

The Impact of Policies on the Orbital Debris Population

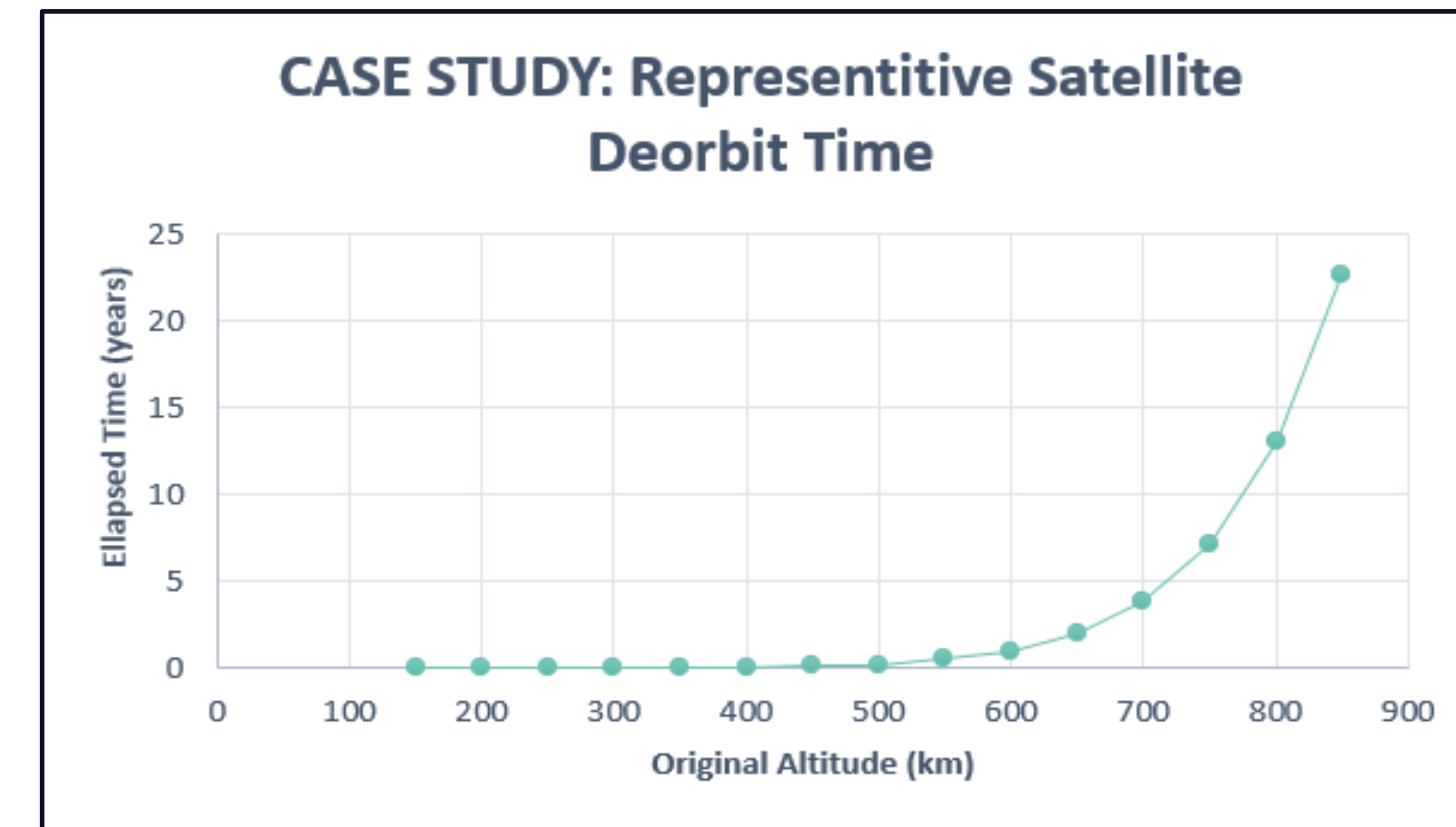
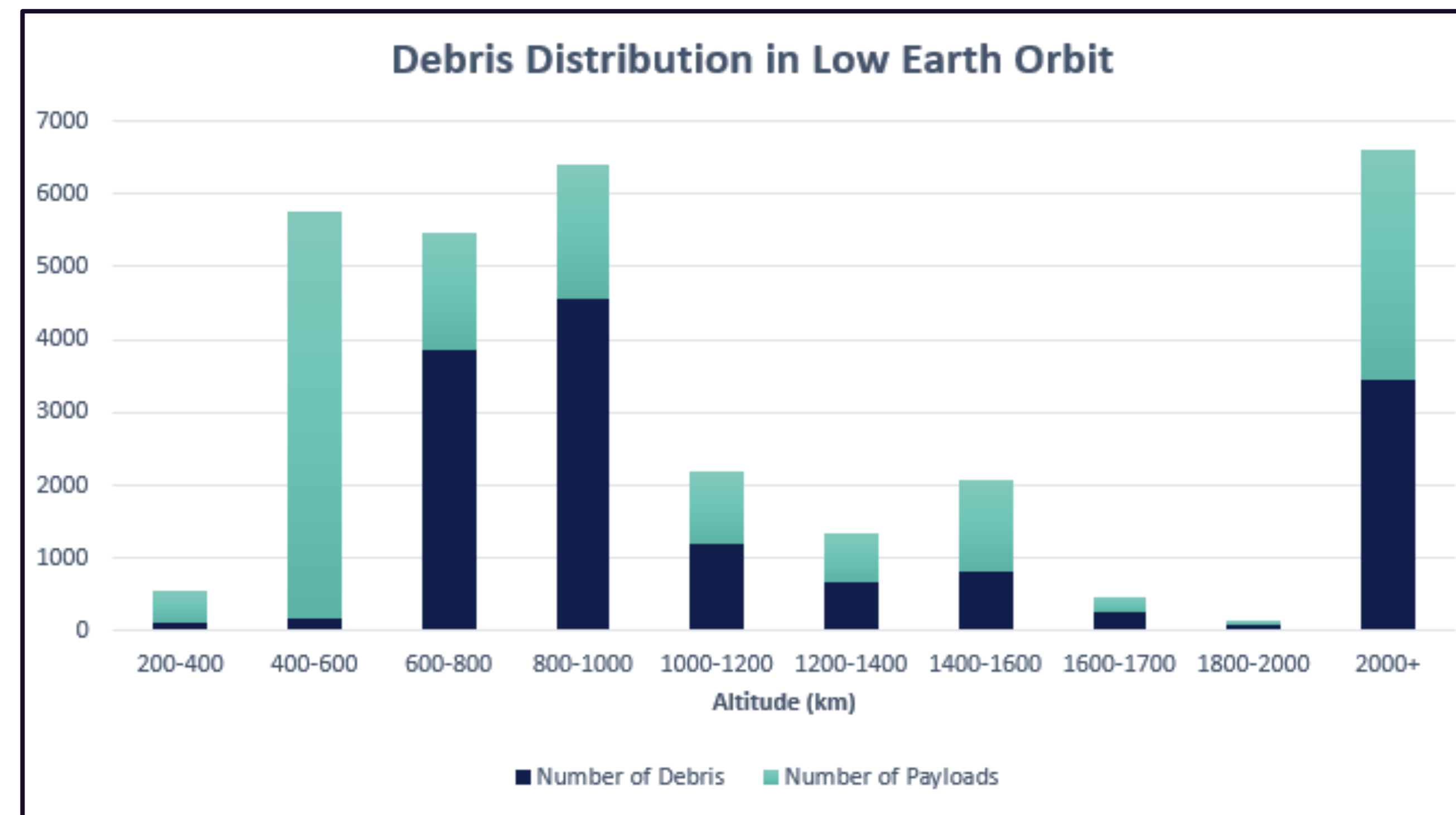
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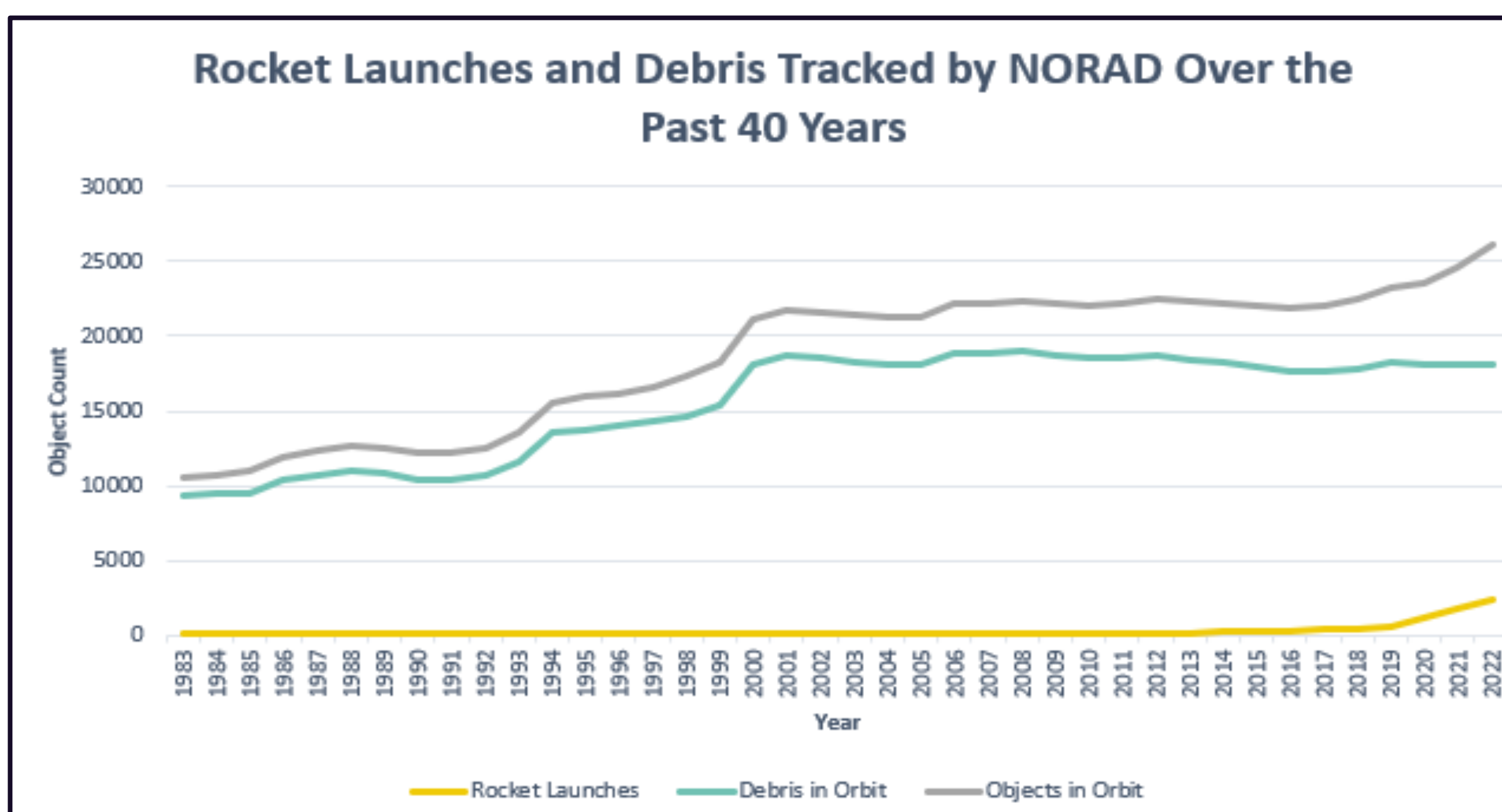
Introduction

- The number of debris in low earth and geostationary orbit is a growing concern.
- Impact with debris in orbit can lead to catastrophic damage to manned and unmanned spacecraft in orbit and the creation of more debris.
- This study examines the orbital environment and policies implemented to mitigate debris over the past 40 years.
- Goal is to determine the policies' effect on the orbital debris population.



Methods

- Examine the rocket launches and debris in orbit over the past 40 years.^{7 11}
- Identify high-risk orbits.
 - Determine orbital shells with the most concentrated debris.
 - Identify how many satellites and debris are in those shells.⁷
- Conduct a case study on the time it would take for a representative satellite to deorbit.
 - Modeled deorbit of a STARLINK satellite from various orbits using the General Mission Analysis Tool (GMAT).
 - Derived Keplerian Elements from the two-line element set (TLE) for STARLINK-4181.¹
 - Determined deorbit times.
- Create a timeline of major changes in space debris mitigation policies.



Future Directions

- Look at the individual orbital debris mitigation policies of each space agency or government and compare them to IADC guidelines.
- Model a STARLINK satellite constellation in GMAT and analyze the impact of the whole constellation in orbit.
- Examine the differences between the objects that NORAD tracks and the objects that other organizations track and model them accordingly.
- Examine the impact of antisatellite tests on the orbital debris population.

References

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Conclusions

- As space traffic increases there is an increased need for policies to mitigate the creation of orbital debris.
- The implementation of the Inter-Agency Space Debris Coordination Committee (IADC) by the United Nations (UN) seems to have influenced the creation of more debris.
- A wider study of international policies would allow for a more accurate analysis of the role policies play in the population of debris.

