

Barriers to Proactive Population Relocation in Preparation for Coastal Flooding

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Background

- We have grown used to thinking of displaced persons as a developing-world problem
- Hopefully, citizens in the developed world will rarely become political refugees (fleeing war or persecution):
 - But flooding due to sea-level rise could lead to mass relocations



Magnitude of Relocations

Hurricanes and Flooding

- Hurricane Katrina (2005):
 - Louisiana evacuated about 1.5 million people before landfall
 - Roughly 80-90% of New Orleans evacuated prior to the hurricane
 - Population of New Orleans in the year after Hurricane Katrina was reduced by more than half (by 2010, at 75% of its previous peak)
- Hurricane Sandy (2012):
 - Over 200,000 homes were damaged or destroyed in the U.S.
 - A year and a half later, tens of thousands of people had still not been able to move home



Magnitude of Relocations

Coastal Flooding due to Climate Change

- Melillo et al. (2014):
 - “more than \$1 trillion of property and structures are at risk of inundation from sea level” between 2050 and 2070
 - “half of the vulnerable property value is located in Florida”
- Haer et al. (2013), Hauer et al. (2016):
 - Flooding could result in the need to relocate ~10 million people
- Martinich et al. (2013):
 - 20% of those affected come from disadvantaged populations, and might have little capability to deal with the costs of relocation



Social and Economic Impacts

- Population relocation can cause significant economic impacts (e.g., due to business interruption and loss of housing)
- Based on Hurricane Katrina, Denning and McGhee (2013) estimate relocation cost to be about \$50,000 per person:
 - Total cost of Katrina exceeded \$100 billion



Economic Impacts

- According to Risky Business Project (2014), climate change will cost the U.S. hundreds of billions of dollars by 2050:
 - **Housing and infrastructure damaged by coastal flooding**
 - Lost productivity
 - Reduced crop yields
- \$66 to \$106 billion of property below sea level by 2050:
 - \$238 billion to \$507 billion by 2100
- More than half U.S. population is in vulnerable coastal areas
- Comerio (1998) indicates that loss of housing is one of the largest costs in most natural disasters:
 - So number of people relocated is a good proxy for disruption



Characteristics of Relocations

- Forced relocation is disproportionately difficult for those without strong community or labor-market ties:
 - Social capital seems to mitigate the effects of relocation
- Forced relocation does not offer the same opportunities as economically motivated migration:
 - Less ability to choose a new location based on factors such as job availability, housing cost, other amenities
- Forced location also occurs after people have experienced significant loss of personal property



Characteristics of Relocations

- In the case of coastal flooding, we have a unique advantage, in that we can predict where flooding is likely to be a problem:
 - E.g., New Orleans, Miami, and Tampa known to be vulnerable
 - Gradual relocation over years is likely to be much less costly than a sudden massive relocation at the time of a flood



Characteristics of Relocations

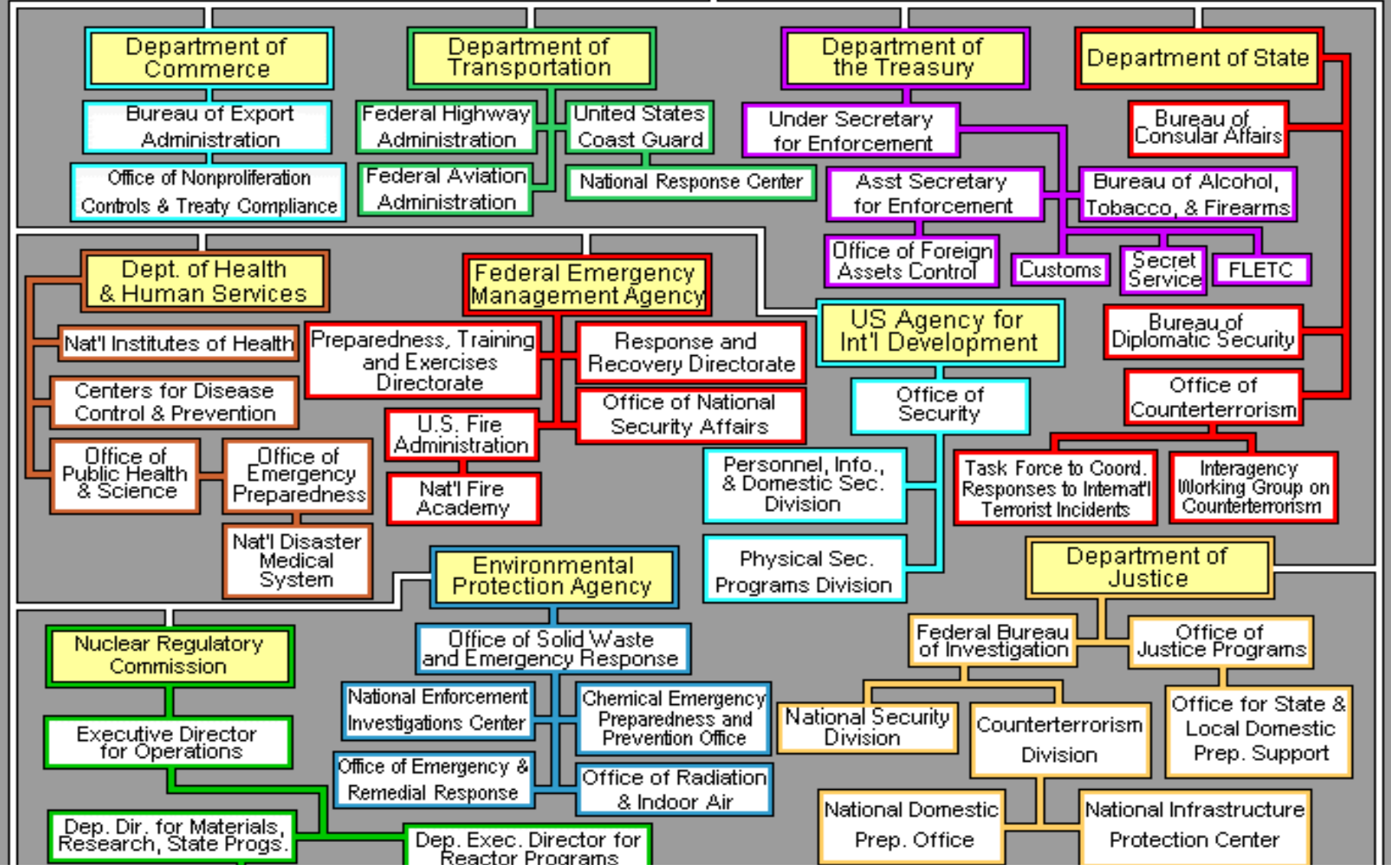
- Even when the need for relocation can be **predicted**, that does not ensure that it will be effectively **planned**
- Busby (2007):
 - “Reducing risks ahead of time is almost always less costly than responding to disasters after the fact...”
 - “Yet the world currently spends too little on adaptive strategies that would reduce climate risk...”
- Sadowski and Sutter (2008):
 - “communities rarely respond to hazards and consider mitigation until after a disaster occurs”



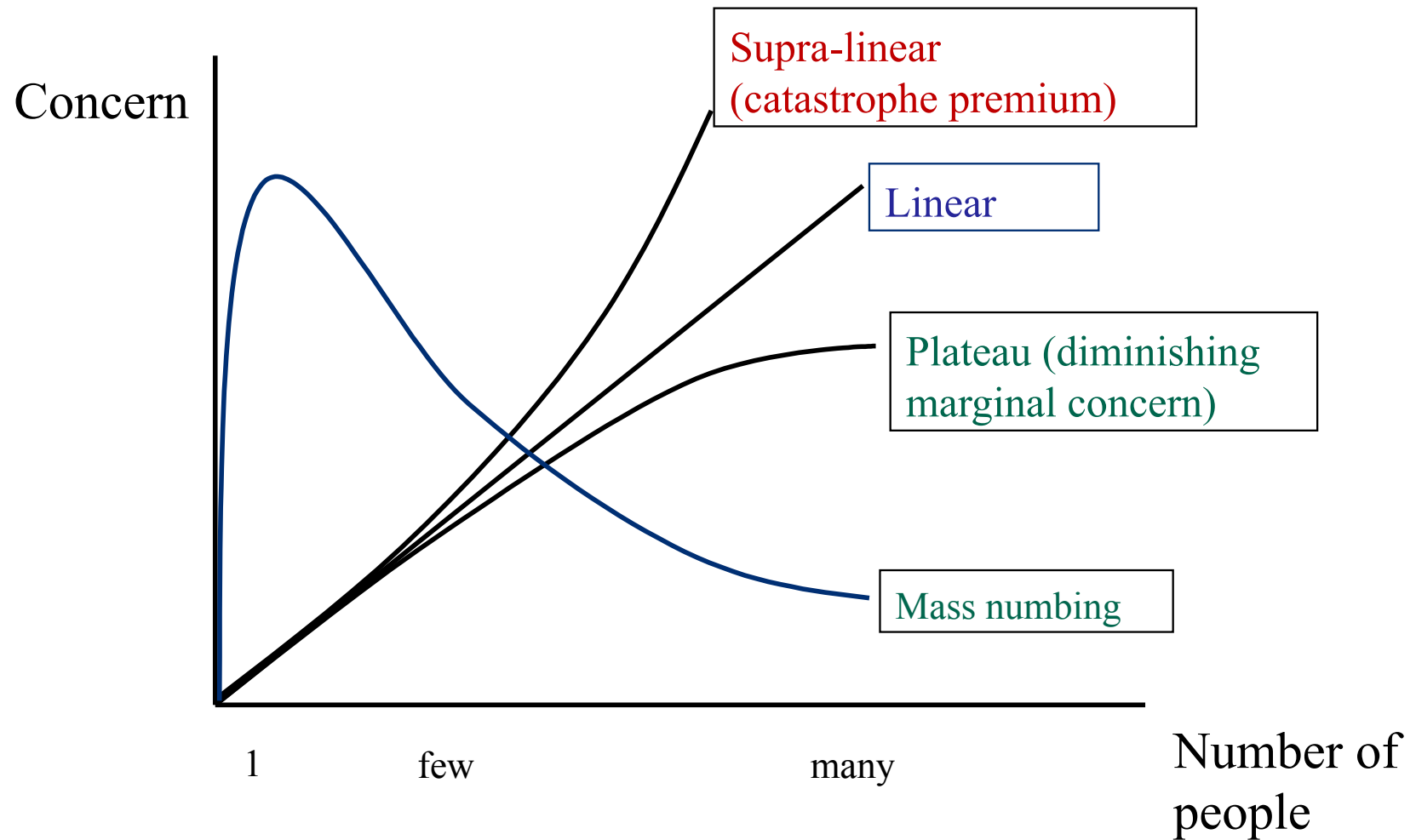
Barriers to Planning

- Collective-action problems:
 - Between jurisdictions (e.g., Coral Gables vs. Miami)
 - Between current and future residents (e.g., condo reserve funds)
- Long time horizon:
 - Lower social discount rate makes this a government problem
- Wide range of federal, state, and local agencies involved
- Competing factors:
 - Coastal amenities
 - Surprisingly large benefits of agglomeration
- “Psychic numbing” reduces sensitivity to large disasters

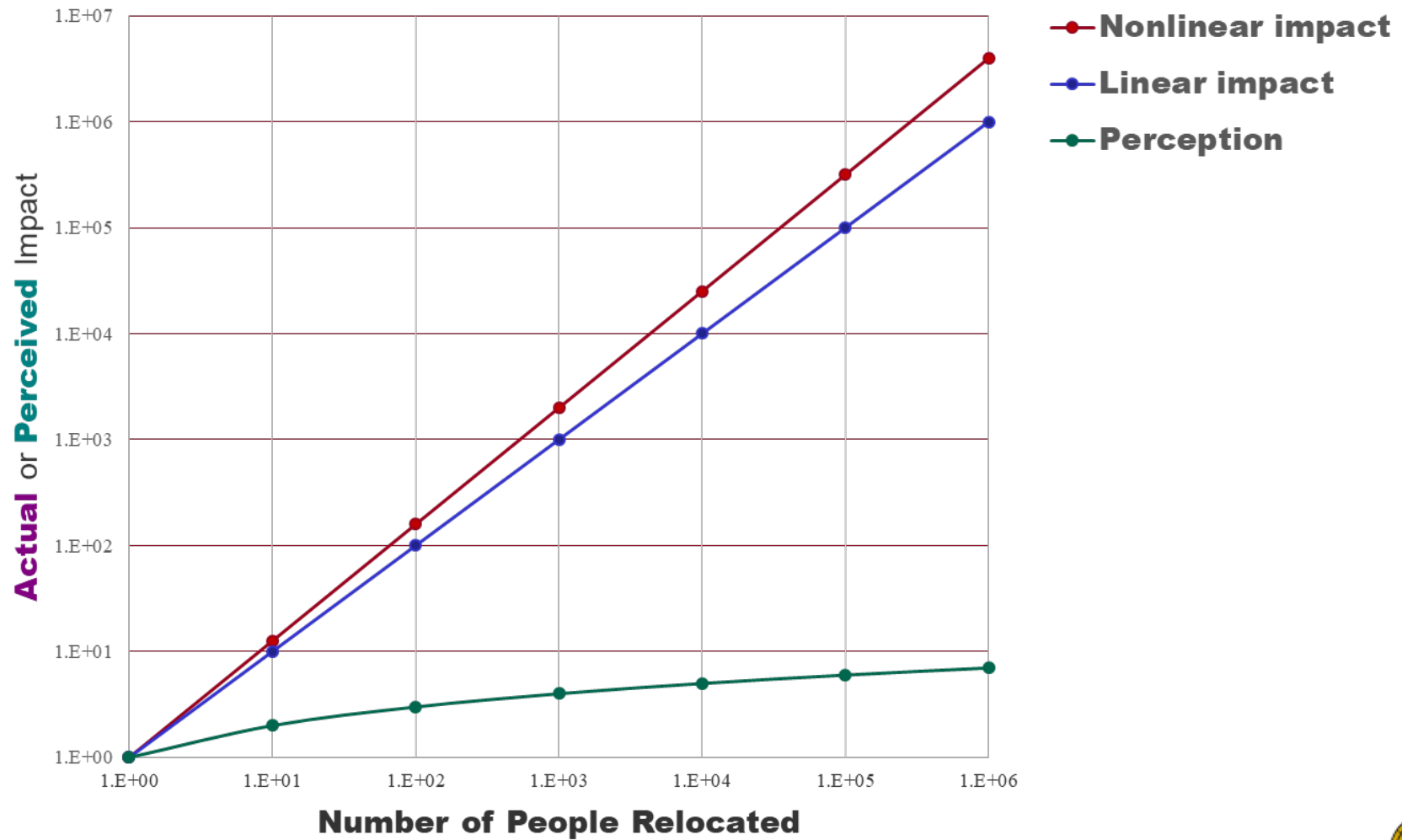




Psychic Numbing (Weiner 2016)



Effect of Psychic Numbing



Mitigating the Impacts

- Flooding researchers recommend:
 - Higher floodwalls, better wetlands management
 - “Early warning and evacuation systems, more comprehensive insurance schemes and other forms of post-disaster response to quickly rebuild affected communities” (Hallegatte et al., 2013)
 - Distributed generation, more reliable backup systems, and reduced building vulnerability (Udvardy and Winkelman, 2014)
- Little attention to incentives for people to relocate from coasts:
 - Location trends are viewed as being essentially immutable



Mitigating the Impacts

- It might be desirable to encourage relocation prior to a disaster through mechanisms such as zoning or location of amenities:
 - However, such policies are controlled by local governments, which are susceptible to political pressure, may not be farsighted
 - North Carolina has banned the use of mathematical models of sea-level rise in setting policies for coastal management!
- Busby (2007) suggests “ensuring that federally funded disaster insurance discourages dangerous coastal settlements”:
 - “By limiting government guarantees to rebuild homes and infrastructure that are situated in vulnerable places”
- Hayat and Moore (2015) recommend national flood insurance be contingent on an agreement to relocate “following floods that cause substantial damage”



Research Needs

- Surprisingly little is known about long-term relocation:
 - Tierney et al. (2001) bemoan the “seeming inattentiveness to the economic dimension of hazards”
 - Tierney (2008) states that “...the nation in fact has no effective plans for responding to catastrophic events”
- Better understanding of the impacts of massive relocations:
 - E.g., econometric analysis of past disasters
 - Computable general-equilibrium analysis for hypothetical risks
 - Determinants of “relocation trauma” and psychosocial stresses
- Interventions to encourage orderly and appropriate relocation before a disaster in areas under significant threat

