PACIFIC ISLANDS GIS&RS NEWSLETTER

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PACIFIC ISLANDS GIS&RS NEWSLETTER

Dear Reader,

The Pacific GIS and Remote Sensing Newsletter has a new team dedicated to revitalising the publication and supporting Pacific Island users in sharing their work. The team can assist with editing articles related to GIS and remote sensing applications in Pacific Island Countries. The newsletter also provides updates on data and technology applicable to Pacific Island Countries.

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Any member of the team can be contacted to discuss and edit new articles.
The newsletter can be downloaded from the PGRSC website https://pgrsc.org/newsletter/.

Thirty years ago, it was printed and sent to focal points in Pacific Island Countries. Unfortunately, this is no longer possible. We hope you enjoy reading this issue!

CONTENT

2024 Pacific Islands GIS & Remote Sensing Conference Recap

by Bradley Eichelberger

For more than 20 years, the Pacific Islands GIS and Remote Sensing User Conference has provided a platform for:

(i) GIS and Remote Sensing (RS) users from nearly all Pacific Island Countries,

(ii) Satellite data, software, hardware, and consulting enterprises

(iii) Scientists from universities and research institutions.

The 2024 Pacific Islands GIS and Remote Sensing User Conference was held in Suva, Fiji, from November 26-30, 2024 under the theme:

"Sustainable Management for Coastal Areas through Remote Sensing and GIS"

The event hosted over 150 participants from 14 Pacific Island nations and 7 regional countries and consisted of 65 presentations, 4 workshops, a Women's Session Panel, 5 discussion panels, and social events to encourage networking.

The Opening Keynote Speakers and Chief Guests were Filimoni Vosarogo (Fiji Minister of Lands and Mineral Resources), Surendra Prasad (Head of Schools Sageon at University of the South Pacific), William Romaine(Deputy Public Affairs Officer for the United States Embassy) and Salote Viti (Chair of the Pacific GIS and Remote Sensing Council (PGRSC). Partners for the event included the United States Embassy - Fiji, Kiribati, Nauru, Tonga, and Tuvalu Mission, University of South Pacific, DataTerra and Pacific Fund, United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER),Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ), LandPro, Kahuto Investments, OS Geo Oceania, Drone Services Fiji, Secretariat of the Pacific Regional Environment Programme (SPREP), Fijian Elections Office (FEO), Vodafone, and Geo Week.

The 2024 conference also provided PGRSC's national Focal Points the opportunity to highlight in-country activities around GIS and remote sensing, as well as identify data and capacity needs.

The 2024 PGRSC Conference Committee

Fiji's Minister for Lands and Mineral Resources, Hon. Filimoni Vosarogo, officiates as Chief Guest

Workshops for the 2024 year focused on using software for remote sensing (Hexagon/ERDAS), exploring open-source and free GIS technologies (OSGeo Oceania and QGIS), cloud-native computing for supervised classification of coastal ecosystems (GIZ MACBLUE and the Pacific Community (SPC) Digital Earth Pacific), and a training program for using NASA ocean satellite data (NOAA-CoastWatch and PacIOOS).

PGRSC Conference attendees participating in a GIZ Pacific workshop

Travel grants were provided by the US Embassy for 4 participants, including Halalilika Etika (Tonga), Oroititi Bakatenuateaba (Kiribati), Tewaea Keariki (Kiribati), and Dolores Leneuati (Tuvalu).

Additionally, UN-SPIDER provided travel awards to 4 participants (Antoine Nia (Cook Islands), Diminski Reweru (Nauru), Jacqueline Ngiraimau (Palau), and Rodney Yoshida (Palau)).

DataTerra provided travel awards for 6 participants (Yoann Roncin (French Polynesia), Mathilde Souchon (Fiji/New Caledonia), Maria Kottermair (Guam), Pascal Dumas (New Caledonia), Remi Ardreoli (New Caledonia), and Tingneyuc Sekac (Papua New Guinea)). GIZ also provided travel awards for 3 participants, including Fiona Meke (Solomon Islands), Smith Malvi (Solomon Islands), and Johnie Tarry Nimau (Vanuatu).

The Pacific Islands GIS and Remote Sensing Council also held their Annual General Meeting during the event. Overall, the 2024 conference was an engaging event that brought together members of the Pacific GIS and remote sensing user community!

Transitioning from University to the Professional World: My Geospatial Science Journey

by Zahrah Farzana Ali

Image © Josaia Cakacaka

Leaving The University of the South Pacific (USP) with a degree in Geospatial Science felt like the closing of one chapter and the beginning of another. As I stepped out of the comfort of academia and into the real world, I was filled with excitement, but also a degree of uncertainty about what lay ahead.

The transition from university life to the job market brought its own set of challenges, but it also provided me with invaluable lessons about the real-world applications of geospatial science.

At USP, I had been immersed in the technical aspects of GIS and remote sensing, using powerful tools like ArcGIS and QGIS to solve environmental problems. Whether analysing land-use changes in Fiji or mapping coastal erosion using satellite imagery, I was constantly in awe of the impact geospatial science could have on our understanding of the world. However, once I graduated, I quickly realized that applying these skills in a professional setting required more than just technical know-how—it required adaptability and a readiness to embrace the unknown.

SPOT-7 Satellite Image of Fiji

Stepping into the professional world as an intern with the Pacific Geospatial Women Network (PGWN) at The Pacific Community (SPC) was both an exciting and daunting experience. Suddenly, I was part of a team focused on addressing real-world challenges, from climate resilience to natural resource management. The theoretical knowledge I had gained at USP was being put to the test in a dynamic, fast-paced work environment. I found myself facing complex projects where technical skills were only one part of the equation. Critical thinking, teamwork, and effective communication were just as essential.

One of the biggest challenges I faced was learning to manage the unpredictability of real-world projects. Unlike university assignments, which had clear guidelines and timelines, working in the geospatial field meant navigating changing project scopes, managing data limitations, and finding innovative solutions on the fly. It was a steep learning curve, but each challenge helped me grow and become more resilient.

In this transition, networking played a crucial role. Being part of the Pacific Geospatial and Remote Sensing Council (PGRSC) and PGWN introduced me to a vibrant community of professionals who were eager to share their knowledge and experiences.

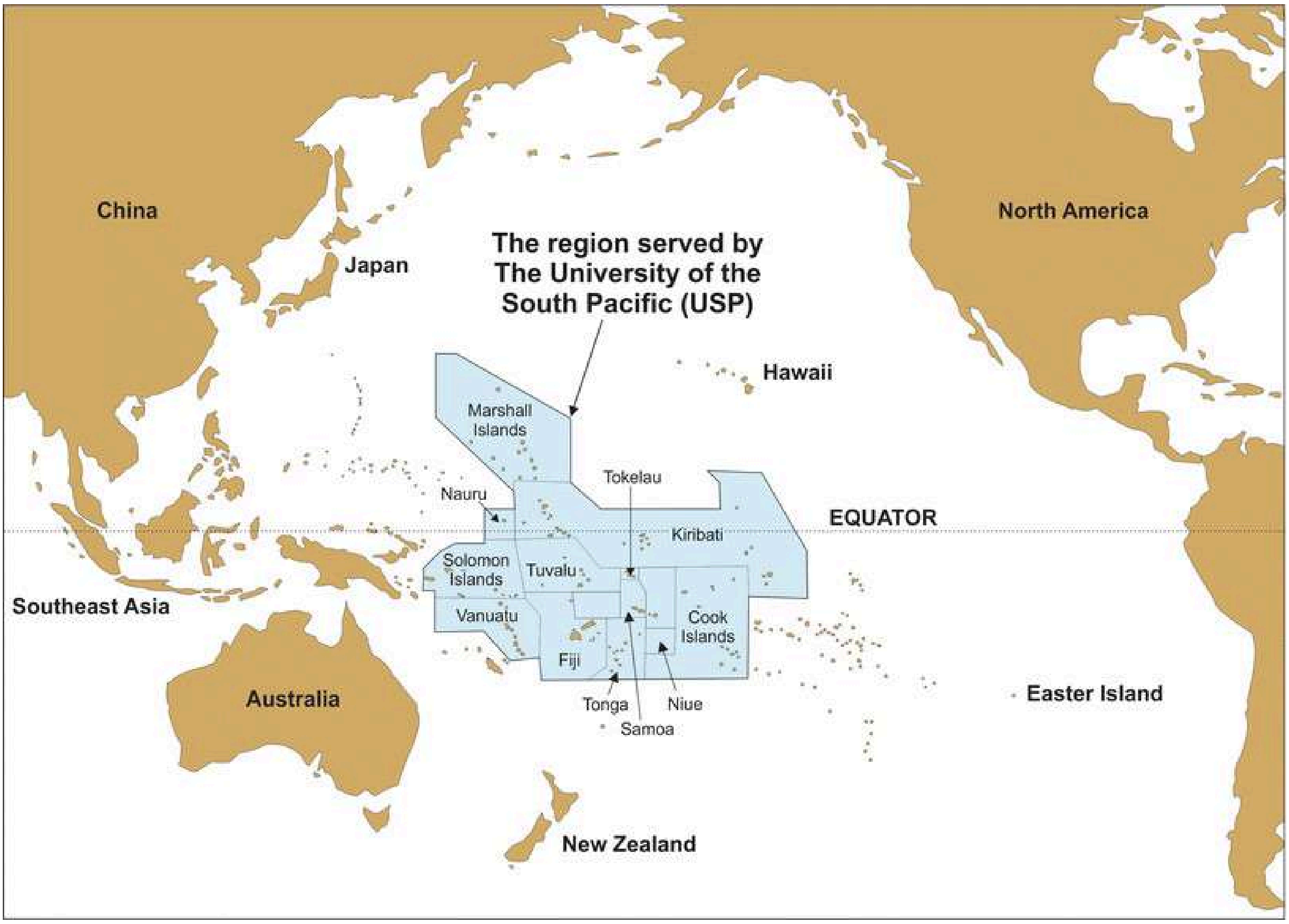
The mentorship and support I received from these networks helped me gain confidence and develop a deeper understanding of the industry. It reinforced the importance of staying connected, especially in a field as dynamic and collaborative as geospatial science.

The University of the South Pacific © Wansolwara

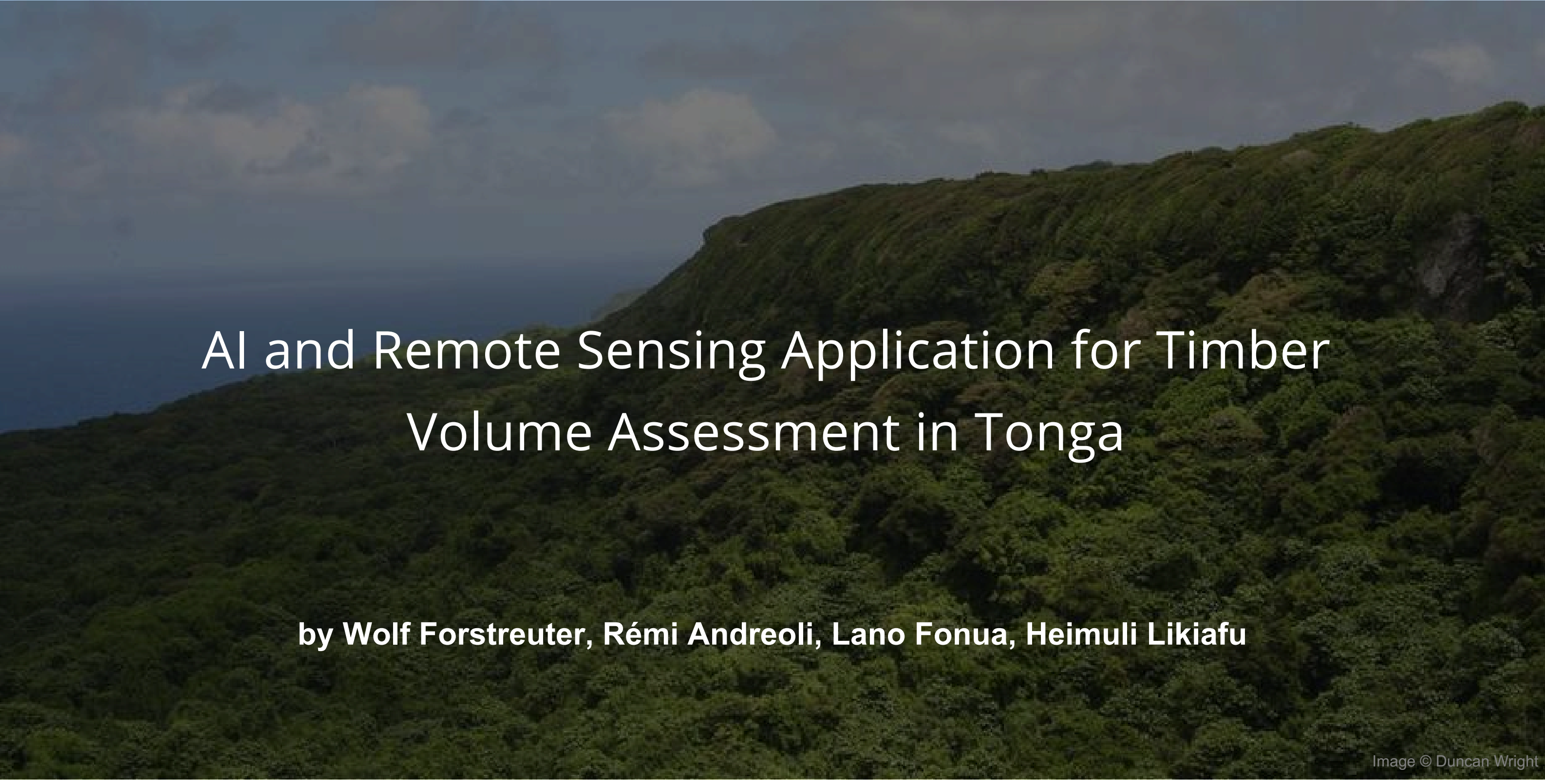
As I reflect on my journey from university to the job market, I am grateful for the skills and experiences I gained at USP. My time there gave me a strong foundation in geospatial science, but it's the real-world applications and challenges that have truly shaped me. For anyone entering the job market, my advice is simple: be open to learning, stay adaptable, and don't underestimate the power of your network.

Geospatial science is a field with endless opportunities, and while the transition from university to the professional world can be challenging, it's also incredibly rewarding.

The reality of the job market has taught me that geospatial science is not just about mastering tools and techniques—it's about using those skills to make a tangible difference in the world around us. And for that, I couldn't be more excited about the path ahead.



The region served by the University of the South Pacific, Scott-Parker, B. et al., 2017. Regional Environmental Change. 17. 10.1007/s10113-016-1001-8.



AI and Remote Sensing Application for Timber Volume Assessment in Tonga

by Wolf Forstreuter, Rémi Andreoli, Lano Fonua, Heimuli Likiafu

Image © Duncan Wright

Tongan Forestry Department requested the Global Green Growth Institute (GGGI) to assist in conducting the country's first National Forest Inventory (NFI).

Since Tonga had never conducted a NFI before, the term "forest" had not been officially defined, as it typically is in the national forest laws of other countries.

After defining "forest" for Tonga, the inventory had to be designed to capture all forest components accurately. This process required very high-resolution space-borne imagery and artificial intelligence (AI) to calculate crown diameters from the crown areas identified in the imagery.

GGGI forest data collection and mesurement participants from the Department of Forestry

Tongan Forest Definition

As the leading world forest organisation, the Food and Agriculture Organization (FAO) of the United Nations defines "Forest"[1] as: Forests are lands of more than 0.5 hectares, with a tree canopy cover of more than 10 percent, which are not primarily under agricultural or urban land use.

FAO also defines "Trees outside forests":

1. Groups of trees covering an area of less than 0.5 ha, including lines and shelter-belts along infrastructure features and agricultural fields;
2. Scattered trees in agricultural landscapes;
3. Tree plantations mainly for purposes other than wood, such as fruit orchards and palm plantations; and
4. Trees in parks and gardens, and around buildings.

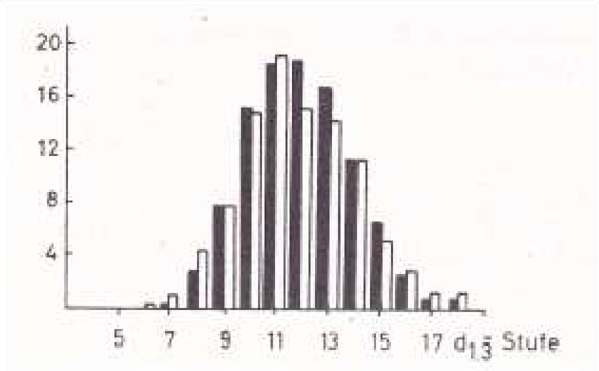
Due to the importance of land-based carbon storage, Tonga established a forest definition that deviates from the FAO standard. In Tonga, every tree is considered part of the "forest," including coconut palms and fruit trees used for agriculture. The minimum area requirement of 0.5 hectares is not included in this definition, which has significant implications for the inventory design.

Inventory Data Requirements

Tonga has a small remaining area of original rainforest, approximately 21 hectares. Most of the current forested areas consist of planted woodlots and tax allotments in small parcels. For these forest patches, standard forest inventory sample plots will be established to measure timber volume, allowing for the calculation of cubic meters per hectare. This figure can then be multiplied by the total area to estimate the standing timber volume available.

As previously explained, individual trees are also considered part of Tonga's forest. However, the approach of calculating a per-hectare figure and multiplying it by the area is not suitable for individual trees.

Since measuring each tree would be challenging, remote sensing information will be necessary to assist in assessing timber volume.



Crown diameter measured in aerial photographs and DBH measured on the ground in the beech forest. Hildebrandt 1969

Tree Parameters

The most commonly collected parameters for tree volume calculation are tree height, trunk height, and diameter at breast height (DBH). Using a tree-specific form factor to account for stem tapering, these measurements can be used to estimate tree volume. However, trunk height, tree height, and DBH cannot be estimated using optical space-borne remote sensing data. Therefore, other tree parameters need to be analysed, such as the relationship between crown diameter and DBH. This relationship was already investigated by Hildebrandt in 1969.

Tree counting: AI allows to perform an automatic counting of all dominant trees participating in the canopy which can be extracted for all sub-areas such as woodlots or tax-allotments

Current investigations[3] manifest the fact that there is a very strong relationship between crown diameter and DBH, but this relationship differs from species to species.

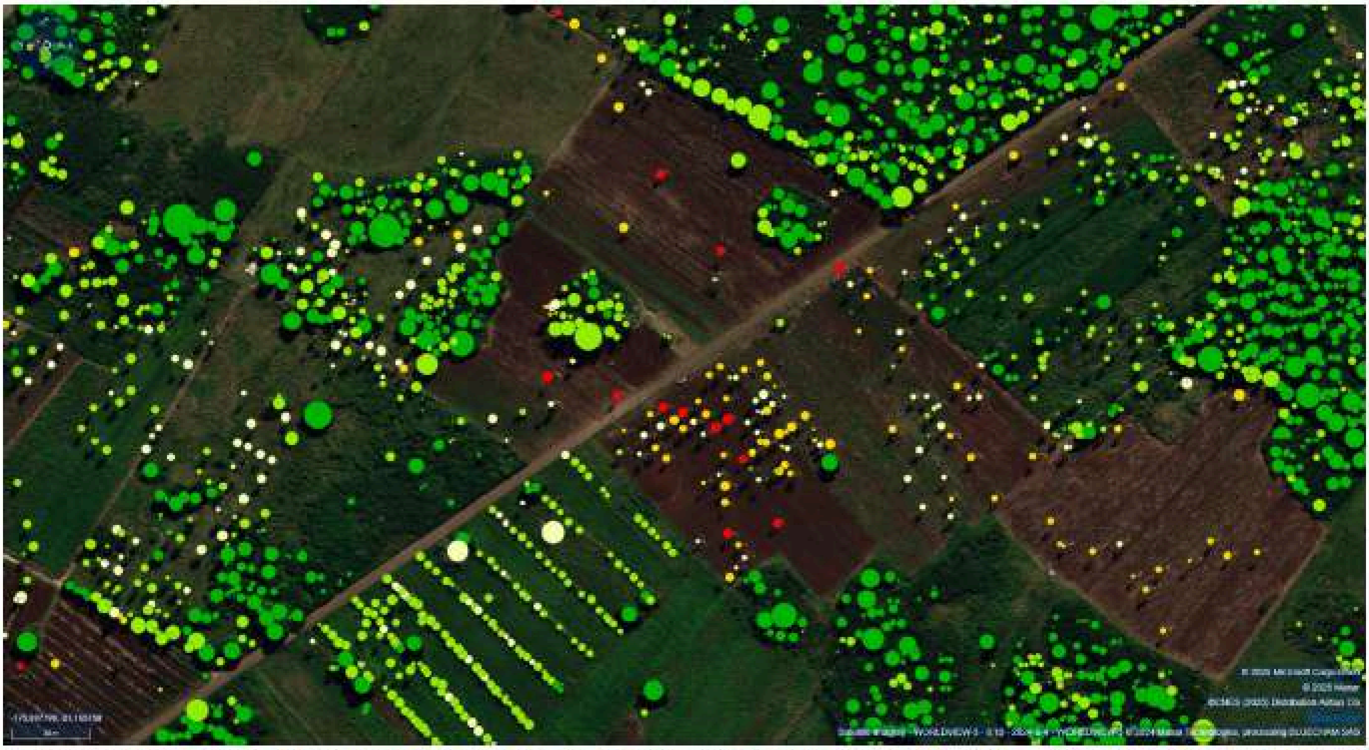
Applied Remote Sensing Data

Satellite imagery with a 30 cm resolution was purchased from the Pacific company Bluecham[3] in New Caledonia. This enhanced the data to a 15 cm spatial resolution. This higher resolution allowed AI to delineate the crown area of all trees in the upper canopy and calculate the crown diameter from that area.

However, calibrating the relationship between crown diameter and DBH is still required, as it varies among species. To achieve statistical reliability, 60 single-standing trees need to be measured across the DBH range for the main species. Using plot measurements in the woodlots presents challenges because (i) trees within stands might have a different DBH-to-crown relationship compared to isolated trees and (ii) accurately identifying individual crowns is difficult, even with GNSS assistance, as the trees do not stand perfectly upright.

Conclusion

Single trees are typically not included in carbon assessments. However, for a country like Tonga, they make an important contribution to calculating carbon storage. AI offers a new opportunity to incorporate single trees into these assessments and it is likely that other countries will adapt their forest definitions accordingly. The work is still in progress the newsletter will provide an article when a relation crown diameter and DBH can be established.



Crown diameter: The image of Tongatapu shows the crown diameter calculated by AI algorithms from the crown area visible with 15 cm resolution image data. The image also shows the health situation for each tree calculated through the Normalised Difference Vegetation Index (NDVI

References

[1] FAO. 1998. FRA 2000 Terms and Definitions. FRA Working Paper 1, FAO Forestry Department. (Available at http://www.fao.org/forestry/fo/fra/index.jsp under Publications)

[2] Indriani Ekasari & Rifaangga Kurnia, 2023. Relationship between crown diameter and DBH for fifteen fruit tree species in Bogor Botanical Gardens.

[3] BLUECHAM SAS, 101 rue Roger Laroque 98807 Nouméa

Developing Space Capacity and Capability in the Pacific

by Peter Kinne

Image © Getty

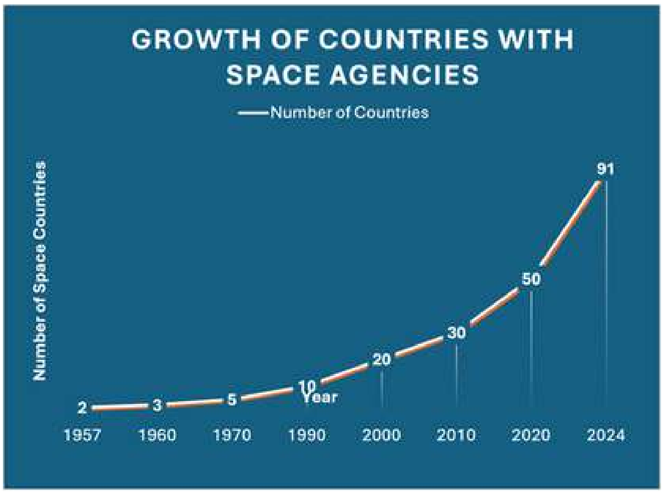
What if the Pacific Nations were to create an integrated space ecosystem that supports economic growth, technological innovation, and international collaboration?

Pacific nations have always played an important role in the international space industry as consumers of products and locations for assets such as ground stations. This document outlines a strategic question as to how Pacific nations can collectively expand their role and establish sovereign space industries that would drive national development, enhance technological capabilities, and increase global competitiveness.

The global space industry is undergoing rapid growth, driven by increasing demand for space-based services. This trend presents substantial commercial opportunities for emerging economies. Developing a sovereign space industry offers the Pacific the potential to move upstream, enabling significant economic growth, technological advancement, and strategic advantages.

A sovereign space industry may provide independent capabilities in satellite component manufacturing, on-orbit tasking, ground station maintenance and operation, and the utilization of space-based data for applications. The trend is for more and more emerging economies to develop sovereign space capacity and capability.

Pacific nations have a strategic location, which is already recognised for positioning ground stations, meaning it is a strength for developing sovereign space infrastructure.



Investing in the space industry will create high-skilled jobs in engineering, data analysis, and research, providing significant employment opportunities for the Pacific nations. Consider the Australian Space Agency aims to triple the size of its civil space sector and create up to 20,000 additional jobs by 2030, illustrating the potential for job creation in the space industry. For the Pacific, this sector offers a pathway to economic diversification, reducing reliance on traditional industries.

Space industry investments have historically provided substantial returns. For instance, the return on investment (ROI) in the space sector ranges from $7 for every $1 spent on the Apollo Program to $40 for every $1 invested in space development today. These figures underscore the economic benefits that a well-developed space industry can bring to the Pacific.

National Security: Developing sovereign space capabilities will enhance or improve surveillance, border monitoring, and disaster response capabilities.

International Influence: A robust space industry will bolster the Pacific's geopolitical influence and foster beneficial international collaborations.

Commercial Opportunities: Images and data collected by the Pacific's assets can remain sovereign assets, not to be shared with other entities without authorization, and can be monetized or used for national interests.

Financial and Economic Resilience: Investments in space infrastructure offer long-term returns and resilience against economic shocks.

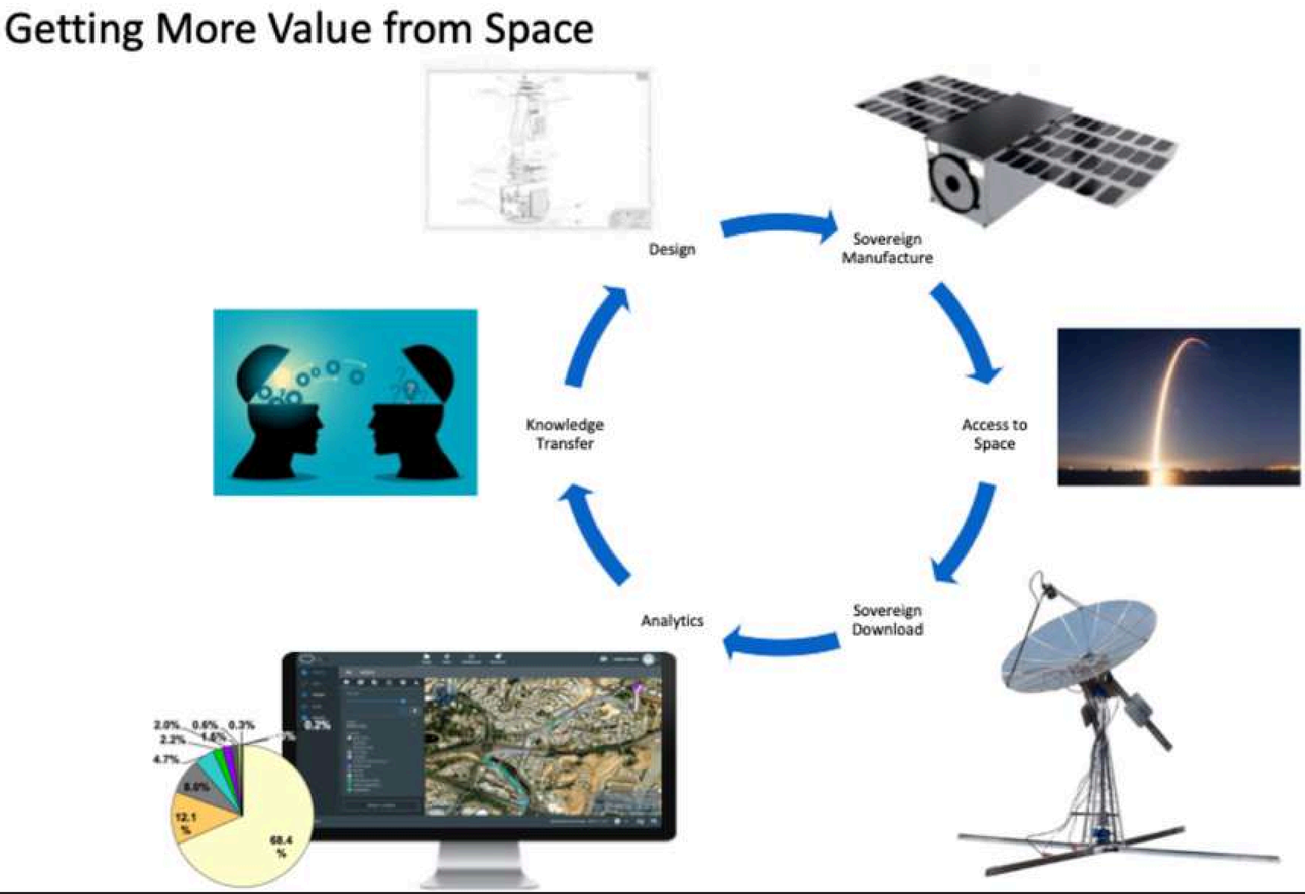
Private Sector Growth: Government investment in the space industry will stimulate private sector innovation and growth in niche technologies and services.

Space Economy Participation: By establishing commercial ground stations, the Pacific can support both local and international satellite data needs, enhancing its economic scale and revenue potential.

Environmental and Societal Benefits: Satellites will aid in sustainable development, environmental monitoring, disaster management, and technological advancement, contributing to societal well-being and global environmental efforts.

Conclusion

Investing in the Pacific's sovereign space capabilities will drive economic growth, foster innovation, and ensure future resilience. The expected return on investment is comparable to successful global models, providing the Pacific with a strategic advantage in the rapidly expanding global space industry.



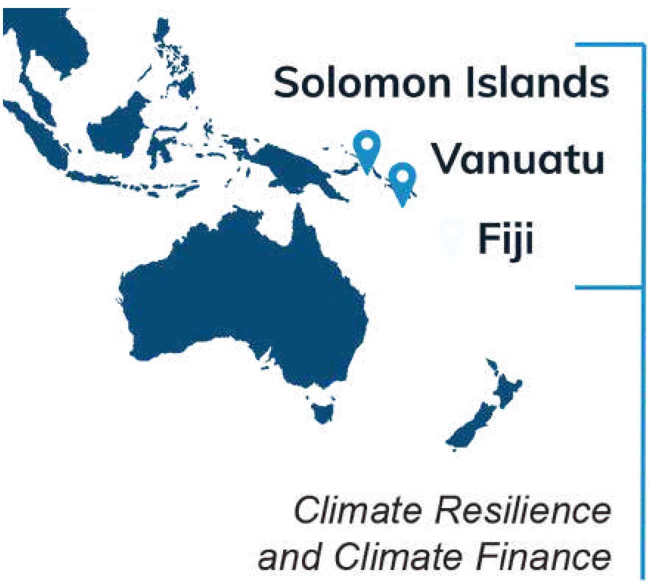
UNOSAT Geospatial Insights for Climate Resilience: Summary of 2024 Highlights

by Joy Papao

Image © Asso Myron

Empowering Pacific Resilience

Launched amid the challenges of the COVID-19 pandemic, UNOSAT's Pacific Initiative aimed to strengthen climate resilience, disaster risk reduction, environmental preservation, and food security across eight countries: Bangladesh, Bhutan, Uganda, Lao PDR, Nigeria, Solomon Islands, Fiji, and Vanuatu. The three-year project emphasized collaboration with national ministries and academic institutions to develop geospatial solutions tailored to local decision-making.



Countries and fields of application for Geographic Information Technologies (GIT) with UNOSAT

A key milestone in 2024 was the launch of UNOSAT's Geospatial Decision Support System (DSS) applications, featured prominently during technical training and networking events in Fiji, Vanuatu, and the Solomon Islands. These DSS tools offer analytical capabilities to identify hazard-prone areas, evaluate risks, and prioritize adaptive responses to meet the needs of local authorities, emergency responders, and planners.

The DSS suite includes:

- Sea Level Rise and Critical Infrastructure App: Visualizes potential impacts of rising seas on vital infrastructure using an interactive slider.
- Multi-Criteria Decision Analysis (MCDA) Tool: Integrates diverse criteria to support decisions like optimal evacuation zones and resilient infrastructure placement.
- Relocation Suitability Tool: Assesses terrain, flood risk, and accessibility to guide new community development.

Through tailored trainings, UNOSAT focused on building local capacity in using geospatial technologies. With strong regional participation, including 50 attendees in Fiji, 36 in Vanuatu, and 42 in Solomon Islands, the initiative has laid a strong foundation for data-driven climate resilience planning.

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Pacific GIS and Remote Sensing Council

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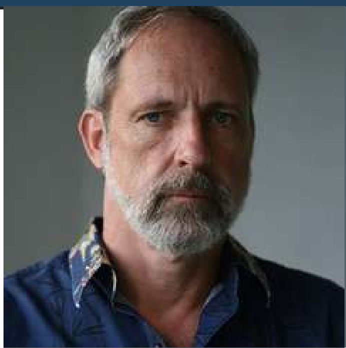

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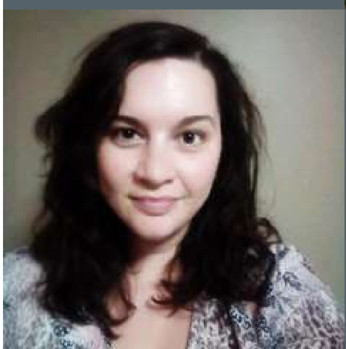

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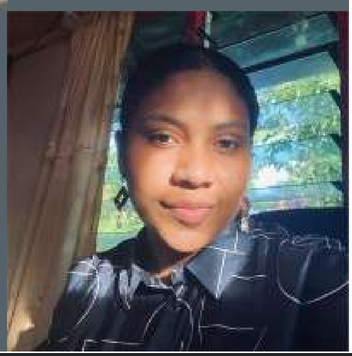

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