

Utilising Digital Earth and Big Earth Data to support Pacific efforts in meeting Sustainable Development Goals

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Pacific Islands Countries and Territories (PICTs) are at a crossroads with improving sustainability outcomes. While climate change is a global problem that PICTs contribute little too, the dual pressures of climate change and limited resources, require PICTs to find innovative ways to build resilience, foster sustainable growth, and ensure the wellbeing of their communities. In this context, digital earth and big earth data offer new pathways to bridge data gaps, strengthen decision-making, and accelerate progress toward the United Nations Sustainable Development Goals (SDGs).

The opportunities and new pathways that digital earth as a field of big earth data offer are only as good as the people who are able to identify core problems, analyse the data to inform solutions for a Pacific context. Therefore, it is important that strong Pacific capacity-building skills in technical and programming capacities are developed in order for digital earth and big data to have a larger impact at different scales from individuals to regional stakeholders.

Why Digital Earth and Big Earth Data Matters

One of the most persistent challenges for PICTs is the lack of reliable, high-quality data. Without robust data systems, it is difficult to measure progress, identify vulnerabilities, or allocate resources effectively. Digital Earth is a recent field of big Earth data can help PICTs to address these challenges. As Guo and colleagues (2017) have argued Digital Earth as an idea premised on big data – large quantitative datasets obtained through Earth observations has developed over the last two decades into a comprehensive system for organising, analysing, simulating, representing and creating data and knowledge from the Earth system.

Digital Earth is the integration of satellite observations, geographic information systems (GIS), artificial intelligence (AI), and advanced computing to create a dynamic, data-rich model of our planet. Big Earth Data refers to large quantitative Earth Science datasets. For PICTs, where traditional data collection is often hampered by geographic isolation, small economies, and limited technical infrastructure, Digital Earth and Big Earth Data can assist with:

- **Filling Critical Data Gaps:** Through integrating geospatial technologies such as satellite imagery, remote sensing, and interoperable datasets with AI, PICTs can overcome the limitations of traditional data collection.
 - **Real-Time Climate Monitoring:** Satellite data and AI-driven analytics allow PICTs to track environmental changes and monitor natural hazards, to prepare respond quickly to disasters. This information can help to strengthen current Disaster Risk Reduction activities.
 - **Climate Action:** Advanced data frameworks allow for the integration of satellite observations, GIS, and AI, supporting climate adaptation and mitigation strategies.
 - **Resource Management:** Digital Earth tools enable evidence-based management of land, water, and marine resources, supporting food security and economic development.
- **Enhancing Capacity:** Training and capacity-building initiatives help local experts develop the skills needed to manage, analyse, and interpret Big Earth Data. Activities can include:
 - **Training Local Experts:** Workshops, seminars, and educational programs equip researchers and policymakers with the skills to use digital tools effectively.
 - **Fostering Collaboration:** Regional and international partnerships create opportunities for knowledge exchange, technical support, and joint innovation.
- **Supporting SDG Monitoring:** Digital Earth enables precise tracking of SDG indicators, from climate resilience to sustainable resource management.
- **Evidence-Based Policy:** Big Earth Data provides the foundation for informed decision-making, enabling governments to design policies that are grounded in accurate, up-to-date information.
- **Inclusive Growth:** By democratising access to data and digital tools, Digital Earth empowers local communities,

researchers, and policymakers to participate in shaping their own futures.

- **Data storage capacity:** Storing such data requires masses of data storage that are often beyond the scope of what PICTs can afford. Partnerships with cloud storage providers and data owners helps to ensure equitable access to necessary datasets using existing digital infrastructure and utilities

Big Data and Digital Earth Policies and Strategies

Governments from the global north have progressed national strategies to take advantage of the benefits provided by big data for research and development. This includes the United States who launched their Big Data Research and Development Initiative in 2012 and in Australia the Australian Public Service Big Data Strategy in 2013 and the subsequent Australian Data Strategy 2030 which provides a whole-of-economy vision for data and an understanding of data as an asset and public good.

In 2015 Future Earth, a global 10 year initiative to advance a global network of interdisciplinary scientists and researchers to advance sustainability science and research capacity building was launched. The custodian organisations include the International Science Council the Belmont Forum, the United Nations Educational, Scientific and Cultural Organisation (UNESCO) and the United Nations Environment Programme (UNEP).

These policies and strategies at different levels and scales demonstrate the need for a new approach to protect the Earth system and future generations. Underpinning these policies is the fundamental premise to integrate and better utilise existing big data systems devise urgently needed global sustainability solutions for planetary and human health and wellbeing.

Responsible Innovation

In utilising Digital Earth and Big Data Earth there is a need to be mindful of responsible innovation to ensure activities promote and align with responsible and ethical stewardship of Pacific data. Key considerations include ethical frameworks ensure that AI and digital technologies are used responsibly, respecting local contexts and priorities. This includes:

- **Data Sovereignty:** Ensuring that island nations retain control over their data and digital resources. Data is used to pursue national priorities rather than international interests.
- **Cultural Sensitivity:** This includes respecting local contexts, integrating local knowledge and values into digital frameworks, so that technology serves the needs of families and communities.
- **Inclusive Participation:** Engaging diverse stakeholders—from government officials to community leaders—in the design and implementation of digital initiatives.

Strategic policy priorities

To maximise the benefits of Digital Earth and Big Earth Data, PICTs should focus on several strategic priorities to leverage the potential of Digital Earth and Big Earth data in supporting technical solutions for SDGs. These include:

1. **Infrastructure investment:** Develop regional hubs and digital platforms that provide access to advanced geospatial technologies and data analytics similar to Future Earth hubs and national committees.
2. **Expand Training and Education:** Create accredited programs and workshops to build expertise in digital tools, data science, and AI. This will help to support Pacific digital innovation for sustainable development and ensure big data tools and instruments are complemented by local knowledge and contexts.
3. **Foster Partnerships:** Strengthen collaboration with international organizations, scientific institutions, and other PICTs to share resources and best practices.
4. **Promote Open Data:** Encourage the development of standardised datasets that are accessible to all stakeholders and relevant to PICTs.
5. **Integrate Policy and Practice:** Embed Digital Earth approaches into national development plans, ensuring alignment with the SDGs and local priorities.

Conclusion

The strategic policy priorities identified in this Policy brief will help to strengthen climate resilience through improved monitoring of environmental changes, anticipate risks, and adapt to new challenges. They will also provide important data and information to track progress against SDGs particularly in regard to economic development, resource management, and inclusion. Care and consideration must also be taken into consideration to protect Pacific data sovereignty and ensure ethical concerns and issues with open data are sufficiently mitigated and addressed. There is opportunity and potential in harnessing the power of Digital Earth and Big Earth Data together with Pacific indigenous knowledge, nations and communities to bridge data gaps, strengthen resilience, and achieve the SDGs.

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Brief prepared by



With financial support from



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