What Drives Climate Preparedness:
An Assessment of State Climate Adaptation Planning in the United States

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Introduction

Research Question

What factors lead state governments to develop a comprehensive climate adaptation plan?

- Advance our understanding of subnational adaptation decisions.
- I use event history analysis to model the adoption of adaptation plans.

Status of State-level Adaptation Planning

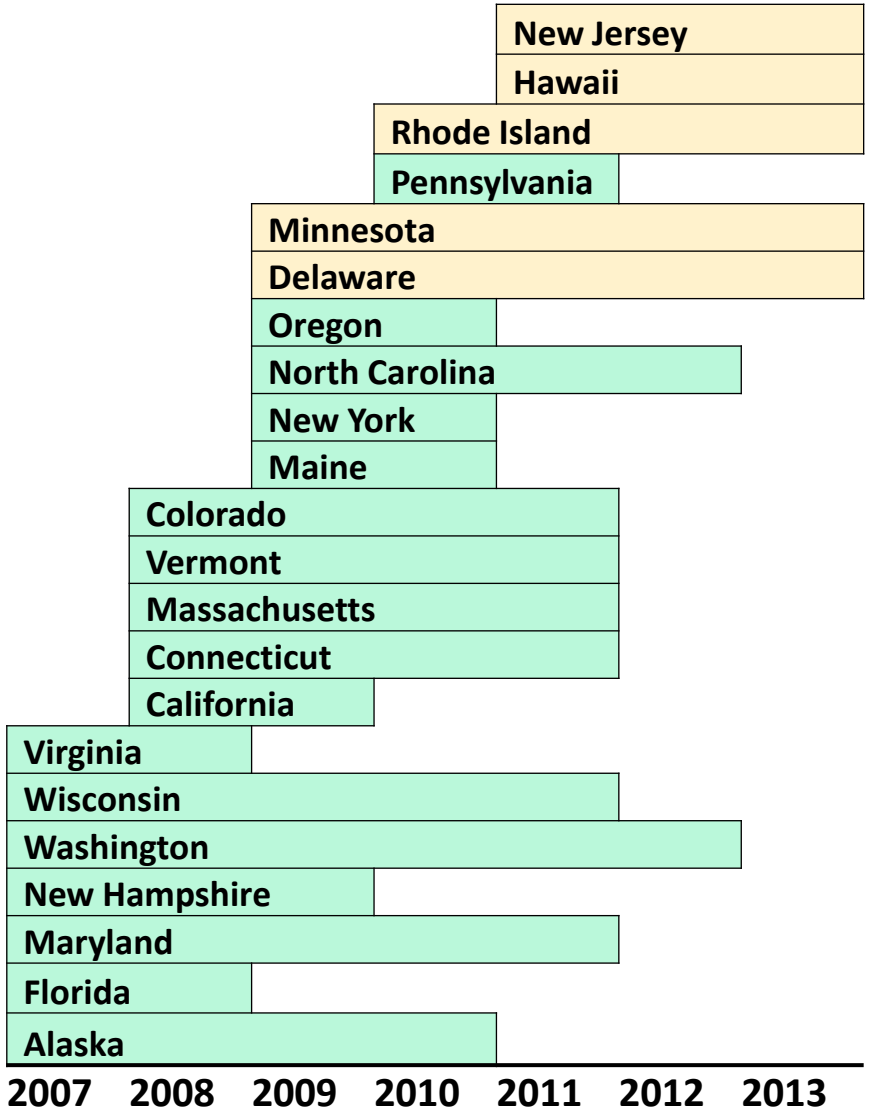
What constitutes a plan ?

- Provide climate change risk assessment;
- Identify adaptation options;
- Prepared by state governmental agencies;
- Focus on major climate sensitive sectors - **comprehensive**

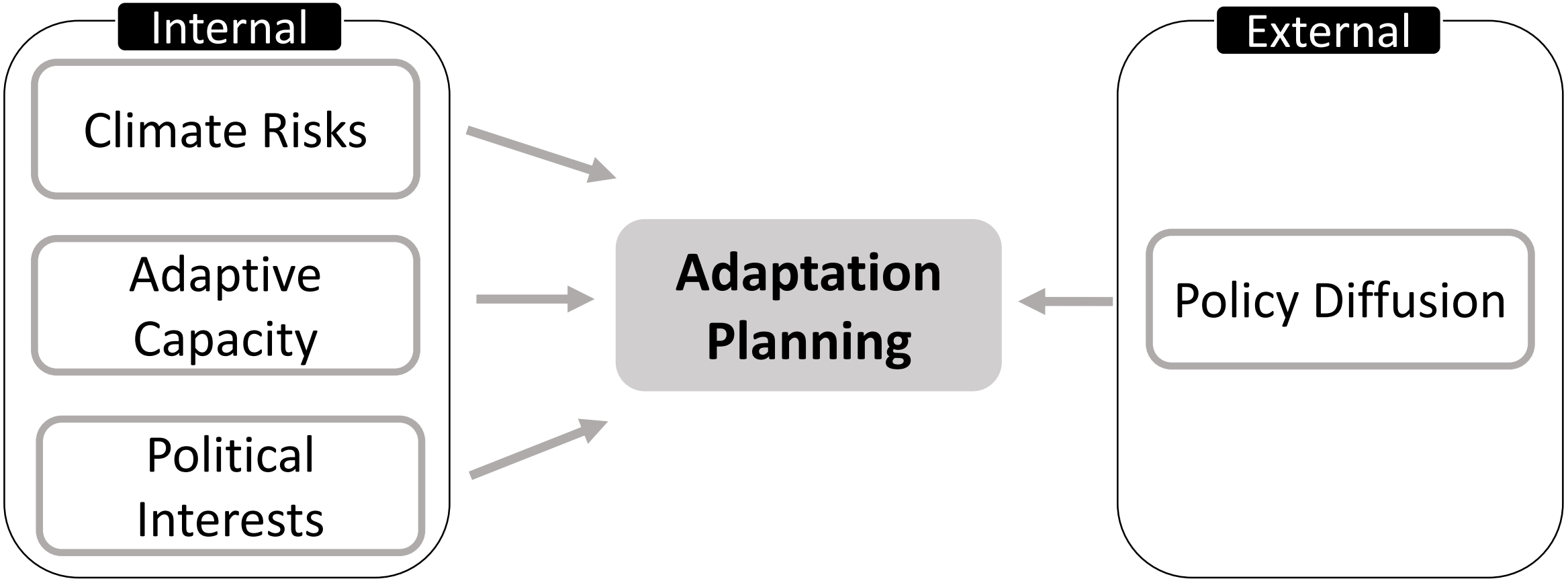
How do I identify them ?

The Center for Climate and Energy Solutions, Georgetown Climate Center, EPA, online searches and E-mail inquiries

Status of State-level Adaptation Planning



Factors Influencing Adaptation Planning



$$P_{it} = f\{ X_{risk}, X_{capacity}, X_{interest}, X_{diffusion}, Baseline\ Hazard(t) \}$$

- P_{it} is the conditional probability that state *i* **starts** adaptation planning in year *t.*
- *f(.)* is a logit functional form

	+ Damage (1)	A.M.E (2)	+ Death (3)	A.M.E (4)
Total damages as faction of GDP (%)	0.132**	0.42%		
Total deaths (hundred)			0.804**	3%
The elderly (%)	-0.124	-0.40%	-0.0759	-0.20%
Agricultural sector (%)	0.106	0.30%	0.137	0.40%
Coastline length (thousand miles)	1.019***	3.30%	1.060***	3.40%
Coastal economy (%)	0.0264***	0.10%	0.0263**	0.10%
Forest cover (%)	0.0939***	0.30%	0.0960***	0.30%
Poor infrastructure (%)	-0.104*	-0.30%	-0.108*	-0.30%
Median household income in year t-1	0.112**	0.40%	0.122**	0.40%
Civic engagement (Public meeting attendance)	0.175*	0.50%	0.187*	0.60%
Democratic governor	1.055	3.40%	1.101	3.50%
Democratic legislative control	-0.357	-1.50%	-0.379	-1.20%
Citizens' environmental preference (LCV score)	0.0486**	0.20%	0.0472**	0.20%
Unemployment rate in year t-1 (%)	-0.0636	-0.20%	-0.0589	-0.20%
Percent nearby adapting states in year t-1 (%)	0.011	0.04%	0.0121	0.04%
t	4.487***	14.50%	4.570***	14.80%
t^2	-0.381***	-1.20%	-0.387***	-1.2%
Observations	349		349	
Log likelihood	-38.59		-38.37	

Robust standard errors clustered at the state level. My sample includes 50 states for the period 2005-2013.
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States' adaptation planning driven by extreme weather events.

- Include *flooding, severe storms, droughts, heat waves, wildfires, hurricanes and other coastal hazards*.
- Events in the past <u>two</u> years matter.
- Suggests reactive adaptation responses.

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The 2013 Colorado floods, which caused over one-billion-dollar damage that would account for about 6% of a median state GDP in 2005, would increase its likelihood of adaptation planning by 2.4%.

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Hurricane Sandy, which caused around 285 deaths, would increase the likelihood of adaptation planning by 9%.

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Mixed evidence on vulnerability-driven adaptation planning.

- Coastal characteristics and forest coverage matter.
- Some aspects of vulnerability relate to the inadequate capacity to adapt.
  - E.g., Vulnerable infrastructure

Adaptive Capacity

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Political Interests

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Regional Diffusion

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How different climate hazards matter ?

- Disaster severity matters, but maybe it varies by type of hazards.
- I disaggregate the total losses by hazard types:
  - Separate regressions using cumulative hazard-specific damage/deaths over different time scales + other explanatory variables

How different climate hazards matter ?

	Past two years	Past three years	Past four years
Damage			
Coastal hazards (e.g. **hurricanes**)	0.132**	0.0736	0.0307
	(0.0543)	(0.0562)	(0.0582)
Droughts, wildfires, Heat waves	3.347*	3.361*	3.487**
	(1.831)	(1.844)	(1.765)
Flooding and severe storms	-2.489	-0.198	-1.620
	(7.876)	(0.628)	(3.772)
Deaths			
Coastal hazards (e.g. **hurricanes**)	0.00793***	0.00513*	0.00373
	(0.00251)	(0.00275)	(0.00312)
Heat waves and wildfires	0.0441*	0.0531	0.0303
	(0.0242)	(0.039)	(0.0307)
Flooding and severe storms	-0.384	-0.212	-0.0456
	(0.266)	(0.211)	(0.128)

Regressions control for variables related to adaptive capacity, political interest, regional diffusion and baseline hazard .
Robust standard errors clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1

Findings and Policy Implications

- Recent climate-induced losses serve as a stimulus
  - Impact varies by types of hazards
  - Adaptation is reactive
  - More proactive adaptation actions should be encouraged.

- Climate change may worsen inequality
  - Policies to integrate climate adaptation and economic development
    - Federal support on climate-proof development, particularly long-term capital stocks

- Civic engagement matters
  - Enrich our understanding of climate adaptation as a collective action
  - Innovative approaches to engage the public in planning and implementing adaptation

Thank you!