GREATER WHITSUNDAY GEOSPATIAL HUB ECONOMIC IMPACT ASSESSMENT

Geospatial and Earth Observation Opportunities, Strategy and Roadmap

GW3D
GREATER WHITSUNDAY ALLIANCE
MACKAY ► ISAAC ► WHITSUNDAY

FRONTIER SI

Contents

Acknowledgements

FrontierSI respectfully acknowledge the Aboriginal and Torres Strait Islander people of Australia, first custodians of the lands, air and waters that sustain the places we live, work and play. These first peoples have had a vibrant, living culture that has remained in sustainable synergy with the natural environment for tens of thousands of years, and continues to do so.

We recognise that the lands of the Aboriginal and Torres Strait Islander people of Australia were never ceded, and coexist with the Commonwealth of Australia.

The Greater Whitsunday Alliance team live and work in Mackay Isaac Whitsunday region and long before these places were known by their colonial names, they were known as Yuwibara, Koinmerburra Barada Bana, Wiri, Birri, Ngaro, Gia, Juru, Jangga and Birriah respectively. We would like to acknowledge the traditional owners of the Greater Whitsunday region, and their continuing connection to the land, water and community. We pay our respects to Elders past, present and emerging

Introduction

The Greater Whitsunday region is an economically diverse and resource rich zone that comprises the Whitsunday, Mackay and Isaac local government areas.

Traditionally, the Greater Whitsunday region's economy has been driven by sectors like mining, agriculture, construction and tourism. However, in an increasingly digital and automated world, it is essential to explore new opportunities that will boost productivity and efficiency across all industries while tackling workforce challenges.

In the Greater Whitsunday Workforce Development Playbook[1], a key iconic initiative proposed was the Greater Whitsunday Earth Observation Hub, that would provide a centralised location for the reception, processing, and distribution of satellite data for application in industry, boosting digital jobs and encouraging the development of STEM skills. This initiative has now been extended to the Greater Whitsunday Geospatial Hub, that would enable priority industries to utilise Earth Observation (EO) satellite data, geospatial information, and socio-economic services to enhance digitalisation, improve regional workforce and capabilities, and increase industry productivity for the region.

This report identifies the benefits of establishing a Greater Whitsunday Geospatial Hub that facilitates the growth of geospatial and EO business and workforce capability in the Greater Whitsunday region, and provides a strategic vision and roadmap for a Greater Whitsunday Geospatial Hub initiative.

[1] Greater Whitsunday Workforce Development Playbook: www.greaterwhitsundayalliance.com.au/newsroomblog/greater-whitsunday-workforce-development-playbook-to-build-a-future-fit-workforce

Geospatial and Earth Observation

Technologies

Geospatial data identifies the geographic location and characteristics of natural or constructed features and boundaries on the earth. This data can be derived from a variety of technologies.

EO and remote sensing

Spaceborne, airborne and ground-based sensors that image and measure the Earth's surface, its features and underwater environments.

Utilising open data and analysis-ready data, initiatives like **Digital Earth Australia** are transforming how geospatial information is accessed, analysed, and utilised for decision-making and innovation.

Positioning, navigation and timing (PNT)

Using satellite and ground-based networks to provide accurate where, how and when data.

In Australia and New Zealand, the SouthPAN network that is currently under development provides a **Satellite Based Augmentation Service** (SBAS) to deliver positioning accuracies to within 10 centimetres.

Engineering surveying and hydrography

Measuring distance, area, volume, direction and position of features on land and underwater.

Digital Twins, virtual representations of planned or existing systems, are increasingly used to develop built environments, model their usage over time, and understand natural environments.

Land surveying

Identifying property boundaries, construction site conditions, access to roads and utilities.

Modernisation of the **Foundational Spatial Data Framework** (FSDF) is a joint initiative of the Federal and State governments to manage and provide fundamental geospatial data sets for use across government and all sectors.

Geographic Information Systems (GIS)

Help capture, store, manage, analyse and visualise geospatial information.

Growing support for 3D and 4D capabilities across platforms, from open-source solutions to comprehensive desktop and cloud-based tools, enables the creation of volumetric models of structures and allow dynamic landscapes to be analysed over time.

In addition to the trends driven by these geospatial technologies, key enablers include the use of **cloud infrastructure** to make big data more accessible and easier to analyse, and the integration of **Artificial Intelligence and Machine Learning** (AI/ML) that is driving increased automation and providing deeper data insights for real-time decision-making.

Challenges to Adoption

While there are challenges and limitations for all of the technologies described, there are three key challenges to adoption of geospatial and EO technologies that can be addressed through a Greater Whitsunday Geospatial Hub:

Challenges to adoption

- Insufficient user maturity and confidence in the usability and accuracy of geospatial/EO data.
- A lack of understanding about the limitations of geospatial/EO and its impact on downstream processes.
- A lack of clear value propositions, communicating how geospatial/EO can reduce risk and increase productivity.

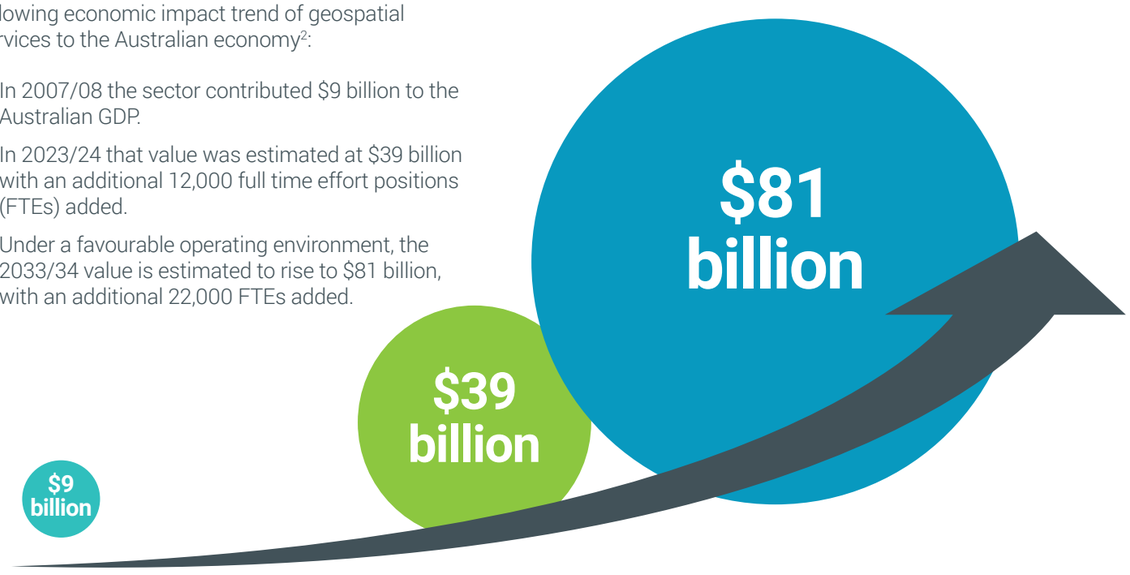
Role of a geospatial hub

- Increasing the general awareness of geospatial and EO and their value to end user sectors.
- Understanding these technologies as part of a solution and how to build them into total solutions.
- Encouraging plain language when discussing how these technologies will solve sector challenges.

Economic Impact

The Geospatial Council of Australia identified the following economic impact trend of geospatial services to the Australian economy[2]:

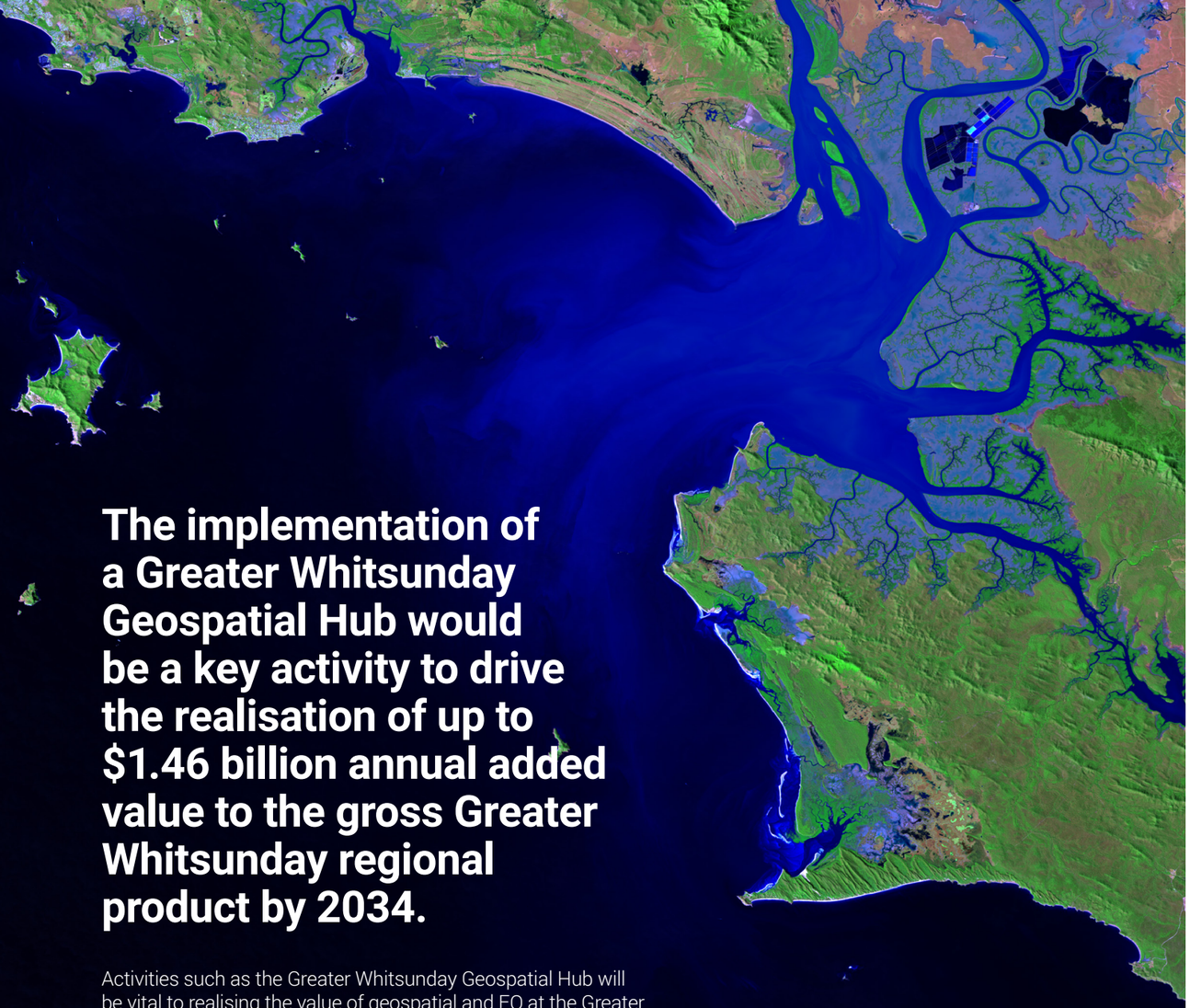
- In 2007/08 the sector contributed $9 billion to the Australian GDP.
- In 2023/24 that value was estimated at $39 billion with an additional 12,000 full time effort positions (FTEs) added.
- Under a favourable operating environment, the 2033/34 value is estimated to rise to $81 billion, with an additional 22,000 FTEs added.



Activities such as the Greater Whitsunday Geospatial Hub will be vital to realising the value of geospatial and EO at the Greater Whitsunday region level and facilitating what the Geospatial Council of Australia has defined as a "favourable operating environment". With the Greater Whitsunday region's 2022 gross regional product (GRP) estimated at $74.36 billion (1.8% of Australia's GDP)[3], the value potential of geospatial and EO in the Greater Whitsunday region, under favourable conditions, would be:

- $700 million annual value in the current 2023/24 period
- Growing to $1.46 billion annual value in 2033/34 under a favourable operating environment.
- A total value of $12 billion in the ten-year period 2024-2034.

[2] Economic impact of geospatial services in Australia Preliminary Findings: https://acilallen.com.au/uploads/projects/876/ACILAllen_ImpactGeospatialAustralia_2024.pdf
[3] Mackay - Isaac - Whitsunday Economy, Jobs, and Business Insights: https://app.remplan.com.au/greaterwhitsundayalliance/economy/industries/output



The implementation of a Greater Whitsunday Geospatial Hub would be a key activity to drive the realisation of up to $1.46 billion annual added value to the gross Greater Whitsunday regional product by 2034.

Activities such as the Greater Whitsunday Geospatial Hub will be vital to realising the value of geospatial and EO at the Greater Whitsunday region level. In considering the costs of operating the Greater Whitsunday Geospatial Hub and sustainability/cost recovery models, it will be important to identify where costs can be absorbed by co-investing and sponsoring organisations in order to create this "favourable operating environment".

> **Maximising its (EO's) value depends on a dramatic increase in end-user adoption. Achieving that calls for resolute strategies and investments to increase awareness of what is possible with EO, encourage innovation, advance core and enabling technologies, ensure equity in access to EO insights and bridge the gap between EO data and end-user solutions worldwide."**
>
> ~ World Economic Forum[4]

[4] Amplifying the Global Value of Earth Observation: www3.weforum.org/docs/WEF_Amplifying_the_Global_Value_of_Earth_Observation_2024.pdf

Sector Opportunities

Key industry sectors that have significant economic activity in the Greater Whitsunday region will drive the demand for, and uptake of, geospatial and EO technologies and services.

These sectors include mining, agriculture, tourism and construction, alongside those that are priority growth areas for the Greater Whitsunday region, including biomanufacturing, decarbonisation and aerospace. This section examines the potential economic value[5,6,7,8,9], key applications and opportunities for each of these sectors.

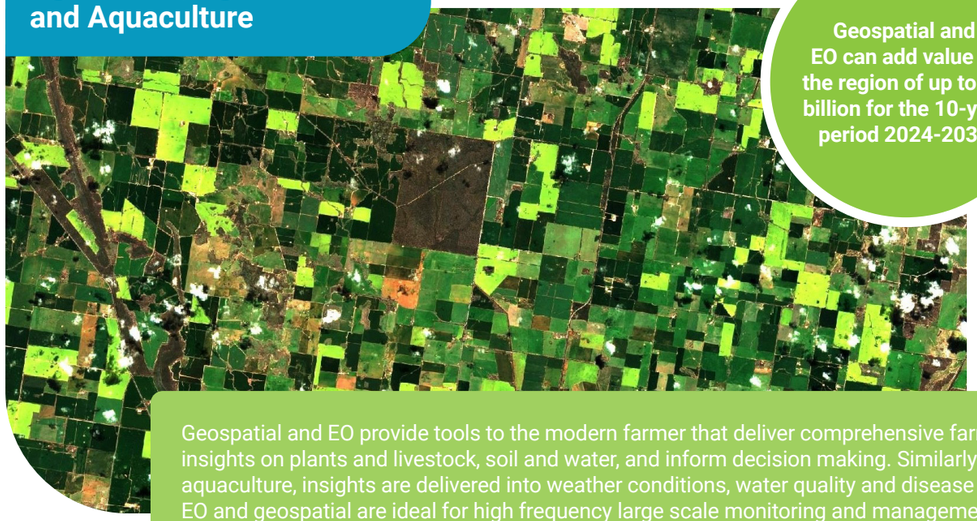
Mining and METS

Geospatial and EO can add value to the region of up to $10 billion for the 10 year period 2024-2034

The mining and Mining Equipment, Technology and Services (METS) sectors are the Greater Whitsunday region's largest source of economic output, supporting an estimated annual output of $44.75 billion. Geospatial and EO technologies add significant value across the mining lifecycle, from exploration to closure and rehabilitation, primarily through economic efficiency gains and managing ESG obligations. Opportunities include increased exploration efficiencies, risk assessment, fast tracking exploration and mining approvals, site design, automation and fuel efficiency, output forecasting, environmental impact monitoring, climate impact assessment, ESG reporting, engagement with First Nations and enhancing social license to operate.

[5] Remplan. Mackay - Isaac - Whitsunday Economy, Jobs, and Business Insights: https://app.remplan.com.au/greaterwhitsundayalliance/economy/industries/output
[6] Economic impact of geospatial services in Australia Preliminary Findings: https://acilallen.com.au/uploads/projects/876/ACILAllen_ImpactGeospatialAustralia_2024.pdf
[7] Tourism Research Australia Data and research: www.tra.gov.au/en/data-and-research
[8] QLD Dept Tourism and Sport: www.dts.qld.gov.au/tourism/tourism-strategy/towards-tourism-2032/2023-queensland-tourism-industry-scorecard/economic-scorecard
[9] Benefits of drones in Australia: www.drones.gov.au/drones-australia/benefits-drones-australia

Agriculture, Agtech and Aquaculture



Geospatial and EO can add value to the region of up to $1 billion for the 10-year period 2024-2034

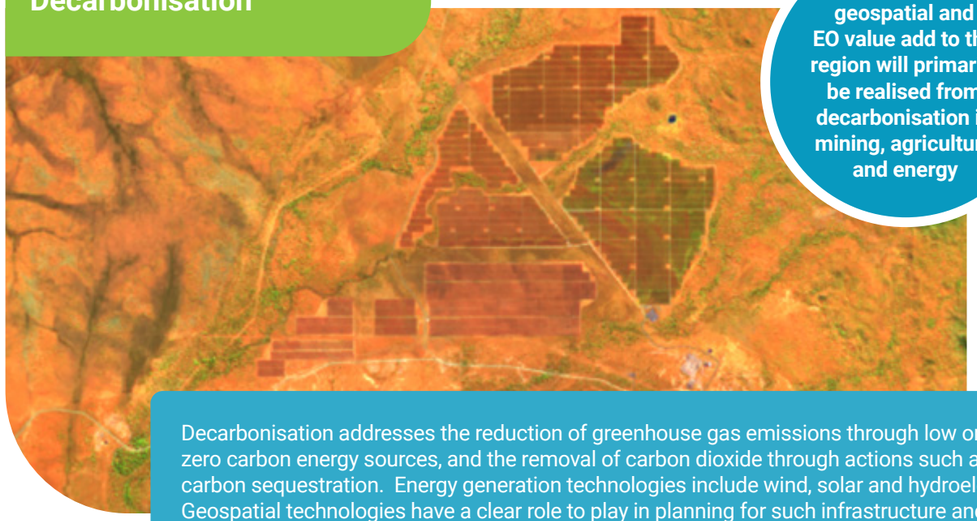
Geospatial and EO provide tools to the modern farmer that deliver comprehensive farm insights on plants and livestock, soil and water, and inform decision making. Similarly for aquaculture, insights are delivered into weather conditions, water quality and disease risks. EO and geospatial are ideal for high frequency large scale monitoring and management of agriculture and aquaculture, supporting analysis of crop and soil health, water quality and usage, pest and disease risks, yield forecasts and the management of livestock, farm assets and transport infrastructure. Opportunities include regulatory compliance reporting, managing irrigation, soil moisture, water access and reliability of water supply, managing soil fertility and degradation, planning for climate change and responding to adverse weather events, and improved precision agriculture and automation to create equipment and labour efficiencies.

Biomanufacturing

The geospatial and EO value add to the region is primarily through agriculture/ aquaculture and construction sectors

Biomanufacturing utilises biological systems to undertake industrial processes or create products at large scale, including medical materials, alternative proteins and biofuels. Through its Biomanufacturing Blueprint 1.0 , the Greater Whitsunday region has identified opportunities to play a significant role in the global biomanufacturing ecosystem, leveraging mature agriculture and manufacturing industries, abundance of biomass feedstocks and access to export markets. Examples of opportunities for geospatial and EO uptake in biomanufacturing exist for supply chain management to ensure feedstocks are available in the required quantities and qualities, and for facility site selection, design and management.

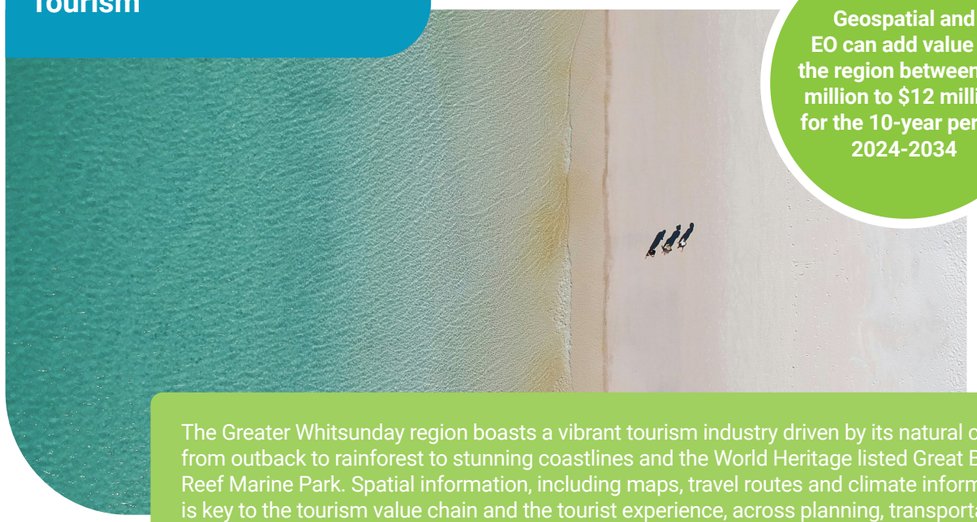
Decarbonisation



The geospatial and EO value add to the region will primarily be realised from decarbonisation in mining, agriculture and energy

Decarbonisation addresses the reduction of greenhouse gas emissions through low or zero carbon energy sources, and the removal of carbon dioxide through actions such as carbon sequestration. Energy generation technologies include wind, solar and hydroelectric. Geospatial technologies have a clear role to play in planning for such infrastructure and promoting investment. In addition, decarbonisation of industrial supply chains is driven through the application of both geospatial and EO technologies. Increased accuracy in Positioning, Navigation and Timing will drive optimised transportation, precision agriculture and automated processes in mining. Opportunities exist to use remote sensing and digital twins in low energy building design, monitoring of GHG emissions from agriculture and mining, maximising energy production and operation, managing carbon sinks and developing new energy initiatives including Pumped Hydro Energy Storage (see Case Study).

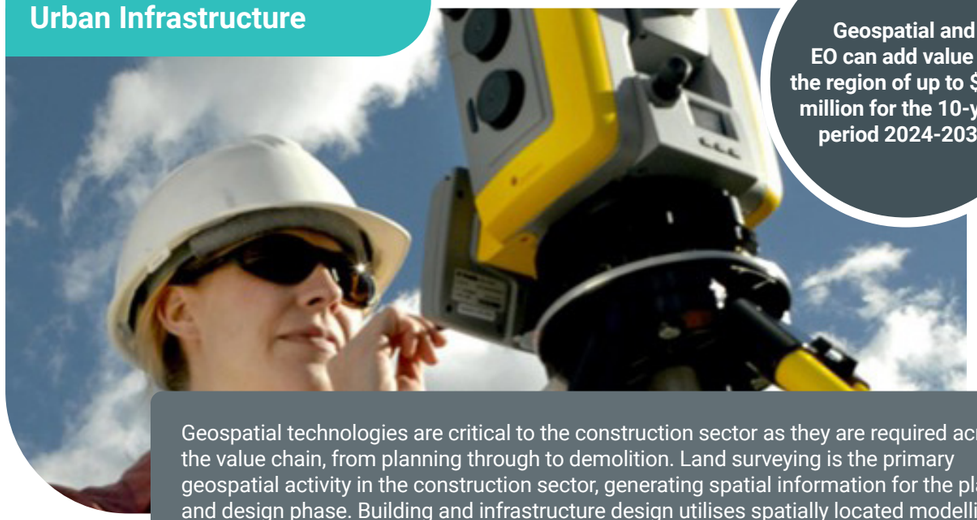
Tourism



Geospatial and EO can add value to the region between $6 million to $12 million for the 10-year period 2024-2034

The Greater Whitsunday region boasts a vibrant tourism industry driven by its natural capital, from outback to rainforest to stunning coastlines and the World Heritage listed Great Barrier Reef Marine Park. Spatial information, including maps, travel routes and climate information, is key to the tourism value chain and the tourist experience, across planning, transportation accommodation and leisure activities. Data on tourism demographics, movements, bookings and consumption are likewise key to the development and maintenance of the sector in the region. Opportunities are in high accuracy positioning providing direct location-based services and augmented reality applications, more detailed and region-specific tourism data analyses and sustainable tourism through operators and tourists alike understanding impacts and risks of tourism for environmentally vulnerable areas.

Construction and Urban Infrastructure



Geospatial and EO can add value to the region of up to $400 million for the 10-year period 2024-2034

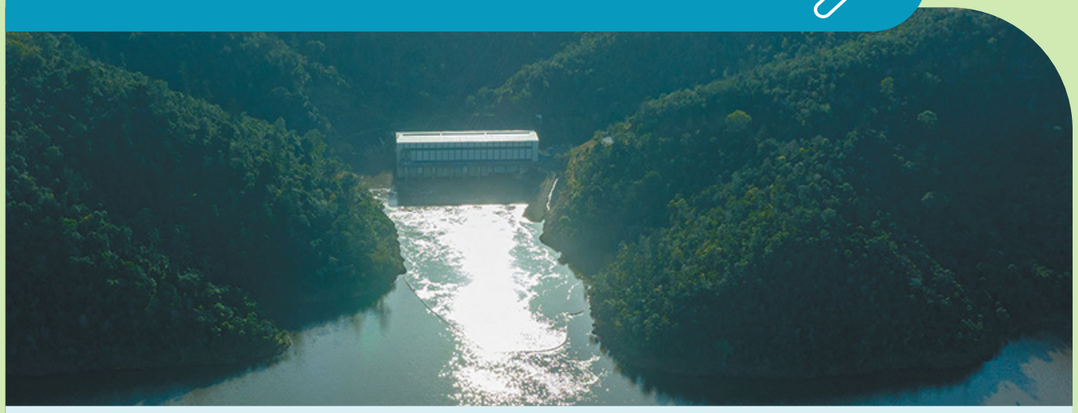
Geospatial technologies are critical to the construction sector as they are required across the value chain, from planning through to demolition. Land surveying is the primary geospatial activity in the construction sector, generating spatial information for the planning and design phase. Building and infrastructure design utilises spatially located modelling techniques which then feed through to supply, construction and maintenance. Both survey data and building information are managed through a variety of Geographic Information Systems (GIS) platforms. EO is increasingly used to supplement land surveying and planning through highly accurate digital terrain models (DTMs). Geospatial and EO can inform insurance risk analysis, while digital twin technologies will drive new techniques in planning, construction, site management and ongoing maintenance.

Aerospace

The value add of drones on mining, agriculture and construction to the region is up to $642 million for the period 2020 to 2040

The aerospace and aviation industries leverage the Greater Whitsunday region's location advantages and growing technical capability. The development of the Bowen Orbital Spaceport puts the region at the forefront of Australia's growing space commercialisation and sovereign space capability. The Greater Whitsunday region's strengths in the aviation sector are reflected in managing increased traffic for tourism and in support of the mining sector, driving demand for infrastructure planning and air-traffic management services. The most significant shift in the aerospace sector is in uncrewed aircraft systems (UAS) which includes remotely piloted drones, with significant impact on other priority sectors, particularly agriculture and mining. Agriculture and mining will benefit from increased automation via UAS/drones, reducing manual overheads on farm inspections, livestock movement and targeted chemical/fertiliser application.

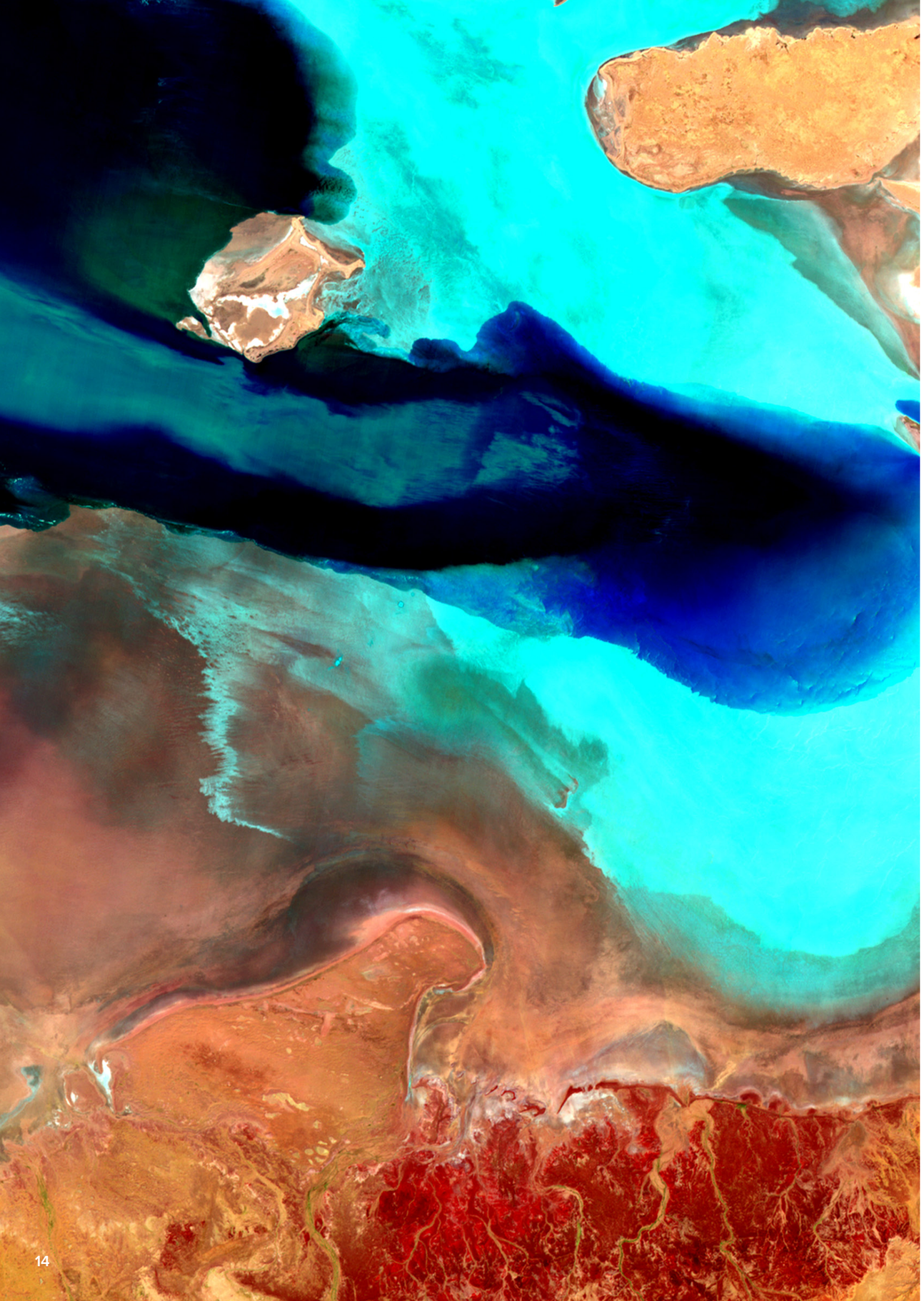
Case Study: Pumped Hydro Energy Storage



Pumped Hydro Energy Storage (PHES) utilises energy generated by solar and wind to fill a reservoir of water that then generates electricity on release, acting as a battery for when there is no sun or wind. While existing water infrastructure is being considered for PHES, retired deep cut mines are also potential sites, having advantages including existing transmission and pumping infrastructure, road access, and reduced environmental impact on disturbed land. A study by the Australian National University combined elevation data from the German TanDEM-X synthetic aperture radar satellite platform with geospatial datasets on land use, protected areas, and urban areas to identify mine sites, both active and closed, that could be repurposed for PHES. One site identified was the Coppabella mine in the Isaac region of the Greater Whitsundays. While still an active mine, further geospatial and geological surveys could be conducted to plan for the future of this mine.

Case Study: Predicting Sugarcane Yield

Farmacist is a Mackay based company that utilises satellite data to identify changes in crop performance and produce yield maps. Established in 2010, Farmacist saw the opportunities to utilise satellite imagery, Global Position Services (GPS) and Geographic Information Systems (GIS) to improve farm management and increase yield through precision agriculture and improved soil nutrient and chemical management. Through an approach of research and development, and pushing the boundaries of technology, Farmacist has grown to more than 40 professional staff and a wide range of technical services, including the use of satellite imagery to produce sugarcane yield maps. (www.farmacist.com.au)



Addressing Broader Challenges and Opportunities

Adopting a whole of industry view, there are several key requirements to be addressed if these challenges and opportunities are to be successfully and sustainably realised.

Digital Literacy

Foundational digital skills will be critical to not only drive businesses creating geospatial and EO products and services, but for the businesses maximising their usage.

Spatial Literacy

Spatial literacy needs to be promoted alongside digital literacy to encourage the confident use of maps and geospatial data to inform and make decisions and improve broader awareness of the importance and impact of geospatial and EO.

Education & Training

Fostering a skilled workforce through geospatial and EO technologies and data analysis focused education and training programs, including skills in applying AI and machine learning to spatial analysis.

Regional Needs

It is necessary to support geospatial businesses in gaining insights into the needs and drivers of growth for the priority sectors in the region, primarily through engagement and collaboration.

Industry-Research Collaboration

Innovation driven partnerships between industry and research resulting in collaborative projects that address real-world challenges for the region and promoting the development of cutting-edge technologies.

Small Business Support

Providing business assistance, services and digital infrastructure to geospatial and EO startups and small to medium-sized enterprises (SMEs) to establish a foothold in the region and grow, such as business development services.

Data Infrastructure

Initiating a strategy for the creation of a data infrastructure that provides access to key Greater Whitsunday regional datasets and analysis services, promotes data policies that facilitate sharing of data.

Community Development

Establishing a community of practice for geospatial, EO and related data sciences, overcoming isolation of SMEs and fostering discovery and sharing of capabilities, generating collaborative activities to tackle challenges and opportunities.

First Nations

Engagement with First Nations communities to utilise geospatial and EO technologies for land monitoring and community management purposes.

The Greater Whitsunday Geospatial Hub Vision

The Greater Whitsunday region has several advantages that would support and benefit from a region focused geospatial initiative, the Greater Whitsunday Geospatial Hub, including a strong drive to embrace new technologies such as drones and AI while supporting the advancement of priority sectors.

Of these, the mining and METS sector and the agriculture and aquaculture sectors would benefit the most from a region focused geospatial data infrastructure initiative.

A long-term objective of a geospatial data infrastructure initiative would support the expected expansion of digital capabilities and growth of digitally literate businesses by providing a data and analytics platform on which these businesses would operate, collaborate and innovate.

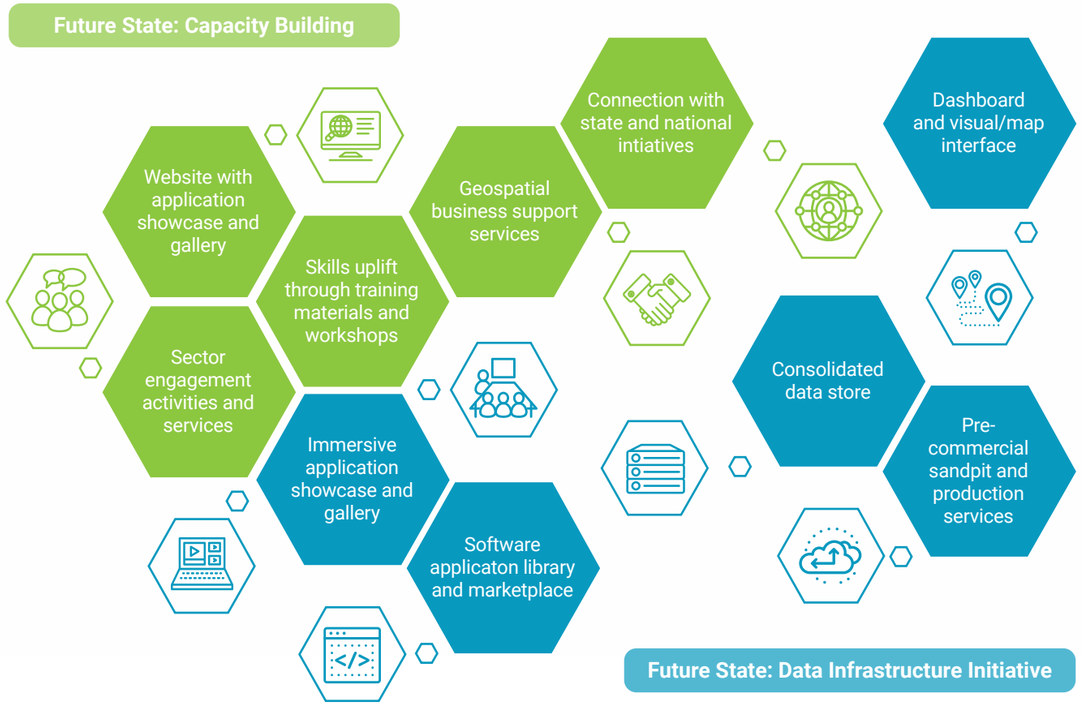
The creation of the Greater Whitsunday Geospatial Hub directly aligns with the Greater Whitsunday region's strategy of developing a comprehensive and coordinated regional approach to strategic workforce development through enhanced digital skills.

The application of geospatial and EO technologies to the region's priority sectors will boost the productivity of these sectors and increase their economic value. The implementation of a Greater Whitsunday Geospatial Hub would be a key activity to drive the realisation of up to $1.46 billion annual added value to the gross Greater Whitsunday regional product by 2034.

Future State

The Greater Whitsunday Geospatial Hub would provide a focal point for industry and research, across the priority sectors, to build regional capacity, create partnerships, attract funding and investment, and ultimately create and share a common geospatial data infrastructure initiative.

Two complimentary components are proposed for a future state: a capacity building capability that would focus on promotion, collaboration and capacity building, and a geospatial data infrastructure initiative that would provide geospatial data and application infrastructure. Each would have a unique set of requirements, resources and activities that would combine to create the overall Greater Whitsunday Geospatial Hub.



The initial phase of the Greater Whitsunday Geospatial Hub would be focused on capacity building through raising awareness of the value of geospatial and EO and increasing investment and uptake. In this phase the hub would connect with priority sectors in the Greater Whitsunday region to provide access to geospatial and EO data, services and the professionals who have the capabilities to analyse data and apply outcomes to sector challenges.

The geospatial data infrastructure initiative is then an ideal future state for the Greater Whitsunday Geospatial Hub, where data and analytics can be brought together with skilled professionals to develop and showcase new, innovative products and services in a way that contributes to the digital uplift of the region, and directly drives economic growth for the region.

The benefits of a geospatial data infrastructure initiative at the Greater Whitsunday region level are that it readily supports repeatable analysis within a limited study area (i.e. the Greater Whitsunday region), allows users to incorporate their own datasets (private or public), and allows users to develop their own analysis algorithms and workflows that may not be publicly or commercially available. This also means that a business can develop algorithms for a customer who can then access it within the data infrastructure environment. Marketplace services can allow users to discover and access or subscribe to these algorithms and services.

Value Proposition

A clear value proposition will be critical to guide the development of the Greater Whitsunday Geospatial Hub and ensure the value of the hub is understood by all stakeholders. A detailed value proposition will be developed in the Align phase of the roadmap, with key elements including:

- Development of digital skills, driving innovation and delivering capabilities.
- Assisting businesses to access customers and develop new opportunities.
- Assisting sector-based customers to discover and access products and capabilities.

Stakeholder Alignment

Key stakeholder groups include those who will directly and indirectly benefit from the Hub's activities, influence the success of the Hub and may provide funding support for the Hub at different stages.

Priority Sectors

- Increased economic output and reduced cost
- Better geospatial solutions through co-design workshops
- Industry bodies contributing to funding

Geospatial & EO

- Greater connection to market
- Increased demand for services
- Enhanced research collaborations
- Access to skilled workers

Research

- Enhanced targeted research collaborations
- Increased industry adoption

Education and Training

- Increased demand for training
- Enhanced career pathways for graduates
- STEM pathways

Government

- Increased value of government investment
- Improved government services
- Funding opportunities

Case Study: The Virginia Open Data Cube Hub

The VMASC (Virginia Modeling, Analysis & Simulation Center) Virginia Open Data Cube Hub is a cloud hosted geospatial analytical platform built on top of open data cube technology and supports the state of Virginia in the U.S. to manage and organise geospatial data and time series satellite imagery. The Virginia Open Data Cube Hub capabilities can be utilised to provide insight and information for future-focused environmental, economic, or public health decisions based on past data, or a multitude of other problem solving possibilities. The open data cube platform provides both data and a range of services to support geospatial analysis, supporting repeatable analysis within a limited study, allowing users to include their datasets, and allowing users to develop analysis algorithms and workflows that may not be publicly or commercially available. (www.vmasc.org)

Roadmap and Recommendations

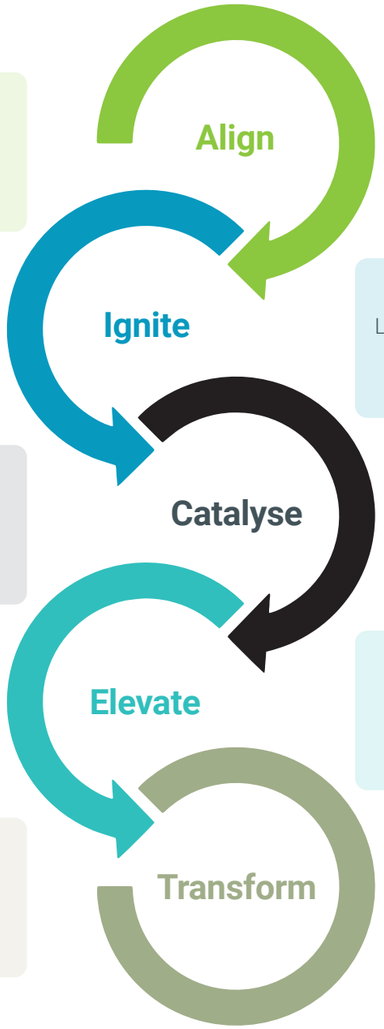
To address the challenges of limited awareness of geospatial and EO technologies and a shortage of skilled professionals, the recommendation is to implement a phased approach to building geospatial and EO capability through a Greater Whitsunday Geospatial Hub.

This phased approach would begin with in-depth stakeholder engagement to build buy-in and refine the vision and scope of the Greater Whitsunday Geospatial Hub, followed by the establishment of a capacity building capability.

Alongside capacity building, early Hub activities will foster research-industry collaborations for targeted solution development in the Greater Whitsunday region and pave the way for a Greater Whitsunday Geospatial Hub that is backed by strong partnerships and a sustainable workforce.

Expanding on this initial capacity building focused Hub, a geospatial data infrastructure initiative would be developed to provide a tailored collaborative environment for the Greater Whitsunday region, focusing on geospatial and EO data management and analysis.

0 – 1 year
Engaging stakeholders, gathering insights, building buy-ins and refining the vision and scope



1 – 2 years
Laying the groundwork, establishing strategic partnerships, securing funding and resourcing

2 – 3 years
Activating capacity building, identifying and initiating research partnerships

3 – 4 years
Scaling up, activating solutions for impact and engage broader partners

4 – 7 years
Establishing regional geospatial data analysis infrastructure and operational capability

Within this roadmap, five foundational activities will be carried out progressively to develop Hub capabilities:

Initial focus on capacity building for the region, supporting early stakeholders, providing initial data and infrastructure, and facilitating community building

Establishing an office location that demonstrates commitment to the region and facilitates access to training and showcase/demonstration spaces

Initiate sector focussed capacity building programs that promote the adoption of technologies and grow the geospatial industry opportunities

Develop innovation collaboration programs that focus on growing sustained partnerships between research and industry

Create a data infrastructure initiative to provide a tailored collaborative environment focused on geospatial and EO data management and analysis

Conclusion

Under a favourable operating environment and a significant increase in the end user adoption of geospatial and EO technologies, a value of up to $12 billion can be realised for the Greater Whitsunday region in the ten-year period 2024-2034. This value realisation requires resolute strategies and investments.

The vision presented here is for a future state of the Greater Whitsunday Geospatial Hub where a geospatial data infrastructure initiative can be brought together with skilled professionals who will use it to develop and showcase new, innovative products and services in a way that contributes to the digital uplift of the Greater Whitsunday region, and directly drives economic growth for the Greater Whitsunday region.

The Greater Whitsunday Geospatial Hub would provide a focal point for industry and research, across the priority sectors, to build regional capacity, create partnerships, attract funding and investment, and ultimately create and share a common geospatial data infrastructure initiative.

Approaching that future state could have two phases: a capacity building capability that would focus on promotion, collaboration and skills, and a data infrastructure initiative that would provide Greater Whitsunday region focused geospatial data and application infrastructure. A seven-year timeframe has been designed to guide the development of the Greater Whitsunday Geospatial Hub from an initial consultation period, to a capacity building capability, and ultimately the geospatial and EO data infrastructure.

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