

# **The Silver Bullet: How to Use the National Bridge Investment Analysis System to Develop Bridge Targets and Risk Based Asset Management Plans**

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FHWA

## Topics

- What NBIAS Does
- How it Does it
- How to use the information



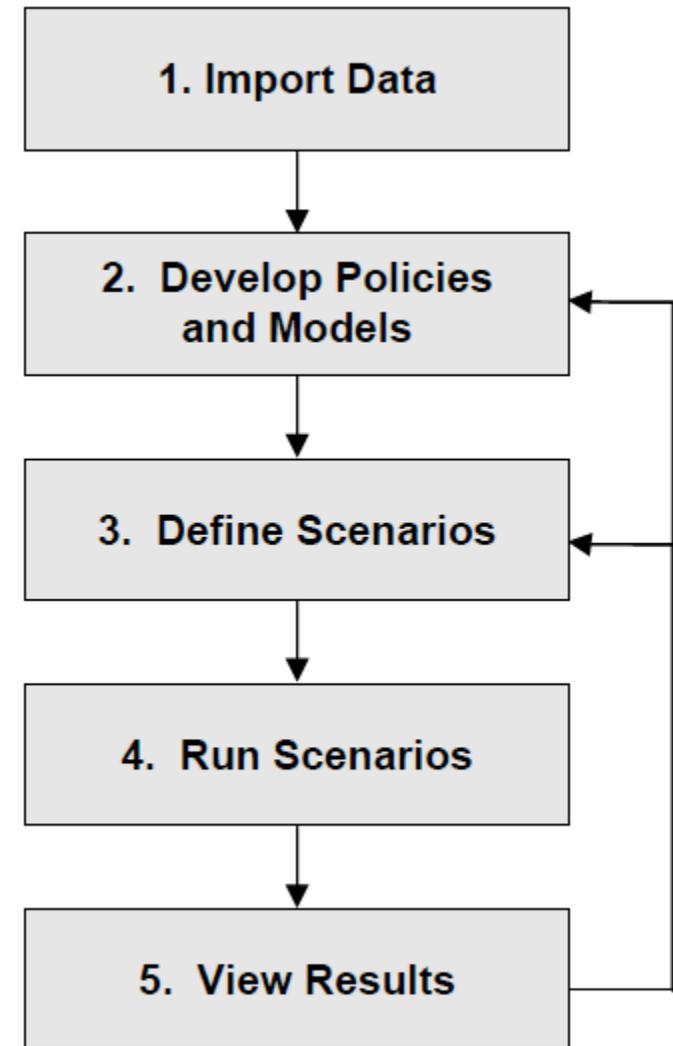
## What NBIAS Does

- Develops network level strategies with state collected National Bridge Inventory (NBI) data
- Deteriorates all the bridges on a state's network using algorithms for each element on each bridge.
- It then assigns financial resources to cost-beneficial corrective actions.
- Produces an annual list of investments per bridge (**Risk Based**)
- Incorporates Graphical and tabular reporting capabilities for 203 performance measures

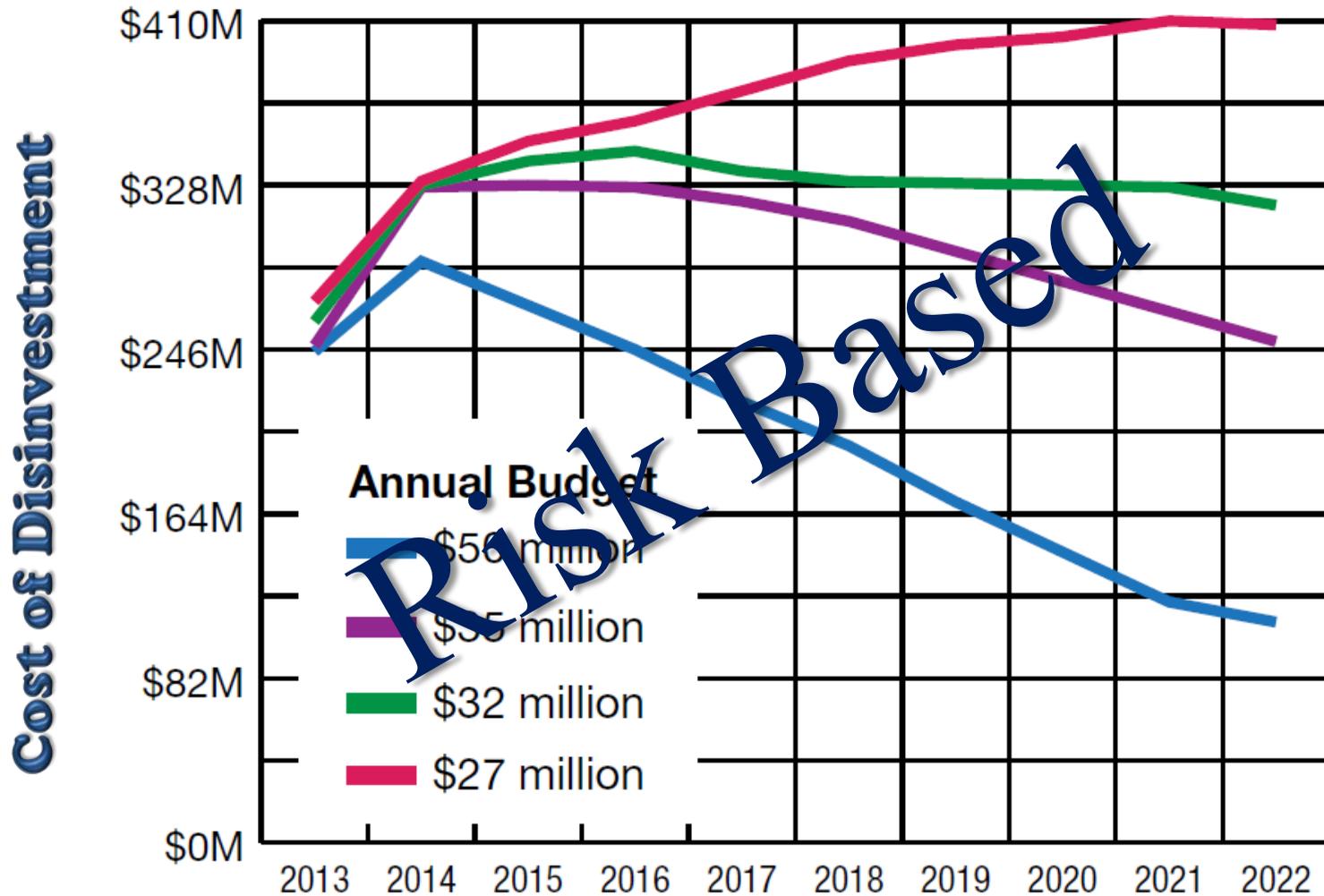


## How it Does it

- Imports NBI data(component level) and converts it to element level data(Reverse Translator)
- Subjects each element on each bridge to probability transition Matrix based on Markov Chain deterioration modeling(**More Risk**)
- Assigns financial resources to mitigate deterioration on an incremental benefit cost basis(minimize life-cycle and detour costs)
- Identifies annual investment plan and outcomes in numerous data tables

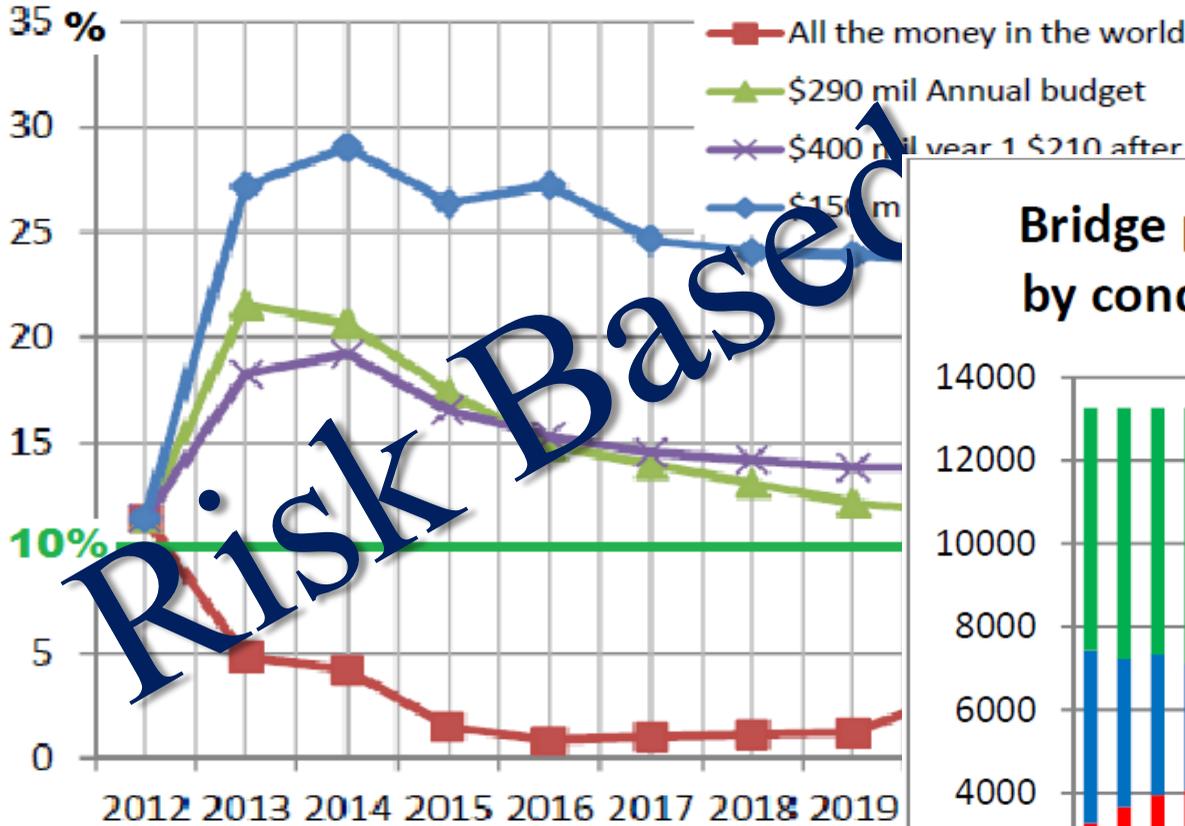


## How to use NBIAS Output

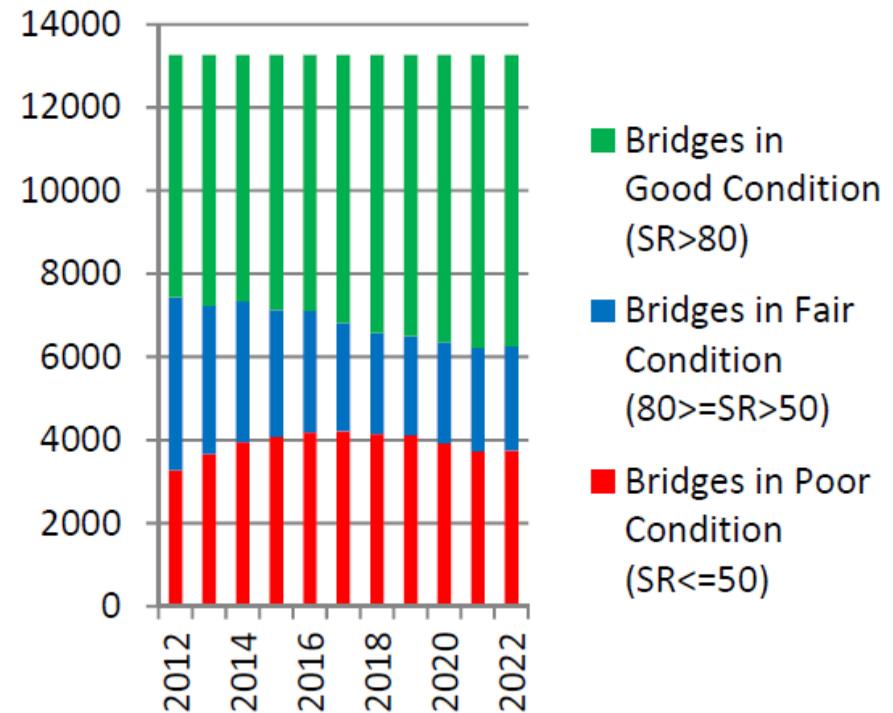


## How to use Output

What will it take to get to  
10% Structurally Deficient?



Bridge population distribution  
by condition under Scenario 1



## The Role of Economic Analysis in PBPP

- Transportation Decision Makers pursue various objectives based on various trends. These include:



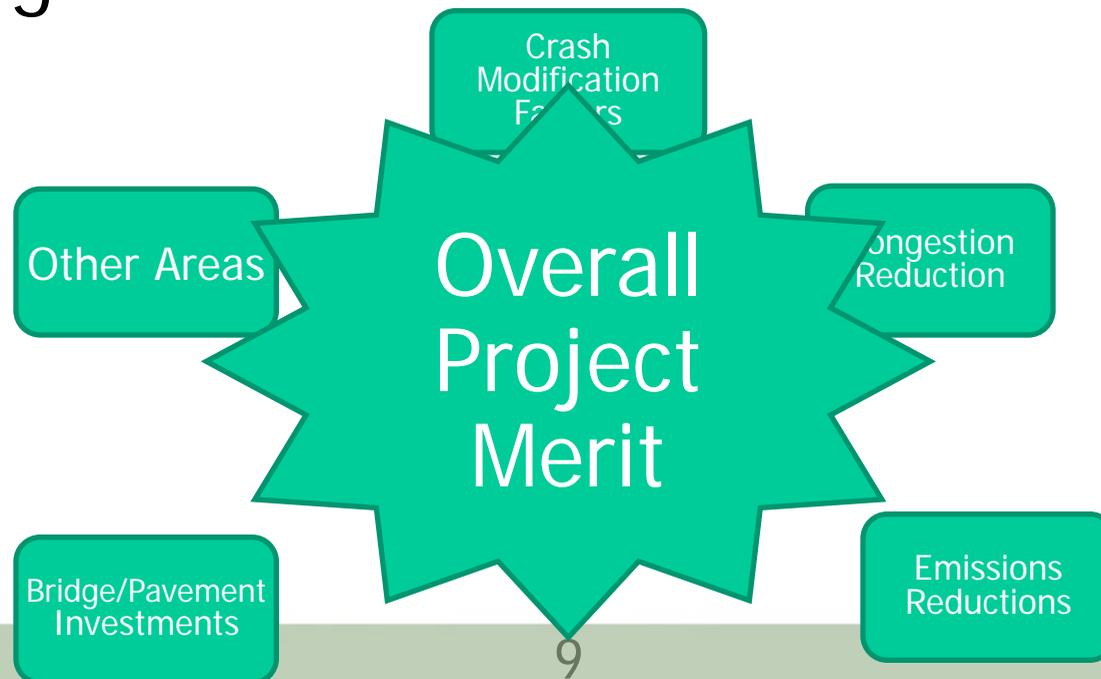
- **Safety** – Reducing fatalities, injuries, & property damage
- **Infrastructure Condition** – maintaining roads and bridges in good condition
- **Congestion** – reducing congestion
- **System Reliability** - improve the efficiency of traveling
- **Freight movement and Economic Vitality** - improve freight networks & support economic development
- **Environmental Sustainability** - protecting and enhancing the natural environment

## The Role of Economic Analysis in PBPP

- Each consideration has specific performance metrics that decision makers use:
  - **Safety** – # of fatalities, # of injuries by severity, & Value(\$) of property damaged
  - **Infrastructure Condition** – Life-cycle costs(\$) of building and maintaining
  - **Congestion & System Reliability** – costs of congestion, delay
  - **Freight movement and Economic Vitality** – Costs to businesses
  - **Environmental Sustainability** – amount of pollution emitted
- Notice that each of these considerations is valued differently

## The Role of Economic Analysis in PBPP

- Decision makers responsible for different areas make decisions individually, but we implement projects that span focus areas.
- We need to evaluate investment decisions considering all factors



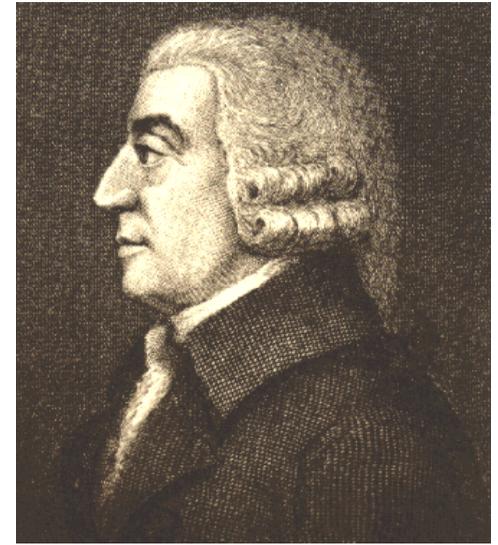
## The Role of Economic Analysis in PBPP

- We should invest the same way we design
- We Choose investments based on characteristics of traffic flows.
  - ADTs
  - Types of Vehicles
  - Volume/capacity
  - Forecasts
- To compare alternative designs, we need to be able to compare all of these quantitatively



## Fundamentals of ROI Analysis

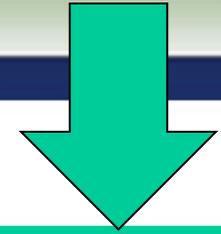
- Mechanism for monetizing, evaluating and comparing long-term costs and benefits of alternatives
- Economic analysis results
  - Help structure project and program level strategies
  - Quantify & Qualify costs and benefits to the agency and to roadway users
  - Support repeatable and transparent project justification and prioritization
- Does not provide THE decision. It provides a logical framework to support decisions
- We are making choices under scarce resources



Adam Smith

## Fundamentals of ROI Analysis

Analyzing Transportation Decisions  
Build a Program or Plan



	Benefit/Cost Ratio	Safety ROI	Life-Cycle Costs	Environmental ROI	Net-Benefits ROI
Overall Project Merit	7.3	\$2.3m -234 serious injuries Avoided	\$5.1mil	\$3.1m Or Metric Tons NO <sub>x</sub>	\$6.5Mil
Overall Project Merit	2.1	\$2.1m -182 serious injuries Avoided	\$7.1mil	\$7m Or Metric Tons CO <sub>2</sub>	\$10.4Mil
Overall Project Merit	.03	\$1.7m -137 crashes Avoided	\$6.1mil	\$1.9m Or Metric Tons NO <sub>x</sub>	\$8.3Mil
Overall Project Merit	-2	-\$0.3m 69 crashes additional	\$2.1mil	\$5.3m Or Metric Tons VOCs	-\$1.3Mil

## Benefit Cost Analysis(BCA)

For public agencies benefit-cost analysis (BCA) is essentially ROI. Traditional benefit cost analysis and ROI analysis for transportation includes user benefits (time, cost, safety) for travelers and select environmental effects (air, quality, noise) along with capital, operations, and maintenance(O&M) costs.



# More Information

U.S. Department of Transportation  
Federal Highway Administration

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## Transportation Performance Management

FHWA > TPM > Resources > Evaluation and Economic Investment > Economic Analysis

### Economic Analysis

Economic analysis is a critical component of a comprehensive project or program evaluation methodology such as Transportation Performance Management and Asset Management. It allows highway agencies to identify, quantify, and value the economic benefits and costs of highway projects and programs over a multi-year timeframe. Highway agencies are then better able to target scarce resources to their best uses in terms of maximizing benefits to the public and to be more accountable for those decisions.

FHWA is promoting the application of economic analysis methods to highway decision-making by developing, collecting, and distributing relevant information and tools to the transportation community. The office is publishing a number of documents, including the [Economic Analysis Primer](#), various fact sheets on economic analysis topics, and case studies of successful State and local applications of economic analysis.

**Roadway Economic and Investment Analysis 101:** FHWA is now offering to State and local governments a one-day workshop on the application of economic analysis to highway decision-making. This free workshop covers a broad range of economic subjects, including inflation, life-cycle cost analysis, benefit-cost analysis, traffic forecasts, and risk analysis. The workshop does not require prior training in economics.

**STEAM Technical Support:** Technical support to the Surface Transportation Efficiency Analysis Model (STEAM). [Visit the STEAM site](#) for more information on STEAM, including the new "Ask the STEAM Expert" feature, Frequently Asked Questions, and STEAM User's Group Registration.

### Features

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**Thank You**

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<http://www.fhwa.dot.gov/infrastructure/asstmgmt/economic.cfm>