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# ***CREATE Research Orientation***

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# **Past CREATE Work: Game-Theoretic and Reliability Methods for Counterterrorism and Security**



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# Game theory



- Determine the optimal defense against an optimal attack
- Game theory is useful for security and infrastructure protection:
  - Appropriate when protecting against intelligent and adaptable adversaries
  - Recognizes that defensive strategies must account for attacker goals and behavior

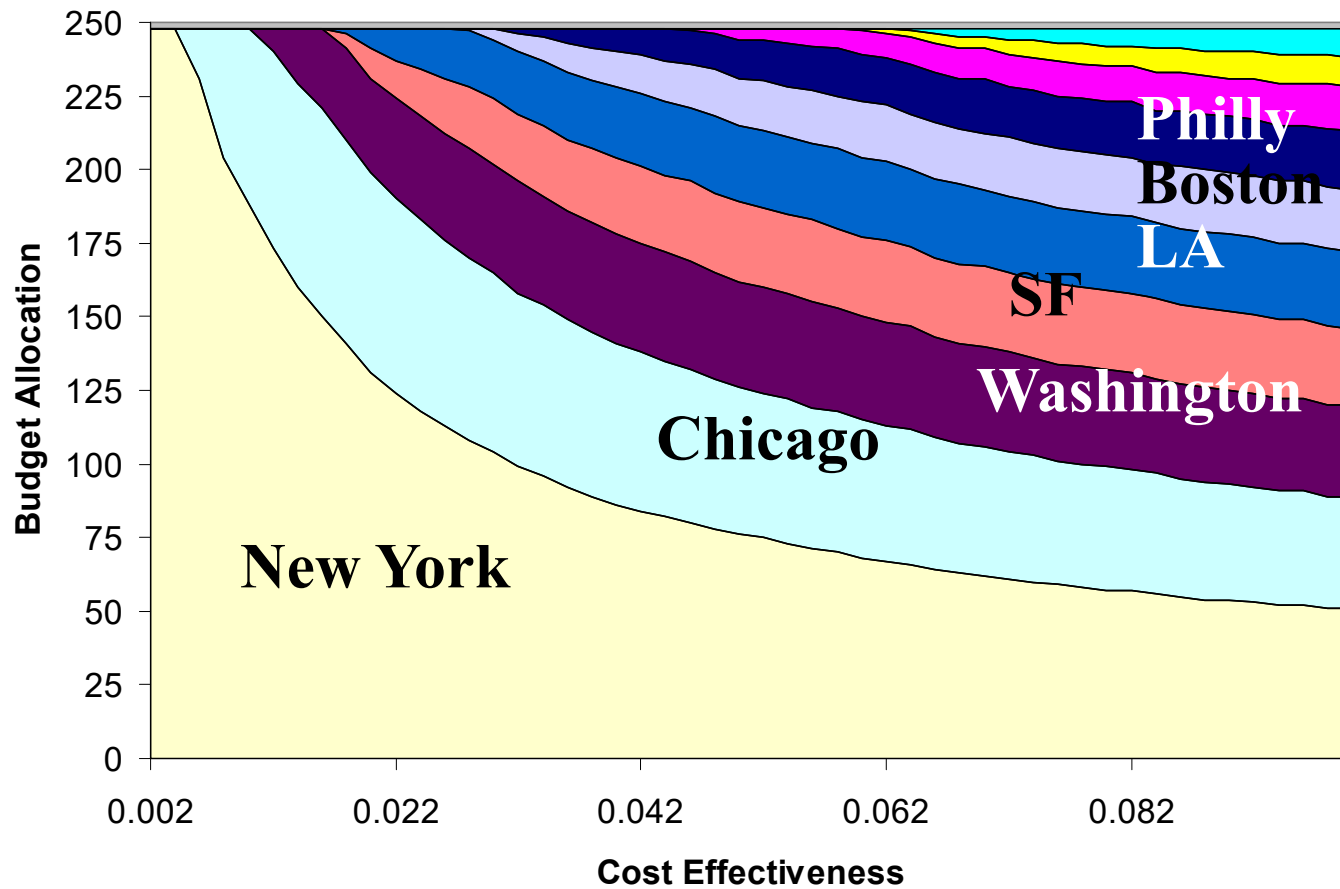


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## Sample Results for 10 UASI Cities





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# Future Research Directions?



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# Relocation for sea-level rise

Find optimal time for relocation:

Government trades off benefit from early relocation against subsidy  $S_k$  required to achieve relocation in year  $k$ :

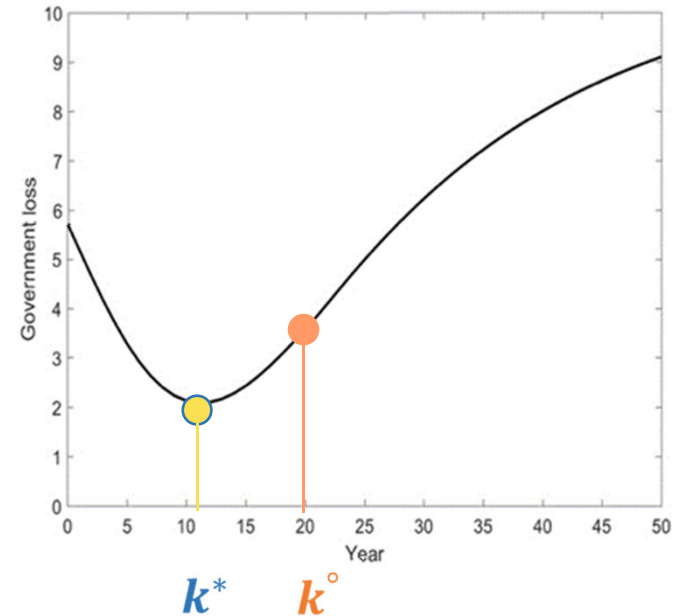
$$\min_k \left\{ \frac{S_k}{(1+r_G)^k} + \sum_{i=0}^{k-1} \frac{E(L_i)}{(1+r_G)^i} \right\}$$

Subsidy

Flood  
losses

$k^\circ$ : Moving year for resident without subsidy

$k^*$ : Moving year for resident with subsidy





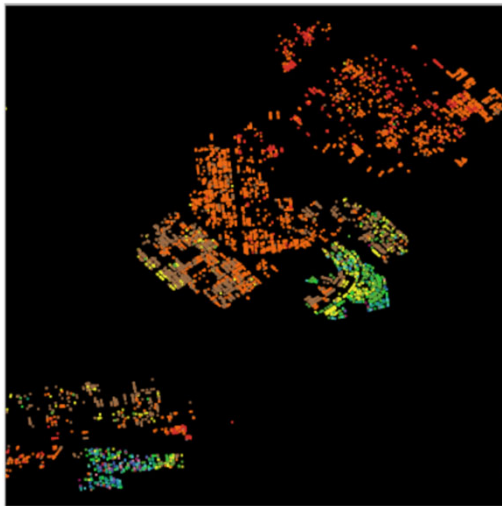
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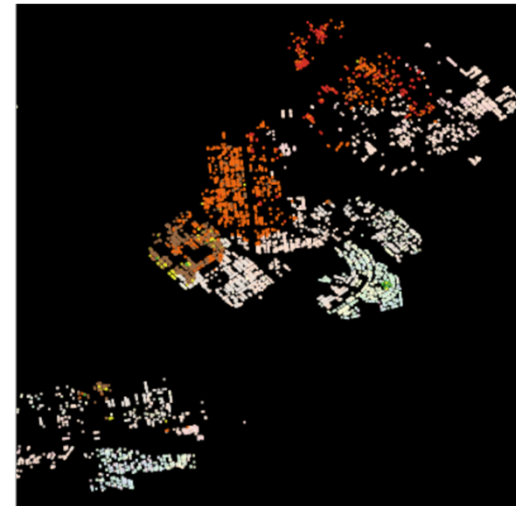


# Agent-based Simulation

- **Model the decisions of individual households:**
  - Using agent-based modeling



Over 100 years



Color represents the house price—**blue** is highest, **red** lowest  
Paler colors represent households that have relocated



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# Pandemic Decision-making

- Understanding of exponential growth?
  - Creates a need to take action early
  - May be difficult in the face of significant uncertainty
- Complex trade-offs—e.g.:
  - Health vs. economics (short term vs. long term)
  - Health effects of pandemic vs. lock-down
  - Trade-offs between different industry sectors (manufacturing vs. retail/hospitality, bars vs. schools)
- Which personal characteristics influence these?
- Can we improve decision making through message framing, practice, and feedback?





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