Integrated Environmental Planning
James K. Lein

CHAPTER 1

The Nature of Planning

Each of us engages in the process of planning, whether it is in the context of our next vacation, our eventual retirement, or the selection of courses for our next academic term. Planning has been observed to be a fundamental human activity, and suggests an important strategy that helps us consider possible outcomes before we commit to a specific course of action (Catanese & Snyder, 1988). Yet the concept of planning and the intellectual tools that we apply in our daily lives are substantively different from how the environmental professional practices planning. When applied to the environment, planning is concerned with the problem of reconciling environmental functioning to broadly defined stakeholders, each with diverse and often conflicting interests. The goals of planning when placed into this arena and the means to achieve them can be highly uncertain, and the results of most environmental plans can be realized only after long periods of time have passed. In this chapter we will set out on our exploration of environmental planning by looking first at the intellectual tools that drive it. From here we can examine what it means to plan and how we can organize our thinking to focus our recommendations about the future in the way that is most productive. Throughout this introduction to the nature of planning, emphasis is given to the idea that planning is problem-driven, information dependent, and never an absolute or perfect answer.

Common themes and common problems

To begin our exploration of environmental planning we can examine a few hypothetical situations that help place the problem of planning and its role in society in its proper context. Above all, these examples remind us that the environment in which planning takes place is complicated by the numerous voices, issues, and opinions that must be addressed as alternatives and recommendations for the future are expressed.

If you build it, they will drive, then what?

In this first example, a land developer approaches officials in a small community with a proposal to construct a regional mall. The community sees this proposal as an important opportunity to increase employment and to encourage economic development. The necessary permits are granted and construction begins. Once the project is completed and the mall opens, the single road leading to the new facility quickly becomes congested with traffic and the need to widen this major artery to accommodate the activity generated by the mall is quickly recognized. Widening the road, however would require businesses along one side of the street to lose valuable land that is presently used for parking and product display. On the opposite side of the street, road widening would mean that a row of 15 regionally significant

trees would need to be removed. The trees are considered by many in the community to be aesthetically pleasing, and indicative of the rural small-town atmosphere that is a source of pride in the community.

In the absence of any road improvements, neighborhoods paralleling the main mall access road have noticed a steady increase in traffic as shoppers explore shortcuts to avoid traffic snarls and delays. The increased traffic elevates noise levels and introduces serious safety concerns for residents in the affected areas. Residents of these neighborhoods would like to see the mall access road improved to alleviate the traffic, noise, and safety problems. Businesses along the access street would also like a wider street, but not if it means losing front footage they need for off-street parking. Residents of the community who travel along the street leading to the mall would also like a wider road since it would reduce travel time and congestion, but many would hate to see the tree-lined street destroyed. A "save our local environment" group opposes any plan to widen the road on the grounds that it would encourage more traffic, and the loss of historically significant trees would degrade the sense of "place" in the community. They advocate greater funding for alternative forms of transportation and press civic leaders to consider more sustainable forms of land development.

As decision-makers weigh options for the future, if a mechanism had been in place that would have foretold the possibility of these consequences, a more appropriate decision could have been made that would have avoided some, if not all, of the problems that are now more difficult to resolve.

Homes on the range

Across the river, residents of a hillside housing development are concerned by a proposal to expand their subdivision. This neighborhood, comprised primarily of upper-middle income professionals, is isolated in a wooded area, quiet, surrounded by habitat native to the region. Residents in this area enjoy the proximity to open space and use this area as a local recreation resource. However, there is an intense demand for single-family housing in the region and the land area in question is extremely attractive, accessible, and well suited for the types and densities of development proposed. Construction of homes in this area would satisfy local demand, enhance the community tax base, and reduce land market pressures that have already begun to elevate rents and house prices in the region. Being somewhat isolated, the area is served only by a single two-lane road that traverses over a sequence of small ridge tops and passes by a series of houses dispersed in this historically rural area. Present residents are concerned that the addition of more homes would increase vehicle trips and increase traffic along this narrow corridor. This would lead to noise and safety problems and alter the atmosphere of this quiet rural setting. Others in the region are concerned over the loss of a valuable amenity resource that by itself provides important habitat functions for deer and other animals living in the region. Others are worried that new development cannot be accommodated by the existing water and sewage system and that inadequate water pressure may degrade the flow of fire hydrants in the area and present a very real risk to public safety. In the absence of a clear plan, the objectives and needs of the community cannot be adequately balanced by the equally important need to maintain the viability of the larger environmental system.

Down by the sea

Finally, there is the example of the community located in a coastal area popularized by summer vacation cottages, and where recreation and tourism have traditionally supported the local economy. To maintain the rural setting and atmosphere, building densities were kept purposely low and the dispersed pattern of settlement required most homes to use septic systems to treat domestic waste water. Over time, growth pressures coupled with urban encroachment emanating from the large urban center only 40 miles away have transformed this community to an ex-urban settlement well within the commuter shed of the rapidly growing metropolitan region to the north. Population now resides here year round, and because of

the widespread use of septic systems, coupled with the community's location on predominantly sandy soils with a water table close to the surface, serious water quality problems have become recognized. Cultural eutrophication and overloading is common in the marshlands and estuaries along the coast and this has adversely impacted wetland functioning and altered habitat. Residents now complain of the bad smell, algae growth, and other nuisances, while environmental groups ask for growth controls and demand steps be taken to mitigate the adverse impact development is having on the coastal region.

Each of these illustrative vignettes introduces several common themes that focus our attention on the nature of planning and problems that encourage an environmental approach. This environmental response to planning recognizes the need to achieve a balance between human requirements to exploit the landscape to satisfy societal wants, with the equally important need to maintain and enhance environmental quality. Thus, unlike community planning, urban planning, or its variants, environmental planning is uniquely concerned with understanding the connection between human landscape and the ecological and physical processes that directly and indirectly sustain our existence. By employing this understanding in the design of plans and policies, better plans can be developed and more sustainable human patterns can be crafted. A set of common ideals or themes helps project that understanding.

The first major theme underscored in the vignettes introduced above is that of change. As a theme, change reminds us that the world we inhabit is dynamic and that we (humans) are always responding to or encouraging change in our world. This change may be purposeful or inadvertent; nonetheless it is a process that we live within, and a process that directs us as we attempt to direct it. The second theme is that of consequence. Consequence describes the culmination of a sequence of events that represent a pattern or reality that we must confront. It points to the fact that processes produce events and events take on a form and become real. The third theme is uncertainty. As events and decisions reshape our world, we recognize that change is underscored by an element of uncertainty. In this context uncertainty points to the unknown and often the unknowable. It also suggests to us that change, the processes it defines, and the events that materialize are always subject to our ignorance. The next theme is choice. Although the presence of choice may not always be obvious, those consequences result from a given alternative: a possible arrangement of things that contributed to the events which ended with the reality we see. Of course we may not always know that ahead of time, so we often wait for events to unfold. What's more, we may be uncertain as to which alternative is the best choice and how events may be connected as they drive us toward change. However, in most cases no one wants to wait for the end to be realized. We'd all like to know in advance what the possible outcomes might be, or at least be given a hint as to what we might expect. This universal human quality introduces the final theme that motivates planning: risk. Risk explains the possibility of being wrong and what being wrong may mean in human and environmental terms. Although risk can be defined more precisely later in this text, for the moment we can think of risk as the proverbial fork in the road where we have to decide which path to take, and learn to understand the implications of the wrong choice and accept the poor alternative and the adverse consequence that may follow.

In each of the illustrative examples presented above human beings introduced or suggested a change. From that change an outcome was produced, an alternative was selected, an element of risk could be identified, contrasting perspectives were shown, and each ended with an uncertain reality. Those realities invite more opportunities to affect change, consider a set of alternative actions, deliberate over uncertainty, and make judgments about risk. For most of us, none of the outcomes presented in our illustrative scenarios are desirable. In the first example we are left with a street that cannot be widened since it will compromise local businesses on one side, and a line of historically significant trees on the other. In the meantime, neighborhoods suffer the consequence of increased traffic and possible risks to safety.

Wouldn't it have been easier to have "seen" these consequences well before we introduced this change, looked critically at all the factors involved, and considered the implications of choice?

In the second example we are asked to decide between the need for housing for people and the loss of habitat for deer. In addition we are required to consider the value of land for its aesthetic use and realize its value for that purpose, while also evaluating the importance of meeting basic human needs. In this hypothetical example, we'd like to know what the alternatives are, how well they meet the human need for affordable housing while also protecting important habitat qualities for functioning, sustainable environment. Can we acquire that information to guide us to make the appropriate choice?

Again, in our final example we are dealing with change and the external forces that introduce effects that we don't always see. Here, we are asked to examine the connections between human-driven processes of change and how they interact with those of the environment. We are also required to look at the cumulative effects of change and how they create a reality that would be difficult to see one person and one transformation at a time. Above all, this example, as do the others, suggests the importance of seeing the future or at least directing the future toward a compatible state. It is this future orientation and the need to be proactive that embodies the concept of planning.

The concept of planning

The concept of planning is difficult to define in precise terms. Perhaps at its most fundamental level planning can be described as a universal skill that involves the consideration of outcomes before a choice is made among alternatives (Feldt, 1988). To illustrate this idea, consider the desire of Anytown, USA, to preserve open space for recreational uses. Open space and recreation are fairly well understood ideas, but the decision of which lands to preserve as open and for what recreational uses is not a simple matter. Should lands be preserved for hiking or off-road vehicle use? How do we decide? What if we are wrong? Therefore, we can refine our definition to describe planning as a method for reconciling choice under conditions of risk and uncertainty. However, regardless of definition, a central element of planning is the desire to direct change in order to produce a beneficial consequence at some point in the future. In this sense we can think of planning as a "vision." For example, in a small town faced with the pressure to grow and develop, planning becomes the means by which this community sees itself and expresses how it wants to appear in the future. This future orientation is a critical aspect of what planning means, although it can be a perspective that is easily forgotten when reactive thinking dominates public-policy making agendas. Because planning takes place along a time continuum, it is more than simply a skill, it is a future-oriented activity that contains its own unique formalisms and directives.

From this simple definition, the scope of what planning is and what it means begins to take shape. Here we may introduce several pragmatic considerations to extend our definition. First is the realization that planning as an activity is motivated by specific goals and objectives. This idea suggests that when one undertakes the intent to plan, one necessarily defines a course of action. As such the plan describes a type of decision-making where goals and objectives are used to help select among alternative solutions. The implication, based on the above, is that planning is purposeful and defines a continuing process that helps organize our thinking. Above all, as Barlowe (1972) reminds us, planning is the opposite of improvising. Thus we can consider the activity of planning as a form of proactive decision-making where the risks and uncertainties of the future are minimized and a course of action or program takes form that facilitates the wise allocation of important and potentially scarce resources. Recent events surrounding the California energy "crisis" illustrate how unanticipated events and the cumulative effects of "poor" planning can leave few options and force policy-makers into a reactive posture. By minimizing risk and uncertainty, planning supports the belief that the future can be

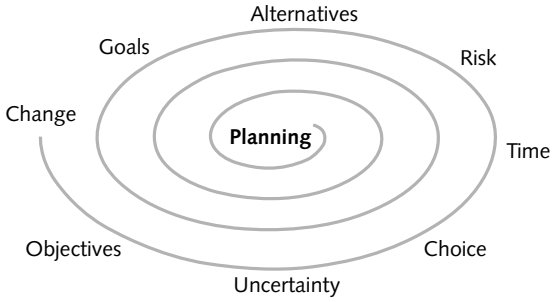

Fig. 1.1 The features of the planning problem.

controlled, albeit in a limited and selective way, so that societies' "vision" can be realized (Fig. 1.1).

As Levy (1997) asserts, the need for planning in this context simplifies to two basic words, interconnectedness and complexity. If the earth were sparsely populated and the technologies we lived by simple, there would be little need for planning (Levy, 1997). The observed fact, however, is that planet earth is not sparsely populated and our technologies are sufficiently complex that without consideration for the future and the wise management of resources an orderly progression of society cannot be assumed. A reasonable person may argue that as society commits itself to a more intensive use of the earth's surface, planning becomes a necessity. However, there are differential levels and degrees to which the concept of planning is applied and practiced which contributes to many of the problems society confronts. Therefore, through planning we can prioritize the goals and needs of a community and manage scarcity with improved efficiency. For that reason it becomes convenient to conceptualize the question of why we plan as the process which evolves to guide us toward the future.

The process of planning

Planning is both a logical process and a methodology that defines a series of components that direct our attention toward four interrelated activities:

1 Establishment of goals and objectives.
2 Collection and analysis of information.
3 Evaluation of alternative courses of action.
4 Recommendation of a course of action.

A general planning procedure is typically comprised of a number of stages or phases executed systematically over a specific time schedule. Although there is a tendency to conceptualize the activity of planning as a clearly defined linear sequence, in actuality the stages are not always followed in a rigid sequential fashion – and nor should they always be. Rather the process may evolve iteratively with considerable elaboration and refinement along the pathway to the solution. One convenient way to examine the process of planning is through the lens of rationality. The fundamental stages of the rational approach to planning include:

1 Identification of the problem and determination of need.
2 Collection and analysis of data.
3 Development of goal and objectives.
4 Classification and diagnosis of the problem and surrounding issues.
5 Identification of alternative solutions.
6 Analysis of alternatives.
7 Evaluation and recommendation of actions.
8 Development of an implementation program.
9 Surveillance, monitoring and evaluation of the outcome.

This nine-step process is illustrated in Fig. 1.2 and presents the logical flow of tasks together with several non-linear elements that suggest places along the sequence of phases where review and refinement may be encouraged. According to this rational approach to planning, each phase in the process consists of numerous substeps that vary in detail in relation to the nature of the problem.

Real-life planning decisions do not always follow the rational approach (Leung, 1989). Several reasons can be offered to explain why. First is the realization that many planning decisions are reactive in nature and have a much shorter time horizon and scale than long-range planning enjoys. Secondly, there is often a lack of resources that frustrates attempts to create carefully articulated, systematic methodologies. Lastly, the structure of the rational approach may not fit with the nature of the planning problem under consideration. All

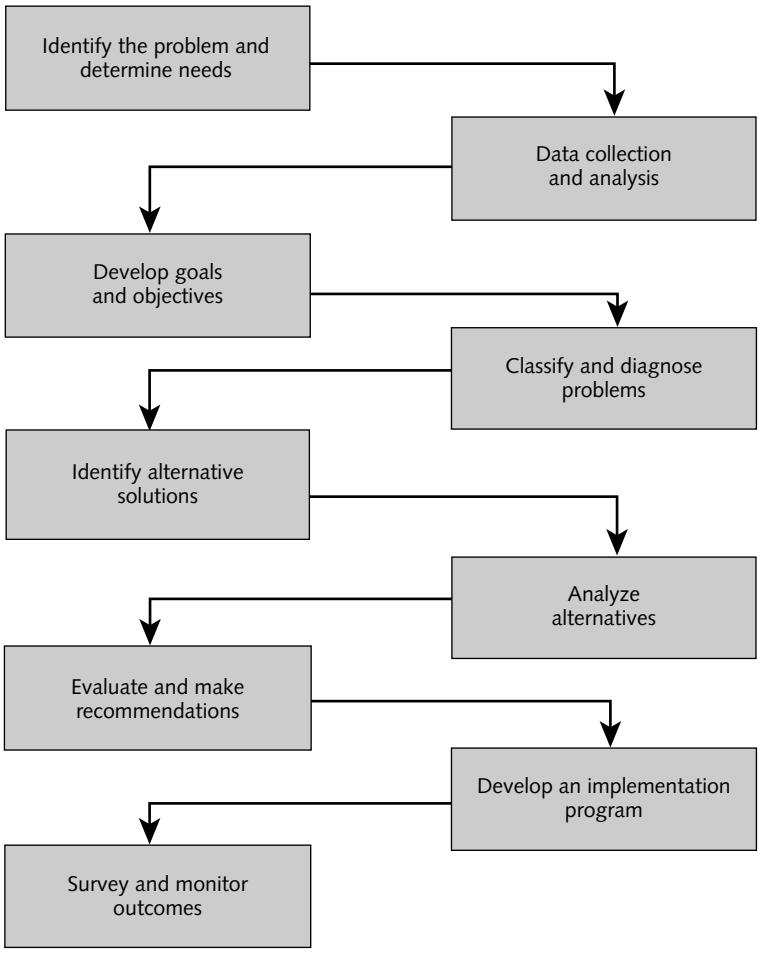

Fig. 1.2 The general process of planning.

too frequently, the complexity, interconnectedness, and uncertainty that surround planning contribute to the development of problems that are poorly structured or "wicked." Such problems often keep transforming themselves or contain elements that are not well understood. In these situations the qualities of the problem suggest that a rigid adherence to a particular mode of thinking or analysis may be unrealistic and undesirable.

However, when viewed as a process, planning, while methodical, must remain sensitive to changing needs and circumstances as dictated by the problem (Leung, 1989). In this context, regardless of complexity, the availability of resources, and time pressures, planning always involves the careful definition of the problem, the development of goals and objectives, the identification and analysis of alternatives, the collection of data, and the implementation of a program or course of action. By connecting these analytic components of the planning process to the substantive issues that motivate us to take action, an outline to direct planning can be developed. That procedural outline and its salient characteristics are examined below.

Problem definition and expressing needs

Formulation of the right planning problem is the pivotal beginning place in the process of planning

(George, 1994). Problem formulation begins with the awareness of need, where need may be expressed in very specific terms, such as the need to widen a road to accommodate increased traffic, or can be articulated in a much broader sense, such as a community's need to enhance environmental quality or preserve open space. Needs, however, can be very elusive and difficult to express, particularly in situations where community aspirations conflict. Therefore, identifying the problem may mean more than simply problem-solving, but also problem avoidance. In practice, planning is most frequently used to address perceived problems and to ensure that these problems do not occur in the future (Leung, 1989). However, the question to consider when defining the problem involves careful consideration of the distinction between a problem and the "right" problem. This is not unlike the situation encountered in areas such as northeastern Ohio that are experiencing the loss of agricultural land. It's not that farms are disappearing, it's that annexation and land-tax policies encourage homes to appear instead.

While it may seem an oversimplification, a problem when viewed through the lens of planning defines the difference between expectation (farmland) and reality (suburbanization), and those expectations and the reality perceived are often heavily value laden. Consequently, problems tend to be identified by reference to an expectation or goal. Expectations may be as basic as a road that is free of traffic congestion, a development proposal that will not adversely affect wetland functioning, or a housing stock that is affordable to middle income groups. Expressions of a problem may be based entirely on a description of symptoms, the outgrowth of previous studies that have discovered an issue that requires action, or an idealistic affirmation of community values voiced under specific conditions or circumstances. In each of these instance we must ascertain whether the problem is the right problem.

George (1994) notes that problem-solving is a ubiquitous human endeavor found in different facets of everyday life as well as in crisis situations. Planning is also a vital problem-solving endeavor; unfortunately, planning problems are not always solved successfully. While there may be numerous reasons to explain planning failures, solving the wrong problem is a surprisingly common factor (George, 1994). Solving the wrong problem is similar in concept to a Type III error in statistical hypothesis testing. In statistics, a Type III error explains the situation where the hypothesis tested has little relevance to the phenomenon under investigation. Therefore, when attempting to determine whether the right problem has been identified, it becomes important to recognize the fact that problems, in the abstract, are not real entities, but mental constructs. They explain or represent an unsatisfactory reality that is subjective and does not exist outside the perceptions and conceptualizations of the individuals confronting them (Smith, 1989). This point noted, problems are, in essence, the products of thought acting on environments that characterize elements of problematic situations that have been abstracted by analysis. The fact that a hillside poses a landslide threat is only problematic if we wish to subject that hillside to some form of human use. Likewise, an earthquake fault trending under a valley presents a problem only if its presence is unsatisfactory to the goal of developing that valley for high-density urban uses. Thus, before continuing along this line of reasoning, a distinction must be drawn between the problem, explained as a mental construct, and a problematic situation, which is an external reality. With respect to the planning process, problematic situations are the targets of identification, and from those situations problems are defined. Problematic situations can be arranged along a continuum that can be used to show how they may be approached and which solution strategies are most appropriate when considering their influence (Fig. 1.3). At the low end of this continuum are problematic situations that are puzzle-like and comparatively well defined (the need for additional parking spaces in a downtown shopping district). When confronted with problem situations of this type, goals can be clearly prescribed and solution strategies can be derived that will yield satisfactory results. At the opposite extreme lie the "messy" situations that are characterized by highly interrelated problems that interact with one another and tend to be difficult to decompose into more tractable descriptions (locating a site for

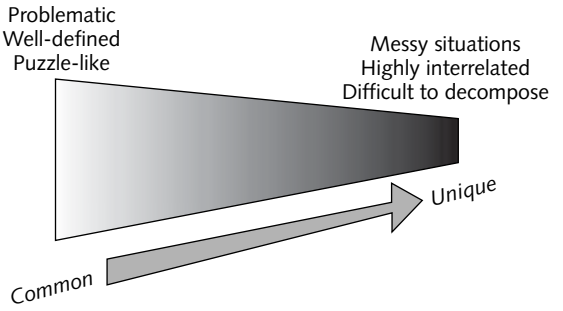

Fig. 1.3 The problem continuum.

the perpetual storage of low-level radioactive waste). Messy situations have numerous goals that often conflict, and this often makes it impossible to determine whether a satisfactory solution has been found. Between these two extremes lie problematic situations that are commonly referred to as "wicked" (Churchman, 1967). Although such problematic situations may not involve conflicting goals, they typically cannot be conceptualized in a unique fashion, and therefore tend not to have well-specified solutions.

The importance of drawing these distinctions when examining the nature of problematic situations arises from the fact that the more complex a problem situation is, the more ways it can be represented. To the planner, this suggests that problem definition involves both perception (seeing) and conceptualization (thinking). Therefore, how a problem is perceived and conceptualized will influence how it is represented; yet the strategies used to address the many possible expressions a problem may take may not address the "real" situation, since a representation can be incorrect, incomplete, or inappropriate. Put simply, an incorrect representation of a problem does not recognize any of the elements that constitute the problematic situation; an incomplete representation misses several elements; and an inappropriate representation ignores features salient to those affected by the situations (George, 1994). For example, in a plan to encourage the reintroduction of native plants into an urbanizing watershed, critical soil or microclimatic variables may have been omitted from the "model." Consequently, because important elements of the environment were left out, the description of the habitat will not adequately reflect the real situation.

Successful problem definition rests with how problems are formulated. Through careful problem formulation the attempt is made to:

1 Conceptualize the problematic situation – forming an "image" of what is involved.
2 Arrive at a representation of the problematic situation – trying to explain what that "image" looks like.
3 Form a basis for generating solutions – looking for all the possible alternatives that might address the problem.
4 Develop a means to evaluate alternatives – defining a way to make a choice.

Problem formulation begins with a mental representation of the problem. However, due to the complexity and high degree of interrelatedness that may surround the problem, specialized problem formulation methods are frequently used to help structure and promote a systematic approach to the representation and manipulation of pertinent information. These methods specify how "images" of the problem are created, how information pertaining to the problem is examined and organized, and how that information is analyzed. Although formulation methods will differ based on how they emphasize the representation and manipulation of information, most fall into one of two general categories: formulation tools and formulation procedures (George, 1994). In either case, formulation methods tend to be more heuristic (based on judgment and "rules of thumb") than algorithmic and function to promote componential rather than marginal analysis. Examples of common formulation tools and procedures are listed in Table 1.1. In general, formulation tools provide a systematic way of representing information, whereas problem formulation procedures guide the process of manipulating that information to help clarify the problem. Ideally, these tools or procedures when carefully applied should improve the likelihood of making decisions that address complete and appropriate representations of the problem.

Today, geographic information systems have become an important formulation tool where facets of the problem can be visualized and sub-

Table 1.1 Selected problem formulation tools common to planning.

Tool	Description
Problem diagram	Arrows used to indicate the direction and nature of causal relationships between elements of the problem.
Decision graph	Decision areas are linked and grouped to indicate problem focus.
Interaction matrices	Nature and intensity of the interaction among factors, constraints, alternatives are displayed.
Q-methodology	Factors are uncovered through statistical analysis of problem elements.
Delphi technique	Grouped judgment is aggregated to form consensus.
Assumption analysis	Important and uncertain assumptions are identified, debated, and resolved.

jected to analytical operations that yield possible alternatives and solutions to a given problem.

Developing goals and objectives

If we can characterize planning and the process of designing a "vision" of the future, then to realize that vision we need goals and objectives to help focus our efforts and direct our actions. In general, planning goals reflect the ideological positions and social values of those involved in the process. Goals can be an affirmation of an ideal or a response to a problem, but in either case they are subjective and may change with time or circumstance. Within the planning process, goals provide direction first for plan-making and then later in the process for evaluation and decision-making (Kaiser et al., 1995). In general, goal-setting involves three interrelated activities:

1 Identifying present and future problems.
2 Determining community aspirations.
3 Identifying strategic issues and priorities.

In the context of these three activities, a goal represents an end toward which planning efforts are directed, while an objective is an intermediate condition achieved along the pathway toward some larger desired accomplishment (outcome). For example, a waterfront community may have expressed a goal to improve public access to the ocean shore. A policy to encourage the purchase of public right of ways may be an objective that will help realize the larger goal. Consequently, goals tend to be general in nature and expressed in broad terms. Therefore, we can consider goals to represent "broad brush" definitions of conditions that a community would like to realize though may never fully attain. Simple examples of goals expressed in a plan might include statements pertaining to:

- An enjoyable and safe environment.
- A well-balanced urban/environmental system.
- Preserving unique habitats.
- Providing maximum access to open space.

Five common types of goals expressed in plans have been summarized by Kaiser et al. (1995). These include:

1) **Legacy goals**: are left over from previously adopted and currently followed policies. Developing legacy goals begins with an inventory of the goals expressed in current plans. In some instances they may be inferred from patterns of past decisions or from an earlier stage in the current round of advanced planning. Using legacy goals as a starting point recognizes that a community has a history of discourse that defines its values.

2) **Mandated goals**: define requirements found in state or federal policy or from the judicial system's interpretation of statutory authority and constitutional rights. Such goals should be introduced into the community's goal-setting process to clarify directives that are important to the success of the plan.

3) **Generic goals**: describe ideals suggested by current thought and theory. Generic goals address matters of public interest on issues related to environmental quality, equity, quality of life, economic efficiency, and health and safety. Goals of this type may be viewed as an alternative source of community goals intended to support good practice and broader societal values.

4) **Community needs**: explain goals derived from forecasts of population, economic, and envi-

ronmental changes that require an appropriate response. Since planning is future oriented, forecasting is an integral part of the process. Translating forecasted changes in demand for housing, water supply, facilities, and waste disposal into needs allows future considerations to be balanced against other goals expressed within the community. Translating change into an expression of need involves the application of standards and a comparison of those standards against the projected future to be accommodated. Deviations from the standard help direct goals to meet desirable service requirements.

5) **Community aspirations**: characterize wants developed out of a participatory goal-setting process. The goals articulated by voices of the community define concerns and priorities that help focus and crystallize issues, problems, and desires as the community perceives them. Such goals help the planner gain a sense of what the public find important and what they see as their real needs.

Objectives tend to be much more specific when compared to goals, and prescribe steps that when followed produce attainable results. Expressed in concrete terms, the objective points to particular actions that can be implemented which, if followed, will produce a result related to the larger goal. These results can be measured or evaluated in relation to how successful they have been at bringing about an observable outcome. For example, a community may recognize that existing landfill capacity is low; therefore, to conserve capacity and extend the life expectancy of the existing landfill, a series of objectives may be proposed:

- Expand community recycling to include local business by a given date.
- Reduce the use of nonrecyclable products in local fast-food establishments by 30%.
- Develop capacity to accept a wider array of materials by 20% at local recycling centers.

Once goals and objectives have been established, they need to be examined and articulated in a form that allows the planning process to gain focus on their content. Making goals more than simple good intentions begins by

1 Ranking goals to prioritize their importance and provide a means to spot conflict.
2 Explicitly stating relationships between goals and objectives.
3 Selecting the most salient few objectives for a goal.
4 Examining the relationship between goals, their purpose, ends, and the means by which they can be pursued.

Each of these steps require information and a means to analyze data.

Data collection

With an understanding of the problem and a clear expression of the motivating goals and objectives, the next phase in the planning process requires the collection and synthesis of data specific to the goals. Data, information, and intelligence are essential for good planning. The question is what type of information and how much data is needed to produce it? Although there is no simple answer to this question, data collection and analysis actively direct our need to learn more about a given problem, its root causes, and to better understand the alternatives that may provide a solution. In essence, data supplies planning intelligence. It represents essential strategic decision support information that illuminates the problematic situation. The central problem in the data collection question, however, is that data is useless unless it can become information. Information in this regard describes a level of knowledge needed to solve a problem. Thus planning information should be able to answer in an accurate and timely fashion critical questions concerning:

- The nature of change.
- The pattern of opportunity and constraint.
- The important mitigating circumstances active in the planning area.

In this sense the data collected should be able to provide the information needed in order to facilitate the analysis of social, environmental, economic, and fiscal ramifications of change, and to compare trends to historic, current, and projected patterns (Kaiser et al., 1995).

In environmental planning there are "standard" items of data that have traditionally been

Table 1.2 Information and data applied in planning analysis.

Natural environment
Slope
Topography
Climate
Vegetation
Geology
Natural hazard
Hydrology
Wildlife habitat
Air quality
Water quality
Noise

Built environment
Land use
Road systems
Water supply systems
Housing stock
Viewsheds
Historic structures/sites
Employment centers

Public facilities
Schools
Fire protection
Police protection
Libraries
Churches
Park and recreation
Healthcare facilities

Social/demographic factors
Population characteristics
Income patterns
Economic indicators
Employment patterns

Governmental factors
Jurisdictional boundaries
Land development regulations
Zoning regulations
Tax rates
Annexation policies

Transportation characteristics
Trip generation patterns
Traffic volumes
Road capacities
Modal characteristics

Indicator conditions
Land ownership patterns
Carrying capacities
Growth patterns
Decline patterns
Neighborhood characteristics
Environmental quality trends

considered essential to the process (Leung, 1989). A selection of data items commonly employed in environmental planning are summarized in Table 1.2. While they may not be indispensable, appropriateness and relevance to the problem determines if and when they become useful. In general, data availability, scope, and format impart the greatest influence on data collection efforts, and data gaps may be common for a variety of reasons.

The planning information base typically includes a mix of primary and secondary sources. Primary source material describes data collected from an original source. This may include surveys, air photos, satellite images, or data collected in the field. Secondary sources define data that has been collected and obtained by other parties and made available for use. Examples of secondary source data include census information and other documents, reports, or statistical tabulations assembled by local, state, or federal agencies. Depending on the nature of the problem, there are many types of data and collection procedures that can be employed, and care should be taken to ensure that the appropriate methods of data collection are used.

Identifying and selecting alternatives

Any goal or objective can be achieved in more than one way. Identifying and examining alternatives is an essential part of the planning process. Consideration of the alternative solutions to a given problem is important for several reasons. First, it suggests options that encourage debate and discussion regarding a given solution, its relative effectiveness, feasibility, and compatibility. Secondly, alternatives provide a basing point for raising questions about planning strategies, and the disposition of the motivating goals and objectives. Lastly, alternatives assist in the process of setting priorities in response to need. Unfortunately, the importance of generating alternatives has become a neglected dimension in recent planning theory (Bayne, 1995).

For any given problem a number of alternatives can generally be devised to meet a particular objective, and any one (or a combination of several) of these may be more appropriate than the original idea under the given set of circumstances. The issue confronting this phase of the planning process involves compiling a comprehensive listing of feasible alternatives. Developing that list places a premium on our understanding of the problem and the goals, and on our creativity. Creativity and thought are perhaps the two most critical influences when it comes to the task of conceptualizing alternatives. We have all heard the expression that "there is more than one way to skin a cat," but has anyone ever been told what those ways are? While much of the planning literature concentrates discussion on how alternatives are selected, evaluated, and compared, how planners come up with alternatives initially remains primarily an exercise in conceptual block-busting (Adams, 1974). Although a generic method cannot be offered, several techniques can be described

that can create an atmosphere for thinking and exploration:

- *Brainstorming* – describes a group problem-solving technique that relies on creating an atmosphere of suspended judgment to encourage the articulation of ideas free of censoring. In a brainstorming session participants are asked to list ideas without concern for internal evaluation.
- *Synectics* – another group problem-solving technique fostering ideation, however unlike brainstorming, some evaluation is permitted. According to this technique, the problem is examined and restated to ensure that it is understood. Next, analogy and metaphor are used to allow participants to explore the problem in new ways. Finally, options are expressed that lead the group toward a solution.
- *Backcasting* – defines a method for exploring the implications of alternative development, the directions they move in, and the values that underly them (Robinson, 1988). Although not strictly a form of ideation, to undertake backcasting analysis, future goals and objectives are used to create a scenario of the future. This scenario is then evaluated in terms of its physical and socioeconomic feasibility. Iteration of the scenario is usually required to resolve inconsistencies and to mitigate adverse economic, social, and environmental impacts that are revealed during the analysis.

These examples suggest that alternatives emerge from creative thinking, an understanding of the problem, and a willingness to explore solutions that may challenge conventional "norms."

With a tangible set of alternatives listed, focus shifts from development to the question of selection. During the process of developing alternatives, little regard was given to the question of evaluation. However, when a set of alternatives must be analyzed and decided upon, greater emphasis is placed on concepts like feasibility, reasonableness, and the constraints surrounding each as judgment points help to narrow down the number of possibilities to a more appropriate list.

Table 1.3 Strategies and methods used to evaluate alternatives.

Method	Description
Matrix methods	Conducting a pair-wise comparison of alternatives against operational goals or anticipated benefits.
Linear programming	Quantitative evaluation of alternatives against a set of criteria variables to establish "best fit" relationship or optimal benefit.
Judgment trees	Evaluation of causal interaction between alternatives and anticipated or desired outcomes based on using judgment or subjective probabilities to derive best solution.
Scenario analysis	Placing alternatives into a description of a desired future state and evaluating either qualitatively or quantitatively how selection of a given alternative may influence the future.
Simulation	Developing and using a model to explore the relative impact or success of an alternative and evaluating the "what if" ramifications of a given selection.

The analysis of alternatives defines the general process of determining the effects or impacts of each against a goal or objective in question. This phase of the planning process cannot proceed, however, without the choice of criteria for making evaluations. Alternatives are typically evaluated both qualitatively and quantitatively and assessed in relation to their physical, social, economic, fiscal, environmental, and aesthetic implications on the planning area. A wide assortment of tools and techniques has been devised to assist with alternative analysis and selection. A sample of common approaches to the issue of selecting alternatives is presented in Table 1.3.

The methods identified in Table 1.3 focus on two major evaluation tasks: forecasting and comparison. Forecasting the impacts associated with a given alternative can be accomplished in one of three ways: (1) *extrapolation* – the extension of a trend logically into the future based on past behaviors; (2) *modeling* – the creation of a represen-

tation of the situation that can be examined; (3) *intuition* – the application of judgment and experience. The principal features of these approaches have been reviewed by Sawicki (1988).

- **Extrapolation** – trend extrapolation is based on the empirical examination of some phenomena with respect to measurements taken across time. Forecasting through the projection of trends is a frequently used method of exploring future conditions. As a technique it may include the use of moving averages, linear regression, curvilinear regression, or envelope curves to fit a line to the data points that summarize the important trend. An excellent discussion of trend extrapolation can be found in Hill (1978).
- **Modeling** – a model is simply a representation of an object, system, or concept in a form different from the entity itself. All decisions are made on the basis of some type of model, whether a formal computer representation written in a programming language or a simple "idea" of how we think something works or behaves. Models provide a means to simplify complex problems. Approaches to use of models in a planning context have been discussed by Gordon (1985) and Lein (1997).
- **Intuitive forecasting** – implies the use of expert judgment and experience to forecast the possible outcome of an alternative action. The use of judgment and informal heuristic reasoning is a type of knowledge acquisition process where the analyst queries a group of experts to illicit a causal process related to an alternative. Perhaps the most widely practiced form of intuitive forecasting is the Delphi method. This approach is described in detail by Linstone and Turoff (1975). Lein (1993b) has examined other forms of formalizing judgment for application in environmental forecasting as well.

Comparison methods describe a family of techniques designed to facilitate the "ranking" of alternatives or to provide relative measures of attractiveness that can be used to prioritize and select among alternatives. Commonly used methods of comparison include matrix methods, scaling techniques, and programming designs.

- **Matrix methods** – a matrix describes a two-dimensional system of rows and columns that allows pair-wise comparisons of alternatives against evaluative criteria. Because of its two-dimensional structure, a matrix provides a tabular format that simplifies one's ability to visualize the interactions between alternatives. Within the cells of the matrix, symbols or scores can be assigned to identify critical relationships and possible conflicts that can be associated with a given alternative. The matrix can then be used to first identify effects by systematically checking each alternative against the criteria set, and secondly to ascertain the relative importance or significance of the effect. Should an impact become evident, a "score" is placed in the corresponding cell. Although scoring implies numerical measurement, in actuality scores suggest subjectively derived evaluations that are employed to express or rate the relative attractiveness of an alternative in pseudo-quantitative terms.
- **Scaling techniques** – scaling or rating methods are based on the assumption that an attractive score (S) can be derived for a set of (i) alternatives using the general relationship

$$S_i = \Sigma \kappa_i \nu_{ij}$$

where S_i equals the total value of scores for alternative (i), κ_i explains the weight placed on criteria (j) and ν_{ij} defines the relative value achieved by criteria (j) for alternative (i). This fundamental relationship has been extended to create a range of multicriteria, multi-objective decision aides that are useful in situations where more than one criterion is needed to asses the attractiveness of an alternative solution. Perhaps the best-known and most widely adapted of these was introduced by Saaty (1977). The main objective of multicriteria scaling techniques are: (1) to identify choice alternatives satisfying the objectives in relation to the problem, and (2) to reduce and order the set of feasible choices to the most preferred alternative.

- **Programming designs** – programming designs apply mathematical or statistical procedures to select the optimal allocation of resources needed in order to achieve the desired goal with a minimum of "cost." Programming designs require identifying a set of decision variables, criteria for choosing the "best" (optimal) values of the decision variables, and a set of constraints or operating rules that govern the procedure. These terms are expressed in the form of linear equations or linear inequalities written as functional relationships of the decision variables.

Regardless of approach taken to formulate and select alternatives, there are four basic principles that guide the process (Sawicki, 1988):

1 Conclusions drawn about each alternative should be displayed in a way that is simple and transparent.
2 Techniques used for selecting alternatives must be capable of handling multiple criteria, and the advantages/disadvantages and trade-offs made visible.
3 Consideration must be given to nonquantifiable criteria and methods to include these criteria should be utilized where possible to accommodate their evaluation.
4 Methodologies should lend themselves to a decision and display the attributes of each alternative to allow consideration of all relevant factors and permit compromise when that becomes necessary to reach a decision.

Synthesis and implementation

The final phase of the planning process described in this chapter is an amalgam of elements needed to make planning work. A major concern in planning is that all too often the process becomes the central focus and the "plan" becomes a document that resides on a shelf with little hope of becoming realized. With goals and objectives carefully articulated, data collected and analyzed, the problem well defined, and a set of alternatives selected, the plan begins to take shape, not just as a document, but as a well-integrated idea. Integration implies synthesis with an eye toward the future. In this context, synthesis is concerned with the degree to which elements of the problem and solutions fit into a framework for action. It takes creative thinking and critical evaluation to create this framework and to ensure that the plan will encourage good decisions. The questions of creative thinking and critical evaluation draw attention to the plan itself and how this plan relates to the future.

A plan may be conceptualized in a number of ways. In one sense we may think of a plan as a "blueprint" for the future. As such, the plan becomes a detailed documentation of the environmental characteristics, community features, problems, goals, objectives, recommendations, and programs germane to design of a desired future state of the community. Viewed in this manner, the plan becomes a statement of policies that explain what the community wants to achieve relative to its environment (physical, social, economic, aesthetic) and a physical document with specific language to illustrate, educate, and direct the design of this future.

Although the technical content of a plan can vary, certain elements are commonly included:

- Introduction and background to the plan.
- Statement of purpose.
- Description and documentation of the planning area.
- Elements of the plan.
- Statement of findings.
- Recommendations and evaluation.
- Implementation strategies.

Implementation has been described as one of the more difficult phases of planning. A major reason for this is that implementation moves us from the "science" of planning to the political realities in which planning operates. Since implementation identifies the actual carrying-out of the plan and its recommendations, implementation must enable the outcome. This enabling aspect of planning may require bringing together the necessary legal instruments, policy mandates, or building existing law and programs into the plan as part of its implementation. This suggests that plan implementation may proceed in either of two ways. One way calls simply for the adoption of the plan, letting its policy recommendations become translated into design and policy actions. Taking this

approach may create conflict and uncertainty. Consequently, the plan may be adopted as a pilot program or demonstration project prior to full implementation. By so doing, the implementing agency has the time needed to acquire experience with the program, monitor its effectiveness, and adjust the program where necessary prior to widescale adoption.

A similar strategy may call for a phased implementation where certain elements or recommendations of the plan are adopted according to a timing schedule. Phased implementation may be appropriate when the plan requires specific legislative action, or to give those affected by some aspect of the plan critical time to prepare. In either case, implementation requires a program that adequately addresses the issues which may hinder realization of the plan. With a sound implementation program the number of obstacles encountered can be kept to a minimum. However, new problems will arise that will require repeating or revising earlier phases of the planning process. Recently, Talen (1996) has reviewed the implementation problem and offered a typology for plan evaluation, yet the planning process and all the elements that it embodies are complex. Keeping all the features of the plan and all of the factors that need to be included requires a management strategy. In the following section systems analysis is examined as one possible strategy the environmental planner can call upon to help organize the intricacies of the problem.

Adopting a systems view of planning

Planning is a complex task simply because the subject matter involved is multitemporal, multivariate, and multidimensional. To make the planning process work requires not just an organizational framework of tasks or phases, but a construct that integrates elements of the problem into a synoptic view (the big picture) that facilitates understanding, guides analysis, and supports prediction. One useful construct for organizing the complexity of the problem in a manner that enhances understanding of interrelatedness and interdependence introduces the concept of a system and the methods of systems analysis (Chadwick, 1974; Feldt, 1988).

The concept of a system has been used in a wide range of contexts. In some instances, its meaning may be implicit in how it is being used. However, because it is a concept that is so widely applied, a formal definition will help connect us to the planning problem. A system may be defined in several ways (Lein, 1997). Perhaps the most fundamental explanation of the concept characterizes a system as a set of objects together with relationships between the objects and their attributes (Hall & Fagen, 1959). Put another way, a system is nothing more that a set of interrelated elements together with relations between the elements and among their states that function in a complementary manner. What is important about these definitions is that we can extend the concept beyond the idea of a physical entity and describe a system as a perspective and a subject of inquiry. Considered in this way, a system becomes a "model" that represents a way of thinking about how things are connected and how they work, whether we are talking about space stations or planning areas. A system also becomes a way to organize the complexity of observed reality and somehow manage or control that complexity. In addition, the system concept encourages a functional view of the real world and helps us recognize that there are purposeful connections that bind elements of a problem together into a coherent structure. One need not be an automotive engineer to understand how an automobile's cooling system works. When a car overheats and stops running, we can understand the problem by a basic model of the car's cooling system. Similarly, we can appreciate the relationships that make up the planning area by casting them into this same "systems" framework. So watershed and neighborhood can become systems and we can examine what they are made up of, how they work, and, more importantly, how they change.

From the planner's perspective, perhaps the most important quality of systems thinking is that it directs our attention to the "whole" and fosters identification of cause and effect processes. This concern for process may lead to prediction and the

representation of events that make a possible future discernible. Although prediction may not be the goal, the system model lends itself to analysis and simulation. Therefore, the value of defining and analyzing systems is that they enable the structure and behavior of complex interrelationships to be explored (Bennet & Chorely, 1978). Consider the example of land use. Using the system concept, the relationships between types of uses, their location, arrangements and juxtapositions can be placed into a model that allow for some understanding of the patterns visible on the landscape. With this model, the complexities of how residential uses support commercial areas, and the mix of uses needed to maintain economic efficiency and serve a given level of population can be examined. In a similar vein, the system concept can be used to explain the interaction between urban processes and the environment, and depends only on how that interaction is defined. Definition in this regard is the key. Because a planning problem may be complex, there is a natural reaction to isolate parts of the problem and explain how each of these parts operate under simplified conditions. For this simplification to work, these isolated pieces of reality must maintain connection with the real-world. To maintain this connection a method is needed. This is the method of systems analysis (Huggett, 1980).

As an analytic device, a system can be defined at varying levels of resolution and detail (Lein, 1997). One type of system we can identify is the abstract system. With an abstract system, the elements comprising its structure are concepts whose components have connecting relationships based on certain assumptions. A second type of system is referred to as a concrete system, where at least two defining elements are actual objects. When we apply systems methods in planning, we are also interested in how to represent change and capture the dynamic nature of the problem using the system design. To conceptualize and capture process, the list of system types can be expanded to include other relevant forms. These include:

Static systems – systems whose states are held in equilibrium conditions.

Dynamic systems – systems whose states vary over time.

Homeostatic systems – systems that strive to maintain balance.

Continuous systems – systems that display behaviors uninterrupted over time.

Discrete systems – systems where change occurs in finite time intervals.

Stochastic systems – systems whose behaviors are influenced by an element of randomness or chance.

Deterministic systems – systems where future states are dependent upon direct functional links to past states.

These representations provide a focus in the system design process that leads to the formulation of a model. As Lein (1997) notes, through the application of these system concepts and the formulation of a process-oriented system design, the complexity which surrounds a planning problem can be reduced to an ordered and structured set of objects that helps us "see." Producing this model depends on the success to which the system has been defined. To the planner this involves four critical steps:

1 Specifying the variables to use in the system.
2 Stating the hypothetical relationships that define variables comprising the system.
3 Developing a simple explanation of the system and its structure.
4 Testing and refining the system model.

Adopting a systems view of planning compliments the planning process outlined previously in several ways. Both require recognition and definition of the problem, a set of goals and objectives; and once the model has been developed it must also be implemented. A general outline explaining the steps followed when performing a systems analysis is given in Fig. 1.4. As suggested by the illustration, systems analysis begins with the critical step of identifying the components that will define the system.

Defining the system and possible subsystem components is based upon several presumptions regarding relationships that will organize and connect elements together. It is also typically assumed that a meaningful structure can be hypothesized that separates the system from the real world. Taking these ideas and applying them to planning we will note that systems will possess

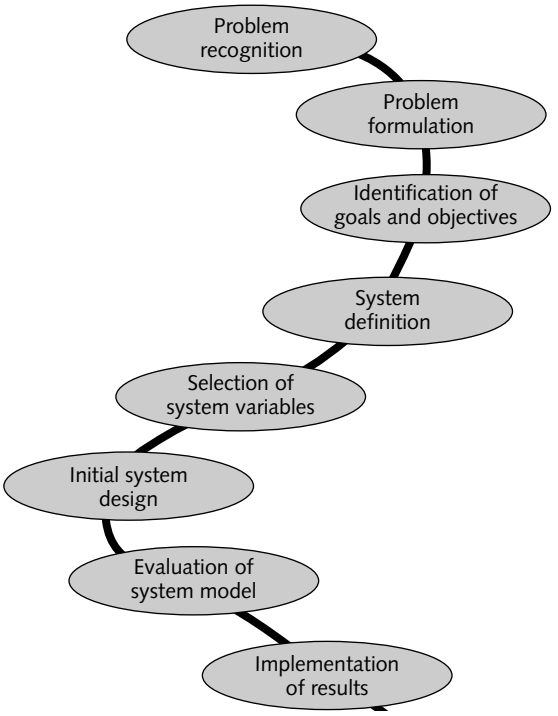

Fig. 1.4 The general method of systems analysis.

two important features that must be identified and described in order to produce something meaningful: (1) A functional or process structure that characterizes some definition of a flow and (2) a morphological structure that defines a spatial (geographic) arrangement. These two features help direct our inquiry and assist us in adding specifics to the model that make its representation more useful. Specifics draws attention to the details of our design and the requirements that the features embedded in the system provide a dynamic view of the problem. Several key attributes assist us in developing this type of representation. Among the more relevant to the application of systems methods in planning are:

- **System state** – the state of a system at a given point in time is the set of properties it described (i.e. number, size, age, color, mass). The system state is defined by the value these variables have at that instant in time.
- **System environment** – because every system is composed of elements, systems are bounded into an environment space. This environment is a set of elements and their relevant properties that are not part of the system but can influence its state. Therefore, a system environment consists of all variables that can affect its state. State variables outside the system as bounded are termed exogenous variables, while those within the system are called endogenous.
- **System interaction** – a system that is defined in such a way that no interaction takes place with elements not contained within it (completely self-contained) explains a closed system. Conversly, a system which displays interaction with its environment is an open system.
- **System event** – characterizes change in one or more properties of the system. This change will occur over a period of time with a specific duration.

Systems, change, and feedback

Among the more useful aspect of systems analysis is that it offers a perspective from which the planner can study change. Because planning has been described as a future-oriented activity, projecting, predicting, and responding to the changing status of the planning area is of fundamental interest to the planner. In planning we are constantly asked to explain change, describe the processes that drive it, identify its consequences, and predict the behavior of systems subjected to change. When examining change our attention is directed toward dynamic systems and their characteristics. Since change may be said to manifest as a deviation in system state, it can be observed by noting the disposition of the system's state variables. Through careful observation cause and effect relationships can be categorized in one of three principal ways:

1 Reaction – a system event that is deterministically caused by another event.
2 Response – a system event produced by another system or environmental stimulus.
3 Behavior – a system change that initiates other events.

Another important concept when system methods are applied in planning is that of feedback. Regardless of type, any system operating in the environment exhibits a degree of sensitivity to the manner by which its defining components are connected and arranged. Loosely defined, feedback explains the return of information as input to the system. This cycle of returned information acts directly on the performance of the system and its structure. Feedback can assume two basic forms: (1) positive feedback – characterizing a "deviation-amplifying" process that influences a change in state and functions to maintain that change, and (2) negative feedback – characterizing a "deviation-dampening" process that retards the effects of change in the system.

Specifying the design

With the fundamental features of systems analysis understood, a basic design of the problem as a system can be produced. For the systems approach to work, however, we must have a hypothesis or process around which design can focus. This nucleus of our system can be a very general idea or a specific relationship where representation in system form will enhance understanding. To achieve this important goal the design qualities need to be arrived at so that a function model of the problem may be realized. The critical factors influencing the design on a system are:

- Size – the number of variables that comprise the system must be determined with special interest given to those controlling variables that exert the greatest influence over its behavior.
- Associations – this property specifies how the variables relate to one another, where consideration is given to the degree of correlation among variables, and the strength, direction, and sensitivity of those relationships.
- Causality – the connection of cause and effect to process, how process directs the system, and the manner by which it functions.
- Pattern – the intercorrelations defining the network that connects elements together in the system.
- External forcings – the influence of an external variable on one or more components of the system.
- Inputs and outputs – the nature of flow into and from the system that gives rise to its behavior.

Planning as decision-making

Up to this point in this chapter we have explored the concept of planning, the basic features of the planning process, and the role of systems methods as an organizing perspective that can guide us through the planning problem. Throughout, we have suggested that planning is essentially a type of decision-making with the plan standing as the primary decision focus. In this section the nature of decision-making and its connection to the planning problem is examined.

Decision-making has been defined as a process by which a person, group, or organization identifies a choice or judgment to be made, gathers and evaluates information about alternatives, and selects from among those alternatives. These familiar steps paint the process of decision-making as a stream of thoughts and behaviors that also include elements of risk and uncertainty (Lein, 1997). The decision, in this context, unfolds through the combination of learning, understanding, information processing, and information accessing, all with careful definition of the problem and the circumstances involved. This simple description of the decision-making process is underscored by a reasoning method used by people when approaching a decision problem. Because everyone approaches a decision differently, it is critical to understand how such factors such as personal background, experience, inherent psychological conditioning, and the situation surrounding the problem will influence both the way decisions are made and how the problem is perceived. To understand how these factors direct the process of deciding, several models have been offered that introduce and summarize the various styles decision-making can take (Davis, 1988).

- **The rational model** – we have discussed this approach with respect to the planning

model. This decision style views decision-making as a structured process where a group systematically reduces the decision problem to a set of measurable quantities or qualities. The comparative merits of each determine a possible outcome, and that alternative with the greatest merit (value) is selected.

- **The organizational model** – decision-making according to this model follows the established policies or guidelines of an organization. Here, the decision-maker takes action based on a set of guidelines or policies rather than evaluating the relevant factors that influence the decision. In this regard, the decision-maker avoids uncertainty by following a predetermined path.
- **The political model** – places decision-making in a political setting where decisions result from group interaction and deliberation. In this setting individuals rely on persuasion or authority to satisfy subjective goals. According to this model, there is no universally accepted best decision, but rather the identification of an alternative that provides the most acceptable solution.
- **The satisfycing model** – recognizes that an optimal solution to a problem may not exist. In such instances, the decision-maker seeks an adequate alternative, one that satisfies one or more initial requirements of the solution. From here, the decision-maker relies on feedback to improve the next iteration of the problem.

Realizing that a problem will be approached differently depending on circumstance, and that many factors direct planning decisions, gives emphasis to the setting in which decisions are made and how setting may influence or shape a solution. Therefore, while certain problems may be routine and repetitive and conform easily to an organizational style of decision-making, it is more likely that planning problems will be unstructured, unique, and require the exercise of judgment, intelligence, and adaptive problem-solving behavior. Such nonprogrammed decisions may initially be approached using the rational model. However, it is more likely that constraints imposed by time, situational factors, and financial limitations will move decision-making toward a more satisfycing mode. These constraints point to the many issues that propel planning and influence how the planning process unfolds. Several of the more relevant issues are examined in the next section.

Propelling issues in planning

Planning focuses on the management and maintenance of the human landscape: that mix of social, cultural, economic, political, and administrative attributes that reflect who we are and what we deem important and essential to our survival and sustenance. The issues of planning are as basic as the needs of human beings multiplied many-fold. These fundamental planning issues are no different today at the beginning of the twenty-first century than they were 100 years earlier. We can consider these as the constants of planning which explain the fundamental needs of a society:

- the provision of housing,
- the allocation of employment sources,
- the facilitation of commercial and service functions,
- the delivery of clean water,
- the removal of solid and liquid waste,
- the production of a healthful environment,
- the design of efficient means of communication and transportation,
- the creation of a functioning and balanced system of institutions, and
- the maintenance of recreation and aesthetic qualities within the built environment.

Yet each item listed above suggests a larger context composed of numerous driving forces that propel change, moderating forces that redirect and transform change, mitigating forces that provide balance and a resource base from which the material to sustain change are derived. Through the interplay of these complex actors the human world – the urban environment – takes form. The nature of that form, its magnitude, and consequence both in human terms as well as those of a geographic entity that interacts within the boundaries of a greater environmental system move the

planning problem to a higher plane of awareness and purpose. It is here that the distinctions compartmentalizing planning into specific specializations begin to blur and the planning problem broadens in perspective.

At this level the issues of planning may appear to be more conceptual, yet they remain intertwined with those fundamental needs of society and connected to the patterns those needs display. Here, urban form becomes the driving force of change that exerts its own influence in both social and environmental terms. The recognized and potential impact of these changing patterns, coupled with the demands it places on its primary means of support and the manner by which these demands are satisfied, introduce an entirely new set of concerns. Four propelling concerns that form the backdrop against which all planning issues will be framed follow.

1 Urban growth and growth management

The development of urban form is an attractive force. As human habitat it offers the support systems that enhance our quality of life. As we become attracted to the possibilities offered within this landscape, urban form multiplies. This growth is due in part to the development pressures encouraged by our own demands. Thus as our demands become realized and satisfied, built form expands. Such expansion increases wealth, which in turn encourages new demands, which become satisfied through yet another round of expansion. Expansion is both a physical quality that assumes a geographic expression and a social feature explained in terms of increases in population, exchanges, variety, opportunity, and preferences. At the opposite end of the growth question are the management issues that must keep pace with each cycle of expansion. These issues are not well articulated in the market forces or the opportunity/demand preferences that fuel growth, but they are there. Consider the simple question: What does it take to keep the urban system functioning? Addressing this questions directs our attention to the energy, water, waste capacities, infrastructure, and other support services that those of us living in this landscape rely on. With each round of expansion those support functions must also expand. It has been noted that the urban system grows cheaply, but is expensive to maintain. The diminishing returns of growth, the vexing problems associated with solid and hazardous waste removal, land-use change, congestion, sprawl are all features of the management problem. These features also place in sharp contrast the competing realities of the built environment as a consumption system, commercial system, production system, and environmental system (Douglas, 1983). Reconciling these differing views and roles is one aspect of the growth management problem. Put simply, how does one maintain human habitat when human habitat is dependent on natural habitat for its survival, and what are the costs involved?

2 Sustainable development and cumulative change

Growth is not an evil, although it is easy to couch it in those terms. Growth is a reality that we depend on to maintain our livelihood. The question, therefore, is not the simplistic dichotomy of growth or no growth, but rather the redefinition of growth in more sustainable terms. The concept of sustainability has become a much overused term in the debate surrounding the question of growth and environmental change. While a basic definition of the term is insufficient, sustainability is a concept with many implications. First the concept suggests a wider view of the growth and development process. Traditionally, growth is described in economic terms and tends to assume a human-centered perspective. From this point of view the physical processes that feed growth and supply resources to support the built environment tend to be poorly integrated into the development model. A sustainable view is more integrative and places human landscape as part of the fabric of a larger environmental system. A second aspect of this concept directs us to adopt a much longer time horizon toward what we consider the future than is typical in most planning applications. Thus, rather than the usual 1- to 5-year planning horizon, sustainability calls for a conceptualization of tomorrow that spans several generations into the

future. Another implication of the term influences how we view and use the resources needed to maintain our built environment. Sustainability is based on the use of renewable and perpetual resources in harmony with the ecological system that patterns the landscape. Such a view stands as an important compromise between the extremes of no-growth versus unlimited growth, and directs planning to consider alternatives that promote efficiency and environmental balance. Perhaps the most important implications of sustainability are societal. Sustainability is a model of social, economic, and environmental interaction that will foster change in the manner by which basic human needs are met. With respect to planning, a move toward a sustainable system will require critical transitions in our political, economic, and resource systems, and essential ethical and behavioral shifts in attitude toward a reshaped worldview that removes the separation of humans and environment.

3 Equity distribution and conflict

As the forces of growth and change commit society to a more intensive use of the earth's surface, the question of fairness and the avoidance of conflict will exert great influence on the planning process. With heightened awareness and concern over the impacts of growth and the implications of environmental change on all corners of society and the ecosystem, the simple solutions and rationales of the past are likely to be ineffective and unacceptable to a growing segment of the population. Environmental equity has recently emerged as a critical issue. It developed slowly from the observation that socioeconomically disadvantaged groups historically bear a disproportionate burden of risk and hazard in the environmental policy-making arena. The equitable treatment of all races and cultures in decision-making represents a challenge to the practice of planning and the processes by which planning decisions have been made. Through greater efforts to improve citizen participation and the inclusion of advocacy groups, mediation and conflict resolution strategies may redirect how plans are made.

4 Environmental process and urban entropy

Focus on the human landscape and the economic and social processes that motivate and shape it has traditionally ignored the environmental processes modified as a consequence. Bringing the environment more directly into the planning process is an idea nearly three decades old, yet the renewed emphasis on maintaining balance within the built environment point to the importance of the natural processes that regulate and ultimately control the scale and extent of human endeavors. Integrating environmental processes into the planning process means more than simply understanding the physical characteristics of the planning area. It means understanding how the environment works and recognizing its potentials, limitations, and risks as active elements of our planning efforts. The total environment and the interactions that describe the form and function of the landscape create the need to develop broader goals. These goals begin with the requirement to plan in close accordance with natural processes and culminates in a reinterpretation of the built environment not as an artificial arrangement superimposed on a natural system, but as a synthesis of processes that create a recombinant form. In many respects this issue is intimately linked to the ideas presented throughout this chapter. In addition, they provide the theoretical focus that bridges the entropic effects of the growth model with a sustainable perspective based on a wider inclusion of stakeholder interests and a tighter integration of natural process as an organizing structure from which a vision of the future can be assembled.

Summary

Planning is a fundamental human activity with common themes and problems. In this chapter the concept of planning was examined and dissected. Discussion introduced the logical process and methods common to planning to demonstrate the formalisms associated with this type of decision-making. Whether explained in ordinary terms or with reference to a technical specialization such as

environmental planning, the process begins when goals and objectives are established, information is analyzed, and alternatives are compared, and culminates when a course of action is selected. Knowing what is needed to organize thinking, and understanding whom the plan is for and when optimal solutions and appropriate alternatives are found are complex questions that can be difficult to answer. In this chapter a framework was presented that relies upon the methods of systems analysis. Systems analysis is a well-tested tool for managing complexity. Through its application, the planner may approach complex problems, organize thinking, and form an understanding of problems that will enable better solutions to emerge.

Focusing questions

Explain the concept of planning.

Discuss the rationale that supports the planning process.

What are goals and objectives, how are they derived, and how to they help define the "right" planning problem?

Critically evaluate the utility of systems thinking in planning and explain how process-oriented thinking drives proactive decision-making.