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Conclusions

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The expansion of Low Earth Orbit satellite technology presents critical challenges that demand immediate attention. As satellite systems reshape global connectivity, security, and economic structures, existing legal frameworks must evolve to ensure effective governance. Without an interdisciplinary approach, current policies risk being inadequate in addressing emerging cybersecurity threats, digital sovereignty concerns, and geopolitical tensions. The priority must shift toward ensuring that governance mechanisms balance end users' interests against more prevalent corporate or state interests.

The reliance on space treaties that establish broad principles and fragmented regulatory frameworks creates substantial challenges in managing the rapid expansion of satellite numbers and space-based activity. As a result, significant gaps exist in addressing the complex and evolving needs of satellite regulation and governance with commercial actors taking the lead in satellite deployment, issues such as market monopolization, orbital congestion, and equitable access require urgent international coordination. Economic policies and governance structures must adapt to these realities, ensuring that innovation does not outpace regulation. Without clear rules, private enterprises could dominate access to space resources in a way that prioritises their commercial targets, limiting present and future opportunities for global sustainable and equitable development and creating new forms of digital dependency for less technologically advanced nations. The current regulatory landscape remains focused on state actors, failing to fully incorporate the commercial space industry's increasing influence and role in shaping contemporary space governance. The privatization of satellite networks calls for policies that prevent exploitation while encouraging innovation balancing economic incentives with public interest safeguards.

The rapid growth of satellite networks also amplifies cybersecurity risks. Without comprehensive legal mechanisms, vulnerabilities in satellite infrastructure risk data breaches, cyber warfare, and system failures with global implications. The increasing reliance on privately owned satellite networks for governmental,

commercial, and civilian purposes makes it imperative to establish regulatory oversight that is both adaptive and enforceable. Cyber threats originating from state and non-state actors require coordinated policy responses that integrate cybersecurity standards with international legal frameworks. Additionally, questions of digital sovereignty must be addressed to prevent overreliance on a handful of powerful entities that control access to essential services, raising concerns over jurisdiction, data ownership, and the ability of individual states to ensure their own security and economic stability. The fragmentation of global cybersecurity regulations further exacerbates vulnerabilities, highlighting the need for collaborative frameworks that facilitate information-sharing and coordinated responses to cyber threats.

The use of satellites by states with varying governance models highlights the risks of technological misuse. Some governments are more likely to leverage satellite systems as part of their surveillance and information control infrastructure. The dual-use nature of satellite technology means that the same infrastructure designed to improve connectivity and facilitate economic growth can also be weaponized for strategic military advantages or political suppression. Global legal structures must balance national security interests with human rights protections, ensuring satellite technology is used responsibly. Without proper oversight, these tools could exacerbate geopolitical tensions rather than bridge digital divides. The lack of universally accepted norms governing the responsible use of satellite data further complicates efforts to mitigate these risks, emphasizing the need for international cooperation in the development of ethical and legal guidelines. The intersection of space law, cyber law, and human rights law underscores the necessity of interdisciplinary approaches that incorporate principles of transparency, accountability, and fairness in satellite governance.

Current regulatory efforts often lack the interdisciplinary collaboration needed to address real-world implications. Satellite governance should integrate input from law, technology, policy experts, and human rights to create adaptable and forward-thinking frameworks. The scope of new space law instruments must be expanded in consideration of economic justice, cybersecurity resilience and environmental sustainability. Spacefaring nations should adopt these instruments. The increasing congestion of orbital pathways presents long-term risks, including the growing threat of space debris that could endanger current and future satellite operations. International institutions must facilitate cross-sector discussions that prioritize practical solutions over bureaucratic inefficiencies. This approach ensures that governance structures are not only legally sound but also technically feasible and aligned with user needs. Technical experts, economists, and human rights advocates should collaborate with legal scholars to craft policies that reflect the complexities of modern satellite use, ensuring that regulations keep pace with technological advancements rather than reacting to crises after they arise. The integration of technical expertise in legal discourse is critical to crafting solutions

that are both feasible and enforceable, preventing regulatory stagnation in an industry that continues to evolve at a rapid pace.

As reliance on satellite technology grows, end-user interests must be central to governance discussions. This approach includes ensuring equitable access to satellite communications, protecting privacy, and preventing economic exploitation. The development of legal frameworks must account for those who depend on satellite services the most, including remote and underserved communities. The digital divide remains a pressing issue, and while satellite broadband has the potential to expand internet access, market-driven pricing models often place these services out of reach for marginalized populations. Without regulatory intervention, commercial satellite operators may continue to prioritize profitability over equitable access. Regulatory bodies should focus on creating policies that are transparent, inclusive, and responsive to technological advancements. The role of multistakeholder governance in shaping policies that reflect both technical realities and societal needs cannot be overstated. The interests of corporations, governments, and civil society organizations must be balanced to create frameworks that are both enforceable and adaptable to the dynamic nature of satellite technology. Public-private partnerships, regulatory innovation, and participatory decision-making processes must be explored as mechanisms to create governance models that effectively address the interests of all stakeholders.

The urgency of satellite governance requires a shift toward interdisciplinary, user-focused solutions. Existing treaties and regulations must evolve to meet the needs of modern satellite technology, moving beyond the foundational agreements that were designed for a space environment dominated by state actors. Collaboration between international organizations, governments, and private actors is essential for effective governance. Private sector involvement in space infrastructure has introduced efficiency and innovation but has also created new regulatory challenges that require oversight to ensure accountability. Technical and legal safeguards must be established to protect satellite networks from cyber threats, data breaches, and operational failures. Policies must be structured to prevent monopolization and support fair global connectivity, ensuring that the benefits of satellite expansion are not disproportionately concentrated among wealthier nations and corporate entities. Space governance should prioritize human rights and transparency, mitigating risks associated with state and corporate control. Issues such as the militarization of space, the commodification of data, and the environmental impact of satellite launches must be examined within the context of international law and policy frameworks. The importance of environmental considerations in satellite governance is growing, as space debris and unsustainable launch practices pose long-term threats to global space infrastructure. The establishment of environmental protocols specific to LEO satellites is critical in ensuring the long-term sustainability of satellite operations.

The expansion of satellite networks offers both opportunities and risks. Without an interdisciplinary, forward-thinking approach, governance structures will

fail to keep pace with technological advancements. The international community must act now to develop legal and policy frameworks that prioritize end-user needs, ensuring that satellites contribute to global connectivity and security rather than deepening existing inequalities. Without proactive legal and policy measures, the opportunity to create an inclusive and sustainable satellite ecosystem may be lost, reinforcing existing power imbalances and restricting access to critical digital resources. The need for international cooperation in space governance has never been more urgent. Stakeholders across legal, technical, and policy fields must work together to shape a future where satellite technology serves as a tool for equitable global development rather than a mechanism for control and exclusion. Time is running out to establish practical, inclusive solutions before regulatory gaps become insurmountable, and failing to act now could result in consequences that extend far beyond space policy into the broader fabric of global governance. The future of global connectivity, economic equity, and digital sovereignty will be determined by the choices made today in crafting adaptive and enforceable satellite governance frameworks.