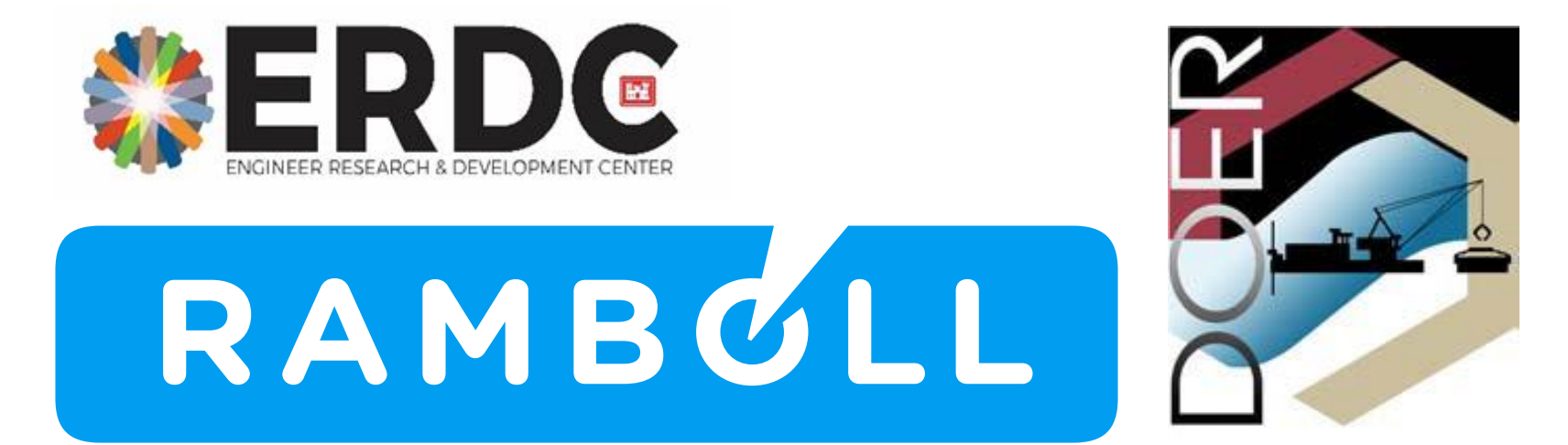


Increasing Sustainable Beneficial Use Opportunities Working With Contaminated Sediment

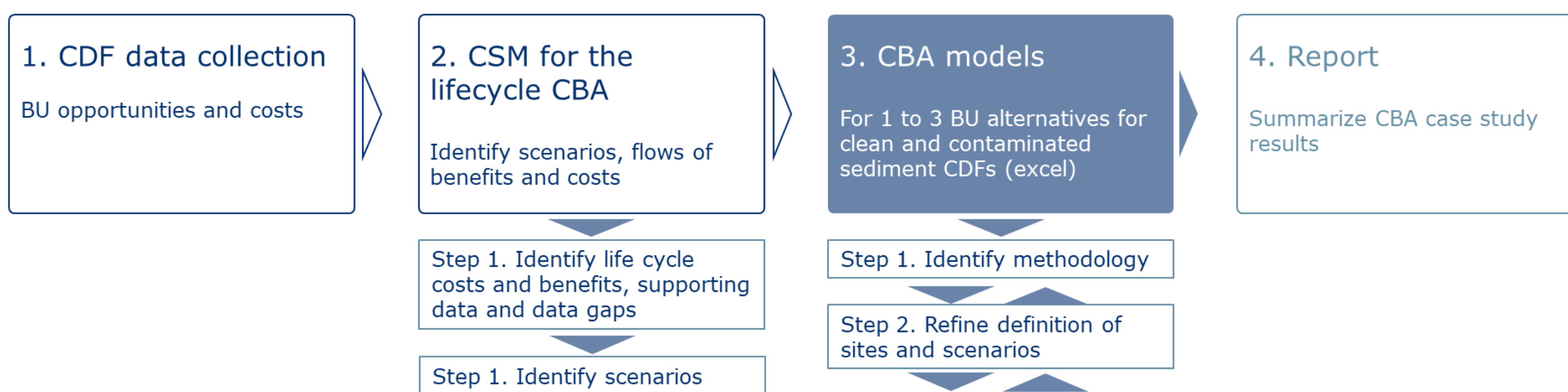


Authors

Victor Magar, PhD, PE (vmagar@ramboll.com; Ramboll),
 Clare Leary, PE (Ramboll)
 Lara Alvarez (Ramboll)
 Karen G. Keil, PhD (USACE ERDC)
 Melissa Bosman (USACE Detroit District)
 Madison Doman, PE (USACE Detroit District)
 David Moore, PhD (USACE ERDC)

Abstract

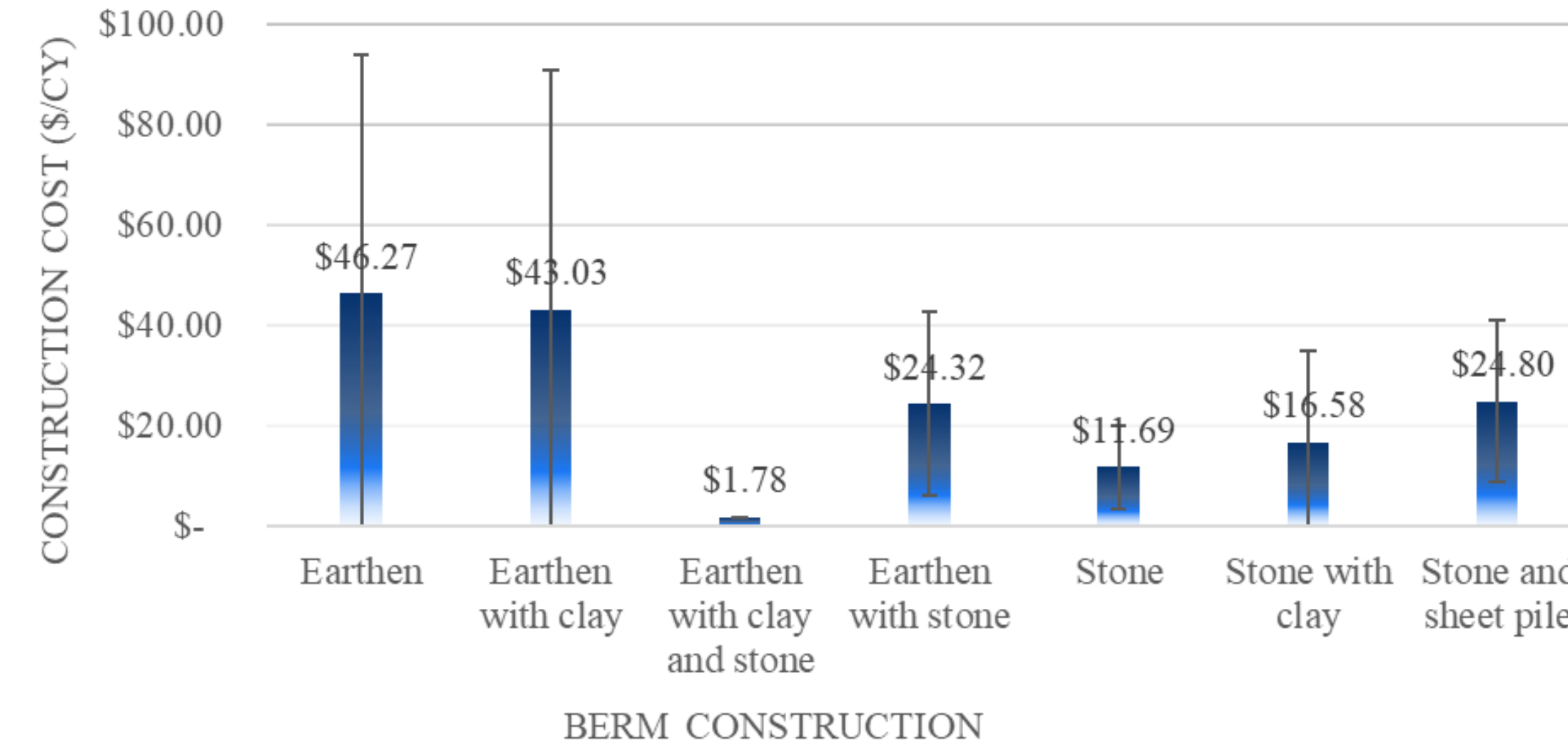
The USACE ERDC is seeking innovative methods to use contaminated sediment beneficially and to include contaminated sediments in their 70/30 goal (70% beneficial use by 2030). While CDFs were originally built decades ago to confine contaminated sediments, much of the sediment more recently placed in CDFs is relatively clean, having been placed due to cost or other efficiencies in dredged material management. Clean sediment in CDFs can be used beneficially to realize more CDF capacity for contaminated material. This approach creates dual opportunities for beneficial sediment use: The first is to use clean material salvaged from existing CDFs, and the second is to use the expanded CDF capacity for contaminated sediment, which later will serve as a foundation for new lands.



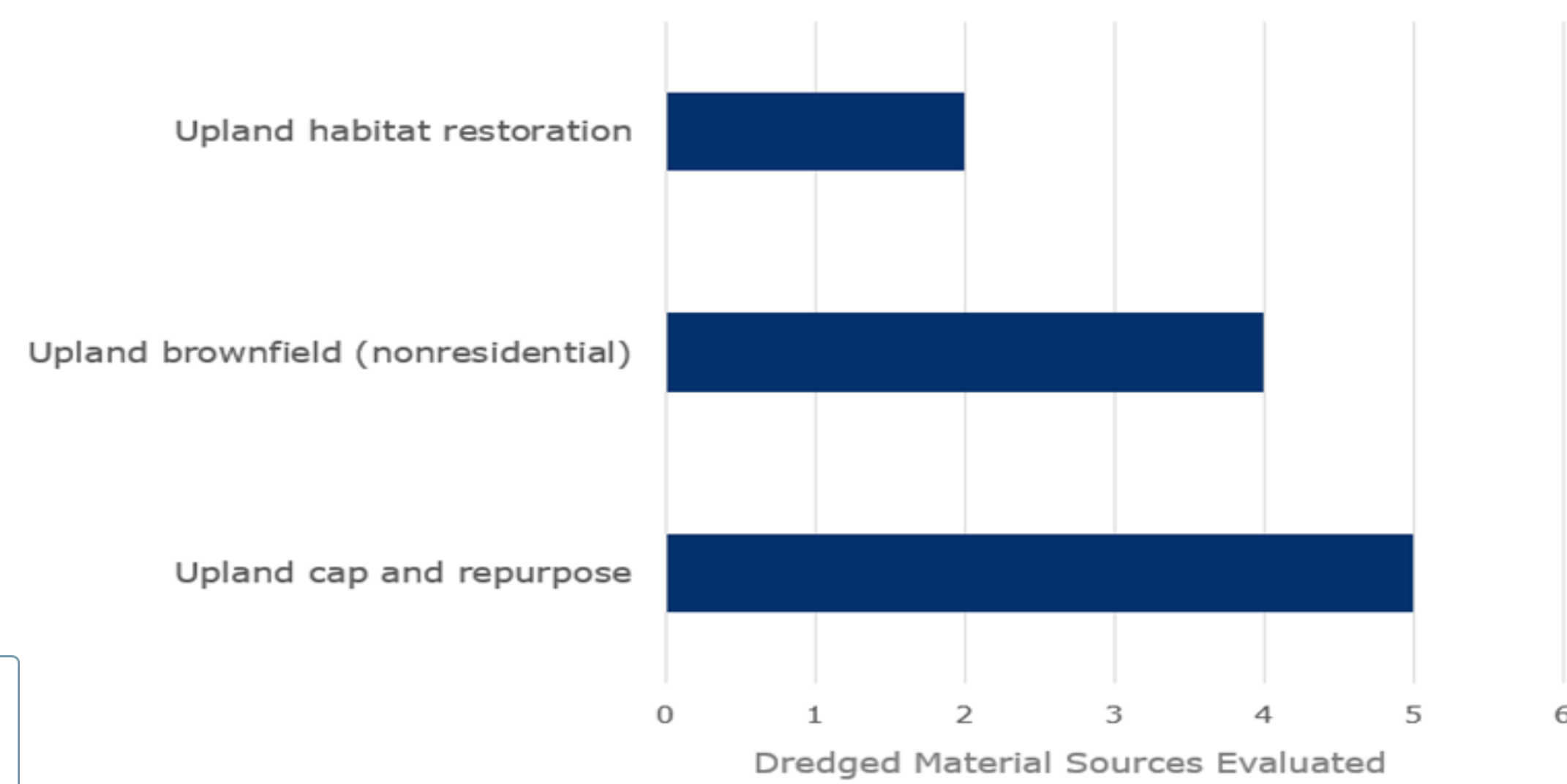
Acronyms:
 CBA: Cost Benefit Analysis
 CDF: Confinement Disposal Facilities
 CSM: Conceptual Site Model
 BU: Beneficial Use

Support is provided by USACE Detroit District to model real-world scenarios for CDF sediment beneficial uses

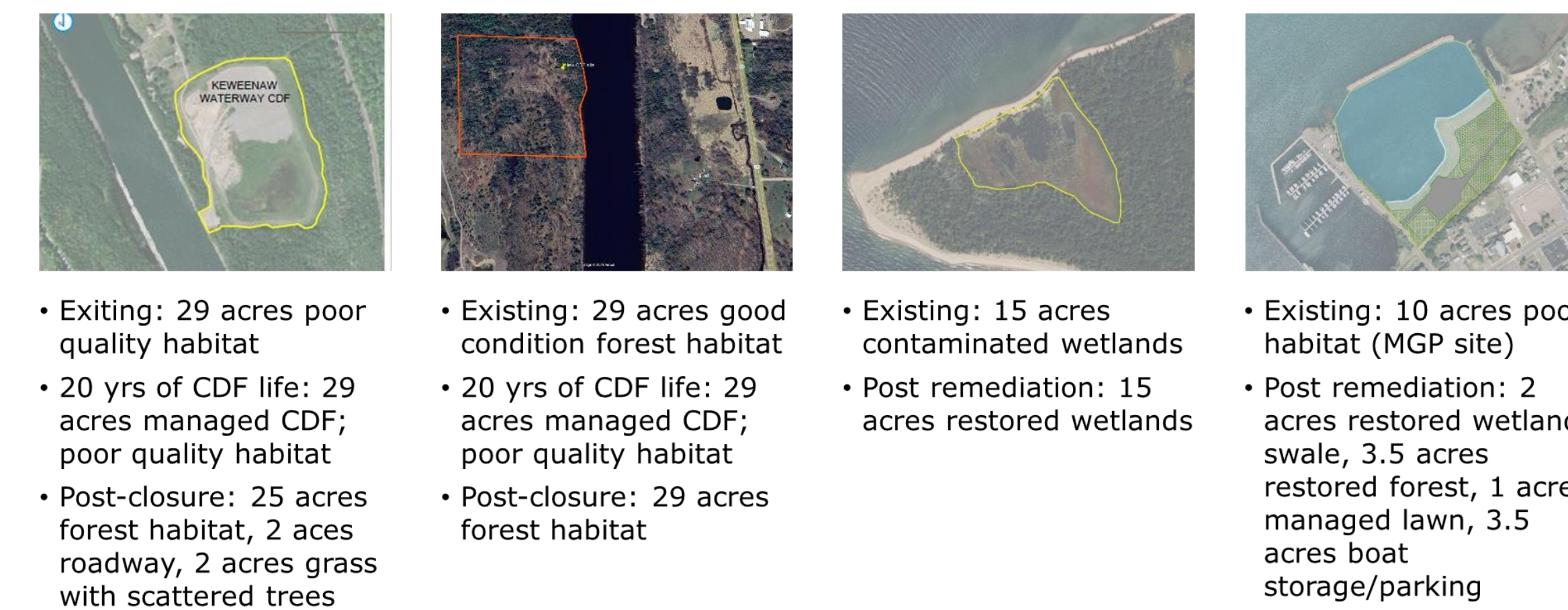
CDF Costs and Detroit District BU Opportunities



Average Great Lakes CDF Construction Costs (2023 USD) by type



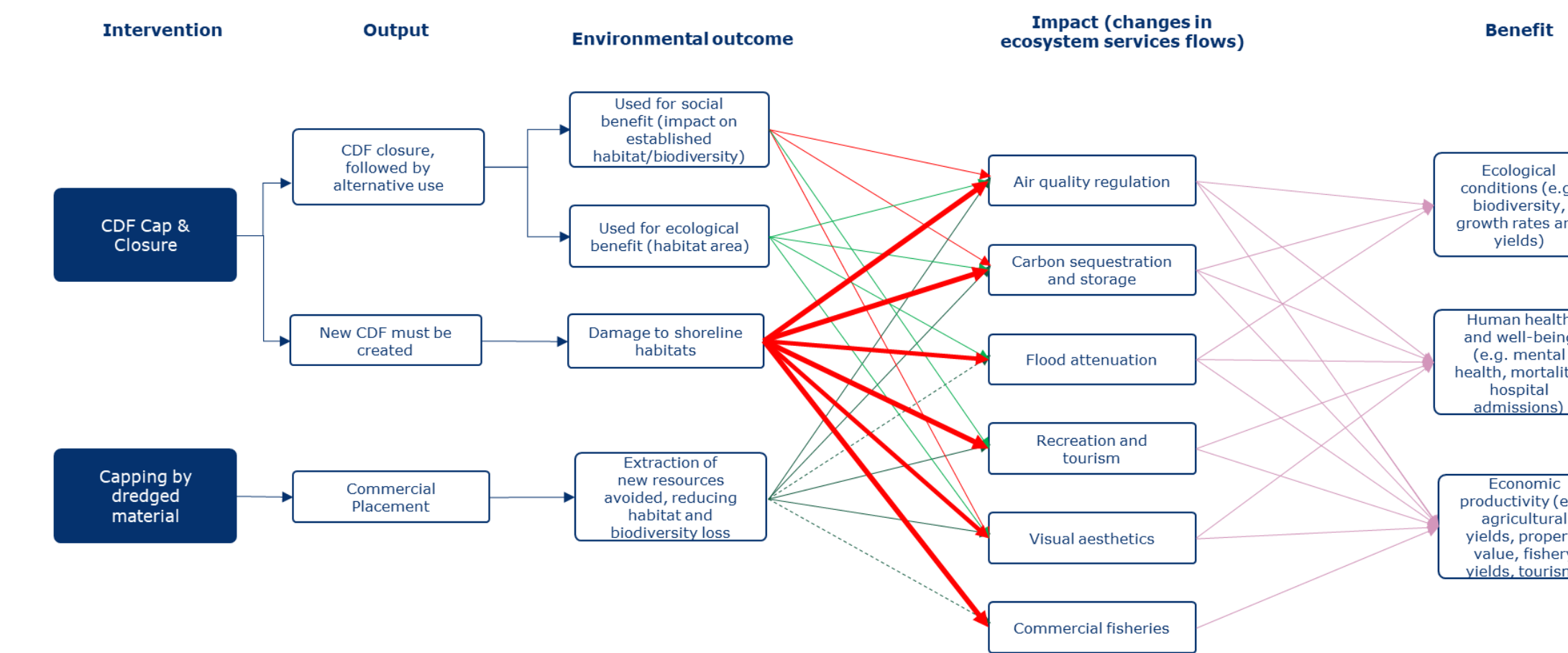
No. of dredged material sources suited for potential BU alternatives



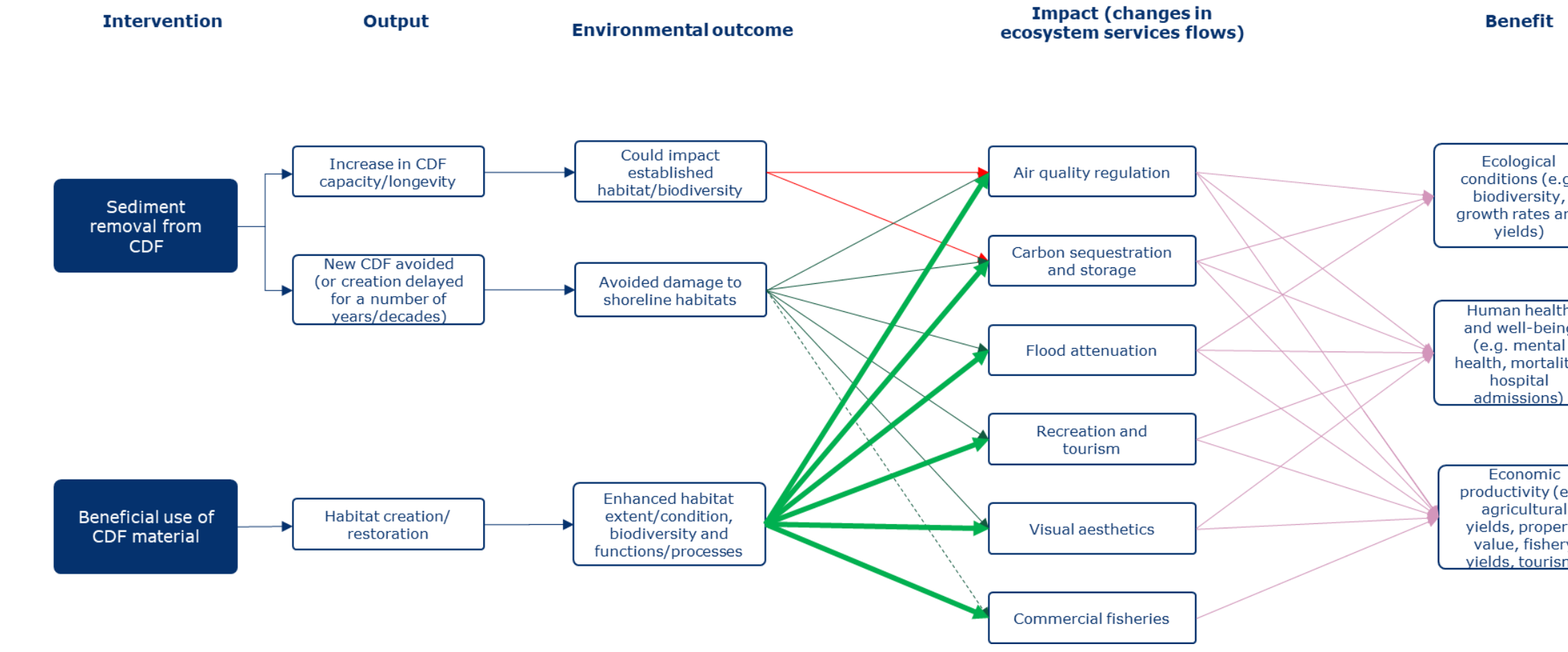
Overview of Ecological Services

Conceptual site models used to visualize CDF BU Opportunities and Costs

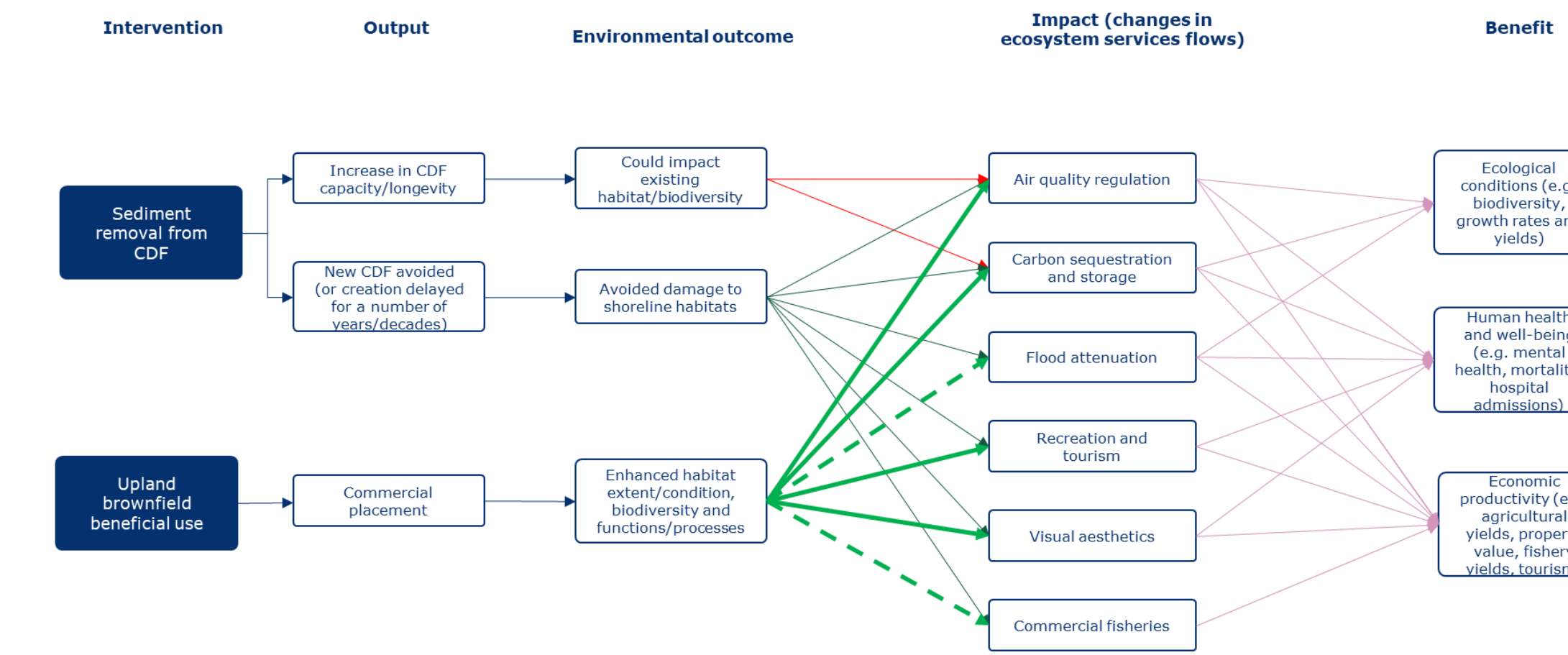
Base Case CDF: No BU using CDF Material



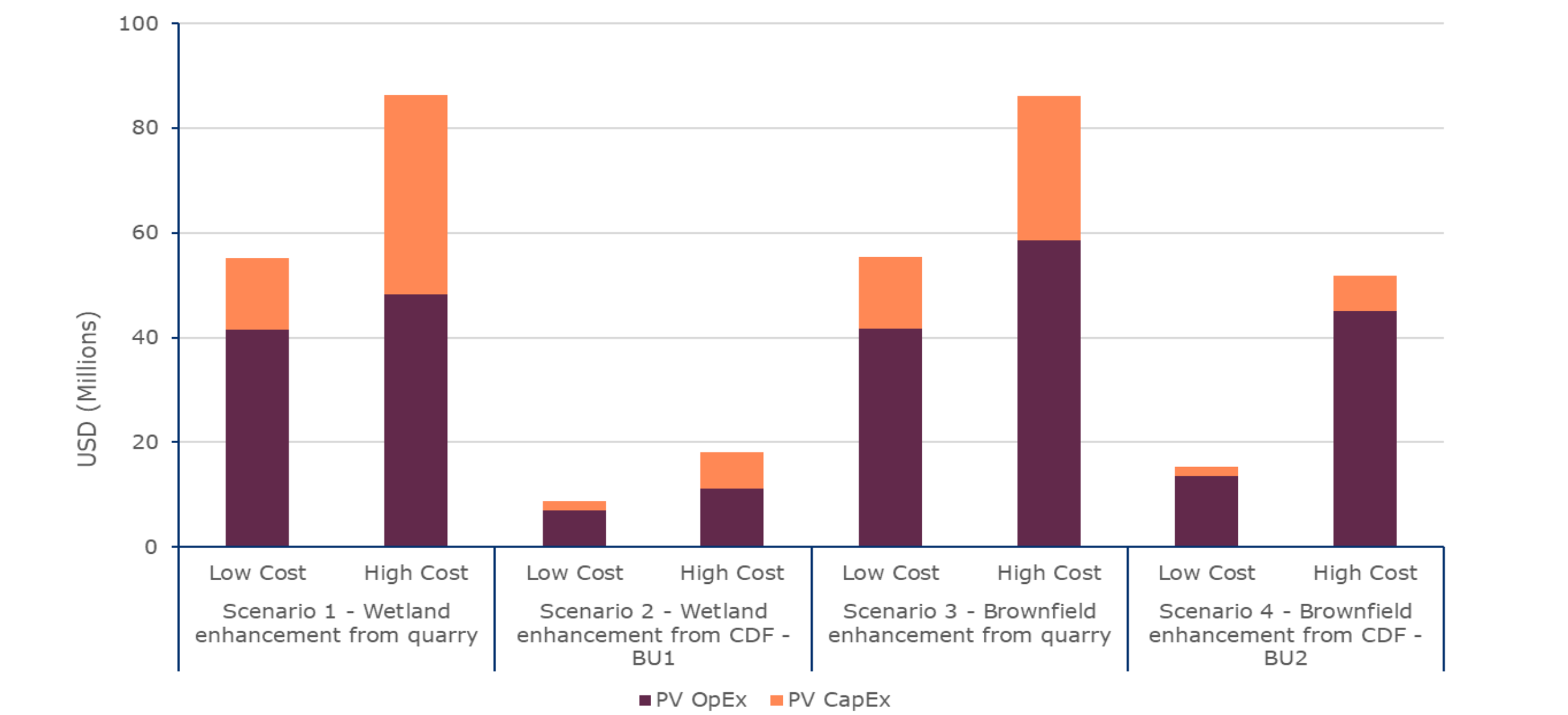
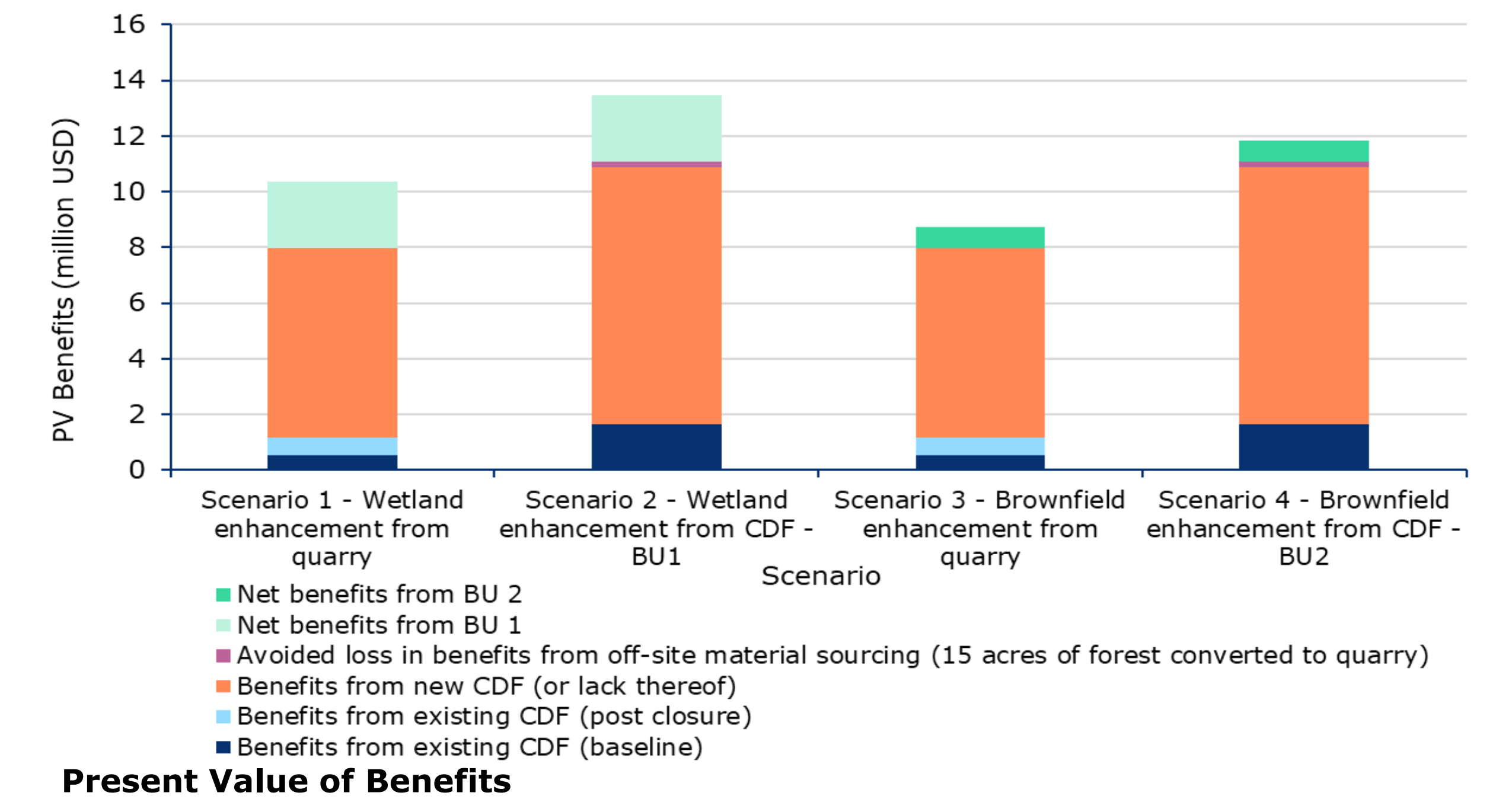
Case 1: Beneficial Use for New Habitat



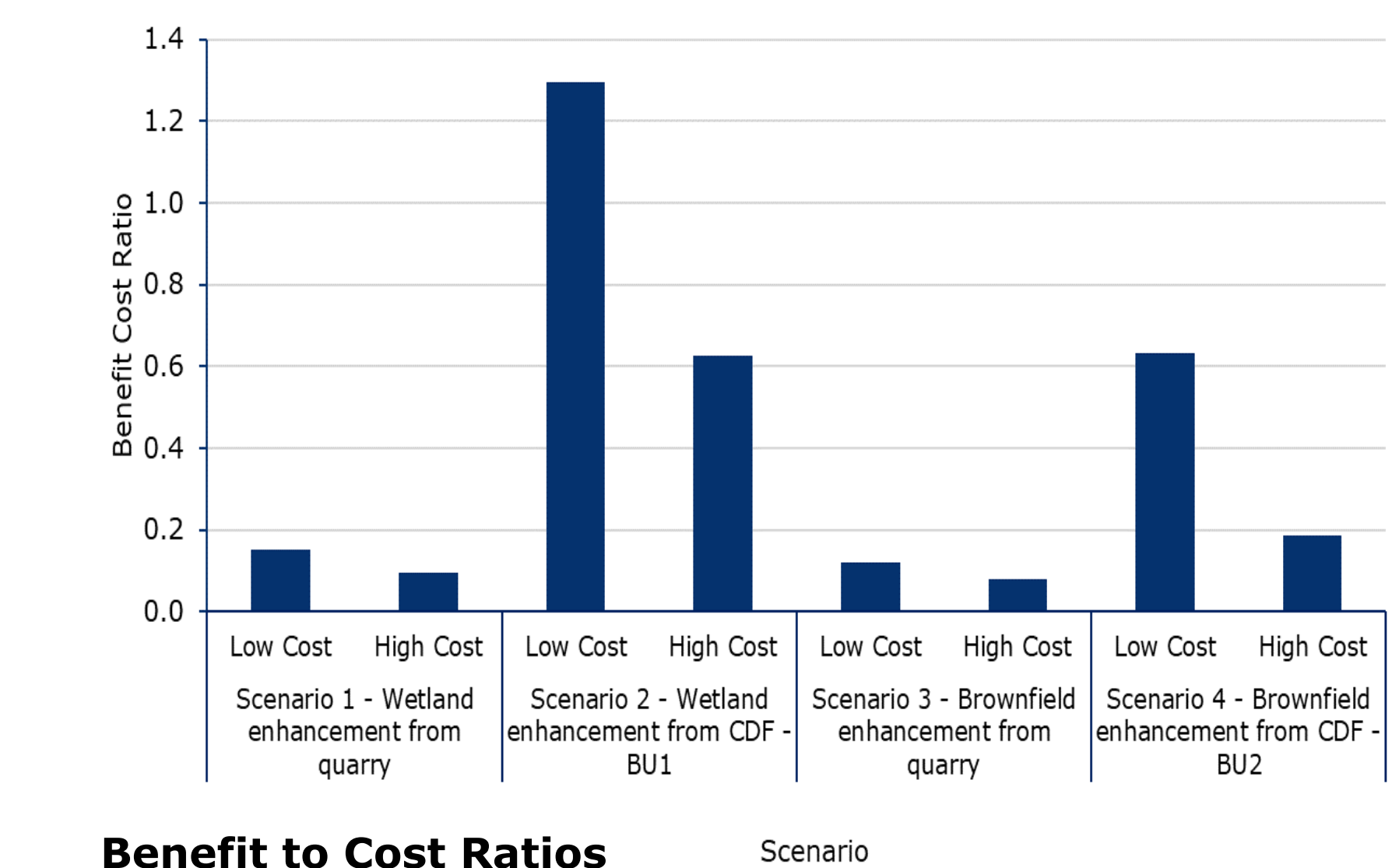
Case 2: Upland Brownfield BU



Legend for flow lines:
 - Red arrow: Ecosystem service deterioration (reduced flows)
 - Green arrow: Avoided loss in ES
 - Green arrow: Ecosystem service enhancement (increased flows)
 - Dashed green arrow: Potential ecosystem service flow (context-dependent)
 - Pink arrow: Potential changes (+ and -) in benefit flows
 The thickness of the line denotes the anticipated magnitude of the flow



Present Value of Costs



Benefit to Cost Ratios

- The BCA Model shows the benefit of resourcing clean CDF material
- Use of CDF material for wetland uplift and brownfield enhancements was much more cost effective than resourcing borrow material (e.g., quarried material)
- Costs drove the BCRs far more than benefits
- Updated model can be a valuable tool for USACE to critically evaluate longevity of CDFs and the opportunity to beneficially use material at existing CDFs

Contact

Victor Magar, PhD, PE
 vmagar@ramboll.com, +1 (312) 288 3840 (D)

This work was funded through a public private partnership initiative under the USACE Dredging Operations Environmental Research Program.