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Headline: Sustainability is Singapore's edge in the space-tech economy

Sustainability is Singapore's edge in the space-tech economy

A clear focus on sustainability and ethics signals trust and strengthens partnerships. **By Victor Cole and Janice Wong**

WITH the National Aeronautics and Space Administration (Nasa)'s latest moon rocket mission and the popularity of science-fiction movies like *Star Wars*, it is easy to see space as a story of ambitious exploration or technological competition. But beyond the headlines and Hollywood hype, more pragmatic considerations are emerging for Singapore.

The global space economy is projected to grow from US$630 billion in 2023 to US$1.8 trillion by 2035, according to the World Economic Forum. Singapore does not plan to send astronauts to space or lead deep-space missions, so what role can the country play in this economy?

The National Space Agency of Singapore (NSAS), launched on Apr 1, is the latest addition to the Asean space ecosystem, where half of member nations now have a space agency.

As global uncertainty mounts and energy disruptions are forcing economies to think long term, Singapore's move to launch NSAS comes at a critical moment.

With ties and technical expertise across the space value chain, from engineering to artificial intelligence (AI), Singapore is well placed to distinguish itself among emerging space nations.

A clear focus on sustainability and ethics, backed by strong communication of these values, can do more than shape good behaviour in orbit. It signals trust, strengthens partnerships, and helps one stand out from others in the sector.

Space sustainability can be understood in two ways: The first is sustainability from space, where satellites, data and space-related technologies are used to make our lives on Earth greener and better. The other is sustainability in space, which focuses on keeping Earth's orbit safe and usable.

Tangible impact

From monitoring climate change and managing disasters to optimising resource management, space capabilities can deliver tangible economic and environmental impact.

For instance, ST Engineering's observation satellite in low Earth orbit provided the Maritime and Port Authority of Singapore with images from space to track the movement of oil spills.

As extraterrestrial initiatives can feel abstract or distant, making such facts known more widely will increase visibility of how space technologies are being translated into practical applications.

Space technologies can also create spillover benefits, where innovations originally developed for space are adapted to improve everyday life.

For example, medical technologies first developed to monitor Nasa astronauts' health have inspired diagnostic tools and telemedicine that can improve access to care and support sustainable healthcare delivery.

Singapore can harness spillover effects by supporting sustainable technologies that benefit both the economy and the environment.

The global space economy is projected to grow from US$630 billion in 2023 to US$1.8 trillion by 2035. PHOTO: REUTERS

However, vulnerabilities and paradoxes remain, especially in the face of ongoing supply disruptions.

High-tech production of sustainable solutions can be energy-intensive – more so if augmented by AI – and many components depend on global supply chains.

These constraints make it even more important to safeguard sustainability in the space environment itself. For instance, extending an orbiting satellite's lifespan or powering it with a lower-energy source would help reduce its lifecycle carbon footprint.

In developing legislation, NSAS will have to strike a balance between being pro-business and ensuring the sustainable use of space.

Preserving the environment

Discussions on space sustainability are also centred on preserving the space environment. Sustainability in space focuses on ensuring that Earth's orbit remains a safe and usable environment by deploying technologies to reduce debris and manage orbit congestion, effectively treating orbital space as a limited resource.

A prominent player dedicated to removing space debris is Japan-headquartered Astroscale, which is one of the 70 space companies with a presence in Singapore. Founded in Singapore in 2013, Astroscale is now listed in the growth market of the Tokyo Stock Exchange.

Space technologies do not always have to be large-scale. Imagine a kid's shoe box – that's roughly the size of a miniaturised satellite called a CubeSat. Singapore's space ecosystem has already been supporting small-scale and resource-efficient technologies like CubeSats.

Start-ups and medium-sized enterprises have a fair chance in these high-growth markets. For example, Singapore-based company Aliena provides low-power electric propulsion engines to enable small satellites to fly closer to the Earth for higher quality data needed by businesses.

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For Singapore, both "in" and "from" sustainability dimensions will matter, and together they point to a clear opportunity to build trust and long-term business advantage.

Ethics and communications to build trust

Sustainability encompasses acting ethically and communicating transparently. To develop a policy framework that will strengthen our position as a trustworthy spacefaring nation, NSAS' predecessor Office for Space Technology & Industry (OSTIn) agreed to collaborate with the United Nations on the "Space Law for New Space Actors" project in 2025.

But ethics goes beyond laws. Hence, voluntary adoption of standards such as the Space Sustainability Rating by Singapore space players may signal greater transparency to international investors and partners.

By fostering companies with strong values and sustainable behaviours, NSAS could build even more public trust and investor confidence. Ethical leadership is particularly valued in frontier industries where innovation often outpaces regulation.

People drive sustainable success

Sustainability is also a differentiator when attracting talent to the industry, so we must communicate it effectively.

Research indicates that a company's sustainability practices and social impacts play a part in career decisions, especially among the younger generations. A growing space sector will require a steady pipeline of talents across a wide range of disciplines who understand the industry.

Deep tech industries like space are inherently complex and often difficult to grasp. Together with OSTIn, local universities and niche training providers such as Space Faculty have been helping to nurture interest among both professionals and youths in Singapore. Let's build on this momentum.

Singapore: 'Guardian of the galaxy'

Clear and targeted communication about Singapore's approach to sustainability, both in space and from space, is essential for the public and partners alike to understand the contributions of this nascent industry.

Done well, such efforts can effectively position Singapore as an ethical and sustainable space player on the local and world stage. This is how Singapore can translate trust into a tangible competitive advantage as it reaches for the stars.

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