Strategic Investment Decisions on Highway Improvement Projects

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Outline

- Context
- Tool Development
- Conclusions
- Acknowledgements
Context: Quantitative Safety at the Planning Stage

- Quantitative safety is becoming an important element in the project selections process at the planning phase

- Key Questions: Location and type of improvements

- Limited to emphasis areas identified in Florida Strategic Highway Safety Plan (SHSP) 2012-2016
Tool Development: Sources

● **Strategic Highway Safety Plan (State of FL)**
  ○ Identify emphasis areas to categorize countermeasures

● **CMF clearinghouse** ([http://www.cmfclearinghouse.org/](http://www.cmfclearinghouse.org/))
  ○ Includes CMF for different countermeasures and quality rating for each CMF (Only with rating 3 and above)

● **Crash Data**
  ○ FDOT

● **Cost Information**
  ([http://sv08data.dot.ca.gov/contractcost/](http://sv08data.dot.ca.gov/contractcost/))
  ○ Preliminary Cost estimates using Caltrans’ online tool
Tool Details: Homepage

Strategic Investment Decision on Highway Improvement Projects

Project Information  Crash Data  Countermeasures  Analysis Methods  Crash Benefits  Visualizations

Please make sure to save a copy of this tool with a relevant project-alternative name before entering any data.
Tool Details: Project Information

Excel-based benefit-cost analysis tool includes worksheets for:

- Project Information *(For Analyst to Input)*
  
  **Agency:**
  
  **Project Title:**
  
  **Date:**
  
  **Analyst:**
  
  **Build Alternative Name**
  
  **Analysis Period (Years)**
  
  **Length of Construction Period (Years)**
  
  **Total Period**
  
  **Annual Discount Rate (Percent)**
Tool Details: Countermeasures

- The tool provides existing countermeasures from the CMF clearinghouse categorized by Emphasis Areas

<table>
<thead>
<tr>
<th>CMF ID</th>
<th>Countermeasures</th>
<th>CMF Value</th>
<th>Crash Type</th>
<th>Crash Severity</th>
<th>Star Rating</th>
<th>Cost per mile/intersection</th>
<th>Cost of Allowances and Contingencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>3360</td>
<td>Install Central Line Rumble Strips</td>
<td>0.35</td>
<td>Head On, Side-Linie</td>
<td>K (Fatal), A (Serious Injury), R (Minor Injury), C (Possible Injury)</td>
<td>5</td>
<td>$15,000.00</td>
<td>$15,000.00</td>
</tr>
<tr>
<td>3364</td>
<td>Install Edge Line Rumble Strips</td>
<td>0.67</td>
<td>Run Off Road</td>
<td>K (Fatal), A (Serious Injury), R (Minor Injury), C (Possible Injury)</td>
<td>4</td>
<td>$6,000.00</td>
<td>$6,000.00</td>
</tr>
<tr>
<td>6127</td>
<td>Install Cable Median Barrier</td>
<td>0.59</td>
<td>Other</td>
<td>K (Fatal), A (Serious Injury)</td>
<td>3</td>
<td>$8,000.00</td>
<td>$8,000.00</td>
</tr>
<tr>
<td>6775</td>
<td>Install High Tension Cable Median Barrier</td>
<td>0.39</td>
<td>Other</td>
<td>K (Fatal), A (Serious Injury)</td>
<td>3</td>
<td>$8,000.00</td>
<td>$8,000.00</td>
</tr>
<tr>
<td>8402</td>
<td>Install W-Beam Guardrail</td>
<td>0.85</td>
<td>Run Off Road, Other</td>
<td>K (Fatal), A (Serious Injury)</td>
<td>3</td>
<td>$6,700.00</td>
<td>$6,700.00</td>
</tr>
</tbody>
</table>

- In the green-rows analyst may input their own countermeasures
- Cost estimates are preliminary and may be updated by analyst
## Tool Details: Analysis

Analyst may choose from drop down menu for the six items:

<table>
<thead>
<tr>
<th>I) Emphasis Area</th>
<th>Lane Departure</th>
</tr>
</thead>
<tbody>
<tr>
<td>II) Functional Class / Facility Type</td>
<td>Principal Arterial - Other (Rural and Urban)</td>
</tr>
<tr>
<td>III) Single or Multiple Countermeasure</td>
<td>Multiple Countermeasures</td>
</tr>
<tr>
<td>IV) Calculation Method</td>
<td>Dominant Effect</td>
</tr>
<tr>
<td>V) Countermeasure 1</td>
<td>Install Central Line Rumble Strips</td>
</tr>
<tr>
<td>VI) Countermeasure 2</td>
<td>Install Edge Line Rumble Strips</td>
</tr>
</tbody>
</table>

For multiple countermeasures there are four options for the analyst:

- **Dominant Effect** (Only use the most effective treatment)
- **Additive Method** \( CMF_t = 1 - [(1 - CMF_1) + (1 - CMF_2)] \)
- **Multiplicative Method** \( CMF_t = CMF_1 \cdot CMF_2 \)
- **Dominant Common Residuals Method** \( CMF_t = (CMF_1 \cdot CMF_2)^{CMF1} \)
Tool Details: Visualization

**Annual Reduction in Fatal Crashes**

- Not Applicable: 13.1
- Dominant Effect: 13.1
- Additive Method: 23.7
- Multiplicative Method: 19.4
- Dominant Common Residuals Method: 13.5

**Annual Reduction in Serious Injury Crashes**

- Not Applicable: 150.5
- Dominant Effect: 150.5
- Additive Method: 271.6
- Multiplicative Method: 221.9
- Dominant Common Residuals Method: 154.7
Tool Details: Key Aspects

- Benefit-cost estimate at functional class level
- Effects of multiple countermeasures and the option to choose the underlying methodology
- Flexibility to incorporate new countermeasures and updated CMFs
- Visualization to provide feedback to inform decision making process
Acknowledgments
Questions?

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