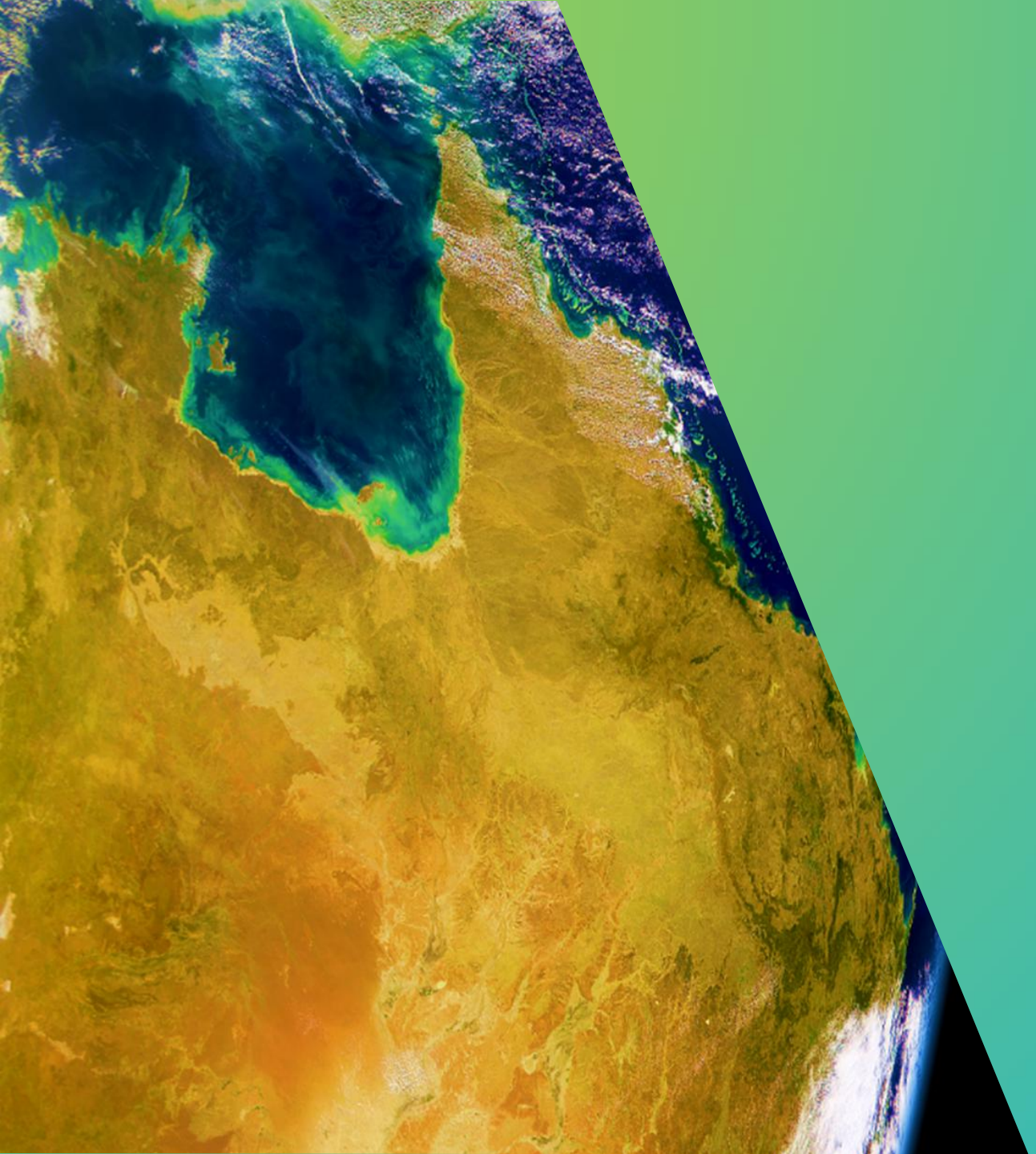

QUEENSLAND **EARTH OBSERVATION** HUB

DRIVING EARTH OBSERVATION THROUGH COLLABORATION AND INNOVATION

GAVIN KENNEDY

COORDINATOR

QUEENSLAND **EARTH OBSERVATION** HUB

Queensland Government | SMARTSAT COOPERATIVE RESEARCH CENTRE | Australian Government Department of Industry, Science and Resources | Cooperative Research Centres Program

The Queensland Earth Observation Hub

- The Queensland Earth Observation Hub incorporates the SmartSat Queensland Node and is a jointly funded initiative of SmartSat and the Queensland Government through the Department of State Development, Infrastructure and Planning.
- The EO Hub is accelerating the growth of Queensland's, and Australia's, Earth observation industry by supporting commercialisation of research, and EO product and service development.
- The EO Hub is generating opportunities for data analytics businesses and researchers, as well as downstream industries and upstream service providers of Earth observation imagery.

Qld EO Market Study

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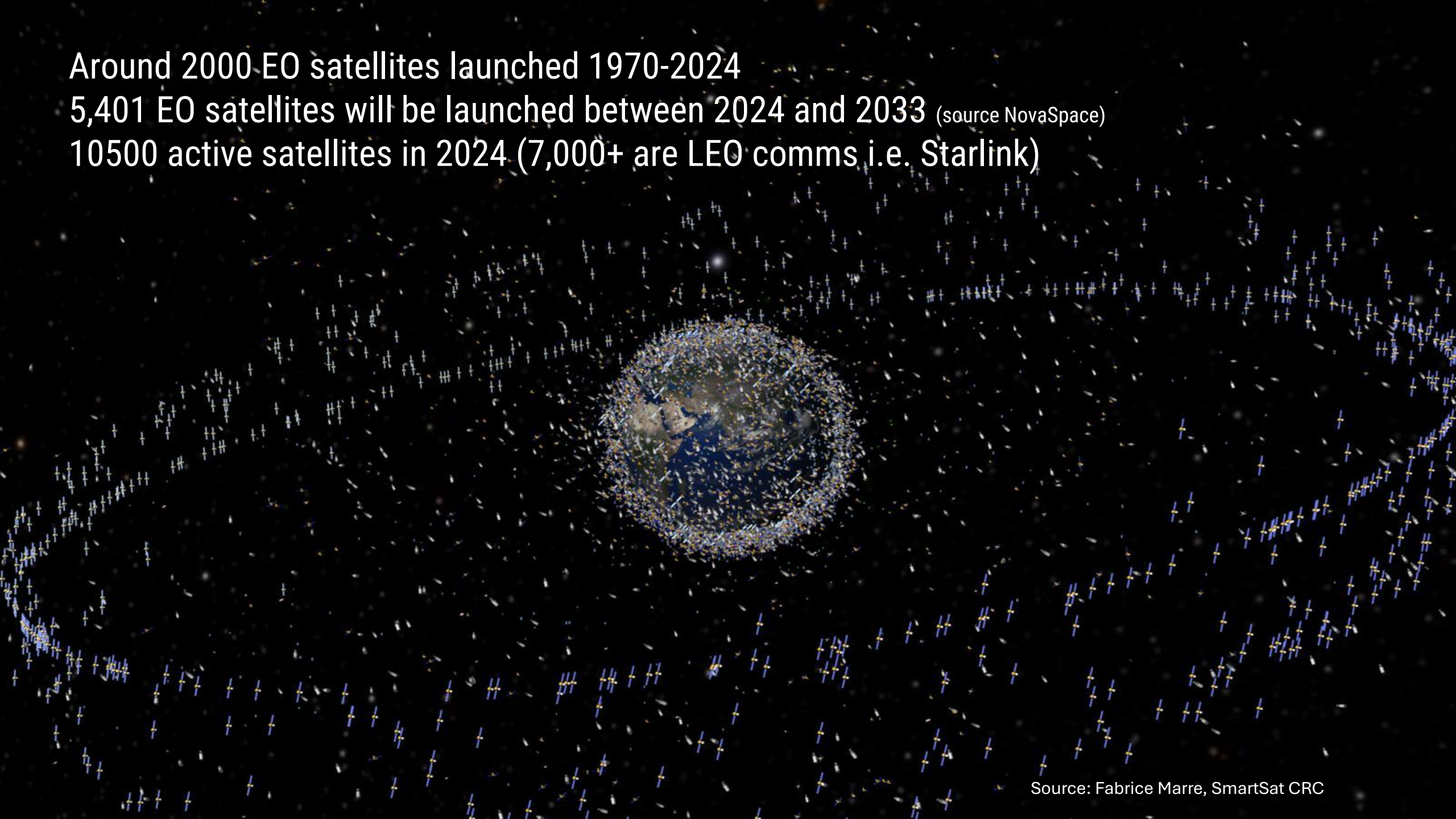
Around 2000 EO satellites launched 1970-2024
5,401 EO satellites will be launched between 2024 and 2033 (source NovaSpace)
10500 active satellites in 2024 (7,000+ are LEO comms i.e. Starlink)



Source: Fabrice Marre, SmartSat CRC

The Evolving Landscape Of EO

Reduced cost of launch and manufacturing

Miniaturisation

Constellation

Advances in on-board tech

Rise of AI processing

Better space communications

Advanced sensors

Shift from data to analytics

Source: Fabrice Marre, SmartSat CRC

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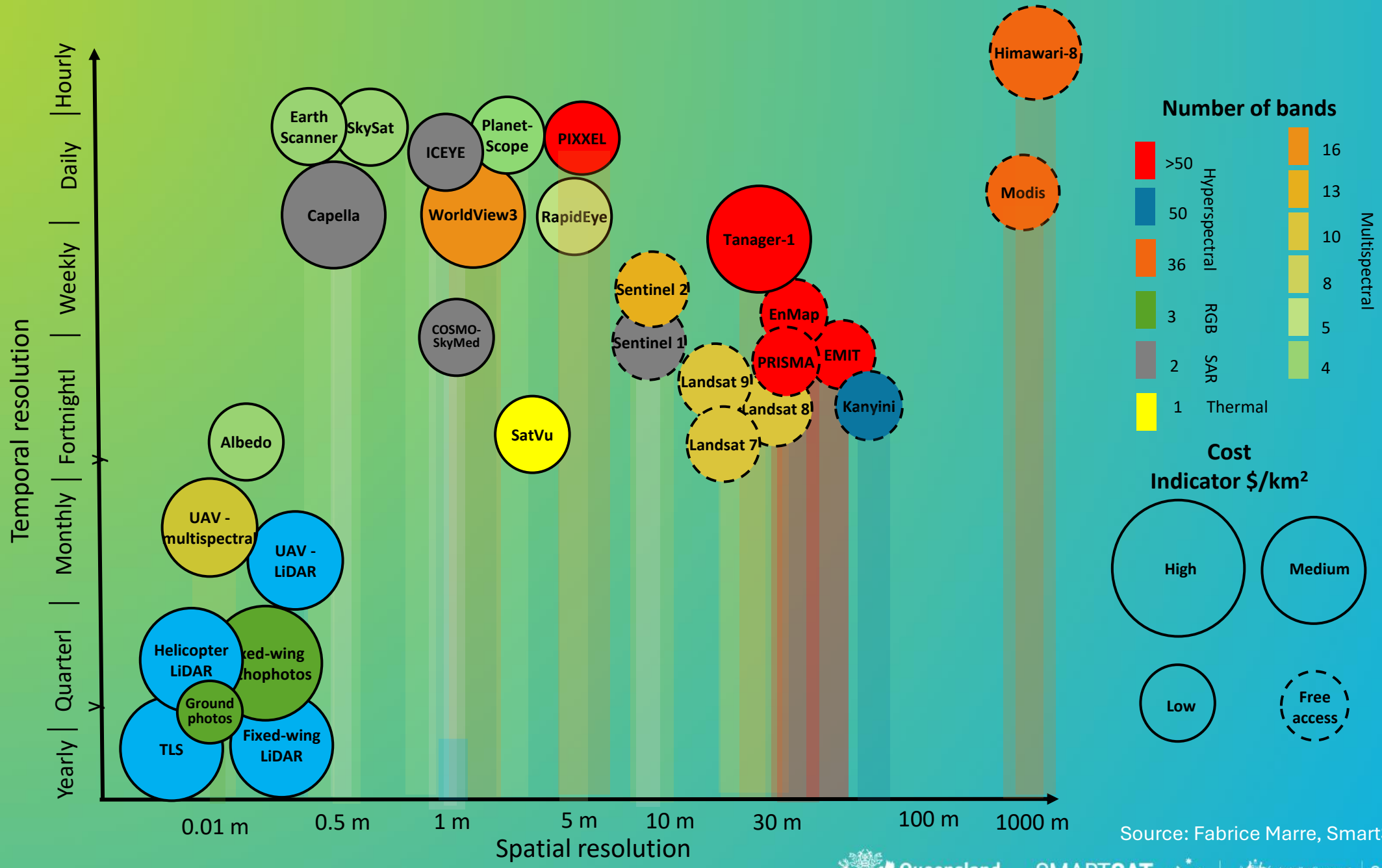

Source: Fabrice Marre, SmartSat CRC

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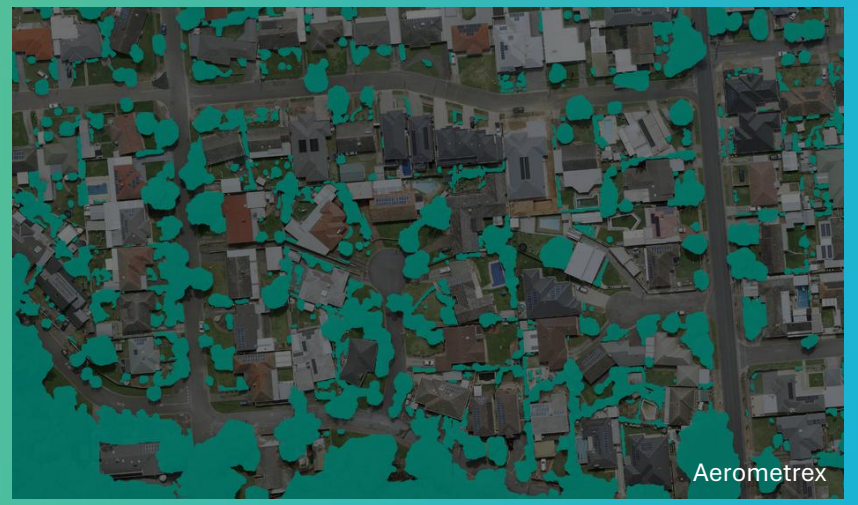
AI FOR DATA ANALYSIS

GeoAI technology combines geospatial location-based data with advanced analytics provided by artificial intelligence to support decision making.



TECHNIQUES

- Semantic classification
- Classification
- Object detection
- Data fusion
- Regression
- SVM
- Hybrid (data-driven/physical)
- …

PRODUCTS

- Tree Canopy Cover
- Vegetation Height estimation
- Crop boundaries extraction
- Weed identification
- Permeable vs impermeable surface
- Change detection
- Forecasting and predictions
- …

Source: Fabrice Marre, SmartSat CRC

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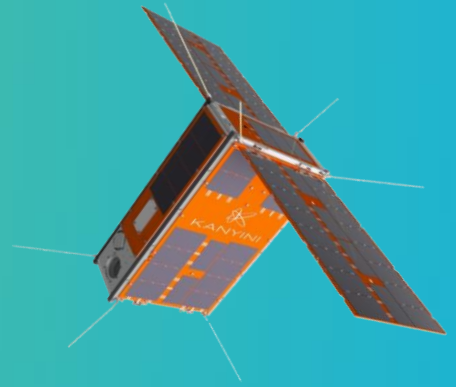
AUSTRALIA'S CHALLENGES AND OPPORTUNITIES



FACTORS	IMPACT	MITIGATION STRATEGIES
Population growth Economic development Land-use change Climate-change Natural resources depletion Hazards	Heat island, environmental degradation, bushfires, flood, erosion, drought, deforestation, biodiversity loss, etc.	Resources monitoring and assessment Sustainable practices Technological innovation Policy development and regulation Public awareness and community engagement

Source: Fabrice Maree, SmartSat CRC

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Potential benefits of EO driven solutions at scale

Food Production

- **Crop production** needs to **DOUBLE by 2050** to meet projected 2050 food demand.
- Identification of **early-stage pests, weeds and diseases** via multi and hyperspectral imagery shows an ability to **prevent crop loss of up to 20%**

Greenhouse gases

- Agriculture **emits 1 billion tonnes of greenhouse gases from fertilizer and pesticide inputs** annually.
- Optimising inputs and reducing costs using EO will likely cut GHG 4-6% overall.

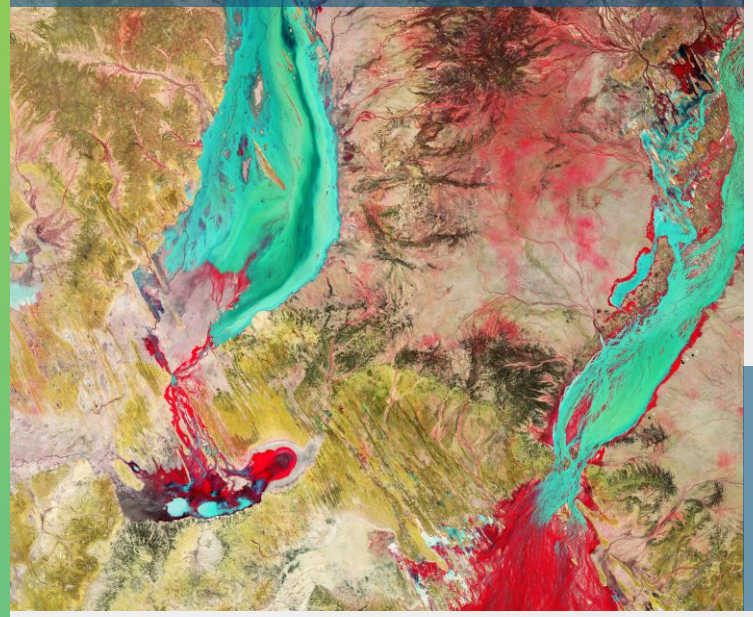
Water Availability

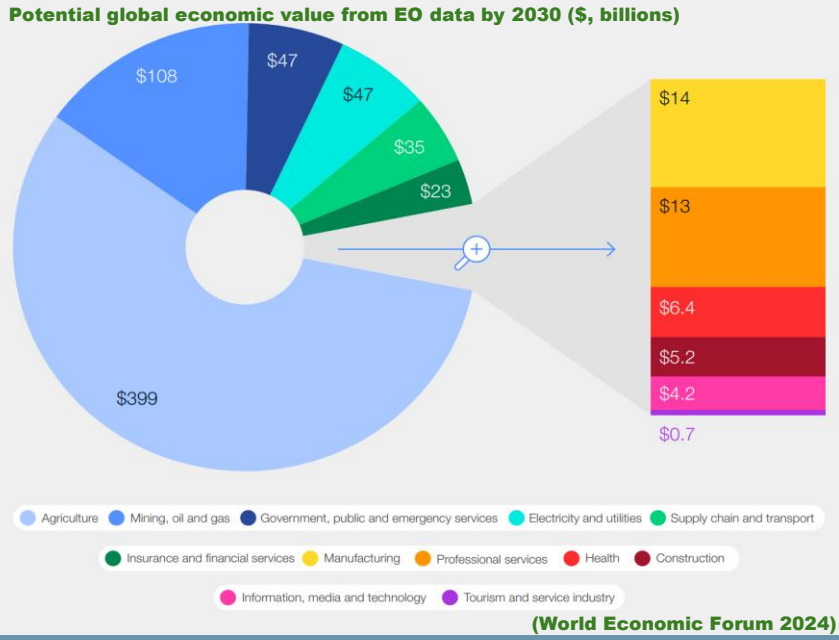
- **Water use for agricultural represents 70%** of global use.
- Satellite-enabled analysis of soil moisture content will likely cut water use by 5-10% through more efficient irrigation practices.

Source: Space Applications in Agriculture: Enhancing Food and Water Security, Improving Climate Action
Dr A. Potgeiter, University of Queensland

Favourable Operating Environment

In Australia - The value of the economic benefits attributable to EO were of the order of $2.5 billion in 2020 (Deloitte Access Economics, 2021)





EO could add $703 billion to the global economy while eliminating 2 gigatonnes of GHG emissions in 2030 (World Economic Forum 2024).

"maximising its 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 2024)

Growth in Australia relies on increased collaboration and uptake of Australia's EO capabilities (Deloitte, 2019, KPMG 2020), as well as bringing the nation's cutting-edge research capabilities to work closer and more strategically with the EO industry.

EARTH OBSERVATION IN QUEENSLAND

Opportunity rich environment

Significant end user sectors

It’s the size of Europe!

Diversity of skillsets coming to EO

Brilliant people = energy & innovation

Active state imagery program

Growing community

International vendors attracted

Qld Market Analysis

Priorities for Queensland EO

- Data Accessibility and Open Data Initiatives
- Education and Training
- Supporting Startups and SMEs
- Industry-Academia Collaboration
- Sector Awareness and Outreach
- National and International Engagement
- Policy and Regulatory Support
- Showcasing Success Stories
- Investment in Earth Observation Infrastructure

FRONTIER SI

ngis

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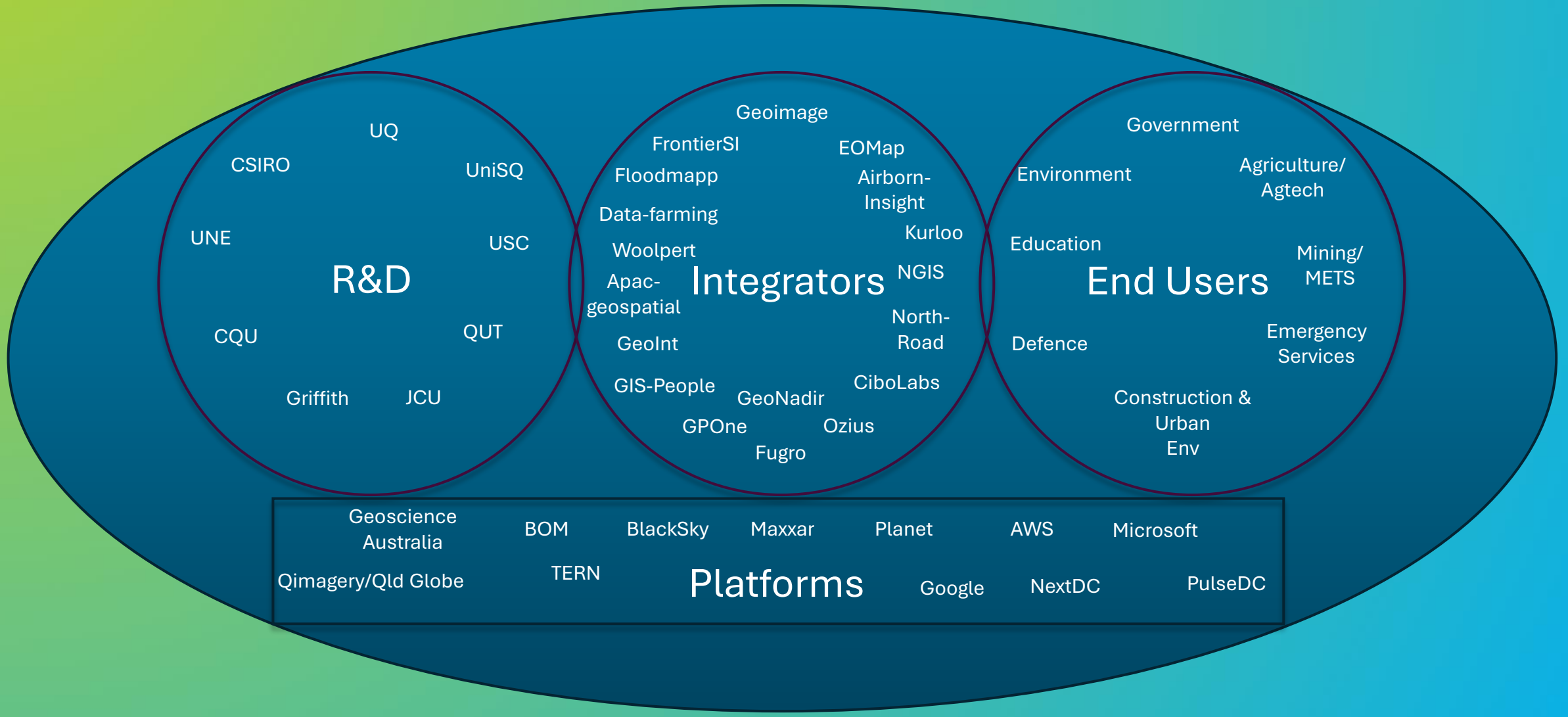
Australian Government Department of Industry, Science and Resources

Cooperative Research Centres Program

Queensland's EO Ecosystem



Qld Market Analysis

Priorities for Queensland EO

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"Partnerships and collaboration are considered to be a critical component of an effective and successful EO market"

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Australian Government Department of Industry, Science and Resources

Cooperative Research Centres Program

Building Community, Growing Industry

The current vision for the Hub is to grow Queensland's Earth observation industry through collaboration, innovation and communication.

Build an active community that drives collaboration and capacity building.

Enable the Queensland Earth Observation community to grow and succeed.

Engage in the promotion and representation of the Queensland EO industry.

Help create sustainable change in the Queensland Earth Observation industry.

Building Community and Collaboration


Market Study Jul 23


Critical Minerals Oct 23


EORabble Oct 23


GCA Oct 23


Hub Sundowner Feb 24


Agriculture May 24


BNE Geospatial N/W June 24


PostGrad Futures Aug 24

SmartSat Conf Sep 24

Aust EO Forum Sep 24


Environment Workshop Dec 24

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Hub Funding Programs

Partnering Program

Industry led collaboration with research
Total cash budget: $300,000
Cash co-funding ratio 1:2 (industry : hub)

Mobility Scheme

Research to Industry/Industry to Research placements
Up to 1 FTE for 6 months duration
No co-investment for salary and on-costs

Calibration/Validation Projects

Projects relevant to calibration and/or validation of EO data & services
Total cash budget: $150,000
Cash co-funding ratio 1:2 (industry : hub)

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Cooperative Research Centres Program

Overall Impact

19

Projects Funded

$2.5 Million

Funds Awarded

$8 Million

Direct Activity

2025 Funding

5

Projects Funded

10

EOIs Received

$934,000

Funds Requested

$500,000

Funds Awarded

$1.7 Million

Direct Activity

Incl: SmartSat Additonal $85K

QUEENSLAND **EARTH OBSERVATION** HUB PROJECT PARTNERS

The University Of Queensland AUSTRALIA

University of Southern Queensland

University of the Sunshine Coast

James Cook University AUSTRALIA

QUT the university for the real world

Griffith UNIVERSITY

CSIRO

City of Logan

Pacific Seeds

cibolabs

geoimage

EOMAP

City of Gold Coast

Noosa Council

GEONADIR

NGIS

Brisbane City

City of Logan

Sunshine Coast Council

GPOne CONSULTING

kurloo

The Moreton Bay Foundation

FUGRO

tern Ecosystem Research Infrastructure

Queensland Government

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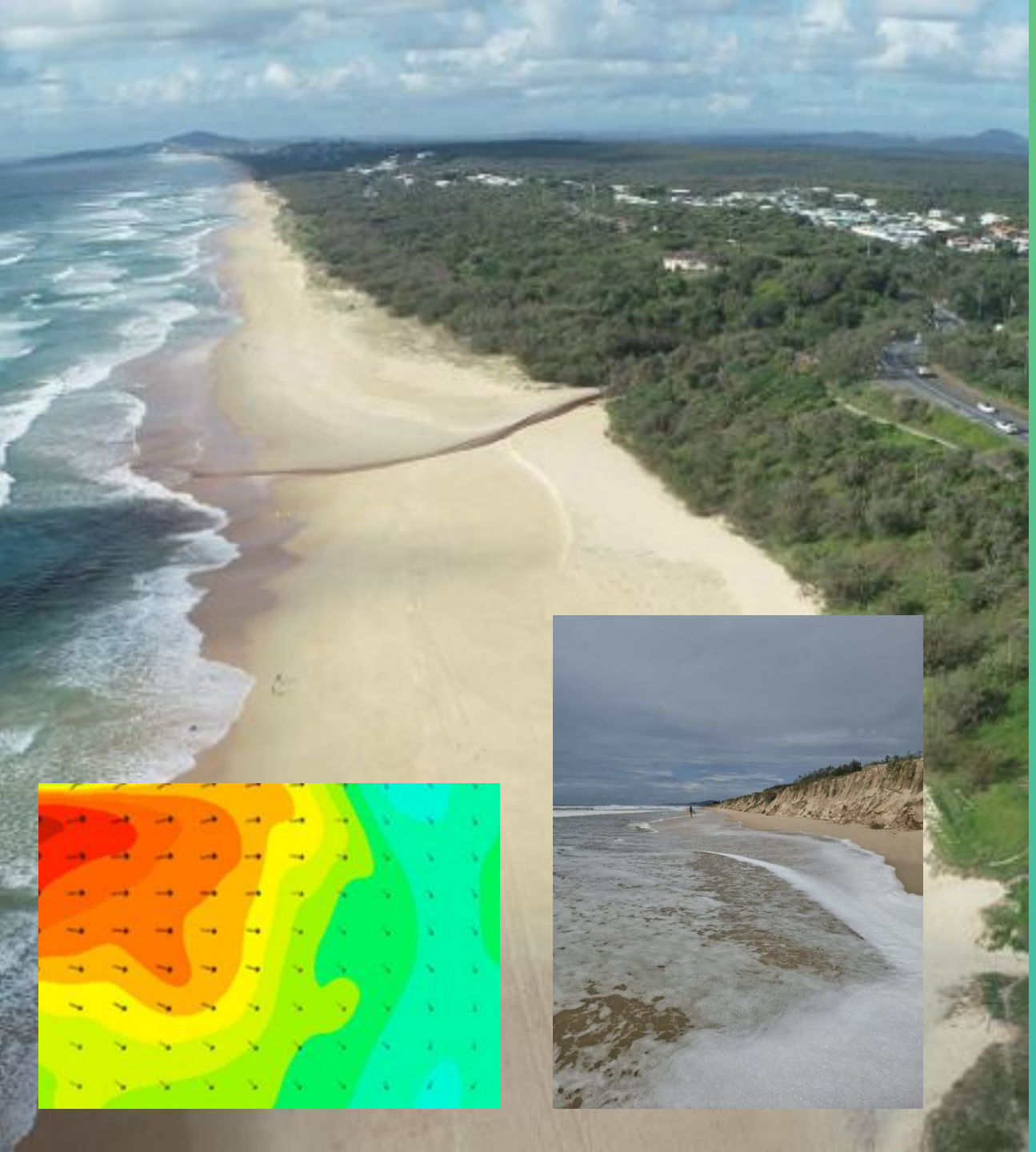
Australian Government Department of Industry, Science and Resources

Cooperative Research Centres Program

QUEENSLAND **EARTH OBSERVATION** HUB

COASTS

COASTAL CHANGE OBSERVATION AND ANALYTICS (MULTI-) SCALE TECHNOLOGY SYSTEM



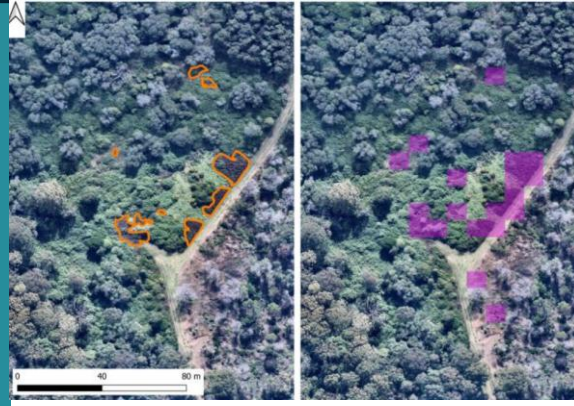
- UNDERSTANDING COMPLEX COASTAL PROCESSES FOR GOVERNMENT & INDUSTRY
- FREQUENT, HIGH-QUALITY SPATIAL INFORMATION ACROSS COAST
- USES SATELLITE IMAGERY, DRONES, NUMERICAL MODELLING, AI-BASED ANALYTICS AND CLOUD-BASED PORTAL TECHNOLOGY

University of the Sunshine Coast · NOOSA Council · EOMAP · The University Of Queensland AUSTRALIA

Queensland Government · SMARTSAT COOPERATIVE RESEARCH CENTRE · Australian Government Department of Industry, Science and Resources · Cooperative Research Centres Program

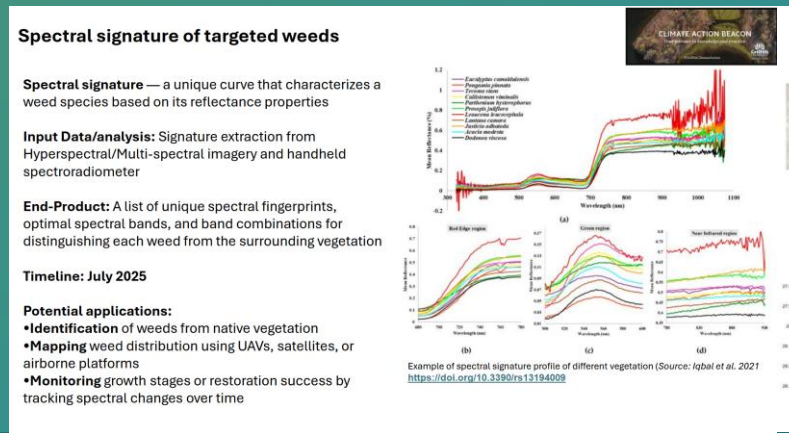
SATELLITE DATA CALIBRATION FOR VEGETATION CONDITION ASSESSMENT

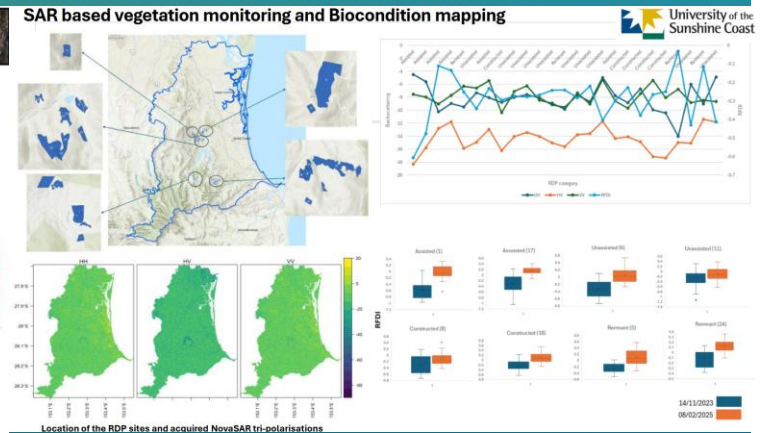
develops and validates tools to interpret SAR and Tri-Stereo optical data for assessing vegetation condition for restoration monitoring, carbon accounting and fire risk assessments for Queensland councils and land managers.



NRM TOOLS FOR MANAGING TARGETED INVASIVE PLANTS IN SE QUEENSLAND

utilises field validated satellite hyperspectral and LiDAR analytics to help SE Queensland councils manage invasive plants.





Pleiades Neo tri-stereo acquired 06 November 2024
Natural Colour

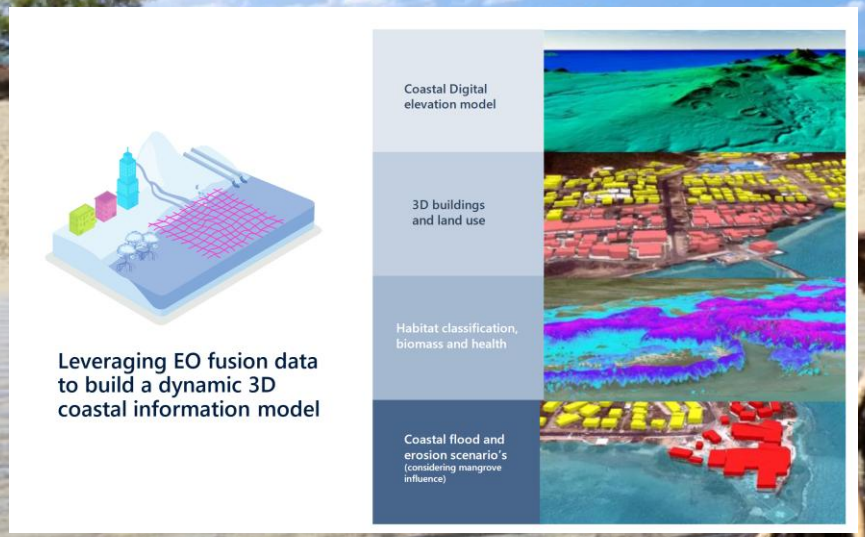
SmartCoast

FUGRO

EOMAP

JAMES COOK UNIVERSITY AUSTRALIA

QUT the university for the real world



Leveraging EO fusion data to build a dynamic 3D coastal information model

Coastal management digital twin pilot in Torres Strait

Assessing coastal ecosystems, focusing on mangrove health using fused satellite and LiDAR data.

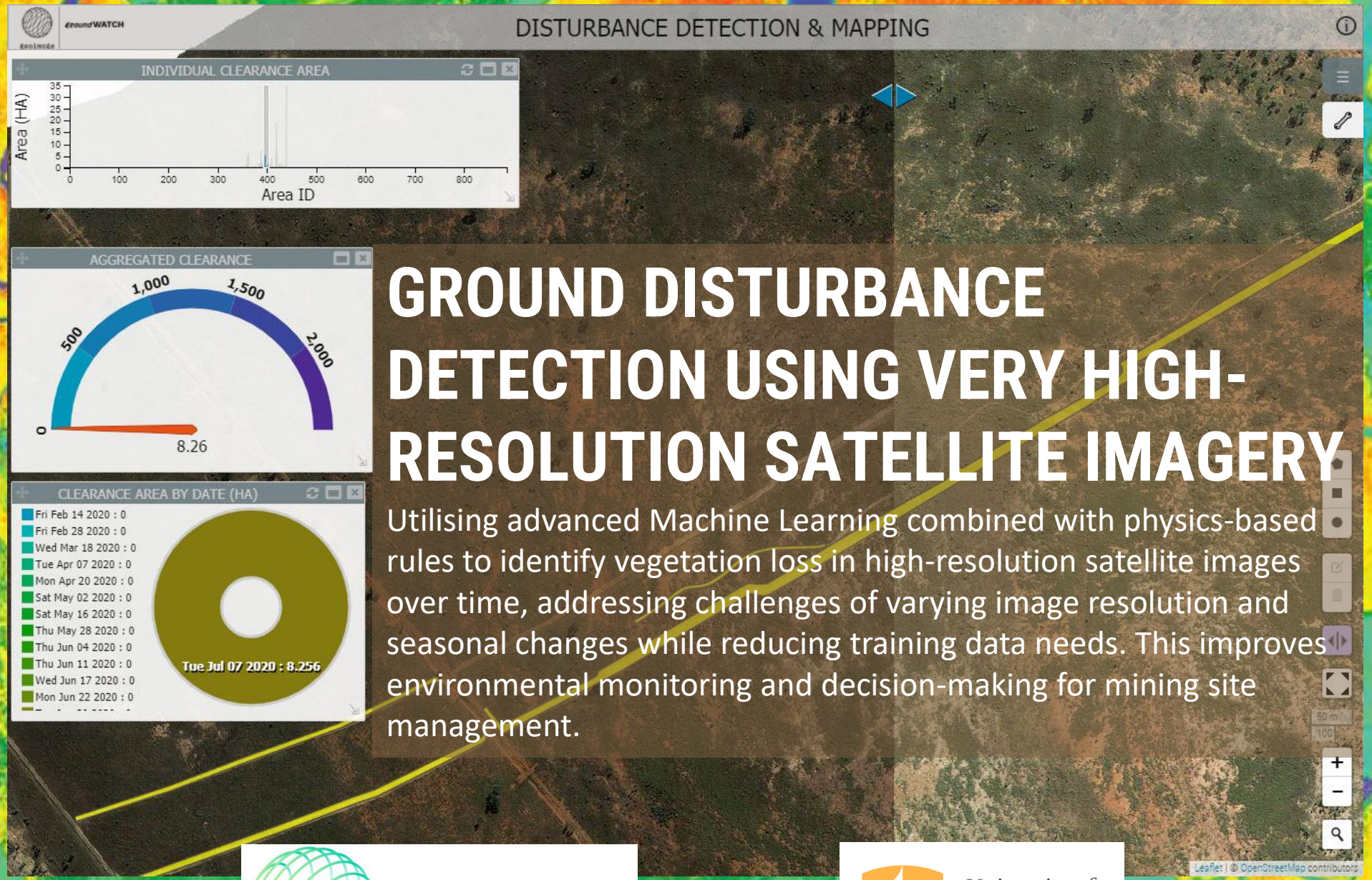
SmartCoast Phase 2 develops a scalable Net Ecosystem Value (NEV) framework, linking ecological data with financial and policy decision-making, unlocking new funding pathways for climate adaptation and sustainable coastal management

VALIDATION OF SATELLITE-DERIVED IN-LAND WATER TOPOGRAPHY MAPS

Using Kurloo mass deployable global navigation satellite system (GNSS) precise positioning technology provide absolute spatial and temporal measurements that can validate satellite water height products.

kurloo

CSIRO



GROUND DISTURBANCE DETECTION USING VERY HIGH-RESOLUTION SATELLITE IMAGERY

Utilising advanced Machine Learning combined with physics-based rules to identify vegetation loss in high-resolution satellite images over time, addressing challenges of varying image resolution and seasonal changes while reducing training data needs. This improves environmental monitoring and decision-making for mining site management.

geoimage

University of Southern Queensland

GEONADIR

CALIBRATING AND VALIDATING SATELLITE DATA FROM DRONE IMAGERY

Uses vast coverage of drone data to create a comprehensive library of data labels for calibrating and validating satellite data products.

A DISTRIBUTED DATA MANAGEMENT PIPELINE TO SHARE DRONE DATA PROCESSING

Enables scalable, automated processing and publication of TERN's drone data through a shared system with Geonadir.

ADVANCING SATELLITE-DERIVED ENVIRONMENTAL INTELLIGENCE

An AI-driven feature density scaling workflow that integrates high-resolution drone data with satellite imagery to deliver accurate, percentage-based measurements of vegetation and marine habitats.

JAMES COOK UNIVERSITY AUSTRALIA

tern Ecosystem Research Infrastructure

Griffith UNIVERSITY Queensland, Australia

MACQUARIE University SYDNEY·AUSTRALIA

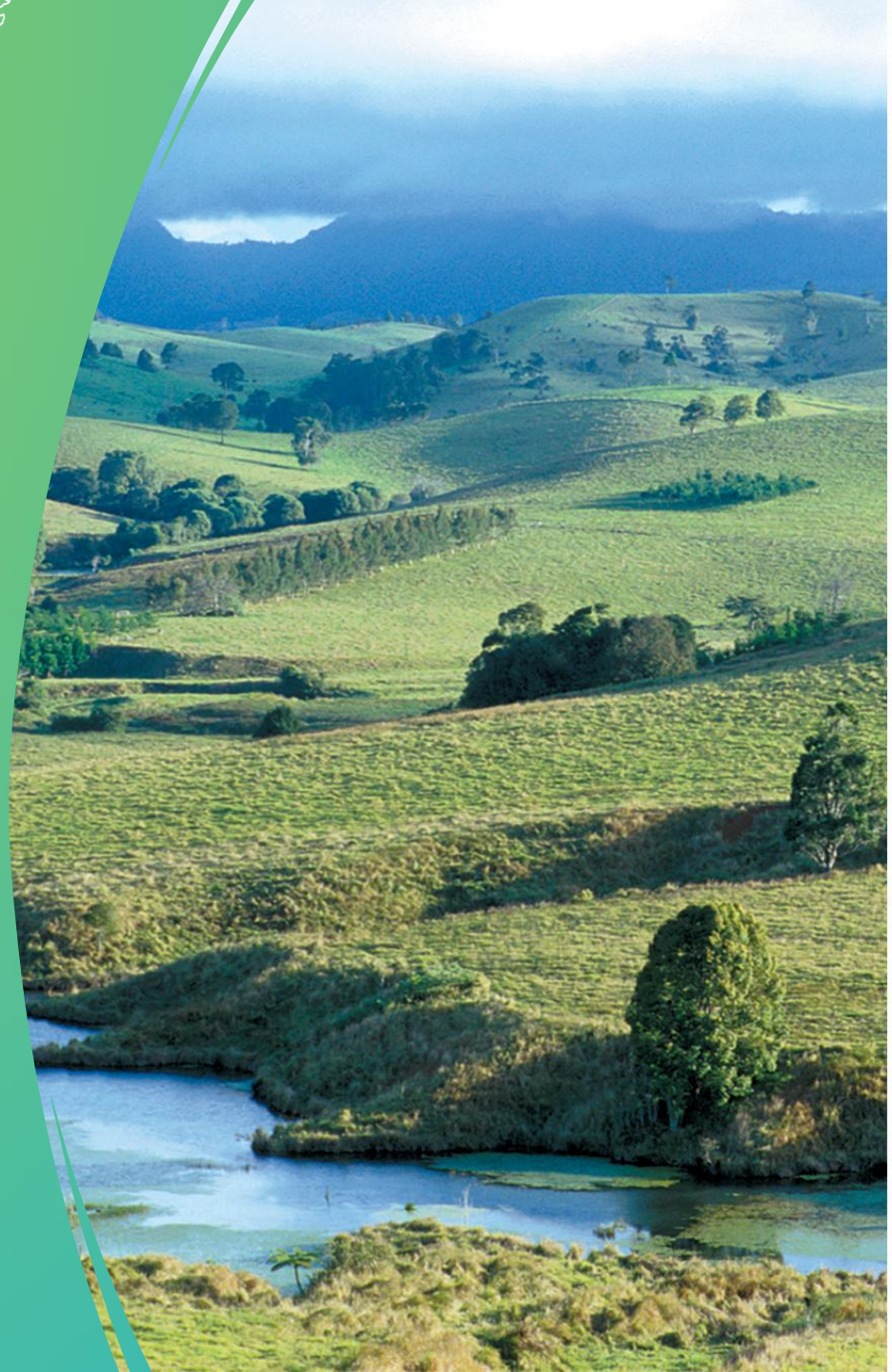
QUEENSLAND SOILS AND CLIMATE RISK

QUANTIFICATION OF CLIMATE RISK ON THE CROP PRODUCTIVITY OF QLD'S DOMINANT SOIL TYPES

- Address Lack of systematic assessment of climate risk of agronomic management on major soils
- Complex interactions of soil health, crop productivity, management and climate.
- Pipeline extending Agricultural Production Systems sIMulator (APSIM) simulations across regions and soil types using historical climate and EO data.

NGIS

University of Southern Queensland



OPTIMIZING CATTLE GRAZING MANAGEMENT THROUGH EARTH OBSERVATION DATA

Enhancing outcomes for Queensland beef producers by leveraging EO data and GPS tracking to analyse cattle grazing behaviour, preferences and responses to environmental conditions.

cibolabs

The University Of Queensland
AUSTRALIA

QUEENSLAND **EARTH OBSERVATION** HUB

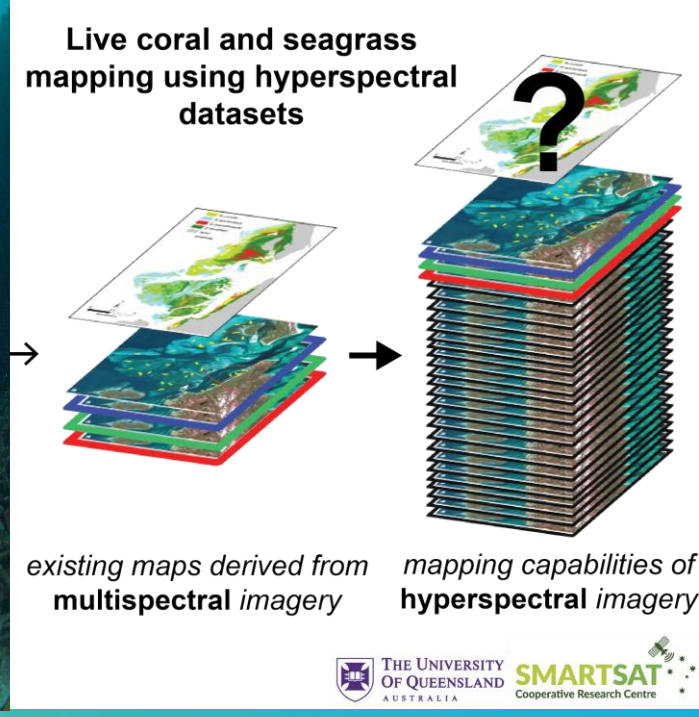
RISKSMART

Digital Tool For De-risking Sorghum Production Decisions

- ADDRESS CHALLENGES OF DRYLAND SORGHUM IN A CHANGING CLIMATE
- HIGH TEMPORAL-SPATIAL-SPECTRAL RESOLUTION IMAGERY TO IDENTIFY INITIAL SOIL MOISTURE STATUS
- DECISION SUPPORT FOR OPTIMISING CROP MANGEMENT PRACTICE FOR GENOTYPE/ENVIRONMENT

Pacific Seeds · The University of Queensland Australia · QAAFI Queensland Alliance for Agriculture and Food Innovation · ADVANTA

Queensland Government · SMARTSAT Cooperative Research Centre · Australian Government Department of Industry, Science and Resources · Cooperative Research Centres Program



ASSESSING LIVE CORAL AND SEAGRASS USING SATELLITE HYPERSPECTRAL IMAGERY

Developing high quality archived hyperspectral data for mapping live coral on shallow coral reefs and seagrass in Australia and globally, providing essential information to coral reef scientist and managers.

The University of Queensland AUSTRALIA

The University of Adelaide

CSIRO

SA Water

Government of South Australia

Queensland Government

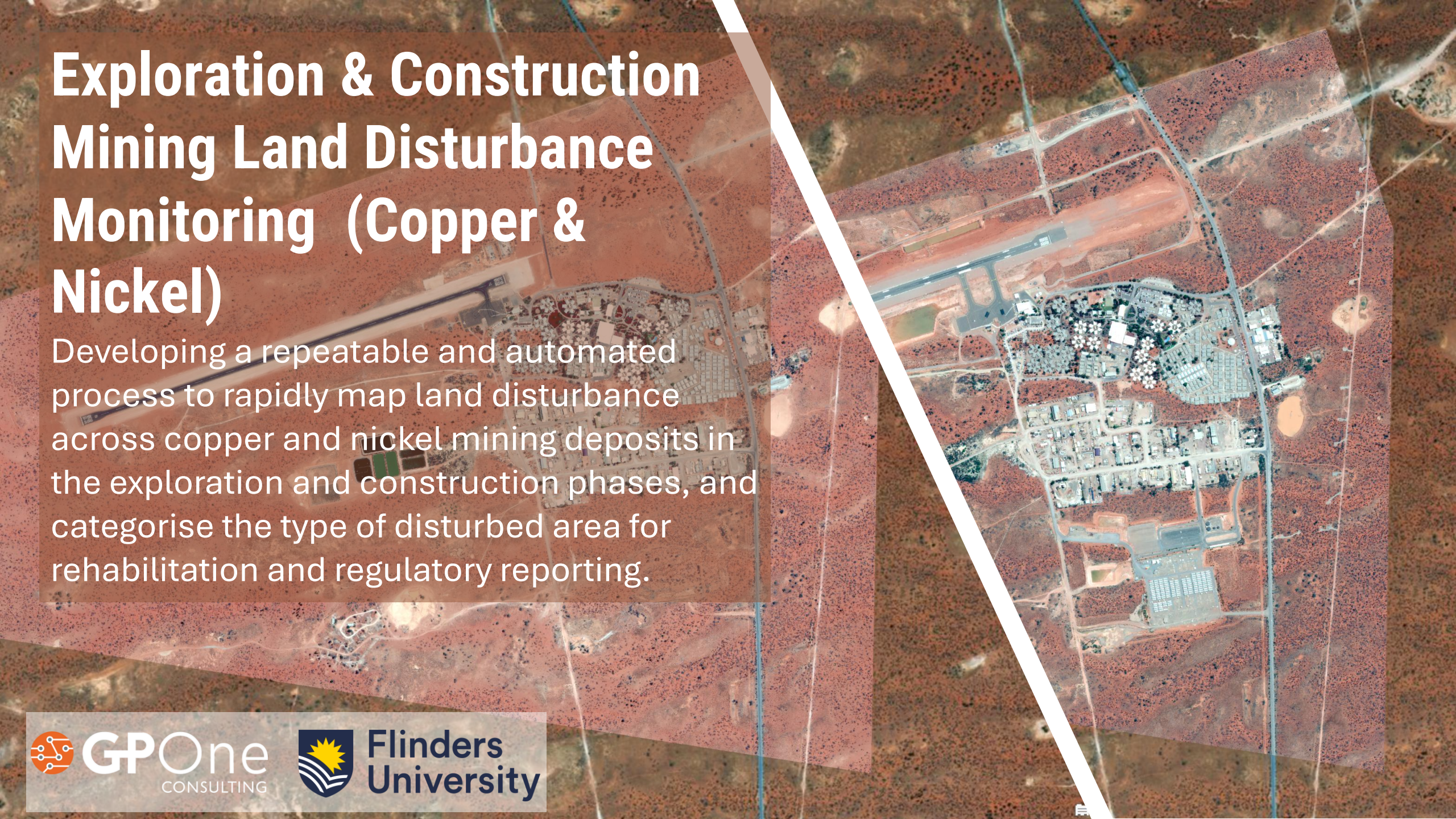
SMARTSAT Cooperative Research Centre

Australian Government Department of Industry, Science and Resources

Cooperative Research Centres Program

Exploration & Construction Mining Land Disturbance Monitoring (Copper & Nickel)

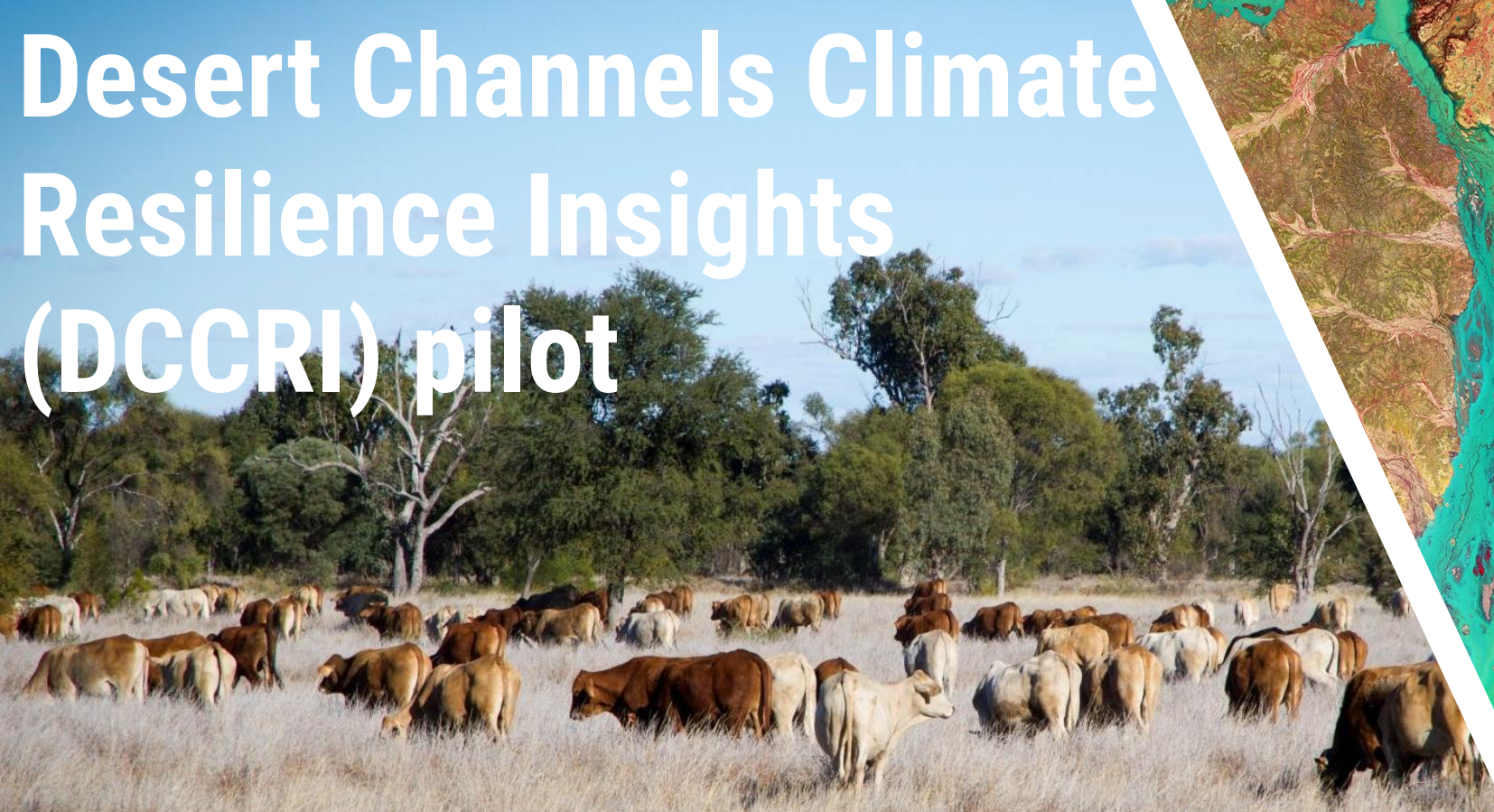
Developing a repeatable and automated process to rapidly map land disturbance across copper and nickel mining deposits in the exploration and construction phases, and categorise the type of disturbed area for rehabilitation and regulatory reporting.



GPOne CONSULTING

Flinders University

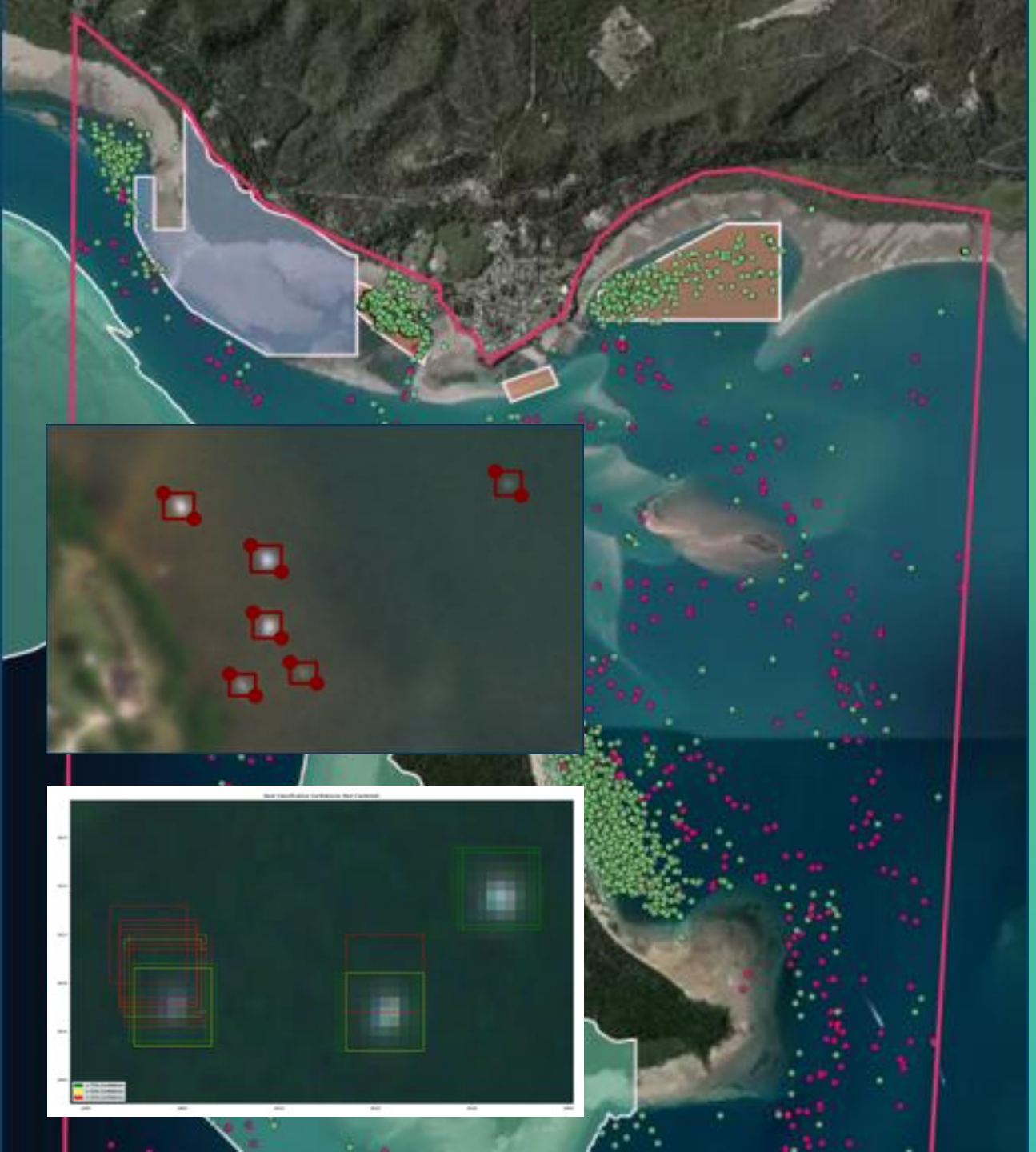
Desert Channels Climate Resilience Insights (DCCRI) pilot



Integrates Earth Observation and localised ground observations to provide near-real-time fine-scale insights for graziers managing arid rangelands, supporting effective drought preparedness, water management, and livestock nutrition planning.

University of Southern Queensland

desert channels QUEENSLAND



QUEENSLAND **EARTH OBSERVATION** HUB

LIVING & PLAYING TOGETHER

VISUALISATION INTERFACE FOR SUSTAINABILITY OF USES & VALUES OF MORETON BAY

- COMBINES REMOTELY SENSED EO & UNDERWATER DATA TO DEVELOP KEY OUTPUTS FOR DIVERSE STAKEHOLDERS
- INTERACTIVE INTERFACE & ASSOCIATED MACHINE LEARNING ALGORITHMS

QUT the university for the real world

The Moreton Bay Foundation

Queensland Government

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Australian Government Department of Industry, Science and Resources

Cooperative Research Centres Program

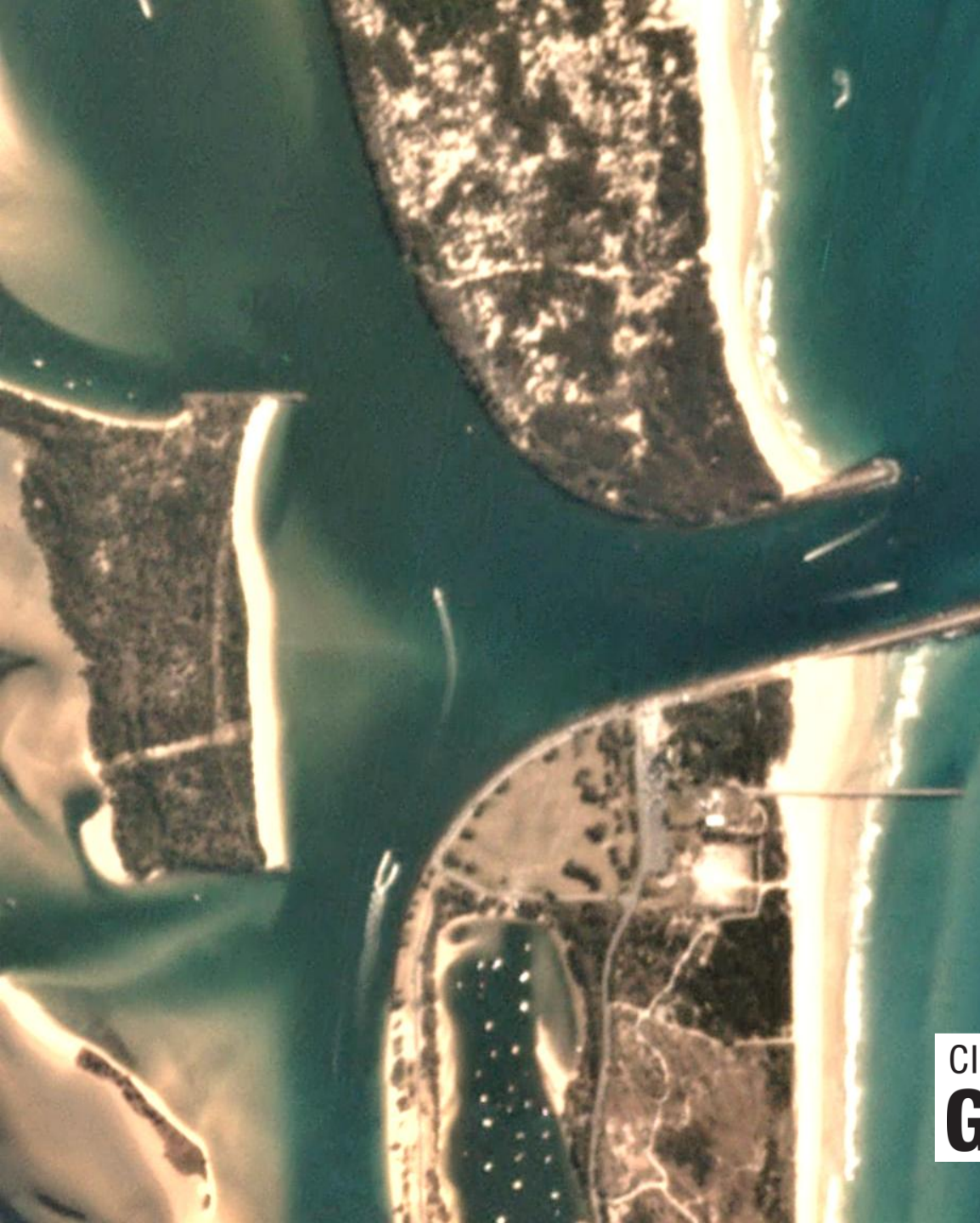
COST-EFFECTIVE AND SCALABLE WOODY WEED MAPPING FOR QUEENSLAND SOFTWOOD PLANTATIONS

Leverages high-resolution satellite imagery, LiDAR, and AI-driven data fusion to detect and map broad-leaf woody weeds in early-stage pine plantations, enabling large-scale weed monitoring and precision weed management .

HQPlantations

University of the Sunshine Coast Australia

geoimage



EARTH OBSERVATION FOR COASTAL MANAGEMENT

Uses Satellite-Derived Bathymetry (SDB) to map underwater topography and sand movement at the dynamic Nerang River Entrance on the Gold Coast. It enables frequent, cost-effective monitoring to support public safety, coastal infrastructure maintenance, surf quality, and tourism.

CITY OF GOLDCOAST.™

Griffith UNIVERSITY

EOMAP

What Have We Seen?

- Connection
- Collaboration
- Innovation
- Real-world Challenges
- Practical Solutions
- Impact
- Growth

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Australian Government Department of Industry, Science and Resources
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Where Next?

- Think about what you need
- Think about what you could do
- Think about who to do it with
- Stay connected with the EO community
- Be ready for the next phase of the EO Hub
- **Stay curious. Stay involved.**
- Think about “If I had a satellite (or 10)”

Reflection

Who have you met today?

Thanks

Join the LinkedIn Group

Our website
smartsatcrc.com/queensland-hub
Or contact
gavin.kennedy@smartsatcrc.com
0413 337 819

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