

Expanded benefit assessment for alternative evaluation

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Situation: Assessment of additional categories and enhancement of methods captures important benefits delivered by flood risk reduction projects

To justify flood risk reduction projects, USACE considers a limited set of benefit categories, such as structure and content damage, and assesses these using traditional methods. However, the projects provide additional benefits, which are not included or are not fully reported. We need to assess those fairly and systematically, as that assessment will inform better our decisions.

Task: Identify additional benefit categories and enhance or develop practicable methods for quantifying

We reviewed literature on hazard and benefit analysis to identify additional benefit categories and assessment methods. This included review of guidance documents, project reports, and journal articles, with a primary focus on practices of Federal agencies. We then applied the methods to determine if they were practicable.

Action: Identified opportunities for enhancing USACE benefit assessment, considering approaches by other agencies

We identified two categories that USACE has considered in past studies for which enhanced methods are available and one new category. The application and inclusion of these would have an impact on decision making, including decisions that consider social justice. The three categories and assessment methods are, reduction in:

- Life risk. USACE has assessed life risk in previous studies in terms of statistical lives lost (SLL). This is determined based on the population exposed to flooding and vulnerability to flooding. However, this method can be enhanced by monetizing SLL. Several Federal agencies have established the monetary value of a statistical life (VSL). For example, the FEMA VSL is \$6.9M (\$2017). This means that a project that saves one statistical life delivers a benefit of \$6.9M.
- Displacement and temporary housing cost. USACE has also assessed displacement and temporary housing cost in previous studies. However, FEMA has developed an enhanced method. According to the FEMA method, for businesses, the cost is determined based on the initial cost of disruption and rental costs. For residences, the cost is based on the cost of lodging and the additional cost of eating out rather than at home. Both consider duration of displacement based on flood depth.
- Cost attributable to mental and emotional distress. When flooding occurs, people can suffer mental and emotional distress, including post-traumatic stress disorder, depression, and anxiety. USACE has not included this category in previous studies, but assessment could yield a significant economic value. Cost is determined based on the cost of treatment and the cost to employers for lost productivity. These are assessed based on estimates of the affected population, fees for treatment, and hourly wages.

Results: Enhanced assessment is practicable, valuable, and in line with USACE approaches

We applied these methods for the Sacramento River Basin and found that:

- The methods are usable. The methods can be practiced with a reasonable amount of effort using available data and modeling software.
- Use of the methods increases the total reported benefit significantly.
- Use of the methods is in line with the USACE risk assessment context and initiatives to capture the full array of public benefits. The enhancements are also in line with practices of other Federal agencies.

Case study: Enhanced assessment identifies \$43.9M annually in additional benefits

For the Sacramento River Basin case study, we applied the enhanced methods for assessment of displacement and temporary housing cost and life risk. We found:

- The total benefit assessed with current USACE methods is \$752K annually.
- The total benefit assessed with enhanced methods is \$44.63M annually—an increase of \$43.9M annually.

Displacement and temporary housing cost: Using the enhanced method, the reported benefit increases by \$2.47M annually.

Plan	Current method: Expected annual cost (\$1M)	Enhanced method: Expected annual cost (\$1M)
Without-project	0.22	4.8
With-project	0.19	2.3
Annual benefit	0.03	2.5

Life risk: Using the enhanced method to capture the cost of statistical lives lost increases the reported benefit by \$41.4M annually. This is based on FEMA's value of a statistical life of \$6.9M. Values used by Federal agencies range between \$6.9M and \$9.6M.

Plan	Statistical lives lost	Expected annual cost (\$1M)
Without-project	7	48.3
With-project	1	6.9
Annual benefit	6	41.4