



ABU DHABI
SUSTAINABILITY WEEK

SPACE TECHNOLOGY _____
**ENSURING A
SUSTAINABLE
PLANET FOR
FUTURE
GENERATION**



Introduction

Last year, the world watched as billionaires took to the skies and launched themselves into space. Today, the space race has become a phenomenon, providing the ordinary person with a potential opportunity to take an extraordinary spaceflight. But there is more to space than meets the eye – through research and science, space improves people’s lives around the world by contributing to environmental monitoring, natural resource management, weather forecast and climate modelling, and early warning systems to assist in minimising future disasters.



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Abu Dhabi Sustainability Week gathered global leaders from government, business and industry to explore how researchers and scientists are using

space technologies on earth to better our daily lives, and the challenges and opportunities we face in maintaining long-term sustainability in space.

ADSW Web Series

Held under the title **“Space Technology – Ensuring a Sustainable Planet for Future Generation”**, the ADSW Web Series welcomed Khalfan Al Romeithi, Strategic Research Specialist at the UAE Space Agency, who discussed the benefits of space applications and how technological developments can preserve and protect the outer space environment for future generations.

Space is a vital pillar in our daily life. Some examples of this include downstream applications that use data received from space, such as major or GPS data, to serve these applications on the ground.

The Agency uses different types of data, like Synthetic Aperture Radar (SAR), to analyse the ground’s deformation which helps monitor infrastructure, such as oil pipelines and energy structures, to sustain and maintain them on the long term.

“We have GPS data in everything in our life, like Google Maps and delivery applications,” Al Romeithi explained. “This data is used to recognise the location of the user, to deliver and to take them to the destination they would like to go to.”



Khalfan Al Romeithi

Strategic Research Specialist at the UAE Space Agency



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Dr Abdul-Halim Jallad, Professor at the National Space Science and Technology Center at the UAE University, described such applications as the two most critical emanating from space: earth observation and geolocation. Further details can be deduced from these two primary applications, including urban planning, and monitoring forestry and desertification impact. In that regard, the United Nations (UN) produced sustainable roadmaps for 2030, entitled the Sustainable Development Goals (SDGs). A total of 17 key elements were categorised within those goals, in which space plays a crucial role by helping fight

poverty, monitoring crop cultivation, desertification, and other elements that affect poorer areas around the world, as well as monitoring habitats and life on land. “Current recent applications, such as communications with the private sector, including Starlink, SpaceX and others, are focusing on providing internet and communication to areas that have not really previously been covered by normal internet connection, which helps in connecting these remote areas to the rest of the world,” Jallad noted.

In addition, space exploration and satellite development spur much innovation. One of them includes water recycling and life support systems. As water and air are limited resources in space, technologies have started to recycle fluids from a human body in space to create water. Air is also being recycled through systems that reprocess the astronauts' carbon dioxide into oxygen.

"These systems are now on the ground," Al Romeithi said, as he further explained a new trend in fuel cells which is currently being tested in maritime applications and remote oil rigs. "They take hydrogen and oxygen in their chemical operations, and they have water as an output – these are the main three elements that are affecting us today: water, oxygen and energy," he added.



The United Arab Emirates devotes around 1.5 percent of its GDP to space technologies, and for Jallad, such spin-off technologies are what makes the spending worth it. Yet many of them go unnoticed, although their importance in today's world cannot be understated. Following the country's Mars mission, the technologies required for going into deep space will require the development of more efficient solar panels, and investment in Artificial Intelligence (AI) to allow for the remote operation of a spacecraft. "Need is what actually brings innovation," he said. "If you would like to land something on the moon within an area of one square kilometre, you would have to invent the technologies, the computational power and the propulsion system that is able to land that spacecraft on the moon with high accuracy."

Historically, several inventions have emerged from space, such as NASA's Eye Tracking Device technology which was used to track astronauts' eyes during their time spent in space and to evaluate how weightlessness directly affected the human's frame of reference. Today, this technology is widely used in LASIK eye surgery. Other discoveries include increased efficiency of solar panels and the computer mouse. AI and machine learning have developed a great deal thanks to research within the space industry. "So if you are actually increasing the bar of your aims and the bar of your goals, in order to reach that particular goal, you will have to come up with solutions and these solutions happen to be very useful here on earth," Jallad added.

However, space itself suffers from a sustainability issue. As a result, more needs to be done between governments and the private sector to ensure the long-term sustainability of space activities. And the UAE has taken such an element on board. With sustainability serving as an important pillar for the Agency, it has been working on several technical, policy and regulation programmes to create this kind of sustainability within the space sector.

For Jallad, such a matter falls under two aspects, including appreciating the level of the problem and having governments increasingly understand that it will continue to be a growing problem with time. However, in the UAE and around the world, he has witnessed such an appreciation by governments and space agencies. "We have to understand that this is going to be a big problem in the future," he added.



Dr Abdul-Halim Jallad

Professor at the National Space Science and Technology Center at the UAE University



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Statistics from 2020 have revealed that around 1,300 satellites have been registered, which accounts for 10 percent of the total number of satellites that have been launched in the past 10 years. Such a figure is expected to continue increasing, with the likes of SpaceX planning the launch of as many as 42,000 Starlink satellites. Other mega satellite constellations are also planned, which is only set to pile up space debris, particularly when the UN has estimated that a total of 70,000 satellites will be in orbit by 2050. "So this is going to be a really serious problem on governments, and not only government, but also the private sector," Jallad mentioned. "In order for them to protect their assets and their business, they have to also take this seriously."

In the past five to six years, an increasing interest in this area has been noted, in terms of making some of these regulations obligatory on the operators' side. How to mitigate such a problem and avoid having space debris in the first place will lie in enforcing such regulations. "The basic role of governments around the world and the UN is to find out solutions in order to avoid this in the first place," he concluded.

RECOMMENDATIONS



Al Romeithi: We are looking forward to creating more usable space tools and technologies, how to be more sustainable and how to use space to sustain earth in several applications. We are proud to cooperate with the National Space Science Technology Centre and several of these programmes, and now we can see a lot of scientific breakthroughs that help to sustain space, such as the reusable launchpads and moreover, reusable satellite parts.



Jallad: Dealing with space debris will also rely on finding technologies that will clean up the space debris from space. A few companies and start-ups have come up in the last few years that are actually specialised in figuring out methods of capturing space debris, trying to clean it from space and avoid it becoming an accumulating problem.



For more information

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