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Assuring a Safe, Secure and Sustainable Environment for Space Activities (4)

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SPACE WEATHER: PRACTICAL IMPLICATIONS AND POLICY FRAMEWORKS FOR  
ADDRESSING VULNERABILITIES IN INFRASTRUCTURE AND SOCIO-ECONOMIC  
DEPENDENCE

**Abstract**

Space weather events can adversely affect everyone on Earth and in planetary orbit, from space assets (i.e. satellites, ISS) to space dependent ground technologies and applications on Earth (i.e. internet, GNSS, telecommunications). This can lead to partial or total loss of services, with catastrophic socio-economic impacts due to the inherent interconnectivity between modern infrastructure and the economy. In fact, studies indicate that socio-economic recovery periods for severe space weather events could last up to a decade. Furthermore, space weather forecasting capabilities are currently inadequate to meet the growing needs of the user community (i.e. critical infrastructure, owners, operators) in real-time to provide adequate warning of potential threats.

Consequently, space weather research, and continuity of that research, plays an informative and crucial role in Space Situational Awareness, for both infrastructure and socio-economic risk prevention and mitigation purposes. For decades now, a growing web of actors in civil government, military, academia and industry have worked under various agreements, public programs and science policies, with each actor serving a vital function in the obtaining and analyzing of scientific data on space weather phenomena. Increasing the scientific knowledge base is part of the challenge, the other part requires development of advanced operational models, simulations and forecasting tools. In looking to ensure a progressively secure, prosperous and technologically sophisticated future it is imperative that we continue to expand the global reach and understanding of space weather through multilateral collaboration, research and information exchanges by both governmental and nongovernmental entities and networks, worldwide.

This article will first provide an analytical synthesis of the major issues and risks that space weather presents to societal interests and critical infrastructure (in space and on Earth); highlighting pertinent risks to civil, military and private/commercial sectors, respectively. Secondly, identify major networks and space actors currently engaged in researching and monitoring the space environment, highlighting each sector's unique contributions and challenges. Third, acknowledge remaining challenges inherent to space weather research and application at the global level. Lastly, provide a current survey of active legal frameworks, policy initiatives, and capacity building efforts on space sustainability and space weather at the international level (i.e. UNCOPUOS, WMO, and ICAO). In conclusion, this paper will highlight critical implications for space weather and recommend areas for continued/new sector collaboration, technological growth, and international governmental and nongovernmental cooperation.