Earth Observation Platform to Support Pacific Island Nations

Workshop Summary

CSIRO

Australian Government
Geoscience Australia

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE
AMBASSADE DE FRANCE
EN AUSTRALIE

Australian Government
Department of Foreign Affairs and Trade

EUROPEAN UNION
Delegation to Australia

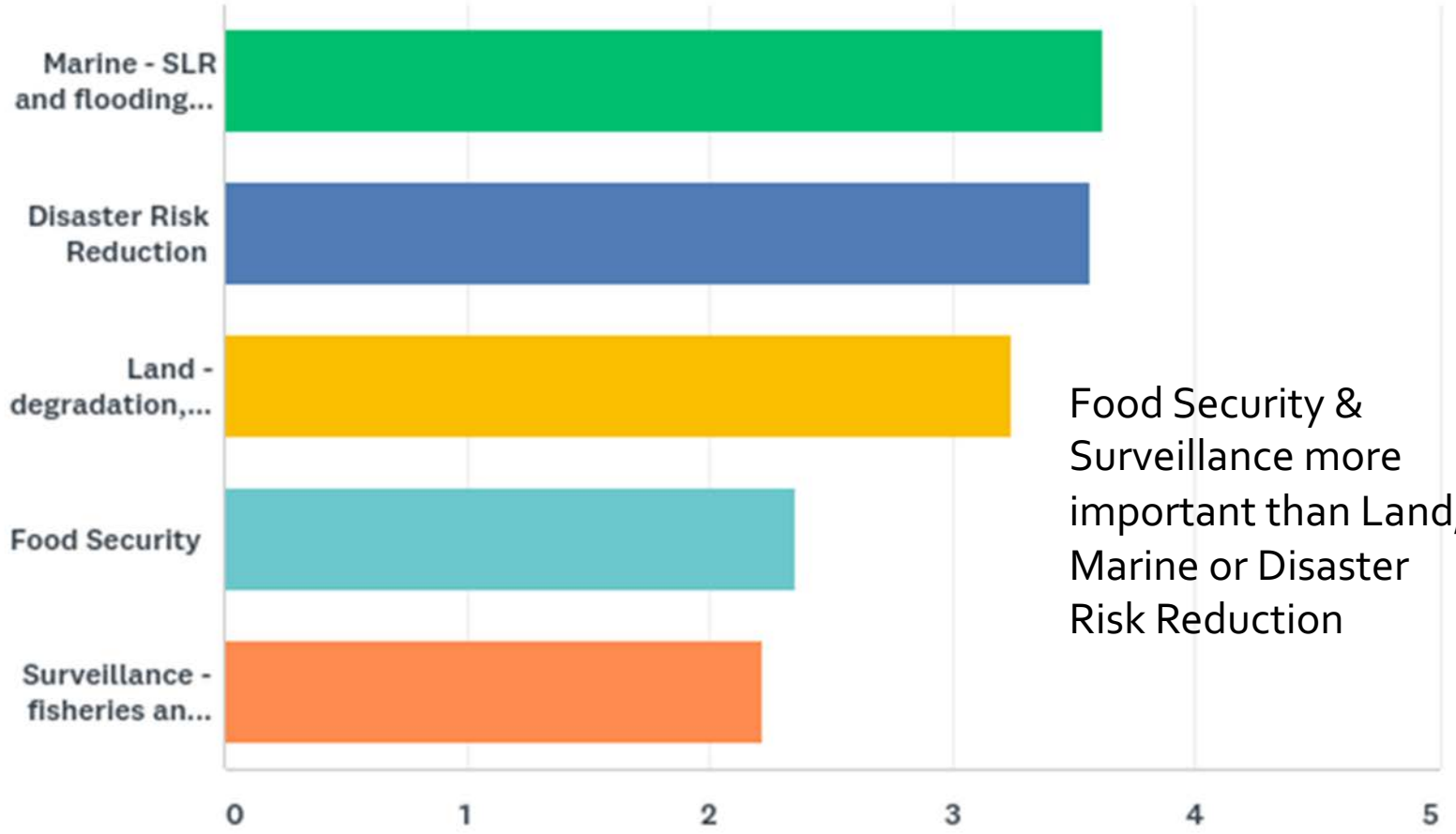
Objectives

- Listen to understand Pacific Island country reality and needs in relation to
  - **Current use** of Earth Observation data
  - Current **expertise / capacity**
  - **Main barriers** to using EO data in country
  - **Questions for EO data providers**
  - **Desired applications** of EO
  - **Assistance required**
- Share some of the possibilities EO holds to contribute to societal outcomes
- Develop an action plan and/or proposals for joint projects
- Communicate this action plan to high-level fora including upcoming CEOS, GEO and APEC meetings.

Participation

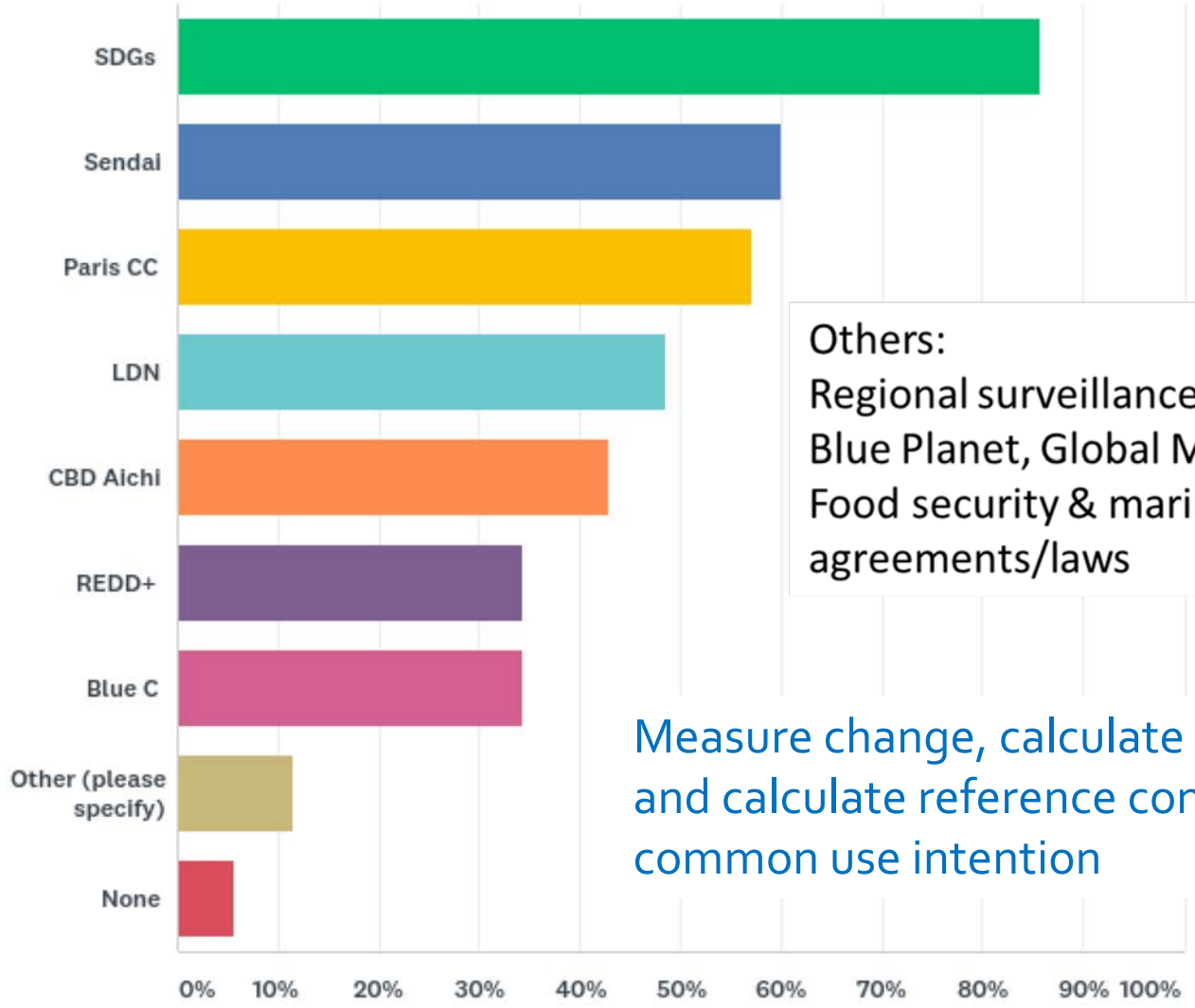
- Pacific Island countries
  - Fiji, Solomon Islands, Tonga, Samoa, Cook Islands, Kiribati, PNG, New Caledonia, French Polynesia
- Regional Coordination bodies
  - FFA – PI Forum Fisheries Agency
  - SPREC – South Pacific Regional Environment Programme
  - SPC – The Pacific Community
- EO Data Providers
  - GEO, CEOS
  - GA, CSIRO
  - NZ CSST
  - CNES, EC, ESA
  - NOAA
  - Japan
  - Airbus, Digital Globe

Use themes



Food Security & Surveillance more important than Land, Marine or Disaster Risk Reduction

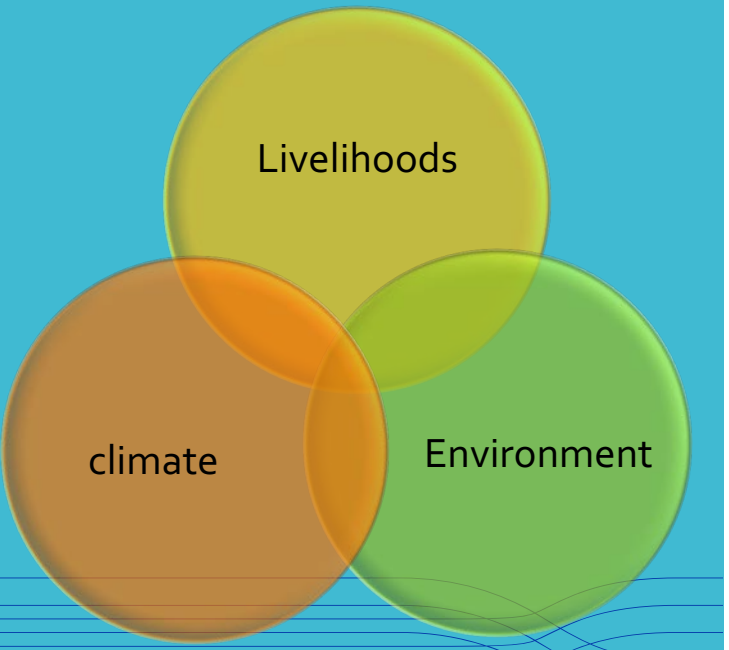
Key Global Initiatives

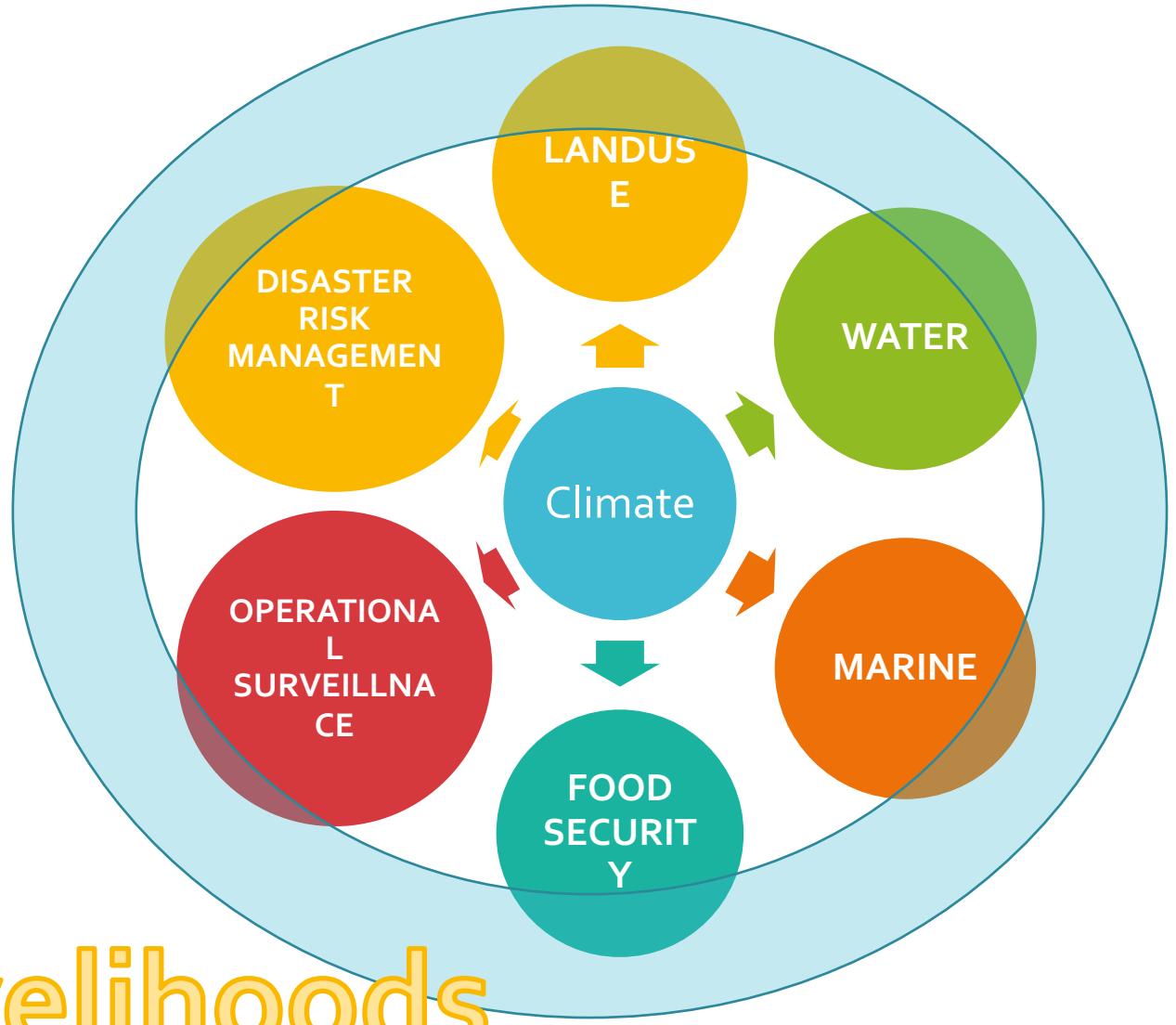


Others:
Regional surveillance, Blue Growth, Blue Planet, Global Mangrove Watch, Food security & marine agreements/laws

Measure change, calculate baselines and calculate reference conditions most common use intention

Why this Workshop?





Livelihoods

A. BUILDING A COMMON UNDERSTANDING

1. Understanding Pacific EO needs
2. Understanding what is possible with EO

B. EXPLORING THEMATIC NEEDS

3. Thematic application of EO to the Pacific Islands
4. From Data to decision-making Products

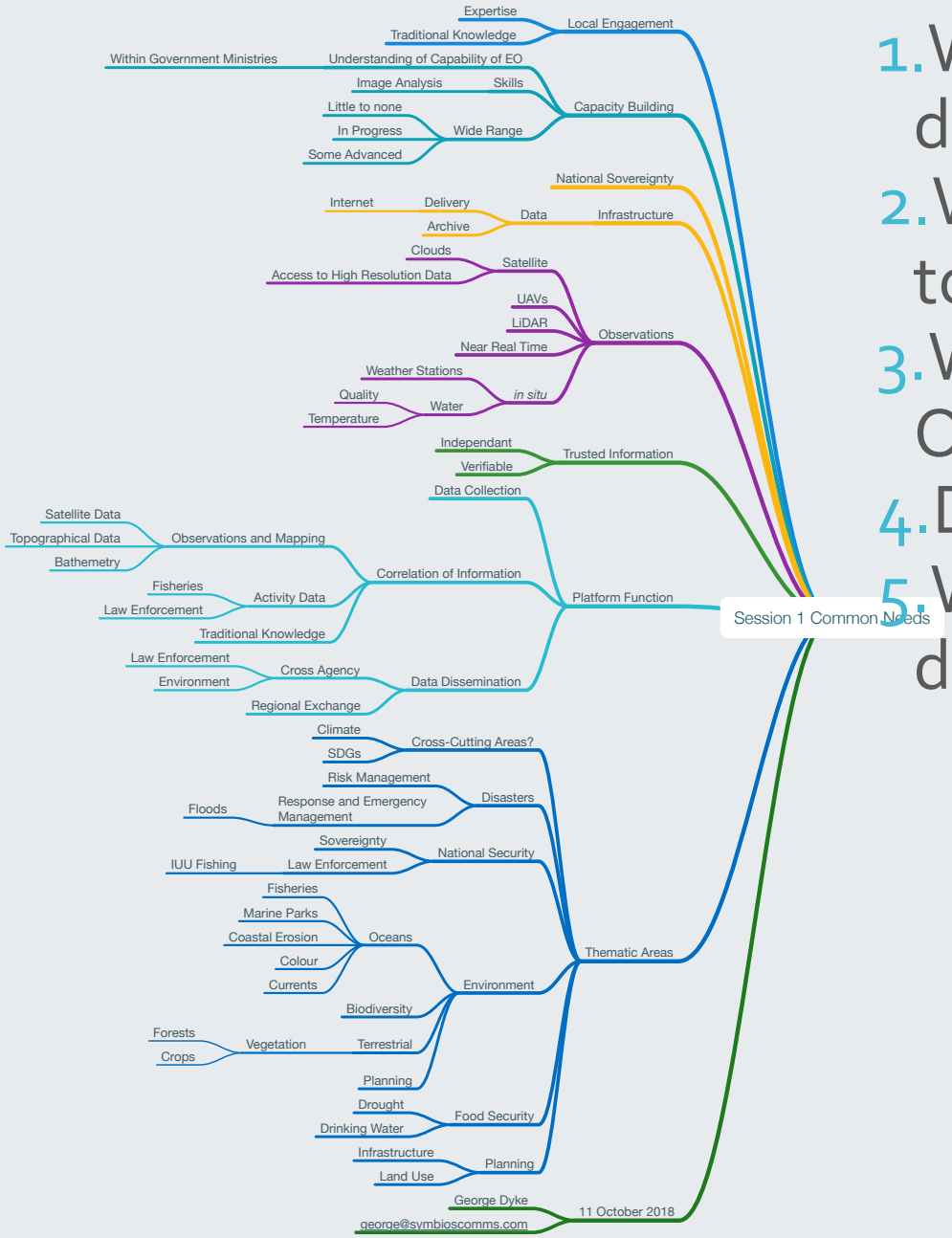
C. BUILDING A PLAN OF ACTION

5. Developing a plan for harnessing EO for Pacific Island Needs
6. Breakout Group presentations on Thematic Plan of Actions
7. The Way Forward

Establishment of an Earth Observation Platform to Support Pacific Island Nation Environmental, Climate and Livelihood Needs

1. What do you **currently use** Earth Observation data for?
2. What current **expertise / capacity** do you have to analyse Earth Observation data?
3. What are the **main barriers** to using Earth Observation data in your country (if any)?
4. Do you have **questions for EO data providers**
5. What would you **like to use** Earth Observation data for, and **how can we help**?

Establishment of an Earth Observation Platform to Support Pacific Island Nation Environmental, Climate and Livelihood Needs



1. What do you **currently use** Earth Observation data for?
2. What current **expertise / capacity** do you have to analyse Earth Observation data?
3. What are the **main barriers** to using Earth Observation data in your country (if any)?
4. Do you have **questions for EO data providers**
5. What would you **like to use** Earth Observation data for, and **how can we help**?

Thematic Discussion (1)

- **Operational Surveillance**
  - Vessel tracking (IUU, illegal fishing)
  - Ocean productivity markers (sea surface temperature, currents)
- **Food Security**
  - Unique crop types differ from global crops such as wheat – global approaches not always useful
  - Rainfed production vulnerable to climate change
  - Vegetation mapping, possible focus on atoll and volcanic growing areas

Thematic Discussion (2)

- **Land**
  - Both land cover and land use
  - Issues around discovery and access for current satellite data sets
  - Industry-linked examples considered
- **Marine**
  - Need to identify appropriate indicators for ocean, reef, mangrove etc. health
  - Diversity of data sources may be required, e.g. satellite, *in situ*, UAV
  - Lack of local statistics

Thematic Discussion (3)

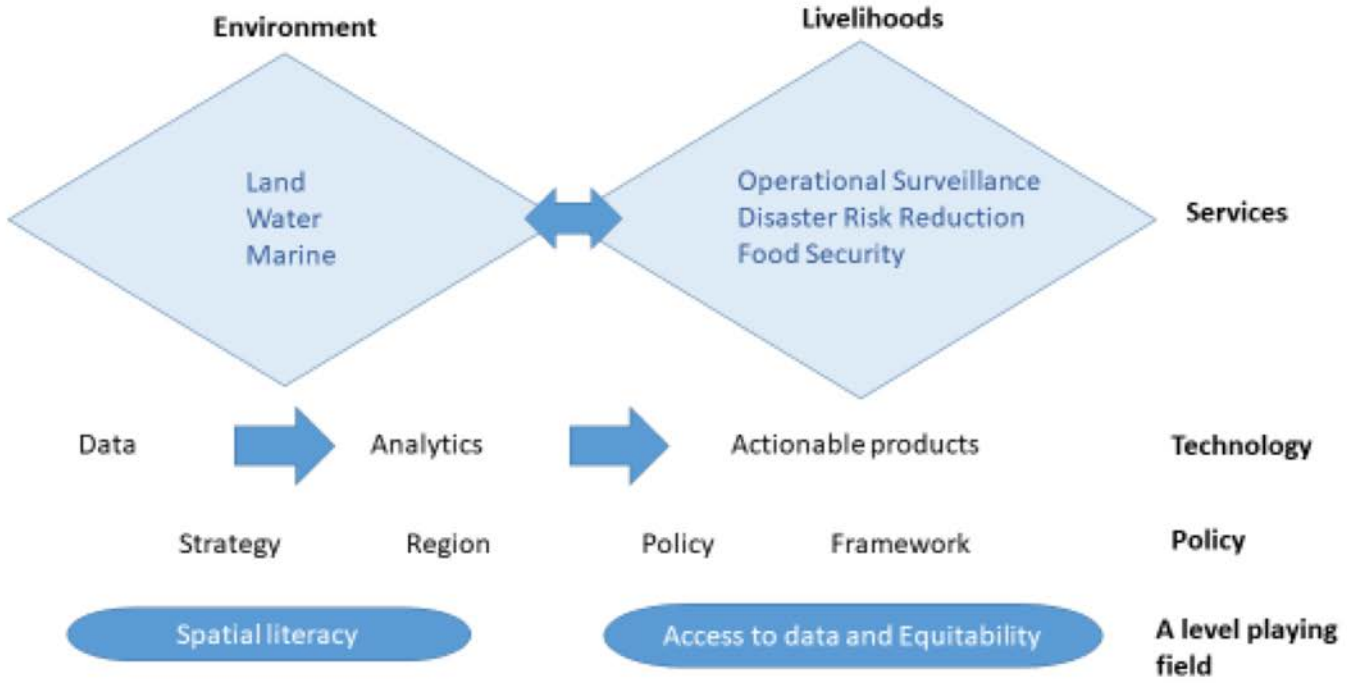
- **Freshwater**
  - 50% of residents lack access to safe drinking water
  - Quantity and quality important
  - Sea-level inundation supply risk
- **Disaster Risk Reduction**
  - Historical experience, forecasting
  - Overcoming cross-jurisdictional boundaries may be helped by external actors
  - Flood, volcano, drought key hazards

Technical Topics and Needs

- **Technology agnostic** solutions
- Data **discovery** and **access**
- **Internet** infrastructure highly variable
- **Finer resolution imagery** (sub 5m, sub 1m)
- Future importance of **machine learning**
- **Need for validation data** clear; role for crowd sourced *in situ* observations?
- **Long term support** and technical **capacity building** required

Platforms

socio-political as well as technological co-designed and developed by PICTS need to harmonise various proposals



Next Steps

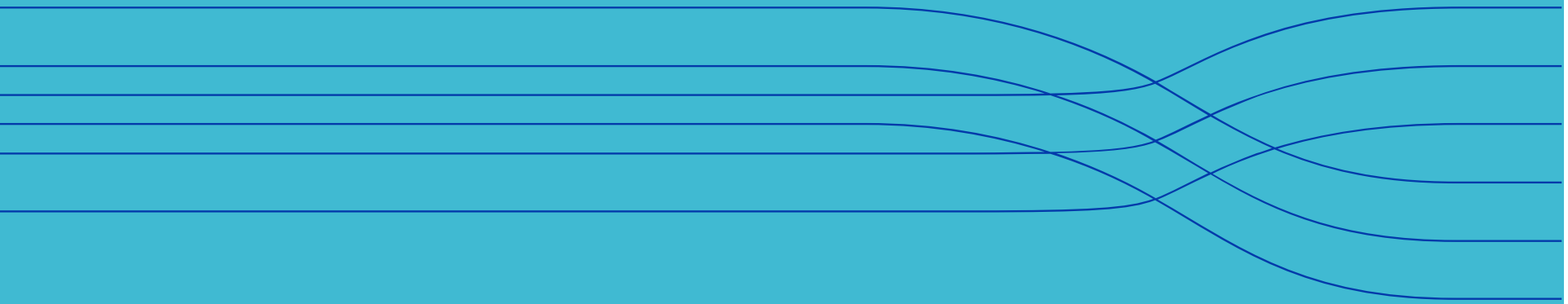
- Develop a **plan of action**
- Consider **approach to funding bodies**
- **Engage GEO** in a dialogue around a 2019 GEO Ministerial focus
- **Engage CEOS** exploring Copernicus coverage in the region (ESA / EC), opportunity for engagement

How Can TG OCI Engage with PICTS to assists with EO Needs?

- OCI is the home for all island related activities undertaken in AOGESS
- Access to high resolution data
- Algorithm development and validation
  - In water properties
  - Habitat mapping
  - Atmospheric Correction
  - Vicarious calibration

Session 4: From Data to decision-making products

Work groups



CSIRO

Australian Government
Geoscience Australia

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE
AMBASSADE DE FRANCE
EN AUSTRALIE

Australian Government
Department of Foreign Affairs and Trade

EUROPEAN UNION
Delegation to Australia

1. Capability Building

2. Infrastructure Requirements for EO data

3.Informing Sustainable Development Goal (SDG) Indicators

4. Research Needs and Validation of EO Data

5. Information sharing Open Data and Platforms

6. Role of Citizen Science

- **Information sharing**
- **Open Data (also proprietary, security/ sovereignty and commercial data)**
- **Platforms**

Facilitated by Matt Paget (CSIRO) and Richard Moreno (CNES)

Guidelines

- Current situation
- Constraints and Limitations
- Objectives and Needs
- Opportunities and Solutions

Information sharing

Current status

Catalogs – who to ask?

Regional networks

- Communities of users
- Intermediary experts (companies)

Challenges / opportunities

Trust

- Provenance
- Sovereignty + security
- Quality
- Attribution

Not sharing data

- Between agencies and countries
- Value recognition (value proposition)
- Capacity

Open Data
also proprietary, security/ sovereignty and commercial Data

Current status

EO medium resolution

- Easy enough (if you know how)

EO high resolution > challenges

- Cost > focused areas/activities, on-demand
- Managing local-collected data > capacity

Challenges / opportunities

EO / Spatial companies and expertise

- Critical, intermediary role
- Collate and assess
- Technical capacity

Help desk

- Community of practices
- Case studies using data sets

Govt. (open) data policies

Platforms

Current status

GIS software and tools

GeoNode

- Rolled out to some countries > maintenance

Inter-agency sharing

- Environmental Management Information System (Kiribati example)

Challenges / opportunities

Which data to use?

- Relevant, validated, trusted
- (match maker)

Regional partnerships

- Critical
- Coordination and communication

Overview

- Consultation workshop on **an EO platform to support Pacific Island Nations** held jointly by Australia and France in Brisbane last week 11-12 Oct
  - Eight Pacific Island countries (nine invited)
  - CSIRO, GA, CNES, and NOAA all represented
  - Broader Australian and French government representatives including the French Ambassador to Australia
- Strong thematic interest including **land, oceans, Climate and SDGs**
  - Fisheries, law enforcement, sea level, disasters, food security, water
- **Opportunity to promote EO uptake** in a region which is generally underrepresented in a lot of CEOS and GEO activities
- **Challenges**
  - Knowledge of EO data, capabilities, limitations
  - Fostering cross-regional coordination
  - Capacity Building
  - Satellite coverage, e.g. Copernicus
- **GEO Ministerial 2019** a potential milestone

Objectives

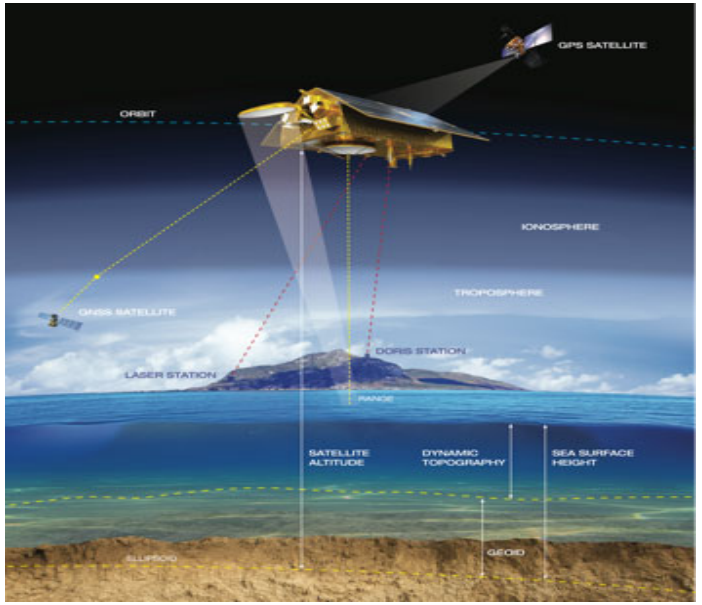
- Identify the needs of the Pacific Ocean nations and regional organisations in relation to EO data for reporting on progress towards their agreed SDGs
- Identify areas of common interest and expertise between Australia, New Zealand, UK, France and the EU in Earth Observation for the SDGs
- Develop an action plan and/or proposals for joint projects to help meet the needs of the Pacific and Indian Ocean island states, and develop key enabling capacities in the region based on the common interests of EO providers.
- Communicate this action plan to high-level fora including upcoming CEOS, GEO and APEC meetings.

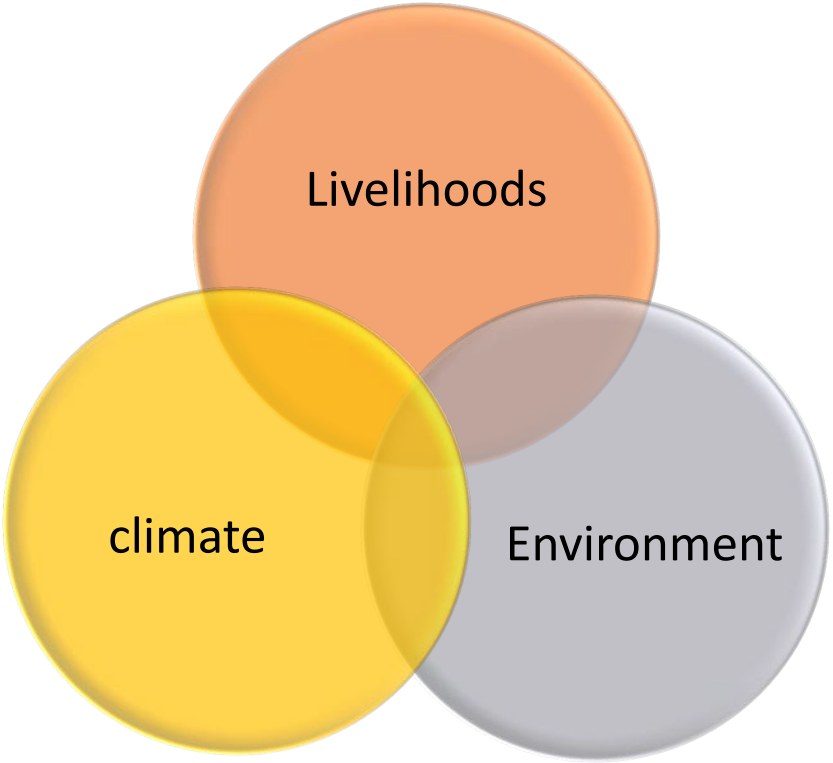

CSIRO
Australian Government
Department of Foreign Affairs and Trade
RÉPUBLIQUE FRANÇAISE
Ambassade de France en Australie
Copernicus

Attendees

Program Format

Why this Workshop?





Platform

1. A raised level **surface** on which **people** or things can stand.
2. A declaration of the **principles** on which a group of **persons** stands.
3. A group of **technologies** that are used as a base upon which **other applications** or processes **are developed**.

What are we going to do?

A. BUILDING A COMMON UNDERSTANDING

1. Understanding Pacific EO needs
2. Understanding what is possible with EO

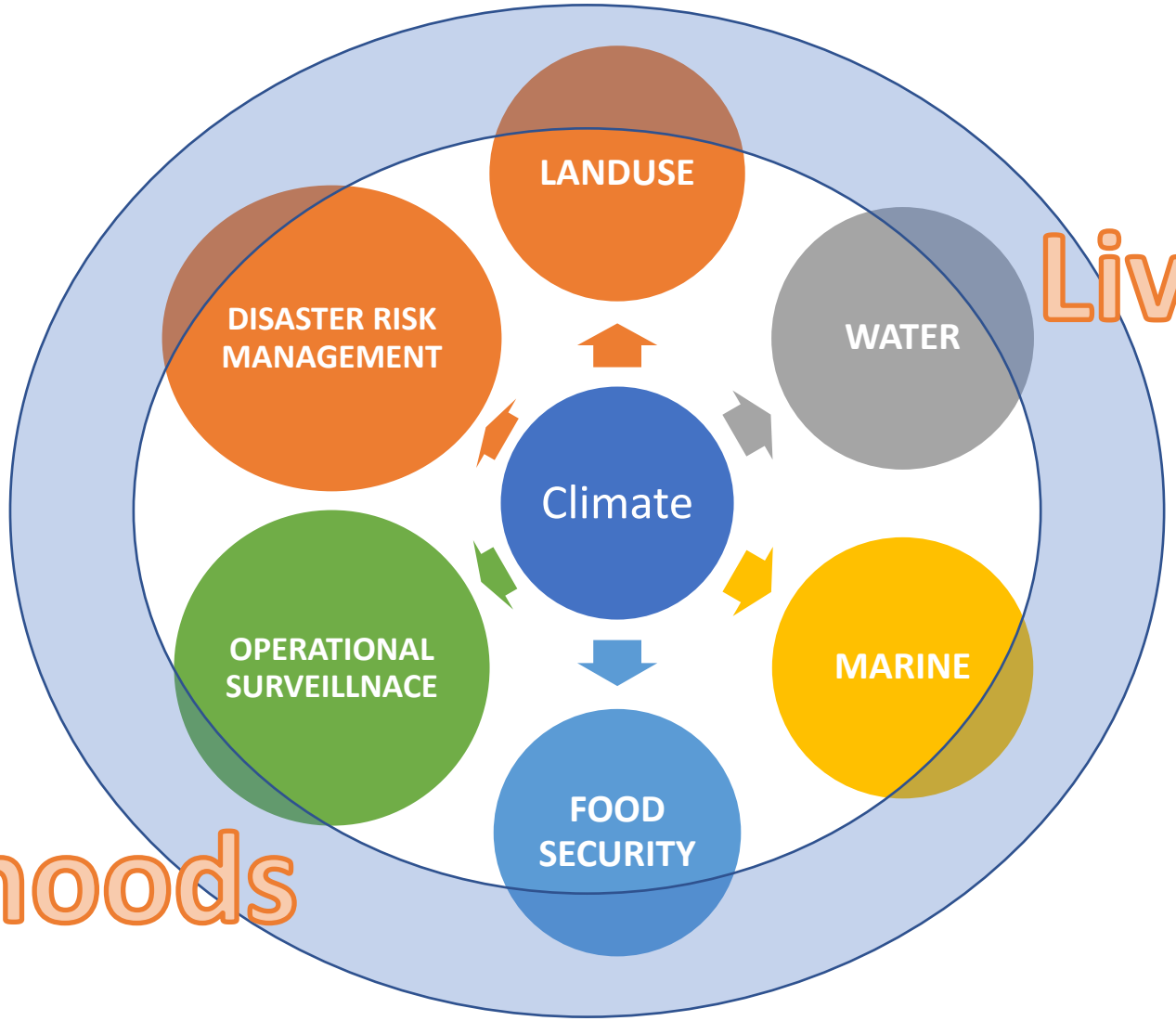
B. EXPLORING THEMATIC NEEDS

3. Thematic application of EO to the Pacific Islands
4. From Data to decision-making Products

C. BUILDING A PLAN OF ACTION

5. Developing a plan for harnessing EO for Pacific Island Needs
6. Breakout Group presentations on Thematic Plan of Actions
7. The Way Forward

What Issues are we going to Talk about?



Livelihoods

Livelihoods

- **COOK ISLANDS**
- Mr Timoti Tangiruaine

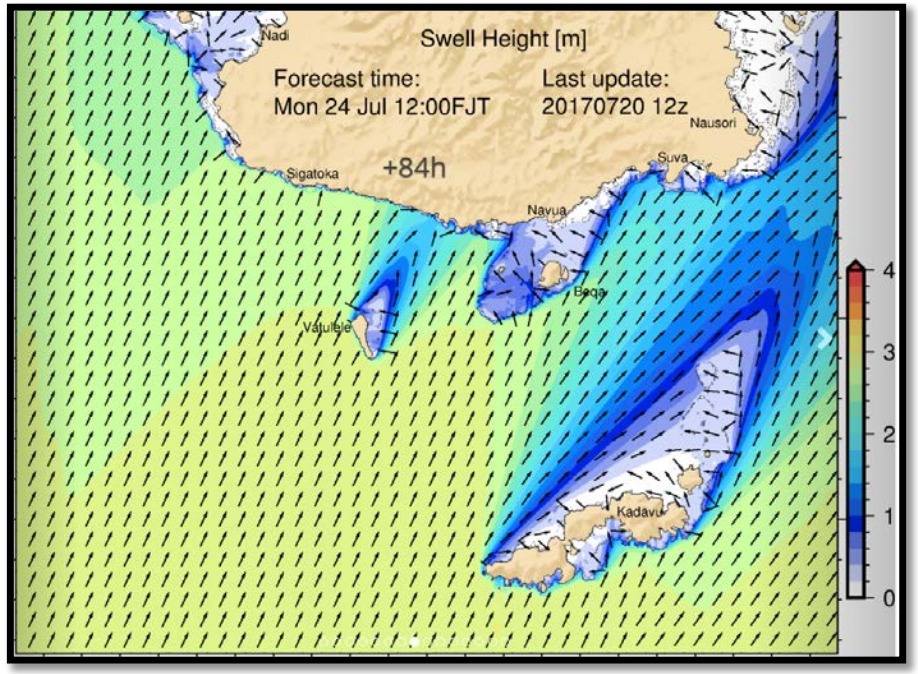
- Kiribati

New Caledonia
French Polynesia
Samoa
Fiji
Cook Islands
Kirbati
Solomons

Maritime and oceans

10 **Current projects** on:

- Coastal Inundation Hazard Assessment
- Coastal Monitoring
- Risk Assessment
- Early warning / Inundation & impact forecasting
- Capacity Building on Oceanography



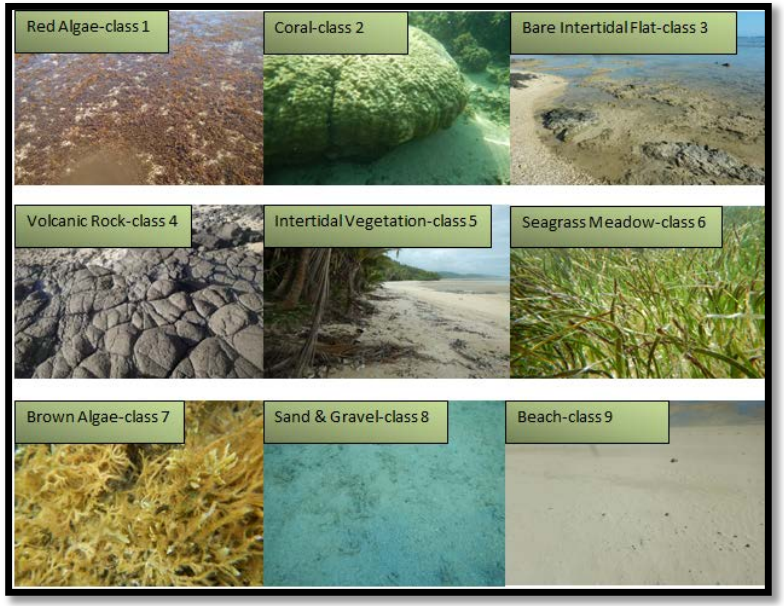
Skills:

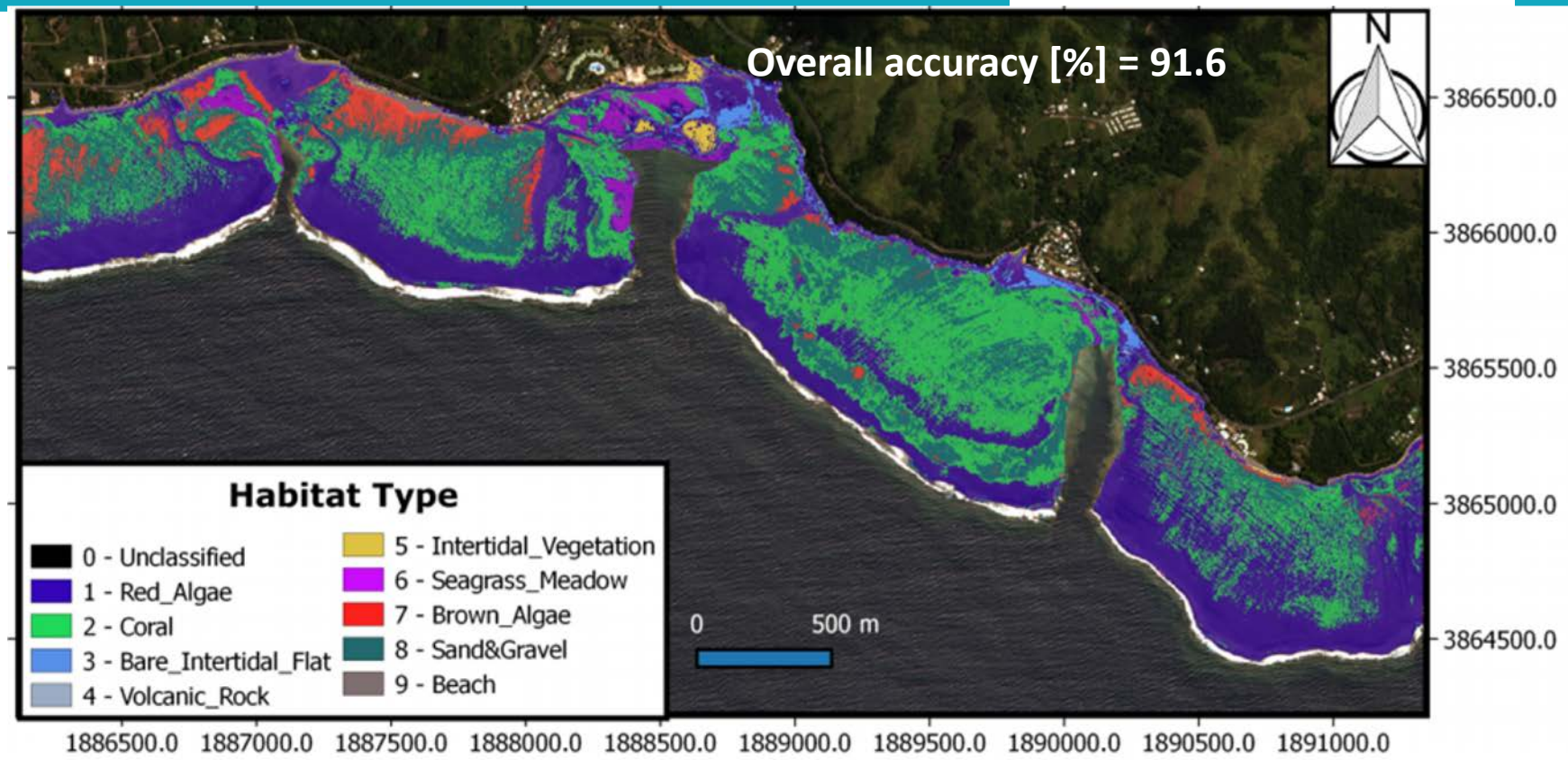
- Numerical Modelling of Wave, Current, Inundation, etc…
- Statistical & Probabilistic Analysis
- Machine Learning
- Tool development
- Risk Assessment
- Remote Sensing & GIS
- Data collection:
  - Oceanographic data (Including wave buoys)
  - Topography data (Drone and GNSS)
  - Bathymetry (Echosounder)
  - Post disaster survey / hazard & impact data

Marine Habitat Mapping

Using Semi-Automatic classification

Pacific Community
Communauté du Pacifique

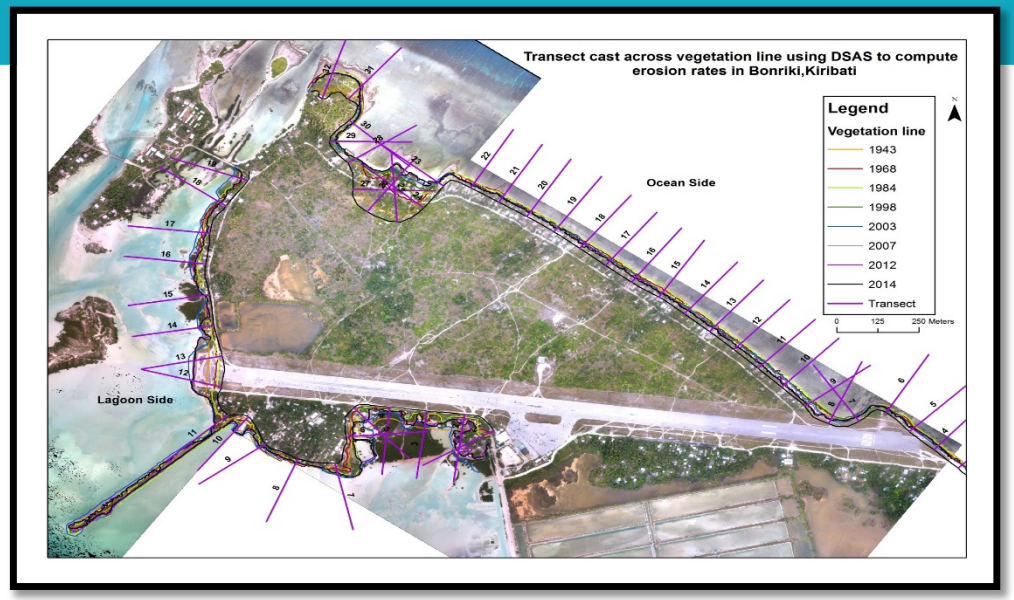


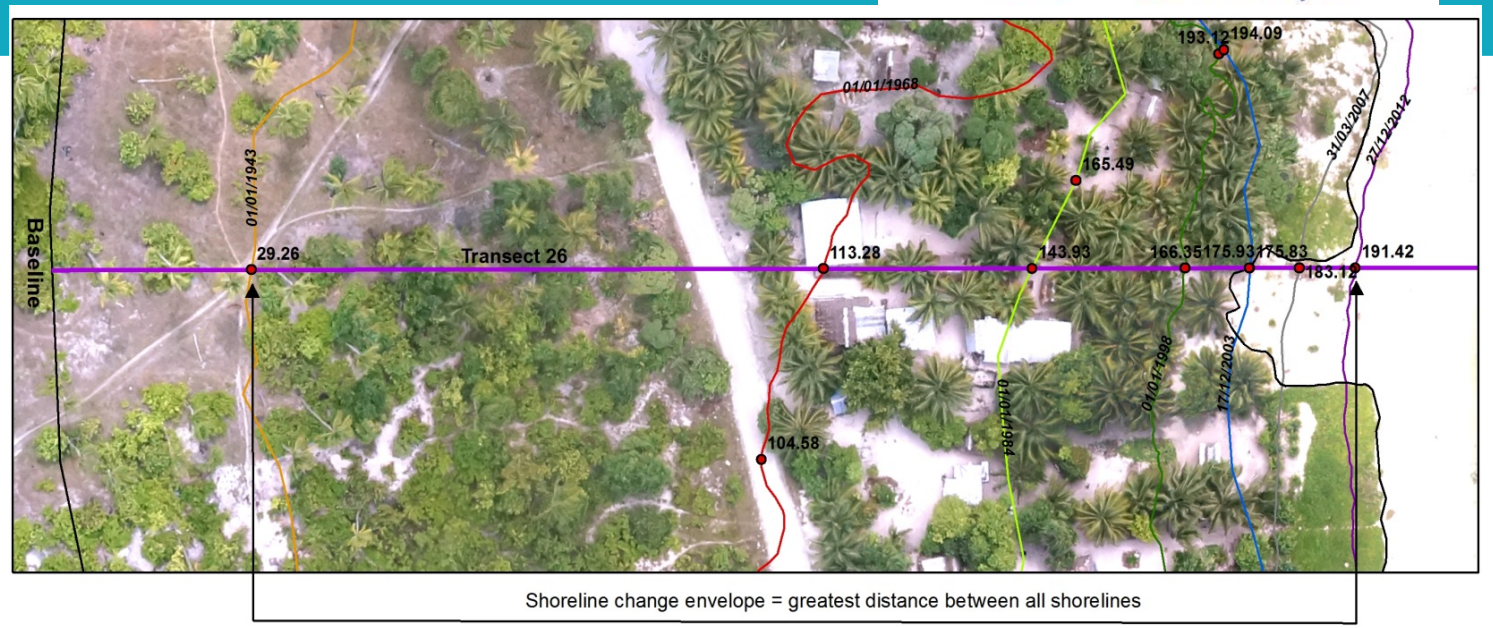


Habitat Map of Komave, Coral Coast, Fiji

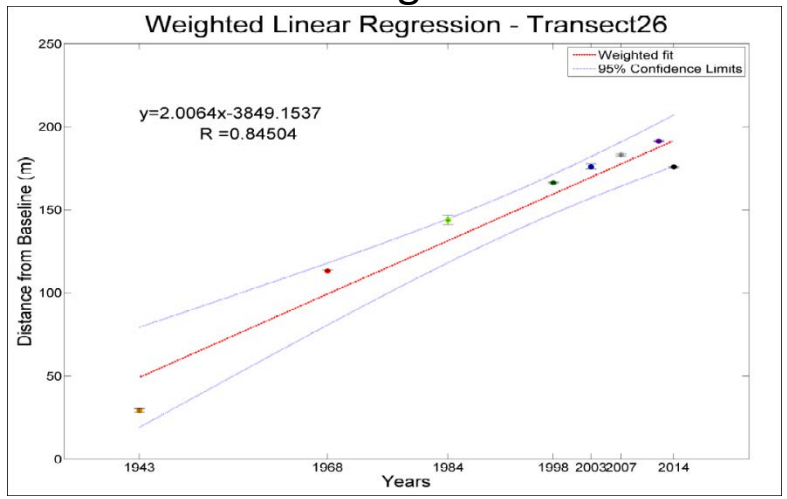
Shoreline Change Analysis

Using image interpretation and open source tools





Assess rate of change for each transect



2m accretion/year since 1943

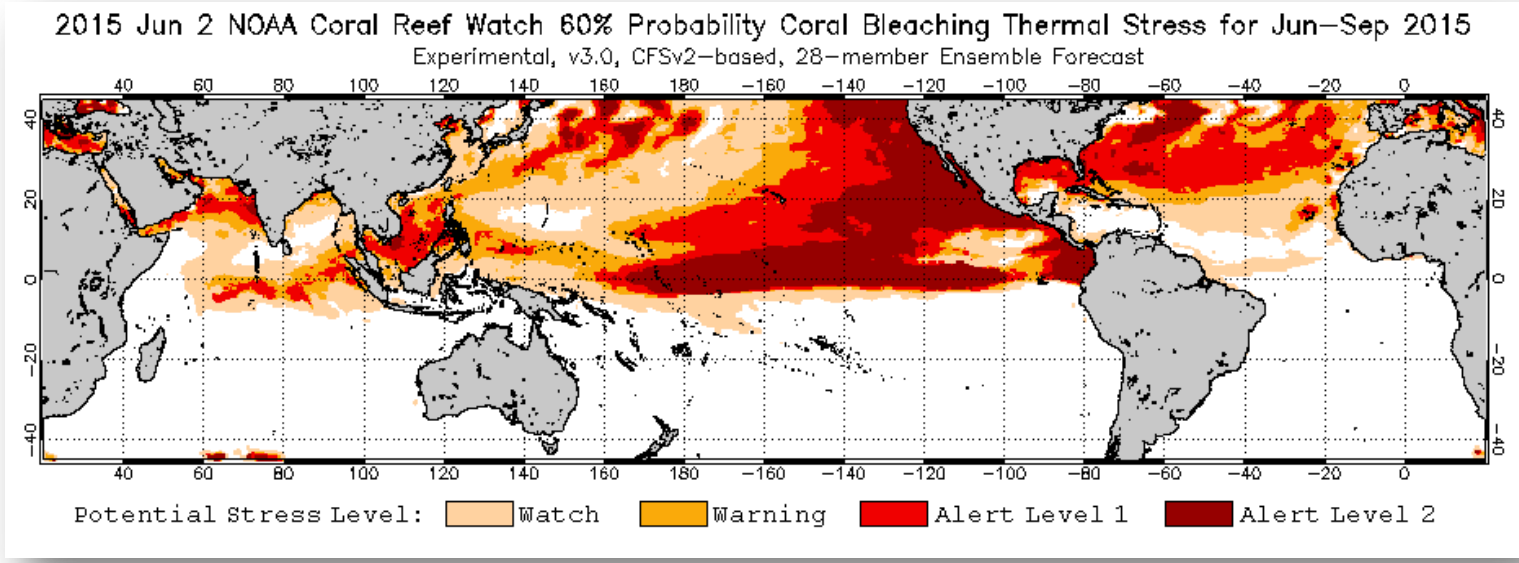
Disaster Event Response

Pacific Community
Communauté du Pacifique

Infrastructure Damage Assessment using Digital Globe FirstLook Imagery:
6 – 12 Hr Post-Event
http://services.gsd.spc.int/gita

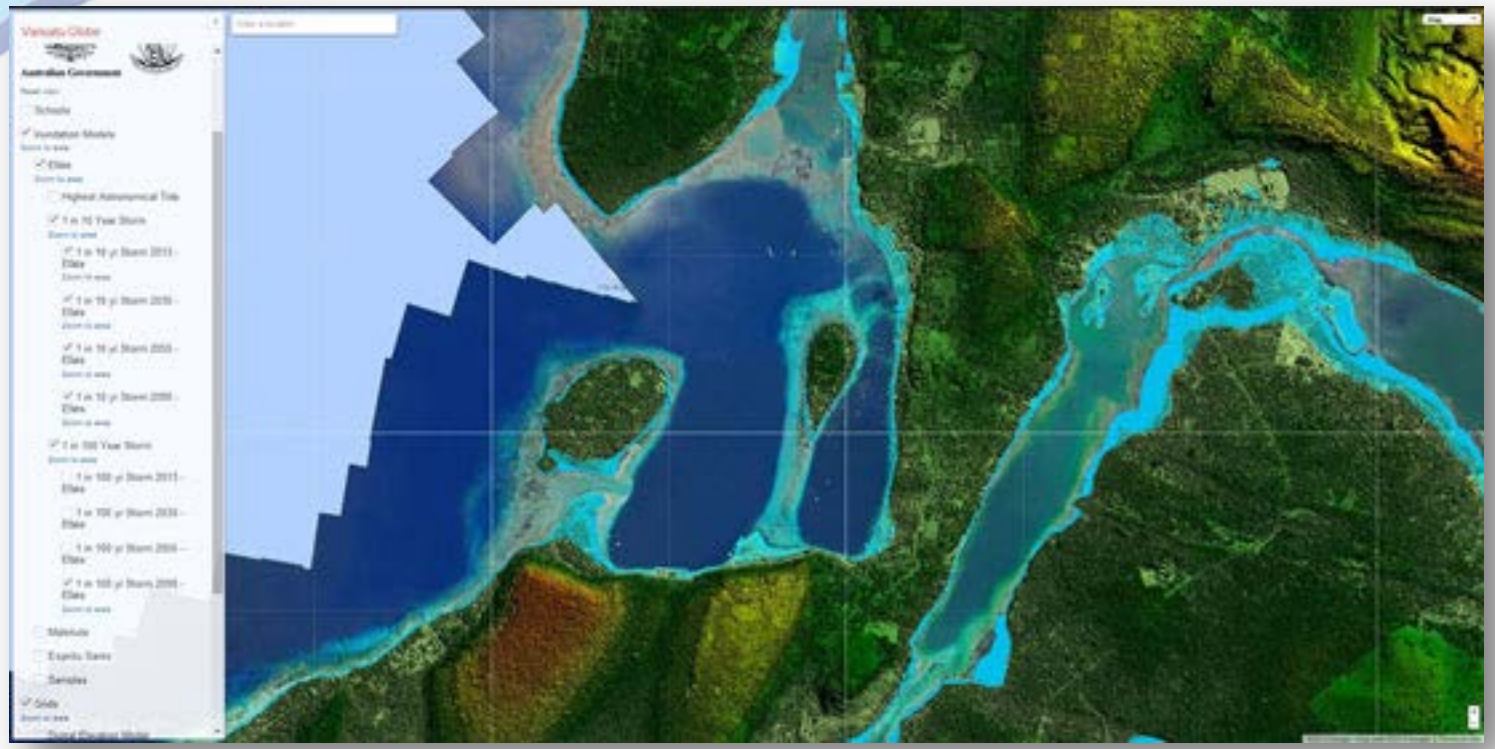
Climate Change 1

Under the Van-KIRAP project (GCF funded), EO data is being used to assess historical coral bleaching events in order to predict future bleaching events – Data provided by NOAA (Coral Reef Watch).



Vanuatu and Regional

Climate Change 2



Coastal LiDAR across Vanuatu in order to develop a baseline future monitoring for coastal erosion and SLR. (Build on airborne LiDAR captured by AAM in 2012).

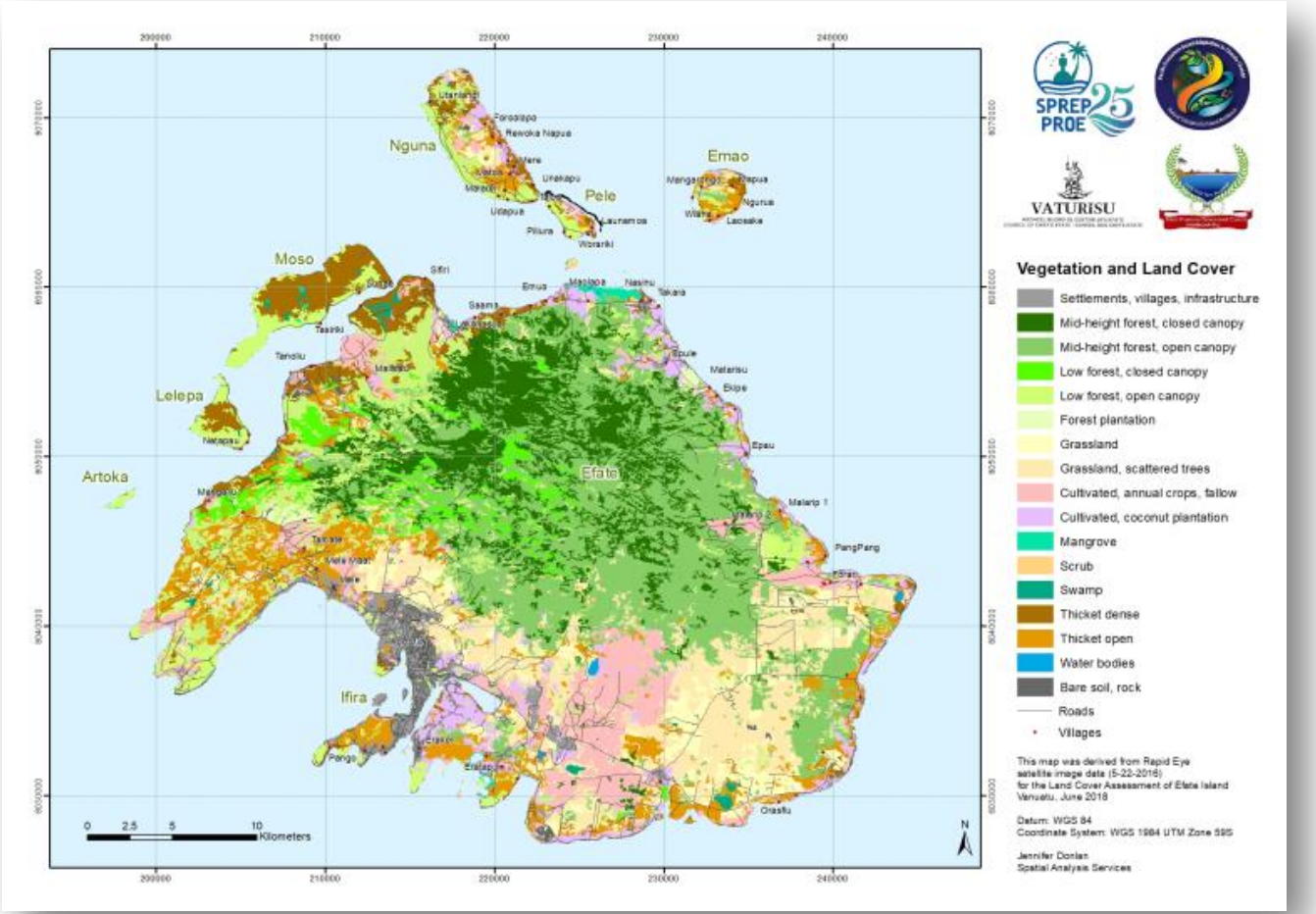
Islands and Ocean Ecosystems 1

Land cover mapping for:

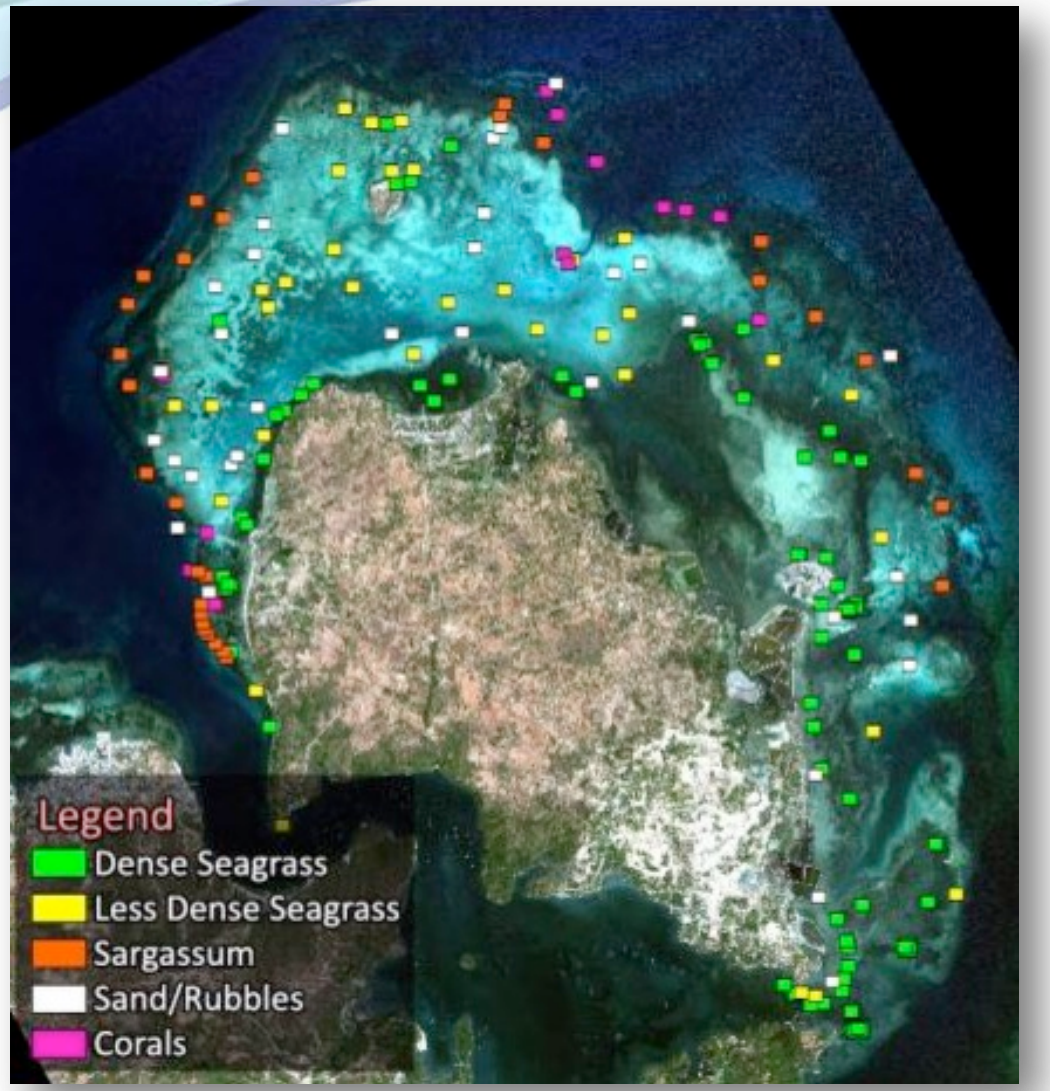
- LULC Change,
- Ecosystem Service mapping (carbon),

Using RapidEye data.

Taviuni – Fiji, Tanna and Efate – Vanuatu, Wagina and Honiara – Solomon Islands



Islands and Ocean Ecosystems 2



Coastal Ecosystem Mapping for:

- Coastal blue carbon assessment,
- Reef condition,
- Marine spatial planning.

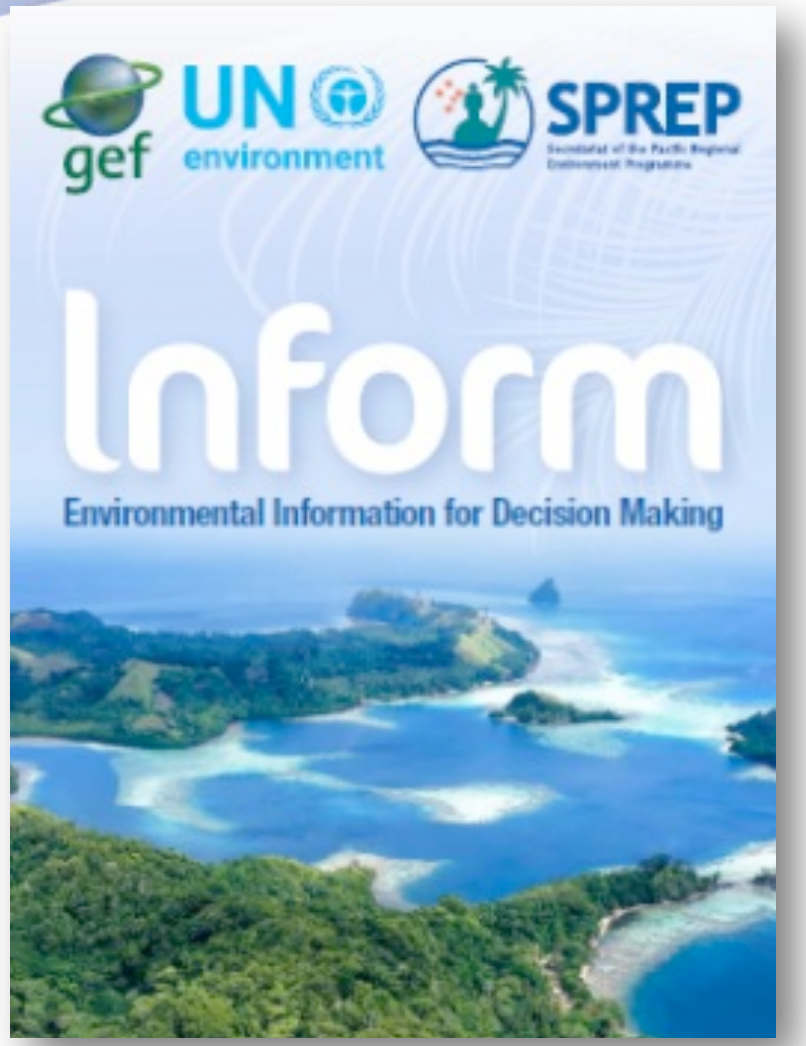
Melanesia

Waste

Monitoring seagrass as an indicator of water quality and sedimentation. Using Sentinel data for coarse assessment and drones for detailed assessment. Partnering with CEFAS.

Vanuatu and Solomon Islands

Environmental Governance



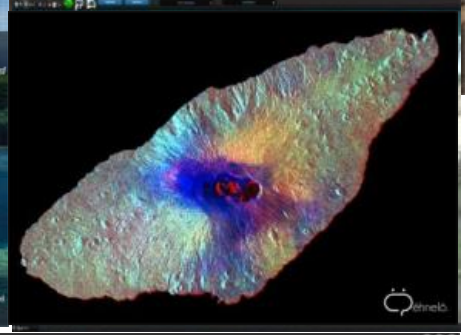
Inform Programme

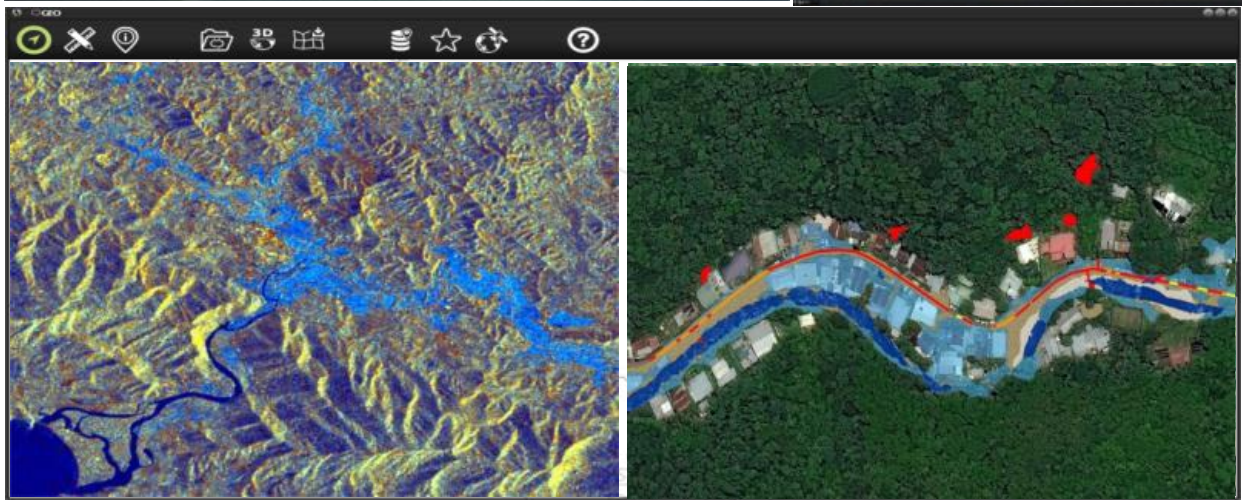
Inform will help Pacific islands have reliable access to their own national datasets for environmental information, as well as a process and guide for information use standards.

Inform will work in the Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Republic of the Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu.

DISASTER EMERGENCY

Vanuatu, French Polynesia, New Caledonia, PNG...

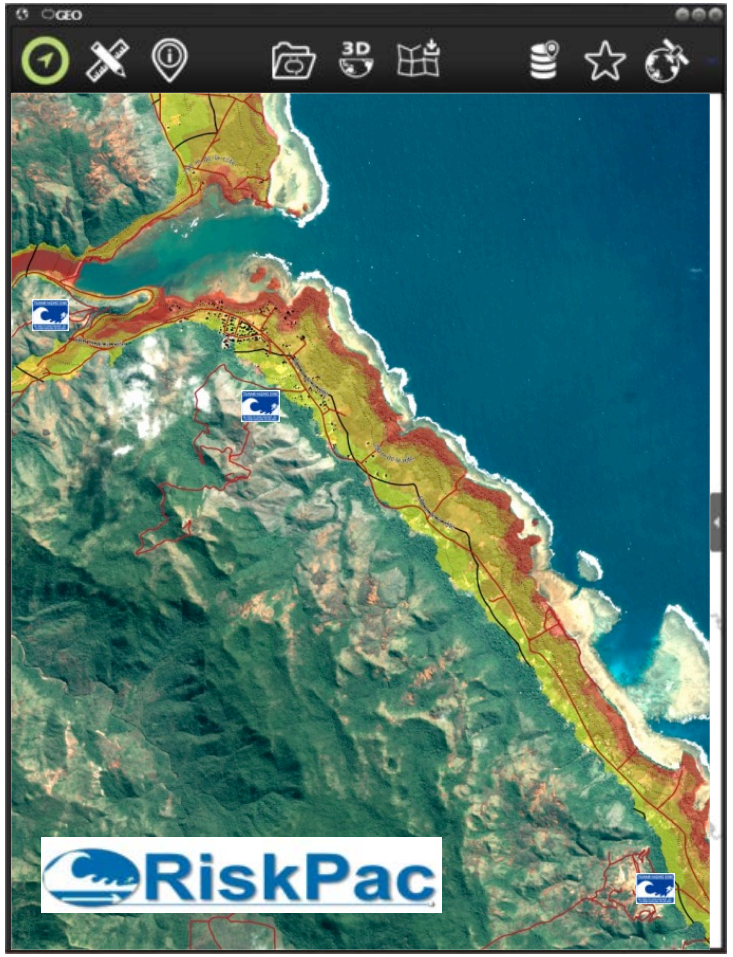




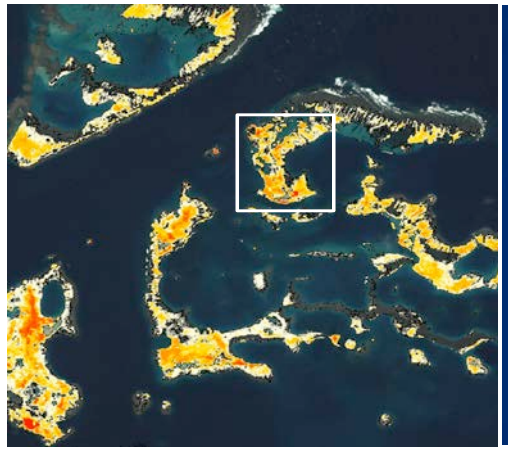
LAND & MARINE APPLICATIONS

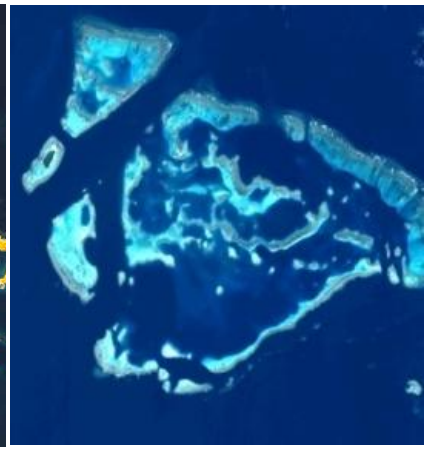
QHub New Caledonia

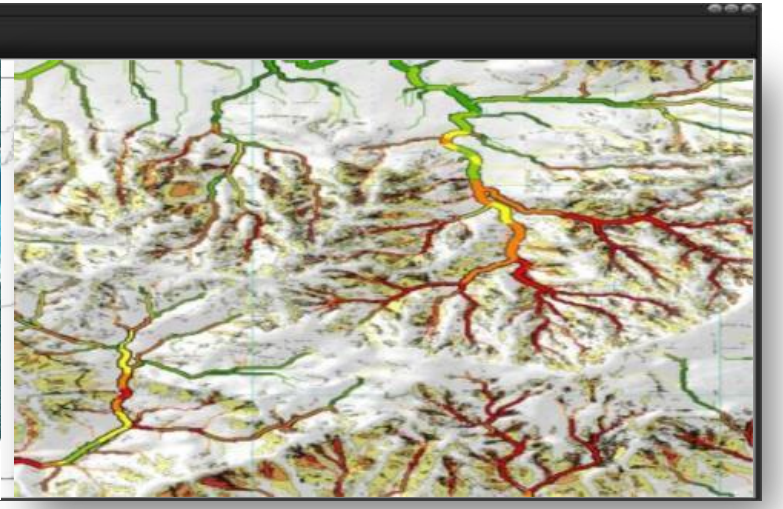
Disaster management



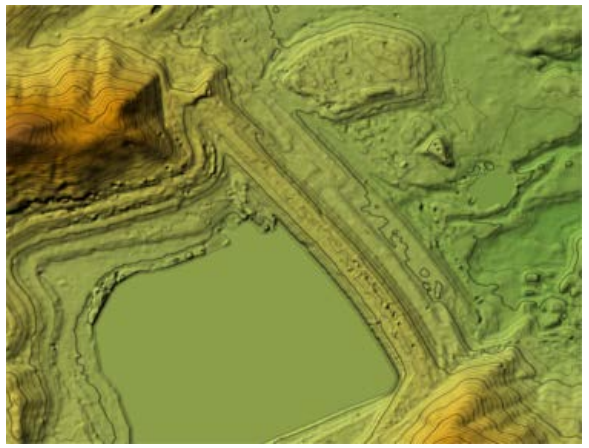
Coastal and lagoon monitoring





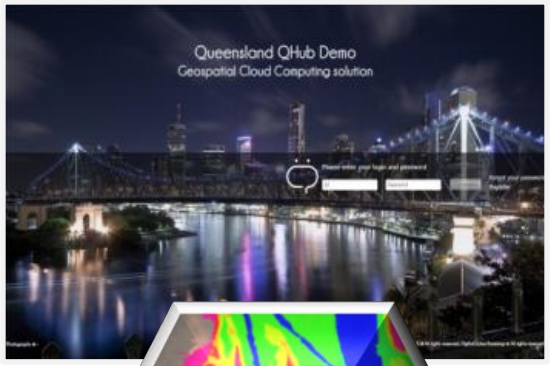


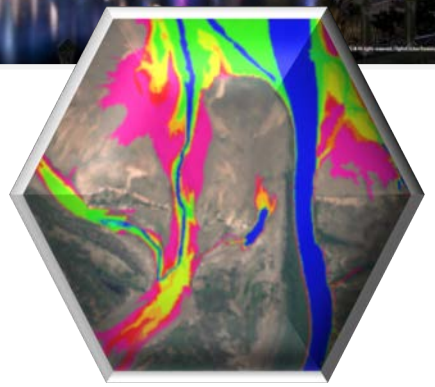
Erosion assessment



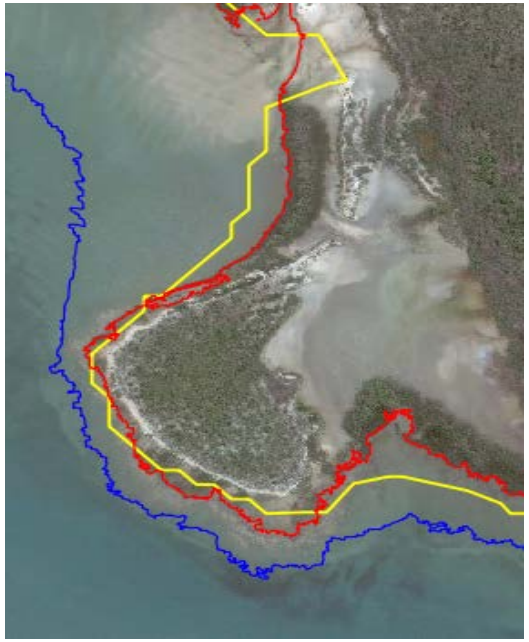
HIGH PRECISION COASTLINES AND COAST CHARACTERIZATION

QHub Queensland, Northern Territories & Worldwide





Below, in comparaison with SRTM



HIGH PRECISION COASTLINES AT GLOBAL SCALE or how to exploit terabytes of very high resolution satellite imagery in the cloud to analyse coastlines at a country scale - By Rémi Andreolin

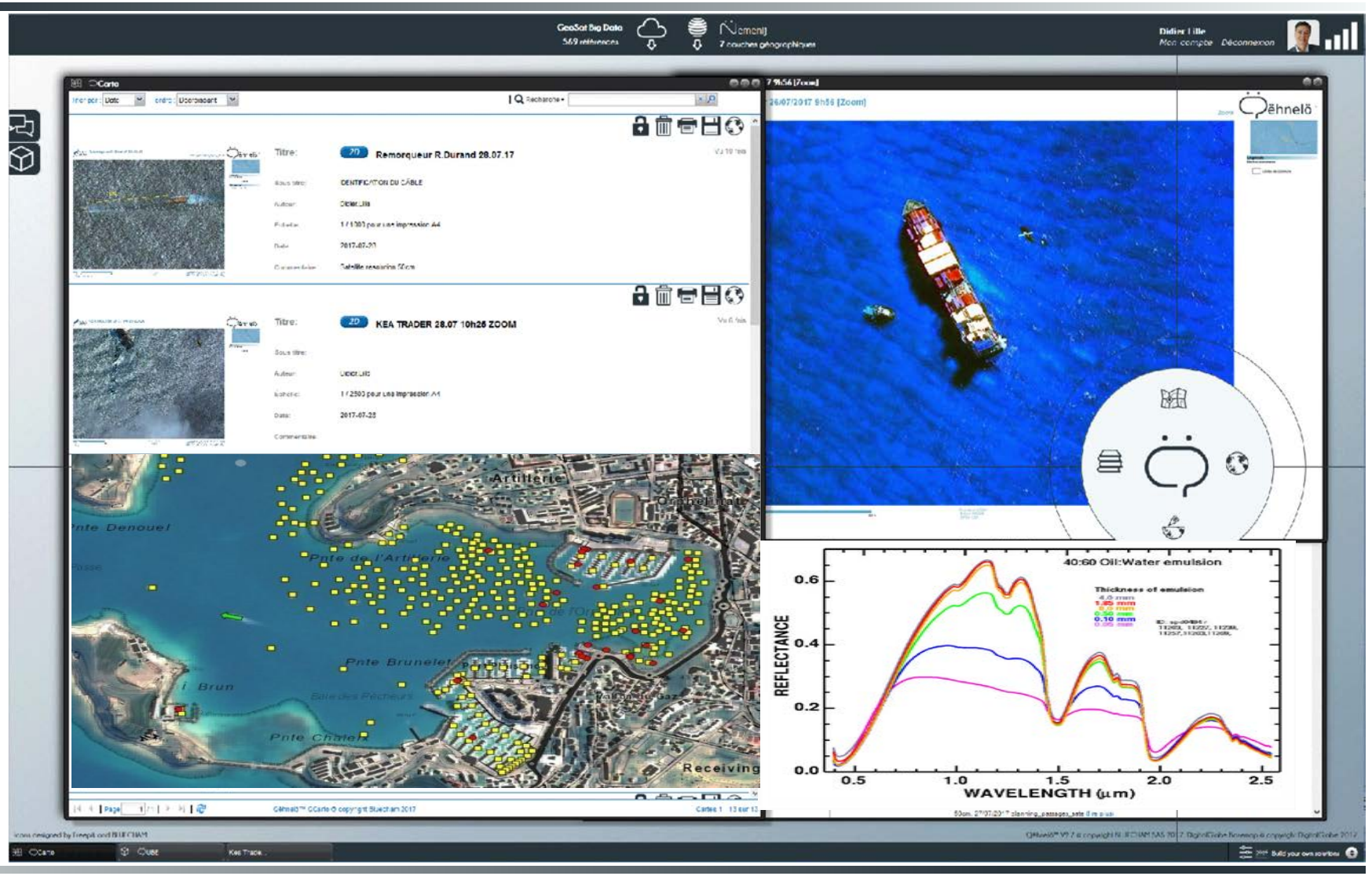
Littoral is not a well-known zone. However, 66% of the world population resides less than 100km from coastlines and 7 of the world's 10 largest agglomerations are on the coast ; the coast is an interface between the Ocean and the Earth; It is a place of exchange and economic development. In the context of climate change, coastal management is a global issue. The existing data doesn't actually allow to respond to present needs: information is either accurate but sparse, or dense and mostly inaccurate.

BLUECHAM has thus developed a scientifically-controlled algorithm to analyse very high resolution data of the DigitalGlobe's GBDx Platform to assess the low, high and intermediate water marks and the variations of the sea level within the intertidal zone.

HIGH PRECISION TIDAL WATER VARIATIONS

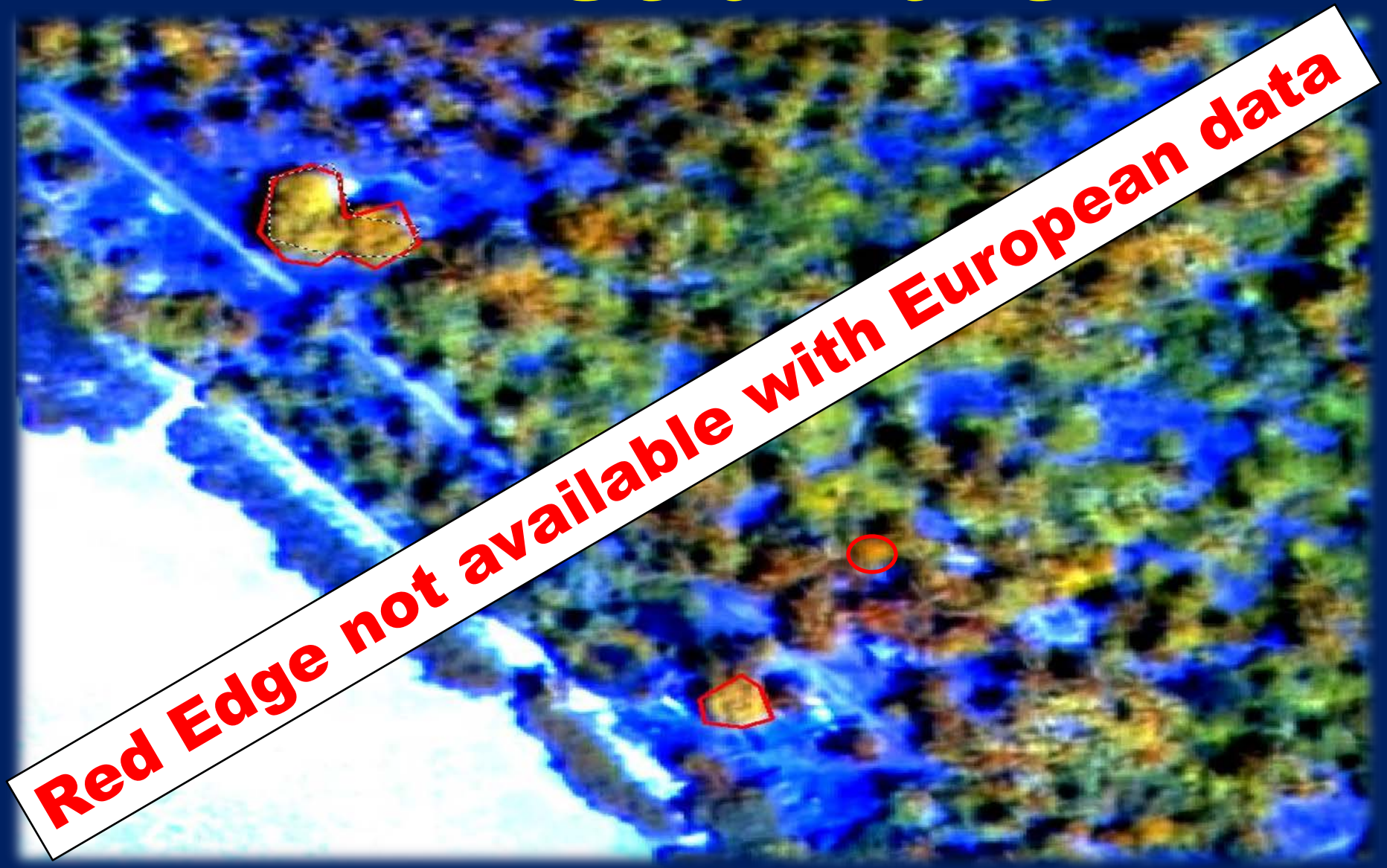
OPERATIONAL SURVEILLANCE APPLICATIONS

QHub New Caledonia



African tulip
Spathodea campanulata

Breadfruit



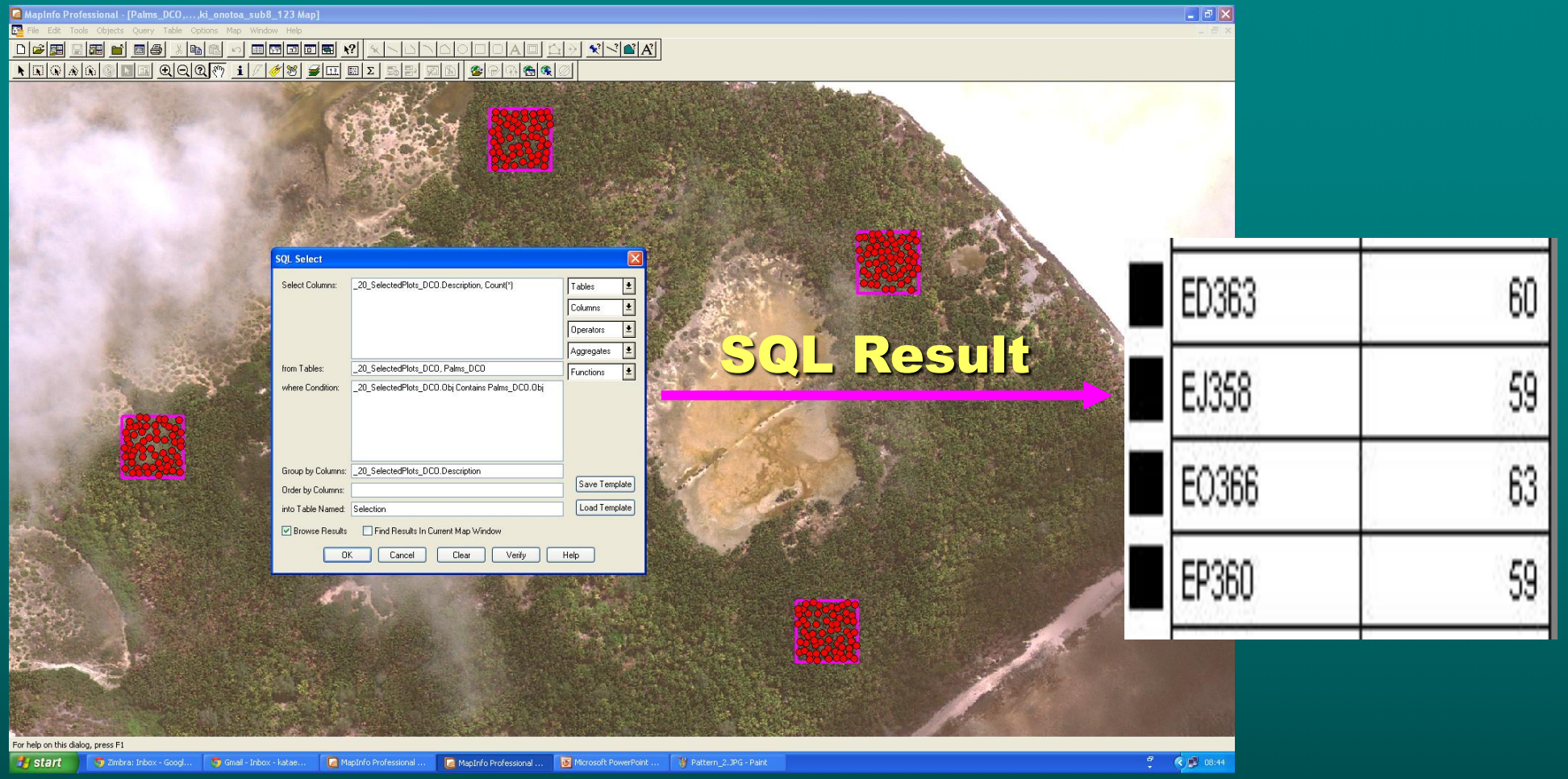
Near Infra-Red 1, Red Edge and Red

Bands: 8,6,5 Enhanced

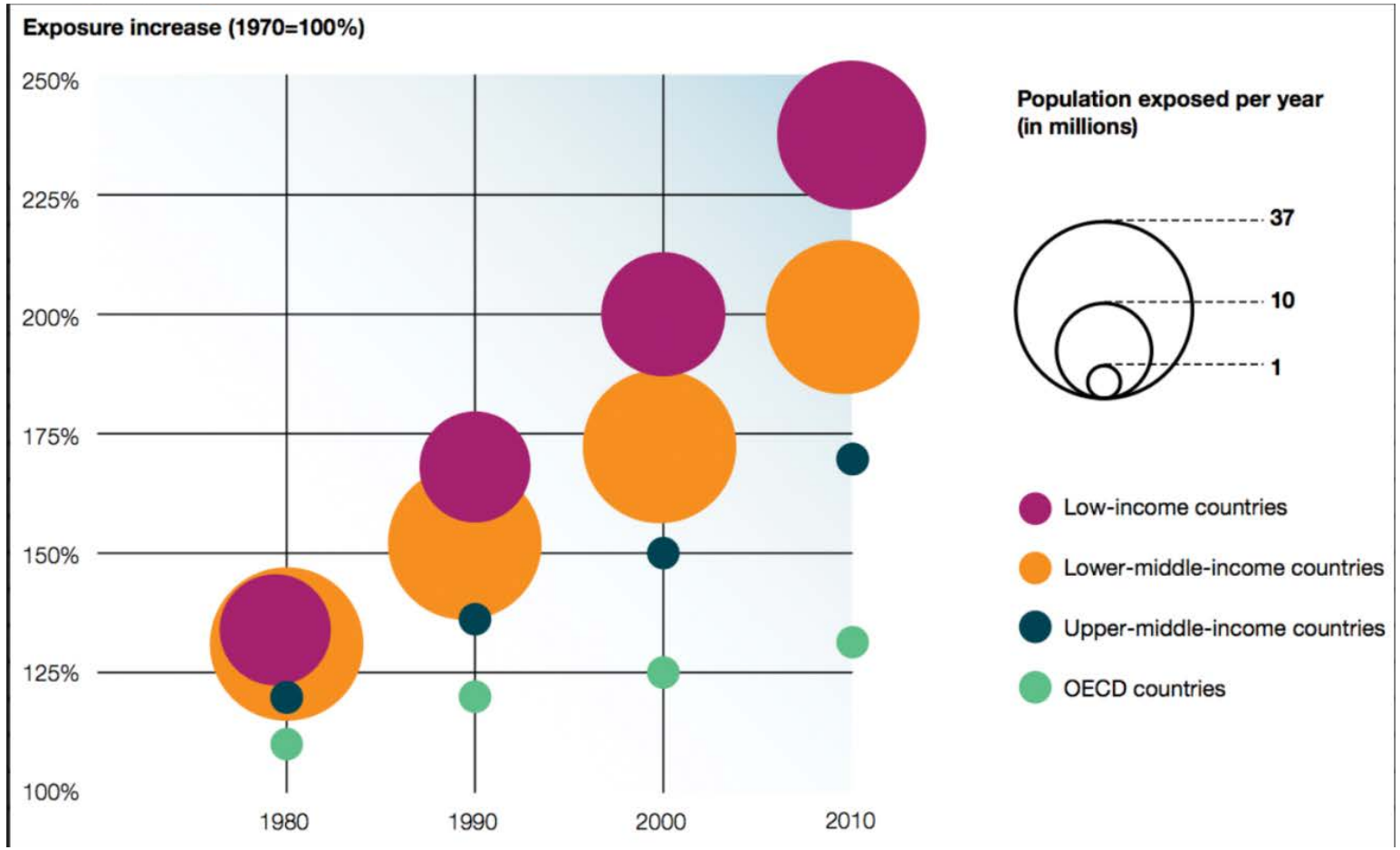
Delineation of Palm Density

50 x 50 m grid helps interpretation

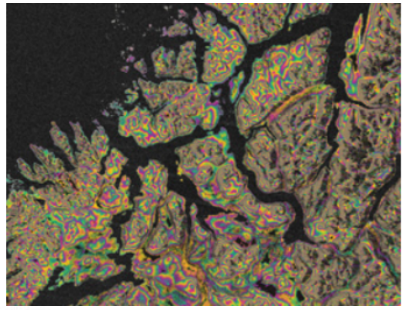
Palm Counting (in Grid Cells)

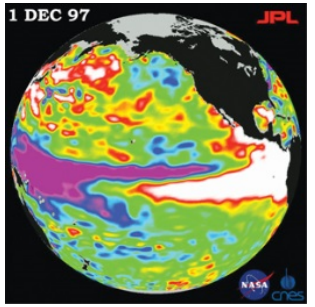


GIS software semi-automatically counts the number of palms per cell



Landslide risk





Drought vulnerability

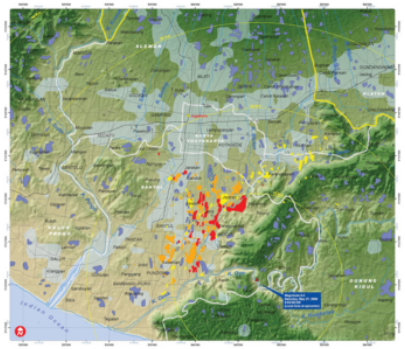
Remote area hazard

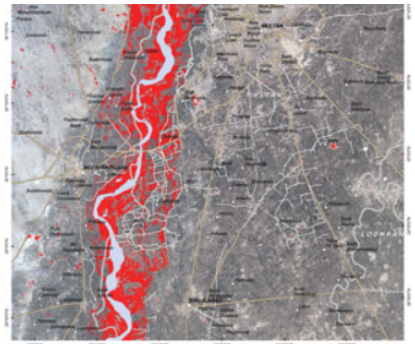
Extreme event or acute crisis

Damage assessment

Impact monitoring

Recovery monitoring





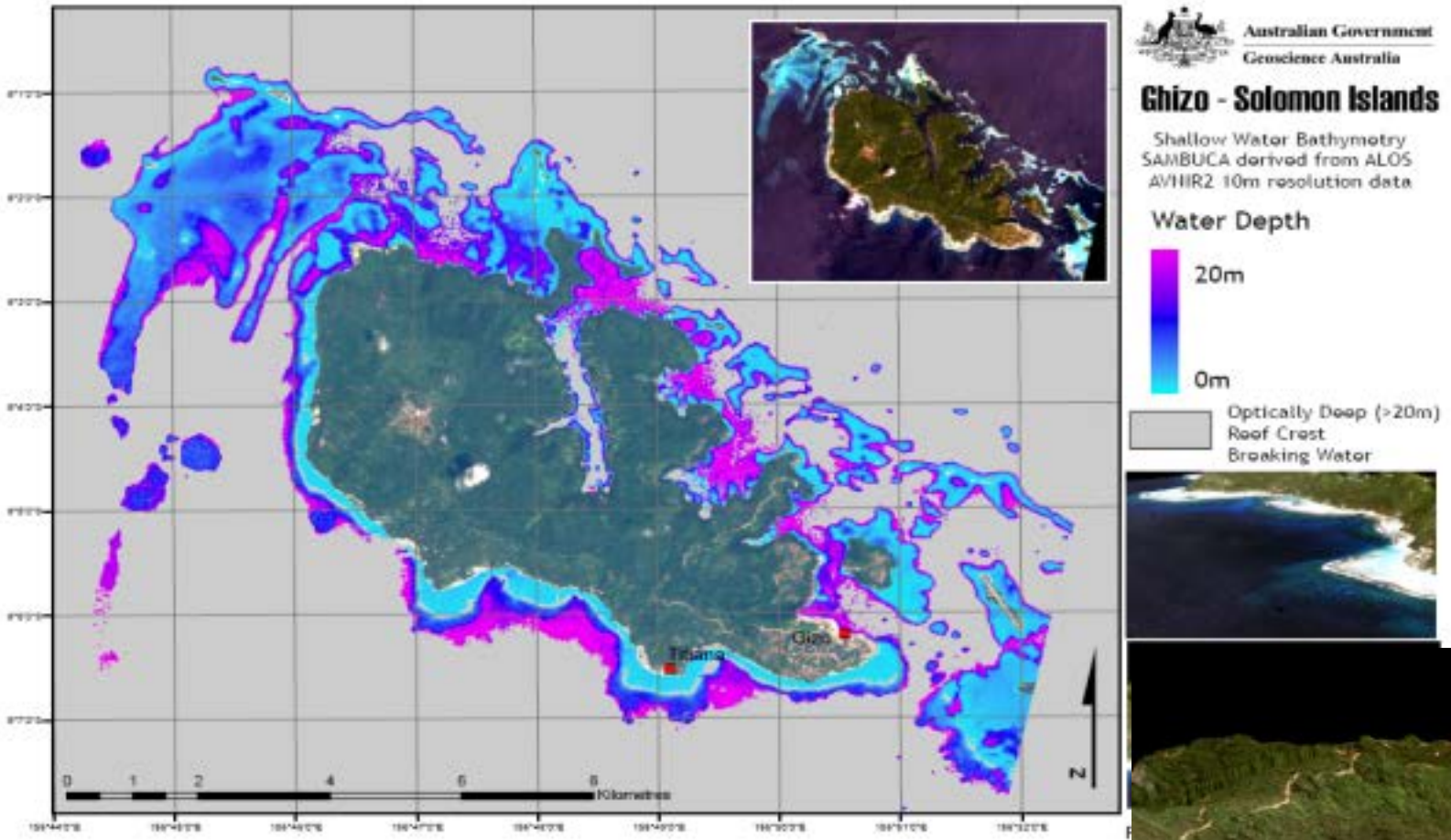
Some activities in the Pacific

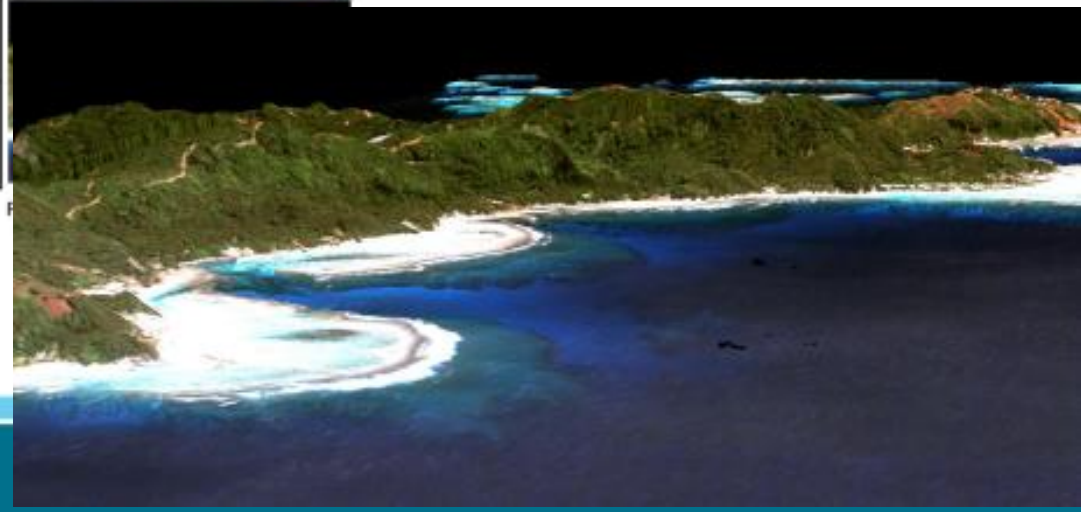
Initiatives active in the Pacific (*)

- Capacity Development Programs from countries like Australia
- Sentinel Asia
- International Charter on Space and Major Disasters
- Regional Support Office for UN-SPIDER / UNESCAP RPOA
- European Union's *Copernicus EMS*
- CEOS Working Group on Disasters
- GEO and AOGEO
- APEC Earth and Marine Observing

(*) that I am aware of. One of the great things is the diversity of players; one of the challenges is the diversity of players.

EO4Pacific Planning and Preparedness

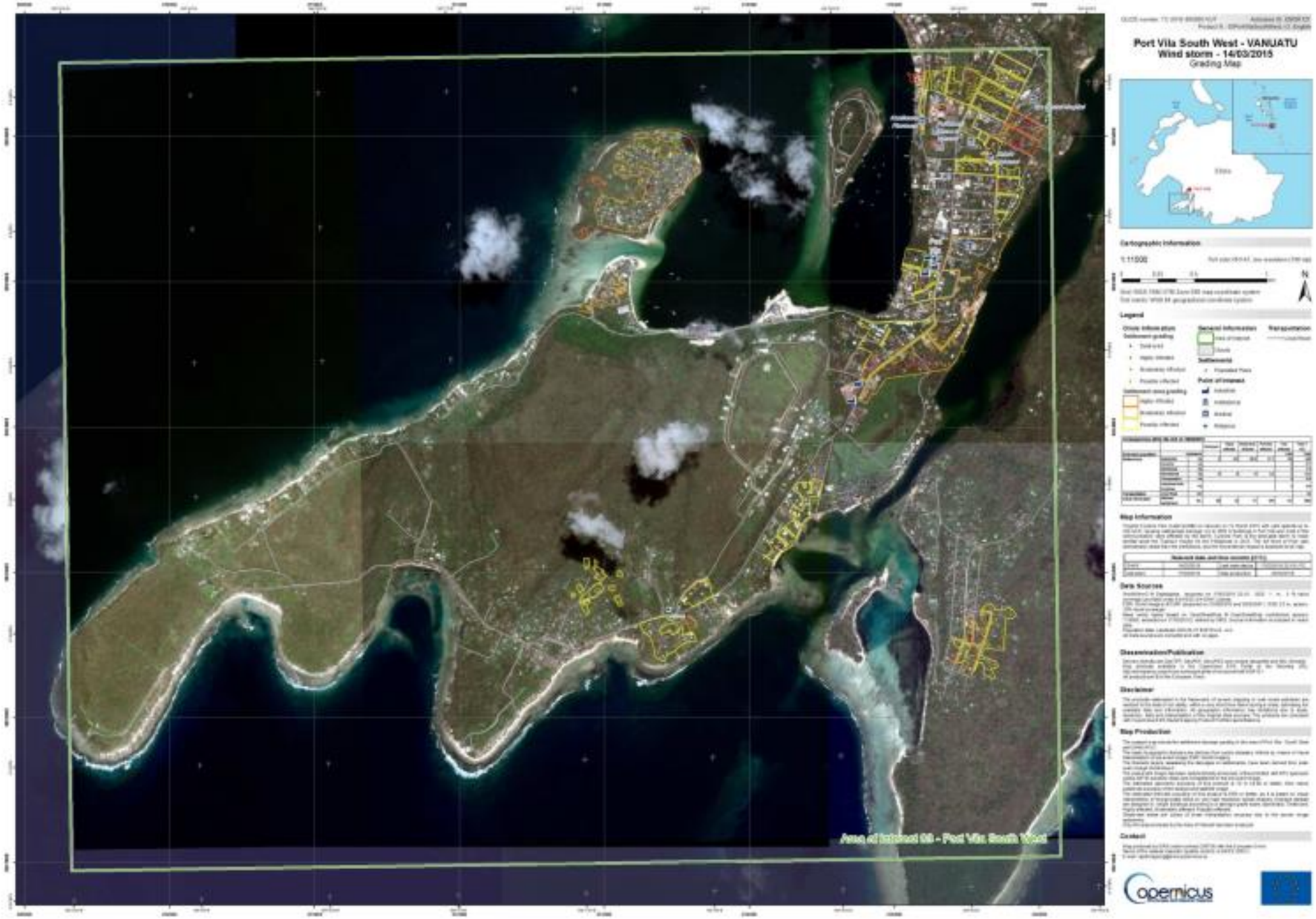




DFAT/SOPAC/GA satellite derived bathymetry for the Solomon Islands using Japan's ALOS AVNIR-2

Data used to facilitate tsunami modelling calibration based on the April 2007 Solomon Islands tsunami

EO4 Response (Rapid onset): Europe's 2015 Vanuatu hurricane response



Australian Government
Geoscience Australia

Sentinel Hotspots

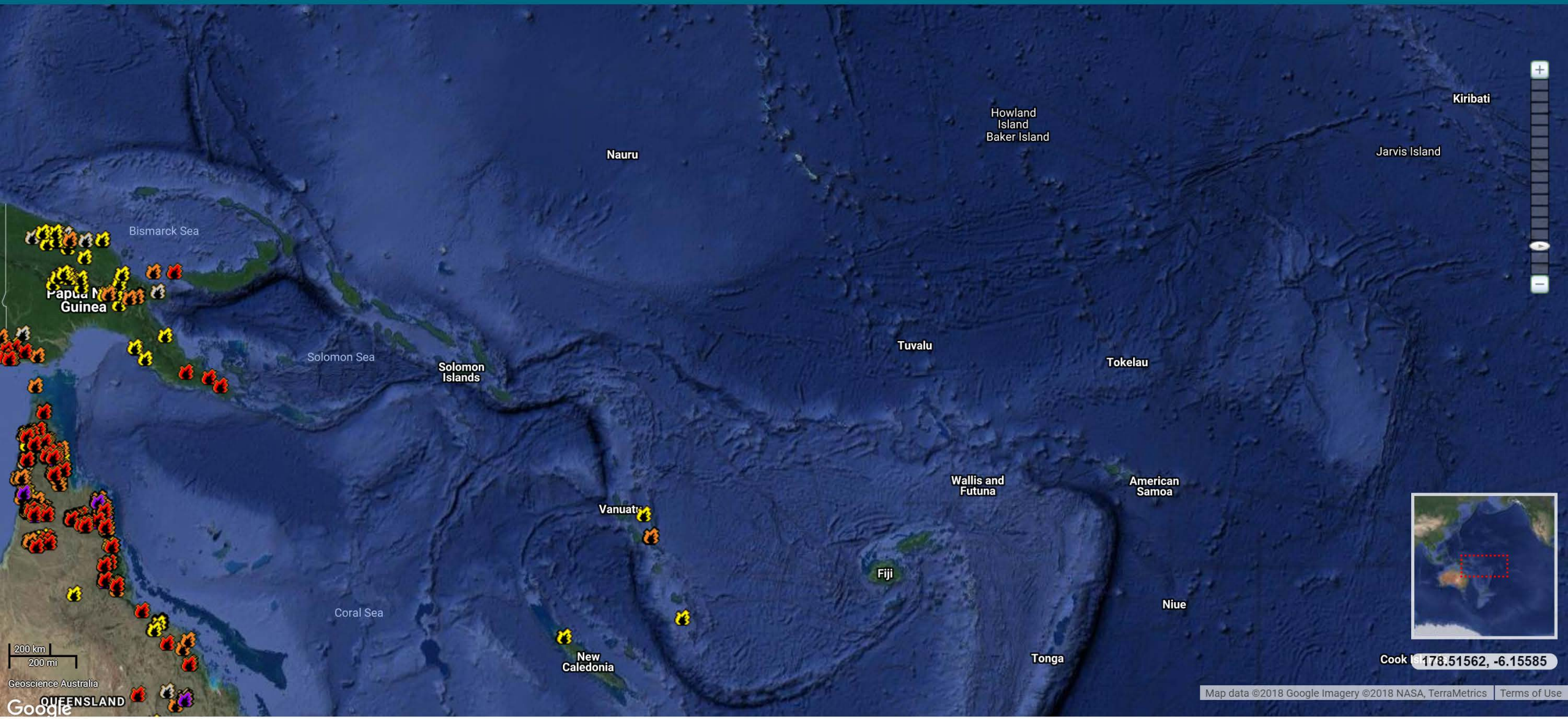
Quick Links

Populated search place

?

Layers | 0-2 hours | 2-6 hours | 6-24 hours | 24-48 hour | 48-72 hours

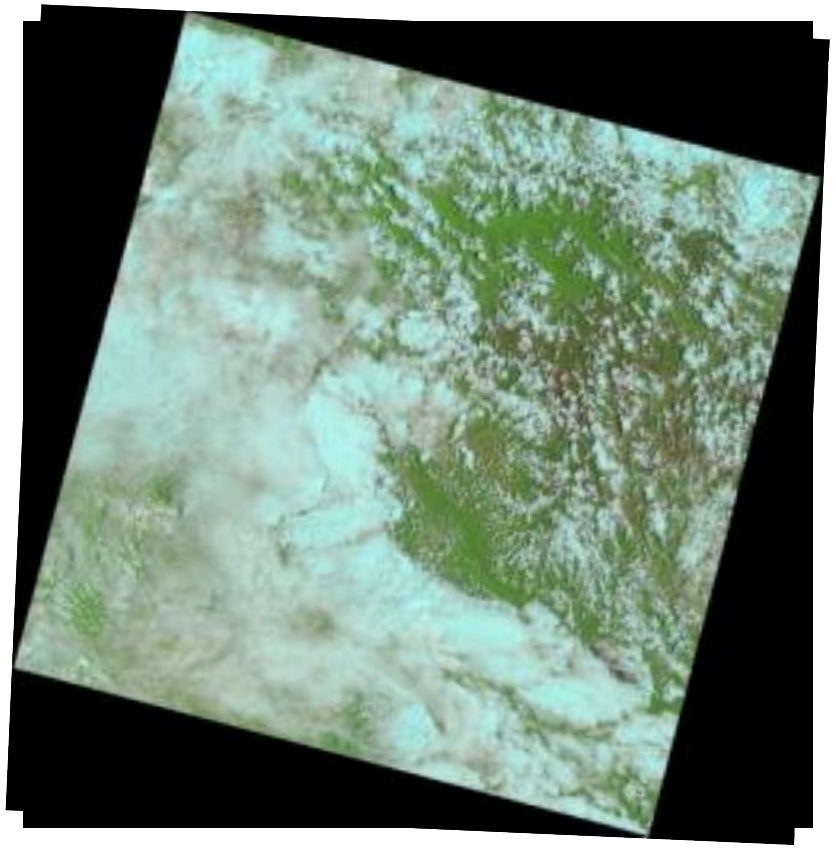
Measure | Update | Locate | Identify | Historical | Reset

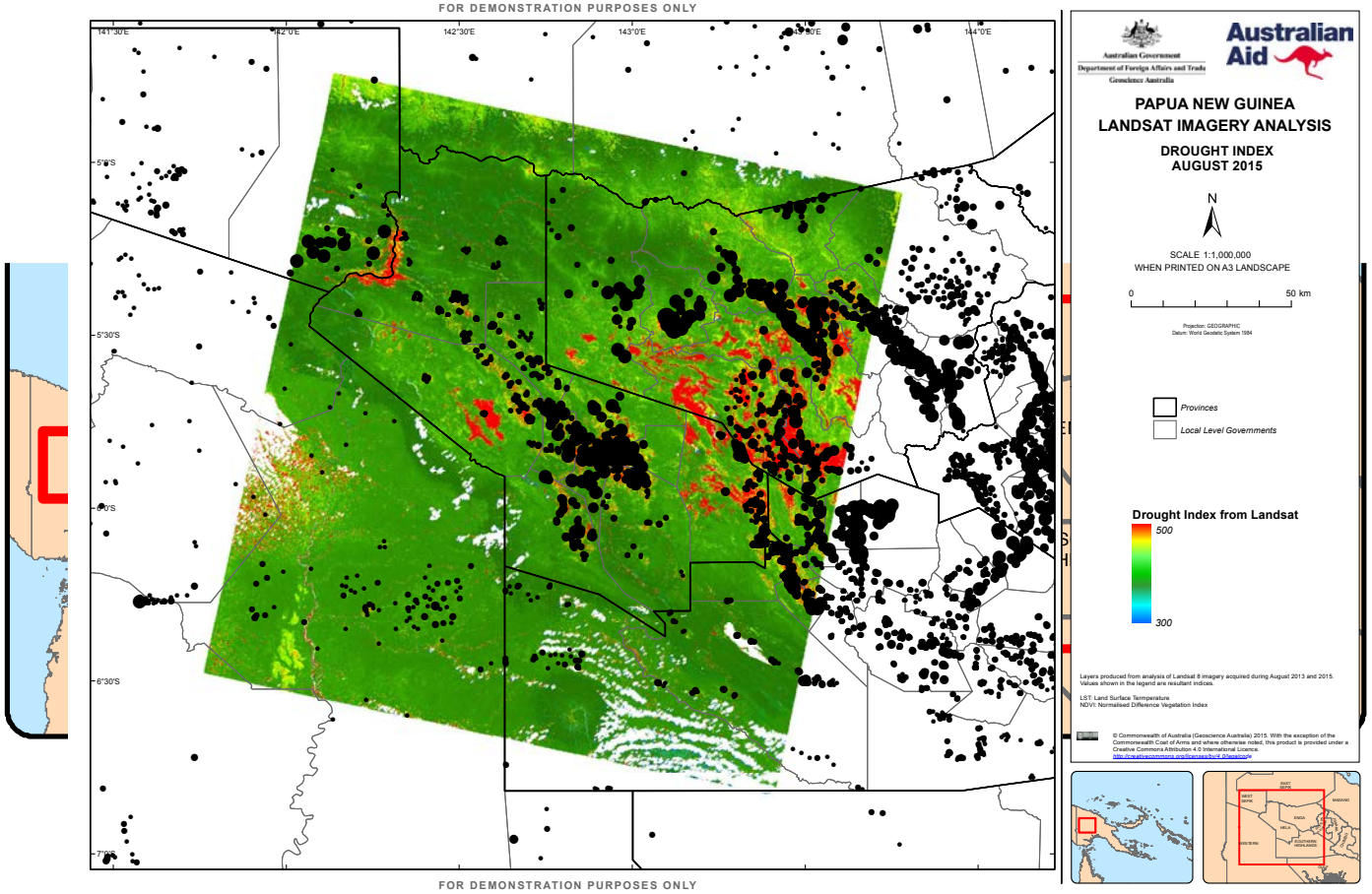


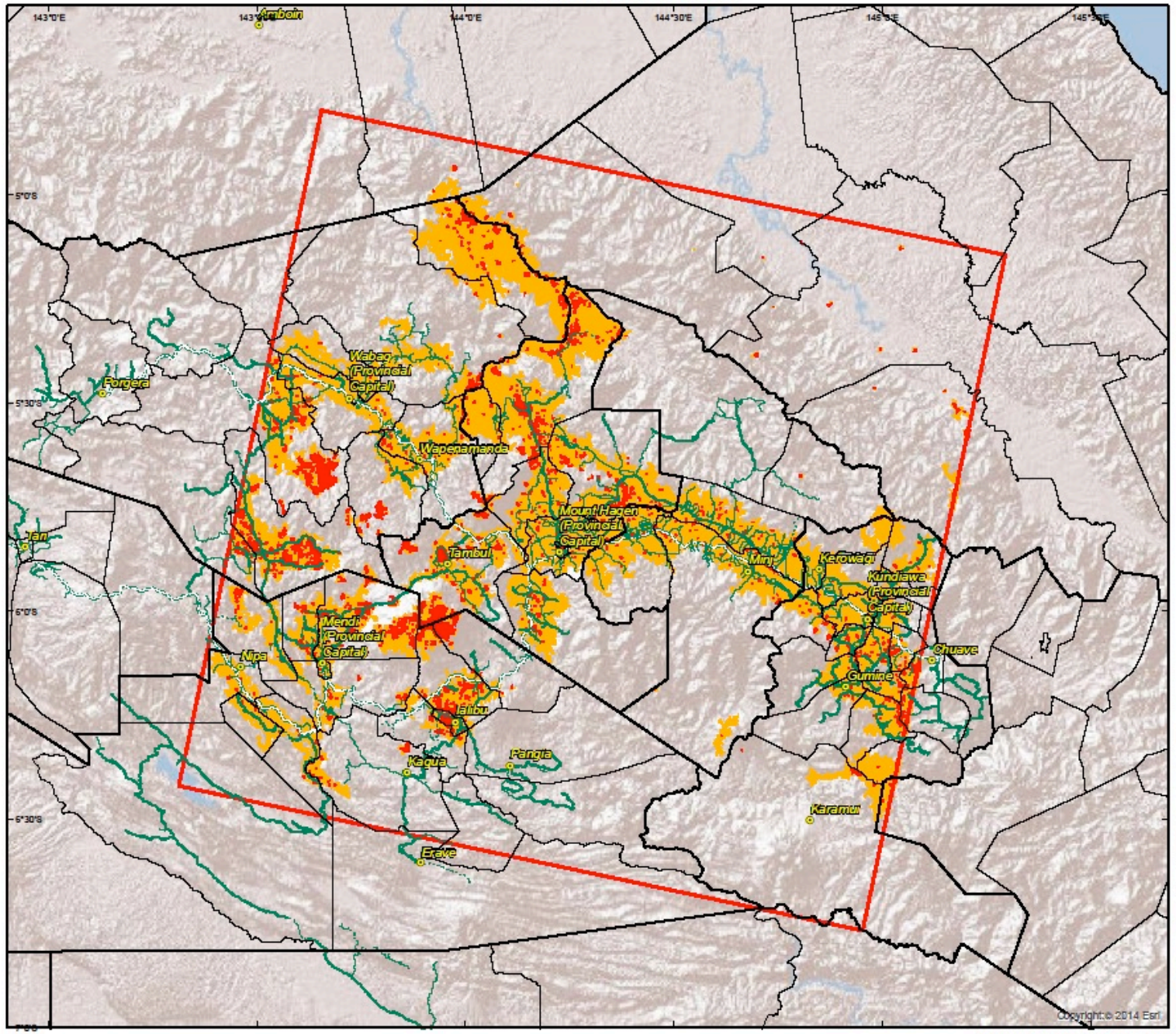
Hotspots Last Acquired: 2018-10-05 00:46 UTC Updated: 2018-10-05 01:02 UTC

Himawari-8 Mosaic Last Acquired: 2018-10-05 00:40 UTC Updated: 2018-10-05 01:01 UTC

EO4Response (Slow onset): PNG drought







Australian Government
Department of Foreign Affairs and Trade
Geoscience Australia

Australian Aid

PAPUA NEW GUINEA DROUGHT ANALYSIS

LANDSAT DROUGHT INDEX ANALYSIS DIFFERENCE BETWEEN 2013 AND 2015

SCENE 98-64

Drought Index is a measure of temperature and vegetation 'greeness' (photosynthetic activity). More heat and less vegetation is an indicator of worse drought.

Significant change is a 10% change, or greater, in the 2015 Drought Index compared to the 2013 'normal' state.

Highly Significant change is a 25% change, or greater, in the 2015 Drought Index compared to the 2013 'normal' state.

N

SCALE 1:1,000,000
WHEN PRINTED ON A3 LANDSCAPE

0 50 km

Projection: GEOGRAPHIC
Datum: World Geodetic System 1984

- Provinces
- Local Level Governments
- Landsat scene extent
- Significant change
- Highly significant change
- Highway
- National Road
- Provincial Road
- Other Road
- Major Towns

Census Unit population data modelled from 2011 Census data (conducted by the National Statistics Office) and population estimates from data provided by the Global Facility for Disaster Reduction and Recovery (GFDRR).

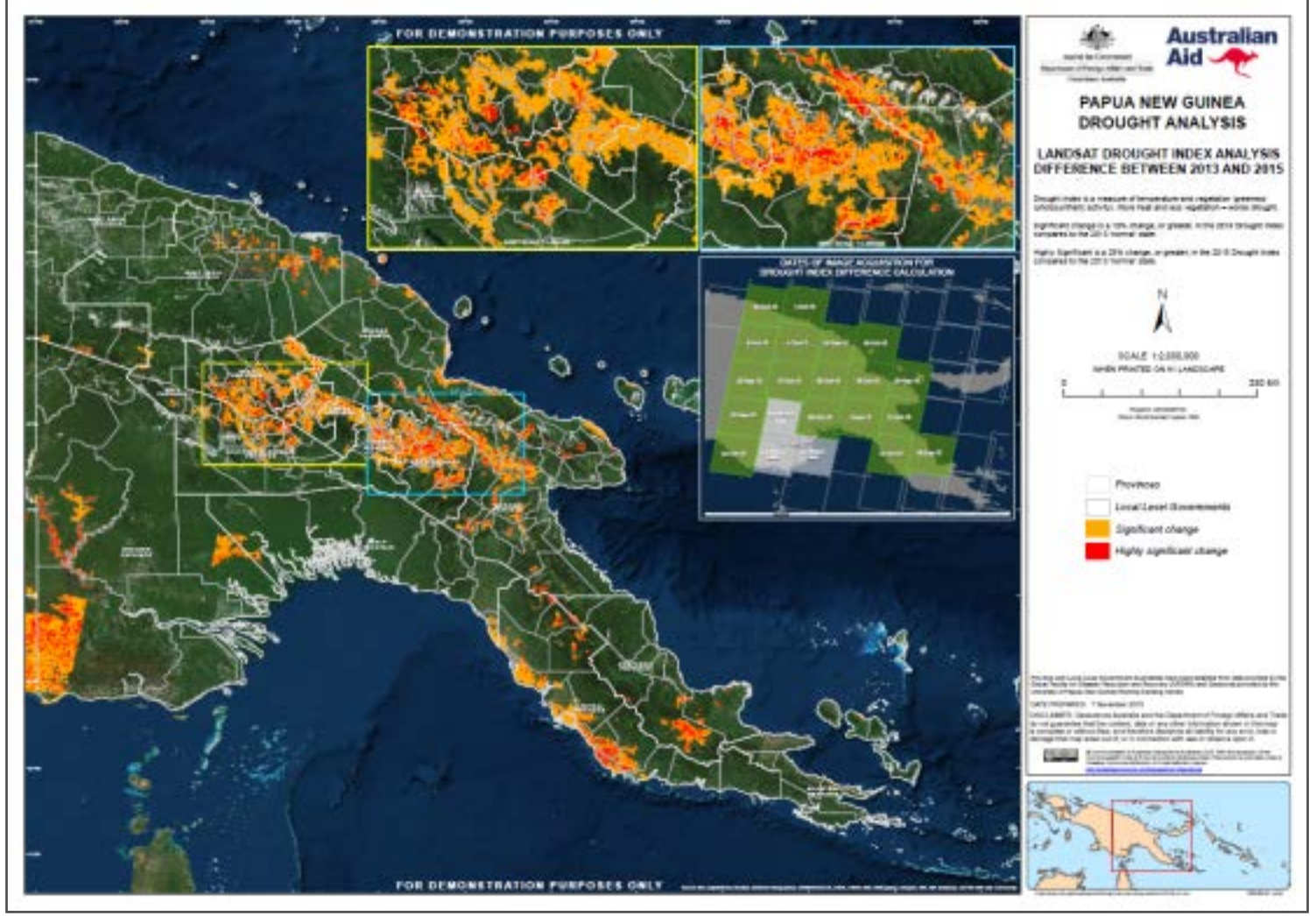
Shaded relief imagery was developed by ESRI using GTOPO30, Shuttle Radar Topography Mission (SRTM), and National Elevation Data (NED) data from the United States Geological Survey (USGS).

Roads and places data sourced from Geobooks provided by the University of Papua New Guinea Remote Sensing Centre.

DISCLAIMER: Geoscience Australia and the Department of Foreign Affairs and Trade do not guarantee that the content, data or any other information shown in this map is complete or without flaw, and therefore disclaims all liability for any error, loss or damage that may arise out of, or in connection with use or reliance upon it.

Z:\International_res\5_proj\drought\maps\mxd\Landsat_scene_Drought_Affected_population_LS8_98064_2015_2013_20151102_All_CU_annotated.mxd

FOR DEMONSTRATION PURPOSES ONLY



PNG National Disaster Centre

Ensuring safe and sustainable communities in PNG

Australian Government

Geoscience Australia

How to harness these opportunities?

Possible components of an integrated approach to EO4DRR for the Pacific?

- Structured engagement with regional/global programs
    - Consolidated statement of needs and priorities
- Strategy to leverage existing technologies and data collections (e.g. regional hubs)
- Input to existing satellite missions to increase monitoring of the pacific
    - Possibly assisted with new ground stations
- Co-development of environmental monitoring / hazard monitoring products
- Capacity development around using remote sensing environmental monitoring products
- Capacity development around using remote sensing emergency response products.
- Consolidate requirements for future satellite missions

Next Steps