

ACRP 02-78

Climate Resilience and Benefit-Cost Analysis –
A Handbook for Airports

Executive Briefing

GRA, Inc.

RFMarchi Aviation Consulting

LMI Government Consulting

AECOM

CHPlanning

June 2018

OVERVIEW

1. The goal of this project is to help airport practitioners assess the benefits, costs and financial feasibility of infrastructure projects designed to improve resilience to the impacts of climate change and extreme weather events.
2. A Handbook has been developed which describes up-to-date methods and data to conduct both benefit-cost and financial feasibility analyses that explicitly recognize risks and uncertainties inherent in long-term climate projections and their potential effects on long-lived airport infrastructure.
3. The methodology also is broadly applicable to any uncertain financial or economic matter being considered by the airport.

METHODOLOGY PRESENTED IN HANDBOOK

4. Recommended two-step process
 - a. Step 1 – Perform screening analysis using existing ACRP software tool called ACROS (climate projections for 2030 and 2060 available for 489 U.S. airports). ACROS provides process for identifying when airport infrastructure might be vulnerable to climate change and whether the infrastructure itself is critical to airport operations.

Focus is on ACROS worst case forecast for 2060 to assess whether there are areas to investigate more thoroughly. If Yes, then proceed to Step 2.

- b. Step 2 – Evaluate risk more systematically and consider potential ways to reduce it through investments (or operational changes). Suggested method focuses on a potential mitigation project to reduce or eliminate potential damages caused by uncertain future climate changes.

Based on current data availability, the Handbook focuses on two specific areas of climate change likely to affect airports (but method can in principle be used more widely):

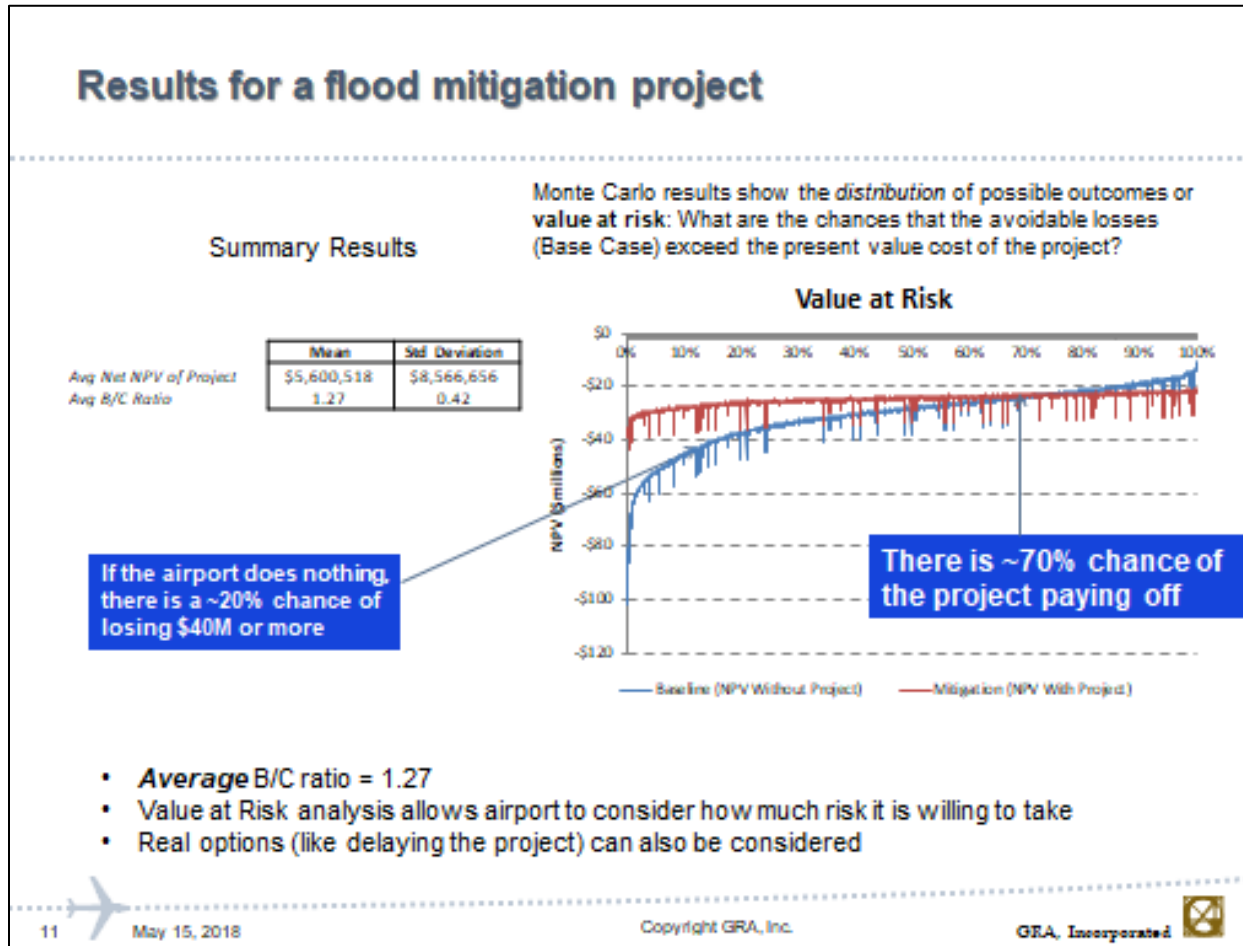
- i. The potential for extreme flooding events due to storm surge and sea level rise near coastal airports;
 - ii. The potential for rising temperatures that require weight restrictions on aircraft takeoffs (or possibly full flight delays) at airports with shorter runways in warm climates or at high elevations.

5. Details of Step 2 methodology

- a. Investment decision-making under uncertainty can be captured in a “Monte Carlo” framework, where many “what-if” simulations are considered that randomly sample from different climate projections to capture the variation in potential outcomes.

- b. Each simulation results in an outcome of benefits and costs under both the Baseline (no mitigation project) and the Scenario (with the mitigation project). Outcomes from Monte Carlo simulations can be analyzed with a “Value-at-Risk” (VaR) analysis that sorts the results by probability from best (highest net difference between Scenario and Baseline outcomes) to worst (lowest net difference).

6. Sample results for a flood mitigation project:



7. The Handbook is accompanied by two Microsoft Excel files (one for analyzing effect of extreme flooding events, one for analyzing effect of high temperatures on takeoff weight restrictions). The files allow the user to assemble and utilize the latest climate data to run Monte Carlo simulations and assess VaR results.

OTHER TOPICS COVERED

8. Related Inputs and Factors
 - a. Classifying relevant airport assets and infrastructure
 - b. Assessing vulnerability of assets

- c. Identifying feasible responses (including those not involving infrastructure) and financial constraints
9. Miscellaneous
- a. How to handle hard-to-quantify impacts
 - b. Direct environmental strategies
 - c. Identifying broader economic impacts beyond the strictly-defined project benefits and costs typically used for benefit-cost analysis

USEFULNESS FOR AIRPORT DECISION-MAKERS

10. To be clear, the range of results available from the recommended methodologies do not necessarily make the decision whether to invest in a mitigation project to combat climate change any easier; but the results do provide a full range of potential outcomes and possibilities for upper management to consider.
11. Airport decision-makers must essentially decide how much risk from uncertain climate change they are willing to accept, and the methods presented in the Handbook provide essential quantifiable estimates of the risks.