in favor of values ranging between $0.75 and $2.25 for general recreation sites (Water Resources Council, 1971). The Corps of Engineers, in its latest revision of the project evaluation, used a figure of $1.10 per visitor day -- a figure that seems high in terms of present standards, but about right in terms of the proposed standards.

The specific values chosen for evaluating alternative recreation uses of the Skunk River Valley resulted from considering many factors -- particularly those concerned with aesthetic attributes of the site, uniqueness, and degree of expected crowding. While additional rationale for the specific values is presented in Chapter 4 of Appendix 3, the following prices were utilized in the recreation portion of the analysis:

	Unit-day values
Alternative 1 -- Ames Reservoir as planned	$1.25
Alternative 2 -- minimum conservation pool only	$1.50
Alternative 3 -- tributary recreation lakes only	$2.00
Alternative 4 -- green-belt development	$2.00
Alternative 5 -- Ames Reservoir with minimum development	$0.75
Alternative 6 -- no reservoir or other development	$1.50

It should be noted, finally, that these values are not recommended without reservation by the study team. Use of these weights should not preclude parallel presentation of raw measures of recreation usage and character in the political forum, since the above values constitute overt value judgments as to the relative quality of recreation experiences provided by the different alternatives. Ordinarily the assignment of different impact weights for different project alternatives runs totally contrary to the very assumptions underlying the valuation element. Because of data limitations on recreation quality attributes for the different project configurations, however, the only recourse was to reflect those variations by means of judiciously selected differentials in the weightings for each alternative.

Other Beneficial-Use Impacts

Besides flood control and recreation, the proposed Ames Reservoir also involves three other beneficial uses: water supply, water quality, and fish and wildlife enhancement. As will become evident in Appendix 6, the aggregate economic value of these additional benefits -- for the alternatives examined in this study -- are substantially less than the benefits relating to flood protection and recreation. Although other appendices treat these benefits and the technical rationale for their respective valuations in detail, said rationale is summarized briefly in this section.

Water Supply Impacts

According to Senate Document 97, benefits from the provision of domestic, municipal, or industrial water supply are legitimate if the project affects the quantity, dependability, quality, and/or physical convenience of water use. It is said, correctly, that the amount water users should be willing to pay for such an improvement rather than going without should provide a reasonable estimate of the value of such project output. In practice, of course, people or municipal water districts are not quizzed concerning their willingness to pay for such outputs, and other means are sought. The most frequent technique is to resort to an estimate of the costs of providing a similar service by the most likely alternative in the absence of the project. And, in the event that such an alternative is

not available, or is not economically feasible, it is said that the benefits "...may be valued on such basis as the value of water to users or the average cost of raw water...from municipal or industrial water supply projects planned or recently constructed in the general region (Water Resources Council, 1962, p. 9)."

In this study an alternative-cost approach is utilized to determine the economic value of water supply benefits. It is assumed that a given reservoir configuration (for the range of pool levels considered in this study) will either sustain present drawdown levels of the area's shallow well system or provide a supply of water of comparable quality. The alternative used for reference, then, is the utilization of deep bedrock wells which eventually would be necessary in the absence of a reservoir. The estimated difference in construction, pumping, and treatment cost between the lower-quality bedrock groundwater and the higher-quality shallow aquifer water establishes the maximum economic benefit attributable to the reservoir.

Based on the comparative cost analysis documented in chapter 3 of Appendix 5, the following equation is used to determine the total comparative incremental cost per 1000 gallons of water (TCIC):

$$TCIC = 0.1902\ M \frac{1}{Q} \frac{1}{P} + L + S + E$$

where

M is the annual worth of the capital investment plus the annual maintenance cost in dollars per year,

Q is the pumping rate in gallons per minute,

P is the percent of the year that the well is pumped,

L is the cost of lime in dollars per 1000 gallons,

S is the cost of soda ash in dollars per 1000 gallons, and

E is the cost of the electrical power in dollars per 1000 gallons.

Tables 5-3-10 and 5-3-11 in chapter 3 of Appendix 5 list actual values for a variety of conditions, and the discussion surrounding those tables elaborates on the rationale underlying these determinations.

Water Quality Impacts

An alternative-cost approach is also used in this study to determine the monetary value of water quality benefits. This approach calculates the costs of wastewater treatment at Ames to meet State and federal water quality requirements regarding organic carbon material, ammonia nitrogen, and phosphorous. Incremental treatment strategies, for purposes of comparative cost analysis, include trickling filter, activated sludge, activated sludge plus nitrification, and the latter plus phosphorous removal. The treatment strategies selected for pairwise comparison of particular reservoirs are defined in chapter 6 of Appendix 5. The basis for the cost calculations synthesizes methodology from Smith (1968) and Eckenfelder (1972) as documented in that same chapter.

Fish and Wildlife

According to Senate Document 97, benefits from the protection or provision of fish and wildlife come from a project providing for net increases in the recreational, resource preservation, or commercial aspects of fish and wildlife. That is, "... in the absence of market prices, the value of sport fishing, hunting, and other specific recreational forms of fish and wildlife may be derived or established in the same manner as prescribed... (in the section on recreation benefits) (Water Resources Council, 1964, pp. 10-11)." There, general statements are offered about the value of a simulated market and the utilization of other analogous sites. Of all the areas of valuing project outputs, it is this area which is perhaps most susceptible to charges of sophistry. In the Ames Reservoir project, estimates were provided for the Corps by the Bureau of Sport Fisheries and Wildlife; these estimates were retained throughout the economic analysis in this study.

The Discount Rate

Because of the crucial role that the discount rate can play in the economic viability of a project, this area is very often the focus of spirited debate among those who are qualified to speak on the subject, and those qualified to speak on other subjects. Unfortunately, there is often less agreement among those "qualified" to speak, than between the

two groups. The root of much of the confusion is that either the experts fail to make explicit the assumptions necessary to reach the conclusions they reach, or they fail to draw a clear distinction between the social opportunity cost of capital and the social rate of time preference. Often, both oversights are committed simultaneously.

To determine the first of these items -- the social opportunity cost of capital -- Haveman has defined four relevant categories (1969). The first -- OC_1 -- is the observed rate of return before taxes on capital invested in private sector activities for investment purposes only. The second -- OC_2 -- is the observed average rate of return before taxes on capital invested in private business -- counting not only investment, but consumption. The third -- OC_3 -- is the risk-free interest rate, adjusted for both consumption and investment taxes. And, the last -- OC_4 -- is the effective interest rate on which consumers make savings-borrowing decisions, and the rate of return on private investments of consumers. Havemen comes out in favor of OC_4, as does the Joint Economic Committee. They favor a calculation and application of a social discount rate which is the weighted average opportunity cost of private spending which is displaced when the federal government finances its public expenditures. At the time of Haveman's study, he determined OC_4 to be slightly greater than 7.3 percent. At that time -- 1966 -- water development agencies were using a rate in the neighborhood of $3\frac{1}{2}$ percent.

The other issue mentioned above -- the distinction between the social opportunity cost of capital, and the social rate of time preference -- is very important yet one that receives little attention. Basically the issue is that society has some preference for goods and services allocated through time -- such temporal allocation being quite independent of the current cost of borrowing money, or of financing federal programs, etc. That temporal preference is referred to as the social rate of time preference. The first issue which must be addressed is: should the outputs of public sector projects be discounted back to the present at a rate similar to the social cost of capital, or at a rate similar to the social time preference? And, once that decision is reached, should all of the diverse outputs of a water resource project -- irrigated crops, water quality, recreation, etc. -- be discounted at the same rate (whatever it is), or at different rates? Economists of the "strict" school would be inclined to argue for a discount rate that is representative of the social costs of capital, and for the use of that rate throughout. This rate would be higher than one ever used in water development programs, and might approach 10 percent. Those economists who argue thusly do so for mixed reasons.

First, they might argue that way out of a strict adherence to the "market" and basic disdain for collective action. Others might argue that way, knowing full well that higher discount rates are effective ways to prevent water development agencies from allegedly destroying more rivers with their fixed water resource budget.

The other school of thought regarding interest rates is more "liberal" than the others, and would argue for: (1) one rate of interest which would reflect the social opportunity cost of capital; and (2) others which reflected the social rate of time preference for different project outputs. The first would be used to discount costs, the other rates to discount future benefits. An example of how these people would argue is that future agricultural production would be discounted at a rather high rate -- reflecting a high rate of time preference or low value of future agricultural production, while recreational sites might create benefits which are discounted at very low rates -- reflecting a low rate of time preference for such outputs (or a higher future value). The controversy is yet to be settled, with the latter school -- the liberals -- making some headway.

The Water Resources Council has recently argued that the opportunity cost of all federal investments is the real rate of return on nonfederal investments. Hence, the best estimate of the proper discount rate is the average rate of return on private investments in physical assets, including all specific taxes on capital. The Council maintains that the federal government should not displace funds in the private sector unless its return on investment is equal to or greater than the return in the private sector. They continue their "hard line" by asserting that the net benefits generated by the federal government are maximized only if the marginal rate of return on all federal activities is equal, and if that rate is equal to the rate of return on investments by other institutions in the country.

The correct rate then is the average marginal real rate of return in each part of the nonfederal sector, weighted by the proportions of investment in the respective private sectors. This position then is basically that of OC_1 above. And, the Council admits that this rate, as of 1971, was approximate 10 percent. However, the Council then goes on to argue that: "...the revealed preferences of the federal political process clearly indicate a desire to transfer income to people in specific regions by subsidizing water resource projects (Water Resources Council, 1971, p. 24167)." The Council goes on to argue:

> In the past, these subsidies have been implemented in several ways but most importantly by the use of an interest rate to evaluate these projects that is lower than that for alternative Federal and non-Federal investments. Accepting the legitimacy of the political process in determining income transfers and subsidies, the use of a low interest rate, unfortunately, is often an inefficient instrument for these purposes because it also biases the design of these projects toward those with higher near-term costs and lower near-term benefits (Water Resources Council, 1971, p. 24167).

The Council concludes that if one recognized both the objectives of subsidizing water resource projects and the objective of an efficient mix between federal and nonfederal investments, a seven percent discount rate is optimal for the next five years.

A seemingly rational approach as regards the discount rate issue would be to utilize a rate of 10 percent to discount future operation and maintenance costs, and to charge interest during construction, while using a series of rates to discount future benefits. As indicated above, flood protection for agricultural production should be discounted at a rather high rate -- say seven percent, while future recreation or water quality should be discounted at, say four percent. Preservation of fish and wildlife should be discounted -- when it is a legitimate project benefit -- at, say, two and one-half percent. As Steiner argues:

> ...the benefit-cost estimator may regard his assignment to be the design of an appropriate choice procedure for selection of projects within a well-defined area, for which he will receive a budget. Thus he needs to judge the adequacy of his measures or his models for choice only in the context of optimizing within his own budget; he can ignore the effects his choices might have on the total government budget or the tradeoffs between widely different types of programs... This means, for example, that what constitutes benefits in water resources, how such benefits should be measured, and how different timestreams should be evaluated, can be decided with reference to what is best for choosing among alternative projects in the water resources field and need not be the same as, or equivalent to, devices designed to choose between alternative forms of missiles or to evaluate a subsidy to the merchant marine or to education (Steiner, 1969, p. 71-72).

Application of these recent guidelines to the Ames Reservoir is questionable on institutional grounds, given that the project as specified by the Corps has received Congressional authorization.* The rate which was applicable when the Corps carried out its economic analysis was $3\frac{1}{4}$ percent. The Bureau of the Budget, with the approval of the President, announced adoption (on 22 December 1968) of new guidelines calling for the following rationale advanced by the Water Resources Council (1968, sec. 704.39(a)):

> The interest rate to be used in plan formulation and evaluation for discounting future benefits and computing costs, or otherwise converting benefits and costs to a common time basis, shall be based upon the average yield during the preceding fiscal year on interest-bearing marketable securities of the United States which, at the time the computation is made, have terms of 15 years or more remaining to maturity: Provided, however, that in no event shall the rate be raised or lowered more than one-quarter of one percent for any year. The average yield shall be computed as the average during the fiscal year of the daily bid prices. Where the average rate so computed is not a multiple of one-eighth of 1 percent, the rate of interest shall be the multiple of one-eighth of 1 percent nearest to such average rate.

The same document also gives specific direction for projects already authorized (sec. 704.39(d)):

> Where construction of a project has been authorized prior to the close of the second

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*As explained elsewhere in this report, the Ames Reservoir as proposed by the Corps received such authorization in connection with the route location of Interstate 35 in the vicinity of the impoundment site.

> session of the 90th Congress, and the appropriate State or local governmental agency or agencies have given prior to December 31, 1969, satisfactory assurances to pay the required non-Federal share of project costs, the discount rate to be used in the computation of benefits and costs for such project shall be the rate in effect immediately prior to the effective date of this section, and that rate shall continue to be used for such project until construction has been completed, unless the Congress otherwise decides.

The specific rate defined in that document, with BOB and Presidential approval, was 4 5/8% (sec. 704.39(e)):

> Notwithstanding the provisions of subsections (a) and (b) of this section, the discount rate to be used in plan formulation and evaluation during the remainder of the fiscal year 1969 shall be 4 5/8 percent except as provided by subsection (d) of this section.

The applicability of this 4 5/8 percent to the authorized Ames Reservoir is a point of contention within the context of this study, since there seems to be some ambiguity as to whether "satisfactory assurances" were obtained from Story County per the requirements of section 704.39(d). Specific Corps guidelines, drafted in response to the BOB release, include the following provision for such circumstances (Office of the Chief of Engineers, 1969, p. 1):

> For those active projects where the District Engineer is fully satisfied that appropriate local interests have given adequate expression of assurance that the requirements of local cooperation or of reimbursement will be met, the applicable discount rate will be $3\frac{1}{4}$ percent. This office should be notified of these projects, with copies of appropriate documents supporting the assurance, by report furnished before 28 February 1969.

If this requirement were indeed met vis-à-vis Story County, then the earlier rate of $3\frac{1}{4}$ percent would apply; otherwise 4 5/8 percent would appear to govern. The ultimate determination on this issue falls to the discretion of the District Engineer.

For the purposes of this study, the economic analysis uses a range of rates in order to portray the sensitivity of the benefit-cost calculations to interpretive technical and institutional assumptions. As discussed in chapter 3 of Appendix 6, an initial economic analysis is conducted for the Corps' original base year of 1968, incorporating selected technical corrections which the study team feels were overlooked in the Corps' original analysis. For those 1968 recalculations three rates are used: $3\frac{1}{4}$ percent (as originally applicable with "satisfactory assurances"); 4 5/8 percent (as applicable without those assurances); and 7 percent (per Water Resources Council, 1971). All other calculations, updated to 1973 terms, utilize $3\frac{1}{4}$, $5\frac{1}{2}$, and 7 percent for similar reasons (the $5\frac{1}{2}$ percent represents the currently applicable rate for FY'73, per annual increments since 1969).

In both cases the lowest rate represents applicable conditions at the time of the Corps' original economic analysis. The "middle" rate is justified not only in terms of the BOB directive, but also on the grounds that, in the period 1968-1970, this is a rate which many in the water resources field thought appropriate -- since it was closer to the real opportunity cost of capital, yet not so high as to eliminate completely the explicit

subsidy to water resource projects. The seven percent rate is justified on the grounds that it more accurately reflects current social opportunity costs of capital (which the Water Resources Council admits to being close to 10 percent), and that this is the rate which the water Resources Council has advocated in its Proposed Principles and Standards.

Summary

To recapitulate, this chapter has addressed the "valuation" element of project evaluation, and, with some qualification, has described the rationale for applying monetary weights to the direct economic impacts of alternative project configurations. Procedures for converting various purposeful benefits into dollar terms have been indicated.

Crop prices for valuing flood-control benefits were determined by reference to WRC interim price standards (adjusted normalized prices for the nation in 1964) and prorating those values forward to 1970. Different values for weighting recreation benefits were defined for different project alternatives to reflect variations in expected quality, within the overall range prescribed by Senate Document 97 for "general recreation experiences." Water supply and water quality benefits were valued according to alternative-cost concepts,* and fish and wildlife benefits were taken as originally determined the Corps by the Bureau of Sport Fisheries and Wildlife.

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*See Appendix 5 for elaboration.

Finally, technical arguments and institutional considerations for defining appropriate discount rates were reviewed. For purposes of sensitivity analysis, three different rates were advocated ($3\frac{1}{4}$, $5\frac{1}{2}$, and 7 percent), with a rate of 4 5/8 percent also being used in the recalculations of the original (1968) economic analysis. All of the parameter values resulting from these deliberations constitute inputs into the integrated benefit-cost analyses reported in Appendix 6.

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AMES RESERVOIR ENVIRONMENTAL STUDY

Appendix 2. Economic and Social Impacts

Part I -- Economic Considerations

Chapter 5

INDIRECT ECONOMIC EFFECTS

Contribution to the
Ames Reservoir Environmental Resources Review Study

Sponsored by
US Army Corps of Engineers Contract DACW25-72-0033

by

Michael P. Hailperin
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1973

CONTENTS

TABLES

Chapter 5

INDIRECT ECONOMIC EFFECTS

Michael P. Hailperin* and Joseph S. Drake

Introduction

As discussed in chapter 3 of this appendix, the literature on economic impacts of water-resources development projects distinguishes between primary (monetary) benefits and secondary (monetary) benefits. Primary benefits refer to physical linkages, either directly between a project and users of its outputs, or indirectly via technological externalities. Secondary benefits refer to indirect market linkages, or pecuniary externalities of a given project.

This chapter deals exclusively with secondary benefits. Direct primary benefits (i.e., patterns of various beneficial uses) and indirect primary benefits (e.g., reduction in production losses and land enhancement via flood control) are analyzed in various chapters throughout this report; monetary valuation thereof was addressed in the previous chapter. Hence, this chapter focuses on interindustry pecuniary linkages which the literature identifies either as "stemming-from" or "induced-by" benefits.

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*Mr. Hailperin worked as a Research Assistant on the study, and now is employed as a planner for the city of Columbus, Georgia.

Whether these secondary benefits may legitimately be included within a formal benefit-cost evaluation is a point of controversy in the literature and, indeed, in this particular study as well. The main concern here is merely to determine the rough order-of-magnitude of secondary benefits relating to the major project purpose of flood control, for distributional insights if not for project efficiency appraisals. In any event, whereas the preceding chapters have fashioned those elements of project evaluation methodology which theoretically stand independent of particular alternatives, the main concern of this chapter requires specific examination of those alternatives which provide some degree of flood protection. Again, the results of this chapter together with the provisions of preceding chapters are integrated in chapter 3 of Appendix 6.

Given this orientation, the chapter is organized as follows. The next section focuses on the basic controversy regarding the relevance of secondary benefits, and explains the position taken in this study and the corresponding implications to the scope of analysis. The third section then documents the analytical methodology which was utilized to estimate secondary benefits within that limited scope, utilizing concepts of input-output analysis and location quotients. The fourth section presents the results of the analysis in terms of selected interindustry technical coefficients and implied impacts of flood control benefits upon industrial sectors with immediate linkages to the agricultural sector. The final section summarizes the chapter.

The Secondary Benefits Controversy

Treatment of secondary benefits within the state-of-the-art in water resources development has been rather inconsistent. Earlier practice in project evaluation has employed, at least occasionally, various factors to account arbitrarily for such indirect impacts -- factors which "bump up" estimates of direct project benefits. As indicated in chapter 3 of this appendix, such practice has come under pointed criticism to the extent that it includes such secondary benefits for project justification within benefit-cost calculations.

Those criticisms are quite convincing in their argument that such inclusion of pecuniary externalities constitutes double-counting. Except under very particular conditions pertaining to potential scale economies, these externalities which ostensibly add value through interindustrial market linkages do not represent a distinct contribution to economic efficiency from the national view. They are mere transfers of economic gains, in much the same character as land-value increases associated with transportation facilities (a classical context for this point of debate).

An improvement to a transportation corridor has the immediate benefit of reducing user operating costs. In general, any increases in adjacent land values merely constitute a pecuniary reflection of those user cost savings through the workings of the land market; such increases generally are offset by relative reductions in land value elsewhere within the surrounding region.

Although those increases in adjacent land value may appear to be a real gain from a narrow perspective toward the corridor itself, a larger (and more appropriate) view would likely expose no net benefits beyond the direct savings in user costs.

The argument in the context of water-resources development is quite parallel. Take for example the provision of flood protection for agricultural activities, which is the main purpose for contemplating construction of the Ames Reservoir. Direct benefits are received by downstream farming operations in terms of reductions in crop and livestock losses. Under the "without" condition such periodic losses may affect industrial activities which supply capital inputs and process the outputs of those agricultural activities. With the added flood protection those industrial interests similarly may reflect a corresponding economic gain. However, unless those vending and purchasing industries are characterized by substantially idle capacity under the "without" condition, or if internal or external economies of scale (e.g., in overall patterns of spatial organization via reductions in transportation costs) obtain, it is likely that these indirect economic gains to the region are offset in absolute magnitude by decreases in activity elsewhere in the nation.* It may be reasonable to claim the

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*It is recognized here that certain industries which supply emergency-oriented products and services "gain" through responses to the agricultural sector in events of flooding. Partly because of the "pure pecuniary transfers" argument, but mainly because of their second-order significance, the losses which increased flood protection implies to such firms are neglected here insofar as quantitative analysis is concerned.

added stability of these interindustrial interdependencies is of some real benefit, but this consideration must be distinguished from the basic concern for economic efficiency.

In reference to the aforementioned exceptional circumstances regarding idle capacity and scale economies, it seems unwarranted to assume these considerations are not negligible in the Ames Reservoir context. Substantial unemployment or underemployment of factor resources may suggest real gains to the nation as well as the region yet, as discussed in chapter 1, the relevance of the regional development objective which relates to this reasoning is minimal in Iowa. As for potential economies of spatial reorganization, the proposed project (and all alternatives considered in this study) seems insufficiently large in its flood control function to promote any significant relocation of agriculture-related industry in this regard (again, in comparison to patterns which might be extrapolated under the "without" condition).

The upshot of this discussion is that, according to strict interpretation of the national income objective and analytical accounting thereof, secondary benefits are redundant to direct project benefits and therefore should not be included within formal benefit-cost calculations. They represent merely pecuniary transfers and, from that traditional perspective toward project evaluation, are rightly ignored. However, as underscored in chapter 3, the perspective of this study deliberately transcends this traditional view.

Specifically, the study attempts to forge a less formal but more comprehensive framework of project evaluation which accommodates meaningful participation by various interest groups. This aim suggests that secondary benefits -- where deemed "significant" on technical grounds -- rightly belong in the assembly of information which is provided to such a participatory public forum, out of a basic concern for patterns of impact incidence. Notwithstanding the exacting and rigorous efficiency criteria of welfare economists, the debate over double-counting of pecuniary externalities becomes moot within this broader context. Interested representatives of the agricultural processing industry cannot be told that their fervor is redundant to that of the farming constituency itself. Rather, it must be presumed that all interested parties want to know what is going to happen to them.

Although this position argues for provision of information on secondary benefits, it does not do so indiscriminately. On paper, the analysis of "stemming-from" and "induced-by" impacts of agricultural flood protection could be carried ad infinitum, since the complexity of interindustry linkages suggests some "rippling" effect throughout the regional economy. Given that the motivation for analyzing secondary benefits relates purely to the concern with incidence, rigorous economic criteria of the regional scientist admittedly are compromised. As a practical matter, some arbitrary judgment regarding the significance of such interindustry linkages is advisable.

For example, interindustrial interdependencies eventually would translate the impacts of agricultural flood protection upon the agricultural processing industry -- through a series of indirect as well as direct linkages -- into impacts upon the construction and mining industries. Yet contractors and mining operators are hardly likely to coalesce significant political interest in the Ames Reservoir project on the grounds of such interindustrial relationships. Indeed, analysis of secondary benefits for the reasons cited above may not even be warranted at all unless, as in the Ames Reservoir situation, major supplying and processing sectors stand out as having strong interdependencies with the immediate users of project outputs. The exercise of judgment in such matters ultimately must appeal to notions of interest-group formation (e.g., per Olson, 1965); chapter 1 of Appendix 6 elaborates on such notions.

Guided by such concepts, by the interindustrial technical coefficients to be discussed later, and by some familiarity with active and reactive political forces focusing upon the Ames Reservoir project to date, it was decided to limit this analysis of secondary benefits to the immediate indirect impacts upon one major industry on each "side" of the agricultural sector. On the supply side all industrial sectors except producers of farm machinery were neglected. On the demand side the analysis focused only on producers of food and kindred projects.* The technical analysis documented in the remaining sections of this chapter is addressed specifically to these particular interindustrial relationships.

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*These decisions also were influenced by operational considerations of sectoral aggregation as discussed later in this chapter.

Analytical Methodology

In order to estimate the likely magnitudes of these "stemming-from" and "induced-by" impacts, it is necessary to establish the character of regional interindustrial linkages within the restricted scope defined above. A variety of techniques within the discipline of regional science might be utilized for this purpose, particularly those concepts embraced by economic base analysis and input-output analysis. The methodology employed in this study was shaped in terms of the input-output approach, because of its balanced attention to both the supply and demand "sides" of any given industry and because advantage could be gained from recent work on inferences of state-specific interindustrial structure.

Any empirical study of regional interindustrial structure faces a basic dilemma of data acquisition, wherein a choice must be made between conducting direct surveys of interindustrial transactions and utilizing "secondary" sources as a basis for inference. Although no inferential scheme can provide the confidence which could be realized from a well conceived and executed survey, the costs of such an undertaking would far exceed the resources and needs of this study. Hence secondary data was utilized for this limited inquiry.

Basically, the information desired for this limited analysis of secondary benefits was a first-order approximation of economic linkages between Iowa's agricultural sector and related sectors, for some recent and representative base-year. Given the aforementioned decision

to apply the framework of input-output analysis by means of secondary data sources, several methodological variations for implementing the analysis were considered. To enhance the reader's understanding of the analytical procedures that were actually used, it is necessary here to sketch a brief review of input-output concepts and of methods for inferring inter-industrial structure for a region.

Basic Concepts of Input-Output Analysis

Input-output analysis essentially is an accounting scheme for describing the pattern of intersectoral transactions which take place in a given economy (e.g., national or regional) during a specified time period. It structures such transactions in terms of a two-dimensional matrix, in which rows represent activities in a vending role and columns represent activities in a purchasing role. Producing sectors typically are classified into intermediate industrial sectors and primary inputs sectors, and purchasing activities into intermediate and final demand sectors.

This accounting system takes on straightforward analytical structure in terms of various flow-balance relationships. Total output of any industrial sector is the sum of all its contributions to intermediate production and final demands (i.e., total output for each row is the sum of the row's elements over all columns):

$$X_i = \sum_j X_{ij} + \sum_f Y_{if} \qquad (2\text{-}5\text{-}1)$$

where X_{ij} denotes transactions from sector i to sector j, Y_{if} denotes the f-th sector of final demand for products of industry i, and X_i represents the total output of sector i.

Similarly, total outlays of any industrial sector include its purchases from all intermediate sectors (X_{ij}) and primary inputs (V_{pj}):

$$X_j = \sum_i X_{ij} + \sum_p V_{pj} \qquad (2\text{-}5\text{-}2)$$

Assuming a one-to-one correspondence between the various intermediate sectors and commodities, and assuming linear production functions, the transactions among those intermediate sectors may be abstracted in terms of input-output coefficients ("technical coefficients"), defined as follows:

$$A_{ij} = X_{ij} / X_j \qquad (2\text{-}5\text{-}3)$$

For any selling sector i and purchasing sector j, this coefficient indicates the amount of output from sector i that would be required as input to sector j to produce one unit of output by sector j. In this manner the elements A_{ij} of any column j indicate the mix of intermediate inputs necessary to produce one unit of sector j's output. Though less common, one also can define a similar matrix of coefficients B_{ij} which express the proportional allocation of sector i's output to all intermediate purchasing sectors j:

$$B_{ij} = X_{ij} / X_i \qquad (2\text{-}5\text{-}4)$$

The purpose of such abstractions is to characterize the technical conditions of production for a given interindustrial system in a manner which transcends particular levels of output. Assuming that technical conditions of production remain constant, such coefficients reveal the immediate implications of a change in any sector's output to the output levels of all vending and purchasing sectors. Moreover, since these immediate or "first-round" output changes implt additional input requirements for the affected sectors, the total matrix of such coefficients can be applied to determine "n-th round" system effects which ripple throughout the economy.*

Assumptions and Overall Approach

The main concern of this study was to infer, from secondary data, information on selected interindustrial linkages for an appropriate region surrounding the upper Skunk River basin. Specifically, the intention was to infer input-output relationships between the region's agricultural sector

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*For example, the most common application of input-output analysis is to trace all implied output levels from an exogenously specified change in aggregate final demands Y_i. For this purpose eqs. (2-5-3) are substituted into eqs. (2-5-1) and solved for the X_i. In matrix notation this solution is expressed in terms of the "Leontief inverse," or $(I - A)^{-1}$:

$$X = (I - A)^{-1} Y$$

where I is the identity matrix and A is the matrix of technical coefficients. Such an approach was not utilized in this study, given its much more limited purposes regarding the analysis of immediate "induced-by" and "stemming-from" impacts.

(where output would be increased via flood protection) and two particular sectors directly related to agriculture. On the vending side, it was desired to infer the technical coefficient which indicates the output of the farm machinery sector required for one unit of agricultural output (to estimate immediate "stemming-from" benefits). On the purchasing side, it was desired to infer the "output allocation" coefficient which indicates the output of the food and kindred products sector implied by one unit of raw agricultural output. For reasons of convenience as well as qualitative insights into spatial patterns of commodity distribution, the "region" was defined in this study as the entire state of Iowa.*

Although the information of immediate interest to the analysis pertained to this particular subset of intersectoral linkages, construction of an entire matrix of structural coefficients was deemed necessary to ensure internal consistency within the entire regional account. Typically, the various methods which have been utilized for such inferences from secondary data (see below) confront some computational problems regarding potential flow imbalances. In order to arrive at logically consistent parameters for the selected linkages of interest here, the inferential analysis had to reconcile such potential imbalances in the broader context of a complete interindustrial input-output matrix.

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*This definition of the study region as the state is not especially limiting, since the resulting structural coefficients are also representative of a broader Midwest region.

Any method for inferring regional interindustrial structure from secondary data must ultimately refer to some source of data on interindustrial structure for some "base" economy. In practically all previous studies of similar purpose, national input-output tables are used as such a benchmark. In a few isolated cases, including Iowa (Barnard, 1967), regional coefficients have been updated from an earlier direct survey of the local economy.

Given various existing sources of data for Iowa and for the national economy, two distinct approaches were considered in this study. One approach was to update an intersectoral transactions matrix for Iowa which Barnard (1967) himself updated from a 1954 direct survey. The alternative approach was to follow the lead of various recent studies by inferring intersectoral linkages for Iowa from more recent input-output matrices for the nation, by means of locational adjustment techniques.

This choice was largely a matter of weighing the recentness of the national data* against the locational specificity of the 1954-based Iowa data. Input-output analysis basically is an analytical expression (albeit simplified) of technological conditions of production for various industrial sectors and, as such, perhaps its greatest vulnerability is to

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*At the time this analysis was executed, the most recent source of national data which was available to the staff was the table of 1966 input-output coefficients (U.S. Department of Commerce, 1972).

technological change. Although this study recognizes that the technology of Iowa's agriculatural production may deviate somewhat from an aggregate national representation, it was felt that technological change is much more dynamic in the temporal rather than the spatial dimension. For this reason the methodology adopted for this analysis was the latter approach noted above, namely, applying locational adjustments to 1966 national input-output data.

National input-output data is usually accessible in two forms: the input-output (or "technical") coefficients themselves, and the underlying matrix of raw intersectoral transactions. Those transactions include not only the flows among intermediate industrial sectors (X_{ij}), but also final demands (Y_{if}) and primary inputs (V_{pj}). Procedures for inferring regional interindustrial structure may operate on the technical coefficients (A_{ij}) themselves, unless some type of sectoral aggregation is desired. Given the concern in this study for first-order approximation only, aggregation into thirteen sectors was deemed sufficient for such purposes (see the next section for specific definition of these sectors). In terms consistent with the notation used above, then, the first stage of the analysis called for the recalculation of national technical coefficients in terms of aggregated industrial sectors (I or J) as follows:

$$A_{IJ} = \frac{\sum_{i \in I} \sum_{j \in J} X_{ij}}{\sum_{j \in J} X_j} = \frac{X_{IJ}}{X_J} \qquad (2\text{-}5\text{-}5)$$

Given this aggregation at the national level, some independent source of data on regional levels of economic activity must be used as a basis for locational adjustments of the resulting A_{IJ}. Oftentimes measures of gross regional output (x_I) for each industrial sector are used.* Where output data itself is not readily available, the usual recourse is to utilize employment data (w_I) such as that published regularly in the County Business Patterns series of the U.S. Bureau of the Census. Since the purpose of such data is strictly to serve as a basis for prorating national technical coefficients (see the next subsection), the use of employment data assumes merely that the relative ratios of employment between different industrial sectors are approximately the same as the corresponding relative output ratios. This approach and the implied assumption were invoked in this study.

The aggregated national coefficients (A_{IJ}) and the regional values of sectoral employment (w_I) constitute the basic inputs for the analysis. Given these inputs, the problem ultimately is to estimate the regional technical coefficients a_{IJ}, where

$$a_{IJ} = x_{IJ} / x_J \qquad (2-5-6)$$

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*The notation used here, patterned after that of Schaffer and Chu (1969), refers to national transactions in upper-case and regional transactions in lower-case terms.

x_{IJ} and x_J represent the regional counterparts to X_{IJ} and X_J. The next subsection discusses alternative procedures for solving this problem.

Methods for Inferring Regional Interindustrial Structure

Two distinct classes of methods have been developed to translate national technical coefficients into regional technical coefficients: location-quotient techniques and pool techniques. Location-quotient methods estimate the a_{IJ} by reference to any of several prorating formulas, all of which involve ratios calculated from national and regional output or employment data (e.g., see CONSAD, 1967). On the other hand, pool techniques immediately apply the national technical coefficients (A_{IJ}) to regional output levels (x_J); the resulting table of regional transactions ($\hat{x}_{IJ}$) are then adjusted in some manner.*

Although many articles in the area call for careful research which compares these strategies, only the work of Schaffer and Chu (1969) has

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*Barnard and Charlesworth (1970) summarize possible procedures for locational adjustment in the pool approach as follows. "One method of adjustment is to use sample surveys and collect primary data for adjusting the interindustry flows for those sectors of the economy that are known to differ from the national economy. Another method...is to adjust the various elements in the interindustry transactions table, relying on the subjective judgment of investigators and industrial leaders." In their analysis for the state of Kentucky, the authors followed the subjective approach.

done so with any authority. Using 1958 national input-output data, this study applied various location-quotient and pool techniques to estimate the 1963 regional production coefficients for the state of Washington, and compared the results of each technique with an independently derived input-output table for the same state and year. While these authors directed their investigations toward pedagogic uses, their results stand as practically the only objective key for choosing one technique over others. Because those results indicated that location-quotient procedures were more successful than pool techniques, the former approach was chosen for this study.

Location-quotient techniques involve several variations, of which three stand out as representative of distinct stages in the development of solutions to the locational adjustment problem: (a) the simple location-quotient approach; (b) the purchases-only location-quotient approach; and (c) the cross industry quotient approach. Schaffer and Chu (1969) document each of these methodologies in succinct fashion; repetition thereof is not necessary here. Based on the results of their experiments and the added sophistication evident in the development of these techniques,* the cross-industry approach was adopted for this study.

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*This "added sophistication" is reflected in the feature that the cross-industry method addresses particular I-J linkages individually. The two other location-quotient techniques lack such specificity, instead prorating "across-the-board" for each sector I.

The cross-industry puotient is a prorating formula which compares the proportion of national output of vending sector I in the region to that for purchasing sector J:

$$Q_{IJ} = \frac{x_I / X_I}{x_J / X_J} \qquad (2\text{-}5\text{-}7)$$

If this expression exceeds unity, the output of sector I exceeds the output of sector J in the region, relative to the nation, implying (by assumption) that the regional sector I can provide all of its product required as input by regional sector J. On the other hand, if $Q_{IJ} < 1$ then regional sector I may be interpreted as unable to provide the entirety of such regional requirements; some importing of output I to regional sector J is implied.* In this case the regional technical coefficient (a_{IJ}) must be adjusted downward from its national counterpart (A_{IJ}). The actual analytical operations in the two cases may be summarized mathematically as follows:

$$a_{IJ} = \begin{cases} A_{IJ} & (Q_{IJ} \geqslant 1) \\ (Q_{IJ})(A_{IJ}) & (Q_{IJ} < 1) \end{cases} \qquad (2\text{-}5\text{-}8)$$

Like any technique of locational adjustment, balancing problems may arise in the application of this formula. Ideally, such application would be

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*These interpretations which infer export and import roles in each of the two cases, respectively, rest on several underlying assumptions regarding similarity between the regional and the nation in tastes and expenditure patterns, interregional trade patterns, household income levels, production practices, and industry mix (Schaffer and Chu, 1969). For the purposes of this study, relaxation of such assumptions was deemed not to be cost-effective. (Note that in the special case of $Q_{IJ} = 1$ no exports or imports are implied.)

supplemented by methodical accounts of regional exports and imports by reference to comprehensive trade data. The only viable source for such data at any meaningful level of commodity detail is the Census of Transportation conducted and compiled by the U.S. Bureau of the Census. However, that Census provides no sectoral identification for shipment destinations and would have required petitioning the Bureau for a special tabulation in order to distinguish the state of Iowa from its parent multistate region. Moreover, information on raw agricultural products at such detail is precluded by the fact that carriers of those commodities are not bound to the same reporting requirements as common carriers of manufactured goods. Circumvention of these problems was not feasible nor cost-effective within the time constraints and purposes of this analysis.

Procedures for Estimating Secondary Effects

The structural characterization of the regional economy according to the above methodology provides a basis for first-order estimates of "induced-by" and "stemming-from" secondary effects of agricultural flood protection. Each of the flood control alternatives considered in this study (and, for that matter, any impoundment whatsoever) will lead to some estimated level of (net) additional output* within the agricultural sector in the region. As explained earlier, the scope of this analysis defines relevant "induced-by"

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*In the case of impoundment alternatives without any flood-control purpose, this "net output" would be negative (reflecting upstream inundation).

effects as the related additions to the output of the farm machinery sector, and relevant "stemming-from" effects as the implied additions to the output of the food and kindred products sector. Again, in both cases only "first-round" effects are considered here rather than tracing the entire "rippling" effects throughout the regional interindustrial system, for reasons discussed earlier.

First-order estimation of "induced-by" effects upon the farm machinery sector may be accomplished merely by multiplying the projected (net) increment of agricultural production (Δx_Z) by the regional technical coefficient a_{IZ} (where Z denotes the agriculture sector):

$$\Delta x_I = (a_{IZ})(\Delta x_Z) \qquad (2\text{-}5\text{-}9)$$

This straightforward calculation yields the additional production of farm machinery necessary to realize the additional agricultural output, ceteris paribus, indicated by any given impoundment alternative.

Parallel estimation of "stemming-from" effects to the food and kindred products sector also is quite straightforward, although the regional structural parameters determined by location-quotient methods do not enter the calculations. Again denoting the agriculture industry as sector Z in this case, eq. (2-5-4) may be enlisted to infer the implied additional purchases of raw agricultural commodities by the food and kindred products sector (J):

$$\Delta x_{ZJ} = (b_{ZJ})(\Delta x_Z) \qquad (2\text{-}5\text{-}10)$$

Assuming the food and kindred products sector (FKP) sector within the region

processes all of this additional agricultural output (and assuming all other inputs to FKP are correspondingly acquired, including raw agricultural imports), the output increment for that sector can be inferred from eq. (2-5-3):

$$\Delta x_J = \Delta x_{ZJ} / a_{ZJ} \qquad (2\text{-}5\text{-}11)$$

Substituting eq. (2-5-10) into eq. (2-5-11) gives:

$$\Delta x_J = (b_{ZJ} / a_{ZJ})(\Delta x_Z) \qquad (2\text{-}5\text{-}12)$$

Now, the output allocation coefficient b_{ZJ} can be determined readily from its corresponding a_{ZJ} by reference to eqs. (2-5-3) and (2-5-4), giving:

$$b_{ZJ} = (a_{IJ})(x_J / x_Z) \qquad (2\text{-}5\text{-}13)$$

Substituting this relationship into eq. (2-5-12) above reveals:

$$\Delta x_J = (x_J / x_Z)(\Delta x_Z) \qquad (2\text{-}5\text{-}14)$$

Thus the "stemming-from" effect upon the FKP sector -- assuming, of course, that it can market the additional output -- may be inferred simply by weighting the agricultural output increment by the ratio of regional FKP output to regional agricultural output (as determined by base data). Again, if output data is lacking then employment measures may be used as surrogates.

As footnoted earlier, these procedures make tacit assumptions regarding export-import relationships between the region and the rest of the nation (or world). In general, any application of a regional technical coefficient which is derived from the cross-industry quotient method may be interpreted

as respecting the export/import implications of the Q_{IJ} value as discussed in the previous subsection. For the procedures just outlined, the inference of "induced-by" impacts upon the output level of the farm machinery sector assumes $Q_{IZ} \geq 1$ ($a_{IZ} = A_{IZ}$); hence the region's agricultural sector presumably would receive all additional farm machinery inputs from firms within the region. The inference of "stemming-from" impacts upon the output level of the food and kindred products sector assumes $Q_{ZJ} < 1$ ($a_{ZJ} < A_{ZJ}$). In this case the presumption is that the FKP sector will purchase additional levels of all inputs, <u>including</u> raw agricultural imports, in proportion to the output increment implied by the regional Δx_{ZJ}. The particular assumptions indicated here regarding Q-values anticipate the actual results which are summarized in the following section.

Results

Implementation of the cross-industry quotient method for this study involved three sequential operations: (a) aggregation of national input-output coefficients for 1966; (b) application of the cross-industry quotient method utilizing 1966 employment data from County Business Patterns tabulations; and (c) application of the resulting measures of regional interindustrial linkages to estimate expected levels of "stemming-from" and "induced-by" effects, for each impoundment alternative. The results of each step are documented in the following pages.

Aggregation of National Technical Coefficients

Given the main concern of the analysis with immediate linkages between the agricultural industry and both the farm machinery and the food and kindred products industry, the 1966 national technical coefficients were aggregated into thirteen sectors as defined in Table 2-5-1.

Table 2-5-1. Definition of Aggregated Industrial Sectors Utilized in Secondary Effects Analysis

Sector Number	Description
1	Agriculture
2	Mining
3	Construction
4	Food and Kindred Products
5	Other Non-Durables
6	Farm Machinery
7	Other Machinery
8	Other Durables
9	Transportation and Public Utilities
10	Trade
11	Finance, Insurance and Real Estate
12	Services
13	Other

These sectors were defined largely to focus most specific attention on the aforementioned linkages; other sectors of less immediate interest were defined more or less in correspondence to those defined by Barnard (1967), with due consideration given to facility in computation.

National transactions data for 1966 was obtained from a staff paper published by the Bureau of Economic Analysis, U.S. Department of Commerce (1972) and aggregated to the thirteen sectors according to eq. (2-5-5). The results of these calculations are summarized in Table 2-5-2.

Regional Coefficients per Cross-Industry Quotient Calculations

Given these aggregated national input-output coefficients, regional a_{IJ} values were inferred by means of the cross-industry quotient method described in the previous section. As is often the case in studies of this kind, in lieu of comprehensive output data the quotients Q_{IJ} were calculated using employment data abstracted from County Business Patterns (1966). In terms of the notation used in the previous section, eq. (2-5-7) became as follows in this application:

$$Q_{IJ} = \frac{w_I / W_I}{w_J / W_J} \qquad (2\text{-}5\text{-}7a)$$

where w_I and W_I denote the recorded number of employees in sector I for the region and nation, respectively.

The results of these calculations are summarized in Table 2-5-3. It is of interest to note that all coefficients for the agriculture row -- with the exception of purchases by the FKP sector -- remained identical to the corresponding national values. The implication of this result is that Iowa's agricultural sector was able to provide all of the agricultural output required by all of the state's other industries except the regional FKP demand. On

		1	2	3	4	5	6	7	8	9	10	11	12	13
1	agriculture	.3043	.0000	.0032	.3223	.0156	.0000	.0000	.0056	.0007	.0015	.0199	.0001	.0448
2	mining	.0021	.0542	.0086	.0006	.0651	.0007	.0003	.0178	.0293	.0001	.0010	.0000	.0075
3	construction	.0093	.0205	.0003	.0019	.0048	.0011	.0016	.0028	.0282	.0033	.0498	.0087	.0492
4	food and kindred products	.0604	.0000	.0003	.1597	.0082	.0000	.0001	.0002	.0017	.0056	.0009	.0030	.0811
5	other non-durables	.0503	.0282	.0472	.0460	.3416	.0372	.0381	.0497	.0256	.0315	.0141	.0957	.0982
6	farm machinery	.0038	.0000	.0000	.0000	.0000	.0467	.0028	.0009	.0000	.0002	.0000	.0009	.0005
7	other machinery	.0014	.0252	.0459	.0007	.0035	.1532	.2461	.0508	.0050	.0057	.0042	.0157	.0156
8	other durables	.0085	.0279	.2804	.0395	.0310	.2654	.1922	.3437	.0131	.0111	.0035	.0279	.0551
9	transportation, public utilities	.0226	.0518	.0375	.0387	.0376	.0248	.0190	.0373	.1212	.0335	.0166	.0551	.2130
10	trade	.0296	.0152	.0796	.0326	.0297	.0372	.0324	.0280	.0164	.0177	.0141	.0280	.0220
11	finance, insurance, real estate	.0458	.1318	.0112	.0093	.0206	.0120	.0149	.0113	.0291	.0685	.1116	.0625	.0130
12	service	.0235	.0156	.0461	.0349	.0334	.0298	.0248	.0223	.0391	.0634	.0450	.0615	.0631
13	other	.0208	.1004	.0071	.0351	.0396	.0626	.0212	.0451	.0951	.0261	.0232	.0321	.0446
	value added	.4176	.5292	.4326	.2787	.3693	.3293	.4063	.3845	.5955	.7318	.6961	.6088	.2923

Table 2-5-2. Aggregated National Technical Coefficients for 1966

		1	2	3	4	5	6	7	8	9	10	11	12	13
1	agriculture	.3043	.0000	.0032	.2415	.0156	.0000	.0000	.0056	.0007	.0015	.0199	.0001	.0448
2	mining	.0004	.0542	.0038	.0001	.0530	.0000	.0001	.0138	.0128	.0000	.0004	.0000	.0032
3	construction	.0044	.0205	.0003	.0007	.0048	.0001	.0014	.0028	.0278	.0025	.0452	.0079	.0469
4	food and kindred products	.0604	.0000	.0003	.1597	.0082	.0000	.0001	.0002	.0017	.0056	.0009	.0030	.0811
5	other non-durables	.0131	.0282	.0257	.0090	.3416	.0011	.0178	.0474	.0138	.0128	.0070	.0472	.0511
6	farm machinery	.0038	.0000	.0000	.0000	.0000	.0467	.0028	.0009	.0000	.0002	.0000	.0009	.0005
7	other machinery	.0008	.0252	.0459	.0003	.0035	.0093	.2461	.0508	.0050	.0049	.0042	.0157	.0156
8	other durables	.0023	.0279	.1605	.0081	.0310	.0079	.0943	.3437	.0074	.0047	.0018	.0145	.0301
9	transportation, public utilities	.0109	.0518	.0375	.0140	.0376	.0013	.0165	.0373	.1212	.0252	.0153	.0505	.2058
10	trade	.0190	.0152	.0796	.0157	.0297	.0026	.0324	.0280	.0164	.0177	.0141	.0280	.0220
11	finance, insurance, real estate	.0241	.1318	.0112	.0037	.0206	.0007	.0141	.0113	.0291	.0561	.1116	.0623	.0130
12	service	.0124	.0156	.0461	.0138	.0334	.0017	.0235	.0223	.0391	.0520	.0450	.0615	.0631
13	other	.0104	.1004	.0071	.0132	.0396	.0034	.0191	.0451	.0951	.0203	.0221	.0305	.0446

Table 2-5-3. Inferred Regional Technical Coefficients for Iowa, 1966

the other hand, regional values within the agriculture column generally were less than the corresponding national values, except for inputs from agriculture itself, food and kindred products, and farm machinery.

Application to Impoundment Alternatives

The results of the regional analysis described above were applied, finally, to the estimated net increments to agricultural output (as documented in Appendix 4 and summarized in chapter 6-3) for each impoundment alternative. In so doing, the interindustrial activity patterns prevalent in 1966 were assumed to hold in the future and, given the "order-of-magnitude" interest of this analysis, final demand levels were not projected into the future.

Table 2-5-4 summarizes the results of the calculations of "induced-by and "stemming-from" impacts -- defined here merely in terms of aggregate increases in output levels for the farm machinery and FKP sectors respectively -- for each of the alternatives examined in this study (the definition of alternatives here is the same as defined in Appendix 6). The estimation of "induced-by" effects utilized the regional technical coefficient a_{IZ}, where I denotes the farm machinery sector and Z the agricultural sector, which was determined per the previous subsection (see Table 2-5-3) to have a value of 0.0038, the same as the corresponding national A_{IZ}. The estimation of "stemming-from" effects utilized the regional ratio of FKP output to agricultural output, which was computed as 0.312.

Alternative	Direct Agricultural Impact			Output Factor		Output Level	
	Downstream	Upstream	Net	Induced	Stemming	Farm Machinery	Food and Kindred Products
1	$444,900	$179,593	$265,307	0.0038	0.312	$1008	$82,775
1A	444,900	179,593	265,307			1008	82,775
2		63,705	(63,705)			(242)	(19,875)
3							
4							
4A							
5	444,900	179,593	265,307			1008	82,775
6	375,738	123,864	251,874			957	78,585
7				0.0038	0.312		

Table 2-5-4. Summary of Induced-By and Stemming-From "Secondary" Impacts

As the table shows, the estimated "induced-by" impact upon the output level of the farm machinery sector is quite small, on the order of $1000 per year for the flood-control alternatives. On the other hand, the "stemming-from" effects calculated for the food and kindred products sector are more substantial, on the order of about $80,000 per year. Perhaps most importantly, among those alternatives which provide flood protection there is only a very slight variation in the magnitude of these impacts.

Summary

The purpose of the analysis documented in this chapter was to develop rough order-of-magnitude estimates of "secondary" economic consequences of flood-protection alternatives. Based largely on anticipated strengths of various industrial interest groups, this selective analysis was limited to immediate linkages of the agricultural sector with the farm machinery and the food and kindred products sectors. Although including these impacts in the project benefit-cost analysis would constitute double-counting in this case, the estimates were considered to be of some interest in terms of impact incidence.

Given the limited concern for these effects in contrast to other impacts throughout the study, the analytical methodology employed was quite approximative, involving a host of assumptions which a more intensive inquiry might have relaxed. This methodology yielded first-order estimates of "induced-by" and "stemming-from" effects, with the results indicating

that the former were practically insignificant. "Stemming-from" increases in output for the food and kindred products sector (FKP) -- assuming the entire increment in raw agricultural products would be utilized and that all other inputs to FKP would be increased according to corresponding technical coefficients -- were estimated to be on the order of $80,000 per year. However, the degree of variation among the several flood-control alternatives was too slight to offer any meaningful discriminatory power.

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AMES RESERVOIR ENVIRONMENTAL STUDY

Appendix 2. Economic and Social Impacts

Chapter 6

SUMMARY

Contribution to the
Ames Reservoir Environmental Resources Review Study

Sponsored by
US Army Corps of Engineers Contract DACW25-72-0033

Note by Principal Investigators:

This chapter was deleted and its contents incorporated into the Summary Report.

PART II

SOCIAL EVALUATIONS

AMES RESERVOIR ENVIRONMENTAL STUDY

Appendix 2. Economic and Social Impact

Part II -- Social Evaluations

Chapter 7

PEOPLE AND THE RESERVOIR

Contribution to the
Ames Reservoir Environmental Resources Review Study

Sponsored by
US Army Corps of Engineers Contract DACW-25-72-0033

by

John F. Hultquist

1973

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TABLES

Chapter 7

PEOPLE AND THE RESERVOIR

John F. Hultquist*

"My father ... went to Paris and became solicitor to the British Embassy .... After my mother's death, her maid became my nurse .... I think my father had a romantic mind. He took it into his head to build a house to live in during the summer. He bought a piece of land on the top of a hill at Suresnes ... It was to be like a villa on the Bosphorus and on the top floor it was surrounded by loggias .... It was a white house and the shutters were painted red. The garden was laid out. The rooms were furnished and then my father died."

Somerset Maugham, *The Summing Up*

Introduction

Described in the foregoing literary passage is the apparent sudden and unexpected death of Somerset Maugham's father. As psychiatrist Dr. Richard Rahe and colleagues point out, however, a critical evaluation of the events of a year or two prior to the father's demise reveals changes

*This section (Chapters, 7-12) was completed with the assistance of John Milligan, Lane Palmer, John Johnson and Alan Holst. Hultquist is Administrative Coordinator of the Institute of Urban and Regional Research at the University of Iowa.

in his occupation, residence, personal habits, finances, and family constellation (1). The concept of major alternations in health status, so vividly portrayed in Maugham's passage above, is not new, but only recently has the relationship between life changes and illness been systematically investigated (Hinkle and Wolff, 1958; Rahe, 1968; Rahe, 1969; and Holmes and Rahe, 1967).

Findings from a host of such studies are of considerable interest with respect to the societal impact of constructing and operating a major reservoir or other project requiring the relocation of households and the disruption in the lives of others in the vicinity.

It is important to recognize that change itself, not this or that specific change, but the general rate of change in a person's life is an important factor contributing toward the person's well-being. It is a general consensus that some things, say the death of a parent or divorce, are stressful in that they are unhappy situations. It is being argued here that pleasant situations, say a vacation or a desired move to a new home, have an impact on the individual just as surely as do the unpleasant changes.

Different types of life-events affect individuals differently, but obviously some carry greater impact than others. It appears that there is widespread agreement among people regarding the relative impactfullness of various life events, that is which events in their lives require major adaptations and which ones are comparatively unimportant. Table 2-7-1 indicates the rank order of forty-two life events in terms of their impactfulness.

Table 2-7-1. Rank Orderings of Life Events

Life Event	Order
Death of spouse	1
Divorce	2
Marital separation	3
Marriage	4
Death - close family member	5
Jail term	6
Major personal health change	7
Fired from work	8
Marital reconciliation	9
Retirement from work	10
Gain of family member	11
Sex difficulties	12
Change in health family member	13
Major business readjustment	14.5
Major financial change	14.5
Change to different work	16
Change in arguments with spouse	17
Pregnancy	18
Death - close friend	19
Change in work responsibilities	20
Foreclosure on mortage or loan	21
Son or daughter leaving home	22
In-law troubles	23
Mortgage over $10,000	24
Wife start or stop work	25
Major personal achievement	26
Begin or end of formal school	27
Major change in living conditions	28
Trouble with boss	29
Revision of personal habits	30
Change in work hours or conditions	31
Change in residence	32
Change in school	33
Change in recreation	34
Change in social activities	35
Change in church activities	36
Mortgage or loan less $10,000	37.5
Change in sleeping habits	37.5
Change in family get togethers	39
Change in eating habits	40
Vacation	41
Minor violations of the law	42

N=168. This number was selected from a larger group (N=396) of American subjects. It was restricted to Caucasion, middle-class, second or third generation Americans with higher than average educational experience. The age range was confined to 25-59 years. The majority of this group proved to be married. Males outnumbered females, 101 to 67.

Source: Rahe (1969), p. 192, Table 1.

In general, these life change events concern ordinary aspects of an individual's relationships with his family, work, community, and includes reference to personal, inter-personal, residential, economic, recreational, religious, and health adjustment factors.

Each of the life-events ranked in the table, and many others, require adaptive behavior by individuals. Studies show a strong relationship between the rate of change, that is the frequence of occurance of such impactful events, and the ability of the mind and body to adjust. Body tissues, organs, and body systems, such as the endocrine system, are all responsive to the rate of change one experiences (Selye, 1956; Hinkle, 1965). Besides creating disturbing symptoms, when sustained, these changes in function often enhance the body's vulnerability or susceptibility to illness. The greater the significance of the life situations or changes that cluster together "the greater becomes the risk of ensuing major body breakdown of its resistance to general health change" (3).

The exact ranking of an event in the table is of less significance than its general position as the ranking is subject to sampling error and sampling biases. The general position is more stable, that is to say, retirement from work (10th ranked) is a relatively more significant event than is a change in eating habits (40th ranked). Whether the former is 9th, 10th, or 11th or the latter is 39th, 40th, or 41st is of minor importance.

Another unanswered question of life-event research is the manner of estimating the magnitude of combined events. The ranking given treats

each event separately even though some frequently occur together. For example, a change in residence often involves the purchase of a new home through the acquisition of a large mortgage. The question is, do the separate impacts average, add, or perhaps multiply in producing a joint effect. The most conservative estimate would be that the combined effect would not be less than the larger of the two separate effects. A plausible interpretation would be that the separate impacts would be simply additive. It is unfortunate that so little is known about such problems, but it would be more unfortunate if what is known is ignored or disregarded.

Every individual experiences change, for events and living are inexorably bound. It is the clustering of life-events that has the greatest potential for harm and just such a prospect has been authorized for a number of individuals in the Skunk River Valley between Ames and Story City. The property purchases for Ames Lake will require the relocation of families, place people in different residences, alter travel and shopping patterns, require adjustments in social ties, affect existing financial arrangements, and result in numerous other rapidly occurring events in the lives of these people.

It is not possible to tell whether the impending cluster of life-events will result in mental or physical illnesses for those involved. One writer, for instance, notes his inability "to demonstrate the precipitation of illness by moving house in previously adjusted personalities . . ." (4). As an introduction to this section, however, it

should be recognized that the disruptions and relocations to be brought about by the project can involve more than mere inconveniences to the local inhabitants. The above point is not made without good reason. Recent changes in legislation, in particular, the Relocation Assistance Act of 1970, were intended to provide increased aid for those displaced by Federal projects.[5] The above possibility my induce complacency on the part of some regarding the "takings" for the Ames Lake Project because a greater level of economic assistance is now generally possible. It is terribly important, therefore, to understand that most residents derive intangible, but very real benefits from their cultural and natural environment and economic retribution cannot fully ameliorate a dislocation.

A second point is important. A plan begins to accrue costs and benefits from the first moment that it influences the behavior of people or firms and the total time stream of costs and benefits requires a summation in some fashion (6). With respect to the Ames Lake Project it is impractical, but perhaps theoretically possible to determine the dollar costs over an extended period of time. As an example, perhaps a farmer has postponed painting barns and sheds because of a belief that inadequate compensation would result in a financial loss for him. The farmer then loses whether the government purchases his property or not. If it does, it desires to pay only the value of the barn, now depressed by lack of maintenance. If the government does not purchase the property, the farmer is left with poorly maintained structures. The

time cost, as it might be called, is that outlay of resources necessary to repair the structures to that level of soundness at which they would be had a normal program of maintenance been followed. To argue that a regular program of maintenance should have been followed is to miss the entire message.

Individuals without experience or training do not know or entirely understand the nature or extent of Federal procedures designed to serve their interests. A feeling of insecurity is not uncommon among individuals and they do not make decisions as would their rational textbook counterparts "economic-man," "legal man," and "political man."

For the above reasons, then, it is of considerable interest to note the period of time during which the Ames Lake concept has been influencing behavior. Thus, before turning to the enumeration of the valley's people a brief historical sketch of the project is of some interest.

Historical Brief

Periodic flooding of the bottom lands along the Skunk River were most destructive during May 1944 and June 1947. Flooding previous to this had been serious and the possibility of flood control measures had been discussed. Nevertheless, the current reservoir project, if we are to recognize a beginning, has had its birth in the following resolution. (7)

> "Resolved by the Committee on Flood Control, House of Representatives, That the Board of Engineers for Rivers and Harbors, created under Section 3 of the River and Harbor Act approved June 13, 1902, be and is hereby requested to review the report on the

Skunk River, Iowa, printed as House Document No. 170, 72nd Congress, 1st Session, with a view to determining the advisability of undertaking improvements for flood control in the Skunk River at this time." (Adopted 18 December 1945)

"Resolved by the Committee on Public Works of the United States Senate, That the Board of Engineers for Rivers and Harbors, created under Section 3 of the River and Harbor Act, approved June 13, 1902, be, and is hereby, requested to review the report on the Skunk River, Iowa, printed as House Document Numbered 170, Seventy-second Congress First Session, and subsequent reports on the Skunk River, Iowa, with a view to determining the advisability of undertaking improvement for flood control and major drainage in the Skunk River Basin at this time." (Adopted 1 June 1948)

These resolutions provided, and still provide, the Congressional authority for flood control studies in the Skunk River Basin. The prior study indicated in the resolutions (House Document No. 170, Seventy-second Congress) is dated 12 February 1930 and was completed under section ten of the Flood Control Act approved 15 May 1928. Subsequent Corps documents summarize the findings of the study thusly,

> "The investigation for that report showed that additional improvement of the river or its tributaries for flood control or flood protection was not economically feasible at that time. Studies of possible future power development indicated that potentialities therefor were generally lacking. No need for development of the streams for other beneficial water uses was indicated." (8)

Subsequently, a report dated 21 January 1939 and printed as House Document No. 669, Seventy-sixth Congress third session, still considered Skunk River projects unsound. In summarizing the 1939 report the Corps states:

> "Construction of certain reservoirs previously included in the comprehensive plan for control of floods on the

Mississippi River was considered inadvisable at that time. The report discussed development of additional hydroelectric power at two sites on the Skunk River, but concluded that such development was not economically feasible at that time. Also considered infeasible was the possibility of accomplishing channel rectification and the construction of levees along the Skunk River in Keokuk and Washington Counties, Iowa." (9)

The Corps studies indicated major flood losses in the early 1940's with major damage in the 1944 May flood. (10) Prior to the resolutions of 1945 and 1948, flood control measures on the Skunk were not recommended following Army Corps of Engineers studies.

The report resulting from the congressional authorizations reverses the earliest findings and recommends both the Ames and the Gilbert Reservoirs. This report was prepared following public meetings in Sigourney and Newton in September 1950 and related studies. Findings and recommendations were presented at a public meeting in Ames on 30 November 1950. (11) The announcement for this meeting provided, apparently for the first time, public disclosure of the proposed dams and the nature of the resulting impoundments.

The fate of this report is succintly told by a later document; namely

> "The Board of Engineers for Rivers and Harbors, however, after holding a public hearing, returned the report for further study and consultation with local interests. Since return of the report in October 1952 and prior to the current investigation reported on herein, the investigation on the Skunk River has been in an inactive status." (12)

The Interstate Highway

Under the terms of the Federal Aid Highway Act of 1956, the United

States embarked on the construction of the National System of Interstate and Defense Highways designed to meet the traffic needs of 1975. Planning and design guidelines for highway construction have evolved over a number of years into elaborate but rather well defined packages. To oversimplify, the usual result of technical studies is to suggest the shortest, that is the straight line, path between two points. This is so because of an emphasis on the cost of travel over the many years of future use of the facility. Even a small mileage increment can result in significant cost accumulation over a period of years when traffic counts are projected to be high, as they are for the interstate links.

Resource sites, such as the Ames Dam site, are external to the planning packages of the Bureau of Public Roads, or more properly were external to them until imposed by the National Environmental Policy Act of 1969. Thus, Interstate - 35, which was to pass through the reservoir site,was of considerable concern to those interested in the possible destruction of this resource. The Director of the Iowa Natural Resources Council wrote in 1963 to the Corps of Engineers:

> "Unfortunately the Council was unable to come up with any recommended solution to the difficult problem involved. It appears that the State of Iowa is in the position of not having the funds, nor the necessary legal tools at the present time to solve the problem involved. It also appears that neither the Corps of Engineers, nor the Bureau of Public Roads have the necessary tools at their disposal to take care of the problem either.
>
> The Council is quite concerned that the State is faced with possible destruction of one of its few reservoir sites. It is also alarmed to find that

> there appears to be no tools available for solving the problem involved. In the interest of preserving reservoir sites throughout the nation and avoiding possible duplicate federal expenditures some Congressional action maybe warranted."*

Individuals in the Ames area also took an interest in the conflict between the interstate and the reservoir site. One Ames business person wrote to the Board of Engineers for Rivers and Harbors in Washington suggesting that:

> "the Road User Analysis application be relaxed in favor of the perimeter routing in the best interests of the traveling public, local interests and above all, water conservation.
>
> By reason of the minimum difference disclosed by these cost studies the expenditure of several millions to accomodate the present I-35 location to the disparagement of water conservation, flood control, etc. is not in the best public interest and the insistence on application of Road User Analysis is strictly arbitrary and capricious."*

The elected representatives of the people of Iowa voted to urge state agencies and officials to fully cooperate in every way to secure approval of the Ames Project. This urging was in the form of the following resolution:

---

*From the letter to Colonel Richard L. Hennessy from Othie R. McMurry, dated March 20, 1963; written following a meeting of the Iowa Natural Resources Council on March 14, of that year.

*From page 2 of a letter dated January 29, 1965

House Concurrent Reṣolution 23*
By Gannon of Jasper and Gillette of Story

"Whereas, the construction of drainage ditches, tiling and sewers in the Skunk River area had dumped billions of gallons of extra water into the Skunk River, resulting in increased flooding of the commercial, residential and farm land downstream during some months, and

Whereas, water in the river has been so low during some other months as to cause pollution, damage to fish and wildlife, and such a health hazard that the city of Ames has considered using its drinking water supply to help flush the stream, and

Whereas, recreation provided by a lake in the Ames area would provide Iowa industries, Iowa State University, and research activities with a much better chance to secure professional and technical personnel whose skills are so much in demand that they can choose the place they want to work in accordance with the availability of water recreation, and

Whereas, recent floods have again caused damage to both private property and public roads, and the threat of more flooding is present, and

Whereas, damage loss from flooding was in excess of $625,000 in one year, without considering the loss Iowa will sustain if we do not encourage industrial development, and

Whereas, there is now an opportunity to begin to catch up with the rest of the nation in the development of our great water resources if our state agencies cooperate with federal officials, therefore,

Be it Resolved by the House, the Senate Concurring, that we deem it necessary and proper that the Sixty-first General Assembly support the project providing for the construction of a dam near Ames, now pending before the United States Board of Rivers and Harbors, and urge their favorable consideration of this measure as a valuable aid in the control of flooding along the Skunk

---

*Journal of the House, April 7, 1965, p. 939.

River, water quality control, a long-term assurance of a water supply, recreation, and protection for fish and wildlife, and attracting new industry to Iowa.

Be It Further Resolved, that the Iowa Natural Resources Council and all other state agencies and officials should fully cooperate in every way to secure approval of this project as quickly as possible.

Be It Further Resolved, that a copy of this resolution be sent to the Iowa Natural Resources Council, Iowa Highway Commission, Iowa Conservation Commission, Army Corps of Engineers, the Board of Rivers and Harbors and to all United States Senators and Members of the House of Representatives from Iowa.

Given the expressions of interest as disclosed in the above passages, it is not surprising that the Corps attempted to preserve the reservoir site. In order to do so, the Corps recommended that the Skunk River, Ames Reservoir be authorized by Congress.* Such authorization was provided in Public Law 89-298, approved October 27, 1965. This authorization gave the Corps the power to participate with the Bureau of Public Roads and the State Highway Commission to effect the changes necessary to the design and construction of I-35 which would preserve the reservoir site. It also meant that the Ames Reservoir was authorized and that engineering and design studies were to be completed. The culmination of these efforts are reported in the Design Memorandum #1 of 30 September 1968.

---

*House Document 267, 89th Congress, 1st Session.

The Environmental Movement

Much has been written about the environment in recent years, both before and after the Nation Environmental Policy Act (NEPA) of 1969, which requires impact statements for Federally sponsored projects. The following passages summarize some of the feelings that have developed about environmental issues, which have crystallized and have been articulated since the authorization of the Ames Project.

> All of us -- but especially politicians, financiers, and industrialists -- must begin to respond to qualities of society and environment, not solely to monetary profits and self-serving news stories. We desperately need to adopt additional value systems, not simply based on money or vanity but recognizing the worth of ecological balance and social harmony. There is frequent conflict between these sets of values. Donald Gray has discerned that economic systems generally aim to maximize short-term gains whereas ecologists strive to minimize longer-term liabilities.
>
> I strongly suspect that several environmental catastrophes must, unfortunately, occur before basic problems are effectively attacked. Meanwhile, most individuals feel overwhelmed and powerless to affect constructive change and most institutions do nothing (except orate). In the final analysis it is we, as individuals, that must change. Our impact on environment results from the kind of people we are and the kinds of societies we have built.*

The above passage speaks of "ecological balance and "social harmony" and it speaks of necessary changes at the individual level to lessen man's derogatory impact on environmental quality.

---

*From the "Summary and Prospect," Man's Impact on Environment, Thomas R. Detwyler, McGraw Hill Book Co., Inc., 1971.

The environmental movement gave hope to the people in the Skunk Valley upstream from the now authorized dam. The NEPA Act and the general growing concern for environmental quality suggested to them that the construction of the reservoir might be aborted. This feeling is expressed in a resolution proposed to both houses of the Iowa legislature with the backing of land owners in the affected area. That resolution, on which action was deferred, reads:

> A JOINT RESOLUTION to declare a moratorium on the construction of large multi-purpose dams in the state for a period of six years.
>
> WHEREAS, excessive siltation has lessened the flood control and recreational values of some multi-purpose dams now in existence in the state; and
>
> WHEREAS, siltation has shortened the anticipated life of existing multi-purpose dams; and
>
> WHEREAS, there is evidence that the accumulation of chemical substances in reservoirs above multi-purpose dams has been detrimental to some aquatic life and to some animals which feed upon aquatic life; and
>
> WHEREAS, authoritative studies indicate that the construction of some multi-purpose dams would disturb drastically the ecological balance of the affected areas; and
>
> WHEREAS, effective long-range land use programs would enhance benefits derived from our natural resources for future generations; NOW THEREFORE,
>
> BE IT ENACTED BY THE GENERAL ASSEMBLY OF THE STATE OF IOWA:

> Section 1. Regarding construction of large multi-purpose dams in Iowa by the United States Army Corps of Engineers, it is the policy of the state that approval shall be withheld for any such future plans and all activity shall be terminated on any such approved plans which are not under construction by July 1, 1971, for a period of six years. During that time those agencies of state government which are responsible for proper use of our natural resources shall act jointly in investigating and developing criteria by which future proposals for large multi-purpose dams might be approved. Activity or interest by the Corps of Engineers in any are prior to July 1, 1971, shall not prohibit the development of alternative recreation or conservation projects in those areas.

The "Infamous" Notice

Given that the political and social climate was right in 1965 to obtain a public statement for support of the Ames Project, the climate had, for many, reversed itself by 1970. This reversed view is expressed in resolutions opposing the building of the dam as passed by the delegates to the 1970 county conventions of both political parties:

> The Republicans:
>
> "We recommend that the dam, proposed by the Army Corps of Engineers to be built on the Skunk River near Ames, not be built and that alternate means of developing this area for recreational use be explored."
>
> The Democrats:
>
> "Be it resolved that a dam not be built on the Skunk River in Story County, north of Ames, but that the area of the proposed Skunk River Dam be developed as a recreation area."

Circumstances had therefore developed by 1971 that led to a sociologically important misunderstanding. That misunderstanding came about as a result of a rather unfortunately worded notice. (See supplement to this chapter.) Passages

underlined and labeled were not highlighted on the original, but have been so marked for reference.

This notice contains the words "further development" in passages A and D and the words "largely solved" in passage B. However, the literary meaning of these phrases must be tempered with an expanded understanding of passage C. In short, "further development" seems to mean 'development beyond what has previously been authroized', and since the Ames Project is (and was) authorized the notice does not indicate an unfavorable review for the project.

Discussions with local residents clearly indicate a misunderstanding of the substance of this November notice. More than one resident was surprised to find the two State Universities doing a study for a project that had just been cancelled! For those who had worked for years to prevent construction of the Ames dam the unfavorable notice was greeted, one might say, as a "major personal achievement"; the realization of their mistake and the fact that the dam was still a possibility was, therefore, a reversal of good fortune. The choice of words here is not arbitrary: Refer to Table 2-7-1 (page 2-7-3) and consider the impactfulness of life events. It is not actually known where the described situation might fall on such a scale of life events, but since it is a rather rare and important occurence to the people most involved, the impactfulness may be quite high. For others less concerned, it may be quite low.

It is easy to suggest that the memo is not misleading when carefully read, but in doing so one must then explain the following editorial which appeared in the Des Moines Register Thursday, December 2, 1971:

Cool on Skunk River Dam

The U.S. Army Corps of Engineers has recommended "no further development for flood control or major drainage in the Skunk River basin be made at this time."

The report raises a question about the future of a dam already authorized by Congress on the Skunk River, a $12.9 million project which would be about five miles northeast of Ames. The report says nothing directly either for or against the Ames dam, merely recaps briefly its legislative history.

However, many general comments in the report could be read as unsupportive of the Ames dam. For example, "Major drainage problems in the basin have been largely solved by improvements made by local interests. These consist of channel-straightening projects on the Skunk and North Skunk Rivers and drainage works in the upstream reaches of the watershed."

The report disapproves a proposed Gilbert Reservoir on Squaw Creek which would serve about the same flood control function as the Ames dam. The Corps noted that strong opposition exists and "local interests have indicated their unwillingness to share in the first cost and to maintain and operate the recreational facilities." These same obstacles exist for the Ames dam. The Iowa Conservation Commission, for example, has said it would have no funds to develop or manage recreational facilities around the Ames reservoir.

About $600,000 has been appropriated by Congress to begin acquisition of land for the Ames reservoir, but President Nixon has frozen this money along with funds for other Corps projects. The Corps reports it is undertaking an extensive environmental impact study of the reservoir area which might take another year to complete.

The investigation of the need for a dam has been going on for more than 20 years -- the House authorized a study in 1945 and the Senate in 1948. But in those days little thought was given to "environmental impact" -- other than the prevention of floods. Dams were justified largely on that basis plus recreational facilities from the new lake formed behind the dam (with liberal estimates of the recreation value).

Now, finally, the Corps seems to be turning to a real study of environmental impact and has become lukewarm about a dam which might spoil a lovely river valley. Maybe the Army Engineers and Fifth District Representative Neal Smith (long an ardent promoter of this dam) have been reading the papers about the public's concern for the natural environment.

This editorial reports that the Corps is undertaking an extensive environmental impact study; a fact not reported by the "unfavorable notice". Thus, the writer of the editorial either already had additional information or found it necessary to seek clarification from the Corps. The editorial also reports that the Corps has become "lukewarm" ("Cool" in the title) about the dam; something that would seem obvious from the unfavorable review notice and the environmental study, but, in fact, this is not obvious, as has already been discussed above. With respect to the environmental study, it must be remembered that this is required and not optional, so in itself says very little about the Corps attitude.

In all fairness it must be noted that the Corps has shown its concern in this matter through its substantial funding of the university researchers. Nevertheless, such information was not publicly available until 3 March 1972 when the Iowa State University Information Service announced the joint-university interdisciplinary study.

Summary

This chapter attempts to demonstrate the significance of the activities surrounding the past history and possible future of the Ames Dam and Lake Project. This is accomplished by first suggesting the importance of changes in people's lives through discussion of "life events" research and then by briefly reviewing the project's history. We find the people's felt security, the smoothness and naturalness of their life events, threatened first by the reservoir, then the Interstate, and then again the reservoir. For a brief period the threat was lifted by the "unfavorable notice", and then was abruptly clamped back with the announcement of the University study.

Other aspects have not been covered in this chapter. They might have been. Two examples will serve as illustrations. In the discussion with residents concerning the impact of the planned reservoir on their lives, one stated failure to obtain a permit from local authorities to build a house within the reservoir area; a second reported failure to obtain a private telephone line because the company wanted to avoid capital investments in the area. Neither of these episodes should have happened. The fact that they have

been reported simply means that the reservoir, even before construction has begun, does have an impact on the lives of the people within and near its projected boundaries.

The message of this chapter is that resource planning will, even in the very early stages, have sociological impacts of varying nature on different groups of people. Responsible planning must show cognizance of these effects and work to ameliorate them.

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Supplement to Chapter 7

NOTICE OF UNFAVORABLE REVIEW REPORT ON SKUNK RIVER, IOWA FOR FLOOD CONTROL AND MAJOR DRAINAGE*

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*Passages underlined and labeled were not highlighted on the original, but have been so marked for reference.

DEPARTMENT OF THE ARMY
NORTH CENTRAL DIVISION, CORPS OF ENGINEERS
536 SOUTH CLARK STREET
CHICAGO, ILLINOIS 60605

24 November 1971

NOTICE OF UNFAVORABLE REVIEW REPORT ON SKUNK RIVER, IOWA, FOR FLOOD CONTROL AND MAJOR DRAINAGE

Notice if hereby given that the review report on the Skunk River, Iowa, has been completed by the District Engineer, Rock Island, Illinois, and the Division Engineer, North Central Division, Corps of Engineers, U. S. Army, and is unfavorable to further development on the Skunk River for A flood control and major drainage.

The review report was authorized by a resolution adopted 18 December 1945 by the Committee on Flood Control, House of Representatives, and by a resolution adopted 1 June 1948 by the Committee on Public Works, United States Senate. Public meetings were held by the District Engineer as follows:

27 September 1949	Sigourney, Iowa
28 September 1949	Newton, Iowa
30 November 1950	Ames, Iowa
27 February 1964	Newton, Iowa

Skunk River rises in Hamilton County in central Iowa and flows southeasterly to discharge into the Mississippi River about 9 miles downstream from Burlington, Iowa. The watershed area is about 4,355 square miles. The basin is long and narrow, having a length of about 180 miles and an average width of 24 miles. The length of the river is about 264 miles and its total fall is about 680 feet.

The Skunk River Basin, Iowa, was thoroughly investigated to determine the needs for flood control and major drainage. Water supply, irrigation, water quality, hydroelectric power, recreation, fish and wildlife, and erosion and sediment were also investigated. Full use of the report of the Upper Mississippi River Comprehensive Basin Study was made in assessing these needs.

The flood plain of the Skunk River has been extensively developed for agriculture; approximately 85 percent of the total area subject to inundation is devoted to crops and pasture. Corn, soybeans, oats, wheat and hay are the principal crops grown in the bottom lands. Generally, throughout the flood plain, the soils produce abundant crops during non-flood years. Property losses in the flooded area include damage to railroads, highways, local roads, utilities, and farm improvements.

Lands most greatly affected by floods are located along that reach of Skunk River between its mouth and Ames, Iowa. Flood damage occurs predominantly in rural areas. Urban damage is relatively small, even in very severe floods, except at Ames.

Major drainage problems in the basin have been largely solved by improvements made by local interests. These consist of channel-straightening projects on the Skunk and North Skunk Rivers and drainage works in the upstream reaches of the watershed. B

The reporting officers completed an interim report under the above authorities in 1965, recommending construction of the Ames Lake on the Skunk River, upstream from the city of Ames, for multiple-purpose water use. The Ames Lake project was authorized by the Congress in the Flood Control Act of 1965. Funds have been appropriated for initiation of construction of this project. C

The reporting officers have considered further plans to relieve the flooding which occurs throughout the length of the river downstream from Ames, the resulting damage being almost entirely agricultural. Local flood protection of rural areas was found not economically feasible. Flood control by reservoirs was also found to be economically unwarranted, except for a reservoir on Squaw Creek several miles upstream from Ames at the Gilbert site.

The Gilbert Reservoir on Squaw Creek was determined to be economically feasible as a single-purpose flood control project, and, in addition, would produce substantial recreation and fish and wildlife benefits. Strong opposition exists, however, not only to the Gilbert Reservoir but to proposed reservoirs on other rivers in the State of Iowa. Local interests have indicated their unwillingness to share in the first cost and to maintain and operate the recreational facilities in accordance with local cooperation requirements under the Federal Water Project Recreation Act. Because of this opposition and the lack of local support, development of the Gilbert site is considered to be inadvisable.

Improvements for water supply, water quality, irrigation, or hydroelectric power were found not to be warranted at this time. Erosion and sediment problems could be relieved by land treatment programs.

Reduction of flood damage by nonstructural methods was considered not generally applicable in rural areas. Flood plain information from which such methods could be employed has been furnished for the area of Ames and vicinity.

The reporting officers recommend that no further development for flood control or major drainage in the Skunk River Basin be made at this time. D

In accordance with law, the report is being referred for review to the Board of Engineers for Rivers and Harbors in Washington, D. C. Interested parties may present written views on the report to the Board. Statements submitted should not repeat material previously presented in their reports, as this information is already available to the Board. Information submitted should be new, specific in nature and bear directly on the findings in the report.

Written communications should be mailed to the Board of Engineers for Rivers and Harbors, Washington, D. C. 20315, in time to reach the Board by 22 December 1971. If extension of this date is considered necessary, written request stating reasons and additional time desired should be mailed to the Board soon after the receipt of this notice.

Information furnished by mail is considered just as carefully by the Board and bears the same weight as that furnished at public hearings; therefore, hearings will be held only when found to be in the public interest. Requests for a hearing should be fully supported by reasons why the new material cannot be submitted just as effectively by mail as at a hearing.

Copies of information received by mail will not be furnished to other parties. However, such information will be regarded as public information (unless the correspondent limits its effective value by requesting otherwise), and may be inspected and notations made therefrom by other interested parties, in the office of the Board.

The Board will not take final action on the report until after expiration of this notice, or any extension thereof that may be granted, and full consideration of all information submitted in response thereto. Should the Board contemplate action materially different from the recommendations of the Division Engineer, appropriate notice to that effect will be furnished to local interests directly concerned inviting their views and comments prior to final action.

Further information may be obtained from this office or the District Engineer, U. S. Army Engineer District, Rock Island, Clock Tower Building, Rock Island, Illinois 61201. Interested parties, including the press, may make such notes of the contents of the report as they desire. However, copies of the report will not be loaned for use outside of the office, but interested parties may purchase copies of the report, or parts thereof, including illustrations, at the cost of reproduction. The charge for this report is $5.00. Checks should be made payable to the Treasurer of the United States and remitted to the District Engineer, U. S. Army Engineer District, Rock Island, Clock Tower Building, Rock Island, Illinois 61201.

You are requested to give the foregoing information to any persons known by you to be interested in the report, and who, not being known by the Division Engineer, do not receive a copy of this public notice.

ERNEST GRAVES
Major General, USA
Division Engineer

AMES RESERVOIR ENVIRONMENTAL STUDY

Appendix 2. Economic and Social Impact

Part II -- Social Evaluations

Chapter 8

A VIEW OF THE VALLEY'S PEOPLE

Contribution to the
Ames Reservoir Environmental Resources Review Study

Sponsored by
US Army Corps of Engineers Contract DACW-25-72-0033

by

John F. Hultquist

1973

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Chapter 8

A VIEW OF THE VALLEY'S PEOPLE

Introduction

The development of a natural resource, whether it be the opening of a national park, initiation of a major oil or coal extraction, establishing a major airport, or constructing a reservoir, affects many people in many different ways. The people who live in the affected area share an important characteristic through the development that others do not. This shared experience is that of having their home-life disrupted.

A reservoir is built because someone seeks to have it built. This suggests a statement attributed to Harold Laski, one of the intellectual leaders of the British Labor Party: "When the leaders of a people ask their followers to die for a dream, those followers have a right to know in whose behalf the dream is being dreamt."* In the case of the present reservoir the leaders of the Nation's people are asking them to invest nearly $20,000,000 on a reservoir. On someone's dream? But the people through their representatives have set up a mechanism, a benefits to cost ratio,

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*As quoted in "On Whose Behalf is the Dream Being Dreamt?" by Max Lerner in Environment and Change: The Next Fifty Years, W.R. Ewald, Jr., (ed.), Indiana University Press, 1968, pp. 176-181.

to protect their investment. If the calculations are correct the people earn a return on their investment; the Corps earns their pay; the politicians earn their glory and maybe more; and everyone gains a reservoir. This is a blessing that those disrupted would generally prefer to be without. This is not universally true because some individuals are not strongly tied to the land on which they reside; the present case is no exception. Only in this approximate sense, then, does this chapter discuss those at whose expense the dream is being dreamt.

Field Survey

A meeting was held in Story City in order to meet with people in the affected area to determine the most effective manner of ascertaining the people involved and the extent of disruption they faced. Following this meeting, which was attended by about sixty people, a field survey was conducted.* The area covered in the survey is shown in Figure 2-8-1.

The area shown in the figure is neither coincident with the tentative taking-line for the project nor the larger area set up for other purposes within the environmental review study. Had the larger area been chosen, a sampling design would have been necessary. A complete survey of all dwelling units within the study area was possible using the restricted area.

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*The survey was completed with the cooperation of the Iowa State Statistical Laboratory.

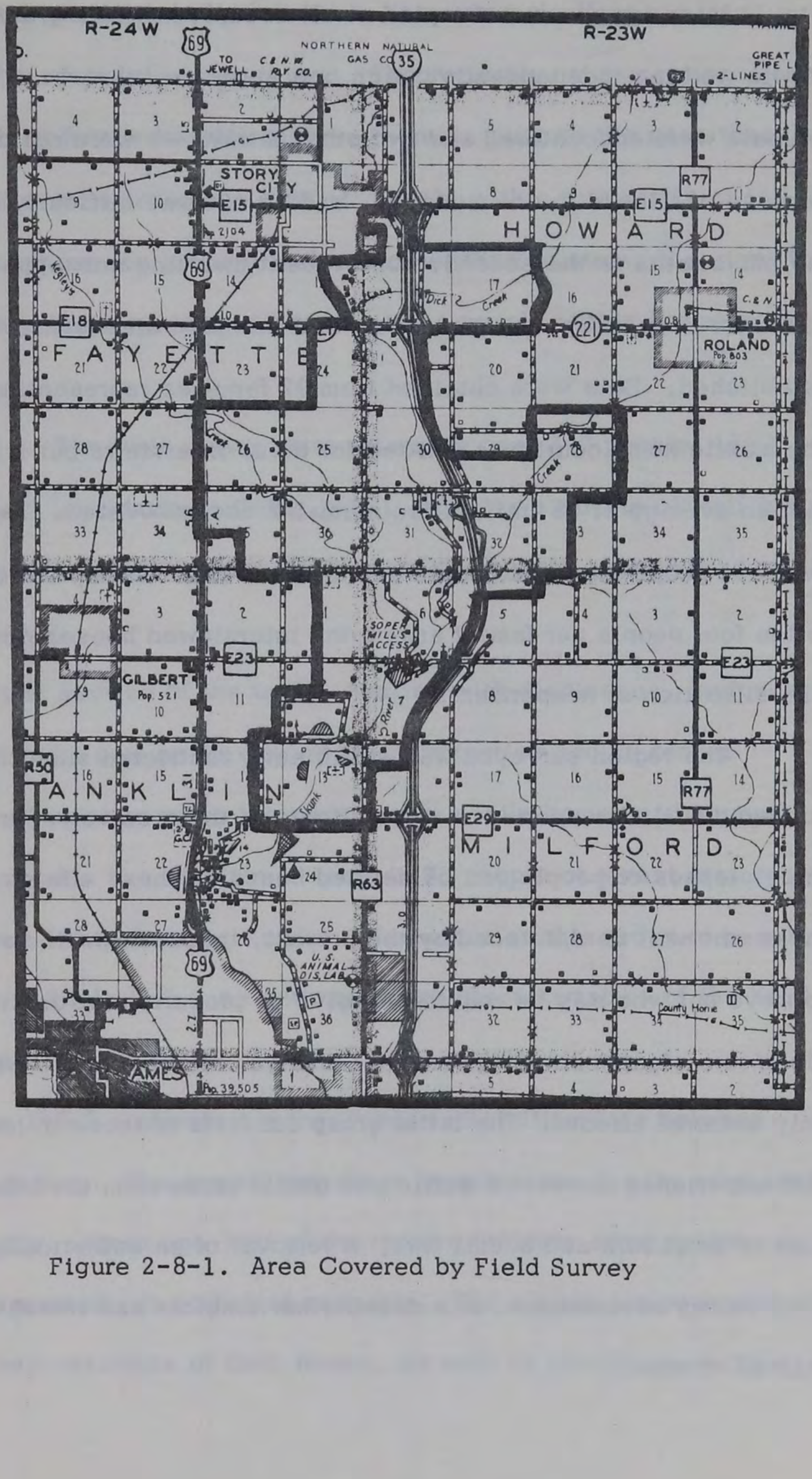

Figure 2-8-1. Area Covered by Field Survey

Interviews were attempted at all occupied dwelling units by four people working independently, each in a separate sub-area. Only two outright refusals were encountered and two other interviews were not completed, because of illness in one instance, and an extreme difficulty in contacting the inhabitants in the second. One vacant dwelling unit appeared sufficiently sound for occupancy, but ownership and intended disposition were not established. Data were obtained from 92 families representing 361 individuals. The mobile home court was omitted for these interviews but it is estimated that an average of 35 trailers are normally accommodated. This would represent over 100 people at three people per trailer. This assumption is in contrast to the four people per family among the interviewed households.

Classification of Respondents

The region surveyed was sufficiently restricted such that the people surveyed will all experience some effects of the reservoir. Broadly speaking, three classes of people can be defined based on these effects, namely, those who will be displaced by the project, those who will not be required to move but who may be required to give up property and/or find themselves very close to a significant environmental change, and those who will experience only external effects. The latter group consists of those in locations which will experience increased traffic and traffic noise from the lake attractions, or loss of neighbors and social ties, or removal of an esthetically pleasing river valley environment, or a dozen other tangible and intangible (sometimes subtle) effects.

The category of people defined by the external effects is much larger than the number of people interviewed. Theoretically, if recreational benefits are to be derived from a 25 mile radius, then, it must be the case that the reservoir exerts some influence over all people within this circle of influence. Such a reflection serves no practical use other than to stress the significance of the influence the reservoir will exert on the people within the restricted sub-area.

People. The field survey data reference over 360 people; 460 if the trailer court is included. Table 2-8-1 provides a simple classification of these people based on the trivariate "degree of impact" schema discussed earlier.

The first section of the table, dealing with displacees, includes 35 households who own or are buying their properties and 20 tenant households. The latter group includes seven mobile homes and several joint occupancies. The displacees include 70 people of tenant status and 103 of ownership status. Further information on this group of people is contained in Table 2-8-2 as determined by characteristics of the head of the household.

Table 2-8-2 suggests a rather fundamental difference between renters and owners. The owners represent farm families for the most part, but not entirely. About one-half of the renters indicate some connection with Iowa State University in a student capacity. The owners are generally older and longer term residents of their homes, as well as elsewhere in the county.

Table 2-8-1. People Significantly Affected by Reservoir Development

		Degree of Impact										
		Displaced				Disrupted				External		
Adults		M	F	S[a]	O[b]	M	F	S	O	M	F	S	O
Number		55	51	58	9	25	28	35	25	21	17	31	6
Average Age		43.5	44.4	9.0	19.8	51.6	51.4	10.8	19.1	38.9	39.3	9.4	23.8
Sums:	Individuals	173				113				75			
	Number of Households	55				28				20			

Not Interviewd (all potential displacees):

4	Single family homes; approximately --	7 people
35	Mobile homes; approximately --	100 people
39		107

Sums

Anticipated Displacees: 94 households
280 people

[a] Ages 0 through 16; public school census ages.

[b] Others: includes college students and other young adults; minimum age 17, maximum 27

Table 2-8-2. Further Classification of Displacees[a]

	Renters (N=20)	Owners (N=35)
Average Age (Head)	34 years, 6 months	49 years, 8 months
Average Length of Current Residence	2 years, 7 months	15 years, 2 months
Average Period Elsewhere in Story County[b]	9 years, 7 months	20 years, 0 months
Current Residence Occupied Less Than One Year	7	4
Average Years of Formal Education	12 years, 2 months	11 years, 6 months

[a] Not including trailer-court residents.

[b] For renters, N=16; for owners, N=24 for this item. Smaller group sizes are because others have not lived elsewhere in the county.

Table 2-8-3. Dwelling Units of Displacees[a]

Unit Type	Number
One story, older	5
One story, newer	9
Two stories, older	23
Two stories, newer	5
Mobile homes	7
Downstairs apartment	1

[a]Not including trailer court residents.

Not contained in the table is the fact that the ages of people within the valley span the century mark. The oldest resident had reached that mark more than a year previous to the survey. The youngest resident could claim only three and one-half months of life's experiences.

Dwelling Units. The survey interviewers classified dwelling unit types according to a six category scheme. The numbers in each category are shown in Table 2-8-3.

Land. Much will be said elsewhere in this study about the land and its use. For purpose of calculating costs, estimated acreage of various categories are given in a later chapter in this section. The work on which that chapter is based indicates that over 7,500 acres will be required by the basic Ames Project. Of this acreage, about 50% is high and medium grade cropland. Further discussion of the number of acres devoted to various uses is left to other sections. Here some complexities of land use and interrelationships will be discussed. Major portions of the valley's land are devoted to the agricultural sector, and it is here that the greatest complexities exist. Several examples will convey the nature of these interdependencies.

In one case, a plot of land is owned and lived on, but not farmed by the residents. Instead the farmable land, about 60 acres, is rented. The person farming the land does so from a base of operations external to the tentative taking-line. For discussion, assume the 60 acres are

planted with corn yielding an average of 120 bu./acre which is then sold for $2.00/bushel. Using these figures the rented land would produce a $14,400 crop, the net return, after all costs are borne may be sufficient to mean the difference between a viable farming operation and a marginal one.

A second type of situation is of interest. One farming operation is based within the tentative taking-line on owned land but utilizes nearly a quarter section of rented land beyond the boundary. In fact most of the operation (about 85%) relies on rentals. In other instances land is co-owned and/or co-rented with parcels within and beyond the proposed taking-line.

The above types of situations are not uncommon practices as reported by the people interviewed. Because not all land was accounted for during the interviewing, it has not been possible to specify precisely the extent of the linkages that will be severed with the coming of the reservoir. The cases mentioned above only serve to illustrate such linkages and suggest many second and third round effects of the reservoir land purchases. It is impossible to specify the nature of the adjustments which will be made in the lives of the people and in the operations of the farming community. Because a number of the farm operators are nearing retirement age a forced sale at the current time may only hasten a planned ceasing of operations. Some individuals recognize this possibility and are mentally prepared to move into Story City, Nevada, or other small communities. However, there are very strong feelings among the middle-aged and younger farmers; these individuals wish to stay on their farms. Many cite their own efforts

at developing their land over a period of years as an asset that could not be replaced. Also they fear that good land would not be available to them at all without an extensive move; even a move out of Iowa is felt by some to be probable.

Other Project Alternatives

The emphasis of this chapter has been on describing the characteristics of the Valley's inhabitants. The basic Design Memo project has been used as a vehicle to show the relationship of the people to a resource project. These same people are affected differently by each alternative. This section summarizes the effect of each of the alternatives studied.

Alternative 1. This alternative is an expansion of the original authorization and was presented by the Corps in Design Memo No. 1, 1968. Two subimpoundments are provided in addition to the 5,000 acre temporary flood storage lake. Maximum elevation of the lake is 976 feet. The survey, discussed more fully above, indicates that this alternative will displace about 300 people, disrupt 125 others, and have external effects on 90 more.

Alternatives 1A and 5. These two alternatives are essentially equivalent and have been discussed in detail in the initial sections of this Chapter. The results are that 280 people will be displaced, 113 disrupted, and 75 others will experience external effects.

Alternative 2. This is a recreational lake alternative. The project consists of 1410 acre lake at elevation 940 feet. It does not provide for a flood pool. Fewer people would be displaced than in the previously discussed alternatives, but the disrupted and internal effects categories would increase. The numbers in each category would be approximately 60, 250, and 158 respectively.

Alternative 3. Two small recreation lakes at the Dam site and on Bear Creek would displace about 20 people, disrupt another 20, and have internal effects on 20 or so more. These and all other figures are based on the rate of 4 people per household and on estimates of the taking-lines for the various projects. The numbers given for the alternatives should be considered relative to one another rather than as precise measurements. Only a proposed taking line is available for one project, and even that is subject to discussion, offer, counter-offer, and litigation.

Alternative 4. This is a private-ownership greenbelt concept, which could be accomplished with minimum disruption to the Valley residents and possible gain to "willing" sellers of the few acres contemplated for purchase.

Alternative 4A. This is the intensive greenbelt plan, and it too could be accomplished with minor impacts on the people of the Valley. While many landowners would be required to transfer land into greenbelt control, major

portions would be required of very few owners. About 330 people would notice the external effects, however.

Alternative 5. This alternative is similar to Alternative 1A. The minimum development of potential recreational lands may reduce conflict between local landowners and recreationists with regard to operation of the reservoir.

Alternative 6. The reduced-scope multipurpose reservoir, considered as Alternative 6, has a conservation pool of 1,410 acres as compared to 2,100 acres in Alternative 1. Similarily, the flood pool is reduced from 5,000 to 3,620 acres. It is assumed (2-11-20) that whenever feasible, the take-line would be positioned so as to take only as much land as necessary and allow the continued existence of homes when there is no threat of flooding to the property. The relative position of structures with regard to the break in slope will permit more than a few "leavings" of this nature. The alternative would not require the taking of the trailer court or nearly one-third of the homes. The impact is reduced to about 120 relocations, 170 disruptions, and external effects on 80 other individuals.

Alternative 7. This is a do-nothing or "business as usual" alternative. It is a do-nothing plan from the aspect of planned resource development and would allow the continuation of present trends. Thus, there is no direct or measurable impact that is meaningful in the context of this section.

It is meaningful to point out, however, that current expectations are for continued suburbanization (or rural non-farm development, if you like) in the Skunk Valley north of Ames. The rapidity of this metamorphic trend is dependent on numerous factors, many of which are not subject to control of Story County residents or even the State of Iowa. As an example, mortgage rates will affect the number of new housing starts and the local effect on lending rates is negligible. This is not a very attractive alternative for those who wish things to remain as they are in the Skunk Valley.

AMES RESERVOIR ENVIRONMENTAL STUDY

Appendix 2. Economic and Social Impact

Part II -- Social Evaluations

Chapter 9

DIRECT RESERVOIR IMPACT

Contribution to the
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by

John F. Hultquist

1973

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Chapter 9

DIRECT RESERVOIR IMPACT

From a sociological perspective the most significant impact of the reservoir will be the disruption in the lives of those displaced and those adjacent to the project's boundary. These issues were considered in the previous chapter. It is useful to comment on other aspects in order to demonstrate their lesser importance.

Transportation Routes

Two independent issues must be considered with respect to the effect of the reservoir on transportation. The first relates to activity patterns, the second to road development. The significance of the former issue has been lessened because of I-35. East-west closings were made at the time of the Interstate's construction. While the reservoir would close several others, it would provide better access to the Interstate via E-29, especially if this road which crosses the dam were extended directly westward to U.S. 69. This possibility, with a twist, has previously been suggested. In a letter to the Corps dated August 30, 1968, Harold S. Ersland, then Chairman of the Story County Board of Supervisors, suggested:

> "...that further consideration be given to the relocation of this proposed road so as to tie in the west terminus on the North line of Section 23, T84N, R24W to the existing county road. The County considers the further extension at a later date to be more desireable along the section line so as to make a previously planned connection at U.S. 69 at the N.W. Cor. of Section 23. Further, construction design should comply with the current Farm to Market Road Standards, with planning to provide a road grade for future paving."

Mid-way between Story City and Ames the east-west road, two miles south of highway #221, would remain but only as a low level route. This situation is felt to be undesirable and avoided if possible. Again, quoting from Ersland's letter to the Corps:

> "...it is our opinion that the east-west segment, which is scheduled to be left as a low level road, is of much more importance than your planning would indicate. This is further supported by an earlier decision to construct a bridge over I-35 at the time of the interstate construction. It is certainly our desire that the Corps make further studies concerning the alternatives for this route and that we be provided with meaningful cost estimates so that we might make a more responsible and intelligent decision prior to writing this route off for full time use."

The second issue with respect to transportation is road development. Under current standards, roads in Story County are paved only if there is a minimum daily traffic count exceeding 200 vehicles. With the recreation-related traffic and the closings, remaining river crossings would likely need upgrading. At least part of this cost should be tied to construction or maintenance of the reservoir. Slow growth in the region, particularly expansion into this area, indicates that these roads will require attention in the future in any case. The reservoir only means the problem must be faced immediately upon its completion.

School Districts

The tax base of the townships and school districts will be affected by the reservoir. Appendix 6, Chapter 4 suggests that for townships, at least, over a period of years the tax loss is offset by increasing property values on the remaining land. Assuming the assumptions there to be valid,

the tax base of the school districts is probably minimally affected also.

Fortunately, while there are several districts affected, they have common boundaries within the Valley. Thus, the effect of the reservoir would be to push back the outer boundary of each system in the area of the reservoir rather than isolating one portion of a district from another. This could have the effect of reducing busing and busing costs.

The effect on enrollments cannot be determined. The relocation decisions of the displacees must be known before school populations and related state-aid payments can be investigated. However, major shocks to any one system have low potential. Too few school age children are involved, and their varying ages and the numerous districts suggest that only through coincidence would relocations work jointly to adversely affect a school system. The manner of developing "next year's budget" on project enrollment could result in a reshuffling of funds and even extra funds through per pupil based state aid. Major problems are not foreseen unless the reservoir relocations are ignored in the school planning program.

Private Business

The economic force in the area is agricultural production and related activities. Approximately 4,000+ acres will be removed from production with the coming of the reservoir. This will cause a direct and immediate decrease in the demand for farm serving activities. Although such establishments are not found within the project boundary, they are near in Story City,

Gilbert, Ames, and Nevada. These service industries will suffer a loss in trade which, while it may be rekindled elsewhere in the state or national economy, cannot be replaced locally.

AMES RESERVOIR ENVIRONMENTAL STUDY

Appendix 2. Economic and Social Impact

Part II -- Social Evaluations

Chapter 10

ANTICIPATED POST-CONSTRUCTION IMPACT

Contribution to the
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Chapter 10

ANTICIPATED POST-CONSTRUCTION IMPACT

Introduction

A reservoir brings with it the prospect of development both in a recreational and a residential sense. The two are not unrelated because the attractiveness of the area as a recreational site contributes to the residential amenities. Likewise residential development contributes to the population base and the potential recreational usage. The recreational aspects of the Ames project have been treated elsewhere in the study* while this chapter looks at residential prospects.

Surveys conducted in the Southeast near a variety of reservoirs suggests the potential for a number of serious public problems related to environmental quality and the management of the reservoir facilities (1). This potential trouble stems from unplanned and unrestricted development, primarily from the activities of land development amateurs, the original land owners and the consumers. Land adjacent to a reservoir which is developed has passed through a series of stages from an initial state of rural use preceding the announcement of a reservoir to a final state of active

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*For a discussion of the recreational aspects of the Ames Reservoir project, see Appendix 3, page 16.

residential use. Generally, the decision to construct a reservoir marks a sharp break in the normal market for rural real estate. With the announcement of a reservoir project, owners of several parcels which are destined to adjoin the project's boundary, usually evaluate their current use of the land and make decisions which will determine its future. Speculators, investors, developers, and even potential consumers begin to assess boundary tracts for urban development. Without a local land use plan, zoning, or subdivision regulations, there is a strong tendency to cut corners and expenses in transforming raw land into residential sites.

Problems associated with uncontrolled development near a reservoir generally include the physical and psychological appropriation of shoreline (public) lands by private ownership. While private ownership doesn't extend to the water's edge, such misnomers as "lakefront property", and "shoreline lots" attest to the reality of a "locked up" reservoir in many development sections. Other problems include miles of string development with low investment cottages and trailers, inadequate sanitary facilities, site crowding, poor water access facilities, irregular placement of houses and generally low quality commercial facilities, overcrowded access areas, and a deteriorating aesthetic quality. Such problems which accompany and result from this haphazard land development are generally not subject to remedial public programs or to planning controls which might have prevented this occurence in the first place.

While the above remarks follow from the surveys conducted in the Southeast (mentioned earlier), the problems are more generally true and point out the often unsuccessful aspects of planning in rural areas (2). The situation at the Coralville-Macbride Lake complex typifies many of the above issues.

The Coralville-Macbride Experience

A comparison of the Ames Reservoir area and the Coralville-Macbride area reveals both similarities and differences. The most significant similarity with respect to development potential is the relative location with respect to the educational and light manufacturing centers of Ames and Iowa City. In the Coralville-Macbride case, the City of Cedar Rapids also plays a minor role. A significant difference between the two areas is, of course, the relative magnitudes of the normal impoundments, with Coralville being larger than the authorized Ames Lake. The stable pool of Lake Macbride adds another dimension of dissimilarity unless the Bear Creek sub-impoundment were to be re-introduced at the Ames site.

The generally larger size of the Coralville-Macbride complex has as a corollary rather longer distances to the influences of urban centers. For example, central Cedar Rapids is approximately fourteen miles from the nearest reservoir access on U.S. 218. Iowa City residents are sixteen

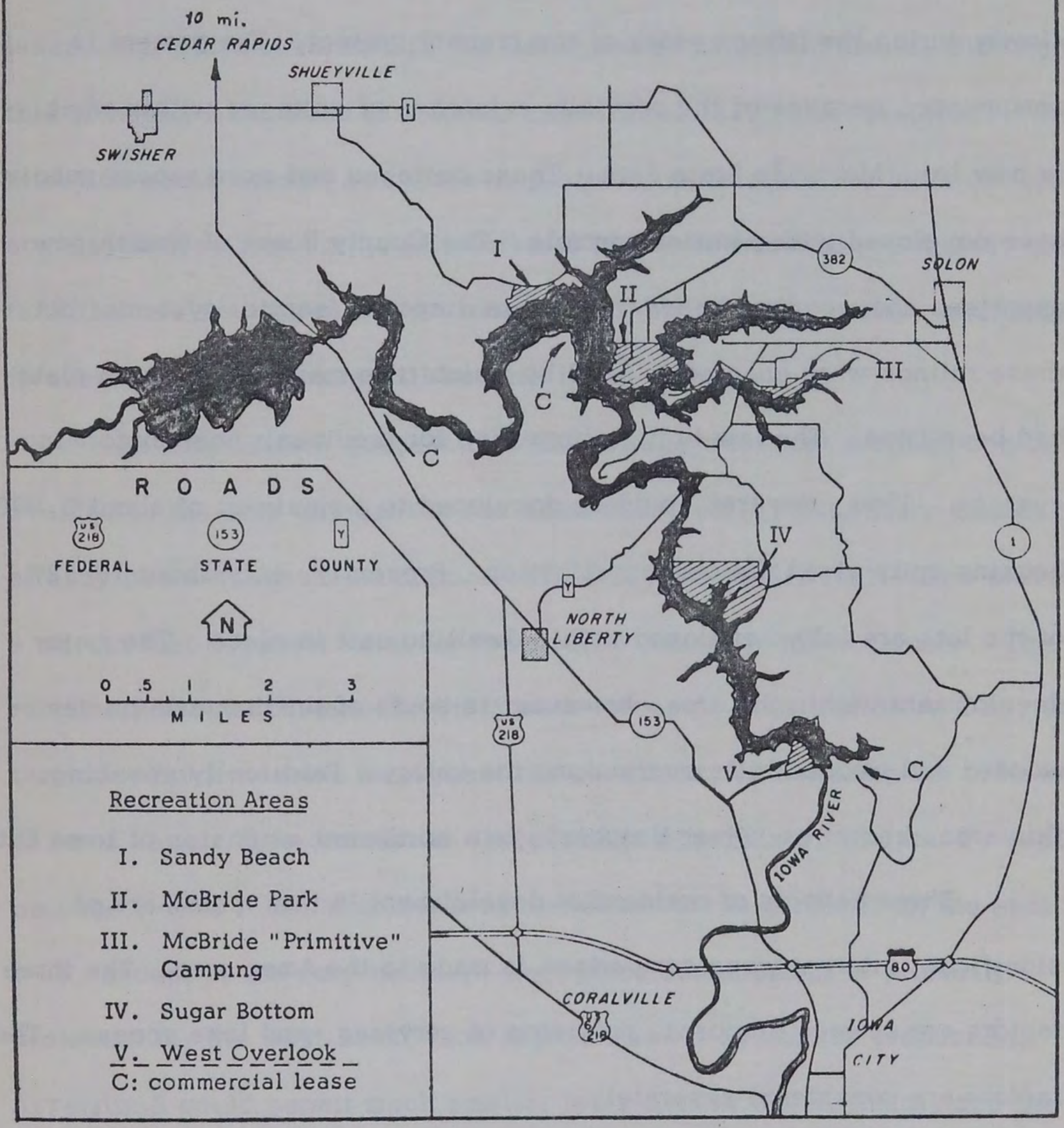
to eighteen miles from Lake Macbride access but only a few miles from the southern-most reaches of the Coralville reservoir area. Both sides of the dual lake area are accessible, however, from Iowa City and Cedar Rapids. Figure 2-10-1 provides graphic display of these spatial relationships. The map shows Iowa City and Coralville at the lower edge and indicates a ten mile distance between the center of Cedar Rapids and County Road "I" at H-218 near Swisher.

Recreation and commerical access areas are shown on the map; the former with Roman numerals and the latter with the letter "C". The swimming and boat rentals at Macbride Park (Area II) are operated through commercial leasing arrangement also. That part of the Coralville pool extending west of U.S. 218 is operated as the Hawkeye Wildlife Area by the State Conservation Commission. The map does not indicate this area explicitly nor does it show several smaller access areas. Two horse-rental operations exist adjacent to the government property; one is just east of the Sugar Bottom area (IV) and the second is midway between North Liberty and the reservoir on County Road "Y". Trails from the latter stables extend north from the highway to the reservoir..

Residential Development

Subdivisions border the public property line in the Coralville-Macbride area. There are over twenty subdivisions known by popular "image" names, such as Lake View Knolls, Lake Crest Manor, Country Estates, and Coralville Lake Manor. Many of the subdivisions which border

FIG. 2-10-1 MAP OF CORALVILLE - MACBRIDE AREA



the reservoir are small, perhaps five to tèn houses. Others exceed forty units, and contiguous subdivisions in one area currently contain about 120 units with room for that many more.

Development about the Coralville-Macbride lakes has proceeded slowly during the fifteen years of the present project. The pattern is compounded because of the previous existence of cottages within what is now Lake Macbride State Park. These cottages and more recent subdivisions have developed with minimal controls. The County Board of Health now exercises some control based on sewage disposal (septic) systems, but these rulings were enacted in 1969 by which time many subdivision plats had been filed. The law is not retroactive for previously non-conforming systems. Thus, the area could be developed to a maximum of about 3,000 housing units given the current situation. Presently, only about 10-12% of the lots are fully developed with a dwelling unit in place. The major development within the area, however, is south of the dam site on semi-wooded and wooded hills overlooking the valley. Practically speaking, this area, known as "River Heights", is a northward extension of Iowa City.

Three aspects of residential development in this region are of significant interest when comparison is made to the Ames area. The three factors are sewage disposal, provision of services, and lake access. These factors are considered separately.

Sewage Disposal

Discussions with county health officials and residents indicate existing problems with septic systems in the area. However, these problems are not generally serious and have minimal effect on the water quality of the lakes. Agricultural run-off is the major source of contaminants, although this is hardly an excuse to tolerate unhealthful residential practices. The situation could worsen as presently platted subdivisions are built up. In some instances lots are quite small and given unfavorable soil types, septic tank failures do happen. With increased dwelling unit density, increased (preventive) maintenance will become necessary.

Several factors suggest that the sewage treatment problem can be avoided in the area adjacent to the Ames Reservoir. First, Story County already has a minimum lot requirement of 25,000 square feet. This provides a margin that does not exist for the smaller lots of Johnson County. The relatively shorter distances, the growth forces of Ames and Story City, and the topography combine to suggest the possibility of sewering the area west of Ames Lake. This concept is discussed in Appendix 5, Chapter 7, beginning on page 5-7-27. Because the proposed reservoir is bordered on the east by I-35, except at the very southern most part, development is primarily projected for the west bank. The regional sewer system as proposed in Appendix 5 could permit much smaller lots, cluster development, and the maintenance of a pleasant landscape. Development based completely on septic tank systems may not prove hazardous health wise but could not be easily controlled so as to prevent as aesthetic degradation of the valley landscape.

Development pressures exist within the Valley and the distances are not sufficiently great to be limiting. Whether the reservoir becomes a reality or not, land will slowly move from agricultural and other uses to residential properties. Without the reservoir, this development will likely proceed at the most rapid pace just east and north of the dam site. This area is quite accessible to the developing industrial district and the National Animal Disease Laboratory. As planned, the Ames project will remove much east bank developable land from the market, thereby increasing the rate of conversion on the west bank.

It is increasingly clear that many people are willing to forego spatial proximity to activity sites (work, shop, etc.) for a semi-natural environment. This feature of contemporary American life has not been fully grasped by academicians and planners, by small town and county governments, nor by many long time rural residents. Society has yet to work out a proper response to this phenomenon. But is is also becoming increasingly clear that a response must be forthcoming. The treatment of wastes is just one issue which must be faced. In Johnson County, development has occurred prior to developing a rational approach to these problems; what unfolds in Story County need not be quite so disruptive.

Provision of Services

Johnson County officials have recently observed that rural subdivisions can become a monetary burden on local governmental units.

Road and law enforcement budgets are both increased by rural subdivisions. A subdivision may assess its residents to maintain internal roads but additional traffic on feeder routes can increase maintenance costs. Fire protection is difficult to provide in remote areas and for the home owner, insurance costs are correspondingly higher. Rural developments place an additional burden on school districts with increased demands for busing.

Haphazard "spot" development is inefficient and costly to both individuals and governmental units. Most spot developments return insufficient tax revenues to pay for the customary services expected. Therefore, increased taxes accrue for all properties within the taxing district. Contiguous and orderly development is a more efficient development scheme from this perspective. Chapter 3, Appendix 6, discusses some of the costs and benefits related to the development of the reservoir. With regard to the issues raised here, there is almost no data regarding increased costs. How much is the cost increase for bus operation, road maintenance, snow clearance, etc. with the addition of several new rural homes? Per unit the cost increase may be small but the combined effect, region wide, can strain financial tax sources.

Lake Access

In this section the land development patterns about reservoirs are discussed from a different perspective, namely the visiting public. Although the Corps of Engineers' reservoirs are flood control oriented, rather than

being justified on recreational benefits, thè latter can be a significant item. It is in the Ames Reservoir project.

Unfortunately, access to the impoundment and adjacent lands becomes more and more formalized as development proceeds. In the Coralville case, access to the reservoir has become restricted in several ways. Subdivisions adjacent to the boundary take on an exclusive "keep out" stature. Also, large tracts of land are leased to organizations; three are in such evidence at Coralville -- the Boy Scouts, Girl Scouts, and the University of Iowa. Agricultural land is both private (trespassing laws apply) and generally uninviting (fences, livestock, planted fields). When an original land owner sells lots from the property while maintaining control of the land adjacent to access roads, a double buffer is in evidence. Such a situation is depicted in the accompanying diagram, Figure 2-10-2.

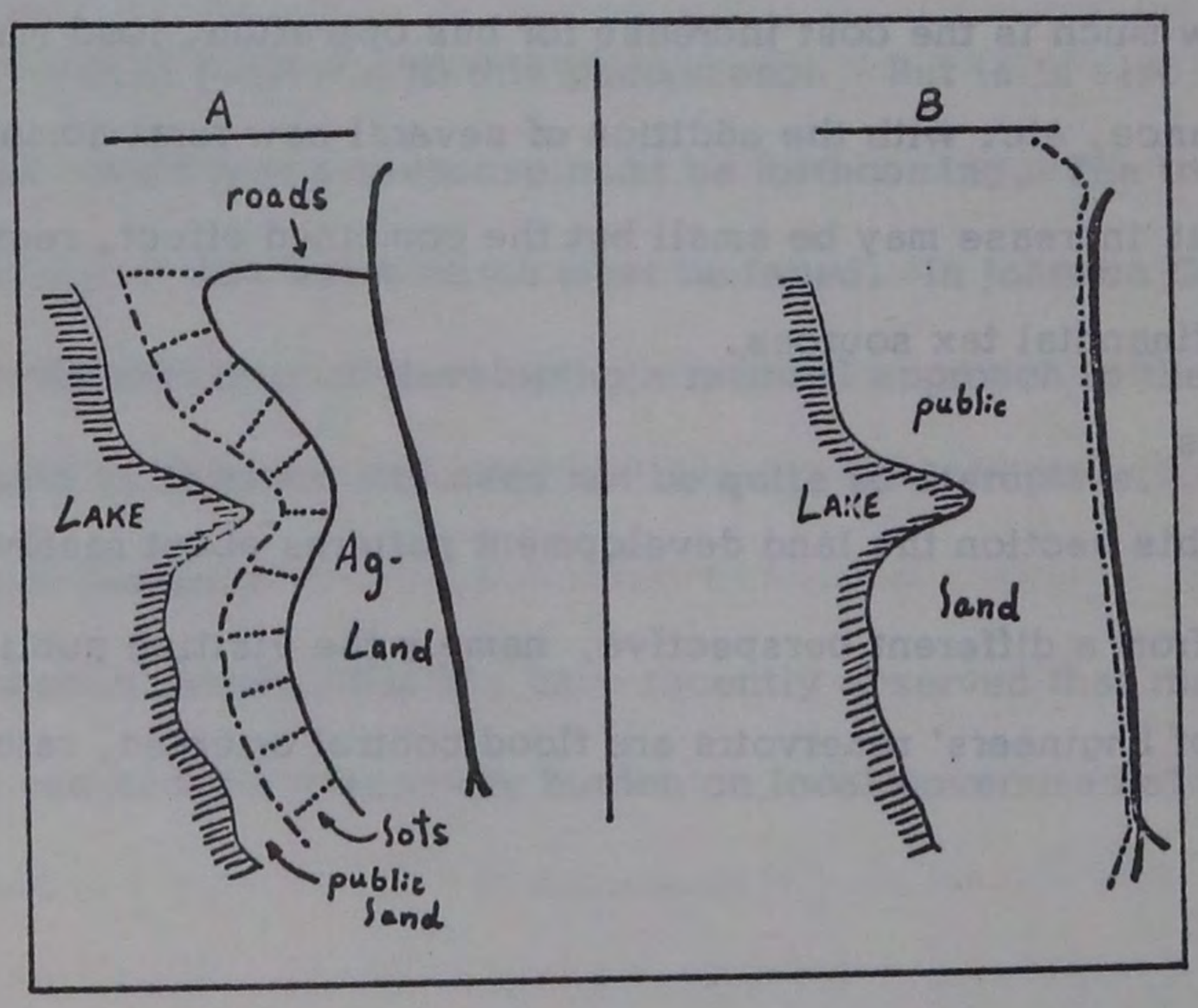


Figure 2-10-2 Lake Access Alternatives

On the left, situation A, an access road is shown leading to a row of lots bordering the public property. Farm, pasture land, or even wooded land buffers the residential area from the through highway. The public land becomes "locked in", so to speak. It is not accessible to the general public from the outer region, and more subtly, it is psychologically inaccessible from the reservoir itself. In many instances, this public land is used by the adjacent property owners as their own. At Coralville, out of 96 permanent homes surveyed (visual inspection from the lake), only 29 left the shoreline unaltered. Ten places were mowed to the water's edge, nine "brushed out" the public land but left it unmowed, and nineteen others cleared a path to the water. The majority of the latter group (13 of 19) maintained the path with stone or wood or dug footsteps. Thirteen places showed evidence of a mooring point for power boats, and ten of these were being used at the time of the survey (July, 1972).

Part B of the diagram shows the only real solution to the "locking in" of the reservoir by private property rights. In "B" the take-line has been extended to include all land between the through road and the reservoir. If it is desirable to lease tillable land, then a road, as in "A", could be constructed which would provide access to the lake front. Residential development could take place to the right of the road in "B", but this would not significantly affect accessibility to the public land and reservoir.

There is a high potential for the abòve situation to occur in the Ames Reservoir area. For example, on the highway leading southeast from Story City through Section 13, this situation is "built in". The solution in this case would require the additional purchase of several modern houses at a cost probably approaching a quarter of a million dollars. In other cases, the circumstances permit more flexible solutions. One such instance is displayed in Figure 2-10-3.

At the left-center of this figure a possible joint road and take-line is shown. This boundary roughly follows the Corps' proposed take-line which is quite irregular and includes easement parcels. Two options are immediately available. The boundary could be extended outward sufficiently far as to make feasible the construction of the road and then either (1) the road could become part of the project, or (2) construction of the road could become part of a regional planning package which would include the sewage system as proposed in Chapter 7, Appendix 5.

The example shown in Figure 2-10-3 would require minimal additional land purchases, although this might not always be the case. Whether the road is initially constructed or not, it should be planned and other private roads should be planned accordingly. This means that developers should know that the road is planned and where it will be located.

Pressure for Development

Many of the larger property owners indicated that they had been approached about selling part of their land for residential use. In some

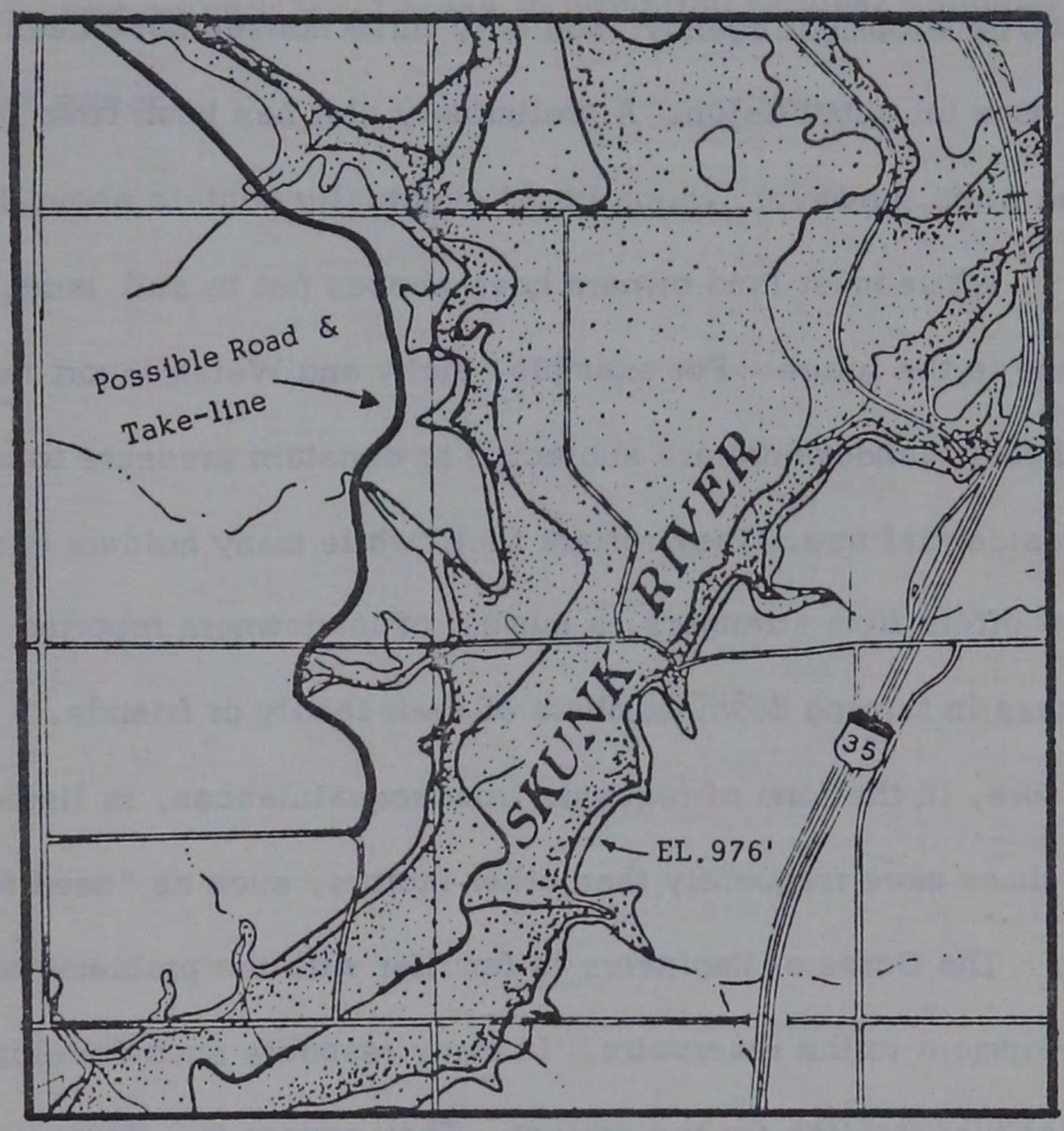


Figure 2-10-3 Unlocking The Reservoir

instances, the owner reported as many as twenty to thirty contacts with potential buyers. In most cases, the pressure to sell property has been partially successful. The area east of the reservoir site is owned by a real estate/development agency, and only three houses have been erected on a nine lot subdivision. A preliminary plat has been filed for the remainder of the tract, however, which could eventually contain about 200 units.

While most land owners have chosen not to sell land, this could change in the future. For example, Burby and Weiss report that in the southeast, landowners are subjected to constant pressure to sell their land for residential use. They remark that "while many holders can successfully resist offers from strangers, a number of landowners reported much less success in turning down members of their family or friends." In fact this pressure, in the form of requests from acquaintances, is listed nearly four times more frequently than other factors, such as "need for the money".

The Corps of Engineers is familiar with the problems of adjacent development to the reservoirs. In many respects such development is a partial justification for the project. They expect it. However, they cannot control development outside their take-line. Directing growth in an orderly fashion is a responsibility of the local governmental jurisdictions, and they wouldn't want it otherwise. Failure to exercise this perrogative generally

results in a haphazard pattern of development. Because of the wide experience of the Corps with these problems, it may be useful for them to play a more active role in this matter, somewhat on the order of the TVA, which has shown good cooperation with local areas in providing rational planning in relation to their projects.

AMES RESERVOIR ENVIRONMENTAL STUDY

Appendix 2. Economic and Social Impact

Part II -- Social Evaluations

Chapter 11

THE DOLLAR COSTS

Contribution to the
Ames Reservoir Environmental Resources Review Study

Sponsored by
US Army Corps of Engineers Contract DACW-25-72-0033

by

John F. Hultquist

1973

CONTENTS

FIGURES

TABLES

Chapter 11

THE DOLLAR COSTS

From the previous chapters it is seen that many costs, both economic and psychological, will not be quantified or in some instances even articulated with respect to the Ames Reservoir Project. The same point may also be expressed with regard to the benefits that should be attributed to the project. Hopefully, the reader is in agreement with this contention and will thus recognize the limitations of a lands and damages estimate, however precise it appears.

The government takes upon itself the responsibility of assuming many of the economic costs related to the residents to be displaced. The significance of these costs is that as they occur the totals are easily accumulated, measuring the flow of dollars from the Federal Treasury to private individuals and related organizations. When this dollar flow has ceased (after several years), the total transfer can be very accurately and precisely measured.

A cost estimate is a forecast of the magnitude of this transfer, and reflects what the government expects to pay out, rather than full costs incurred by all parties affected by the project. Discussion about a cost estimate versus full costs is of interest, therefore, before considering actual estimates.

The Concept of Compensation

Federal policy specifies those "goods" for which a transfer can be made. Such "goods" are generally thought to be real property, but increasingly society is coming to believe that incidential expenses, loss because of interruption of normal activities, and other non-property goods should be compensated.

To continue this discussion requires a notion of the meaning of at least three concepts: namely, just-compensation, fair-market value, and full compensation. The attempt here is not to provide a legal definition but rather an intuitive one.

Just compensation is a concept relating primarily to the taking of real property and to the economic worth of that property. Such worth is measured by fair-market value. The question becomes "for what amount would the property sell under normal circumstances?". Operationalized, this leads to a comparison of the property in question with existing properties in the area to determine in essense what the "market will bear". This situation results in a economic value being placed on the property, not based on the total "value" of the property to the owner, but on what is assumed to be reasonable in a strictly economic sense.

That expropriation practices do not provide full payment for "taking" is generally recognized. According to Allard,

> ...verdicts (by juries) are usually higher than the value of the taking as estimated on the basis of fair market value... If the verdicts which have been rendered by juries in land-condemnation cases are an accurate measure, then another method to properly measure just compensation, aside from the fair market value concept, must be found. (1)

The problem is apparently due to interpreting fair-market value of property as just compensation, which disregards the owner's non-economic interest in it.

Whenever part of project costs are borne by individuals and groups displaced or disrupted, rather than included in project budgets, resource development planning can be distorted. Full compensation is an expression of fairness, recognizing all the extra costs incurred by individuals when "goods" must be given up. Full compensation should include individual and societal concerns in the definition. Individual concerns are important because no individual should suffer uncompensated costs at the expense of the project even though it could be argued that the general welfare has been served. Michelman quotes Hobhouse: "...a rational social order cannot base the essential happiness of forty million men on the misery of one". (2) Societal concerns are important because frequently it is impossible to adequately disaggregate the costs. As an example, assume the project prevents the quarrying of a certain amount of gravel which is now used for secondary road improvement in the county. As a result, other local gravel, now scarcer, should increase in price to balance demand or more remote sources will be sought, thereby increasing transportation costs. The

increase in price is carried by the local tax base. However, project benefits accrue beyond the borders of the taxing authority. Fees, revenue sharing or other methods may work to ameloriate this discrepancy, but only through mere accident would all such costs and benefits undergo proper accounting.

Both costs and benefits are unevenly distributed among individuals and groups and some incur mostly costs while others receive mostly benefits. Thus, if full compensation is to be achieved, all costs and benefits must be disaggregated and distributed accurately by geographic location, social class, and over time. In principle, one criterion that perhaps should be applied to the taking of goods is that compensation should be promised by those who stand to gain from the proposal to those that stand to lose from it, such that the proposal can win unanimous approval. (3) Unanimity, of course, is a goal that will seldom, if ever, be attained but the principle would seem to be an essential aspect of fairness in expropriation practices.

Uniform Federal Policy

Another term may be useful, namely, operationally practical compensatio This term refers to the degree of compensation possible given recent legislation and court interpretation. A recent act, generally referred to as the Uniform Relocation Act of 1970, attempts to equate full compensation and operationally practical compensation. (4) This act makes it possible to compensate all displacees, with a few exceptions, to a much greater degree than ever before.

Full compensation is approached in some individual cases but not in others, and not in the aggregate. The problem of impact on the persons and institutions not displaced but disrupted remains.

The Corps of Engineers, Rock Island District, prepared an informational brochure in 1971 describing the provisions of the new legislation. That brochure is reproduced at the end of this chapter for reference.

Working Guidelines

Within Iowa there are only two organizations that have significant occasion to engage in expropriation. The Iowa State Department of Highways follows Federally established procedures that have been largely initiated by the Federal-Aid Interstate Highway Program. Such procedure includes the Uniform Relocation Act of 1970. The second group operating under the provisions of this legislation, as previously indicated, is the Corps of Engineers. The final cost outcome for a project's takings theoretically would differ very little between the agencies. On the other hand, projected costs (estimates) may differ substantially when interpreted from an individual's standpoint.

The projected cost estimates can differ because of the interpretation the agencies use to determine working guidelines for estimation purposes. Such guidelines are not generally unequivocal but it is possible to discern a different viewpoint between agencies regarding relocation assistance. There appears to be less reason for concern regarding the taking of real property because such takings are based on fair market value at least theoretically. Such estimation is more of a technical matter than a

substantive one. On the other hand, relocation assistance costs utlimately are determined by the choices open to displacees.

In producing rough estimates of anticipated costs within the relocation assistance program, the Iowa Highway Commission proceeds under the assumption that a replacement dwelling for a rural residence is another rural residence, "built if necessary", to meet the safe, sound, and sanitary conditions spelled out by the law. The estimate of the necessary supplemental housing payment is then based on the price of a new home providing adequate space for the family's needs, and ready for occupancy on a one acre site.* By law, the supplemental payment cannot exceed $15,000. Assume, however, that the average value of a rural residence is $10,000 while the average cost of a basic three bedroom house, including lot, is $25,000. The maximum allowable supplemental payment would thus be approached, on the average if all families choose the new house option. In so far as some choose existing housing, either urban or rural, the average supplemental payment may decrease. The housing supplement payments will also decrease as the condition of the dwellings taken approach or exceed the standards of a safe, sound, and sanitary unit. In this case the major cost will be borne by the compensation payment rather than the supplemental relocation assistance. Many of the housing units to be taken by the Ames Reservoir project are not contemporary, but older one and two story frame structures. Because of this the average compensation will need to be supplemented by the additional housing payment.

Housing Costs

Occupied housing structures within the proposed take-line number eight-five.* These include forty-three mobile homes which are involved because of recreational space requirements rather than because of maximum flood pool considerations. Thirty-five owner occupied units are located within the take-line; these will be eligible for a supplementary housing payment.

It is also possible for some tenants to receive supplemental housing payments; that number in the present case would appear to be fifteen. The reasoning behind this is there are fifteen tenants including some in mobile homes that are on separate lots. It would seem that all of these individuals would have the choice of moving either into other tenant quarters or a newly purchased structure. In either case a supplemental housing payment would be feasible.

Tenants of mobile homes separately located may wish to move into a trailer in a mobile home park. It is assumed that this is not the case, and further that they should not. Story County now requires trailers to locate only within such designated parks. Therefore, even for these tenants a comparable dwelling place would mean the purchase or rental of a standard

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*Numbers given here are given without qualification. However, as indicated in Chapter VIII, these figures are estimates based on a near 100% survey and a tentative take-line.

house. Those already located in a mobile home park could be relocated in a similarly designated area, thus, being eligible only for moving expense and dislocation allowance. The above are assumptions, accepted only to permit an estimate of relocation assistance costs, and should not be considered as legal determinations.

Market Value. The Corps of Engineers uses a cost category termed "Improvements and Severance". This category includes residential units, sets of farm buildings, and partial takings. Table 2-11-1 summarizes the market value of these items. The residential properties are broken down into four sub-classes with average values indicated. For all forty-two dwelling units considered jointly the derived per unit estimates are $9,928, $13,047, and $16,833. (The precision of these figures is artificial being derived mathematically from the numbers in the table.) Within the table, low, medium, and high average estimates of unit value are arbitrarily set, but based on general experience in the study area. These figures should also be interpreted as averages. Therefore, the numbers do not rule out the possibility of a one-story older unit being of higher value than a two-story older unit. The variation in value may be quite great within classes; however, no attempt was made to appraise each unit separately.

The number of units to be taken, as estimated here, is greater than in the 1968 Design Memo. This appears to be a function of construction within the take-line and realignment of that tentative boundary itself as was previously discussed in Chapter 8.

Table 2-11-1. Estimated Cost of Improvements and Severance

Type	Number*	Estimated Per Unit Average Value			Estimated Value Per Category		
		Low	Medium	High	Low	Medium	High
a. one story, older	5	$ 7,000	$10,000	$14,000	$ 35,000	$ 50,000	$ 70,000
b. one story, newer	9	12,000	15,000	18,000	108,000	135,000	162,000
c. two story, older	23	8,000	11,000	15,000	184,000	253,000	345,000
d. two story, newer	5	18,000	22,000	26,000	90,000	110,000	130,000
Average residential value:		$ 9,928	$13,047	$16,833			
e. farm buildings (sets)	30	8,000	10,000	12,000	240,000	300,000	360,000
f. partial takings	60	1,000	1,200	1,500	60,000	72,000	90,000
				TOTALS	$717,000	$920,000	$1,157,000

*a, b, c, and d estimated from survey; e and f adapted from Corps documents

Relocation. Relocation assistance estimates are presented in Table 2-11-2. Earlier it was explained why fifteen tenants could be expected to be eligible for a supplemental housing payment. All tenants and owners are eligible for the moving expense not to exceed $300, and a dislocation allowance of $200. Businesses, in this case farm operators primarily, are eligible for payments between $2,500 and $10,000.

The Land Costs

Lands within the tentative take-line slightly exceed 7,500 acres. A classification of this land for cost estimating purposes is shown in Table 2-11-3. The number of acres assigned to each class was determined by air-photo interpretation. No attempt has been made to adjust this interpretation to others given elsewhere in the project documents.* Three primary categories of land are recognized, namely, farmland, river bottom, and residential-investment lands.

Farmland is divided into three subgroups: high, medium and low. Photo interpretation was based on cropping patterns, vegetation, drainage networks and other recognizable features. The classification was intended to approximate the land value classes reported by Murray

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*Note, that in Appendix 4, Chapter 1, Tables 7 and 8, independent estimates are given for cropland and for pasture and woodland. These independent estimates correspond reasonably well if allowance is made for the inclusion of roads and such in the Appendix 4 results.

Table 2-11-2. Estimated Cost of Relocation Assistance

Type	Number*	Per Unit Average Payment			Estimated Cost Per Category		
		Low	Medium	High	Low	Medium	High
Owners	35	$10,000	$12,000	$14,000	$350,000	$420,000	$490,000
Tenants	15	1,500	2,200	3,000	22,500	33,000	45,000
Moving expense and dislocation allowance	85	300	375	450	25,500	31,875	38,250
Businesses	25	4,000	6,000	9,000	100,000	150,000	225,000
					$498,000	$634,875	$798,250

Figure 2-11-1.

Iowa farm land values rise in 1971

by William G. Murray
Professor of economics
Iowa State University

Larry A. Walker
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IOWA farm land values jumped an average of $10 per acre in 1971.

Actual increase was from $385 to $395, representing a 2.6% advance. This compares with an increase of 1% or $3 an acre in 1970. Figures are based on the Iowa Agricultural Experiment Station survey of 660 real estate brokers located thruout the state.

Land markets gained in all areas. Highest increase was from $368 to $383 per acre in the northeast dairy area, a change of 4.1%. Smallest increase was in the north central grain area. Price moved up only 1.8% here, from $448 to $456. The eastern and western livestock areas and the southern pasture area recorded increases near the state average.

Farm enlargement was cited as the main reason for the boost in values. Of the brokers reporting, 37% placed this point at the top of the list compared to 21% in 1970. Of the 5 state areas it was most important in the north central grain region, being listed by 49% of the brokers.

Land for expansion was of least concern in the western livestock area, where 30% ranked it as the main reason for higher prices.

Availability and use of the land contract method of purchase were also mentioned by many of the brokers as helping to keep values climbing.

Contract sales as a market factor were reported by 20% of the brokers as compared to 23% last year. Contracts were mentioned most frequently in the northeast dairy and north-central grain areas—25% and 23%, respectively. Only 13% in the southern pasture area and 15% in the eastern livestock area said contract purchases had some effect.

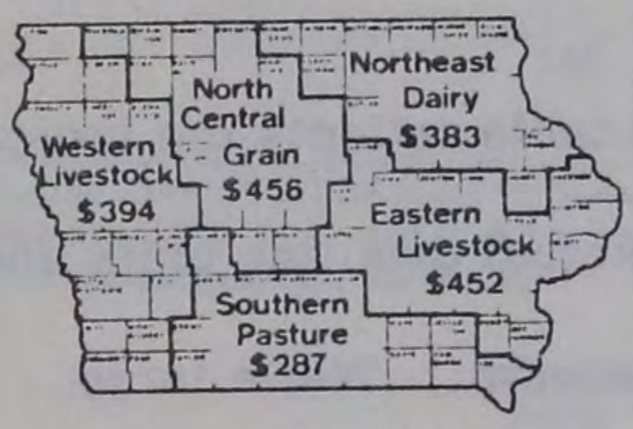
More than 30% of the brokers felt high interest rates were holding land values down.

Low return to farmers was mentioned by 21% as a major price depressing factor. High taxes and high farm input prices were included by 6% of the real estate men as unfavorable factors in the land market.

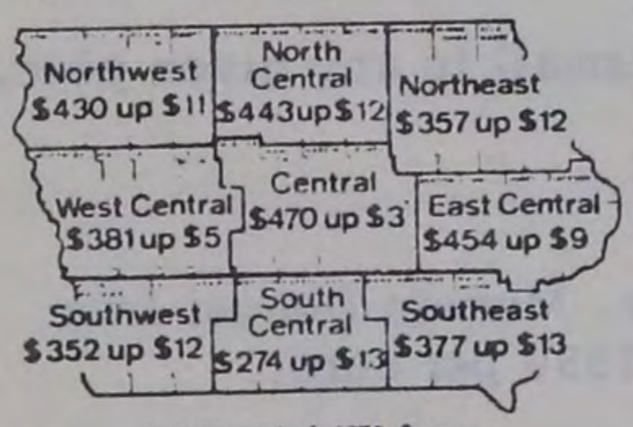
Scarcity of listings and outside investments were also reported as causing land price boosts. A few brokers listed land purchase as a hedge against inflation as contributing to the rise in values.

Along the eastern border, several brokers reported farmers buying land in Iowa rather than in Illinois because of its lower price.

The tables and maps below show land values for the 5 major regions and for the nine crop reporting districts.



Map 1. Average Iowa farm land values on Nov. 1, and amount of change over previous year in economic areas.



* From revised 1970 figure.

Map 2. Average Iowa farm land values on Nov. 1, and amount of change over previous year in crop reporting districts.

Table 1. Average value per acre of Iowa farm land and buildings by farming areas on Nov. 1 for years listed.

Area	1970	1971	$ change
North central grain	$448	$456	+ 8
Eastern livestock	442	452	+10
Western livestock	385	394	+ 9
Northeast dairy	368	383	+15
Southern pasture	279	287	+ 8
State average	385	395	+10

Table 2. Average value per acre of Iowa farm land and buildings, by crop reporting districts and grades of land, Nov. 1 for years listed.

All grades land

Year	State average	Northwest	North central	Northeast	West central	Central	East central	Southwest	South central	Southeast
1960	$237	$270	$271	$214	$238	$287	$280	$191	$149	$224
1965	293	340	346	250	302	354	325	239	191	276
1966	331	383	386	281	346	403	359	272	212	318
1967	362	415	419	314	369	444	410	287	225	346
1968	375	422	438	334	380	468	418	313	238	350
1969	382	423	328	341	386	467	438	332	246	362
1970	385	419	431	345	376	467*	445	340	261	364
1971	395	430	443	357	381	470	454	352	274	377

* From revised 1970 figure.

High grade land

1960	$344	$354	$382	$317	$350	$403	$416	$281	$238	$366
1965	414	454	452	358	422	481	478	339	297	436
1966	466	509	506	400	497	550	525	392	328	498
1967	508	554	546	445	518	602	593	417	341	538
1968	526	565	571	467	522	636	608	439	359	547
1969	534	554	565	479	529	642	628	461	370	559
1970	538	557	548	486	517	646	628	479	390	556
1971	552	567	589	508	525	648	644	491	401	578

Medium grade land

1960	$232	$271	$272	$205	$235	$283	$277	$184	$140	$208
1965	287	337	348	241	299	349	319	236	185	263
1966	324	379	383	272	331	402	352	260	200	301
1967	355	412	418	307	362	441	401	290	215	330
1968	368	420	435	326	372	464	407	308	226	334
1969	375	428	428	334	378	464	428	321	231	343
1970	376	414	434	335	370	461	432	329	246	351
1971	387	426	447	340	375	458	450	340	266	362

Low grade land

1960	$136	$178	$180	$200	$131	$175	$148	$107	$ 70	$ 97
1965	177	230	238	153	185	232	180	143	91	130
1966	204	261	268	169	212	256	201	162	108	155
1967	224	280	295	191	228	290	237	187	118	171
1968	232	281	303	209	246	304	240	191	129	170
1969	238	288	291	210	252	294	256	215	136	184
1970	240	286	291	215	246	295	274	213	146	185
1971	245	298	294	224	212	304	269	225	156	192

However, in some instances the land is already being developed or at least awaiting development. Further, some individuals have been approached about portions of their land for residential development or speculation. This residential category takes account of these situations, referencing land that is in or near development and a second, larger, acreage that is somewhat more speculative. While it may be argued that many more acres have long term development potential, the argument accepted here is that the market does not currently exist for extensive tracts and the great majority of land should be valued as cropland.

Easement lands referenced in the table are comprised mostly of wooded pasture and wooded river bottom lands which may occasionally be flooded, but with such infrequency that the blocking out of these areas and adjacent fields according to normal procedures is not warranted. The purchase of easements is generally estimated to require 50% to 70% of the fair market value. The low, medium, and high estimates, therefore, cover this range.

The "other" category includes gravel resources, public open space, and incidental land which is of public or commercial worth. The Corps suggested a price of $1,250 per unit for such a category but including residential properties. Eliminating the residential lands should raise the average price per unit. Such a situation is depicted in the somewhat higher estimates shown in the table.

The total land cost estimates, based on the per unit values given and the acreage assigned to each category, range from about $3,230,000 to $4,260,000. The medium estimate of $3,800,000 represents a value per acre of $505 for about 7,500 acres, including easements. With easement excluded and improvements included, the average per acre value is nearly $600.

The land costs and the improvements and severance costs are summed to obtain a "total gross appraisal". Corps methodology provides for a 15% contingency based on this amount. The total effect of this contingency is nearly $600,000 for the low estimate and over $800,000 for the high estimate. This contingency fund serves as a cushion, within the methodological framework, for value estimation errors, excess condemnation awards, damage payments, and possible acreage changes or errors.

The estimates derived in this section do not reflect an actual appraisal of property involved. Rather given the amount and type of land and/or improvements to be acquired, the section determines a range of costs based on limited available data. The recent and current events in the agricultural and related sectors of the economy may mean these data are even now inappropriate. The estimates are quite sensitive to the value of agricultural land because of the high percentage of such lands relative to the total project. The current rate of increasing value for good cropland, whatever it may be, has <u>not</u> been part of the input to these estimates.

A second feature of the agricultural-land-market should be mentioned. Murray and Walker, Figure 2-11-1, cite farm enlargement as a major reason for a boost in land values. It is generally recognized that a scale factor exists in this respect. An entire farm of several hundred acres may sell for less per acre than it would had it been divided and sold separately to adjacent land owners. It is beyond the scope of the present report to determine just what consideration this situation should play in evaluating the land purchases of the Ames Reservoir Project.

Other Expenses

In determining lands and damages the Corps includes acquisition expense and land management costs. Estimates of acquisition expenses are here based on 155 ownerships and $1,300, $1,350, and $1,400 per unit. The cost of land management is given as lump sums of $50,000, $52,000, and $55,000. For the lack of reasonable alternatives these values are adapted from Corps estimates.

Design Memo: Basic Summary

Table 2-11-4 summarizes the gross appraisal of lands and damages. The figures in this table have been rounded to further indicate that they are indeed estimates. In general, the rounding has the effect of increasing the cost estimate. If each figure were carried through separately the actual (overly precise) estimates would be $5,284,939, $6,334,584, and $7,299,926.

Table 2-11-4. Estimated Total Cost of Lands and Damages of Design Memo Projec

Land Costs	Low	Medium	High
Land Costs	$3,230,000	$3,810,000	$4,260,000
Improvements and Severance	720,000	920,000	1,160,000
Contingencies	600,000	710,000	820,000
Relocation Assistance	500,000	640,000	800,000
Acquisition Expense	200,000	210,000	220,000
Land Management	50,000	52,000	55,000
Total Land and Damages	$5,300,000	$6,342,000	$7,315,000

*Values are rounded from previously given tables and figures.

Bear Creek Sub-impoundment Supplement

The basic project would supposedly be enhanced with a permanent pool on Bear Creek. The assumption here is that if this item is contemplated additional land would be required to support the expected recreational use which justifies the impoundment.

Two aspects of such an addition must be considered. First, approximately 140 acres of top grade cropland might be added to the project. Second, 45 acres of low grade land would be transferred from easement to purchase. The low to high cost estimates would be incremented by these respective amounts: $106,289, $117,013, and $126,184, again carrying the calculations to extreme precision. In a similar manner, the adjusted totals for this alternative are $5,391,228, $6,451,597, and $7,426,140, or more realistically $5,392,000, $6,452,000, and $7,427,000.

Reduced Scope Alternative

The objectives of a reduced scope alternative are numerous, but several assumptions need to be stated regarding the effect on the tentative taking-line. The alternative in question would base the taking of land on elevation 970 rather than on elevation 980. This accomplishes 27 percent reduction in the surface area of the impoundment, totaling 1550 acres.*

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*Howard Green Report, p. 12.

Total land requirements for the project are not necessarily reduced in an equivalent fashion.

The local relief is such that offsetting features preclude an easy answer to the question of total land requirements. In those reaches of the valley where slopes are steep the reduced pattern may not differ appreciably from that of the Design Memo. Conversely, there exists those areas where this ten foot difference could release major portions of high grade crop land from the project.

A further assumption is necessary. The reduced project would theoretically receive less recreational pressure. This is particularly true because given the reduced surface area of the impoundment the Saylorville project becomes a significantly better alternative for water based recreation. Assuming the above to be so and assuming an objective of minimizing costs and disruption of local activities, then lands needed specifically for recreational uses could be cut back.

Finally, in this section it is assumed that wherever feasible, dwelling units would not be taken even though the technical criteria for takings may be violated. This is a real possibility because of the commonness of locating residential properties at or just above the break in slope.

Given the above considerations and assumptions, the estimation of costs for land and damages has been determined using the following percentage reductions by category: land costs, 20%; improvements and severance, 30%; relocation assistance, 35%; acquisition expense, 10%; and land management, 5%. The small reduction of the latter two items is suggested because the reduction in land required actually has incidental effect on the number of transactions which are likely to be involved. The number of ownerships in question is expected to be reduced only slightly and the acquisition expense will simply be for a lesser number of acres. Land management is not necessarily a fixed cost but the total land reduction does not seem to be of the order of magnitude necessary to alter the scale of these operations, thus the slight relative reduction.

Applying the percentage reductions to the figures given in Table 2-11-4, the cost estimates for the reduced scope alternative are determined. This information is contained in Table 2-11-5. The joint effect of these differential reductions suggests that the reduced scope project will be about 75% as costly as the basic design memo alternative.

Table 2-11-5. Estimated Total Cost of Land and Damages of Reduced Scope Proje

	Low	Medium	High
Land Costs	$2,584,000	$3,048,000	$3,408,000
Improvements and Severance	504,000	644,000	812,000
Contingencies	463,200	553,800	633,000
Relocation Assistance	325,000	416,000	520,000
Land Management	47,500	49,400	52,250
Total Land & Damages	$3,923,700	$4,711,200	$5,425,250

Supplement to Chapter 11

Information Brochure Concerning

The Uniform Relocation Assistance and

Real Property Acquisition Policies Act of 1970

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING
ROCK ISLAND, ILLINOIS 61201

INFORMATION BROCHURE CONCERNING
THE UNIFORM RELOCATION ASSISTANCE AND
REAL PROPERTY ACQUISITION POLICIES ACT OF 1970
PUBLIC LAW 91-646, 84 Stat. 1894

JULY 1971

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INTRODUCTION

The United States Army Corps of Engineers is responsible for the acquisition of real property for the Departments of the Army and Air Force for use for military purposes as authorized by the Congress. It is also responsible for the acquisition of real property for use, among other things, for dams and reservoirs and for river and harbor and flood control projects under the National Water Resource Development Program. The Corps is also responsible for real property acquisition for the purposes of the Atomic Energy Commission, the National Aeronautics and Space Agency, the Postal Service and other agencies upon request.

In order to carry out these responsibilities, individuals and families at times must move from their dwellings, farms and businesses and must relocate elsewhere. This may cause serious problems to the people involved. It is the earnest desire of the Corps of Engineers to reduce to a minimum the inconveniences and problems resulting from its real estate activities. Public Law 91-646 which was passed by the Congress and signed into law by the President on January 2, 1971, eliminates many of the existing differences in relocation benefits incidental to real estate activities of various Federal agencies. This new law authorizes many new and important benefits to minimize inconvenience and to provide for relocation and financial assistance to people who will be displaced by a project which is partly or totally financed by Federal funds.

Perhaps you already know that all or part of your property will be needed for construction of such a project and that you will have to move yourself, your family or your business to another location. This booklet was prepared by the Corps of Engineers to explain the rights and benefits for which you may be eligible.

This booklet describes the nature and extent of the Relocation Advisory Service available to you; what payments may be made; who is eligible for the various payments and under what conditions; and how to apply for benefits. It also sets forth several pertinent items with respect to the Uniform Real Property Acquisition Policy.

The Office of the Division or District Engineer responsible for the program or project which affects your property or holdings will assist you in applying for relocation services and payments for which you may be eligible.

The information contained in this brochure is a broad outline and should be studied carefully. Your Corps of Engineers relocation assistance representative will routinely call on all persons who are considered to be eligible for the relocation assistance program.

If you are about to purchase, rent or move to a replacement property, or are considering making a major commitment toward the selection of a replacement site, your particular attention is invited to the last page of this booklet, which sets out the standards for decent, safe and sanitary housing. The supplemental housing payment cannot be made unless the replacement dwelling meets these standards.

Written questions or requests for assistance should be directed to:

District Engineer
U. S. Army Engineer District, Rock Island
Clock Tower Building
Rock Island, Illinois 61201

Telephone requests for assistance or information should be directed to Mr. Edwin J. Kolvoord or Mr. Harold E. Kendall at Rock Island 309/788-6361. Office hours are 7:30 A.M. to 11:30 A.M. and 12:00 Noon to 4:00 P.M., Monday through Friday.

Upon receipt of your letter or telephone call, your case will be given priority and you will be among the first persons contacted when our representative is again in your area.

RELOCATION ADVISORY ASSISTANCE

In the past it has always been the express policy of the Corps of Engineers to administer its programs so as to achieve to the greatest degree possible fair and equitable treatment of all individuals required to be displaced. Now, through P. L. 91-646, Congress has made the uniform and equitable treatment of persons displaced by a Federal or Federally-assisted project a statutory requirement. The provision of advisory assistance and help to you in your relocation and attendant problems is also specifically required by the new law, should you need or desire such services.

In furtherance of the above policy and in the light of the new statutory requirement the Corps of Engineers has established guidelines and services for all who are displaced by one of our projects or programs.

Whenever the taking of property or a portion thereof will require your displacement a relocation advisory program will be established and will be administered by the Division or District Engineer having real estate responsibility for the project. This service will provide measures, facilities or services as needed:

To assist in determining your needs for relocation assistance.

To have available for you current and continuing information on the availability, prices and rentals of comparable, decent, safe and sanitary

sales and rental housing and comparable commercial properties and farms, and locations for displaced businesses.

To assure, for your benefit, that within a reasonable period of time prior to your having to move from the acquired property, there will be available to you a comparable decent, safe and sanitary replacement dwelling adequate to your needs and reasonably accessible to your place of employment. (In extreme circumstances, the regulations may have to provide for the waiver of this assurance).

To provide assistance to a person displaced from his business or farm operation by the project or program and to help him in obtaining and becoming established in a suitable replacement location.

To supply, to all such displaced persons, information concerning Federal and State housing programs, disaster loan programs, and other Federal or State programs which offer various types of assistance or service to such displaced persons.

To provide personal counseling and other advisory services as needed or desired by you, the displaced person, in order to try to reduce to the minimum any hardships or problems attendant to your dislocation and adjustment to the necessary relocation.

To assist, guide and instruct all displaced persons (individuals, families, businesses, farm operators, non-profit organizations and owners of other personal property) in the preparation and processing of their applications for relocation payments and reimbursement of expenses for which they may be eligible.

To inform and advise those individuals occupying property which was acquired prior to January 2, 1971, but who had not moved as of January 2, 1971, as to their rights, benefits and liabilities under the previous law ("Resettlement" Act; Title 10 U.S.C. 2680) in order that such persons may determine and elect under which law they wish their applications to be processed.

PAYMENTS

The payments for which you may be eligible if your property is acquired and you have to move from your dwelling, business or farm to a new location are intended to provide relief from the economic problems attendant to your dislocation and assist you in obtaining comparable; decent, safe and sanitary housing.

The kinds of payments which are authorized to be considered pursuant to P. L. 91-646 are:

Moving and Related Expenses

Supplemental Housing Payment for Homeowners

Supplemental Housing Payment for Tenants and Certain Others

Costs of Conveying Property to the Government

MOVING AND RELATED EXPENSES

Any displaced person, business or farm operation may be eligible to be reimbursed for actual reasonable costs of moving from the acquired property for a distance of not to exceed 50 miles, except where the displacing agency determines that relocation beyond the 50-mile area is justified.

Reimbursable items include dismantling, disconnecting, crating, loading, transporting, unloading, temporary storage, reinstalling and insuring.

Within certain limitations any displaced person, business or farm operation may elect to apply for a fixed amount rather than prove actual expenses incurred in the move.

A person displaced from a dwelling may elect to receive a moving expense allowance, determined according to a schedule established by the Division or District Engineer, not to exceed $300, plus a dislocation allowance of $200.

A person who is displaced from his business or farm operation may elect to receive a fixed payment in an amount equal to the average net annual earnings of the business or farm operation and such payment shall not be less than $2,500 or more than $10,000. Such payment can only be made as to a business after it is determined that the business cannot be located without a substantial loss of existing patronage and that such business is not part of a commercial enterprise having at least one other establishment not being acquired which is engaged in the same or similar business.

The following types of items are not eligible to be considered for payment as moving and related expenses:

Additional expenses incurred because of living in a new location.

Cost of moving structures, improvements or other property reserved by the displaced person as part of the acquisition by the Government.

Improvements made to the replacement site.

Interest on loans to cover moving expenses.

Loss of goodwill.

Loss of profits.

Loss of trained employees.

Personal injury.

Cost of preparing your application.

Modification of personal property to adapt it to the replacement site.

When an item of personal property used in connection with a business or farm operation is not moved but is sold and is promptly replaced with a comparable item, reimbursement shall not exceed the replacement cost, minus the proceeds received from the sale, or the cost of moving, whichever is less.

When personal property used in a business or farm operation is of low value and high bulk such as junk yards, stockpiled sand, gravel, minerals, metals and similar types of personal property, reimbursement will not exceed the difference between the amount which would have been received for such item on liquidation and the cost of replacing it with a comparable item available on the market at the new location.

When a business or farm operation is discontinued, the displaced person is entitled to the difference between the in-place value of the personal property and the sale proceeds, or the cost of moving, whichever is less.

When personal property used in connection with a business or farm operation is abandoned, the displaced person is entitled to payment for the difference between the in-place value and the amount which would have been received from the sale of the item, or the cost of moving, whichever is less.

The owner of a farm or business is entitled to reimbursement for actual reasonable expenses incurred in searching for a replacement business or farm. Such reimbursable costs include travel expenses, extra cost for meals and lodging and the value of the time spent in searching. There is a limitation of $500 unless the Division or District Engineer determines that a greater amount is justified based on the circumstances involved.

SUPPLEMENTAL HOUSING PAYMENT FOR HOMEOWNERS

In addition to your being paid for the property acquired by the Government and your reasonable expenses of moving, a homeowner who is displaced by the program or project may be eligible under the new law for a supplemental housing payment if necessary to assist in the purchase and occupancy of a comparable, decent, safe and sanitary house; provided you have owned and occupied your present home not less than 180 days prior to initiation of negotiations to acquire your property.

To determine the amount of this supplemental payment, you must consider three basic factors and amounts.

First, the amount, if any, which when added to what you were paid for your dwelling will equal the reasonable cost of a comparable decent, safe and sanitary dwelling adequate to your needs. The appraisal process applied by the Corps of Engineers to replacement homes in the area will determine whether you are entitled to this supplemental amount.

Second, you may be eligible to have included an amount to cover the increased interest costs which you are required to pay on the current market to finance your replacement house. You would only be eligible to be considered for this interest payment if you had a valid mortgage on the dwelling the Government bought and the mortgage had been in existence for not less than 180 days prior to initiation of negotiations by the Government to acquire your property. The payment, if any, would be calculated on and would be limited to the unexpired term of the existing mortgage on the property acquired from you. So, if you did not have an existing mortgage you would not be eligible to have this interest payment included.

Third, you may also have considered for reimbursement as part of the supplemental housing payment those reasonable expenses incurred for evidence of title, recording fees and other closing costs incident to purchase of your replacement dwelling, except this does not include prepaid expenses.

This supplemental payment, if any, based upon the above 3 factors, cannot exceed $15,000.

SUPPLEMENTAL HOUSING PAYMENTS FOR TENANTS AND CERTAIN OTHERS

All tenants and those homeowners who have owned their homes less than 180 days but more than 90 days, must have lawfully occupied their dwellings for not less than 90 days prior to initiation of negotiations to acquire the property in order to be eligible to receive a supplemental housing payment.

Your payment, if any, would be for the supplemental or additional amount in excess of the rent you were paying or would have paid necessary to enable you to lease or rent a decent, safe and sanitary dwelling adequate for your needs for a period of not to exceed four years and the supplemental amount cannot exceed $4,000.

Should you elect to buy a home instead of renting, you could use the supplemental amount determined, again limited to $4,000, to apply toward the down payment and closing costs, except that you must in this case equally match each dollar in excess of the first $2,000 of any supplemental payment in order to be entitled to the maximum supplemental payment determined to be applicable in your case.

COSTS OF CONVEYING PROPERTY TO THE GOVERNMENT

This is also a new benefit for you, the landowner, and allows you to be reimbursed for expenses you have incurred in conveying your title to the United States or State agency as the case may be. The reimbursement permitted consists of three types of items.

Recording fees, transfer taxes and similar expenses.

Mortgage prepayment penalty costs. In other words, if you had a mortgage on the property the Government bought and there was a penalty charged by the mortgage holder for paying it off in advance you may be reimbursed for this expense after you have paid it.

The pro rata portion of real property taxes paid which are allocable to a period subsequent to the date of vesting title in the United States, or the effective date of possession of such real property by the United States, whichever is earlier.

UNIFORM ACQUISITION POLICY

Public Law 91-646 provides that none of its provisions shall be construed as creating in any condemnation proceeding any element of value or damage not in existence immediately prior to 2 January 1971. As a practical matter, this means that the new relocation assistance benefits mentioned above are to be considered as separate and apart from the payment to you of just compensation for your real property.

Public Law 91-646, in addition to the relocation assistance provisions contains provisions for the use of uniform policies and procedures by Federal agencies in the acquisition of real property for Federal purposes. Some of the policies by which Federal agencies will be guided to the greatest extent practicable are set forth below.

Every reasonable effort shall be made to acquire real property expeditiously by negotiation.

The owner or his designated representative shall be given an opportunity to accompany the appraiser during his inspection of the property.

Before the initiation of negotiations, an amount will be established as just compensation and a prompt offer will be made to acquire the property for the full amount so established. In no event shall such amount be less than the agency's approved appraisal of the fair market value of the property. The owner will be provided with a written statement of, and a summary of the basis for, the amount established as just compensation.

An owner will not be required to surrender possession of real property until he is paid the agreed purchase price or until a deposit is made with

the court, for the benefit of the owner, in an amount not less than the agency's approved appraised value or in the amount of the award of compensation by the court.

The construction or development of a public improvement will be scheduled to the greatest extent practicable to give the owner at least ninety days written notice to move.

If the acquisition of real property would leave the owner with an uneconomic remnant, an offer will be made to acquire the entire property.

Public Law 91-646 contemplates that agencies of the several States shall abide by the provisions of P. L. 91-646 in connection with the acquisition of real property and uniform relocation assistance for projects receiving Federal financial assistance.

QUESTIONS AND ANSWERS

QUESTION: IF MY PROPERTY WAS ACQUIRED IN AUGUST 1970 AND I HAVE NOT YET MOVED, WHAT LAW DO I COME UNDER AND WHAT ARE MY RIGHTS?

ANSWER: You are eligible for the benefits of the new law (P. L. 91-646) or you may elect to process your application under the old law ("Resettlement" Act; 10 U.S.C. 2680). In this case you must make an election; you cannot avail yourself to both laws. It may be to your advantage to process your application under the old law: (1) if you find that many of the supplemental benefits of the new law do not apply to your case because of what you were paid for the property acquired; or (2) if, as a result of the acquisition you have incurred considerable search time and expense in looking for a new location pursuant to information received from Corps of Engineers representatives at the time of acquisition; or (3) if the site to which you propose to relocate and do relocate is a distance substantially in excess of the 50 mile limitation imposed upon your moving under the regulations issued pursuant to the new law. The Corps Real Estate Representative will counsel with you in detail on this matter setting forth your rights, liabilities and monetary amounts involved in order that you may be fully informed to make the intelligent election which is yours to make. Once the election is made, processed and paid it cannot be changed.

QUESTION: IF MY PROPERTY WAS BOUGHT ON 2 JANUARY 1971 AND I HAVE NOT MOVED, DO I HAVE AN ELECTION TO PROCEED UNDER THE OLD OR NEW LAW?

ANSWER: No. P. L. 91-646 was effective immediately upon execution by the President on 2 January 1971 and the provisions of the law are not retroactive. You may only proceed under the new law.

QUESTION: IF MY PROPERTY WAS ACQUIRED ON 31 DECEMBER 1970 AND I MOVED ON 1 JANUARY 1971 WOULD I BE ENTITLED TO THE BENEFITS OF THE NEW LAW?

ANSWER: No. Your property was acquired and you moved prior to 2 January 1971, the effective date of the new law. Your rights will be determined under the old law and its regulations.

QUESTION: WHAT MOVING COST BENEFITS ARE AVAILABLE TO THE OWNER OF A DWELLING?

ANSWER: If you are displaced from your dwelling, you may be reimbursed for the actual reasonable expenses of moving yourself, your family and your personal property a distance of not to exceed fifty miles. You may not include as moving cost any expense you may incur to move a dwelling or to add to, improve, alter or make physical changes in the property.

QUESTION: WHAT ARE MOVING COSTS?

ANSWER: Moving costs include such items as dismantling, disconnecting, crating, loading, transporting, unloading, temporary storage, reinstalling and insuring.

QUESTION: DO I NEED RECEIPTS FOR MY ACTUAL MOVING AND OTHER REIMBURSABLE EXPENSES?

ANSWER: Yes. You must be prepared to make available to the District Engineer all receipts and records in order to support the expenditures claimed.

QUESTION: AM I ELIGIBLE FOR ANY PAYMENT WHEN I ACCOMPLISH THE MOVE MYSELF RATHER THAN HIRING A MOVER?

ANSWER: Yes. You may be paid when the move of your personal property is accomplished by you rather than using household or commercial movers; however, the allowance to you for the move will in no event exceed the cost of moving commercially.

QUESTION: MAY THE OWNER OF A DWELLING ELECT TO RECEIVE A FIXED LUMP SUM IN LIEU OF ACTUAL MOVING COSTS?

ANSWER: Yes. Eligible dwelling owners may elect to accept a moving expense allowance of not to exceed $300 and a fixed dislocation amount of $200 in lieu of proving actual moving expenses. The portion of the $300 applicable in such case will be determined pursuant to established moving allowance schedules and that amount plus the $200 dislocation amount will be the total of your fixed payment.

QUESTION: IF I AM ALLOWED TO RESERVE AND KEEP MY HOUSE AND OTHER IMPROVEMENTS AND MOVE THEM TO MY NEW LOCATION, DO I GET PAID FOR THE COST TO ME FOR MOVING THE IMPROVEMENTS?

ANSWER: No. The moving of reserved improvements from the acquired property is an expense which you must bear.

QUESTION: MAY A MEMBER OF A DISPLACED PERSON'S FAMILY, LIVING IN THE SAME DWELLING UNIT, ALSO RECEIVE PAYMENT FOR MOVING EXPENSES AND OTHER SUPPLEMENTAL BENEFITS?

ANSWER: No. No member of a displaced person's family living in the same dwelling unit is eligible to receive moving expenses and other supplemental benefits.

QUESTION: ARE THERE ANY LIMITATIONS ON HOW FAR I CAN MOVE?

ANSWER: No. You may move to any location of your choosing. However, all dwelling occupants, businesses and farm operations may only be reimbursed for their actual, reasonable expenses for moving a distance of not to exceed 50 miles regardless of how far they do move. On rare occasions and under extraordinary circumstances, the District Engineer may allow a distance in excess of 50 miles.

QUESTION: ARE DWELLING OWNERS OR TENANT OCCUPANTS OF DWELLING ENTITLED TO BE REIMBURSED FOR TIME AND EXPENSE INCURRED IN SEARCHING FOR A NEW HOME?

ANSWER: No. P. L. 91-646 specifically excludes dwelling occupants from receiving this benefit.

QUESTION: ARE OWNERS OF FARMS AND BUSINESSES ELIGIBLE TO BE REIMBURSED FOR SEARCH TIME AND EXPENSE INCURRED IN SEARCHING FOR A NEW BUSINESS OR FARM SITE?

ANSWER: Yes, to the extent that such expenses are reasonable and actually incurred. There is a limitation of $500 unless the Division or District Engineer determines that a greater amount is justified based on the circumstances involved.

QUESTION: IS THERE ANY TIME LIMITATION WITHIN WHICH I MUST FILE MY APPLICATION FOR THE BENEFITS UNDER THE NEW LAW?

ANSWER: Yes. You are required to file your application with the appropriate District Engineer not later than 18 months from the date full payment for the real property acquired was made by the Government or not later than 18 months from the date you moved from the acquired property, whichever is the later of the two dates.

QUESTION: SUPPOSE I AM A TENANT, HOW WILL I KNOW HOW TO CALCULATE THE 18 MONTHS?

ANSWER: The Division or District Engineer Real Estate Representative will provide you with the necessary information.

QUESTION: IS A PERSON RENTING A ROOM WITHIN THE DWELLING UNIT ELIGIBLE FOR MOVING EXPENSES?

ANSWER: Yes.

QUESTION: AM I REQUIRED TO MOVE INTO DECENT, SAFE AND SANITARY HOUSING?

ANSWER: No. You may move anywhere you please into any kind of dwelling that you desire. However, you will not be entitled to any of the Supplemental Replacement Housing Payments for which you may be eligible unless you do move into decent, safe and sanitary housing adequate to your needs within one year after you are required to vacate if you are a tenant or homeowner of less than 180 days. If you are a homeowner eligible for the Replacement Housing Payment for Homeowners you must move into decent, safe and sanitary housing within one year of receiving final payment for your acquired property or one year from the date you move from the acquired dwelling, whichever is later. The standards for decent, safe and sanitary housing are set out on the last two pages of this brochure.

QUESTION: WHO IS ELIGIBLE FOR ALL THESE PAYMENTS?

ANSWER: Your eligibility for each payment will depend upon the circumstances attendant to your particular case. You should ask the Division or District Engineer Real Estate Representative and he will fully inform you as to all matters attendant to your case.

QUESTION: DO THESE PAYMENTS UNDER THE NEW LAW HAVE ANYTHING TO DO WITH WHAT I GET PAID FOR MY PROPERTY TAKEN?

ANSWER: No. P. L. 91-646 authorized payments which are in addition to what is determined to be due you for the value of the property acquired by the Government.

QUESTION: ARE ALL THESE ADDITIONAL PAYMENTS, FOR WHICH I MAY BE ELIGIBLE, CONSIDERED TO BE INCOME AND DO I HAVE TO REPORT THEM TO THE INTERNAL REVENUE SERVICE OR THE STATE INCOME TAX PEOPLE?

ANSWER: Section 216 of P. L. 91-646 provides that "No payment received under this title shall be considered as income for the purposes of the Internal Revenue Code of 1954; or for the purposes of determining the eligibility or the extent of eligibility of any

person for assistance under the Social Security Act or any other Federal law." Interpretations of this language can only be made conclusively for you by the U. S. Internal Revenue Service or the taxing authority of the State in which your acquired property is located. (The word "title" in the language of the law quoted above, however, has reference to Title II of P. L. 91-646 which deals with Uniform Relocation Assistance and payments. There are other reimbursements authorized in connection with acquisition under Title III of the law.)

If you have any questions on the tax status of any of the payments you should contact the appropriate Federal and State revenue office and obtain their written answers to your questions to avoid future controversy.

QUESTION: WILL ANYONE HELP ME TO FILL OUT THE NECESSARY APPLICATION FORMS?

ANSWER: Yes. The Division or District Engineer Real Estate Representative will assist you in every way possible.

QUESTION: DO THE FORMS HAVE TO BE NOTARIZED?

ANSWER: No.

QUESTION: IF I BORROW MONEY TO MOVE WILL THE GOVERNMENT PAY THE INTEREST ON THE LOAN?

ANSWER: No. You will not be required to surrender possession or vacate the property until you have received payment from the Federal agency or money has been deposited with the Court for your benefit and withdrawal. In either case the money would be available for your use in relocating.

QUESTION: WHAT IF YOU DO NOT APPROVE ALL THE ITEMS SET FORTH IN MY APPLICATION AND I DO NOT AGREE WITH YOUR DETERMINATION?

ANSWER: Any person aggrieved by a determination as to eligibility for a payment authorized by P. L. 91-646, or the amount of a payment is entitled to have the disputed matters reviewed pursuant to the appeals procedure established for administration of the law. In such cases you should submit your request to the District Engineer having jurisdiction of the project from which you were displaced setting forth in detail and in writing the disputed items and amounts with supporting documentation of your reason for the appeal from the determination made by the District Engineer. Upon review to ascertain completeness and sufficiency of attachments only, it will be forwarded by the District Engineer with his comments to higher authority for review, determination and notification to you as to the final decision. No particular form is necessary for your appeal to be considered.

QUESTION: I OWN A HOME IN TOWN WHICH IS NOT BEING TAKEN BY THE GOVERNMENT; HOWEVER, THE GOVERNMENT IS TAKING MY NEARBY FARM WHICH IS THE SOURCE OF MY LIVELIHOOD AND I MUST MOVE. WILL YOU PAY TO MOVE MY FAMILY & GOODS TO A NEW LOCATION?

ANSWER: Yes. You are eligible for moving costs.

QUESTION: I LIVE IN AN APARTMENT IN THE SAME BUILDING IN WHICH I CONDUCT A BUSINESS. I OWN THE ENTIRE BUILDING AND THE GOVERNMENT IS TAKING IT. AM I ENTITLED TO MOVING AND RELATED EXPENSES AS A DWELLING OCCUPANT?

ANSWER: Yes.

STANDARDS FOR DECENT, SAFE AND SANITARY HOUSING

Minimum Requirements. A decent, safe and sanitary dwelling is one which meets all of the following minimum requirements:

(1) Conforms to State and Local Housing Codes and Ordinances. Conforms with all applicable provisions for existing structures that have been established under State or local building, plumbing, electrical, housing and occupancy codes and similar ordinances or regulations.

(2) Water. Has a continuing and adequate supply of potable safe water.

(3) Kitchen Requirements. Has a kitchen or an area set aside for kitchen use which contains a sink in good working condition and connected to hot and cold water, and an adequate disposal system. A stove and refrigerator in good operating condition shall be provided when required by local codes, ordinances or custom. When these facilities are not so required by local codes, ordinances or custom, the kitchen area or area set aside for such use shall have utility service connections and adequate space for the installation of such facilities.

(4) Heating System. Has an adequate heating system in good working order which will maintain a minimum temperature of 70 degrees in the living area under outdoor design temperature conditions. A heating system will not be required in those geographical areas where such is not normally included in new housing. Bedrooms are not included in the "living area" as referred to in this paragraph.

(5) Bathroom Facilities. Has a bathroom, well lighted and ventilated and affording privacy to a person within it, containing a lavatory basin and a bathtub or stall shower, properly connected to an adequate supply of hot and cold running water, and a flush closet, all in good working order and properly connected to a sewage disposal system.

(6) Lighting. Has provision for artificial lighting for each room.

(7) Structurally Sound. Is structurally sound, in good repair and adequately maintained.

(8) Egress. Each building used for dwelling purposes shall have a safe unobstructed means of egress leading to safe open space at ground level. Each dwelling unit if a multi-dwelling building must have access either directly or through a common corridor to a means of egress to open space at ground level. In buildings of three stories or more, the common corridor on each story must have at least two means of egress.

(9) Habitable Floor Space. Has 150 square feet of habitable floor space for the first occupant in a standard living unit and at least 100 square feet (70 square feet for mobile home) of habitable floor space

for each additional occupant. The floor space is to be subdivided into sufficient rooms to be adequate for the family. All rooms must be adequately ventilated. Habitable floor space is defined as that space used for sleeping, living, cooking or dining purposes and excludes such enclosed places as closets, pantries, bath or toilet rooms, service rooms, connecting corridors, laundries and unfurnished attics, foyers, storage spaces, cellars, utility rooms and similar spaces.

AMES RESERVOIR ENVIRONMENTAL STUDY

Appendix 2. Economic and Social Impact

Part II -- Social Evaluations

Chapter 12

SUMMARY AND RECOMMENDATIONS

Contribution to
Ames Reservoir Environmental Resources Review Study

Sponsored by
US Army Corps of Engineers Contract DACW-25-72-0033

by

John F. Hultquist

1973

CONTENTS

Chapter 12

SUMMARY AND RECOMMENDATIONS

This section, Appendix 2, brings to the forefront issues that have frequently not been considered in public development planning. Because the Corps of Engineers has in the past stressed engineering design, as was their mandate, and proceeded with less detailed "soft" data, it has been the purpose of this section to highlight many of the issues of increasing concern in American planning functions. In so doing, some significant issues have not been developed in great detail. The target, rather, has been a frequently general perspective on the nature of the impact in this realm of "soft" issues.

The overall sociological impact of the proposed reservoir can never be known. The impact began when the planning began, which for practical purposes was the late 1940s. The rebirth of the project, resulting from construction of Interstate 35 in the mid-1960s, marks the "modern" history of the project.

The overriding sociological impact of the project, then, is this off-again/on-again prolonged planning stage. Very little is known as to how uncertainty of this nature affects people. Chapter 7 brings up the concept of "life-change," that is the rate of change in a person's life. Change is a condition for living, but rapid and unordered change has physical and psychological impacts on the person. Thus, two important

points can be stated. First, the prolonged planning and uncertainty of the reservoir has affected the social and economic history of the Valley for twenty-five years, and especially so for the past ten years. The second point is that upon construction and operation of the reservoir and its supplemental facilities, the lives of hundreds of people will be permanently disrupted. Each of these points warrant recapitulation.

Planning Fatigue

For want of a better term, the label "planning fatigue" is applied here to the first of the above issues. It is apparent that as the potential of the reservoir waxes or wanes following one study after another the people whose environment it threatens become frustrated and alienated. The prolonged planning stages for the reservoir produce uncertainty in their lives. How is it possible to measure the stress produced by these forces? The very act of interviewing a person on the subject of the reservoir, for some, is an impactful event.

There is a feeling in our society that if something can be measured and written down as a number then it is real; if it's not a number then it doesn't exist. This feeling when applied to the Ames Project focuses attention on the number of people that will be moved, the number of acres inundated, or the number of dollars of benefits. Numberwise, those who will be displaced are few when compared to other projects. For example, as many as 80,000 people may have been moved for each

of the several major dams in Africa. The Ames project will require the relocation of about one-half of one percent of this or several hundred individuals.

Numbers, therefore, have little meaning unless viewed within a space and time framework. As has been shown in the chapters of this section, this space/time context has changed over the history of the project. Our society now questions very seriously many projects that were generally welcomed several years ago. Some attribute this to environmental issues, but this is true only if the term is used in its broadest sense. Witness the stall of the urban-interstate highways. The construction of the intra-urban links in the interstate system have greater impact on the social/economic environment than the natural environment. Yet many of the links have not been constructed because of protests. A turnabout has also appeared with respect to such diverse issues as the prevention of forest fires and stream channelization.

None of the above argues for or against the Ames Project, rather it is a presentation of an issue which must be considered at a policy level, perhaps in the political arena. Trade offs must be made by society. Is the reservoir absolutely necessary or is it just desirable? Perhaps it is not desirable, and not even necessary but rather useful. In the present case, these issues have never been clearly resolved and the planning, and to many the threat, of the reservoir continues.

Construction and Operation Disruption

The impending construction of Interstate 35 initiated an apparently dormant interest toward developing the long proposed reservoir and brought about Congressional authorization. Upon construction the reservoir, as currently planned, will displace about 300 people; just under 100 house-holds. Those who own or are buying their homes, about 35 families, have an average length of current residency exceeding fifteen years. These people, especially, have strong historical ties to the Valley and long time social linkages with each other. Those who support the reservoir must realize that they are asking these families to sacrifice. This is not referring to a dollar and cents sacrifice, which should not be the case, although for some there may still be a monetary loss. It is referencing the loss of a way of life for a few so that, theoretically, many may benefit.

The displacees also include a number of renters who collectively average about two and one-half years residency in their current dwelling and nearly ten years elsewhere in Story County. For these people, as a group, the displacement should be less psychologically traumatic; their bonds to the Valley and to the people are generally weaker. This is not universally true however. Since the renter group is younger than the owners (34 years vs 49 years), they have spent a larger proportion of their adult life in the region.

Property purchases for the reservoir will also disrupt another group of households, numbering about 30, and the changed environment will have

immediate effect on these and at least 20 more households. These estimates do not include the many families living in Story City or Ames outside of the survey area (Figure 2-8-1).

From a sociological standpoint, then, the reservoir will directly and immediately disrupt the family life of several hundred people. For many residents of the Valley, the planning of the reservoir has disrupted their lives for years. These are two different issues. The latter issue is history and cannot be ameliorated; the former issue, if it does happen, can be dealt with in a more forthright manner than in many previous cases. The Relocation Assistance Act of 1970 provides some of the needed flexibility, but not enough.

Planning Process

Two planning issues are raised by the above discussion. First, how can the planning of resource development projects, such as a reservoir, be made less uncertain and disruptive during the formative stages of the project. Second, assuming construction begins, how can the impact be lessened. Neither of these questions seems to have been given the serious consideration they seem to warrent. The former appears to have been ignored in the planning literature of this country. The second issue is too closely tied to the concept of compensation. When an attempt is made to pay a reasonably fair price for a person's property and associated relocation expenses, the individual is left alone to handle the disruption in his life and that of the community.

Pre-Planning

These disruptive forces could be lessened with a frontal approach to the problems. Consider the question of uncertainty preceding authorization and construction. This period could be shortened considerably simply by a national policy of resource site designation. Reservoir sites are a natural resource, and although development of a reservoir may not be necessary at a given point in time, independent changes in many other variables may reverse this finding. A policy of resource site designation could serve several functions. From a sociological viewpoint, the uncertainty of a continuance of "life as normal" would be removed. A "designation" would inform all that a particular site was no longer an open market area. (For instance, the "designated" area in the Ames Reservoir project would include the region which will eventually become a northward extension of Ames' suburban growth.) From a resource development perspective, such a policy could prevent tremendous capital investment in the way of houses, sewers, roads, utilities, and the like, which would require acquisition and removal if the site was to be used for a reservoir.

An operational program is beyond the scope of the present study because of the necessary specificity to the Ames project. But if the project's start is not imminent then the proposal takes on increasing meaning with each passing month. Such a program could look to the Scenic Rivers Act for stimulation, to the federal-local cooperation of the TVA for planning

initiative, and to other groups, agencies, or countries for workable ideas.

Post-Planning

Distruption of family life caused by the development of the reservoir is of a dual nature. First, there is the immediate problem of relocation and disruption associated with completion of the structure, facilities, and the filling of the lake. A second set of problems are of concern with the operation of the reservoir and the associated recreational lands and facilities. Lake access, picnicing, and camping facilities are traffic generating nodes. Highways connecting these points, nearby urban places, and separate regions frequently are used beyond their intended capacity. For the families remaining on or near the access roads, traffic and traffic generated dust and noise increase as do interactions with strangers. People visiting the public areas seek the assistance of the closest telephone, tractor, or other equipment for all types of reasons; illness, being out of gas, being stuck in mud or snow are examples. Because of this dual nature of disruption, namely immediate vs continuing, post-planning functions should be established accordingly.

A short-lived office of disruption and relocation assistance could work to ameliorate the problems of adjusting to a rapidly changing environment for some in a new location. For example two features which such an office might provide would be a real estate and employment opportunities clearinghouse. This would not be to replace private efforts

but rather to present them fully and coherently to those significantly affected by the reservoir. In the case of a displaced farming operation, such a service could attempt to demonstrate the feasibility of piecing-together existing parcels to make a viable farming unit. The point is that these activities will take place to some extent in the private market over a period of years. The clearinghouse concept would be a way of shortening this period of disorder and more fully realizing the potential of the entire region which the dam is meant to serve.

This introduces the second issue involved, that of continuing planning. Good planners realize that planning is not the development of a rigid "future map" of their area, but rather that it is a process, a continuing process. Such planning should include elements of repair as well as elements of development. With respect to the former, a farmer who suffers a partial taking may feel he can remain in operation either through more intensive use of existing land, land purchase, or rental arrangements that may be contemplated. Three to five years may be needed to determine whether the new operation will be a viable one. If it is not viable, then the individual involved must make new arrangements. Until such time as those affected by the reservoir have reasonably well recovered from its impact, the responsibility of assuring adjustments should be shared by the society that initiated the problems. Thus, a short term "adjustments" effort is suggested.

The reservoir is a capital investment with a purpose; it is the development of a natural resource. Planning is necessary to assure that a reasonable attempt is made to reach the potential return on such investment. The dissatisfaction of some downstream farmers with the river levels below the Coralville Reservoir and others, where flood peaks are moderated but extended for longer time periods, suggest that the land is probably not in its best use. Yet, these are the very areas and the very people expected to be the beneficiaries of the flood control practices. From this situation and others, it is easily argued for a program of development planning following the construction of the reservoir.

PART III

PUBLIC RESPONSE TO PLANNED ENVIRONMENTAL CHANGE

AMES RESERVOIR ENVIRONMENTAL STUDY

Appendix 2. Economic and Social Impact

Part III -- Public Response to Planned Environmental Change

Chapter 13

A SUMMARY OF A STUDY OF CITIZEN VIEWS AND ACTIONS ON THE PROPOSED AMES RESERVOIR

Contribution to the
Ames Reservoir Environmental Resources Review Study

Sponsored by
US Army Corps of Engineers Contract DACW-25-72-0033

by

Gordon Bultena, David Rogers,
and Vince Webb

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NOTE: This section has been published separately as Sociology Report #106 by the Department of Sociology and Anthropology, Iowa State University, January 1973. The Forward, Table of Contents, and a short Summary are provided on the following pages. The Department of Sociology and Anthropology has copies of the report which is 108 pages with numerous tables documenting the findings of the study.

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1973

FOREWORD

This analysis is part of a larger study conducted at Iowa State University into potential environmental and community impacts of the proposed Ames Reservoir.

This report examines some attitudes and behavior on the reservoir issue of persons living in the three counties most directly affected by the proposed project.

The purpose of the research is to better determine if the Ames Reservoir is in the "public interest," as this interest is reflected in the views and actions of local citizens.

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APPENDIX 2

Part III

Summary

The results of this study follow from interviews with 390 people over eighteen years of age, who were selected by a linked process of area-probability and random sampling. The sampling area extended upstream to Jewell and downstream to near Bondurant (see map, page 21). The findings are organized by key questions which guided the research. To provide a perspective on the nature of the study these organizing concepts are listed below:

1. What has been the nature of past public response to the Ames Reservoir proposal?
2. What are the present attitudes of local populations toward the Ames Reservoir?
3. What, if any, are the relationships between characteristics of people and their attitudes with regard to the proposed Reservoir?
4. What is the nature and level of public awareness about the project?
5. How are the projects' benefits and detrimental effects perceived by the people?, and
6. What actions have been taken by local people in relation to the Reservoir?

These questions, through the concepts they express, were key elements in the construction of the questionnaire.

Past Public Response. Information presented by citizens at the 1964 Corps of Engineers hearing on the Ames Reservoir largely dealt with potential personal economic benefits or costs accruing from the project. The 1965 Iowa Natural Resources Council hearings, on the other hand, saw a greater number of non-economic considerations being raised, such as the possible effects of a reservoir on the natural environment and on local wildlife populations. Outdoor recreation, as a potential benefit or cost of the Ames Reservoir, received little citizen attention at either the 1964 or 1965 public hearings.

Present Attitudes. Approximately one-fourth of the respondents in this study favor building the reservoir, thirty percent oppose construction, sixteen percent are undecided, and four percent don't care one way or the other. Twenty-four percent of the respondents were unaware of the reservoir project. Using an "upstream/downstream" (from the dam) classification the sample is split into two groups of 101 and 289 people respectively. Fifty percent of the upstream subgroup oppose the reservoir, twenty-three percent favor it, and eight percent were unaware of it. Similar data for the downstream group show twenty-four percent opposed, twenty-six percent in favor, and thirty percent unaware of the reservoir project.

Attitude - Characteristic Relationships. People having favorable and unfavorable attitudes about the reservoir project did not materially differ in their age, sex, income, education, and occupational characteristics. On the other hand, support for the reservoir was found to be positively related to other attitudes. It was found that attitudinal support for the Ames Reservoir was related to a positive attitude toward construction of other reservoirs in Iowa, to a favorable view of the program and operating procedures of the Army Corps of Engineers, and to a developmental orientation toward management of the natural environment.

Public Awareness. One fourth of the respondents were unaware that a project such as the proposed reservoir might be built, about two-thirds were unaware that the Army Corps of Engineers was the government agency spearheading the project, and about three-quarters of the respondents were unaware that public hearings had been held on the project.

Of those knowing about the project, many respondents indicated that the Army Corps of Engineers had made little effort to acquaint the general public with plans or rationale for the proposed Reservoir.

Only a small proportion of respondents felt that flooding and poor water quality were serious problems on the Skunk River. Furthermore, persons who perceived such problems tended to feel that alternative plans posed better solutions to the problems than did construction of the Ames Reservoir.

Perceived Benefits and Detriments. Flood control and recreation are perceived by the people as the two most important justifications given by the government for the Ames dam. Their own opinions about problems are the following: sixty-five percent feel there is a lack of water-based recreational opportunities in the local area, fifty-four percent feel flooding to be a problem on the Skunk, and forty-one percent feel water quality is a problem. Generally, those who oppose the project agree that it will (a) flood too much farm land (seventy-seven percent), (b) benefit too few people (eighty-one percent), (c) seriously damage wildlife habitat (seventy-nine percent), and (d) reduce the physical attractiveness of the valley (seventy-two percent). Consequently, of those who favor construction of the reservoir, only ten-to-twenty percent perceive the above-mentioned social and economic costs.

Grass-Roots Action. Only a small proportion of the respondents, about seven percent, had engaged in actions designed to influence governmental decision making on the Ames Reservoir, such as signing petitions, writing letters, speaking to government officials, or attending public hearings. A larger proportion of persons opposing the project, than of those favoring it, were found to have been active in efforts to influence decision on the Reservoir; the ratio was about four to one.

Proponents of the Ames Reservoir project were more likely than were opponents to feel that opportunities for citizen involvement in government decision making were adequate, and concomitantly, they

were less likely to perceive a need for increased provision for such participation in the future by government agencies.

Discussion

The Ames Reservoir controversy reflects in microcosm many issues which pervade natural resource decision making in the United States. Securement of widespread public support for resource programs increasingly is problematic, given the multiplicity of demands being made on the natural environment. As a society we face, on the one hand, rising demands that the environment provide a variety of material products to sustain established consumption patterns. This pressure is matched, on the other hand, with rising and often conflicting public expectations for a quality environment in which aesthetic and recreational demands on resources are being pressed.

Two questions lie at the heart of decisions that have been, and will be, made in setting priorities for resource use in the Skunk River Valley. First, what factual information and value judgments underlie these decisions? Second, who should properly participate in the decision making process?

The opportunity for choices between development plans is readily apparent in the Ames Reservoir controversy. There is a choice not only between whether a reservoir will be built or the area left in its natural state, but also between other alternatives such as a smaller reservoir impoundment or development of a greenbelt park.

Selection between these alternative uses of the Skunk River Valley will not be made on the basis of factual information alone. An added factor is the value orientation of decision makers, and in this the Ames Reservoir controversy is similar to other environmental projects. Unfortunately, there are no ready or easy answers to most of these controversies, only points of view. The questions, however, deserve attention if resource programs are to truly reflect the public interest.

The present study provides one type of data that should be considered in decisions between alternative uses of the public's resources: namely, citizen views on the desirability of these alternatives. This does not suggest that favorable or unfavorable citizen reactions should dictate the eventual determination of management programs. It does suggest, however, that when programs are submitted and defended as being in the public interest, there should be some demonstrable evidence as to how the public actually feels about these proposed programs, and about alternative programs that might be implemented.

WATER RESOURCES DEVELOPMENT BY THE U.S. ARMY, CORPS OF ENGINEERS IN IOWA

1 JANUARY 1979

SCALE OF MILES 0 5 10 20 30 40 50

AUTHORIZED FEDERAL PROJECTS

	COMPLETED	CONSTRUCTION UNDERWAY	NOT STARTED
LAKE & DAM			
WATERWAY			
LEVEE			

NAVIGATION PROJECT | FLOOD CONTROL PROJECT

CONGRESSIONAL DISTRICT 1 2 3 4 5 6

CONSTRUCTION CONSIDERED UNDERWAY IF CONSTRUCTION FUNDS ARE ON HAND.

MINNESOTA

SOUTH DAKOTA

NEBRASKA

ILLINOIS

MISSOURI

IOWA

ST. PAUL DISTRICT

ROCK ISLAND DISTRICT

NORTH CENTRAL DIVISION

MISSOURI RIVER DIVISION

OMAHA DISTRICT

KANSAS CITY DISTRICT

ROCK ISLAND DISTRICT

UPPER IOWA RIVER

DRY RUN

LANSING HARBOR

LOCK & DAM NO. 9

UPPER MISSISSIPPI RIVER 9-FOOT CHANNEL

LOCK & DAM NO. 10

ELKPORT

LOCK & DAM NO. 11

DUBUQUE COMMERCIAL HARBOR

LOCK & DAM NO. 12

SABULA

LOCK & DAM NO. 13

CLINTON HARBOR

BEAVER SLOUGH

CREDIT ISLAND SMALL BOAT HARBOR

LOCKS & DAM NO. 14

BETTENDORF

DAVENPORT

LINDSAY PARK SMALL BOAT HARBOR

LOCKS & DAM NO. 15

LOCK & DAM NO. 16

LOCK & DAM NO. 17

MUSCATINE ISLAND L.D & MUSCATINE-LOUISA COUNTY D.D. NO. 13

IOWA RIVER-FLINT CREEK L. DIST. NO. 16

LOCK & DAM NO. 18

GREEN BAY L.D DISTRICT NO. 2

COMMERCIAL HARBOR

FORT MADISON HARBOR

LOCK & DAM NO. 19

KEOKUK HARBOR

MUSCATINE (MAD CREEK)

MUSCATINE HARBOR

DAVIDS CREEK LAKE

RED ROCK DAM AND LAKE RED ROCK

RATHBUN LAKE

MERCER LAKE

AMES LAKE

SAYLORVILLE LAKE

CORALVILLE LAKE

MARENGO

CHELSEA

MARSHALLTOWN

EVANSDALE

WATERLOO

IDA GROVE

SIOUX CITY MARINA

FLOYD RIVER AT SIOUX CITY

BIG SIOUX RIVER AT SIOUX CITY AND NORTH SIOUX CITY

LOWER BIG SIOUX RIVER

DRY CREEK

LITTLE SIOUX R.

MISSOURI RIVER LEVEE SYSTEM

De Soto Bend

Decatur Bend

Snyder Bend

COMPREHENSIVE PLAN MISSOURI RIVER BASIN

MISSOURI RIVER STAB. AND NAV. PROJECT (9-FOOT CHANNEL)

COUNCIL BLUFFS

COUNCIL BLUFFS 624-627 L

601 L

594 L

575 L

HAMBURG

RED OAK

EMERSON

OMAHA

DES MOINES

SAYLORVILLE

VAN METER

ADEL

EXIRA

BEDFORD

OTTUMWA

BURLINGTON

KEOKUK

FT. MADISON

IOWA CITY

DAVENPORT

ROCK ISLAND

MUSCATINE

WAPELLO

CEDAR RAPIDS

ANAMOSA

MONTICELLO

INDEPENDENCE

BELLEVUE

DUBUQUE

CLINTON

LANSING

DECORAH

ELGIN

LITTLEPORT

GUTTENBERG

NEW HARTFORD

MASON CITY

ESTHERVILLE

FORT DODGE

WEBSTER CITY

JEFFERSON

BOONE

AMES

AKRON

HAWARDEN

SIOUX CITY

Rock River

Big Sioux River

Perry Creek

Floyd River

West Fork Sioux River

Wolf Creek

Little Sioux River

Maple River

Soldier River

Boyer River

Silver Creek

Indian Creek

Nishnabotna River

West Nishnabotna River

East Nishnabotna River

Walnut Creek

Plum Creek

Middle Nodaway River

East Nodaway River

Nodaway River

Grand River

Thompson River

Weldon R.

Platte River

Middle River

South River

East Fork Des Moines River

Des Moines River

Boone River

Raccoon River

North Skunk River

Skunk River

Red Cedar River

Wapsipinicon River

CEDAR RIVER

Turkey River

Volga River

Upper Iowa River

Mississippi River

Buffalo Creek

North Fork Maquoketa River

Maquoketa River

Duck Cr.

Charlton River

Wyaconda River

Fox River

Iowa River

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