



Incorporating Social and Environmental Outputs in Decision-Making: Workshop Outcomes

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PURPOSE: This document summarizes the notable outcomes of the workshop “Quantifying and Incorporating Social and Environmental Outputs in Decision-Making—Research and Development Needs and Strategy Workshop.” The workshop was held 24 and 25 July 2019 in Alexandria, Virginia, at the US Army Corps of Engineers’ (USACE) Institute for Water Resources (IWR). The workshop sought to identify gaps in knowledge, methods, data, and tools and to identify types of subject matter experts who would be needed for the research team. A total of 22 participants attended the facilitated workshop, representing a broad array of expertise: economists, scientists, planners, social scientists, project managers, and researchers from a number of USACE organizations and partnering academics across the United States. Together, these attendees reviewed existing policy and research and prioritized future work to fill gaps in methods and procedures for incorporating social and environmental inputs across a broad range of USACE projects.

BACKGROUND: When formulating plans for a civil works (CW) water resource development projects, various outputs are identified, described, quantified, and monetized during the planning phase to evaluate alternatives and recommend a plan. Such outputs are the foundation for any recommended plan as well as the basis for the resulting projects’ authorization, budgeting, engineering, design, construction, and operations and maintenance. Absent a notable gain in these desired outputs, as reflected in evaluations of alternatives performed during the planning phase, a project or action is not justified. To date, the scope of outputs considered during planning has been limited to those most directly relevant to the study or project authority, as defined by Congress. USACE has often not identified adequate methods, data, tools, and knowledge to reliably characterize or quantify all beneficial and adverse effects that might result from a CW project. As such, it presently lacks the capacity to apply such information to decision-making in a uniform, robust, and cost-effective manner.

USACE organizes the evaluation of project effects into four accounts (per 1983 principles and guidelines [P&G], US Water Resources Council 1983, v): National Economic Development (NED), Regional Economic Development (RED), Environmental Quality (EQ), and Other Social Effects (OSE) (Figure 1). NED is a well-developed concept backed by economic theory with robust methods and tools (CECW-P 2000). USACE projects may also generate beneficial or adverse effects outside of economic changes. Unfortunately, however, no unified theory of value

associated with these changes presently exists, and so many times projects and actions lack metrics to measure these changes.

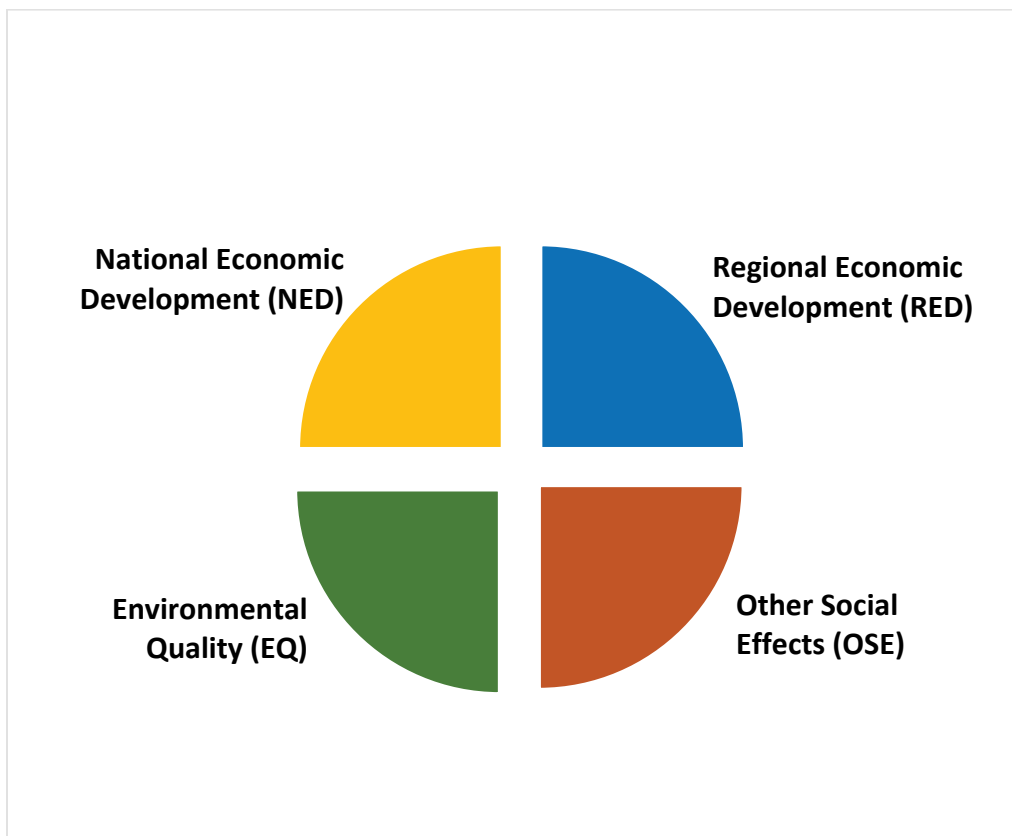


Figure 1. The 1983 principles and guidelines (P&G) four accounts.

Although the EQ account is used to evaluate aquatic ecosystem restoration projects as well as environmental impacts of other projects, understanding the value of such projects can prove challenging. The most common output used to display changes in EQ is the *habitat unit*, a generalized representation of habitat quality and quantity focused on a given species or habitat that represents non-use values associated with ecosystems. Developing a robust suite of metrics would better express the broader value of goods and services produced by the natural environment. Additionally, non-use ecosystem benefits can arise from non-ecosystem-restoration projects, but positive outcomes are rarely assessed, with the environment seen instead as merely a constraint on these projects.

The OSE account is important because it encompasses many quality-of-life benefits and impacts: life, health, and safety; income and employment; community cohesion; socially vulnerable populations; and long-term maintenance and productivity of resources. These categories are particularly susceptible to change as hazards associated with climate change increase in frequency and intensity, and CW projects are designed to counteract those hazards. Although there is ongoing research in the areas of public health and safety, much work remains to define and evaluate a broad array of OSE factors in the context of project analyses.

By not yet having the procedures and tools to identify, quantify, and—possibly—monetize changes to the environment and society, USACE has constrained its decision-making. An inclusive analysis of project effects and the use of such analysis in decision-making will better fulfill USACE's federal roles and responsibilities.

This technical note summarizes the major themes of the workshop, its guiding questions and principles, the breakout session discussions and outcomes, and the subsequent prioritization of future research.

WORKSHOP OVERVIEW: The workshop sought to lay the foundation for a cross-business-line (Flood Risk Management [FRM] / Navigation [NAV] /Aquatic Ecosystem Restoration [AER]) research strategy building on ecosystems good and services (EGS) and OSE work to date by ERDC, IWR, and Districts (for example, Wainger et al. 2020; Durden and Wegner-Johnson 2013). The workshop opened with several foundational presentations to ground the participants in the current state of practice and research: current USACE project evaluation and decision processes; a review of USACE policies and procedures; an overview of existing and past research; and a discussion identifying the gaps, challenges, and opportunities for creating the desired holistic project-evaluation process. The cross-business-line strategy will create this comprehensive and holistic project-evaluation approach. The supporting metrics would enable the agency to formally and consistently consider the full range of benefits across different project types. Workshop participants also discussed future policy changes needed to support this approach.

Specific questions addressed during the workshop introduction included the following:

- What are the current USACE project evaluation, comparison, and recommendation processes?
- What metrics are currently considered during planning- and budget-related decision-making for FRM, NAV, and AER projects or for environmental impact analyses?
- What are the overarching metrics—relevant to projects under all the business lines?
- What are business-line-specific metrics?
- What metrics are not routinely evaluated, quantified, or monetized in an alternatives evaluation?
- What would be the benefits of a more holistic approach, inclusive of EGS, other EQ approaches, and OSE in evaluation of project alternatives?
- What progress has USACE made towards a more holistic process? What has been learned?
- What are the key research opportunities?
- What are the critical policy constraints and potential opportunities? Where is policy change needed, and where is policy change considered feasible?

The workshop agenda (Figure 2) began with a presentation by the USACE headquarters senior policy advisor leading the effort to develop and adopt consistent, science-based, reproducible metrics for social and environmental outputs of CW projects to be considered in the decision-making process. The presentation provided the participants with an overview of current USACE policies and practices, issues, and directives from a national perspective. This overview was

followed by presentations and discussions on past and ongoing related research and development (R&D) efforts; perspectives and case studies from four different regions of the United States; and related programmatic work within the Engineering with Nature (EWN) program. Throughout the course of the day’s presentations and discussions, the opportunities, gaps, constraints, and metrics discussed were captured on flip charts to be referenced in the second day’s session.

Day 1: July 24, 2019
Welcome and Workshop Purpose (Trudy Estes)
Setting the Context: CW Project Justifications—Current Corps Policy and Practice (Maria Wegner)
Moving Beyond Current Practice—Ongoing R&D (Elizabeth Murray and Lisa Wainger)
Regional Issues/Case Studies—Gaps/opportunities for considering EGS/OSE metrics North Atlantic Division; Southwest Division; South Atlantic Division; and Alaska District
Programmatic Examples—Engineering With Nature (ENW) (Todd Bridges, Sarah Thorne)
Summarizing Opportunities, Gaps and Alignments—Discussion (Sarah Thorne facilitate)
Day 2: July 25, 2019
Developing Our Research Strategy—Breakout Groups (Maria Wegner and Susan Durden were subject matter leads)
Breakout Groups Reports—Framework and Action Plans

Figure 2. Workshop agenda.

Building on the presentations and discussions that followed, participants were divided into two facilitated breakout groups and were asked to focus on the following tasks:

1. Determine the research required in the next one to three years.
2. Determine the anticipated outcomes of the research.
3. Identify the key participants for the research.
4. Describe the scope (business lines and geography).
5. Determine a time frame for the plan.
6. Estimate the scale (that is, cost).

The breakout groups did not do the research or choose the metrics. Instead, they identified the needs and path forward as a foundation for a comprehensive research strategy. Breakout groups discussed two different categories of outcomes:

1. Life Safety Including Life Loss and Morbidity, Social Vulnerability
2. Community Resilience and Environmental Quality—Determining Environmental Outputs Including Alternatives Habitat Units

SUMMARY OF BREAKOUT GROUP DISCUSSIONS: At the end of the second day of the workshop, the breakout groups reported their recommendations to the whole group for discussion.

Life Safety and Social Vulnerability. The report from the Life Safety and Social Vulnerability group included the overarching determination that morbidity issues (for example, people who cannot go back to work because of injuries, cumulative effects of multiple floods on physical and mental health) comprise a major gap, as benefits are generally not identified, quantified, or used in project planning. Additionally, there is a need to research how social vulnerability impacts life safety (that is, mortality, morbidity, and indirect life loss).

Life safety research considerations and priorities included the following:

- The research plan should not start from scratch, given past and ongoing work.
- Life loss models have incorporated some vulnerability factors to mortality already, but this needs to be better communicated.
- There is current work on research methods for quantifying indirect life loss.
- There is current work on a technical reference manual on life loss methods and assumptions.
- Planning community of practice may know of the potential of existing tools.

Social vulnerability research considerations and priorities included the following:

- The current Social Vulnerability Index (SOVI) tool will become outdated if it is not updated to 2020 Census information. It could be made more useable if it integrated with existing HEC tools, but a potential administrative obstacle to accomplishing this is the lack of an identified tool owner.
- Could an index be sufficient for quantifying effects for OSE?

- How would quantified vulnerability for the OSE account be applied across business lines?
- What other tools could complement SOVI (for example, EPA's Environmental Justice tools, EJSCREEN: Environmental Justice Screening and Mapping Tool | US EPA).
- How is social vulnerability used in planning in other countries or other decision processes?
- Do any new metrics being considered include the most useful vulnerability factors according to current research and literature?
- Can any new metrics being considered be applied nationally, or are regional adjustments needed?
- Do any new metrics being considered offer the granularity needed for the use at the project level for alternatives comparison or for other types of decisions? Do they match with granular (parcel-based) approach used in life loss assessment (that is, Lifesim)?
- How can the output of any considered metrics or tools (for example, a GIS data layer) be integrated with other models?
- How could the output be used in forecasting without project conditions?
- Is there research support for a threshold of social vulnerability that could be used to summarize the degree to which USACE is addressing it nationally or make other policy decisions (for example, no more impacts in high vulnerability communities)?

Community Resilience and Environmental Quality. This group discussed problems with the current EQ metrics (particularly habitat units). Notably, NED-centric business lines such as FRM and NAV do not normally include environmental benefits that may occur with the project, only environmental impacts and mitigation needs. The group put forth that benefits in the EQ account should be considered in the decision-making process and budgeting for all business lines. However, habitat units derived from complex ecological models may not be appropriate for use under SMART Planning studies where the project purpose is not ecosystem restoration (CECW-P 2012). Additionally, for community resilience, metrics should have a national focus but should also allow for unique situations (for example, Alaska or Puerto Rico).

Community resilience research considerations and priorities included the following:

- Begin with a literature review of relevant research and methods developed or used in previous USACE projects (for example, Barrow Alaska Coastal Erosion Feasibility Study^{*}).
- Examine and evaluate the different models—establish the pros and cons of each and synthesize into something that meets USACE's objectives.
- Develop a *resiliency unit score* that could be nationally consistent.

^{*} Feasibility study report available at <https://www.poa.usace.army.mil/Portals/34/docs/civilworks/publicreview/Barrow/AppendixEBarrowCostAppendix20190729.pdf?ver=2020-02-14-185804-100>.

Environmental quality research considerations and priorities included the following:

- Primary priority is a generalized, multivariate EQ index metric that can be used across non-AER business lines where detailed ecological modeling and the use of habitat units is infeasible under SMART Planning (CECW-P 2012).
- Start with a literature review to identify existing indices, tools, and data that may be used for this purpose.
- EGS Framework (Wainger et al. 2020)
- Budget criteria categories used to prioritize AER projects nationally
- USACE CW Program Development Manual (PDM) metrics
- Recreation metric *unit day value* (CECW-P 2020a)
- NEPA assessments
- Determine categories of EQ benefits to be assessed and potential-benefit relevant indicators if indices do not exist.
- Determine drivers and indicators that work across business lines.
- Develop a general EQ index that can be applied nationally.

Anticipated outcomes of EQ research could result in a metric or series of metrics in the form of an attachable score sheet with weights and values, potentially following the format of green infrastructure or building scorecards. The metric should be flexible enough to adapt to changing needs and focus and transparent in its application. The group proposed starting with a retrospective evaluation of approaches for general EQ assessments. The scope for EQ metrics is that they are intended for use across business lines and across the country. However, the details of the assessment may need to change to address different systems (for example, riverine versus coastal) or management goals (for example, reservoir shoreline management).

Synthesis Discussions Summarizing Breakout Findings. The two breakout groups both recommended that past and current relevant research, and metrics and criteria being used by other federal agencies or external organizations, should be evaluated for potential incorporation into USACE project-evaluation and decision-making processes. Incorporating this research would likely be the most efficient way to realize changes to policies, processes, and decision-making. The two groups also created a list of subject matter experts to include in research efforts, including members of academia and other agencies and organizations as appropriate, and recommended cross-business-line approaches.

Participants agreed that cohesion between the OSE and EQ research efforts is a key requirement to moving forward. Parallel reporting will facilitate collaboration on common themes, which will help create synergy. Funding for developing guidance as well as research will be needed. As this work will apply across business lines, a single point of contact within each business line's research program (for example, the research program manager) will help coordinate efforts and avoid duplication.

KEY WORKSHOP OUTCOMES: Workshop participants clearly saw the need and strongly supported the effort to identify, adopt, adapt, and establish methods, tools, and metrics for

measuring EQ and OSE more consistently across CW projects. They emphasized that effective innovations will need to apply across all business lines. They noted that an efficient way forward would be to build on work already done by USACE, other federal agencies, and other organizations. The three priorities identified were (1) the use of science to inform policy and decisions; (2) identification, adoption, and adaptation of existing decision-support tools as the most efficient way to progress; and, if needed, (3) the development of new decision-support tools. The workshop focused on putting the groundwork in place for a research strategy that supports this need for innovation.

The following key themes arose during the course of the workshop and can inform the research strategy:

- Build on what we have: develop an inventory of current tools and metrics.
- Assess methods, tools, and metrics of others for USACE application.
 - Agree on definitions of context.
 - Prioritize documentation and communication of research results.
 - Address the gaps—where science and research are needed.
 - Improve engagement and communications.
 - Use workshop results to inform policy change.

Status. Following the workshop, the work unit leads from HQ, ERDC and IWR identified priority topics and formed two teams—EQ benefits and social effects—to focus on these priority topics. The teams are composed of IWR, ERDC, and field personnel. The social effects team addresses priorities identified under life safety, social vulnerability, community resilience breakout groups of the workshop, all of which fall under the OSE account. The smaller EQ Benefits team focuses on the primary priority identified in the EQ breakout. Both teams are undertaking curated literature reviews with a focus on use and adaptation of other federal agency tools and techniques. The social effects team is engaged with a number of field teams who are responding to a new directive from the Assistant Secretary of the Army for Civil Works on expanded consideration of social effects (CECW-P 2020b; SACW 2021). These collaborations will continue in FY21 and FY22.

Additional work has begun under the FRM research programs and EWN. Coordination of these efforts will be implemented at the program director and headquarters levels.

RELEVANT RESOURCES:

- Other Social Effects Primer, <https://www.iwrlibrary.us/document/db6818d6-9f18-43ed-fdd6-c38283559b39>
- Handbook on Applying “Other Social Effects,” <https://www.iwrlibrary.us/document/d4a71e46-fba0-403c-b905-083608cf0432>
- Theoretical Underpinnings of the Other Social Effects Account, <https://www.iwrlibrary.us/document/d4a71e46-fba0-403c-b905-083608cf0432>

- Social Vulnerability Analysis Methods for Corps Planning, <https://www.iwrlibrary.us/document/d4fa0d05-b398-4699-82f3-e6b0f05f59a6>
- Social Vulnerability Analysis: A Comparison of Tools, <https://www.iwrlibrary.us/document/91a1cc9f-2b59-451c-ec12-d0374d59883a>
- IWR White Paper: Issues and Applications in Formulation and Evaluation Considering the Four P&G Accounts, <https://www.iwr.usace.army.mil/Portals/70/docs/iwrreports/WhitePaper4Accounts.pdf>

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