A BRIEF OVERVIEW OF ONGOING RESEARCH:
LIFE-CYCLE LIQUEFACTION HAZARD ASSESSMENT & MITIGATION

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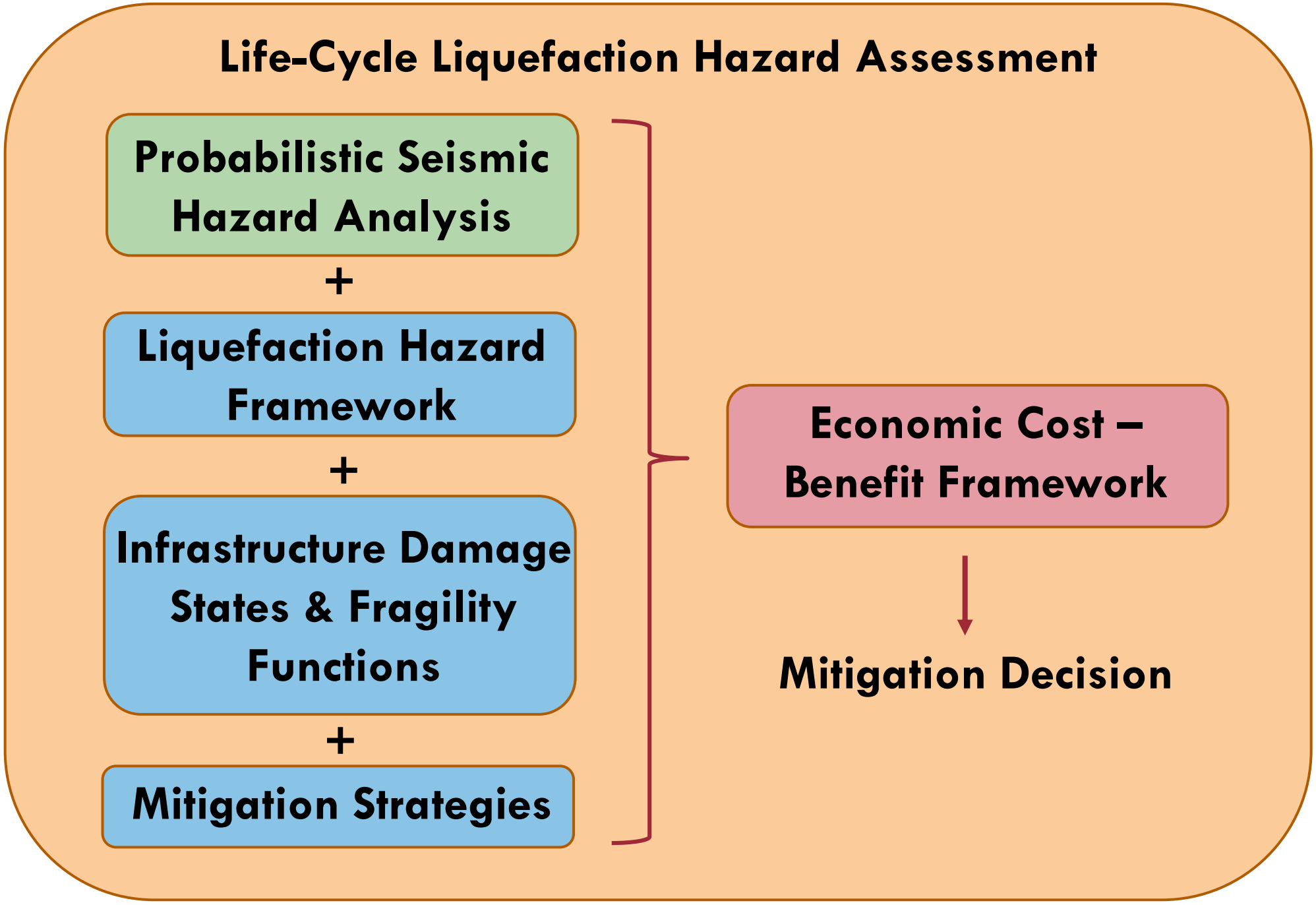
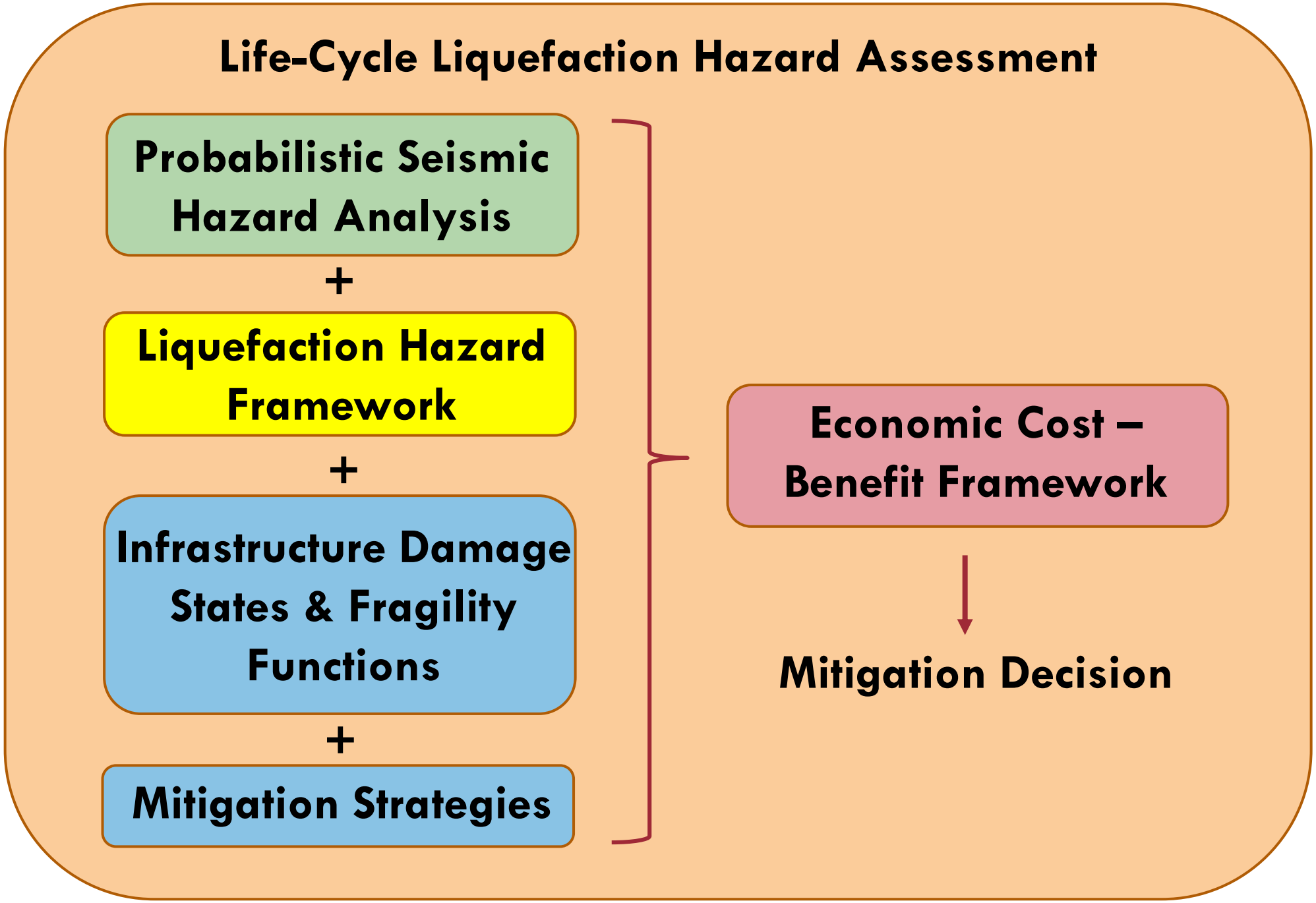
Overview of Research Track



Overview of Research Track



Overview of Liquefaction Hazard Framework Research

Driving Question: What Hazard Framework performs best? Can we improve upon this performance?

Liquefaction Potential Index (LPI)
Modified Liquefaction Potential Index (ISH)
Liquefaction Severity Number (LSN)
1D Post-Liquefaction Settlement (1DS)

Canterbury Earthquake Sequence (CES) Dataset

- 10,000 Case Studies
- 3 Events
  - 4 Sept 2010
  - 22 Feb 2011
  - 14 Feb 2016

Global Dataset

- 280 Case Studies
- 23 Global Events

Overview of Liquefaction Hazard Framework Research

Driving Question: What Hazard Framework performs best? Can we improve upon this performance?

Performance assessment is complicated. Consider that the following three models may have equivalent overall efficiency.

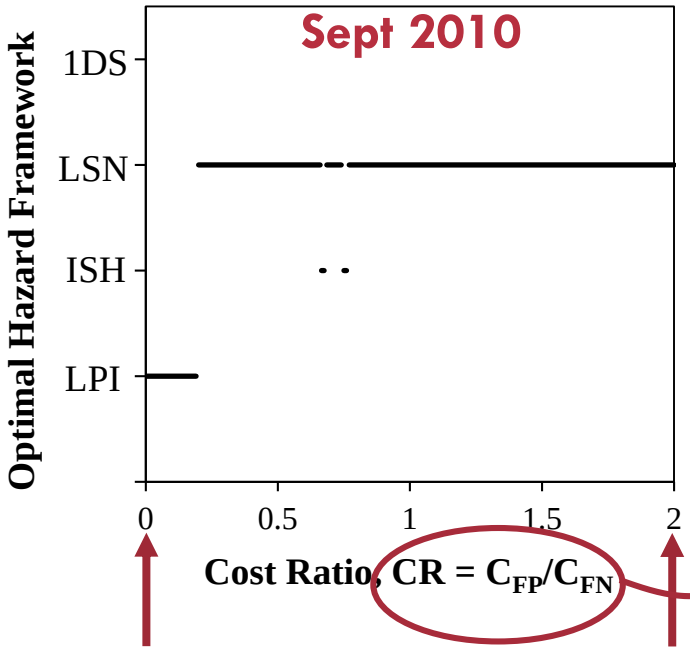
1) Works very well in the *conservative* range (make positive classifications with weak evidence); few false negatives but many false positives.

2) Works very well in the *liberal* range (make positive classifications only with strong evidence); few false positives but many false negatives.

3) Works well across broad range of misprediction economies.

Overview of Liquefaction Hazard Framework Research

Optimum Framework vs. Misprediction Economy



Most Conservative Analysis
$C_{FP} << C_{FN}$

Less Conservative Analysis
$C_{FP} >> C_{FN}$

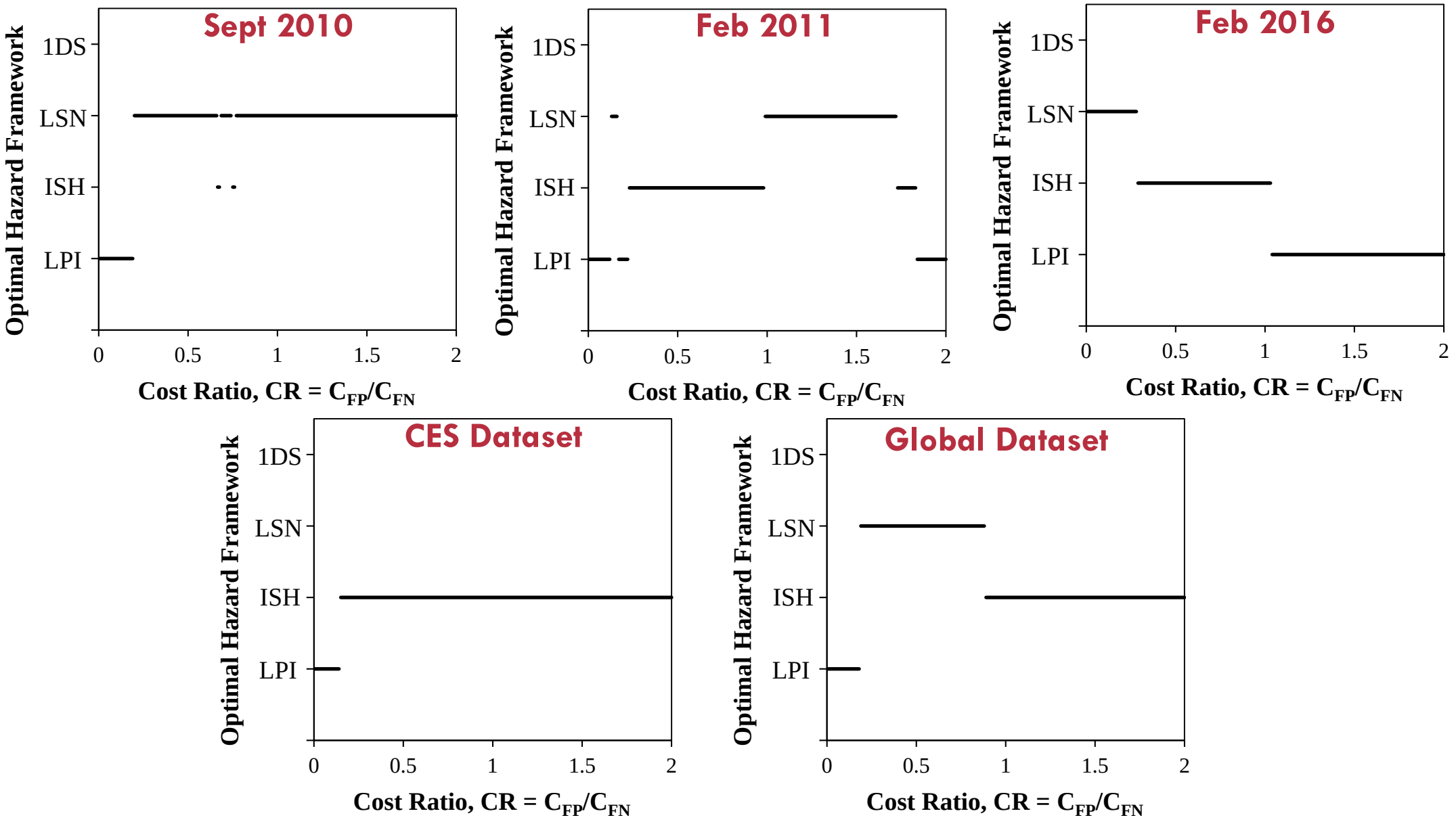
Relative Consequences of Misprediction

C_{FP} = Cost of a False Positive

C_{FN} = Cost of a False Negative

Overview of Liquefaction Hazard Framework Research

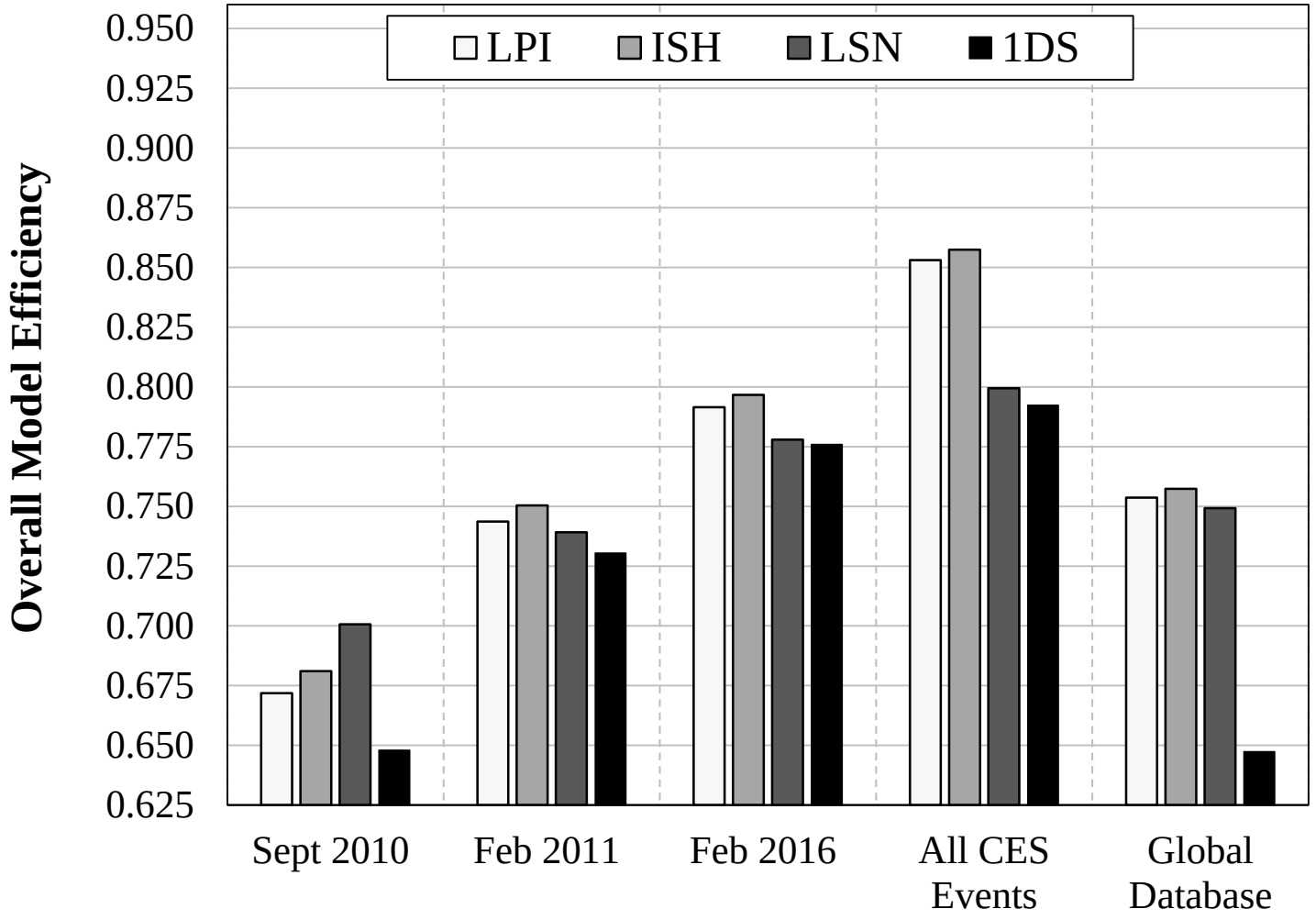
Optimum Framework vs. Misprediction Economy



Key Point #1: The "optimal" framework depends on site-specific economics

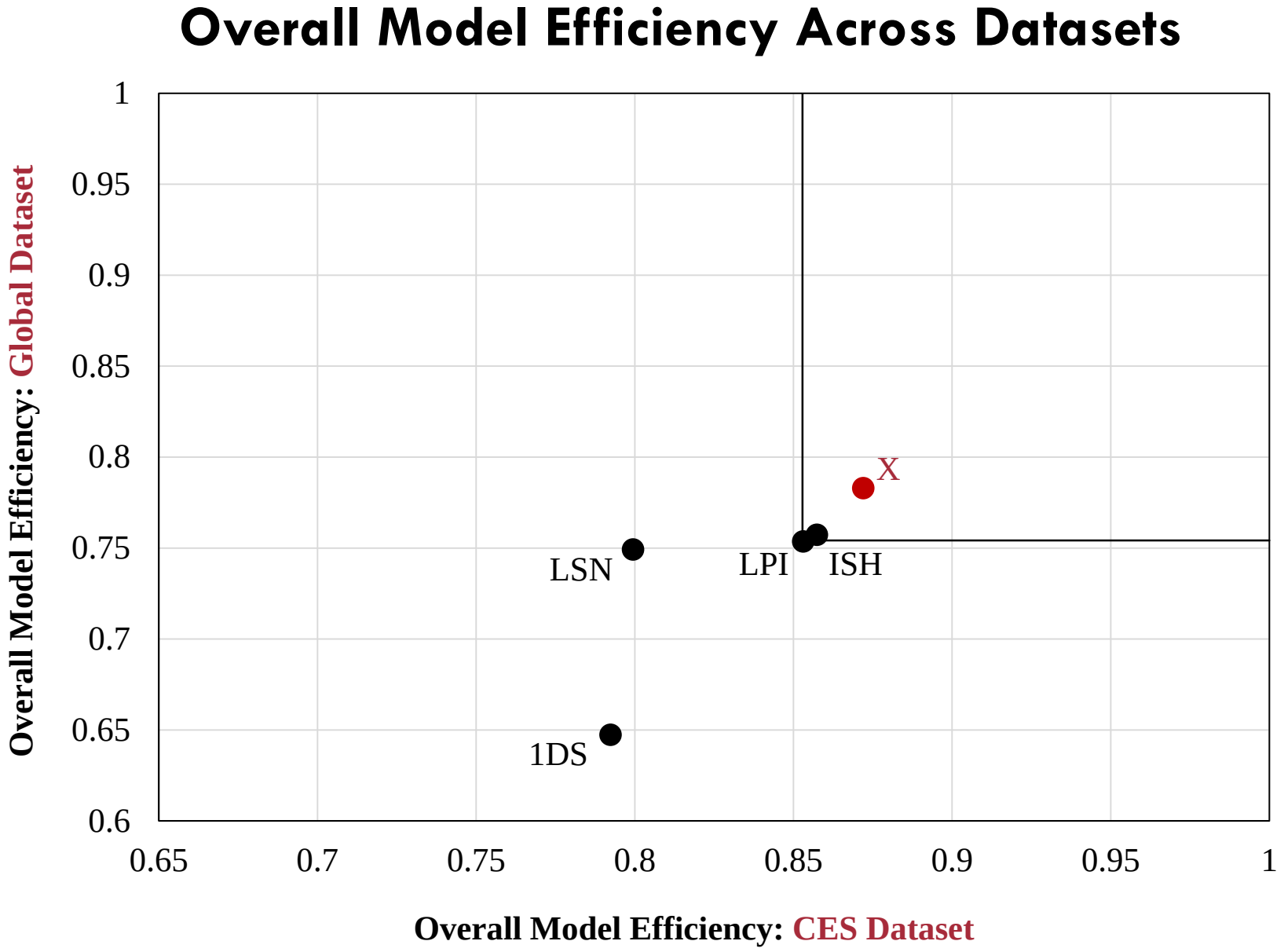
Overview of Liquefaction Hazard Framework Research

Optimum Framework based on Overall Model Efficiency



Key Point #2: **Alternatives to LPI provide little to no statistical benefit w.r.t. overall efficiency; significant room for improvement exists.**

Overview of Liquefaction Hazard Framework Research



Key Point #3: New approach to liquefaction triggering & hazard assessment (Framework X) has resulted in more significant improvement; work in progress.

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