

# Rearranging the Deck Chairs:

*A Simulation Model of Behavioral Resource Utilization Under Crisis*

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**NOTE: Key slides for Conference Proceedings**

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## RESOURCE MANAGEMENT UNDER CRISIS

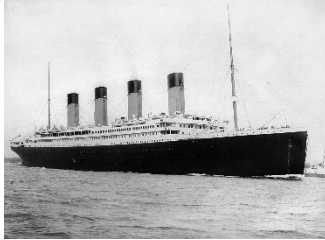
In crisis management, *Time* as a resource does not (need to) degrade at a constant rate



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## RESOURCE MANAGEMENT UNDER CRISIS



CNN



CNN

About 112 years ago, in the early morning of April 15<sup>th</sup> 1912, the RMS Titanic rapidly sank after hitting an iceberg.

- A combination of **poor evacuation management** and inadequate supplies of rescue equipment resulted in thousands of passengers and crew still being aboard as the vessel sank.

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## RESOURCE MANAGEMENT UNDER CRISIS



Frits Ahlefeldt - "The Hiking Artist"

How did the passengers and crew spend and manage their resources during this crisis?

What options did they have aside from:

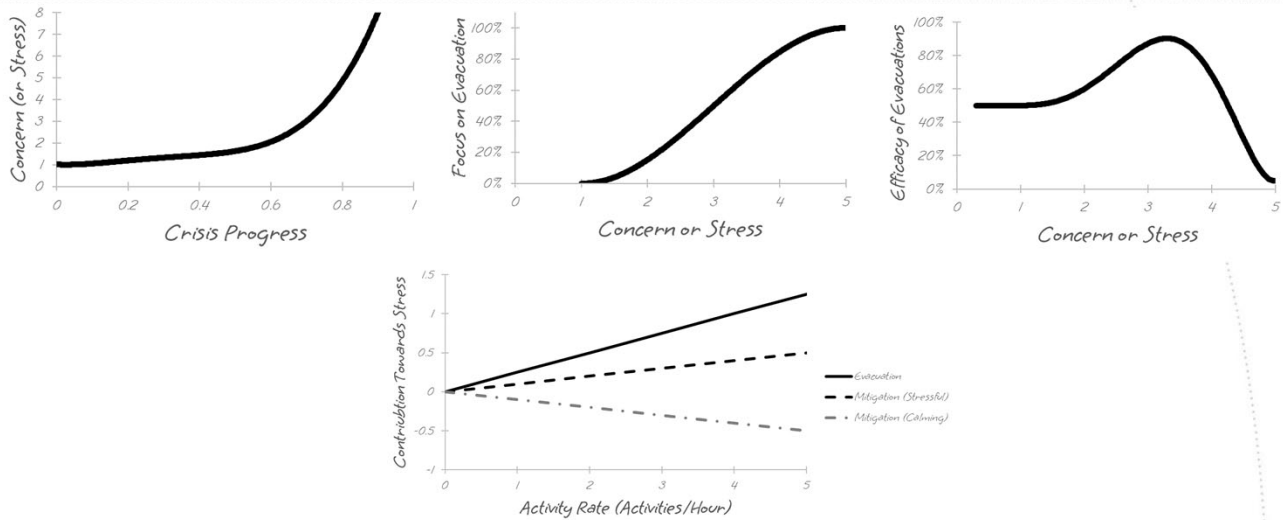
***"Rearranging the deck chairs on the Titanic"***\*

*\*typically used metaphorically in the sense of to occupy oneself with some trivial activity while ignoring something much more important.*

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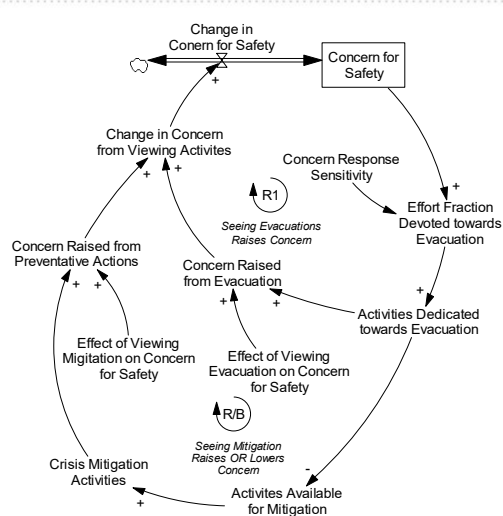
## REFERENCE MODES AND HYPOTHESIZED FUNCTIONAL RELATIONSHIPS



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## CAPTURING EFFECT OF ACTIVITIES ON STRESS



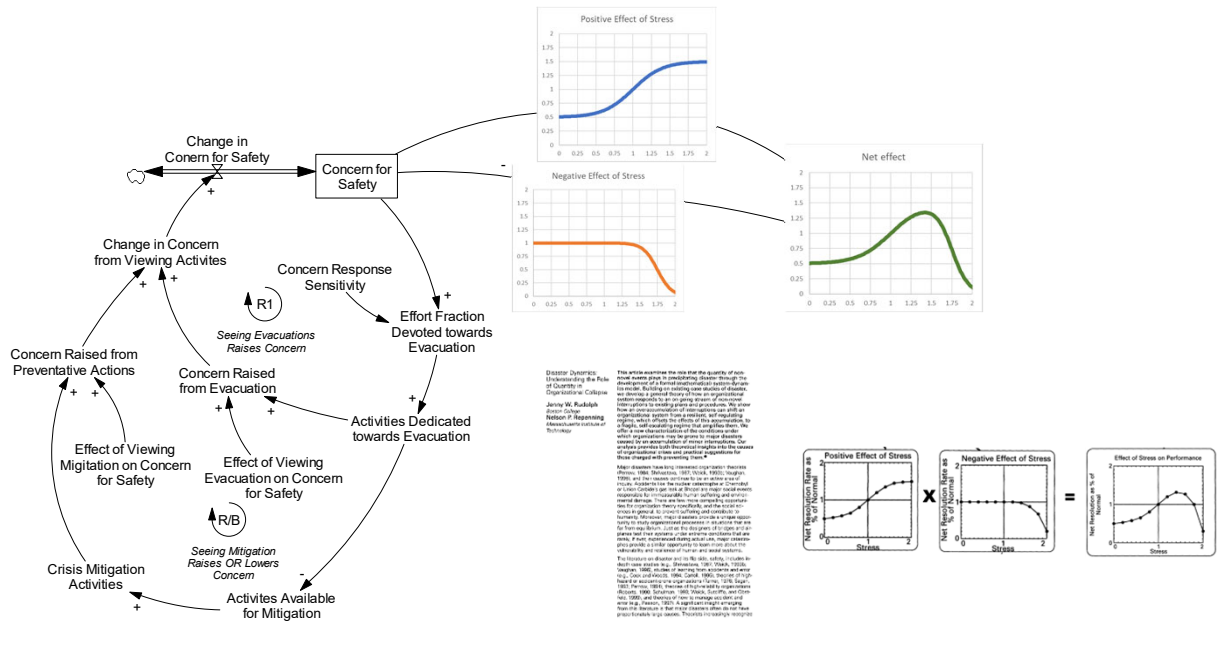
### Concern for Safety

- Increases as crisis develops and fraction of time left begins to drop
- Affected by perception of crisis mitigation activities going on
- Assume that seeing evacuations will only drive up concern
- **Polarity of Loop through Mitigation Efforts can be Reinforcing OR Balancing**
  - Reinforcing if sign on Effect is (+)
  - Balancing if sign on Effect is (-)
  - E.g. 'calming' to see mitigation happening during crisis

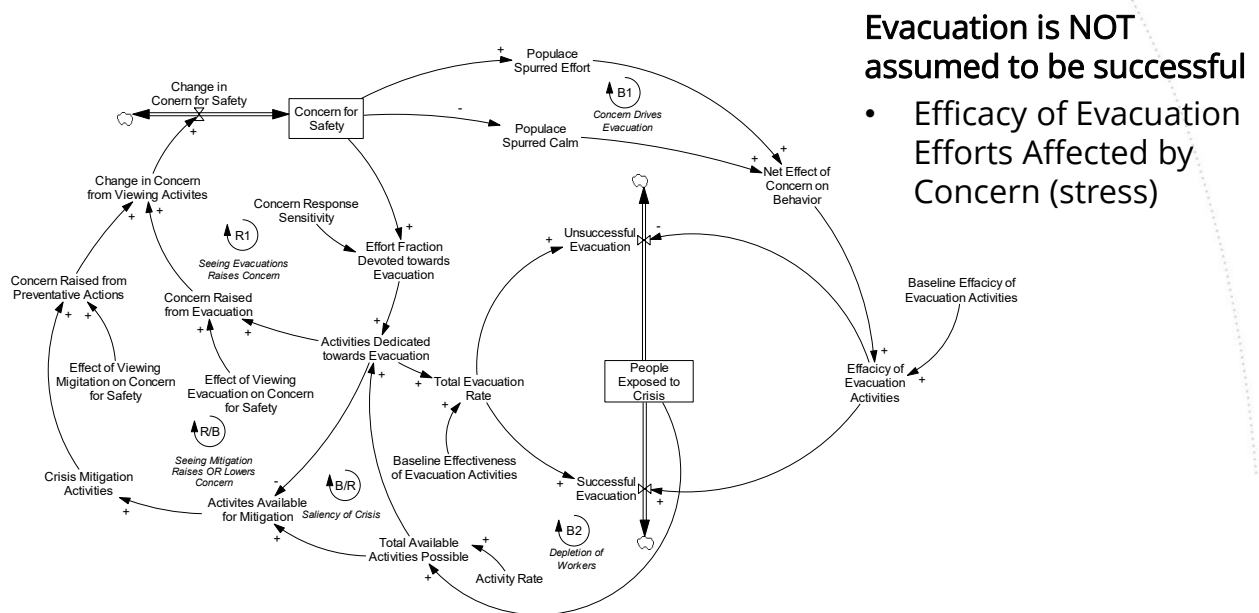
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# CAPTURING EFFECT OF STRESS ON PERFORMANCE



# EVACUATION EFFICACY IS AFFECTED BY STRESS

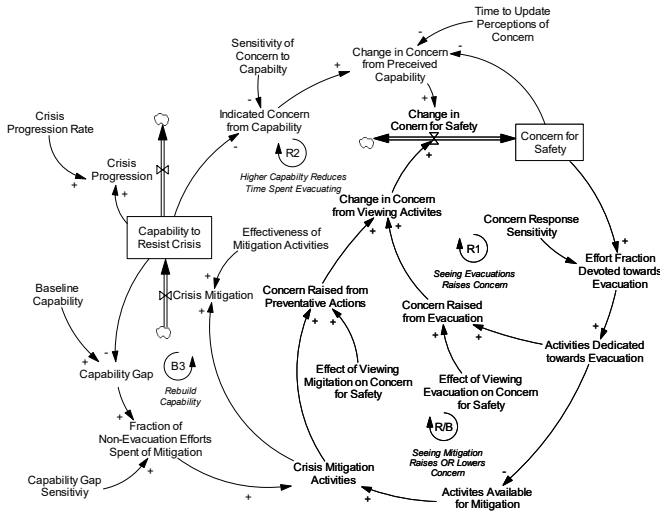


Evacuation is NOT assumed to be successful

- Efficacy of Evacuation Efforts Affected by Concern (stress)

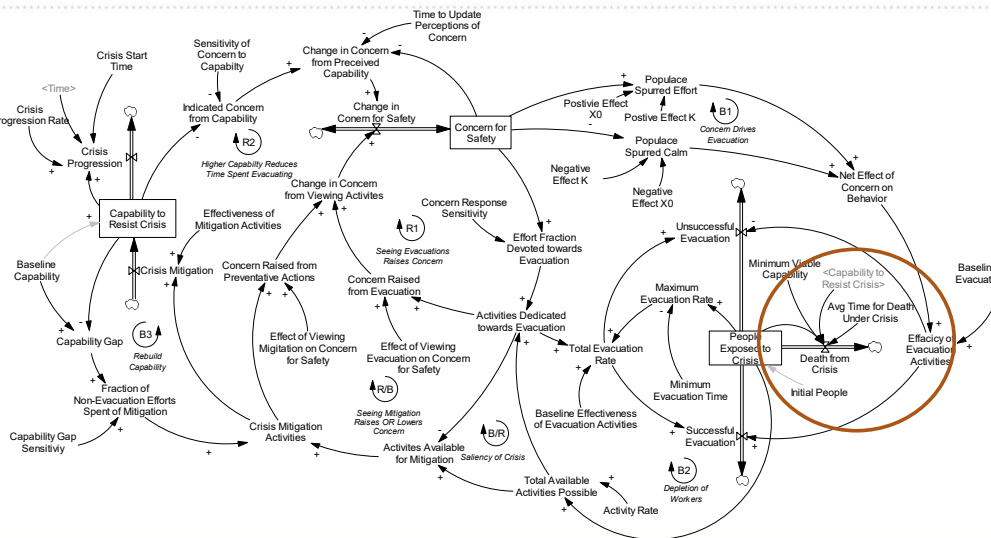
# CAPABILITY TO MANAGE (RESIST) A CRISIS

In crisis management, *Time* as a resource does not (need to) degrade at a constant rate



- Perception of capability to resist crisis affects level of concern and how much idle time is spent in mitigation activities
- Can spend one resource (activities) to maintain another (time)
  - Exogenous crisis progression erodes capability, but mitigation effort and rebuild it!

# FULL COMBINED MODEL



One more way to exit the system

- Assume that below a critical capability, people start involuntarily exiting (dying)

# EXPLORING DYNAMIC BEHAVIOR

Parameter	Baseline Value	Units
Activity Rate	1	Activities/Person/Hour
Avg Time for Death Under Crisis	1	Hour
Baseline Capability	1	Dmnl
Baseline Efficacy of Evacuation Activities	0.5	Dmnl
Capability Gap Sensitivity	1	Dmnl
Concern Response Sensitivity	0.05	Dmnl
<b>Crisis Progression Rate</b>	<b>0.5</b>	<b>Dmnl/Hour</b>
Crisis Start Time	10	Hour
Effect of Viewing Evacuation on Concern for Safety	0.25	Dmnl/Activity
<b>Effect of Viewing Mitigation on Concern for Safety</b>	<b>0.01</b>	<b>Dmnl/Activity</b>
Effectiveness of Evacuation Activities	1	People/Activity
<b>Effectiveness of Mitigation Activities</b>	<b>0.05</b>	<b>Dmnl/Activity</b>
Initial Population	100	People
Minimum Evacuation Time	5	Minutes
Minimum Viable Capability	0.01	Dmnl
Negative Effect K	-10	Dmnl
Negative Effect X0	1.75	Dmnl
Positive Effect K	5	Dmnl
Positive Effect X0	1	Dmnl
Sensitivity of Concern to Capability	5	Dmnl
Time to Update Perceptions of Concern	0.5	Hour

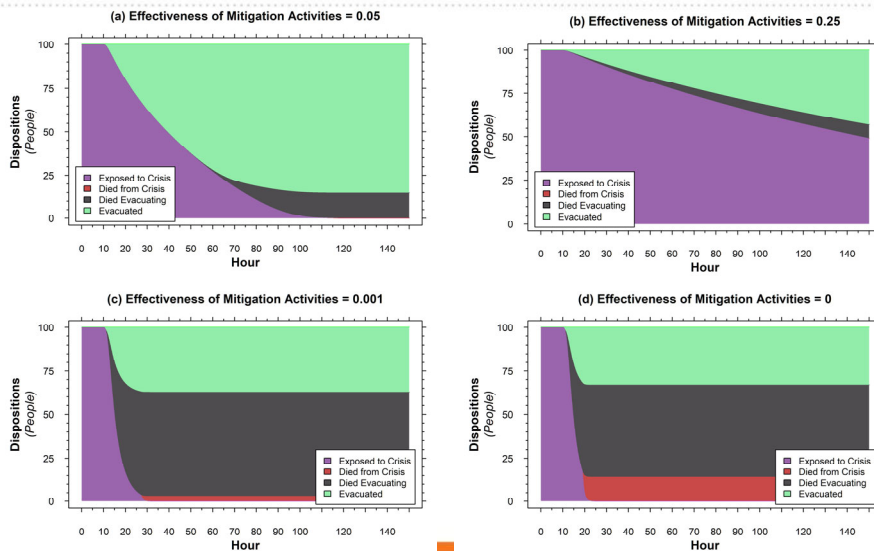
Parameterized with an emphasis on *policy analysis*

- Vary intensity of how fast the crisis erodes the system's capability to support life
- Vary how effective mitigation activities are
  - >0 but small (effective but weak)
  - =0 no actual influence on crisis
- Also vary behavioral effect of viewing mitigation activities specifically:
  - >0 (stressing)
  - <0 (calming)

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# VARYING EFFECTIVENESS OF MITIGATION ACTIVITIES

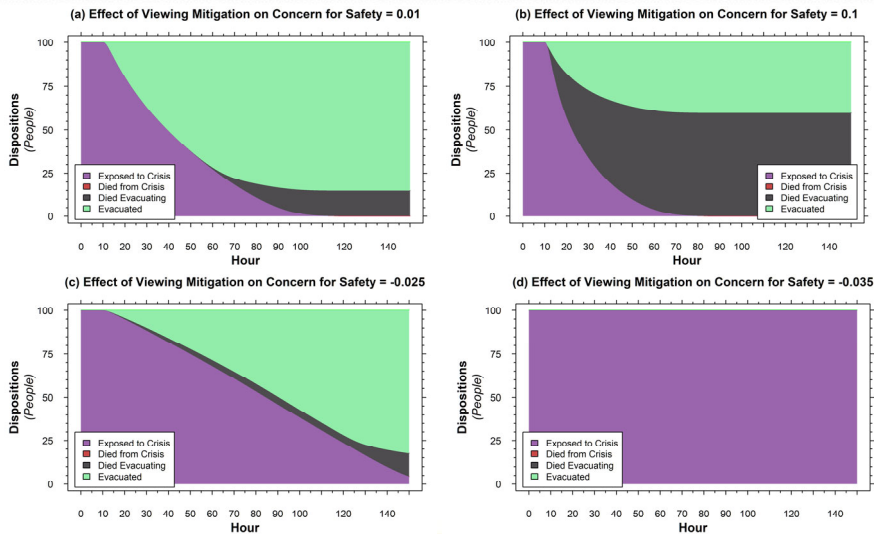


- Less Effective Mitigation leads to quicker evacuation but also more deaths
- Totally ineffective mitigation leads to significant deaths from the crisis itself

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# VARYING EFFECT OF VIEWING MITIGATION



More stressful mitigation means faster evacuation, but often less efficacious

Calming, but still effective, mitigation can increase evacuation efficaciousness,

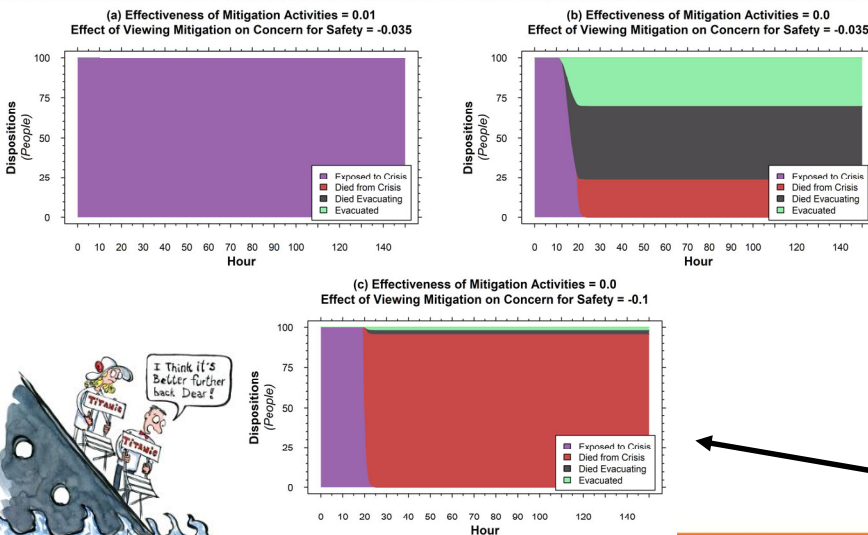
...or even allow people to prevent crisis from progressing

- Here, people don't panic and flee, and instead spend effort maintaining system capability

FOR ...but what if mitigation is totally ineffective for building capability?



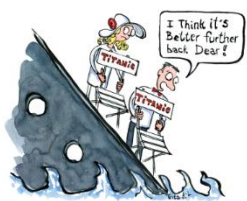
# EFFECT WITH TOTALLY INEFFECTIVE MITIGATION



Previous positive effect of calming mitigation lost when mitigation is totally ineffective

For *very* calming mitigation, can get 'head in the sand' outcome with negligible evacuation until it is too late

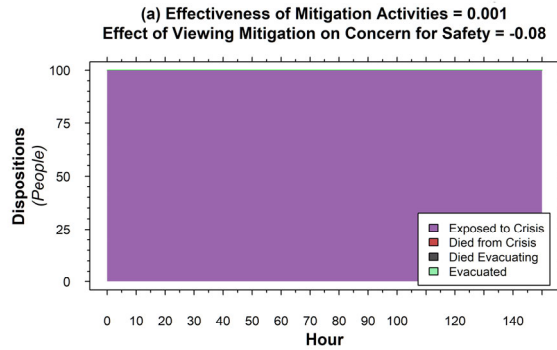
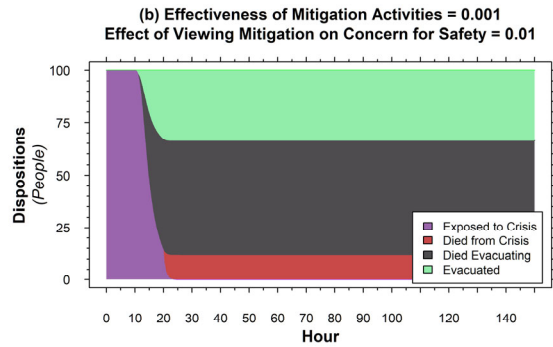
This is 'rearranging the deckchairs'



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# MITIGATION MUST BE MARGINALLY EFFECTIVE

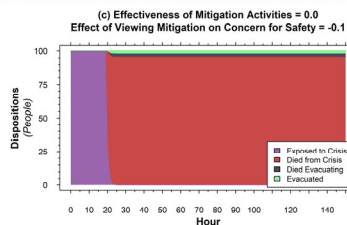
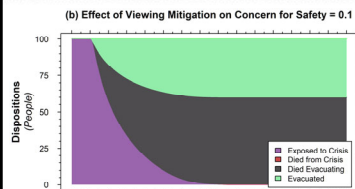


**For even marginally effective mitigation, calming can be helpful**

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# ADDITIONAL THOUGHTS



Dynamic outcomes are a function of physics and behavioral mechanisms

- Resource management under crisis includes *time*
- Mitigation activities can have two purposes: buying time and calming people down
- But, if too calm, then can ignore the problem at hand and before long its too late

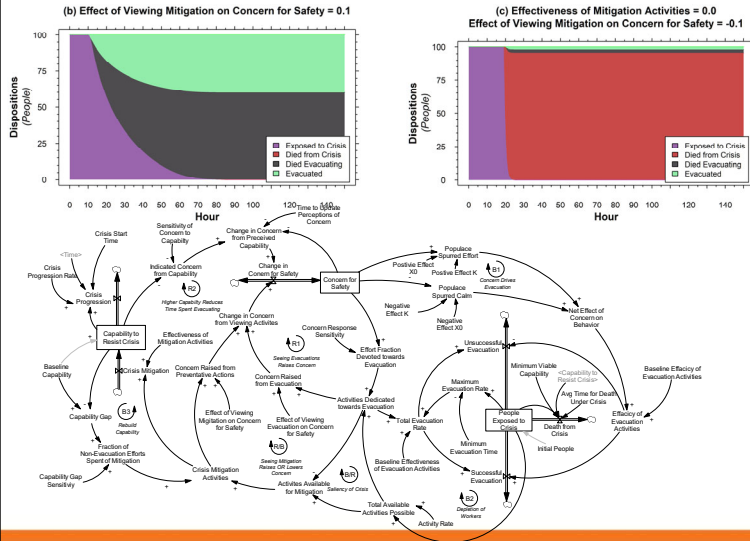
**Raises practical question: how to identify effective vs ineffective mitigation?**

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# ADDITIONAL THOUGHTS



This work provides *framework* for further discussion

- In crisis: Calming mitigations are helpful, if and only if they still have marginal efficacy
- In addition to humanitarian logistics, direct application to mitigation versus adaption discussion in climate change debate

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# THANK YOU

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<https://www.jpaine.info/>

<https://papers.ssrn.com/abstract=4804391>  
<https://github.com/jpain3/Rearranging-the-Deck-Chairs>

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# Additional Backup Slides

## FULL MODEL BY ITSELF

