

Sea level rise (SLR) & coastal impacts

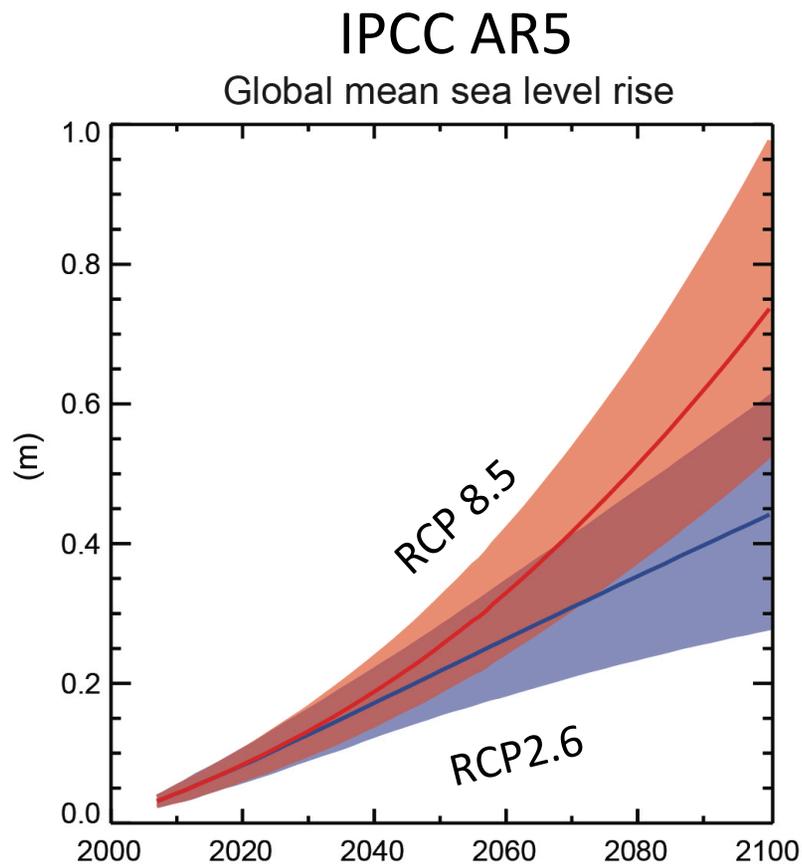
Delavane Diaz, Stanford

1. Physical drivers of coastal impacts
2. Relationship between mitigation and SLR
3. Approaches to modeling coastal adaptation
 - Interactions with other impact sectors

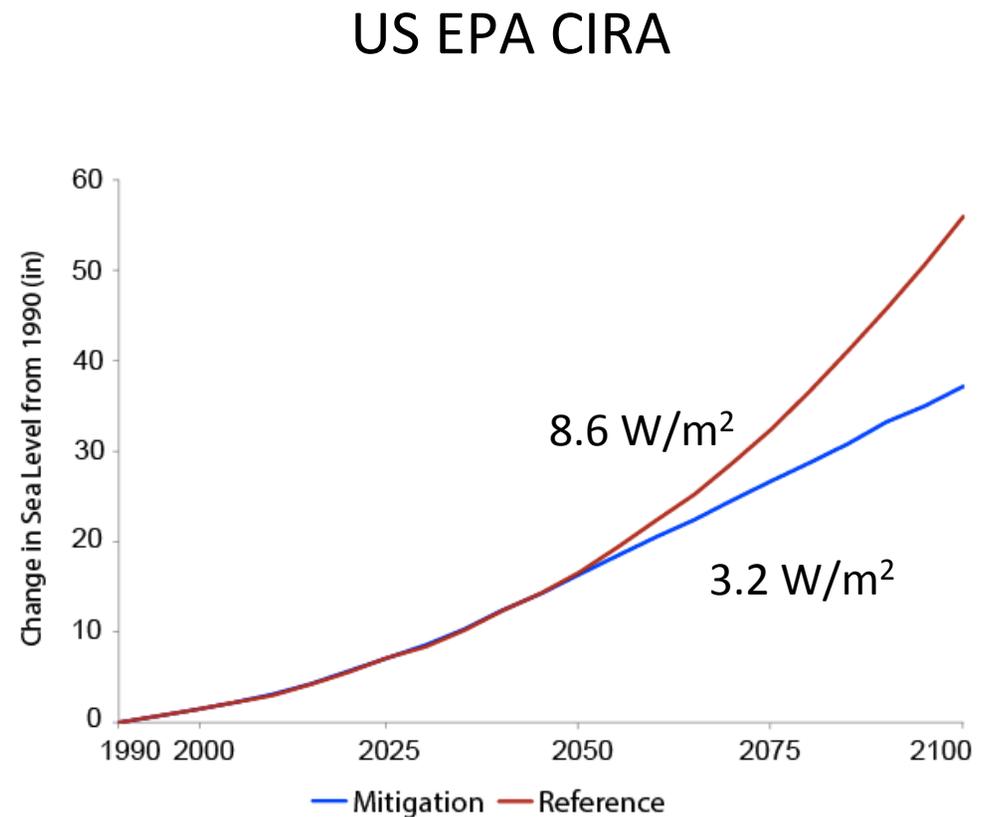
1. Physical drivers of coastal impacts

- Incremental rise
 - thermal expansion (plus subsidence/other local change)
 - rate responds \sim linearly to T
- Extreme events
 - storms/surge (also wind, rain)
 - how does this respond to T??
- Catastrophic SLR
 - dynamic melt/discharge from polar ice sheets
 - how does this respond to T??

2. Relationship between mitigation and SLR: Mitigation has little effect on near-term response



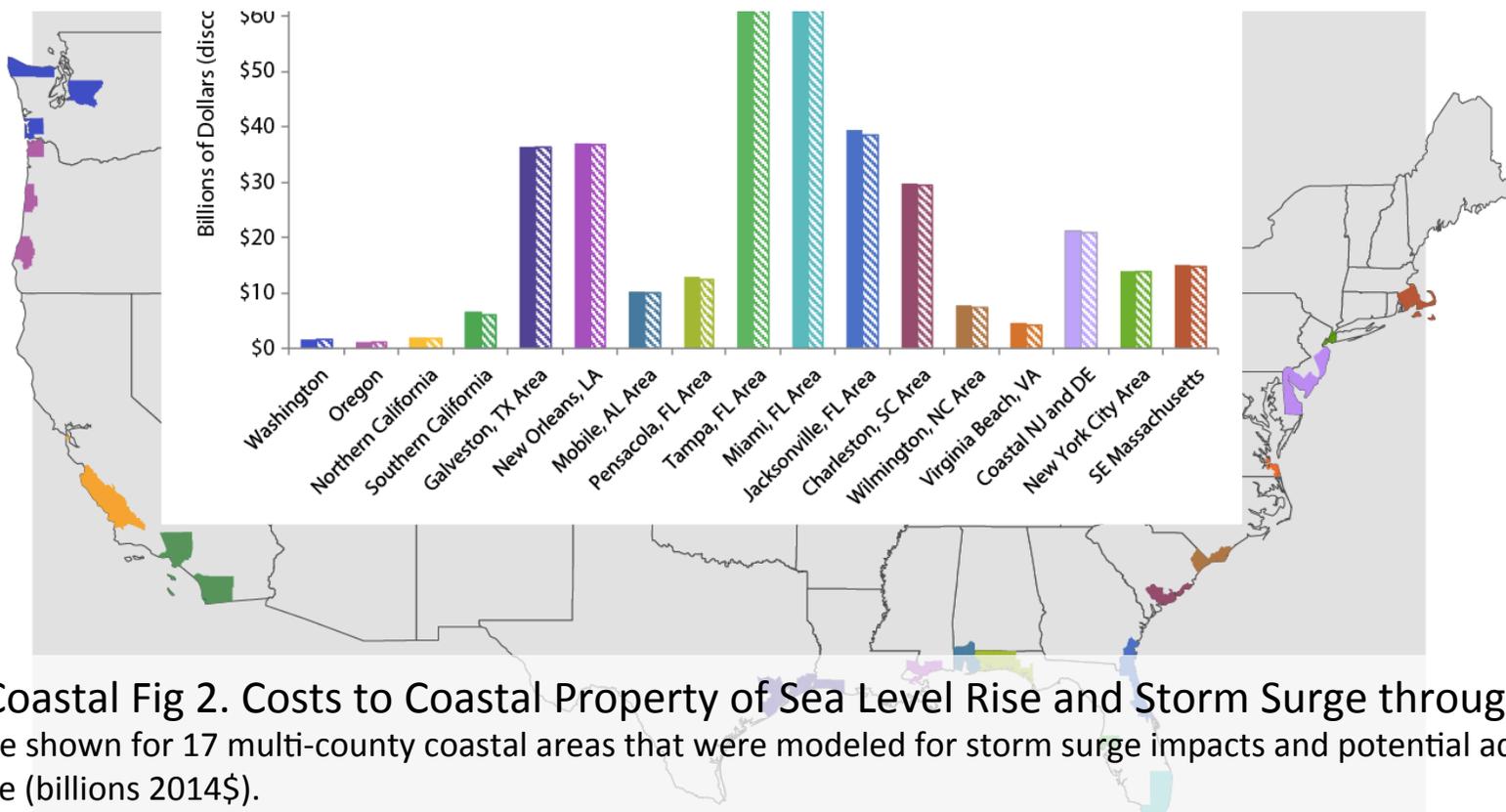
AR5 WG1 Fig SPM.9



CIRA SLR Fig 1

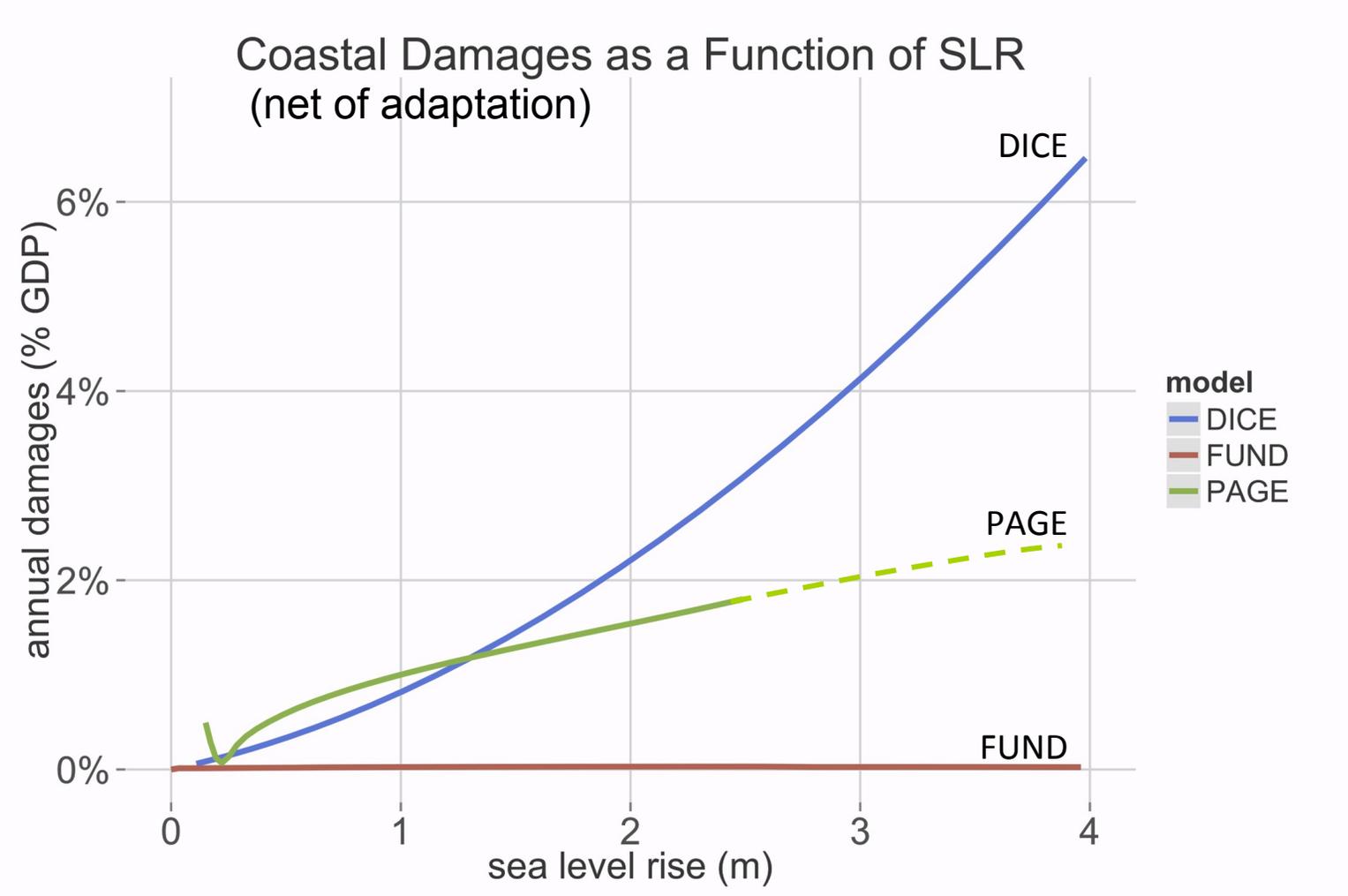
This implies that benefits of mitigation are very small in the coastal sector

$$\frac{\partial D_{coastal}}{\partial E} = \frac{\frac{\partial D_{coastal}}{\partial SLR} \frac{\partial SLR}{\partial T}}{\frac{\partial T}{\partial C} \frac{\partial C}{\partial E}}$$



CIRA Coastal Fig 2. Costs to Coastal Property of Sea Level Rise and Storm Surge through 2100. Costs are shown for 17 multi-county coastal areas that were modeled for storm surge impacts and potential adaptation response (billions 2014\$).

Wide range of SLR damage functions in US SCC models



DICE: Nordhaus and Sztorc (2013), PAGE: Hope (2011), FUND: Anthoff and Tol (2014)

3. Approaches to modeling coastal adaptation

- Many studies find large potential for adaptation to reduce/avoid impacts
- Lots of other important and interesting issues remain:
 - How under-adapted are we now?
 - Role of insurance markets?
 - Public vs private adaptation?

SLR and interactions with...

- storm surge
- tropical/extra tropical cyclones
- erosion
- saltwater intrusion
- wetlands
- migration (domestic, existential threats), geopolitical implications, stability
- adaptive capacity and governance

- But coastal sector is unique in many respects, and perhaps better suited for an isolated study