PLANNING MANUAL

by

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PREFACE

What is planning? Who does planning? How do they do planning? Why do planning at all? When we looked at the guidance that has been prepared to help the Corps in its role as a steward of the Nation's water resources we saw a gap. There was policy guidance for planners and numerous publications describing methods for accomplishing many important tasks. But, there was nowhere for new planners or non-planners to turn to find out what planning is all about. This manual attempts to fill that gap.

Will you get answers to the questions raised here from the pages that follow? We hope so. It may help to begin with two points about the manual's contents.

- First, this manual was prepared for new Corps planners with five or fewer years of experience. While this is our target audience, we hope that other professionals, people outside the Corps, and even more experienced planners will find something of value here.

- Second, this manual describes what planning is and how it is best practiced by the Corps of Engineers. It is not a "how to" manual nor does it deal with policy questions of why things are done the way they are.

It is our hope that this manual will help planners understand what planning is all about and that it will help them become better planners. The six-step planning process that forms the core of this manual's content is a flexible, robust and effective model for systematic problem solving. Understanding it provides you with an invaluable method for approaching a wide variety of problems within and outside the Corps program.

This manual was prepared by the U.S. Army Corps of Engineers, Institute for Water Resources. Many people throughout the Corps, and some outside the Corps, provided invaluable assistance in a series of interviews and the review of early versions of this manual. As the result of the good advice of so many experienced and knowledgeable people we made many changes in the draft manual to produce this final. Even if you read the draft, you should read this manual for more good ideas from practicing planners.

Reducing the Cost and Time of Doing Planning

As you will see, planning is a dynamic process. It takes place in a dynamic environment that requires that the process continues to evolve to meet ever-changing social needs. We have attempted to remain faithful to the planning process and the public policies that guided it at the time this manual was prepared.

Even as this manual was being completed changes in the policies that guide the planning process were under discussion. For example, beginning in Fiscal Year 1997, all new reconnaissance planning studies are targeted for completion in 6 to 12 months and are limited to $100,000 in study costs. Other changes to achieve "faster and cheaper" planning, in the overall interest of better government, can be expected.

Good planning, working through a step-by-step process to reach a recommendation, can fit any schedule or budget. Good planning can be done in an hour, a day, a week, a month, a year, a decade. You can do it with any amount of time, effort and resources you care to dedicate to it. The one hour answer will rarely be as good as the one year answer, but the realities of time and money constraints need not preclude good planning.

A Word About the Principles and Guidelines

The Principles and Guidelines (usually referred to as the P&G) provide the fundamental operating guidance for planning studies of the Federal water resource development agencies, including the Corps Civil Works planning studies. The P&G are the most recent in a series of Federal planning requirements (see Chapter Three) that have evolved with changing national priorities. Sooner or later, we expect the P&G will also be changed to reflect our Nation's needs into the twenty-first century. While change in the guidance is inevitable, fundamental planning principles will endure. A step-by-step process for problem solving is a timeless tool. Whether its in six steps, or five steps, or any number of steps, such a process is useful far beyond the planning of Federal water resource projects. The process is basic to human nature, and it is the heart of this manual.

A Challenge

Read, or browse through, this manual. Pick out one thing that you can use to do better planning. Use it, somewhere, somehow, to plan something in the next thirty days. Repeat, as desired.

So...

What is planning? Who does planning? How do they do planning? Why do planning at all? Read on, and we will tell you what we have found. Practice it, and you can enlighten us with what you have discovered.

Acknowledgments

This manual was prepared by the U.S. Army Corps of Engineers, Institute for Water Resources, under the Planning Methodologies Research Program. Ms. Jessica Fox, formerly of the Institute, was the Work Unit project manager and directed the development of this manual through February 1995; Mr. Kenneth Orth, of the Institute, was the project manager through its completion. Mr. Michael Krouse, Chief of the Technical Analysis and Research Division, Institute for Water Resources, was the Program Manager for this research. Mr. Kyle E. Schilling was the Director for the Institute for Water Resources. Mr. Robert Daniel of the Corps Headquarters, Civil Works Directorate, Planning Division, was the Program's Technical Monitor; and Mr. Steven Cone, Ms. Cheryl Smith, and Ms. Lillian Almodovar, all of the Headquarters, Civil Works Directorate, Planning Division, oversaw this Work Unit.

Dr. Charles Yoe, a principal of The Greeley-Polhemus Group, Inc., and Mr. Kenneth Orth, Institute for Water Resources, were the principal authors of this manual. Dr. Yoe started his professional career as an economist in the Baltimore District, and has worked with many Corps District planners and the Institute over the past several years. His work on this manual was for The Greeley-Polhemus Group, Inc., under contract to the Institute for Water Resources. Mr. Orth is a community planner with experience in the Buffalo, Los Angeles, and Jacksonville Districts and the Headquarters.

An initial outline for this manual evolved from the results of over fifty interviews with practicing Corps planners in early 1995. The outline was presented to an advisory group at a May 1995 workshop, and a first draft manual was prepared as a result of the group's suggestions and direction. The advisory group and others reviewed the first draft during the summer of 1995. The final form of the draft manual was crafted at a second advisory group workshop in August 1995. The advisory group included the following members:

Mr. Stuart Appelbaum, Jacksonville District
Ms. Sharon Bond, Louisville District
Mr. David Brandon, Omaha District
Mr. Edward Cohn, Southwestern Division
Mr. Steven Cone, Headquarters
Mr. Kenneth Cooper, Omaha District
Mr. Robert Daniel, Headquarters
Mr. George N. "Skip" Fach, Jr., Headquarters
Mr. William Fickel, Fort Worth District
Mr. Robert Gore, Baltimore District
Mr. William Hansen, Institute for Water Resources
Mr. James Karsten, Buffalo District
Mr. Harry Kitch, Headquarters
Mr. Michael Krouse, Institute for Water Resources
Mr. Robin Mooney, South Pacific Division

The draft manual was published in December 1995 as IWR Report 95-R-15 and was

widely-circulated for a six-month review. Copies were distributed throughout all levels and across the functional areas of the Corps. The draft was also provided to planning offices and other interests in selected local, State and Federal agencies, professional and special interest groups, planning businesses, and university planning programs. Eighteen letters of comment on the draft manual were received through June 1996. These included many thoughtful ideas from Planning, Engineering, Operations and Project Management offices across the Corps. We particularly appreciated the ideas provided by people outside the Corps, which included comments by representatives of:

Bureau of Reclamation, U.S. Department of the Interior
Civil Engineering Department, University of Kansas
Planning Commission, The County of Chester (Pennsylvania)
St. John's River Water Management District (Florida)

In May and June 1996, three two-day Planning Workshops were conducted in the Baltimore District. The workshops focused on basic principles and the planning process, and provided an opportunity to discuss material from the draft manual in an interactive format. Sixty-six planners, civil engineers, cost estimators, economists, biologists, archeologists and others attended one of these sessions. Their comments and questions were a real-time check on the manual and stirred some rethinking of topics. We appreciate the ideas from all those who attended, and the additional effort of Mr. Robert Gore and Ms. Vaso Karanikolis of the Baltimore District in arranging the sessions.

A smaller advisory group was assembled to assist in preparing the final manual. This group met in July and October 1996, and included:

Ms. Lillian Almodovar, Headquarters
Mr. Steven Cone, Headquarters
Mr. George N. "Skip" Fach, Jr., Headquarters
Mr. Robert Gore, Baltimore District
Mr. William Hansen, Institute for water Resources
Mr. Michael Krouse, Institute for Water Resources
Mr. Ridge Robinson, Institute for Water Resources

Ms. Barbara Grider of the Baltimore District also provided a final editorial review.

The authors acknowledge and thank, without implicating, all who thought, wrote, spoke, took action and otherwise contributed to this final manual.

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ACRONYMS USED IN THIS MANUAL

ASA(CW) - Assistant Secretary of the Army for Civil Works
BCR - Benefit-cost ratio
BOB - Bureau of the Budget
CAP - Continuing authority programs
CEQ - Council on Environmental Quality
CW - Civil works
EC - Engineering Circular
EM - Engineering Pamphlet
EO - Executive Order
EPA - Environmental Protection Agency
EQ - Environmental quality
ER - Engineering Regulation
ETL - Engineering Technical Letter
FCSA - Feasibility Cost-Sharing Agreement
FONSI - Finding of no significant impact
GIS - Geographic Information System
H&H - Hydraulics and hydrology
HEP - Habitat Evaluation Procedures
HSI - Habitat Suitability Index
HTRW - Hazardous, toxic, and radioactive waste
IWR - Institute for Water Resources
MCEM - Multi-criteria evaluation methods
NED - National economic development
NEPA - National Environmental Policy Act of 1969
No. - Number
NTIS - National Technical Information Service
O&M - Operations and maintenance
OMB - Office of Management and Budget
OSE - Other social effects
P&G - Principles and Guidelines
P&S - Principles and Standards
PCA - Project cooperation agreement
PED - Preconstruction engineering and design
PGL - Planning Guidance Letter
PGN - Planning Guidance Notebook
P.L. - Public law
SD - Senate Document
SOW - Scope of work

SWB - Social well-being
U.S.C. - United States Code
WES - Waterways Experiment Station
WRC - Water Resources Council
WRDA - Water Resources Development Act

CHAPTER ONE: INTRODUCTION

"We must ask where we are and whither we are tending." Abraham Lincoln (1809-1865) Sixteenth President of the United States.

INTRODUCTION

Planning with a little "p" is problem solving and it is done throughout the U.S. Army Corps of Engineers organization. Some of it is done by planners in Planning Divisions on planning studies. Some of it is done by engineers in Construction Divisions. Some of it is done by wildlife biologists in Regulatory Offices. Much of it is being done by people who do not think of themselves as planners. Planning is called for to one degree or another any time a decision is required.

No matter who does it, planning is best when done well by people who understand and value it. This manual offers a rational and systematic approach to planning that is applicable to virtually any planning activities the U.S. Army Corps of Engineers needs to undertake.

What is planning? How is it done? Where do plans come from?

Water resources planning is the bread and butter of the Corps' planning functions. As national values and priorities change, new planning functions are emerging outside the realm of water resources. Planning within the Corps of Engineers is far more pervasive than most people would imagine. There are the traditional reconnaissance and feasibility studies for the typical single purpose project that virtually everyone recognizes as planning. Then there are operations and maintenance budgeting problems, dredged material placement, major rehabilitation, environmental infrastructure, the regulatory program, military construction projects, project validation assessments, mobilization planning, master planning for military facilities, reservoir master planning, logistics planning, planning assistance to the States, formerly used defense sites, the installation restoration program, special projects, incidental hazardous, toxic and radioactive wastes (HTRW) issues, and strategic planning as examples of some of the other newly emerging Corps planning functions. Planners have a great deal to offer to these activities.

It's of little importance whether planners are concentrated in one place in the organization or spread throughout it. What is important is that the people who are planning know how to plan. Planners are solvers of wicked problems; complex intractable problems for which there is no one right answer. Planners are shapers of the future. They are generalists with a specialty. They are the kinds of people 21st century organizations are going to need.

Few people are trained as planners. Most learn on the job. To be a good planner, however, one needs to know how to go about planning. There has to be a way to approach planning. A planner needs a framework upon which plans can be built. Over the last two centuries, a remarkably simple and flexible planning process has emerged in the water resource development field. It is, in fact, one of the most logical and best described planning processes to be found anywhere. The six-step planning process currently used by the Corps and applicable to all the Corps' water resources and other planning functions is described and elaborated upon in this manual.

What is planning? How is it done? Where do plans come from? Elementary questions, yet experience shows the answers are not so easily derived. Answering them is the goal of this manual.

PURPOSE AND AUDIENCE

The primary purposes of this manual are twofold. First, it explains what planning is. Second, it explains how planning can be done by the Corps of Engineers. Its focus will be on water resources planning, though the principles, tools and methodologies discussed are equally applicable to other planning functions as well. This manual deals with planning. It is not about Planning Divisions, project management, budgetary processes, or types of reports.

The target reader for this manual is the Corps planner with less than five years of experience. To the extent the manual succeeds in explaining the basic tenets of planning in general and the Corps' planning process in particular it may also be of interest to anyone who has to find rational solutions to complex problems. Non-planners within the Corps as well as non-Federal partners and members of the general public may find it helpful to understand the planning process and the reasons for it. Experienced Corps planners may also find the manual to be a useful refresher.

This is not a comprehensive planning document. It does not repeat in detail the guidance or planning procedures that can be found in other documents. Nor does this manual provide a cookbook approach to planning. As the reader will learn, that would be antithetical to the planning process.

The manual has been written so you can read from it selectively, though it is most congruent and complete if read in its entirety. Readers are encouraged to browse through the manual and read what interests you. A measure of redundancy has been added to ease the burden of those who do read this manual a piece at a time.

ORGANIZATION OF MANUAL

The manual consists of 14 chapters and an appendix as shown in Figure 1. The first four chapters are introductory in nature and explain what planning is. Chapter Two defines planning generally, and the Corps' six-step planning process specifically, as a rational problem solving process. The basic terminology and concepts needed to understand the greater content of the manual are presented here. Chapter Three provides a brief history of water resource planning by the Corps. This history is presented against the backdrop of the larger issues of water resources development in the United States. The final introductory chapter, Chapter Four, provides an overview of the key planning guidance that directs the plan formulation process. These are primarily the *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (also known as **Principles and Guidelines** or **P&G**) and **Engineering Regulation (ER) 1105-2-100, Guidance for Conducting Civil Works Planning Studies.**

The next seven chapters address the questions of how planning is done and from where plans come. This is done in a detailed discussion of selected elements of the Corps' **six-step planning process**. A separate chapter is devoted to each of the planning steps. Chapter Five, however, first discusses iterations, screening, and other essential concepts that run throughout the six planning steps. Chapter Six addresses the first step, **identification of problems and opportunities**. Substantial emphasis is given to the specification of **planning objectives** and **constraints,** critical steps in the formulation process.

Chapter Seven covers the second step of the plan formulation process, the **inventory and forecast of resources**. Step three, the **formulation of alternative plans**, is covered in Chapter Eight. The next chapter addresses **plan evaluation**, the fourth major planning step. Chapter Ten discusses the **comparison of plans** and Chapter Eleven describes the sixth and final step in the planning process, **plan selection**. Though these steps are presented in separate and discrete chapters, the conduct of the steps in actual practice is anything but separate and discrete. In practice the planning steps entail a great deal of overlap, iteration, and even ambiguity.

The last three chapters address topics of special interest to Corps planners. Chapter Twelve deals with some problems and constraints that planners frequently encounter in the planning process. Chapter Thirteen is devoted to a discussion of planning teams and public involvement. The final chapter describes the art of documenting the planning process by simply telling your story. Appendix I presents a list of planning publications that planners may want to include in their working library.

FIGURE 1: ORGANIZATION OF MANUAL

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As noted above, the manual has been written so that it can be read selectively. The only loss of continuity is likely to be an occasionally unfamiliar term or phrase. To assist readers who find themselves in this situation an index is provided at the back of the report along with a list of references. Quotation boxes, in which parts of the text are excerpted, are used to highlight some important ideas in the chapter and to aid "skimmers". In addition, liberal use of italics is made to further direct the selective reader's attention to important ideas of the chapters. Sidebar boxes are used to introduce details and explanations that supplement the general flow of the material.

…the six-step planning process…offers a rational, systematic, and flexible approach to planning that can be used for any planning activity in the Corps' organization.

SUMMARY AND LOOK FORWARD

This manual provides an introduction to planning in the Army Corps of Engineers. The following chapter defines planning in general terms and then introduces the six-step planning process the Corps uses, which is essential knowledge for all Corps planners. It offers a rational, systematic, and flexible approach to planning that can be used for any planning activity in the Corps' organization.

CHAPTER TWO: PLANNING DEFINED

"We should all be concerned about the future because we will have to spend the rest of our lives there." Charles F. Kettering (1876-1958) American engineer and inventor.

P&G and the Corps

Over the Nation's first two centuries U.S. water resource development policy has evolved to what it is now. Currently, and since 1983, the principles, standards, and procedures that guide water resource development at the national level are articulated in the Principles and Guidelines. The P&G were "...developed to guide the formulation and evaluation studies of the major water resource development agencies." In prior years, each water resource development agency had developed its own formulation and evaluation procedures. The P&G is the most recent effort to standardize these practices.

Consequently, to characterize the P&G's six-step planning process as the Corps' planning process could be misleading. It is indeed the Corps' process in that it is the process the Corps follows. However, it was neither developed by the Corps nor restricted to the Corps' use. Other agencies use the P&G's planning process to varying extents.

INTRODUCTION

Planning is a creative process. Like many creative processes, it can tend to be unstructured and ad hoc, at times bordering on chaotic. It requires unequal measures of experience, analysis, intuition, and inspiration. There are many ways to add structure to this process. The one used by the Corps has been promulgated by the Federal government in the Principles and Guidelines. Inasmuch as this planning process has been adopted by the Corps, it is referred to simply as the Corps' planning process throughout this manual. It provides a flexible, systematic, rational framework from which planners can work and to which they can return when chaos threatens. It provides general guidance on how to proceed and a logical means of describing the thought processes that might otherwise remain opaque to others. This chapter offers several definitions of planning, then introduces the Corps' planning framework. That framework is described at length in subsequent chapters.

Three questions are the focus of this chapter. The chapter begins by answering the question, "what is planning"? It then answers the "how is it done" question with an overview of the Corps' planning process and a brief look at some types of planning and planners. It next turns to the question, "where do plans come from?" by introducing some basic notions of plan formulation, a significant step in the planning process.

WHAT IS PLANNING?

What is planning? That seems a simple enough starting point for our discussion, but *a review of the literature reveals a wide range of opinion and very little consensus on what planning is.*[1] The following paragraphs offer several definitions of planning. They are summarized in Table 1.

Table 1: Planning Defined

- Basic human activity
- Rational choice
- Control of future action
- Special kind of problem solving
- What planners do

Though we'll offer a working definition, it is not important that you agree. Pick the definition that most appeals to you. It is far more important to have a sense of the big picture of what planning is about than that you agree with any one of the definitions offered here.

PLANNING AS A BASIC HUMAN ACTIVITY

Some see planning as a basic human activity that pervades our behavior at every level of society. In this view, planning is a process of human thought followed by action based upon that thought. This makes planning a very general human activity.

You plan what to wear to work, the route to take to the office and what to have for lunch. This makes planning very ordinary. At the same time, it does not preclude the notion of expertise. Many people run. Few of them devote themselves to running to the point they become Olympic athletes. Likewise, though everyone plans, few do it as well as the professional planners.

...important to have a sense of the big picture of what planning is about...

If planning pervades human activity then surely it pervades the development and use of water and related land resources and the performance of the Corps' various missions. We, as a society, think about water resources, then take actions based on those thoughts. These activities are complex enough, however, to require the services of experts.

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[1] The material in this section is adapted largely from Ernest R. Alexander's article, "Planning Theory," found in *Introduction to Urban Planning* edited by Anthony J. Catanese and James C. Snyder.

PLANNING AS RATIONAL CHOICE

This view of planning is confined to matters of deliberate choice. It emphasizes the link between planning and rationality. *Planning thus becomes a process for determining appropriate future actions through a sequence of choices. It is a structured rational approach to achieving desired ends.*

As subsequent chapters will reveal, water resources planning is nothing if it is not a rational decision-making process. The rationality of the six-step planning process used by Corps planners is undeniable.

PLANNING AS CONTROL OF FUTURE CONSEQUENCES

Planning may be seen as an attempt to control future consequences through present actions. This view fuses planning and action together, for if we do not implement a plan, there can be no control exerted over the future. Some would measure the success of planning by the future consequences we are able to control.

The Corps' planning framework relies extensively on the consideration of future consequences. The comparison of future scenarios without and with a project in place is central to the Corps' planning process.

PLANNING AS A SPECIAL KIND OF PROBLEM SOLVING

Another line of thought is that planning is problem solving that is aimed at very particular kinds of problems. Planning theorists have defined the problems they deal with as **"wicked" problems**. *A wicked problem is one with no clear answers; solutions are only better or worse.* The data available to solve these problems are usually messy. There are no rules for approaching wicked problems and no clear tests to formulate or judge their solutions. *Water resource problems are always wicked problems, as are most of the planning problems the Corps faces.*

PLANNING IS WHAT PLANNERS DO

Planners help decision-makers identify their problems, conceive solutions to them, and compare the importance of the inevitable conflicting values inherent in any solution. This is a simple and intuitive definition with which many Corps planners can identify. The job is unique; and it differs so from day-to-day that it defies a more precise definition.

The definitions offered here are not mutually exclusive. They are overlapping and somewhat imprecise, but taken together they provide a fairly reasonable picture of what planning is. To further sharpen that picture, let's consider what planning is not.

WHAT PLANNING IS NOT

Though brief, this review of what planning is makes several points clear. First, there is no consensus on what planning is. Second, it is easy to see the

Plan

"Plan" is both a noun and a verb:

". . . n. 1. Any detailed scheme, program, or method worked out beforehand for the accomplishment of an objective . . ."

". . . v. 1. To formulate a scheme or program for the accomplishment or attainment of . . ."

This manual focuses on the verb rather than the noun.

elements of what the Corps planner does in each of the definitions. It may be helpful at this point to consider a few things that planning is not.

The little "p" planning used in this manual is not the same as Planning Division. Planning Division does little "p" planning but it also does big "P" Planning. Big "P" Planning entails a great deal more than does little "p" planning. This manual is concerned with little "p" planning, no matter who does it or where it is done. The planning process is not the same as the report review process, the budget process, or any of the many regulatory review and consultation processes. These processes are important to successful planning; but they are not substitutes for it.

Planning is not report writing or the technical work done by experts working on a planning study. Good story telling is essential - Chapter Fourteen is devoted to it - but it only describes how, what, and why you planned. Planning requires sound scientific and engineering input from many disciplines, but the science is only part of the story. Great hydrology, great economics, great biology, or great anything alone is not planning. Great planning weaves these inputs into a successful solution.

Planning is not a purely individual activity. It is done by individuals in a team environment intended to affect groups of people. While there may be personal planning, that is not the concern of this manual. Additionally, *planning is not present oriented*. Planning is primarily concerned with the future. Future actions and their consequences involve substantial uncertainty.

Planning is…the deliberate social or organizational activity of developing an optimal strategy for solving problems and achieving a desired set of goals.

Planning cannot be routinized. Problems that are unique can be approached with existing solutions or problem-solving algorithms, such as standard operating procedures, rules, or programs. These problems, however, are not the wicked problems that planners confront. Let this serve as fair warning to the reader; there will be no standard operating procedures for planning found in this manual!

Planning is not a trial-and-error process. It is not experimental. It is a focused, thoughtful, and rational process. The plans themselves may involve feedback loops, monitoring, evaluation, and adjustment. Such adaptive management is a concept the Corps encourages for ecosystem restoration plans. The point is that *while it may be reasonable for the plans themselves to be experimental, the planning process should never be.*

Neither is planning just the imagining of desirable futures. While specifying objectives and creating alternative plans to achieve them are extremely important parts of the planning process, they are not sufficient for planning. *Planning is more than utopian thinking. The intention to implement plans and the power to do so are essential elements of planning*. Planning is not done for planning's sake. Do not confuse the planning process with the report writing or the review process. Planning goes well beyond completing a report.

If planning is not an individual action, not routinized, not trial-and-error, not academic or utopian, then what is planning? Planning is societal, future-oriented, non-routinized, deliberate, and action oriented. *Planning is here defined as the deliberate social or organizational activity of developing an optimal strategy for solving problems and achieving a desired set of objectives.*

HOW IS PLANNING DONE?

Planning is done by people. It's done in a sequential, multi-staged process in which many of the stages are linked to their predecessors by feedback loops. It can be done in an hour, a day, a week, or a year. Conclusions reached at a later stage of the planning process may lead to revisions of an earlier stage or another iteration of the entire process. The specific sequence and stages of a planning process vary with the type of planning and the institutional setting in which the planning is done. Generalizations about how planning is done are reflected in the two planning models that follow. The first is a generic model of the planning process, the second introduces the planning model used by the U.S. Army Corps of Engineers in its Civil Works activities.

A GENERIC PLANNING MODEL

There is no such thing as "the" **planning model**. Planning models abound in the literature. Sometime in your education, way back in elementary school, you probably encountered the "**scientific method**." It told you how to learn things. You observe a condition and form a hypothesis. You test your hypothesis in an experiment and compare the results to your hypothesis. You either confirm your hypothesis or repeat the process with a revised hypothesis. It was probably your first step-by-step, iterative, problem-solving process. Well, that same time-tested method has been dressed up, modified, and recycled as a planning process. The major components in Table 2 can be found in most of the planning models in general use.

Table 2: Two Planning Models

Generic Model	Corps Model
1. Problem diagnosis	1. Identify problems & opportunities
2. Goal articulation	2. Inventory & forecast resources
3. Prediction and projections	3. Formulate alternative plans
4. Alternative development	4. Evaluate plan effects
5. Feasibility analysis	5. Compare effects of alternative plans
6. Evaluation	6. Select best plan
7. Implementation	

Planning often begins with some notion that we are dissatisfied with the status quo. If there is no problem, there is no reason for plans or actions. Diagnosis of the problem requires an image of a desired state.

Goals relate to problem definitions. Translating vague, incoherent or conflicting goals into operational objectives is one of the toughest jobs a planner faces.

Solving problems and achieving goals always involves moving from where we are now to some different place in the future. Prediction is essential for evaluating and selecting alternatives and for moving to future places. We need to make some guesses about the future to formulate and evaluate plans.

The development of alternative plans has a profound effect on the quality of the final decision. As Lichfield [2] has said:

> "The ability of an evaluation exercise to demonstrate the comparative merits of possible courses of action is limited, ultimately, by the quality of the plans put forward for assessment. A "good" plan cannot be chosen from a "poor" set of alternatives."

Where do alternatives come from? They must be generated by people from some mix of experience, analysis, inspiration, and creative invention.

Feasibility analysis asks, can the alternatives be done given known constraints and available resources? Evaluation begins when planners have a number of alternatives they know can be implemented. Which alternative do you like most? What does it do for you? The answers to these questions depend on the evaluation criteria you use: benefit-cost analysis, cost-effectiveness, environmental quality, other social effects, program output indices, and so on.

...alternatives...must be generated by people from some mix of experience, analysis, inspiration, and creative invention.

Implementable plans seem to require a strong political commitment, though that is not a sufficient condition. Plans that can be implemented within existing organizational frameworks are more likely to succeed than complex plans that require new institutional structures and relationships.

There are any number of ways to include these basic tasks in a planning process. The Corps of Engineers' planning process

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[2] Lichfield, Nathaniel, Peter Kettle, and Michael Whitebread. *Evaluation in the Planning Process.* Oxford: Pergamon, 1973, p. 13.

is but one of many possible planning models. It is one of obvious interest here, however, for it is the focus of this manual.

THE CORPS' PLANNING MODEL

The direct correspondence of the generic planning model with the Corps' six-step planning process is also shown in Table 2. The language used in the generic model differs somewhat; however, the elements of the steps indicate a clear correspondence in concept and theory. The two models together show the Corps' planning process is consistent with good planning theory.

Though the Corps' process is presented as if it is a simple sequence of six rational steps, it is not that easy. No clean lines can be drawn among the steps in the Corps' planning process. Problem definition, goal setting, devising alternative solutions, etc. are more simultaneous activities that wax and wane throughout the process with the relative importance of each step varying from time-to-time, often in an unpredictable manner. The steps do, however, suggest that the emphasis in the planning process will occasionally change to one of these activities as shown in Figure 2.

In the beginning, the emphasis will be on step one, identification of problems and opportunities, even though work may be proceeding on the other steps. There may even be several iterations or passes through the steps in which step one is emphasized. But, in time, the emphasis will shift to step two, as the second large rectangle indicates. At this stage in the planning study there may again be one or more iterations through the various steps but the emphasis is clearly focused on the second step. This process of iterating through the steps continues with a continually shifting emphasis on the next step.

The steps are presented in a linear fashion in the P&G, but the planning process is anything but linear. At times it borders on chaotic. But always it comes back to the order imposed by the rational framework present in the steps. There is a chapter on each of these steps later in the manual. For now, we simply list the steps. It is easy to see the relationship of the Corps' specific model to the generic planning model. The generic steps have in essence been restated in a water resources context.

…the planning process is anything but linear.

The six-step planning process is described in the P&G as follows:

1) *Specification of the water and related land resource problems and opportunities (relevant to the planning*

setting) associated with the Federal objective and specific State and local concerns.

2) *Inventory, forecast, and analysis of water and related land resource conditions within the planning area relevant to the identified problems and opportunities.*

3) *Formulation of alternative plans.*

4) *Evaluation of the effects of the alternative plans.*

5) *Comparison of alternative plans.*

6) *Selection of a recommended plan based upon the comparison of alternative plans.*[3]

This process makes use of several tools, including criteria, goals, objectives, constraints, solutions, and effects. The success of the process depends on the involvement of the right people at the right time; in other words, interdisciplinary planning and public involvement. These tools will be highlighted throughout the discussions of the planning process that follow.

EXAMPLES OF PLANNING IN THE CORPS

On the verge of the 21st century, in a world of changing missions and tight budgets, planning is needed more than ever. At the highest levels of the organization where the future of the agency and new missions are discussed there is a role for planning. The need for planning pervades the functional levels of the Corps as suggested in Table 3.

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[3] Section III paragraph 1.3.2(a) of *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies.*

Figure 2: Corps' Planning Process

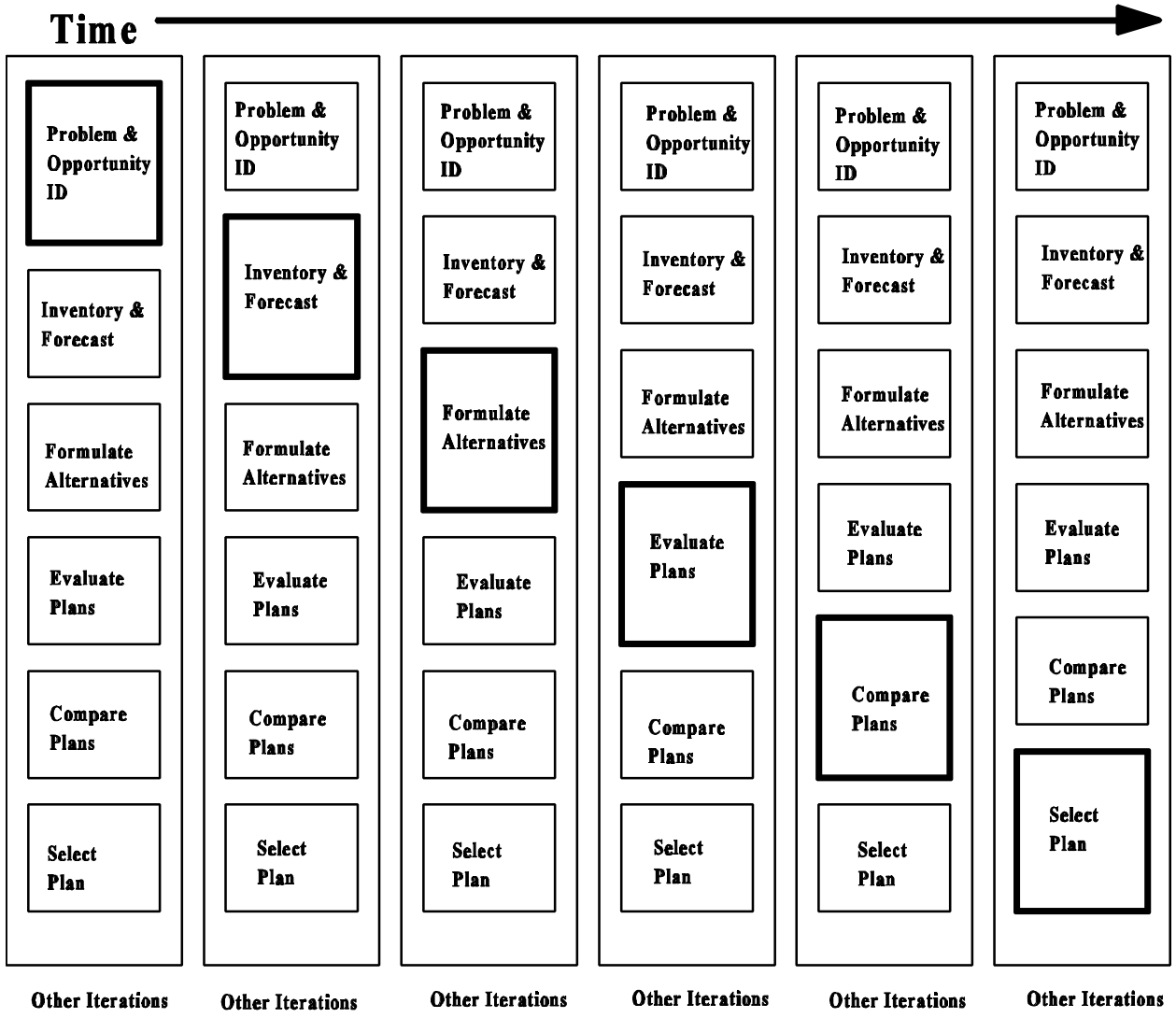


Table 3: Planning in the Corps

Water resources development planning
- flood and storm damage reduction
- ecosystem restoration
- navigation

Watershed planning
Planning assistance to states
Operations and maintenance planning
- major rehabilitation
- maintenance dredging
- master planning

Regulatory permits planning
- special area management plans
- mitigation banking planning

Environmental infrastructure planning
Drought preparation planning
Military planning
- master planning
- military construction planning
- logistics
- project validation assessment
- mobilization planning

Restoration planning
- formerly used defense sites planning
- installation restoration program planning

Support for others planning
Strategic planning

Operations and maintenance personnel are forced by tight budgets to plan their O&M work. Construction operations personnel must choose from among options to correct design deficiencies and compare them to continued maintenance, choosing the option that best meets public and agency needs. Military construction branches are formulating alternatives and recommending the best course of action. Resource management personnel evaluate and compare options for getting the Corps' essential support work done.

Planning is problem solving and there is no shortage of problems. *Planning offers a structured, rational approach to solving problems of all types.* If planning can improve agency performance through problem solving and informed, rational decision-making, it is essential to accomplish the agency's missions.

The bread and butter of Corps planning has been the traditional civil works **water resources development planning**. Such Corps planning currently is:

- Authority based, relying on various public laws and Congressional

Committee resolutions to provide the authority to study and implement projects. This includes the Corps' Continuing Authorities Program.

- Phased, with an initial 100% Federally financed, 6-12 month reconnaissance study, followed by a feasibility study that is 50/50 cost shared with a non-Federal sponsor and targeted for completion in three years.

- Oriented toward the Federal objective of national economic development consistent with protecting the nation's environment. Planning in other Corps programs may be directed at other national goals.

- Oriented toward specific types of water-related problems and opportunities. Today's water resources program focuses on flood and storm damage reduction, commercial navigation, and ecosystem restoration as priority outputs. Table 4 lists historic project purposes.

The Corps' expanded environmental mission has brought about something of a revived interest in **watershed planning**. Watershed planning resembles the basin level planning studies of the past.

Table 4: Types of Project Purposes

- Navigation
- Flood damage reduction
- Shore protection
- Hydroelectric power
- Recreation
- Water supply
- Fish & Wildlife enhancement
- Ecosystem restoration

Section 22 of Public Law 93-251 authorized the Corps to cooperate with the states and Native American Tribes in the preparation of comprehensive plans for the development, utilization and conservation of the water and related land resources of drainage basins located within

the boundaries of the state. This program is often called "Planning Assistance to States."

Several **drought preparation study** (DPS) prototypes were conducted as part of the recent National Drought Study. Such studies recommend actions to be taken by government and community in advance for the purpose of preparing for the occurrence of droughts, coordinating a proper response to drought, managing water supply and water use during drought, and otherwise mitigating the effects of the impacts associated with droughts.

In 1982, the Operation and Maintenance, General, portion of the Corps' budget exceeded $1 billion for the first time. By 1985, the O&M portion of the budget exceeded Construction, General, for the first time. Little "p" planning is becoming increasingly important as this function grows ever larger and more complex. Dredged material placement plans, beneficial uses of dredged material, project master planning, and major rehabilitations are some examples of O&M functions in which planning is already used.

Table 5: Examples of Other Planning Functions

- Master planning
- Military construction
- Mobilization planning
- Logistics planning
- Disaster preparedness & emergency response
- Operations & maintenance budgeting
- Facilities management
- Formerly used defense sites
- Installation restoration program
- Work for others
- Strategic planning
- Special studies

While water resources related planning remains the bread and butter of most Corps' planning, other Corps missions can and do benefit from good planning, as Table 5 indicates. The Corps has a substantial military program. In the 1980s, planners became actively involved in **mobilization master planning**. More generic **master planning** is basically the development of long-term plans for the optimal usage of lands and facilities at reservoirs and military installations. Military installation master planning might involve housing, office space, production and research facilities, health care, signage, and infrastructure including water, sewage, street lighting, roads, energy, and the like. In other words, it includes anything and everything needed to make the installation effective and efficient in performing its missions.

What's a Continuing Authority?

Once all Corps projects required a specific act of Congress to authorize their construction. In other words, if Congress did not specifically mention its desire to construct a project in a piece of legislation the project would not be built. Typically, all projects were bundled together into an **omnibus bill** that included all water resource development projects. Initially, flood damage reduction projects were included in **Flood Control Acts** and navigation projects in **Rivers and Harbors Acts**. The current omnibus acts are called **Water Resource Development Acts** (also known as WRDA, pronounced "word-uh").

Congress has decided to give the Secretary of the Army the authority to approve and construct certain size and type projects. This can be done on a continuing basis. Thus, we have the so-called **continuing authority programs** (CAP). Congress establishes the type of projects that can be built without specific Congressional authorization in the language that creates the authority. These authorities are generally found in one of the omnibus acts. The Federal cost share of the projects is established by dollar limits periodically set by Congress. The programs include the following:

- Section 14: Emergency Streambank & Shoreline Erosion
- Section 103: Beach Erosion Control
- Section 107: Navigation
- Section 111: Mitigation of Shore Damage
- Section 204: Beneficial Uses of Dredged Material
- Section 205: Flood Damage Reduction
- Section 206: Aquatic Ecosystem Restoration
- Section 208: Snagging & Clearing (Flood)
- Section 1135: Environmental Improvement

The number of projects constructed is established through the joint interaction of Congress and the Administration in the budget process. Each continuing authority program has a separate authorization, spending limit, and budget. See ER 1105-2-100, Chapter Three for more information.

Planning has also been used to assist the **military construction projects** program. In these projects a few objectives are established,

an estimate of the cost of accomplishing these objectives under a status quo situation is prepared, then one or more alternative ways of accomplishing the objectives are formulated and costed out for the purpose of identifying the best option for attaining the objectives.

This type of planning has been done for child care facilities, family housing, barracks, communications centers, wastewater treatment, training facilities, research facilities, parking garages, laundry facilities, and many other functions and facilities. A variation of this type of planning is the **project validation assessment**. This is a planning process used to obtain funding for projects that have not been appropriated funds. It usually entails a cashflow or pay-back analysis.

Logistics planning is another area in which planning has made significant contributions. Moving materials and people in the most effective manner that meets the objectives of the move is a natural for planning. Planners have been involved with the **military traffic management command** to help plan movements of Army Reserve and National Guard units at a number of locations throughout the country.

Corps offices are occasionally asked to become involved in planning efforts that do not fit neatly into any of the above categories. **Special studies** are authorized by Congress from time-to-time. **Support for others** planning involves work for other Federal agencies. This has included planning for embassies, wastewater treatment facilities, prisons, roads, and other infrastructure. In addition to these special studies, strategic planning has become more widely used by Corps offices. **Strategic planning** highlights the significance of devoting more attention to analyzing operating environments and formulating strategies that relate directly to environmental conditions. The ultimate purpose of strategic planning is to help the organization, be it the agency, a district, or an

Environmental Planning

"**Environmental planning,**" though an expanding Corps mission, is nothing new. In fact, a case could be made that the Corps has always been involved in environmental planning, it's just that the desired adjustments to the environment have evolved and changed over time.

There are different types of planning activities Corps planners do that relate to the environment. First, there is the **evaluation of environmental effects** of alternative plans. This is sometimes referred to as **environmental impact assessment**. Environmental impact assessment became a formal necessity for the Corps with the promulgation of the Council on Environmental Quality regulations following the passage of the National Environmental Policy Act (NEPA) in 1969. Under NEPA, the environmental assessment (EA) may lead to a finding of no significant impact (FONSI) or an environmental impact statement (EIS). This type of environmental planning has been done for over two decades and the methods are well defined and well executed.

The Corps has also done extensive planning for environmental **mitigation**. Section 661 of the Fish and Wildlife Coordination Act of 1958 provided that **fish and wildlife conservation** receive equal consideration with other project purposes. Section 906(a) of WRDA 1986 authorized mitigation of unavoidable damages to fish and wildlife that result from construction of a project.

Finally, ecosystem restoration is now a priority output for the Corps. Restoration of degraded ecosystem structure, function, and dynamic processes represents a new challenge for Corps planners. For example, Section 1135 of WRDA 1986 makes **restoration** of fish and wildlife habitat possible and it authorizes the Secretary of the Army to modify Corps projects for the purpose of improving the quality of the environment in the public interest.

Although there are environmental planning objectives and new environmental programs and authorities, the simple truth is that planning for and about these values is exactly the same planning process described in this manual. The only difference is a focus on nonmonetary outputs rather than the traditional economic outputs.

office, to increase performance through improved effectiveness, efficiency, and flexibility.

The important point to make here is that *no matter whether the planning responsibility is in water resources or other areas, whether it is formal or informal, the Corps' six-step planning process is equally applicable.* It is a robust, rational planning framework that is sufficiently flexible for any and all types of planning encountered by Corps personnel. That is not to suggest that it is or should be pursued with equal resources, detail, or rigor in every situation. As mentioned

...the entire planning process can be completed in an hour, a day, a week, a month, a year, or a decade.

earlier, the entire planning process can be completed in an hour, a day, a week, a month, a year or a decade. The level of detail and quality of the results can be expected to vary with the time and resources devoted to planning. But, no matter what the time frame, it is inevitable that a planning decision made based on a planning process is going to be better than a decision made without one. Budgets, schedules, the significance of the work, knowledge of the planning process and other factors will dictate the extent to which a structured planning process is pursued. The basic approach to problem solving embodied in these steps is, however, sound and proven and can be used in all planning situations.

Planning can contribute to agency performance wherever problems are encountered. When those problems are wicked, planning is indispensable.

TYPES OF PLANNING AND PLANNERS

Planning is best done by planners. In this section, we consider some of the planning specialties and who planners are.

GENERIC TYPES OF PLANNING

The present-day planning profession has emerged in response to the growth, changing values and critical problems of 20th century urban development. Though planning theory may have developed around the needs of cities, there are many different types of planning, water resources development planning and military master planning being but two examples.

Based on the variety of definitions of planning offered above, we are able to identify a rather lengthy list of different planning specialties. Table 6 shows the areas of specialty recognized by the Association of Collegiate Schools of Planning. Interestingly, the typical Corps planner may find herself involved in

Table 6: Selected Planning Specialities

- Land Use Planning
- Policy Planning & Management
- Transportation Planning
- Housing & Community Development Planning
- Human Services Planning
- Historic Preservation Planning
- Economic & Resource Development Planning
- Environmental Policies Planning
- International Development Planning
- Urban Design and Physical Planning
- Computers in Planning

Source: Association of Collegiate Schools of Planning

A Planner's Best Friends

- The newspaper(s) and telephone book(s) that cover the area under study.
- The alphabet and chronology; two organizing tools that just about everyone understands and can agree to.
- Lists of everything and anything, such as telephone numbers, reasons why Plan 7 won't work, what to talk about at the next team meeting, etc.
- Questions, particularly: "Why?", "How do you know that?", "Who cares?", and "What will happen if we don't?"
- The abilities to tell the story (spoken and written), and to listen.

virtually all of these specialty areas at one time or another.

PLANNERS

Within the Corps, you will find planners and other people who plan. *A* **planner** *is "a generalist with a specialty."* Planning requires men and women with knowledge, imagination, and skills, and a commitment to critically examine and act on objectives concerned with the improvement of the human condition. Planners must respond to complex and interrelated processes of social, economic, cultural, environmental and political change at every scale from the local to the global. Their specialized expertise derives from their ability to relate scientific and technical knowledge to action in the public domain. No one discipline prepares a person to be a planner. *Planning is intrinsically an interdisciplinary process.*

The skills of a planner, which should be considered "in addition to" their specialty skill, are shown in Table 7. The skills, ranked in order based on a somewhat dated (1976) survey of Massachusetts Institute of Technology planning graduates might show a different order today (computer skills would surely rank higher and more communication skills would be prominently ranked), but the array of skills is still relevant.

Planners come from many backgrounds, including urban studies, environmental studies, architecture, political science, engineering, economics, sociology, law, the natural sciences, management, geography, and public administration among others. The Corps' study team would reflect this same mix of skills, adding some

particularly useful in water resources problems. Chapter Thirteen discusses the planning team in more detail.

In addition to planners there are the other people who plan. These are the specialists who may not recognize the work they do as planning. They may be found in operations and maintenance, engineering, or construction divisions, the front office or virtually anywhere else in the organization. Helping other people who plan to do their job better is one of the greatest values of the Corps' planning process.

Table 7: Planner's Skills

- Writing
- Synthesis
- Interaction
- Consulting
- Research Design
- Community Organizing
- Information Retrieval
- Environmental Analysis
- Data Analysis
- Teaching
- Original Information Getting
- Management
- Economic Analysis
- Spatial Design
- Evaluation
- Site Planning
- Computer Skills
- Operations Research
- Recording

WHERE DO PLANS COME FROM?

Where do plans come from? They come from people. There comes a time in every planning model when **alternatives** are designed to address the problems that motivated the planning process in the first place. *Alternatives are solutions to problems that contribute to stated planning objectives.* In the Corps' planning process the emphasis shifts to identifying and designing alternatives that solve a problem in step three, **plan formulation**. Thus, plans emerge from the plan formulation process, a subject addressed at length in Chapter Eight. For now, we content ourselves with the "big picture" and how this formulation activity fits into it.

Yes, There Really Are "Planners"

Planners have been called generalists with a specialty. Planners are often civil engineers, architects, or from other professional disciplines. But some people are truly "planners" and their specialty is planning.

- There are about 90 graduate and post-graduate university planning programs in the United States.
- Most planners work in government agencies. Some are consultants, and some are academics.
- Many planners work for local governments. Common products in local planning are comprehensive plans, zoning regulations, and subdivision regulations.
- The Federal government's personnel series GS-0020 Community Planner recognizes the unique specialty of planners.
- The American Planning Association is the nation's largest professional society for planners.

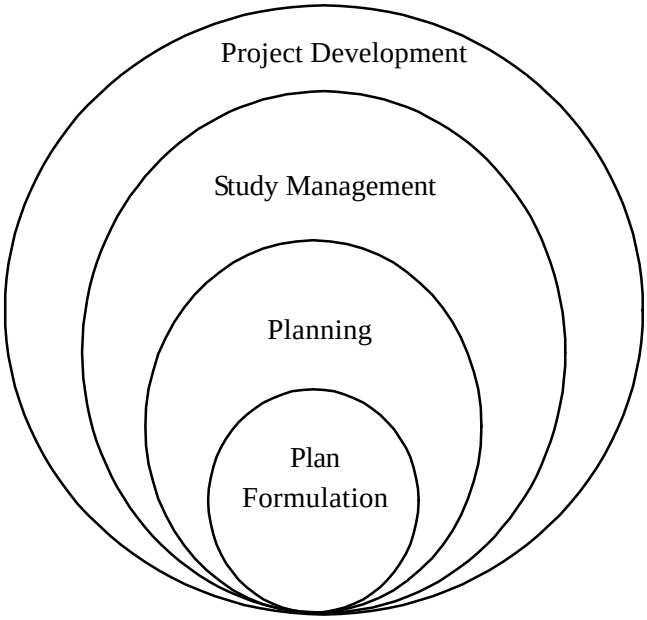
PROJECT DEVELOPMENT AND PLANNING

It's fair to say that not everything Corps planners do during the course of a day can be called plan formulation or even planning. Thus, we find it necessary to invent terminology that makes distinctions among the types of work Corps planners do. Their *work can be considered one of four different types:* **project development**, **study management**, **planning**, *and* **plan formulation**. The relationship of these tasks to one another is shown in Figure 3. The two larger tasks are part of what we call big "P" Planning, practiced more in Project Management and Planning offices. The last two tasks are little "p" planning that can be done anywhere in the organization.

Project Development Process

Planning and plan formulation can be separated from the milieu in which they take place. To facilitate that distinction, we define the most inclusive concept to be *project development*, i.e., *all the activities from initiation of a study through construction*. This is done to allow the separation of the planning process from implementation activities as well as from the institutional setting in which planning is done.

Figure 3: Relational Terminology



The Corps' way of doing business has evolved over time. This "way" includes the financial, administrative, organizational and management styles; the requirements of the agency; and the multitude of institutional relationships they have developed. Some of this culture is clearly related to the planning process. Other tasks may be necessary to the planning process, but they are not part of it.

Study Management

This subset of project development includes all the planning process tasks plus activities that include study management. *Study management activities include* the activities that support the planning process that may not be directly involved with the problem solving aspects of planning. These activities include: *contracting; budget work; inter-agency transfers of funds and personnel; other personnel issues; report preparation, printing, and distribution; shepherding the report through the review process; and so on.*

Planning

Planning, of course, comprises all the work associated with the six-step planning process. More details on this are provided in subsequent chapters.

Plan Formulation

This is the point in the planning process "where plans come from." How that bit of magic happens is considered at greater length in Chapter Eight.

Study Levels

Sometimes you need a lot of information to make a decision and other times you only need a little. There are different levels of detail required for different decisions. We gather less information when buying a candy bar than when we buy a car. The consequences of the decision are substantially different.

Just as the Corps has different project purposes and different types of reports, there are different levels of studies. Since the Water Resources Development Act of 1986 there have been **reconnaissance** and **feasibility** studies. The feasibility study is the more detailed of the two. In reconnaissance efforts there may be less detail or emphasis at some points in the planning process than there would be in a feasibility study, but the differences are of degree, not in approach. The Corps' six-step planning process can be used for all types of planning studies at all

SUMMARY AND LOOK FORWARD

Lesson One. Planning is what Corps planners do. There is a process, a set of steps, a way to do planning.

Lesson Two. There is no single "right" process but some steps are universal among all processes.

Lesson Three. The Corps uses a six-step planning process.

Little "p" planning has been defined here as the deliberate social or organizational activity of developing an optimal strategy for solving problems and achieving a desired set of objectives. It will take the remainder of this manual to detail some of the nuances of this process. That detailing begins in the next chapter with brief histories of water resources development in the United States and the evaluation of water resources planning by the U.S. Army Corps of Engineers.

SUGGESTIONS FOR FURTHER READING

For a nice introduction to planning theory we suggest *Introduction to Urban Planning*, Anthony J. Catanese and James C. Snyder, editors. It has a collection of informative articles that are easy to read. More recent books that provide some nice

overview concepts are Ernest R. Alexander's *Approaches to Planning, Introducing Current Planning Theories, Concepts and Issues;* Jay M. Stein's (editor) *Classic Readings in Urban Planning*; Edward J. Kaiser, et al in *Urban Land Use Planning*, and *Planning in the Public domain: From Knowledge to Action*, by John Friedman.

A fair number of books have been written specifically about water resources planning. Some of the better ones were written during the 1970s and 1980s including the following:

Alvin Goodman's *Principles of Water Resources Planning*
Otto Helweg's *Water Resources Planning and Management*
David Major's *Multi Objective Water Resources Planning*
Jim Mulder, et al's *Integrating Water Resources and Land Use Planning*
Margaret Petersen's *Water Resources Planning and Development*.

You can't go wrong with these for starters. For something more recent we suggest Jim Heaney's article, "New Directions in Water Resources Planning and Management," which appeared in the Autumn 1993 edition of *Water Resources*.

CHAPTER THREE: HISTORY OF WATER RESOURCES PLANNING

"The past is only the present become invisible and mute; and because it is invisible and mute, its memorized glances and its murmurs are infinitely precious. We are tomorrow's past." Mary Webb(1881-1927) English novelist.

INTRODUCTION

The Principles and Guidelines (P&G) is only the latest version of a planning process that has been evolving for 200 years. It is not likely to be the last version of a planning process to be used by the Corps of Engineers. The nation's water resources planning framework has evolved gradually, reflecting the changing political and social values of the day. The current P&G have persisted for 13 years at this writing, a modern record for longevity among planning principles.

Knowledge of the historical background of Federal policies for water and related land resource planning is indispensable to an understanding of the present-day situation and its future prospects. In this chapter, we provide a brief review of some events and circumstances of the past 200 years that are still shaping problems and issues in the controversial field of water resource development and, consequently, water resource planning. Examined without perspective, current policy may look contradictory, arbitrary, and confusing. In historical perspective it makes sense, embodying constitutional traditions, political convictions, institutional developments, and changing national values to be reckoned with now and into the future.

The values of a society are reflected in its public policy goals. Different mixes of values will appear in different historical epochs. As a result, policy goals will shift and evolve over time. Corps personnel recognize the present as a time of significant changes. The advent of changes in the cost-sharing formulas and an expanded role for non-Federal partners befitting their expanded financial responsibilities marks a serious change in the Corps' programs.

When the history of the Federal government's role in water resource development and planning is recounted, however, we see

wave after wave of significant change. Even in relatively stable periods during which "business as usual" had enough time to take on meaning, we see the seeds of change sown in the Nation's political and public landscapes. With remarkable regularity, these seeds would blossom into periods of upheaval and major reorientations in water resource development. Only the passage of time and the change of personnel mask the significance of these upheavals to the programs and those executing them. If nothing else, recent history shows the resiliency of the planning process as it has repeatedly adapted to changing priorities and circumstances.

While there are many excellent, detailed writings on the history of Federal water resource planning,[4] there are none concisely focused on the evolution of the planning process. There is a great deal of historical and institutional knowledge in danger of being lost in the absence of this work. This chapter does not pretend to be such a work. It is, however, an attempt to document some of the more important events and circumstances in the evolution of Federal water resources planning in the U.S. as related to the greater focus of this planning manual, so that interested students of this subject can begin their own study.

...seeds of change would blossom into periods of upheaval and major reorientations in water resource development.

A BRIEF HISTORY OF WATER RESOURCE PLANNING IN THE U.S.

THE BEGINNINGS OF WATER RESOURCE PLANNING

The purpose of this section is to provide a sense of the evolution and change that has shaped and continues to shape Federal water resource programs. Water resource planning is as old as civilization itself. Navigation began when people learned wood floated. Irrigation accompanied agriculture. Parts of one of the earliest water supply systems, the Roman aqueducts, are still in use.

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[4] Reference to several of these writings can be found in the bibliography of this manual. Nonetheless, two authors merit special recognition. Beatrice Hort Holmes has done an extraordinary job of documenting the history of water resource policy through 1970. The many works of Henry P. Caulfield, Jr., present one of the most thoughtful and farsighted analysis of Federal water policy available in the literature. This chapter owes a great debt to the work of Henry P. Caulfield, Jr. Much of the history of water resource development given here has been taken directly from his works.

EARLY WATER RESOURCE DEVELOPMENT IN AMERICA

Look at the United State's first major urban centers: Baltimore, Philadelphia, New York, Boston. All are port cities. Find the oldest towns in the original states and they are generally nestled along the rivers and coasts as ports, mill towns, or fishing villages, all dependent on water.

One of the first acts of the Congress of the newly formed United States was, on August 7, 1789, to authorize construction of a lighthouse at Cape Henry, Virginia. This was the first **public works project** undertaken by the Federal government. It was built in recognition of the fact that coastal and foreign shipping was the lifeblood of the nation's economy.

Before the advent of the railroad in the 1820s, water transport on rivers, lakes and canals - although largely undeveloped - was by far the cheapest means of internal bulk transport. The interest in internal improvements was so great that, in 1807, the Senate directed Treasury Secretary Albert Gallatin to make a thorough investigation of waterways, canals, and roads. *Apologizing for the "lateness" of his report, Gallatin in 1808 presented a foresighted summary guide to future development of a system of roads and inland water routes that would unite the states and provide access to the interior of the continent*. The objectives of the **Gallatin report** were **economic development of the West**, **political unity**, and **national defense**. Gallatin believed these improvements were of little value unless they were all undertaken at once.

Water resources planning is as old as civilization

During the period 1817 to 1838, state and city governments took the lead in the development of inland waterway projects in cooperation with private enterprise. Most of these canals failed to pay back the substantial investments required for their construction, the Erie Canal being a notable exception. State and private enterprise lacked the financial resources and the technical personnel required to make these projects economically viable, despite the fact

that the Federal government provided some land grants and army surveying personnel to assist the canal-building efforts.

The failures of the great canal era are significant because they opened the door for Federal assumption of responsibility for planning, financing, constructing, operating, and maintaining **inland navigation**.

...support for Federal navigation development grew stronger because of popular disenchantment with railroad rates and

There were many milestones in the evolution of water resource development in the U.S. during the 19th century. The 1824 landmark case of **Gibbons vs. Ogden** that gave Congress power over "... navigation within the limits of every state in the union" was based on the Supreme Court's interpretation of the Commerce Clause. That same year, the first **Rivers and Harbors Act** was passed. It provided for $75,000 worth of improvements to navigation on the Ohio and Mississippi Rivers.

The **Swamp Acts of 1849 and 1850** turned lands over to the states to be sold, with the revenues being used for flood control, drainage and reclamation. In these actions, we find the beginnings of a national **flood control** function, although it was initially linked with **navigation**.

After the Civil War, support for Federal navigation development grew stronger because of popular disenchantment with railroad rates and discrimination. Waterways were seen as a way to regulate rail rates through competition.

A catastrophic flood on the Mississippi in 1874 led to a Congressional report and the 1879 establishment of the **Mississippi River Commission** (MRC). The MRC was empowered to survey the river and prepare plans to improve navigation and prevent floods. Flood control was still tied to navigation improvements. *Despite the introduction of flood control, drainage, irrigation, and water power as new water development purposes, the century ended as it had begun with navigation for the purpose of uniting the expanding nation for*

economic development as the major force in water resource development.

The **Reclamation Act** *of 1902 introduced a new major water resource purpose,* **irrigation**. This act enabled the government to make use of its proprietary powers over public lands in the West to build irrigation reservoirs to supply water for family farm settlement. By the late 19th century, Congress could see that Federal resources would be required to settle the West. Large water projects were expensive and required more expertise in planning, development and management than was locally available.

The Conservation Movement

One of the political reactions to the rise of industrialism and large cities after the Civil War was an elite reformist drive favoring government action to "preserve" natural resources. At the turn of the century, natural scientists had become established in some of the new and important Federal government agencies. They and their professional colleagues in academia developed the knowledge of the natural environment that, combined with ethical and aesthetic concerns, provided the intellectual basis for the **Conservation Movement**. The future of the world's energy resources was a particular concern of this movement.

...basin flood control evolved from a local concern to a national interest...

"Development and wise use" may stand as an odd philosophy of conservation today but it was a water resource policy philosophy formulated during the Roosevelt years that prevailed into the 1960s. *The trend toward planning and developing* **multi-purpose projects** *fit nicely into the traditions of the 19th century that included pork barrel politics, nearly semi-annual omnibus bills, an expanding concept of national interest, a rapidly advancing state-of-the-art for engineering and other sciences, a growing base of political and public support, and an*

intangible sense of adventure in the great engineering projects of that age. Multi-purpose projects in the early 20th century meant navigation, irrigation, hydroelectric power, water power, and, soon, flood control.

Flood Control

The 1927 flood resulted in the **1928 Flood Control Act** in which Congress adopted a project for the control of floods on the Mississippi because of the large local expenditures in the past and the failure of these works to contain the flooding. As the magnitude of the national flood problem grew, basin flood control evolved from a local concern to a national interest as expressed in the **Flood Control Act of 1936**. Flood control became a Federal policy with this act.

The **River and Harbor Act of 1925** authorized the Corps of Engineers to estimate the costs of conducting comprehensive multi-purpose planning studies for all the major river basins of the U.S. That cost estimate was submitted to Congress in **House Document No. 308** in 1926. In the decades that followed, the Corps completed reports on some 200 rivers. *The resulting* "**308 Reports**" *were the most complete and comprehensive studies of the river basins of the U.S. ever undertaken to that point in time.*

Although the plans did not set forth recommendations, they did include specific plans of improvements and projects. The plans addressed problems with and potential for navigation, flood control, power, and irrigation throughout the U.S.

During the 1940s, Congress gave the Corps the **continuing authority** to conduct studies and implement projects for clearing and snagging (**Section 3 of River and Harbor Act of 1945**), emergency bank protection (**Section 14 of Flood Control Act of 1946**), and small flood control projects (**Section 205 of Flood Control Act of 1948**). With these authorities, it was no longer necessary for the

Corps to receive explicit authorization and appropriations for small-scale projects. The **Flood Control Act of 1944** further authorized the Corps to develop recreation facilities at its projects.

Section 107 of the River and Harbor and Flood Control Act of 1960 established a continuing authority for the construction of small navigation projects. Over the years the annual program and individual project limits for the various continuing authorities have changed with the budget imperatives of the day.

Looking back on the history of water resource development, particularly as it relates to the Corps of Engineers, we see, *beginning with the* **River and Harbor Act of 1875**, *a series of* **omnibus bills** *defining, expanding and changing the Corps' programs, authorities and responsibilities in managing the nation's water resources.* The River and Harbor Acts were generally omnibus bills dealing with navigation improvements. The last of 24 River and Harbor Acts was in 1958. Omnibus flood control laws began with the **Flood Control Act of 1917**. The ninth and final Flood Control Act was passed in 1948.

Beginning in 1960, the omnibus bills were combined in a series of five **River and Harbor and Flood Control Acts**. The last act was in 1970. Since that time, the omnibus bills have been called **Water Resources Development Acts** (WRDA). The first was in 1974.

In addition to these omnibus bills there have been many significant pieces of legislation that have affected Corps programs. These are discussed in more detail in the Corps' Policy Digest (1996).

The environmental movement of the 1960s...was built upon... nature preservation principles.

The **environmental movement** *of the 1960s through the present was built upon the nature preservation principles that the conservation movement of Pinchot-Roosevelt rejected in favor of multi-purpose project development. Gradually the word "environment" was used officially in policy considerations in place of the earlier "natural resources" which, at the time, implied economic development and use of the resources.* The

word, "natural," did not seem to encompass the interest in preservation of historic buildings, landscape architecture, job health and safety protection, control of highway billboards, screening of junkyards, anti-littering campaigns and other means of enhancing **environmental quality**.

The animus that seemed to guide the development of the official objective of environmental quality was concern for the aesthetic and the ethical, in the tradition of Emerson, Thoreau, and the 19th century Naturalists. Congressional response to the growing concern for environmental quality was positive, strong, and manifest in many acts of Congress.

PLANNING PRINCIPLES THROUGH THE YEARS

The Early Years

Little is known about the planning principles employed during the first 150 years of our nation's water resource development. For most of our national history, water resources planning has been oriented toward understanding the physical and natural systems at work in order to harness or modify them to preserve and enhance human values.

What has changed most about the planning process has been its level of sophistication, made possible by advances in our understanding of the complex natural, environmental, economic, social, and political systems involved. The P&G planning framework in use today reflects decades of evolution in thought about and in experience with methods of water resources planning in the United States. It also reflects the current balance of politically determined national values. Though that evolution is far from complete and the framework is far from perfect, it is currently considered better than any other framework available. The P&G planning framework can be better appreciated from a historical perspective.

First Half of the 20th Century

Prior to 1900 and for some years thereafter, investigative, planning, and reporting procedures used by the Corps were largely those developed in consideration of navigation improvements. The **Board of Engineers for Rivers and Harbors** was created by the Act of June 13, 1902.

The Federal government in 1917 prescribed that all examinations and surveys for flood control should include a **comprehensive study of the watershed**. This would include water power and "other such uses as may be properly related to or coordinated with the project."

> ***District offices developed their own methods of engineering and economic analysis.***

The **River and Harbor Act of June 5, 1920** provided that all reports "Shall contain a statement of special or **local benefit** which will accrue to localities affected by such improvement and statement of general or **national benefits**, with recommendations as to what **local cooperation** should be required, if any, on account of such local benefit."

Experience gained and procedures used to prepare some 200 comprehensive 308 Reports were to exert a strong influence over subsequent planning activities of the Corps. In preparing the 308 reports, district offices developed their own methods of engineering and economic analysis. These methods were widely exchanged among the field offices. Planning remained very much focused on the engineering aspects of solutions to problems. In the 1930s, planning guidance began to appear in the form of **Circular Letters** and **Engineer Bulletins**, precursors to the modern ERs, ECs, and similar guidance.

One of the first and most significant developments in the articulation of a Federal water resource planning framework occurred with the Flood Control Act of 1936. Section 1 declared that flood control is a proper Federal activity, that improvements for flood control purposes are in the interest of the general welfare, and that *the Federal government should improve or participate in the improvement of navigable waters or their tributaries for flood control "if the benefits to whomsoever they may accrue are in excess of the estimated costs, and if the lives and social security of people are otherwise not adversely affected"* (49 Stat. 1570, 33 U.S.C. 701a).

Planning Studies

The actual study process, as it evolved near the middle of this century, tended to comprise two steps. A **preliminary examination** was done first. This is clearly akin to the modern reconnaissance study.

If the preliminary report was favorable it was followed by a more detailed "survey". The **survey report** was to determine:

> "the most suitable plan for improvement and whether such improvement is economically justified...If...the improvement appears to be justified, engineering and economic data are developed to the extent necessary for project formulation and evaluation."[5]

The "Report on the Federal Civil Works Program as Administered by the Corps of Engineers U.S. Army: Appendix D Policies and Procedures for Investigating and Planning Civil Works" describes the "Procedures for Project Formulation and Evaluation" circa the early 1950s. These, in a sense, were the major steps in the planning process. The procedures must: (1) establish the need for the project; (2) select the proper scope, type, and details of design; (3) demonstrate its economic value; and, (4) provide for allocation of costs when a sharing of cost between various interests is involved.

Though a comparison of benefits and costs was required only for flood control projects the Corps applied the benefit-cost analysis test to all its projects. Thus, economic analysis of projects has been essential to the planning process for well over half a century. *The with- and without-project condition analysis framework was introduced during this time.*

Bureau of the Budget Circular A-47

By the middle of the century, several familiar elements of the planning process were well established. What was missing was a Federal policy that would assure uniformity of planning among all water resource agencies. There were several agencies involved in water resource development including the Corps, the **Bureau of Reclamation** and the **Soil Conservation Service**. In December 1952, the Bureau of the Budget issued **Circular A-47** to water resource agency heads to inform them of the standards it intended to use to accept or reject agency evaluations of water resource projects.

The Green Book

In 1950, a report of the Subcommittee on Benefits and Costs was circulated among the agencies. This document was revised and published in May 1958 as a comprehensive and objective approach to project formulation and evaluation called "Proposed Practices for Economic Analysis of River

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[5] Ibid, pp. 238-241.

Basin Projects." This document came to be known as "**the Green Book**[6]" like its 1950 predecessor, because of the color of its cover. *The report covers the basic principles and concepts of* **benefit-cost analysis***; principles and procedures for project and program formulation; standards, problems and procedures in benefit and cost measurement; analysis of various project purposes; and,* **cost allocation**.

The Green Book clearly established the principle of **maximizing net benefits**. The major planning steps appear to include an **analysis of needs** and **available resources** and the consideration of **alternative means** of accomplishing project purposes.

The discussion of the formulation process describes a "nucleus of development" that is identified. Then alternative scales of development greater and lesser than the nucleus are considered. The optimum scale is that which maximizes net benefits. The consideration of alternative plans concentrates on assuring that there is no cheaper means of accomplishing the same purpose. It is recognized that "in theory, the broadest range of alternatives...should be considered," but the emphasis is clearly on a severely limited range of objectives.

A project is "...properly formulated and economically justified if: (1) project benefits exceed project costs; (2) each separable segment or purpose provides benefits at least equal to its costs; (3) the scale of development is such as to provide the maximum net benefits; and (4) there are no more economical means of accomplishing the same purpose..." There is no explicit mention of any criteria other than economics.

Though the document was never formally adopted by the Federal Inter-Agency River Basin Committee or its successor, many of its principles were embodied in Circular A-47 and others were followed by the water resource agencies. These principles and Circular A-47 were mandating one objective for water resources projects, national economic efficiency. This was contrary to the history of American water resource development, which had always included a strong regional economic development component. This and other possible water resource objectives, like unity, national defense, environment, and other human satisfactions, were effectively being denied a role in the planning process.

Plan Formulation in 1959

A statement prepared for the Appropriations Committee of the first session of the 86th Congress entitled "Laws and Procedures Governing

[6] The Green Book was originally issued in 1950 and was revised in 1958. The final, 1958 version is generally what is meant by the Green Book.

Conduct of the Civil Works Program" dated April 1959 contains one of the earliest and most concise descriptions of the planning process. Section IV of this statement describes plan formulation as follows:

> *"Project formulation is the process of designing water resource improvement projects and programs to serve specific needs efficiently and economically."*
>
> The four "principal phases of study" were:
>
> - Determination of the nature and scope of the problems for which solution is sought;
> - Identification of all alternative measures and combinations of measures which reasonably might be applied in the solution of these problems;
> - Determination of the benefits and costs or, more broadly, the determinate effects, beneficial or adverse, tangible or intangible, of the alternative projects and programs which have been identified; and,
> - Selection of the best solution from the array of alternative solutions which have been considered.

Formulation is described as, from beginning to end, largely a matter of weighing and comparing alternatives to determine their relative efficiency in doing the desired water resources improvement job. Subsequent articulations of the planning steps clearly show the debt they owe in spirit to these earlier versions of the plan formulation process.

Senate Document Number 97

President Kennedy, on May 15, 1962, "...approved a statement of policies, standards and procedures to be used...in the formulation, evaluation, and review of plans for the use and development of water and related land resources."[7] This was "Policies, Standards, and Procedures in the Formulation, Evaluation, and Review of Plans for Use and Development of Water and Related Land Resources" contained in **Senate Document Number 97 (SD 97)**, the name by which these policies are better known.

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[7] From a letter dated May 15, 1962 by Director of the Bureau of the Budget, David G. Bell to the heads of all executive agencies, rescinding Circular A-47.

SD 97, an interdepartmental agreement that was never formally approved by Congress, was in response to the President's request for a review of existing standards for formulating and evaluating water resource projects. These changes superseded Circular A-47 (the Green Book was never officially adopted) and were to enable Congress and the President to make informed judgments about the desirability of water projects. The changes, like all the changes before them, reflected the evolving values of the Nation and moved the decision process away from the consideration of a single planning objective.

SD 97 identifies three objectives of planning that are each to receive full consideration. They are (1) **Development**, i.e., national economic development and development of each region within the country (comprising what today would be considered two objectives); (2) **Preservation**, i.e., proper stewardship in the long-term interest of the Nation's natural bounty; and (3) **Well-being of people**. Significantly, the document says "Well-being of all people shall be the overriding determinant in considering the best use of water and related land resources."

For the first time, preservation of resources is added as an objective that is distinct from the development of resources. This was a significant step in the evolution of environmental planning objectives that was due to the growing strength of the environmental movement. Also for the first time, policies, procedures, and standards for plan formulation were put forth in a single document. It was directed that all viewpoints - national, regional, State, and local - be taken into account, although the national viewpoint is clearly preeminent. **River basins** were to be the preferred planning area, and **multi-purpose planning** was to be used.

River basins were to be the preferred planning area...

The Water Resources Council began its review of the principles and standards for planning water and related land resource projects mandated by the Water Resources Planning Act of 1965 in 1968, amidst much controversy. The Council had to respond to the imperatives of the National Environmental Policy Act (NEPA). A Special Task Force to the Council prepared reports on "**Principles**" and "**Standards.**" A third report on "**Procedures**" was to be completed later. These two reports known as "the Orange Books" suggested major changes from the SD 97 planning framework. *Four objectives for planning were proposed. They were (1) to enhance* **national economic development***; (2) to enhance the* **quality of the environment***; (3) to enhance* **social well-being***; and (4) to enhance* **regional development**. No one of any of the four objectives was to be considered more important than any other.

"Principles and Standards"

Section 209 of the **Flood Control Act of 1970** expressed Congress' intent that all four objectives be equal. Nonetheless, the Orange Books were never adopted. Instead, the Water Resources Council in December 1971 issued its own "*Proposed* Principles and Standards for Planning Water and Related Land Resources" (italics added for emphasis). The major changes from the Orange Books were that (1) social well-being was dropped as an objective; (2) using regional development as an objective in plan formulation would require advance approval; (3) a plan maximizing contributions to national economic development was now required; (4) a plan contributing to environmental quality was now required; and (5) the discount rate would not be that used by OMB.

Four Accounts

In the 1970 Flood Control Act, Congress identified four equal national objectives for use in water resources development planning. They were: national economic development; regional economic development; environmental quality; and social well-being. During the 1970s two of these, NED and EQ, were actually national objectives. Now only NED remains a national objective. However, these four categories of plan effects remain important considerations of water resource projects.

All significant effects of a plan should be accounted for in the planning process. In order to facilitate an orderly display of project effects it has been suggested they be grouped into one of four accounts. Those effects resulting in changes in national economic development would be included in the NED account, those affecting environmental quality would be in the EQ account, etc. The four accounts remain an effective way to organize and present plan effects for the consideration of decision-makers and the public.

Two years of extensive review and debate ensued. On September 10, 1973, "Principles and Standards for Planning Water and Related Land Resources" **(P&S)** were published in the Federal Register, finally replacing SD 97. *The major change in the final P&S was that environmental concerns were placed on an equal basis with national economic development. There were two objectives for water resource planning.* First, to enhance national economic development by increasing the value of the nation's output of goods and services and improving national economic efficiency. Second, to enhance the quality of the environment by the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural and cultural resources and ecological systems.

...environmental concerns were placed on an equal basis with national economic development.

In addition to the two objectives, there would be **four accounts***: national economic development (***NED***); **environmental quality** (**EQ**); regional development* (**RD**)*; and social well-being* (**SWB**). Plan impacts on the different accounts were to be evaluated and displayed in a system of accounts. The obligation to formulate an EQ plan was eliminated from the final rules. *A six-step planning process was provided*. The major steps of the evolving planning process were (1) Specify components of the objectives relevant to the planning setting; (2) Evaluate resource capabilities and expected conditions without any plan; (3) Formulate alternative plans to achieve varying levels of contributions to the specified components of the objectives; (4) Analyze the differences among alternative plans which reflect different emphasis among the specified components of the objectives; (5) Review and reconsider, if necessary, the specified components for the planning setting and formulate additional alternative plans as appropriate; and (6) Select a recommended plan from among the alternative plans based upon an evaluation of the trade-offs between the objectives of national economic development and environmental quality and considering, where appropriate, the effects of the plans on regional development and social well-being.

The Carter Administration issued its "Water Policy Initiatives" in 1978, challenging the then-current way of doing business. Proposed changes in cost-sharing formulas also began to be publicly debated. Following a very controversial "**Hit List**" in which numerous authorized projects in various stages of planning or construction were threatened with being halted, another round of changes in water policy resulted. Chief among these may have been the development of the *Procedures for Evaluation of National Economic Development (NED) Benefits and Costs in Water Resources Planning (Level C) and Proposed Revisions to the Standards for Planning Water and Related Land Resources.* The NED procedures standardized the estimation of benefits and costs for Federal projects for the first time. The P&S were revised effective September 29, 1980.

The language describing the national objectives of planning studies was modified to make the status of the two objectives clearer:

> "Two coequal objectives provide the basis for water and related land resources planning. These objectives are protection and enhancement of national economic development (NED) and protection and enhancement of environmental quality (EQ)."

More generally, the language of the P&S was considerably changed with relatively little change in substance.

The six major steps of the revised P&S planning process were essentially the same, but they are more clearly described as follows:

1) Specification of the water and related land resources problems and opportunities (relevant to the planning setting) associated with the NED and EQ objectives.

2) Inventory, forecast, and analysis of water and related land resource conditions within the planning area relevant to the identified problems and opportunities.

3) Formulation of alternative plans.

4) Evaluation of the effects of the alternative plans.

5) Comparison of alternative plans.

6) Selection of a recommended plan based upon the comparison of alternative plans.

The revised P&S go on in §711.101(b) to say:

"Plan formulation is a dynamic process with various steps that should be iterated one or more times. This iteration process, which may occur at any step, may sharpen the planning focus or change its emphasis as new data are obtained or as the specification of problems or opportunities changes or becomes more clearly defined."

The new P&S required that alternative plans be formulated in consideration of the four tests of **completeness**, **effectiveness**, **efficiency**, *and* **acceptability**. *The major changes in the formulation of plans were (1) the requirement to include a* **primarily non-structural plan** *whenever structural projects were considered and (2) the requirement to establish* **water conservation** *as a new national priority to be fully integrated into project and program planning. The alternative plans were now to include an* **NED plan** *and an* **EQ plan**, a notion proposed by the Orange Books but rejected in the original P&S. Plans were to be formulated without regard to which level of government had the authority to implement them.

The effects of the plans on the four accounts were still to be displayed and traded-off in the selection process. The name of the Social Well-Being account was changed to Other Social Effects (OSE). Environmental planning procedures were formally added at this time as well. Though not actually part of the P&S, a significant addition to planning guidance was the "Environmental Quality Evaluation Procedures for Level C Water Resources Planning: Final Rule" which accompanied the P&S. The relationship between the planning process and the EQ evaluation phases and stages was detailed here.

"Principles and Guidelines"

The new P&S were in effect for about two years. *The Reagan Administration repealed the Principles and Standards in September 1982, replacing them*

with proposed "Principles and Guidelines." The new Principles were approved by the President in February 1983, and the new Standards and Procedures were approved March 10, 1983, in the "Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies" better known as Principles and Guidelines or P&G.

The "Principles" changed the focus from two coequal national objectives back to a single Federal objective. "The Federal objective of water and related land resources project planning is to contribute to national economic development consistent with protecting the nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements." The only required plan was the NED plan.

The only required plan was the NED plan.

The only change in the major steps of the planning process in the P&G was a minor modification of the first step, shown below with the changes italicized:

1) Specification of the water and related land resources problems and opportunities (relevant to the planning setting) associated with the *Federal objective and specific State and local concerns.*

The intent of the P&G was clearly to give economic development a higher standing than environmental quality as a criteria for Federal water project planning. The requirements to formulate EQ and nonstructural plans were eliminated.

The new guidelines make mandatory only the NED account. The other three accounts are to be used when they contain information that may bear on the decision-making process. They are no longer required in the sense they once were. The detailed procedures for evaluation of NED benefits and costs, published by the Carter Administration in 1979 as rules, were included in the P&G as administrative guidelines. The EQ evaluation procedures of 1980 were also included in the P&G.

The major change with the P&G was to focus on a single economic development objective. Some had argued that multi-objective planning had become too time consuming, complicated, and costly. Environmental groups objected vigorously to the elimination of an EQ objective. Many considered this in conflict with the expressed intent of the National Environmental Policy Act. Also significant was the downgrading of this material from rules to guidelines. Changes to the Guidelines can be made by agency heads if they have the approval of the Cabinet Council on Natural Resources and the Environment.

WRDA 1986

The Water Resources Act of 1986 (WRDA'86), Public Law 99-662, was one of the most significant pieces of water resources legislation in recent history. It marked the first omnibus water act in a decade, a decade in which many policy changes had taken place. Section 101 of the Act established new project cost-sharing percentages that required non-Federal interests to contribute a greater share of project costs than they had been accustomed to in the past. Section 105 required non-Federal interests to contribute 50% of feasibility study costs. Raising the costs of Federal projects in these ways is believed to have reduced the demand for Federal projects as well as increased the role of the non-Federal partner in the study process.

Among the other significant impacts of this law were the creation of an Inland Waterways Users Board to direct Inland Waterways Trust Fund expenditures; the authorization of fish and wildlife enhancement; legislation of the assumption that the benefits of environmental measures at least equal the costs of creating them; and the establishment of a continuing authority program to modify projects to improve the environment.

Subsequent WRDA's have continued the evolution of Federal water resources development policy. None have had the same impact as WRDA '86, however.

CONTINUING EVOLUTION

The Corps' water resource programs continue to be revised - expanding in some areas, contracting in others - by Water Resource Development Acts and a planning process that continues to develop. Increased cost-sharing responsibilities for the non-Federal partner (WRDA '86) highlight the need to quantify and assess the importance of regional and local economic impacts of plans. These are often of far more importance to local partners than are NED benefits. Burgeoning interest in environmental investments, ecosystem

restoration (WRDA '86), and environmental impacts argue for an enhanced role for environmental quality.

Some would suggest that the P&G are ill-suited to meet water planning needs today. History has shown the opposite. Despite the swing to and from emphasis on NED, only the planning process itself and the four-account framework remain remarkably robust and resilient. An iterative six-step planning process that assesses plan impacts in a multiple-account framework offers planners an organized, comprehensive, and rational approach to assessing and evaluating plans.

RECOMMENDATIONS FOR FURTHER READING

The reader interested in the historical background of water resource development in the U.S. has many options. The single best source for comprehensive detail are the works of Beatrice Holmes, a former Department of Agriculture employee. The shame is that she did not continue her work beyond 1970.

Holmes, Beatrice Hart. *A History of Federal Water Resource Programs, 1800-1960*. Washington, D.C.: U.S. Government Printing Office.

Holmes, Beatrice Hart. *History of Federal Water Resource Programs and Policies, 1961-1970*. Washington, D.C.: U.S. Government Printing Office, 1979.

One of the best sources for insight and understanding of the underlying historical and political themes are the works of Henry P. Caulfield. His works tend to papers that can be a little difficult to find without the assistance of a good interlibrary loan librarian to help you. A few suggestions follow, but you'll be rewarded by any of his works. The following works were used extensively in this chapter.

Caulfield, Henry P., Jr. "History of U.S. Water Policy." Colorado Agribusiness Roundup. Fall / Winter 1980-1981. Colorado State University. 1981.

Caulfield, Henry P., Jr. "Let's Dismantle (Largely but not Fully) the Federal Water Resource Development Establishment, or the Apostasy of a Longstanding Water Resource Development Federalist." Denver Journal of International Law in Policy. Volume 6. Special Issue 1976.

Caulfield, Henry P., Jr. "The Living Past in Federal Power Policy." Resources for the Future 1959 Annual Report. Washington, D.C. 1959.

Caulfield, Henry P., Jr. "Perspectives on Instream Flow Needs." Paper delivered at Instream Flow Needs Conference. Boise, Idaho. May 4, 1976.

Caulfield, Henry P., Jr. "Planning Programs and Water Problems: Do They Match?" Paper delivered at 1977 National Conference on Water. St. Louis, Missouri. May 24, 1977.

The most serious students will want to make use of the extensive public record. Committee reports on the major legislative actions can be revealing sources of information obscured from the public eye by time or the rigidity of the act's language. Likewise, testimony before the committees considering the acts can be rich sources of information. Want a glimpse behind the scenes? Only the most serious students will want to review the one-of-a-kind documents of the Rivers and Harbors Congress, now part of the library collections of Tulane University in New Orleans.

The evolution of the P&S and P&G is well documented in a series of documents available from the National Technical Information Service (NTIS), U.S. Department of Commerce. The working files of the Water Resources Council are another source of valuable information. Some documents of possible interest are listed below with their NTIS order numbers.

The "Green Book" of 1958. Order # PB-209 180.

Senate Document Number 97. Order # PB-209 171.

Report to the Water Resources Council by the Special Task Force, Procedures for Evaluation of Water and Related Land Resource Projects, June 1969 ("Blue Book"). Order # PB-209 171.

Summary: Federal Agency Technical Comments on the Special Task Force Report Entitled "Projects for Evaluation of Water and Related Land Resource Projects," July 1970. ("T.F. Report" - Vol. I). Order # PB-209 172.

Summary and Index: Public Response to the Special Task Force Report entitled "Projects for Evaluation of Water and Related Land Resource Projects," July 1970. ("T.F. Report" - Vol. II). Order # PB-209 173.

Report to the Water Resources Council by the Special Task Force: Findings and Recommendations, July 1970. ("T.F. Report" - Vol. III). Order # PB-209 174.

Report to the Water Resources Council by the Special Task Force: Principles for Planning Water and Land Resources, July 1970. ("T.F. Report" - Vol. IV). Order # PB-209 175.

Report to the Water Resources Council by the Special Task Force: Standards for Planning Water and Land Resources, July 1970. ("T.F. Report" - Vol. V). Order # PB-209 176.

Report to the Water Resources Council by the Special Task Force: A Summary Analysis of Nineteen Tests of Proposed Evaluation Procedures on Selected Water and Land Resource Projects, July 1970. ("T.F. Report" - Vol. VI). Order # PB-209 177.

Interested in a history of the agency? Many of the districts have commissioned their own histories. A nice history of the Corps has also been prepared. But if you read the official history, you owe it to yourself to read the Maass book, which is another view of the Corps, a scathing one that must be read by any serious student of history.

Maass, Arthur. Muddy Waters. Cambridge: Harvard University Press, 1951.

U.S. Army Corps of Engineers. *The History of the US Army Corps of Engineers.* EP 360-1-21. Washington, D.C. January 1986.

A somewhat prophetic study is a study published by Colorado State University. It provides some statistical analysis of then-developing trends in the Corps' program.

Yoe, Charles. *The Declining Role of the U.S. Army Corps of Engineers in the Development of the Nation's Water Resources.* Colorado Water Resources Research Institute, Fort Collins. 1981.

To round out your reading list with a few more current titles you might find some of the following of interest.

Arnold, Joseph L. *The Evolution of the 1936 Flood Control Act*. Office of History, U.S. Army Corps of Engineers, Alexandria, Virginia. 1988.

Moore, Jamie W. And Dorothy P. Moore. *The Army Corps of Engineers and the Evolution of Federal Flood Plain Management Policy*. Institute of Behavioral Science, University of Colorado. 1989.

Reus, Martin. *Reshaping National Water Politics: The Emergence of the Water Resources Development Act of 1986.* U.S. Army Corps of Engineers, Institute for Water Resources. IWR Policy Study 91-PS-1. October 1991.

Rosen, Howard and Martin Reus, ed's. *The Flood Control Challenge: Past, Present, and Future.* Proceedings of a National Symposium, New Orleans, Louisiana, September 26, 1986.

National Academy of Sciences. "Alternatives in Water Management." National Research Council, Washington, D.C. 1966.

SUMMARY AND LOOK FORWARD

Lesson One. Today's planning process has evolved from a rich history of changing policies, practices, and national priorities. It will continue to evolve.

Lesson Two. The fundamental principles of a step-by-step planning process, driven by national objectives and evaluations across different accounts, have endured through this history of change.

This chapter provides an overview of water resource development and planning in the United States over two centuries. It describes in general terms how the planning process evolved to the current Principles and Guidelines. The next chapter picks up where this one has left off and goes on to describe in a bit more detail the current state of planning guidance.

CHAPTER FOUR: PLANNING GUIDANCE

"If you obey all the rules you miss all the fun." Katharine Hepburn (1909-) American actress.

INTRODUCTION

The Corps' planning guidance comes from different places. National policy is expressed by the Congress and the Administration in legislation, Federal rules and regulations, and Executive Orders as well as in the Principles and Guidelines. The Corps itself has generated a great deal of guidance in the form of engineering regulations, circulars, etc. Though only the planning guidance is of interest here, the Corps is subject to guidance that covers a wide variety of topics and functions.

The Corps of Engineers' planning guidance can be found in five primary sources. The first and most important of these is the *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies*, also known as the Principles and Guidelines or the P&G. The second most important source is Engineering Regulation 1105-2-100 *Guidance for Conducting Civil Works Planning Studies*. In no particular order the remaining sources of information are the Digest of Water Resources Policies and Authorities,; Guidance Letters series, and, a series of engineering regulations (ERs) and engineering circulars (ECs) in addition to ER 1105-2-100.

...sooner or later the P&G will be changed...

Planning policy and guidance are dynamic things. If past is prologue to the future, the previous chapter would suggest that sooner or later the P&G will be changed in another evolutionary leap forward. Policy will likewise continue to evolve as national priorities change. As a result, *it's not possible to provide you with a timeless and unchanging handbook to planning guidance*. Though current at the time of this writing, the materials discussed in this chapter are subject to regular revision and change.

To function effectively as a planner, one must read these documents and have a working knowledge and understanding of their contents. Those who would like to understand what Corps planners do would be well advised to browse through the P&G and ER 1105-2-100.

This chapter presents an overview and introduction to these and other selected planning documents. The original documents should be consulted

for a more detailed explanation of the topics found in this chapter. Appendix I contains a list of relevant Corps planning documents.

THE PRINCIPLES AND GUIDELINES

The P&G is currently the Corps planner's bible. It is the philosophical source document. Established March 10, 1983, the most significant aspects of the P&G are as follows: (1) They marked a departure from their predecessor Principles and Standards' reliance on multi-objective planning; (2) They established national economic development as the one and only Federal objective for water resources planning; and (3) The P&G were intended to serve as guidance that is recommended, rather than as rules that are required. The structure of the P&G is shown in Table 8.

Table 8: Content of P&G

- Principles
  - 13 principles
- Guidelines
  - Chapter I - Standards
  - Chapter II - National Economic Development (NED) Benefit Evaluation Procedures
  - Chapter III - Environmental Quality (EQ) Evaluation Procedures

PRINCIPLES

The Principles comprise a two-page statement that ensures proper and consistent planning by Federal agencies that formulate and evaluate water resource implementation studies. Because they represent a philosophical statement for Federal agency planning they are reproduced in their entirety inside the front cover of this manual.

GUIDELINES

Table 8 also shows the structure of the Guidelines. Each of the three components is discussed in turn.

Standards

In Chapter I of the Guidelines, the Standards establish the criteria upon which plans will be formulated, evaluated, and weighed. They are shown in Table 9. The

Table 9: Standards

- Introduction
- The Federal Objective
- Summary of the Planning Process
- General Planning Considerations
- Inventory and Forecast of Conditions Without a Plan
- Alternative Plans
- Accounts
- Displays
- Cost Allocation
- Plan Selection
- Risk and Uncertainty

standards establish the basic process for Federal agencies to follow in their planning activities. The six-step planning process is presented in this section of the P&G. Many of the principles identified in the two pages of the Principles are explained in more detail in the Standards. The four accounts are addressed at some length in the Standards.

NED Benefit Evaluation Procedures

The general approach to NED benefit evaluation is to estimate changes in national economic development that occur as a result of differences in project outputs with a plan, as opposed to national economic development without a plan. Only project-related changes in levels of national economic development are estimated. These values are to be expressed in average annual equivalent dollars. Specific procedures have been developed to estimate NED benefits of the types shown in Table 10.

Table 10: NED Benefit Evaluation

1. M&I Water Supply
2. Agriculture
3. Urban Flood Damages
4. Hydropower
5. Inland Navigation
6. Deep Draft Navigation
7. Recreation
8. Commercial Fishing
9. Other Direct Benefits
10. Unemployed or Under-employed Labor Resources
11. NED Costs

Chapter II of the Guidelines presents detailed procedures for estimating national economic development benefits for most of the Corps' water resource planning purposes like flood damages, navigation, hydropower, and the like. Most of these benefit procedures have been supplemented by a series of **National Economic Development Procedures Manuals** produced by the U.S. Army Corps of Engineers' Institute for Water Resources. Thus, anyone interested in how the Corps of Engineers estimates benefits for its traditional planning projects should begin by consulting the procedures in the P&G. For more detailed explanations and examples, the procedures manuals are the next logical step. A list of procedures manuals is provided in Appendix I.

EQ Evaluation Procedures

A sometimes overlooked part of the P&G is Chapter III, which presents environmental quality procedures. The definitions, general evaluation requirements, and processes of this chapter provide the basis for **environmental impact assessment** analyses at which the Corps has become so proficient.

The purpose of the EQ evaluation process is not to identify plans that meet planning objectives. Rather, *EQ evaluation is used to identify significant beneficial and adverse effects of alternative plans on significant EQ resources.* Just

as the NED benefit evaluation procedures are used in the planning process, so, too the EQ evaluation process is used.

The EQ impact evaluation process proceeds in the four phases and 10 activities shown in Table 11. Phases are shown at the first level of detail, activities at the second. These phases and activities are natural, integral parts of the six-step planning process.

Table 11: EQ Evaluation Process: Phases and Activities

Phases	Activities
Define resources	Identify resources Develop evaluation framework
Inventory resources	Survey existing conditions Forecast without-plans condition Forecast with-plan condition
Assess effects	Identify effects Describe effects Determine significant effects
Appraise effects	Appraise significant effects Judge net EQ effects

ER 1105-2-100 PLANNING GUIDANCE

Prior to the publication of ER 1105-2-100, planning guidance was provided in a series of engineering regulations (ERs). Now, all planning guidance is collected and presented in ER 1105-2-100 *Guidance for Conducting Civil Works Planning Studies*. The ER is alternately known as ER 100, the Planning Guidance Notebook, or PGN (pronounced "pigeon"). The

Table 12: Contents of ER 1105-2-100

1. Introduction
2. Planning Programs
3. Continuing Authorities Program
4. Project Purposes
5. Planning Principles
6. Economic Considerations
7. Environmental Planning & Evaluation Considerations
8. Washington Level Review
9. Seventeen Topical Appendices

contents of the 28 December 1990 version of the ER are summarized in Table 12.

This ER provides guidance that is specific to the Corps' conduct of planning studies. In essence, it puts the Corps' spin on the P&G, fleshes out the P&G, and fills the voids the P&G fail to address. The first task of any new planner should be to read this regulation from cover to cover. How can we recommend this over the P&G? Not to worry, the P&G comprises most of Chapters 5, 6, and 7 of the ER.

Chapter 2 of the ER provides the best summary of the types of studies, reports, and study procedures available. Planning assistance to states as well as other planning assistance is also described there. Chapter 2 is recommended reading for anyone who will be intimately involved in the Corps' planning study process.

The third chapter of the ER describes the Corps' continuing authority programs (CAP). The CAP are a set of legislative authorities that allows the Secretary of the Army acting through the Chief of Engineers to plan, design, and construct certain projects without specific Congressional authorization. These CAP projects are usually smaller scale, limited scope, single purpose projects with periodically adjusted Federal funding limits. Chapter 3 is recommended reading for anyone pursuing a project through one of the Corps' continuing authority programs.

Chapter 4 of the ER provides a detailed introduction to important aspects of the Corps' traditional project purposes. Important terminology and policy issues are presented in this chapter. It is recommended reading for anyone involved in a Corps study.

Chapters 5, 6, and 7 basically present the P&G. The chapters begin with a verbatim reproduction of part of the P&G. The ends of each chapter add relevant additional material to the P&G Standards (in Chapter 5, beginning on p. 5-34), P&G Economic Evaluation Procedures (in Chapter 6, beginning on p. 6-141), and Environmental Evaluation (in Chapter 7, beginning on p. 7-37). The report submittal, assessment and processing procedures of the Corps are described in Chapter 8, "Washington Level Review." A set of 17 appendices provide technical details on a number of subjects, sample documents, and examples.

ER 1105-2-100 is a lengthy document. It is not a compendium of all planning guidance, however. Additional materials can be found in a series of related ER's and other Corps guidance. Nonetheless, it *is the best single source of planning guidance*. It's currently under revision. Though it is updated periodically, updating is a major undertaking and it is not done on a routine basis. Thus, it may be necessary to look to other sources for the most up-to-date policy.

Guidance Letters

CGL	Counsel Guidance Letter
DGL	Dredging Guidance Letter
PGL	Planning Guidance Letter
PGL	Policy Guidance Letter
PM	Policy Guidance Memorandum
RGL	Regulatory Guidance Letter

GUIDANCE LETTERS

The Guidance Letters are an effective vehicle for providing guidance on issues needing clarification or on changing priorities. Guidance Letters are issued by the Planning, Policy, and other offices of Headquarters. They are an important source of information that Corps planners should not overlook. A selected list of Guidance Letters is included in Appendix I.

POLICY DIGEST

The "Digest of Water Resources Policies and Authorities" is a periodically updated compilation of existing administrative and legislative water resource policies and authorities pertinent to the Civil Works activities of the Corps of Engineers. The most recent version of the digest at the time of this writing was dated 1996. The reader must beware that as the digest becomes more dated, it will contain no information about more recent initiatives. Insofar as more recent initiatives are the ones planners most need information about, the digest may be of limited use in describing the most recent policy initiatives.

The 1996 Digest provides a comprehensive overview of policy considerations, as opposed to the planning or procedural considerations. This is a technical and detailed document that is very faithful to the legislative and administrative history of the Corps' activities.

Table 13: Corps Guidance

AR	Army Regulation
EC	Engineer Circular
EM	Engineer Manual
EP	Engineer Pamphlet
ER	Engineer Regulation
ETL	Technical Letter
OM	Office Memorandum
1105	Planning
1110	Engineering
1120	Construction - Operations
1130	Construction - Operations
1140	Construction - Operations
1165	Policy

OTHER CORPS GUIDANCE

It's difficult to stay abreast of Corps policy because it is contained in so many documents. If you want to be familiar with the Corps' guidance, read the materials referenced above. Once you have done that, you are ready to tackle the Army regulations (ARs), engineering regulations (ERs), engineering circulars (ECs), engineering pamphlets (EPs), engineering technical letters (ETLs),

engineering manuals (EMs), and office memorandums (OM) that have accumulated over the years. Table 13 provides a guide to the various types of guidance and the numbering system commonly used by the Corps. The guidance identification system begins with the type of guidance, AR, ER, EC, EP, and soon followed by a four-digit number from Table 13 that indicates the subject of the guidance.

There is an Index of Publications EP 25-1-1 that has been updated from time-to-time. Though it is a logical place to start, it must be used with caution because of frequent changes in the listed guidance.

Another important source of guidance is the annual budget guidance found in the *Annual Program and Budget Request for Civil Works Activities Corps of Engineers, Fiscal Year 199X*. Additional guidance helpful in the planning process can be found piecemeal in the ER's and EC's of Corps functions other than Planning. The reports of the Institute for Water Resources and the Waterways Experiment Station, such as the NED Manuals and reports from the Evaluation of Environmental Investments Research Program (EEIRP), are additional resources for Corps planners.

SUMMARY AND LOOK FORWARD

Lesson One. To understand the Corps' planning process, read ER 1105-2-100.

Lesson Two. If you want to be an expert on the Corps' planning process, read all the materials mentioned in this chapter then do planning for a few decades.

How do you do planning? That question is addressed (notice we did not say answered) in the next seven chapters that describe a couple of characteristics of the Corps' planning process and its six steps. We begin with a consideration of several very important and somewhat unique characteristics that pervade the Corps' planning process.

SUGGESTIONS FOR FURTHER READING

The reader is encouraged to read and become familiar with the documents described in this chapter. For more detailed or specific information, consult the documents listed in Appendix I.

CHAPTER FIVE: CHARACTERISTICS OF THE CORPS PLANNING PROCESS

"Let all things be done decently and in order." Corinthians 14:40.

INTRODUCTION

Each of the following six chapters addresses one of the six planning steps. Though the sequence of presentation is a simple linear progression, *the practice of planning is anything but simple or linear*. There are some characteristics of the Corps' planning process that pervade and even pre-exist the six-step planning process and that warrant consideration before we begin to consider the steps. The **iterative planning** process; **screening** as a tool for making on-going, criteria-based decisions throughout the planning process; **scoping**, a special kind of screening; and the general planning context are some of these characteristics that form the basis for this chapter.

PLANNING IS AN ITERATIVE PROCESS

Planning has six steps, but it is not a nice, neat, sequential process. It is more marble cake than layer cake. Understanding the iterative nature of the planning process is one of the more difficult things for new planners to grasp. You do a step and then you do it over and you keep on doing it until it is done. All the steps will be finished when planning is done well. But, along the way, they may be started in any order and addressed a different number of times to varying extents before they are finished. The discussion that follows begins with what we imagine might be some frequently asked questions about the iterative process.

Planning is…more marble cake than layer cake.

SOME FREQUENTLY ASKED QUESTIONS

What Is An Iterative Process?

Webster's *New Collegiate Dictionary* defines iterate as reiterate. Reiterate is defined as: to say or do over again or repeatedly sometimes with wearying effect. This latter part of the definition conveys a nuance many experienced planners can identify with easily. An iterative process, then, is one that is repeated, at times over and over.

What Is Iterated?

The six steps of the planning process are the things that are repeated. A planning iteration is essentially a pass through some or all of the six steps of the planning process. Or, it could be simply returning to a single step in the process to elaborate, refine, correct, or complete what was done before.

Why Is The Planning Process Iterative?

It's impossible to anticipate, execute, and revise each of the six steps of the planning process in one run through the steps. *Typically, each iteration has a different emphasis*. In the early iterations, problem identification and resource inventories and forecasts receive more emphasis than in later iterations, when the other steps are emphasized.

You learn as you plan. Information becomes available, our understanding improves and it is often necessary to go back over something. The process is designed to be iterative, and so it is.

How Do Iterations Differ From One Another?

Iterations typically differ in the emphasis placed on the different planning steps. The six steps describe a logical and sequential thought process. The emphasis in the various iterations shifts at a varying rate from one step to the next in general accordance with the step sequence. That is, step one is generally emphasized before step two, which is generally emphasized before step three, and so on.

Iterations may also differ in their duration. It can take an hour, a day, a week, or longer. It is quite possible the study team may make an

Purists and Philistines Among Planners

Does each iteration start at step one? Does each iteration include all the steps? These are some of the questions planning purists and Philistines might debate in the locker room after a long day of planning. They differ little if at all over the reality of what planners do, it is more their philosophical views of what is done that digress.

The non-Federal partner walks in on day one of a study with a plan. Is the Corps' study team "starting" at step three? The Philistine says who cares. The purist says the author of the plan has already done steps one and two.

On the initial site visit, the study team's senior member sizes up the situation and announces that dredged material from the channel can be used to create wetlands along the west bank of the river. There is already a front runner for the recommended plan. Has the planning process begun at step six? Again the Philistine says who cares. In the purist's view steps one through five have been done implicitly. They may have been private mental exercises, possibly done in the blink of an eye. Almost certainly there is no record of what the planner's assumptions were or why they were made.

There appear to be differing views on this aspect of the Corps' planning process. Some hold it is impossible to take the steps out of sequence. The preceding steps are always accomplished, albeit sometimes in implicit, undocumented, even snap judgment ways. Others believe the process is a bit more chaotic, can begin anywhere, and proceeds at times in an almost random order.

Both would agree, however, the entire iteration during their initial site visit. None of the steps will have been very detailed, but each step would have been preliminarily considered. As the sidebar on purists and Philistines indicates, some steps may be virtually instantaneously processed, while others can be long and laborious.

How Many Iterations Are Required?

If you're trying to count iterations you're missing the big picture. There is no prize for either the most or the fewest iterations. You do as many iterations as it takes to arrive at the best plan. Iterations, like the six steps themselves, willrarely have a discrete beginning or ending other than the start and end of the study. The big picture view is that the steps are repeated. You do something then you do it again. The initial iteration of a step may be little more than an educated guess. Subsequent iterations may be because you have more definitive data or they may be simple fine tunings of an earlier result.

When Do You Stop the Iterations?

When all of the planning steps have been completed as fully and as well as they are going to be done in your study effort, the iterations can stop. That could be

after a day or after a year. The culmination of the iterative process is the identification of a recommended plan.

THE ITERATIVE PROCESS

What would the ideal iterative planning process look like? It's easier to describe what it is not, so let's begin there. Though the planning process is sequential, it is not done by beginning only with step one and completing it before moving to step two, then once that step is complete, proceeding to step three, and so on. That is a sequential step process devoid of iterations. Good planning cannot be done that way.

Iterations are necessary because the planning process is a fluid, dynamic, evolving process that relies on feedback loops of every stripe and variety. Information becomes available over time and our understanding is adjusted to reflect the increased understanding that comes from additional knowledge.

The identification of problems and opportunities is the focus of the first iteration of the planning process. The study's early emphasis is on this first step. However, experienced personnel know that certain data are going to be needed. Mapping or hydraulics and hydrology, for example, will be required for many water resource studies regardless of the specific details of the

Levels of Iterations

Though there is no ideal or recommended number of iterations it is possible to identify different levels of iterations. Each level may require a variable number of iterations but generally the planning process can be recognized as passing through different levels. We've identified three.

The first level of iterations is devoted to identifying possibilities. The second level of iterations is the screening level. Possibilities are whittled down and evaluated. The third level of iterations is the optimization level. At this level plan dimensions are fine-tuned. This level culminates in the selection of a plan.

The basic theme running through these levels is an increasing sense of purpose and quality of information. Level 1 iterations can be likened to turning on a TV set. Level two is scanning the channels for possibilities. Level 3 is watching candidates for awhile and fine tuning the pictures and sound. When all levels are completed you select a show and watch. Or, you turn the TV off.

problems. Efforts to obtain these data can begin simultaneously. This is important to the resource inventory and description of the without- project condition. Thus, we have two steps beginning simultaneously, though the emphasis is on step one, problem identification.

In initial site visits, study team members will see situations that connect with some of their past experiences and begin to suggest measures that may work here or that won't work here. This kind of thought process is the embryo of plan formulation (step three). As soon as a team member begins to think about measures, she applies some preliminary, often intuitive, evaluation, assessment, comparison, and selection criteria. These are the first iterations of the later planning steps (four, five and six) and is a form of screening, discussed later in the chapter.

As the problems and opportunities become well defined and give way to planning objectives (a process explained in the next chapter) the study team is better prepared to identify the data required to inventory relevant resources and to complete the existing and without-project future condition scenarios. This represents a move away from the first step and an increasing focus on the second. What iteration are we in at this point? It doesn't matter. Problem identification may be completed in a single comprehensive iteration or it may be revisited dozens of times throughout the study. *The number of iterations is not important; that the step is completed and done well is*.

During this time, people continue to make progress on tasks that contribute to the other steps. Team members talk and compare notes, and preliminary project sites may be identified along with the preliminary list of appropriate measures. When step one is essentially complete and planning objectives have been identified, people can begin to think about potential measures and their possible effects more explicitly. This can aid the evaluation, comparison, and selection steps in this and subsequent iterations.

As the **existing conditions** become defined and a forecast of the most **likely future** without a project comes into focus, it is easier to begin to identify specific plans that can address the planning objectives and the creation of alternative futures. None of this precludes the fact that as the study progresses, it may be necessary to go back and revise the problem definitions, the planning objectives, or any other supposedly completed step in the planning process.

In subsequent iterations, when specific plans are identified, precise evaluations of the plans can be made. When the evaluations have progressed to a sufficient point, comparisons of the assessed effects of the plans will be

made. All the while, revisions to previous steps may be on-going, and subsequent steps will be anticipated.

Generally, the ideal iterative process is one in which the current step is being executed; previous steps are being revised, and subsequent steps are being anticipated. A good iterative process continues to move the planning process forward. It is not an endless loop that repeats forever. The number of iterations in each stage is purely arbitrary. Do as many iterations as it takes to do the job well.

It is fairly safe to say that the iterations end when the selection of a plan has been completed. At this point, there is nothing more to do in the planning process. The Corps' planning process diverges from the generic model of Chapter Two because implementation of the plan is often considered an integral step in the generic planning process. Implementation is more appropriately considered part of project development, the larger process that encompasses the planning process. This distinction is more a matter of semantics than substance, however, because implementation is clearly the primary reason for planning for the Corps of Engineers.

Criteria for Screening

cri•te•ri•on, *n.: pl.* **cri•te•ri•a,** a test, means of judging, a standard of judging; any established law, rule, principle or fact by which a correct judgment may be formed.

Screening is not an arbitrary process. Criteria are used to decide what data, measures, scenarios, plans, and the like pass through the screening process to the next iteration. Some criteria are absolutes (i.e., pass/fail, like a toggle switch), but most are not (they are more or less, like a fader switch). Some of the criteria, such as the P&G criteria of completeness, effectiveness, efficiency, and acceptability (discussed in Chapter Nine), are given for all planning studies. Other criteria are derived from the specific planning study, based on the planning objectives and the opportunities and problems of the affected communities.

SCREENING

Screening *is a discriminating thought process during which we examine "things" methodically and separate them into groups of "drop" and "consider further."*

It is a form of decision-making based on criteria. Screening is a tool that can be applied to any little "p" planning task. It comes to the fore at three points in a typical planning process: first, during scoping. Scoping is a special step in the planning process during which significant issues are identified; it's discussed at greater length in the next section. Second, screening is emphasized whenever the four

criteria of effectiveness, efficiency, completeness, and acceptability are applied. These criteria are discussed in Chapter Nine. Third, screening emerges in the plan selection process, the subject of Chapter Eleven.

Screening is the process of separating what is important from what is not. It distinguishes what is valuable from what is worthless. It is the process of systematically eliminating options from the choice set. Planners screen a lot of things. They use screening criteria to separate the good from the bad: eliminating what is no longer of interest and extracting what is good and worth keeping from all that is available. This is the purpose of the screening process.

…use screening criteria to separate the good from the bad…

Any aspect of the study can be screened. Planners screen problems, opportunities, objectives, constraints, data, forecasts, scenarios, measures, plans, effects, and so on. Screening is only applied to those things that have been considered to some extent. Screening is selecting the good parts of the work the planner has done, based on planning criteria, and considering them further.

Screening is necessary because as the study progresses, the data, measures, alternatives, and the like can multiply. In order to maintain the problem-solving and opportunity-seizing focus of the study, it is essential that the planner discern what is worth considering further and what is worth eliminating. It's the only way to get from the many to the few to the one.

Screening is more than eliminating plans. It's more than executing steps four (evaluation), five (comparison), and six (selection). These are the specific steps used to select good plans from all possible plans, better plans from good plans, and the best plan from among the better plans. Indeed, taken together, these steps comprise a screening process. Evaluating, comparing and selecting plans is the most visible type of screening in the six-step planning process. However, screening is not limited to the screening of alternatives.

Data are screened. Measures are screened. You name it and there's a good chance you can screen it. *The evaluation and assessment of data and measures, however, are not to be confused with the evaluation, comparison, and selection of alternative plans*. They are two different types of screening. The process by which an analyst decides which population forecasts are best may be more or less formal. It may be as simple as considering the credibility of the organization that prepared the forecast or it may involve a more

detailed examination of how well the forecasts have predicted actual populations.

The exception to this flexibility is encountered in the screening of alternative plans. Here the process is prescribed by the planning process; you apply steps four, five and six. The alternatives are evaluated, compared, and the good ones are selected in the early iterations. In later iterations, the better ones are kept. In the final iteration, the best plan is selected.

Screening is an essential part of each iteration of the planning steps. In a sense, screening defines the beginning or end of an iteration. If the iterations are devoid of screening we run the risk of entering an endless loop in which the same alternatives are considered over and over with no progress toward identification of a recommended plan. Screening ideas and plans over a number of iterations is the essence of how a best plan emerges from a sea of potential plans.

Some amount of screening is required by law. One required screening is called **scoping**.

SCOPING

Scoping is a special kind of screening.

Scoping is a special kind of screening. It's an early planning activity that is required by both the P&G and the regulations implementing the National Environmental Policy Act (NEPA). Scoping identifies the most important issues raised by the proposed action. All public and private organizations that may be affected should be involved in the scoping process.

Scoping is defined in the Federal regulations for implementing the procedural provisions of the NEPA as "...an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action."[8] Initiating a scoping process as soon as practicable is a requirement with the force of law.

The accompanying sidebar details the requirements of the NEPA scoping process. The P&G in section 1.4.8 detail a scoping process to be used by Federal water resource planning agencies that is complementary to

[8] From 40 CFR Parts 1500-1508 § 1501.7.

the NEPA scoping process. The P&G have the following to say about scoping:

(b) As part of the scoping process, the agency should:

(1) Determine the extent to which the likely significant issues will be analyzed.

(2) Define the planning area based on the problems and opportunities and the geographic areas likely to be affected by alternative plans.

(3) Identify and eliminate from detailed study any issues that are not significant or that have been adequately covered by prior study. However, important issues, even though covered by other studies, should still be considered in the analysis.

(4) Identify any current or future planning that is related to but not part of the study under consideration.

(5) Identify review and consultation requirements so that cooperating agencies (as defined in 40 CFR 1508.5) may prepare required analyses and studies concurrently with the study under consideration.

(6) Indicate the tentative planning and decision-making schedule.

(7) The scoping process should be integrated with other early planning activities.

The NEPA scoping requirements along with the P&G scoping requirements constitute decisions that planners are obligated to make as early in the planning process as possible. *Making incremental decisions that move the planning effort toward a decision is what the screening process is all about. Scoping is, in this sense, the regulatory screening process. These are the things you must do.* If you're following the six-step planning process and doing good planning, these are things that would naturally be done anyway.

NEPA Scoping Process

Section 1501.7 of the Council on Environmental Quality's NEPA regulations describes the tasks of the scoping process beginning at paragraph (a).

(a) As part of the scoping process the lead agency shall:

(1) Invite the participation of affected Federal, State, and local agencies, any affected Indian tribe, the proponent of the action, and other interested persons (including those who might not be in accord with the action on environmental grounds), unless there is a limited exception under §1506.6.

(2) Determine the scope (§1508.25) and the significant issues to be analyzed in depth in the environmental impact statement.

(3) Identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (§1506.3) narrowing the discussion of these issues in the statement to a brief presentation of why they will not have a significant effect on the human environment or providing a reference to their coverage elsewhere.

(4) Allocate assignments for preparation of the environmental impact statement among the lead and cooperating agencies, with the lead agency retaining responsibility for the statement.

(5) Indicate any public environmental assessments and other environmental impact statements which are being or will be prepared that are related to but are not part of the scope of the impact statement under consideration.

(6) Identify other environmental review and consultation requirements so the lead and cooperating agencies may prepare other required analyses and studies concurrently with, and integrated with, the environmental impact statement as provided in §1502.25.

(7) Indicate the relationship between the timing of the preparation of environmental analyses and the agency's tentative planning and decision-making schedule.

PLANNING SETTING

Water resources planning takes place in a context or setting. This setting is determined by national values, goals, objectives, policies, programs and constraints. It exists in a political, economic and social context that is unique to the time during which the planning is undertaken. We call that context the **planning setting** and some of its elements are described below.

PARTNERSHIP

The P&G (paragraph IV.1.4.1(a)) mandate that the planning process be a "coordinated planning effort." The Corps of Engineers has gone substantially beyond this mandate to create a **Federal/non-Federal partnership** in water resources planning. The planning jurisdiction for the nation's water resources is clearly Federalist in structure, with both the Federal and state/local levels of government involved.

Borrowing from the language of the private sector, a partnership can be defined as a business co-owned by two or more partners. They share in the profits and the debts of their enterprises. The sharing of profits and debts need not be equal; the terms of the partnership may vary from case-to-case. *The partnership exists, however, for one primary purpose: to serve the interests of the partners by meeting the needs of their customers*.

The partnership exists…to serve the interest of the partners by meeting the needs of their customers.

Corps planners often see the "non-Federal sponsor" as their customer, i.e., the entity whose needs are to be met. In a partnership, one's partner is not the customer. One's partner is the party relied on to help meet the needs of the customer.

It is easy for some planners to think their job is to complete planning studies. In this mode of thinking the customer would appear to be the one who makes the plan possible. That could be the non-Federal partner who signs a **Feasibility Cost-Sharing Agreement** (FCSA) or **Project Cooperation Agreement** (PCA). Or, it could be the decision-makers in the chain of command, without whose support there is unlikely to be Federal involvement in a plan. Without these parties there is no one to share study costs or to provide evidence of a significant need for the study.

This is not the proper view of a planner's job. Meeting human wants and needs is perhaps the simplest statement of a planner's job. Solving problems and taking advantage of opportunities to improve the quality of life for present and future generations is another way to describe it. The customer is the community. The people of the study area specifically and the people of the United States more generally are the partnership's customers.

Thus, the planner participating in the new partnership must keep a clear focus on who the customer is. Obviously, all partners have to be satisfied in order for a partnership to work. However, the customers' needs must come first or there is no reason for a partnership to even exist. Once the basis for the partnership is understood, the needs of the customers must come before the agendas of the individual partners.

PLANNING AREA

What geographic area should we take into consideration when formulating plans? The area we end up considering is called the **planning area**. Related concepts include the **study area**, **project area**, and **affected area**. Though related in meaning, each has its different nuances. When planning, the planning area best describes the area of interest. The terms, however, are essentially interchangeable.

Planning areas may encompass administrative regions, political jurisdictions, states, or watersheds. River basin planning has long been recognized as the most logical basis for planning the development and preservation of water resources. Though basin level planning is beginning to enjoy a resurgence, many Corps planning studies are still implementation studies that affect an area that does not encompass an entire river basin.

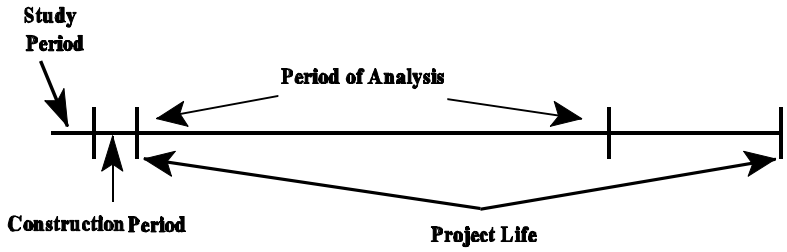
The P&G (1.4.7) define the planning area as a geographic space that includes the following (bold emphasis has been added):

> "(a) The area defined in the study's authorizing document; (b) The locations of alternative plans, often called "**project areas**"; and (c) The locations of resources that would be directly, indirectly, or cumulatively affected by alternative plans, often called the "**affected area**."

PERIOD OF ECONOMIC ANALYSIS

How long a time period should we use when considering the impacts of plans? We should consider only the time it makes sense for us to consider. This time frame is called the **period of economic analysis,** also known as the **period of analysis.** It's the period of time over which we think it is important to extend our analysis of plan impacts. This time period is frequently confused with the **planning horizon**, which is a longer and more encompassing concept. Figure 4 shows the period of analysis is part of the planning horizon.

Figure 4: Planning Horizon



Planning Area Examples

A storm damage reduction project may require upland borrow sites several counties removed from an eroding shoreline. The planning area should include the area that includes the shoreline and the borrow sites. If the shoreline is a significant recreation resource, the planning area should include the region from which significant numbers of tourists come.

A deep water port improvement study need not include the entire United States and all the foreign countries from / to which commodities move. It would be sufficient to define the planning area as the hinterland of the port. That is, the area from which most exports arise and the area to which most imports are destined. This is the area that encompasses the bulk of the economic, social, and political impacts of the port and port-related activities. It is not uncommon for such areas to encompass numerous counties and several states.

A local flood control project may be confined to a single community, for example, in the case of a Section 205 study. It is common practice to use the political jurisdiction(s) or economic area encompassing the flood plain as the planning area. In instances where goods and services produced in the flood plain have a significant impact on other areas, they should also be included.

Few studies explicitly consider the source of construction materials when defining planning areas. When unique resources are required for implementation, like sand borrow, large rocks for jetties, and so on, the impact of the project on the source areas should be considered when defining the planning area.

The time it takes to conduct the study and implement the plan is not part of the period of analysis even though it is part of the planning horizon. The project may last longer than the period of analysis. The period of analysis is the subset of the planning horizon over which we consider plan effects.

The first rule for choosing a period of analysis is, you must use the same period of analysis for each plan considered in a study. To do otherwise would mean that we are considering different time streams of plan impacts, and that would render any comparisons of plans invalid. The period of analysis is usually 50 years and is never over 100 years. Forecasting conditions and impacts beyond 100 years is pure guessing, even if some structural projects may last more than 100 years.

If significant impacts do not last 50 years, the period of analysis should be restricted to the duration of the significant impacts. Significance can be measured in many ways. One of the most common measures has to do with the time value of money. Future dollar values, whether benefits or costs, are worth less than current dollar values. Discounting is the process used to place dollar values

Period of Analysis

Planning Guidance Letter 96-01 in paragraph 10 defines the period of economic analysis as follows:

- The period of time over which any alternative plan would have significant beneficial or adverse effects; or
- A period not to exceed 50-years except for major multiple purpose reservoir projects; or
- A period not to exceed 100-years for major multiple purpose reservoir projects.

This does not negate the P&G requirement that appropriate consideration should be given to environmental factors that may extend beyond the period of analysis.

incurred at different times on an equivalent time basis. After 50 years the discount factor alone reduces monetary values to a mere fraction of their former value[9]. Unless the future dollar values being discounted are large there is no apparent point to continue to include these values among project impacts.

INTERDISCIPLINARY TEAM

Chapter Thirteen is devoted largely to the planning team. Nonetheless, team planning is essential to the modern planning context. As a result of the proliferation of goals and objectives that must be addressed by water resources planning studies, it is impossible for any single discipline to adequately address the more complex issues that arise in a world that is multi-objective in its outlook. *Many disciplines are needed for planning. In addition to a diversity of disciplines, the planning team should include a diversity of interests including other government agencies*.

STAKEHOLDERS

Stakeholder *is a word used in water resources planning that has come to mean a person or group of persons who can stop you or whose support is necessary for success.* As members of the public, stakeholders are also addressed in more detail

[9] For example, if the discount rate is 10%, one dollar 50 years from now is worth only $0.0085. At 7% the same dollar is worth $0.0339.

in Chapter Thirteen. The Federal and non-Federal partners are two obvious stakeholders in a study. Government agencies at all levels of government are frequent stakeholders. Organizations and individuals that have an interest in the project should be actively included in the planning process, as should public interest groups with a particular point of view that bears on the project. They go a long way toward forming the specific planning context of a study.

SUMMARY AND LOOK FORWARD

Lesson One. The iterative nature of the Corps' planning process is one of its most distinguishing features. It is through the process of repeating the planning steps and screening elements of the planning study that the recommended plan eventually emerges.

Lesson Two. Screening is the ongoing process of eliminating, based on planning criteria, what is no longer important or interesting from further consideration. Alternatively, screening is the process of preserving what is important. Scoping is a special kind of screening process. All of these tasks and those yet to be described are carried out in a planning context.

Absent from our conversation to this point are the details of what the planning steps are. That description begins with step one in the next chapter.

SUGGESTIONS FOR FURTHER READING

Most of the material presented in this chapter is rather original. Some unique discussion of the iterative nature of planning and the screening process can be found in the water resources planning books referenced at the end of Chapter Two. The interested reader should read about scoping in its original contexts found in 40 CFR Parts 1500-1508 and the P&G beginning at section 1.4.8. The planning setting is a mosaic that can be pieced together from ER 1105-2-100 and evolving policy guidance such as guidance letters and sources like those described in Chapter Four.

CHAPTER SIX: STEP 1 - IDENTIFYING PROBLEMS AND OPPORTUNITIES

Would you tell me, please, which way I ought to walk from here?" "That depends a good deal on where you want to get to," said the Cat. "I don't much care where --" said Alice. "Then it doesn't matter which way you walk," said the Cat. From Lewis Carroll's *Alice's Adventures in Wonderland*.

Step One: "Specification of the water and related land resources problems and opportunities (relevant to the planning setting) associated with the Federal objective and State and local concerns." (P&G Standards, Section III paragraph 1.3.2 (a)(1))

INTRODUCTION

As the conversation between Alice and the Cat points out, if you don't know where you're going, it doesn't matter which way you go. In water resource planning it is essential that planners have a sense of the direction in which they want to head. That sense of direction is obtained in the first step of the planning process.

Historically the nation's goals and objectives in water resource planning and development have reflected national values. These national values have evolved and changed over our two centuries as a nation as new problems, challenges and opportunities have emerged. Water resource projects have been planned and implemented to solve those problems, meet those challenges, and seize those opportunities. If they did not, they would serve no purpose.

Without a clear statement of the problems to be solved or the opportunities to be seized, there is no rationale, no reason for planning. As the first step, identification and specification of the problems and opportunities to be addressed is the most important step in the planning process that follows. This first step produces what is essentially the mission statement of the Federal/non-Federal partnership. It is an enduring statement of purpose that distinguishes this partnership from all others.

The identification of problems and opportunities ensures unanimity of purpose within the partnership. Solving these problems and taking advantage of these opportunities provides a basis for motivating and allocating the partners' pooled resources. This step provides a focal point for all stakeholders in the planning process. It says, "This is why we are undertaking this study."

Two Sheets of Paper

Every planning study, from the multi-million dollar multiple purpose study to the several thousand dollar military study and everything in between, should produce two sheets of paper early in the study. One of them lists the problems and opportunities, the other the planning objectives and constraints. The first sheet says this is what is wrong here, the second says this is what we intend to do about it. Together, these two sheets of paper make the most informative summary of your study's purpose that is possible.

Identifying problems and opportunities facilitates translation of the partnership's purposes into appropriate planning objectives. The concerns of both the Federal and non-Federal partners are identified in this step. Ultimately, plans to meet these objectives will be produced. The culmination of the planning process depends critically on the success of this first step.

There are five basic concepts in this chapter: **problems**, **opportunities**, **goals**, **objectives**, and **constraints**. Understanding these concepts is critical to the success of the planning process.

PROBLEMS AND OPPORTUNITIES

Webster's *New Collegiate Dictionary* defines a problem as a question raised for inquiry, consideration, or solution; or an intricate unsettled question, a source of perplexity or vexation. We can think of it as an undesirable condition. Not everything is a problem and problem solving is only part of the planning story. The other part of the story are the opportunities. Webster defines an opportunity to be a favorable juncture of circumstances; a good chance for advancement or progress. Water resource projects often provide those chances.

Problems and opportunities are conditions that exist in every community. They are the first things you seek to identify in step one of the planning process. Through this first step in the planning process, some problems and opportunities will evolve into planning objectives.

In practice, opportunities are sometimes treated as less important than problems in the planning process. Capitalizing on opportunities, however, is every bit as important as solving problems.

Is there really a difference between a problem and an opportunity? That depends. In many cases it may come down to whether you see the glass of water as half empty or half full. In general, problems tend to be both negative and current conditions. Something *is* broken, something *is* missing, and the like. Opportunities tend to focus on positive and future conditions. Something *can be* made better. Other ways to think about the differences between problems and opportunities are suggested in Table 14. If problems differ from opportunities in some ways, they are similar in others. Some similarities are presented in Table 15. There are no absolutes in these comparisons. The rule of thumb is to be flexible in defining problems and opportunities.

Table 14: Differences Between Problems and Opportunities

Characteristic	Problem	Opportunity
FOCUS	Existing undesirable condition; Description of what is.	Future desirable condition; description of what could or should be.
MESSAGE	Negative; objection.	Positive; desire.
OCCURRENCE	• Past - Usually occurred • Existing - Usually occurs. • Future "without" - Usually expected to occur.	• Past - Usually didn't occur. • Existing - May or may not occur. • Future "without" - May or may not be expected to occur.
RELATIONSHIP TO OTHER RESOURCES	• Existing condition may adversely affect other resources • Survival may be an issue.	• Existing condition does not affect other resources. • Survival not an issue.
IMPLICIT OBJECTIVES OF ACTION	• Return to a past condition that was not considered objectionable (example: restore a degraded habitat). • Create a future condition that would not be objectionable (example: stabilize an eroding shoreline).	• Create a future condition considered to be desirable (example: develop new wetlands). • Return to a previous condition considered to be desirable (example: rehabilitate an historic structure).
CONSEQUENCES OF DOING NOTHING	Usually direct, immediate, and adverse.	Usually indirect and long-term due to benefits foregone.

Problem definition is the detailed description of a problem. It begins with a **problem statement**; a simple, usually one sentence, assertion of what the basic problem is. Pick up any Corps planning study and you'll find a section entitled "Problems and Opportunities." Read it, and you'll usually have a good idea what problems the study is going to address. It is rare, however, to find a clear and concise statement of these problems. It is far more common to find a problem described and defined in a piecemeal fashion over several paragraphs of text than it is to find a direct statement of a problem, like "The problem is loss of coastal wetlands along Utopian Point." It may require many paragraphs to properly characterize the nature, cause, location, dimensions, origin, and importance of this problem, but it is important to be able to clearly state it. *If a planner can't finish the sentence, "The problem is . . ." clearly and concisely, then nothing else that follows in the study is likely to be very clear either*. Every study should include a problem statement.

Problem definition can be expanded to identify the nature, cause, location, dimensions, origin, time frame, and importance of the problem, as well as an indicationof who considers this a problem. An opportunity can be defined the same way. A

Table 15: Similarities Among Problems and Opportunities

Characteristic	Similarity
NUMBER	Variable; few to many.
HOW STATED	In practical, meaningful, operational terms in a single statement.
SOURCE	Developed; from people, observation, analysis, and documentation.
SPECIFICITY	Specific; narrow; essentially limited.
SPECIFIC SUBJECT	Usually limited to a specific resource.
SPECIFIC LOCATION	Usually found in a particular place or locale (example: "study area").
SPECIFIC MEASURABILITY	Moderate to high; usually measurable or easy to recognize change that would result in a "better" or "worse" condition.
ABILITY TO ACHIEVE	High; problems can be solved, opportunities can be realized.
"IDEAL"	• An "ideal" usually exists and can be identified. • The "ideal" is not the same as the existing condition. • The "ideal" is not the same as the long-term "without" condition.

detailed profile outline that may be handy to use in thinking about and describing your study's problems and opportunities can be found in the sidebar.

An important aspect of problem definition is describing its cause. If the underlying causes of a problem are not identified, the solutions can end up being superficial and unsuccessful. People usually complain about problem conditions long before the underlying causes are known. People know the fish are disappearing from a creek long before they know why. The solutions to the problem can vary considerably depending on whether the cause is overfishing, loss of habitat, disease, or declining water quality due to increasing urbanization.

A Simple Problem Statement

A problem statement need not be elaborate. It can be as simple as the following example.

Franklin Creek Basin Problem Statement

The problems in the Franklin Creek Basin are:

1) Loss of fish habitat in Franklin Creek due to urbanization;
2) Flood damages in the industrial section of Central City;
3) Streambank erosion along Campus Park;
4) Saltwater intrusion in the Franklin Bay estuary;
5) Loss of coastal wetlands along the South Ditch section of Franklin Bay.

The definition of these problems will take considerably more

. There are criteria that characterize good and bad statements of problems and opportunities. For example, good problem statements never include solutions or the suggestion of a specific solution. "The problem is we don't have a floodwall" is not a good problem statement. As a matter of fact, it skips the entire planning process and jumps to the selected plan. All the planner has to do is figure out the details; where the wall should go, how high should it be, and so on. The problem is not that someone does not have a floodwall. The problem may be that the watershed is developing without thought being given to the effects on runoff and streamflow, thus expanding the flood plain and exacerbating floods. The problem may be unrestrained development of the flood plain itself. The problem may be the catastrophic damages

A Simple Opportunity Statement

An opportunity statement need not be elaborate. It can be as simple as the following example.

Franklin Creek Basin Opportunity Statement

There are opportunities in the Franklin Creek Basin to:

1) Increase wildlife habitat along Campus Park.
2) Restore indigenous fish species in the upper basin.
3) Provide increased recreational opportunities along the waterfront.

that occur with infrequent flooding. Or, it could be the minor nuisance associated with frequent floods. The problem is not what the customer wants but doesn't have. The problem is usually far more complex than that.

Problem/Opportunity Profile

1. Source. What source first identified the problem or opportunity? Examples: study authority, local master plan, conversation with city mayor, Corps experts based on field observations.

2. Public Concerns
   a. Advocate - Who is the spokesperson for the problem or opportunity? Identify specific groups, agencies, and individuals.
   b. Basis - What is the advocate's basis for the problem or opportunity? Examples: homeowners who have experienced flooding, state agency legally mandated to oversee wildlife resources.
   c. Background - In the advocate's view, what is the problem or opportunity, and what are the causes and effects?
   d. Other Stakeholders - Who else believes the problem or opportunity does or does not exist? Why or why not? Identify specific groups, agencies, and individuals.

3. Technical Analysis
   a. Subject - Describe the subject of the problem or opportunity.
   b. Location - Describe the location of the problem or opportunity; map it if possible.
   c. Measurement - Identify one (or more) measurable indicator that is used to measure change in the problem or opportunity.
   d. Conditions - Describe past, present and future conditions related to the problem or opportunity:

      (I) Historic condition
      (ii) Existing condition
      (iii) Future "without project" condition

   e. Decision Criteria - Identify any standard, target or other criteria that may be used to define the magnitude of a problem or opportunity. For example: state water quality standards, design vessel dimensions, and so on.

Plans are formulated to achieve **planning objectives**. Planning objectives and constraints are inexorably linked to problems and opportunities. Thus, clearly articulated problem and opportunity statements are essential to the success of any planning process. *Planning objectives provide a clear statement of the purpose of a study*. There is no study without planning objectives and there are no objectives without carefully defined problems and opportunities. These simple facts and this simple linkage between problems and objectives make this step the most important in the planning process.

What's the Problem?

When you read a planning report, you should be able to deduce the problem and opportunity statements from a good set of planning objectives and constraints. The linkage between "problems and opportunities" and "objectives and constraints" is a critical one.
See if you get a feel for the problems to which
these objectives refer:

- Increase habitat heterogeneity.
- Reduce flood damages on Seminole and Miccosukee tribal lands.

GOALS AND OBJECTIVES

To understand planning objectives and constraints, we return to the basic concepts of this planning step. In a perfect world, the logical sequence for encountering these ideas over the life of a planning study is:

- *Goals*, which are given to us; followed by
- *Problems* and *opportunities*, which we identify; followed by
- *Objectives* and *constraints*, which we base on the problems and opportunities.

Will we always encounter them in this order? Probably not. But by the time a final plan is selected, we will have struggled with each, and it is important to understand their individual and complementary roles in getting us to a selected plan.

One thing these five concepts have in common is that each can and should be expressed in a simple and clear statement - a sentence. It may require paragraphs, pages, or volumes of backup documentation to fully explain their various technical dimensions, complexities, interrelationships, public opinions, and other factors; but they must also exist as short summary statements that can be read and understood by everyone with a stake in the outcome.

Problems and opportunities have already been defined. Now we backtrack a little to consider goals and objectives. A subsequent section will take up a comparison of objectives and constraints.

Webster's New Universal Unabridged Dictionary defines a goal as the end or final purpose. An objective is defined as something aimed at or striven for. Both convey the same basic intent; in short, "do good." And the definitions establish a hierarchical structure that suggests we set goals first then establish objectives that will help us attain our goals. A goal says "do good broadly;" an objective says "do good specifically." Other ways to think about similarities and differences between goals and objectives are suggested in Table 16.

GOALS AND OBJECTIVES ILLUSTRATED

An example can help define these terms. Let's say that you and some friends agree that you should all be happy. Your common goal is "happiness." Everyone will individually define what "happiness" means for themselves. These individual statements will be their personal objectives to achieve "happiness." Perhaps the results look like this:

- Goal: Happiness

- Your Objectives:

  Go on vacation next month.
  Get a promotion.
  Finish reading the Planning Manual.

- Friend 1's Objectives:

  Double my salary.
  Spend more time with my family.

- Friend 2's Objectives:

  Get a motorcycle.
  Go camping this summer.
  Lose 10 pounds.

The group has a common goal. Some individuals' objectives are similar and others differ among the group. Collectively, they are all consistent with the message of the goal. The objectives follow from the goal. With this simple framework in mind, we can understand the relationship between the NED Federal objective and planning objectives. It begins with another important distinction between goals and objectives.

Table 16: Goals and Objectives

Characteristic	Goal	Objective
NUMBER	Few in any given study.	Variable; few to many.
HOW STARTED	In idealistic terms.	In practical, meaningful, operational terms.
SOURCE	Given.	Developed from problems and opportunities
SPECIFICITY	General; broad; conceptual; Essentially unlimited.	Specific; narrow; essentially limited.
SPECIFICITY: SUBJECT	Covers a wide variety of subjects, resources, or issues.	Usually limited to a single subject, resource, or issue.
SPECIFICITY: DURATION	Timeless; undated; intended for to the long-term.	Dated; time-phased; can or intended be achieved within a particular time frame.
SPECIFICITY: LOCATION	Applicable to large areas; international, national, or regional.	Applicable to a particular place or locale ("study area"); regional or local.
SPECIFICITY: MEASURABILITY	Moderate to low; not necessarily measurable measurable or easy to recognize achievement.	Moderate to high; usually or easy to recognize achievement.
ACCEPTABILITY	High; generally acceptable to all; Agreement.	Low to high; may be conflicts; Consensus may be lacking.
CHANGEABILITY	None (in the near-term) to low; stable.	Variable; low to high.
ABILITY TO ACHIEVE	Low to moderate; not realistic to expect one solution to fully achieve all aspects.	High; can be achieved, in whole or part, by a single solution.
MESSAGE	Do good ("motherhood and apple pie") and do not do bad ("Thou shalt not...").	Do good.

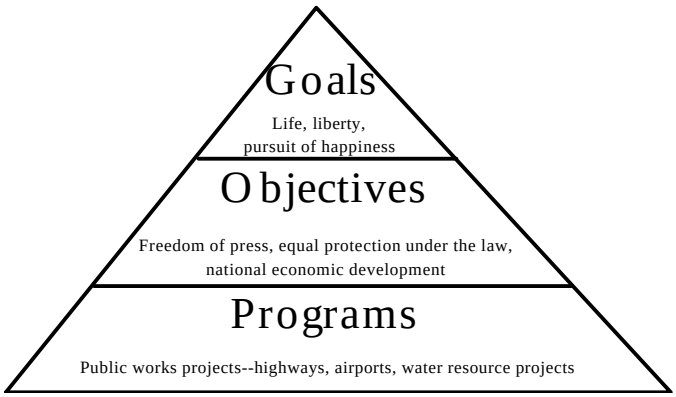
FEDERAL GOALS AND OBJECTIVES

Suppose for the sake of simplicity that we take "life, liberty, and the pursuit of happiness" as some of our nation's goals. These are ultimate destinations for the citizens of this country, and provide a broad and enduring direction for the nation's government. The goal statements do not suggest a way to achieve these goals, however.

Further suppose that freedom of the press, equal protection under the law, and economic development are some of the objectives that could help us attain our national goals. Now, suppose national economic development (NED) can be achieved through a variety of missions and programs of various Federal government agencies, like monetary policy, job training, education, and public works projects. In turn, public works projects could consist of highways, airports, and water resource projects.

At the national level we have described the hierarchy shown in Figure 5. From the perspective of the President, the Congress, and the general populace of the United States, *our national goals - life, liberty, pursuit of happiness, and others - are further defined through a complex set of national objectives, such as national economic development, that flow from and support the intent of the goals*. Thus, we have national economic development as a true national, or "Federal," objective.

Figure 5: National Goals and Objectives



Beware. Perspectives change. What is a goal and what is an objective change when you move from the national level to your local planning level. *The Federal objective becomes a goal for Corps' planners in each of their planning studies*.

PLANNING GOALS AND OBJECTIVES

Because this is an instructional manual, let's not worry about the goals and objectives of the Corps or its planning partners for now. Instead let's think about a specific planning partnership, i.e., a specific study. Where do the planning goals come from? Generally, the planning goals are the objectives of some organization higher up in the hierarchy. For example, the P&G make it clear that national economic development is the Federal objective. National economic development, from the Federal perspective, is the primary purpose of a water resource project. It is not something that water resources projects try to do a little of, it is the entire reason the Federal government is involved in water resource development in the first place. Plans are not formulated specifically for national economic development; that is understood to be the reason for the program's existence.

The Federal NED objective is a goal for the planning partnership. One of the planning team's first responsibilities is to develop planning objectives that will help the partnership contribute to that goal.

There can be other goals as well. Goals are the broad, over-arching purposes for a study. They may be defined by the non-Federal partner or any other stakeholder, and will be unique to each study. In Corps' planning under the requirements of the P&G, the NED goal ("Federal objective") is always a given that you will start with.

Thus, for a planning partnership, Federal and non-Federal objectives become planning goals. One person's objective is another person's goal. The objectives of the organizations higher in the hierarchy become the goals of the planning partnership. The planning partners must then develop planning objectives to help attain these goals. Although the terminology may seem confusing, do not be confused about their roles in doing planning. *Goals will be given to you; you will develop objectives*.

PLANNING OBJECTIVES AND CONSTRAINTS

An objective is a statement of the intended purposes of the planning process; it is a statement of what an alternative plan should try to achieve. More specific than goals, a set of objectives will effectively constitute the mission statement of the Federal/non-Federal planning partnership.

Our planning partnerships exist in a world of scarcity where it is not possible to do everything. Our choices are constrained by a number of factors. Planning is no exception. An essential element of any planning study is the set of constraints confronting the planners. *A constraint is basically a restriction that limits the extent of the planning process*. Constraints, like objectives, are unique to each planning study.

Two distinctly different categories of constraints can be identified. First, there are **resource constraints** on the planning process. These include limits to our

knowledge, expertise, experience, ability, data, information, money, and time. These constraints limit the scope of a study in significant ways. Resource constraints are considered again in Chapter Twelve. Here we need to focus on a second category of constraints - **planning constraints** that restrict plan formulation. These can be divided into **universal constraints** and **study-specific constraints**.

Universal planning constraints are the legal and policy constraints that need to be included in every planning study. They may vary from study type to study type, but for a given type of study, there are some predictable constraints. For example, you don't formulate plans that intentionally adversely affect threatened or endangered species. The Corps of Engineers will not formulate flood damage reduction plans for streams where the 10 percent discharge is less than 800 cubic feet per second. The Corps' guidance, regulations, policies, and authorities define some of these constraints. Others are defined by the laws and regulations of the Federal government and the applicable laws and regulations of the State and local governments.

Study-specific planning constraints are statements of things unique to a specific planning study that alternative plans should avoid. While universal constraints are applicable from one study to another, study-specific constraints are not. Examples of study-specific constraints include the following:

Do not induce salinity intrusion into freshwater aquifers.
No loss of flood protection from an existing levee system.
No increase in shoreline erosion related to navigation.

The significance of both types of constraints is that they can limit choices. The presumption is that constraints limit choices in socially desirable ways.

Planning objectives are the things we want to accomplish with a plan. They are the desired changes between the without- and with-project conditions. *In contrast, study specific planning constraints are things we want to avoid doing*. Constraints are designed to avoid undesirable changes between without- and with-plan conditions. They are things we don't want to “mess up” with our plans.

While plans are formulated to achieve planning objectives they are also formulated to avoid violating the constraints. The simplest difference between the two concepts can be summarized as follows: Objective--do good; Constraint--don’t do bad. Some other similarities and differences between objectives and constraints are suggested in Tables 17 and 18.

Table 17: Similarities Between Objectives and Constraints

Characteristic	Similarities
NUMBER	Variable; few to many.
HOW STATED	In practical, meaningful, operational terms and in a single statement.
SPECIFICITY	Specific; narrow; essentially limited.
SPECIFICITY: SUBJECT	Usually limited to a single subject, resource, or issue.
SPECIFICITY: MEASURABILITY	Moderate to high; usually measurable or easy to recognize achievement.
ACCEPTABILITY	Low to high; may be conflicts; consensus may be lacking.
CHANGEABILITY	Variable; low to high.
ABILITY TO ACHIEVE	High; can be achieved, in whole or part, by a single solution.

Planning objectives and constraints are indications of what is important to people. Planning by objectives, i.e., formulating plans to meet valid social, environmental, economic, and engineering objectives and to avoid undesirable consequences, is what the planning team is supposed to do. This is very different from planning to maximize NED benefits. When specifying planning objectives and constraints is an exercise to be checked off a planning team's "to do" list, we see the latter form of planning.

The planning objectives and constraints are in reality a statement of the reasons for the planning effort. The objectives and constraints should reflect the views of the public regarding the problems and opportunities of the planning area. They are a list of results that are desired from a project. The planning objectives and constraints are the reason for the Federal/non-Federal partnership. They are, in a sense, the partners' mission statement - that enduring statement of purpose that distinguishes this partnership from all others. Plans are formulated to meet the planning objectives and to avoid the constraints; there can be no other reason for a plan.

PROFILE FOR AN OBJECTIVE OR CONSTRAINT

Objectives, as well as constraints, are written statements -- simple sentences -- that should generally include the following four types of information: **effect**, **subject**, **location**, and **timing** and **duration**. The detailed profile in the sidebar can be helpful in developing objectives and constraints.

Table 18: Differences Between Objectives and Constraints

Characteristic	Objective	Constraint
SOURCE	Developed from problems and opportunities.	Given (example: some legal design constraints); or developed based on area-specific conditions (i.e., public views, resource limitations).
SPECIFICITY: DURATION	Dated; time-phased; can be or are intended to be achieved within a particular time frame.	Variable; may be dated and time-phased, or intended for the long-term.
SPECIFICITY: LOCATION	Applicable to a particular place or locale ("study area"); regional or local.	Variable, depending on the subject being constrained.
MESSAGE	Do good.	Don't do bad.

The effect is the verb part of the statement that expresses the intent to "do good" in an objective and "don't do bad" in a constraint. It describes the type of effect that alternative plans should cause. Table 19 lists some verbs commonly used in objectives and constraints. Many of them have specific regulatory meanings and in certain situations carry policy implications, i.e., cost sharing for "mitigation" or "restoration." Others might invoke personal biases. Exercise caution and care in choosing and using these terms or others.

Table 19: Objective & Constraint Verbs

abate	preserve
advance	prevent
avoid	produce
compensate for	prohibit
conserve	promote
contribute to	protect
control	provide
create	reclaim
destroy	reconstruct
develop	recover
eliminate	recreate
enforce	rectify
enhance	reduce
establish	rehabilitate
exchange	repair
harmonize	replace
improve	restore
maintain	retire
manage	stabilize
minimize	substitute
mitigate	

The subject part of the statement tells us what is to be changed for the better through meeting the objective, or not changed through avoiding a constraint. This part of the statement is the link to a problem or opportunity. It captures the problem or opportunity in a phrase.

The location defines where the objective is to be achieved, or where the constraint is to be avoided. It is often the planning area.

Time and duration define when and for how long the objective is to be achieved or the constraint is to be avoided. Oftentimes, "timing and duration" will be the "period of analysis" and it will be the same for the study's objectives and constraints. Such similar conditions don't have to be repeated in each statement, but could be described once as applicable to all the objectives and constraints.

CHARACTERISTICS OF GOOD OBJECTIVES AND CONSTRAINTS

There are few hard and fast universal rules that must apply to all objectives. However, the following characteristics that apply generally to both objectives and constraints are helpful to keep in mind.

Specific. Specific objectives provide useful guidance for plan formulation. *The more specific the objective, the easier it is to identify measures or to formulate plans necessary for attaining it*. Non-specific objectives cannot be effectively pursued or attained and are to be avoided. "Improve the environment" is a non-specific objective that does little to aid planners or decision-makers. "Increase tidal wetlands in the King River vicinity" is specific enough to guide planners in the formulation process.

Objective/Constraint Profile

1. Problem/Opportunity Statement. Provide a clear and brief description of the problem or opportunity that is the basis for the objective/constraint.

2. Analysis.
   a. Effect - Describe the type of effect to be achieved. This is the objective's/constraint's "verb".
   b. Subject - Describe what is to be changed by meeting the objective, or not changed by meeting the constraint. This is the objective's/constraint's "subject".
   c. Location - Describe the location where the objective is to be achieved, or the constraint is to be avoided.
   d. Timing and Duration - Describe when and for how long the objective is to be achieved or the constraint is to be avoided.
   e. Measurement
      (I) Output - Identify one (or more) indicator that will be used to measure change. For each indicator, identify one (or more):
         (1) Measurement Unit - Identify the unit to be used to measure change.
         (2) Measurement Technique - Identify the procedure that will be used to measure change in the specified unit.
      (ii) Thresholds - If applicable, identify output thresholds:
         (1) Minimum - Is there a minimum level of output, such that amounts of output less than the minimum are not useful, are not reasonable, or otherwise don't make sense?
         (2) Maximum - Is there a maximum level of output, such that amounts of output greater than the maximum are not useful, are not reasonable, or otherwise don't make sense?
   f. Decision Criteria - Identify any standard, target or other criteria that will be used to judge how well or poorly the objective/constraint would be achieved. Identify the source (law, regulation, master plan, etc.), responsible entity (agency, organization, etc.), penalties for noncompliance, and other characteristics of each decision criterion.
   g. Sponsor - Identify an objective's "sponsor" - what entity would potentially share the cost of a solution that would achieve the objective? Identify a constraint's proponent.
   h. Other Stakeholders - List any other stakeholders in the objective/constraint - what other entities have an interest in seeing that the objective/constraint is achieved or not achieved? Briefly describe the nature of each stakeholder's interest.
   I. Sources of Information - List sources of information about the objective/constraint and its characteristics.
   j. Studies needed - Briefly describe the types of additional studies needed in further planning for the objective/constraint.

3. Statement. State the objective or constraint.

4. Potential Solutions. List any potential solutions that may meet, at some level, the objective or constraint.

Flexible. Objectives should be flexible enough to accommodate alternative ways for achieving them as well as to allow alternative levels of results. "Build a floodwall that provides 100-year protection" is the worst kind of objective. First, it states a solution rather than focusing on a problem or opportunity, thereby eliminating any flexibility in choice of measures to reduce flood damages. Second, it does not allow for any flexibility in determining the level of flood damage reduction. Planners must be cautioned that flexibility in objectives may come at the expense of specificity and the relative merits of the two must be assessed by the planner in light of customer feedback.

Measurable. A good, specific objective can also be measured. To be measurable an objective must be stated in terms that can be assessed or quantified. Though it is not necessarily always desirable for the objective to specify the actual measure, the objective should be measurable in some appropriate units. An exception is where there are thresholds or legal mandates that make specific levels of output necessary. An objective to "Enhance community cohesion" is not easily measured, but "Increase the number of protected structures" gets at the same objective in a measurable manner.

A measurable objective is useful to decision-making. If we can measure a plan's contribution to increasing open space we can more easily evaluate its value. Measurability allows us to observe exactly what a plan contributes.

Attainable. *Objectives should provide a challenge to planners, but they must also be realistic and attainable*. "Restoring the Minnow Creek ecosystem to its natural condition" is an admirable objective that may be popular with the public, but it is not realistic in an urban environment, hence it cannot be attained. "Increasing dissolved oxygen in Minnow Creek" is a more attainable objective. Unattainable objectives may do little more than frustrate people because they are unable to meet them. Once such a situation arises, it may be very difficult to motivate people. Specificity can often make an objective more attainable.

Congruent. Ideally, objectives will be congruent with each other. Congruency means the objectives fit together. More specifically, attainment of one objective would not preclude the attainment of another. This is not likely to be the case, however, when the problems and opportunities involve any complexity at all. The variety of different and, at times, conflicting viewpoints on the planning area's problems and opportunities virtually assures some incongruencies among objectives.

Incongruent objectives can lead to conflict within the planning process. Conscious or unconscious efforts to minimize conflict by eliminating incongruencies among objectives are to be avoided when the incongruent objectives represent legitimate, conflicting problems and opportunities. Incongruencies should be avoided whenever they add nothing to the planning process. For example, there is no point to specifying the objectives: "decrease flood damages" and "hold flood damages constant." These conflict for no apparent purpose. On the other hand it may be wholly appropriate to specify the local objectives: "increase open space" and "increase regional tax base." In this latter case, there may be an incongruency if the former

objective would be served by relocating structures from the flood plain, and the latter is served by developing the flood plain. Different plans can be formulated to meet incongruent objectives. Conflicting objectives provide a good reason for different alternative plans.

Acceptable. Good objectives have to be acceptable to those responsible for achieving them - that is, the planning partners. They must also be acceptable to the partners' customers and major stakeholders. *Not every objective must be acceptable to all stakeholders, but the set of objectives should be acceptable in principle to all study interests*. The acceptability of objectives is founded in their responsiveness to stakeholders' problems and opportunities. There is no better investment in a plan's credibility than paying attention to people's problems and opportunities.

WHAT A GOOD OBJECTIVE IS NOT

Just as the aforementioned qualities will lead to good objectives, the following characteristics are warning flags for objectives and constraints that could lead you astray.

Absolute Target. Though specific, an objective should not specify an absolute target as the only level of the desired result. It needs to be flexible. For example, "Increase tidal wetlands in the King River vicinity by 2,000 acres" is not an appropriate objective. Outputs vary with the nature and size of the alternative plan and are therefore a product of the formulation process. While a target may be useful, or even necessary, in later plan selection, objectives should generally not contain targets.

Solution. As mentioned earlier, objectives should not include solutions, i.e., neither individual management measures, alternative plans, nor programs. If we are to seek optimal solutions that meet as many of the objectives as possible, we cannot begin by ignoring the full range of measures available to us. Objectives should not specify the measures or plans that can be used to meet the objective. Thus, unlike a for-profit business, objectives should not specify a precise level of attainment or a specific means for attaining it.

Federal Objective. National economic development is not a planning objective. The Federal objective specified in the P&G is a goal. This goal, like other goals supported by other study stakeholders, provides the reason for the study rather than a reason to formulate alternative plans. Good objectives are not goals.

Account. The P&G define four categories (or "accounts") of effects to facilitate evaluation and comparison of alternative plans. They are discussed in more detail in Chapter Nine. One account, national economic development (NED), includes the effects that can be counted in demonstrating progress toward the Federal objective. The other three accounts, environmental quality (EQ), regional economic development (RED), and other social effects (OSE), are neither goals ("Federal objectives") nor planning objectives. Good objectives are not account entries.

Study tasks and study resource constraints. Study task objectives describe the day-to-day activities that must be accomplished in planning. They are not planning objectives. Similarly, study resource constraints define limits on resources like knowledge, expertise, experience, ability, data, information, money, and time. They are not planning constraints.

WHERE DO OBJECTIVES COME FROM?

There is no one way to identify planning objectives. It's a task easier prescribed than accomplished. If your method works, it's a good one. Bearing in mind who does it, why they do it, what a good one is, and so on, there are a few activities that would appear to be a necessary part of any effort to identify objectives. They're listed in an idealized process outlined in Figure 6.

Good Planning Objectives... or Not?

Which of the following are good planning objectives?

1. Reduce flood damages in the City of Maccaville through the year 2020.

2. Provide a levee to prevent flooding in the City of Maccaville.

3. Contribute to National Economic Development in the City of Maccaville consistent with protecting the Nation's environment.

4. Assess the impacts of a flood control project in the City of Maccaville through the year 2020.

5. Minimize disturbance of riparian habitat used by the endangered Ferocies along the Macca River.

Answers: 1). Yes; 2). No, includes solution; 3). No, this is a goal; 4). No, this is a study task; 5). No, this is a constraint.

Begin at the beginning. What clues does the "study authority" provide about planning objectives? A study authority (see sidebar) usually lists major categories of problems and opportunities, i.e., navigation, flood damage reduction, ecosystem restoration, and others, that are the reasons for the study. The authority also usually includes a short verbal description of the "study area." Always begin by squeezing the clues from your authority.

Study Authority

In Corps reconnaissance and feasibility planning studies conducted under the general investigations program, a study authority is usually a one-paragraph statement from a committee of the U.S. Congress (i.e., "study resolution") or the full Congress (i.e., section in a public law) that requests a senior Army or Corps official to investigate a specified problem or opportunity, and report the results back to the Congress. For example:

> "Resolved by the Committee on Transportation and Infrastructure of the United States House of Representatives, that the Secretary of the Army is hereby requested to review the report of the Chief of Engineers on the Big Blue River and Tributaries... with a view to determining if further improvements for flood control, navigation, erosion, sedimentation, water quality and other related water resources needs are advisable at this time."

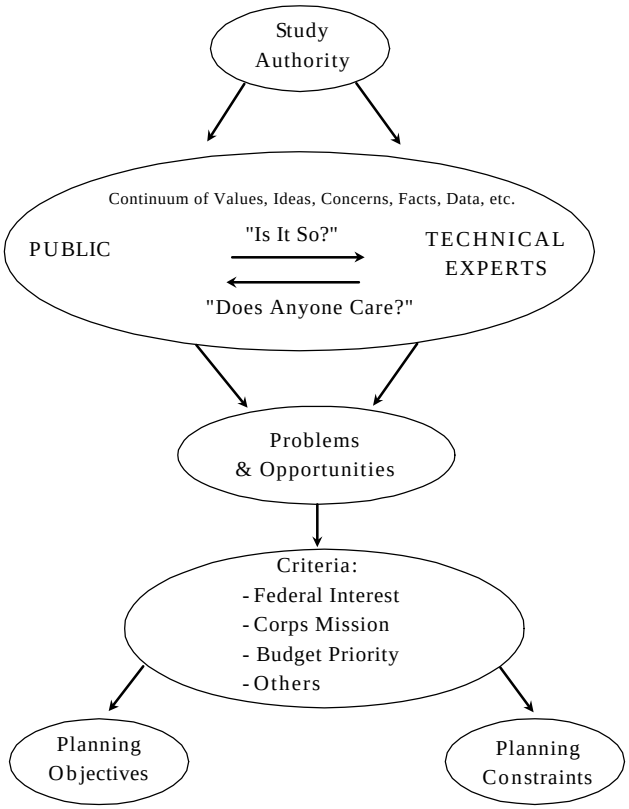
What does this tell you about the study area? What types of problems and opportunities are identified? Notice that the door to other problems and opportunities beyond those explicitly listed is opened through the recognition that there may be "other related water resource needs."

The next step in identifying objectives and constraints is to ask, "What does the public say?" Given that your study authority points to one or more problems and opportunities, the next step should be to verify them and see whether there are any others. You can do this rather simply. First, ask the public. What are the problems and opportunities they think should be investigated? How do they know about those problems and opportunities; have they experienced them? How would they know if the problems were "solved" or the opportunities "realized"? To whom else should you talk?

Whom in the public should you ask? Ask everyone who may have something to offer. Ask the potential local sponsor. Ask officials and representatives of local, State, and Federal agencies. Ask people in local businesses, interest groups, and homeowners' associations. Ask them in whatever format makes the best sense -- individual conversations, single-interest meetings, open public meetings. The means of asking the public must be tailored to suit each individual planning situation; the point is to ask. See Chapter Thirteen for additional discussion of public involvement.

Frequently the public will only be able to describe their problems and needs in a general form. For example, residents may be capable of defining flooding from a stream as a problem, but the study team will have to do some analysis to determine the extent of the flood plain, the frequency and depths of flooding, the properties affected, and the expected annual damages under existing conditions. *The study team will have to put a technical face on the community's problems and needs*.

Figure 6: Where Objectives and Constraints Come From



The second source of information about problems and opportunities is technical experts. Relying on technical experts is a traditional approach to this step of the planning process. The technical studies conducted to establish the scientific basis for problems and opportunities are generally well known (see sidebar). The resulting descriptions of technical concerns will look much different from the public's concerns. Typically, they are included in great detail in report appendices for hydrology, economics, real estate, and other specialty areas. Where brief statements are usually adequate to convey public concerns, technical concerns often include maps, drawings, tabular and graphic displays of data, and technical text.

Like the general public, experts include people from many backgrounds, including hydrologists, engineers, environmental scientists, economists, and many others. They can refer you to previous studies, identify other experts, and provide their professional judgment about the situation. Your initial contacts will undoubtedly be with the experts on your study team and elsewhere in your District office. Beyond them are experts in other agencies, universities, consulting firms, and the general public. This is where the line between “the public” and “technical experts” blurs but it doesn't

Key Factors

Although the study team actually specifies the planning objectives, they must do so while taking several key factors into account.

- External Environment. The partnership's external environment often exerts considerable influence on the objectives. The external environment comprises all those factors that the partnership cannot control. External stakeholders can influence the planning process by social norms, specific constraints, pressure campaigns, court challenges, direct controls (e.g., resource agencies sometimes have effective veto powers), and so on. Thus, setting planning objectives is, in part, a process of establishing a favorable balance of power between the partnership and its external environmental factors.

- Resource Constraints. The partnership's resources influence the nature of the objectives. Studies hampered by severe time and money constraints will not be able to address as complete a range of objectives. Plans will consequently be less comprehensive in scope. Non-Federal partners who contribute databases and work in-kind may constrain a study from considering a broader range of objectives. Better funded studies can set more objectives.

- Internal Relationships. The partnership's internal politics and power relationships will influence planning objectives. Planning teams with more overall support of the partners can set more ambitious planning objectives. Innovative planning objectives that do not enjoy the support of higher elements on either side of the partnership may have a more difficult time gaining support.

- Decision-Makers' Values. The value system of top decision-makers in the partnership affect the specification of planning objectives. In the Corps, annual budget guidance identifies the agencies' priorities for the year. Many planners will see no point in deviating from this guidance in setting planning objectives, and in so doing, they may miss the chance to solve other problems or to capitalize on opportunities.

- Iterative Process. Defining objectives is an iterative process. Though specifying objectives early in a study is essential in order for planning to proceed, the final set of objectives may not be available until rather late in the planning process. Objectives, like plans, may require clarification and refinement as additional information comes to light or when it becomes clear some objectives cannot be addressed by the study.

really matter. What does matter is that you get the problems and opportunities identified and described.

Once the public and your technical experts have become involved in the problem identification process, the time has come to compare, verify and reconcile what you've heard about problems and opportunities. This may be the first truly difficult task in planning, but the difficulty is often more in perception than reality. Some basic questions can be used to guide this task.

"Is that so?"... "Who cares?"

On the one hand, the technical experts should examine the problems and opportunities identified by the public, and ask "Is that so? What evidence do we have that supports or refutes these concerns?" For example, what damages resulted from the last flood? Or, how many ships have grounded in the channel? Have fish populations actually declined over the last 10 years? Similarly, the public should have an opportunity to review problems and opportunities identified by the experts to determine "Who cares?" While there may be scientific evidence of a problem condition, it may not be important enough to the public to warrant further attention.

Examples of Technical Problem Definition

The Corps knows exactly how to technically "define a problem" for flood control and navigation. They know who has to do what and in what order. Defining other problems is not as straightforward. The point, however, is that there is a set of technical tasks that have to be performed by a group of people in order to define the parameters of any problem the public might surface. Following are some sample tasks required to define a few selected problems:

Flood Damage Reduction
- floods of record - hydrologist
- cross-sections - survey engineer
- discharges - hydraulic engineer
- property inventory - economist, real estate specialist
- "ANSWER" = damages for selected events

Commercial Navigation
- bathymetry - surveyor
- sedimentation studies - coastal engineer
- channel geometry - design engineer
- disposal area - design engineers and environmentalists
- commodity and fleet forecasts - economist
- "ANSWER" = costs of moving commodities on commercial vessels

Ecosystem Restoration
- habitat suitability index models - environmentalist
- hydrology - hydrologist
- "ANSWER" = environmental outputs

At this point you're ready to write statements of problems and opportunities. *Problems and opportunities that pass both the "Is that so?" and "Who cares?" tests are good candidates for your planning objectives*. The information you developed from contacts with the public and technical experts should be presented, and summarized in a brief statement, preferably a simple declarative sentence.

If you look, and not even very hard, you will probably find an abundance of problems and opportunities in your study area. The Corps cannot hope to solve them all, and, indeed, is neither expected nor authorized to. The business of sorting out which problems and opportunities your study will address and which it won't, is in some respects very straightforward. There are many criteria that can give you a sense of whether or not, or to what extent, the Corps will be likely to study and implement a solution for a problem or opportunity. Some of them include the following:

Is there a "Federal interest" in the situation?
Does the language of the study authority cover the situation?
Is the situation related to a Corps "mission"?
Are traditional project purposes involved?
Is the situation related to current "priority budget outputs"?
Is the situation within the scope of the Federal objective?
Can the outcomes be described in terms of NED benefit categories?
Does the situation involve significant environmental resources?
Is the situation covered by other Administration policies related to the Corps' program?

These are not pass-fail criteria. There is much room for interpretation in arriving at answers. The questions may lead to different answers at different times and among different studies. Answers may even depend on whom you ask. However, these questions are effective screens for focusing limited Corps resources on specific problems and opportunities.

The more questions you answer with "no," the more you will have to work to make the case for addressing a particular problem or opportunity. You may need more information to be convincing. Or you may have to do an excellent job of telling the story of a problem or opportunity. At the very least, you should recognize that policy criteria will arise on the road that leads to your objectives. Good problem definition will address these questions as a routine part of the job.

What is to be done about problems and opportunities that exceed the current policies and authorities of the partners, especially the Corps? High crime rates near the river, for example, may be a significant issue, but it's unlikely this problem can be addressed by the Corps. When another entity has an established responsibility for the problem identified, it may be possible to involve them in the study process. For example, although crime is well beyond the authority of the Corps' programs, it may be possible to solicit police and other public safety agencies' input in the design of floodwalls to assure that access through the wall, visibility of pedestrians, and minimization of potential hiding places are considered in project design.

Federal Interest

What is in the "Federal interest"? Although there is no single, enduring answer to that question, you can get some idea of the breadth and depth of the "Federal interest" from the following:

- *Catalog of Federal Domestic Assistance.* Superintendent of Documents, Government Printing Office. Library of Congress No. 73-600118 (revised quarterly). The Catalog lists all Federal programs, including the Corps' programs. A recent catalog included over 1300 listings.

- *National Environmental Policy Act (NEPA) Implementation Procedures; Appendices I, II and III; Final Rule.* Council on Environmental Quality. 40 CFR Chapter V (Federal Register, Friday, December 21, 1984, pages 49750-49782). Appendix II includes a listing of Federal and Federal-State agencies with jurisdiction by law or special expertise on environmental quality issues, including the Corps.

In other cases, information about problems or opportunities may be passed on to the appropriate authorities. Suppose, for example, a traffic flow problem is identified during this stage of the study. Even if it is beyond the scope of the water resource study, this information can be passed along to the appropriate agency for attention, rather than be ignored because it is beyond the Corps' authority.

In some instances, problems may be water-related but beyond the current Corps' authorities and policies. There are two schools of thought on this. One is to decline involvement in any activities that are beyond the Corps' authority. The other is to look for a way to blend these water resources needs into existing authorities, perhaps stretching and extending them a little. Acid mine drainage is an example of a problem over which the Corps has no current authority. New environmental programs and a renewed interest in watershed planning have provided the impetus for at least one district to address this problem. One aspect of watershed planning is to identify issues like these that might require a broader partnership. Bringing other Federal, State, and local agencies with an interest in these "new" issues into the partnership can be an effective way to developp more comprehensive planes.

If the public believes there is a problem or opportunity and the technical experts agree, or vice versa, and the situation seems to fall within the bounds of current policies, you can write your study's planning objectives and constraints. The results become your mission statement. Agreement with and general support of this mission statement by all of your study stakeholders is critical to the study's success.

Planning Objectives and Constraints

In this example, adapted from a Corps study, the objectives and constraints are directly associated with a problem or opportunity statement. The report text that follows a statement like this can then expand on each objective or constraint as necessary.

Problem 1:	Declining extent of wetlands ecosystem.
Objective 1:	Increase the total spatial extent of wetlands.
Objective 2:	Reestablish relative balance among lost historic plant, fish, and wildlife communities.
Constraint 1:	Protect threatened and endangered species.
Problem 2:	Continuing flood damages.
Objective 3:	Reduce flood damages on tribal lands.
Constraint 2:	No loss of flood protection from existing flood damage reduction projects.
Opportunity 1:	Improve water supply.
Objective 4:	Restore more natural water quality.
Constraint 3:	Meet state water quality standards.

Are you done? Yes, for a while, but keep in mind that the process is iterative. Objectives and constraints will change or even drop out and new ones may arise as planning progresses. The steps to identify planning objectives are presented sequentially because an orderly approach to the discussion is needed. The actual identification of planning objectives is not so orderly. The study team may begin specifying objectives when they first see the study area. We want the planning professionals to have ideas and reactions from day one. We don't want those ideas to become crystallized and finalized, however, until all the work is done.

Nonetheless, the team will begin with some very preliminary notions of planning objectives. As problem identification proceeds these objectives will change. When public feedback about problems and opportunities is sought, more refinement and clarification will follow. As technical analysis begins to give dimension to the problems, more specific objectives can be fashioned. As the study

Multi-Objective Planning

Multi-objective planning is a confusing term. It has been used to mean both multiple Federal objectives and multiple planning objectives.

The Principles and Guidelines officially commit the Nation's water resource agencies to a single Federal objective, national economic development subject to certain environmental constraints. *When people talk about multi-objective planning, they are usually referring to the past practice of planning for more than one Federal objective.* Federal policy is currently single objective in nature.

progresses through the various iterations of the steps of the planning process, further refinements may be necessary. If your notion of specifying planning objectives is a team meeting where the doors are closed and the objectives are set once and for all, dispel that notion. That exercise may be a very useful starting point, but *specifying objectives is an iterative and participatory process*.

Early in the planning study, objectives may be very general in nature. As planning progresses and becomes more refined, the objectives should be continuously reexamined so that a limited number of very specific objectives are identified and used to develop alternative plans.

WHAT DO YOU DO WITH OBJECTIVES?

Use them. Use them to let people know what your study is all about.

In step 2, use them as guides to the information you gather. Collect information that will enable you to convincingly tell the story behind your objectives and constraints.

In step 3, use them as reasons for identifying management measures and formulating plans. What can you do to meet the objectives and avoid the constraints?

In step 4, use your objectives and constraints to identify plan effects to be evaluated. They can help you identify the plans that qualify for further consideration.

In step 5, use them to compare the relative effectiveness of your qualifying plans. How well do the various plans do in meeting the objectives and avoiding the constraints?

In step 6, use the objectives and constraints as reasons for selecting a plan. All other things equal, the recommended plan should be the one that best satisfies your objectives and constraints.

SUMMARY AND LOOK FORWARD

Lesson One. The study begins with an identification of an area's problems and opportunities. The partners, their customers and publics provide the information needed to develop a consensus agreement on the problems and opportunities to be considered in a study.

Lesson Two. Planning objectives and constraints may be a whole lot more important than you ever imagined. The objectives specify what the planning team and its plans intend to do. Constraints describe what the plans shouldn't do. Together, they are, in a sense, the mission statement of the partnership. If you get the planning

Multi-Purpose Planning

The purpose of a plan may be thought of as its primary output. Traditional purposes of Corps projects include: flood damage reduction, navigation, hydroelectric power, municipal and industrial water supply, agricultural water supply, recreation, hurricane and storm damage protection, aquatic plant control, water quality improvement, fish and wildlife mitigation and enhancement. Water resource plans may be **single-purpose** or **multi-purpose**. A single-purpose plan serves one of these purposes; a multi-purpose project serves two or more of these purposes. In recent years, multi-purpose projects have tended to be primarily for one purpose with some ancillary inclusion of other purposes. There is nothing in the Principles and Guidelines that precludes multi-purpose planning.

Planners are often faced with a dilemma. On the one hand, authorizations and the Principles and Guidelines challenge them to develop plans that fully address a community's problems and needs. On the other hand, Administration policy tells them some problems and opportunities may not be considered a priority in the budget request. When walking through such political ground, planners must tread with sensitivity. *The sum total of the current situation is that planners are limited in what they can do but there is some flexibility*. True comprehensive multi-purpose planning is not currently practical, but some multi-purpose planning is possible. The Corps' currently evolving program for watershed planning and management is an avenue for multi-purpose problem solving. Perhaps the best practice is for planners to be positive and capitalize on what policy and circumstance permit.

objectives wrong, the formulation, evaluation and selection will be wrong. The choice of planning objectives determines to a significant degree the success of a planning study.

Lesson Three. Planning objectives are used in every step of the planning process.

The next chapter describes the second step of the planning process, the inventory of resources and the without-project condition description. This step establishes a benchmark for comparison of all alternative plan effects.

SUGGESTIONS FOR FURTHER READING

There is relatively little to read about the individual steps in the literature. That is one of the primary reasons for this manual. Generally speaking, the water resource planning references in Chapter Two and others like them are going to be the best sources of additional discussion on these subjects. The National Technical Information Service publications relating to the Principles and Standards listed in the References section of this report provide an additional source of material that may be of some limited interest.

Problem identification is a subject of many books in business management and it is a recurring theme in many planning texts. These books can provide refreshing insights from time-to-time, albeit from a different perspective.

CHAPTER SEVEN: STEP TWO - INVENTORYING AND FORECASTING RESOURCES

Future, *n*. That period of time in which our affairs prosper, our friends are true and our happiness is assured. Ambrose Bierce, *The Devil's Dictionary*.

Step Two: "Inventory, forecast, and analysis of water and related land resource conditions within the planning area relevant to the identified problems and opportunities." (P&G Standards Section III paragraph 1.3.2 (a)(2))

INTRODUCTION

Information gathering is one of the principal tasks of any planning effort. Information is needed to identify and quantify problems and opportunities. It's needed to measure plan effects. *Information is essential to making good decisions*.

Information gathering is divided into two basic types by the P&G: **inventory** and **forecast**. Gathering existing information, current and historical, is the inventory type of data collection. Gathering information that describes potential future conditions is the forecast type of information gathering.

Information is data put to purposeful use.

Information gathering is distinguished from data gathering by the quality of its content. For present purposes, data are considered to be facts or figures from which conclusions can be inferred. Information implies that data have been considered, and conclusions useful to the planning process have been inferred. Information is data put to purposeful use.

Information is used to define relevant conditions in the planning area under various scenarios. These conditions include **historic conditions**, **existing conditions**, **base year conditions**, **most likely future conditions without a project**, and **most likely future conditions with a project**. The last three of these are forecasts of conditions. Differences among these various conditions are evaluated and compared, and provide a major basis for plan selection.

The gathering of useful information almost certainly will have begun long before the planning effort. It will continue throughout the planning effort. Last-minute revisions to relevant information have both vexed and saved many planning efforts. Information gathering is one of the planning steps that is continued relentlessly, although not necessarily by the planning team, even after the planning study is completed.

With and Without is not Before and After

"Before storm protection was built in the coastal town of Amity in 1960 there was little economic activity. Now there is a $1 billion tourist industry," says the mayor in a tribute to the artificial dunes. The implication is clear. The dunes have caused a tremendous economic growth. But did they?

Suppose the mayor forgot to mention that a bridge replaced the five-car ferry in 1965. Population within two-hours of the town has more than doubled and personal income has tripled. In addition, a very successful advertising campaign attracts visitors from 15 states. Would it still be fair to attribute the economic growth to the dunes? These other changes would have taken place anyway.

The mayor provides an example of a before and after analysis that measures a variable, economic activity, at one point in time and again at a later point in time. There is no cause and effect analysis. A without- and with-project condition introduces cause and effect analysis to these comparisons over time.

Information gathering is usually the most time-consuming and expensive part of the planning process.

This chapter explores the dimensions of information gathering. It begins by defining the scenarios that plans require information to describe. From there it proceeds to a consideration of some of the types of data that may be collected to describe the scenarios and to complete the study.

PLANNING CONDITIONS

To choose the best course of action from among the alternatives available to us, we need to know what difference any given course of action will make. A "difference" implies that some sort of comparison has been made. A future oriented activity like planning requires the comparison of different conditions at different points in time. Let's begin by considering the different points in time that might be of interest.

The past may be very important to planners. *It is not easy to understand the present without some knowledge of the past*. Your present standard of living is important information. Considered in the context of your past standards of living, however, the same information about your current situation is far richer. With past information, we know whether your standard of living is rising or falling. When a scenario describing past conditions is required for a study, it is called the **historic condition**. Because there is the possibility for one or more historic conditions, ten years ago, 50 years ago and so on, it is necessary to adequately described the context and purpose of the historic condition described in a study.

Conditions that exist at the time of the study are collectively called the **existing condition**. Try to avoid getting too literal in the definition of this scenario. Reasonable accuracy is more important than literal truth. You may have to rely on average conditions in recent years rather than precise data for the year of the study. There is nothing wrong with that if the average reasonably represents the relevant study area conditions. The existing condition is sometimes called the **base condition**, or **current condition**.

Because plans take time to implement, it is quite possible that planning area conditions will be different at the time the project is finally operational from what they are under the existing condition scenario. When this is the case, the most likely future condition at the time the project is operational is called the **base year condition**, not to be confused with the base condition. The base year condition is a short-run future forecast that is generally a without- project condition forecast, but it can be a with-project condition forecast at times. *The base year condition is often important in the determination of the time value of benefits and costs*. For a more detailed discussion of these issues, see the National Economic Development Procedures Manual. - National Economic Development Costs, IWR Report 93-R-12.

Unless these data become information...time and money were wasted in collecting them and they simply take up space in the report.

When describing future conditions in a planning area, planners are guessing. At best, these guesses are reasoned, scientific forecasts based on experience, good data, and the best appropriate forecasting methods. At worst, they are only guesses. Thus, it is important to recognize from the outset that forecasts of future conditions are fundamentally uncertain. To present them as deterministic or anything more than the best guess possible would be misleading to decision-makers and the public.

Given the many ways the future could turn out, it is the planners' task to identify the **most likely future condition** or the **most probable future**. There may be times when it is not honestly possible to identify one future condition as more likely than another. If plan selection would be affected by the choice of the alternative future, it is advisable to present the different alternative future scenarios. When different futures are possible but none make a material difference to the decision-making process, then a single most likely future condition can be identified. When there is good reason to believe that one alternative future is indeed more likely than any of the others, it is sufficient to identify that one as the most likely alternative future.

Table 20: Planning Scenarios

WAS - historic condition
IS - existing condition
WILL BE - most probable future. . .
. . .base year condition
. . .without condition
. . .with condition

Two important most probable future condition scenarios are the most probable future without a project and the most probable future with a project. To avoid this unwieldy terminology, these are commonly called the **without condition** (or **without-project condition**) and the **with condition** (or **with-project condition**). The structure of these scenarios is summarized in Table 20.

The without-project condition describes the condition that is expected to prevail in the planning area in the future if the **no-action alternative** is selected as the best thing to do.

Condition Scenarios

Suppose there is a conveniently rectangular bird island; 43,560 feet long and 100 feet wide, a total of 100 acres in size, in 1996. Further suppose the island has been eroding one foot in width each year and a nourishment plan that could be operational by 2000 would widen the island to 150 feet but would have no effect on the erosion rate. Let's consider the size of the bird island under the various scenarios planners encounter.

	Historic 1990	**Existing 1996**	**W/O Base Year 2000**	**W/Base Year 2000**	**W/O 2010**	**W/ 2010**
Area in Acres	106	100	96	150	86	140

In 1990 there were 106 acres but there are only 100 today. If nothing is done there would only be 96 acres in the base year, 2000. By the year 2010 the island would be down to 86 acres. However, if the island is restored to 150 acres in 2000 there will be 140 acres ten years later.

What are the impacts of the plan? The answer depends on our temporal frame of reference. In the year 2000 there would be 150 acres rather than 96, a net gain of 54 acres. In 2010 there would still be a net gain of 54 acres, due to the simplicity of our the example. Thus, in this example, the project produces the annual equivalent of an additional 54 acres of bird island.

The appropriate way to identify plan impacts is to compare future conditions with the plan (140 acres in 2010) to future conditions without the plan (86 acres in 2010). The appropriate comparison is not a before (100 acres in 1996) and after (140 acres in 2010) comparison. Corps planning uses without and with condition comparisons, not before-and-after comparisons, in the evaluation of plan effects.

In other words, *the without project condition describes the project area's future if there is no Federal action taken to solve the problem at hand*. There will ordinarily be one without-project condition for the planning area. *Every alternative plan is compared to the same without-project condition*. The exception would be when it is not possible to single out one future scenario as most likely. In such a case, each alternative plan must be compared to each without-project condition.

...each plan will lead to a different with project condition.

The with-project condition describes the condition that is expected to prevail in the planning area in the future

Information: Existing and Future

Suppose one objective is to reduce flood damages in the Minion Creek Township. What might you need to do that? First, keep in mind this is a planning objective and at this step in the planning process we have two tasks. First, we need to establish the nature of the existing flood problem. That will require existing hydrology and hydraulics as well as information about the potential damages in the flood plain.

Second, we need to establish a most likely future scenario if we do not implement any plans. That will require an analysis of future hydrology, hydraulics, and floodplain development. It would also have to include consideration of any potential activities that might be taken by others to lessen flood damages in the future without a plan.

If another objective is to preserve wetlands in the area, this will require additional information. Although hydrologic requirements might overlap the two objectives, it will be necessary to document the amount and quality of existing wetlands. In addition, it will be important to identify activities that could either diminish or increase these resources in the future.

What about the information you need to determine how much flood damage each alternative plan reduces or increases and how much wetland they affect? These kinds of information are gathered in much the same way.

if a particular plan is implemented. There could be more than one with project condition if it is not possible to single out one future scenario as most likely. However, each plan will lead to a different with-project condition. If two plans result in exactly the same future condition scenario, they would have to be identical in their impacts, and that implies they may be one and the same plan.

How long is the forecast period? That depends on the nature of the project. Generally, forecasts are expected to coincide with the project life. However, there are often circumstances in which it may be appropriate to forecast future conditions over a period of time less than the project life. For example, it is common practice in navigation studies to forecast commodity movements over 10 or 20 years, assuming no changes after that. This is done in simple recognition of the fact that these forecasts are so uncertain that they have little credibility when extended beyond 20 years.

Forecast values may be expressed in average annual equivalent units, as project benefits and costs are; or they may be expressed at select points in time, usually at fixed intervals after the base year. For example, the preceding sidebar presents impacts at project year 10 (2010), 10 years after the base year.

WHAT KINDS OF INFORMATION ARE NEEDED?

What kinds of information do planners need to develop these scenarios? Specific types of information required will vary with the type of study and the resources available. The information has to describe the existing, without-project, and with-project conditions adequately enough for decision-making. *Three important generic types of*

information can be identified for any planning effort.

First, information is needed to identify and adequately describe the problems and opportunities of the study area. For example, a flood damage reduction study will require hydrologic and hydraulic data, as well as stage-damage relationships for each reach. Navigation studies will need to know channel depths and channel usage. These data will be required for the existing and without-project conditions just to quantify the nature and extent of the problem. They are also the evidence that supports your planning objectives and constraints.

An ecosystem restoration study might require information about the historic condition to establish the extent of degradation and the level of restoration possible. It would also require information needed to describe existing and future without project conditions.

Second, information is needed to estimate life cycle project costs. These include firsts costs of construction as well as all operation, maintenance, major rehabilitation, and other relevant costs.

Third, information is needed to describe important project effects. Some of the impacts are related to the planning objectives and constraints of the study. Certain kinds of information will be needed to measure objective attainment and constraint avoidance for the alternative considered. The planning objectives and constraints should guide much of the information collection. Identification of some impacts is required by law. For example, Federal laws require effects on significant cultural resources, endangered species and other impacts be considered. A third category of impacts comprises other things of specific interest to the planning partners, i.e., Federal and non-Federal interests.

The Value of Information

Which is the more horrible fate: paralysis by analysis or extinction by instinct? These choices reflect one of the more difficult decisions a planner faces in this step of the planning process. How much information is enough?

Having more information may reduce your anxiety. Unless it changes your decision, it is not worth the cost of obtaining it. An important question to ask when considering what information to gather or how much more of it to get is, "Could this information affect your decision?" If the answer is no, do not get it. If the answer is yes, it's necessary to ask how likely it is to change your decision. If the possibility is remote, do not get the information unless the potential change is significant.

Information for these purposes must be of sufficient quantity and quality to convincingly, not necessarily perfectly, answer the questions: What are the

problems/opportunities? What are the costs of the alternatives? What are the impacts of a plan we're legally required to address? How do the plans contribute to the planning objectives and constraints? How do the plans affect the significant interests of the partners?

"Planner as storyteller" is an appropriate role to assume when thinking about the information you will need. The planning process is a simple adaptation of the scientific process. It is a rational approach to problem solving and decision-making. It's done all the time. What kind of information will you need to tell a convincing story about why you made the decisions you made? If you cannot tell a complete, logical, and easy-to-follow story about what you did, bolstered and supported with the information necessary to do so, then you cannot plan.

If you cannot tell a complete, logical and easy-to-follow story about what you did…then you cannot plan.

As the planning process develops, a story does unfold. That is the story you are going to have to be able to tell convincingly, if stakeholders are to be convinced of the soundness of your decision and the rationality of the process by which you arrived at it. Because you need to guess at the information you'll need at the end from the very beginning, it is inevitable that you'll gather some information that is ultimately not useful (then don't use it!). Likewise, you'll find yourself needing information you don't have (then go get it or work around it the best you can). Revising information needs as your understanding of the problems and opportunities evolves and as planning objectives are refined and the story develops is a constant in every planning study. The following section suggests four parameters of data collection worth considering in this information gathering and management step of the planning process.

FOUR PARAMETERS OF DATA COLLECTION

The four parameters of data collection are **quantity, quality, timing** *and* **location**. How much information is enough? How accurate and how representative must the data be? At what point does the collection process start, how long do you have to collect information, and for what period of time are data required? What geographic area is to be covered? As the study begins, you'll have a preliminary response to these questions. The definitive answer to these questions won't be known until the end of the study. Like virtually everything else in the study process, data collection is an iterative process.

Quantity. Table 21 lists some generic types of data that might be useful for planning. The data types are divided into two broad categories. The first includes **physical data**. These are the data that depend only on the existing physical environment. The second type, socioeconomic data, includes those data that depend on the human element in the environment. You need enough data of sufficient quality to be reasonably certain you have the information you need to move forward in the decision process.

Could the expected annual damage estimates be better? The answer is almost always going to be yes. If you broke the study area into more reaches; had more stream record; used a larger sample of structures; developed site-specific stage-damage curves;

Table 21: Selected Data for Planning

I. Physical
- A. Geology
  1. Formations
  2. Foundation characteristics
  3. Minerals
- B. Land Resources
  1. Soil survey (land classification)
  2. Development
  3. Drainage
- C. Hydrogeology (Groundwater)
  1. Aquifer characteristics
  2. Yields
  3. GW elevations (records)
- D. Physical Geography
  1. Maps
  2. Aerial photographs
  3. Infrastructure (cities, roads, etc.)
- E. Meteorology
  1. Rain gages
  2. Precipitation records
  3. Evaporation and evapotranspiration
- F. Hydrology
  1. Gaging stations, location
  2. Stream flow records
  3. Watershed characteristics
- G. Water Quality
  1. Groundwater and surface water quality
  2. Sensitive areas
  3. Sediment loads
- H. Environment (Ecology)
  1. Flora and fauna
  2. Sensitive areas and significant resources
  3. Air, land, water pollution

II. Socioeconomic
- A. Institutions
  1. Water-related
  2. Political
  3. Regulatory
- B. Demographic
  1. Population (existing & future)
  2. Population characteristics
  3. Location of population
- C. Geographical, Social
  1. Land use (existing & future)
  2. Values and elevations
  3. Zoning
- D. Economic
  1. Markets
  2. Income Distribution/ Employment
  3. Benefits and cost estimates
- E. Financial
  1. Sources of funds
  2. Types of repayment
  3. Cost-sharing and allocation
- F. Legal
  1. Water law
  2. Environmental laws
  3. Agreements, treaties, constraints
- G. Social Publics
  1. Stakeholders
  2. Silent majority
  3. Information to be diseminated
- H. Other Sectors/Functions
  1. Agencies for coordination
  2. Plans (cooperation)
- I. Recreational Needs

Source: Adapted from Helweg, Otto J., *Water Resources Planning and Management*

and so on, the examples would probably be better. But, have youu used reasonable data collection and analytical methods to obtain the informationyou need to feel

reasonably comfortable that you now understand the magnitude of the flood problem as described by expected annual damages?

If you do, you have enough information and it is time to move on. If team members have serious doubts about the quality of the information you're working with, these information gaps need to be further addressed.

Quality. The quality of data depends primarily on the stage and type of the study. For a "continuing authority" project, a visual inspection of a stream may be adequate. For a feasibility study, the stream may need to be gaged. Data should be **homogeneous**, i.e., they must measure one thing consistently. They should also be **representative**. If you're using **sample data**, it should be an **unbiased sample** from the population of interest. For example, a short stream record taken during unusually wet years would not be representative of the long-term stream flows. **Accuracy** is a fundamental aspect of data quality. The accuracy of your data must be known and communicated in the report.

Every question has the one hour answer, the one day answer, the one week answer, etc.

Timing. There are two dimensions to the timing characteristic of data collection. First, is time as it relates to the planner. *When can data collection begin and how long do you have to complete the study*? These dates and periods vary with the type and stage of study. Every question has the one hour answer, the one day answer, the one week answer, etc. The length of time allowed to gather information depends on the importance of the information.

The second dimension is time as it relates to the data themselves. The dates on which data were collected may be important. Streamflow or water quality data collected during a drought may differ substantially from normal data. Economic surveys conducted during recessions will differ from those collected during economic booms. Another aspect of data timing is the length of the data record. This is especially important for hydrology and monitoring the health of ecosystems. The timing of monetary values is important in terms of the time value of money and the price level used to measure monetary values.

Location. The geographic area for which data are collected will usually conform to the planning area. Normally data will not be collected for areas outside the affected area unless the outside data affect the study or are needed to provide perspective and context for the study area data.

The section that follows presents some ideas to consider for developing an information-gathering strategy. When planning to collect data to provide the information necessary for good decision-making, planners must be cognizant of the quantity, quality, timing, and spatial dimensions of their data collection efforts.

PREPARING AN INFORMATION STRATEGY

If you have prepared a problem statement and a list of planning objectives, then you have an invaluable input for determining your information needs. Beneath each statement of a problem, list the types of information you'll need to describe the problem. Beneath each objective list, the information you'll need to see if you are contributing to that objective. Then, you can list the types of data you are going to need to provide the information you require.

Table 22 provides an example of how this information strategy might be arranged. The numbered items indicate the basic information sought. The lettered items identify data that will help provide that information. Obviously, the analysts can provide as much detail as is required or desired in describing the information needed and the data that will provide that information. An **information gathering strategy** like this can be prepared for each problem, opportunity, planning objective, and constraint. In subsequent steps, as alternative plans are identified, additional information may be required for evaluating, appraising and comparing plan impacts. However, if you do a good job in this step, most of those data will already be available.

Table 22: Information-Gathering Strategy

Problem 1: Flood damages from Minion Creek

<u>Information Needs:</u>

1. Definition/extent of flood plain
    a. Topographic maps: obtain existing aerials
    b. Hydrology - existing & future: USGS gage data
    c. Hydraulics - existing & future: field surveys
2. Property at risk of flooding
    a. Property survey - existing & future: field surveys
    b. Appraise value of property: Marshall-Swift
    c. Depth-damage curves: site-specific curves
3. Expected annual damage estimates - existing & future
    a. Frequency curve: H&H section
    b: Rating curve: H&H section
    c. Damage curve: Economics Branch
    d. Estimating algorithm or computer program: risk-based EAD calculations
4. Likelihood of restoration of natural flood plain values
    a. Residents views on evacuation: public involvement
    b. Environmental resources restored: expert opinion
    c. Political support: study coordination

In many cases, planners begin by collecting the same data that was collected for another district study. Planners who collect information in this fashion run the risk of wasting scarce study resources collecting data that are not going to provide useful or necessary information in their own study. More importantly, they may overlooknecessary data and information unique to their own situation. The amount and types of information that can be gathered are virtually limitless, but not all of that information is going to be of equal value in decision-making. *The cardinal rule for information-gathering is to get what you need to make good decisions, not what is available or traditionally gathered.*

Table 23: General Sources of Data

Internal secondary sources
External secondary sources
Internal primary sources
External primary sources

Once the data needs for each problem, opportunity, planning objective and constraint have been tentatively identified as described above, the planner needs a strategy for obtaining the data and information. This activity begins by identifying general sources of information as shown in Table 23.

Internal data are, or have been, produced by study participants. What data do the Corps and its non-Federal partner(s) have? **External data** are data produced by institutions, agencies, individuals, and organizations that are not study participants. What data have already been collected by other agencies, academic institutions, researchers, consultants, and so on?

Let the Planner Beware

The without-project condition makes it possible to describe what society is going to have to give up in order to gain the outputs of an alternative plan. In order to properly describe what is going to be lost, it is important that the existing condition and forecasts include all resources of significance. If problems, opportunities, planning objectives and constraints are properly identified and scoping is completed, this should ensure that all resources of importance are included. However, planners should review the planning area to ensure this has been done.

For example, suppose a study area has some bottom land hardwoods and wetlands. Inexperienced planners might fail to realize the plan has an opportunity to preserve these valuable resources, in which case they could be overlooked in the information-gathering steps. Thus, we offer as a caveat the admonishment that if you have significant resources in a planning area that do not show up in a problem or opportunity statement, or that are not mentioned in a planning objective or constraint, you need to reconsider your step one activities; you may have missed an opportunity.

Primary data are obtained from original research. An example of external primary data would be stream gage data collected by the U.S. Geologic Survey. Internal primary data would include things like original surveys of foundation conditions, channel depths, damage potential, and the like. **Secondary data** have already been gathered for some other purpose. External secondary data would include the data compiled in reports like the Statistical Abstract of the United States. Internal secondary data would include information from previous studies.

Future External Environment

What is going to happen to that tidal wetland if we do not implement a plan? Will it be developed for condominiums and a shopping center or will it be protected from such uses? That depends on many things. If we can show these wetlands were going to disappear anyway, then there is not a significant impact if one of our alternatives would cause their loss, is there?

If there are no legislative restrictions, the future of the wetlands may depend on the state of the economy in this area and on population growth, which may in turn depend on the quality of life in the area. Perhaps if the education system is not improved in this county, people will continue to try to escape the poverty that results, and the land will never develop anyway.

Suppose there is national legislation that prohibits the development of tidal wetlands. Suppose even in the absence of national legislation, we see this state moving toward a more environmentally friendly stance. There could be many factors well beyond the partnership's control that would affect our forecasts of future conditions without a plan. It is the planner's job to consider them adequately and as objectively as possible.

The information-gathering strategy can be expanded as shown in Table 22 to indicate the general source of the data. In a feasibility study, this entire step is nothing more than an update and more specific iteration of the work that was done in the preparation of the Project Study Plan.

What Types of Information Are Typically Needed?

There are many lists of specific data types or sources that might contain the information needed to conduct a successful study. They can generally be found in guidance and the professional literature. The NED benefit procedures manuals produced by the Institute for Water Resources, and the Corps' ECs and ERs are excellent sources of such lists. Those interested in lists of representative or essential information types are advised to review the more detailed guidance. We avoid the lists here because there is no such thing as a typical study and no set of lists would be complete. Each planning effort involves unique circumstances and wicked problems. Hence, a unique information gathering strategy is needed for each study.

FORECASTING FOR THE EXTERNAL AND INTERNAL ENVIRONMENTS

Many factors that affect a plan are external to the planning process. These are the things that cannot be controlled or influenced by the planning process. They include economic, governmental, political, social, natural and technological factors or trends that are beyond the influence of the planning process, but that might influence the planning area directly or indirectly, now or in the future.

There are also internal factors, elements, and systems that exist within the sphere of influence of the partnership. These would include all the institutional elements and systems of the partners themselves, plus those factors of the planning area that can be affected and influenced by alternative plans.

EXTERNAL ENVIRONMENT

The **external environment** is sometimes called the **macroenvironment** by private sector firms engaged in strategic planning. It is important to think about macroenvironmental factors when determining what information is going to be needed to inventory and forecast resources for your study. Table 24 provides some examples of these factors.

Table 24: Examples of Macroenvironmental Factors

- Economic
  - Business cycle
  - Money supply
  - GNP trends
  - Inflation
  - Interest rates
  - Exchange rates
  - Unemployment
  - Balance of trade
- Government & Politics
  - Environmental laws
  - Attitudes toward govt.
  - Tax laws
  - Stability
  - Trade policies
  - Alliances
  - Wars & conflicts
  - Election results
- Societal
  - Quality of life attitudes
  - Lifestyles
  - Career expectations
  - Population growth
  - Crime
  - Education trends
- Natural
  - Pollution
  - Climate change
  - Resource reserves
- Technological
  - R&D spending
  - New products
  - Technology transfer
  - Automation & Robotics
  - Patent laws
  - Spread of technology

The fall of communism provides a dramatic example of an external event that has had enormous implications for the world. During step two, planners should be scanning the horizons of the future looking for the dramatic changes that could affect their plans. They need not be “fall of communism” magnitude, but no reasonably foreseeable significant change should be overlooked.

In order to define a good without-project condition, planners must develop some facility in looking into the future. Deep draft navigation has to be concerned about future trade patterns, trends in energy prices, and the like. These are factors

clearly beyond the control of planners, but they are factors of importance to planners. The fall of communism will open markets formerly closed to U.S. commerce. What will this mean for commodity forecasts and future tonnage? If relations between the U.S. and Cuba are normalized, what will this mean for ports in south Florida?

These are the types of questions with important implications for projects of which planners have to be aware. A major purpose for considering these external or macroenvironmental factors is to try to identify trends, factors, and events that could affect plan outcomes in a significant fashion. In many cases, this kind of information will be incomplete and speculative. In such cases, it may be prudent to define more than one without-project condition. For example, a south Florida port project may be well advised to have a without-project condition that includes a "closed Cuba" scenario and another with an "open Cuba" scenario because project benefits may vary greatly between the two scenarios. The choice of the most likely scenario will depend greatly on information gathered during this step of the planning process.

A common error in forecasting future scenarios is failure to consider foreseeable changes and trends in the macroenvironment. It's the planner's job to identify any future events that could significantly alter the outcomes of a plan, to the extent possible, and to give them appropriate and explicit consideration. A common characteristic of particularly good plans is that ability to consider important things that are not so easy to foresee.

INTERNAL ENVIRONMENT

The **internal environment** is what is commonly considered within the domain of a Corps study. Here, we use the term internal to mean internal to the study process. This information includes the hydrologic, hydraulic, environmental, economic, engineering, and other data and information that are the bread and butter of a Corps study. These are the kinds of data primarily referred to in the information strategy example above. These data will always be critical to Corps studies. Enough has been said about them in other Corps guidance, however, and they are not addressed further here.

RECOGNIZE THE UNCERTAINTY IN WHAT YOU ARE DOING

A little humility will go a long way in this step of the planning process. Describing existing conditions is a daunting task. There is so much information that could be gathered and there are so many stakeholders with their own interests and agendas, that it is virtually assured that you will not have all the information necessary to satisfy all these people. *Limitations on the quantity and quality of information will result in uncertainty*. Admit that from the outset. Explain what you collected and why you collected it, tell your story. If important dimensions of the planning effort are subject to serious uncertainty, be open and above board about it.

Uncertainty is a fact of life.

Describing future conditions is even more uncertain. In this step, you are asked to forecast conditions for the variables, elements, and systems identified in your information-gathering strategy. *No one expects you to foresee the future with perfect clarity, but everyone will expect you to see what, after the fact, everyone claims was obvious*. Partners must be honest with one another and with the stakeholders. Uncertainty is a fact of life and both Corps customers and partners can handle that as long as the uncertainty is described honestly, openly, and in a straightforward manner.

HOW TO FORECAST

Suppose you have done an extraordinary job in identifying and gathering the information you need to describe the existing conditions in the study area. Further suppose you have identified the variables, conditions, elements, and systems that need to be forecast in order to describe alternative future conditions. There is still the considerable task of making those forecasts. How do you do that?

To develop plans for a community or region, we need to predict the type of environment they'll be facing in the short- and long-term future. *The purpose of forecasting is to identify patterns in natural systems and human behavior and to discover relationships among variables and systems so we can estimate the timing, nature, and magnitude of changes in future conditions*.

Though many taxonomies of forecasting methods could be used, we'll rely on three major categories as shown in Table 25, taken from Wheelwright's book *Forecasting Methods for Management*. **Judgmental methods** are the most common forecasting technique used in planning. These forecasts include individual judgments, committee or team decisions, and other forms of professional opinion. Professional judgment is often relied upon to forecast the effectiveness of ecosystem restoration alternatives, project performance, and many other important aspects of both without and with conditions.

Quantitative methods are the subject of most of the forecasting literature; three subcategories are identified. **Time series methods** forecast future events based on trends in historical data. **Explanatory methods** attempt to identify cause and effect relationships among variables in the past. These relationships are then used to forecast future outcomes. These two sets of methods are frequently used by economists. **Monitoring methods** are relatively new. They seek to identify changes in patterns and relationships to make forecasts when extrapolation of past patterns or relationships is not appropriate. Such methods may be particularly useful in environmental planning, where systems are poorly understood because of their complexity or lack of data.

Table 25: Forecasting Methods

Approaches to Forecasting	Selected Groups of Forecasting Methods	Major Forecasting Methods
Judgmental	Individual Judgment	Intuitive
		Ad hoc
		Multiple attribute decision-making
	Group	Committees
		Sales force estimates
		Juries of expert opinion
	Aggregates	Anticipatory surveys
		Market research
Quantitative	Time Series	Naive
		Decomposition
		Simple time series
		Advanced time series
	Explanatory	Simple regression
		Multiple regression
		Econometric methods
		Multivariate methods
	Monitoring	Tracking signals
Technological	Extrapolation	Delphi
		Trend extrapolations
		Morphological research
		Systems dynamics
	Normative	Cross impact
		PATTERN
		La Prospective

The third forecasting category includes **technological methods**. These methods address long term issues of a technological, societal, economic, or political nature. There are two subcategories. **Extrapolation methods** use historical patterns and relationships as a basis for forecasts. **Normative methods** rely on objectives, goals, and desired outcomes as a basis for forecasting.

Details of these and other forecasting methods can be found in the considerable forecasting literature. Texts and articles are available on each of the major forecasting methods shown in Table 25. There are considerably more techniques in use, however. A 1975 IWR report, *Handbook of Forecasting Techniques*, and its appendix, *Part II Description of 31 Techniques*, remain good source documents.

When data exist, time series and explanatory methods will generally be the most useful techniques. These are covered best in the literature. Courses in these techniques are available at many universities. When faced with unique situations or situations in which data are unavailable, judgment and technological methods will dominate. Opinion analysis will be another valuable tool for planners. There are any number of specific techniques that comprise the major forecasting methods shown in the table. For example, subjective probability elicitations and nominal group methods are two examples of juries of expert opinion. Consult the literature, like the IWR Handbook, for details on specific forecasting methods.

THE WITHOUT-PROJECT CONDITION

The "without-project condition" is universally regarded as vitally important to the evaluation, and comparison of alternative plans. No single element of the planning process is more critical to those steps of the planning process than this forecast of the most likely future conditions that will exist in the study area if no action is taken as a result of your study. The inventory and forecast of conditions in the study area are the step two tasks necessary to develop the without-project condition.

In forecasting, we look into our crystal ball and try to describe the most important aspects of life in the study area over the next several decades. This forecast is based on our existing condition, in which we adequately describe the most important current aspects of life related to our planning effort. Our forecasting efforts build upon that base condition. Using a variety of forecasting techniques, we paint one or more pictures of what the future might look like. From the alternative future conditions, we select one as the most likely future condition.

...we look into our crystal ball and try to describe the most important aspects of life...

This most likely future condition is not necessarily the only possible future condition but it does become our baseline picture of the future. *When we consider how our alternative plans will alter the future, we are always comparing alternate future conditions, with different plans in place, to our without project condition.*

The other possible futures without a plan in place may be considered again in a sensitivity analysis. If we have selected a plan that looks "best" under all forecasted futures, then we can be confident we have the best plan. If the "best" plan varies with the forecasted future without a plan in place, then decision-makers must be apprised of the differences and their implications.

Every plan is compared to the same without- project condition.

Planners identify and quantify the explicit differences among plans (to anticipate a future chapter, this is called evaluation) and make some judgments about their relative merits (comparison) before a decision is made (selection). Every plan is compared to the same without-project condition.

Think of the future in the study area without any plans as consisting of a mix of good and bad outcomes. We have a pile of good things that will happen (dogwoods in spring, jobs, fishing, and so on) and a pile of bad things (pollution, flood damages, recessions, and the like). Conceptually, we estimate the most important of these things related to our study over the planning horizon and pile them up.

We do the same for each of the plans we formulate. The piles without a plan and with a plan can differ in many ways. The size of the piles may be different. There may be more or fewer good things with the plan. There may be more or fewer bad things. In addition to different sizes, the piles are likely to have different compositions. The beautiful dogwoods in spring may be gone now; they may have been sacrificed to levees that reduce flood damages. Thus, the future good pile has fewer dogwoods, but the future bad pile has less flood damage.

The No Action Alternative

The without-project condition describes the future that society will have to forego if action is taken. Conversely, that means the without project condition is what will result if no action is taken. When formulating plans, NEPA regulations require that the no action alternative always be considered. In essence, this requires any action that is taken to be more in the public interest than doing nothing. The without-project condition is, then, the default recommendation. It is the no-action alternative.

The image of the piles helps us understand the basic trade-offs society faces. If a plan diminishes or changes the pile of good things the without condition produces, then these are things that society loses as a result of the plan. They are costs to society. If the without condition pile of bad things gets smaller, that's a benefit to society. The with condition will, of course, add good things (additional benefits to society) at the cost of some bad things (additional costs to society). Thus, beneficial plan impacts come from the elimination of "bad" things in the without condition scenario or the addition of "good" things in the with-project condition. Negative plan impacts come from the elimination of good things under the without condition scenario and the increase in bad things from the with-plan condition.

The decision-makers' difficult task is to decide which set of piles are better to have, the without condition or the with condition piles. That decision can't be made based solely on size, because we have not addressed the all important question of the value that society places on the things in each pile. The important point to understand at step two in the planning process is that all plans are compared to the same piles of good and bad things without a plan implemented. *The decision cannot be a good one unless the without condition description is fair and accurate*. The piles have to include all the important things, and those must be measured reasonably.

It has been suggested by experienced planners and plan reviewers alike that one of the most common problems with Corps planning efforts is that the without condition description is not adequate. In the worst instances, the description of the most likely future condition can be slanted to favor a specific alternative plan. It would not take much to manipulate the descriptions of the things that go into our good and bad piles in a manner that could distort results. Sometimes the descriptions are naive or incomplete. *A good without condition description is essential to a good decision.*

CHARACTERISTICS OF A GOOD WITHOUT PROJECT CONDITION

Table 26 summarizes some characteristics of a good without-project condition. First, it is **comprehensive**. *The without condition must adequately describe the future.* Significant variables, elements, trends, systems, and processes must be sufficiently described to support good decision-making. If it's important to the decision process, it has to be addressed in the without-project condition description. Planners cannot overlook important information.

Table 26: Characteristics of a Good Without Condition

Comprehensive
Rational
Alternative Future Oriented
Honest
Inclusive

Next, the without condition must be **rational**. Forecasts must be based on appropriate methods, and professional standards must be applied to the use of those methods. **Accuracy** *is an important element of a rational scenario.*

Good without conditions are not irrational. All future scenarios should be based on the assumption of rational behavior by future decision-makers. *Future scenarios must make sense*. Scenarios that rely on an unlikely series of events or irrational behavior make no sense. If a problem can be solved by a $500,000 expenditure each year or a one-time $1,000,000 expenditure, it would be irrational to assume an indefinite expenditure of $500,000 under most circumstances. A good scenario must pass the test of making common sense.

Without project conditions are not before and after comparisons. Before and after comparisons can miss the causality that is important to effective plan evaluation. Suppose a county has 2,000 jobs. Part of the without-project condition includes legalization of gambling and construction of a casino that will increase county

Policy May Affect Without Condition

Without-project conditions should be rational. Rationality can come from different directions, however. Section 4-11 of ER 1105-2-100 provides a list of eight constraints to, and clarifications of, the without-project condition.

Suppose for example, Congress has established a clear Federal interest in undertaking certain activities through legislation, as it has done with flood control. Further suppose that if the partnership does not build a project, the non-Federal partner will. What is the without-project condition? The truth is the without project condition includes the project! In this case, however, paragraph 4-11.a.(8) says:

> If local interest (sic) are willing to build a given flood control project, but only if the Corps doesn't do it, assume no project as without-project condition.

jobs to 11,000, a net increase of 9,000 jobs. Suppose a wetlands restoration project limits the development potential of some land such that the county, with its new casino, will have only 10,000 jobs.

A before and after plan analysis shows jobs rising from 2,000 to 10,000, a net increase of 8,000 jobs. Such a comparison gives the impression of causality when none exists. The appropriate comparison is a without and with project comparison in which we see a net decrease of 1,000 jobs. The implementation of the wetlands restoration plan actually costs the county 1,000 jobs.

Without-project conditions have to be **future oriented**. Conditions that concentrate on causality of existing conditions and focus too narrowly on how existing conditions might change fail to be future oriented. Without-project conditions are not mere extensions of existing conditions. They need to be oriented toward comparing alternative future scenarios.

The fourth characteristic of a good without condition is **honesty**. *This obviously means there should never be deliberately misleading information in a scenario, nor should any important information ever be deliberately withheld*. This quality goes beyond basic honesty, however, to include the forthrightness about the strengths and weaknesses of the analysis that is needed to enable an interested stakeholder or a decision-maker to make their own qualitative assessment of the work you have done.

An honest scenario would point out weaknesses and soft spots in the analysis, taking care to try to identify the implications of these "faults." Honesty also implies a sincere effort to convey the full implications of the scenario. Honesty requires that if significant differences in the future scenario exist, they are also honestly and completely described as alternate without-project conditions.

A good without-project condition is also **inclusive** in the sense that it is subjected to rigorous review and comment as part of the public participation process and throughout the coordination and review process. *Because the without- project condition occupies such a critical role in the planning process, it is essential that it be developed in the open and subjected to the scrutiny of all project stakeholders before the project proceeds too far.* In some cases, this will simply mean that

technical data and information receive an unbiased thorough technical review. In other cases, where judgmental or technological changes are being considered, the review and coordination may have a structured part in the public participation process.

SUMMARY AND LOOK FORWARD

Lesson One. Planning studies are iterative processes. The problems and opportunities of the planning area cannot be understood until we have information about existing and future conditions. The distinctions between the first and second steps are not as clear as we would like them to seem.

Lesson Two. Planners need information not data; but data contain the necessary information. In a world of limited budgets, the key is to collect the data needed, not the data available. An information-gathering strategy can help you identify what is needed and where to get it.

Lesson Three. Acknowledge the uncertainty you face. No one expects you to have all the information or to forecast perfectly. Let stakeholders and decision-makers know the limits of your knowledge and certainty.

Lesson Four. The future is usually different from the present.

Lesson Five. With-and-without planning is not the same as before-and-after planning. Describe the without-project condition as comprehensively, rationally, honestly, future-oriented and inclusively as you can. Use more than one scenario if necessary.

Now that we know the problems and opportunities and have described future conditions without a plan, we need some plans that can alter that future in a favorable way. Formulating alternative plans is the subject of the next chapter.

SUGGESTIONS FOR FURTHER READING

The NED Benefit and Cost Manuals and ER 1105-2-100 provide additional details on the without-project condition. Many of the items listed at Appendix I provide detailed suggestions of useful data for various types of planning studies. The *Handbook of Forecasting Techniques* IWR Contract Report 75-7 and its supplement, *Handbook of Forecasting Techniques Part II Description of 31 Techniques*, though somewhat dated, still provide a good basic introduction to many of the forecasting techniques mentioned in this chapter.

CHAPTER EIGHT: STEP THREE - FORMULATING ALTERNATIVE PLANS

"Think left and think right and think low and think high. Oh, the thinks you can think up if only you try." From Dr. Seuss in *Oh the Thinks You Can Think*.

Step Three: "Formulation of alternative plans." Principles and Guidelines, Standards, Section III, paragraph 1.3.2(a)(3).

INTRODUCTION

Put on your thinking caps - this is the step where you're going to need them. Your training might get you this far, but nothing quite prepares you for plan formulation. The basic question here is where do plans come from? The answer is they come from people. People devise solutions to problems. They do it individually and in teams, inside and outside the Corps, using an uneven mix of experience, analysis, inspiration, intuition, and inventiveness. The challenge of plan formulation is to guide these diverse inputs in developing an array of good plans.

This chapter describes where plans come from. It begins by defining formulation and its policy framework. The befuddling concepts of formulation and three phases through which formulated plans often pass are then discussed. Some different approaches to formulation are described at some length. The chapter concludes with some practical suggestions for describing and naming a plan.

FORMULATION DEFINED

Plan formulation is the process of building plans that meet planning objectives and avoid planning constraints. It requires the knowledge, experience, and judgments of many professional disciplines. Planners define the combination of management measures that comprise a plan in sufficient detail that realistic evaluation and comparison of the plan's contributions to the planning objectives and other effects can be identified, measured, and considered. Plan formulation requires the views of stakeholders and others in agencies and groups outside the Corps to temper the process with different perspectives. Plan formulation capitalizes on imagination and creativity wherever it is found, across technical backgrounds and group affiliations.

What? Who? How? When?

What do you formulate...plans devised to satisfy planning objectives and constraints.

Who formulates these plans...planners, with input from stakeholders and the public.

How are plans formulated...in teams and by individuals, using experience, inspiration, and anything else that's handy.

When are plans formulated...iteratively, throughout the planning process.

Plans are formulated to address the planning objectives. Formal formulation of alternative plans, as described in this chapter, cannot begin until the planning objectives have been at least preliminarily identified. Formulation of plans implies purpose and that purpose only finds definition in the planning objectives. Generally, a reasonable amount of information (i.e., step two activity) must be available before alternative plans can be formulated.

In most cases, there will be more than one alternative that will meet the planning objectives, although they meet them to varying extents. Good planning will eliminate the least suitable alternatives while refining the remaining alternatives fairly and comprehensively.

Sometimes, the formulation process emphasizes structural details, costs, project outputs, safety, reliability, and other technical matters. That's understandable because many of us are more comfortable with our familiar technical approaches and products. Nonetheless, formulation must be balanced with environmental, social, institutional, and other information that is often less quantified and otherwise less comfortable to consider in building plans. To ignore such information in formulation runs the risk of developing plans that cannot be implemented.

POLICY FRAMEWORK FOR FORMULATION

Plans are composed of **measures.** They can be **structural** or **nonstructural measures.** Alternative plans should be *significantly differentiated* from one another. This is the basis for the distinction we make between alternative plans and refinements of plans. Different levee heights for a given alignment are not different plans, they are refinements of the same plan.

Plans don't have to be restricted to things the Corps has the authority to do. Planners are empowered by the P&G to develop plans that can be implemented by other Federal agencies, State and local government, or other organizations. Despite this leeway, there are limits to what the Corps can do. The priorities of any given Administration define these limits. The P&G do

not make existing authority to implement a plan a requirement for formulating plans that solve problems and capitalize on opportunities. The opportunity to innovate is there.

Policy Constraints

Policy can sometimes place limits on the plan formulation process and the identification of the NED plan. These constraints can affect cost-sharing and the support a plan might receive from the Administration. For these reasons alone, the study team and the non-Federal partner need to be aware of any and all such relevant constraints.

For example, recreation cannot be included as a feature of a flood damage reduction plan until after it has been established that flood damage reduction benefits exceed the cost of the protection. Even then, recreational features can only be added if they are incrementally justified and they increase project costs by no more than 10 percent. However, nonstructural flood damage reduction projects need not have flood damage reduction benefits in excess of costs in order to add recreation features to the plan. Nor is there a limit to the amount of recreation allowed.

Got that? Then you're ready to consider how recreation can enter into commercial navigation or hurricane and storm damage reduction projects. These projects do not have to be justified on the basis of their primary purpose benefits, but those benefits must cover at least 50 percent of the costs of the project. Once that threshold is met, recreation features may be added in any amount as long as the entire project has a benefit-cost ratio of one or more. The catch here is that the benefits must be incidental. That is, they can be obtained without significant increases to the project costs.

Recreation policy is just one example of a policy constraint. Another is the requirement that structural flood damage reduction studies be formulated to address existing development flood problems. Benefits that may accrue to future development in the flood plain may be counted but only when they are incidental to plans formulated to reduce damages to existing development.

Thus, policy constraints can lead to situations in which you "formulate plans for
___" where the blank might be filled in with flood damage reductions, commercial navigation, or some other high priority output. In these cases, planners identify the most cost-effective plan for that purpose and then other purposes are added as policy permits. As this sidebar indicates, these can be confusing situations. Therefore, it is all the more important that the study team and the non-Federal sponsor understand the policies that constrain plan formulation.

Some districts do plan beyond what they have existing authority to implement. Under the proper circumstances, they are sometimes permitted to venture into a new area. The Corps' activities are not expanded by great leaps forward as much as by marginal extensions of existing and new authorities.

Plan formulation should pay attention to the mitigation of adverse plan effects. In water resources planning applications, the more common effects mitigated include adverse effects on fish and wildlife habitat; adverse effects on cultural resources; relocation of residential and commercial activities; and induced flood damages. Mitigation is explicitly required for many types of adverse effects; and is otherwise just good planning.

The P&G require the formulation of an **NED Plan** for the Corps' Civil Works water resource studies. This does not mean planners "formulate" an NED plan per se. *They formulate an array of plans that meet the planning objectives and constraints. From these plans they are required to "identify" the NED plan*. Thus, the NED plan is a plan that meets planning objectives and constraints and coincidentally maximizes net NED benefits. Only if planners investigate enough plans that meet the planning objectives and constraints can we be assured that the plan that maximizes net NED benefits has been identified.

Identifying an NED plan requires formulating other plans. The number of alternative plans depends on the complexities and extent of problems and opportunities in the study area, study resources, the availability of different appropriate measures, and the preferences of the stakeholders. The decision-maker will then judge whether alternative plans' contributions to planning objectives are sufficient to justify deviating from the NED plan. The **locally preferred plan** is the name frequently given to a plan that is preferred by the non-Federal sponsor over the NED plan. It is sometimes recommended instead of the NED plan.

FORMULATION CONCEPTS

Plan formulation has spawned a jargon capable of crippling communication. This section defines and describes some of the more important formulation concepts.

SOLUTIONS

A **solution** *is a way to achieve all or part of one or more planning objectives*. Solutions can be **management measures**, **alternative plans**, or **programs**.

Management Measures

A measure is defined as a means to an end; an act, step, or proceeding designed for the accomplishment of an objective. *The definition of a management measure (or "measure") is a* **feature** *or* **activity,** *that can be implemented at a specific geographic site to address one or more planning objectives.* Measures are the building blocks of which alternative plans are made. Measures become more specific and better defined as planning progresses.

Example Management Measures

Features:

breakwaters	water pumps
jetties	water control structures
groins	fences
channel modifications	food plots
dams	brush piles
detention basins	nest boxes and baskets
levees	roosting platforms
floodwalls	relocations

Activities:

actions:
- modifying water releases
- seeding, cutting, & burning vegetation
- applying pesticides

policies that affect actions at a site:
- vessel transit restrictions
- zoning restrictions
- grazing agreements

A feature is a "structural" element that requires construction or assembly on-site. An activity is defined as a "nonstructural" action. An activity can be a one-time occurrence, or it can be a continuing or periodic occurrence. Examples of commonly used management measures are provided in the sidebar.

Features and activities happen somewhere. The physical location or site at which they occur is an important characteristic that distinguishes one measure from another.

Alternative Plans

A plan, according to Webster, is a "scheme for making or doing something." *Our working definition of an alternative plan (also known as, "**plan**" or "alternative") is that it is a set of one or more management measures functioning together to address one or more planning objectives.* Many alternative plans have more than one measure. Different plans have different measures or they combine the same measures in significantly different ways. For example, suppose we have a town with two creeks. Plan A channelizes one creek and builds a levee along the other. Plan B builds the levee along the first creek and channelizes the second. Both plans consist of the same measures. The specific sites of these measures are sufficiently different to constitute two different plans.

Planner-Speak

The Principles and Guidelines tell us "An alternative plan consists of a system of structural and/or nonstructural measures, strategies, or programs formulated to alleviate specific problems or take advantage of specific opportunities associated with water and related land resources in the planning area." Other terms commonly used interchangeably with alternative plan include:

action	increment	program
activity	input action	project
alternate	management action	proposal
alternative	management measure	scenario
approach	management practice	scheme
component	measure	solution
concept	option	strategy
feature	plan	system
improvement	practice	technology

If measures can be actions instead of features, then alternative plans need not involve construction. Changes in the management of resources, institutions, and human behavior can sometimes be more effective than structural projects.

Programs

Just as management measures can be combined to form plans, so, too, can plans be combined to form programs. In a planning context, program means a set of one or more plans, usually located over a large geographic area. For example, there are several continuing authority programs. Examples of other Corps programs or programs in which the Corps is participating are listed in Table 27. Most Corps programs are nationwide in scope, but some are limited by law or policy to certain geographic areas.

SCALES

Sometimes people think of different **scales** of the same measure as different plans. For example, consider a plan with a concrete channel as its single measure. Different channel capacities don't constitute different plans. These are three differently scaled versions of a single plan. Plan scales are mutually exclusive; if you pick one scale you preclude all others.

Scales are most typically thought of as different "sizes" of a plan, but they also apply to other plan dimensions. *Several different properties of a management*

Table 27: Examples of Current Corps Programs

National Programs
- Section 107 Navigation Projects
- Section 205 Flood Control Projects
- Section 1135 Program - Project Modifications for Improvement of the Environment
- Coastal America Program
- North American Waterfowl Management Plan

Regional Programs
- Section 201 Program
- Upper Mississippi River System Environmental Management Plan
- Coastal Wetlands Planning, Protection, and Restoration Act Program ("Breaux Bill"; currently implemented in coastal Louisiana)

Source: EC 1105-2-210, Ecosystem Restoration in the Civil Works Program (June 1995)

measure may be scaled. These include its physical properties, its composition, its location, and its timing and duration.

Physical properties *of plans include sizes, amounts, counts, and the like*. For example, the size of a site (30 acres, 40 acres, 50 acres), the number of plantings per acre, the percent canopy cover of vegetation, water depth, and discharge capacity of a pump are examples of physical properties of a plan or measure that can have different scales.

Composition *includes different materials and methods that would accomplish the same purpose*. For example, a fence may be constructed as a chain-link fence, or a barbed-wire fence, or a wooden slat fence. The different materials may be thought of as different scales of a fence. In some cases, a levee and a floodwall could be different compositions of the same plan.

Locations *include different sites for the same solution*. Duck boxes at these sites or those sites are different scales of the same plan.

Timing *and* **duration** *include different start and stop times or durations for the same solution*. For example, low flow releases could be scheduled to last 6, 8, or 12 hours. The construction of a navigation channel could be phased over 5, 10, or 20 years.

If you scale the measures of a plan differently you end up with **refinements** *of a single plan, not multiple plans*. If you scale the plans of a program, you end up with refinements of the program.

Let's look at different alternative plans versus different scales of a plan. Suppose we have identified a range of plans to address a flood damage problem. For simplicity, assume each plan consists of a single measure. Plan A is a floodwall, B is a levee, C is a channel, D is a reservoir, and E is flood plain evacuation.

Suppose the evaluation and comparison steps of planning eliminate all but the floodwall choice, Plan A. The next iteration of plan formulation might scale the floodwall. That is, the optimal siting, dimensions, composition, and staging of the same plan can yield different refinements.

A concrete or steel sheetpile wall would not constitute two different plans. They are simply two different compositions of the wall. Likewise, the 10-foot and 5-foot walls are not separate plans but different physical dimensions of the same plan. A wall in front of or behind the railroad is another example of a distinction based on a single plan's siting rather than an example of alternative plans. Questions about whether to build the wall all at once or to construct it in sections over time are also issues of scale.

The final array of plans presented in many studies is not really an array of alternative plans at all. It is often a set of different scales, i.e., refinements, of a single plan. There is nothing wrong with making a final

selection from among a set of refinements of a single plan. Don't get bogged down in terminology. If the final array resulted from a more comprehensive planning process and decision-makers had the opportunity to consider a wide array of truly different plans, then it was a good planning process.

COMBINABILITY

In a planning study, management measures may or may not be mutually exclusive. *Measures that are not mutually exclusive are combinable.* **Combinability** allows us to mix and match measures into different plans. Conversely, some measures may preclude others. When building plans, consider whether two measures may be mutually exclusive because of location, function, or overlapping.

Location *limits combinability when two different measures can't occupy the same physical space at the same time.* For example, at a particular stream site you could create a calm slackwater area by either excavating the channel or by constructing a dam across the channel. You can only do one or the other at the same site.

Function limits combinability when two different measures may work against one another. For example, it probably wouldn't make sense to both build a retaining dike to hold water at a site and install drains to speed the removal of water from the site.

Overlapping limits combinability if one measure is actually a smaller scale, a subset, or an intersection of another measure. For example, you could not combine a 4-acre wetland with a 5-acre wetland to produce a 9-acre wetland if the two wetlands overlap each other.

One way to describe the combinability of measures is to display them in a matrix as illustrated in Table 28. In this example matrix, measures are arrayed against one another and their ability to be combined is indicated by a simple "Yes" or "No." In the example matrix, levees in the protected area are considered potentially compatible with measures 3, 7, 9, and 12 through 22. It has also been determined that levees aren't compatible with measures 2, 4, 5, 6, 8, 10, or 11. Note that the matrix reflects only pair-wise comparisons and does not indicate what measures might be incompatible in combinations of more than two measures.

DEPENDENCY

Some measures may be dependent on other measures in order to be implemented. The **dependency** of two measures can exist for several reasons.

First, one measure may be necessary to the function of another measure. For example, the survival of willow tree plantings may be dependent upon an irrigation system. Without irrigation, the plants will die. In this case, irrigation is necessary for the willows to function.

Dependencies may serve to reduce risk or uncertainty in project performance. For example, a flood forecast and warning system may function perfectly well without an automated telephone notification system for flood plain properties at risk. Combining the telephone notification with the warning system does, however, reduce the risk that a property owner will not hear a flood warning. The success of the forecast and warning system is to an extent dependent on the automated telephone notification system and vice versa.

Dependency can improve project performance. For example, we may elect to improve the growth rate of willow plantings by fertilizing them. The fertilizer is not necessary for the plants to function, nor will it reduce any risks or uncertainties of survival. However, it will improve the willows' performance by producing more mature trees faster. Recognizing dependency relationships among management measures can assist in screening out plans that are not feasible because they fail to meet dependency requirements.

FORMULATION PHASES

The process of building alternative plans from management measures is called **plan formulation**. There are many different approaches you can use to formulate plans. Before reviewing some of them in the next section, consider how the formulation process evolves through three very general phases. *First, you* **identify** *management measures. Second, you* **formulate** *alternatives. Third, you* **reformulate** *plans.* In every study, these phases overlap and are repeated again and again.

IDENTIFICATION OF MEASURES

One phase of formulation requires you to identify the individual pieces, the building blocks, that can be put together to form alternative plans. Plans are most often built-up from measures. Sometimes, you might identify measures by breaking an alternative plan down into its component parts.

Table 28: Pairwise Compatible Measures

Measure	Measure 1	Measure 2	Measure 3	Measure 4	Measure 5	Measure 6	Measure 7	Measure 8	Measure 9	Measure 10	Measure 11	Measure 12	Measure 13	Measure 14	Measure 15	Measure 16	Measure 17	Measure 18	Measure 19	Measure 20	Measure 21	Measure 22
1: Levees	NA	NO	YES	NO	NO	NO	YES	NO	YES	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
2: Floodwalls		NA	YES	NO	NO	NO	YES	NO	YES	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
3: Bridge modifications			NA	NO	NO	YES	YES	YES	YES	NO	YES	YES	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
4: Reservoirs				NA	NO	NO	NO	NO	YES	NO	NO	YES	NO	NO	NO	NO	YES	YES	YES	YES	YES	NO
5: River diversion					NA	NO	NO	NO	YES	NO	NO	YES	NO	NO	NO	NO	NO	YES	YES	YES	YES	NO
6: River dredging						NA	YES	NO	YES	NO	NO	YES	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES
7: Island removal							NA	YES	YES	NO	YES	YES	NO	NO	NO	NO	NO	YES	YES	YES	YES	NO
8: Channel modification								NA	YES	NO	NO	YES	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES
9: Flood forecast anf warning									NA	NO	YES	YES	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
10: Evacuation protected are										NA	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
11: Flood proofing & nonstructural protected area											NA	YES	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
12: Flood insurance												NA	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
13: Levees induced area													NA	NO	NO	NO	YES	YES	YES	YES	YES	YES
14: Floodwalls induced area														NA	NO	NO	YES	YES	YES	YES	YES	YES
15: Evacuation induced area															NA	NO	YES	YES	YES	YES	YES	YES
16: Flood proofing & nonstructural induced area																NA	YES	YES	YES	YES	YES	YES
17: Bird islands																	NA	YES	YES	YES	YES	NO
18: Acid mine drainage migration																		NA	YES	YES	YES	YES
19: Fish channels on tributaries																			NA	YES	YES	YES
20: Duck boxes																				NA	YES	YES
21: Watering holes																					NA	YES
22: Wetlands restoration																						NA

FORMULATION OF ALTERNATIVES

Another formulation phase involves matching and mixing management measures into different alternative plans. This process is best served by observing the realities of combinability and dependency. Otherwise this phase is unconstrained and open to all ideas for problem solving.

REFORMULATION

Chapter Five described the iterative nature of planning. **Reformulation** *is a special type of iteration during which alternative plans previously formulated are changed for one or more reasons*. It may be helpful to think of the basic plans that come out of the previous formulation phase as parent plans, and the reformulated plans as their offspring. Reasons for changing plans vary from study to study, as well as over time within a study. Typically, the reasons for reformulation are related to the four evaluation criteria listed in the Principles and Guidelines and are discussed in the next chapter.

Measures may be added, dropped, rescaled, or otherwise modified such that the reformulated plan will better achieve a planning objective or stay within the limits of a constraint. Measures can be modified to develop a reformulated plan that is less costly, i.e., more cost effective, than its parent plan. We may need to add or otherwise modify measures to make sure that a parent plan includes everything that it needs to work successfully. For example, local interests may need to provide navigation berthing areas, or flowage easements, or restoration of adjacent upland habitats, to ensure that a basic Corps plan will indeed work and provide the expected benefits. Stakeholders may request plan modifications that will address concerns or desires beyond those included in the planning objectives and constraints.

"Mitigation" is always a reformulation reason because it is undertaken as a response to the adverse effect(s) of a parent plan. In most studies, mitigation is either a constraint or a necessity for a complete and acceptable plan.

SEQUENCE OF PHASES

Plan formulation begins where you are. Sometimes you will find yourself at ground zero with no prior information. Other times you may have an earlier Corps study that has already done a significant

Plan formulation begins where you are.

amount of formulation. Some studies begin with a plan from another agency or a plan preferred by the local sponsor that needs some reformulation. Plan formulation is not a monolithic process that always begins at the same place using the same processes. Wherever it begins, there is always a process and the next section describes some approaches to formulation.

FORMULATION APPROACHES

Returning to the central theme of this chapter we again ask, "Where do plans come from?" They come from people. Specifically, they are born of ideas driven by planning objectives and constraints. In a series of workshops and training courses held around the country in 1995, over 130 Corps professionals were asked where plans come from. Three recurring and overlapping themes emerged from the great variety of their answers. Plans come from (1) sources outside the Corps, particularly the local sponsor; (2) the study team and their bosses; and (3) other sources such as technical expertise, experience, creative thinking, analysis and politics. The single common thread to these responses is people. People generate solutions. The people who can formulate plans are not limited by technical background or group affiliation.

People's ideas for plans should be driven by the planning objectives and constraints. The objectives define what the planning process is trying to do. The plans define how the objectives will be obtained. Plans emerge over time from a well developed set of objectives and constraints as the study team and public complete the iterative planning process.

This section addresses the "how" of plan formulation rather than the "who" of plan formulation. It begins with the one truth about the how of formulation: there is no one way to do it. The corollary to this truth is that there is no sure way to do it either. The most effective ways, however, begin with and use the planning objectives throughout the process.

The professional literature and experienced planners alike acknowledge two factors in plan formulation, experience and creativity. This section briefly explores ways to exploit both of these factors. Let's begin by considering how we think about plan formulation.

HOW TO THINK FORMULATION

Creativity requires planners to break out of old, self-perpetuating patterns of thinking and generate new ways of looking at things. **Vertical thinking** *(experience) needs to be supplemented by* **lateral thinking** *(creativity)*. Both are needed to succeed in formulation.

General Approaches to Plan Formulation

There are some tried and true ways to generate plans. They include...

- Ask an expert -- Use informed judgment and informed personal intuition.
- Consider plans of others -- Other people may provide you with ideas about solutions.
- Checklists -- Lists capture past experiences in problem solving.
- Formal Problem-Solving Methods -- Some methods provide clues to what measures may work, others help you develop combinations.

Vertical thinking follows the most obvious and probable line of reasoning. It's based on mechanistic information processing principles such as are used in mathematics and logic. Like climbing a stair, it proceeds one step at a time in a predictable direction. It's a more structured and experiential process.

Lateral thinking, on the other hand, tries to get away from patterns that lead in one definite direction. Lateral thinking seeks to break out of one's habitual domain of thought. It is based on biologically-based information processing. It's a more creative process.

Typically, all thoughts, all information gathering and interpretation, and all search at some point in the planning process begin to pull in one direction. The problem solving gets "locked in" through a process that builds logically on all the prior steps taken. This is not undesirable. A logical process that zeros in on a solution is clearly valuable, if the solution is a good one.

Sometimes, however, solutions require a sideways move in another direction. Does flood damage reduction need more or higher levees? That's vertical thinking. Or do evacuation and flowage easements make more sense? That's lateral thinking. Lateral thinking is not necessarily better thinking, but it is necessary to ensure that we make informed decisions. *A good plan, the "best plan," can only be selected if the array of alternatives provides a good set of feasible solutions.* There is no way to get a good plan from a weak

set of alternatives. Great plans come only through purposely challenging and extending one's habitual ways of thinking.

There are many tried and true management measures that are good ideas. The value of levees and floodwalls has been proven time and again. Experience and analysis will frequently be enough to identify these kinds of good ideas. But where do new good ideas come from? That is a far more vexing problem.

There are no fail-safe methods that guarantee good new ideas in every case. However, new ideas might be generated in a number of ways:

- By inventing or introducing new measures to address planning objectives.
- By creating new combinations of old measures.
- By modifying existing measures to meet new objectives.

While these suggestions lend some structure to the attempt to exploit people's inventiveness and creativity, by themselves they are of limited value. These are ways to help us think about new solutions. What we need are some approaches for generating new ideas, for doing plan formulation. We'll start with one of the most familiar approaches, asking an expert.

Ask an Expert - The Heuristic Search Approach

...go down the hall and ask Pat...

The **heuristic search**, *or* "ask an expert" *approach, may be the most common aid in use today for designing solutions to problems*. Heuristic search relies on the use of simple rules of thumb such as: Call up your old professor and ask her for some thoughts; go down the hall and ask Pat, he knows more about this than anyone; find a bulletin board or news group on the Internet and see what you can find out; read the previous report. While it is usually the easiest and most readily available approach, a systematic and deliberate heuristic search is still relatively neglected as a plan formulation tool. When planners seek to exploit the experience of others, how often do they call another district? experts in academia? retired personnel? other outside experts?

Your most immediate and perhaps best place to start a search for alternatives is right in the district. In-house personnel are frequently overlooked, but they can offer years of experience and familiarity with problems and what may or may not work to fix them. Talk with knowledgeable individuals. Hold a one-hour brown bag brainstorming session for everyone in your office to contribute ideas. Conduct a district-wide survey for solutions. When you do, don't forget to include the people in the Regulatory Office who handle permits for your study area; the people in the Real Estate Office who deal with many different local land issues; and the people in the Operations Office, including people at project sites who inspect, repair, and maintain projects and perhaps who even live in your study area. Extend your search to the rest of the "Corps family." Call the hydraulic engineer who retired last year. Now could be the time to call that planner from another district whom you met at a training class.

Professionals outside the agency are also valuable formulation resources. Other public agencies at the Federal, State, and local levels are charged with similar problem-solving missions and can often provide formulation ideas. The academic community, consultants, and professional associations should also be considered, especially those located in the study area.

What types of solutions do homeowners, boaters, owners of businesses, and others with day-to-day familiarity and experience with the problems think will work? What alternatives would they like to see? Which ones do they oppose?

A broader and more innovative array of alternatives can also be obtained by using published materials like professional journals, textbooks, earlier Corps reports, and related reports. The information superhighway is a promising new avenue. Literature research, in all of its manifestations, should continue to play an important role in formulation.

The information superhighway is a promising new avenue.

If people come up with plans, then a systematic effort to involve as many people as possible can only help. *Making the heuristic search more systematic will immediately improve the plan formulation process. It may be the cheapest, quickest, and best way to improve your array of solutions.*

Creative Problem-Solving Techniques

Another way to generate ideas for plans is to use some structured approaches to creative thinking. Such approaches, collectively called **creative problem**

solving techniques, are essentially systematic ways to generate ideas that can be used to formulate solutions to problems. Table 29 lists 46 such techniques.

Table 29: Idea Generation Techniques

- Individual Techniques
  - Analogies
  - Progressive Abstractions
  - Metaphors
  - Hypothetical Situations
  - Reversals
  - Wishful Thinking
  - Attribute Listing
  - Catalog
  - Checklists
  - Focused-Object
  - Free Association
  - Fresh Eye
  - Listing
  - Nonlogical Stimuli
  - Relational Algorithms
  - Circumrelation
  - Lateral Thinking
  - Morphological Analysis
  - Idea Tracking
  - Packays Scientific Approach
- Group Techniques
  - Battelle-Bildmappen-Brainwriting
  - Brain writing Pool
  - Classical Brainstorming
- Group Techniques (Continued)
  - Collective Notebook
  - Crawford Slip Writing
  - Force-Fit Game
  - Gallery Method
  - Gordon/Little
  - Method 6-3-5
  - Phillips 66
  - Pin-Cards
  - Semantic Intuition
  - Successive Integration of Problems Elements Method
  - Stimulus Analysis
  - Synectics
  - Systematized Directed Induction
  - Trigger Method
  - Visual Synectics
  - Wildest Idea
  - Bobele-Buchanan
  - Coca-Cola
  - Creative Problem Solving
  - Delphi
  - Nominal Group Technique
  - Phase of Integrated Problem Solving
  - Problem-Centered Leadership

Source: Van Gundy's *Techniques of Structured Problem Solving*, p. 29.

Some techniques are designed for use by individuals, others for use by groups like an interdisciplinary team. The techniques vary in complexity. Some can be used immediately, others require training. Although it is not practical to review all of these techniques in this manual, interested planners can find a discussion of each, as well as additional references, in Arthur B. Van Gundy's *Techniques of Structured Problem Solving* (1981).

Objectives-Measures Matrix

Another formulation technique is to develop an **objectives-measures matrix.** This technique recognizes that alternative plans are made up of one or more compatible and feasible management measures that contribute significantly to a set of planning objectives. Thus, a reasonable starting point for plan formulation is an examination of the relationship between objectives and measures. A simple preliminary formulation exercise would be to ask your experts to identify and list as many measures as possible, but at least one, for each planning objective. This will give substantial emphasis to each objective. If there was diversity in specifying the planning objectives and there is creativity and diligence in the identification of measures, this approach should ultimately produce a truly differentiated array of alternative plans.

For example, let's suppose for the moment that three planning objectives were identified in the first planning step of your study. *The first step in building an objectives-measures matrix is to ask your experts to identify management measures that address each planning objective, either directly or indirectly*. A composite list that could result from this type of questioning is shown in Table 30. Identification of measures is the most critical phase in the entire plan formulation process. It is the "A number 1" activity in the third step of the six-step planning process. As many measures as possible should be identified. This is the time to "think the thinks you can think." More creativity is required in identifying measures than in assembling them into plans.

We cannot be sure we have the best plan unless we have the best set of alternatives from which to choose. Our alternative plans will only be as rich and as good as the measures that are combined to create them. Choice requires more than one option. *Though multiple measures will not always be possible for each objective, it remains a modest goal*. Under no circumstances should there ever be an objective that is not addressed by at least one management measure. An objective that is not paired with a measure cannot be attained. Consequently, it is either not an objective or the formulation process has been inadequate.

The second step in building an objectives-measures matrix is to array the planning objectives against the full set of identified measures in the matrix format. Then indicate which measures are expected to contribute to which objectives. Table 31, a 3 by 22 matrix, is an example. The columns show the objectives to which a particular measure contributes. In this example, reservoirs and floodplain evacuation contribute to each of the three objectives. The rows of the matrix show the various measures that will contribute to a specific objective.

As planning progresses, an objectives-measures matrix can be prepared for each formulation iteration. Then, cognizant of the combinability and dependability of measures, plans can be constructed to meet the objectives. This technique is just one example of how planners might approach the assembly of alternative plans.

Consider Plans of Others

Anyone, at any time, may offer you a plan. To them, it may be "the" plan. It may come from the local homeowners' association, from the port authority or from a coalition of environmental groups. They may hand it to you before you even have a study authority. You might get it the day before the final report goes to print. It may be detailed or general. It might be nonsense or right on target. *Regardless of from whom, when, and in what form they're offered, the plans of others are legitimate pieces of the plan formulation process.*

What do you do with a plan developed by someone else? The first and most important thing to do is to take the presenter of the plan seriously. No plan should be dismissed out of hand. Each idea, regardless of its source, should receive appropriate consideration. Too often, ideas that do not arise from the study team or non-Federal sponsor, are regarded as lacking in credibility. They may not receive appropriate consideration. On the other hand, not every idea floated by a member of the public is worthy of serious consideration. The important point is to *be willing to consider feasible suggestions and good ideas, no matter where they come from*.

If the plan cannot be used as is, does it have components that might be useful in other plans? Does a plan that does not contribute to your planning objectives suggest an objective that you may have missed? Even when another's plan is not directly useful, it may contain information useful to your planning process.

Consult a Checklist

Management measure checklists are simply that, lists of different measures. Management measure checklists capture past experience in problem solving. They are convenient ways to keep track of what has worked in the past. A checklist can be a ready source of potential solutions that can provide you with a place to start your formulation.

Some checklists are simple lists of measures. Other useful lists were not designed as lists. For example, you might thumb through the manual "Flood Proofing Techniques, Programs, and References" prepared by the U.S.

Table 30: Objectives and Measures

Objective 1:	Reduce flood damages in riverside communities
Measure 1:	Levees
Measure 2:	Floodwalls
Measure 3:	Bridge modifications
Measure 4:	Reservoirs
Measure 5:	River diversion
Measure 6:	River Dredging
Measure 7:	Island removal
Measure 8:	Channel modifications
Measure 9:	Flood warning and preparedness
Measure 10:	Evacuation of floodplain
Measure 11:	Flood-proofing
Measure 12:	Flood insurance
Objective 2:	Minimize induced flood damages and flooding in communities upstream and downstream of the study area
Measure 4:	Reservoirs
Measure 5:	River diversion
Measure 6:	Dredge river
Measure 7:	Island removal
Measure 8:	Channel modifications
Measure 9:	Flood warning and preparedness
Measure 12:	Flood insurance
Measure 13:	Levees in induced flooding area
Measure 14:	Floodwalls in induced flooding area.
Measure 15	Evacuation of floodplain in induced flooding area
Measure 16:	Flood-proofing in induced flooding area
Objective 3:	Maintain or increase the quantity and / or quality of fish and wildlife habitat in protected area
Measure 4:	Build Reservoirs
Measure 10:	Evacuate floodplain
Measure 17:	Create bird islands
Measure 18:	Mitigate acid mine drainage into Big River
Measure 19:	Construct fish channels on Big River tributaries
Measure 20:	Construct duck boxes
Measure 21:	Construct watering holes
Measure 22:	Restore Wetlands

Table 31: Objectives-Measures Matrix

Measure	Objective 1	Objective 2	Objective 3
1. Levees	X		
2. Floodwalls	X		
3. Bridge modifications		X	X
4. Reservoirs	X	X	X
5. River diversion	X	X	
6. River dredging	X	X	
7. Island removal	X	X	
8. Channel modification	X	X	
9. Flood warning and preparedness	X	X	
10. Evacuation		X	X X
11. Flood-proofing	X	X	
12. Flood insurance	X	X	
13. Levees induced area			X
14. Floodwalls induced area		X	
15. Evacuation induced area		X	X
16. Flood-proofing induced area			X
17. Bird islands			X
18. Mitigate acid mine drainage			X
19. Fish channels on tributaries			X
20. Duck boxes			X
21. Watering holes			X
22. Wetlands restoration			X

Army Corps of Engineers National Flood Proofing Committee to compile a list of flood proofing measures. Topical reports, their tables of contents and indices can sometimes serve as sources of lists, although that was never their intention.

What might you do with a plan offered by someone else?

- Take it seriously and give it appropriate consideration.
- Use its component measures in other plans.
- Verify the objective or constraint it's intended to address.

Formal Methods

Another formulation approach is to use a **formal methodology**. These are different from the idea-generating approaches mentioned earlier in that they comprise formal methodologies that encompass the entire problem-solving process. These methods are more than simple tools to aid the thought process. They go well beyond the heuristic search methods and checklists that are most commonly used. The methods involve the design, what we call "formulation," of alternative means of problem solving. They help develop decision options of one type or another. In instances where a structured and systematic approach for formulating plans is desired, one or more methods may be worth investigating. These techniques include the analysis of interrelated decision areas (AIDA, Luckman 1967, and Morgan 1971), the morphological box (Zwicky 1969), the IDEALS concept (Nadler 1967), idealized design (Ackoff 1978), issue-based information systems (IBIS, Dehlinger and Protzen 1972), the strategic choice approach (Friend and Jessop 1977), and strategic options development and analysis (SODA, Eden 1989). The interested planner is directed to the referenced material for additional details.

Habitat suitability index (HSI) models are often used to estimate environmental outputs of ecosystem restoration projects. A thoughtful examination of HSI models can provide valuable clues for finding successful management measures. *Sometimes the analytical models used in planning can provide focus and clues to potentially successful management measures.*

Examining HSI models may suggest that management measures that alter habitat variables farthest from their optimal conditions may be more fruitful. The mathematical structure of the models often identifies a limiting variable that suggests that plans that affect limiting variables may be more effective than plans affecting non-limiting variables. Other insights are also available from these models. *The important point is to look for ideas and insights in the generation of plans wherever they may be found.* Sometimes this includes

the analytical models.

The "all possible combinations" method is the ultimate tool for mechanistic formulation. As its name conveys, for a given list of management measures, it will provide you with the set of every conceivable combination of those measures. In principle, this method is very simple. It must be used judiciously, however, or it can easily get out of hand.

Is "No Action" An Alternative Plan?

Yes and no.

Yes, "no action" is an alternative future condition that you could elect to choose. As we'll discuss in Chapter Eleven, it's the first default recommendation. "No action" is an alternative just like the future conditions that would result from any alternative plan.

On the other hand, the "no action" alternative does not require the Corps to do anything. Just like its name says, it represents the future that will occur if we take no action. Alternative plans require that we take some action to meet the planning objectives. Therefore, while "no action" is an alternative future, it is not strictly speaking an alternative plan.

The all possible combinations technique is a tool, not a requirement. It can be used in any situation in which planners find it helpful. Step-by-step instructions for the all combinations method are presented in *Evaluation of Environmental Investments Procedures Manual Interim: Cost Effectiveness and Incremental Cost Analyses*, IWR Report #95-R-1, May 1995.

CHARACTERISTICS OF SOLUTIONS

How do you know when you've done a good job identifying solutions? How much do you need to know about a solution before it's really a solution? Experience shows that the answers to these questions are very situational. At a minimum, however, every solution be it a measure, a plan, or a program , should have the following describable characteristics:

Subject - What is it, a feature or activity?
Verb - How would it come about, through excavation, enforcement, etc.?
Site - Where would it be located?
Purpose - What planning objective(s) is it intended to address?
Cost friendly - Can you *estimate* its dollar costs?
Output friendly - Can you *estimate* what, and how much, you expect to get from it in the later planning steps?

Good solutions emerge from a rational, iterative planning process that has considered a comprehensive set of alternatives. At some point in the process, good solutions are sufficiently differentiated from one another so as to offer a full range of truly different ways to achieve the planning objectives. Good solutions are more complete, more effective, more efficient and more acceptable than bad solutions. Good solutions are not constrained for lack of authority. Good solutions make significant contributions to the overall set of planning objectives and do not violate planning constraints. Good solutions are hard to formulate.

NAMING ALTERNATIVE PLANS

Talking about solutions means we have to name them. So, how do you know what to call different measures or plans? There is no universal convention for naming alternatives, and the short answer is you can call them whatever you want. However, it is most helpful if the names have some easily communicated meaning. Some commonly used naming conventions are described below.

Geographic sites. Name alternatives after neighborhoods, towns, villages, land forms, or other geographic sites. For example: "Downtown Plan," "Lake Sullivan Plan," "Ravenswood Plan," and the like. These are often the most descriptive, hence the best names.

Management measures. Name alternatives after their dominant management measures. For example: "Channel Plan," "Levee Plan," "Relocation Plan," and the like; combine measures and sites, e.g., Downtown Channel Plan. When dealing with plan refinements like a levee raising perhaps simple descriptions like "One-foot raising" or "Agnes level" will serve the purpose of effective communication. These names are also descriptive.

Numbers. Simply number alternatives: "Plan 1," "Plan 2," etc. This is very logical, but not very descriptive. It often requires the reader or listener to continuously refer back to a description.

Letters of the alphabet. Like the numbering scheme the alphabet can be used: "Plan A," "Plan B," etc.

It is likely that people outside the study team will be discussing your plans at some point. *Short descriptive names can be an effective way of communicating a great deal of information in a shorthand fashion*. Try to avoid complex and opaque naming schemes like 290BC2 that contain elements or symbols that stand for design flows (290,000 cfs), geographic regions (Bitter

Creek) and versions (second) of the plan. Although logical to anyone with a history of the project and a table that describes the plan elements, it remains cold and opaque to the public.

SUMMARY AND LOOK FORWARD

Lesson One. Planning objectives drive plan formulation.

Lesson Two. A plan is one or more compatible measures that make significant feasible contributions to the set of planning objectives. People identify measures and plans.

Lesson Three. In water resource planning under the Corps' Civil Works Program, the P&G require the identification of an NED plan from among the alternatives considered. Ecosystem restoration planning, for example, does not require an NED plan.

Lesson Four. A good plan can only emerge from a good set of truly differentiated plans and optimized versions of these plans.

Lesson Five. The are many different approaches and methods available to assist the formulation process.

The most rational way to move from an array of many solutions toward identification of one best solution is by evaluating their effects. Evaluation is the fourth step in the planning process and it is the subject of the next chapter.

SUGGESTIONS FOR FURTHER READING

If you'd like to read about the heuristic search approach to formulating alternative solutions, you might consider one of the following:

Marquis, D.G. 1969. "The Anatomy of Successful Innovations." *Innovation*, 1 (1969): 28-37.

Pounds, W.F. 1969. "The Process of Problem Finding." *Industrial Management Review*, 11 (1969): 1-19.

Simon, H.A. 1977. Models of Discovery. Dordrecht, Holland: D. Reidel.

A particularly good book to investigate if you want some ideas about techniques for generating ideas is Van Gundy's: *Techniques of Structured Problem Solving*. It includes a discussion of 46 creative solving techniques.

You can find out more about the other techniques by consulting the sources cited in the chapter's text.

CHAPTER NINE: STEP FOUR - EVALUATION OF ALTERNATIVE PLANS

"We cannot discuss the evaluation of things without knowing what it is that is being evaluated." Frank H. Knight (1885-1972), *Risk, Uncertainty and Profit*, 1926, p. 125.

Step Four: Evaluation of the effects of the alternative plans. (P&G Section III.1.3.2(a)(4))

INTRODUCTION

In the evaluation step, the significant contributions or effects of an individual plan are quantified and judged. That's done for two reasons. *First, the evaluation allows planners to determine whether or not the plan qualifies to advance and be compared against other plans that have independently qualified. Second, evaluation surfaces the specific criteria that will be used to compare those plans that do qualify and advance to the comparison step.*

The purpose of evaluation is to find the value or worth of something. Only the best of the alternatives formulated need to be evaluated in more than a preliminary fashion, but all measures and plans require some evaluation. *Evaluation is a two-part process:* **assessment** *(quantification) and* **appraisal** *(judgment).* Evaluation, like all other planning steps, is also an iterative process. It begins with the first screening of measures and plans and its detail and rigor increases as planning moves closer to a final decision.

This chapter begins with a brief discussion of how to evaluate, that introduces five simple evaluation tasks. After considering what to evaluate, each of these tasks is considered in turn. Qualifying plans requires some criteria or minimum standards that a plan must meet. Candidate criteria comprise the next part of the chapter, which is followed by a discussion of some sample measurement techniques.

The chapter concludes with the consideration of how the evaluation results are to be displayed.

Examples of Things to Evaluate

- NED "benefits"
- Cost estimates (MCACES)
- Real estate appraisals
- Fish and wildlife (HEP, etc.)
- Cultural resources (National Register)
- Water quality (Section 404)
- Regional Economic Development (RED)
- Other Social Effects (OSE)
- Contributions to planning objectives and constraints
- Other

WHAT TO EVALUATE

First, you need **things to measure**. These are resources, plan outputs, and plan effects.[10] *Second, you have to know* **what is important**. It is the important things that are evaluated in this step. There are so many potential effects of a plan that it would be impossible to evaluate them all. The process of determining what is and isn't important begins in the scoping process described in Chapter Five. Significant resources, outputs and plan effects should be evaluated. Effects that tell you whether and how much you are contributing to the planning objectives will be among them.

Other significant effects include changes in NED benefits and costs, measured in dollars. Significant effects can also include many non-monetary effects like many environmental impacts and local concerns that predictably accompany any study (see sidebar).

The criteria for determining significance are institutional, technical and public recognition of importance. There are laws, policies, and other institutional realities that define some resources, project outputs or project effects as important. Other things are clearly important for technical reasons. The ability to move commerce among cities, states and nations is important to economies. Flood problems are important to communities. These things are important for technical reasons. Some study issues are significant because they are important to the public. People care about historical buildings and safety.

The criteria by which we judge a resource (wetlands), an output (navigation), or an effect (community cohesion) significant can be overlapping. Wetlands are important because the public cares about them, because they perform an important function in our ecosystems, and because they are protected by law. Thus, all the criteria point to wetlands as important. It's less important to worry about what makes something important than it is to recognize it as important.

[10] In order to avoid burdensome repetition, "plan effects" will be used to encompass resources and plan outputs as well.

HOW TO EVALUATE?

Evaluation in the six-step planning process requires the planner to perform five tasks. First, forecast a most likely with-project condition for each plan. That means with-project condition scenarios must be developed to describe all important project resources, outputs, and effects. For example, we might need to know what will happen to the habitat of the mottled duck if a plan is implemented.

The second task is to compare the without- and with-project conditions in order to identify any important differences. It may be clear that a plan will increase mottled duck habitat. The third task is to assess, i.e. describe, all important differences that result from the plan. For example, the 400 habitat units expected without a project would be compared to the 500 habitat units with a project to yield an increase of 100 habitat units as a plan effect.

The fourth task is to appraise the differences. In this case, the increase in habitat units may be judged as a significant positive environmental output. The fifth and final step is to qualify plans for further consideration or to drop them. Based on the significant contribution of the plan to mottled duck habitat we decide to consider it further.

Five Evaluation Tasks

1. Forecast a with-project condition for each plan.
2. Compare with- and without-project conditions.
3. Assess, i.e., describe, important differences between the two conditions.
4. Appraise the plan's effects.
5. Qualify the plan for further consideration or drop it.

The main tasks that have to be completed to evaluate plan impacts are shown in the sidebar. *The primary reason for evaluating plan impacts is to qualify plans for further consideration in the comparison step of the planning process*.

...qualify plans for further consideration or to drop them.

The result of the evaluation process is that a plan's effects are identified, measured, and weighed. This can be an informal and subjective process, or it may be a very formal evaluation process. The evaluation step as defined by the P&G (Section III of the Standards paragraph 1.3.6) consists of assessment and appraisal. The first step, assessment, is an objective analysis to identify and measure economic, environmental, social, and other effects expected to result from implementation of the plan. The second step, appraisal, is a more subjective analysis that attempts to classify the importance and desirability of plan effects to plan stakeholders.

Significance

Significance is a confusing term because it has a dual nature. First, we identify resources, conditions and other variables that are significant based on institutional, technical and public criteria. Then we need to determine whether the effects of a specific plan on these variables are significant.

Institutional recognition of an effect means its importance is recognized and acknowledged in the laws, plans, and policies of government, public agencies and private groups. Effects on endangered species and NED impacts are examples. **Technical recognition** of an effect is based upon scientific or other technical criteria that establish the significance of an effect. For example, maintaining salinity levels may be scientifically established as important to the biodiversity of a freshwater marsh. **Public recognition** means some segment of the general public considers the effect important. Public recognition may be manifest in controversy, support, or opposition expressed in any number of formal or informal ways.

Planning objectives and constraints should reflect the views of these institutional, technical, and public interests. But just because a resource has been identified as significant, this does not mean any one plan will have a significant impact on it. Furthermore, some resources may become significant simply because they will be affected. Sound confusing? Consider this. Suppose a wetland is identified as a significant resources. Now suppose Plan A has no impact on that

It is important that all significant plan effects be evaluated fully. Qualification requires it. Plan comparison and selection will be based upon it. Comparison requires a common set of significant impacts across which to make trade-offs. Plan selection will be judicious only if all the significant effects of a plan are known. A thorough evaluation will diminish the possibility of a "surprise" after implementation that could be disturbing to the public or stakeholders. Finally, the reputation of the partners rests on their ability to adequately forecast the effects of projects. This latter point can make an assessment of "no change" as important as a measured assessment of change for certain plan effects.

Therefore, the *significance* of resources, plan outputs, and plan effects is the common thread that runs through all the evaluation tasks. We forecast, compare, and assess only what we believe to be significant. The appraisal task is a formal judgment of a plan's significant effects. Qualification is the evaluation decision to accept a plan for further consideration, i.e., comparison with other qualifying plans, or to drop it from further consideration. The next section discusses each evaluation task in more detail.

EVALUATION TASKS

The evaluation process can be broken down into five tasks, introduced above. Each of these tasks is discussed in turn in the following subsections.

WITH-PROJECT CONDITION

In the second planning step, the most likely future condition without a project is forecast. It provides a benchmark against which an individual plan's effects can be measured. *In step four, the planner must forecast future conditions with the alternative plans in place. A most likely future condition is separately forecast for each alternative*. The important variables measured in step two under the without project condition are

measured again in step four under the with project condition. The resource conditions, project outputs, and plan effects forecast under both the without- and with-project conditions are those that are believed to be significant based on the institutional considerations, technical analyses, and public opinion.

The qualities of a good with condition are similar to those of a good without condition described in Chapter Seven. There may be more than one potential with-project condition. When that is possible, a most likely condition should be identified. The other conditions should be considered in a sensitivity analysis of the plan's effects.

COMPARE WITHOUT AND WITH CONDITIONS

Table 32 provides a simple comparison of a without- and with-project condition comparison. It essentially means forecasting values for a common set of resources, outputs, or effects. In the table we have used population, expected annual flood damages and acres of wetlands as examples of important variables to forecast and compare.

Table 32: Compare Without and With Plan Conditions

Effect	Without Conditions	Plan A Condition
Population	147,000	147,000
Expected Annual Damages	$2.1 million	$0.7 million
Wetland Acres	412 acres	258 acres

This evaluation task involves only Plan A. Note that the differences have not yet been assessed. Plans B, C, and others will also be separately evaluated. Only important effects should be compared.

How do you know what an important effect looks like? Once again, we fall back on the criteria of institutional, technical, or public recognition of importance. Planning objectives are by definition important effects. These define the reasons for your study and were specified because they were recognized as important. Each plan should be evaluated against the planning objectives. As for other effects, does anyone say an effect is important? Do either of the partners or a significant stakeholder consider an effect important? Is there legislation that defines an effect as important? Do your technical experts say it's important? These are the ways we recognize important effects. More is said about importance in the assessment section that follows.

ASSESSMENT: DESCRIBING DIFFERENCES

Once you have identified an effect as important you **need a way to measure it.** Describing differences between without- and with-project conditions is the primary means of measuring plan effects. Measurement means describing the duration, location and magnitude of a plan effect as precisely as possible. *Measurement should be quantitative whenever possible*. If an impact can be measured in dollars, habitat units, acres or any other common metric, it should be.

Quantitative measurement is not the only kind of measurement. Effects can be assessed in a subjective manner. Subjective rankings of effects may be possible when quantitative measurements are not. We may not have any metric that quantifies scenic beauty, but it may be entirely possible to say that Plan A contributes to scenic beauty or that it does not. Without some means of measurement, assessment cannot proceed. The general framework for assessing plan effects is the without- and with-project conditions comparison.

Table 33 presents the comparison of without- and with-project conditions for Plan A, with the differences in the two conditions assessed. If it is not obvious from the context, the location and duration of differences should be identified. For example, there is a $1.4 million reduction in expected annual damages downtown over the economic life of the project. Downtown was specified, the economic life of the project is implicit.

Table 33: Assessment of Plan Effects

Effect	Without Condition	Plan A Condition	Differences
Population	147,000	147,000	No difference
Expected Annual Damages downtown	$2.1 million	$0.7 million	$1.4 million reduction
Wetland Acres the river	412 acres	258 acres	154-acre decrease along

With less data or earlier in the planning process, we might have had to rely on a subjective assessment of the differences due to plan A. For example, the magnitude of effects might have been no change in population, a decrease in flood damages, and a decrease in wetland acreage. The description of differences should be as quantitative as possible.

MEASUREMENT PROCEDURES

A great deal of guidance already exists for the evaluation of plan effects. The P&G contain specific evaluation procedures for estimating NED benefits and costs as well as a set of procedures for evaluating environmental quality effects of a plan. Many of these evaluation procedures have been supplemented by additional guidance. Most notable among this guidance is the series of **National Economic Development Procedures Manuals** and the Evaluation of Environmental Investment Research Project reports prepared by the Institute for Water Resources. These manuals and reports provide additional guidance and examples detailing evaluation procedures. These manuals are listed in Appendix I.

There are some rather handy subjective evaluation techniques that are quite appropriate for early iterations of the planning process. "Is there any possible way this could work?" might be a question to ask of a plan early in the planning process. If the answer is yes, it qualifies for further consideration.

"Is there any possible way this could work?"

As the evaluation process matures, the evaluation techniques evolve from totally subjective measures like the above question to very objective measures, such as those found in the NED manuals. In between are several other simple techniques and metrics. Before data are available or for impacts that are fundamentally subjective judgments, e.g., contributions to community cohesion, there are any number of ways to evaluate.

The idea is to provide an evaluation of each screening criterion on a plan-by-plan basis. It is perfectly acceptable to use a different evaluation technique for each criterion. We would expect NED costs and habitat units lost to be measured in different ways. It is also expected that any given criterion will be evaluated the same way for all plans that are at comparable stages in the planning process.

Scales are a common means of making subjective judgements. This simply ranks a plan on a scale of 1 to 5, or any other convenient scale, where 1 might be "very negative impact" and 5 a "very positive impact" with 3 "no impact."

Using ratings of +/0/-/? is another common means of evaluating plans. If it makes a positive contribution it gets a plus sign, no contribution is a zero, a negative contribution is a minus sign. The question mark is for when we don't know the impact.

Index *numbers can be used for some impacts*. An index of 100 is arbitrarily affixed to some ideal level of attainment of an objective. Plans can then be evaluated with numbers greater or less than 100 that show the plans achievement relative to that ideal level.

APPRAISING PLAN EFFECTS

The appraisal task in the evaluation step requires the planner to determine the value and significance of the differences they have described.. This is the last step before determining whether a plan qualifies for the next round of consideration or not. It is a values-based evaluation step in contrast to the more objective measurement of the assessment step. Judge the impact. Is it good or bad? Is it important or not?

Every impact that was assessed should be appraised. It is during this task that the determination of an effect's significance comes to the fore. *There is a difference between making a value judgment about an effect and determining if it is significant*, as was pointed out in the earlier sidebar. Determining an effect's magnitude, duration and location is part of the assessment. You only assess those effects you believe to be significant. In the appraisal you determine whether the assessed difference is beneficial or adverse, and significant or not. This means considering each plan's contributions to the planning objectives and constraints, its NED benefits and costs, its environmental impacts and whatever other effects have been deemed significant in your study.

You can usually categorize an effect as good or bad.

The first step in the appraisal is to determine if the assessed effect is adverse, beneficial, or neutral. Fewer flood damages is good, fewer wetland acres is bad. You can usually categorize an effect as good or bad. *It may be more difficult to say how good or how bad it is, the second step in the appraisal task*. The loss of wetlands will, for example, always be bad and it will always be important. Noise during construction will always be bad, but is it significant? The answers to such questions will have to be given on a case-by-case basis. Appraisals are by nature subjective judgments.

Appraisals are by nature subjective judgments.

QUALIFYING PLANS

Hundreds of plans can be conceived of during the plan formulation process. Not all of them deserve to be considered for long. Certainly, relatively few of them will ultimately be compared against others to determine the best of all possible plans. *Perhaps the most important purpose of the evaluation step is to qualify plans for further consideration*.

Formal evaluation of alternative plans raises the screening process to new levels of sophistication. Early in the formulation process a plan can be eliminated because "it's a goofy idea," "it'll never work," and similar subjective evaluation criteria. As the planning process matures, so must the evaluation techniques. At some point, evaluation must come back to the planning objectives and constraints.

The purpose of the evaluation step is to carefully examine each alternative and determine if it is worthy of additional consideration. This is accomplished by holding each plan to a frequently subjective and always study-specific set of minimum standards. *A potential plan has to meet some minimum standards in order to merit further consideration. Criteria are needed to determine those minimum standards*. Each plan, taken individually and without comparison to any other plan, can be evaluated against the qualifying criteria to determine whether or not it qualifies for additional consideration. That is, is the plan good enough? This is the culmination of the evaluation process.

Subjective judgments of a single plan tend to be pass/fail, go/no go, enough/too much types of statements. These are as opposed to the types of subjective judgments made in the comparison step when you can use more than/better than/less than types of statements. *The standards for determining enough, too little, go, and so on are related to the significance of the plan's effects on significant factors*. At the completion of the appraisal task, we'd like to have sufficient information to determine whether a plan is good enough to qualify for the next round of analysis, comparison of plans.

If a plan's qualifications are not readily apparent based on any single screening criterion we need to consider it's overall qualifications. Once each effect has been appraised, the next task in the evaluation process is to judge the plan in light of its overall contributions to our evaluation criteria. The focal point for doing this should be appraising the specific plan's contributions to the planning objectives. We are seeking some degree of "objective fulfillment." Are the plan's effects on planning objectives good or bad? Does it qualify?

If the plan is good enough it will eventually be compared to other plans at a comparable level of development in the planning process. If a plan does not qualify, it is dropped from further consideration. What criteria do you evaluate a plan against to determine if it qualifies for further consideration? They include all significant resources, outputs and plan effects. Significant plan effects must include contributions to planning objectives and constraints. They also include the Federal objective, environmental compliance requirements, what is important to stakeholders, and the P&G's four evaluation criteria.

QUALIFYING CRITERIA

To determine whether a plan qualifies for further consideration, planners need some criteria. Some of the things we know are going to be recognized as significant by institutions, technical analysis or the public are predictable and are discussed in the following subsections.

PLANNING OBJECTIVES AND CONSTRAINTS IN EVALUATION

The tasks described above make frequent reference to qualifying criteria, minimum standards each plan must separately meet, in order to be considered further. These minimum standards may represent the required degree of objective fulfillment. The degree of objective fulfillment may be empirical (e.g., reduce flood damages by at least 25 percent or increase habitat by 50 habitat units) or it might be subjective (enough/not enough). In either case, the culmination of the evaluation step is a decision whether to continue to consider the plan just evaluated.

The planning team will have to establish some minimum standards of objective fulfillment for qualifying a plan for further consideration. These standards can be based on contributions to the most important objectives contributed to, the number of objectives, the size of the contribution, or any other standards that make sense at a particular point in the study. It is, however, important to bear in mind that *this is not a comparison of plans. It is a simple qualifying round*. It is akin to determining whether your tomato is good enough to enter in the county fair. You can worry about whether it's the best tomato if and when you get it into the fair.

FEDERAL OBJECTIVE

For most water resource planning, estimates of NED costs and benefits are going to be needed. *A plan that does not have benefits in excess of costs would normally not qualify for further consideration*. Although ecosystem restoration projects are not justified based on an NED benefit-cost analysis, it is still necessary to identify their costs and, in the interest of full disclosure, the economic benefits they would produce. NED benefits and costs are clearly criteria that can result in a pass/fail evaluation of a plan.

…establish some minimum standards for qualifying…

ENVIRONMENTAL COMPLIANCE REQUIREMENTS

Environmental compliance requires that each plan meet minimum standards with respect to significant resources like endangered species, cultural resources, and so on. IWR Report 96-PS-3, "Civil Works Environmental Desk Reference," summarizes the potentially applicable Federal requirements. These will be important qualifying criteria once identified. A plan that does not meet these minimum standards will not qualify for further consideration.

OTHER IMPACTS

There may be other impacts not covered among the above criteria that are important to people. If so, they should be included among the qualifying criteria. These will typically be effects important to key stakeholders.

P&G SCREENING CRITERIA

The P&G (Paragraph 1.6.2(c)) suggest the use of four evaluation criteria -- completeness, effectiveness, efficiency and acceptability -- in the screening of alternative plans. Plans that require substantial activity by others, that is not likely to be forthcoming, in order to reach a "go" appraisal for critical objectives are not complete. Plans that are not appraised as a "go" for planning objectives are not effective. Plans that achieve contributions to objectives at higher costs, whether objectively or subjectively measured, are not efficient. Plans with effects that result in infeasibility are not acceptable. Minimum standards for these four criteria must be established in order to determine whether a plan is worthy of additional consideration.

These standards will generally be subjective, where each plan is measured on a continuum. Figure 7 illustrates the point conceptually. The thin line represents a subjective minimum standard for each of these criteria. The hypothetical plan has exceeded the standard for completeness and acceptability but it has failed to measure up under the effectiveness and efficiency criteria. As long as a plan exceeds the minimum standard for each criterion it qualifies for further consideration and comparison with other plans. This plan would have to be modified to be more effective and efficient or it will be dropped from further consideration. Each criterion is discussed in turn below.

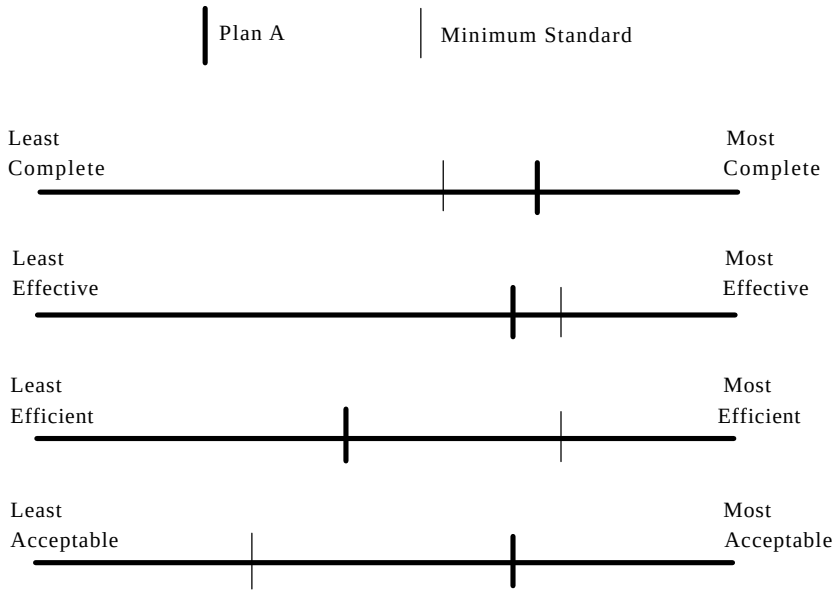
Completeness

> "Completeness is the extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects. This may require relating the plan to other types of public or private plans if the other plans are crucial to realization of the contributions to the objective." (P&G Section VI.1.6.2(c)(1))

A complete alternative is…well thought out.

A complete alternative is one that is well thought out. All the necessary implementation actions have been accounted for in the planning process. During the planning

Figure 7: Screening and Evaluation Criteria



process, before plans are likely to be complete, this criterion will be of limited use for screening.

Once plan effects have been identified, it is important to scrutinize the plan to ensure that it includes all that is necessary to realize the plan effects. This means considering those things beyond the planners' control as well as those things beyond the scope of the Corps' program and the local partner's commitment. For example, a plan that relies on a strong economy or world petroleum markets to produce all of the navigation benefits forecast is not as complete as a plan whose benefits do not depend on factors beyond the control of the planners.

To establish the completeness of the plan, it is helpful to list those factors beyond the control of the planners that are required to make the plan effects a reality. If a plan's effects, like project benefits, will not be realized unless there is a strong international economy, dredging of private berths, and relatively peaceful conditions in the oil-producing nations, these factors must be identified. The plan is not complete unless these conditions are met.

Effectiveness

> "Effectiveness is the extent to which an alternative plan alleviates the specified problems and achieves the specified opportunities." (P&G Section VI.1.6.2(c)(2))

An effective plan is responsive to the wants and needs of people. An effective plan makes a significant contribution to the solution of some problems and achieves some opportunities. In other words, it contributes to the attainment of the planning objectives.

The most effective alternatives make significant contributions to all the planning objectives. "Effectiveness," then, becomes an imprecise matter of degree. How much does an alternative contribute to how many planning objectives? The answer determines how effective an alternative it is.

In the screening process, it is often possible to identify alternatives that make little or no contribution to the planning objectives. When this is the case, these alternatives can be rejected because they are relatively ineffective. When the formal evaluation process has been completed, the extent of a plan's effectiveness may well be quantified, facilitating a more objective application of this criterion.

Efficiency

> "Efficiency is the extent to which an alternative plan is the most cost-effective means of alleviating the specified problems and realizing the specified opportunities, consistent with protecting the Nation's environment." (P&G Section VI.1.6.2(c)(3))

When you think about cost-effectiveness, don't think only about dollar costs. Costs refer not just to the number of dollars that will have to be paid to implement a plan, but to opportunities that will be sacrificed if the plan is implemented.

Efficiency refers to the allocation of resources. Are resources used efficiently in the construction of a project or the implementation of a plan? Are the outputs produced by the plan produced in an efficient manner? Are the resources that are going to be significantly affected by the plan still going to be available for efficient use by society?

The more familiar articulation of the criterion of efficiency is **cost-effectiveness**. Of all the ways of developing and implementing a plan, have we identified the lowest cost means of implementation? An obvious question is, is there a cheaper way to accomplish the same planning objectives? If there is, we do not have a cost-effective plan.

The efficiency criterion transcends the NED criterion. When all tangible/monetary and intangible/non-monetary costs are considered, do we have the plan that meets objectives in the least costly fashion? If a plan costs society the loss of some wetlands and there is another way to achieve the same objectives with no or less wetland loss, the plan is not efficient.

Efficiency must be considered in light of all opportunity costs, not just monetary costs. This makes the efficiency criterion considerably more difficult for

planning for the Corps' environmental mission, because planners may have to trade-off increased implementation costs against less environmental losses.

Acceptability

> "Acceptability is the workability and viability of the alternative plan with respect to acceptance by State and local entities and the public and compatibility with existing laws, regulations, and public policies." (P&G Section VI.1.6.2(c)(4)

If a plan has opposition…that doesn't make it unacceptable.

There are two primary dimensions to acceptability. One we call **implementability***, meaning is it feasible in the technical, environmental, economic, social, and similar senses? The other is the* **satisfaction** *it brings*. A common error that must be avoided with this criterion is the tendency to equate acceptability with the non-Federal partner's willingness to sign a Project Cooperation Agreement for the plan. It's often thought if they would sign, the plan is acceptable; if they wouldn't, it is not. This is <u>not</u> what acceptability means. If it were, there would be no need for a partnership or a planning process at all. The local partner would need only say, "this is what we want," and it would become the only acceptable plan.

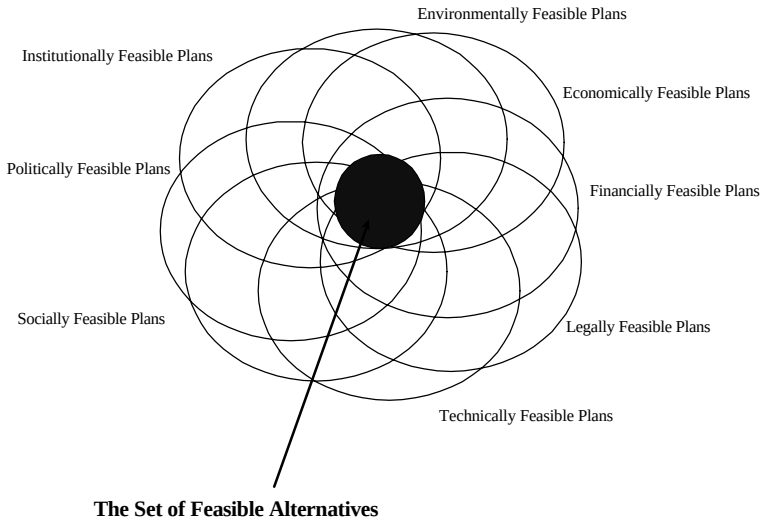
To be acceptable to state and local entities as well as the public, a plan has to be doable. There are many factors that can render a plan infeasible. These factors can generally be categorized as technical (engineering or natural world limitations), economic, financial, environmental, social, political, legal, and institutional. Figure 8 illustrates this notion of feasibility.

If a plan cannot be done for legitimate reasons, it is not feasible. If a plan has opposition or is not the favored plan of the non-Federal partner that does not make it infeasible or unacceptable. That simply makes it unpopular. If a plan requires changes in laws or authorities, that alone doesn't make it unacceptable. That only makes it difficult.

Acceptability can also be defined as the extent to which a plan is welcome or satisfactory. These are qualitative dimensions, not absolutes. If a plan is feasible in a pragmatic sense, in that it could be done, there is no objective way to determine what is welcome or unwelcome, satisfactory or unsatisfactory. This is not a pass/fail criterion.

Acceptability may be the most useful criterion for eliminating potential alternatives. In the formal evaluation stage there will be more fully developed and documented rationales for the elimination of alternatives based on feasibility. Though the satisfaction of a plan will remain subjective, sufficient measurement,

Figure 8: Screening Plans



appraisal, and comparison will have been completed to support judgments about which plans and versions of plans are acceptable enough to carry forward for further consideration.

Not coincidentally, when the team carefully evaluates a plan, they are providing a firm basis for the comparison step. The resulting information about effects will form the basis for the comparison step.

ORGANIZING EVALUATION RESULTS

Evaluation can result in a great deal of information.

Evaluation can result in a great deal of information. That information is useless unless it improves decision-making. To be most useful to decision-makers, it must be effectively organized for consideration by team members, stakeholders, the public and partnership decision-makers for use in the comparison step.

The P&G established four accounts to facilitate evaluation and the display of the effects of alternative plans. These accounts have been devised to encompass all significant effects of a plan as required by the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.) and Section 122 of the Flood Control Act of 1970 (PL 91-611, 84 Stat. 1823).

THE SYSTEM OF ACCOUNTS

The system of accounts is one way to organize and keep track of the effects of alternative plans. Think of it as a set (system) of effect categories (accounts). It's simply one way of dividing the universe of potential plan impacts into four fairly robust categories. The accounts established by the P&G include **national economic development** (NED), **regional economic development** (RED), **environmental quality** (EQ), and **other social effects** (OSE). All of the evaluated plan effects are assigned to and displayed in one of these four categories. Strictly speaking, only the NED account is required, though it is common practice to use the four-account system. A sample is shown in Table 34. Note the table title indicates a summary comparison. The comparison is to be based upon the results of plan-by-plan evaluation.

Why bother with a display like this system of accounts? Establishing the system of accounts is a bookkeeping exercise with several important aspects. First, all effects important to decision-making can be shown somewhere in the accounts. Second, NED effects must be explicitly shown because they are the basis for establishing the economic feasibility of the plan. Third, it is a rational, organized framework for presenting the results of your analysis. It also provides a handy means for readers to compare plan effects.

You are not restricted to these four accounts. If it is convenient to present a wetlands account or subaccount for a restoration study, or a water use account for a drought study, or town impacts account for a Section 14 streambank erosion study, then by all means do so. Though the four-account system is robust enough to accommodate virtually any plan effect, the P&G permit the use of any system of accounts or alternative display of plan effects as long as NED effects are displayed.

Some planning efforts such as those for military installations, for regulatory actions, and for O&M dredging, are not subject to the P&G. Nonetheless, the generic idea of organizing plan impacts and displaying them in a set of categories in which the categories are based on the specific needs of the study is not a bad idea.

National Economic Development

> "Contributions to national economic development (NED) are increases in the net value of the national output of goods and services, expressed in monetary units. Contributions to NED are the direct benefits that accrue in the planning area and the rest of the nation. Contributions to NED include increases in the net value of those goods and services that are marketed, and also of those that may not be marketed." (P&G Section II(b))

The NED account is the account that includes the estimates of project benefits and costs used to calculate net economic benefits, upon which the economic feasibility of traditional plans rests. The NED account is the successor to the historical objective of economic development that has run throughout the history of

Table 34: Summary Comparison of Detailed Plans for Duck Creek, Ohio [11]			
	No Action	**NED Plan**	**Locally Preferred Plan**
1. PLAN DESCRIPTION	No Action/Without Project Condition	Reach DC-A 25-year protection; Reach DC-B 600-year protection; & Reach DC-C 100-year protection	Sections DC-A, DC-B, DC-C Uniform 100-year level of protection
2. IMPACT ASSESSMENT			
A. National Economic Development (NED)			
(1) Project Cost (2) Annual Cost (3) Total Annual Benefits (4) Annual Net Benefits (5) Benefit to Cost Ratio	$0 $0 $0 $0 N/A Ranks 3rd	$13,895,000 $ 1,357,000 $ 1,721,000 $ 364,000 1.27 Ranks 1st	$14,817,000 $ 1,445,000 $ 1,783,000 $ 338,000 1.20 Ranks 2nd
B. Environmental Quality (EQ)			
(1) Air/Noise	Normal noise levels created by traffic, business, and industrial activities. Ranks 1st.	Temporary increased noise levels during 4-year construction period. Ranks 2nd.	Temporary increased noise levels during 4-year construction period. Ranks 3rd.
(2) Water Quality	Existing water quality is poor due to discharges into the stream from combined sewer system outfalls and flood runoff from industrial areas adjacent to the stream. Ranks 3rd.	Temporary increased turbidity levels during 4-year construction period. Contamination from flood runoff from adjacent industrial areas partially eliminated in DC-A, and fully eliminated in DC-B and DC-C. Ranks 2nd.	Temporary increased turbidity levels during 4-year construction period. Contamination from flood runoff from adjacent industrial areas eliminated for all reaches. Ranks 1st.
(3) Vegetation	Existing vegetation typical for streams in Southwest Ohio. Excellent habitat for woodland songbirds and urban wildlife. Ranks 1st.	Permanent loss of 12 acres to project features; temporary loss of 8 acres during 4-year construction period. Ranks 2nd.	Permanent loss of 13 acres to project features; temporary loss of 8 acres during 4-year construction period. Ranks 3rd.
(4) Threatened & Endangered Species	No endangered species in work area.	No impact.	No impact
(5) Aquatic Birds	Existing biological community sparse due to pollutant discharges from combined sewer systems outfalls. Ranks 3rd	Temporary decreased biota populations during 4-year construction period. Possible increase in biota population with decrease in contaminant runoff from protected industrial areas. Ranks 1st (Tie).	Temporary decreased biota populations during 4-year construction period. Possible increase in biota population with decrease in contaminant runoff from protected industrial areas. Ranks 1st (Tie).
(6) Cultural Resources & Historic Properties	No cultural resources or historic properties in work area.	No impact.	No impact.
C. Regional Economic Development (RED)	Same as National Economic Development (NED) impacts. Ranks 3rd.	Same as National Economic Development (NED) impacts. Ranks 1st	Same as National Economic Development (NED) impacts. Ranks 2nd.
D. Other Social Effects (OSE)			

Table 34: Summary Comparison of Detailed Plans for Duck Creek, Ohio [11]			
(1) Life, Health and Safety	Little or no residential threat. Commercial and industrial property with over 1,000 employees during normal shifts have continued exposure to threat of loss of life, and disruption of health & safety services. Red Bank and Madison Roads flood beginning at 25-year event. Ranks 3rd.	Provides only 25-year level of protection to area DC-A, 500-year to DC-B, and 100-year to DC-C. Red Bank Road flooded by events greater than 25-year. Madison Road will require installation of closures for 10-year floods and higher, with 3 to 4 possible false alarm closures each year. Ranks 2nd.	Provides 100-year level of protection to all damage areas along Duck Creek. Red Bank Road flooding eliminated. Madison Road will require installation of closures for 10-year floods and higher. Other false alarm closures may occur 3 to 4 times a year. Ranks 1st.
(2) Community Cohesion (displacement of people & businesses)	Future flooding and in particular, occurrence of large flooding events, could displace selected businesses over time. Ranks 3rd.	Some displacement of businesses is possible in low-level protection area DC-A. Displacement of portion of one small business by plan. Ranks 2nd.	100-year level of protection to all homes and businesses in the study area. Displacement of portion of one small business by plan. Ranks 1st.
(3) Recreation	No existing recreation facilities in the study area floodplain. Ranks 3rd.	Existing low intensity use recreation facility downstream of study area to be used for environmental mitigation site. Compatible with facility master plan. No opportunity or interest by local partners to add other recreation features to proposed plan. Ranks 1st (Tie).	Existing low intensity use recreation facility downstream of study area to be used for environmental mitigation site. Compatible with facility master plan. No opportunity or interest by local partners to add other recreation features to proposed plan. Ranks 1st (Tie).
3. PLAN EVALUATION			
A. Contribution to Planning Objectives			
(1) Efficiently reduces flood damages to maximum practical extent	Average Annual Flood Damages (AAD) are $1,844,000. No effective reduction from limited private non-structural measures. Does not meet objective. Ranks 3rd.	Residual AAD = $174,000 for a 91% reduction in AAD. Meets objective. Ranks 2nd.	Residual AAD = $113,000 for a 94% reduction in AAD. Meets objective. Ranks 1st.
(2) Provide optimum level of flood protection	Damage outputs starting at the 2-year flood level. Does not meet objective. Ranks 3rd.	Provides 25-year DC-A, 500-year DC-B, & 100-year DC-C, NED plan. Meets objectives. Ranks 1st.	Provides uniform 100-year flood protection for all reaches. Meets objectives. Ranks 2nd.
(3) Minimize environmental impacts	Existing vegetation typical for streams in southwest Ohio. Excellent habitat for woodland birds and urban wildlife. Meets objective. Ranks 1st	Permanent loss of 12 acres to project features; temporary loss of 8 acres during 2-year construction period. Temporary disturbed areas to be restored. Enhancement of offsite wildlife areas for mitigation. Contamination from flood runoff from adjacent industrial areas partially eliminated in DC-A, fully eliminated in DC-B and DC-C. Meets objective. Ranks 2nd.	Permanent loss of 13 acres to project features; temporary loss of 8 acres during 4-year construction period. Temporary disturbed areas to be restored. Enhancement of offsite wildlife areas for mitigation. Contamination from flood runoff from adjacent industrial areas eliminated for all reaches. Meets objective. Ranks 3rd.

Table 34: Summary Comparison of Detailed Plans for Duck Creek, Ohio [11]			
B. Response to Planning Constraints			
(1) Financial capability of local partners to cost-share project construction	N/A	Local cost share of $3,474,000 is within local capabilities. Meets constraint.	Local cost share of $3,704,000 is within local capabilities. Meets constraint.
(2) Institutional acceptability	Red Banks and Madison Roads flood beginning at 25-year event flood waters. Ongoing high level of flood damages not acceptable to local partners. Does not meet constraint.	Red Bank Road flooded by events greater than 25-year. Madison Road will require installation of closures for 10-year floods and higher, with 3 to 4 possible false alarm closures each year. Non-uniform level of protection not acceptable to local partners, but acceptable under Federal criteria. Partially meets constraint.	Red Bank Road flooding eliminated. Madison Road will require installation of closures for 10-year floods and higher. Other false alarm closures may occur 3 to 4 times a year. Uniform 100-year level of protection acceptable to local partners and meets Federal criteria. Meets constraint.
(3) Public acceptability	Not acceptable. Does not meet constraint.	Not fully acceptable. Partially meets constraint.	Fully acceptable. Meets constraint.
C. Response to Evaluation Criteria			
(1) Completeness	Does not meet objective.	Partially meets objective.	Meets objective.
(2) Effectiveness	Does not meet objective.	Meets objective.	Meets objective.
(3) Efficiency	Does not meet objective.	Meets objective.	Meets objective.

[11] The table is a system of accounts display taken from a Corps report. It was prepared prior to the requirements for a risk-based analysis of flood protection levels. Hence, references to 25-year protection and so on would no longer be used in such a display.

water resource development in the U.S. The NED account has been described at great length in a series of IWR procedures manuals. Two of these deal with the NED objective in an overview fashion and should be of particular interest to planners. One, the "National Economic Development Procedures Manual - Overview Manual for Conducting National Economic Development Analysis" deals with NED benefits. The other, "National Economic Development Procedures Manual - National Economic Development Costs", deals with the adverse effects of plans on the NED account.

NED Decision Criteria

Once all benefits and costs have been expressed at comparable price levels and at comparable points in time, usually average annual equivalent dollars, it's possible to calculate two different comparisons of benefits and costs.

Net benefits is defined as average annual equivalent benefits minus average annual equivalent costs. Economic feasibility requires that net NED benefits be non-negative. The NED plan is the plan that maximizes net benefits.

The benefit-cost ratio (BCR) is defined as average annual equivalent benefits divided by average annual equivalent costs. Economic feasibility requires that the BCR be equal to or greater than one. The BCR is not used to identify the NED plan.

In some cases where benefit estimates are unavailable, cost effectiveness and incremental cost analyses may be used. Cost effectiveness means choosing the least costly means of producing like amounts of output.

Regional Economic Development

> "The RED account registers changes in the distribution of regional economic activity that result from each alternative plan. Two measures of the effects of the plan on regional economies are used in the account: regional income and regional employment." (P&G Section VII.1.7.4(a)(1)).

This account is mentioned second simply because of its close relationship to the NED account. Not all economic effects, beneficial or adverse, have national implications. For example, a plan may prevent a manufacturer from leaving one area to locate in another. From a national perspective, there is no difference. The manufacturer would still be producing his wares in the U.S. From the regional

perspective the manufacturer's location will be of great importance because of the jobs, income, and tax revenues he produces.

This regional perspective…has become increasingly important to non-Federal partners…

This regional perspective, particularly as it relates to the effects of plans on jobs, income, and tax bases, has become increasingly important to non-Federal partners as they have been required to help finance studies and projects. Regional interests want to know more precisely what they are getting for their money. If an NED perspective is intended to protect the national interest in projects, it only stands to reason that as the non-Federal financial stake increases, an RED perspective is required to address the regional and local interests in a project.

There is less Corps' guidance on regional economic analysis but it is the primary type of analysis addressed in the economic literature. There are no shortages of methods, tools, or techniques for conducting RED analysis.

Environmental Quality

> "Beneficial effects in the EQ account are favorable changes in the ecological, aesthetic, and cultural attributes of natural and cultural resources. Adverse effects in the EQ account are unfavorable changes in the ecological, aesthetic, and cultural attributes of natural and cultural resources." (P&G Section VII.1.7.3(a)(2&3)

Environmental quality is the successor to the preservationist thrust that began earlier in the history of water resource development in the U.S. Consideration of EQ effects, as well as all effects on the quality of human environment, is required by NEPA 1969. Chapter III of the Guidelines is devoted exclusively to procedures for conducting an EQ evaluation. This remains the best source of a detailed description of the EQ assessment and appraisal processes for all planners. ER 1105-2-100, beginning in Section V of Chapter 7, offers additional procedures for environmental evaluation. Sections VI through IX describe ecological resources, historical preservation, aesthetic resources, and water quality and related requirements.

Other Social Effects

> "The OSE account is a means of displaying and integrating into water resource planning information on alternative plan effects from perspectives that are not reflected in the other three accounts. The categories of effects in the OSE account include the following: Urban and community impacts; life, health, and safety factors; displacement; long-term productivity; and energy requirements and energy conservation." (P&G Section VII.1.7.5(a)(1))

The OSE account lends the system of four accounts the flexibility to address any effects that are judged significant by any stakeholder, if the planning team so desires. This is the account that reflects anything that affects the well being of people. All the difficult issues of equity, income distribution, fairness, and the like are included here.

Less has been written about OSE evaluation procedures than any other account. Most of what has been written on this topic with regard to water resource projects dates back to the late sixties and early seventies when inclusion of well-being as a national objective was being debated. One of the best sources for Corps planners is the "Proceedings of the Social Scientists Conference, Memphis 20-24 September 1976" produced by IWR in two volumes dated December 1977.

DISPLAYING EVALUATION RESULTS

The P&G, in Section VIII, provide some general guidance on the nature of graphs, tables, drawings, photographs, summary statements, and other graphics used to analyze and compare plans. Conciseness and clarity are prized most of all. Displays of evaluation results should make the plans' contributions to solving problems and seizing opportunities clear. The plans' effects presented in the system of accounts should ideally relate to the plans' contributions to planning objectives. The effects of the plans should be so arranged that the differences among the plans will be evident for the comparison of plans that is to follow the evaluation step.

Conciseness and clarity are prized most of all.

The P&G empower the agency to define report content and format. However, they require (1) a clear description of existing and forecast conditions without the plan in place; (2) alternative plans fully described in terms of their component measures, NED effects and other significant effects; (3) the effects of the recommended plan on natural and cultural resources displayed in detail; (4) a matrix showing other projects or actions related to the recommended plan; and, (5) a description of the formulation process. How to tell your story is discussed at length in the last chapter of this manual.

SUMMARY AND LOOK FORWARD

Lesson One. Evaluation comprises an objective assessment of plan effects and a subjective appraisal of the assessed effects.

Lesson Two. The first goal of evaluation is to qualify plans for further consideration. The second goal is to facilitate the eventual comparison of plans. Plan evaluation provides the basis for reducing the set of potential alternative plans to a set of finalists.

Lesson Three. A most likely with-project condition is described for each alternative plan. Effects are evaluated on the basis of a without- and with-project condition comparison.

Lesson Four. Detailed evaluation procedures have been developed for many NED, EQ, and physical effects of plans.

Lesson Five. The four accounts provide a detailed and flexible framework for identifying and summarizing plan effects.

Once plan effects have been evaluated and displayed effectively, they must be compared so planners can identify and describe significant trade-offs to decision-makers who will select the best plan.

SUGGESTIONS FOR FURTHER READING

The various disciplines used in planning provide guidance on how to evaluate specific types of plan impacts. For example, there are countless books and articles discussing the estimation of regional economic development impacts. As it turns out, the discipline based literature is often the best place to look for more help on evaluation of impacts.

The water resources planning literature cited at the end of Chapter Two provides some discussion of these concepts in a water resources context. There is relatively little substantive content found there, however. Don't overlook the possibility of finding something good in a Corps report. If you get a chance to thumb through some reports, look and see how they handled the evaluation of plans. Good ideas are worth repeating.

CHAPTER TEN: STEP FIVE - COMPARING ALTERNATIVE PLANS

"Nothing is good or bad but by comparison." Thomas Fuller (1608-1661), English cleric.

"Step Five: Comparison of alternative plans." (P&G Section III.1.3.2(a)(5))

INTRODUCTION

The best plan can not be selected from among a set of good plans unless we have some way to compare them. *It is only by comparison that a plan is no longer good enough, or that a good plan becomes the best plan*. The purpose of the comparison step is to identify the most important criteria plans were evaluated against and compare the various plans across those criteria. Ideally, the comparison of plans concludes with a ranking of plans or some identification of the best course of action for the decision-makers. The comparison method must be transparent. That is, it must be easy to explain and easy for the public to follow and understand.

When all the important plan effects are measured in the same units, like dollars, the comparison can be simple. Financial decisions are often based on choosing the alternative with the largest net benefits or smallest total cost. More realistically, plan effects will be measured in a combination of dollars, habitat units, housing relocations, water quality changes, noise levels, navigation safety, changed erosion rates, or a host of other units, tangible and intangible. When that happens, planners have to advise decision-makers about **trade-offs**, i.e., **value judgments**. That's the hard part of comparing alternative plans.

Value judgments are made throughout the planning process. They are made throughout all screening activities. But, they take on special significance in the last three steps of the planning process as the study team, decision-makers, and other stakeholders move toward selecting the best most likely alternative future for a society. These value judgments are first made about the individual plan in evaluation. Is it good enough to warrant further consideration? The next step is to make a value judgments across all the plans. This is the comparison of alternative plans, the subject of this chapter.

STEPS RUNNING TOGETHER

As a practical matter, it is very difficult to neatly separate evaluation from comparison from selection, as the discrete chapters on each might imply. These three steps overlap, run together, and are in practice, most often indistinguishable from one another. They are discussed separately so the tasks can be clearly understood. The execution of these steps is much messier. So, if you find it difficult to separate these three steps in practice, relax; that's a good sign.

When more than one plan is being evaluated, it's impossible, in fact it's undesirable, to evaluate without comparing. Deciding whether a plan is good enough to qualify is a lot easier when we have some basis for comparison. As plans are being compared, some of them are being dropped from further consideration even though they may have been judged good enough to make it this far. That is selection. The planning team is selecting sets of plans to advance to the final rounds.

At this point in a planning study the steps seem to be all running together, and it is difficult to distinguish one activity from another. That's okay. What is important is that plans are evaluated, compared, and selected. What it looks like when you're doing it is unimportant. If the steps of the planning process seem to all be bleeding together at this point, let it bleed.

COMPARISONS OF WHAT?

Evaluation identifies the most important effects of your plans. These effects now need to be compared among plans. Comparison at any stage in the planning process should be based on the evaluation criteria at that same stage of the planning process. In other words, when you are looking for ways to compare plans, the place to look is at the plan impacts that were identified in the evaluation step. Comparison is based on the different contributions of the alternative plans to planning objectives and constraints, NED benefits and costs, environmental compliance requirements impacts, other plan impacts that are important to stakeholders, and the P&G screening criteria of completeness, effectiveness, efficiency, and acceptability. These are the things being compared. Water resources studies will involve different combinations of these impacts from those that the Corps' non-water resources studies will.

In an ordinary planning study it would not be unusual to have evaluated dozens of different impacts. Not all of them are equally important. For example, the Endangered Species Act requires the Corps to consider impacts on threatened and endangered species. Therefore, this should be an evaluation impact. If there are no threatened and endangered species impacts, then this is not important to the decision-making process, but it is important to say so.

"What should be compared?"

The answer to the question, "What should be compared?" is, compare the project impacts that will affect decision-making. These are the important impacts. Not all impacts evaluated will be equally important. It is the planning team's job to determine what subset of the evaluated plan impacts are important to compare. Importance depends on policy, partners, and the public.

Law and policy determine importance. For example, a civil works plan comparison should certainly include net NED benefits or incremental NED costs. That is a requirement. The Federal and non-Federal partners also get to say what they think is important.

The values and issues important to stakeholders and the public will also determine which impacts are important to plan comparison. If the planning team thinks the effects of ship wakes on erosion rates is a negligible factor, but it has been the number one topic of concern at public meetings, then ship wake erosion rates are important.

Comparisons are easier to make and easier to explain when fewer things are being compared. The trick and the challenge is to identify and compare all the important plan impacts, but only the important impacts. One starting point for determining importance would be to include those impacts that everyone on the study team agrees are important. Another could be to pretend you are the District Engineer or the non-Federal partner; what do you want to know before you sign the report? What is the public going to want to know about the plan before they support it? All other plan effects should be debated heartily and included only when persuasive, though not necessarily unanimous, arguments can be advanced.

Primary Methods of Comparison

Economic factors are a primary means of comparison. Any traditional water resources plan will require some sort of NED analysis. In most studies, that will mean a benefit-cost analysis in which net benefits, not benefit-cost ratios, are compared. For environmental and other projects where NED benefits are not estimated, the incremental cost of plans will be compared. Financial costs of plans will also be a component for virtually any planning effort, including military and other non-civil works planning.

COMPARING EFFECTS

Not to overlook the obvious, **comparing plans** *means looking at them and identifying differences among plans*. Plan A has lower net benefits than B. Plan B creates more wetlands than A or C. Of the five plans, Plan D has the highest costs. These are the types of comparisons that should be evident if the evaluation step of the planning process has been successfully completed.

When plans have different impacts, selecting Plan A rather than Plan B means foregoing the future Plan B would have offered. In other words, selecting Plan A means a future with fewer wetlands. Thus, pointing out the important differences among plans is not a trivial step.

It really is not so difficult to identify differences among plans once the planner has identified the important impacts to consider. The difficult part comes in weighing those differences, as when one plan contributes more to one objective and less to another. Suppose, for example, two plans have identical NED contributions and one creates more wetlands while the other protects bottomland hardwoods. Which is better? How do you compare things that are not comparable?

The NED Plan

Good planners do not formulate an NED plan. Good planners formulate plans that meet objectives and pass the screening criteria. Then an NED plan is identified from this set of objective achieving, complete, effective, efficient, and acceptable plans.

The NED plan is the NED plan only by comparison. A good planning process assures the NED plan is derived from a set of plans that make significant contributions to other planning objectives and screening criteria. Designation of the NED plan is one of the more significant outcomes of the comparison step for civil works projects.

COMMENSURABILITY

Ideally, we'd like an evaluation process that quantifies all plan impacts. When all impacts are quantified in the same units, they are said to be **commensurable**. Dollars, used to quantify benefits and costs, are the most widely used commensurable units of measure.

If all the important impacts of a plan to be compared are commensurable, the comparison of plans is simple and very transparent. You simply add or subtract all the impacts and identify the maximum or minimum value, depending on the situation, as the best of the plans. Such comparisons are easy to explain to the public and they have no trouble understanding the identification of the largest or smallest number.

For example, many private business decisions are based on profitability. It is a rather simple matter to add all the revenues and subtract all the costs to arrive at a most profitable option. The outcomes of some Corps studies may be determined purely on a financial basis. Others may be determined on environmental or other bases. These will be relatively rare instances.

INCOMMENSURABILITY

The more frequent situation will involve plans whose important impacts reflect a wide variety of concerns. There may be NED net benefits, construction noise disruption of migratory waterfowl, potential future oil spills, ship wake impacts on shoreline erosion rates, and so on. Although all the impacts can be quantified, there is no one unit of measure that can be used to quantify all of these impacts. Hence, there is no practical and transparent way to add or subtract these impacts and declare one plan better than another.

...incommensurability...makes comparison difficult.

Incommensurable plan impacts are more the rule than the exception. It is incommensurability that makes comparison difficult. *Pointing out the differences is easy. Weighing and trading-off those differences is the hard part.*

METHODS OF COMPARISON

Comparison, like all the planning steps, is an iterative process. Comparison of plans during early iterations can be quite abbreviated. Plans are often compared without a formal analysis. Ranking plans as better or worse, identifying plans that result in more or less effects of interest can be sufficient in early iterations. As the planning process moves toward a final array of plans, the comparison must be more formal and analytical to ensure that plans are responsive to the needs of the public.

There are many comparison methods that can be used early in the planning process. **Simple description** is perhaps the place to begin. Identifying differences that are important and pointing them out is the simplest form of comparison. For example, the NED section of Table 35 compares net benefits by a simple ranking from first to second.

Early in the planning process when the varying plan impacts are being explicitly compared, it can be convenient to rank impacts. The **rankings** can be from 1 to n, where n is the number of alternatives being compared. This is simple description and it can be used no matter what the unit of measure is for the impact being compared. Once the various differences have been described it may be possible to identify the plans from best to worst. For example, if one plan dominates all others by being first in every important impact category, it's the best plan. A plan that is last in all categories is the worst plan. *If a simple comparison clarifies the choices, don't use anything more complex*. This is another transparent comparison process.

Simple weighting is a more sophisticated approach to the comparison of plans. It's used when there are no dominant plans, and it's the simplest way to make trade-offs. Trade-offs are necessary when, once the important impacts of a plan are identified for comparison, one plan scores well on some impacts and not so well on others. For example, Plan 1 may be less costly but it destroys more wetlands, while Plan 2 is more costly and actually creates some wetlands. If costs and wetlands are both important, how can you compare plans like this?

One way to make trade-offs is to create a commensurable metric, we'll call a **ranking index**. First you describe the differences in plans and rank each plans' contribution to that impact. For example, if there are five (n) plans, the highest ranking plan on any impact gets 5 (n) points, the second best gets 4 (n-1) points, and so on through the last plan which gets 1 point. If all criteria are equally important, it's sufficient to sum the points to rank the plans.

In order to make the trade-offs someone must say what the relative importance of the impacts is. This can be done in a variety of ways. The easiest is to allocate 100 points (i.e., 100 percent) to the array of plan impacts being compared. Thus if we have only cost and wetlands we might say that cost gets a subjective weighting of 75 points and wetlands gets 25 points.

The simple weighting for this plan is shown in Table 35.

Table 35: Simple Ranking Index

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Plan	Cost Rank	Cost Points	Cost Weight	Wetland Rank	Wetland Points	Wetland Weight	Ranking Index
A	1	2	75	2	1	25	175
B	2	1	75	1	2	25	125

The ranking index is given by:

$$\text{Ranking Index} = \Sigma_i \Sigma_j p_{ij} w_i$$

where p is the number of points awarded plan i for impact j and w is the weight for impact j. In other words multiply the points by the weight for each impact and add them up for a plan. In the example, the index is columns 3 x 4 plus columns 6 x 7.

This is a simple process and it is transparent insofar as it's easy to show how the index was derived. It is fundamentally a subjective process, however. It would be misleading and a mistake to lead anyone to believe there was any science behind the ranking index. It is, however, a simple way to reflect value judgments.

This simple weighting may be well suited to military studies and other efforts with a relatively circumscribed number of "publics" to satisfy and little controversy. The method can work in civil works studies, but its subjectivity can become an issue. For example, if we flip-flop the relative importance of wetlands and cost in the example above, the ranking indices flip-flop as well. When results are very sensitive to the weights assigned, this method might be less than transparent.

Figure 9 shows an **effects matrix**, an adaptation of the simple weighting method. The columns of the matrix are alternative plans. The rows show important impacts to be compared, i.e, planning objectives and the like. Each cell is divided by a diagonal line. Above the line is the measure of the impacts. A 1-to-10 scale has been used in the example to indicate the relative magnitude of the effect (or attainment of the objective). The 1 to 10 scale is an alternative to ranking projects as was done above. It allows finer degrees of differences in plan contributions. Plans 1 and 2 are equal in terms of their first two impacts, so questions of how to handle ties are easily resolved.

Figure 9: Effects Matrix

Objective/Effect	Plan 1	Plan 2	Plan 3	Plan 4
Reduce Flood Damages	+ 7 / 8	+ 7 / 8	+ 6 / 8	+ 8 / 8
Reduce Potential Loss of Life	+ 2 / 10	+ 2 / 10	0 / 10	+ 3 / 10
Maintain Fish & Wildlife Habitat	-3 / 7	0 / 7	+ 1 / 7	+ 2 / 7
Enhance Open Space Land Use Opportunities	-1 / 2	+ 1 / 2	+ 3 / 2	-2 / 2
Minimize Relocation of Homes & Businesses	0 / 5	-4 / 5	0 / 5	-6 / 3

In addition, the range of differences is more flexible. Under a ranking rule, the range in points awarded would be from 1 to 4. With a scale like this, the difference can be less as for the reduction of flood damages (3 points) or more as for relocations (6 points). The numbers may be positive or negative, depending on the nature of the impact.

Below the line another number from +1 to +10 is entered to indicate the relative importance, or weighting, of the plan effect to be compared. In both cases, 10 indicates the extreme value. Different interests may

Different interests may have differing opinions...

have differing opinions about the relative importance of plan effects. This matrix may be used as a summary or it can be used to calculate ranking indices as was done above. In that case, the ranking indices for Plans 1 through 4 would be 53, 58, 61, and 86 points, respectively. It is important at this point to bear in mind that these numbers are just information. They are not decisions. They reflect the judgments of the planners, who must deal with the potentially disparate points of view on plan effects, and they reflect what looks best based on that set of judgments.

There is nothing magical or scientific about these comparison methods. Other qualitative values may be used. High, medium, and low judgments could appear above the line. Very important, moderately important, and unimportant are examples of value judgments that could appear below the line. It becomes more difficult to trade-off such values, but the option does exist. If it works and it is transparent, use it.

There are more formal comparison methods. One commensurable set of methods includes **monetary evaluation methods**. These methods have focused on refinements of benefit-cost analysis and **cost-effectiveness** and make comparison a simple and straightforward matter. The range of methods is presented as a continuum in Figure 10. To be useful in multi-impact plan comparisons, it must be possible to reduce important plan impacts to monetary terms. This is clearly not possible at the present time, and many would argue it is not even desirable. Nonetheless, monetary evaluation methods, such as traditional NED benefit-cost and **net benefit analyses**, incremental cost analysis, life-cycle costing, and payback period analyses still play a critical role in the comparison of alternative plans.

Multi-criteria evaluation methods (MCEM) comprise another class of methods that can be used when it is either not possible or not desirable to express all plan effects in a single metric, such as dollars. Thus, more than one evaluation metric can be considered with these methods. The strength of these methods is that they enable planners to take into account a whole gamut of differing but relevant criteria when comparing plans. On the basis of this idea of multi-dimensional compromise, a series of MCEMs have been developed in recent years. Many of them are quite complex and we can do little more here than provide the briefest of overviews and a reference for further details. Their major difficulty is that they are not all transparent methods. Some are neither easy to explain nor easy to understand.

Trade-off analysis[12] is an MCEM method commonly used by the Corps. It can be as simple as the methods described above or as complex as you want to make it. In the least structured applications, this method frequently relies on professional judgment. Planners trade-off plans' various contributions to

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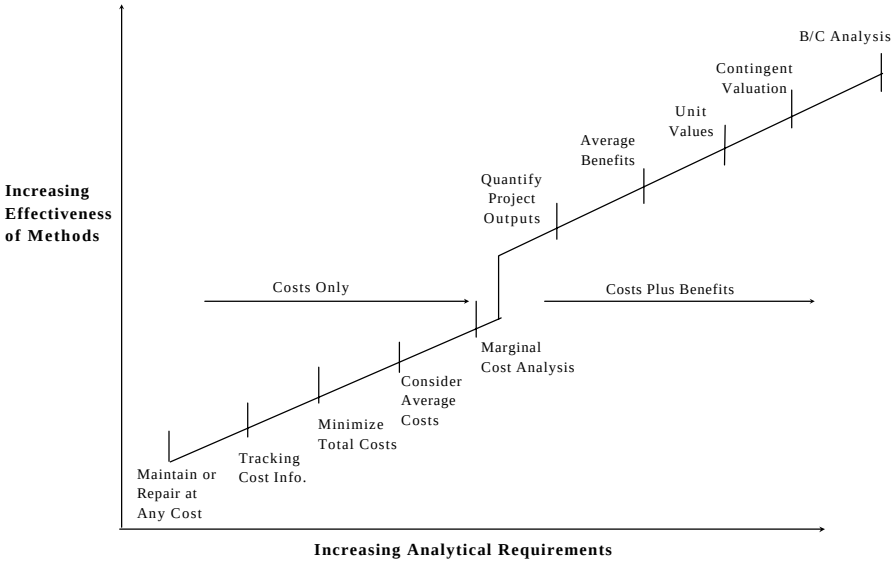
[12] See Edmunds, E. and J. Letey, *Environmental Administration*, McGraw-Hill, New York, 1973 for a discussion.

Figure 10: Monetary Evaluation Methods



objectives based on their accumulated technical expertise, general experience, and specific knowledge of the study area, including stakeholder views and values. In essence, planners sit down and decide a plan with "a little more of this" is better than a plan "with a little more of that." The trade-offs tend to be subjective.

There are a great many other trade-off methods. **Multi-dimensional scalogram analysis**[13] is a generalization and extension of the ranking index, also known as the **goals-achievement method**,[14] presented above. **Correspondence analysis**[15] is a method of pattern recognition between alternatives with different characteristics. Using a **principle component analysis** of the row and column values in a plan-effect matrix,[16] similar to that above, the relationships between certain

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[13] See Hill, M. and Y. Tzamir, "Multi-dimensional Evaluation of Regional Plans Serving Multiple Objectives," *Papers of the Regional Science Association*, vol. 29, pp. 139-165, 1972.

[14] See Hill, M. "A Goals-Achievement Matrix for Evaluating Alternative Plans," *Journal of the American Institute of Planners*, vol. 34, no. 1, pp. 19-29, 1968. Also see the Regional Science Institute's *Planning for Multiple Objectives*.

[15] See Spliid, I. "Use of Correspondence Analysis in a Planning Procedure for Local Governments," Paper Third Advanced Karlsruhe Summer Institute in Regional Science, Karlsruhe, 1974.

[16] In such a matrix, the plans form the columns (or rows) and the measured impacts form the rows (or columns). Each cell is a specific measured impact for a plan. Qualitative variables must be converted to nominal numerical values.

decision criteria and alternative plans can be examined on the basis of clustering procedures. Conclusions can then be inferred about the desirability of plans.

A **discrepancy analysis** sheds some light on the relative merits of a certain alternative, like the NED plan. This approach measures the difference between the NED plan and every other plan. Ranking the discrepancies among the other plans, a Spearman rank correlation coefficient can be used to establish an ordering of plans.[17]

Concordance analysis consists of **pairwise comparison** of alternatives. In the **analytical hierarchical process** (AHP)[18] the objectives are assigned subjective weights and the extent to which plans contribute to these objectives is resolved on the basis of a pairwise comparison of all plans. Indices reflecting these weights are generated and can form the basis for ranking alternatives.

These concordance analysis processes have become very accessible in recent years with the development of user friendly software like Expert Choice and Logical Decisions. They are recommended as reasonable methods for dealing with multi-objective decision-making. They offer tremendous advantages for sensitivity analysis and are powerful tools. However, they are not going to be transparent methods of comparison as far as the public is concerned.

Additional methods include the **dominance criterion**, **maximin criterion**, **maximax criterion**, **conjunctive method**, **disjunctive method**, **lexicographic method**, **elimination by aspect**, **simple additive weighting**, **weighted product**, **TOPSIS**, **ELECTRE**, and the **median ranking method**. A description of these methods and a good list of references can be found in Yoon and Hwang's 1995 monograph *Multiple Attribute Decision-Making, An Introduction*.

Despite the abundance of multi-criteria evaluation methods, trade-off analysis based on professional judgment remains the most common method. If comparisons based on seat-of-the-pants methods like this yield the best plan, there is no need for anything more complex.

WHAT ARE COMPARISON RESULTS?

First, when dealing with NED-oriented planning efforts, a true NED plan must be identified. Second, the comparisons should be made explicit. **Simple comparisons** can be straightforward statements like "Plan A is best because it maximizes net NED benefits." Simple comparisons will be more appropriate for early

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[17] Nijkamp, P. "Stochastic Quantitative and Qualitative Multi-Criteria Analysis for Environmental Design," *Papers of the Regional Science Association*, 1977.

[18] See Saaty, Thomas L., Luis G. Vargas, and Kevin P. Kearns, *The Analytical Hierarchy Process* 4 Volume Set.

planning phases and more abbreviated planning processes. More **complex comparisons** will offer either objective or subjective rankings of the final array of alternatives. These comparisons, whether simple statements or complete rankings, effectively represent the study team's advice to decision-makers based on stakeholders' views and the team's experience throughout the planning process.

Third, the comparisons must be objective. Despite our attempts to present the planning process as a scientific journey of discovery, the reality of the situation is that some studies begin with a **favored alternative**. In others, a favored alternative can emerge at any point in the study. There is nothing inherently wrong with the appearance of a favored alternative on the planning scene.

A problem arises if the planning process is manipulated to justify the selection of a favored plan. If the planning process is conducted in a professional, conscientious, and thorough manner, and the favored plan prevails, then it was clearly favored for good reason. However, the planning process must be objective. Favored plans can persist only when they are the best alternative from among a strong set of alternatives. To assure the integrity of the planning process, a rigorous comparison of plans is essential.

COMMUNICATING RESULTS

…tell people which plans are best and why.

If the comparison involves professional judgment and trade-offs among values they won't necessarily be obvious to everyone. The planning report must be able to tell people which plans are best and why. *The comparison should be transparent*. The planner is once again a story teller. How did you compare the plans to one another? What things did you look at? Which were most important? Why? How did you rank the plans? What were your criteria? What trade-offs are worth making? Why do you feel that way?

Rather than rely on stiff report-style writing, try to tell a story with a beginning, a middle, and an end. Tell the reader how it happened. Write so readers can understand. Save the details for appendices. See Chapter Fourteen for a discussion of how to tell your story.

SUMMARY AND LOOK FORWARD

Lesson One. Plan evaluation determines whether a plan is good enough to consider for implementation. Plan comparison rates all the plans considered for implementation against one another based on the most important impacts identified in the evaluation process.

Lesson Two. Comparisons can be qualitative or quantitative, simple or complex. There are many ranking techniques available. A trade-off analysis based on professional judgment is most often used. Use a transparent method.

Lesson Three. The NED plan arises from the comparison of plans.

Lesson Four. Finally, the comparison results should rate or rank the plans, identifying the best plan and the reason(s) it is best.

Though planners may do an exemplary job throughout the planning process, up to and including ranking the plans, decision-makers still select the plan for implementation. Selection of the recommended plan is the subject of the next chapter.

SUGGESTIONS FOR FURTHER READING

As is so often the case, relatively little has been written explicitly about this step of the planning process. There is some material found in the water resources planning references following Chapter Two. A great deal more has been written about the so-called multi-criteria evaluation/decision models. Suggestions for further reading about these models have been included at appropriate points in the footnotes of this chapter. Although these articles are good, many are dated and some are quite difficult to read if you are not familiar with the literature. Perhaps a better place to start is with Yoon and Hwang's monograph. It is informative and has a wealth of further references.

CHAPTER ELEVEN: STEP SIX - SELECTING RECOMMENDED PLAN

"Given a set of viable action alternatives," the analyst assures us, "I'll assist you in selecting the best choice or I'll recommend the best solution." From Milan Zeleny's *Multiple Criteria Decision- Making*, p. 100.

Step 6: Selection of a recommended plan based upon the comparison of alternative plans. (P&G Section III.1.3.2(a)(6))

INTRODUCTION

If something is going…we assume it will be the NED plan.

Planners do the analyses and may make a recommendation, but the decision is not theirs to make. The selection process begins with the assumption that doing nothing is best. The no-action alternative is the default decision for every planning effort. The only reason to do anything is if it is better for society than doing nothing. If something is going to be done for water resource plans governed by the P&G, we assume it will be the NED plan. If anything but the NED is recommended or selected, there have to be good reasons for doing so. Planning that does not require NED analysis will default to other actions. That is the selection process. Some details follow.

THE PURPOSE OF SELECTION

Selecting a recommended plan is the decision-making stage of the planning process. The planners are not necessarily the decision-makers, and their recommendations may or may not be followed.

The purpose of the selection step is to try to purposefully choose the best alternative future path for society. In practical terms, the P&G have established a rather straightforward method for doing that. *The first choice is do nothing. The second choice is to implement the NED plan. The third choice is to do something else*. There must be good reasons for the final selection.

NO-ACTION

NEPA regulations (40 CFR 1502.14(d)) require that no action always be considered a viable alternative in any final array of plans. The no-action plan is the default choice. The planning process is, in a sense, built on the default assumption that the Federal agency should do nothing. The Federal agency should become involved in

a project of some type only if doing something is better for society than doing nothing. Hence, the planning process must convincingly establish that Federal involvement in some project is preferred over no action. Do not overlook the importance of the first decision to be made at this step, should something be done?

THE NED PLAN

The NED plan…must be presented.

After the "no-action" alternative is rejected, the selection criteria are policy matters that vary by program and that change over time. *For water resource planning, the P&G provide that the NED plan is the default "action" plan*.

One of the plans formulated must be designated the NED plan. An NED plan is not formulated. Instead, plans that meet the planning objectives are formulated. From among these, one is designated the NED plan based on the comparison of the plans. The NED plan is the plan that maximizes the excess of NED benefits over NED costs, i.e., it maximizes net NED benefits. *From a Federal perspective, the NED plan is the preferred plan because it makes the greatest contribution to the one Federal objective*. This means that if you decide to do something, it's assumed you will implement the NED plan.

The NED plan is the only plan that must be presented in detail. Although only one plan must be described, that does not mean only one plan is considered. It would never be appropriate to consider only one plan.

There is More than NED

With the current emphasis on the NED plan some planners think their only goal is to find the plan that maximizes net NED benefits. Nothing could be further from the truth.

It bears repeating that plans are not formulated to maximize NED benefits. Plans are formulated to meet planning objectives. An array of plans is developed and the one of these that maximizes NED benefits is designated the NED plan. Corps planning is objective oriented, not NED oriented.

THE LOCALLY PREFERRED PLAN

Frequently, the non-Federal partner will find it in their interest to pursue a plan that sacrifices some NED net benefits for additional contributions to other planning objectives. Clearly, if a plan is complete, effective, efficient, acceptable, and it meets local needs better than the NED plan, it deserves serious consideration for selection and implementation. An NED plan may contribute less to or to fewer planning objectives than another plan. The non-Federal partner may have a strong preference for another plan or may weigh the trade-offs among plans differently. When the non-Federal partner prefers a plan that is not the NED plan, that plan is designated the **locally preferred plan**.

"Buy-downs"…are…normally granted deviations.

Current Corps Civil Works policy allows deviation from the NED plan when there are overriding and compelling reasons for doing so. The locally preferred plan may be more or less costly than the NED plan. "Buy-downs," i.e., the preference for a plan less costly than the NED plan, are, according to Corps guidance, normally granted deviations. "Buy-ups" or larger, more costly plans are exempted from the NED preference if the non-Federal partner bears all the costs in excess of the NED plan costs. A larger, more costly plan must have outputs similar in kind and equal to or greater in magnitude than the NED plan to be selected. In such a case, the NED plan is important because it determines the basis for plan cost-sharing.

DEFAULT ACTIONS IN THE ABSENCE OF AN NED PLAN

Not every kind of planning the Corps does results in an NED plan. Ecosystem restoration does not result in an NED plan. The selection criteria favor a plan that is cost effective and that subjectively maximizes net benefits through an incremental cost analysis. Such a plan is essentially NED in spirit, but it is not a traditional NED plan.

Military planning is not NED-oriented. Corps planners are not always involved in the military planning process from the beginning. In these cases, the default action plan is usually the plan of action preferred by the installation commander requesting the study. This may be a plan initially conceived in a master plan, or a plan that has evolved from a planning process by installation personnel or their contractor. Frequently, planners get involved primarily to assist this default plan through the NEPA evaluation process. This default plan may be preferred to any other action plan until the superiority of an alternative can be established.

In many other types of planning the default action plan, absent some form of benefit-cost analysis, is the most cost-effective plan that reasonably meets the planning objectives and constraints. This is not the same as saying the cheapest plan is the default action. All viable plans must obtain a minimum level of achievement when measured against the planning objectives and constraints. Of those plans that warrant consideration for selection, the least costly is the default choice. Again, this does not mean it is chosen. It simply means that it sets the standard for choice. If a more costly plan is chosen, incurring the extra cost will presumably be justified on the basis of other value trade-offs.

WHO SELECTS THE PLAN?

The **principles of the partnership** are the decision-makers who will make the selection of a recommended plan. Their actual identity will vary from study to study. The Corps' decision-making process is hierarchical, as one would expect in a military organization. The decision process can, however, be bottom up or top down.

In a bottom up process, the study team makes the first judgment about which plan is best in consideration of all the analytical results and with substantial support of the stakeholders. The team then embarks on a journey of presentation and persuasion in which they advise their supervisors, the non-Federal partner, and the District and Division Engineers of the study findings and recommendations. The process proceeds through Corps Headquarters to the Secretary of the Army and the Office of Management and Budget where formal, final approval is provided or denied by the Federal partner. Alternatively, the decision may be top down, made by the senior managers of the Federal and non-Federal partnership agencies. The locally preferred plan, for example, may be selected by the non-Federal sponsor over the team's recommendation of the NED plan.

The decision-makers who select a plan from among the final set of alternatives are not the planning team. The planning team does the planning, makes its recommendation and sets its results before the decision-makers. The comparison of plans in step five represents the team's de facto recommendation. The decision-makers review the team's work and make a selection from among the final set of plans, either confirming the team's judgment or providing their own, which may lead to a different recommendation.

…decision-makers may or may not agree with the study team's findings.

If the planning team has had access to the key decision-makers and has communicated with them throughout the planning process, the evaluation and comparison of plans will reflect the decision-makers' views. In other cases, the decision-makers priorities may not be explicitly known. Their positions tend to be much more susceptible to political winds that can change serendipitously. When this is the case, decision-makers may or may not agree with the study team's findings. The decision-makers may select any plan from among the final array for implementation or they may offer their own alternative.

If decision-makers concur with the judgments of the study team's evaluation and comparison, the reasons for the selection will be evident. If they disagree and recommend another plan, they should provide their rationale for doing so. *A rational planning process should lead to rational results*. From the vantage point of the decision-makers, the study team may have been unaware of

certain external considerations, for example, changing political climates and changing priorities. Decision-makers may differ in the significance they attach to the various planning objectives. These rational reasons for deviating from the study team's findings should be documented in the description of the plan selection.

Planners, don't take it personally if your favorite plan is not selected. Your job is to give good advice. Decision-makers select the plans.

…don't take it personally if your favorite plan is not selected.

THE CHOICE SET

In the final iteration of the planning process, decision-makers are presented with a final array of plans that have been compared. These are the plans that have survived all previous iterations of the planning process. They have all been assessed and appraised and found to be complete, effective, efficient, and acceptable. *Any of them is a viable candidate for implementation*.

The final array may consist of different alternatives or it may now be down to several versions of a single alternative. There is nothing wrong with a final array that consists of more or less of a single alternative as long as this array emerged from thorough and rigorous formulation, evaluation, and comparison processes that weeded through a wide range of alternative measures.

SELECTION CRITERIA

The P&G's selection criteria is very clear. If you're going to do something, choose the NED plan unless you've got a really good reason not to! To choose a plan other than the NED plan, the decision-makers must offer a convincing rationale that the NED gains sacrificed or the additional NED costs incurred by deviating from the NED plan are more than offset by the other plan's contributions to other planning objectives.

It is widely recognized that not all important project outputs are commensurable in dollar terms. Beneficial effects of ecosystem restoration projects need not, in fact cannot in most cases, be expressed as NED benefits. In the absence of NED benefit estimates, cost-effectiveness, i.e., attaining the given outputs at the lowest possible cost, remains an important NED-related criterion. In the case of some environmental projects, cost-effectiveness extends all the way to an incremental cost analysis. Although an analysis of NED costs and any important NED benefits is still required, the NED plan is not identified in an

ecosystem restoration study. The selection criteria for these planning activities are based on contributions to planning objectives other than NED.

There is no way to escape the reality of the central importance of the NED objective. It is mandated for the Corps' water resources program. However, NED effects are not the only effects and planners and decision-makers both must bear in mind the leeway they do have to deviate from selecting the NED plan.

In other studies NED is not often a relevant concern. Absent an NED-driven planning study, the changes in the selection process are minor. Presumably, it will always make sense to maintain a no-action alternative, regardless of the planning effort. Likewise, if action is to be taken, then cost effectiveness will always be an important criterion. Ultimately, however, the selection criteria will be determined on a case-by-case basis.

DOCUMENTING THE SELECTION

A repeating theme in the last few chapters is the importance of documenting the decision process. Problems, opportunities, existing conditions and forecasts can be described with facts and data. They are easier to document than a rather circuitous decision process. Nonetheless, it is absolutely essential that the decision process be carefully and adequately described. Explain what was done and why. Tell your story as simply as possible and no more simply than that.

WHY PLANS FAIL

Many plans have been produced and never implemented. Plans sometimes fail simply because the obstacles to implementation could not be overcome. *There are four main reasons why plans fail*. These reasons generally are associated with poor planning.

The first reason is not complicated: the **plan is flawed** *and should not be implemented*. Not all plans are good plans. The planning objectives may have been incorrect. Planners may have misunderstood the problems or needs of the community. The plan may have been incomplete, not having anticipated that some things necessary for implementation were not possible. It may have overlooked laws and be illegal to implement.

There could be errors in the cost or benefit estimation. The plan could just be a bad idea. Flawed plans emerge from a flawed planning process. This is an avoidable error. The Corps' six-step planning process provides a formal framework that, if followed carefully, should avoid flawed plans.

The second reason plans fail is that during the time between plan selection and implementation, **circumstances change**. Financial and economic circumstances may be different. National priorities change, as can be seen in the history of water resource development. Problems and opportunities change and so might the objectives of locals.

Key supporters leave. Stakeholders change position, or special interests gain power. Public attitudes can change. Events like a dam failure may give opponents a rallying point. Alternative uses for resources may arise. Any of these can be enough to turn support into opposition. The Corps' iterative process can be very responsive to changing circumstances and its reevaluation reports are specifically to consider such changes in conditions.

Public attitudes can change.

A third reason plans fail is that they are **never funded**. We live in a world of increasingly scarce resources of all types and at all levels of government. A perfectly good plan with strong support may not be implemented because one of the partners is unable to provide their share of the financing. This may be due not so much to changed priorities as to higher priorities. There may be better plans to be funded, though this one is good. There may be other human wants and needs that require attention and funding first. There is rarely enough money to do everything. The project cost-sharing agreement and accompanying financial analysis limit the potential of this kind of failure.

The fourth reason plans can fail is that the **implementation is blocked**. If implementation requires the approval of the partners and that approval is not forthcoming, the plan will fail. Plans that do not receive the support of the Secretary of the Army or the Office of Management and Budget will not be implemented. Plans that do not receive approval by local authorities will not be implemented.

A plan may be incompatible with the other commitments of one of the partners. Water supply contracts may render plans infeasible. There may be a good acid mine drainage plan that emerged from a study but the local district may fail to find support for such an initiative within the agency or the Administration. There may be lack of support due to other commitments. A change in the Corps' priority outputs may render a good plan dormant.

There may be a lack of support due to lack of interest. A local government may have no interest in supporting a nonstructural flood damage reduction plan. There may be disagreements among institutions as to their proper roles, i.e., who runs what. There could be agreement but it might lack the power needed to mobilize the resources needed for implementation. These approval points can be foreseen but they cannot be controlled. They remain unavoidable risks. An open and informed planning process can go further to avoid this kind of failure than any other step.

SUMMARY AND LOOK FORWARD

Lesson One. Planners and decision-makers are not the same people. They may agree or disagree on which plan is best. Planners are advisors and not necessarily decision-makers.

Lesson Two. Any plan in the final array of plans should be good enough to implement. If it's not, it should have been eliminated by the screening process.

Lesson Three. Taking no action is the first default decision. If action is desirable, then decision-makers are to select the NED plan unless they have a good reason for doing otherwise. Local preferences may be a good reason for doing otherwise.

Lesson Four. Different selection criteria will lead to different decisions.

Now that we've reviewed the theory, history, and current status of the planning process, we need a little reality check. The next chapter considers some of the practical considerations that can arise and keep planners from realizing the idealized planning process described so far.

SUGGESTIONS FOR FURTHER READING

There is a dearth of material on this step of the planning process. The best references include those writings that deal with water resource planning. These were cited at the end of Chapter Two. Don't get your hopes up, however; there is not much there.

An alternative to the water resource planning literature is the decision literature. There is an abundance of literature on the subject of decisions, but little of it is likely to be applicable to water resources planning in a practical sense. That is, if you want to understand how and why decision-makers do what they do, go to the management and decision theory literature. If you really want to know how decisions are made, keep your eyes and ears open.

CHAPTER TWELVE: PRACTICAL CONSIDERATIONS

"Some horribly inconceivable thing happens!" Adaptation of a popular bumper sticker.

INTRODUCTION

...planning...can be...a formless process.

The planning process described in this manual may be quite foreign to experienced planners. "It doesn't happen like that," they might say. And they would be right. This chapter looks at some of the practical considerations that can cause real planning to deviate from the ideals of this manual.

PLANNING CAN BE A MESSY PROCESS

The planning process described herein has been an ideal, an intellectual presentation of a goal for planners to try to achieve, a model to follow. What happens in practice is quite different because planning is complex. It can be, despite the structure offered in this manual, a formless process. Planning has been described as a series of iterations of the six-step planning process. It's not that simple.

Planning begins where it begins. Planners may start at ground zero with little more than the name of a community with a problem. In other cases, they may begin with the benefit of a previously completed reconnaissance or a feasibility report. Still other studies begin when a non-Federal partner presents a plan they would like help implementing, or when a military installation requests help with the NEPA process.

The work proceeds quite a bit more randomly than this manual might suggest. Problems described by people lacking knowledge of natural systems may take quite awhile to understand. Just when you're finishing up your hydrology and hydraulics work, along comes another flood to change your rating and frequency curves. Military installation commanders may know what they want, but they've not gone through a planning process.

Plans can be changed by unexpected incidents. The most promising and popular alternatives formulated may have to be dropped late in the study because foundation surveys found unconsolidated fill at the project site. An analyst may have mistakenly used the frequency curve from one reach with the rating curve from another, making a plan that actually did nothing to reduce flood damages look very good. Everyone has stories about "busts" in

the cost estimate. Horror stories about how crass political considerations aborted some really creative planning abound. Countless plans have been hindered because she thought he knew what she meant when she asked for the work she needed him to do.

These little slices of reality are not unique to planning. These are the messy facts of life for anyone dealing regularly with wicked problems. You just have to deal with them the best you can. It is the most messy processes that need structure. It is precisely because planning is so messy that the iterative six-step planning process is so valuable.

Problems with the Problems

Some years ago a Corps study had advanced substantially along in the planning process. Plans had been formulated to develop flood damage reduction alternatives from a main stream and one of its tributaries in an urban area. The main stream had a long, well-documented history of flooding. The tributary was a small stream. The county engineer reported a coincident flood of surprising magnitude on this stream during the main stream's flood of record. As the study team believed it was nearing the end of plan formulation they learned that the tributary flooding was actually backwater from the main stream. Formulation would have to start all over to do the job right.

Sometimes the problems are hard to understand.

CHANGE IS THE ONLY CONSTANT

Fifteen years or so ago, recreation specialists were at the top of the Corps' most wanted employees list. Today, recreation is not a priority output. One day you're making progress on a study and the next day national debate seems to suggest changes that will substantially change the mission. What is a planner to do?

Planners deal with the wants and needs of people. Corps planners are public servants who are vulnerable to changing priorities and politics, both national and local, like many other professional planners. Recognizing these simple facts, *a good planner learns to expect change.* It comes with the job. As a matter of fact, expecting change in the working environment is good practical experience for planners who are asked to anticipate and forecast changes in their planning areas. Chapter Three provided general details on some of the changes that have occurred in our Nation's two centuries of involvement with water resources development. Missions come and go, but the need for planning remains.

Anticipate changes by staying current in your field, as a planner, and as a Corps employee. Learn as much about changes that affect you and their implications as quickly as possible. Adapt to change when it comes. Look on

it as an opportunity to do new things or to do things differently. Follow these simple suggestions and change becomes an opportunity rather than a threat.

PLANNING BIASES

We are all the result of our own experiences. Each of us is biased to some extent by our culture, how we grew, where we worked, and what's happened to us. Experience is a cruel master. Inevitably, we find some things we always do and others we never do. We all have our biases, i.e., mental leanings or inclinations that leave us with definite ideas about a matter that is no longer open for consideration. Planners are no different. If they've had a bad experience with something in the past, they're inclined to avoid it in the future. They, like others, tend to repeat things that have succeeded in the past.

Experience is a cruel master.

The Corps itself has a unique institutional culture. As a military organization there is great value placed upon tradition, honor, control and predictability. There is also a tendency for certain biases to arise. Biases are not necessarily a bad thing. We all become biased against danger as we grow up, its an effective way to survive. We're not concerned here with the biases that help planning succeed. Rather, we're interested in considering some of the biases that may limit the extent of our planning.

During a series of interviews conducted as part of the preparation of this manual, Corps planners identified a number of biases that can limit the success of a planning study. These biases toward doing some things and avoiding others tend to arise as a direct result of the Corps' culture, i.e., its way of doing

It's Hard to do a SOW

A point that doesn't really fit neatly anywhere in this chapter but that was too important to ignore is that it is hard to prepare a scope of work (SOW). The purpose of a scope of work is to identify the work that will and will not be done during the course of a planning study.

It requires the planning team to not only decide what will be done, but how much and in what manner. For example, will a study require new stage-damage data or will existing data be updated? If new data are to be collected what area will be covered? Will there be a census or a sample? How will the data be collected and at what cost?

These decisions are a bit like educated, if not scientific, fortune telling. Mistakes will be made. Unexpected problems will arise. The SOW gives structure to the beginning of the study. Inasmuch as it is part of the scoping process it, like everything else in a planning study, is subject to revision throughout the iterations of the planning process.

things. The Water Resources Development Act of 1986, two-stage planning, the P&G's emphasis on NED, and priority outputs designated by the budget have contributed to the development of some biases that have shaped the current state of planning within the Corps. This culture needs to be understood if there is any hope of introducing good planning practices into the pragmatic world in which planners must work. The paragraphs that follow address the two-stage planning process, time and money constraints, limits on authority, cost sharing, biases in plan formulation, and the non-Federal partner as ever-present elements in the Corps' institutional culture.

TWO-STAGE PLANNING PROCESS

The Corps' planning process has evolved over time. For the last several decades it has been characterized by a multi-stage planning process. At the time of this writing, a two-stage planning process is in use. *The first stage is the reconnaissance study*. The reconnaissance study is used to make a preliminary determination if there is likely to be a plan the Corps of Engineers can eventually implement. *If the reconnaissance stage ends with one or more promising plans for implementation as well as strong non-Federal support for that plan, planning proceeds to the feasibility stage*. The objective of the feasibility study is to investigate and recommend solutions to water resources problems.

Some planners believe the two-stage process presents several significant constraints to the six-step planning process. First, there is the Corps' insatiable appetite for details. Requirements for Corps studies, as expressed in the various sources of official guidance and in the traditions of the agency, are extremely detailed and technical. Planners sometimes feel reviewers are the source of this insatiable appetite. Reviewers sometimes feel plans are lacking in details that are essential for the support of study recommendations.

The dynamic tension between the planners and the reviewers can actually be a positive force. As long as the two groups share a common interest in the ultimate success of the partnership and the planning process, and as long as they communicate regularly and effectively, there is a better chance that a proper balance in information gathering will be struck.

Some feel a second and more important constraint arises from the very nature of the two-stage planning process. Some planners have suggested the reconnaissance stage may not provide enough time for a thorough and sufficiently detailed application of the six-step planning process. This is undeniably a legitimate concern. However, *the six-step planning process can be completed in a day, a month, a year, or a decade. It is*

perfectly adaptable to any time frame. The primary differences are the amount of detail devoted to the steps and the number of iterations.

The current two-stage planning process has served the Corps well in the past and has been adapted to the new planning partnership. The number of stages used to develop a plan is a matter of convenience to the parties doing the planning. The Corps' non-water resources planning is already done outside the two-stage planning process. The number of stages need not have any impact on the quality of the planning done. Whether the six-step planning process is completed in eight months as the first-stage of a multi-stage process, or in a single eight-month stage makes no difference. It should yield the best possible eight-month plan. As we have often repeated, the planning process can be completed in a day, a week, etc. But, if it is completed in a day, it is the one-day answer, and that is not likely to be as good as an answer that is developed with more time and resources.

TIME CONSTRAINTS

Time is a universal constraint. Planning is not exempt from it. A universal truth is, time is money. The more time something takes, the more it costs. Thus, we have a dichotomous role for time in the planning process. On the one hand there is not enough of it, thus constraining our ability to plan well. On the other hand, we don't want it to take any longer than it must because it increases costs. The partnership <u>needs</u> more of it while they <u>want</u> to use as little of it as possible.

Not having enough time limits the things we can do. With limited time, there could be a bias toward smaller, more easily solved problems. Complex problems take time to understand and more time to solve. Watershed and non-structural approaches to problems take time. Lack of time can cramp creativity. Traditional solutions to problems save time. When time is short, a structured approach is more valuable.

Talking to people takes time. Planners are unable to confer with other professionals about problems when they are pressed for time. Public involvement takes time. Planning takes time. There is no getting around it.

With a sound understanding of the purpose of and a systematic approach to planning, we can make the best use of the time available to us for problem solving. The planning process can be intensified for shorter time frames and expanded for longer ones. Fewer iterations may be possible during short studies. Once again, professional judgment and the back-of-the-envelope may be appropriate. We may have to work with less

…the back-of-the-envelope may be appropriate.

information than we would like to have when we are short on time. It bears repeating that the six-step process can be applied in an hour, a day, a month, or a year.

In such an imperfect world, it is to your advantage to have an organized approach to problem solving. You will never be free of time constraints. If someone didn't say "time is up," planning would never end. The future never arrives and planning is never finished. The six-step planning process can help minimize the strictures imposed by time.

BUDGET CONSTRAINTS

Rarely is there enough money…

Knowledge and understanding in planning costs money. Rarely is there enough money to do everything the planning team would like to do to arrive at a decision. When you can't do everything, you have to make choices. Frequently there can be biases in the funding decisions made by the study team. Previous studies and organizational power structures are two of the most common determinants of study budget allocations. Once study funds have been allocated and the work accomplished, the results of a planning study can be biased by the data that are available as well as the data that are not available.

Inadequate funding may bias planning studies toward narrow visions and small problems that can be solved with traditional solutions. Creativity may be endangered by budget constraints. It is precisely in settings like these that a systematic approach to problem solving can foster some creativity. The simple structure of the six steps suggests that creativity is not needed in data collection, evaluation, comparison, or selection as much as it is in establishing objectives and formulating plans. When budgets are tight, these are not the places to cut corners. Do a thorough job on objectives and formulation and compensate with more screening and professional judgment in the other steps.

There may be occasions when the feasibility cost-sharing arrangement will present a substantial burden to the non-Federal partner. In such cases, the pressure to hold down costs could result in some of the same kinds of biases. *Once again, however, the orderly and predictable nature of the planning process allows the team to anticipate potential problems in the process and to think ahead to avoid or overcome them.*

LIMITED AUTHORITY

The P&G provides wide latitude in the types of plans that can be developed, but good plans may be overlooked because the Corps lacks authority to implement them. There is indeed a discrepancy between what Congress and the P&G tell Corps planners they should do and what the agency and Administration tell them they can do. Comprehensive plans addressing community needs may be overlooked in favor of a smaller, more traditional solution because it's often easier to do what you can than it is to do what you should. Nonetheless, good planning remains the best approach to this dilemma.

Plans should be comprehensive and thorough, regardless of current authorities. Perhaps another agency can implement what the Corps can't. If the problems and opportunities are sufficiently compelling, it is more likely that a way will be found to implement the plan.

Pushing the Envelope

There are some recent examples of planning studies that were not restricted by a lack of authority. One district was able to find support for an investigation of acid mine drainage problems identified in a general investigations study. A second incorporated overland transportation needs into its study by drawing the appropriate transportation agency into the planning process. Both these activities were beyond the Corps' authority. The acid mine drainage was a severe problem in the one community and the transportation improvements were a unique opportunity in the other. These are two good examples of comprehensive water resources planning. Sometimes you can leverage the authority you have to get new authorities through specific authorization.

Existing authorities can bias plans toward what can be easily done rather than what needs to be done. The authorities may become the planner's hammer and the planner goes looking for the proverbial nail to hit. What is required are planners who can determine what is needed rather than what is possible and who can then find ways to get the job done. By following the six steps, proceeding carefully and with full communication among all stakeholders, it is sometimes possible to find support among stakeholders or at higher levels in the Corps for innovative plans. Although authority appropriately biases plans, the planner needs to be willing to fight those biases when the need is great. *When the need is great and support is built carefully, there is almost always a way to get things done*. On the other hand, existing authorities are an important criterion for screening plans.

COST-SHARING

Cost-sharing is frequently cited as a source of bias in the planning process. Finding factual examples of this bias is harder to pin down. *The presumed bias is that local sponsors prefer plans that minimize their own costs over*

better plans with higher non-Federal shares of costs. For example, open ocean disposal of dredged material may be preferred to upland disposal because the former is less costly to the local sponsor. Some have suggested that buy-downs from the NED plan are motivated more by cost-sharing concerns than contributions to other planning objectives. Others fear that if the non-Federal partner caps project costs, it might prevent identification of the true NED plan.

If this bias arises after a comprehensive set of alternative plans have been formulated, evaluated, and compared, it presents no real problem for the planner. Costs are a consideration of any plan. Lower costs might reflect the sponsor's top priority, and biases are not always bad. *If a bias toward lower costs means the formulation process is constrained and all potential solutions are not considered, there could be a problem*. Hence, a bias based on cost-sharing becomes a problem only if it restricts the formulation process. The solution would seem rather obvious: formulate plans without regard to costs and use cost appropriately as a selection criterion in the screening process.

BIAS IN PLAN FORMULATION

The planning process may also be limited by biases planners interject into the planning process. They may have a bias toward past plans; a bias against non-structural plans; a bias against innovation, especially when clear authority to implement is lacking; a bias toward a preselected solution; a bias toward large rather than small projects; or, a bias toward NED-oriented solutions. Any of these, or other biases, can adversely influence the planning process.

There are other, more subtle biases. Now that the non-Federal partner is helping to finance the study, he may have some working assumptions or data he wants used in the study. This presents a problem only when the data or assumptions would not otherwise be used. The most common and significant biases are found in the identification of a most likely without-project condition. Objectivity and integrity are virtues to be prized above all others by planners. Protecting them may require additional coordination, sensitivity analysis or other professional accommodation, but there is no room for bias toward inaccuracy in the planning process no matter what its source.

Price Makes a Difference

Before the cost-sharing changes of WRDA'86, the local sponsors of a deep draft navigation study made it clear that there was no point in even considering a channel less than 1,000 feet in width. Anything less than this was unsafe and unacceptable to the pilots, the Coast Guard and the port authority.

Following WRDA'86, when the non-Federal share of costs rose substantially, the non-Federal partner did some soul-searching and with artful coordination among the various interests it was determined that a narrower channel would do very well. In fact, there would be a negligible difference in navigation safety between the 1,000-foot and the 800-foot wide channels according to the pilots, the Coast Guard and the port authority. Surprisingly, cheaper actually turned out to be better.

Some planners perceive a bias toward environmental measures. They sense a notion among some stakeholders that anything environmental is good and worthwhile. If environmental measures are not subjected to the same analysis, these measures could run up project costs and lessen the overall attractiveness of the plan. This is of particular concern in instances where resource agencies or other environmental interests hold an effective veto power over the planning process.

The flipside of this coin is, of course, the enduring bias against incorporating environmental measures in a plan. All too often, plan formulation is completed before environmental mitigation is even considered. It becomes an "add-on" to the plan. Environmental mitigation measures should be part and parcel of the planning process just like relocations of affected homes and businesses. The cure for both these ills is simple: interdisciplinary teams. If all disciplines are included on a study team from the beginning and they function in a truly interdisciplinary fashion, bias toward or against aspects of a plan, or any other aspect of a plan, can be avoided.

There may be more subtle biases as well. During preparation of this manual, several experienced Corps planners said the Corps is not listening to its partners or its customers. It still wants to approach problems as technical problems rather than as social problems. The full range of plans is never investigated because technical concerns predominate the thought process. Problems are treated as strictly technical issues rather than as the complex technical and social issues they are. Some planners perceive a general bias against planning because many people do not understand or value planning. Some, in and out of the Corps, consider planning a money-consuming waste of time, especially those who believe they already know the problem and the solution as well.

Taking the time to educate people about the planning process and its benefits may not make these problems go away, but it surely won't hurt.

NON-FEDERAL PARTNER

In the Corps' Civil Works water resource planning, there is no partnership and no planning without the non-Federal partner. This makes the significance of the non-Federal partner's potential veto of any planning activity very clear. Some of the feasibility study money is the partner's, too. If they have no interest in a potential solution, there is a strong temptation to give it no consideration. This may or may not present a problem. The screening process is supposed to eliminate plans that are not good enough to implement. Thus, the simple act of eliminating a plan is not necessarily a problem. The problem arises when potential solutions are rejected out of hand. If a plan has not been developed to the point that it can be rationally eliminated, this could be a problem.

Too often, the planning process begins with a misunderstanding of what an acceptable plan is. To many planners, a plan that the non-Federal partner does not like is an unacceptable plan. That is not the case. *The "likability" of a plan is a far more subjective characteristic than one might suspect, as the last sidebar indicated. Partners tend to like reasonable plans more or less rather than yes or no.* As circumstances change, the desirability of plans can change and planners must guard against eliminating plans from consideration without good cause.

...planners need to sell...the value of planning.

To avoid this problem, planners need to sell the non-Federal partner on the value of planning. It is one thing to convey the necessity of planning, "We're required to do this." It is quite another thing to convince someone that what the planning process does for them is to protect their investment and assure them that, from all the possible solutions to their problems, the very best one is selected. It is especially difficult when this planning is going to cost them more. But if you do that, good planning will come a lot more easily.

AVOIDING BIAS

Biases in the planning process are inevitable. Some are more serious than others. The choices for dealing with biases are living with them or eliminating them. *Some of the above biases are simpler to eliminate than others. The starting point in each case, however, is for planners to understand the planning process.*

Planners need to see the "big picture;" to know what planning is, how it is done by the Corps, and what its advantages are. If planners don't know how to plan, other biases aren't going to matter a great deal. *Knowing how to*

plan is the most straightforward way to deal with the biases mentioned in this chapter.

...information is the best way of dispelling the biases...

To assure elimination of biases, the big picture of planning then has to be sold to the non-Federal partner and key stakeholders as well. Planners need to do a better job of informing those for whom they are planning, of the value of planning. As always, information is the best way of dispelling the biases that are so often at the root of many of the more common planning constraints.

SUMMARY AND LOOK FORWARD

Lesson One. Planning is a messy process beset with numerous biases.

Lesson Two. Good planning minimizes the mess and eliminates the biases.

There is a real need for people doing planning work to take their role as planners seriously. This means they have to know and use the planning process. The next chapter turns to some of the important people issues in the planning process: public involvement and teamwork.

SUGGESTIONS FOR FURTHER READING

This chapter deals with some of the unique and practical concerns of doing planning. They are not found in the literature. Practical experience is the sole source of wisdom on these topics. To find out more about these and other practical issues, talk to other planners. Networking with other planners both in and out of your district can be an invaluable source of the kinds of useful information you'll never find in the literature.

CHAPTER THIRTEEN: PUBLIC INVOLVEMENT AND TEAMWORK

"Perhaps if there has been one failing within our organization over the years, it is that we haven't tried to dispel the notion that our success comes out of a computer. It doesn't. It comes out of the sweat glands of our coaches and players." Tom Landry, former Head Coach, Dallas Cowboys.

Who Is the Public?

The public includes any individual interested in your study. In the broadest sense, the public is anyone not on your study team. There are special types of publics like partners, stakeholders, and cost-sharing partners. In this broadest sense, there are Corps publics such as the rest of the district, field offices, division, and headquarters.

Interested individuals often band together in groups of like-minded people. Hence, groups can often be significant portions of your public. Some potential groups and individuals that can be part of the public include Audubon Society, Chamber of Commerce, County Commissioners, Environmental Interest Groups, Federal Emergency Management Agency, Flood Control District, Governor, Homeowners' Association, Mayor, Pilots Association, Port Authority, School District, Sierra Club, State Fish & Game Department, State Transportation Department, U.S. Coast Guard, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, and so on.

INTRODUCTION

The P&G (Section IV) requires public involvement. As a result, the Corps is required to coordinate with State agencies and the Governor or his designated agency, interested and affected agencies, groups, and individuals. Plans that affect the land or resources of another country must be coordinated with the affected country. In addition, the review of any plans must be consistent with all applicable Federal statutes, such as the CEQ NEPA regulations. *For purposes of this manual. the public is any person, group or agency that is not the Corps of Engineers.* Even if such extensive coordination with the public were not required, it makes sense.

In addition to public involvement, the same section of the P&G recommends the use of an interdisciplinary approach to planning. The agency is encouraged to have all appropriate disciplines present and to supplement their expertise as necessary with outside sources. These, public involvement and teamwork, are the primary people issues of the planning process. For that reason, they are both addressed in this chapter.

PUBLIC INVOLVEMENT[19]

Public involvement is a process by which interested and affected individuals, organizations, agencies, and government entities are consulted and included in the decision-making process of a planning effort. *Public information is not public involvement*. Public information is intended to inform the public. Public involvement is intended to both inform the public and to be informed by them by actively soliciting public response regarding their problems, needs, values, ideas about solutions, and reactions to proposed solutions to problems. Public involvement is a two-way communication process.

Public Involvement and the Local Sponsor

Why do we need a public involvement program when we have a local sponsor who knows what he wants? The answer is simple, good planning requires it. Identifying problems, specifying objectives and constraints, gathering information, formulating plans, evaluating, comparing, and selecting plans -- all require the involvement of the public to be done well. If the local sponsor's desires meet the needs of the public this will become evident. If they do not, it's best to find that out as soon as possible.

What role should the local sponsor assume in the public involvement program? Each planning partnership is different. The local partner's desire to be involved in the process will largely determine the role they are given. Each partnership will bring different strengths to the planning process. If you are fortunate enough to have a partner with the capability and willingness to develop and execute a good public involvement program, it would be foolish not to use them.

A public involvement program has to provide people from diverse backgrounds and interests multiple opportunities to ask questions and offer suggestions. The public involvement program has to be responsive to public concerns, though this need not mean acting favorably on everything the public says.

GOALS OF PUBLIC INVOLVEMENT

There are three primary goals of public involvement:

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[19] The bulk of the material in this section has been adapted from the U.S. Department of the Interior's *Public Involvement Manual*, January 1980.

Credibility. An open and visible decision-making process accessible to all on an equal basis makes the planning process credible to groups with diverging points of view.

Identifying Public Concerns and Values. Because various groups have different points of view and values, they will evaluate any proposed action from different perspectives. Public involvement allows the planning team to understand the problems, issues, and possible solutions from the perspectives of the various interests.

Developing a Consensus. An implication of the many divergent points of view is that there is no one philosophy that can guide the planning team's decisions. Consensus must be formed on an issue by issue basis. Public involvement provides a process for evolving such consensus. Consensus, then, allows the team to move forward and solve the problem.

ATTITUDES TOWARD PUBLIC INVOLVEMENT

Why do public involvement? It meets planning requirements and builds consensus. It's needed to make a plan happen. A philosophical commitment to the role of public involvement coupled with practical experience suggest some general observations about how public involvement should be approached.

Program Design Shows Public's Value

No amount of rhetoric or backpedaling will cover up a poorly designed public involvement program. *Actions speaks louder than words when it comes to public involvement*. If the public is not involved from early in the planning process, if participation never results in any tangible change, if the alternatives considered are only the ones the partners want, the public will get the message "we're going through the motions of public involvement; don't expect anything to come of it." Good public involvement is much more than "letter-of-the-law" involvement.

Closing the Loop with the Public

Public involvement is a two-way communication process. One of the most important aspects of such a process is closing the loop. It is important to tell the public how the information they provided was considered and used. Be sure to do a lot of "Here's what you told us...and here's how we used it," communicating at meetings, in press releases, reports and at every opportunity.

Maintain Visible Program

A process that can't be seen can lead to suspicion. Seeing is believing. The best way to establish the credibility of your study is to create complete visibility of everything you do. If you know there will be six months of data collection and analysis before the next meeting, set up a home page on the World Wide Web. Let people visit your site and get weekly updates. Send out a newsletter. Send progress reports to the local media. Form an observer committee and have them represented at meetings. Stay visible to the public.

Don't Sell

Planners often find they feel defensive when dealing with the public. They are defending the agency, defending a decision, defending an alternative, and so on. Defensiveness is a major barrier to good communication.

The defensiveness problem often arises when the agency is in a selling posture, i.e., they have a proposed course of action they are trying to get people to accept. When public involvement is used to push a point of view, it cannot succeed. Use your public involvement to inform and be informed.

...inform and be informed.

Recognize Limits of Expertise

Professional expertise may qualify the study team to estimate plan impacts or to design project features. However, decision-making comes down to values and what people believe is good and bad for them. When it comes to values, experts are just like everybody else. *The planning team is not more expert than anyone else when it comes to value judgments.* When experts push their value judgments too hard, they can expect the public to challenge them vigorously and frequently.

Expertise Should Create Not Close Options

Professional expertise is best used to help the public figure out what they can do to help themselves; not to tell the public what they cannot do. Because the Corps' planning process is often technical and complex it is not difficult for the planning team to slip into a mode in which they are constantly telling the public what they cannot do. The result is too often frustration and resentment on the part of the public.

Speak the Public's Language

…language can make the study team seem like a cult…

All professionals have their own language, which is well understood by members of the same group. It is efficient to talk about BCRs, NEPA, and FONSI's because the terms are understood and make for a very convenient short-hand from of communication. The problem is such language can make the study team seem like a cult practicing arcane rituals in a strange language. Try to remember your first week on the job. The responsibility of communication is clearly the agency's. *It is the team's job to translate their jargon and acronyms into plain language so the public can understand.* It is not the public's obligation to learn your language. Do not use the jargon when talking to the public.

Feelings Are a Source of Valuable Information

Sometimes public involvement is biased toward solicitation of factual, rational, logical information. Although this information can be very valuable, it is not wise to set up conditions under which the public can begin communications. *When people are telling you their feelings, biases, and concerns without factual support, they are doing what they can*. They are telling you how things ought to be. From this information, the team can glean insights into the values and philosophies that should guide agency decisions.

Identify Limits of Your Authority

The public may have unrealistic expectations of what you are able to do in any given situation. They may be unaware of the agency's authorities. They may also be unaware of the fact that the study team is not usually the decision-maker. Your process is not going to be well understood by the public. You can't eliminate the problems of unrealistic expectations but you can limit them by making your authority as clear as possible as often as possible from the very beginning.

Be Creative

Be creative.

Public involvement is still a new and exciting field. Be creative. Experiment. Don't be afraid to break away from the traditional public meeting format. Use the Internet. Use radio, television, newspapers. Get a booth at the local fair. Set up a display in the mall. Use flip charts and 3 x 5 index cards to collect information at meetings with the public. Run focus groups. Interview key individuals. Roam the

neighborhood and do a little door-to-door. Sponsor an outing for the public. Set up a hotline. Meet, talk, and listen anyway you can.

Designing a Public Involvement Program

We offer four general observations about public involvement programs. *First, different publics will be involved at different stages of the decision-making process.* The definition of your publics will grow and contract throughout the study's progress. During technical stages of the study, you can expect more professional groups and agencies. When problems are identified or potential solutions reviewed, there will be a much broader public.

Second, there are appropriate levels of involvement at each step in the decision-making process. It is possible to do too much too soon. Don't burn out

Stakeholders

Stakeholders is a word used in water resources planning that has come to mean a person or group of persons who can stop you or whose support is necessary for success. A stakeholder is someone with something to lose or gain from a recommended course of action. The stakeholders are crucial to the specification of problems and opportunities. Identifying the stakeholders is the first important step in involving them in this process.

The Federal and non-Federal partners are two obvious stakeholders in a study. Government agencies at all levels of government are frequent stakeholders. Organizations and individuals that have an interest in the project should be included as should public interest groups with a particular point of view that bears on the project. These groups might include civic, social, environmental, economic, recreational, public health, political, educational and other interests. All other individuals and organizations who have an apparent interest in the project should also be invited to participate.

Stakeholders are identified in a number of ways. They may identify themselves by coming forward to express their interest or concerns. Third-parties can identify groups or individuals who may be stakeholders. A review of District mailing lists, associations in the area, user groups, newspaper articles, and so on may suggest individuals or groups the planning team should consult with throughout the planning process.

public interest by stirring up a level of interest that cannot be sustained. Save the more intense public involvement for the appropriate spot.

Third, the participation of the public will usually increase as the decision-making process progresses. Although participation waxes and wanes throughout the study, the overall pattern is that more people get involved as the study approaches a decision. The closer you are to a decision, the more information there is for people to react to. This inevitably means you are going to have to spend a lot of time explaining what has already happened. It is great practice for telling your story, part of which is the public involvement program. (See the next chapter.)

Fourth, public involvement programs must be integrated with the decision-making process. Each component of a public involvement program should be designed with an eye to what information exchange is needed at each decision-making stage in the study. Public involvement activities should not be a series of ad hoc events. They should serve a purpose that fits the decision-making process. That is what the public involvement program is all about, involving the public in the decision-making process.

SOME PUBLIC INVOLVEMENT TECHNIQUES

There is no one right way to involve the public in decision making that will work in all cases. However, there are three points when public input can be especially helpful. *Early in the study, ask the public what they think the problems and opportunities are.* Do they agree with those in your study authorization? Are there others? Ask people how they would recognize a successful resolution of the problem? Responses to such early public involvement provide the bases for planning objectives and constraints.

Later, you can ask the public to help you identify alternative measures and plans based on the study's planning objectives and constraints. What solutions do they think will work? What solutions would they not like to see implemented? This information will provide ideas for your formulation activities.

Near the study's conclusion, ask the public to help you evaluate and compare alternative plans. What do they think will happen if different plans are implemented? What do they like and dislike about the plans' effects you've identified? Public views can aid in the evaluation and comparison of plans.

Following are brief descriptions of techniques that can be used to gather these and other kinds of information from the public.

Meetings

There are all kinds of meetings you can use for public involvement. A mix of these or other techniques would probably be best. Meetings can be very formal **public hearings** or large group meetings that could include **briefings**, **question and answer sessions**, **town meetings**, or **panel formats**. **Small group meetings**, **discussion groups**, or **focus groups** may provide viable alternatives in some cases.

Advisory Committees

The Federal Advisory Committee Act, or FACA, puts many limitations on any **advisory committee** that may be formed to assist you in planning. Advisory committees have special approval, membership, notification and reporting requirements that must be met. If you are considering using an advisory committee, consult with your local Office of Counsel for more information and guidance.

Workshops are for small groups and they have a specific task or goal to accomplish. For example, a plan formulation workshop could involve the public in brainstorming ideas for potential solutions. **Charrettes** are intensive workshops usually geared to resolving differences among interest groups.

Coffee klatches or **kitchen meetings** can be held in private homes. These are very small (up to 20 people) and quite informal. This is more a person-to-person discussion than an official function. Walk-in information sessions are a kind of open house. These rely on the use of **exhibits**, **displays, models**, and personnel to provide and take information.

Meetings should have a specific purpose: information giving, information receiving, interaction, consensus forming or negotiation, or summarizing. Know your audience. That means anticipating the size, intensity of feeling about an issue and the credibility of the agency. Seating arrangements and the time and place of the meeting can be strategic considerations. Pre-meeting publicity is also an important consideration.

Questionnaires

Any set of questions that the Corps of Engineers asks of ten or more respondents outside the Federal government must originate from **questionnaires** approved by the Office of Management and Budget (OMB). OMB has already approved a large number of questionnaires for use in planning studies, and the approved questions are periodically distributed throughout the Corps. The latest distribution was "Questionnaires for U.S. Army Engineer Planning Studies" (October 1995). For more information about approved questionnaires, contact the Corps Headquarters Civil Works

Non-Meeting Techniques

There are any number of other techniques that can be used to provide opportunities for the public to become involved in your study. **Interviewing key people** is an effective way to gather information quickly.

Opening a **field office** can overcome the barriers set up by operating a study from a district office hundreds of miles away. Establishing a **study hotline** can help people get the information they need as efficiently as possible. **Toll free numbers** and **e-mail addresses** can give people a way to get their questions answered or their information submitted when the need or desire arises.

Displays and exhibits at malls, state fairs, or anywhere a large group is likely to gather can be an effective way to reach many people. They can also be used over and over. Newspaper **inserts** with response forms can be used to solicit opinions at a modest cost.

Reports, brochures, **newsletters,** and **information bulletins** can be prepared and distributed at appropriate points through the study process. For example, it might be advantageous to distribute such a report after problems have been defined, when preliminary alternatives have been identified, or when the effects of alternatives have been identified.

Participatory **television** or **radio** programs can reach a large number of people. **Booths** at fairs or other large public gatherings can be used to reach people who may not show up at public meetings. Conducting a **contest** or **event** to stimulate public interest in an issue or study area can be very effective. Fishing contests, canoe trips, photo contests, and so on may stimulate public interest in a study. **Mediation, Delphi techniques, simulations**, and **games** are other ways to involve different publics. In some cases, it may be beneficial to form an **observer** or **advisory group**.

The computer offers a tool that has hardly been tapped to involve the public. Establishing a **home page** on the World Wide Web provides the public with an instant source of information around the clock. People can vote on issues via the web site, they can register for **electronic mailing lists**, they can download data or the text of reports and newsletters. Mailing list entries can then be listed so that a **news group** could selectively read the discussions that have involved study issues.

One of the greatest advantages of the computer's Internet capabilities is that it allows people to participate at their convenience. It may also be possible to broadcast public meetings via the Internet if radio or television stations with this capability cover the event. Thus, long-distance participation is possible.

In short, there is no limit to the opportunities that can be afforded to the public to become involved in your study. Although time and money must be allocated up front for the public involvement program, it need not be an expensive burden. It can be an exciting opportunity to do good planning and make a difference.

TEAMWORK

WHY A TEAM?

There are two primary reasons planning should be done by a team. The first and simplest reason is that two heads are better than one. The second and more enduring reason is that late twentieth century America is extremely complex and only a team structure can respond to the needs of customers and organizations in this complex environment.

...two heads are better than one.

Two Heads Are Better than One

No one person, no one discipline, no one group has all the answers. No one person, discipline, or group must be involved in every aspect of the planning effort all the time. Roles change and evolve with the ebb and flow of planning. Sometimes the questions require scientific inquiry and professional judgments. How many core borings should be made? What is a reasonable number for a roughness coefficient? Is the site likely to yield new information about previous cultures? Other times, questions will address matters of public value judgments. What level of residual flood damage is acceptable? How much mitigation is desirable? Who should review the report?

As a result of the proliferation of goals and objectives that must be addressed by water resources planning studies, it is impossible for any single discipline to adequately address the more complex issues that arise in a world that is multiobjective in its outlook. Many disciplines are needed for planning. No one has the background, experience, and knowledge necessary to plan alone.

From the largest river basin studies to the smallest planning activities, a multiplicity of people and expertise is needed. A large planning effort may consist of one or more disciplines. A military planning effort may consist of a contractor, a military installation point-of-contact, and a Corps planner. Large or small, they are teams and no one plans alone.

In addition to a diversity of disciplines the planning team should include a diversity of interests. Some districts feel it is their job to do all of the planning. That is what the non-Federal partner is paying for, they contend. Other districts insist that the non-Federal partner actively participate in the process; it's their community, and their money too. Clearly, there can be no best balance of partner roles that works for all studies in all districts. However, it

is essential that the non-Federal partner be afforded as much a role on the planning team as it is willing to assume.

An often overlooked point is that the team should be interdisciplinary, not just multidisciplinary. The disciplines are to be integrated. It is not sufficient to assemble a group of diverse experts. They must communicate their various viewpoints and work together to fashion plans that truly reflect a diversity of viewpoints on the problems and opportunities that confront the planning area.

We are all trained in our specific disciplines. These disciplines have, over time, developed their own specific and occasionally peculiar way of looking at the world. At times we have been trained to screen out those aspects of the world that conflict with our disciplines' way of looking at things. *If we are to have an effective plan formulation process, we must have an interdisciplinary team involved in the planning process from the very beginning of step one*.

Some major characteristics of interdisciplinary planning include:

- Group meetings with all disciplines and interests represented.
- Participation by environmental specialists in development of alternatives.

Teams Take Time

Teams need to learn how to run meetings effectively.

Teams need to learn to function as a team.

These things take time. Once these skills are mastered, teams can respond very quickly.

- High degree of communication and informal coordination among all team members, especially engineers, economists, and environmental specialists.

If two heads are going to be better than one, both must speak and both must listen. Answers to questions need to be forged from the best that each has to offer. Teams do a better job than individuals. That alone is sufficient reason for using planning teams.

Today's Complexities Require Team Solutions

Individuals do not know enough to develop good solutions to wicked problems on their own. Teams are needed. Large bureaucratic organizations are too rigid, too slow, and too costly to respond effectively in today's environment. Teams are needed. *Teams are a sensible and efficient compromise between the limitations of individuals and the inefficiency of large organizations. They make sense.*

Three Key Team Characteristics

An effective team must utilize three key characteristics.

Effort. A team must work long enough, hard enough, effectively and efficiently.

Talent. A good team needs the skills, knowledge and experience necessary to get the job done.

Task performance strategies. A team needs specific strategies for accomplishing study tasks.

In a world of increasing demands and complexity and shrinking resources, where better, faster, cheaper is the challenge and the credo; teams are essential. The modern organization no longer builds on individual competencies and roles; it builds on teams. Teams are central to meeting the unique needs of organizations.

The structures and assumptions of traditional workplace management are being challenged. Stovepipe functions, rigid bureaucracies, chain-of-command reporting relationships, and encumbering policies and regulations are becoming obsolete in the private sector. This kind of workplace once resulted in remarkable organization, control, and efficiency. As the workplace and the world change, however, many of these structures have proven too slow, too expensive, and too unresponsive to be either competitive or effective. The private sector is moving toward less hierarchy, flatter structures, and a more empowered workforce. There is going to be more reliance on teams, not less. As the Corps gets in step with these business trends, the reliance on teams will transcend the planning team we're discussing here.

Today, any organization that can't produce high-quality work quickly and economically is at serious risk of extinction. An organization might get away with being good, fast, and expensive for awhile. Or maybe even good, economical, and slow to the market for awhile. But to survive and prosper in the modern business environment, an organization must be able to deliver quality, speed, and price. Countless business are using teams as the means to become better, faster, cheaper.

...an organization must be able to deliver quality, speed, and price.

In this respect, teams are going to be an essential component of the Corps' continued success. As planning activities become more customer oriented, the Corps

becomes more and more like any other large, modern organization. Effective teams are essential to the survival of any modern organization. For more background information on the role of teams in modern organizational management, see any of the books cited at the end of this chapter.

WHO SHOULD BE ON THE TEAM?

The composition of a study team is a critical step in determining the planning effort's ultimate effectiveness. As a planning effort is identified, the study manager should be able to determine the kind of personnel required to do the work. A military installation's plan to collect and store all pesticides on the base in a central location may not require a hydrologist or a geographer. A coastal project is going to need knowledge of coastal processes a fluvial flooding study won't require. A wildlife biologist may be needed for ecosystem restoration work while one may not be needed for mobilization planning.

The composition of the team depends on the nature of the planning effort. While the mix of disciplines required for a team varies from study to study, there are some generic characteristics of good team members. Good team members should:

- Possess the skills necessary to perform the required work at the speed needed to meet deadlines;
- Have their needs met through participating in the planning effort;
- Have the temperament to fit in with other team members, the study manager, and the public;
- Work with funding limits, tight timetables, or other project work requirements.

Team members must possess the necessary disciplinary background and knowledge of planning required to be a contributing member of the planning team. New planners will need time and support to grow into the job. It is generally preferable that there be some experienced members on the planning team.

In order to have committed team members, the work has to be rewarding, both personally and professionally. This can mean allowing some team members to stay within their comfort zones while allowing others to expand theirs. Sharing the responsibility and the glory is important.

Interpersonal skills are a critical intangible for the most successful planning teams. Working well with people you respect and like is a luxury few teams enjoy. Liking other members of the study team is not absolutely essential, but when it can be achieved, the team's potential will be greatly enhanced.

Goals, Roles, Procedures, and Relationships

Do team members agree to and understand their **goals**? Do they articulate them in the same words? Do they all own the planning objectives?

Do team members understand their **role** and what's expected of them? Do they accept and value that role? Does the role fulfill them?

Has the team developed effective operations and **procedures** that enable them to move along toward their objectives? Do they use a set of ground rules and structured procedures?

What is the quality of **relationships** among team members?

Team Structure

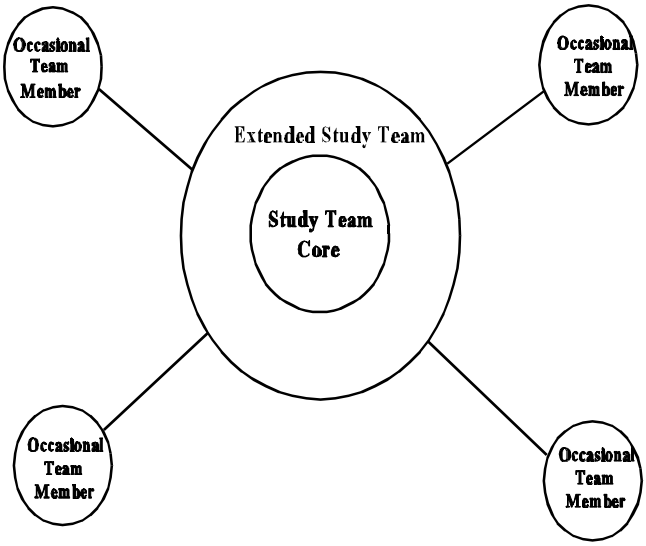
There is no such thing as a typical planning team. But there are some elements common to so many study teams that we have presented a very generalized generic structure for a study team in Figure 11. The figure depicts three levels of commitment to the study team. *There are core members of the team. There is an extended study team and there are occasional members of the study team*.

Every team has a core. This comprises the people assigned to the study. These are the people who, all other things equal, will be involved with the study on a day-to-day basis until it is completed. They are the ones who will be doing the bulk of the planning work. This may or may not include non-Corps members, such as representatives of the non-Federal sponsor, a contractor's representative, or a military installation point-of-contact.

The extended team consists of those people with a regular and on-going involvement with the study that might not be on a day-to-day basis. For example, technical reviewers from the district or elsewhere in the Corps' organization or representatives of natural resource agencies.

The occasional members of the study can change throughout the course of a study. This might include the Corps' field survey team when it gets involved in survey work for a few weeks during the study or, it might

Figure 11: Example Study Team Structure



involve a community association that gets involved long enough to assure that its concerns are being addressed. Occasional members may be involved in the study once for a varying length of time, or they may drift into and out of the sphere of the study team as the situation warrants. Some members of the public will serve as occasional team members.

Table 36: Selected Publics and Team Members

"Publics"	"Experts"
Audubon Society	archeologists
Chamber of Commerce	attorneys
County Commissioners	biologists
Jane and John Doe	chemists
Flood Control District	civil engineers
Governor	ecologists
Homeowner's Association	economists
Mayor	geographers
Port Authority	geologists
School District	hydraulic engineers
Sierra Club	hydrologists
State Fish & Game Department	landscape architects
State Transportation Department	planners
U.S. EPA	psychologists
U.S. FWS	sociologists
etc.	etc.

The distinction we draw between occasional team members and the general public is the level of commitment. Hundreds or thousands of people may be involved in the planning effort at one point or another. Simple involvement does not constitute team membership. A continuing commitment to the planning effort in a significant way does however confer some level of team membership on a group or individual. Table 36 presents some examples of the types of people or groups that might occupy one or more of these levels of membership.

HOW TO WORK LIKE A TEAM

If you had bacon and eggs for breakfast, the chicken was involved in your breakfast, the pig was committed. *Planning teams need people to be committed not simply involved.* This can be a problem in an organization like the Corps in which team members are actually members of functional groups who have their own bosses but also have a study manager to whom they report.

Where does one's loyalty lie? With engineering division, planning division, real estate division, or with the study team? Often it's to the functional group. That's where the boss who may have hired the team member is and that is where their paycheck is sent. This reality requires study managers to work extra hard to win the loyalty of such team members. A team consists of two or more people who must coordinate their activities to accomplish a

Avoid Bandwagons

A bandwagon develops when an idea is put forward and is bolstered by a series of positive comments. Pretty soon the idea gains momentum that may not be commensurate with its value. Always make sure you step back and consider the downside of any idea before a bandwagon effect takes over. Bandwagons should never replace critical assessment of ideas.

Are You on a Team?

Ask yourself the following questions:

- Do the members of your group have common goals or tasks that require working together?
- Do the actions of any one member of the group impact upon the work of other members?
- Is your work most effectively accomplished by members of the group working together?
- Must activities be coordinated on a daily / weekly / monthly basis?

If you answer yes to these questions, you are a member of a highly interdependent team.

common task.[20] Teams just don't happen; they're built. Team building is the deliberate process of creating a successful team from among a group of people. Ultimately, people willingly and enthusiastically engage in an activity only if it is personally rewarding in some way. But when the activity is rewarding of itself, the individual engages in it without expecting additional rewards.

James H. Shank in his 1982 book *Working in Teams, a Practical Manual for Improving Work Groups*[21] presents a list of characteristics of good and poor teams. Compare your team's performance to these two slightly adapted lists and see how your team is doing.

Characteristics of a Good Team

1. Team members are in close physical proximity and able to meet regularly.
2. The appropriate skills are represented on the team.
3. The appropriate levels of organizational authority are present within the team.
4. Team members are involved in the setting of objectives.
5. Objectives are understood by all members.
6. All individuals support the objectives.
7. Objectives are set and met within realistic time frames.
8. Roles are clearly defined and do not overlap.
9. Team members and their leaders know their assignments.
10. Roles are understood by all and are supported.
11. There is a strong, effective leadership with clearly defined responsibilities.
12. Members and leaders are accessible to each other.
13. Decisions are made by consensus.
14. Meetings are efficient and task-improvement oriented.
15. Emphasis is on problem solving, versus blaming the individual responsible for the problem.
16. All members participate in discussions and meetings.
17. Minutes of meetings are promptly distributed.
18. Members listen well.
19. There is frequent feedback to individuals regarding performance.
20. All members are kept informed.

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[20] Mark Plovnick, Ronald Fry, and Irwin Rubin. "New Development in O.D. Technology: Programmed Team Development," *Training and Development Journal*, April 4, 1975.

[21] Shank's book is a useful resource for anyone seeking to improve team performance. It has chapters devoted to team development, analyzing team performance and other practical subjects.

21. Deadlines and milestones are clearly established and agreed to by the team.
22. There is team identity or esprit de corps and pride.
23. There is tolerance for conflict with an emphasis upon resolution.
24. Conflict is openly discussed, often resulting in growth or learning.
25. Members enjoy each other.
26. Team members support each other.

If there are good teams there are, of course, poor teams. Some of the characteristics of a poor team follow.

Characteristics of a Poor Team

1. Physical separation prevents members from meeting frequently.
2. Team is not given adequate resources to do the job.
3. There is no recognition of team effort.
4. There is a lack of recognition by the organization or its leaders that a team exists.
5. Members do not participate in setting goals.
6. Goals are unclear.
7. Goals are not communicated.
8. Everyone is doing his own thing without attention to team goals.
9. Responsibilities are poorly defined.
10. No clear leader is identified.
11. There is buck-passing of responsibility.
12. Members engage in power plays for authority and control.
13. Members refuse to recognize their interdependence and act as if they were independent.
14. Decisions are always a crisis situation.
15. Decision making is dominated by one person.
16. Communications are one way--from top down--and channeled through the leader.
17. Minor points are debated endlessly.
18. Meetings are unproductive with the issues unresolved.
19. Meetings cover trivia, versus significant issues.
20. Actions are taken without planning.
21. Members work individually and ignore each other.
22. Members are late for meetings or do not attend.
23. Members are unwilling to be identified with the team.

24. There is covert conflict between members.
25. There are severe personality conflicts.
26. Relationships are competitive.
27. Members are defensive.

Teams that do more of the things found on the former list and fewer of the things on the latter list are more effective.

THE TEAM LEADER

Every team has a leader.

Every team has a leader. Is the study manager the planning team leader? He need not be. A team leader can emerge from virtually anywhere in the team. Normally, the study manager, by virtue of his experience, demonstrated ability, and responsibilities, will be the most logical candidate to be the team leader. The best team leaders have what Fisher[22] calls behavior competencies. These behavior competencies are leader, living example, coach, business analyzer, barrier buster, facilitator, and customer advocate. These competencies or roles describe behaviors that would be valuable characteristics of any Corps study manager.

The **leader** unleashes energy and enthusiasm by creating a vision that others find inspiring and motivating.

The **living example** serves as a role model for others by "walking the talk" and demonstrating the desired behaviors of team members and leaders.

The **coach** teaches others and helps them develop to their potential, maintains an appropriate authority balance, and ensures accountability in others.

The **business analyzer** understands the big picture and is able to translate changes in the business environment to opportunities for the organization.

The **barrier buster** opens doors and runs interference for the team, challenges the status quo, and breaks down artificial barriers to the team's performance.

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[22] Kimball Fisher. *Leading Self-Directed Work Teams, a Guide to Developing New Team Leadership Skills,* McGraw-Hill, Inc. New York, 1993. The discussion that follows is taken from his work.

The **facilitator** brings together the necessary tools, information, and resources for the team to get the job done, and facilitates group efforts.

The **customer advocate** develops and maintains close customer ties, articulates customer needs, and keeps priorities in focus with the desires and expectations of the customers.

The leader on a study team may change from time to time. As the study begins, the person most familiar with the people and places of the study area may be the team leader. At certain points during the study, team leadership may migrate to other shoulders based on the technical expertise of the team member. As schedules tighten, money runs short, and the frequency and import of contact with the public increases, the study manager is more likely to resume the role of team leader.

It is less important who leads the team than it is that it be lead.

ARE YOU A TEAM PLAYER?

Successful teams need team players. Following is a ladder of team player skills, knowledge, and attitudes.[23] The ladder begins with basic skills and proceeds through the skills outstanding team members possess. See how many of these skills you already possess and which you might want to improve.

1. Attends team meetings regularly.
2. Participates in team brainstorming.
3. Works effectively as a team member by:

    - Sharing communication
    - Negotiating
    - Facilitating
    - Participating
    - Cooperating
    - Trusting
    - Working toward and accepting consensus
    - Functioning as a teacher and learner
    - Valuing and using leadership skills
    - Using conflict resolution skills

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[23] Adapted from Andrew J. DuBrin's *The Breakthrough Team Player, Becoming the M.V.P. on Your Workplace Team*, AMACOM, New York, 1995.

4. Makes original contributions to team issues; builds upon others' contributions.
5. Volunteers to handle action items or to participate in new teams.
6. Actively participates in establishing team's purpose, direction, strategy, or goals.
7. Positively questions and challenges others; utilizes conflicting views in a constructive manner.
8. Acts to create and promote team cohesiveness.
9. Offers to relieve a team member's heavy workload.
10. Considers impact on external relationships when influencing team outcomes.

The lists presented in the preceding paragraphs can serve the very practical purpose of guiding a team in its functioning. Nonetheless, they remain lists. For additional details on the subject matter, see some of the books referenced at the end of the chapter or others of your own choosing.

SUMMARY AND LOOK FORWARD

Lesson One. Public involvement and teamwork are the two most important people issues in the planning process.

Lesson Two. Public involvement is required; there are many publics and many ways to involve them. There is no one best way to do public involvement.

Lesson Three. Teams are needed because today's problems are far too complex for any individual to handle, and because two heads are better than one.

Lesson Four. Good teams don't just happen; they take a lot of work.

When the planning is finished there is one more very important thing to do; tell your story. If you can't explain what you have done and how you arrived at your conclusions in a concise and transparent fashion, then the entire planning process may have been for nought. The next chapter tells a little story about how to tell your story.

SUGGESTIONS FOR ADDITIONAL READING

There is no definitive book on teams, teamwork, or leading a team. However, there are any number of very good books available, they are

usually found in the organizational management section of an academic library. Some suggestions for getting started in this field follow.

DuBrin, Andrew J. *The Breakthrough Team Player Becoming the M.V.P. on Your Workplace Team*. New York: American Management Association, 1995.

Fisher, Kimball. *Leading Self-Directed Work Teams*. New York: McGraw-Hill, Inc., 1993.

Hartzler, Meg and Jane E. Henry. *Team Fitness a How-to Manual for Building a Winning Work Team.* Milwaukee, WI: ASQC Quality Press, 1994.

Lewis, James P. *How to Build and Manage a Winning Project Team*. New York: American Management Association, 1993.

Shonk, James H. *Working in Teams a Practical Manual for Improving Work Groups*. New York: American Management Association, 1982.

Tjosvold, Dean. *Working Together to Get Things Done*. Lexington, MA: Lexington Books, 1986.

Zenger, John, Ed Musselwhite, Kathleen, and Craig Perrin. *Leading Teams Mastering the New Role.* New York: Irwin Professional Publishing, 1994.

IWR has produced a number of publications that will be particularly useful in the area of public involvement:

Environmental Manager's Handbook on Public Involvement. Spring 1995. (Report available through the Institute for Water Resources).

Partnering. IWR Pamphlet 91-ADR-P-4, December 1991.

Public Involvement Techniques: A Reader of Ten Years Experience at the Institute for Water Resources. IWR Report 82-R1, May 1983.

Tri-Service Committee: Air Force, Army Navy. *Partnering Guide for Environmental Missions of the Air Force, Army and Navy*. July 1996. (Report available through the Institute for Water Resources).

CHAPTER FOURTEEN: TELLING YOUR STORY

"The difference between the right word and the almost right word is the difference between lightning and the lightning bug." Mark Twain, American Author.

INTRODUCTION

When the planning is done, you've got to tell someone. That means a report. Too often a report becomes a massive compilation of every bit of data and correspondence generated by the study. The report outline frequently mimics the six steps of the planning process and that rarely tells the story of a planning effort to best advantage.

A common criticism of government reports is that they are unreadable. *To have value, your report must be read and understood.* It doesn't matter if it is a letter report, a reconnaissance report, a feasibility report, an environmental assessment or impact statement, or any other kind of report (see Table 37). If it is not read, it's a waste of time.

Table 37: Types of Planning Reports

- Reconnaissance
- Feasibility
- General Reevaluation
- Limited Reevaluation
- General Design Memorandum
- Environmental Impact Statement
- Special Studies

Identify the primary reader for your report. Are you writing for the general public? The non-Federal partner? Corps reviewers? The Office of Management and Budget? Yourself? Future planners? *Decide who you are writing for, then keep that reader in mind at all times. Then tell your story*. Tell the reader what happened. Tell the story in simple language and in a time-ordered process. Organize the report carefully. Use visuals. Enumerate ideas and points. Make effective use of headings and subheadings. Try to keep the main report short -- can you do it in 50 pages? Put only the essential details in the appendix. Keep the rest of them in carefully organized files. Make maximum use of other communication venues, like Issue Resolution Conferences, review meetings, public meetings, and the like to convey additional detail and complex issues.

Tell your story. Make it a story you wouldn't mind hearing if you were the reader.

This chapter is about documenting the decision-making process by telling your story. It begins with a discussion of documentation and the need for it. It then addresses the writing of the report with an emphasis on simple points like always keeping the reader in mind and making sure your report has a beginning, a middle, and an end. Hints are offered for good writing, effective presentation, and for revising your story. The chapter ends with a few thoughts about the length of a report and other ways to get your story across.

WHY IS DOCUMENTATION NEEDED?

Let's begin with the obvious. A planning effort is initiated at the request of someone else. It is likely that substantial resources have been dedicated to the purpose of finding solutions to problems and answers to questions. Decisions have to be made based on the results of the planning effort. The planners have an obligation to report their findings so decisions can be made. Generally, these findings will be reported in writing.

This need to document creates an interesting role for the planning report. In its earlier versions it serves as an analytical report. It identifies a problem; analyzes, synthesizes, and interprets pertinent information; and presents conclusions and recommendations for appropriate action. As decision-makers concur or dissent with the recommendations, the report becomes a decision document. At this point, its intention is no longer to convince the reader but to inform her of a decision that has been made. During the course of a study, the role of the study documentation will evolve.

WHAT IS DOCUMENTATION?

To document means to provide factual or substantial support for statements made or a hypothesis proposed. Documentation simply means communicating the results of the planning effort. Most often this is done through a study report. Typically, depending on the type of planning effort undertaken, there will be some document that contains a summary of the entire planning process. This may be a letter report of a few pages or a main report that can run hundreds of pages. For Civil Works planning studies, the main report is often accompanied by an environmental assessment or environmental impact statement and one or more technical appendices.

Among the Corps reports used in the preparation of this manual is a reconnaissance report with appendices that is 4.75 inches thick and a feasibility report with appendices that is 6.0 inches thick. With maps, graphics, editing, writing, printing, distribution and related costs,

documentation can be an extremely expensive part of the planning effort. If it is true that few if any people are reading these voluminous documents, maybe it is time to rethink what documentation is.

…ask who the reader is.

In the introduction to this chapter we ask who the reader is. The likely answer is that there are many different readers. If so, doesn't it make sense that there might be many different kinds of documentation? Does John Q. Public need the same kind of documentation that a technical reviewer is going to need? Certainly not.

Thus, *we propose that you think of documentation as a set of different documents that authenticate and support the findings of the planning effort. The composition depends on the intended audience*. For example, technical reviewers are likely to want to have the most detailed documentation. In a flood damage reduction study, this might mean stream flow data, backwater profiles, rating curves, damage functions for each reach by type of damage, detailed calculations of expected annual damages, and interest during construction calculations and so on.

These details of the planning effort can be documented in a variety of ways including the current method of including them in a technical appendix. If better, faster, and cheaper products are one of the goals of Corps planning efforts, then it might be advisable to think of new ways of documenting these efforts. One alternative could be to include a sample calculation in the printed technical appendix. That could mean, for example, one expected annual damage calculation for one type of damages for one reach, rather than dozens of sets of such calculations. Additional details can be provided to technical reviewers or other interested parties directly from project files.

Devoting more effort to carefully documented project files might prove to be a viable alternative to devoting extensive resources to the preparation of voluminous technical appendices at the cost of better documented project files. It is not uncommon for report preparation to absorb so much time and energy that little energy is left to carefully organize and document the raw data in project files. This is precisely the documentation that can be so essential to the replication and authentication of study results that is repeatedly required prior to implementation.

…documentation need not mean put it in the report.

In other words, documentation need not mean put it in the report. Documentation could as easily mean keep it in your files. *Results may often be better communicated to special interest audiences, like technical reviewers, in meetings, workshops and issue resolution conferences*. There is

more than one way to communicate the results of a study to special interest groups.

WRITING THE REPORT

Because planning teams usually do the work, reports are often written by the various team members. Many of the reports they produce read like it too. Not all writers are equally gifted. Not all use the same writing style. Nothing can be more annoying to a reader trying to understand a complex issue than to try to wade through a poorly organized report written by a dozen people who apparently never spoke to one another or bothered to read what the others had written.

The part of the report that really should be read by everyone interested in understanding the planning process and the decision that resulted from it should be easy to read and understand. That does not mean it must be written by one person, but it probably should be. The report is a diary. It's the story of the plan. It should not be held until all the work is done.

"Planography"

If we could invent a word for this chapter it would be planography, the biography of a plan. That is the essence of a good report. It's a diary. Start writing it from day one, don't wait until the end of the study.

In this section of the chapter, we offer some suggestions for report writing that have been culled from experience and a number of authors of books on report writing. For more detailed information and some excellent how-to books, see the suggestions for further reading at the end of the chapter.

WHO IS THE READER?

Who is the intended audience?

The first and most important question the planning team must ask itself is who is the primary reader of this report. Who is the intended audience? If the answer is the technical reviewer, the content of the report will be quite different from what it would have been in a report written for John Q. Public.

If the reader is an installation commander with intimate knowledge of the problem you have been asked to address, it may be quite possible to document your findings in a few pages. If the reader is

a vast and varied public it is going to take more effort and pages to tell your story.

The purpose of a report is to communicate ideas to another person. Once you have identified the reader, empathize with her throughout the writing process. Put yourself in the reader's position. Don't write for the study team or for your own personal glory. Write for that person who is going to be reading. Tell her your story in a way that she can understand it.

To help you empathize with the reader, here are some questions you might ask of the study team before you begin to write. Who will read this report? Who will be affected by the report? What will the reader look for in the report? How will the report be used? Why do the readers need the report? When will the report be used? Where will the report be used and where will it be stored? How can the report be made most useful for all readers?

Ask and answer these questions[24] and you'll be well on your way to writing a report that people will read.

HOW TO MAKE YOUR REPORT EFFECTIVE

To make your report effective, keep the reader in mind at all times. Don't try to say it all at once. Choose a logical method of presentation and stick to it. Don't make conclusions in the introduction or introduce new material in the conclusions. Explain each point you make. Tell why you did the things you did, explain the procedures you used. Use specifics. Give the reader the facts. Don't say you did a survey of selected flood plain properties, say you interviewed owners of 57 commercial properties and surveyed 200 residences. Providing specifics does not mean providing all the specifics. Avoid burdensome detail. A report should have a beginning or introduction followed by the body of the report. It should end with conclusions. A chronological story is best.

A chronological story is best.

Beginnings

Most readers focus their attention on the beginning of a report. If they don't find what they need there they look at the end of the report. *Pay special*

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[24] The questions were adapted from Phillip V. Lewis and William H. Baker. *Business Report* Writing, Grid, Inc., Columbus, Ohio, 1978.

attention to beginnings and endings. They are crucially important, given the way people really read.

In the beginning, tell the reader where you are going. The more the reader understands where you are going, the more likely he is to understand your message. Take care to let the reader know how the report is organized. Let him know where he will find what.

A good beginning should accomplish at least three things. First, it should compel the reader to read on. Second, it should provide enough information for the reader to understand your basic findings or recommendation. Finally, it should establish the writer's rapport with the reader.

Because communication of your ideas to another is the major function of the report, compelling the reader to read on may be the most important function of the beginning. To compel the reader to read on, every beginning should include what the document is about, explain how you will develop your argument, and tell him why the document is important. This latter point is not accomplished by saying, "This is an important report." It is accomplished by striking a chord in the reader; by revealing to him something that he recognizes as important and in his interest to be informed about. It is not likely that beginning with a study authority and a long dry list of previous studies and reports is going to want to make anyone read on. Consider putting such technical material in an appendix. Tell your story from the beginning. Don't clutter it up with "requirements" that add nothing to your main point, which should be some variation of "this is what we did, this is why we did it, and this is how it turned out."

... "this is what we did, this is why we did it, and this is how it turned out."

The Body of the Report

Organize the body of your report in a way that best tells your story. Keep in mind you do have a story. First, this happened. Then, that happened, and so on. Most planning stories are best told as a narrative of events. When a story is a narrative of events, use time order to organize it. Chronology is your friend.

Forget the outline that begins with problem identification, followed by inventory and forecast. Report organizations that follow the six steps of the planning process impose a narrative order that is artificial and likely to be confusing to the reader. If the study began when the non-Federal sponsor

presented a plan and said, "This is what we'd like you to build," then begin your story there. Tell the reader how the study unfolded. Tell the story of how you went from that first day to the recommendation in your study. Don't worry if you did not execute each planning step in proper sequence. Planning is a messy, chaotic process. The six step process is a framework for doing planning studies; it is not a report outline.

Endings

Endings need to provide a sense of closure. There should be nothing important left unsaid. All loose threads in the report must be tied up by now. Clear, unambiguous endings are best. Planning studies have a natural ending: the recommendations and steps necessary for implementation.

SOME HINTS FOR GOOD WRITING

Write so your reader can understand you. The **Gunning Fog Index** is a handy tool to gage how appropriate your reports are for your readers.

Gunning Fog Index

The following description has been taken verbatim from Raymond V. Lesikar's book *How to Write a Report Your Boss will Read and Remember*, p. 48.

> The ease with which the Gunning Fog Index can be used is obvious from a review of the simple steps listed below. Its ease of interpretation is also obvious in that the index computed from these simple steps is in grade level of education. For example, an index of seven means that the material tested is easy reading for one at the seventh-grade level. An index of 12 indicates high school graduate level of readability. And an index of 16 indicates the level of the college graduate.
>
> The simple steps for computing the index are as follows.

<u>Select a sample</u>. For long pieces of writing, use at least 100 words. As in all sampling procedures, the larger the sample, the more reliable the results can be. So, in measuring readability for a long manuscript, one would be wise to select a number of samples at random throughout the work.

Determine the average number of words per sentence. That is, first count words and sentences in a sample selected. The divide the total number of words by the total of sentences.

Determine the percentage of hard words in the sample. Words of three syllables or longer are considered to be hard words. But do not count as hard words (1) words that are capitalized, (2) combinations of short easy words (*grasshopper, businessman, bookkeeper*), or (3) verb forms made into three-syllable words by adding *ed* or *es* (*repeated, caresses*).

Add the two factors computed above and multiply by 0.4. The product is the minimum grade level at which the writing is easily read.

Let's apply this index to the first two paragraphs of this chapter. There are 102 words in 8 sentences, an average of 13 words per sentence. There are 11 words with three or more syllables for 11 percent of the total words. The sum of these two factors is 13 + 11 = 24; and 0.4 x 24 = 9.6. Thus, the introduction to this chapter should be easily read by a high school sophomore.

Ten Commandments for Effective Written Communication

Following are ten commandments for good writing, taken from the Lewis and Baker book. Commandments eight and nine have been adapted to make them more relevant. The original book is chock full of practical suggestions for how to obey the commandments and is well worth a look.

1. Keep average sentence length within 18 words and use no more than 10 long words in each 100 words.

2. Don't waste words; make each pay its own way.

3. Write so your reader will believe you and can't misunderstand you.

4. Write in a friendly informal style whenever possible.

5. Use words of action when you want action and when you want your reader to know you are taking the action he desires.

6. Write so that your words and sentences will stick together.

7. Use a variety of expressions to avoid monotony and to increase reader interest.

8. Acquire proficiency as a typist. Learn a word processing package.

9. Make sure the physical appearance of your report impresses your reader favorably.

10. Continue to improve the thought content of your writing.

A Few More Writing Rules of Thumb

First, *and foremost, avoid acronyms and jargon*. You may find NEPA, NED, CERCLA, HTRW, ASA and other acronyms second nature. No one outside the Corps has a prayer of understanding that last sentence, however. Likewise, mitigation measures, expected annual damages, and so on make your message unclear. Avoid words you wouldn't use in everyday speech.

Fight ambiguity and abstractness. Words mean different things to different people. If you describe the design level for a wetlands restoration

project as -1 foot we don't know if that is mean sea level, national geodetic vertical datum, mean low water or mean high water. Be clear.

Don't *hide behind foot and a half long words.* Obfuscation does not imply profundity.

Kill those euphemisms. A flood is not a wet water event. A gas station attendant is not a petroleum transfer engineer and a school bus is not a motorized attendance module.

Check the logic of your sentences. Inane combinations of words often result when we write in haste, are distracted or careless. Make sure all your sentences make common sense.

...make common sense.

Avoid cop-out phrases. If an alternative is unacceptable to local interests say so. Don't say an alternative was sub-optimal.

Don't *mummify your thoughts.* A common mistake in reports and other kinds of writing that are intended to inform and enlighten the reader, is to take a good basic idea and then wrap so many meaningless, empty, extraneous words around it that the meaning of your thought gets lost.

Don't *attempt humor in a report*. Humor is a very personal thing and you are not likely to hit the target with every reader. See the last paragraph for an example. Did you find it funny? (We enjoyed it.)

Avoid sexist language. Whether you agree or disagree, it attracts attention these days. On the other hand, avoid nonsensical solutions to this modern sensitivity like (s)he, S/he, or she/he. If it is natural to use gender neutral words, do so. Alternate male and female pronouns now and then if gender neutrality becomes clumsy.

Keep explanatory material on target. If you are telling your story, make sure what you are writing contributes to the tale you are telling. Concentrate more on telling your story and less on reporting requirements. Get to the point. Eliminate excess words; avoid redundancies.

Don't let the subject and verb get too far apart. This is a simple problem that plagues writers dealing with technical subject matter.

As the Gunning Fog Index suggests, *write short sentences.*

Always use spell check. Then, proofread your work. Never send anything out for editing or review until you have re-read what you've written. Ask someone else to read it. Does it make sense to them?

SOME HINTS FOR PRESENTATION

Headings and Subheadings

Use **headings** *and* **subheadings** *to organize your report.* The reader should be able to look at the headings and subheadings in your report and get a basic feel for your story. If it is chronologically developed and has descriptive titles, the essence of the story should come through.

The headings give order to your story. Subheadings tell the reader which ideas are subordinate to others. The format you use does not really matter as long as it is consistent throughout the report. If you've seen something you like, use it.

Enumerate

Enumerate facts, ideas, instructions, questions and the like. Lists of things have more visibility than text. *Lists are a good way to conserve space and they can be powerful ways to convey ideas.*

Visuals

Anyone can dress up a report by adding **maps**, **charts**, **graphs**, **figures**, and **tables**. They can be used effectively, but they should never be used gratuitously. Each visual should serve a clear and distinct purpose. *In a main report there should never be a visual of any kind that is not both introduced and concluded.* Introducing a visual means tell the reader it is coming. Make reference to every visual you use. For example, "Containerized cargo forecasts are shown in Figure A." Concluding a visual means pointing out its significance. For example, "Containerized tonnage is expected to peak at 100 million tons in 2010."

Visuals are easy to produce with today's software but very few people have ever received formal training in their usage. There are many good books that deal with business communications or making presentations. Detailed discussions on the use of visuals can be found in these and in some of the books referenced at the end of the chapter.

Following are basic rules of thumb to follow in the use of visuals of any kind:

1. Always include a map that shows the locations of the places and things you discuss in your report.

2. Use tables and charts that make a single point in the text. Insert the visual next to the text that introduces it. Avoid placing all visuals together at the end of a report.

3. Keep tables and charts as brief as possible.

4. Signal the reader when a table or chart is coming up. Introduce it in the text.

5. Don't interrupt the text with a chart. Lead the reader into it and out of it.

6. Conclude the chart. Point out the significance of the chart to the reader. Steer the reader to the significance of the chart by summarizing the most important point it is making.

7. Label charts clearly and specifically. Number them consecutively, but number charts and tables separately.

8. Use a chart or table only if it helps the reader understand your point.

9. Keep the chart or table as simple as possible.

10. Use white space and labeling to make the visual attractive--make the reader want to look at it.

11. Consider using tables and charts in the appendix as a way of summarizing your significant data in a convenient form.

12. Use a consistent method in titling, captioning, and sourcing visuals.

Common Chart Forms

Charts are visual graphics. The **line graph** may be the most frequently used of all charts. It shows movements or changes of a continuous series of data, often over time. Time is conventionally plotted on the horizontal axis. When comparing two or more series on the same chart, take care to distinguish the lines by color or form (dots, dashes, and so on). If the

different series have different scales, be sure to show both on the vertical axis. Tick marks on the axes should be fairly proportionate. Make sure the values on the vertical axis make sense, e.g, use 25, 50, 75, rather than 21, 48, 72.

Alternatively, a line graph may be used to display the relationship between any two variables. For example, relationships between container cargo in tons and the number of container vessels calling at a port can be shown with a line chart. Care must be taken in using a line graph in this fashion. If there is no relationship between the variables, the graphs can look like an incomprehensible mess.

A **scatter diagram** is a useful device for showing the relationship or lack of a relationship between two variables. It is a simple plot of points in space; one point is plotted for each pair of variable measurements. This is most appropriate when one or both of the variables are not time series variables.

Bar charts run a close second to the line graph in popularity. They compare simple magnitudes by the lengths of equal-width bars. They are used to show quantity changes over time, quantity changes over geographic distance, or quantitative distances. The principal parts of the chart are the bars and the grid. The bars can run vertically or horizontally. They can be individual bars, they can be grouped (or compounded) or they can be stacked (or subdivided). The grid should be sufficiently detailed to facilitate easy comparisons. Bar charts are better suited for simple comparisons than for analytical purposes like lines.

A **histogram** is a bar graph used to depict data in a frequency distribution. Usually the bars are vertical. By convention, the bars are usually adjacent and touching.

A **pictogram** is a bar chart that uses pertinent pictures rather than bars to display the information. For example, the number of ships calling at a port could be shown in a bar chart or a line of ships where each picture of a ship stands for 1,000 vessels, could be used to display the same information. Generally, the same rules applied to bar charts are applied to pictograms. There are two special rules to note. First, each picture must be the same size; comparisons are based on the number of pictures. Second, the pictures should appropriately depict the quantity to be illustrated. For example, vessel calls should not be represented by a line of cattle.

Pie charts (or circle graphs) are area charts used to show the percentage composition of variables. The magnitude being displayed is shown as a pie and its component parts are shown as slices of the pie. The slices may be individually labeled, cross-hatched, or colored. An explanatory legend should be used. You can't show more than a whole thing or indicate

changes over time with a pie chart. Its use should be limited to situations in which the subdivisions of a single thing is called for.

Statistical maps can be used to show the spatial distribution of information. Weather maps are a common example. The information is overlain on a clearly outlined map in a variety of ways. Different colors or cross-hatching; placing quantities in numerical form within a geographic area; dots of varying size representing different quantities; and some form of chart, like a bar chart arising from a geographic region, are among the most common forms. With the advent and spread of geographic information systems (GIS), the ability to create statistical maps is markedly easier.

Flow charts are a favorite tool for displaying sequences in natural processes, organizational operations, lines of command in organizations, time stages in development, the structure of programs and other systems, and the like. Band or strata graphs are used to show time sequences. Study schedules are most often displayed in this fashion.

The **high-low-close** (or high-low) **chart** is a good way to display the variations in a variable within a designated time period. For example, these charts are often used to show the daily performance of a stock price. A **boxplot** (or box-and-whiskers plot) displays summary information for a distribution. It displays median, 25th and 75th percentiles values as well as minimum and maximum values of non-outliers. Outliers are also presented in the graphic.

There is virtually no limit to the ways that information can be effectively displayed. **Pictures**, **diagrams**, **cross sections**, **design drawings**, maps, **photographs**, and **drawings** are but some of the more obvious ways you can help tell your story with visuals. Make judicious and effective use of as many of these techniques as is appropriate.

Reader Guides

Make sure you have a good table of contents. If you use a lot of headings and subheadings consider including a "Contents in Brief" that include only chapter titles and main headings. Include a list of tables, a list of charts, a list of maps, and a list of every kind of visual you use. These lists should include titles, numbers, and page location.

An index…really helps the reader.

An index is a pain to create, but it really helps the reader. Include all the words, phrases, and topics that you suspect will be of interest to the reader in an index. This will help people find the things they are most interested in and it will help them locate things

they found while reading your report. Many word processing programs can help you build an index.

If you are going to use acronyms of any kind, make sure you include a list of all acronyms used at the beginning of the report. *If jargon is unavoidable, include a glossary*. Maybe writers will find plain speaking preferable to the effort required to construct a list of acronyms or a glossary. Not a bad trade-off.

A list of references should be included at the end of the text and before any appendices. Footnotes are easier on the reader than end notes.

SOME HINTS FOR REVISING

Editing or revising a report is quality control. Never write a report that you or someone else does not edit and revise at least once. Want to know how your report will sound to the reader? Try reading it out loud. Does it hold your interest? If it doesn't, it won't hold the reader's interest either.

Begin revising by looking at the organization and structure of the report. This is your story outline. Does the structure jump out at you? Is the structure of your story clear? Can you instantly tell the main point of your story from the structure? Can you find things easily? This is where the organization, headings, lists, table of contents, and index are most useful.

Is the purpose of your report clear? Is the beginning effective? Is the organization logical? Do you include all important points? Are key paragraphs well organized? Do you answer the what, why important and how questions? Does your structure keep the reader moving forward or do you keep backtracking?

When you have examined the overall organization of your report and addressed questions like these, then it's time to begin revising and editing words. You know what you want to say, you need to find the best words to say it. Go through the draft literally word by word and ask yourself whether each word is necessary. Then work on each sentence, applying the same tests. Do the same for each paragraph. Be merciless. Throw out the words, sentences, and paragraphs that do not contribute to the telling of your story.

IS SIZE IMPORTANT?

Think about how *USA Today* presents its information. Color graphics, maps, charts, drawings, and so on. These are the standards that have been set

for communicating information effectively today. *Do not underestimate the importance of appearance, if you want your report to be read.* If communicating your ideas to the reader is important to you, if you want your story to be heard, then the size of your report is also important.

…be clear, concise, and compact.

Few if any people are going to tackle a report that is four to five inches thick, even if it is written well. No one is going to read and absorb a 200-plus-page report, the present manual excepted if you've made it this far. Your story needs to be clear, concise, and compact. There are also cost advantages to shorter reports. But it still must be complete.

How long should the report be? Unlike term paper requirements, there are no minimum or maximum page requirements. *The report must be long enough to tell the whole story, but not so long that no one will read or understand it.* Nonetheless, we are going to throw out a 50 page challenge for a reconnaissance report and under 100 pages for a feasibility report. These are not suggestions and they are certainly not guidance. They are challenges. Try to tell your story in 50 pages. With visuals, headings and subheadings, and a well-written story, it is not unreasonable to expect an interested party to read 50 pages. On the other hand, you can get a great deal of information into a well thought-out 50-page report.

OTHER MEDIA

Are there other ways to tell your story besides a printed report? Indeed there are. At the present time, these alternatives must be considered complementary ways to tell your story. In time, they may become substitutes. Experimenting with other story telling media is encouraged, however, because communication is the end goal and multiple media should be used whenever feasible.

Experimenting with other story telling media is encouraged…

VIDEO REPORTS

High schools have been using video yearbooks as a substitute for printed books for over a decade. Video reports could well be an effective means of telling your story. A carefully scripted 20 or 30 minute video could convey a great deal of information effectively. It can be conveyed to a lot of people in a short amount of time. The video offers the options of going on site and illustrating problems explicitly. A wide variety of points of view can be displayed as well.

Producing effective video reports can be expensive. They can be broadcast quality, corporate quality or more amateur attempts. If you think writing a report is difficult, try scripting an effective video. This is a job that requires expertise. That expertise can be purchased or acquired through the school of hard knocks.

RADIO AND TV

Local radio and television are effective ways of reaching interested audiences. Appearances on radio talk show programs can be an effective way to initiate two-way communication with the interested public. Public service programming on radio and television shows can provide another opportunity to present information to the public. Press conferences can also attract media coverage. Appearances on local television news programs in brief interview segments can be effective. If you cultivate a relationship with local media, it may be possible to generate occasional reports as your story unfolds.

The more people know about your story from other sources, the more interested they will be in how it ends.

NEWSPAPERS

Press conferences, press releases, and regular contact with reporters can be effective ways of getting coverage of your story. Anyone who is going to try to involve the local media in telling their story would be well advised to coordinate with their public affairs officers well in advance to initiating such contact. There is an art and science to how this is best done, and doing it poorly can be a disaster.

INTERNET

How about a website or homepage for your study? If you set up a site early in the study and keep it updated, it can become an effective supplementary means of communication with a growing segment of the public. Websites can be used for two-way communication. Including an e-mail address for the study manager can encourage immediate feedback on the information you put out to the public. Reports can be published and made available over the Internet. This could be a great place to make databases or technical appendix-type material available without going to the trouble and expense of preparing a five-inch-thick report.

If you have a study that has generated a great deal of interest, it may be advisable to establish a mailing list. Using a list server, a mailing list ensures that everyone who subscribes to the mailing list gets copies of all e-mail that is sent by anyone on the list. This can be an effective forum for free and open discussion of study issues. It also provides the study team with a cheap and efficient alternative to mass mailings.

...a mailing list...can be an effective forum for free and open discussion...

An alternative to the mailing list is a newsgroup. It is the electronic equivalent of posting every e-mail message sent over a mailing list to a message board. The reader can enter the newsgroup area whenever she wants and read only those things of interest to her. The newsgroup subscriber does not get inundated with e-mailings on a daily basis.

MEETINGS, WORKSHOPS AND THE LIKE

If you want to get your story out to people, tell it as often as you can. Meetings with other Corps interests can facilitate the technical review of your report. Meetings with stakeholders and the public allow you to hone and perfect your story. As people learn what is going on and you learn what people are interested in hearing, you get better at telling your story. If people are familiar with some of the details, it makes it easier to understand your story.

Special meetings and workshops also allow you to deal directly with those issues that may not be of general interest to the reader. Meetings and workshops could be a viable alternative to including voluminous detail of interest to very few people in a report.

SUMMARY AND CONCLUSION

Lesson 1. Planners must report their findings so decisions can be made.

Lesson 2. Always write with your reader clearly in mind.

Lesson 3. Chronology is your friend. Tell your story.

Lesson 4. Write a report that people will read.

Lesson 5. Experiment with other story-telling media.

SUGGESTIONS FOR FURTHER READING

Bookstores are full of books that purport to teach good writing. Find one you like and use it. If you're interested in report writing, your best bet would be to look in the writing for business section of an academic or well-stocked public library. These books provide a wealth of hints, to-do lists, and a variety of helpful, easy-to-absorb suggestions for writing effective reports.

A few books you might find useful include these:

Ewing, David. *Writing for Results in Business, Government, the Sciences, the Professions*. New York: John Wiley & Sons, 1979.

Holcombe, Marya W. and Judith K. Stein. *Writing for Decision Makers: Memos and Reports with a Competitive Edge*. New York: Van Nostrand Reinhold Co., 1987.

Lesikar, Raymond V. *How to Write a Report Your Boss Will Read and Remember*. Homewood, IL: Dow Jones-Irwin, 1974.

Lewis, Phillip V. and William H. Baker. *Business Report Writing*. Columbus, OH: Grid, Inc., 1978.

Weaver, Patricia C. and Robert G. Weaver. *Persuasive Writing: A Manager's Guide to Effective Letters and Reports*. New York: The Free Press, 1977.

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APPENDIX I:
PLANNER'S LIBRARY

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This is a selected list of planning-related publications. Updates may be available on Headquarters' websites:

Planning:
http://www.usace.army.mil/inet/functions/cw/cecwp/guidance.htm

Policy:
http://www.usace.army.mil/inet/functions/cw/cecwa/guidance.htm

INDEX OF PUBLICATIONS

EP 25-1-1, *Index of Publications, Forms and Reports*. CEIM-IV, 30 June 1995.

> This pamphlet list: Corps' supplements to Army Regulations (AR), Engineer Circulars (EC), Engineer Manuals (EM), Engineer Pamphlets (EP), Engineer Regulations (ER), Office Memoranda (OM), Technical Letters (TL), and miscellaneous publications and forms.

REGULATIONS AND PAMPHLETS

U.S. Water Resources Council. 1983. *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies*. Washington, DC: U.S. Government Printing Office (March 10, 1983).

> The Principles and Guidelines guide the formulation and evaluation studies of the major Federal water resource development agencies, including the Corps' Civil Works studies. The full text of the P&G are included in ER 1105-2-100 (see Chapter Four of this manual).

ER 1105-2-100, *Guidance for Conducting Civil Works Planning Studies*. CECW-P, 28 December 1990 (under revision at this writing).

> This regulation provides guidance for the conduct of Civil Works planning studies and related programs by the Corps.

ER 1105-2-101, *Risk-Based Analysis for Evaluation of Hydrology/Hydraulics, Geotechnical Stability, and Economics in Flood Damage Reduction Studies*. CECW-P and CECW-E, 1 March 1996.

> This regulation provides guidance on the evaluation framework to be used in Corps flood control and flood damage reduction studies.

EP 1165-2-1, *Digest of Water Resources Policies and Authorities*. CECW-A, 15 February 1996.

> The "Policy Digest" provides a brief summary of the administrative and legislative water resources policies and authorities that apply to the Corps' Civil Works activities.

Council on Environmental Quality. 1978. *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act*. 40 CFR Parts 1500-1508. Washington, DC: U.S. Government Printing Office (November 29, 1978).

> These regulations tell Federal agencies what they must do to comply with the procedures and achieve the goals of the National Environmental Policy Act of 1969, as amended.

ER 200-2-2, *Environmental Quality, Procedures for Implementing NEPA*. CECW-RE (now CECW-A), 4 March 1988.

> This regulation provides guidance for implementation of the procedural provisions of the National Environmental Policy Act for the Corps' Civil Works Program. It supplements the Council on Environmental Quality's regulations in 40 CFR 1500-1508 (see above).

GUIDANCE LETTERS

Guidance letters are informal and early statements of new and evolving policies, procedures or other guidance. They are issued by several functional offices in the Corps' Civil Works Headquarters.

Planning Guidance Letters (PGL) were first issued by the Headquarters Planning Division (CECW-P) in Fiscal Year 1995. Applicable guidance from these letters will be included in subsequent revisions to ER 1105-2-100. Planning Guidance Letters to date are:

Planning Guidance Letter 95-1, Expediting Reconnaissance Certification (7 October 1994).

Planning Guidance Letter 95-2, Alternative Review Process (25 July 1995).

Planning Guidance Letter 95-3, Processing Reconnaissance and Feasibility Reports Recommending No Further Federal Action (11 August 1995).

Planning Guidance Letter 96-1, Reducing the Cost and Duration of Feasibility Studies (12 October 1995).

Planning Guidance Letter 96-2, Section 933 Study Requirements (29 April 1996).

Planning Guidance Letter 96-3, Expedited Reconnaissance Study Phase (16 August 1996).

Policy Guidance Letters are issued by the Headquarters Office of Policy (CECW-AR). The latest release was "Policy Guidance Letter Number 45, Responsibility for Alterations of Railroad Bridges - Flood Control" (27 April 1995). Applicable guidance from Letters Number 1 through Number 45 was included in the latest edition of EP 1165-2-1 (see above).

RESEARCH REPORTS

The following reports provide additional information on a wide variety of planning topics. Most of these publications were prepared by the Institute for Water Resources (IWR) and can be ordered by contacting:

Publications Manager
Institute for Water Resources
U.S. Army Corps of Engineers
7701 Telegraph Road
Alexandria, Virginia 22315-3868
[Fax orders to 703/428-8171]

General Planning

Project Partnership Kit. IWR Report 96-R-10, March 1996.

This report presents "Corps 101" for State, county and local governments and agencies interested in sponsoring a civil works study or project. It covers partners' rights and responsibilities; Corps missions and programs; who's who in the Corps; phases of project development; funding and financing; negotiable items; and project documents.

Handbook of Forecasting Techniques. IWR Report 75-7, December 1975.

This report is designed to help planners improve their expertise in long-range forecasting. It presents twelve basic methods for forecasting that are described and illustrated with examples.

Handbook of Forecasting Techniques, Part II, Description of 31 Techniques. Supplement to IWR Report 75-7. August 1977.

This report describes thirty-one of the most popular techniques used by forecasters in the early 1970s.

Public Involvement and Related

Public Involvement Techniques: A Reader of Ten Years Experience at the Institute for Water Resources. IWR Report 82-R1, May 1983.

> This is a collection of articles on public involvement programs, defining the public, public meetings, techniques and methods, and other public involvement related topics. A second Reader covering recent experience is in preparation.

Environmental Manager's Handbook on Public Involvement. Spring 1995. (Report available through the Institute for Water Resources).

> This report provides practical information on public involvement activities at Army installations, and much of it is applicable to Civil Works and other planning. Topics covered include public involvement requirements, designing public involvement programs, designing and conducting workshops, and working with advisory groups.

Partnering. IWR Pamphlet 91-ADR-P-4, December 1991.

> This pamphlet describes concepts and the implementation of partnering, an approach designed to create a positive, disputes-prevention atmosphere during contract negotiation. Partnering uses team-building activities to help define common goals, improve communication, and foster a problem-solving attitude among individuals who must work together.

Tri-Service Committee: Air Force, Army Navy. *Partnering Guide for Environmental Missions of the Air Force, Army and Navy*. July 1996. (Report available through the Institute for Water Resources).

> This report addresses partnering in the Department of Defense environmental mission, who are partners, a "how to" guide to partnering, frequently asked questions, and case studies.

National Economic Development Analyses

An Overview Manual for Conducting National Economic Development Analysis. IWR Report 91-R-11, October 1991.

> This manual provides an overview of the National Economic Development principle that is essential in determining whether the Federal government will construct any water resource development project. Analysts working within this framework and decision makers who must understand it are the manual's intended audience.

National Economic Development Cost Manual. IWR Report 93-R-12, June 1993.

This manual provides a framework for thinking about National Economic Development (NED) costs and their various uses by the Corps. The intent is to furnish the reader with the tools necessary to understand what NED costs are, how they are used, and how they differ from other definitions of costs. To understand NED costs, it is essential that the nature of these other costs be considered as well.

Deep Draft Navigation. IWR Report 91-R-13, November 1991.

The two purposes of this manual are: to explain the concept and application of National Economic Development evaluation to harbor project sponsors, and to assist the individuals who perform evaluation studies to expeditiously comply with *Principles and Guidelines'* requirements. The procedures are designated "Deep Draft Navigation" in the *Principles and Guidelines*, but apply to all commercial navigation projects not a part of the "Inland Waterways System". The manual covers theoretical and practical aspects of benefit evaluation, provides sources of information to identify and estimate future project use, and contains examples of benefit calculations.

Urban Flood Damage. IWR Report 88-R-2, March 1988.

The primary purpose of this manual is to provide an expanded description of the benefit procedures described for urban flood damages in the *Principles and Guidelines*. It provides specific procedures for the entire process of estimating National Economic Development urban flood damage reduction benefits and is intended for use in project feasibility planning and evaluation. It is intended to be a reference guide to questions an analyst might have in conducting an urban flood damage evaluation.

Urban Flood Damage - Volume II: Primer for Surveying Flood Damage for Residential Structures and Contents. IWR Report 91-R-10, October 1991.

This manual is a primer for conducting comprehensive flood damage and related surveys. It explains how basic principles of survey research can be applied to data collection for flood damage studies. Two prototype questionnaires (one face-to-face and one mail with a preliminary telephone supplement) for collecting residential flood damage and related information are presented. Examples from previous applications of these questionnaires provide insight as to how they may be adapted and implemented for future flood damage studies.

Coastal Storm Damage and Erosion. IWR Report 91-R-6, August 1991.

This manual provides a description of benefit evaluation procedures for the prevention of coastal storm damage and erosion, based on principles included in the *Principles and Guidelines.* It presents selected, specific procedures for the entire process of benefit estimation and is intended for use in project feasibility planning and evaluation. It is intended to serve as a reference guide to questions posed by an economic analyst in conducting a coastal storm damage and erosion prevention evaluation.

Agricultural Flood Damage. IWR Report 87-R-10, October 1987.

This manual provides an expanded description of the agricultural benefit evaluation procedures recommended in the *Principles and Guidelines*. It presents specific procedures for the entire process of agricultural benefit estimation and is intended for use in project feasibility planning and evaluation. It is intended to be a reference guide to questions an analyst might have in conducting an agricultural benefit evaluation.

Recreation - Volume I: Recreation Use and Benefit Estimation Techniques. IWR Report 86-R-4, March 1986.

The primary purpose of this manual is to provide an expanded description of the recreation evaluation procedures recommended in the *Principles and Guidelines*. It summarizes the conceptual basis of procedures for recreation valuation associated with water and related land resources planning, describes the mechanics of acceptable recreation valuation methods, and offers criteria for determining the applicability of various methods to particular planning situations.

Recreation - Volume II: A Guide for Using the Contingent Value Methodology in Recreation Studies. IWR Report 86-R-5, March 1986.

This manual is designed to assist Corps planners in using the contingent value method (CVM) for the evaluation of National Economic Development recreation benefits. Along with the travel cost method, the CVM is recommended in the *Principles and Guidelines* for evaluating the recreation benefits of water resources development projects. In addition to presenting the concepts and background required for using the CVM, several examples are provided to further describe the basic process required in its application.

Recreation - Volume III: A Case Study Application of Contingent Value Method for Estimating Urban Recreation Use Benefits. IWR Report 90-R-11, November 1990.

> This manuals documents, through a case study demonstration, the practical application of the contingent value method (CVM) in an actual recreation planning study. The case study description serves as a practical guide and, therefore, emphasizes what was done more than the concepts behind the techniques used. Specific objectives include: illustration of the CVM in the estimation of recreation use and benefits in an urban application; illustration of the development of regional valuation models; and discussion of the potential transferability of the process and findings to other planning applications.

Recreation - Volume VI: Evaluating Changes in the Quality of the Recreation Experience. IWR Report 91-R-7, July 1991.

> This manual emphasizes the evaluation of changes in quality of the recreation experience (shifts in the demand schedule). The primary purpose of this manual is to describe procedures and methodologies for valuating changes in recreation use and value resulting from management decisions impacting on recreation facilities and services and on the related natural resource base.

Public Surveys - Volume I: Use and Adaptation of Office of Management and Budget Approved Survey Questionnaire Items for the Collection of Planning Data. IWR Report 93-R-2, January 1993.

> This manual provides guidance for the use of the Office of Management and Budget approved survey questionnaire items. It provides specific guidance on cross referencing the compendium of approved survey questionnaires by: topic of study, methods of data collection, and types of survey questions. It also provides general survey implementation and analysis guidance, supplementing coverage of the survey process contained in earlier National Economic Development Manuals.

Environmental Analyses

Compilation and Review of Completed Restoration and Mitigation Studies in Developing an Evaluation Framework for Environmental Resources, Volumes I and II. IWR Reports 95-R-4 and 95-R-5, April 1995.

> This two-volume set describes important environmental restoration and mitigation planning issues currently facing Corps planners. Findings are based on ten field case studies, including interviews of both Corps and non-Corps study team members, and a focus session

conducted with Washington level reviewers. Volume I includes a description of the research approach, and findings and recommendations for future research. Detailed summaries of the focus session and the individual case study interviews are in Volume II.

Environmental Valuation: The Role of Stakeholder Communication and Collaborative Planning. IWR Report 96-R-14.

This report describes how understanding the perspectives of stakeholders in Corps environmental projects might improve the identification and communication of project benefits. This report is based, in part, on three case studies of current Corps environmental projects as well as interviews with Headquarters personnel involved in policy making for or review of environmental projects.

An Introduction to Risk and Uncertainty in the Evaluation of Environmental Investments. IWR Report 96-R-8, March 1996.

This report introduced Corps personnel involved in the planning of environmental restoration projects to the basics of risk and uncertainty analysis. The taxonomy of terms described in this report provides the new risk analyst with a way to think about the knowledge, model, and quantity uncertainty that is present in environmental planning. Selected tools and broad concepts are introduced as a means of addressing these uncertainties. An example introducing risk-based analysis to the estimation of habitat unit changes is offered to demonstrate the feasibility of some of the methods presented in this report.

Incorporating Risk and Uncertainty into Environmental Evaluation: An Annotated Bibliography. IWR Draft Report 96-R-9.

This report summarizes the applicability of existing Corps of Engineers guidance (on risk-based analysis of flood damage reduction projects and major rehabilitations of hydropower and navigation projects) to environmental projects. In brief, while the sources of uncertainty in the evaluations of these kinds of projects obviously differ from environmental projects, addressing such topics as the decomposition of risk among constituent parts and analytical techniques for dealing with uncertainty do provide valuable insight into how risk analysis might be applied to environmental investment planning. The report also reviews literature dealing with general risk and uncertainty assessment and management techniques and specific examples of risk analysis applications with an environmental emphasis.

Resource Significance: A New Perspective for Environmental Project Planning. IWR Report 95-R-10, June 1995.

> Resource significance is one metric that can be used in the selection and prioritization of environmental projects for implementation. This report provides a brief discussion of the concept of resource significance in terms of scientific or technical, institutional, and public criteria. It provides a summary of a review of 95 existing programs that have been developed for purposes of ranking projects, with more detailed summaries of selected programs that assist in determining environmental significance. Included in the review are examples of Federal, regional, state, and nonprofit programs and programs for historical properties.

Prototype Information Tree for Environmental Restoration Plan Formulation and Cost Estimation. IWR Report 95-R-3, March 1995.

> This report focuses on three specific objectives: 1) developing a prototype information tree to provide and organize information useful for formulating and estimating the costs of environmental restoration and mitigation plans; 2) describing the contents and linkages within the tree; and 3) beginning the process of building the tree database and identifying data deficiencies and data sources. Preliminary implementation of the tree is provided with illustrative linkages of broad problem area/management approaches to management measures to management techniques to major environmental engineering features for lakes and ponds, rivers and streams, non-tidal wetlands, and tidal wetlands.

National Review of Non-Corps Environmental Restoration Projects. IWR Report 95-R-12, December 1995.

> This report has compiled and compared management measures, engineering features, monitoring techniques, and detailed costs for a representative sample of non-Corps environmental projects or engineering projects (39) with environmental features. This report is part of the series of reports that will help build into the *Prototype Information Tree for Environmental Restoration Plan Formulation and Cost Estimation* report. The projects are categorized into sixteen types, based on the project's primary features.

Review of Monetary and Nonmonetary Valuation of Environmental Investments. IWR Report 95-R-2, February 1995.

> Placing value on the environment, whether through monetary-based methods or through other evaluation techniques, has been and will continue to be a widely debated topic. The conceptual foundation and institutional setting for pursuing further study are developed in this

report. Specific objectives are to: 1) describe services provided by environmental resources and systems and methods for their measurement or valuation; 2) review existing research programs and products; and 3) evaluate the resource constraints on potential Corps' field applications. Independent expert views from an economist, engineer, ecologist, and psychologist as to environmental outputs and valuation techniques are included as appendices.

Linkages Between Environmental Outputs and Human Services. IWR Report 96-R-4, February 1996.

This report identifies relevant socioeconomic use and nonuse values associated with environmental projects and also improves the linkages between environmental output measures and necessary inputs for socioeconomic evaluation. It answers the question: What are the possible changes in the ecosystem that may result from Corps environmental mitigation and restoration projects, and what outputs and services do these changes provide society? The report includes a suite of tables which link management options, to ecological inputs, to ecological outputs, and then finally to human services. Also, indirect effects of management options are identified.

Trends and Patterns in Cultural Resource Significance: An Historical Perspective and Annotated Bibliography. IWR Report 96-EL-1, January 1996.

This report offers a broad, analytical review of the literature concerned with the challenging subject of evaluating cultural resource significance. The review of significance includes an annotated bibliography and an analysis section. The literature summarized is extensive and is not accessible widely to the archeological and cultural resource management communities. Twenty-one major themes or concepts were established to characterize the breadth of archaeological views and ideas about significance. A review of each theme was undertaken, including both a discussion and a graphical presentation of trends through time.

Cost Effectiveness Analysis for Environmental Planning: Nine EASY Steps. IWR Report 94-PS-2, October 1994.

The report presents step-by-step instructions about how to conduct cost effectiveness and incremental cost analyses for environmental restoration and mitigation, using an example to illustrate their application to a planning problem.

Bussey Lake: Demonstration Study of Incremental Analysis in Environmental Planning. IWR Report 93-R-16, December 1993.

> The report presents the results of a demonstration study that tested the procedure for cost effectiveness and incremental cost analyses using data from the Bussey Lake habitat restoration study.

Evaluation of Environmental Investments Procedures Manual Interim: Cost Effectiveness and Incremental Cost Analyses. IWR Report 95-R-1, May 1995.

> This manual is a guide for conducting cost effectiveness and incremental cost analyses for the evaluation of alternative environmental restoration or mitigation plans. It presents a procedural framework for conducting the cost analyses and discusses how they fit into, and contribute to the water resources planning process. Discussed are the conceptual underpinnings, practical step-by-step procedures, and implications for decision making.

ECO-EASY, Cost Effectiveness and Incremental Cost Analyses, Beta Version 2.6. May 1995.

> This software automates the step-by-step procedures for cost effectiveness and incremental cost analyses, as described in IWR Report 95-R-1.

Trade-off Analysis for Environmental Projects: An Annotated Bibliography. IWR Research Report 95-R-8, August 1995.

> This study explores the literature for analytical techniques that can support the complex decision-making process associated with Corps environmental projects. The literature review focuses on opportunities for using trade-off methodologies and group processes in environmental plan formulation and evaluation. An annotated bibliography is included.

Development of an Integrated Bio-Economic Planning System for Corps of Engineers Planning Projects: Conceptual Design. IWR Report 96-EL-2, February 1996.

> This report describes the conceptual design of an Environmental Decision Support System (EDSS) that would give planners the ability to design multiple management scenarios and assess the biological outputs associated with each scenario in a "user-friendly" environment. The EDSS would allow comparisons of multiple scenarios and combinations of scenarios using a cost effectiveness and incremental cost strategy. Four major components would be combined to produce the EDSS: 1) spatial information and analysis; 2) environmental benefit and cost evaluations; 3) cost effectiveness

and incremental cost analyses; and 4) multiple management design analyses.

Civil Works Environmental Desk Reference. IWR Report 96-PS-3, July 1996.

This contains summary profiles of 62 Federal environmental laws applicable to the Civil Works Program. Each profile includes: legal citations, common names, statute summaries, references to related Corps guidance, general compliance requirements, and suggestions for restoration-related management opportunities. Full text copies of 22 Executive Orders related to the environment are also included.

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