



Promoting Cooperative Solutions for Space Sustainability

The Evolution of U.S. National Policy for Addressing the Threat of Space Debris

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- Part I: Evolution of space debris policy
 - Changes in awareness and understanding of threat
 - Space debris in US national space policy
 - Implementation
- Part II: Models of change in public policy
 - Punctuated equilibrium
 - Multiple streams
- Part III: Future suggestions
 - Lack of bureaucratic champion for space sustainability
 - Fix via on-going discussions on space traffic management?






Evolution of space debris threat

- 1960s
 - Need to better understand space environmental threats to human spaceflight missions
 - Biggest concern is natural space debris (micrometeoroids)
- 1970s
 - Explosions begin creating more human-generated space debris
 - Kessler & Cour-Palais warn human-generated space debris may eventually become bigger threat than natural space debris
- 1980s
 - More explosions, Space Station Freedom, and military ASAT testing create high-level awareness of space debris
 - Need to minimize creation of space debris from human activities in space

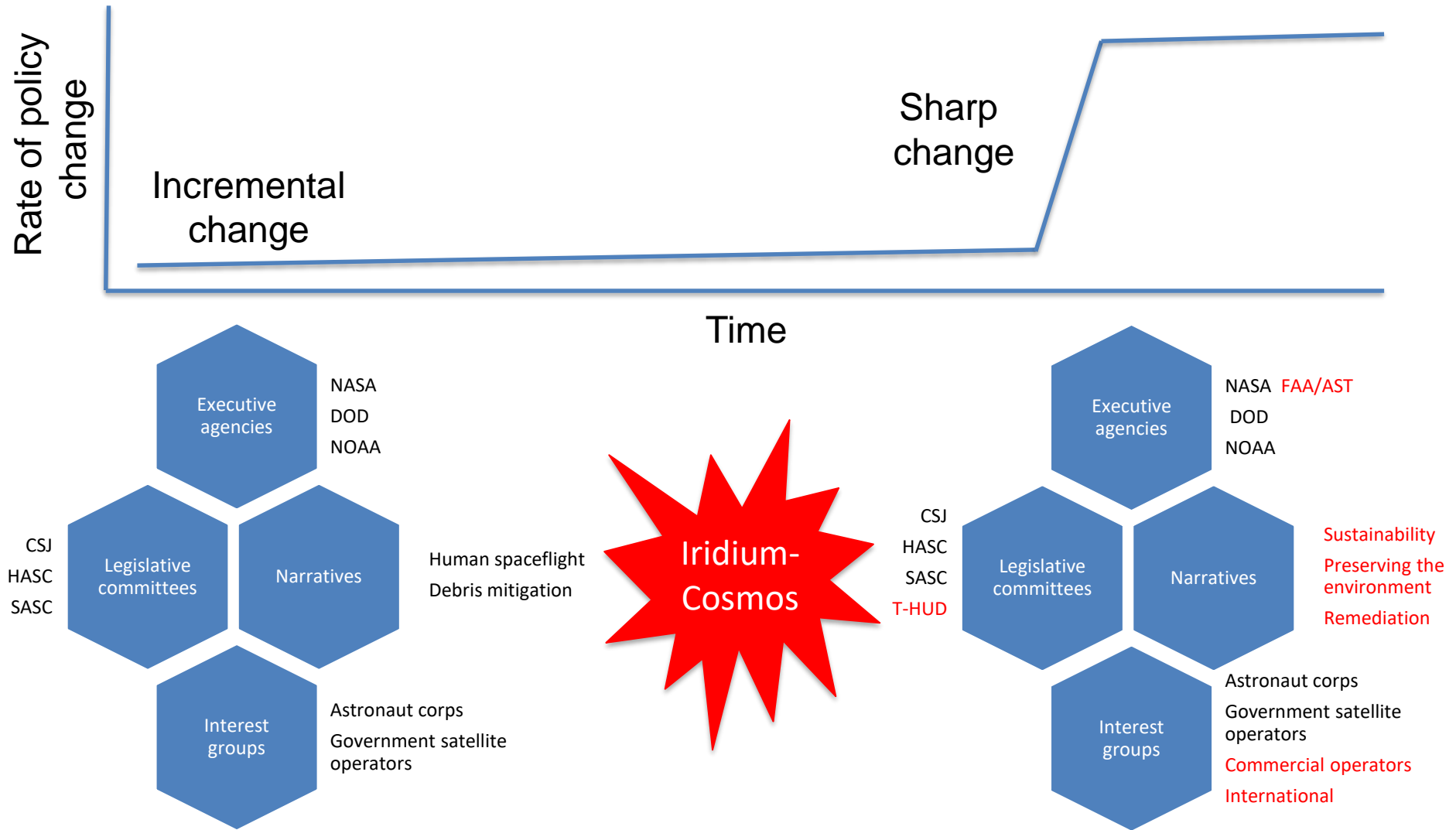
Evolution of space debris threat (con't)

- 1990s
 - Need guidelines to minimize the creation of space debris through on-orbit activities
 - Adoption of national & international mitigation guidelines can slow growth
- 2000s
 - Chinese ASAT test and Iridium-Cosmos collision undo progress from mitigation guidelines
 - Need to develop collision warning & avoidance measures
- 2010s
 - Post-mission disposal (PMD) not enough, needs to be combined with remediation (ADR)
 - Emergence of cubesats and megaconstellations requires high compliance with PMD and ADR

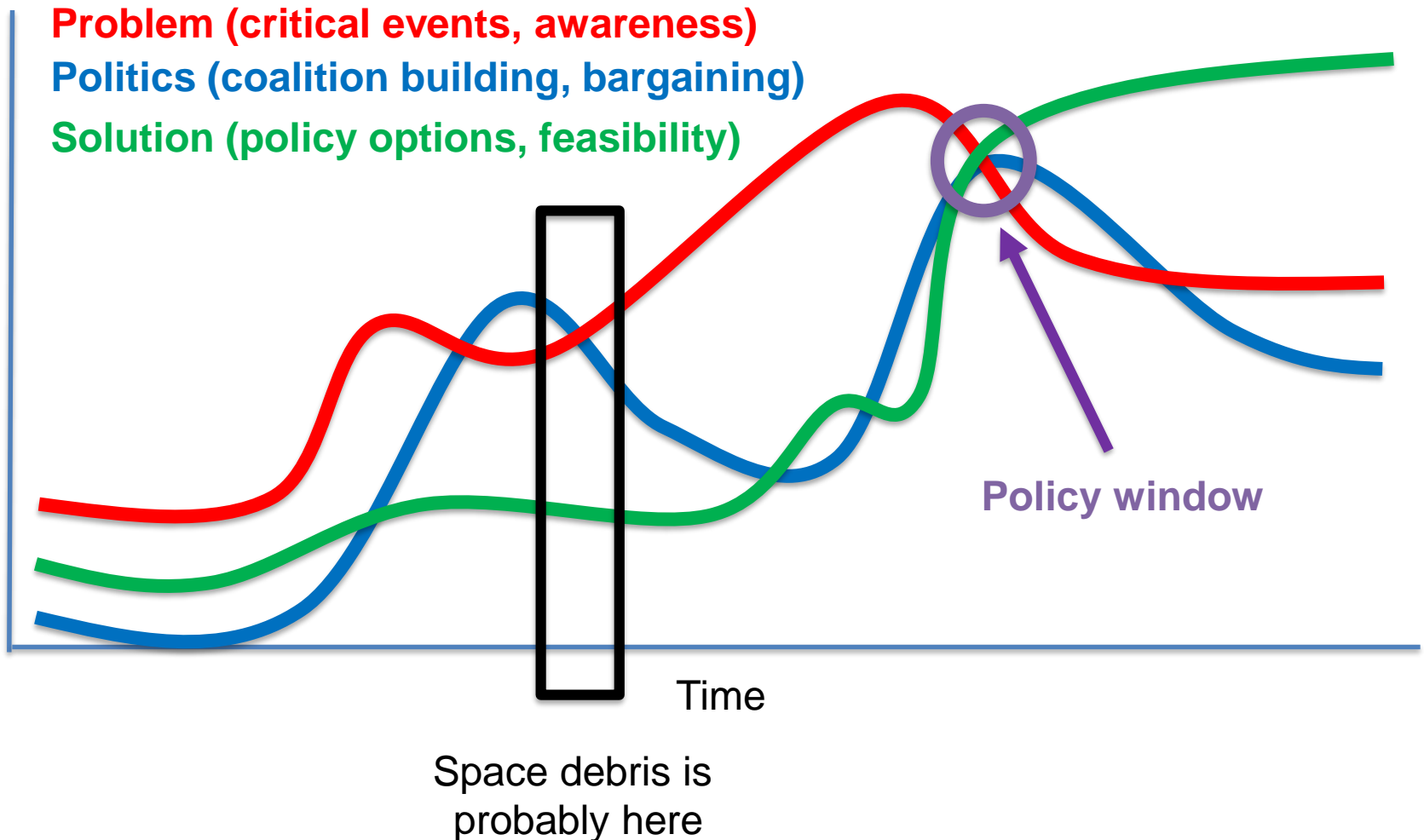
Space debris in US National Space Policy

Year	President	Policy Directive	Implementation
1988	Ronald Reagan	Minimize creation of space debris in tests, experiments, and systems	
1989	George HW Bush	+ Encourage other countries to adopt space debris minimization policies	
1996	Bill Clinton	++ Develop design guidelines for space debris minimization, and take a leadership role in promoting international adoption	
2006	George W Bush	+++ Follow national orbital debris mitigation standards, and incorporate into licensing of commercial satellites	
2010	Barack Obama	++++ Preserve the space environment, foster development of space collision warning measures, and research debris removal technology	

Punctuated equilibrium model



Multiple streams model



- Major impediment to making further progress is the *lack of a bureaucratic champion* for space sustainability
 - If it's everyone's job, then it's no one's job
- Current policy discussions on space traffic management offer a chance to fix the situation
 - Assign responsibility for the space environment to an existing civil agency (NASA, FCC, NOAA, DOT/FAA?)
 - Merge existing authorities into a new agency (Coast Guard for Space?)
- Champion needs to focus on developing ADR capabilities
 - Competition between multiple commercial entities to develop capabilities, government(s) purchase services (e.g. NASA's Commercial Cargo & Crew?)



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Thank You Questions?

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