A Review of the Proposed Revisions to the Federal Principles and Guidelines Water Resources Planning Document

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Committee on Improving Principles and Guidelines for
Federal Water Resources Project Planning

Water Science and Technology Board

Division on Earth and Life Studies

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A Review of Proposed Revisions to the Federal Principles and Guidelines Water Resources Planning Document

SUMMARY

Since it was issued in 1983, the federal document *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* has guided water resources project planning for four federal agencies: the Corps of Engineers, the Bureau of Reclamation, the Tennessee Valley Authority, and the Soil Conservation Service (today the Natural Resources Conservation Service). The "Principles and Guidelines" document was issued by the federal Water Resources Council near the end of the era of large multiple-purpose dam construction.

Since the early 1980s there have been many changes in the national water resources planning landscape. For example, there have been increased cost-sharing requirements for local water project co-sponsors and there has been some decentralization of decision making authority in water project planning and operations. Scientific understanding and appreciation of the natural functions of aquatic ecosystems have increased, and environmental protection and ecosystem restoration have become primary planning objectives for some projects, such as Florida Everglades restoration. At the same time, traditional water resource sectors, such as inland navigation and hydroelectric power production, remain important to many parties. Many national water planning challenges involve balancing decisions and resources among a greater number of water resource users and interests.

In light of these developments, many groups—including committees of the National Research Council—have recommended that the P&G be reviewed and modernized. In the 2007 Water Resources Development Act (WRDA 2007), Section 2031, the U.S. Congress directed the Secretary of the Army to revise the P&G. Congress also directed the Secretary to consult with other entities, including the National Academy of Sciences. During the process of revising the P&G, lead responsibility for the revisions was reassigned from the Secretary of the Army to the Council on Environmental Quality (CEQ). The CEQ released its "Proposed National Objectives, Principles and Standards for Water and Related Resources Implementation Studies" in December, 2009. The following report is from the National Research Council (NRC) *Committee on Improving Federal Principles and Guidelines for Water Resources Planning* and it constitutes a review of the 2009 document issued by the CEQ.

The 1983 P&G contains three main sections: 1) standards, 2) national economic development (NED) benefit evaluation procedures, and 3) environmental quality (EQ) benefit

evaluation procedures. The 1983 document also includes a 2-page statement of Principles. The 2009 proposed revisions from the CEQ do not fully replace the entire 1983 P&G. Rather, the 2009 document reflects changes to the 'principles' and the 'standards' sections only from the 1983 document.

An effort to modernize the P&G document so that it reflects contemporary planning methods and principles, and today's societal and economic priorities, is timely. However, the 2009 proposed revisions lack clarity and consistency in several respects. One weakness is that the distinctions and relations among "objectives", "principles", and "standards" are not clear. The 2009 proposed revisions also exhibit ambiguity in identifying the federal agencies, programs, studies, and projects to which they will be applied. Another weakness is that the planning principles and steps presented in the document are not fully consistent and lack sufficient coherence in defining a process for planning or implementation. For these reasons, detailed advice on specific planning procedures at this point would be premature. As CEQ proceeds with further revisions to the P&G document, clarification and specification in these areas will be necessary for the document to be of value to CEQ and the federal agencies that will use the document in decision making.

The report's recommendations are as follows:

- **The distinctions between the major sections of the proposed revisions—objectives, principles, and standards—should be better defined. The hierarchy and relationships among the major sections should be clarified.**
- **The proposed revisions to the P&G should more clearly specify the agencies, programs, studies, and water projects to which they will apply. If the new document is to apply solely to the four traditional construction-oriented agencies, the proposed revisions should reflect the fact that these agencies today are constructing fewer new projects. It should acknowledge that managing and adjusting existing projects and water supplies are more important to their work programs today, which entails many considerations different than new project planning. There is a clear need for strong federal interagency collaboration on many water planning and management matters. If a revised P&G document is to apply to all federal water-related agencies, however, the CEQ will face considerable challenges in integrating the numerous and diverse mandates, authorities, and programs across these many agencies. One option for CEQ would be to request each relevant water agency to report on how it will help implement national water principles and priorities.**
- **The CEQ should clarify whether a revised P&G document will be used as general policy guidance, or as a decision document that specifies planning steps to be followed, or both. If the proposed revisions are to provide a document that specifies planning steps and analytical procedures, the many challenges that would attend creating a document to be uniformly applied to the large range of modern water projects—locks and dams, levees, navigation channels, ecosystem restoration, flood risk management, watershed protection, water supply projects —managed across an array of federal agencies, should be considered carefully. The national objective**

for water resources development and management activities should be stated more clearly and should be followed throughout the document.

- **Future revisions to the P&G document should acknowledge that many considerations beyond strict benefit-cost comparisons are important in water resources decision making and are necessary to meet societal objectives.**
- **In future revisions, the CEQ should more carefully present and explain broad water resources concepts. The CEQ also should recognize conflicts and inconsistencies among those concepts, and seek to minimize consequences of these conflicts.**

INTRODUCTION

Since the Water Resources Council[1] issued the federal *Principles and Standards for Planning Water and Related Land Resources* (P&S) in 1973 to guide water project evaluation, national concerns and policy emphases have evolved. Development of the science and practice of aquatic ecosystem restoration, recognition of beneficial uses of floodplains, and new emphasis on a full array of structural and nonstructural approaches to flood risk management reflect societal commitments to balance environmental quality, economic well-being, public safety, and other important factors.

A revised document—the *Principles and Guidelines for Water and Related Land Resources Implementation Studies* (P&G)—was issued in 1983. It applied to four water resources agencies: the Bureau of Reclamation, the U.S. Army Corps of Engineers (Corps), the Tennessee Valley Authority (TVA), and the USDA Soil Conservation Service (now the Natural Resources Conservation Service, or NRCS). The 1983 document prescribed an evaluation and screening process for new water projects, which was consistent with the budgets and missions of these agencies. The 1983 P&G document contained three main sections: (1) standards, (2) national economic development (NED) benefit evaluation procedures, and (3) environmental quality (EQ) benefit evaluation procedures. The document also contained a 2-page set of Principles, which were signed by then-president Reagan.

In 1983, the programs of these federal water planning agencies were in flux. They were shifting their emphasis away from new project planning toward managing and rehabilitating existing dams and infrastructure. The Bureau of Reclamation and the Corps of Engineers, for instance, are the nation's two largest dam and water project (e.g., levees, navigation channels) construction agencies. By the early 1980s, they had built a large water storage and delivery, flood protection, and navigation infrastructure. Most of the good sites for large dams had been built upon, and environmental concerns and constraints limited the ability to build new dams. Although they were building fewer dams, they were facing new challenges such as compliance with the federal Endangered Species Act, working with revised cost-sharing rules for water project construction, and accommodating and incorporating ecosystem protection and restoration goals into their planning. There was a shift from constructing new projects, to greater emphasis on operations and maintenance of facilities and reallocations of existing water supplies. The

[1] The Water Resources Council was zero-funded in 1981.

1983 document, however, reflected a philosophy and process that focused on new project planning.

In Section 2031 of the Water Resources Development Act of 2007, the U.S. Congress mandated that the Principles and Guidelines be revised. Congress required that the Secretary of the Army conduct this review. Congress instructed the Secretary to consult with several entities in the course of that review, including the National Academy of Sciences (NAS). In response to this directive, the National Research Council (NRC, the working arm of the NAS) appointed an expert committee to review the proposed revisions.

In the course of the proposed revisions, lead responsibility for the revisions was reassigned to the Council on Environmental Quality (CEQ). This report was authored by the NRC *Committee on Improving Principles and Guidelines for Federal Water Resources Planning* (Appendix A is a roster of committee membership). The project was sponsored by the CEQ with participation of the Corps of Engineers and the National Oceanic Atmospheric Administration (NOAA). The committee's statement of task is listed in Box 1-1.

The committee held three meetings in the course of its review. Its first two meetings were held in Washington, D.C. in March and May, 2010. Both meetings featured public sessions with invited guest speakers (Appendix B) and public comment sessions. A third and final closed meeting was held in Boulder, Colorado in August 2010, at which the committee finalized its draft report.

This report represents the committee's review of the 2009 proposed revisions and offers findings and recommendations for the document's improvement. The committee's statement of task requested input regarding how the proposed revisions might accommodate emerging national water issues, and how its recommendations might benefit national water resources management.

Regarding proposed benefits of the report recommendations, each section within the body of this report provides explanation and support for its findings and recommendations (also listed in the Summary). Regarding more detailed advice on how proposed recommendations might accommodate emerging national water issues and problems, all recommendations implicitly are offered to assist CEQ in addressing emerging issues.

An effort to modernize the P&G document so that it reflects contemporary planning methods and principles, and today's societal and economic priorities, is timely. However, as this report explains, the 2009 proposed revisions lack clarity and consistency in several respects. Given that the 2009 document represents only a partial revision to the P&G document, and given several areas of ambiguity and incompleteness in the 2009 proposed revisions, detailed advice on specific planning procedures at this point would be premature. As CEQ proceeds with further revisions to the P&G document, clarification and specification in these areas detailed below will be necessary for the document to be of value to CEQ and the federal agencies that will use the document in decision making.

BOX 1-1

CHARGE TO THE NRC COMMITTEE ON IMPROVING PRINCIPLES AND GUIDELINES FOR FEDERAL WATER RESOURCES PLANNING

This study will advise the Council on Environmental Quality (CEQ) on proposed revisions to the federal Principles and Guidelines (P&G). Originally, this project was part of response to a 2007 congressional mandate to the U.S. Army Corps of Engineers to revise the federal Principles and Guidelines. The P&G document contains the basis for federal water resources project planning.

The CEQ will provide the committee proposed revisions to a portion of the P&G. That portion will consist of the "principles" (a 2-page policy statement) and Chapter 1 of the P&G document, also known as "standards."

Specifically, the committee will:

(1) Review the proposed revisions to the P&G principles and standards document and provide recommendations and justification for that document's improvement.

2) Consider how these proposed revisions accommodate relevant emerging national water issues and problems and promote better water resources decisions and projects.

For each recommendation or suggested improvement, the committee will explain the intent of its recommendation and how it might affect water resources plan formulation, and explain the prospective benefits of the recommendation to national water resources management.

The committee’s recommendations and report will focus on improving the scientific, economic, risk, and other technical aspects of the proposed revisions. The committee will not investigate potentially related, but non-technical, issues such as budgetary priorities, division of federal agency responsibilities, or passage of new legislation.

KEY NATIONAL WATER MANAGEMENT ISSUES

The Council on Environmental Quality is drafting proposed revisions to the P&G document in a very different planning setting than existed when the 1983 document was issued. For many reasons, national water resources priorities and key planning challenges have shifted. The missions of agencies like the Corps of Engineers have evolved and broadened substantially. Core functions—navigation, flood control, water supply, and hydropower generation—remain important. For the Corps of Engineers, new missions have been added to these functions, especially aquatic ecosystem restoration.

This committee did not conduct a detailed investigation of national water challenges nor did it attempt to prioritize them. Nevertheless, there are many national water resources needs, and the related planning and management challenges are likewise considerable. Some of these challenges, such as reconciling economic and environmental priorities, or coping with extreme flood events, are traditional concerns of the federal water planning agencies. Others such as design of ecosystem restoration projects, reallocating water from traditional users to rapidly growing cities or ecosystem restoration purposes, and controlling nonpoint source pollution reflect more recent changes and needs. Many of today's key national water management issues lie largely outside the missions of the agencies for which the P&G was written.

A partial list of prominent issues and challenges in today's national water planning context includes:

- Integrating floodplain management, risk management, public safety, and ecosystem values;
- Aging water control infrastructure and port and inland navigation facilities in many areas;
- Accommodating diverse stakeholder preferences in operational decisions;
- Integrating social and cultural values into technical aspects of water project decision making;
- Rapid population growth and increasing water demands;
- Increasing demand for water resource projects with diminishing ability to fund, as evidenced by the backlog of authorized but unfunded projects.
- Reallocating water resources to new uses, including ecosystem restoration;
- Water quality, especially nonpoint source pollution;
- Extreme climate events and changing climate conditions;
- Fulfilling legal obligations to protect endangered species while simultaneously meeting demands of traditional water users.

There also is a need to better integrate federal programs, and federal-state-local programs, in addressing some of these challenges. Furthermore, all agencies will be affected and constrained by the realities and limits of federal resources and of appropriations processes. These realities, challenges, and broadening missions are all important considerations for CEQ as it proceeds with revisions to the P&G.

That the setting of national water management, priorities, and agency missions has been in flux is undeniable. The CEQ's efforts to revise the P&G are greatly affected by these changes; at the same time, however, it is not fully clear how the CEQ envisions these challenges and priorities. As CEQ proceeds, the relations between proposed revisions, and national priorities and agency missions, will need to be discussed and clarified.

DOCUMENT ORGANIZATION AND COHERENCE

The proposed revisions are divided into three sections: objectives, principles, and standards. Ideally, the distinctions between these sections would be clear, as would the linkages between them and the logic that connects them. Unfortunately, these distinctions and

relationships within the proposed revisions are unclear. Indeed, the meaning of the terms "objectives," "principles," and "standards," invite confusion in the absence of clear definitions.

There is a hierarchy implied by the division of the document into these three sections. However, it is not clear how any one section would complement or support others, and there is overlap among the sections. The opening section on Objectives, for instance, states that one objective is to avoid "the unwise use of floodplains, flood-prone areas, and other ecologically valuable areas." In the following section on Planning Principles, this same statement about unwise use appears as #3 in a list of 13 principles.

In another example, roughly one-half of the Planning Principles is devoted to Overview of the Planning Process. However, many elements of the planning process are presented in the following section on Planning Standards. Moreover, the language between these two sections on planning is not always consistent. For example, in the Planning Principles, it states that a recommended plan will "Provide(s) the greatest net overall contribution to the National Water Resources Planning Objectives" (p. 2). But in the Planning Standards section, it is stated that the recommended plan will "provide combined beneficial effects for the Nation that outweigh the combined adverse effects…" These are two different standards.

Finding:

The distinctions among objectives, principles, and standards are not clear and their hierarchical relations are not maintained through the document.

Recommendation:

The distinctions between the major sections of the proposed revisions—objectives, principles, and standards—should be better defined. The hierarchy and relationships among the major sections should be clarified

APPLICATION TO FEDERAL AGENCIES

Any guidance document that would apply to multiple federal agencies, which are governed by different laws and authorities, carry out different missions, and apply different methods and metrics of evaluation, will contain ambiguities and abstractions. No single document could, for instance, create a detailed set of prescriptive planning procedures that would apply uniformly to, for example, the Corps of Engineers, the Environmental Protection Agency, and the Department of Agriculture. By most counts there are over 20 federal agencies with water-related responsibilities.

One limitation within the proposed revisions is confusion regarding the agencies to which the proposed revisions will apply. One part of the document (Planning Standards, p. 4) states that planning standards will apply to the Corps of Engineers, the Bureau of Reclamation, the Tennessee Valley Authority, the Natural Resources Conservation Service, and "Any other federal agency studies meeting the general criteria presented above." The document then goes on to state that the Principles and Standards in the proposed revisions "do not apply to routine project operations…or watershed plans or regulatory activities." The language in the following paragraph is confusing, as it states that the 'Principles and Standards' do not apply to, for instance, "watershed plans…." "Watershed plans", however, is not only somewhat abstract and

conceptual, but agencies like the Corps of Engineers and Bureau of Reclamation—often are encouraged to employ a watershed planning approach in studies and operations.

The confusion regarding to which agencies this document will specifically apply affects much of the rest of the document. That is, if the document is to apply to the four agencies covered in the 1983 P&G document, there may be a stronger rationale for issuing a "decision document" that provides specific steps and formula for project evaluation. On the other hand, if the document is to have broader applicability, there will be less reason to present planning steps to be followed and a stronger argument for issuing more of a general, policy statement.

The proposed revisions also could provide greater detail about which programs, studies, and water projects to which they will apply. It is stated, for instance, that the proposed revisions do not apply to regulatory activities, but many regulatory decisions by the U.S. Environmental Protection Agency, for example, drive or constrain water resources project planning. It may also be useful to more clearly explain that the proposed revisions may not be intended to apply to every program or branch within an agency. For instance, the proposed revisions might be applied to construction of USDA/NRCS flood retention structures, but not to USDA farm grants that are aimed at improving water quality.

Finding:

It is clear that the proposed revisions will apply to the four traditional water development agencies. It is not clear, however, to which other agencies the proposed revisions will apply. It also is not clear how application of the proposed revisions to additional agencies would be implemented. Finally, it is not clear to which types of water resources management programs, studies, and water projects the proposed revisions will apply.

Recommendations:

The proposed revisions to the P&G should more clearly specify the agencies, programs, studies, and water projects to which it will apply. If the new document is to apply solely to the four traditional construction-oriented agencies, the proposed revisions should reflect the fact that these agencies today are constructing fewer new projects. It should acknowledge that managing and adjusting existing projects and water supplies are more important to their work programs today, which entails many considerations different than new project planning.

There is a clear need for strong federal interagency collaboration on many water planning and management matters. If a revised P&G document is to apply to all federal water-related agencies, however, the CEQ will face considerable challenges in integrating the numerous and diverse mandates, authorities, and programs across these many agencies. One option for CEQ would be to request each relevant water agency to report on how it will help implement national water principles and priorities.

PURPOSES OF THE PROPOSED REVISIONS

The 2009 proposed revisions contain a mix of general planning principles and operational guidance. The planning principles, presented on P. 1-3, are a 13-point (A-H) list that combines concepts and practices. Although these 13 points listed may not be objectionable, the mix of

concepts presented within the list is highly abstract and provides little practical guidance for setting priorities or ranking project alternatives. For example, the list contains points such as "Account for ecosystem services" (B) and "Ensure the planning process is fully transparent" (L). The list contains other abstract concepts and, as such, offers limited value in terms of specifics for planning guidance. The section on planning standards, presented on P. 4-12, also presents many concepts and phrases that are not clearly defined, are thus open to interpretation, and do not provide clear guidance. The section contains, for example, terms such as "unwise use of floodplains" (P. 6), a term that clearly is open to debate and multiple interpretations. Terms such as "ecosystem based approach" (P. 6) and "best available science" (P. 9), although part of the modern water planning lexicon, are not concrete concepts that provide clear direction.

A large portion of the proposed revisions (p. 13-23) describes a planning process that reflects and copies much of the (6-step) planning process within the 1983 P&G. This section includes many concepts that are reasonable, such as specifying objectives, formulating alternatives, and evaluating potential effects of alternatives. As presented in the proposed revisions, however, this section lacks the specificity and consistency needed for a transparent planning process that would add any value to a decision process. For example, the section contains statements such as "Professional judgment may be applied where data are lacking, as long as the rationale and assumptions are justified." Professional judgment surely is essential to good decision making, especially in instances with limited funds and time constraints. As presented, however, this statement offers no practical advice or examples of instances in which professional judgment is necessary or appropriate. Another example is the statement "All alternatives shall be formulated to fulfill the following criteria: completeness, effectiveness, efficiency, and acceptability." It is hard to find fault with the spirit of such statements, but they do little to provide bounds or guidance regarding appropriate steps or planning priorities.

The abstract terminology of each of these sections, and the lack of concrete guidance that might be used to, for instance, identify and prioritize operational or other water project alternatives, conveys a lack of clarity regarding the purpose of the proposed revisions. The use of planning principles and standards surely could be useful, but they are not presented as part of a coherent decision-making process.

Including contemporary water resources planning principles within an updated Principles and Guidelines document is appropriate. However, the proposed revisions provide insufficient advice on steps for implementing all these contemporary concepts in a planning and operational setting that has changed substantially since 1983. Many of the steps and concepts presented in the 'Overview of the Planning Process' section have merit; but most of the concepts therein are abstract and not clearly defined. For instance, on P. 15 in the section entitled "Determine Existing and Future Conditions" it states that "Key uncertainties for both existing and future conditions shall also be disclosed, such as uncertainties in the water and related resources, climate change, human activities, or in limited understanding of hydrologic, geomorphic or ecological processes." Again, all these concepts could be relevant and could be important. However, this particular instruction to water resources planners could entail years of (expensive) study to adequately consider "uncertainties," "climate change," and so on. In many places throughout the document, analytical requirements are presented that are not linked directly to the water resources project or problem that is being addressed. This lack of guidance to determine

decision-relevant analytical needs can squander increasingly scarce agency analytical and planning resources.

As the CEQ proceeds with the complete revision of the 1983 Principles and Guidelines (and including sections on evaluation procedures) and provides more specific program guidance, this additional guidance may help clarify questions regarding applications of the proposed planning principles.

Finding:

The proposed revisions contain both general planning principles, and steps and concepts that could be part of a planning process. The planning principles are highly abstract and not fully consistent, while the planning steps collectively are confusing and lack sufficient coherence for practical implementation. As such, the proposed revisions have only limited value as policy guidance and are inadequate as an operational, or 'decision' document.

Recommendations:

The CEQ should consider whether they wish this document to be used as general policy guidance, as a decision document that specifies planning steps to be followed, or both. If the proposed revisions are to provide a document that specifies planning steps and analytical procedures, the many challenges that would attend creating a document to be uniformly applied to the large range of modern water projects—locks and dams, levees, navigation channels, ecosystem restoration, flood risk management, watershed protection, water supply projects —managed across an array of federal agencies, should be considered carefully.

STATEMENT OF NATIONAL OBJECTIVES

The first paragraph of Section 3 contains two different statements of the National Objective:

- *Federal water resources planning and development should both improve the economic well-being of the Nation for present and future generations and protect and restore the environment.*
- *The National Objective for water resources planning is to develop water resources projects based on sound science that maximize net national economic, environmental, and social benefits.*

The first statement does not directly address social benefits, except for "economic well-being." The second statement confuses implementation with objectives, using terms such as "sound science" and "maximize" (the term "improve" in the first statement is much clearer). The phrase "planning and development" does not include all water resource quality and quantity activities that support the national objective. "Management and development" is a possible replacement.

Finding:

The statement of National Objectives is confusing and inconsistently applied.

Recommendation:

The National Objective for water resources development and management activities should be stated more clearly and should be followed throughout the document.

ECONOMIC PRINCIPLES

All projects, regardless of purpose or type, generate benefits and costs. Benefit-cost analysis (BCA) is a traditional approach for organizing and presenting information about benefits and costs. The proposed revisions are inconsistent with generally accepted application of benefit-cost analysis in at least two important ways.

The first inconsistency relates to the role of BCA in decision-making. Several papers and reports on the use of BCA in decision making (e.g., Arrow et al., 1996; NRC, 2004a) recommend that BCA be used to inform decisions, but that it not be treated as a binding decision rule. This is consistent with the wording in WRDA 2007, Section 2031, which requires that "water resources projects are justified by public benefits", rather than requiring that project benefits exceed costs. However, the proposed revisions do not specify the role of BCA in agency decisions. For example, page 5 states, "*based on evaluations of the services gained and lost, …only those actions that provide a net national gain shall be considered further or selected"*. This suggests that strict adherence to a single metric of "net national gain" can be used to meet multiple objectives and that strict adherence to a benefit cost comparison can drive decisions. Similarly, page 23 states, *"The recommended plan must provide combined beneficial effects for the Nation that outweigh the combined adverse effects considering all significant monetary and non-monetary impacts, both quantified and unquantified."* This seems to require that benefits (albeit broadly defined) must exceed costs (broadly defined), which is inconsistent with using BCA to provide input into decisions, rather than as a strict decision rule. A simple comparison of benefits and costs by itself does not incorporate all concerns that appear to be referenced in the national objective.

The second inconsistency relates to the conceptual underpinnings of BCA. There is a residue in the 2009 proposed revisions of concepts historically used by the Corps of Engineers and other agencies that applied the 1983 P&G. An example of this residue includes National Economic Development (NED) and Environmental Quality (EQ) accounts, which are used especially by the Corps of Engineers to classify benefits of water projects. There are some limits of these traditional accounts, however, such as (1) a presumption that environmental benefits must be considered in a category distinct from economic development, and (2) a presumption that benefits within the NED account generally can be monetized, while the EQ account contains benefits that cannot be monetized. At the same time, the 2009 document improves on previous practice by moving toward a classification based on monetized and non-monetized benefits, appropriately recognizing that it may not be possible to monetize all benefits and costs.

Some descriptions of project benefits within the 2009 proposed revisions are inconsistent with contemporary best practices in BCA. For example, "Regional Economic Subcategory" (p. 19) is not a separate benefit type/subcategory. A longstanding and well-justified principle of BCA for federal accounting is that (zero-sum) transfers cannot be counted as benefits. Instead,

analysis of regional impacts is more properly part of distributional analysis (to whom are benefits distributed?) within a benefit-cost analysis, and not considered as a separate benefit category.

In addition, the document confuses economic analysis of trade-offs (benefits and costs) with other economic impacts that are monetized such as "regional economic" impacts. For example, economic growth stimulated (e.g., income, jobs), and changes in regional or international competitiveness of particular sectors of the economy, often are important considerations in water resources planning. This was recognized in a 2004 NRC report that commented on future roles and opportunities for the Corps of Engineers. That report recommended that Corps planning studies report not only traditional benefit-cost analysis, but also separately identify the extent to which "water project investment and operations may affect jobs, income, competitiveness of industries among regional economies, and international trade (NRC, 2004b; p.7)". Although it is possible (perhaps desirable) to provide information about income transfers and employment effects, it should be clear that these are not a part of monetized benefits.

Likewise, some parts of the "Natural Resources" and "Public Safety" impacts (p. 20) might be able to be monetized, in which case these benefits would be included in the Monetized Effects. Some of the "Other Social Effects" described in the proposed revisions, such as impacts on sub-populations, are not a separate type of non-monetary benefit and would be appropriately included as part of any analysis of distributional effects. However, impacts on "quality of community life, including community cohesion" could be a type of benefit that would not be easily monetized, and hence appropriately included in the non-monetized effects category.

Current professional opinion consistently finds that analysis of benefits and costs alone cannot quantify and identify a preferred alternative in major environmental decisions (e.g., Arrow et al., 1996; NRC, 1996, 2004a, 2008). Analyses ideally will articulate what is known about the consequences of any particular alternative, including all relevant impacts and tradeoffs. The proposed revisions, however, do not provide guidance on how to articulate and organize analysis to illuminate choices being confronted. Furthermore, if analysis cannot identify a clearly preferred water resources alternative, that selection will need to be identified with informed judgment and through political and social processes. Strides have been made recently on how deliberative analysis can facilitate and advance debate and negotiation over water resource alternatives, and how decision processes can be structured to develop and identify more broadly acceptable projects. Several federal agencies have established formal conflict resolution programs, including the U.S. Army Corps of Engineers (see http://www.iwr.usace.army.mil).

Finding:

Section 2031 (b)(3)(A) of the 2007 Water Resources Development Act requires that the P&G revision ensure the use of best available economic principles and analytical techniques. However, the proposed revisions contain concepts, advice, and language that are carryovers from historical practices and documents and are not fully consistent with contemporary best practices in decision science and economics. This relates to both how analysis is conducted and the role that it plays informing decisions.

Recommendations:

Future revisions to the P&G document should acknowledge that many considerations beyond strict benefit-cost comparisons are important in water resources decision making and are necessary to meet societal objectives.

TERMINOLOGY

The proposed revisions contain numerous concepts that are part of today's water resources management lexicon and implementation. Examples include adaptive management, wise use of floodplains, collaboration, public safety, monetary and non-monetary considerations, sustainable economic development, sound science, ecosystem-based management, integrated water resources planning, and so on. An example can be seen on p. 1-2 of the Planning Principles.

Most of the principles presented in the 2009 document are important and could be useful in guiding good water resources planning. At the same time, many of these concepts (including the 13 principles) are just that—conceptual—and generally open to interpretation. Care should be taken to ensure that the specific meaning of each term is clear, that the terms are consistently used, and that the document is internally consistent.

The drawbacks of over-reliance on poorly-defined concepts and terminology in federal water planning guidance has been noted by previous NRC committees. For example, a 2004 NRC report that reviewed Corps of Engineers planning states, " . . . the Corps has relied strongly on difficult-to-define conceptual terms such as 'sustainability' and 'ecosystem health'" (NRC, 2004a, p. 57).

Several of the 13 Planning Principles (p. 1-2) conflict with one other. For example, if the best available science and tools are used (E), they may be highly complex and difficult for the lay person to understand. Yet, principle I states that the process should be "fully transparent." In another example, consider a dam that is being planned for a low income or tribal or minority community to create a water supply to help promote "environmental justice" (K). If the dam, however, imperils endangered species or otherwise causes ecological damage, this then conflicts with principle A to protect and restore natural ecosystems.

The extensive use of abstract concepts throughout the proposed revisions does not provide concrete advice for decision makers looking to identify, plan, and select among viable water project alternatives. The proposed revisions do contain a Glossary section that provides some additional specifics regarding terms used through the document. Many of the terms listed in the Glossary, such as "ecological attributes" and "integrated water management," cannot be easily and definitely explained in 2-3 sentences. Many of the definitions presented in the Glossary do not provide clear explanation and, unfortunately, may lend to further confusion (e.g., "unwise use"). In addition, some of the definitions (e.g., "efficiency") are incorrect, while others (e.g., "associated costs") are carryovers from the 1983 P&G that have no grounding in contemporary BCA principles. Some terms used in the proposed revisions that would seem to merit further explanation—such as "environmental justice"—are absent from the Glossary. An approach that does not rely on a Glossary to clear up possible misinterpretations, but rather relies on transparent, easily-understood language and concepts, may be preferable.

Finding:

The proposed revisions contain many examples of vague, conflicting, and inconsistent terminology.

Recommendation:

In future revisions, the CEQ should more carefully present and explain broad water resources concepts. The CEQ also should recognize conflicts and inconsistencies among those concepts, and seek to minimize consequences of these conflicts.

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Appendix A

Committee on Improving Principles and Guidelines for Federal Water Resources Project Planning

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Appendix B

Guest Speakers at Committee Meetings

Federal Agencies

Theodore Brown, U.S. Army Corps of Engineers
Jo-Ellen Darcy, U.S. Department of the Army
Al McGartland, U.S. Environmental Protection Agency
Ann Mills, U.S. Department of Agriculture
Paul Sandifer, National Oceanic and Atmospheric Administration
Nancy Sutley, Council on Environmental Quality
John Tubbs, U.S. Department of the Interior

(all federal agency speakers are based in Washington, D.C.)

Nonprofit Organizations and Trade Associations

Gail Bingham, RESOLVE, Washington, D.C.
David Conrad, National Wildlife Federation, Washington, D.C.
Steve Fitzgerald, Harris County Flood Control District, Houston
Amy Larson, National Waterways Conference, Washington, D.C.
Sam Riley Medlock, Association of State Floodplain Managers, Madison, Wisc.
Tony Pratt, Delaware Department of Natural Resources, Dover
Melissa Samet, American Rivers, Fairfax, Calif.
Harry Shoudy, American Shore and Beach Preservation Association, Washington, D.C.

Appendix C

Acknowledgement of Reviewers

This report was reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise in accordance with the procedures approved by the NRC's Report Review Committee. The purpose of this independent review is to provide candid and critical comments that will assist the NRC in making its published report as sound as possible, and to ensure that the report meets NRC institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process.

We thank the following for their reviews of this report: Mark M Brinson, East Carolina University; Peter Gleick, Pacific Institute for Studies in Development, Environment, and Security; Larry Larson, Association of State Floodplain Managers; J. Walter Milon, University of Central Florida; David H. Moreau, University of North Carolina; Craig E. Philip, Ingram Barge Company; Timothy D. Searchinger, Princeton University; and Leonard A. Shabman, Resources for the Future.

Although these reviewers provided constructive comments and suggestions, they were not asked to endorse the report's conclusions and recommendations, nor did they see the final draft of the report before its release. The review of this report was overseen by Walter R. Lynn, Cornell University, who was appointed by the NRC's Division on Earth and Life Studies. Dr. Lynn was responsible for ensuring that an independent examination of this report was conducted in accordance with NRC institutional procedures and that all review comments received full consideration. Responsibility for this report's final contents rests entirely with the authoring committee and the NRC.