RICE UNIVERSITY

URBAN DEVELOPMENT AND PHYSICAL FORM
A PROPOSAL FOR DECISION MAKING

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ABSTRACT

URBAN DEVELOPMENT AND PHYSICAL FORM
A PROPOSAL FOR DECISION-MAKING

Howard B. Christy, Jr.

Realizing that under all decisions concerned with design there is an undefined value base, this thesis has been structured to investigate the problems in identifying that value base and in so doing, proposes an approach for handling similar investigations. The proposal is conceived to question those decision-making processes dealing with urban and regional planning and design, and in particular those processes related to urban development and the resulting physical form. It emphasizes enivronic factors, forces, and influences and their dynamic effect upon natural and man-made conditions. The intent is to encourage and cultivate a better understanding for control and management of natural resources and other conservational assets, and to develop a sense of strategy in their protection and use. Importance is placed upon the relevance of timing and on physical design, both in terms of long-range investment and in immediacy with respect to conditions of current crisis. The concept of land as a commodity which is
exhaustible in terms of destroying its natural and inherent life support quality is a reoccurring theme throughout the investigation.

The degree of success or failure experienced by the architect/planner in his effort to achieve a livable environment is evaluated in the application of the decision-making process to the design process. The conflict between design theory and the practice of design is examined in relationship to the architect/planner's background of knowledge and commitment to professional responsibility.

A case study which typifies the full range of problems anticipated in an urbanization process is scrutinized as a vehicle for testing the validity of such a concern for an approach as well as the approach itself. The keynotes of the proposal are its attempt to eliminate the existences of crisis decisions and design by default within the city-building process. The particular methodology proposed herein is structured to enable the investigator to have a better understanding of the scope of effort necessary in order to identify the means to an end. That end is the elimination of indecisive planning.
ACKNOWLEDGMENTS

The sense in this thesis is largely due to the fortunate accident that I worked with Charles M. Trost at the Houston-Galveston Area Council for Regional Planning and subsequently studied with Professors John Mixon, Earle V. Britton, Jr., and Philip Hendren at Rice University. My expressed thanks go to Charles Trost, one of the few authentic geniuses I have had the honor to know. Any brilliance that may be hidden within this paper I contribute to my association with this man; to John Mixon, for his capacity for scholarship and his responsive realization of a similar need in others; to Earle Britton, Jr., for his seemly limitless understanding of the complexity of the design gamut and his enthusiastic encouragement to "pursue butterflies" in lieu of beautiful buildings; and to Phil Hendren, whose infinite patience endured the pursuit in order to build a solid foundation for future programs. The nonsense in this thesis is my own, and I accept full responsibility for it.

Howard B. Christy, Jr.
Houston, 1971
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Case study: Montgomery County

Montgomery County, Texas, has a problem. In fact, it has several problems, collectively representing a prototypical planning and theoretical architectural exercise not unlike what is being and will be experienced around the fringes of a number of U.S. cities over the next two decades. One of Montgomery County's primary problems is the City of Houston. Equally critical is the reality that the people of Montgomery County do not realize it--yet. In order to put the magnitude of these, as well as other, problems in perspective, I would like to illustrate several specific factors for consideration, and eventually propose an approach for the effectuation of decisions concerning possible solutions.

Montgomery County is located in the rolling, timbered hills twenty-five miles to the north of the City of Houston. Its 697,600 acres\(^1\) are bounded on the south by Spring Creek, making it contiguous with Harris County. Forty-six thousand, one hundred fifty-one of these acres are in lands designated as the Sam Houston National Forest; another 1,725 acres comprise the W. G. Jones State Forest.
Lake Conroe, a major new man-made lake of 21,500 acres is under construction on the San Jacinto River, which runs diagonally from the northwest to the southeast through the county and feeds Lake Houston--one of the primary fresh water supply reservoirs for the nation's sixth largest city. These three major land areas, totaling 69,376 acres, are all located to the north of the existing City of Conroe.

Conroe, situated in the geographic center of the county, is the county seat with a population of 26,932 residents. Seven other small towns or villages with an aggregate population of 12,547 and seventeen rural settlements with a combined population of 10,000 are scattered about the county. The total 49,479 (1970 census figures) county residents enjoy a rural, woodland atmosphere, serene in the knowledge that under their good earth lies one of the richest oil fields in the state. Current annual oil revenues account for 80 per cent of the operating costs for the six major school districts, and are more than adequate to provide a high level of education for their children, at the same time maintaining a tax base which is 30 per cent lower than Harris County. (See Appendix A for maps.)

The close proximity of the wooded county to major economic nodes developing in the northern part of Houston
and Harris County is generating an increasing interest in
Montgomery County as prime land for residential development.
Subdivision developers are intrigued with the prospects of
providing most of the "amenities of the country life" without
the major social pressures experienced in the more urban
communities. To date, most of the new "bedroom-type
developments have been able to maintain easy access to the
economic centers of the Houston metropolitan area. Industrial
parks in north Harris County are readily accessible.
The new Houston Intercontinental Airport, Jetero, with its
developing commercial and industrial complex, is only fifteen
minutes from Conroe. The Houston Central Business
District, itself, is only forty minutes away.

A definitive documentation of the growth potential
of the Houston area is outside the scope of this paper.
However, the economic impact of the dynamic investment
growth occurring in the Houston area must be pointed out as
the most important single major impact item affecting the
future of Montgomery County.

Houston is the sixth largest city in the country and
the largest in the South. It is the leading manufacturing
center of the Southwest, ranking above all other Southwest-
eren cities in value added by manufacture, manufacturing
payroll, and capital investment in new manufacturing. In
the decade 1950-1960, Houston was the fastest growing city
among the Southwest's six largest cities. The growth of the Houston area has been sustained since the beginning of the twentieth century, and all indications point to its continuance. While the population of Texas increased 214 per cent from 1900 to 1960, that of Harris County increased 1,849 per cent.\(^3\)

In 1960, the City of Houston had a population of 986,238 and a total land area of 224,640 acres. Its Standard Metropolitan Statistical Area contained 1,418,323 people and five counties, one of which is Montgomery County. The 1970 census figures registered 1,348,253 people within the Houston city limits of 290,560 acres; and 1,985,031 people within the S.M.S.A., that land area remaining unchanged. Initially, most of these people sought locations within or adjacent to the immediate built-up areas, as is the well documented trend of urbanization. However, in the latter half of the decade—with the completion of a high-access road net—accelerated and sporadic development hopscotched about the county consuming large land areas to the southeast, south, and southwest.

For the most part, recent urbanization has utilized the prime, close-in property for development along existing freeways. This has been true to a large extent in the appended cities in the outlying areas where first phase development has utilized high priority property. Future
development will be generated in hinterland intersected by new freeways. The trend has now shifted to the north.

Population projections for 1990, just twenty years away, conservatively estimate the City of Houston to reach 2,500,000, with a Harris County total of 3,325,000, and an S.M.S.A. total of 4,395,500. The effect of Houston's growth on Montgomery County is revealed in the following figures. In 1960, there were 26,839 people in Montgomery County. By 1970--just ten years--the population had almost doubled to 49,479. In that same time frame, 163 recorded new subdivisions were developed in the county, 82 in the past four years. Projections for 1990 expect a total county population to reach 500,000 or ten times its present number.

It should be quite obvious that the rural countryside of Montgomery County is rapidly becoming the urban fringe of Houston, and that if these figures hold, the problems that we know are inherent in any growth process are accelerated and magnified in the Montgomery County case study by the sheer urgency of the particular situation and the realistic propensity for uncontrolled growth.

A problem in context

Until recently, within the last twenty years, students of the American city have tended to view the problems of urban development in isolation. The trend has been
either to concentrate on the breakdown of "community" within
the urban nucleus of some center city—lamenting its demise
while illuminating its applicability to all other cities, or
to head for some virgin and unencumbered countryside with
paper-plans and high hopes of building a totally new com-
munity. The view that the city and country represented dis-
tinct environments, even opposed ways of life, has been the
basis of popular argument—especially in political debate—
for ignoring not only the sociological, but also the physi-
ological interdependent relationships. Unfortunately, in
America this view will soon be three-quarters of a century
out of date.

In 1900, twenty-five million people lived in the
designated "city areas." The remaining fifty-one million
were classified as rural residents. Even by this time,
the larger cities had enormously extended their spatial
area and influence, and it was difficult to physically dis-
tinguish city from countryside. Today, or at least in
1960, of the nation's 180 million people, 70 per cent were
living in towns and cities, of which 63 per cent were liv-
ing in large cities and their surroundings. This means
that in 1960 less people were living in the rural areas of
the nation than comprised the total urban population sixty
years earlier. The urban population of 1900 had increased
five times.
The oldest of all demographic trends is the one toward urbanization, bringing with it one aspect of the phenomenon of "metropolitanism"--the extension of the influence of a large city over enormous hinterland regions. The concept of "urbanization" is a two-way street, and the influences of urban development and the resulting physical form are seldom responsive to the long-range needs of either "the individual" or "the community" when approached in a non-contextual manner.

Urbanism as a characteristic mode of life must not be approached empirically. The basis for context must find foundation in the interrelated perspectives: (1) as an ecological order, a technology, and the physical structure comprising a population base, "(2) as a system of social organization involving a characteristic social structure, a series of social institutions, and a typical pattern of social relationships; and (3) as a set of attitudes and ideas, and a constellation of personalities engaging in typical forms of collective behavior and subject to characteristic mechanisms of social control." As long as we identify urbanism with the physical entity of the city, viewing it merely as rigidly delimited in space, and proceed as if urban attributes abruptly ceased to be manifested beyond an arbitrary boundary line, we are not likely to arrive at any adequate conception of urbanism as a mode
Factors of control

The major item of constraint on well-planned urban development presently existing in Montgomery County lies in the recognition of the distribution of land. Of the total 697,600 acres, 69,376 acres of national and state forest and reservoir are excluded from urban development. As of 1969, roughly 12,000 acres had already been committed to development. Of the remaining 616,000 acres, 200,000 are in the private or corporate holdings of eight major landowners, virtually unencumbered by any form of land use control at the local level other than that which may be self-imposed at the option of the private sector.

The socio-political patterns, units of government and legal constraints; such as the taxing and utilities districts, elected bodies, subdivision controls, zoning and regulatory authorities, must all be considered as related, but uncoordinated, faction problem generators. Real socio-political patterns, per se, are non-existent, as far as comprehensive consideration for the full gamut environment is concerned. County government is fragmented with multiple-service functions falling under special use districts which often overlap county commissioners' precincts, to say nothing of county lines. The independent school districts--of which there are six fully contained in
Montgomery County, one overlapping Montgomery and Harris Counties, and two shared with three other counties—do not compete with the San Jacinto River Authority, the thirteen independent water districts, or the eight individual cities for taxes. There is no drainage district or authority at the present time. The independent school districts may be assumed to be just that—-independent. With the separate tax base and the revenues from oil activity, their lack of dependence on either Conroe City Hall or the county courthouse, in most instances, and their independent access to state, federal and foundation funds in addition to their own local taxing power, play a more detached role than the central position of the school system configurations would indicate.

The City of Conroe, in a political move to pre-empt new community development of establishing political subdivisions which might infringe upon its taxing controls over the new urbanizing development, exercised its extra-territorial jurisdiction in a move to "freeze" administrative control over the Interstate Highway 75 strip and lands immediately adjacent to the major county roads. The remaining rural towns and incorporated areas followed suit, to the extent of their legal ability. The City of Houston, with its extra-territorial jurisdiction limit of five miles, extends a distance of from one to two miles into Montgomery
County, the entire length of the southern boundary.

The attitudes of locality are perhaps one of the strongest indicators for evaluating the level of political sophistication toward an area's land development policies. The doubling of the population within the county over the past decade has stimulated some serious re-thinking, as well as introduced additional new thinking, about the prospects for the area's growth.

Of course, the prevailing attitudes of the long-time residents of Montgomery County are steeped in traditional provincial ruralism. The reins of controls--control in any fashion--have been retained in the hands of the relatively few locally prominent families. Very little regulatory action has been initiated toward the development or application of any long-range land-use controls--and those minimum requirements and standards that are on the books are not enforced. Until the middle of the decade, what minor subdivision took place within the county was either done by an established member of the community or a "friend" of the existing power structure.

During the middle of the 1960's, Houston based developers and investors became interested in both the land and the freedom offered an outsider who was financially capable of putting together four hundred to a thousand acres for a large subdivision--outside the political concern
of any existing town. This afforded a lot of leeway, and "red-flag" subdivisions sprang up throughout the county. Paved roads, with no foundations—much less a curb and gutter—cut through the forests, overnight converting $400-an-acre land into $8,000-an-acre residential sites. The existing population viewed these foreign spoilers with contempt. While it was evident that they were "messing up the county," it was also evident that they were willing to pay for the privilege—and to pay dearly. Farm and forest that in 1960 one couldn't give away at $200 an acre was going at twice that in 1964; and by 1966 for $1000; by 1968, $2000; and by 1970 again twice that, in many areas along the major roads.

Equally as quick, the developers "got in and got out," taking with them a handsome profit, and leaving the county with the horrendous problems of non-draining ditches, miles of additional roads to maintain—and all in need of resurfacing or major repairs, inadequate sanitary sewers, and outright pollution of the creeks and streams.

One of the few advantages the county did gain as a result of this initial thrust of development was the introduction of urban culture into the rural setting. Those "Houstonians" who "came to the country," anticipating the abandonment of city problems, acquired, among other things an overnight appreciation and concern for their rapidly
declining physical environment. Their disgust in the current development trends led to their activation in civil systems, demanding that if their interest couldn't be maintained by the county, that it could at least protect the interests of future resident-investors. It is amazing how quickly shyster know-how can convert investor-ignorance into high sophistication. Pressured by the market, the red-flag developers were faced with one of several alternatives: (1) to up-grade the "quality" of the subdivision requirements by their own volition; (2) to get into the political game in an overt way in order to counter development policy as generated by the populace; or (3) to get out of the picture completely, leaving future projects to the major land owners with their dreams of new super-subdivisions.

Despite all that has been said about the prospects for Montgomery County's future in terms of growth potential, the fact must be recognized that the total effect of this growth might not be as bright as the land developers would lead one to believe. None of the alternatives discussed really allow much of a choice--for all are playing at a scale insufficient to be responsive to the future needs of Montgomery County in fulfilling her requirements for a regional ecological balance. Montgomery County is a cluster of urban villages in transition--all heading for a highly predictable disaster.
Recognition of the needs of the existing foundation population in planning with people, as well as a concern for an accelerated growth potential was the initial philosophy advocated in this investigation for strategies. This approach was chosen over a planning process geared more to planning for people; a philosophy which could only lead to a deterministic process. A deterministic prototypical design process may produce an intellectual acceptable textbook solution; however, unless total consideration is given to the development process in terms of the particular application situation—balancing systems of ecological order with area market forces, and citizen participation; recognizing the needs, wants, expanding expectations and attitudes of the locality—the end products could well be sterile academic models instead of dynamic, democratic functioning communities.

An ecosystem in jeopardy

We have discussed the "economic" dependence of Montgomery County on the Houston Standard Metropolitan Statistical Area. Now, let us review briefly what the economic dependence is of the S.M.S.A. on Montgomery County, particularly in terms of a higher order life support system. In addition to providing some of the most beautiful natural landscape for residential and new community development anywhere in the five county area, Montgomery County plays a
far more important role in the economic well-being of the S.M.S.A. Montgomery County is very much a part of an easily identifiable web of natural inputs that directly affect the economic, physical, and psychological growth of the entire Houston region.

The plants, animals, and microorganisms that live in an area and make up a biological community are interconnected by an intricate web of relationships, which include the physical environment in which these organisms exist. These interdependent biological and physical components make up what biologists call an ecosystem. The ecosystem concept emphasizes the functional relationships among organisms and between organisms and their physical environment. These functional relationships are exemplified by the food chains through which energy flows in ecosystems, as well as by the pathways along which the chemical elements essential to life move through the ecosystem. These pathways are generally circular; the elements pass through the system in cycles. The cycling of some elements is so slow, however, that in the time span of interest to us, movement appears to be one-way. An understanding of the flow of energy and the cycling of materials in ecosystems is essential to our perception of what is perhaps the most subtle and dangerous threat to man's existence. This threat is the potential destruction by man's own activities, of those ecological systems upon which the very existence of the human species depends.14

Montgomery County constitutes a vital link in the ecological cycling processes that support the Houston Metropolitan Area. For illustrative purposes, we will explore just one of these "food chains" and the effect its element flow has on physical development. The entire county is virtually a wooded reservoir through which hundreds of secondary water-courses, a dozen major creeks, and the San Jacinto River meander into the primary water source for
metropolitan Houston. This wooded area is a part of the major recharge area of the principal aquifer outcrop. Here, due to the holding capacity of the tree density which prevents erosion, a lush ground cover provides the high quality retardation features necessary to slow natural rainfall runoff. This allows the would-be runoff to be absorbed by the earth channels and transferred into the holding zones below the city of Houston and as far south as Galveston and Brazoria County (see Figure 1).
In order to better understand the functioning of a groundwater supply network, familiarity with a few basic terms is required. These "earth channels" are the aquifers--a geological formation, usually sand, from which water can be withdrawn in quantities sufficient to permit development. Two main aquifers "feed" the Houston region--the Principal Aquifer with primary recharge area in Montgomery County, and the Alta Loma Aquifer in the west, southwest.16

The "holding zones" are the actual underground well traps in which the ground water will stabilize. The depth of the well surface will depend on the piezometric level--the static level to which water will rise in a well when not being pumped.17 All wells are subject to a piezometric decline--the vertical decline of the piezometric level or surface--as a result of groundwater pumping.18 Another important concept is that of artesian pressure or the pressure within the aquifer that causes water to rise above the sand in which it is encountered.19 When this pressure is great enough, water will actually bubble up at ground level as the piezometric level is raised to the earth's surface. As demands increase on the amount of groundwater withdrawn in excess to the natural ability for recharge through the aquifer, the artesian piezometric surface withdraws. As shown in Figure 1, the 1966 piezometric surface had declined to a below ground depth of 300 feet from the
abundance of natural surface wells indigenous to the Houston region just forty years ago. When piezometric levels decline, user demands must be met by the drilling of deeper wells as long as groundwater is to be the major source of fresh water supply.

Unfortunately it is not just a problem of digging a deeper well when the existing wells run dry. There are severe limits within the earth's strata which set a degree of tolerance on groundwater removal. Once this degree of tolerance is broached, the water quality is no longer acceptable for human consumption. Because of our close proximity to the Gulf of Mexico, the occurrence of brackish water in deep wells has been encountered. Salt water encroachment is accelerated due to the "faulting" caused by land surface subsidence, common to the Houston region. This subsidence is the result of concentrated withdrawals of earth liquids in a specific area. "The elevation of the natural ground in some localities in the Pasadena Ship Channel area has been lowered nearly six feet; a range in subsidence in the order of two to four feet has been experienced throughout the City of Houston."  

Land surface subsidence in the Houston Region has been the cause of understandable concern among those who are aware of its occurrence. The natural ground surface in the City of Houston has subsided up to four feet; more pronounced subsidence has occurred locally in the Pasadena area, in Baytown, and in Texas City. Since most of the regional subsidence has taken place
within the last 25 years, the rate and amount of future subsidence is of meaningful importance.22

The above statement was written six years ago, before Houston and the surrounding countryside had experienced what may justifiably be called a population explosion. I have--admittedly with tongue in cheek--made the comment that the architects of One Shell Plaza were only too well aware of how this problem of subsidence would eventually affect their physical design. "That six foot deep perimeter beam which now acts as a belt-coursing at the ceiling line of the ground floor is actually a grade beam in anticipation of settlement. That with the completion of one more 1000 acre subdivision in Montgomery County, Houston's first fifty story building may become Houston's first forty-eight story fiasco." The import of my comment loses some of its humor when refocused in reference to the following statement by the engineers for the Comprehensive Study of Houston's Municipal Water System.

By and large, land surface subsidence in the Houston Region has been the result of groundwater withdrawals, and the attendant declines in the piezometric surface.23

In the synopsis of the Comprehensive Water Study of Houston's Municipal Water System, the engineers concluded that the projected future demand compared to the net groundwater potential for the Houston area necessitated the development of "major additional surface water supplies."24 Notice here that the solution is to "develop"--not to
prevent development, or even to try to establish an order for development. Lake Houston is typical of the type of development that results from these recommendations.

Assume Montgomery County is left to its own devices, as it has been, and urbanization continues to develop in the natural sands of the Aquifer outcrop recharge area, unrestricted by any control. An additional 150,000 to 200,000 acres of land will be required to "accommodate" the projected twenty year population increase in the same lifestyle as we know today. (See land use map 1990, Appendix A.) This scale development will require the removal of trees, the reshaping of land, and the tailoring of natural drainage ways. With it will come the paving of streets and the production of hard surface roof areas which will increase the rate as well as the quantity of runoff. With it will come the reduction of natural absorption capacity into the aquifer recharge area, creating an overload on the remaining natural drainage ways which empty into Lake Houston. This overload, in turn, creates bank wash and erosion, killing the natural bank cover along the streams and creeks changing their natural processes for sedimentation, which, in turn, causes water turbidity, diminution of aquatic organisms and a reduction in natural water purification. "These, in turn, will result in channel dredging costs, increased water treatment cost and, possibly, flood damages
and drought cost." Water courses which once carried naturally purified water to surface reservoirs now vomit forth nothing more than a more sophisticated form of pollution.

This is the nature of the case for man's intervention in the environment. And what have we accomplished in our unenlightened attempt to solve the problems we, ourselves, have created--only a bigger and more expensive mess! Montgomery County, in terms of urban development and the resulting uncontrolled physical form, represents the epitome of an ecosystem in jeopardy.
FOOTNOTES


2 1970 Census.


4 Ibid.


7 Ehrlich and Ehrlich, p. 39.

8 Glaab and Brown, p. 271.


10 Ibid., p. 4.


16 Ibid., pp. 4, 12-20.

17 Ibid., p. 4.

18 Ibid.

19 Ibid.


21 Ibid., p. 16.

22 Ibid.

23 Ibid.

24 Ibid., p. iii.

CHAPTER II

THE QUESTIONS OF DECISION-MAKING

The crisis and the need

The environmental milieu is a fragile support system in which resources are precious, limited, and exhaustible. As such, it should, can, and must be managed within the framework of a democratic society. We, as Americans and as urban dwellers, are rapidly becoming aware not only of the urgency of our urban and environmental problems, but also of the seeming dichotomy between our desire to solve them and our inability to do so. This inability apparently stems from a functional failure somewhere within the so-called decision-making mechanism that deals with the city-building processes.

The problems facing the city today are the results of many complex and conflicting social forces, each affecting the sum total of urban environment. The institutions of the city, i.e., political, economical, sociological, psychological, as well as physical, have had to undergo wide and rapid changes to keep pace with developments of these social forces. Unfortunately, because the city has not, as of yet, been able to adapt quickly enough, vast urban decay is occurring.¹

This decay within the urban scene, coupled with a premature and overabundant expenditure of natural resources within the environmental setting, has generated an attitude of
problem solving based on crisis reaction and inadvertent design as opposed to a responsible decision of deliberate choice. By advocating a concept that all new growth is good growth, city-builders have ignored the decaying processes as well as what causes them. In our quest for rapid urbanization, we have made little or no positive physical attempt to genuinely protect the life-support systems of urban development in a comprehensive manner within the context of control.

Victor Gruen, a well-known American architect, has lamented the state of the urban scene and laid the blame rightly so at the feet of the guilty. "Those phenomena that we summarize under the term 'the urban crisis' have not been created by nature or through the interference of a Higher Being. The mess that constitutes our urban environment is entirely man-made."²

The question of crisis is, of course, one of degree. To the economist, as long as the city is growing in terms of economic productivity, everything is O.K. The economist, David Davies emphatically states, "There is no urban crisis today. There are serious problems, but most metropolitan areas will continue to thrive and grow in the foreseeable future."³ To the ecologist, the madness of this blatant dollar-oriented philosophy is in itself crisis enough for alarm. The real crisis, however, lies in the sad fact that
the majority of our urban population is not only unconcerned, but unaware of an ecosystem in existence, much less in jeopardy. As Raymond Vernon has noted, "To most Americans, the personal experience of urban living seems not one of personal retrogression but of continuous improvement."4

It is this Balkanization attitude of the mainstream of middle-class America in terms of a preoccupation with personal things as opposed to a critical understanding of the dynamic processes that call those "things" into being that puts the problems of our mis-allocation of resources in context for the urban planner decision-maker.

If Homo Sapiens is to continue as the dominant species of life on Earth, modern man must come soon to a better understanding of the Earth and of what he has been doing to it. Yet many people—as a result of the excitement over the successful landings of men on the moon—are better informed (and perhaps more curious) about conditions on the surface of that dead satellite than they are about the damage being done by overpopulation and overdevelopment to the only life-supporting planet we know.5

The definition of values

In a democratic society the basic values, with which planning for any community begins, have traditionally been the more general values common to the individual citizens of such a society. In highest abstraction, these values may be described in terms of a wider sharing of power, respect, knowledge, income, safety, health and character and of all other values that contribute to the dignity of "the
individual" and to "the community." It has been the job of the planner, working within the broad framework of these basic values, to devise specific programs and undertakings for which general support can be obtained. These programs and undertakings were predicated on the assumption that the urban planners of a particular area could secure the major values of its people with sufficiently homogeneous desires, attitudes, needs and wants; recognizing and employing the sufficient bases in natural and manmade resources and technology; and thereby placating the appropriate voluntary institutions and governmental organizations. Just how, specifically, this identification of the base values was to be accomplished, has never been spelled out. Consequently, the urban planner, the urban designer, and the urban architect, unlike their professional counterpart, the doctor, are usually called in after the patient is dead.

In the discussion on the nature of the decision-making process, reference is made to the interaction of social forces responding to base values. If the social process is man pursuing values through practices and institutions using resources, what, then, are the reference markers which will prevent him from straying off-course? How does one define value?

The definition of value has many meanings. To an individual, value is an estimation of worth which he places
upon some of his possessions as compared with others, independently of any intent to sell. Whereas, when speaking about the values of the classes, "value" refers to a "preferred event." The term "values is employed for the purpose of designating the broad categories of events that gratify desires." It is in the quest for the gratification of individual desires that each member of a group is willing to allow someone else to compromise. This application of values to physical problems has always led to a surface approach of satiating our desires of the moment. Consequently, our urban problems of today did not start yesterday. They have been with us a long time. By the same token, they will not be solved tomorrow, but the time has come to put a limit on their life before they impose one on ours.

The time has come to find out what we know.

The study of decision - what is it?

The study of decision is undertaken in this section as a means for clarifying the determination of goal values. Just what these "goal values" are and how they might be formulated is the topic of discussion in Chapter III.

"Decisions are value commitments, indulgences or deprivations, arrived at after conclusive consideration by the decision-maker." From this definition, it is quite
clear that various levels of decisions about a single problem can be arrayed according to the degree to which the decision-maker is capable of understanding. Decision, per se, is the process of selecting one action from a number of alternative courses of action. The effectiveness of decision will rest with the decision-maker's capability of thinking manipulatively. One aspect of this is the capability of operating and communicating on a higher level of abstractions. This point becomes crucial when one is concerned with making a "quantum jump" as opposed to an "incremental" decision.

Braybrooke has described four recognizable types of decisions in terms of their potential to effect change within a given range of possibilities based on the degree of information available. He differentiates these types as:

. . . (a) decisions that effect large change and are guided by adequate information and understanding; (b) decisions that effect large change but are not similarly guided--hence, at an extreme, blind or unpredictable decision; (c) decisions that effect only small change and are guided by adequate information and understanding; and (d) decisions that effect small change but are not similarly guided, being therefore subject to constant reconsideration and redirection.

In Figure 2 on page 29, these appear in quadrants 1, 4, 2, and 3, respectively. Several examples of each type decision are shown.
High Understanding

Quadrant 2
Some administrative and "technical" decision-making
Analytical Method: Synoptic
Small Change

Quadrant 1
Revolutionary and utopian decision-making
Analytical Method: None
Large Change

Quadrant 3
Incremental Politics
Analytical Method: Disjointed incrementalism (among others)

Quadrant 4
Wars, revolutions, crises and grand opportunities
Analytical Method: Not formalized or well understood

Low Understanding

Figure 2
The nature of decision

A mammoth amount of academic endeavor has been devoted to exploring the cognitive processes of man, including the heuristics of synthesis. It is relevant to this study that,

... historically, theoretical explorations in design have emphasized the elusive problems of formal synthesis, or simple "form." ... Such investigations can have little operational value, however, until an epistemology has been identified which generates a structure within which environmental problems can be more appropriately formulated. It is here that the issues in design must first be resolved, for the most apt-form maker can have but a superficial effect if he is solving the wrong problem.13

The structure of decision is the frame of reference embracing the fundamental patterns of authority and control that are vitally important for translating the overriding goals of a free society into effective action.14 Such a frame of references would enable the designer decision-maker the objectivity to continually re-evaluate not only the "effects" or impact of a decision on the environment in terms of estimated outcome, but more importantly to classify events as "consistent" or "inconsistent" within the definitions that have been made of goal values.15 Once this structure has been defined, either as a theory or a science, the method and grounds of knowledge for deliberate decisions are set, especially with reference to its limits and validity. The self-established parameters immediately, and at any given point in time, define both the limits of
our knowledge as well as the extent of our responsibility for our environmental indulgences or deprivations.

The decision-making process

The concern for a comprehensive understanding of action has generated a theory of action which is referred to as the decision-making process. The concept of a decision-making process implies that there is a flow of decisions in context with relevant events and that there is a procedure for dealing with these events in a methodical manner. Events may be any occasion for action, the alternative courses of action or the means of discovering them, and the choice among action alternatives.  

The flow of decision is seldom confined within temporal dimensions. For example, a particular act is part of a whole course of conduct. The understanding of a decision requires comprehension of prior circumstances as well as the circumstances of the moment. Many of the decisions of today are in effect the consequences of yesterday's decisions. Even a failure to act, deliberate or otherwise, constitutes a decision, and the defining and dating of a decision may be no more than the satisfaction of a formal need. Every decision is part of a psychological and social process no matter how separable and definable it seems. Thus, decision-making in all circumstances contains recurrent psychological elements; but decisions made in the
fields of design have a special added character of their own. One is the interplay between formal and informal process.

The problem of decision is not the monopoly of designers. The making of decisions, either in public or private life, in or out of a professional context, always involves some of the same psychological processes. The central questions that might be asked here are: (1) how does man reason, and (2) how can he improve his facility for reasoning? I do not intend in this paper to play the word game of the Sophists. "Their set of rules, systematized by Aristotle, was logic. The proper employment of these rules was called reasoning." However, the point is made, that there is a difference between arriving at a choice of action and process of convincing others to effectuate that choice.

It is commonplace (in physics) to study systems interacting with their surroundings, and indeed the whole basis of scientific method is to divide a complicated problem into parts which interact with one another, and then to concentrate attention on one part of the system and make simplifying assumptions about all others, which we call the environment.

Herman Kahn, who has explored the methodology of war games, contingency planning, and scenarios very extensively, also has come to exactly the same conclusion:

... that the main technique is to decide what problems one is talking about and then to break them down into as many manageable subproblems as one possibly can. In this way, one finds that a large number of them have obvious solutions and that others are very difficult; but one has at least narrowed the points of concentration.
This is particularly useful where the decision-making process has been imbedded in formal models: normative economics, statistical decision theory, management science, computer programming, operations research, and certain areas of modern engineering design. The function of mathematical models allows one to conceptualize a portion of the real world and to study its behavior under certain manipulations. Kaplan has pointed out that this not only gives us a clearer picture of phenomena manipulation but also eliminates, to a degree, self-deception. Those ideas that are ill-founded are forced into the open.  

In studying the general characteristics of the decision-making process, Harold D. Lasswell recognizes "that the term 'choice' is appropriately applied to situations in which the individual or the group has at least a minimum degree of freedom in selecting or interpreting goals and strategies." Lasswell qualifies the conception of a decision-process in two senses. 

Broadly conceived, a decision is the political act of the whole body politic. Narrowly viewed, it is the face to face determination of controversial or uncertain courses of action. In the broader sense, the body politic is making decisions when legislatures, executives, administrative agencies, and judicial organs vote; when wars and uprisings succeed or fail; and when the entire electorate commits itself at the polls. All decisions are interactions in the social process; and they involve community coercion. . . . When speaking technically we may reserve the word "decision" for the choices made in the political process. They involve sanctions (that is, severe actual or potential deprivation).
Lasswell further qualifies the thinking of the "body politic as a group" and the "face to face" situations in terms of the "arenas" in which "participants" are striving to accomplish their purposes by influencing "outcomes."²³

The purposes are directed toward "preferred events" ("values" and "interpretations" of values in terms of "institutional practices"). Participants are seeking to maximize power and other values by influencing outcomes. They use the values at their disposal as "base values" according to "strategies." A condensed version of the decision process would be:

Participants (with various value perspectives) employing base values by various strategies interact in an arena to influence outcomes and effect.²⁴

Process of decision - logic and strategy

Few decisions, regardless of their related field of influence, are ever made independently of countless other external situations. The effort to employ the models previously discussed is normally viewed as systematic since the methods by which the context is referred to and examined are made as explicit as possible. However, since decision is not documented or classified, the original basis for its existence is lost and not re-evaluated in light of additional parasitic decision. Decision impact within mathematical models is difficult to determine unless the model is so constructed initially as to be responsive to the preferences of the individual or groups most critically affected by the decision. The probability of satiating the
desires of one individual is not unlikely, as long as he has clearly stated his preference. It is in the group decision, where true preferences are not revealed for underlying reasons either on the part of an individual within the group, or by the groups in general, that conflict decisions are produced.

The relationship between individual and group decisions has received considerable attention by numerous decision theorists. Given information about the desires of the various persons who comprise the group, the problem has been that of reasonable procedures for the reconciliation of those desires into a group decision.25

The discussion of this subject stems largely from the work of Kenneth J. Arrow. His procedure is to list some plausible acceptability criteria for social decisions and to examine their implications. He originally proposed the following four minimal conditions which social choices must meet in order to reflect individuals' preferences:

1. social choices must be consistent (transitive) in the sense that if A will be decided in preference to B, and B in preference to C, then C will not be decided in preference to A;
2. the group's decision must not be dictated by anyone outside the community or by any one individual in the community;
3. social choices must not change in the opposite direction from the choices of the members of society, that is an alternative which would otherwise have been chosen by society must never be rejected just because some individuals come to regard A more favorably; and
4. a social decision as between two alternatives must not change so long as no individual in the community changes the order in which he ranks these alternatives in accord with his preferences.26

While the above parameters appear to be a fairly straight-forward set of conditions for democratic decision-making, Arrow demonstrates in other studies that it is not
so simple a matter. It is impossible to choose among all possible sets of alternatives without violating at least one of his four criteria.

The problem of obtaining a true revelation of preferences has perplexed economists for years. It is interesting as well as applicable to note at this point the observations of Lionel Robbins on defining one's degree of preference.

[I]t is one thing to assume that scales can be drawn up showing the order in which an individual will prefer a series of alternatives, and to compare the arrangement of one such individual scale with another. It is quite a different thing to assume that behind such arrangements lie magnitudes which themselves can be compared. . . . Suppose that a difference of opinion were to arise about A's preferences. Suppose that I thought that, at certain prices, he preferred n to m, and you thought that, at the same prices, he preferred m to n. It would be easy to settle our differences in a purely scientific manner. Either we could ask A to tell us. Or, if we refused to believe that introspection on A's part was possible, we could expose him to the stimuli in question and observe his behavior. . . . But suppose that we differed about the satisfaction derived by A from an income of $1,000 and the satisfaction derived by B from an income of twice that magnitude. Asking them would provide no solution. Supposing they differed. A might argue that he had more satisfaction than B at the margin. While B might argue that, on the contrary, he had more satisfaction than A. We do not need to be slavish behaviorists to realize that here is no scientific evidence. There is no means of testing the magnitude of A's satisfaction as compared with B's. . . . Introspection does not enable A to measure what is going on in B's mind, nor B to measure what is going on in A's. There is no way of comparing the satisfactions of different people.27

When dealing with the environment, the designer can find no justification for the uncertainties of having to
make a decision in an incompletely defined situation. It is no longer just a problem of reducing common sense to calculation. That is a job of translation. The chief obstacle to be resolved is ordering a framework for the problem.

In the ordinary affairs of life, while recognizing the existence of individual idiosyncracies, racial differences, differences due to habit and training and so on, we always assume that groups of prima facie similar men will be mentally affected by similar situations in much the same way; that they will get roughly equal enjoyment from a dish of ham and eggs and will suffer a roughly similar sacrifice from surrendering their seat in a railway carriage. We expect similar situations to produce similar mental effects, and it is only when they seem not to do so that in normal non-philosophic moods that we think there is something to explain.28

As much as we cherish the concepts of community, as much as we long for the realization of a physical utopia, we are forced to admit that the bonds which weave the commonality of men together are weak, at best. By what methods can an observer make reliable forecasts of how decision-makers will in particular contexts choose between rules which are contradictory in their directions or are formulated with degrees of generality which permit multiple choices?

Design: processing decisions

The answer posed in the preceding section is, quite frankly, unknown. And so, no Utopia. "Approaches to the theory of action start with the modalities of common language: in the meanings of 'ought,' and 'must,' and 'can.'"29
The attempt to bind the minds and emotions of the body politic by the cords of constitutional and statutory rhetoric have had no more than a modest degree of success. Words are sifted through the perceptions of men and women having diverse antecedents, conflicting aspirations, and diverging images of the future. By this time we have had enough experience to understand that the [designer's] dream of total rationality, impartiality, and impersonality is incapable of being put fully into effect.  

Christopher Alexander, architect and educator, has surmized that the end result, "the ultimate objective of design is form." In the schools of logic and philosophy, design is concerned with devising possible means for the achievement of ends. It is the vote-casting mechanism for choices which will determine courses of action. Design, in essence, then becomes the act of processing decisions.

"A design process is a process for finding an object that satisfies translation requirements." Simon further concluded in his paper, "The Logic of Rational Decision," that the characteristics of the design process were:

1. its concern with relating actions to consequences;
2. its heavy dependence on heuristics; and
3. the major influence exercised over it by considerations of processing capacity.

I have always approached architecture as a thought process. The manipulation of the design determinants for most projects at the scale of the one-building problem is not that difficult to comprehend. The typical solution of
an architectural design problem is not a program in action space, but a description of an object in the state space. While the determinants for any "design" problem fall into two main classifications of either fixed or variable, the solution to the problem is complicated by the sheer increase in the number of determinants the designer must contend with as the scale of the problem increases. In terms of the urban environment, the degree of difficulty in finding a more ideal solution increases exponentially based on the amount of knowledge one has about the determinants.

Figure 3 can be considered as an array displaying a declining order of flexibility. The degree of flexibility

<table>
<thead>
<tr>
<th>DEGREE OF KNOWLEDGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>100°</td>
</tr>
<tr>
<td>Determinants</td>
</tr>
<tr>
<td>Unknown - 0% Fixity</td>
</tr>
<tr>
<td>Open-ended - Fixed</td>
</tr>
<tr>
<td>Minimal - Fixed</td>
</tr>
<tr>
<td>Known - Fixed</td>
</tr>
</tbody>
</table>

Figure 3
does not necessarily imply that the one solution arrived at, the "set-set," is the best solution. It does, however, probably represent the best thought-out paradigm for a given point in time. Traditionally, architecture has dealt with producing a product. The success of that product was limited by: (1) the architect's ability to come to terms with the design constraints as he understood the determinants; (2) his scholarship and imagination for the prediction of future sets; and (3) the resources available for the interpretation of "his design" into physical form. Generally, it was in this second area of concern that the architect found (usually after the product was built) that in his search for a higher degree of flexibility his product had sacrificed a higher degree of "fit."

As man moves in to seriously consider designing "for the environment," he must realize that the level of some "set-set" is not safely tied to the boundary or limit of "0" degrees flexibility, or best set. As the number of unknowns increases, so does a solution's potential to be a "mis-fit." When form and content are at odds, there is another scale factor of consideration, i.e., what is the level of deprivation incurred? Because the design process is striving for the obtainment of a permanent (within some time frame, of course), physical product, these products are subject to scrutiny in terms of a conflict between "fit"
and "fix." The difference between "fit" and "fix" will be discussed further in Chapter IV. The point is made here to clarify the functioning of the design process as a "moving equilibrium in which component variables tend to re-establish a steady state whenever interfered with."36

As the architect's scale of concern has increased, so has his sense of frustration. Architecture, once considered, at least by the profession, as the mother of the arts, has become the step-child of the sciences. The architect can no longer play at making pretty buildings. He has "slowly been forced to acknowledge that in most cases he does not act upon the environment unilaterally and that when he has approximated total control of the environment, the life of the community has far too often been as bad or worse than before. The image of the architect as the great social prophet has lost whatever credibility it may once have had."37

Reconciling theory with practice

The prophetic and then authoritarian stance of the architect-planner was easy to comprehend and therefore easy to teach. The student was to accept the word of an elder prophet or else to make his own prophecy. Then, if the state, the city, or the client would only grant the architect the authority he so obviously deserved, the systematic deductions from the prophecy could be thrust upon the chaos of the existing environment.38

It has taken the architect a long time, as well as several changes in name, to learn that control can not be
based on guess-work prophecies. The need for methodology in thought is well summarized by Professor Myres S. McDougal in the introduction to a seminar program in Law, Science and Policy at the Yale Law School in 1958. (See Appendix B.) The five intellectual tasks of the designer are summarized here as:

Goal Clarification
Trend Description
Scientific Analysis
Developmental Projections
Policy Evaluation

As urban designers, we must be continuously aware of what we considered and what we proposed. Any scheme that is deviant from the norm—the norm being, "leave things up to the individual or the private sector"—is looked upon as academic meddling by the "fuzzy minded theorists." The crisis in the city has been well documented. Much has been written; little has been read; less has been heeded. Basically, the question remains whether to control or not to control.?

"Control" should not imply that a socialistic approach is advocated toward planning implementation, but rather that the facts be recognized that paralleling the planning process is the urbanization process, and with it comes a myriad of attitudes, aggregate processes without
controls and ecological imbalances with system overloads that are obstacles to any organizational product that we know today. When we relate any planning process to the arduous real world experience, one can't help but wonder how much democracy we can afford.

Control of anything is always a highly respected, highly cherished, highly feared, highly sought after, and highly questioned set of circumstances, with emphasis depending on where one stands within (or without) the framework of whatever is being controlled. In the Montgomery County case study, the projections of probabilities have been studied not necessarily as what is desirous to happen, but--left to its own devices--what will happen based on the absence of the element of control as one of the prime factors in the formulation of urban development policy manipulation and its effect on the physical form of the county.

The primary areas of interest focused on land value dynamics are related to: (1) ownership as a dictator of use; (2) the economy of scale as a dictator of form; (3) the scale of competition as a dictator of policy; and (4) policy formulation as a dictator of control.

This outlined "process" appears to be cyclical, and it is. As must be pointed out from the onset, the ability to aggregate control of land for development does not require a disproportionate amount of development accumen; it
requires only money. In Montgomery County, as in many places, the truth and reality of land development ownership and the dynamics of land value as a controlling factor of physical form is one of the most serious problems facing the community policy-makers today. Ownership of the city has long been the sport of the economic elite who are always less than receptive to the idea of giving up any degree of control. Control of the gaming board means more than just control of the land; it means control of the law.40

The disquieting fact about the city building process is, of course, that we have reached the point of being able to build cities without knowing what we want. The term "quality of life" has been socially, as well as politically, vague, with neither the social theorist nor the local politico knowing what we need nor how to achieve it. "Quality of life," the environmental plank, has become to the political platform what "highest and best use" has been to real estate ethic--absolutely meaningless, for we have never rationally answered the question "highest and best use for whom?" How much longer can we go on wasting the utility of our land resources?

Critical to any land-use proposal is that most landowners--unless they are very eccentric--care nothing about what is built on their land; they just want as much profit
as possible, as soon as possible. The theory that planning pays, and that long-range planning pays even more, seldom advances further than a planning classroom. As planners and urban designers, is it not within our domain to produce design studies which would enlighten and direct this use, generating the highest economic return as well as maintaining a copacetic environmental relationship of functions?

A design study is indeed of key importance. Unfortunately its value as a tool depends very much on the perspicacity of those directing it. It can be superficial, leading to minor improvements in a basically inefficient process; or it can be fundamental, leading to a substitution of a new and efficient method for an old and ineffective one. It takes men of very high intellectual calibre and great independence of mind to direct fundamental planning studies. The question arises whether this sort of man is always to be found among the busy practitioners who rule the roost in the city planning boards and who are so convinced that what they have done for years is so, so right.

The fact that the planning process for most cities is characterized by a struggle for control over the programs between what City Hall "ought to do" and what the private movers of the community "want to have done" is fraught with implications for those who are sincerely interested in community planning. The conception of the planner as being centrally engaged in the planning process of setting goals, assessing means and resources, assigning priorities, and selecting courses of action simply does not hold up within the framework of the local scene. All of these conventional
"planning" functions when performed are performed in an essentially political process in which: (1) the planners themselves are not in control or in any position of major direction of the process, and (2) no single decision-making entity which could be said to plan is in central control of the process.

How relevant is it to the urban designer's role to consider that somehow he is plugged in close to the decision-making power, if he does not have it himself, and that his task is to operate in terms of aggregate processes? It is this conventional concept of the planner's role which has led to a decade of debate regarding the "political" and "rational" components of planning, and how they are to be mixed—as though the planner himself controlled the sluice-gate.42

Are we then to say, planning belongs to the practical men of politics? We have seen the success of "practical" men and their piecemeal solutions. If we are going to execute what real comprehensive development involves—genuine four dimensional planning—then we must reconsider the practicability of the situation over the long haul. As Peter Chamberlin, one architect and social critic, stated some ten years ago,

... my impractical attitude toward enterprise stems from the view that where there is potential wealth in a site or in a situation, this should not be creamed off, but should be ploughed back into some other part of the
town where development is needed but held up for lack of finance. Private enterprise when applied to central area development should mean much more than commercial exploitation: local authority enterprise should imply the duty to consider how the potential wealth in a city may best be deployed to support the development of the whole.43

The more time we devote to studying the problem of urbanization, the more aware we become that our problems are of finance and management, and not only of building or planning technique. But an equally important consideration along with the financial aspect is the enormous and as yet unsolved problem of urban design--the physical form--how the architect may maintain control in the programmatic design development. The answer is simply, that under present conditions, he can't. Without the instrument of an urban settlement policy, and one with teeth which defines the architect component as master of the physical form, the effect of any design endeavor will be fragmentary at best.

Without a policy on urban settlement and distribution, particularly on the local level, the problem which remains the greatest bone of contention is that of whose finance, for whose benefit. How is the money for new sites and the development to be allocated? Private enterprise will always tackle the easy and highly remunerative parts, but no one has suggested what proportion this is of the whole expenditure on roads, pavements, open spaces, museums, theaters, and the myriads of structures necessary to make a
city a place to live in and not to escape from. Certainly a sales tax on land would be one way by which the community would recover some of the value it creates by undertaking planned development. Of course, an even simpler and more effective answer to planning problems would be the nation- alization of the land.44

The extreme measures open to planning and control policies will always be evaluated in terms of cost. Basically it is a matter of what the country is prepared to invest in the future of its cities.

The answer is not simple, but there is an answer. WE MUST NO LONGER ALLOW FOR INDECISIVE PLANNING. It should be the urban designer's concern to deal with "second level questions" in order to objectively evaluate the program criteria; establish a priority hierarchy for satiating the design determinants, recognizing the complexity of the inter-related cause and effect linkages of economics, politics, personalities of power, private and professed goals and aspirations; and to enter the design, decision-making process at a higher level of involvement by understanding the full ramification of "first quadrant solutions" inherent with environmental dynamics.

Architectural theory and the practice of architecture have seldom been in harmony. Conflict patterns of urban development are no different. I initially made the
statement that "theory and practice have always been at odds." This is not entirely the case, for the nature of the theory, per se, is not defined. The paradox in the realization that one man's theory is not necessarily the criteria of another man's practice springs from the consciousness that there is actually a theory schism. In fact, in many instances, particularly in dealing with questions of design, I would suspect to find two theories acting simultaneously on a single product. One, deductive or rational theory, is based on fact or at least historical precedence, i.e., that if we do "this," then "this" is the result. Such is the logic advocated for goal achievement. The second, normative theory, maintains that if we do "this," then "this" ought to occur. Normative results necessitate ethical justification of the end product.

Leon Festinger has attempted to define this theory schism by a term he calls "cognitive dissonance." The term is used to indicate the existence of incompatible beliefs or attitudes held simultaneously by a human being. It is the need for the ethical justification of some event or product that makes one conscious of the incompatibility between some theory and practice. Or to put it another way, the factual "is" and the normative "ought" are acting unconnected. It is when we try to justify an absolute in terms of the dissonance duality that we are at
cross-purposes with the end result. Such is the case in Adam Smith's theory of "highest and best use" in real estate practice. The conflict between man's devotion to nature and his own effect on his environment has existed since time began—nest spoiling has always been the basis for ecological succession. The vested self-interest is by far the most formidable obstacle to the realization of goal achievement in relation to comprehensive planning problems.

"Practical men" have human failings. Even the most objective architect-planner is human. It is the degree of objectivity of which one is capable of obtaining that produces the ability to anticipate these failings. Anticipation of a problem allows one time to give deliberate consideration to a number of possible solutions, one of which may eliminate the potentials for the problem to develop. The recognition of an existing problem may at least lead to a practical resolve through clairvoyance of hindsight which hopefully will prevent the same problem from reoccurring and perpetuating itself. To admit recognition not only of an existing problem but also of an anticipated one and fail to initiate action to correct the situation immediately can only be interpreted as an abdication of official and professional responsibilities and a betrayal of public trust.
The decision myth

For years, architects and urban designers have alluded to a "decision-making process" as the basis for evaluating the form-giving criteria which called their concrete manifestations into being. In the search for methodology, "an increasing awareness of the disparity between basic ideologies and the resulting man-made environments has precipitated a number of serious and complicated questions for the design disciplines." In a singular statement, the primary problem in developing a design process has stemmed from the reluctance of the designers to acknowledge the fact that, regardless of the amount of information available, the basis for decision-making was often founded on pure value judgments. A concern for decision credibility has created a market for a more scientific, systems approach to problem solving. Borrowing on the fact that a systems approach assumed an involved, sophisticated process, implying deliberate decision, value judgments were immediately equated with intuition and therefore discredited. Practitioners and academicians alike have made valiant and laborious efforts to put handles on design problems by justifying solutions as "products" of a design process. This much lauded, but ill-defined, design process has, in actuality, become little more than a scape-goat for an equally overworked and sorely misunderstood cliche--that of
the decision-making process.

In his review of Christopher Alexander's book, *Notes on the Synthesis of Form*, Raymond Studer addresses himself to this theme in his concern for the complexity in design.

The designers responsible for the man-made urban environment find themselves in an increasingly awkward position as a battery of scientific and quasi-scientific disciplines systematically reveal not only the gravity of emerging man-environment problems, but the implicit complexity of them as well. As the designer struggles to get control over his fugacious domain, he finds that problems on all levels are indeed more complex than he had previously assumed. This phenomenon, together with the final breakdown of absolute ideas in this century, bares the possibility that we may have tacitly misunderstood the nature of the problem confronting us.48

The nature of the complexity is a "natural outgrowth of: more people emitting more complex behaviours; more communications; more knowledge about what is required; and more means for finding solutions."49 The architect can no longer approach a design solution in the traditional manner assuming that the physical environment he shapes is an independent variable. As our scope of knowledge as well as our scale of concern increases in moving from the well-defined limits of a set-piece building, to a group of buildings, to the making of an urban place, the architect is forced to "turn his attention to complex environmental systems."50 The importance of this change in scale is that as architects expand their domain of design from the site confined building to the environmental ramifications of large-scale functional intermixes, i.e., cities, they are charged
with the responsibility to explore "the societal context" within which they must work.51

Furthermore, any of the more radical proposals for architecture or planning are prefaced by, or embody certain fragments of theories about the future conditions of society. These fragments may include such concepts as population explosion, increase in scarcity of materials, obsolescence and conspicuous consumption, changing patterns of transportation and communications or the appearance of a leisure class that has a democratic majority. To state the problem briefly, architects and planners have been frustrated by the recognition that their work does have an effect on the future, by a consequent feeling that they must be responsible to the future, and by the disconcerting admission that they do not know the future.52

Designers are self perplexed in the realization that in dealing with the environmental milieu, theirs is a knowledge without foundation, and are hard pressed to make decisions about things they can not know as fact. The symbols of good taste do not scale up well, and public taste is tenuous, at best. Certainly, neither are adequate criteria--the origin of which is forgotten although ostensibly historical--by which to explain such practices, beliefs, institutions or natural phenomena involved in the city building process. Nor can we rely on past experience in determining urban futures. "Experience is a poor teacher. By the time one has accumulated enough of it, success or failure is no longer an issue."53 We must eliminate the need for decision-makers to suffer from many of their future errors, and insure that the "right" decision is made the first time.
FOOTNOTES


8 Ibid.


12 Ibid., p. 78.


Ibid., p. 2.


Ibid.

Ibid.

Ibid., p. 382.


Ibid., p. 272.


30 Lasswell, p. 388.


34 Ibid., p. 7.

35 Ibid., p. 11.

36 Ibid., pp. 10-11.

37 Anderson, p. 5.

38 Ibid.


50 Ibid.

51 Anderson, p. 4.

52 Ibid., p. 5.

The social engine

Consider for a moment how the decision-making process functions in terms of the social forces. Collectively, these forces comprise the institution of society which for the purpose of this investigation will be referred to as the social engine. The components of society, i.e., social pressures, economic interest, political intrigue, technological expertise, and physical intent; all make up the working parts of the institutional apparatus. The output from these component interactions, either meeting in harmony or in opposition with each other, will be considered as a product of decision which will be expected to be absorbed by the external environment. The ramifications of these externalities can be monitored for physical effect by various existing mechanical devices which can render information for input into management methods and procedures for determining and influencing the allocation of future resources. This allocation function generates the criteria for the next phase of investment which provides the economic fuel to recharge the social engine for the next cycle of production.
On the surface, the verbal description appears to be a fairly realistic, if somewhat simplistic model of how things in the real world work. However, as the following diagram (Figure 4) will show, it neglects to recognize the most critical factor in the process, that is the mechanism of control in determining the utilization of resources. It is this mechanism to which I refer as the base values, or the value set. As the regulatory element—never having been defined specifically—it has been allowed to function independently, reacting only to each problem area as an isolated case, without concern for the total effect. How can one express concern for the "quality of life," when we don't even know what constitutes the base values for questioning that level of quality? The problem, as it has been in the past, remains that of establishing a value system and responding to it.¹

The "quality of life" concept

Occasionally, in my thinking about the process of urban development and the resulting physical form, I, too, almost come to the conclusion that there really may not be an urban crisis. For a moment, lost in the viability of the building activity of today's cities, of new roads going everywhere, of the development and redevelopment of large land areas, and of the thought that man is only doing what he has always done, the scope—and the reason—of the
THE SOCIAL ENGINE

COMPONENTS OF SOCIETY

SOCIAL ECONOMICAL POLITICAL TECHNOLOGICAL PHYSICAL ETC.

MONITORING TECHNIQUES

SENSOR AND DATA BANKS DATA MANIPULATORS

TOTAL FUNCTIONAL DISPLAY OF DATA

STORE HOUSE OF KNOWLEDGE

MANAGEMENT METHODS ANALYSIS OF PROJECTION AND ALTERNATIVE STRATEGIES

Figure 4
problems evade me. And then, I hear a co-worker complain, "I'm tired of spending two hours a day in my car just getting to and from work," or a housewife say, "I wish there were a well supervised park nearby where the children could play," or a father reply, "Sure, I'd let my daughter sell Girl Scout cookies but the child down the street has been robbed twice"--and I realize man's capacity for tolerance is not infinite.

"Quality of life" has become a public concern. However, it is a post facto concern. As we look around us and realize that our life style is changing both radically and rapidly without our having much control and little if any direction over it, we indeed have cause for concern. As "livable environments" become less livable, as woodlands give way to wastelands, as once clear lakes become stagnant sewage ponds, as once natural running streams become paved drainage ditches, as transportation corridors fill to standstill capacity, as crime in the home as well as in the streets increases, the breaking point of tolerance draws near.

Some militant ecologists contend that whenever a community fails to provide a "livable environment," it is, in effect, violating the Ninth and Fourteenth Amendments to the Constitution. According to one leader in the movement, these amendments provide that "no state shall make or
enforce any law which shall abridge the privileges or immunities of citizens . . . without due process of law," and he contends that these privileges include the right to enjoy a livable environment.² Livable environments in any region are defined as the disparities between the optimum basic human values that the region can afford and the actual achievement of such values.³

"What--and who--constitutes community?" and "How good do we want to be?" are hard questions to ask of a community and nearly impossible to answer honestly. The ultimate in quality is possible. However, Utopias have never been in fashion. Man has never been willing to pay the price.

Any community, any city, any urban area, any region will only obtain the level of quality to which its inhabitants deliberately aspire. Basically there is the problem of setting limits or definition on the character of "quality" and the recognition of the real cost in terms of sacrifice in the relationships of alternate choice.

Consider, for example, what is the real worth of open space as opposed to an additional tax dollar. Just as we relate the amount of gross national product allocated to defense on a collective or national level, so shall we define the amount of tax money spent on an urban commodity at the individual level. The parallel between the amount of
personal utility of national defense an individual receives and the extent of his enjoyment of the peace and security of a woodland glade, of course, is unqualifiable, except in extremes. Because of a national commitment, one is relatively safe from foreign invasion--like it or not. From a humanistic viewpoint, it appears to be a question of to what degree are we willing to accept mass tolerance of a particular situation in terms of a general betterment for all. With respect to man's diminishing enjoyment of the minimal aspects of environment, it becomes the individual concern that perhaps "mass tolerance has reached a limit" and that the externalities of an action or policy are not measured in abstract terms of betterment, but rather in real terms of personal deprivation.

This leads to the logical, if somewhat ethereal organization of the reasons for established values. In his quest for urbanization, man has paid dearly. His real costs have been not only in what he has knowingly gained, but also in what he has unknowingly given up. Man in cities is less of an individual and more limited in contribution to his total environment by superimposed levels of harrassment. Here again, as institutions and collective dynamic forces over which man, the individual, has no control, establish parametric as well as restrictive limits on the individual's course of action, the logic for decisions
without hysteria becomes paramount.

As former President Pusey of Harvard has pointed out time and again, "we must teach man how to be, and we must learn to be, at home in control of the modern world." The attitudes generated by such concepts as "Our Town" and "Walden Pond" have only spread the institutionalization of man headlong down dead-end streets and turned the business of environmental management into a spectator sport. We are now at that point in time at which our environmental anxieties have begun to coalesce and we are forced point blank with reconciling "progress" and the quality of life.

\[\text{Wants/needs} = \text{reality}\]

The criteria of a value system is normally based on what it is supposed to do, specifically, achieve the gratification of some desire. If we take desire to equal a preferred want in context with a reference set of professed needs realized in terms of economic affordability, we are left with a final product called "reality." The condition of reality is, of course, a dynamic or constantly changing state as opposed to a fixed or static state. The rapidity with which the state changes hinges on the time-lapse factor between the development of technology and the sophisticated intelligence of a community in its acceptance and application of that technology.
An example of the temporal condition of reality as it relates to a state of technology and the effects that technology has on the level of the quality of life in a regional context is better understood by an analysis of the "trade-off" factors in a specific example drawn from the case study in Chapter I. The concept of a "trade-off" function is derived from the recognition that not only is there an apparent or real cost in doing something but also there exists a hidden cost in doing precisely that same thing as opposed to doing something else. This idea is discussed further in the next section as diversity's cost and the sacrifice principle. It is important to note the concept of the "trade-off" factors of alternative choice here, however, for it is critical to the understanding in trying to equate the units of need with the units of want, where the "real" cost of a desire includes not only the obvious monetary expense but also everything else that that same money might have purchased. In the case study we are faced with making a "trade-off" decision about the extent to which we will allow Montgomery County to develop. We realize that at some point, under the presently accepted techniques of land development we may jeopardize the existing as well as any future development in the City of Houston due to critical subsidence. Under present conditions any development within the watershed directly affects the quantity as well as the quality of the water that is introduced into the recharge area.
Current standard practices for handling the elimination of the liquid waters of urbanization—effluence, runoff and storm drainage—necessitate additional expenses for sewers, topographical changes, and drainage ditches, as well as reducing the quantity of the water discharged directly into the aquifer outcrop.

We are able to make a human decision and to state emphatically that we do not want Houston to sink. When it can be proven that a given number of undeveloped acres would maintain the natural recharge requirement for the aquifer to meet groundwater withdrawal requirement without incurring an increase in subsidence, then we could establish a cardinal numerical unit as the minimum amount of "necessity" required to satisfy our want level. Under present conditions of technological development, assume the required number was equal to fifty per cent of the land area in Montgomery County. A range of from 0 to 50 per cent is now established as a safe working limit. Any development outside this limit will be in conflict with the community's declared want.

In structuring a mathematical equation to manipulate the factors of "trade-off," consideration must be directed to a self-correcting variable which would take into account major technological changes. For instance, the recently announced filter system developed by Baylor College of Medicine is capable of producing absolutely pure drinking water.
The application of this filter system as a mandatory component for all construction within the watershed would significantly affect the previous 50 per cent land utilization limit. While the recycling of this water as a drinking product would naturally be subjected to psychological attitudinal challenge--despite the fact that its purity is equivalent to triple-distilled water--the end product could be used for lawn irrigation and discharged directly into the outcrop area, completing its natural cycling process as opposed to being piped or channeled off as an effluent pollutant. A similar requirement would have strong revisional effects on land-use policy in terms of density, function and patterning. The level or quality of the conditional state will vary from community to community as the pursuit of individual wants is recognized in a specific area. It is the conscious recognition of a community's wants in relation to a known condition of required needs that must be accounted for in order to obtain a measurable level of the quality of life within the environment.

If we could have everything we wanted in an environment, assuming we knew what we wanted, as well as have everything necessary to sustain the total system at the ultimate level of want, Utopia would be the result, at least in physical terms. This, obviously, is predicated on the heroic assumptions that we could afford the ultimate "conditional set" and would spend the money not only for the realization
of this "set," but also for its maintenance. It does not take an urban genius to surmise from these two paragraphs why there is no Utopia. The cleverness comes when one tries to meet the challenge to raise the level of quality off rock bottom.

The level of quality that any community achieves is the result of the summation of the total effects of all interactions indigenous to the community. This level of achievement represents a multiplicity of acceptable states of compromise. It does not necessarily imply that all states of compromise are compatible, however. In actuality, there is a propensity for a high degree of conflict to exist which is impossible to resolve in physical terms. Therefore, in making decisions about a physical solution concerning environmental design, it would appear critical to try to resolve as many of the conflict situations as possible prior to the establishment of a fixed level of compromise.

As an approach for coming to terms with a set of compromise conditions, let us consider that we can structure two known scales of determinants with rankings based on our degree of knowledge, similar to the array depicted in Figure 3 on page 39. The first scale, which will represent all of the known or fixed components required for the achievement of a given goal, will be called the hierarchy of necessity. At the base of this scale, which for the time being will remain unweighted, are placed those determinants about which
the ultimate amount of information is known.

On the second scale, which we will call the hierarchy of desire, are reflected the wants and attitudes of a given community in terms of the importance or priority it places on the achievement of a stated goal. This scale compares to the variable determinant in the right-hand column of Figure 3, page 39. The wants at the base of this scale would be those values most commonly shared by the total community. These wants would also reflect the strongest commitment to the realization of a unit of need on the scale of necessity—-with a minimum amount of conflict of interest.

When these two scales, the hierarchy of necessities and the hierarchy of desires, are interfaced, a level of compatibility between the two will stabilize (possibly within a range of sets) somewhere on the scale of flexibility. If we consider this scale of flexibility as an indicator of the level of quality obtained we can use it as a measure of the conditions of reality. This level or locus of equilibrium within a hierarchy of possible states on the reality scale represents the state for a particular point in time. It is the results of all of the community's need values realized in terms of its want values. In this concept the word need is no longer a "professed" need, i.e., a goal, implying a higher degree of want, but is used denotatively to mean "a unit of necessity," without which some predictable condition of deprivation is incurred. The concept implies
that there is a hierarchical counterpoint at which the level of \textit{wants} no longer versus the requirement of \textit{needs} and the condition of conflict is resolved.

If, in order to have the ultimate in a livable environment, a community requires a given number of units of \textit{need} and the common utility for an ultimate in a livable environment is such that there is no alternative for anything less than the realization of that given number, then the community's value system is in equilibrium only when it commits its \textit{want} values to that same number and achieves an optimum in the level of quality.

However, if our level of \textit{needs} remains at the aforementioned given number as a known mandatory requirement for the achievement of a specific goal and we decide that as a community our mutual utility for a commitment to that goal is something less than equal to its need requirement within the hierarchy of \textit{want}, then we have reduced the level of quality obtainable on the hierarchy of reality scale to an equilibrium point of something less than an optimum condition.

Conversely, if our priorities were such that on the hierarchy of necessity scale, for some given commodity we only required one unit of \textit{need}, but on the hierarchy of \textit{wants} scale we desired a utility of more than one unit for that "need," a condition could be created which would be potentially conducive to the raising of the level of quality that might be achieved within the hierarchy of reality for
that particular "set" of influences.

Diagramatically it is difficult to represent clearly how the stabilization of the equilibrium point might be achieved, for we are dealing with a multiplicity of inter-related variables. In all probability, it is questionable to assume that a straight-line relationship between wants, needs and reality actually exists. This concern is expressed with reference to Robbins' example on page 36 of defining one's degree of preference. For each value under consideration, however, there is a parametric or exponential relationship within which a range of desire could be weighted and assigned a cardinal value. This range relationship might be better represented by a topographical depiction.

Returning to the aforementioned concerns for a value base upon which to make a value judgement--openly and honestly--I would like to pose several examples of how the establishment of a value set might be handled. These examples are not offered for the sake of argument, which I am certain they will generate, but more importantly as a point of departure for developing a proposal "we can live with." The first example will temper our approach. For the purpose of illustration I am going to arbitrarily assign a scale of cardinal values from 0 to 10 to the hierarchical scales previously discussed. These numbers represent a range rating more than an absolute integer in actuality. Concurrently, the levels of accomplishment arrayed as the degree
of refinement in the achievement of a specific goal represent my own order of importance and should not be misinterpreted as the complete scope of all possibilities.

Pretend for a moment that we can so define a "commodity" in context with its overall relationship to the state of well-being of a given community. In order to put the importance of this "commodity," which we will call "need" in perspective, we will take as given the known determinant that the presence of commodity "need" is critical for the continuance of all life supporting functions. It is also known through biological and chemical experiments that the absolute minimum amount of the commodity "need" as a fixed determinant of the life/death alternative is equivalent to one cardinal unit on the hierarchy of needs scale. Any less than this amount results in the total obliteration of all life processes as we know them today. This state of reality is depicted in Figure 5.

Therefore, we can safely assume that the minimum level of utility we will tolerate on the hierarchy of wants scale would be such as to produce a cardinal amount of "need" somewhere above the level of one on the hierarchy of needs scale. For base value number one, we must decide how much of a commitment we desire to make to the preservation of commodity "need" in order to insure life. The answer, at first, appears to be quite clear cut--for there is no
real alternative. We must have at least one util of "need" or die.

The crucial question now becomes determining at what point will we establish our commitment to base value number one in order to insure "quality" of life? Here we are faced with the task of finding--if not the point of equilibrium--at least a range of acceptance which we will tolerate, both as individuals and as a community. Collectively, we may feel that the necessity for commodity "need" is so great as to warrant a level reading of 10 on the wants scale, so that in terms of the absolute minimum cardinal amount on the needs scale, the "quality" of life in reality is around 5.50 as the minimum we are willing to accept (see
Figure 6).

![Diagram of Hierarchy of Needs and Hierarchy of Wants](image)

**Ultimate in level of quality**

<table>
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<th>Maximum amount</th>
<th>10</th>
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<th>8</th>
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Hierarchy of Needs (necessities) | Hierarchy of Reality (Desires) | Hierarchy of Wants (Desires)

Figure 6

We now have the option to increase this quality level. If we decide that 10 is not only the maximum obtainable on the hierarchy of wants scale but also the minimum level we will accept, then we must express our preference, revealing a stronger desire in terms of priorities than the minimum straight-line relationship curve would indicate. The resulting conflict of resource allocation is shown in Figure 7.

The conflict in our goal statement can be resolved. Our needs are obviously out of phase with our wants. When we are willing, and knowledgeable enough, to make this
statement, we establish a cardinal value for the commodity "need" which all future decisions must take into account. This cardinal number now becomes the value set for Base Value Number 1--for that is the reference category for any
question concerning the life/death relationship. Having set the level of value at this numerical worth we now have a known established determinant against which violation of this value can be measured. Any action which can be proven to reduce the quantity of commodity "need" in the environment, thus causing a lowering of the level of optimal quality, can not be tolerated by the community without a predictable sacrifice.

Before proceeding to the next example, I wish to elaborate several points which have been underlying but important reoccurring themes, intrinsic if not explicit in my discussion of values and the decision-making process. First, in the illustration of Figure 7, the possible conflict between wants and needs and the degree of tolerance of that conflict will depend on the issue under consideration. Of course, as our commitment toward a goal becomes more universally shared, the level on the hierarchy of needs scale rises; returning the curve plot to a straight-line. However, this is incremental decision-making at its lowest order, and is precisely what I am trying to avoid. I do recognize that base values can be grouped in categories of sensitivity sets. As we become more aware of identifiable critical factors, over time, our worth of "need" of certain base values will change. As our values change there is a sliding-scale relationship between
sensitivity sets which may necessitate the re-ordering of our base value priorities. Within a range of constraint, we may elect to employ law as a means of setting limits, defining a framework for the reshuffling of base values. Having quantified as well as qualified these values for a point in time, we are now in a position to scrutinize them in anticipation of change, eliminating crisis reaction and inadvertent design in favor of responsive decisions of deliberate choice.

Diversity's cost and the sacrifice principle

If, and admittedly it is a big "if," we are going to establish constraints on the "greed factor" that will have any measure of credence on urban development and the resulting physical form, urban designers are going to have to show better reasoning for the limits they propose than just blanketing their justifications in the "for health, safety, and welfare of the general good" syndrome. The success of balancing an ecosystem and economic constraints, under our present system of a democratic society, will be measured in the one unit all members of the society understand well—that prime mover of the social engine—hard, cold cash. Paramount in establishing "the cost" of diversity is the reoccurring problem of setting limits, or at least definition ranges, on the character of "quality" and the inherent
relationships of alternative choices. In other words, "society" must know what the alternative "cost" is, not only in terms of obvious benefits, but also in terms of hidden sacrifices; what is it worth; and who, in the long run, is really paying for it.

Going back to the first example on the necessity for the commodity "need" in the life/death alternative, there is probably little if any argument for our society in general about the worth of one unit of "need." In fact, if 1.1 units of "need" cost 100 per cent of the Gross National Product, we would "want" to pay the price. Likewise, if 2 units would be better, insuring "quality" sufficient to sustain human life, even at 100 per cent of G.N.P. the cost would be worth it (see Figure 8).

<table>
<thead>
<tr>
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<th>% GNP</th>
<th>Max. amt.</th>
<th>Max. util.</th>
<th>% GNP</th>
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*II/N* = Hierarchy of Needs; *II/R* = Hierarchy of Reality; *II/W* = Hierarchy of Wants

Figure 8
However, realizing that it only takes 20 per cent of the G.N.P. to reach a level at which the quality would be sufficient to sustain human life, obviously our utility for commodity "need" may fall to a level of want where preventive medicine will prevail--between the 5.5 level and the 6 points level where most sickness is eradicated on the hierarchy of needs scale (see Figure 9).

Without some individual, or group of individuals, within "the society" giving up an additional unit of G.N.P. all possible states above unit 6 are outside the realm of obtainment. While dealing at this "level of abstraction," I would like to interject two statements on the composition of "society" for argument stabilization. The first is from an economist; the second, from a behavioral scientist. This is done at the risk of incurring the wrath of both disciplines; however, it will help to clarify the polarity of thought with which one must contend in the assignment of values, in terms of well-being.

For any attempt to apply the benefit principle generally as a standard in allocating taxes, an appropriate epitaph can be found in a comment by John Stuart Mill: to assert that individuals receive significantly different benefits from living in a particular society is in effect to assert that there is something seriously wrong with that society.6

America is faced, not simply with an urban crisis, but with a grand experiment in human community: can we create a society which recognizes the dignity of diverse culture patterns? Can we renew our institutions so they are truely human with the full realization that there are a variety of ways to be human?7
Figure 9

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<th>GNP</th>
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Level of Quality

Degree of Refinement in Goal Achievement

- 100 discovery of cure for common cold
- 90 guaranteed well-being for all
- 80 extension of life span to 90
- 70 advanced medical research
- 60 most sickness eradicated
- 50 preventive medicine (vac.)
- 40 plagues & epidemics
- 30 widespread diseases
- 20 quality sufficient to sustain human life
- 10 all life stops
- 0 void
Now, let us turn to the specificities of urban design and the application of this base value approach to design logic with reference to the example of the life/death alternative. Accept as given the fact that the preservation of the commodity "need" requires a continual renewal in an established amount of the elements carbon, nitrogen, oxygen and other essential chemicals into the atmosphere. To be effective we will have to assume a level of sophistication has been reached in our methodology's development. The "state of the art" compels us to "accept the proposition that nature is a process, that it is interacting, that it responds to laws, representing values and opportunities for human use with certain limitations and even prohibitions to certain of these."\(^8\) This is a very safe assumption to make, for the scientific knowledge of the biogenchemical cycles has been available since the nineteenth century.\(^9\)

Energy from the sun is constantly entering and passing through the Earth's ecosystems. But our ecosystems have no similar extraterrestrial source of the carbon, nitrogen, potassium, and sulfur, and many other substances that are required for life. These substances [commodities] must be continually recycled through the ecosystem if the ecosystem is to persist.\(^10\)

Consider the cycling process of one of the essential elements: carbon.

Carbon is the basic constituent of all the large molecules characteristic of living beings. In a real sense life on Earth is "carbon-based"; life is possible only because of the properties of this element. The major reservoir of carbon is the gas carbon dioxide (\(\text{CO}_2\)), which occurs in the atmosphere of our planet and
in solution in its waters. . . . [T]he process of photosynthesis forms the primary pathway by which carbon (as CO₂) is withdrawn from the carbon dioxide "pool" and is used by plants to build carbohydrates and other organic compounds. These compounds transfer the carbon to herbivores, which eat the plants. When herbivores are eaten by carnivores, the carbon moves further along the food chain. Both plants and animals extract energy from these organic compounds by the complex biochemical process called cellular respiration. Photosynthesis is the process by which energy from the sun is used to form the bonds of chemical energy that hold organic molecules together. The inorganic raw materials used in photosynthesis are CO₂ and water. Oxygen, which is released into the atmosphere, is one of its most important by-products. In respiration, which occurs in both plants and animals, the organic molecules are broken down by oxidation (a slow combustion), and the energy of their chemical bonds is extracted. The end products of respiration are water and carbon dioxide.

Thus an essential part of the carbon cycle is the movement of carbon molecules from the pool of CO₂ in air and water to plants and animals further up the food chain. From plants and animals at various positions along the chain, respiration returns CO₂ to this pool. Carbon is also returned to the pool through the agency of the bacteria and fungi that cause decay. These microorganisms serve as the ultimate link in food chains, reducing the complex carbon-containing molecules of dead plant and animal matter, and animal wastes, to their simple components.

In order to keep the mathematics as understandable as possible, I will "assign" weights instead of "real" values to illustrate how the carbon-oxygen cycle might be used as a basis for establishing a base value about urban development and the resulting physical form. These "weights" can be proven biologically that a tree, of a specific variety, with a trunk diameter of X inches can convert through the carbon-oxygen cycle of photosynthesis Y units of carbon compounds into Z units of oxygen—every hour, based on a
10-hour period.

The facts can also be proven chemically that an automobile going $\text{A}$ miles an hour produces $\text{Y}$ units of carbon compounds (carbon monoxide) consuming $\text{Z}$ units of oxygen—creating among other things, smog. It follows, therefore, that if we are going to build a highway which carries an average of 100 cars an hour during this same 10-hour period at a speed of $\text{A}$ miles per hour, we have produced 1000 ($\text{Y}$) units of carbon compounds and consumed 1000 ($\text{Z}$) units of oxygen. To rebalance this segment of "environment" it would appear logical that the urban planner could now safely make several statements about the physical order of land-use.

This road segment from point $\text{O}$ to point $\text{D}$ is going to cost 1000 trees planted along the roadside from $\text{O}$ to $\text{D}$. Moreover, for the trees to live, they will require 100 square feet each of unencumbered "growing room" for the food, water, air and light cycles. Therefore, 100,000 square feet of open space for planting between $\text{O}$ and $\text{D}$ is required (see Figure 10).

We have now established a "need" in terms of a "necessity," and can legitimately make the "need" known in terms of a 100 foot deep planting setback with a minimum number of trees required. This minimum standard, in turn, has very strong effects on the physical structures built along this road from point $\text{O}$ to point $\text{D}$. 
1. Restrictive land-use is based on "natural" as well as a positive pattern of development.

2. Building siting acquires a new responsiveness, i.e., natural barriers to circulation.

3. The effects of the wooded sites may be realized in the materials used in project construction, i.e., more glass is now practical due to natural sun-shading--producing the reduction of heat loss, which, in turn, lowers air conditioning cost.

4. The possibility of opening interior spaces to the daylight with outside views can be considered for the psychological impact on a more workable or livable environment.

5. Etc., etc., infinity.

Ordering priorities: techniques of management

The extent to which those concerned with acting
deliberately in creating livable environments can expand this list of "effect" relationships will only be limited by their ability to think manipulatively. If the architect is going to expand the scale of the project he endeavors to handle, then "architectural education" itself may come under scrutiny. The education of "the architect" is no longer a patient search through the pages of P.A.

Assuming it is still worth the effort to try to effectuate a "livable environment," knowing as we do now what we're up against, we are faced with a moment of truth. At the scale of the world, any "decider" is dealing with a movable target. In order to "improve his aim" at the scale of physical form and urban civil systems, the architect/planner will have to become a highly sophisticated bookkeeper. His first major design problem might well be the development of an environmental accounting system as required to handle the base value manipulation.

In defense of the architect, it is not he alone who is responsible for the urban problems at the city scale. But as the "designer" of the urban forms constrictive thinking which does not recognize the psychological as well as the physical well-being of the users can not be tolerated. We have all admitted--architects, urban designers, politicians, private developers--that the "management of our urban environment is one of the most critical problems facing
urban America in the latter half of the twentieth century. Yet a resolution of this problem requires attention not only to the substantive content of controls over land use and re-use, but to the governmental structure within which these controls are exercised.\textsuperscript{12}

The architect/planner, working within the present system, is fast becoming just one more uncontrollable variable adding to the "quality of the mess" man has made. The rapidity of growth, the character of change, the blighting influences, the new mobility and the changing patterns of life style, have all had their turns at undermining any of the disciplines that devote concerns to "society." As Lewis Mumford has pointed out, "the destruction of the city has been caused [among other things] by the acceleration of growth in the suburbs. Not only is suburbia anti-city, but it is also anti-community."\textsuperscript{13}

The truth or myth of this statement is not the issue here. There are many "kinds" of "community." To criticize suburbia because it doesn't fulfill the criteria of "community" as we know it in an urban case is to criticize it out of context with its design constraints and represents the epitome of twisted logic. Now, if we scrutinize those criteria of suburbia with which we are in conflict, resolution of a problem may be in the making. How applicable is our second example as a design determinant that might be
used in changing the attitudes about suburban physical form and reinforcing a more rewarding concept of "community"?

Consider once more what we know about the thrust of urban development in Montgomery County in context with the value sets developed in the "carbon cycle" study as a means for evaluating the real worth of open space.

We have accounted for 10 per cent of Montgomery County lands as permanent open space assigned to national forests and water acreage. The majority of this area is in the northern part of the county. The remainder of the county is subject to urbanization. Unrestricted priority of development will likely take place along the urban fringe, "extending along the periphery with increased density at the expense of the existing open space. This growth as we have seen to date, is totally unresponsive to natural processes and their values, and as a result--[not] unlike other facilities--open space is most abundant where people are scarcest."^{14}

Optimally, one would wish for two systems within the metropolitan region--one the pattern of natural processes preserved in open space, the other the pattern of urban development. If these were interfused, one could satisfy the provision of open space for the population. The present method of growth continuously preempts the edge, causing the open space to recede from the population center.^{15}

This might be controlled in several ways. As land is planned for development, the quality of the natural amenities is inventoried. The same approach to road
building is utilized as advocated in the "carbon cycle" case study, with the additional stipulations that the removal of any trees would be countered by the replanting of the equivalent number necessary according to type, age, and size, to re-balance the natural state. Planned planting plots or ribbons of greenways could be incorporated into the overall development, creating parks and playways as linkages or boundaries between and around the built-forms of development. The conclusiveness of planting plots, i.e., parks, to cluster oriented complexes of various scales and functions would approach the assignment of density and land-use on a "capacity for accommodation" basis. Here renewed interest in "community" might stand a chance for survival. In the traditional approach, a greenway belt circumscribing the city only reinforced the attitudes of "the inside" and "the outside," or set standards were developed for large land blocks that became a fortress. "Rather than propose a blanket standard of open space, we wish to find discrete aspects of natural processes that carry their own values and prohibitions: it is from these that open space should be selected, it is these that should provide the pattern, not only of metropolitan open space, but also the positive pattern of development." Applied land-use restrictions approached in this fashion would no longer be in valid conflict with the cost and freedom syndrome of the
The questioning of "values" throughout this thesis demands a token investigation of the overall framework within which these "values" function. While I do not intend to take "democracy" to task, I do recognize the problem of imposing land-use controls is fraught with implications of the violation of personal freedom. However, considering the long-range effect of unbridled land abuse, to my way of thinking freedom is a preference for certain kinds of ignorance.17

In his thesis on the process of land-use control as the determinance of urban form, Zuber proposed that "the inter-relationship between land-use restriction and freedom can become clear if the concept of 'freedom' itself is redefined, or at least limited in scope." Freedom or liberty, according to Allison Dunham, professor of law at the University of Chicago, may be defined in terms of man's knowledge of law and its bearing upon his possibility to direct that knowledge to the achievement of his desired ends, rather, than as man's complete and unlimited freedom to do what he pleases regardless of the ramifications of his action.18

The problem of liberty or freedom in relation to planning is the inability of a property owner to anticipate the restraints which are to be placed upon him. As Maitland, the great legal historian, said, "Known general laws, however bad, interfere less with freedom than decisions based on no previously known rule."19

Ordering priorities is no longer a rhetorical question of "which came first, the chicken or the egg?" If the architect/planner is going to maintain any effectiveness whatsoever in dealing with complex systems, then he is
going to have to become a retailer of "physical environment" and learn how to merchandise the concept as well as the products of urban form. It has become clear that when the environment is taken as a point of reference, complex systems become counterintuitive. "They give indications that suggest corrective action which will often be ineffective or even adverse in its results."\(^{20}\)

To make matters still worse, the complex system is even more deceptive than merely hiding causes. In the complex system, when we look for a cause near in time and space to a symptom, we usually find what appears to be a plausible cause. But it is usually not the cause. The complex system presents apparent causes that are in fact coincident symptoms. The high degree of time correlation between variables in complex systems can lead us to make cause-and-effect associations between variables that are simply moving together as part of the total dynamic behavior of the system. Conditioned by our training in simple systems, we apply the same intuition to complex systems and are led into error. As a result we treat symptoms, not causes. The outcome lies between ineffective and detrimental.\(^{21}\)

Consequently we as "deciders" are faced with making crisis decisions creating design by default.
FOOTNOTES


8McHarg, p. 7.

9Ibid., p. 56.


13Ibid.

14McHarg, p. 57.

15Ibid.
16 Ibid.


21 Ibid., pp. 9-10.
A proposal to a problem

In order to evaluate the applicability of the base value approach to effectuating decisions about urban design, reconsider the case study of Montgomery County in its ecological context with the Houston region. We have substantiated Montgomery County's propensity for subjugation by a rapid urbanizing process which will consume large acreages of land indiscriminately. Precisely what effects this uncontrolled form of urbanization will have on the physical and psychological balances of the land and the people over an extended period of time has not been catalogued. In an effort to come to terms with the full gamut ramifications of those problem areas we can anticipate, we must begin by establishing the base value inter-relations for subsystem optimization.

Since this particular approach has never been explored by a comprehensive, co-ordinated scientific study directed to establish fixed determinants for specific application to physical form control, I will correlate only those examples previously discussed in this thesis. From observation it is evident that most of the urban development
in Montgomery County will take place within the primary recharge area of the Principal Aquifer outcrop, dramatically redirecting its natural ability to function properly. The example of One Shell Plaza sinking into the sunset as a result of this development is, of course, one of extreme. However, it is not outside the realm of possibility, either. The consequences of subsidence in the Houston region have been well documented. The continual production of groundwater will be accompanied by continual subsidence if the source of recharge and the points of extraction are not conscientiously managed. The principal effects of earth movements may be divided into three categories for study:

1. effects related to loss of surface elevation
2. effects related to a change in surface slope
3. effects related to vertical displacement along active surface faults, to the extent that these are caused by water level decline.

As described in following paragraphs, many of the effects are undesirable but with varying degrees of importance; some may be beneficial. Some of the effects are indisputably the result of water level decline, whereas others may have other contributory causes. Perhaps the most significant consequence of subsidence in the Houston area has been the loss of elevation above sea level. Following are some examples of this type of effect:

(a) Low-lying lands adjacent to drainage ways, including the Houston Ship Channel, and the low-lying lands adjacent to Galveston Bay on the east side of Harris County are naturally subject to flooding, especially when hurricane tides raise the level of Galveston Bay. Each increment of subsidence in such locations has enlarged the area subject to flooding.

(b) Dock structures along the ship channel have experienced a loss of up to 5 ft. of freeboard, with some negative effect on the utility of
these structures.

(c) The ship channel itself has benefited from an effective increase in channel depth, thereby reducing required dredging.

(d) Casings for water, gas and oil wells which penetrate to depths below the subsiding formations have been subjected to compression loads as the soil adjacent to the casings moved downward. There are numerous examples where the ground surface has subsided more than the wellhead, causing the wellhead to protrude above ground surface. There are other cases where the downward force of the subsiding soil has caused collapse of well casings.

(e) Sinking of survey bench marks, including USGS monuments, has caused complications in performing long-distance level surveys which must extend over a long period of time, and in preparing the many engineering designs which require such surveys.1

An equally important effect of subsidence is classified as changes in surface slopes. The most pronounced cases of this have occurred in a general tilting of the land surface in the Pasadena-Baytown area.

(a) West Canal, which carries water from Lake Houston to the Houston Water Purification Plant, located just north of Pasadena, has experienced a favorable increase in slope; this increase in slope was about 0.5 ft. per 1000 ft. near the south end of the canal in 1964.

(b) The South Houston-southern Pasadena area, which naturally drains to the southeast, has experienced somewhat poorer drainage because of general tilting of the surface to the north; this adverse change in slope was in the order of 0.05 ft. per 1000 ft. in 1964.

These effects are clearly minor because of the small magnitude of slope change—about five thousandths of one percent. Steeper slopes—up to four hundredths of one percent—have occurred in some parts of the Pasadena-Baytown area but have not been beneficial to drainage.

Local slope changes, closely adjacent to small, heavily pumped well fields, may be severe enough to produce adverse effects. For example, in the industrial area of nearby Texas City, clogging of sewer and
drainage lines was reported by Lockwood (1954) to have accompanied subsidence when a slope change of as much as 1.6 ft. per 1000 ft. occurred prior to 1948.2

A third case of critical subsidence occurs in surface faulting. Monitoring of surface faulting effects are obvious through engineering studies.

Within the Houston area are numerous active surface faults which are readily evident from vertical displacements of roadways and other pavements. It has been asserted or strongly suggested in earlier publications that contemporary vertical movement of these faults is either a direct consequence of subsidence or, together with subsidence, a direct consequence of water level declines. Acceptance of this relationship means that any breakage of pavements, structural foundations, buried pipelines and the like that can be attributed to fault movement is, therefore, attributable also to subsidence or to water level decline. Evidence exists, on the other hand, that the surface faults are manifestations of deepseated faults whose origin lies far back in geologic time, which raises a question as to whether, or to what extent, current fault movement is related to groundwater production. Because of the major significance of the surface faults and their possible connection to groundwater production, this general subject is examined in detail in the following section of this report.

Active faults affecting the land surface in the Houston area are indicated commonly by four kinds of evidence:

1. pavement breaks - vertical displacement across fractures in the pavement of streets, highways and airport runways.
2. topographic scarps - abrupt steepening of land slope along a more-or-less continuous belt.
3. drainage anomalies - peculiarities in the land drainage pattern, such as extraordinarily straight segments and sharp right-angle bends in drainage courses.
4. linears - fairly straight, sharp lines of contact between areas of contrasting tone or texture on ordinary aerial photographs.

In the above list, the different kinds of evidence are given in order of decreasing conclusiveness, the pavement breaks being absolutely conclusive under reasonably favorable circumstances and the linears being
typically inconclusive except under unusually favorable conditions. Individual occurrences of each kind of fault evidence range from the obvious to the obscure, and considerable geologic experience is necessary for recognition of the last three criteria. Consequently, the presence of more than one type of surface evidence is of substantial benefit in establishing unequivocally the presence of a fault.

... In all, ... the locations of 39 fault traces totaling about 100 lineal miles [have been identified]. Primary evidence for these faults, consistent with the preceding evaluation of criteria, consists of more than 160 observed pavement breaks at fault intersections with streets and highways. 3

The locations of nine of these elevation changes are depicted in the graphs on pages 99 and 100, which indicate the faulting signature for the particular dates stated for each of the pavement profiles.

Even with this limited information as background, the planner of land-use for Montgomery County is placed in a position (along with his other problems) of having to decide whether or not he will be directly responsible for letting Houston sink. If he could catalogue his concern for decisions, i.e., base values, the planner might be able to establish a position for action justification. With reference to the question of the indiscriminate development of Montgomery County, it follows:
1. **INDISCRIMINATE DEVELOPMENT OF MONTGOMERY COUNTY**

   **HOUSTON AREA SUBSIDENCE**

   Among other things

   **GOAL OF REALITY**

   Prevent further subsidence in region

2. **INDISCRIMINATE DEVELOPMENT OF MONTGOMERY COUNTY**

   **LOSS OF WELL LOCATED OPEN SPACE**

   **GOAL OF REALITY**

   Preserve natural open space in close proximity to user

3. **INDISCRIMINATE DEVELOPMENT OF MONTGOMERY COUNTY**

   **CAPACITY OVERLOAD OF SEGMENTS OF EXISTING ROAD NETWORK**

   **GOAL OF REALITY**

   Restrict access at high density built-up areas

4. **INDISCRIMINATE DEVELOPMENT OF MONTGOMERY COUNTY**

   **ELIMINATION OF CRITICALLY NECESSARY NATURAL RECYCLING PROCESSES FOR WASTE PRODUCT RESOURCE POOL**

   **GOAL OF REALITY**

   Augment cyclatory elements where natural capacity or function threatened or deficient

These four components have been selected as an elemental hierarchy of a singular problem. If, in component one, our utility for the prevention of future subsidence of the Houston area is such that we do not elect to limit
VERTICAL DISPLACEMENT OF PAVEMENT SURFACE, FEET

Fault No. 3 - Almeda-Genoa Road, 1.7 miles West of Gulf Freeway

Fault No. 4 - Gulf Fwy., S Southbound Lane, 1.3 miles South of F.M. 1959

Fault No. 10 - Spencer Highway, 0.3 miles West of Underwood Road

Fault No. 11 - La Porte Road, 0.2 miles East of Battleground Road

Fault No. 16 - Katy Road, 0.4 miles East of I-610

Horizontal Scale - Feet

Figure 11
VERTICAL DISPLACEMENT OF PAVEMENT SURFACE, FEET

Fault No. 17 - Hempstead Road, 0.7 miles east of I-610

Fault No. 24 - Wallisville Road, 0.7 miles east of I-610

Fault No. 25 - Beaumont Highway, 0.6 miles east of McCarty Road

Fault No. 29 - Market Street, Northwest of Baytown, less than 0.1 miles north of North Street

Horizontal Scale - Feet

Figure 12
development in the aquifer outcrop we must do so knowing that even at the 1965 rate of withdrawal, the piezometric level was projected to fall an estimated additional twenty-five feet. It was suggested in the engineering studies at that time that consideration be given to the relocation of the 180 existing wells into areas not subject to rapid urbanization, some of these locations being as far away as Hempstead and Huntsville.

Assume we make the decision that the residents of the region will not pay the "cost" for well relocations. Based on projected daily demands we can establish the amount of raw land necessary to recharge the aquifer within the existing limits of tolerance. (Note, this does not take into account future populations in excess of a certain limit. If these tolerances are to be approached, then advanced mechanical water treatment plants for use on an individual unit basis must be considered.) Now, we must establish our utility for indiscriminancy within a known framework (see Figure 13). We desire no further subsidence; the minimum level of "need" for natural land that will satiate our professed desire is five units.

Now consider component number two--the loss of conveniently located open space. We now designate those lands most critical to the aquifer recharge process and restrict them from development. However, compatible development is
encouraged to utilize the adjacent acreage, following, of course, a full range use evaluation procedure similar to the "carbon-cycle" study.

Applying the same approach to component number three--the capacity overloads on existing road networks--we control location density in confined nodes distributed along secondary and minor street networks which can be so designed in anticipation of maximum traffic volumes as to eliminate capacity buildups. With component number four, the ecological balancing approach of the "carbon cycle" study can again be applied, this time in a co-ordinated effort to augment any of the aquifer recharge area through which a road might run; as a means of increasing tree density in a buffer...
zone between non-compatible use areas; and as an inducement to general land economic improvement.

As we perfect our approach in the optimization of subsystem relationships, we increase the validity for the establishment of base value "sets" and further the development of definitive urbanization controls. As a point of departure, figure 14 describes "a range" of controlling agents which could well be the results of a full blown value base.

The establishment of base values

Reflecting for a moment on what I have said up to this point about the complexity of the achievement of a goal commitment, I would like to expand on the relationships of theory schism, cognitive dissonance, the human capacity to process "knowledge" and the difficulty in the establishment of base values.

In the study of ecology--and more specifically biology--the "web-theory" of natural systems has been fairly well documented. Ecological processes are so interwoven that natural environmental balances are maintained without threat of annihilation, at least among the lower orders of life. Enter man, the "thinking" animal, and things change. The introduction of the human element has been one of the most disrupting factors in the natural order of
OPTIONAL METHODS FOR IMPROVING THE QUALITY OF THE PHYSICAL ENVIRONMENT

Controlling Agents

<table>
<thead>
<tr>
<th>Scale of Reality</th>
<th>Total Control = Nationalization of the land.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unitized planning = co-ordinated local, regional, and national planning and development.</td>
</tr>
<tr>
<td></td>
<td>Strong Land-use Controls = state zoning and urbanization policy enforcement at local level, anticipated development planning, public and private development corporations.</td>
</tr>
<tr>
<td></td>
<td>General Land-use Controls = Sector and district zoning with codes to reflect comprehensive &amp; specific planning by city - private develop.</td>
</tr>
<tr>
<td></td>
<td>Minimum Controls = concept planning by cities, development by private enterprise.</td>
</tr>
<tr>
<td></td>
<td>No Control = total private ownership and private development.</td>
</tr>
</tbody>
</table>

Figure 14
"environment." The most forecastable aspect of the urban crisis is human nature, itself. Forecastable, yes; predictable, no! In the development of a philosophy of man, the "greed factor" has always been the one uncontrollable variable in establishing the ground rule of one-ups-manship, thereby complicating the union of "what is" with that of "what ought to be." One man's theory equates quite nicely to one man's practice and; therefore, there is no conflict of interest, for all "values" are in agreement. An increase in the number of men to two expands the possibilities of conflict. The addition of a third element has the potential to multiply the possibilities of conflict by some unknown exponent, creating conditions of alternative states beyond man's ability for comprehension.

Human beings are information processing systems operating largely in serial fashion, and possessing very modest computational powers in comparison with the complexity of the problems with which their environment confronts them. Their survival depends on attending selectively to that environment, and on finding satisfactory behavioral alternatives for handling those problems to which they attend.4

I fully suspect that we will never have all of the information that would be required in order to establish a balanced systems concept of value sets. A critical requirement would be the total identification of the "invisible web" of man's vested self-interest. This "invisible system" is super-imposed on the "rational order," allowing for a multiplex of open-ended channels through which the variable
determinants of "greed" can cavort uncontrolled. The necessity does exist to define this invisible system if we are ever to bring our "wants" and our "needs" into equilibrium. I am not saying that it can't be done. I am admitting that, to date, it hasn't been.

Over the continuum, man has come a long way. In his cognitive awareness of the search for "quality," he is now at that point in time where he can no longer enjoy the luxury of the pursuit of the "elusive butterfly of undefined value." Urban man must restate the question and in asking himself "how good do we want to be?", come to terms with reality in a meaningful analysis of the vested interest determinants in civil systems.

Incremental movements have brought us to this point of value definition. Elements of constraint, both tangible and intangible, have given us a basic framework for questioning these values. Law and "community pride" have coupled to produce a level of consciousness, embroiling all of the personal parameters of wealth, power, respect, well-being, skill, affection, rectitude, and enlightenment as integrated components of the social engine. However, because we don't know just what that level is, it is difficult to make an ethical justification, i.e., value judgement, on the state of the product on the physical environment.
Planners, and perhaps architects especially, have not responded well to this problem of having to act in an incompletely defined situation. Worried by the uncertainties of that problem, they have sought to find some way to justify themselves. This could be done by assuming that the physical environment shaped by the architect is the independent variable: the architect could thus propose the ideal city that would replace cities as we have known them. Once established, these ideal cities would naturally channel mankind into the good life. For this the architect had to assume a knowledge of both the good life and how this good life is formed by the physical environment. Though never fully carried through, these ideal cities have provided a justificational image for architectural and planning acts that have contributed to the shape of the environment in which we live.\(^5\)

One of the primary reasons why these plans never saw fruition is directly attributable to the limited control over the "greed factor." If it is of any consolation, perhaps the architect/planner can find solace that in the first Utopia, even God had trouble with Adam and Eve.

In what at first appears to be a self-inflicted reprimand, British architect John Weeks has stated the architect's position in dealing with the mini-environment of a hospital design.

But I see no absolute value in shape control by sets of formal convictions. I am prepared to take the deformations of the site, the contractor's available techniques, the poverty of the client, and the principles of indeterminacy itself as shape-making forces and to derive systems which will allow them to operate as shape-makers. I see no more value in one force than another. Nor can I see that to aim at completeness in an indeterminate situation is to aim high; it is simply to aim badly.\(^6\)

Again, on the subject of controls, philosophically speaking, I fear Peter Blake is justified in accusing man of
taking paradise and turning it into "God's own junkyard."/7

One "set" of values

It should be quite clear by now that man's intervention in the environment has never been and is not now controlled effectively enough to prevent an ecological succession the scale of which we have never seen before. The abandonment of cities in the past has been attributed to either fire, flood, plague, famine, or war. Never before has a civilization "quit" its cities simply because it was tired of them. Now for the first time in this nation's history, we are challenged with an appalling number of cities on the brink of financial bankruptcy. We have allowed--no--created the misallocation of resources, transferring our personal avarice and private greed to be corrected and absorbed by the externalities of the public good. Interference on the part of the designer is often referred to as "choice" as opposed to "design."

The knowledge upon which this choice is based establishes the parameters for a solution that falls somewhere between the best set and the set-set on the flexibility scale. As the degree of knowledge about the determinants increases, the sliding scale relationship concept for changing the value set becomes more valid.

The work of those architects and planners who are most concerned with designing for change set certain constraints on the near future. Even the creation of a
physical structure that was self-adopting and always in perfect harmony with rapidly changing needs would be to participate in an attitude about the future. This would be the attitude that there is nothing in society that deserves any degree of permanence—nothing that should control or break or test possible changes.

It follows that the life of "a value set" itself may be limited. This is highly plausible. When we have accomplished a catalogue of decision, then we will have a basis for choice among action alternatives. The environment makes parallel demands on the system of value judgement. "Deciders" can not make demands upon the value sets expecting the system to act intermittently.

The task of choice is to select a function—a time path for the command variables—for a given value of the path of the environmental variables (or a probability distribution of such paths) that corresponds to the maximum of the utility function.

A priority system will work satisfactorily, of course, only if the totality of occasions for high-priority action is small relative to the total action capacity of the system. . . . The standard paradigm for reasoning about decision values is the same as it is in choice models—convert the imperatives to declaratives—that is, consider a system that behaves in accordance with the imperatives. Evaluate the outcomes for that system; and compare them with the outcomes that could be expected with different decision rules.

In essence, what I have proposed is not a sacrifice of freedom for discipline, but rather freedom and discipline welded into a common criteria, so that the designer is free to create, not to destroy.
The future of probabilities

In planning for diversity and choice, the possible futures and their relations to the man-controlled environment must be directed by the "deciders" toward creating and reinforcing the multiple possibilities before man--not toward a prophesy of the future nor even toward the satisfaction in projecting the most probable future. We are going to experience growth. We are going to experience more people. We are going to experience more opportunities for problems to develop. Knowing this, will we experience the preferability-determination to eliminate problem determinants before the fact and increase the probability "quality level" of our environment?

The people and the planners can no longer afford to allow the urbanization process to proceed "at will." If the city-building process is to be responsive to the necessities of the people, "deciders" can not accept the maxim that "all that is past is prologue." It is true, "our nation is the actual sum of the attributes of each individual and of each family group. These people, alone, are responsible for our world position of strength and benevolence. But as our population becomes more dense and the frictions of urban complexity increase, the favorable aspects of our original image threaten to disappear." The future as we suspect it to be is predicated on the past. The future as
we hope it to be—as we want it to be—must be achieved deliberately, if there is to be a next foreseeable future.

**Optimal accommodations**

Whether or not we ever accomplish the next foreseeable future will depend on our capacity for balancing the so-called Base Values against the Natural Values. In the assignment of values to a base, the sacrifice principle makes several major assumptions. The first is that utility is measurable and that it is a cardinal measure. This not only deals with ordering the level of satisfaction but says how much as well. To some extent, this can be done. The second assumption maintains that interpersonal comparisons are possible. On a defined community level, this is true. The third assumption is the most questionable—that the social value of utility is the same for all. If this were so, realization of an ideal state would not be enwombed in theory.

Human nature, being what it is, prohibits any one area from being all things to all people. The development of those significant attributes which are basically sound and intrinsic to the locale—at the scale of community—are important design determinants. If, however, we are going to make decisions about the compatibility of Base Values and Natural Values, then, as "deciders," we are charged with the responsibility of bringing biological
and non-biological processes into equilibrium with the man-made environment; 'architectural' form, structure and space, are decidedly means employed to establish this equilibrium and not ends in themselves."^{12}

If "deciders" approach the utilization of land resources by recognizing the land's capacity for accommodating the necessities of both these value sets, then we are again in a position to justify restrictions. Natural-process value and its degree of intolerance will create natural orders for land use. McLarg has pointed out this order as an array of declining tolerances: flat land, forest and woodlands, steep slopes, aquifers, aquifer recharge areas, floodplains, marshes, and surface water.^{13}

The question of "fit" and the problem of "fix"

The example of the "carbon cycle" is only one of many similar exercises against which our value judgements would have to be tested. The employment of such tactics recognizes utility areas by activity and accommodation capabilities. "Consistencies in land morphology, soils, stream patterns, plant associations, wildlife habitats, and even land-use, . . . can well be examined through the concept of the physiographic region."^{14} Coupled with the technology, education, and economics of an area, fixed as well as variable design determinants for development solutions can
be established that may well redirect the whole concept of land use and physical planning as we know it today.

The concept of accommodation is not novel. The level at which we are now faced with applying the concept is. Alexander, in his Notes on the Synthesis of Form stated the problem thusly:

... every problem begins with an effort to achieve fitness between two entities; the form in question and its context. The form is the solution to the problem; the context defines the problem. In other words, when we speak of design, the real object of discussion is not form alone, but the ensemble comprising the form and its context.15

One of the biggest obstacles, even to our present efforts for co-ordinated design at the scale of "environment," is attributed to the simple observation that Americans have seldom been able to reconcile progress with quality. As the growth process has enveloped the nation, we have constructed the concrete developments without concern over the perfection of the alternatives. In our rush for solution, we have been too willing to pour before we process. The results have been a "set," but seldom the best set. Therefore, as an urbanizing area passes through the phase of population growth and internal development, it settles into an equilibrium which exhibits a set of characteristics. This state is often referred to as a "stagnant condition."16

The level of quality to which we aspire to balance
our wants and our needs must satisfy not only the question of best "fit" but also must address itself to the critical problem of being a permanent "fix." The area of concern here lies in balancing the rate of change as well as the range of change without overstepping the limits of tolerance. We must strive for physical solutions that respond to growth, change and flexibility while at the same time meeting the needs of growth, change and stability.

All concerned with city and urban design programs are deeply impressed with the thought that the requirements will change--that flexibility, if uncritically adopted, costs too much and tempts those involved not to think out their problems in advance. Within broad limits, it is possible to gauge the nature and extent of future change, discarding the concept of planning as an exercise in finite geometry in favor of a concept based on an extendable communication pattern.

The word "flexibility" is used whenever the planning of cities is discussed. Everybody accepts the need for it and large scale planner-designers endeavour to convince their clients that their plans embody such a measure of flexibility that future needs can easily be met. The word is used so much that it has become flaccid and is worthwhile considering with some care its implications if it is not to be used simply to justify indecisive planning.

Flexibility has a time, as well as a space component, to its meaning. In city design it is necessary to provide for the absolute expression, contraction, or even disappearance of whole use areas, this large scale movement taking place rarely, and as a result of a long time-scale trend. However, within the large pattern it should be possible to adjust the physical form
"immediately" so that it is susceptible to daily variations in routine without being taken apart. When working within a highly complex ecological system in which there are many unexpected consequences, the shift of emphasis from the product to the on-going process of which the product is only a part is of prime importance. Over the years of the past two decades the validity of this statement has become alarmingly clear. The wave of development that swept across the country on its initial thrust from the east coast to the west has now reversed itself. In the exposure of the backwash we are disturbed to find that in advocating our policies of rapid expansion we have sacrificed greatly living compatibility. We have sought methods to produce steel more cheaply but we have not questioned how we can produce steel and live in the same place at the same time. We have built a great city with the propensity to sink, strangled by its own ignorance of self-preservation.

The problem as understood

This thesis has tried to identify the interrelationships of urbanization and raw land development existing between the City of Houston and Montgomery County. Investigation is founded on the premise that the city has no limit, conceiving an urban area as an organic living complex set in an unlimited environment. New development, as we know
it today, is not divorced from the same ills that beset any other urban place. Some of the larger, "new community" developments profess to have "solved" the problems of "total environmental planning." But even a "new community" becomes old.

If the normal processes of stagnation and urban decay are allowed to continue in young cities that are still in good health, they too will falter. Furthermore, the process of stagnation and decay that one sees in today's urban areas will, unless preventive measures are taken, overwhelm the present healthy suburban areas. Urban difficulties are not a matter of location so much as a phase in the normal life cycle of occupied land.\textsuperscript{19}

In the approach to problem solving in complex systems, two polemics—an actions lay open. "One is to make a frontal assault with direct-action programs aimed at correcting deficiencies. A quite different approach is to alter the internal system which created the deficiencies."\textsuperscript{20} It is from this second approach that the intent and nature of this thesis has evolved. A more appropriate thesis title reflecting this proposal may well have been "A Decider's Guide for Decision-Making Concerning Urban Development and the Resulting Physical Form."

In reviewing what I have proposed in this thesis, I am reminded of the closing parable of the ant and the grasshopper that Vernon used to conclude his suggestions in The Myth and Reality of Our Urban Problems. Recognizing that the distance between what he proposed and its application may have opened up greater problems than it solved, Vernon
recounted:

The grasshopper dreads the winter months when he will have neither food nor lodging. The ant advises him to change himself into a cockroach. The grasshopper is delighted with the advice, but asks how this can be done. "I have given you the objective," says the ant. "Now you work out the details."^1

This frivolity on the part of an enlightened architect makes H. G. Wells' statement appear in higher stead with credential more valid to modulate physical design. "Human history more and more becomes a race between education and catastrophe."

To what degree we are experiencing an urban crisis in Montgomery County is past debate. To what degree there is a need to debate what we are experiencing there is the meat of the question. Rachel Carson put it this say:

I truly believe that we in this generation must come to terms with nature, and I think we are challenged as mankind has never been challenged before, to prove our maturity and mastery not of nature, but of ourselves.^22

Unlike Vernon's closing parable in his book where neither the ant nor the grasshopper were effective, the architect/planner/decider, whatever he is going to call himself, can no longer survive as an indecisive technocrat. Accordingly, the architect/urban designer/planner/decider can not leave the "details" up to someone else to solve. In the environment--as in architecture--it is the "detail" that kills you.

To be quite candid about the whole thing, I don't know if those who profess to be the manipulators of physical
form can take what I have proposed as a basis for an approach to decision-making about "the environment" and make it work. I do know, however, that we still profess to be the technocrats of the design profession concerned with physical form, and as such must be willing to try.
FOOTNOTES


2Ibid.

3Ibid.


8Anderson, p. 4.

9Simon, p. 3.


14Ibid.


18Anderson, p. 306.

19Forrester, pp. 10-11.

20Ibid., pp. 119-120.


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**WATER DISTRICTS LEGEND:**

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- Liberty County (cont.)
- Montgomery County (cont.)
- Waller County (cont.)
POPULATION DISTRIBUTION 1990
houston-galveston area council eight county region
"Our approach to the decision process is contextual and systematic. It is contextual in the sense that we are interested in locating any specific decision or flow of decisions in the total context of relevant events. It is systematic since the methods by which the context is referred to and examined are made as explicit as possible.

"Five intellectual tasks are to be performed in the process of giving contextual consideration to individual or aggregate decisions. The first task is goal clarification. After clarifying goal values we can give an explicit answer to the question "What of it?" Why bother about decisions? When our goal values are clarified, it becomes evident that we investigate decisions in order to discover the effect of decisions upon value outcomes. We characterize our goal values at some length; and the briefest way to summarize is to say that we are in favor of systems of public order in which values are widely rather than narrowly shared throughout a community. Hence we examine decisions for the purpose of illuminating the impact they have had, or can have, on the shaping and sharing of social values.

"When goals are clarified, we can describe the past (including recent events) according to their conformity to the goals as defined. It is apparent on the face that some decisions (if they have had any positive effect whatever) have influenced the social process toward (or away from) a general sharing of values. This is true, for instance, of a legislative statute prohibiting monopoly, or of a court decision dissolving a monopoly business. Many decisions cannot be satisfactorily classified, even tentatively, on the basis of the manifest content of the language used. One must wait until 'impact research' is done. Furthermore,

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we usually find that pertinent information is fragmentary and poorly representative, so that at any given moment our judgment must be expressed with reserve. Actually the first operation performed in describing a decision is to take note of its explicit features and then to judge whether they conform to previous decisions (of a similar kind) or mark a novel departure. When it is seen in historical perspective, any decision (or sequence of decisions) can be described as in some respects novel or conformist. We speak of a trend study when the chief problem is to make these historical characterizations.

"We referred to the third intellectual task when we spoke of the 'effect' or impact of a decision on values. Strictly speaking, trend study does not estimate 'effects,' but classifies events as 'consistent' or 'inconsistent' with the definitions that have been made of goal events. If shared wealth is defined as absence of monopoly, the manifest content of the sentences in an anti-monopoly statute is clearly consistent with the definition. In practice, we do not always limit ourselves to such comparatively simple operations. On the basis of available information we judge whether a statute has furthered or retarded the sharing of values. It is, however, important to distinguish between complex inferences of this type and studies that employ precise methods to reveal the influence of individual factors, or factor clusters, upon results. Economists may investigate price changes in various markets in order to assess the effect of anti-monopoly legislation or of court decisions. It is evident that we are bound to be interested in factors that account for the decisions themselves. This is more than academic curiosity. Our minds are preoccupied with the future as well as the past; if we are to make informed estimates of the future, it is important to know what variables have affected decision makers up to this time. Such scientific information is essential for predicting or controlling the future of our preferred forms of public order. We speak of the scientific task as that of explaining the influence of any variable upon another (including the feedback effect).

"When we consider the probable shape of things to come on the assumption that we will have no effect of any kind upon it, the task is one of projection. To some extent it is useful to extrapolate curves of past change into the future. But presently this calls attention to the likelihood of conflict, as when two expanding nations grow toward one another. In order to estimate the probability of the conflict, and of a given outcome, it is important to consider the existing stock of scientific knowledge."
"The fifth intellectual task is the invention and evaluation of policy alternatives. We are especially concerned with the integrity of the public order of a free society, and this includes the invention as well as the assessment of policy. In a deep sense the aim of our whole enterprise is to foster creativity on behalf of freedom. Hence we look upon the multiplication of decision seminars as a step in the direction of perfecting the intelligence function of the decision process; and especially of perfecting the relevance of the intelligence function to the furtherance of human dignity."
BIBLIOGRAPHY

Single Volume Works


Zuber, Jeri E. The Process of Land-Use Control as the

Unpublished Sources

Christy, Howard B., Jr. "C.B.D. Ecology: The Truth and
   Realities of Land Value Dynamics." Houston, Texas: Rice University Graduate Program in Urban Design, 1970. (mimeographed.)

McDougal, Myres S. (ed.). "Papers in Law, Science and

Warren, Roland L. "Abstract: Politics, Participation and

Governmental Documents


Lockwood, Andrews and Newman, Inc.; Parsons, Brinckerhoff,
   Quade and Douglas, Inc.; Wilber Smith and Associates. Phase I Comprehensive Planning for Houston-Galveston

Montgomery County Tax Records, 1970. Conroe, Texas:
   Montgomery County Court House, 1970.

Trost, Charles M. (ed.). Environmental Deficiencies of
   the Region's Living Areas: A Diagnostic Survey.

Periodicals


