ACHIEVING URBAN WATER CONSERVATION, TESTING COMMUNITY ACCEPTANCE

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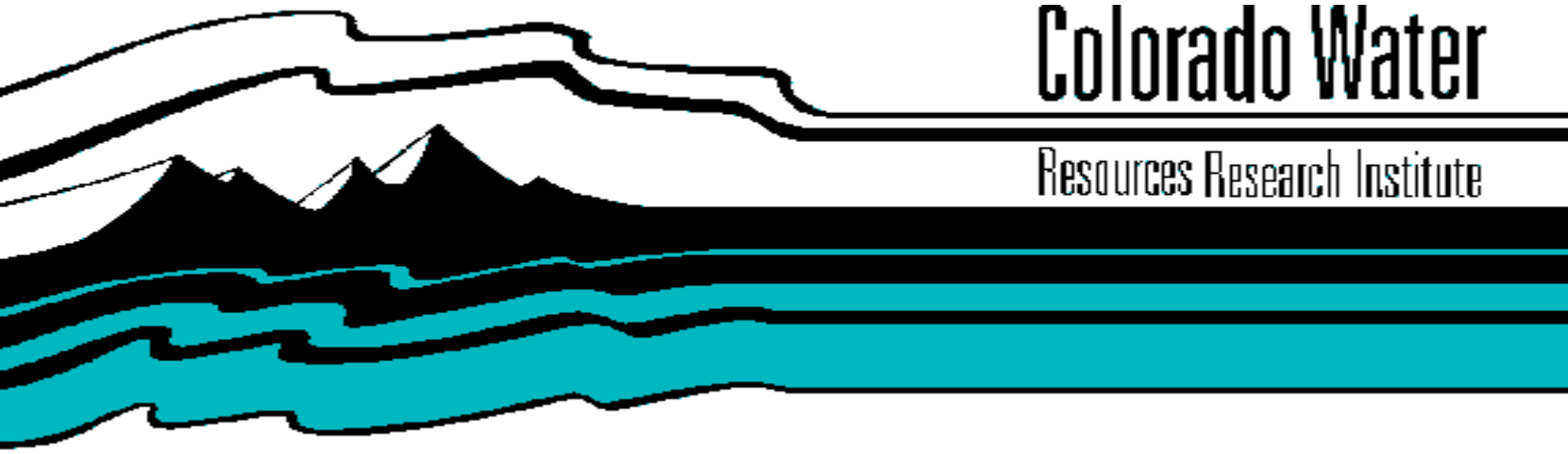

Completion Report No. 81

ACHIEVING URBAN WATER CONSERVATION:

TESTING COMMUNITY ACCEPTANCE

Completion Report, Part II

OWRT Project No. A-030-COLO

by

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submitted to

Office of Water Research and Technology

U. S. Department of Interior

Washington, D. C. 20240

September, 1977

The work upon which this report is based was supported (in part) by funds provided by the U. S. Department of the Interior, Office of Water Research and Technology, as authorized by the Water Research Act of 1964, and pursuant to Grant Agreement Nos. 14-34-0001-6006, 14-34-0001-7011 and 14-34-0001-7012.

COLORADO WATER RESOURCES RESEARCH INSTITUTE

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Fort Collins, Colorado
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ABSTRACT

Employing a Q-Sort Factor Analytical Design, this study sought to develop a system for parametric representation of non-linear data structures using data acquired from representative samples of entire communities. The representations are specified in terms of a spatial metric "social space," an analog of psychological space. The defined social space is then characterized and used to define the community action zone which is hypothesized to a zone of community acceptance for those policies falling within its bounds. Such a zone for the communities of Lafayette and Louisville, Colorado was used to define socially and politically feasible water conservation policies for the communities. Policies with the highest feasibility for acceptance were legal restrictions on water use and restrictions on growth and development. The next most feasible were horticultural techniques and economic solutions. Reuse for agricultural purposes also appeared to have some political feasibility.

This study demonstrated the usefulness of survey research in delineating viable water conservation programs.

ACKNOWLEDGEMENTS

The major portion of this report is composed of the Masters thesis prepared by the senior author titled "The Roles of Water Conservation Values in Community Policy." Much of the field interview data upon which the findings are based was collected under the supervision of Dr. Hill, and made available for this study to augment data collected in Colorado by Mr. Snodgrass.

This study is Part II of an OWRT-sponsored project funded through the Colorado Water Resources Research Institute of the Environmental Resources Center at Colorado State University. Dr. J. Ernest Flack, Professor of Civil and Environmental Engineering at the University of Colorado, Boulder, is co-investigator with Dr. Hill for the project. Part I of the Completion Report on the project, which is a handbook of urban water conservation practices, has been published as Completion Report No. 80.

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CHAPTER 1

SOCIAL AND POLITICAL FEASIBILITY: THE PROBLEM

Traditionally, policy proposals have been developed in planning processes on the basis of their technological and economic feasibility. Questions of technological feasibility simply ask if the proposal is physically possible to accomplish at the time of consideration: "Can it be done?" as distinguished from "Should it be done?". If it is not possible to accomplish then the proposal is, in most instances, removed from consideration. The exceptions are where a proposal is deemed so vital that it may be retained in hopes that new technology will develop to make it possible to accomplish at some future time. A good example is the stern abatement requirements imposed by the Federal Water Pollution Control Act Amendments of 1972 which require removal of certain substances for which technology is presently inadequate.

When a proposal is considered technologically feasible it is then normally judged in terms of economic feasibility, or the ratio between dollar costs and benefits. If the B/C ratio is high it is usually assumed that the proposal will be considered favorably in the decisional processes; that is, its economic feasibility is assumed to make it politically and socially feasible.

Difficulty arises in relation to that latter assumption which presumes that technological and economic feasibility indicate social, political and environmental feasibility. The problem is that in the decision-making process the worth of various policy proposals are frequently based on social and political values which often fail to bear a direct relationship to economic or technological feasibility and therefore should be considered separately. For example, in the planning stage the technological and economic feasibilities of nuclear energy have been, for the most part, established. Yet, in some states at least, the political, social, and especially, environmental feasibilities have yet to be demonstrated. Frequently social and political feasibility estimates have been ignored or have been determined by utilizing a selected economic measure (e.g., money) which has been deemed, incorrectly, to be a surrogate for all social and political benefits and costs. The result of this common tendency has been a host of policy failures which were technologically and economically sound but inadequate socially and/or politically.

The purpose of this study is to estimate the social and political feasibility of including various water conservation alternatives in the existing policy framework of two target communities. Such an effort requires definition of the concept of feasibility in terms of its technological, economic, social, political and environmental applications. In the past, considerable difficulties have stemmed from

failure of specialists in policy planning and development to consider the social and political effects of their proposals. All too often they have viewed such factors primarily as constraints to be overcome. But even when the social and political effects have been taken into account, measures of economic feasibility have often been permitted to dominate, a characteristic of the planning and decisional processes which has frequently contributed to the failure of proposals which reach the political decision-making realm.

As failures of past feasibility measures have mounted, new approaches have been advanced in attempts to overcome the difficulties encountered at the political and social choice stage. Among these approaches have been use of "cost effectiveness" and "Least Cost" models; diffusion of costs and concentration of benefits; institutional reform; social accounting; use of social indicators; wider public participation in decision-making; searches for greater political access and opportunity to influence social choice.[1] Although these approaches have recognized a need, and no doubt, have aided the efforts to solve feasibility problems, they have been inadequate. For one thing, they continued to center attention on economic feasibility and often economic measures cannot supply indicators for crucial social and political variables.[2] Secondly, they are based primarily on the pluralist characteristics of our society, and hence, seek to fulfill scattered group demands. Even

though pluralism is a critically important feature of American society, it does not always stand up as the main factor underlying a policy outcome.[3] Also, because of the preoccupation with supplying group demands, the overall system is frequently ignored.[4] For example, when one group's demands are met, this affects other groups and the system as a whole. Lastly, the benefit-cost approaches usually center on how to avoid constraints irrespective of the effects of successfully doing so. Hence, they lack regard for normative considerations which would decide the effects of the proposal and then judge what should be done.[5]

Because of these shortcomings, the search for adequate political and social feasibility measures should be continued. It is clear these measures cannot be obtained at the expense of economic and technological feasibility concerns. The latter will continue to be vital.

Political and social factors should be considered as logical extensions of the technological and economic ones. Hence, political feasibility concerns itself with questions of "how" as does technical feasibility analysis, but, in this case the "how" is extended to the social and political decision-making arena.[6] Social feasibility, on the other hand, inquires if a proposal is warranted based on its foreseeable social effects.[7] However, the concern over "should" always depends somewhat on "how".

Briefly, then, technological and political feasibility tests ask whether something can be done. Is the proposal

technically possible to accomplish? Can it win political acceptance? Economic and social feasibility asks whether it should be done even though it might be possible to do. And questions of environmental feasibility ask the same question: "Should it be done?"

Now, it has been contended here that "should" feasibility queries must be asked separately. They cannot always be answered in terms of surrogates (e.g., B/C ratios or other measures of economic feasibility). Secondly, all three "should" questions often bear directly upon the question of political feasibility. Indeed, this is where economic feasibility has acquired such prestige and "clout" in times past. For example, whether a bridge could be built often depended upon showing the county commissioners that it had economic feasibility.

The primary focus of this study is political feasibility, however. The question will be asked as to how politically feasible certain conservation and other environmental policies are within two urbanizing rural communities -- Lafayette and Louisville, Colorado, both of which were selected for their special urbanizing characteristics.

Constraints as Political and Social Feasibility Questions

It is contended above that many past efforts to address questions of political feasibility resulted in defining them as constraints. An unfortunate consequence of defining political factors as constraints is the obvious tendency to view them as enemies of solution. They become impediments

to achieving goals, when in actuality, they can be quite the opposite.

It is, nevertheless, true that any effort to develop designs for solving a problem must inevitably define the constraints on the problem itself. It therefore appears that efforts to focus upon constraints will alleviate some of the problems of measurement dealing with social and political feasibility questions. Constraints can be defined as, "any restrictive effect that one factor exerts upon the character or movement of another factor".[8] By examining constraints during efforts to determine feasibility one is viewing the problems through various types of indicators. Hence, the aim herein will be to identify constraints that do exist and to probe into why they exist. This should result in a better understanding of the nature of the constraint and also indicate the "how" and "whether" answers which are being sought.

The limitations of using the concept of constraint are, to a great extent, in the form of cultural biases which can be summarized as follows: "Fixing one's focus on constraints leads the observer to overemphasize restrictions and impeding factors at the expense of facilitating and expediting elements; (there is) . . . a tendency for persons to view anything which they perceive as impeding their goals to be a constraint . . .. The very concept of constraint, then, often reflects personal bias; insistence that the costs and benefits be allocated differently may be, indeed often is,

interpreted as a constraint that is not exactly legitimate."[9] Despite these limitations, however, the concept of constraint is certainly a valid and useful tool in political and social feasibility analyses. In fact, it seems to contribute a great deal to a need to distinguish between the varying types of feasibility.

One task of this research, then, was to identify constraints on the adoption of water conservation alternatives, and thus, to indicate the political and social feasibility of those alternatives. Although the gamut of possible constraints on water conservation policy is too vast to cover in such an effort as the one here, a goodly number can be observed in operation. This will be done by examining constraints manifested in the attitudes and opinions of water users and managers.

Attitudes and Opinions as Constraints

Attitudes and opinions are important as constraints in virtually all aspects of the American policy and decisional processes. If there is a great variance found between the attitudes and opinions of those who make decisions and those who must live with the decisions, the chances are that the outcomes of decision will be modified at some point in the process. Many decision-makers realize this and decide policy on how they anticipate the public will react. But often they use the same measurements discussed previously which give at best, a poor representation of how the public will respond, resulting in conflict created by a

particular proposal or lack of any proposal. Apart from this, decision-makers develop attitudes and opinions that are largely independent from what they perceive their respective publics as having. Consequently, they often make some types of decisions, or perhaps all decisions, accordingly. This would seem to hold true more as the type of decision moves from major to routine and in cases where the public is perceived as disinterested, uninterested, or unaware.

These are just some of the types of attitudes and opinions which can serve as constraints on policy proposals. Hopefully, identification of attitudes and opinions which operate as constraints on conservation policy, will provide indicators of how social and political feasibility barriers may be surmounted.

Statement of the Problem

To put the problem succintly is usually the most difficult task confronting the researcher. To address the problem, two urbanizing, rural communities in Colorado have been selected on the basis of their seemingly obvious rural characteristics as well as their emergent urbanization features. These characteristics and other known and yet unknown demographic, economic, social, situational and attitudinal parameters will be patterned. The patterns will be used to assist in ascertaining the political and social feasibility of selected, alternative water policies, including conservation alternatives within the two

communities. In so doing, attitudinal structures can be employed as possible constraints. Finally, emergent patterns and feasibility outcomes can be compared with patterns and outcomes from other American communities in the United States. Antecedent to these efforts, however, are considerations of the meaning of conservation per se, a description of the communities to be tested as well as a brief delineation and justification of the test model.

CHAPTER 2

THE CONCEPT OF CONSERVATION

The concept of conservation has acquired numerous interpretations since it was first used in its contemporary context during the 19th Century. Prior to that time, it was used primarily on an individual and private basis and its meaning remained simple. However, this simplicity was sacrificed as it developed into an ideology and became the objective of a public movement -- developments which dramatized conservation issues and aided in disseminating the concept through the body politic.

Development of the Conservation Concept

As awareness of the conservation movement grew, more interpretations arose as to what the movement was about; as a result, meanings and interpretations were altered. Today the concept of conservation is perhaps even more obscure than in the earlier years of this century. Over the years individuals and groups interested in natural resources have borrowed the term and bent its meaning to fit their needs. For example, followers of John Muir, founder of the Sierra Club, often associate their preservationist philosophy with conservationism. Moreover, numerous historical and political accounts of the conservation movement have added

to the distortion by concentrating solely on moral and emotional aspects of the movement with little attention being given to the rational, scientific aspects. Even after the obvious denotative and connotative differences are placed in perspective, one is left with an inherently complicated concept because a variety of outcomes can result from application of the same meaning.

In order to clarify ideas underpinning the conservation concept as the founders of the Traditional Conservation Movement interpreted its meaning, and in order to reach a suitable definition for this study, the history of the conservation movement in the United States must be examined. The conditions spawning the movement and the men who advanced it must both be scrutinized. Phrases commonly associated with the concept today had but a small place in the midst of the abundant resources that existed in the United States prior to the Civil War. The American experience east of the Mississippi had seemingly been one of "more than enough of everything for everybody"; and this experience coupled with growing expectations of abundant resources in the West, led Americans to believe that the nation's resources were, for the most part, limitless. As a result, early attempts at far reaching resource programs originating from an expanding scientific community were destined for the back burner. The situation at that point in time did not warrant adoption of resource conservation

goals; and the intellectual source from which such a stimulus might have come, was by and large, distrusted by the American public. There were a few scattered attempts at resource conservation programs prior to the Civil War, but their scope was severely limited and their adoption was usually for reasons other than concern over resource depletion or wiser use of resources. Thus, with few exceptions, the growth of the concept of conservation as it is known today did not really begin until after the War between the States, a war followed by a period of national growth that was concurrent with development of the United States west of the Mississippi River.

After 1865 a great deal of the American West was still unexplored and even when reports did come back, they were often distorted and lacking in scientific exactitude. As a result, decisions to move westward were often based on information containing more myth than reality. This was especially true in relation to the agricultural methods required in the new lands. Consequently, thousands set out ill-equipped to establish new lives in an area many thought to be identical to the East, and although some found what they were hoping for, a great number encountered disaster.

The problem was not a limited supply of land; it was plentiful. Rather, the problem was limited water resources for the vast reaches of available land. Water supplies were widely scattered and, unlike the more humid East, the

western climate seldom brought forth sufficient rainfall for crops. As a result, myths luring many to move westward gave way to harsh environmental realities. It soon became apparent that available water would have to be increased if large regions of the West were to be developed.

Western water problems constituted an important factor which generated consciousness of conservation need. The first usage of the word "conservation" in this context referred to "the storing (conserving) of water in the Spring in order to have the water available for irrigation in the later Summer."[1] However, this applied meaning was soon to become just one among many.

Confrontation of human spirit and ingenuity with the harsh realities of short water supplies for mining and agriculture soon led to one of the most highly developed cycling processes of available surface waters from stream sources to stream outfalls. Such developments quickly converged with growing national government concern over other western problems, especially since the West was where much of the remaining public domain was located and also because a national system of transportation would soon link the coasts. As a result, help was elicited from the scientific community, many members of which were now employed in government agencies. The subsequent application of scientific analysis and the growing number of problem-solving skills to resource problems resulted in a number

of new concepts related to resource management. Several of these new concepts would eventually crystallize under the rubric of "conservation".

In addition, during this period of discovery in the West, the nation as a whole, was changing. There were obvious shifts in the social and economic structure from expressions of individualism and laissez-faire to dependence on the government when it was thought that government could perform certain functions more advantageously. These social and economic changes were conducive to growing concern about the nation's resources on the part of persons in both the public and private sectors. Consequently, still more ideas as to how resources should be managed were developed. Eventually many of the newer ideas would also come to be related to conservation ethics and practice.

Western development then is one situation which helped generate concepts of conservation. The move westward and the resulting problems with water supply were primary in the development of an American conservation ethos. Likewise, the economic, social, and political changes that were taking place in the nation were also important generators of a conservation mode and ethic. However, although such factors were vital in creating concern and stimulating action on conservation matters that culminated in the conservation movement, many were and still are the source of much confusion as to the true nuances and connotations

conveyed by the concept. It was not the narrow resource interests of Big Business or the political group conflicts that gave the term its true importance, but rather, pragmatic needs of a water-short environment combined with a growing scientific movement that was increasingly applying science and technology to resource problems. Consequently, if the term "conservation" is to be put in proper perspective, scientists who initiated the movement and their concepts must be examined.

The Men and the Concepts

Although the Traditional Conservation Movement did not blossom until the turn of the 20th Century under the Roosevelt Administration, many of the concepts associated with conservation were developed years before. Until the early 1900's, however, neither the concepts nor the small band of scientists who developed them had much general public visibility or acceptance. There had been more than enough resource catastrophes to indicate that the scientific community was nearer correct than anyone else in the analysis of the resource situation. Nevertheless, the optimistic mood of the nation at the time, coupled with the low level of political skills possessed by the scientific community, made it difficult for the findings of science with respect to resource conservation to gain much public attention, let alone acceptance.

One scientist who experienced considerable difficulty on this score was John Wesley Powell, the founder of the

U.S. Geological Survey. Powell's first encounter with potential resource problems occurred during his explorations of the Colorado and Green Rivers in the 1860's and again in the 1870's. During these trips his skill at scientific observation yielded a host of novel geologic discoveries which were to give great impetus to his chosen field of geology, ultimately resulting in the creation of the U.S. Geological Survey in 1879. More important than his contributions to geology from the standpoint of conservation, however, was his role in the identification of potential resource problems and his advocacy of the application of scientific knowledge to solve the problems. Beginning with his report, The Arid Lands of the West,[2] written in 1878, Powell stressed the precarious interrelationship of natural resources, especially in the West, and the need to develop methods based on scientific analysis to assure a more stable balance between resources and their use. Thus, he began to envision and develop concepts which would later become fundamental to the development of the conservation movement, namely, wise use and maintenance of the fragile balance of nature. Although it is hard to estimate the degree to which Powell understood the full implications of these concepts, he did feel strongly enough about their benefits to use his position in the U.S. Geological Survey to develop and advance resource legislation based on his findings. His success was greatly limited however. Although he was an excellent public speaker and

knew how to deal with Congress effectively, in most cases, too many factors were against him. Foremost among them was the tendency for his findings to discredit fundamental beliefs which had been ingrained in the American society and had been evident in its policies for a number of years. It would necessarily be a matter of more time before most Americans and their Congress could be brought to the point of feeling strongly enough to change views which had been so strongly reinforced by past experience.

Typical of many scientific responses to the political process, Powell grew impatient with what he believed to be the irrationalities of the political system and public antagonism toward his viewpoints. As a result he soon retired from the battle with Congress leaving the political wars to his younger, more ambitious followers. Yet, no matter how strong his feelings of futility and disgust may have been, his legacy to the American people and their environmental needs grows more monumental with each passing moment. In the context of the conservation idiom he reaffirmed the Newtonian dictum that the natural environment was an interrelated system. Secondly, he stressed the now well-worn (although still often unheeded) notion that mankind's technological ingenuity and development had to honor those interrelationships and constraints. Thirdly, he emphasized, indirectly if not directly, that continued resource availability is a function of properly relating the applications of technology to resource utilization. This infers two

more points that are too frequently ignored; namely, that technology and science are distinct, though not necessarily incompatible, entities; and that proper resource utilization and conservation are dependent upon solid scientific findings.

In 1888 while Powell was still Director of the Geological Survey, Frederick Haynes Newell was appointed to the position of Assistant Hydraulic Engineer. Like Powell, Newell, who was trained at Massachusetts Institute of Technology, was an extremely capable scientist and held great faith in the ability of science to overcome the problems associated with natural resources. Unlike Powell, however, he would find the public and Congress more receptive to his ideas, especially those ideas related to the water problems of the Great American West.

In the same year that Powell was appointed to his position in the Geological Survey, the national government authorized the first water resource investigation of the arid West in order to plan for federal irrigation projects. It was during these investigations that the Hydrographic Branch and Newell, who became its head in 1890, began to develop concepts of water use which were to become paramount in the conservation movement and which, even today, remain synonymous with the concept itself. Based on theories Powell had begun to develop several years earlier, Newell and his colleagues recognized that both quality and quantity of water were ultimately dependent upon the status

of other resources and that when developed properly, keeping this relationship in mind, water could be used for a number of purposes simultaneously. In addition, they emphasized the point that water was a renewable resource which did not simply vanish after irrigation or during periods of drought, but rather relocated to another part of a continuous cycle made up of "precipitation, evaporation, percolation, run-off and streamflow".[3] Thus, Newell and his colleagues, motivated by the goals of scientific resource management and development, began to formulate the notion of multiple use which today is vital to the understanding of the concept of conservation as it is used in its traditional sense. However, since their notion was based upon the interrelationship of water and other resources, especially the forests, specialists from these areas would have to join in support of the overall conservation concept before it would gain the force necessary to spur the conservation movement and be considered as alternative policy.

Simultaneous with the growth in number of scientists concerned with water was the growth of the professional foresters who, like the water specialists, sought scientific solutions to their problems pertaining to the vast lands of the nation. Emerging from this group was Gifford Pinchot, today known as the father of the Traditional Conservation Movement and possibly better known as the intimate advisor to President Theodore Roosevelt.

Pinchot, who was trained in the advanced techniques of German Forestry, became Chief of the Division of Forestry in 1898 and set out to change the traditional role of that organization from one of limited information gathering and dispersal to one of extensive scientific discovery and application. He soon became a leading proponent of the concepts of scientific resource management and especially sustained-yield forestry.[4] Unlike some of his predecessors Pinchot found a deeply-rooted concern over the waste of the nation's forest lands. For years there had been an organized movement which condemned waste for aesthetic reasons. But with the influx of scientists into forestry agencies and increased interest of the forest industry, evident in the late 19th century, aesthetics were beginning to take second place to concerns of efficiency and economics related to forestry practices. Although many of Pinchot's policies were coincidentally related to the aesthetic concerns of the "preservationists", he was in fact motivated by a desire to develop rather than preserve the nation's forests, and therefore, was well suited to the shift toward the utilitarian benefits sought in sustaining the forest lands.

Unlike the members of the U.S.G.S., who were mainly interested in the "multiple-use" concept, Pinchot promoted the idea of "sustained-yield" or, "to provide a continuous supply of lumber for the future by insuring that the annual cutting never exceeds the annual growth, and by utilizing

waste and the reducing fire and disease losses".[5] However, although Pinchot placed a great deal of emphasis on this subsidiary concept of conservation, he nonetheless worked closely with Newell and the rest of the Geological Survey in an effort to bring the ideas of "multiple'use" and "sustained-yield" to the forefront of national concern. Charles R. Van Hise has said:

> "It was seen by Mr. Pinchot and the other scientists . . . that there is a close connection between forests and waters. There was a strong public demand that our rivers maintain a uniform flow for water power and for navigation. Therefore, those primarily interested in forests and those interested in waters became associated in the conservation movement."[6]

As a result of this merger the conservation movement seemingly peaked during the Administration of Theodore Roosevelt (1901-1909). For a brief period conservation policy would be based on the collection of scientific data and the application of scientific principles to resource problems. For the first time a seeming consensus was reached, not only on the ends of conservation, but the means as well. A good summary of the movement and ideas behind it is offered by Samuel Hays in his work, Conservation and the Gospel of Efficiency:

> "Conservation, above all, was a scientific movement and its role in history arises from the implications of science and technology to modern society . . .. Its essence was rational planning to promote efficient development and use of all natural resources. The idea of efficiency drew . . . federal scientists from one resource task to another, from specific programs to comprehensive concepts. It molded the policies which they proposed, their administrative techniques, and their

> relations with Congress and the public. It is from the vantage point of applied science, rather than of democratic protest, that one must understand the historic role of the conservation movement."[7]

Thus, for a short time in history science played a significant role in the formulation of resource policy that resulted in a number of natural resource programs along with the creation of government organizations to carry out these programs. However, the role of science and the unity of thought were soon to be overwhelmed by conflicts arising from various resource groups as they used their power to influence legislative policies in behalf of their own private interests. Pinchot, Newell, and the rest of the conservation leaders had long sought to achieve a compromise among these resource groups, realizing that their combined support was as essential to the development of worthwhile resource policy as it was to the fulfillment of their own goals of efficient resource development. But apparently the individuals and groups became too numerous and diversified for the leaders to cope with and as the conservation movement continued, the purity of the concept of conservation suffered. Norman Wengert, speaking of this shift in control, says:

> "Perhaps by 1910 purity of doctrine was no longer possible for the impressive efforts of public education that culminated in the 1908 Governors Conference and the National Conservation Commission had taken the control of the movement out of the hands of the small clique of scientific bureaucrats and had diffused it among many individuals and groups."[8]

Thus, out of their own pursuit for group support the early leaders of the conservation movement initiated the conflict which would result in doom for many of their tenets.

Although a wide number of concepts are associated with conservation today which are deemed legitimate, the present analysis deals primarily with the concept as developed and employed during the Traditional Conservation Movement. As alluded to in the analysis of the movement above, the present conservation concept arose from a number of subsidiary concepts coming together in support of an effort to achieve a sustainable relationship between man and his natural surroundings. This was and remains today the core idea underlying the movement and the concept itself. Although this study centers on one of the subsidiary concepts (i.e., the cyclic nature of water) it is essential to examine briefly a few of the other components of the conservation outlook to enable illumination of the significance of the concept as a whole for today's situation in which many of the consequences of resource depletion are imminent.

Components of the Conservation Ideology

Stewardship

Many analysts have long contended that resource problems and their solutions have been deeply affected by the Judeo-Christian heritage.[9] Certain of these analysts trace the influence back to the phrase in Genesis: "Man is to increase and populate the earth and have dominion over nature."[10] They find this anthropocentric feature of the

Judeo-Christian doctrines in general, and the Calvinist philosophy in particular, to be one basis of the American belief that extensive exploitation of natural resources is eminently justified.

On the other side of the coin, however, the Judeo-Christian heritage has had a positive influence in behalf of conservation objectives. Indeed, certain influences have resulted in environmental enhancement. Many persons tend to forget that the concept of "stewardship of nature" is also firmly embedded in Scripture. As interpreted by Henry P. Caulfield, ". . . each generation of man should leave the earth in as good condition for use by future generations as he found it . . .. Man uses the earth in trust for future generations."[11] In short, dominion shall not be interpreted as a right to exploit for mere human gratification. The two concepts, dominion and stewardship, are quite compatible in Biblical terms, and they are to be viewed as interdependent and supporting of each other rather than antagonistic. Human beings shall be stewards of God's handiwork (nature) in the exercise of their domain over nature. Above all, the interdependent linkage between humanity and nature must be preserved through time. This is a primary emphasis of the philosophical tradition and it fits Powell's dictum about conservation. Such a philosophical posture can be fitted rather easily to a number of dominant American ethics as, for example, utilitarianism, beneficial use, and pragmatism. One can maximize utilities

in the exploitation of nature without fear of much criticism as long as he is efficient, non-wasteful and maintains a posture of stewardship toward the future of mankind and its environment.

It is impossible to specify the precise role the concept of stewardship has played in the overall growth of the concept of conservation. However, it is safe to say that stewardship added a dimension of emotionalism and morality to the conservation concept which would otherwise be lacking. Within and without the religious context, it gave each person a reason to feel individual responsiblity for the present environment and its latent effects on the unborn.[12] Thus, a concept of conservation, which, at times was so technical that its comprehension was beyond all but the scientific community, could be brought within the reach of everyone by stressing the needs of future generations. In short, it was capable of being popularized.

The moral and emotional dimension that stewardship and other moral components brought to the conservation concept serves to illuminate a tendency for conservation to be more of an ethic shrouded in the symbols of virtue than a defined and sustained set of practices or operative functions. After all, conservation rhetoric pales rather rapidly in the face of efficiency rhetoric. Production and full employment rhetoric tends to eclipse it. Society does not "gear up" for conservation as it does for increased production.

Despite its emotional and moral qualities, the concept of stewardship also has its practical side. It comes from and has been used within a developmental tradition just as surely as the anthropocentric dictum of "dominion over nature." For example, the more recently developed concept of "sustained-yield" can be extracted directly from the ancient idea of stewardship. Therefore, aside from its other qualities, stewardship provided a reference point when "sustained-yield" and related concepts were first emerging in their more technical forms during the late 19th and early 20th Centuries.

Today the concept of stewardship retains much of the role it has played for a number of years in the growth of the concept of conservation. Perhaps most importantly, it helps to distinguish the need to preserve for the present from the need to conserve for the future, and thus, it serves as a vital link to the past when conservation had greater specificity of meaning and its application was more consistent with that specific meaning.

Wise Use

The concept of "wise use" is the focal point of conservation. Under its general heading are the more specific concepts of "multiple-use", "sustained-yield", and prevention of physical waste, which collectively seek to achieve a sustainable relationship between man and natural resources. Perhaps the main notion underlying "wise use" is efficiency,

because this term "suggests a balance, either physical or economic, between input and output".[13] Thus, "multiple-use", "sustained-yield", and prevention of physical waste can be viewed as beneficial inputs into the environmental system which serve to offset the costs of the constant withdrawal of resources from the system and thereby maintain a balance between availability of resources and the demand stemming from resource use.

The difficulties in the application of the "wise use" principle arise from difficulties encountered in efforts to measure such intangible elements as personal preference and esthetic values. Such imponderables weigh heavily upon the analytical process and encourage a return to strict methods of economic feasibility analysis. The return to economics tends to depreciate the full value of the wise-use doctrine for decisional purposes. Dr. Norman Wengert comments on this consequence:

> "Often the concept of wise-use is applied solely in a physical context. In speaking of using land in accordance with its capabilities, the soil conservationist thinks in terms of farming practices which will minimize erosion losses and soil depletion. Decisions of this character in the final analysis must be made in economic context. Just as coal mining depletes coal, so any pattern of cropping for market depletes the soil. The question thus is one of degree, the wisdom of a particular decision being determined by a number of related factors, including costs. Every farmer and every society may at one time or another have to decide on the rate of depletion, or whether to risk long-term returns. In short, although esthetic values,

> personal preferences, and judgements as to consequences are all relevant, economic cost considerations are an indispensible element of wise-use."[14]

Thus, although "wise-use" is an essential element in obtaining the goals of conservation, its application, based as it is on efficiency, is limited by its inability to weigh certain intangible factors adequately by utilization of economic analysis.

Exhaustibility, Inexhaustibility, and Renewability

Essentially none of the earth's resources are exhaustible in the sense that they will never again exist. As a water resource engineer, Kenneth Wright says, "waste is largely resources out of place".[15] However, all resources are exhaustible in the sense that for some purposes they may never be usable again. For example, the processes that resulted in coal, beginning in the Carboniferous Period in geology, are still occurring today. Organic debris still accumulates in swampy regions and over millions of years, under the proper conditions this debris is transformed into coal. The time it takes for this process to occur is called cycling time, and since coal has a cycling time of several million years, for practical purposes, it can be considered an exhaustible item.

On the other hand, the cycling time for most varieties of trees is usually less than a human life span and can, therefore, be considered renewable. Many, though not all (for reasons given below) resources having a short or rapid

cycling time, or a use which leaves them in essentially the same state, may be considered inexhaustible.

Thus, from a resource conservation perspective, renewable resources are those with short cycling times while exhaustible ones are those with long cycling time. This however, does not solve the classification problem because the time element is just one of several factors involved in the classification exercise. Despite a short cycling time, the cost factor might negate a resource's usefulness. Less costly exhaustible resources might replace it. As an example, although solar energy is essentially inexhaustible in terms of Millenia, it is not utilized extensively because more exhaustible oil products are cheaper. In one sense they are not cheaper, for solar energy does not have the sunk costs for development invested in it that oil has.

In addition to the cost factor are the related economic factors of demand and consumption. Renewable resources might become more in demand due to exhaustion of a similar resource. High consumption could produce utilization levels surpassing a resource's capacity to regenerate and thereby bringing it into an exhaustible class of resources.

Mode of human use can also affect the classification system. If a use is one which makes the resource easily retrieved for reuse with minimal loss, then even a scarce or highly exhaustible resource may be properly classed as being nearer inexhaustible than exhaustible. It is knowledge of this, of course, that led to the recent stress

on segments of the body politic to recycle their waste materials.

These are but a few of the complexities involved in classification of natural resources. To fit a resource into one of the categories it is vital to consider such things as time, B/C ratio, the state of technology and so on. But even after a resource is carefully classified, there is no assurance that it will remain within its classification for any given length of time. Hence, long range predictions such as water supply futures, or the disposition and use of Colorado River water are normally riddled with faults.

The Resource Cycle

The principle of a resource cycle is not only essential to classification of resources in general, but also to the classification of the same resource as it exists at different locations in time. A resource may have an extremely short cycling time in locations where geological and climatic conditions are conducive to its reproduction, while its cycling time may be much longer at another location where the conditions are absent. So, despite a resource's renewability at most locations, in certain other locations where availability might be equally important, cycling time may be so long that the resource cannot be defined as renewable.

Although water is seldom considered non-renewable, it can serve as an example for the purposes here. The amount of water molecules present in the biosphere have remained much the same despite the alterations to the environment over time. However, it is the location and the characteristics of these molecules that are the important factors in relation to the usefulness of water to man. When water molecules evaporate from the ocean into the atmosphere, rain down on land and return to the ocean via rivers they are said to be going through the hydrologic cycle. The routes these molecules take, and hence the time it takes them to complete the cycle, varies from one year in humid regions to perhaps thousands of years in some arid regions. Thus, the classification of water depends on its location and its relation to other environmental parameters. In certain areas the period of time it takes for the hydrologic cycle to provide water naturally is too long compared to the needs for water in those areas. Thus, the need to slow down the stage of the cycle of water from land to sea becomes essential if the uses which water is put in these areas are to be maintained.

As with water, all resources required by mankind frequently must be manipulated in some degree to insure that their availability for use is continued. This can be, and often is cited as a matter of stewardship. In the past manipulation has not been required to the extent it is today because the population was smaller and civilization

tended to develop only in areas where resources were abundant. However, with the sporadic growth patterns of today made possible by advances in technology, such as transportation improvements and diversion techniques, alteration of the natural cycle of resources is imperative, and it is this alteration of the cycle that has become a key factor as well as a central concept of resource conservation.

Failure to recognize the role of cycling in resource savings, preservation, recovery, and renewability have had a dramatic effect upon conservation efforts and ability to develop successful resource policy. Seckler and Barkley[16] pointed to essential consequences of these failures a few years ago when they addressed the question of how and why solutions tend to become the problems. When applied to the natural resource cycling phenomena, their dictum of "solutions becoming problems" surfaces a severe deficiency in our policy efforts. Colorado River Development provides a glaring illustration of that policy-making deficiency.

It is quite obvious at this time that each and every political and technological intervention into the hydrologic cycle of which the Colorado River is naturally a part, has tended to slow or accelerate that cycle in various ways and to various extents. Probably the most widely advertised and easily understood interventions were the steadily growing number of intermountain diversions of the resource from one watershed to another; that is, from one hydrologic cycle to another.

A similar failure to account for the hydrologic cycle vis a vis the Colorado River policy occurred in the arbitrary political decision to divide the basin into lower and upper basins for purposes of exploitation and management of the resource. Many subsequent policies have been adopted which presumably fulfill the design needs of the two artificially defined basins and relationships between them, but ignore nature's overall pattern or design. The Glen Canyon Dam, for example, was located at a point near the dividing line between basins, providing detention for the lower basin from upper basin flow. This political and economic location appears now to have dramatic natural and hydrologic consequences. For one thing, the sponge-like sandstone at the base and walls of the Powell Lake reservoir absorb from 1.5 to 2 million A/FT of water annually, all of which is practically removed from or held at a single point in the natural hydrologic cycle for an extremely long time. Much of it will likely remain lodged in the thirsty sandstone for millions of years. Resource renewability is practically lost for these amounts of water.[17]

Resource Savings

As should be evident from the above, concepts of recovery, renewability, sustained-yield, and a host of other concepts associated with conservation have emphasized resource savings. The "savings" concept, of course, just happens to fit the capitalistic-utilitarian ethic rather handily. Even for Pinchot conservation was something that

had to be fitted to a more dominant ethic. Conservation was, he said, intended to secure "the greatest good for the greatest number for the longest time". Was this utilitarian? Yes! The object of forest policy was not to preserve the forests "because they are beautiful . . . but . . . (for) the making of prosperous homes". In practice, therefore, the Roosevelt-Pinchot policies initiated instrumental means for blunting the wide range of the Liberal-Capitalist exploitive and other goals of excess while keeping the conservation ethic fitted to the overriding utilitarian ethic.[18]

For a segment of the American public conservation has meant savings--especially savings through efficient, non-wasteful uses of resources. This meaning serves well until it infringes some of the more deeply seated values of the utilitarian ethic which it is designed to fit; for example, when a time and motion study shows it to be less costly to sweep away a machined part rather than pick it up and use it. In such a situation conservation values usually succumb to profit values. If noted as a value conflict, the upshot may be a new definition of term "conservation"; or selected conservation functions may be suppressed. Indeed, requiring conservation concepts to be fitted to a more dominant ideology has profound consequences for resource development.

Impacts of Capitalist Ideology

With the publication of the Wealth of Nations in 1776,[19] Adam Smith had largely laid to rest the modern economic conception of mercantilism, and stimulated support for the emergent system of capitalism, in which the means of production and distribution are privately owned and operated for profit.[20] Thus, the development of American political democracy converged with the ascendancy of capitalist theory and practice in a large number of economic systems.

Although capitalism practices have changed dramatically over the years, the basic values and goals remain much the same. The goals can be summarized broadly as individual self-fulfillment and general material progress. To achieve them, capitalist ideology stresses the values of individualism, private property, individual self-seeking, and materialism.[21] Although these goals and values have remained as basic Anglo-American beliefs since Smith wrote his treatise, several major events since then, such as the Great Depression of the 1930's, the rise of large corporations and institutions of finance capitalism, have led to certain adjustments in some of these beliefs to include an acceptance of a larger governmental role in the economy and a feeling of an "aura of benignity and egalitarianism that now forms part of the image of the American economy".[23]

Yet, despite such shifts, the ideology retains much the same values and goals it always had; it is these and

their economic implications that conservation policy continues to encounter. In order to clarify the relationship between capitalism and conservation it seems appropriate to observe these values and goals as they are evidenced in three important components of the capitalist ideology; namely, the production ethic, the pluralist ethic, and the human cost-human benefit equation. Subsequent to this, a more specific economic analysis of conservation will be offered and a working definition of the concept of conservation will be advanced which fits up to the capitalistic ideological framework.

The Production Ethic

The production ethic is based on the premise that progress is good and must be continued and that the best way to maintain progress is through increased productivity. It emphasizes that production is best accomplished by means of individual effort to serve one's own needs through the pursuit of material goods. If each individual strives to accumulate as many material possessions as he can, then the collective demand for material goods will increase and hence production will increase, and eventually it will reach a point of fulfilling all the wants of a society. Adam Smith stated, "The produce of industry is what it adds to the subject or materials upon which it is employed."[23] If an economy is to support the pursuit of material wealth which presumably results in progress, the means of production of material goods, namely, land, labor, and capital

must be made available; once made available, they must be balanced with the demand for their use. The major instrument for accomplishing this balance is called the economic market place. In this market place producers and consumers compete between and among themselves and eventually reach a price which will yield the best profit available for the respective participants. The price reached for a particular commodity thus determines the amount of that commodity to be produced in the future, and therefore stabilizes the means of production with demand for use of production. Adam Smith clarifies the theory of how this process works in his famous work, The Wealth of Nations:

> "The quality of every commodity brought to market naturally suits itself to the effectual demand . . .. If at any time it exceeds the effectual demand, some of the component parts of its price must be paid below their natural rate. If it is rent, the interest of the landlords will immediately prompt them to withdraw a part of their land; and if it is wages or profit, the interest of the labourers in the one case, and of the employers in the other, will prompt them to withdraw a part of their labour and stock from this employment. The quantity brought to market will soon be no more than sufficient to supply the effectual demand . . .. If, on the contrary, the quantity brought to market should at any time fall short of the effectual demand, some of the component parts of its price must rise above their natural rate. If it is rent, the interest of all other landlords will naturally prompt them to prepare more land for the raising of this commodity; if it is wages or profit, the interest of all other labourers and dealers will soon prompt them to employ more labour and stock . . .. The quantity brought thither will soon be sufficient to supply the effectual demand."[24]

The benefits of this market process can be summarized as follows: first, scarce resources are put into use in the most efficient way possible; second, stabilization of the economy is maximized by balancing supply and demand through market competition; third, it is the consumer in the final analysis who decides what is to be produced and at what level it will be produced; and finally, the market place eliminates the need for government involvement and thereby insures every consumer that his individualism is secure. All of these benefits presumably result in the "best possible products at the lowest possible cost" and in turn "the greatest good for the greatest number".

The emphasis that the production ethic places on such values and goals as individual self-seeking and materialism, for example, serves to obscure its ethical and moral content. Nevertheless, Smith and the other economists who were concerned with the production ethic realized that in order for it and the other elements of capitalism to be successful in an economic sense the processes must be desirable in an ethical sense as well. In the following argument Smith illustrates his concern over the ethical justification of capitalism and the production ethic:

> ". . . every individual necessarily labours to render the annual revenue of society as great as he can. He generally, indeed, neither intends to promote the public interest, nor knows how much he is promoting it . . . he intends only his own security; and by directing industry in such a manner as its produce may be of the greatest value, he intends only his own gain, and he is in this, as in many other cases, led by an invisible hand to

> promote an end which was no part his intention . . . by pursuing his own interest he frequently promotes that of the society more effectually than when he really intends to promote it. I have never known much good done by those who affected to trade for public good. It is an affectation, indeed, not very common among merchants, and very few words need be employed in dissuading them from it."[26]

Thus, Smith stresses the Hobbesian dictum that it is man's nature to be self-serving and that this is not necessarily unethical or immoral because collectively self-service or selfishness results in good for society as a whole. And that should be viewed as outweighing any possibility of unethical or immoral considerations. Man is guided to do the right things by a God-like force and should not be admonished for his actions as long as they result in ethical ends.

It can be and has been argued that all of this has made the production ethic an extremely potent motivating force underlying national growth. It has in the past and continues today to provide a justification for the development, and ironically the exploitation, of the nation's natural resources. It is in this context that the relationship of the capitalist ethic to the conservation ethic is most evident. The production ethic is actually in harmony with the concept of conservation on several scores in that it stresses efficient resource use and aims at the greatest good for the greatest number through the functions of supply and demand in the free market place. In addition, by stressing the virtues of individual self-seeking as it

does, the production ethic suggests the inevitability of conflict and sees conflict resolution as a means by which social change and progress occur. This is basic to the pluralist ethic, discussed later. Competition resolves conflict between individuals and results in compromise of their interests. Thus, change is a pluralistic, incremental process and consists of a blend of the best elements of competing individual interests. As a result, when conflict surfaces over an issue such as conservation, the outcome is likely to be deemed by a capitalist as a product of an equilibrium reached by competing individuals functioning in a market mechanism.

Over the years many persons in capitalist systems have decided that their self-interests are best served when they are represented in the economic market alongside those with similar interests. From this conclusion there emerged the interest group concept which views the group as both a structure and a process. This concept has become so powerful that it dominates not only capitalist economic thinking, but a considerable body of political and social thought too. It is the competitive group role in the capitalist economic system and pluralist social and political systems that has loomed larger with each passing decade.

The Pluralist Ethic

Pluralism centers around the idea that, in reality, democratic political systems are made up of a wide variety

of groups, each of which represents a different set of interests, and each of which seeks to advance its interest in society through a political process. At the heart of this group theory is the idea of competition and/or conflict which stimulates bargaining in the political arena, the result of which is conflict resolution leading to a public policy. Even though individual members might depart a group the interests represented remain long after. In essence, the group becomes an institution with a life of its own much the same as a capitalist corporation. Its primary concern is to maintain enough flexibility to satisfy periodic modifications in interests so that it can sustain a sufficiently large membership and preserve its role in the political system.

A chief advantage of pluralism is said to be its contribution to the fairness of the public's decision-making process. Rather than arriving at a decision by passing judgment on whose values and goals are more suitable, pluralism seeks to decide issues in the neutral atmosphere of a political market place which is analogous to an economic market place. Each group participating in the market place realizes that if its interests are to be served to any degree it must abide by the rules of the game. If a group does not then its bargaining position may be substantially weakened. In essence, the groups must be satisfied to compromise their positions and promote their interests on a step by step basis rather than all at one

time. Thus, in a pluralistic system, power is scattered among the various groups rather than centered in one group in particular. As Robert A. Dahl states in his text, Pluralist Democracy:

> "The fundamental axiom in the theory and practice of American pluralism is, I believe, this: Instead of a single center of power there must be multiple centers of power, none of which is or can be wholly sovereign."[27]

Some groups are larger than others (e.g., unions) and in this sense they have more potential for power, but theoretically each group can achieve equal power if need be by enlisting the support from groups outside the immediate conflict who would not otherwise be involved.

Another important characteristic of pluralist democracy is multiple membership and overlapping loyalties. The benefits of these features are summarized effectively by Nimmo and Ungs in their text, American Political Patterns:

> "As members of several organizations, individuals are not totally dependent upon any particular social group or political agency for advancement of their interests . . .. Second, since multiple affiliations contribute to, as well as reflect, multiple interests, there is little tendency to invest any single issue of public policy with an extreme degree of emotional attachment . . .. Finally multiple affiliation means that groups must compete for the loyalty of their members."[28]

Thus, the individualistic values of capitalism are sustained in pluralist democracy through the proposition that, in the final analysis, the status of various interest

groups depends on how well they fulfill the self-interests of the individuals who comprise them.

The relationship of pluralist ideology to the conservation ethic is therefore extremely important because any conservation policy that emerges must be seen in terms of a balance among the interests of a variety of groups. Thus, a sharp distinction must be made between the best conservation practices technologically available and the best practices socially and politically acceptable. This is the central problem of the thesis presented here; namely, social and/or political feasibility of policy. It is usually social feasibility that ultimately determines what public policy on conservation will be. Therefore, in searching for the best possible conservation practices one is likely to be required to discover the most beneficial practices with the least cost to the aggregate number of powerfully focused interest groups. In other words, Those practices which will be most easily compromised in the system usually must be given critical weight.

However, at this point, it should be emphasized that the analytical tools and techniques for deciding which alternatives are most socially and politically acceptable (or feasible), and therefore most in the public interest, are extremely inadequate. As a result, decisions based on the best intentions often produce unwanted results and failures. This limitation in the pluralistic quality of decision making must be realized and dealt with as best it can. One of the more crucial criteria in the decision-

making process which attempts to come to grips with the problems in predicting the effects of policy decisions is "human cost-human benefit" measurement.

Human Cost -Human Benefit

A major determinant of public policy in the past has been its economic efficiency arrived at by examination of a policy proposal for some project in terms of the project's economic benefits and costs. In recent years, however, there has been a gradual shift in emphasis, away from strictly economic benefits and costs of resource programs to broader benefit-cost approaches which accomodate social and political objectives as well. This shift in emphasis has been motivated by the realization that in analyzing the merit of resource programs solely in terms of their economic efficiency one cannot suitably measure the degree to which the other objectives of the program will succeed. These other objectives, even though related to economic efficiency, should be considered as separate, and in many cases, more significant for program acceptance by the concerned groups. Arthur Maass clarifies this point using the example of income redistribution:

> "Now, in all complex objective functions of government programs, economic efficiency will be one term. A second will frequently be income redistribution . . . . These two objectives may be complementary in some ways: a program designed to transfer income from the rest of the nation to Appalachia or from the wealthy to the poor, may also increase national product. But a government program that maximizes efficiency will not necessarily, indeed

> is not likely to, achieve a specified high level of income redistribution."[29]

Thus, in searching for the best public policy dealing with an objective such as conservation one must weigh what can be called the human benefits and costs in addition to, and perhaps sometimes in place of, economic benefits and costs, that is: those concerned primarily with efficiency. However, human benefits and costs are not easily or adequately measured by observation of the preferences of individuals in the economic market place. Because human benefits and costs often deal with much more intangible factors than capital or levels of production, they must be measured in different, and usually, by less accurate schemes. Yet, in a pluralist system the group frequently serves as a good indicator of the values held by the public. It is presumably in a group that each individual makes known what price (political, economic or other type of price) he is willing to pay for the benefits afforded. The accumulated price of individuals emerges in the announcement of the compromised interest of the group as a whole. In other words, through the group, the political interests of numbers of individuals can be portrayed, as opposed to their own economic self interests. As Arthur Maass states:

> "Thus an individual has the capacity to respond in a given case, to formulate his preferences, in several ways, including these two: (1) what he believes to be good for himself--largely his economic self interest, and (2) what he believes to be good for the political community."[30]

Thus, individuals do not necessarily make all decisions on the basis of how they are affected economically; in many cases they make decisions on the basis of more intangible factors which are frequently identifiable as a product of the group and possibly best determined through analysis of the group. But regardless of where such factors are best observed, their measurement is vital to successful formulation of resource policies such as conservation policy. Although there has long been a tendency to ignore it, many times at our peril, it is still a fact that "efficient" conservation policy usually never converges fully with socially and/or environmentally beneficial conservation policy.

Toward a Working Definition of "Conservation"

Four Essential Criteria

A working concept of conservation, then, is probably best derived through employment of four criteria: First, it must take into account the variant meanings of supporting conservation concepts. Terms such as resource-savings, efficiency, and sustained-yield must be weighed for their relative contribution to or deduction from workability of the whole concept. Secondly, conservation must fit the capitalist idiom. Past attempts to avoid this need for convergence with the capitalist idiom have often had unfortunate consequences for some of the very best conservation policies. The economic justification for

conservation is both real and crucial, and in the United States it is ideologically demanding. Third, the concept of conservation must be accommodated to the pluralistic process. A working definition of the concept cannot be based strictly on its past empirical vitality. Nor can it be based strictly on logical reasoning. Rather, it must be seen as a product of varying group definitions and group demands, which are subject to change in each instance that the concept is suggested. In relation to this, a fourth criterion arises, namely, that the definition of conservation for policy purposes is dependent on the relevant community public's own definitions of the concept. Thus, similar to the more general group concept, conservation in each community, will be colored differently depending on the definitions of those who influence policy in those communities.

With these criteria in mind a restatement of the problem to be studied in this paper is, how resource conservation with respect to water can be achieved (reach political feasibility) within a community depending on the technological, economic, and social feasibility of various proposed conservation alternatives. While studying this problem it will be emphasized that, (as indicated in the foregoing discussion), arrival at a pure concept of conservation which has withstood incessant misapplications over the years is an extremely difficult task; indeed, perhaps it is an unwarranted task if dependence is upon

the public's own definition in each community. The distinction between conservation and preservation, for example, is justifiable in that the values and goals of conservation are manifestly different from those of preservation. But a specific community may not make such a distinction. Likewise when differences of interpretation stop short of transcending the values and goals of conservation as Americans have generally known them, distinctions between the various usages of the concept should be made with exceeding care, if at all. Why? Because it is in these different usages that the public interest in conservation is found and therefore the applicability of the concept for today's situation.

Thus, if the concept of conservation is to be successful in sustaining America's natural resources it cannot be interpreted in a narrow, normative sense of what it should be; but rather, it must be seen in the reality of what the various conflicting viewpoints of various publics will let it be.

The analysis of conservation will now turn to more specific consideration which are necessary in arriving at a working definition of the concept for the purposes of this study. These considerations will be based, for the most part, on the book, Resource Conservation-Economics and Policies, by S. V. Ciriacy-Wantrup.

Resource Use Over Time As a Basis for Definition

As mentioned previously it is difficult to arrive at a definition of conservation with a high degree of precision and yet one general enough to be acceptable to the diverse interests involved with the concept. However, because of the cyclical nature of natural resources, all ideas pertaining to conservation can center on the use of resources over time, or more exactly, on "the intertemporal distribution of physical rates of use".[31] When resource use over time is compared with its cycle time one can draw conclusions about the amount of conservation that is taking place and from this form the basis for prediction of the amount of conservation that should be taking place in order to maximize distribution of use rates for a maximum period of time. To decide what maximum distribution of use rates over time is possible one can observe the objectives of conservation in terms of maximizing revenues and minimizing costs to reach the "optimum state of conservation".[32] Although most experts agree that this optimum state would be extremely difficult to reach in reality, it is an essential theoretical goal if the cost-benefit approach is to result in the most conservation.

When using the cost-benefit approach in search for the optimum state of conservation one must distinguish between conservation as it was or is and conservation as it was or is intended to be. Ciriacy-Wantrup calls the

former "ex post conservation" and the latter "ex ante conservation".[33] The necessity for this distinction lies in the fact that although conservation decisions are often made on a careful comparison of economic alternatives they are just as often made on the basis of habits or traditions which might result in successful conservation practices even though they were not so intended. Thus, "ex ante conservation" cannot adequately weigh the effect of such things as habit patterns while "ex post conservation" can, because it ignores what the intended outcome was and looks only at what, in fact, resulted from various decisions. Therefore when seeking to maximize revenues and minimize costs in order to approximate the optimum state it is better to observe conservation decisions in the "ex post" sense because these indicate the movement toward or away from the optimum state, regardless of intentions.

Conservation Policy: A Determinant of Meaning

The end result of the application of the concept of conservation and its true meaning at any point in time is determined by conservation policy or "the study of actions of governments at different levels with reference to the intertemporal distribution of use rates of resources".[34] As mentioned in the discussion of pluralism conservation policy is influenced to a large extent by the various interest groups and hence these groups become an important unit of analysis. However, before groups can

be analyzed successfully it is necessary to determine what motivates them to behave in the ways they do, and in relation to this both individual and group behavior can be explained in terms of social institutions. Social institutions are usually defined as regularized behavior patterns (e. g., law); they display motivational qualities; and they have a structure that functions as a relay mechanism for reaching members of the public. Moreover, social institutions parallel policy closely in that the structures, concepts and terms are analogous to the terms, objectives and tools associated with policy.[35] Social institutions, however, are much broader than policies in that they represent the cumulative result of numerous policies and other forms of social action through time. Institutions differ from policy in the following ways. Institutional habit patterns can influence behavior more than policy can. Policies have the "Sanction and authority of governments, and social institutions may not."[36] Economic effects of institutions are more widely diffused than effects of economic policies.[37]

Despite the differences conservation policy is closely related to social institutions and therefore policy and institutions tend to influence each other. It is in relation to this interactive influence that an important role of conservation policy emerges. When social institutions fail to keep pace with economic changes, they will eventually undergo change. There may

be a "time lag" before change occurs, but change is almost certain. Thus, such policies can be viewed as a means for changing the social institutions which influence the state of conservation.[38]

As mentioned, conservation policy seeks to reach the optimum state of conservation in social economics by maximizing social net revenues. This attempt is based on approximations to the private economic system with focus on the cost-benefit analysis used in that system. The revenues and costs in private economics are largely what is called "entrepreneurial" while those in public revenues and costs are called "collective".[39] While both can be considered under social revenues and costs it is usually the "entrepreneurial" revenues and costs that vary more from social revenues and costs. One of the main objectives of conservation policy is to reduce the difference between this variation so that the private optima in the state of conservation reached through "entrepreneurial" revenues and costs will more closely resemble the social optima in the state of conservation reached through social revenues and costs.[40] It is sometimes the case that "entrepreneurial" revenues and costs form such a large part of the social revenues and costs that the public interest is thought not to be involved.[41] Thus, public subsidies for conservation are often denied if the public interest is not clearly apparent.

Ciriacy-Wantrup lists two criteria for addressing the above problem: "First, we must ask, are subsidies the most economical tool for reducing differences between private and social optima in the state of conservation . . .? Second, assuming subsidies are the most economical tool, are the resulting social net revenues greater than if the same amount of public money was spent in alternative fields?"[42] Thus, in a capitalist system the line between public and private decisions is often thin, and this results in attempts to influence both realms in the most economical way. In so doing, it is projected (hopefully) that the collective result of all decisions will approximate the general welfare.

Reading the Social Optimum

Another factor to be considered in arriving at the optimum state of conservation in social economics is the valuation of what are called extramarket goods, based on extramarket values. In a social economic sense these goods are highly intangible and deal with such things as aesthetics, enjoyment of recreation, and other such considerations that do not lend themselves to easy measurement. So far, the best way to approach extramarket goods has been through attempts at objective measurement which gives these goods a monetary value. This can be attempted through opinion polls and similar tools which attempt to weigh how much individuals and groups are willing

to sacrifice extramarket goods for market goods. Market goods in this case do not necessarily need to be weighed in terms of money. Surrogates can be employed. Although extramarket goods and values are still a great problem in determining the social optimum for conservation policy the above approach has alleviated certain problems to a substantial degree.

Still another factor to be considered in relation to the optimum state of conservation is called "social weighting".[43] This follows from a premise that not all individual and group preferences are equal. Thus, there are some individuals and groups whose vote for a particular alternative is given greater weight and as a result the true valuation of the social demand for a particular alternative is distorted. Since it is highly unlikely that inequality can ever be completely eliminated, conservation policy can only attempt to compensate for such inequalities in the best way possible.[44] However, as mentioned in the discussion of pluralism, because of the diversity of groups and hence ways to represent interests, social weighting probably will not hamper the selection of the best alternatives to such a degree that accuracy is totally sacrificed.

Although all of the above factors indicate the difficulty in reaching the social optimum in the state of conservation it should be stressed that, in fact, the normal goal of conservation policy is an incremental improvement

toward the optimum state rather than an all-out effort to reach it. Thus, these factors, although important, are not as influential on the actual outcomes of conservation policy as they might first appear.

Safe Minimum Standard: Approximating Social Optimum

With the realization that the social optimum of conservation in all probability can never be reached, the objectives of conservation have to be lowered to a more practical level. So far the best practical level seems to be what is called a "safe minimum standard".[45] The "safe minimum standard" means "avoiding those physical conditions brought about by human action, which would make it uneconomical to halt or reverse depletion . . .." A "safe minimum standard" can be reached through the adoption of certain conservation practices which aid in avoidance of irreversible resource depletion or what can be called the critical zone. The main advantages and disadvantages of the "safe minimum standard" in this regard can be summarized as follows:

> "The main advantages of defining a safe minimum standard in terms of conservation practices are great adaptability to local conditions, easy understanding by resource users, and fairly economical administration by governmental agencies charged with the execution of conservation policy . . .. The main disadvantage is that the suitability of conservation practices for avoiding the critical zone in resource depletion must be established first . . .. For establishing such suitability, it is not sufficient to show that a given conservation practice is technologically effective in avoiding the critical zone. It must also be shown that no other practice or

> combination of practices accomplishes the same result more economically . . . a safe minimum standard of conservation should be realized with minimum total social costs."[47]

Sometimes individual resource users have developed conservation practices above the requirements of the "safe minimum standard", by far the largest portion of agricultural, forest and grazing lands are managed by private individuals with a state of conservation at or above the safe minimum standard".[48] Thus, the practices which are used in gaining a safe minimum standard are in many cases readily accepted.

Once a "safe minimum standard" has been agreed upon it is suggested that it form the basis for approximating the social optimum by "additional examination of total social revenues and costs".[49] It should be emphasized here that terms such as "safe minimum standard" and "critical zone" only have significance in relation to the public acceptance of their meaning. Hence, only the public, in the final analysis, can adopt a "safe minimum standard" and avoid the "critical zone in resource depletion".[50] This highlights the urgent need to discover ways of specifying public acceptance zones--the primary purpose of the research herein.

CHAPTER 3

THE COMMUNITIES UNDER STUDY

In this chapter attention will be directed to the communities selected for study, especially their changing social, political, and economic characteristics. The information is intended to serve as a supplement to the results of the survey of these communities analyzed in later chapters.

Changing Characteristics and Consequences[1]

Two communities, Lafayette and Louisville, Colorado, were selected for study. Both are located in Boulder County, Colorado approximately 23 miles northwest of Denver. Like a number of the other communities in this county, historically they have been agriculturally based and both still retain a significant number of residents with rural orientations. Although Boulder County ranks seventh in the state population, it is third in numbers of city dwellers. Despite these rural and agricultural qualities, however, as with most of the other counties similarly located along the Front Range of the Rocky Mountains, Boulder County and its communities are experiencing a significant amount of growth resulting from two pronounced demographic trends: the rural-to-urban

and urban-to-suburban movements. These two trends are most apparent in Colorado along the Eastern Slope of the Rockies extending from Wellington in the North to Pueblo in the South. Over 70% of the state's total population resides in this strip and the largest portion of this percentage lives in the Denver SMSA. Table 1 shows the growth to date and the projected growth for Boulder County and Louisville and Lafayette. Of all the communities in Boulder County under 5,500, now only three, Lafayette, Louisville and Lyons are expected to keep growing after 1980.

The two trends which have spurred the growth shown in Table 1 have produced a number of difficulties for Boulder County and its communities. First, although the county's increasing population is accompanied by an increasing tax base, the rate of increase of the tax is not rapid enough to meet the more immediate demands for education and other public services. Thus, services tend to lag behind population increases. As elsewhere such a gap tends to create pressures by established communities to enlist aid from other levels of government or private organizations in the form of loans, grants and other types of outlay to offset a need to increase local taxes or other local sources of needed revenue. Second, although a large percentage of the population have moved out of the core areas, many have a desire to retain their urban life styles and the amenities flowing from the urban

environment. Here, as elsewhere in America, this has created a demand for subdivision developments rather than more isolated rural dwellings. Such developments have tended to locate around previously established communities. Both Lafayette and Louisville have been experiencing this phenomenon for some time. Subdivisions of this sort are usually poorly planned and inadequately projected financially to provide adequately for schools, utilities, roads and other services which feed expected life styles. Thus, not only growth in itself but how and where it develops are important considerations.

A crucial consequence of the above type of change is the problem of adaptation to change itself. As suburbanization and urbanization overtake established communities, there is almost always a change in perceived needs. Not surprisingly established residents frequently resent the intrusions and their consequences as well as the newcomers who may be viewed as precipitators of such change. Indeed, such resentments are often indirect, subtle, enduring, and not readily identifiable. Expressions of hostility toward growth or a new shopping center may be a simple surrogate for resentment of what newcomers bring in terms of new demands, new services, and new life styles and expectations. Not infrequently newcomers (and old timers too) attempt to capture the best of two worlds--the urban and rural amenities--without paying the full cost of either, producing gaps as described above.

TABLE 1. Population Trends and Projections

	1960	1970	1971	1980	1990
Boulder Co.	74,254	131,889	136,657	192,000	240,000
Lafayette	2,612	3,498	3,800	7,500	15,000
Louisville	2,073	2,404	2,500	6,500	13,000

(Building Permits)

	1965	1966	1967	1968	1973	1974	1975
Lafayette	8	7	6	48	53	63	104
Louisville	3	5	5	18	53	161	178

(Source: U. S. Bureau of the Census)

In a competitive pluralistic group system, the previously described social phenomena has been growing more prevalent with each passing decade. The tendency has been for more and more economic and social functions to find their way out of the private market and into the public market where they become objects of use by competing groups for economic and social advantage. Not that this growing tendency to move functions from the private to the public market is new, and not that the tendency to use political resources and clout within the political system to gain economic advantage is new; for the examples of such behavior have been legion since before the American Revolution. Nor are such attempts confined to the weak competitors or disadvantaged groups in the private market. For example, realtors and developers have long used local zoning ordinances for economic advantage.

What is new is the growing proportion of such transfers from the private to the public market, especially during recent decades. A consequence has been greater burdens upon the public market, especially the local government sectors of that market. The recent problem of New York City's insolvency is a prime example. Another glaring example is the extraction policies employed by both the wealthy and disadvantaged groups upon Medicaid and other welfare programs -- even to the point of impoverishment and corruption.

Finally, the growth trends in Boulder County have often resulted in displacement of prime agricultural land. As mentioned earlier, despite the advancing suburbanization, many communities in Boulder County are still highly dependent on agriculturally based income. But remaining agricultural land owners in the area are finding it extremely difficult to rationalize retention of their property while receiving increasingly high offers for their land from speculators and developers. This is true for the agricultural land near the communities of Louisville and Lafayette. Both communities are located in the midst of highly productive irrigable cropland. Tables 2 and 3 give more exact indicators of the agricultural land use trends in Boulder County and the presence of agriculturally-related industry.

Table 2 shows a steady decline in the number of farms since 1945, but indicates that between 1950 and 1959 the land in all farms as well as the land in irrigated farms increased. Although this trend continued for irrigated farmland up to 1964, both total farmland and irrigated farmland were sharply reduced from 1964 to 1969. The price per acre for all farmland increased steadily from 1945 with the greatest increase occurring in the 1965-69 era. The summary of change in land use for farms from 1964 to 1969 might be partially explained by the weakened market value of agricultural products as compared to other products during that five-year span. Yet, that is but one

TABLE 2. Agricultural Trends for Boulder County

Year	No. of Farms	Total Land in Farms (Acres)	Acres In Irrigated Farmland	Per Acre
1945	1,425	237,632	NA	$ 69.48
1950	1,320	265,619	195,963	136.52
1959	882	287,466	218,138	219.55
1964	744	276,793	251,988	336.12
1969	643	173,276	45,328	516.86

(Summary of Change 1964-69)

Year	Total Land in Farms (Acres)	Market Value Of All Agricultural Products Sold
1964	276,793	$ 16,225
1969	173,276	$ 14,543
% Change	-37%	-24.2%

(Source: U.S. Bureau of the Census)

factor in a rapidly changing picture of a one-time stable agricultural environment.

A number of the trends in agriculture for Boulder County could be explained by general national trends, such as population growth along with increased value for virtually all types of land. Although these more general trends undoubtedly are influential, the more specific national trends of rural-to-urban and urban-to-suburban seem to be a primary cause in this instance. This is especially evident when Boulder County trends are compared to those of neighboring Weld County. Although it is larger in area, Weld is comparable to Boulder County in its community size and land quality. Much of Weld County is located in the population belt mentioned earlier; but it has by no means experienced the degree of urbanization that has characterized Boulder County. Thus, comparison of Weld and Boulder counties seems warranted if only to determine the role of the urban-suburban trends.

Weld County has experienced a decline in the number of farms from 1950 to 1969; yet unlike Boulder, the percentage of total farmland increased to an all time high of 95.7% in 1969, an increase of +13.5% from 1964. Another obvious difference between Weld and Boulder trends is the proportion of irrigated farmland. Although Weld has had a steady decrease in irrigated land, it declined by only 1.1% from 1964 to 1969 as opposed to a 6% drop in Boulder County for the same years. Finally, the average price

per-acre for farmland in Weld County was $150.70 in 1969, only $14.18 more than the price for Boulder County farmland in 1950. In sum, this comparison would seem to indicate a definite influence of the two trends mentioned on Boulder County agriculture.

Table 3 indicates that those Boulder County agriculturally-related industries are extensive and numerous at this time. This large economic segment is presently a strong candidate for attrition and decline. Two points should be mentioned in relation to this table. First of all, there are a number of other industries which have lesser connections with agriculture in Boulder County. Thus, the figures given should not be considered totally explanatory for the effect from agricultural losses. Secondly, a great many of the industries which do serve agriculture more directly are located in the smaller communities, such as Lafayette and Louisville, many of which were founded solely for this purpose. Industry that is less agriculturally-related tends to be located closer to the City of Boulder. Hence, decline may not be as great as gross county figure would indicate.

One of the more specific problems associated with growth in Lafayette-Louisville area is how to supply enough water for all uses now demanded by the population increase. Table 4 shows the capabilities of the present Lafayette and Louisville systems in terms of predicted needs in supply.[2] According to the table, Lafayette will have an

TABLE 3. Agriculturally Related Industry in Boulder County 1973

	No. of Employees Mid-March	Taxable Payrolls (January-March) $1,000
Agricultural Services, Forestry, Fisheries	212	311
Agricultural Services, and Hunting	212	311
Animal Husbandry Services	131	215
Manufacturing Food and Kindred Products	890	1,459
Building Materials and Farm Equipment	620	903
Hardware and Farm Equipment	155	242
Farm and Garden Supply Stores	89	141

(Source: U.S. Bureau of the Census)

TABLE 4. Present Water System Capabilities and Projected Needs

City	Treatment Capacity	Storage Capacity	Distribution System and Condition	Projected Need For 1970 Pop. Per Day Including Fire Demand
Lafayette	3,000,000 gal. per day	5,000,000 gal. per day	6&8 Inch Mains.Fair	2,325,120 gal. per day
Louisville	2,000,000 gal. per day	1,083,000 gal. per day	4 Inch Mains.Poor	2,174,990 gal. per day

	Projected Need For 1980 Pop. Per Day Including Fire Demand	Present Capacity	Excess or Deficit For 1970 and 1980
Lafayette	3,690,290 gal. per day	5,998,400 gal. per day	+3,673,280 gal. (1970) +2,308,160 gal. (1980)
Louisville	3,389,760 gal. per day	1,750,200 gal. per day	-424,680 gal. (1970) -1,639,560 gal. (1980)

(Source: Oblinger-Smith Corporation, Water and Sewer Facility Plan for Boulder County Colorado)

excess of water under conditions including an 8-hour fire and Louisville will have a deficit. The Lafayette prediction, however, is made assuming its storage facilities are full, something that has not been the case in the past. Nevertheless, projections for both cities show a need for a larger supply to maintain a safe surplus. In relation to this, both cities anticipated the need to be concerned with water supply as early as twelve years ago when they, along with other communities in the area, formed the Coal Creek Water and Sanitation District. This organization has the function of recommending new sources of water supply. Yet, despite this foresight, both cities have experienced difficulty in relating to the supply during recent years. Lafayette experienced the worse problems. This is evidenced by the restrictions placed on water users in that city during the summer of 1975 as well as more recent water moratoriums imposed by that city's government.

As a result of these difficulties the Coal Creek Water and Sanitation District commissioned a water study on alternatives to increase the supply in the area. This action has had the potential for easing the supply problem at least temporarily. Yet, from a long-range outlook the problems of supply loom large. First, much of the anticipated increase in supply involves projected acquisition of agricultural water. As water grows shorter, however, even this readily available source will not be

so easily acquired as it once was. It is becoming a great deal more expensive and more importantly, much harder to condemn, because of recent court rulings requiring proof that the condemnation is necessary, rather than a mere declaration of higher use which was once adequate.[3] Secondly, the overriding fact is that ground and surface water reserves east of the Rockies in Colorado cannot keep up indefinitely with the rate of growth. This will necessitate an increased amount of diversions from the Western Slope of the Rockies. But even now there are questions being raised as to how long Western Slope reserves can hold up. There has been considerable discussion by some state officials of trans-state diversion possibilities.[4]

In summary, Lafayette and Louisville are typical examples of communities which are being put under severe stress to increase the quantity and quality of water and other resources as a result of the rapid growth of the population and shifts in population concentrations to suburban area. Because they are so analogous to many other areas experiencing these growth-related problems they would seem to qualify as suitable areas in which to examine resource attitudes, and specifically, attitudes relevant to water conservation and the policies invoked for achieving conservation objectives within a framework of community goals and perceived public needs.

Specific Community Indicators[5]

The study design requires a detailed analysis of social, economic, and political characteristics, by focusing on specific indicators of these characteristics. Because data on these indicators is, for the most part, limited to certain population sizes, much of the socio-economic analysis will necessarily focus on the available data for Lafayette and Boulder County in general. However, because Louisville and Lafayette are close neighbors and are comparable in many ways, it will be assumed that the data given for Lafayette will also be relevant for Louisville. For some indicators, the community evaluation and activity levels will be taken from a sample population rather than from the total population used for the other indicators.

Socio-Economic Characteristics of the Population

The social and economic standing of the individuals of the community gives insight as to how the community as a whole might react to various policy proposals. The indicators which will be used here are the traditional ones: education, income, age, sex, and occupational class.

Education. The educational levels for Lafayette and Boulder County are shown in Table 5. The greatest percentage of the population 25 years and older have 4 years of high school. In both areas the percentage of some education is very high. The 20% difference in the four-year

TABLE 5. Distribution of Total Population 25 Years and Older by Education in Percentages

AREA	% of Pop. 25 Yrs. & Older	No Schooling	Some Elementary	Eight Years Elementary	Some High School	4 Yrs. High School	Some College
Lafayette	52%	15%	16%	18%	33%	10%	6%
Boulder Co.	48%	Less Than 1%	4%	8%	12%	32%	18%

AREA	Total of Some School	Median School Completed
Lafayette	98%	12.0 Years
Boulder Co.	99.9%	12.9 Years

(Source: U. S. Bureau of the Census)

college column between Lafayette at 6% and Boulder County at 26%, is most probably caused by the inclusion of the University of Colorado faculty and students in the Boulder County Data. It will be assumed that the Louisville percentages will probably come closer to paralleling those of Lafayette, since both are almost the same distance away from the City of Boulder, where the University population is most heavily concentrated.

Income. The income categories for Lafayette and Boulder County are presented in Table 6. Both areas have the majority of income levels in the middle ranges from relatively low incomes, $5,000 to $8,999, to moderate incomes, from $9,000 to $14,000. The greatest difference between income levels in Lafayette and Boulder Counties is the $15,000 and over bracket, where there is a 17% variation. This is probably explained by the availability of a greater number of professional employment opportunities in the more highly urbanized parts of the county. Again it will be assumed that the Louisville figures align closely with those of Lafayette.

Age and Sex. The age and sex distributions for Lafayette and Louisville are shown in Table 7. The male-female ratios for Lafayette and Louisville are identical while the Boulder County figures show only a 1% variation. The remaining age group columns show only a slight variation between Lafayette and Boulder County percentages, with the greatest differences being evident in the

TABLE 6. Distribution of Income for All Families and Unrelated Individuals of Total Population: In Percentages

AREA	% of Pop. 25 Yrs. & Older	$1,000 and Under	$2,000 to $4,999	$5,000 to $8,999	$9,000 to $14,999	$15,000 and Over
Lafayette	27%	3%	11%	30%	46%	10%
Boulder Co.	24%	3%	10%	22%	38%	27%

AREA	Median	Mean	Per Capita
Lafayette	$9,841	$9,681	$2,870
Boulder Co.	$11,196	$12,267	$3,383

(Source: U. S. Bureau of the Census)

groupings of those males under 25 but older than 18 years, and females under 25 years. The most noticeable difference between the three areas shown is in the median age category which indicates that of the three areas, Louisville has a slightly older median age population than either Lafayette or Boulder County in general. However, the percentages of the population 65 and older show only a 1% variation between Louisville and Lafayette and only a 2% variation between Boulder County and the two communities. The divisions of occupational class, namely, upper, middle and lower, are based on the type of jobs held by the population regardless of the income actually received at the jobs. Thus, even though a professional person (e.g., doctor, lawyer, etc.) might be receiving a lower salary than a non-professional (e.g., clerical, sales, etc.) he is still considered to have an upper class occupation, based on his potential earning capability as a professional and other factors. Farmers and farm workers are considered separately from the other classification, mainly because their earning potential varies a great deal.

As Table 8 illustrates the greatest percentage of the population in both areas have middle class occupations. Boulder County shows a substantial variation from Lafayette in the upper class percentages. Again, this is probably due to factors analogous to those mentioned in the discussions of education and income distributions. Although the proportion of farmers and farm workers to

TABLE 7. Distribution of Total Population by Age and Sex In Percentages

AREA	Sex	% Sex	Under 25	25-34	35-54	55-64	Over 65	Under 18	Median Age
Lafayette	Male	48%	48%	15%	21%	8%	8%	3%	26.2 years
	Female	52%	47%	14%	20%	12%	7%	37%	26.7 years
Boulder Co.	Male	49%	53%	16%	20%	6%	5%	34%	23.8 years
	Female	51%	51%	15%	20%	6%	8%	32%	24.7 years

AREA	% Male	% Female	% Under 18	% Over 65	Median Age
Louisville	48%	52%	34.1%	14.9%	30.0 years

(Source: U. S. Bureau of the Census)

TABLE 8. Distribution of Total Work Force 16 Years and Older by Occupational Class: In Percentages

AREA	Total Employed 16 Years and Over	Upper Class	Middle Class	Lower Class	Farm Workers and Farmers
Lafayette	1,478	13%	58%	27%	2%
Boulder Co.	52,482	37%	43%	18%	1%

(Source: U. S. Bureau of the Census)

the other groupings is relatively small, it should be emphasized that a significant number of the upper, middle and lower class occupations are connected in some way with the agricultural demands of the Boulder County Area.

Community Identifications

The community identifications provide insight into the general behavior and attitudes of the individuals who compose a community. In addition, they provide some knowledge of the political orientations of those individuals. The indicators for community identification used here will be: Length of residence, place of birth, community evaluation, and general activity level. With the exception of the community evaluation and the general activity level the percentages will be based on total population. The other indicators of the sample population of Louisville-Lafayette, will be analyzed in detail in subsequent chapters.

Length of Residence

Length of residence indicates familiarity of the resident with the area and, hence, provides further indication of the degree of his or her knowledge of community related factors. In addition, it gives an idea to the degree of communication within the community as a whole.[6] The distributions of length of residence for Lafayette and Boulder County in general are shown in Table 9. The

TABLE 9. Distribution of Length of Residence For Total Population 5 Years Old and Over: In Percentages

AREA	% Total Pop. 5 Years Old and Over	Same House Since 1965	Same County Since 1965
Lafayette	90%	44%	28%
Boulder Co.	92%	29%	18%

(Source: U. S. Bureau of the Census)

majority of the population in Lafayette and Boulder County have resided there for at least five years, which would indicate some knowledge of the area and possibly a fair communication of attitudes related to knowledge of the area.

Place of Birth

The area in which an individual is reared can have a profound influence on how he reacts to the environment of the area where he currently resides.[7] Although information on where the populations relating to this study grew up was not available in great abundance, some indications are provided by Table 10 which shows the distributions of place of birth. Over half of those currently residing in Lafayette were born in the state. Thus, there are some grounds to indicate that these people have a higher level of insight into factors peculiar to the state and possibly to the local area, and may have developed attitudes accordingly. Boulder County shows substantially lower native population than does Lafayette.

Community Evaluation

The degree to which individuals value their community indicates depth of knowledge of the community and its problems, with these problems as well as the strength of general community identification.[8] The community evaluation of Lafayette-Louisville is based on the study sample of 116 respondents and is displayed on Table 11. The

TABLE 10. Distribution of Place of Birth For Total Population: In Percentages

AREA	Born In Colorado	Born In North East	Born In North Central	Born In South	Born In West	Born In Abroad
Lafayette	58%	1%	20%	6%	8%	Less Than 1%
Boulder Co.	36%	7%	31%	8%	9%	Less Than 1%

(Source: U. S. Bureau of the Census)

TABLE 11. Distribution of Community Evaluation In Percentages of a Sample of 116

Absolutely Stay					Absolutely Leave
1	2	3	4	5	6
44.8%	21.6%	8.6%	6.9%	6.0%	12.1%

(Source: Lambda Survey, 1976)

evaluation in this case is based on how likely the individual would be to stay in the community if he or she were given the opportunity to move elsewhere. As shown in Table 11, the majority of the sample indicated that they would probably stay with 25% expressing doubt as to whether they would stay. Thus, there would seem to be a high level of community satisfaction in these particular communities indicating some degree of identification of the individuals with the community and its problems.

Activity Level

The activity level measurement shown in Table 12 includes, participation in social groups, politics, church and so one. In this case the distribution of activity in Louisville-Lafayette is based on the survey sample of 116. Although more specific indicators of political orientations and more detailed analyses of the sample will be provided in later chapters, the summary in Table 12 serves as an indicator of overall activity levels in both communities. The figures show at least some activity on the part of 38.0% of the sample population with only 5% demonstrating a high level of community involvement.

Attitudinal and Opinion Distribution

The adoption of a policy alternative, such as one relating to water conservation, is constrained by the attitudes and opinions of the public toward the alternative

TABLE 12. Distribution of General Activity Level of the Communities Based on A Sample of 116: In Percentages*

AREA	Low Activity	Moderate Activity	High Activity
Louisville-Lafayette	27.6%	32.8%	5.2%

*(Includes Participation in Social Groups, Politics, Church, etc.)

(Source: Lambda Survey, 1976)

itself. Although this study is mainly concerned with water relevant attitudes and opinions, and more specifically, those relating to water conservation, it is first necessary to describe the attitudes and opinions of the public which relate to more general categories of problem areas. This operation enables observation of the priorities of specific publics with respect to various problem areas and thus provides insight into the interrelationships between problem areas and specific water conservation problems.

Successful analysis depends heavily upon definition of the terms attitude and public opinion. Very often these terms are thought to be synonymous, but they are not the same in some ways, even though they are often closely related. Thus, although both terms are important to this study and will be used in their relationship to each other, they should be distinguished at the outset. The definition given attitudes in this study is borrowed from Daniel Katz.[9] The definition of public opinion is taken from Lee Benson.[10]

Defining Public Opinion and Attitude

An individual evaluates his environment either negatively or positively on the basis of a general orientation toward it and/or his attitudes (predispositions to act). All attitudes include the feelings and beliefs of an individual, and collectively, they form his system of values.

Katz outlines the difference between these component parts of attitudes as follows:

> "Attitudes include both the affective, or feeling core of liking or disliking, and the cognitive, or elements which describe the object of the attitude, its characteristics, and its relations to other objects. All attitudes thus include beliefs, but not all beliefs are attitudes. When specific attitudes are organized into a hierarchical structure, they comprise value systems."[11]

When one attempts to disclose the attitudes of a group of individuals, as will be done later in this study, it is important to keep the above distinctions in mind.

The component parts of attitudes and specifically how these parts relate to the dimensions of attitudes have been summarized as follows:

> (1) Intensity, (or), the strength of the effective component . . .; (2) The specificity or generality of the attitude and the degree of differentiation of the beliefs, (or), the number of beliefs or cognitive items contained in the attitude . . .; (3) The number and strength of its, (the attitude's), linkages to a related value system, (the more numbers and strength of these linkages the more difficult to change the attitude); (4) The centrality of an attitude, (or), its role as part of a value system which is closely related to the individual's self-concept . . .; (5) (the relation) of attitudes . . . to action or overt behavior, (or the distinction) between attitudes where the effect is tied to verbal expressions and attitudes where the effect is tied to behavior . . ..[12]

The above delineation of the component parts and dimensions of attitudes illustrates several complexities of attempts to define attitudes of a specific group of individuals accurately. Hence, great care must be taken in selection

of tools for measuring attitudes. Also, outcomes of attitudinal examination must always be considered with a degree of skepticism.

Opinions although related to attitudes are distinguishable in that they illustrate a more "specific position on specified public issues"[13] and at the same time are more yielding to change than are attitudes. The opinions of an individual are most probably influenced by his attitudes but they are more spontaneous and more directly related to the peculiarities of the specific situation and issue at hand. Thus, if one knew the attitudes of a certain individual toward an issue area he would be more able to predict what the opinion of that individual would be on a related issue which was more specific. However, attitudes are not as easily disclosed as are opinions and, thus, opinions must often be used as indicators in themselves, or at best, in combination with complex and less certain attitudinal indicators.

Even after opinion has been defined there remains the task of deciding the circumstances in which opinions should be considered public. A suitable response to this problem is offered by Benson, when he states:

> Public opinion is arbitrarily defined to refer only to opinions on political issues . . ..
>
> In the sense of who, the public is defined as referring to all inhabitants of a specified political entity having the right, or claiming the right, explicitly or implicitly, to influence government actions, directly or indirectly.[14]

Lastly, although this study is mainly concerned with the characteristics and distribution of public opinion it should be noted that public opinion has two additional dimensions; namely, (1) formation, or how people are influenced to have the opinions they do, or (2) impact, or how public opinion affects governmental decisions. Although all of the above dimensions of public opinion are closely interrelated, to acquire insight into any particular dimension is a formidable task, but one which results in an abundance of information about other dimensions of opinion.

Resource problem areas are always related to attitude and opinion distributions. This is especially true of those problem areas resulting from increased growth in the Denver Metropolitan Area and Boulder County. The problem areas include: rate of population growth; rate of industrial and economic growth; pollution control; preservation of parks and natural areas; sustained encouragement of farming on plains land; establishment of more land use controls; water use, waste, and conservation. For the purposes of the study, the attitudes and opinions on these problem areas are taken from samples of the Denver Metropolitan and the Boulder area populations. The patterns of attitudes and opinions discussed are assumed to be somewhat representative of the Front Range residents who live within or close to the Denver SMSA. That includes the Louisville and Lafayette citizenry.

Rate of Population Growth

The rate of population growth is an important factor in attitudinal formation and the expression of opinions about policies related to growth in general as well as the specific problems growth creates. Colorado and the Denver Metropolitan Area have experienced in the past, and there is every indication that they will continue to experience in the future, a substantial increase in the rate of growth, especially along the front range of the Rockies. Table 13 indicates the concern of residents of the Denver Metropolitan Area that the growth rate is too fast in the state as a whole and in the specific communities which make up the Denver SMSA. Table 14 indicates that a substantial number of the sample (43.3%) feel that growth should be discouraged by state government policies while only a small percentage (10.8%) think growth should be encouraged by state government policies, with the remainder expressing the view that the growth rate is about right.

The growth rate has not been quite as dramatic in Boulder County as it has been in the Denver Metropolitan Area, however. The population redistributions mentioned in Chapter III indicate that the rate of growth may increase greatly in the future. In a survey of 1400 Boulder Area residents conducted by The Boulder Area Growth Study

TABLE 13. Growth Rate in Colorado and Denver Metropolitan Area

Opinions	Rate of Growth in Colorado	Rate of Growth in Denver Metro
Too Slow	.9%	2.1%
About Right	32.3%	37.9%
Too Fast	66.9%	60.1%

(Source: Business Research Division, Graduate School of Business Administration, University of Colorado, Boulder, Growth Attitude Study, 1973, p. 4)

TABLE 14. Opinions on State Policies Toward Growth

Opinions	Percent
Encourage	10.8%
Neither	45.9%
Discourage	43.3%

(Source: Business Research Division, Graduate School of Business Administration, University of Colorado, Boulder, Growth Attitude Study, 1973, p. 5)

Commission, growth was ranked fourth in importance among problems in the Boulder Region. However, growth-related problems such as traffic congestion and lack of adequate parking were ranked first, indicating that the concern about the rate of growth may be equal to that found in areas closer to Denver.[15]

Industrial and Economic Growth

Attitudes and opinions on industrial and economic growth serve as valuable indicators of concerns about growth policies in general and are especially revealing when compared with attitudes and opinions about the rate of population growth. The percentages shown in Table 15 indicate that the Denver Metropolitan Area Sample does not equate expansion of industrial and economic growth with the population growth rate in general. This is especially evident in their responses to the state policies on industrial and economic growth. However, when favorable industrial and economic growth policies are proposed the percentages of favorable opinions declines.

Table 16 indicates that attitudes on the rate of industrial and economic growth are similar to attitudes on the rate of growth. Suburban population redistribution may provide an explanation for this difference of opinion between Boulder Area and Denver Area residents. The reason many Boulder Area residents live where they do is to avoid some of economic and industrial development which

TABLE 15. Denver Resident Attitudes Toward State and Community Policies on Economic and Industrial Growth

	State Government Policies	Community Government Policies
Encourage	48.7%	35.8%
Neither	27.3%	30.5%
Discourage	24.0%	33.7%

(Source: Business Research Division, Graduate School of Business Administration, University of Colorado, Growth Attitude Study, 1973, pp. 5-7)

TABLE 16. Boulder Area Opinions on Industrial and Economic Growth Policies

Expanding Business and Industry Should Be Encouraged	
Disagree	70%
Nuetral	10%
Agree	20%

(Source: Boulder Area Growth Study Commission Study)

is more evident in the Denver Area. Thus, the Denver Metropolitan population appears to be less threatened by economic and industrial development (in fact, tends to see it as somewhat beneficial); while Boulderites being farther removed from the core city and its problems, express stronger opposition to this sort of development. Yet, both Denverites and Boulderites are negative about rapid population increases.[16]

The above findings are strongly supported by two other recent studies; namely, The City of Boulder Opinion Survey (1973) and Robert Carley's study entitled Wastewater Reuse and Public Opinion.[17] Boulder's opinion survey shows that population increase ranks second among the community's problems according to a sample of more than 400 respondents. Similarly, Carley's study shows that Denverites consider population growth to be next to air pollution as an "environmental problem". Carley's study of some 441 randomly selected respondents further shows that Denverites perceive restrictions on population growth as one of the most viable alternatives for overcoming future water supply problems. More than 63% list this among the top three alternatives.

Pollution Control

It is generally agreed in the United States and elsewhere that all forms of pollution should be controlled. A good example of the intensity of feelings relating to the

need to halt pollution on a national level is shown by the rather drastic measures in The Federal Water Pollution Control Act Amendments of 1972, (Public Law 92-500), which makes strong demands on both the public and private sectors.[18]

Although the specific Denver Metropolitan Area views on pollution control are not available it is safe to assume that they closely parallel those found in the Boulder Area Growth Study Commission Report which indicated that 99% of the 1400 sampled residents surveyed in the Boulder Area thought that pollution including water, air, noise, and pollution side effects such as odors, had to be controlled.[19]

Carley's study,[20] also showed a high level of concern about pollution (73% of the Denverites). Likewise, the Boulder Opinion Survey [21] revealed an extremely high concern among Boulderites over air, water and noise pollution.

Preservation of Parks and Natural Areas

The Boulder Area study also indicates that 99% of the sample were in agreement with a need to preserve parks and natural areas.[22] There is an indication that the Denver Metropolitan sample is, for the most part in agreement with this, in that 54% of that sample thought Colorado State Government should encourage tourism and recreation visitor growth while only 14% thought this should be discouraged. Thus, there would seem to be at least some correlation of

Denverite to the Boulderite resident views on preservation of parks and natural areas. Denverites would support it if for no other reason than for the sake of tourism and recreation.

Encouragement of Farming on Plains Lands

As mentioned earlier, many of the communities in Boulder County are still closely associated with agricultural pursuits. This proposition is also supported by The Boulder Area Growth Study data which showed 70% of the sample throught that farming on the plains should be encouraged.[23]

Establishment of More Land Use Controls

The responses to previous problem areas indicate that Boulderites favor land use controls to a considerable degree. Although indicators for the Denver Metropolitan Area attitudes on land use controls were not readily available, 80% of the Boulder Area sample answered negatively to the statement that "there should be fewer land use controls".[24] Denverites could be less favorably disposed toward land use controls. This seems to be indicated in their greater acceptance of economic and industrial growth.

Water Use, Waste, and Conservation

It has been shown that many residents along the front range of the Rocky Mountains have in general, "a strikingly

high level of interest in water matters".[25] Studies of residents in the Denver Area conducted by Carley (1971) and later by Flack (1973) indicate the following attitudes and perceptions of Denver Area residents on water use, waste and conservation which are assumed to be typical of attitudes in the general study area:

> ". . .Water users in Denver could be classified as sensitive to water issues but they did not see water supply as a critical problem. They believed that they and their neighbors waste water. They selected restrictions on this waste as their first choice in meeting future water shortages. They would appear to be receptive to a water conservation program, but rate metering quite low as a supply alternative.
>
> They note reuse as an acceptable source of new water supply when compared to the environmental hazards associated with additional mountain development . . . ."[26]

The results of the foregoing examination of the general attitude and opinion distributions of the Denver and Boulder Area populations show that there is a great deal of concern about growth related resource problems. Although the data used in this examination are not easily utilized to indicate the exact rankings of some of these problems, it would, nevertheless, seem possible to make a summary estimation of their relative importance based on the Boulder Area and Carley data. This estimation appears in Table 17.

In summation, the reader can be quite confident in both the rural character and the urbanizing features that typify the communities selected for analysis. Residents

TABLE 17. Importance of Resource Concerns in Boulder Area

	Percent Agree	Percent Disagree	Percent Neutral
Pollution Control	99%	0	1%
(Water Use, Waste, and Conservation)	Est. 99%	Est. 0	Est. 1%
Preservation of Mountain Parks and Natural Areas	99%	0	1%
Fewer Land Use Controls	10%	80%	10%
Encourage Farming	70%	5%	25%

(Source: Graduate School of Business, University of Colorado, City of Boulder Opinion Survey)

of the SMSA in which both communities are located display a pronounced concern about environmental decay and the consequences of urban growth. Whether Louisville and Lafayette residents are equally concerned is an empirical question to be addressed in this study. Both demographic and attitudinal characteristics of the the two communities indicate that residents of both typify the rural American under urbanizing pressures. It might be hypothesized that their attitudes and approaches will be constrained by such stresses and experiences.

CHAPTER 4

MODEL DEVELOPMENT

The analysis to be performed in this study was designed to determine whether safe minimum resource use fits the community acceptance zone. To put it differently, the analysis was designed to ascertain whether two communities to be examined could avoid the critical zone of resource use (cf., Chap. 3). This calls for a tracing of the community acceptance zones. Such tracings should enable the analyst to isolate dominant patterns within or near the zones which should be useful in prediction, since it will enable the specification of dominant community characteristics -- or what Jay Forrester calls "control points" in the community domain.[1] When the control points are defined, they can be employed to estimate probable community action patterns.

Modeling Problems

Control Point Definition Problem

Specifying the control points is not a simple matter however, simply because the tools for defining them have not been tested or refined sufficiently. As defined for analytical purposes, they constitute the dominant or the most influential community characteristics. They are elements of a community's intellectual and physical

environments which make the community "do what it does" and give it a special overall character.[2] Traditional approaches to control variables were usually satisfied by resort to demographic and socio-economic-situational characteristics (e. g., age, education, income, migration).[3] For decades such variables were assumed, on rational rather than empirical grounds, to be control points or variables that had the most influence; yet, no one really knew that for sure.

Soft Data Problems

A major reason for the concentration on socio-economic variables was their apparent "hard data" quality; but again, this was apparent rather than scientifically established. Variables such as population growth, income level, size of labor force, or bank debit inspired confidence in data hardness due to their tendency to be interval in character and therefore more amenable to mathematical and statistical manipulation. Yet, appearance insures neither data hardness nor control qualities. Nor does a uniform interval such as years of age necessarily have psychological uniformity. People of the same age differ markedly in maturation both pyschologically and physically.

In this study, as in most specialized efforts in social science efforts, unquestionably one of the most severe problems to be confronted is the softness of the data. The soft quality is normally obvious to any student for so many of the data are nominal in character and non-parametric. If

not nominal they are usually no better than ordinal, meaning that the researcher cannot establish intervals or ratios which would render them more amenable to the Aristotelian modal logics and other requirements underlying mathematical applications. It is, indeed, most difficult to establish an interval for many social variables. Even when one does, he finds to his chagrin that the length of the interval changes over short periods of time, sometimes radically. Attitudes, for example, constitute vectors for they definitely have magnitude and direction; yet they are highly erratic within the same person through time. We might conceptualize them as having elastic qualities. Apparently this elasticity was what Gabriel Almond was identifying to some extent in his study of the radical shifts in moods and attitudes precipitated by international crises such as the Cuban crisis.[4] There is, however, no need for a crisis to have this occur; simply getting up with a sour stomach may shift any person's hierarchy of attitudes dramatically.

The Problem of Assumed Intervals

An equally serious, but less noticed problem, arises from the use of variables which are unquestionably interval in character. Dollars, for example, have equal intervals, but different meanings and values are attached to them by different persons and by the same person to the same dollar as well as to different dollars over time. Most any person will place a different value on the three thousandth dollar

than the thirty thousandth dollar unit. Likewise, the same number of years of formal education represent different levels of educational attainment for different people, and even for the same person over time. Such variances produce interval elasticity.

The Human Factor As A Problem

Other barriers to adequate analysis arise from the inability to experiment with humanity as one can with non-human subjects. This, however, is not simply a restraint on treatment of living human beings, for it also curbs the way data are used after they are retrieved. Ideologies and beliefs of Western Cultures impose severe constraints on the way data are handled. Judaic-Christian ideology, for example, holds that the individual human being is an integral whole with integrity as a whole. Human data, therefore, are frequently restricted to interpretations which do not depart from the notion of integral whole-person units.

Many observers reject partialing of human behavior on the grounds of reductionism which they believe to be the conceptual cornerstone of behaviorism; while others implicitly assume the illegitimacy of conceptualizing behavior as something other than the function of whole units. Indeed, it is seldom difficult for a critical reader to isolate nonscientific restraints on the uses of human data; restraints which are quite apart from the uses and treatment of human beings per se. For example, readers

and observers of human research activity nearly always demand somewhere along the line, an identification of some whole or integral human units who comprise a scientific category. "Just who are the units of a labor category for instance?" Or, "Who are these people?"

Such questions tend to impede efforts to establish scientific validity, for they direct attentions in terms of a premise that a strong climate of opinion or attitudes in a community (e.g., conservative attitudes) are the product of integral wholes instead of something partially independent of individual persons as such, but to which they contribute in varying strengths and to some degree are a part.

With respect to the two major problems identified above, (1) interval elasticity and (2) restraints on the acquisition and uses of human data, the reader should be made aware of the researcher's commitment to preservation of the constitutional and ethical restraints on the acquisition of human data, but not on the uses or manipulation of any data acquired. The problem of highly probably interval elasticity, however, is largely technical in character and must be addressed in the efforts of model development and instrumentation.

Interval Elasticity as a Major Modelling Constraint

Difficulties arising from elasticity of the interval are even more severe than indicated in the discussion above. The entire notion of an expanding and contracting interval

violates a basic premise of the Aristotelian Modal Logics on which modern mathematics and statistics are based. When mathematicians define an interval, they define a constant (K). Indeed, a change in the interval length is usually expressed as a new constant (K_1). Other mathematical operations have been geared to this premise which makes the notion of a non-constant interval illegitimate in terms of standard mathematics and statistical theory. The whole problem of elasticity suggests a corollary problem of mathematical constraints on testing and measurement.[5]

Mathematical Theory as a Constraint

Clearly, problem-solving models that employ mathematical theory extensively tend to suffer severely from two maladies; namely, a human tendency to ignore or fail to recognize implicit assumptions and a more common tendency to over-simplify or ease the mathematical trip. First, nearly any model employing modern mathematics is laden with implicit assumptions of human rationality. This says that their validity is heavily dependent upon assumptions about the currency of rational thinking and action.

But such consistency of rationality is apparently quite uncommon. For example, it is now a well established finding that over 90% of the U.S. population possess es contradictory attitudes, beliefs and values.[6] Also, as a so-called pluralistic nation of "joiners," a legion of Americans have conflicting identifications and loyalties. The human mind, fortunately for the purpose of sanity, has

a miraculous way of screening, protecting, and rendering consistency to the contradictory and inconsistent intellectual phenomena. In short, the non-rational and/or irrational are easily rationalized.

Mathematics, however, does not submit to such rationalization processes. Built squarely upon a hard foundation of Aristotelian premises, it tends to be unsuitable in many instances as an analytical tool for behavior that emanates from such contradictory bases. Furthermore, modern mathematics follows the Aristotelian "yes-no" "off-on" "plus-minus" binary system pattern. There is a notable lack of facility for accommodating the "maybe", and social behavior is riddled with "maybes". Modal logics have existed for centuries which offer some promise of overcoming the seeming impasse, but evidently their origins, which are largely Arabic and North African, have contributed to low interest in developing and testing them for use on so-called "soft" data, at least until very recently.[7]

Finally, there is the obvious penchant in mathematicians, as in most human beings, to simplify the operations and ease the pain and stress of analysis. Simplification understandably sacrifices precision in many instances. Because factor analysis employs a type of multiple regressions, the mathematical operations involve simplification which easily sacrifices precision in data analysis such as that employed in this study.

First, regression lines are vectors that provide summary statements of data points and factors are separate and independent vectors which provide summary statements of several data vectors. Such summaries provide the analyst with relief from massive data manipulation and measurement. So-called hard, interval and ratio data sacrifices very little precision and/or information when standard statistical and mathematical pressures are applied.

The situation is radically different for soft data however. For example, certain data introduced from other studies herein for comparative purposes reveal categorized clusters of data points in three-dimensional space which are closely related but nearly impossible to represent or summarize with a straight line--a vector. When plotted in three-dimensional space, for instance, one cluster of data points gives the appearance of a twisted or coiled rope hanging in space. The obvious mathematical penchant for mastering representation of the points is to pressure the data so that it will conform to mathematical requirements and thus ease the researcher's "analytical journey." Pull the rope of points into a straight line, for example, or shoot a vector through the coiled points. But as Coombs[11], Kruskal[12], and Shepard[13] have observed, the distortion and error introduced can be often immense.

Pulling the rope straight obviously transposes the points in space resulting in a change of the angles between

the individual point vectors which are originally established or set where they are in space by the members of the community. Since the cosines of these angles can be used to define distances between points, the empirical relationships within the "real world" are altered, even radically changed in certain instances.

Second, to shoot a rod-like vector through the coil also invites distortion, for it ignores the large number of little distances around curves and the tiny distances across breaks and places having sharp angular changes in direction. Though each distance or curve may be very small, cumulatively they are large.

Finally, it should be obvious to anyone that the old mathematical axiom that a straight line is the shortest distance between two points involves assumptions about the character of the space in which the points are located or are set. For instance, a straight line between the Chrysler Building and Kennedy Airport does not provide one with the knowledge of the shortest surface distance for human purposes. Similarly, in psychological or social space, the distance from one point to another might be increased by having to curve around obstacles or the the need to pass through several other points. Shepard[11] and Kruskal[12] both note that social and physical space are quite unlike each other. It is for this reason that they have attempted to develop algorithms which allow for differences in types of space.[13]

Pluralistic Constraints

As practicing pluralists, Americans can be expected to find group concepts attractive for analysis. But attitudes and beliefs defined in terms of group theory often fail to portray how people behave or respond to situations.[14] As a result it is often difficult and sometimes an impossible task to draw accurate conclusions on policy issues when these conclusions are based on the categorization of individuals and groups.

In addition, conclusions based solely on "group analysis" are also troublesome because the contradictions which are evident in almost all of us tend to be translated easily into a group context. For example, even though an individual belongs to a labor union he does not necessarily agree with all of the values, policies and propaganda that the union espouses. Hence, in relation to certain policy issues, the members of a particular union, including officials, usually have many beliefs totally apart from those advanced or supported by the union group. In essence, what is called "the group" may become totally independent of its membership in certain instances.

Toward A Battery of Methods

The above shortcomings in policy research create a need for methods that will enable extrapolation of accurate indications of the true overall community attitudes and beliefs within any specific issue area. Jay Forrester has suggested

employment of straight forward types of systems analysis for isolating "control points".[15] R. J. Rummel has advanced a specialized approach through systematic factoring of community variables.[16] Rummel's theory seemingly builds off a foundation laid by the factoring of socio-economic community variables by Jonassen and Peres on the one hand, and the theoretical developments in psychometry and statistics on the other hand.[17]

As outlined earlier, one research objective is to define a community acceptance zone for policy. This involves a more basic objective of developing criteria which enables identification (definition) and measurement of environmental and other community values in a manner that further enables definition of the role of such values within total community value systems. Ultimately, the goal has been to define the values and their roles in such a way that the planners and decision makers, whether national, state, or local, might be enabled to determine with the proper instruments certain probable responses of a selected or particular communities to selected alternatives or proposed policies.

The tools selected by the researcher were located rather than invented. As such, they are not envisioned as replacements for existing methods; rather, they are viewed as supplemental and additive. Indeed, mankind has developed tools over the centuries which have been used for precisely the same purposes as the ones employed on this project.

Perhaps this point should be made unquestionably clear to the reader.

If human beings are to avoid the hazards of constant surprise as well as the hardship and catastrophe that comes with a world of uncertainty and surprise, they must be able to estimate what others will do. We know from everyday experience with other persons that people differ markedly one to another in their behavior, their utterances, and their appearance. Since time beyond memory, men have invented and used various criteria for discriminating between persons and for categorizing like types of persons. Crude devices have been developed for telling whether a person is a conservative, a "labor man", an "Easterner", a "Texas-type", a "high-liner", a "mover", and so forth.

We also observe similar techniques for classifying total communities or collections of people which are used to tell the differences among them. For example, some communities are crudely defined as "conservative", "labor-oriented", "Southern in outlook", "Republican", a "resort community", a "railroad town", a "wealthy set", and the like. Such labels are assigned by applying conceptual criteria, often by the use of criteria that have varying weights that the layman assigns mentally. Then we use these criteria and weightings to describe a particular person or community to others, to calculate how the community will respond to some sets of circumstances, policies and the like. Such crude, everyday tools enhance our powers of prediction. We

know, for example, that if a community is "conservative" that its decisions and policy are apt to differ from what they would be if the community were "liberal". Crude though they may be, the mechanisms aid in making predictions and we use them extensively. This is really theory, albeit in the popular domain. Walter Lippmann has defined it aptly as "pictures in the head" that we use as a shorthand abstraction for gauging our behavior and the behavior of others.[18] We will say, for example, "That man is too conservative to accept such a policy."

Such tools, however, are so crude that they tend to "cross-up" the average person a considerable amount of the time. It has been the object of this project, therefore, to locate and develop better tools for enabling such predictive efforts. Although the tools were not developed "from scratch", so to speak, they appear to do a considerably better job than the widely used "off-the-cuff" labeling method described above. One tool referred to and employed here is simply a factor analytical design of community characteristics and behavior.

Factor analysis enables the researcher to measure variables by means of what can be called community poles which are identified by machine as independent factors. Such poles are not comprised of whole personal units or groups of people. Rather the poles represent the dissemination of attitudes and opinions of personal units in multidimensional space. This offers opportunity to avoid some of

the manifestations involved in the problems of human contradiction. Ideally this procedure also results in what can be called the community climates of opinion and preference overall, which enable the researcher to obtain a more exact estimate of probable community reaction to a policy area.

Use of the factor tool calls for acceptance of certain axioms, many of which are Aristotelian and mathematical, a limiting feature. Then there are also certain social assumptions which further limit the powers of analysis. These include: (1) that no individual and no community would fit a perfect type. (For example, common sense tells us that a "labor man" or a "liberal" also harbors "anti-labor" or "illiberal" characteristics. Every community labeled as "rock-ribbed Republican" will have many Democrats in it.); (2) that the more carefully and precisely characteristics are defined and trade-offs among them specified, the more the prediction of behavior and policy will be enhanced; and (3) that certain characteristics tend to exert influence and governance over others. The latter is really a hypothesis underlying tests conducted on this project.

The factoring method employed herein will be a Q-Sort factor analysis. The Q-Sort provides factor scores or distance measures among the variables themselves yielding what is called factor space.[19] The linear relationship between the variables and the factors, in this instance, depends on the total variance accounted for by a factor.

In Fig. 1 a graphical display of the Q-Sort analysis is shown using data collected from the survey of Lafayette, Colorado. The Axis lines forming 90^0 angles are the factors, in this case, Factors 1 and 2. The broken line connecting the variable points mark the factor space boundary. The lines extending from the origin of the two factors to the variable points, or the vectors, show the magnitude of the variables given. The longer a variable's vector the greater the magnitude of that variable. In the example given in Fig. 1 it is obvious that variable 97 has the greatest magnitude of the variables displayed. Thus, in its Cluster it is the more influential in relation to the other two variables, 18 and 56. The angle between any two vectors provides the correlation between the variables. Thus, in quadrant I variable 18 has an extremely high correlation to variable 56 while variable 97, although still highly correlated to 18, is less so than is variable 56.

To compute the actual distance between variables a line can be drawn from the termination of one variable vector line to termination of the other vector line as has been done between variables 30 and 66. This line is known as the distance vector in two-dimensional space whereas the vectors originating at the axis origin are known as row vectors. R. J. Rummel clarifies the use of the distance vector in measuring correlation as follows:

> "The magnitude or length of the distance vector is a precise measure of the Euclidean distance between cases . . . . By computing the magnitudes of the

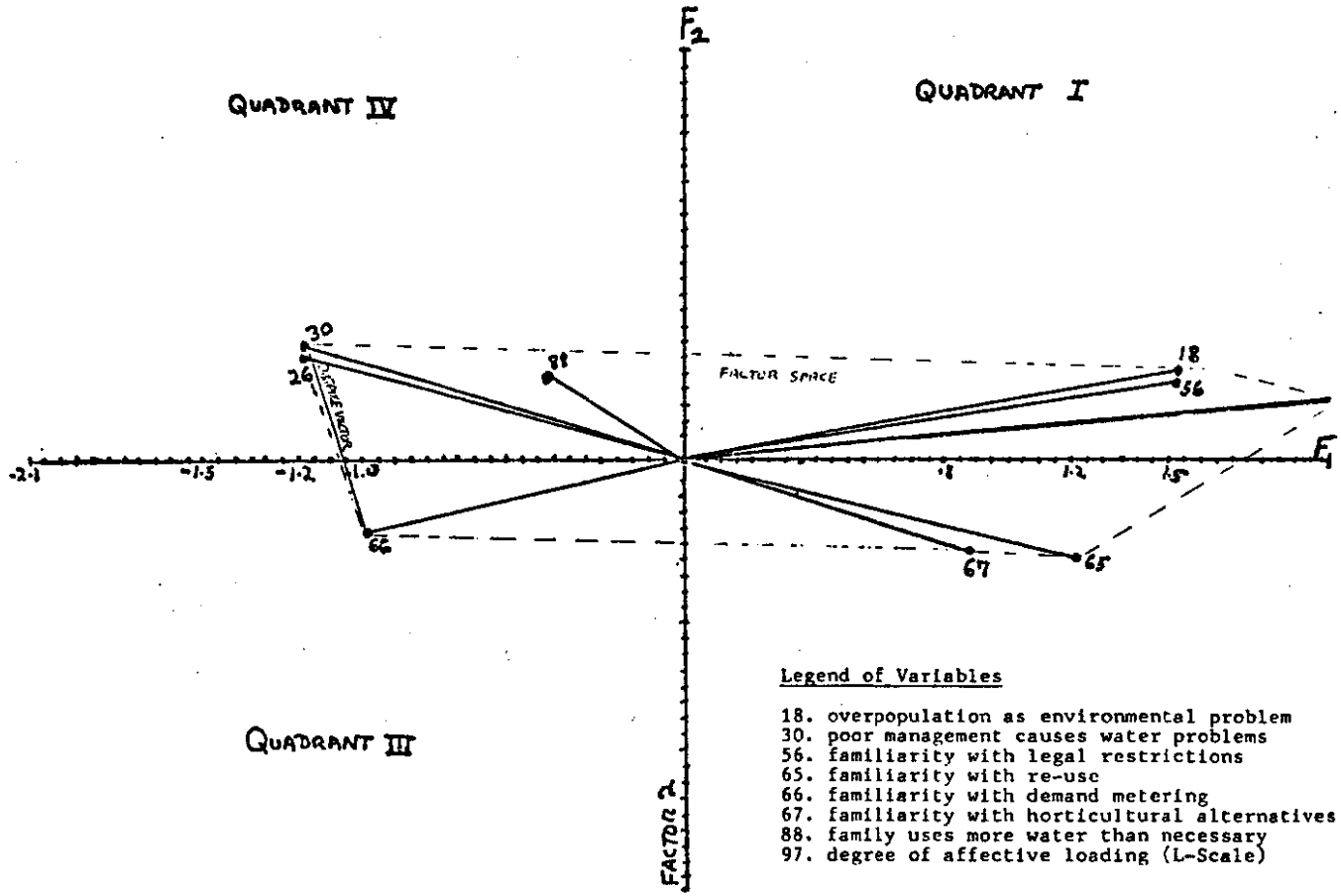

FIGURE 1: Community Factor Space Example

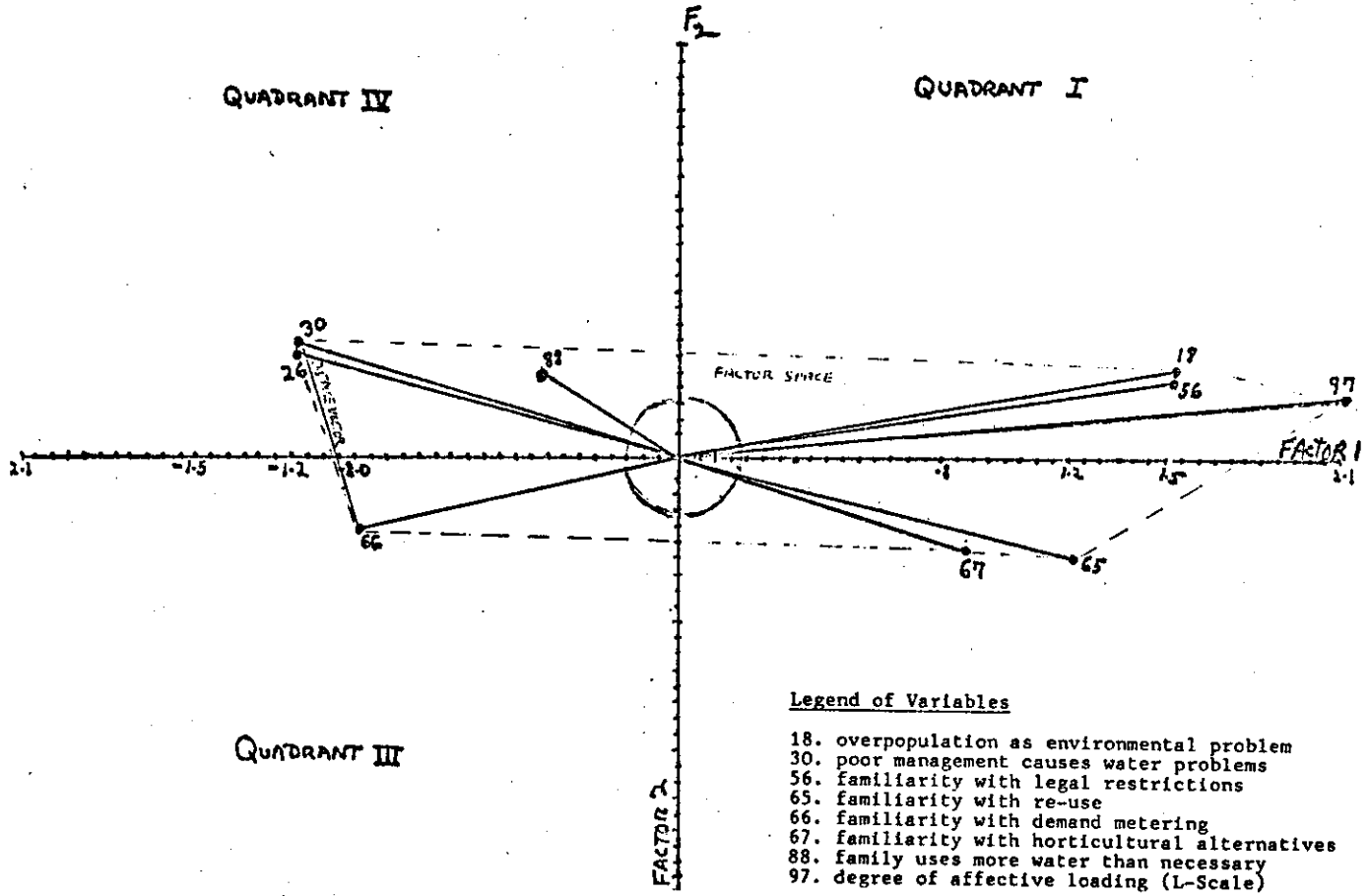

FIGURE 2: Community Factor Space with Vector Angles Circled

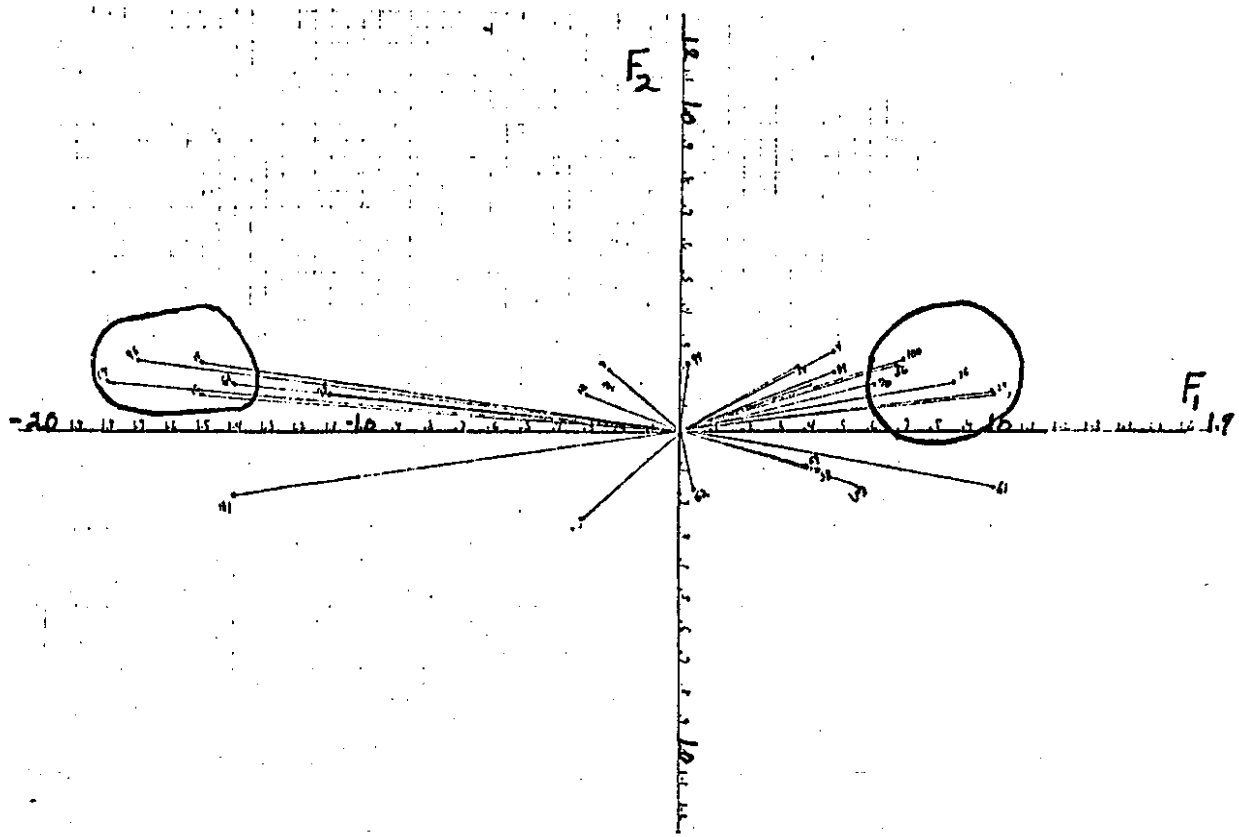

FIGURE 3: Louisville Variable Clustering

> distance vectors between cases of interest, the researcher can compare his cases in terms of their similarity to each other on the p factors.[20]

Rummel goes on to offer the explanation and precise formula for measurement of distance vector magnitude: "The length or magnitude of the distance vector is then the square root of the inner product of the distance vector with itself . . . (thus)

$$d_{gi} = d_{gi} = (S_i - S_v) = \sum_{l=1}^{p} \left[(S_{il} - S_{gl})^2 \right]^{1/2}$$

This is the well-known Pythagorean theorem for two dimensions . . . (If there are more than two dimensions) the formula is a straightforward extension of the theorem."[21]

A less elaborate but more lucid method of measuring correlation between variables, as already indicated above, involves measuring the angle between the row vectors. In Fig. 2 notice that the circle at the point where vectors 1 and 2 meet, has been included, creating angles between each of the row vectors. The smaller the angle produced by the row vectors the greater the correlation between variables. A 45^0 angle would indicate a correlation coefficient of .50 whereas a 90^0 angle would indicate no correlation. Thus, at 90^0 there is no relationship between variables indicating complete independence, and between 90^0 and 180^0 an inverse relationship builds to a perfect inverse relationship at 180^0. For example, in Fig. 2 variables 97, 18 and 56 are highly correlated and these three variables have some degree of correlation with variables 67 and 65 in

quadrant III. However, none of the five are correlated strongly with variables in either quadrants III or IV. To carry the example further, remember that the length of the row vectors indicates the magnitude or influence of the variable it represents. As mentioned, variable 97 has a strong influence on variables 18 and 56 as do variables 65 and 67. The variable list on Fig. 2 indicates that variable 97 measures emotive (affective) rather than pragmatic or instrumental predispositions of the respondents. Variable 18 indicates the extent to which over-population is considered an important environmental problem, while 56 indicates the level of familiarity of respondents with legal restrictions as a conservation measure. Even at this point then, one can say hypothetically that the emotive predispositions of the respondents influence attitudes about over-population as a problem, and does to a lesser extent, than do attitudes on legal restrictions. However, this is only a small piece of the puzzle in two-dimensional space. Little significance can be attached to such findings until the remaining pieces are assembled. That becomes possible when clusters of related variables emerge. Fig. 3, which is based on the Louisville survey, shows such clustering.

It should be stressed at this point that so far only two factors have been used as examples. If a third factor were included, a new dimension would appear and the variables would be arrayed accordingly in three dimensions. Hence, the way variables appear might be radically different

in three dimensional space from what it was in two dimensional space. Each added dimension in space provides increased precision of distance between any two points, except in cases where curvature is sufficiently large to introduce distortion.

Perhaps the best way to clarify further the operation and goal of this analysis is by analogy. Imagine one were given a box full of rods and connecting balls, (such as the ones used in construction of molecular models), and told to arrange them so that they fit as tightly together as possible into the smallest possible or most efficient space. The product of this endeavor would be a unique structure according to the space created by different lengths of the rods used in construction. These rods measure distance between pairs of community characteristics (points in community space) and the space they create might be called community space in the same sense as Osgood speaks of psychological space.[22] Figure 4 shows Osgood's model of how one person's mental space might look.[23] Hence, if one can visualize a community as a huge mind, by utilizing a Q-Sort one can build a structure similar to the one shown in Fig. 4. By observing this structure one is observing a representation of social reality in the community. Thus, one is enabled to estimate the compatibility of something like safe minimum resource use with other community characteristics.

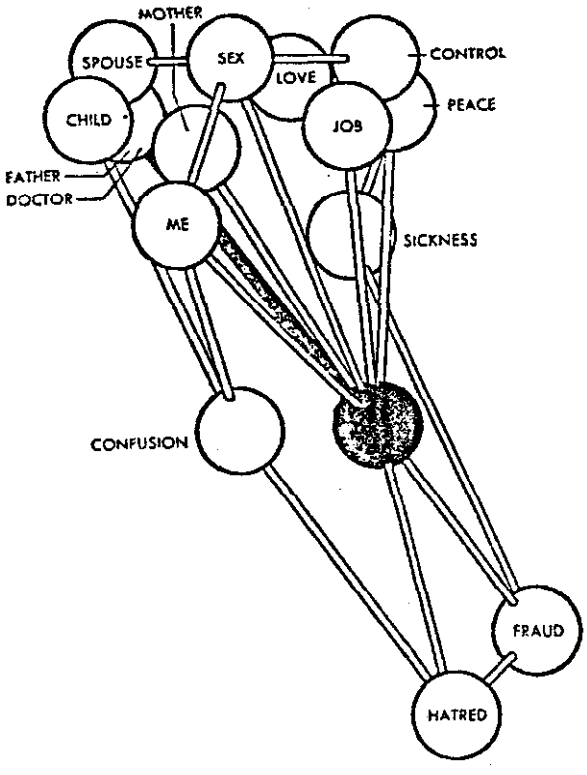

FIGURE 4: Example of Psychological Space Representation

CHAPTER 5

COMMUNITY ANALYSIS

Toward An Operational Mode of Analysis

The basic model for analysis is a Factor Analytic Design of a type discussed in the previous chapter. Utilization of such a design involves certain assumptions which should be acknowledged at the outset. First, the analysis to follow employs both R-sorts and Q-sorts of the data. In an R-Sort cases (single persons) are on the X-axis of the machine matrix comprising columns and variables are rows on the Y-axis.

An R-sort generates independent factors. Output includes a correlation matrix which specifies the correlation of each variable with each of the other variables. It also includes a factor loading matrix which specifies the extent of correlation between each variable and each independent factor. Another matrix of factor scores on an R-sort specifies the involvement of each case (person's overall response pattern) with each factor. The higher the score the greater the involvement.[1]

The Q-Sort Model

A Q-Sort is the same as an R-Sort except that the R-Sort data input matrix is inverted because that matrix

is rotated 90^0 turning cases (persons) into variables and variables into cases. The important feature of the programmed Q-sort is that the involvement of the variables with each factor is measured by the factor score, thus giving an accurate reading of variable involvement. This provides far harder data than that provided by the correlations of variables and factors generated on the Factor Loading Matrix in the R-sort. It is necessarily assumed, therefore, that Q-sort Factor Scores provide quite accurate indicators of the extent of involvement of a Particular variable with a distinctive set of related community characteristics that are independent of other factored sets of characteristics as specified by the program.

Basic Assumptions about Distances

Second, as indicated in the previous chapter, Factor Scores can be employed to determine the spatial distances between variables set in space by the members of the community. These distances serve as indicators of the independence of one variable from another. The latter capability provides much greater power of explanation than would mere correlation.[2]

Assumptions about Independence

It is, therefore, also assumed that the independence of a particular variable gives one an important indication of the effect that variable has on other variables and its contribution to the explanation of a factor. In using a

Q-sort it is assumed, too, that a more exact indication of the nature of a variable can be achieved by observing the variable in several dimensions.

Assumptions Relative to Significance

Another battery of assumptions underlying the design relate to significance criteria. Generally factor analysts consider factors with eigenvalues of 1.0 or better to have a sufficiently high level of significance for analytical use.[3] Factoring of hard data generally yields a small number of factors with eigenvalues of 1.0 or more, and this small number normally explains from 70% to 80% of the variance. In the social data examined in this study, however, all of the output reveals a large number of factors with eigenvalues of 1.0 or more. In one sample nearly thirty factors were at that level and together they explained 82% of the variance.

When most factors with eigenvalues of 1.0 or better are each explaining less than 15% of the variance in the total sample, factor scores can be legitimately inflated proportionately to provide a clearer picture of the influence of each. One can "eyeball" graphs of the relationships. Therefore, in this analysis it is assumed that eigenvalues of 1.0 or more indicate significance and that each factor having such a value comprises an independent pole of community characteristics which have a potential for influencing policy.

A variable's involvement with any factor is measured by the length it puts on that factor.[4] The length is a function of the proportioned factor score. Table 18 lists proportioned variable distances on the first ten factors as generated empirically by randomly sampled respondents in Lambda. "Lambda" designates combined data from the communities of Louisville and Lafayette.

Representing distances

In the analysis it must be remembered that where I.D. numbers are identifiable for the loadings, one cannot give the factors names such as "conservative factor" or "positive factor." Normally, the Q-Sort I.D. loadings for any single column will, upon examination, reveal no organizational pattern or other human social conformation which corresponds to anything needed for social analysis.[5]

Such a discovery can discourage an investigator from seizing an opportunity afforded by the Q-Sort to perform dimensional analysis. As has been seen previously, factor scores generated by a component Factor Analytic Model define the distance that a case (or object) vector represents on the factor vector. For a Q-Sort, the cases are variables which enable the investigator to measure distances between them. Below, this is illustrated, using data from a New Jersey community, how these distances can be measured. In so doing use is made of raw data outcomes which were empirically generated by a sample. This

enables the reader to see what the machine sees in terms of the input and do it without being overly concerned with the refinements imposed by Aristotelian modal logics.

It should be remembered, however, that the machine is looking at the points it projects into space in terms of Pearson-R correlations (regression coefficients).[6] Second, it must also be remembered that the machine plottings beyond three dimensions become extremely difficult to represent on paper (or to visualize) without resorting to traditional numeric representations. Figure 5 shows distance between two variables taken from a domain called Community Beta (level of satisfaction with public officials' actions and an item from a water concern scale hypothesized as identifying the extent to which persons in the sample endorse man's right to free and unlimited use of water).[7] The distance between the two points on the factor vector is simply a matter of subtracting point "W" from point "I" or 3.08 - 1.12 = 1.96. Because distances are proportional and measure the degree of involvement of a case with a factor, this says that in terms of the generated community empirical response pattern, the issue orientation variable is about three times as much involved with the factor as is the water attitude variable.

Now, let us look at the same two variables in two dimensional space -- between Factor 1 and Factor 2 (See Figure 6). Since factors are independent, they can be

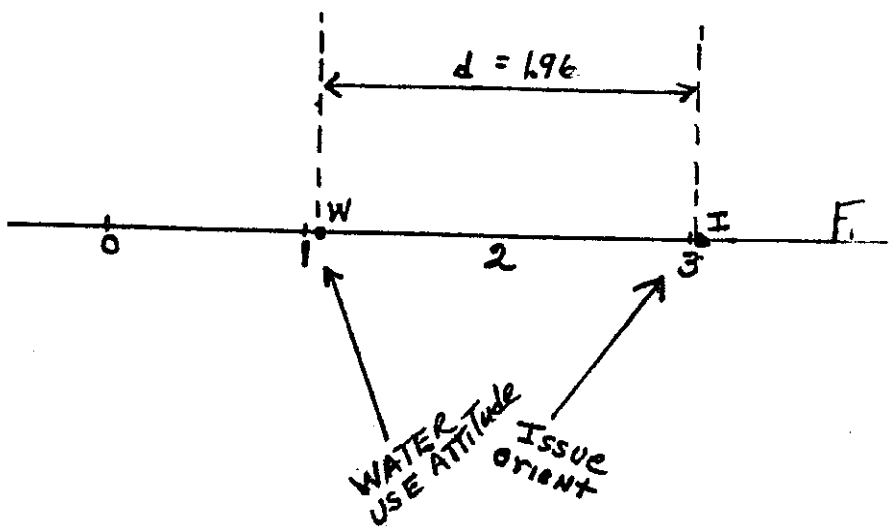

FIGURE 5: One-Dimensional Distance Between Two Self-Generated Data Points

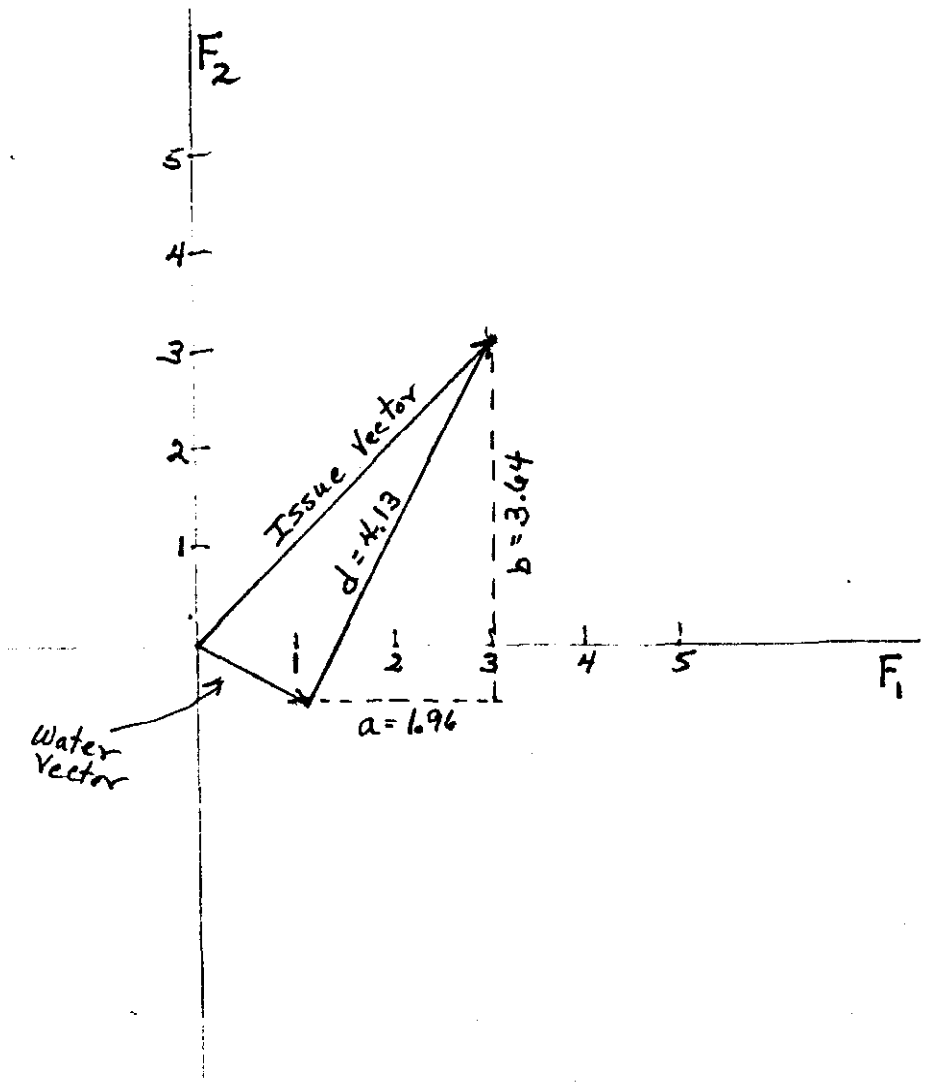

FIGURE 6: Distance Between Two Community Self-Generated Variables in Two-Dimensional Space

represented by an axis on a two dimensional plane. Given the coordinates of Factor 1 and Factor 2 and employing the Pythagorean Theorem, the distance between the points as seen by the machine in two dimensions is 4.13 units.

That distance, however, is dependent upon some crucial assumptions, the first of which is the old adage that a straight line is the shortest distance between two points. But suppose the total data pattern contains data characteristics which prohibit going in a straight line such as one encounter's in a developed city of concrete canyons. That is, suppose the relationship between the two variables must follow a line around obstructions as one might be required to do in following a grid of streets in getting from one point to another in a city since a person would find a straight line through concrete walls impossible to negotiate. Then the distance might be a + b or 5.60 units rather than d or 4.13 units. It might, on the other hand, be something between 5.6 and 4.13 units, or even more than 5.6 units.

Further, the "d" value in Figure 6 assumes that no Euclidean transformation is in operation. Figure 7 reveals the effect of such a transformation on distance values. The figure makes the differences on the abscissa equal to "x" and the difference on the ordinate equal to "y".

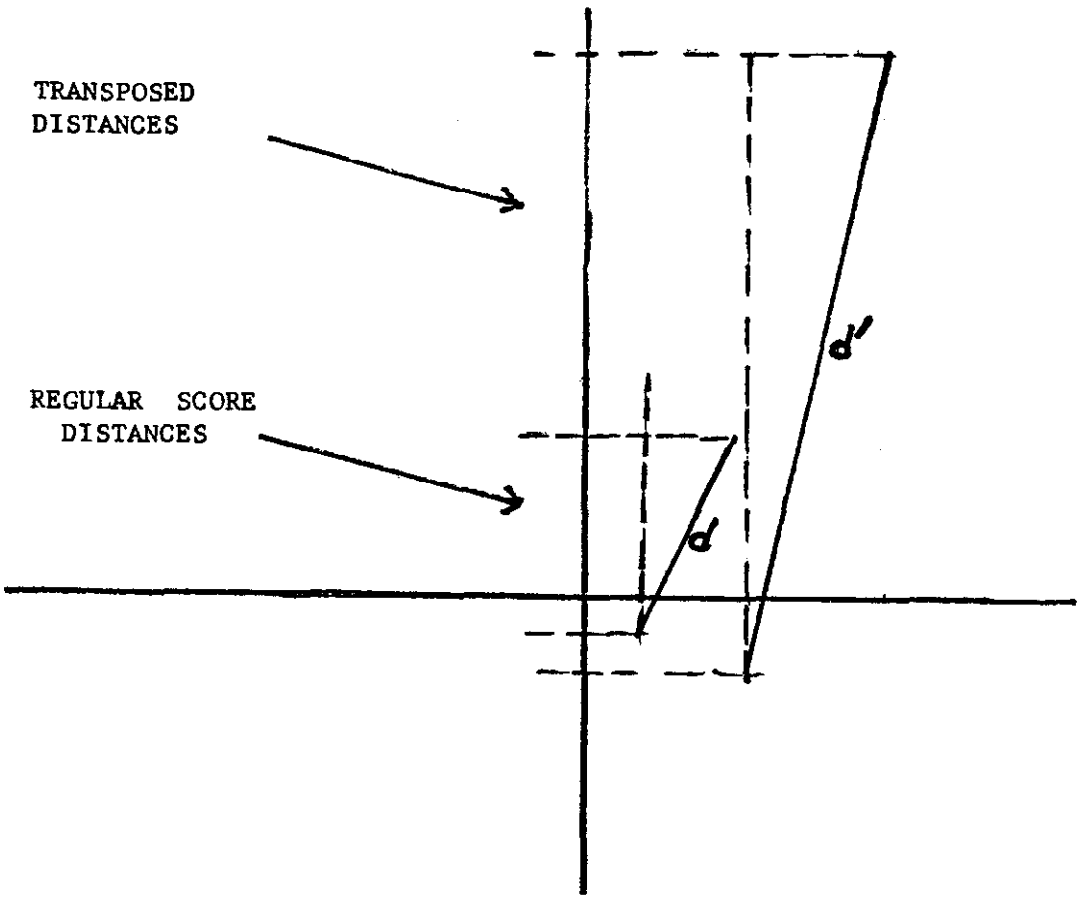

FIGURE 7: Effect of Transpose of Two Data Points in Two-Dimensional Space

Figure 7 illustrates that the Euclidean transform gives "d'" a larger value than was obtained for "d" in Figure 6. This presents no problem, however, unless a transform is not accounted for in the analytical process.

Introducing a third dimension (See Figure 8) and using the previously cited formula:

$$d_{ab} = \sum_{1=1}^{p} \left[(s_{al} - s_{bl})^2 \right]^{\frac{1}{2}},$$

we obtain $d_{ab} = (3.84 + 13.20 + 15.18)^{\frac{1}{2}} = 5.68$ units of distance. Both points hang in space below the plane which bisects a cube. Adding the fourth dimension will increase the distance to 5.94 units of distance.

However, the above 5.94 units have meaning only in relation to distances within a complex of variables. Essentially, the data comprises a set of multi-variate observations which constitute characteristics of a community. The problem, then is to see if it is possible to find any structure in such a set which can be employed for comparison across a number of communities. If each observation in a set is represented by a point in p-dimensional space this involves a search for such a structure of some multiple configuration of points in high-dimensional space. To find linear relationships among the characteristics, one has access to such techniques as linear regression, principal component and several other factor analytic techniques. To locate non-linear relationships,

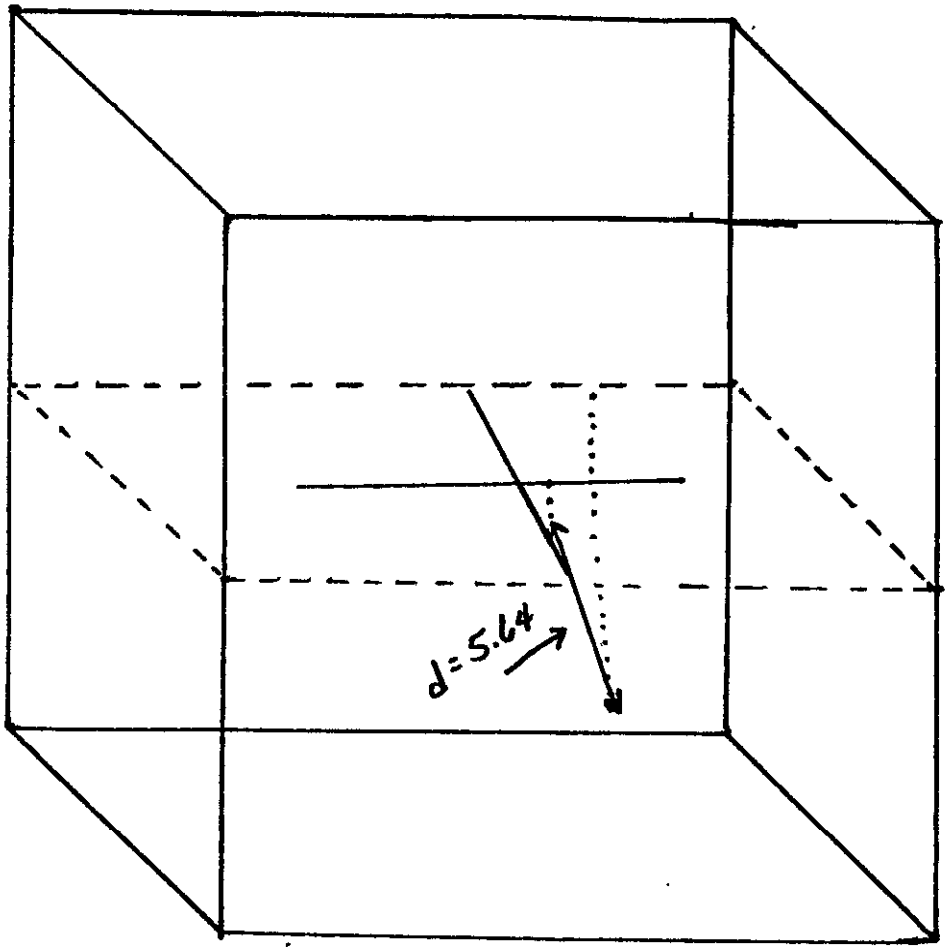

FIGURE 8: Community Generated Data Points in Three-Dimensional Space

however, more generalized regression procedures, curvilinear procedures and polynomial procedures such as Polynomial Conjoint Analysis are available. One rather simple notion that has evolved a complex set of variant techniques is clustering procedures, primarily along lines in space or around points in space. For example, one technique seeks to cluster points whose interpoint distances in space are very small (see Shepard and Carroll, 1966).[8]

Such distance techniques are quite naturally sensitive to linear transformations of the data simply because transformations can alter the interpoint distances radically. For instance, inclusion of irrelevant data such as miles of several different types of streets, aggregates of different hair colors, etc., can radically alter the point distances. Again, use of factor scores that are not normally distributed will alter distances from what they would be if the scores were normalized.[9]

The Polynomial Conjoint Measurement Model

Before proceeding it is important to acknowledge that the models herein spin off the algorithm developed by Shepard in 1962[10] for nonmetric multi-dimensional scaling. Shepard developed his algorithm specifically to derive or define metric structures for unknowns, that is, unknown configurations of data points in a Euclidean space which had dimensions that were also unknown. This describes

the condition of the data used in this study. The configuration of data points and their spatial dimensionality are unknown.

To accomplish his important feat, Shepard used nonmetric information about the proximity of points (and/or vectors) in space by devising a simultaneous means of converting proximity measures into Euclidean distances and then obtaining coordinates underlying those distances, or coordinates whose Euclidean distances or effects were monotonic (invariant) with the proximity measures. In algebraic terms, Shepard expressed it as follows:

$$S \overset{m}{=} D = f(x)$$

where

S = symmetric matrix of proximities between "p" points

D = distance matrix

x = matrix coordinates of p rows and v columns

$\overset{m}{=}$ = monotonicity

Hence, a matrix D can be related to a matrix X through the Euclidean distance function which is that faimiliar formula cited earlier,

$$f(x) = \sum_{l=1}^{p} \left[(x_{il} - x_{jl})^2 \right]^{\frac{1}{2}}$$

The model has become known as a Polynomial Conjoint Measurement Model and has been further refined and adapted

by Kruskal through injection of a disparity matrix into the model to obtain a more objective definition of the maximal solution as well as a clearer and more precise definition of the monotonicity (invariance).[11] But it was Clyde Coombs who developed and extended a theory of psychological and social data which applies variants of Shepard's Algorithm. Coombs'[12] Theory of Data is that individual persons and stimuli can be represented as vectors in p-dimensional space. Stimulus data can be represented in multidimensional spatial terms and be classified into single stimulus situation data and dyadic (or pair) situations. A major axiom he develops is that all psychological data can be viewed as interpretations in which a relation exists on a pair of points (a dyad) or on a pair of dyads. As he theorizes, "the relation is on a pair of stimuli where each distance is between a pair of stimuli."[13] The preference a person shows for certain stimuli, for example, means that the distances between those stimuli points or vectors is shorter than for the non-preferred stimuli.

Now, the theory for the present enterprise is not confined to a single person's psychological space; rather, it applies to a multiple individual, group, or community social conformation of space in which distance vectors represent, for example, a relation between points (dyads) which are data empirically generated by members of a

representative community sample or some multiple unit, and exist in a community space with their conformation and structure unknown, but probably amenable to determination through Shepard's model or some variant thereof. For example, in Coombs' terms, if a community empirically and cumulatively generates a preference for selected policy alternatives these can be represented as vectors or points in social space as can action patterns (assumed to be preferred action courses), perceptions of official behavior, and a host of other phenomena. Using the theory previously generated, we can then begin our attempt to define the structure of the community space.

The real test for success of such operations is the consequent facility to predict directions a community will go as problems arise. Once such predictions can be made and subsequently validated by the community outcomes, we can then compare successful with unsuccessful predictive structures to ascertain why some predicted and others did not. Many such comparisons are beyond the scope of this research at this time, but research findings herein are ordered to enable comparison at a later date.

A Comparative Basis for Hypotheses

The essence of scientific testing is comparison. Figures 9, 10, 11, and 12 provide a basis for comparing data from Louisville and Lafayette with data from other communities located elsewhere in the United States. The

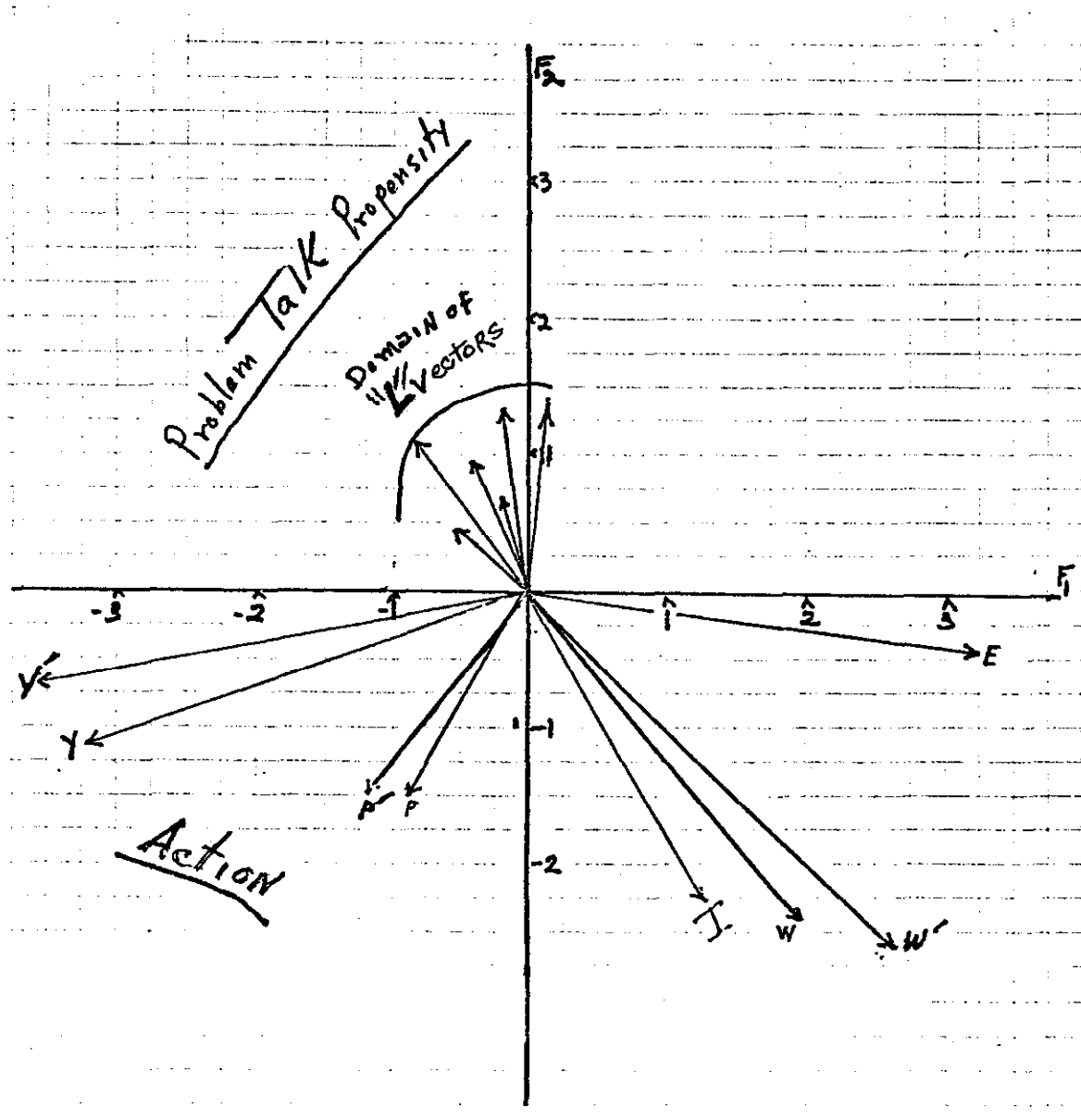

FIGURE 9: Community Space for Alpha (Ault, Colorado)

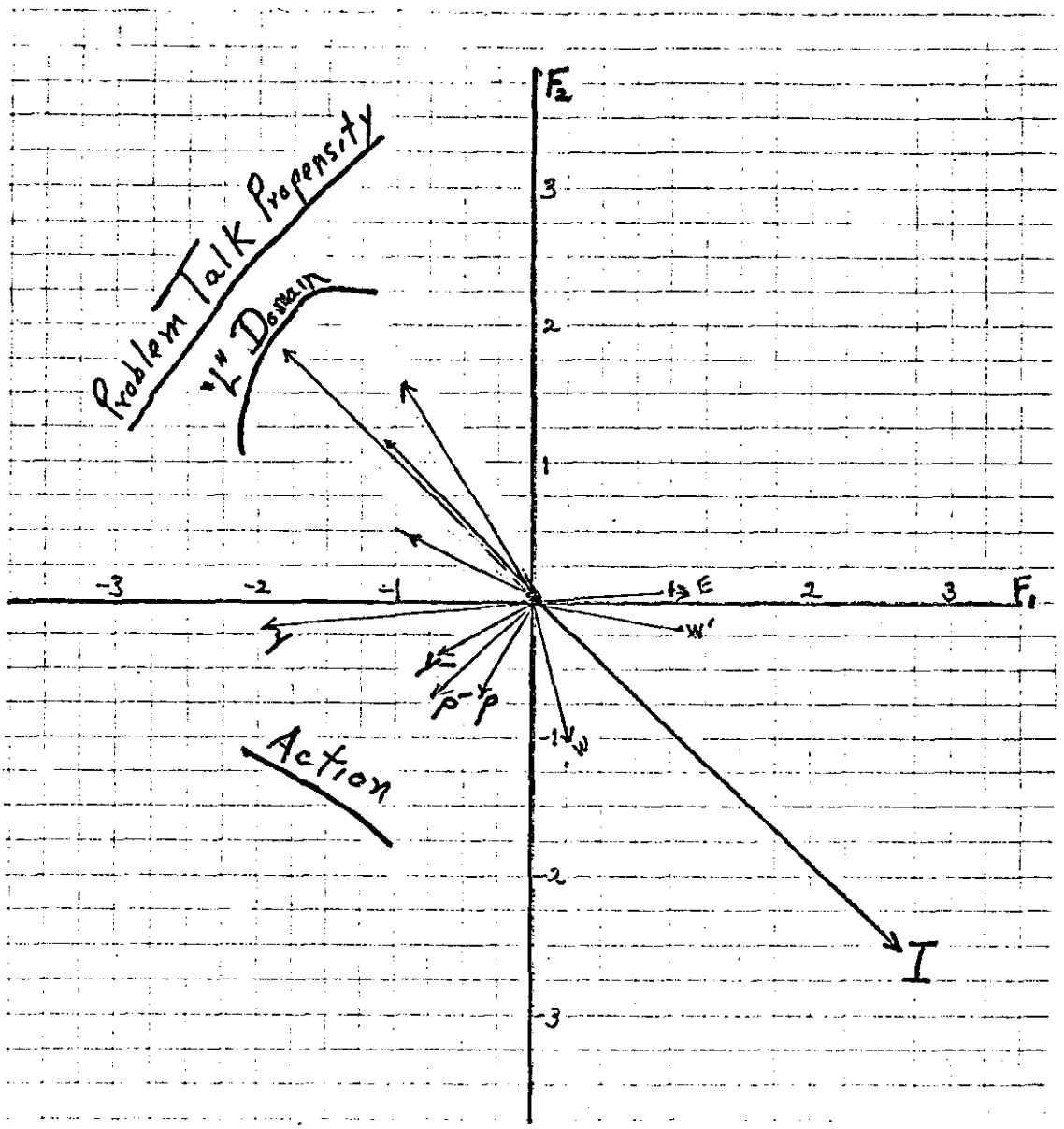

FIGURE 10: Community Space for Community Beta (Boonton, New Jersey)

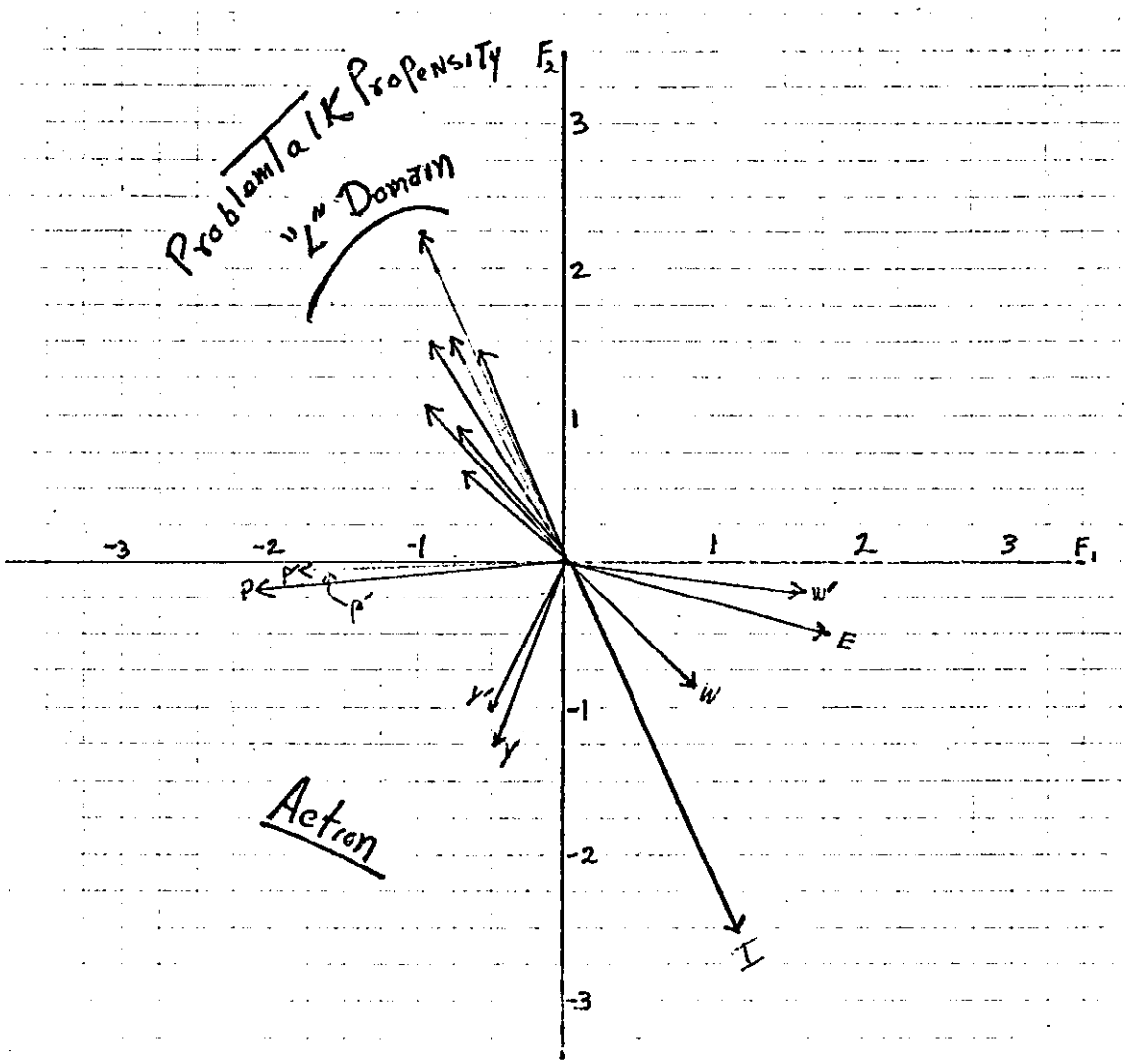

FIGURE 11: Community Space for Delta (West Des Moines, Iowa)

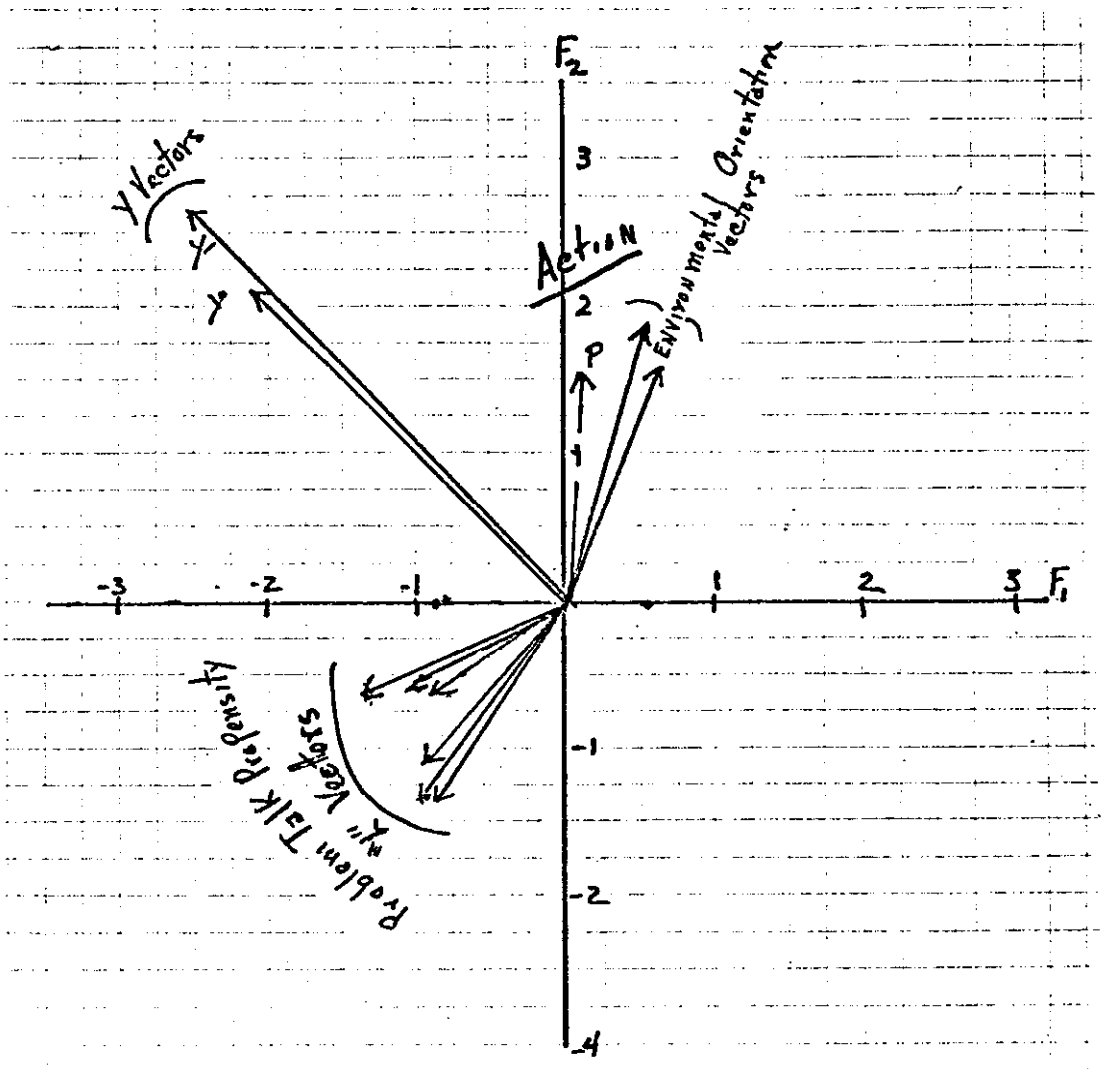

FIGURE 12: Community Space for Sigma (San Rafael, California)

four configurations reveal remarkably similar data performances from four widely dispersed American communities. The similarities are especially remarkable when their regularities are compared with the many past efforts of social scientists to isolate such regularities across community samples.[14]

Each sample constitutes more than 100 respondents drawn by randomization procedures from an overall household count. Essentially the same instruments were employed in all communities. One sample comes from the Parsippany-Boonton area of New Jersey close to New York City. A second comes from the city of West Des Moines, Iowa. A third is drawn from the small city of Ault, Colorado; and the fourth from San Rafael, California. Three of the samples were collected under the supervision and direction of Phillip J. Skraba of Fort Collins, Colorado and the fourth was collected under the direction of Dr. Duane W. Hill, also of Fort Collins. Totally different batteries of trained interviewers were employed on each sample.[15]

Each "y" vector represents an index of the level of involvement in community action patterns taken from a battery of responses to questions on the extent of involvement in community group, political, social, and religious activities. The "y'" vectors measure the levels of religious involvement and activity. The "p" vectors are results of indexes of a battery of questions on the extent of discussion and other forms of communication

respondents engage in with peers, neighbors, friends, and fellow workers about political, economic and other community problems. Likewise, "p'" measures the extent of communication on water problems.

The "w" vector measures the extent of concern the respondent has about water problems generally, and "w'" identifies the concern respondents express about a specific water problem in their community, if a crucial problem can be defined and if it is sufficiently recognized by the community (e.g., the water shortage in Marin County, California). Similarly, "E" defines levels of concern about environmental problems generally and nationally; while "E'" defines the extent of concern about an immediate and local environmental problem such as air pollution in Boonton, N. J. or West Des Moines, Iowa, and feed lot odors in or near Ault and Greeley, Colorado.

Judging from previous study results, a most important set of vectors includes the "L" scale items identified on the figures as "L". Each of the vectors is from responses to one item on the Himmelstrand "L" Scale, each of which is designed to evoke the respondent's predisposition to "talk" about problems rather than "do" anything about them. These are attitudinal measurements and must be distinguished sharply from measures of action and talk per se. According to the framework of the concept originally advanced by the eminent philosopher, C. S. Stevenson,[16] and the designer of the measuring instruments,

Ulf Himmelstrand,[17] the instruments should measure the extent to which a person will be expressive and emotive as opposed to being instrumental and pragmatic about problems if the person does address the problems. It does not tell the observer whether the respondent is active or addressing problems. Again, the measure is attitudinal.

Using the Himmelstrand instruments in a 1970 urban flood plain study of Atlanta, Georgia publics, Drs. Duane W. Hill and L. Douglas James found "L" vectors to have a pronounced degree of control over other variables. They also found that they tended to be perpendicular to and therefore independent of action variables.[18] Thus, the "L" domain helps to distinguish between propositions which might receive a great deal of emotive support and those propositions with effective and instrumental support; that is, those with sufficient strength in terms of effective action to win public acceptance or passage.

Finally, note that the "I" or instrumental vectors measure a predisposition to act and do not measure effective action <u>per se</u>. They say that if action is taken it will be instrumental rather than expressive. Note also that the "I" is inversely related to the "L" on the displays in Figures 9 through 12. If this did not occur, it would be a basis for suspecting the Himmelstrand instruments and possibly rejecting the entire study design.

The "L" vectors also tend to have considerable length in each community. This suggests a hypothesis that policy proposals falling in or very near the "L Domain" would encounter greater difficulty in gaining community acceptance under stable conditions than would proposals falling near effective action and communications vectors. Such hypotheses are difficult to test since laboratory conditions depend upon transpiring events in the real world. In Boonton, N. J., where two issues were tested by ballot, the hypothesis was validated. A development project falling very close to the "L Domain" on Figure 10 failed by a wide margin, while another referrendum on the same ballot -- a proposed day care center -- which was lying very close to the "y'" vector passed by a comfortable margin. Likewise, two city council proposals in West Des Moines, Iowa yielded the same patterns of success and failure.[19]

Previous studies having shown that variables located close to the "y" (action) vectors have a greater probability of gaining community acceptance,[20] it was hypothesized in this study that the greater the angular distance between policy and action vectors, the greater the probability that the policy vectors lie outside the zone of community acceptance and the lower the probability that the policies would be adopted if proposed. Hence, on the basis of the evidence cited above, and despite the sparsity of tests conducted thus far, it appears reasonable to define community acceptance zones as those areas of community space which

lie within or very near the area between the effective communications space and the effective action space.

Lambda Analysis

Lambda identifies combined data collected from Lafayette and Louisville. Preliminary analysis of machine output, especially the original factor runs, produced such negligible differences between the two communities that separate analysis was deemed wasteful of time, effort, and money. Surprisingly, the two communities were very similar, despite Lafayette's severe water shortage problem which Louisville did not share more than in a mild way.

As previously mentioned, data was collected from a randomized household sample, and selection of each household's respondent was also by a process of randomization from the total number of residents within the household who were 18 years of age and over. Instruments employed were patterned directly after those used in the four Resources Development Corporation samples displayed on Figures 9-12 above. The major reason for patterning the instruments after those employed by RDC was, of course, the impressive regularities the RDC instruments obtained from samples of four widely dispersed communities across the continent. A second major reason was the severe quality controls that were invoked by RDC on data

collection as well as instrument development and testing.[21] It appears that the quality controls -- a feature that is truly uncommon in much social research outside the private sector -- may have been responsible for the emergence of those regularities across the samples.[22]

There is one very significant difference between the RDC samples and the Lambda sample. Lambda's survey schedule was about one-third as large as the schedules used in the RDC efforts. There is a very important reason for the difference in size. Social surveys are a costly business. They are, in fact, far more costly in terms of money, paid interviewer time, both free and paid respondent time consumption, analytical costs, and even curiosity costs than most professionals in as well as outside the social sciences care to admit or even recognize. Further, large survey schedules induce interviewee fatigue that naturally lowers data quality.[23]

Large schedules have long been the bane of social science qua science efforts. One of the major objectives of the RDC contract with the OWRT of the Department of the Interior was to test items in a multiple community cross-cultural context in order to reduce the number of items (weeding).[24] A brief perusal of the "L" vector distribution on Figures 9-12 indicates how such reductions can be achieved using Q-Sort analytic techniques. Note how the plotted "L" vectors tend to cluster together in a position that is nearly perpendicular to the "y" vectors

in all four samples. Simple logic tells the observer that where no more than an estimate of the true "L" position is needed, seven to twenty-seven or more "L-scale" items are hardly necessary. Hence, in the Lambda survey, the 9 items used by RDC to read "L" were reduced to the two that appeared the most determining of "L" across all four samples. This sort of reduction was also applied to other types of variables, but with one exception; namely, the action and communications variables. First, examination of the RDC data indicated that they were highly important variables; and second, these variables are defined by indexed responses to a number of questions about all sorts of different kinds of activities. It essentially requires a large number of answers to specific questions.

Finally, the Lambda survey differs from the RDC surveys in its central focus upon the question of conservation per se. It therefore contains a number of schedule items not found in the RDC data.

A Preliminary Search for Control Points and Dominant Community Poles

A review of TABLE 18 indicates that variables 4, 62, 69 and 21 could be prime candidates for control points (see Chapter IV), because they tend to put a good deal of distance on two or three factors. TABLE 19 provides a display of distance dyads covering ten dimensions for the four above variables as well as a number of others that also

TABLE 18: Normalized Lambda

Case #	F_1/100%	F_2/86%	F_3/68%	F_4/55%	F_5/50%	F_6/45%	F_7/42%	F_8/38%	F_9/36%	F_{10}/35%
1	1.4	.33	-.19	-.28	-1.1	-	.11	-	.33	-
2	.6	.55	.52	.55	-.25	.3	.27	.28	.19	-.44
3	-.15	-.32	-.67	-.28	.69	.46	-.14	.31	-.24	.31
4	-1.8	-.83	-.98	-.47	.81	-.18	-.12	-.1	-.20	-.24
5	-1.1	.17	.1	.52	.21	-.44	-.5	-.2	-.62	.60
6	.66	-.5	-	-.25	-.21	-.44	.24	-.40	-.14	-.13
7	.92	-1.6	.1	-.33	-.23	-.70	.35	-.40	-.21	-.18
8	-1.4	-.11	-.5	-	-.63	-.43	-.32	.49	-	-
9	.90	.91	-.67	-.10	-	-.8	.18	-.32	.35	-.13
10	1.7	-.49	.49	-.17	.42	.26	.55	.17	-	.22
11	.2	-1.5	.73	-.71	-.59	.13	.76	-.15	-.33	.44
12	-.51	.16	-1.8	.66	.37	-	-.26	-.33	-	-.39
13	-1.4	.42	-.24	.40	-.33	-.35	-.56	-.26	.49	.41

TABLE 18: Normalized Lambda (Cont.)

Case #	F_1/100%	$F_2$86%	F_3/68%	F_4/55%	F_5/50%	F_6/45%	F_7/42%	F_8/38%	F_9/36%	F_{10}/35%
14	-.14	.7	.32	.53	-	-.54	.57	-	-.23	-
15	.8	-.8	.12	-.22	.45	.51	-.61	-.21	.56	-
16	1.8	-.17	-.67	-.35	1.0	-.44	-	-	.25	-
17	2.0	.16	-.1	-.18	.63	-.48	.25	.68	.44	-
18	.22	-.51	-1.0	.32	.25	-.31	.14	-.53	.36	-.2
19	-.38	.74	-.36	.27	-1.0	-.17	.47	-.19	-.11	.54
20	-1.5	.30	-.15	.27	-.39	-.60	-	-.90	-.3	.13
21	-1.9	-1.2	.79	.42	-.24	.26	.29	.26	-	-.23
22	.13	.51	.50	.41	-	.17	.63	.53	.23	-.22
23	-	-.15	.43	.47	-.46	.72	-.14	-.25	-.25	-.36
24	-.1	-.53	-.1	.14	.50	.2	-	-	-	-.41
25	.50	-	.24	.21	.45	-.34	.12	-	-	-
26	.77	-	.94	1.1	-	.12	-.18	.36	.20	-.29

TABLE 18: Normalized Lambda (Cont.)

Case #	F_1/100%	F_2/86%	F_3/68%	F_4/55%	F_5/50%	F_6/45%	F_7/42%	F_8/38%	F_9/36%	F_{10}/35
27	.25	.28	-.51	-.17	-.77	-	-	-.2	-	.19
28	.82	-.44	.39	-.37	-	.12	.96	.13	.64	.14
29	-.24	-1.4	-.7	-.38	.37	.66	-.14	.22	-.26	-.21
30	1.5	.31	-	.5	-	-.5	-.71	.57	-.45	-
31	-.40	.37	.62	.56	-.32	-.27	.33	.48	-.23	.10
34	.24	.57	-.64	.41	.12	-	-	-	-.65	-.3
35	2.1	-.77	.48	-.17	.12	-.21	-.5	.22	-.2	-.36
36	-.42	-.74	-1.2	-.17	.12	.71	.59	.42	-.72	.15
37	2.1	-.38	-	.13	-.29	.13	-.74	-	-.47	-.47
38	-	.7	.48	.33	.27	-.27	.36	.29	-.51	-
39	-	-.29	1.2	1.1	-	.60	.21	-	-.14	.52
41	2.0	.5	.16	-.45	-.18	-	-.44	.30	-	-
42	.76	-.38	-.19	.19	-	.17	-.42	-.27	.48	-

TABLE 18: Normalized Lambda (Cont.)

Case #	F_1/100%	F_2/86%	F_3/68%	F_4/55%	F_5/50%	F_6/45%	F_7/42%	F_8/38%	F_9/36%	F_{10}/35
43	.73	-.12	-.15	-.53	-1.1	.51	-	-.18	-.18	-.13
44	1.6	.17	.22	.10	-	-.26	-.8	.16	-.34	-.49
45	.7	.66	.37	.47	-	-.49	-.19	-	-.42	-
46	-.37	-1.7	-.56	.73	-	.23	1.1	.69	-.42	.11
47	.39	-.53	-.67	-	.19	.18	-.47	-.2	-.65	-.28
49	-.18	-.84	-.42	.22	.68	.68	-.2	.22	.12	-.1
51	-.27	.82	-.15	-.20	-.46	.16	.28	-.24	-.11	.21
52	-.41	-.43	-.57	-	-.19	-.32	-.17	.1	-	.15
53	.82	.3	-.26	-	-.58	.43	-.36	.47	-.61	-.38
54	.37	1.9	.8	-.92	.6	.38	.17	.13	-	.48
55	-.52	.62	-	-.56	-	.91	-.71	-	.35	.21
56	.24	-.12	-.17	-	.27	.32	-	.1	.18	.19
57	-.58	.71	.49	-1.1	-	-.76	-	.29	-.2	-.2

TABLE 18: Normalized Lambda (Cont.)

Case #	F_1/100%	F_2/86%	F_3/68%	F_4/55%	F_5/50%	F_6/45%	F_7/42%	F_8/38%	F_9/36%	F_{10}/35
58	.36	1.7	-.52	-1.4	.22	.18	-	-	-	-.13
59	.66	-.19	.91	-.25	.48	.43	.35	-	.40	.34
60	-.65	.22	.42	-.38	.45	-.51	-.2	-.26	.1	-.41
61	-1.4	.95	.58	-.23	-	-.41	.43	.21	.18	.26
62	-1.3	1.4	1.2	-.38	-	.53	-	.1	-	-
63	-.70	.49	.39	-	1.1	-	.18	.12	.35	.33
64	-.6	.52	-.64	-.61	.54	.48	-	-.54	.28	.56
65	-.93	1.0	.18	-.81	.37	-.11	.21	-.11	.47	.38
66	-.34	1.2	.80	-.26	.32	.5	-	.18	-.32	.26
67	-.91	1.1	.6	-.2	.52	-.16	-.1	-.86	-.56	-.11
68	.27	.44	-.3	-.98	.15	-	-.24	.43	-.33	.62
69	-1.1	-1.9	-.73	-.50	.1	-.76	.31	.14	-.35	.12
70	.73	1.7	-.85	-.11	-.43	.60	.93	-.26	.18	-.33

TABLE 18: Normalized Lambda (Cont.)

Case #	F_1/100%	F_2/86%	F_3/68%	F_4/55%	F_5/50%	F_6/45%	F_7/42%	F_8/38%	F_9/36%	F_{10}/35%
71	.54	.18	-.12	-.42	-.24	-	.38	-.26	-.20	.12
72	-	-.72	-.20	-	.53	-.34	.61	.26	-.12	.10
73	-	-1.0	-.14	-.47	-.25	-.18	.23	-.28	.50	-.27
74	-	.54	.52	1.20	-	.40	-.28	-.26	-	.18
75	1.1	1.1	-.37	.14	-.21	-.16	-.11	-.18	-	.26
76	-1.4	-1.1	-.18	-	.30	-.14	-.53	.15	.52	-.26
77	-	.64	.30	.83	.16	.16	.27	-.39	-.16	-
79	-.37	1.3	.17	.98	-	-.21	.17	-.98	-.37	-
80	.50	-.22	.35	.17	-.76	-.31	.11	-	.16	-
81	-.60	-.96	.43	-.68	-.91	.37	-.15	.24	-	.10
82	.04	-1.70	.88	-.59	-.90	.34	-.25	-.20	-	.36
83	-2.2	.55	.31	-.40	-.25	-.40	-	.18	-.38	-
84	.75	.10	.99	.46	-.58	-.34	-	.49	.49	-.28
85	-1.50	.03	.72	.52	-.52	.13	.40	.31	-	-.61

TABLE 18: Normalized Lambda (Cont.)

Case #	F_1/100%	F_2/86%	F_3/68%	F_4/55%	F_5/50%	F_6/45%	F_7/42%	F_8/38%	F_9/36%	F_{10}/35
86	-1.2	.43	-	-	-.66	-	-.61	-	-	-.21
87	.87	.81	.82	-	.51	-.25	-.47	.51	.38	.78
88	.84	-.65	1.0	.74	.51	-.34	-.14	-.12	.18	.76
89	-.68	-.54	-.73	.51	.25	-.23	-.39	.20	.57	-.47
90	.26	-	1.1	.72	.63	-	-.14	-.35	.41	.78
91	.37	-.15	-.98	-.45	-.4	.66	-.16	-.36	-	.42
92	-1.6	-.42	-	-.71	.75	.36	-	-.80	-.25	.39
93	-	-.31	.96	-.98	-.29	-.19	-.53	-	.23	.47
94	.36	.36	-.66	.30	.99	.83	-	.22	-.18	.88
95	1.8	-1.6	-	.49	.20	.48	.28	-.98	-	.15
96	.21	-.76	-.67	.13	-.20	-1.1	-.22	-.19	.21	-.39
97	.04	1.1	-1.5	.60	-.48	.42	.14	.19	.38	.54
98	-.23	.33	-1.6	.58	-.45	.26	-	-	.71	-

TABLE 18: Normalized Lambda (Cont.)

Case #	F_1/100%	F_2/86%	F_3/68%	F_4/55%	F_5/50%	F_6/45%	F_7/42%	F_8/38%	F_9/36%	F_{10}/35
99	-.45	-	-.96	.68	-	-.28	-	.74	.14	.14
100	-.84	.82	-.93	-.18	-.19	-.16	-.63	.62	.38	.25
101	-.51	-1.1	.22	.84	-.13	-.19	-	-.49	.59	.51
102	-.74	-1.3	1.3	-.74	.33	.57	-.37	-.31	-	.3
103	-1.3	.07	.18	-.12	-.18	.76	.30	.6	-.11	-.2

show considerable power. It should be remembered that if the cumulative angles across ten dimensions are very small, the more such variables represented by the points are involved with each other. Dyad distances provide estimates of cumulative angular distances. In this instance anything less than 2.25 units is considered very close, while distances of 3.0 and more indicate large angular distances and therefore less inter-involvement of variables. Also, the greater the length of the variable vector on each factor, the stronger its influence on the shorter vectors with which it is involved, or the more influence it exerts over the entire factor.

Examination of the selected community distance dyads in Table 19 reveals the existence of two clusters of inter-involved variables. A primary cluster of seven variables demonstrate that the one community pole displays a strong concern about urban growth. The raw data demonstrates that the major contributors to this cluster in the Lambda populations (about 25 to 30% of the population) register a high issue salience and are highly communicative within the community confines. This contingency of people (whoever they may be) perceives urban and population growth as a primary community problem. Members of this contingency further consider over-population as an environmental problem and they look on the water shortage as a manifestation of environmental problems. As might be expected, closely locked with these other variables is

TABLE 19: Clustered Community Distance Dyads For Lambda

VAR.	69	4	76	29	8	21	81	86	18	13	82	95	17	16	7	10
69	-															
4	1.71	-														
76	1.82	1.43	-													
29	1.85	1.94	1.87	-												
8	2.15	1.88	1.59	2.36	-											
21	2.39	2.34	1.67	2.19	2.21	-										
81	2.27	2.61	1.94	1.89	1.87	1.93	-									
86	2.91	2.37	1.72	2.56	1.06	2.24	1.94	-								
18	2.37	2.38	2.17	1.88	2.31	3.14	2.56	2.43	-							
13	2.93	2.34	1.77	2.89	1.28	2.43	2.40	1.38	2.17	-						
82	2.60	3.30	2.53	2.23	2.91	2.42	1.11	2.81	2.87	3.15	-					
95	3.61	4.64	3.68	3.94	4.13	4.05	3.30	4.03	2.41	4.11	2.87	-				
17	3.95	4.20	3.79	3.04	3.69	4.47	3.49	3.70	2.52	3.83	3.57	2.76	-			
16	3.59	3.74	3.52	2.83	3.67	4.45	3.49	3.67	2.02	3.77	3.40	2.41	1.10	-		
7	2.32	3.14	2.83	3.67	3.10	3.25	2.29	2.30	2.02	3.48	1.97	1.87	2.60	2.35	-	
10	3.57	3.95	3.51	2.63	3.69	3.82	2.11	3.51	2.37	3.73	2.36	1.65	1.58	1.66	2.04	-

TABLE 19 (Cont.)

LEGEND OF VARIABLES

Variable #	Variable Identification
69	Measures communities preference for legal restrictions for solving water problems.
4	Measures the extent to which community members perceive urban growth as a primary community problem.
76	Measures the levels of community support for restrictions on growth.
29	Measures the extent to which the community regards population growth as a primary cause of the communities water problems.
8	Measures the levels of salience and understanding of political, social and economic issues within the community.
21	Measures the extent to which the community members rank water shortage as an environmental problem.
81	Measures the levels of social and political activity of community members.
86	Measures the levels of community communication about water problems (PEER GROUP COMMUNICATION).
18	Measures the extent to which community members rank over population as an environmental problem.

TABLE 19 (Cont.)

LEGEND OF VARIABLES

Variable #	Variable Identification
13	Measures the extent to which community members rank unemployment as a major national problem.
82	Measures the levels of religious identification of the community members.
95	Measures the levels of expressed interest in politics by the community members.
17	Measures the levels at which community members rank water pollution as a primary environmental problem.
16	Measures the levels at which community members rank air pollution as a primary environmental problem.
7	Measures the extent to which community members perceive declining morality as a primary community problem.
10	Measures the extent to which community members rank crime and violence as a major national problem.

one which seeks a solution to their community problems through restrictions on urban growth. This corresponds to an already developing pattern in the neighboring community of Boulder which has attempted to put restrictions on urban growth. Finally, a very dominant variable among all others is one which shows a high level of preference for legal restrictions to solve water problems.

The second cluster might be called a moralization pole. This cluster of community characteristics shows considerably high perception of declining morality as a community problem and ranks crime and violence as a major national problem. The pole also includes a perception of unemployment as a primary national problem and both water and air pollution are ranked as primary environmental problems.

These two poles set the stage for attempting to relate other variables to overall community patterns as revealed on the dyads. It should be noted however, that the action variables and the communications variables tend to relate to both clusters at varying points, a fact which suggests more control than their vector distances would indicate. As stated earlier, action variables have tended to be very powerful in some community data on which this kind of analysis has been employed. The communication and activity levels are not extremely low for these rural communities. Approximately 26% communicate rather widely and freely and might be defined as opinion leaders. A

somewhat similar percentage of over 20% are quite active in the community.

It is appropriate to pause at this juncture to note probable impacts of contradictory beliefs, behaviors, attitudes, values, and policy positions on the part of individual persons -- impacts resulting from large contributions by individual persons to contradictory community poles. As yet, no one appears to have devised adequate techniques for defining such impacts. In the Lambda and RDC data answers to this puzzling phenomena appear to lie in some sort of comparative manipulation of R-Sort and Q-Sort data. In the R-Sort data from Lambda, for example, the factor score distances for R-Sort cases (individual persons) show high contributions to independent, opposing factors. In one instance, 18% of the population had factor scores of 1.0 or more on R-Sort factors which closely approximate the moralization and the community action poles defined earlier. This indicates that factor designs might be used to identify these longstanding social science enigmas.

Estimating Policy Acceptance Zones for Lambda

Figures 13 and 14 show that the policy acceptance zone for Lambda would be located in the lower left quadrant of the axis near the community action vector; that is, if the analysis is to follow the definition advanced earlier, then the acceptance zone would be in and around the community action vector. But action vectors could be only

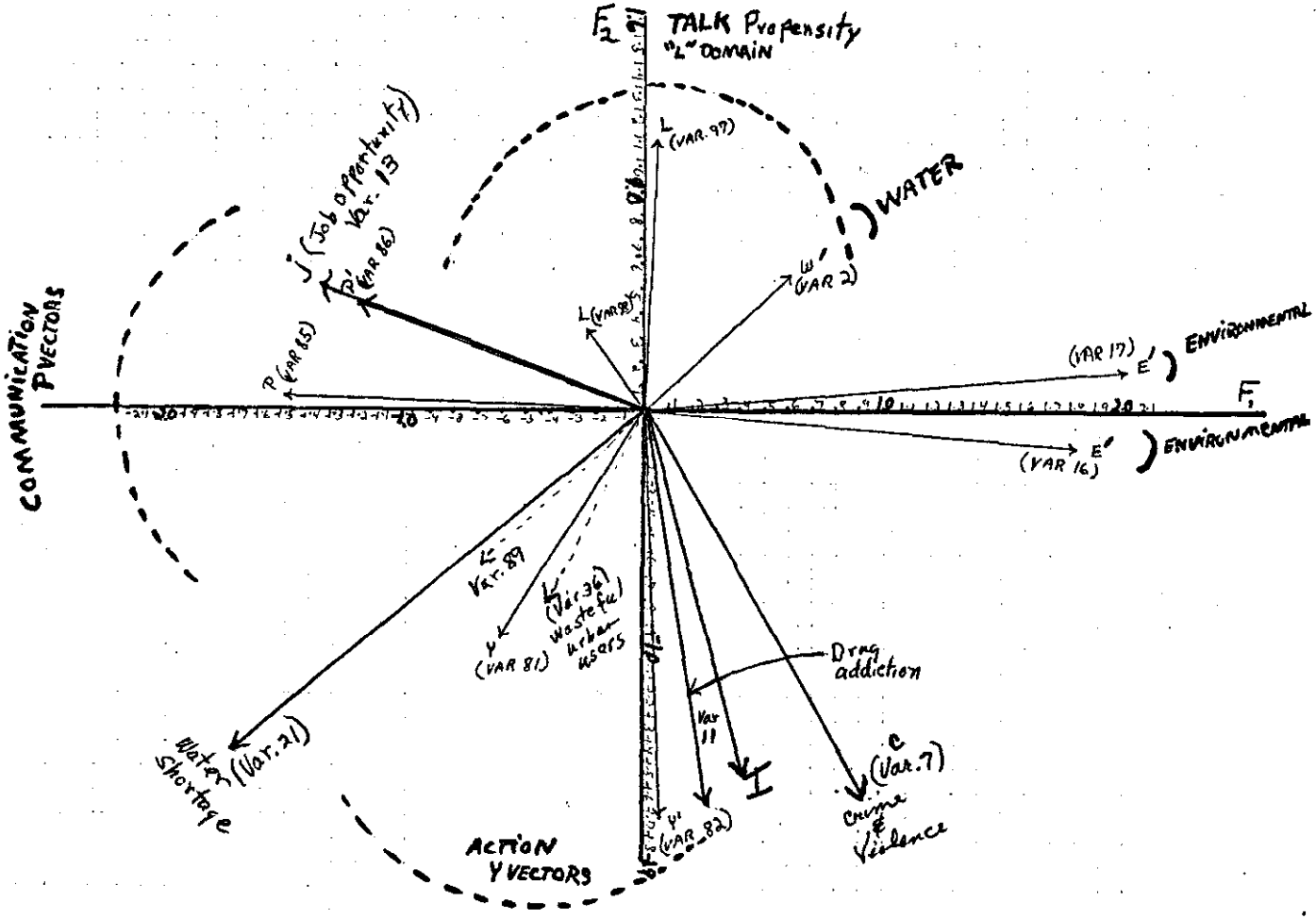

FIGURE 13: Community Space for Lambda (Louisville & Lafayette, Colorado) with domains specified

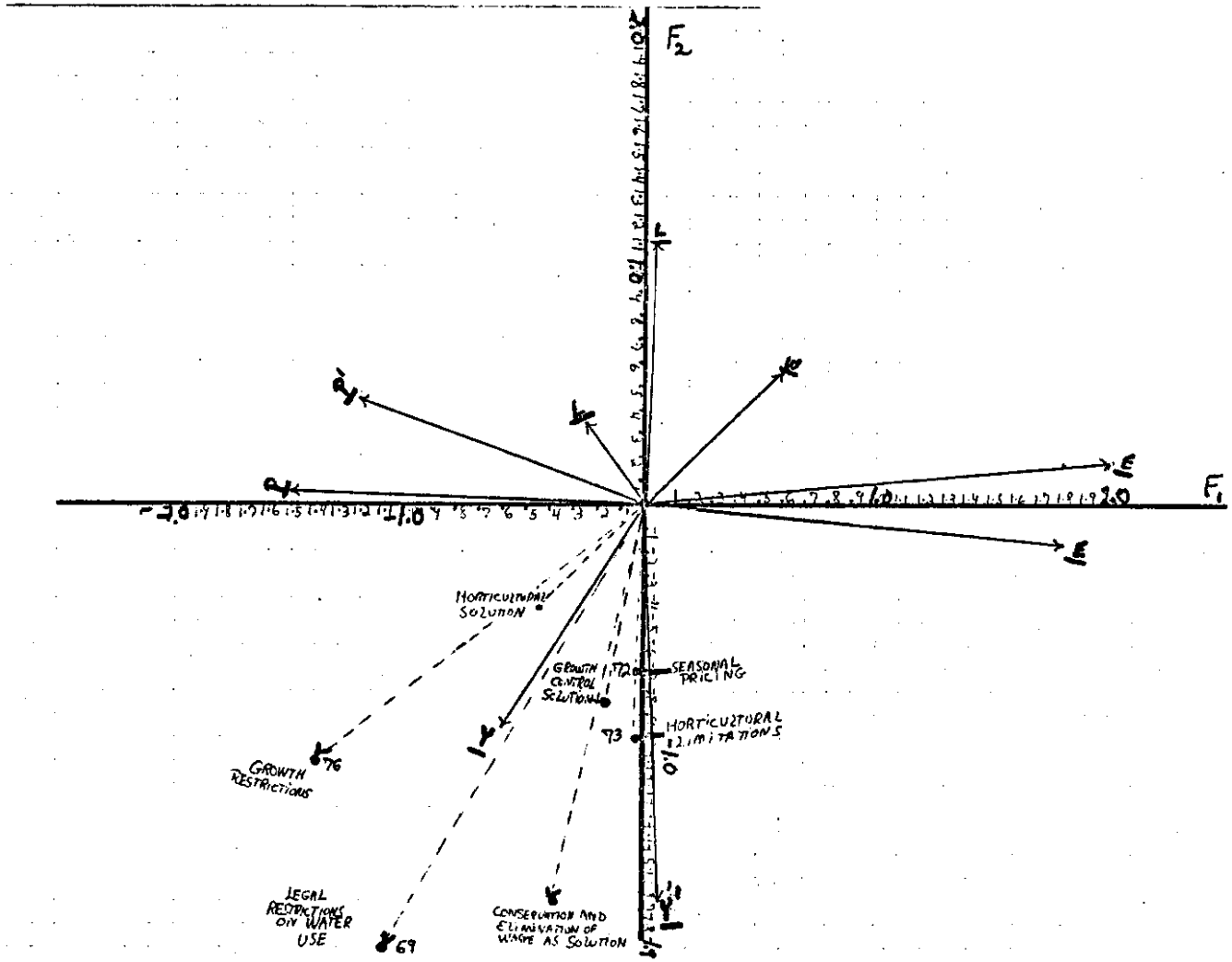

FIGURE 14: Conservation Alternatives Near Action Domain

community action vector. But action vectors could be only partial definers of the zone. Whether the active communications vectors are also partial definers of the zone must remain a moot question possibly for some time after this thesis has been put to bed. Nevertheless, because the so-called policy acceptance domains in Figures 9-12 resemble the Lambda domain, (see Figures 13 and 14), variables falling between the "y" and "p" vectors, or close to them, will be considered within the community acceptance zone in this study. Hence, it will be further hypothesized that any conservation alternatives which are aligned near these vectors have a high probability of being developed and eventually adopted by the Lambda communities.

Consistent with the community distance dyads (Tables 19 & 20), Figures 13 and 14 show three viable solutions to the water problems in the communities of Louisville and Lafayette, as well as three specific conservation alternatives out of thirteen offered, that fall near the action and communication domains. As expected, and consistent with the analysis thus far, restrictions on city growth and population size (VAR 76) and legal restrictions on water use (VAR 69) fall between the action and communication vectors. As a result, these two alternatives should have the highest probability of being accepted by the communities and might be considered politically feasible. Though it is not quite as well situated in the

TABLE 20

Ten-Dimensional Distances of Selected Variables from the Effective Action Variable

VAR #	VARIABLE I.D.	DISTANCE LIMITS
82	Religious Activity	1.11
86	Peer Group Communication	1.33
73	Preference for Horticultural Limitations	1.48
11	Ranking Drug Addiction as National Problem	1.49
93	Low F- Non-Authoritarian Vector	1.49
102	Length of Residence in Community	1.68
43	Economic Solution for Water Problems	1.77
59	Familiarity with Metering	1.86
8	Issue Salience	1.87
29	Population Growth as Cause of Water Problem	1.87
21	Water Shortage as Environmental Problem	1.93
76	Preference for Growth Restrictions as a Solution	1.94
55	Familiarity with Metering	2.08
10	Crime and Violence as Major National Problem	2.11
68	Preference for Metering as a Solution	2.20
28	Insufficient Water Supply as Cause of Problem	2.22
69	Preference for Legal Restrictions	2.27
89	Does Not Believe That Colorado Has Enough Water	2.28
57	Familiarity with Condemnation of Agriculture Water	2.28
7	Perceives Morals Problem in the Community	2.29
5	Perceives Service Problem in the Community	2.29

display, horticultural limitations as a conservation alternative (VAR 73) would seem to indicate that it too is backed by sufficient strength to be a viable choice in the community, thus having feasibility too. This is reinforced by the presence of horticultural techniques in general as a solution which is located between the "y" and "p" vectors. The final alternative which has probability of being successful in the communities is seasonal pricing (VAR 72). Although its vector is somewhat shorter than those of the other alternatives its location near horticultural limitations would make it comparable in strength to that alternative.

The location of the above conservation alternatives around the action and communications vectors (Community acceptance zone), gives them a higher probability of adoption as compared to other conservation alternatives which were in the design. This, of course, depends upon the validity of the measuring instruments. However, it is equally important to ask which alternatives would have the poorest chance of winning acceptance according to the design.

Non-Acceptance Zones

If the analysis remains true to the research design and the yields from past studies, then those alternatives having the lowest probability of acceptance should fall somewhere in an area ranging from 90^0 (independence) to 180^0 (inverse relationship) from the acceptance zone.

According to strict mathematical logic, variables which are inversely related would have the least chance of acceptance, and according to past research results variables falling in the "L" zone would have a very low chance. Inspection of Tables 9-12 shows the "L" zone tends to be located somewhere between 85^{0} and 160^{0} from the acceptance zone. It seems safe to hypothesize that the location of policy vectors at an angular distance of 150^{0} - 180^{0} from the acceptance zone places them in a non-acceptance zone.

In Lambda it will be noted on Figure 13 that the mid-point between the two "L" vectors is about 150^{0} from the action vector. Figure 15 shows the Lambda vectors located opposite the acceptance zone. They would be defined as unacceptable under normal conditions and circumstances, and therefore, unfeasible. Significantly, it appears that the moralizing components within the community tend to fall within this sector. Apparently both specified and unspecified components of the moralization pole isolated by means of a ten-dyad matrix analysis tend to emerge in the non-acceptance sector. In this regard, it will be recalled that high-L persons tend to judge matters in terms of principle, moral commitment, and unquestioning belief rather than in terms of fact and instrumental tests.[25] They are, moreover, expressive rather than instrumental about problems (in the Dewey sense of instrumentalism).[26] In the pragmatic and utilitarian

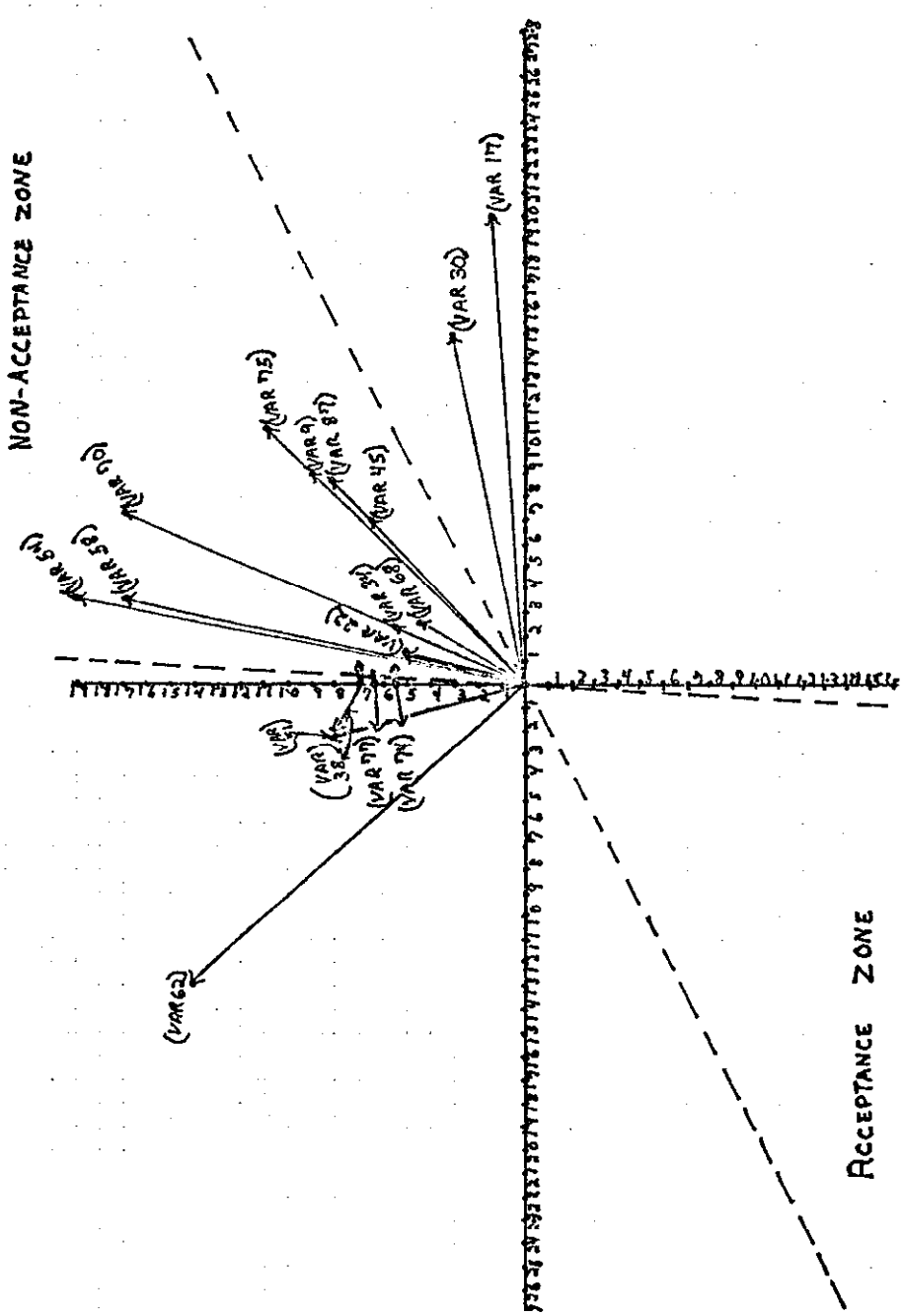

FIGURE 15 : Lambda Non-Acceptance Zone

American society they tend to find it more difficult to rise to positions of social and political leadership than do the low-L individuals.[27] Therefore, one would expect the high-L community pole to be independent of or inversely related to the community action pole. Yet, it must be recognized that there are doubtlessly communities in the United States where the high-L pole would fall close to or within the community action sector. Lambda, however, is not one of those. Nevertheless, the high probability of convergence of the action and "L" sectors in a number of American communities dictates that the non-acceptance zone be defined mathematically between 150° - 180° angular distance from the acceptance zone.

At this juncture another pause may be in order to respond to possible queries about the position of the religious action vector with respect to the "L" domain. One basis on which the design's validity might be challenged is that religious persons logically could be expected to respond to problems by resorting to principle rather than instrumental considerations; and hence the religious action variable should fall near the "L-domain". Yet, it is well-established that the so-called "church-type" person, as distinguished from the fundamentalist "sect-type" is numerically dominant in America and conforms remarkably to the utilitarian, pragmatic, capitalist ethos.[28] Further, a large number of political studies have

shown that church-types find their way into positions of political leadership rather handily.[29]

Returning to the non-acceptance zone on Figure 15 which also houses a considerable portion of the moralistic "L" sector, the water problem is defined in terms of inequitable distribution of the resource (Var. 34). Scapegoating tendencies also seem evident; to wit, blaming the water problem on the city fathers and their governmental kin -- poor urban management (Var. 30), which lies near the non-acceptance zone; planners and interest groups (Var. 38). This pole ranks litter, trash and solid waste as a primary environmental problem, (not shown, but lying very close to Vector 51), possibly because it is sufficiently obvious and obtrusive to impinge on the human consciousness. In addition, this pole perceives supply as the nature of the water problem (Var. 22). Thus, this pole would seem to be related to a certain segment of the American population which views shortages solely as a function of supply. That view is, of course, highly oversimplified. In 1971 L. D. James and Duane Hill concluded that terms such as "flood plain management" and "water management" are really misnomers. It is not really floodplains or water supply and sewage that must be managed; rather, it is people.[30] Merely increasing water supply and/or reducing waste is only a part of the story, although an important part.

As might be expected, solutions falling within or near the non-acceptance zone include more equitable resource distribution (Var. 51); demand for changes in public behavior on the ground that the public is wasteful and waste is one root of the water problem (Var. 54); perceiving change of management and/or reform of management as a solution to the water problem (Var. 45); preference for metering (Var. 68); preference for waste control (Var, 74); and to a lesser extent, preference for horticultural techniques (Var. 75), but not limitations (Var. 73), which is near the acceptance zone. Also, this pole is familiar with re-used water for irrigation (Var. 58) and expresses a preference for reused water for irrigation as a solution to water problems (Var. 70).

Variable 62 which falls outside both the acceptance and non-acceptance zones, and has considerable length, identifies the extent of community familiarity with an awareness of system waste. That waste is blamed on the public in general (Var. 87) and the government officials who are perceived as somewhat negligent about upgrading a faulty and leaky system.

Significantly, as in the Atlanta urban flood plain sample,[31] this pole registers dissatisfaction with the community (Var. 9) by indicating a high preference to migrate. Again, as in Atlanta, this pole is critical of its community leadership (Var. 30) and demands reform of the city administration.[32]

Notes of Caution on Use of the Design

The emergent patterns in both the acceptance and non-acceptance zones developed from two-dimensional analysis are clearly locked logically. They make sense. Nevertheless, two qualifying points need to made to these findings so as not to overestimate their immediate applicability.

First of all, it should be emphasized that the findings immediately above are arrived at by using only two dimensions. When the data is pressured by analyzing the variables on ten dimensions it is always likely that they will take on another form, perhaps to the point of changing the overall picture the data give of the communities. Thus, the utilization of results such as those achieved in this study should be made only after careful examination of the data as they might appear after being pressured over a number of dimensions. Nevertheless, in defense of the two-dimensional analysis, it should be remembered that to date there is no way of portraying the acceptability of a variable except around a single set of vectors in no more than three-dimensional space.

A second point that needs to be made is that the data used in this study were acquired during stable community situations. If a certain amount of conflict were to arise in the two communities, the acceptance zones for the conservation alternatives might change drastically. During a stable situation it is empirically clear in the data

that only a certain percentage (about 30%) of the community members have any measurable impact on policy. However, given a stimulus, the potential for impact on policy increases substantially. Thus, a crisis situation might unveil a host of new and powerful views being exerted on community policy. This could change the overall acceptance level for certain policy alternatives.

The above point is crucial in almost all community analysis, for understandably most predictions are based on normalized conditions and circumstances; yet, this tendency can lead to inaccurate projections and conclusions which often produce disillusionment with and low confidence in the results of social research. Although social and political stability is a prevailing condition across the many thousands of communities throughout the United States, it is equally normal for almost all American communities to house a majority of citizens who are politically and even socially unstimulated. These majority segments are normally uninterested in community and general political problems and affairs. They are nearly always poorly informed or uninformed about community issues and not easily alerted or stimulated except by crisis or sudden intrusion on their life styles.[33] They form what Berelson and McPhee have called a "cushioning mass", a large majority whose low interest and involvement along with general apathy can act as a cushion to the volatility induced by the actives.[34] Yet, as James Coleman has discovered in his studies

of community conflicts, most apathetic mass men can become a threat to sustained political and social stability when they are stimulated.[35] Coleman's analysis indicates strongly that the low information levels and the low interest coupled with low political skills, low understanding, and a lack of experience lead such persons to respond irrationally and with high volatility and emotion. He finds, for example, that most people of this sort (and there are a lot of them in every community) take sides in controversy or join causes not out of any rational consideration, but out of primary group considerations and for nonrational reasons. "I am for that because Uncle Joe is for it." [36]

Hence, if stability is a normal American community condition, the potential for disrupting it is equally normal and present at all times -- a potential which must be anticipated by the social researcher as he goes about his business. To compensate for this potential, as well as the earlier warning point, a brief analysis needs to be advanced which is based on the views and preferences of the total population, and which then relates the general population views, preferences and orientations to the outcomes from attempts to factor sets of select community variables which were defined under stable political and social circumstances.

Social and Political Posture of the General Population

Table 21 shows that the total Lambda population appeared most concerned about inflation at the time the survey was administered. Although environmental problems such as air and water pollution as well as water problems generally are ranked rather high by the entire community, a low score on environmental problems generally would seem to restrict the probability that environmental problems have an elevated position of importance in the general public's scale of concern. This is reinforced by the low levels of issue salience over the general population -- a fact that tends to degrade all perceptual rankings of the community until one remembers that issue salience is normally abysmally low for 70% of most American community populations.

Close examination of the empirical tabulations leads to the inference that the general publics in the Lambda communities are similar to other community publics in that they do not perceive many problems which fail to intrude upon their individualized realms. However, the rankings of the general community publics do show what problems those publics would probably stress if the problems did intrude upon their individualized realms. In relation to this, it is significant that figures on conservation alternatives reveal that general public familiarity with the alternatives runs over 50% for nearly half of them and that percentages on all of them are quite high.

TABLE 21: Total Public Views

Problems (National and Local)

Rank Inflation High As Problem	58%
Rank Air Pollution High As Problem	48%
Rank Crime and Violence High As Problem	45%
Rank Water Problem High As Local Problem	43%
Rank Water Pollution High As Problem	40%
Rank Water Shortage High As Community Problem	39%
See Water Problem As Constraining Way of Life	37%
Rank Unemployment High As Problem	36%
City Administrators At Fault For Water Problem	36%
Rank Over-Population High As Problem	34%
Rank Drug Addiction High As Problem	26%
Rank Poverty High As Problem	18%
Issue Salience	12%
Rank Environmental Conditions High As Problem	12%

TABLE 21: Total Public Views (Cont.)

Familiarity with Alternatives	
Legal Restrictions	95%
Metering	88%
Waste Control	80%
Pricing Mechanism	75%
Growth Restrictions	70%
Horticultural Techniques	67%
Re-Used Water For Irrigation	46%
Water Saving Technology	44%
Re-Used Water For Household Use	43%
Seasonal Pricing	41%
Condemnation of Agricultural Water	28%
Horticultural Limitations	23%

Preference for Alternatives	
Waste Control	48%
Growth Restrictions	29%
Legal Restrictions	28%
Horticultural Techniques	28%
Re-Used Water For Irrigation	23%
Water Saving Technology	18%
Re-Used Water For Household Use	12%
Horticultural Limitations	10%
Pricing Mechanism	8%
Seasonal Pricing	8%
Demand Metering	4%
Condemnation of Agricultural Water	3%

So one can conclude that the general community publics are quite aware of a variety of conservation possibilities.

With few exceptions, too, it is notable that preferences for conservation alternatives tend to be low despite the generally high familiarity with such alternatives. In addition, the fairly high score given to improvement of facilities as a solution to water problems indicates that the general publics in Lambda are presently looking outside the conservation realm for their solutions. Like many other Americans, they may be looking to technology rather than conservation to solve their water and other resource problems. Other data not displayed here supports this observation; namely, that they perceive their systems to be leaky and inadequate for supply needs. However, those general public preferences which were ranked the highest by the total population were the same as those found to fall within the acceptance zones in the vector analysis (Figure 14). This would seem to provide additional strength to the viability of these alternatives in the communities under either stable or unstable situations.

Ten-Dimensional Analysis

Table 20 shows which variables have the highest scores on the action variable (81) across ten dimensions. Note that religious activity, peer group communication and issue salience received very high scores on ten dimensions.

This is to be expected of the segment of the population which is more active in the policy arena. As mentioned earlier, the picture of the community acceptance zones is likely to change across ten dimensions; and it does appear to have changed in many respects in this analysis (Tables 19 and 20). But the change is largely in the form of variables being added to the acceptance zones. Note that growth restrictions and legal restrictions on water use are still within the acceptance range under ten-dimensional analysis. Seasonal pricing and horticultural techniques, on the other hand, did not score high on ten dimensions. Yet, horticultural limitations as an alternative scored the highest. This variable, and to a lesser extent, metering and familiarity with the pricing mechanism, suggests that these three types of alternatives show considerable viability when placed under pressured analysis.

Therefore, it is possible to conclude from the three analytical attempts conducted thus far that orientations, viewpoints and opinions exist in Lambda communities which support the conclusion that the community recognizes or acknowledges the existence of a water problem and perceives conservation as a worthy solution. Obviously the data indicates that population growth is perceived as the major cause underlying water problems and that the alternatives of growth restrictions and legal restrictions on water use are perceived as the best conservation solutions. However,

there does seem to be evidence of a base for more innovative types of conservation alternatives, especially in relation to horticultural techniques, economic solutions, and to a lesser extent, re-using water. Hence, the acceptance zones in the communities as they now stand and as they are estimated in periods of transition appear receptive to conservation in general and the alternatives specified above.

The Question of Safe Minimum Standard

As indicated in Chapter 2 above, it is vitally important to discover whether the Lambda communities have a self-defined "safe minimum standard" of resource use in order for the community to avoid the "critical zone in resource depletion."[37] As already determined by the analyses above, both communities in this study seem strongly predisposed toward growth restrictions and legal restrictions on the use of water. This ready acceptance of what might be deemed rather drastic measures indicates that the communities as a whole are, in fact, capable of developing a "safe minimum standard" with respect to water resources.

Since both communities appear capable of developing suitable water use standards, the question follows: What then is the probability that they will adopt such standards? The question is, of course, not easy to answer. One reason is that adoption of conservation policies and practices must be introduced by water resource managers and

political leaders and they must subsequently survive the policy processes. Examination of the present water resource management perceptions reveals a perceptual field that does not appear favorable to any but token conservation practices. This condition appears to be indicative of the Lambda communities as well as of many other communities throughout Colorado. Indeed, attitudes of water officials throughout the state endorse conservation as an obviously good thing, but only if it does not disrupt economic growth to any measurable degree. Again, as cited in Chapter 2, neither society nor its management will gear up for conservation as they will for production. It is indeed a function of the national ethos (see Chapter 2).

The entire management posture on the subject of conservation was recently revealed in the April 11th issue of the Fort Collins Coloradoan in which the paper reported a meeting of area water managers whose basic purpose was to share views as to proper responses and policy to meet a possible crisis precipitated by recent drought conditions. The City of Fort Collins water project engineer stated, "We really don't need conservation . . .(but) we are concerned about the situation (drought), because we rent water to agriculture." Greeley's water director said that "the restriction that allows residents to water only on alternate days may increase water consumption," the reason being that it encourages persons to water when

they are legally permitted to do so rather than when they need to do do so. The Boulder city representative said that his city fathers were content with metering, the implication being that conservation was unnecessary as long as supplies were adequate for short-run purposes.[38]

Representatives from all the communities, in fact, indicated that the truly important factor was not water conservation, but rather how much water was in storage. They are the victims of what Professor Carl E. Kindsvater, recently retired from the USGS, calls the "water supply and sewerage syndrome."[39]

In addition, the article also supported the common perception of water supply as a short term, year to year concern; and curiously, no mention was made of how the public might or should react to the water situation.[40] Such a water management posture in a state-wide context tends to lower the capabilities of communities like Lafayette and Louisville to develop conservation strategies. However, these communities are probably not entering the "critical zone" of water use; at the same time, they are not, by any means, moving farther from it.

What seems to be a very important factor and one which could determine the fate of such communities is the illusion of continuous supply, perpetuated to a considerable extent by water managers. One wonders whether a similar situation did not exist around the turn of the century relating to oil and natural gas supplies. Although such

an analogy would at first seem to be stretching the facts, the reality of proposals such as trans-national diversions, transporting icebergs for water, and cloud seeding, would tend to add substantially to the similarity of the two situations.

General Conclusions

Conclusions are directed at the primary purposes of this study which were to develop a social measuring instrument for determining the social and political feasibility of alternate conservation policies; and secondly, to develop means for determining the community policy acceptance and non-acceptance zones in order to estimate feasibility. As previously mentioned, it is a difficult task to convert soft data, such as responses to a questionnaire, into measurable units and something meaningful for subsequent use of inductive logic. However, the factor analytic method seems to overcome many of the inherent difficulties in such a task, perhaps better than any other instrument now available. It is concluded, therefore, that factor analysis should be further tested as an instrument for use in community studies such as the one being reported here.

Secondly, based on previous studies the action and communications vectors were selected to define the acceptance zones in the two communities of Lafayette and Louisville, Colorado. From this effort, it is concluded that two alternatives are defined as being acceptable in

the communities; namely, growth restrictions and legal restrictions on water use. In addition, a third alternative, horticultural techniques, proved to be extremely close to the acceptance zones as defined. However, in identifying these alternatives as being politically feasible it should be mentioned that three factors could constrain their feasibility to a considerable extent: (1) existing management perceptions dealing with conservation; (2) the general public's heavy reliance on technology to solve problems; and (3) the ethos that production must rule, not conservation. These constraints lead to a third conclusion which is that both the general public and the political actives in Lafayette and Louisville show considerable potential to develop safe minimum standards relating to water conservation. However, the above constraints may be functional impediments to achieving these standards.

Significantly, the data show that the Lambda communities are about evenly divided between Hi-L and Lo-L types, thus indicating that instability and stimulation of the inactives might spell problems for the conservation alternatives that are viable under stable conditions. Stability is largely a function of political and social leadership. Both types of leadership are strongly Lo-"L"; that is, pragmatic, instrumental and practical. No reading was made of their sensitivities to potential instability or of their level of political skill. It is suggested that future

tests of the study design used herein include such readings. This would assist measurably in attempts to estimate the truly non-feasible alternatives which in the Lambda community appear strongly to include: (1) more equitable distribution formulae; (2) leadership change; (3) seasonal pricing; and (4) system overhaul to eliminate perceived waste. As it stands, the research design defines all four as unfeasible under stable community conditions. The validity of such definitions, of course, depends upon future tests of the design which result in prediction, system monitoring and careful estimates of the community action to determine if community action conforms to the predicted outcomes.

ENDNOTES

Chapter 1

[1]Duane W. Hill and L. Scott Tucker, Social and Political Feasibility of Automated Urban Sewer Systems: Technical Report #5, OWRR Project #C-2207 (Springfield, Virginia: National Technical Information Service, U. S. Department of Commerce, 1971), pp. 9-10.

[2]Ibid., pp. 7-12.

[3]See Floyd Hunter, Community Power Structure (Chapel Hill, N. C.: University of North Carolina Press, 1953); Robert Agger, et al., The Rulers and The Ruled (New York: John Wiley, 1964); See also Robert F. Baker, et al., The Use of Underground Space to Achieve National Goals (New York: American Society of Civil Engineers, 1972), pp. 148-158., Edward Banfield, Political Influence (Chicago: Free Press, 1961).

[4]Duane W. Hill and L. Scott Tucker, op. cit., pp. 4-12; Robert Agger, et al., op. cit.; Edward Banfield, op. cit.

[5]See Robert F. Baker, et al., op. cit.; U.S. Department of Health, Education, and Welfare, Toward a Social Report (Washington: GPO, 1969).

[6]Duane W. Hill and L. Scott Tucker, op. cit., p. 13.

[7]Ibid., p. 17.

[8]Ibid., p. 14.

[9]Ibid., pp. 15-16.

Chapter 2

[1]Gifford Pinchot, as quoted by Henry P. Caulfield in a syllabus on water policy. Water policy seminar, Department of Political Science, Colorado State University, (1976), mimeographed.

[2]John Wesley Powell, Arid Lands of the West (Washington, D.C.: GPO., 1878).

[3]Samuel Hays, Conservation and the Gospel of Efficiency (New York: Atheneum, 1972), p. 8.

[4]Ibid., p. 29.

[5]Ibid., p. 28.

[6]Charles R. Van Hise, The Conservation of Natural Resources in the United States (New York: Macmillan, 1910), p. 5.

[7]Samuel Hays, op. cit., p. 2.

[8]Norman Wengert, Natural Resources and the Political Struggle (New York: Random House, 1955), p. 24.

[9]Lynn White Jr., "The Historical Roots of Our Ecologic Crisis", 155 Science 1203-1207 (March 1967).

[10]The Book of Genesis, I:28.

[11]Henry P. Caulfield, Personal files and notes for a Water Policy Seminar, 1976.

[12]Michael Hamilton, ed., This Little Planet (New York: Charles Scribner's Sons, 1970), p. 167.

[13]Norman Wengert, op. cit., p. 26.

[14]Ibid., p. 27.

[15]Kenneth R. Wright, quoted from conversations recorded in the personal files of Duane W. Hill, Ft. Collins, Colorado, 1971. Mr. Wright is President of Wright-McLaughlin Engineers, Denver, Colorado.

[16]Paul W. Barkley and David W. Seckler, Economic Growth and Environmental Decay (New York: Harcourt Brace Jovanovich, 1972).

[17]As reported in the film, "Where Did the Colorado Go?", NOVA, Public Broadcasting Company, 1976.

[18]Gifford Pinchot, from his Address to the Society of American Foresters, 1903.

[19]Adam Smith, An Inquiry into the Nature and Causes of the Wealth of Nations (Many editions, 1776).

[20]Alan P. Grimes and Robert H. Horwitz, eds., Modern Political Ideologies (Chicago: Markham, 1971), p. 31.

[21]Kenneth M. Dolbeare and Patricia Dolbeare, American Ideologies (Chicago: Markham, 1971) p. 31.

[22]Ibid., p. 46.

[23]Adam Smith, op. cit., Bk. IV, Chap. 2.

[24]Ibid., Bk. I, Chap. 7.

[25]Ibid.

[26]Ibid., Bk. IV, Chap. 2.

[27]Robert A. Dahl, Pluralist Democracy (Chicago: Rand McNally, 1967), p. 24.

[28]David Nimmo and Thomas Ungs, American Political Patterns (Boston: Little, Brown, 1969), p. 31.

[29]Arthur Maass, "Benefit-Cost Analysis: Its Relevance to Public Investment Decisions in Water Research," 80 The Quarterly Journal of Economics 208-226 (May 1966).

[30]Ibid.

[31]S. V. Ciriacy-Wantrup, Conservation, Economics and Policies (Berkeley: University of California Press, 1963), p. 51.

[32]Ibid., p. 58.

[33]Ibid., p. 54.

[34]Ibid., p. 31.

[35]Ibid., p. 225.

[36]Ibid.

[37]Ibid., p. 227.

[38]Ibid., p. 228.

[39]Ibid., p. 236.

[40]Ibid., p. 237.

[41]Ibid.

[42]Ibid., p. 238.

[43]Ibid., p. 245.

[44]Ibid., p. 246.

[45]Ibid., pp. 252-253.

[46]Ibid., p. 252.

[47]Ibid., p. 259.

[48]Ibid., pp. 259-263.

[49]Ibid., p. 262.

[50]Ibid., p. 259.

Chapter 3

[1]All demographic and other types of census data are taken from publications of the U. S. Bureau of the Census unless otherwise specified.

[2]Oblinger-Smith, Inc., Boulder County Water and Sewer Facility Plan (Denver: Oblinger-Smith, 1972) pp. 41-46.

[3]Noel Hobbs, Remarks (Minutes of the Coal Creek Water and Sanitation District, November 5, 1975).

[4]Clarence J. Kuiper, Colorado Water Use in Perspective (a speech before the Colorado Water Congress, Denver, Colorado, 1975).

[5]For examples of social indicators, see Robert F. Baker, et al., op. cit.; Raymond A. Bauer, ed., Social Indicators (Cambridge: M. I. T. Press, 1966); U. S. Department of Health, Education and Welfare, Toward a Social Report (Washington: GPO, 1969).

[6]A person's socialization process is continuous over the life span. Hence, where a person spent his formative years is frequently more important as an influence on thinking and behavior than recent influences. See, Yasumasa Kuroda, Political Socialization (a Ph. D. Dissertation, University of Oregon, Eugene, 1962); see also, Herbert H. Hyman, Political Socialization (Glencoe, Ill.: Free Press, 1959).

Bernard Berelson, Paul Lazarsfeld, and William McPhee in their classic study entitled, Voting(Chicago: University of Chicago Press, 1954) pp. 111-112 concluded that the volume of individual discussion about politics is a direct function of the number of community contacts, the number of organizational and group memberships, the amount of available leisure time, higher social status, and opportunity generally. Harry Sharp, "Migration and Voting Behavior in a Metropolitan Community," 19 Public Opinion Quarterly 209 (1955); Basil G. Zimmer, "Participation of Migrants in Urban Structures." 20 American Sociological Review 218-224; Richard Whalen, "An Exploratory Study Based on Aggregate Statistics of the Relation of Voting Turnout to Population Change," (unpublished ms., Yale University, 1956), all found that voting is a function of length of residence. Newcomers to a community vary widely in their electoral, group, and discussion assimilation as well as levels of participation; and discussion volume increases as residency accrues. They also found that the differences between newcomers and old-timers is not, as might be expected, a function of age, income, occupation, or level of education; but rather, they are a direct function of where the migrants came from.

[7]Ibid.

[8]See, Robert E. Lane, Political Life (Glencoe, Ill.: Free Press, 1959), pp. 165-166.

[9]Daniel Katz, "The Functional Approach to the Study of Attitudes," 24 Public Opinion Quarterly 163-176 (Summer, 1960).

[10]Lee Benson, "The Scientific Study of Past Public Opinion," 31 Public Opinion Quarterly 522-567 (Winter, 1967-68).

[11]Daniel Katz, op. cit., p. 168.

[12]Ibid.

[13]Lee Benson, op. cit., p. 524.

[14]Ibid.

[15]Boulder Area Growth Commission, Study, 1973.

[16]Ibid., p. 4.

[17]Robert L. Carley, Wastewater Reuse and Public Opinion (M. A. Thesis, University of Colorado, Boulder, 1972); Graduate School of Business, City of Boulder Opinion Survey (Boulder: University of Colorado, August 6, 1973).

[18]These amendments are considered drastic because they have short time limits in face of technology yet to be developed (e. g., filtering systems to obtain extremely high purity; reduction of sewerage by-pass to zero).

[19]Boulder Area Growth Study Commission, op. cit.

[20]Robert L. Carley, op. cit., p. 109. The figure of 73% includes air, water, noise, and radiation pollution. However, 65% of the population register concern about air pollution.

[21]Graduate School of Business, University of Colorado, op. cit., Table 25, p. 32.

[22]Boulder Area Growth Study Commission, op. cit.

[23]Boulder Area Growth Study Commission, op. cit.

[24]Ibid.

[25]Duane W. Hill and Roy L. Meek, An Exploration of the Components Affecting and Limiting Policymaking Options in Local Water Agencies (Fort Collins, Colorado: Natural Resources Center, Colorado State University, 1970), p. 61.

[26]J. Ernest Flack, A Water Conservation Program for Denver (Boulder, Colorado: University of Colorado, 1973), p.7.

Chapter 4

[1]Jay Forrester, "Counterintuitive Behavior of Social Systems," Technology Review (January, 1971) pp. 6ff.

[2]Ibid.

[3]Two examples of the huge number of studies which assume the premises of the traditional approaches are: Jack P. Gibbs, "Demographic Adjustment to a Decrease in Sustenance," 2 Pacific Sociological Review 61-66 (1959); Chauncey D. Harris, "A Functional Classification of American Cities," 31 Economic Geography 81-89 (1954-55).

[4]Duane W. Hill, The Uses and Abuses of Social Data: Distortions of Knowledge and Science as a Function of Bias and Interest Fulfillment (Atlanta: Georgia Institute of Technology, 1970), pp. 28-32 (an unpublished address delivered to the Department of Geography and Environmental Engineering, The Johns Hopkins University).

[5]Gabriel Almond, The American People and Foreign Policy (New York: Frederick A. Praeger, 1960), pp. 69-115.

[6]Duane W. Hill, op. cit., pp. 35-41.

[7]For an analysis of the Aristotelian modes, see: Storrs McCall, Aristotle's Modal Syllogisms (Amsterdam, Holland; North-Holland Publishing, 1963).

[8]Angus Campbell, et al., The American Voter (New York: John Wiley, 1960), pp. 107-215; Seymour Martin Lipset, "Political Sociology," in Robert K. Merton, et. al., Sociology Today (New York: Basic Books, 1959), pp. 81-114; Bernard Berelson and Gary A. Steiner, Human Behavior (New York: Harcourt, Brace & World, 1964), p. 266.

[9]Charles E. Osgood, et al., The Measurement of Meaning (Urbana: University of Illinois Press, 1957), p. 201; Bernard Berelson and Gary A. Steiner, op. cit., pp. 266; 557-584.

[10]For ideas about potentials of new types of measurement and measuring systems using alternate modal logics, see Robert Feys, Modal Logics (Paris: Gauthier-Villars, 1965); Nicholas Rescher, Temporal Modalities in Arabic Logic (Dordrecht, Holland: D. Reidel Company, 1967).

[11]Duane W. Hill, op. cit., pp. 35-41.

[12]Ibid., p. 34.

[13]Clyde Coombs, A Theory of Data (New York: John Wiley, 1967), pp. 433-526.

[14]J. B. Kruskal, "Multidimensional Scaling by Optimizing Goodness of Fit to a Nonmetric Hypothesis," 29 Psychometrika 1-28 (1964); and his "Nonmetric Multidimensional Scaling: A Numeric Method," 29 Psychometrika 115-129 (1964).

[15]R. N. Shepard, "Stimulus and Response Generalization: A Stochastic Model Relating Generalization to Distance in Psychological Space," 22 Psychometrika 325-345 (1957); and his, "The Analysis of Proximities: Multidimensional Scaling with an Unknown Distance Function," 27 Psychometrika 125-140 (1962).

[16]For one example of the Cosine Models, see A. J. Boyce, "Mapping Diversity: A Comparative Study of some Numerical Methods," in A. J. Cole, ed., Numerical Taxonomy (New York: Academic Press, 1969), pp. 1-31.

[17]Robert A. M. Gregson, Psychometrics of Similarity (New York: Academic Press, 1975), pp. 91-134.

[18]Warren S. Torgerson, Theory and Methods of Scaling (New York: John Wiley, 1962), pp. 251-268.

[19]R. N. Shepard, "Stimulus and Response Generalization", op. cit.; and his, "Analysis of Proximities," op. cit.

[20]J. B. Kruskal, "Multidimensional Scaling by Optimizing Goodness of Fit to a Nonmetric Hypothesis," op. cit.

[21]A key problem seems to result from the multitude of definitions given the symbol "group". D. W. Hill notes that the number of definitions advanced do not lag far behind the number of users. This looseness or liberty of definition can and does function as a "sleight of hand which insures the validation of self-fulfilling prophecy, either innocently or purposely, merely by choosing the definition in advance of the analytical effort. This looseness and lack of professional scientific agreement on the definition of the concept, easily leaves the impression on both the user of the concept and the consumer of his research product that scientific rigor has not been sacrificed."

Charles B. Hagan echoes the above sentiments with some examples. He cites one school of investigators who define "group" in terms of "interests". This, of course, leaves the definition of "group" crucially dependent upon the definition of "interest" which Hill also finds

susceptible to a very large number of differing definitions. Hagan's analysis reveals that most group theorists have been descriptive theorists utilizing the concept "group" presumably as an explanatory principle, "since all verbal formulae are treated as principles in a system of description." This enables the author to "more or less explain the findings of an empirical character." Coming to his example, Hagan finds that "interest" is frequently used to define "group", being employed to "designate a kind of activity (collective action) which follows an inference from a premise. Thus one finds in the literature that it is to the interest (definition is being advanced implicitly) of labor unions to oppose legislation prohibiting union contributions to political parties. If, on examination it is discovered . . . that unions were unopposed to such legislation, one could say that unions acted contrary to their interests. That kind of explanation is often found in the literature. One wonders what kind of a science finds activity (collective action = the group) contrary to its explanatory principles. As Hill scathingly concludes at the end of one of his examples, "The explanatory goals of science are easily submerged or turned aside, permitting polemics and implicit biases to dominate. It is merely a matter of artful definition." Thus, whether attitudes and values which are defined within a framework of group theory, really tell a researcher how people behave is a matter of the definition of the concept "group" which has a multitude of definitions. (Italic and Parentheses mine)

See, D. W. Hill, op. cit., pp. 18-23; Charles B. Hagan, "The Group in Political Science", in Richard W. Taylor, ed., Life, Language, Law: Essays in Honor of Arthur F. Bentley (Yellow Springs, Ohio: The Antioch Press, 1957), pp. 109-124.

[22]Ibid. Hill notes that translations are also a function of the definitions as well as other factors.

[23]J. B. Forrester, op. cit.; see also, Forrester's Urban Dynamics (Cambridge: M. I. T. Press, 1971).

[24]R. J. Rummel, Applied Factor Analysis (Evanston: Northwestern University Press, 1970). Rummel uses national community characteristics for his examples. See pp. 323-513.

[25]C. T. Jonassen, and S. H. Peres, Interrelationships Among Dimensions of Community Systems: A Factor Analysis of Eighty-Two Variables (Columbus: The Ohio State University Press, 1960).

[26]Walter Lippmann, Public Opinion (New York: Macmillan, 1922), Chapter 1.

[27]R. J. Rummel, op. cit., Chapter 22.

[28]Ibid., p. 493.

[29]Ibid., p. 496.

[30]Charles E. Osgood, op. cit., pp.

Chapter 5

[1]R. J. Rummel, Applied Factor Analysis (Evanston: Northwestern University Press, 1971), Chap. 22.

[2]Ibid., p. 493-495.

[3]Ibid., pp. 349-365.

[4]Ibid., pp. 500-507.

[5]Ibid., Chapter 19.

[6]Resources Development Corporation Files (1977).

[7]Ibid.

[8]See R. N. Shepard and J. D. Carroll, "Parametric Representation of Non-Linear Data Structures," Paper presented at the International Symposium of Multivariate Analysis, Dayton, Ohio (1965); and especially, R. N. Shepard, "Metric Structures in Ordinal Data," 3 Journal of Mathematical Psychology 287-315 (1966).

[9]Robert A. M. Gregson, Psychometrics of Similarity (New York: Academic Press, 1975) Chapter 6.

[10]R. N. Shepard, "The Analysis of Proximities," 27 Psychometrika 125-140 (1962); also see, Shepard's "Stimulus and Response Generalization: A Stochastic Model Relating Generalization to Distance in Psychological Space," 22 Psychometrika 324-345 (1957).

[11]J. B. Kruskal, "Multidimensional Scaling by Optimizing Goodness of Fit to a Nonmetric Hypothesis," 29 Psychometrika 1-28 (1964).

[12]Clyde Coombs, A Theory of Data (New York: John Wiley, 1967), Chaps. 12-19.

[13]Ibid., p.

[14]Resources Development Corporation Files (1977).

[15]Ibid.

[16]C. S. Stevenson, Ethics and Language (New Haven: Yale University Press, 1944), p. 72.

[17]Ulf Himmelstrand, Social Pressures, Attitudes and Democratic Processes (Stockholm: Almquist & Wiksell, 1960), pp. 47-70.

[18]L. Douglas James, Eugene Laurent, and Duane W. Hill, The Flood Plain as a Residential Choice: Resident Attitudes and Perceptions and Their Implications to Flood Plain Management Policy (Atlanta: Environmental Resources Center, Georgia Institute of Technology, 1971).

Several of the relevant findings on the power of the "L" Scale (and also on the fatalistic-Euphoria scale) were included in the first draft issued by Dr. James for review; but in view of their peripheral importance to the central objectives of the study, these spin-off findings were deleted by the team in the final draft. See, Duane W. Hill, Professional Files (1971).

[19]Resources Development Corporation Files (1977).

[20]Ibid.

[21]Ibid.

[22]Ibid.

[23]See, Seymour Sudman, Reducing the Cost of Surveys (Chicago: Aldine Publishing, 1967).

[24]Resources Development Corporation, Socially Defined Environmental Values in Urban Water Resources Planning: A Proposal submitted to the Office of Water Resources Research of the U. S. Department of the Interior (1972).

[25]Ulf Himmelstrand, op. cit., pp. 47-70.

[26]See John Dewey, Reconstruction in Philosophy (New York: The New American Library, 1952); and Dewey's, The Public and Its Problems (New York: Henry Holt, 1927).

[27]Studies in political and social alienation show that persons identified by their foes as "extremist" tend to be ideological and expressive in their approach to problems and politics generally. Compromise, pragmatic approaches to problem solutions, and doing the utilitarian "thing" rather than "sticking to principle" are all viewed as hypocritical, wrong, and even immoral, or at least corrupt. The alienated on both the "Left" and "Right" end of the political spectrum tend to eschew a pluralistic order or regime which they find willing to sacrifice principle to achieve goals; readily embracing the dictum: It is better to be liked than to be right; placing emphasis upon appearance rather than performance; and allowing political decisions to be the product of a market mechanism rather than a product of an ideological decision process. /e.g., See Daniel Bell, The Radical Right (Garden City, N. Y.: Doubleday, 1963) pp. 1-110/. Most notably, they reject the use of materialistic criteria rather than moralistic criteria as a basis for judgment and decision. (Daniel Bell, op. cit.). William Gerberding notes that the alienated Americans, especially those on the lefthand side of the political spectrum, view the political system as illegitimate. "They refuse to abide by the 'rules of the game' because they do not approve of the game. /See Gerberding's analysis in his and Duane E. Smith's The Radical Left (Boston: Houghton Mifflin, 1970), pp. 312-314; see also, Seymour Martin Lipset, Political Man (Garden City, New York: Doubleday, 1960), Chaps. 1 and 4-6/.

Most Hi-L persons are not subject, of course, to the extremist, radical, and/or alienated labels; but they do share the commitment to principle and ideological basis for decision-making. Their value commitments and perspectives on politics and public policies settle no better within the pluralist decisional market system than do those of the radicals and the alienates. They, indeed, are about as apt to feel shut out of a system of pluralist politics as do the alienates. The extent to which they are shut out is, of course, an empirical question; but the fact that many Hi-L persons feel shut out is not. Nor is the fact that they encounter considerable difficulty in succeding in a pluralist's world. /See, Duane W. Hill, Charles L. Garrison, and Charles J. Tripp, The Alienated Face of the Modern Conservative (unpublished ms), Colorado State University, Fort Collins, Colorado, 1967/.

[28]Wendell Bell, Richard J. Hill and Charles R. Wright, Public Leadership (San Francisco: Chandler, 1960) pp. 75-87.

[29]Ibid.

[30]L. Douglas James, et al., op. cit., p. 196.

[31]Ibid., pp. 142-155. Hi-L persons were far more inclined to be dissatisfied with their residential choice and more inclined to move than were Lo-L persons. Hi-L persons also assessed the quality of the community as lower than did the Lo-L.

[32]Ibid. Because it was not central to the objectives of the study, the Hi-L persons' darker assessments of the quality of political leadership was not reported directly in the final report, but it does exist in the analytical residue (machine printout) of the Atlanta North Survey (Peachtree-Nancy Creeks Floodplain).

[33]Robert E. Lane, Political Life (Glencoe, Ill.: Free Press of Glencoe, 1959), pp. 340-348; Morris Rosenberg, "Some Determinants of Political Apathy," 18 Public Opinion Quarterly 349-366 (1954-55); Seymour Martin Lipset, op. cit., Chaps. 4-6.

[34]Bernard Berelson, Paul Lazarsfeld, and William McPhee, Voting (Chicago: The University of Chicago Press, 1954), Chaps. 13-14.

[35]James S. Coleman, Community Conflict (Glencoe, Ill.: The Free Press of Glencoe, 1957), pp. 10-26.

[36]Ibid.

[37]S. V. Ciriacy-Wantrup, Conservation, Economics and Policies (Berkeley: University of California Press, 1963), pp. 252-253.

[38]Fort Collins Coloradoan (April 11, 1977), p. 1.

[39]This comment appears several times in the private papers of Dr. Duane W. Hill and the intra-Center memos addressed to Dr. Hill by Professor Kindsvater during 1969-70 when Dr. Hill was on the staff of the Environmental Resources Center at Georgia Institute of Technology.

[40]Fort Collins Coloradoan, op. cit., p. 1.

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