



UNITED NATIONS
Office for Outer Space Affairs



From
the People of Japan

UNOOSA, estd. 1957



Preparing for the Pacific Islands GIS and Remote Sensing User Conference 2026

Satellite Data, Digital Twins and GeoAI for Pacific Resilience

A webinar in the lead-up to the User Conference hosted by the Pacific GIS and Remote Sensing Council (PGRSC)

240 attendees!



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SPACE4SDGS

Where you work

- ministries, universities, space agencies, UN and regional organizations



Where you join from

- 75 countries, including 32 participants from Pacific Island countries

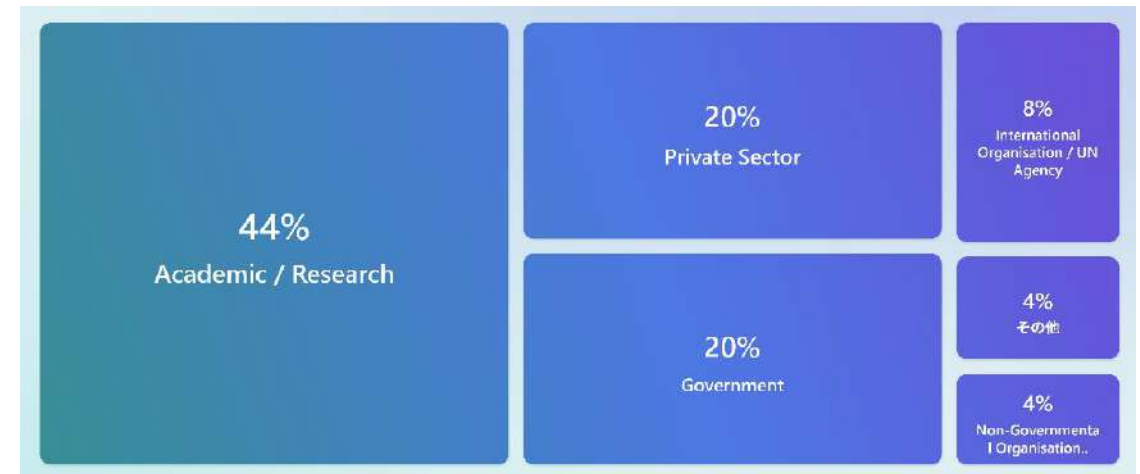


What you do

- GIS officers and analysts, researchers, students, directors and developers



Who you are



UNOOSA and UN-SPIDER: space for the hardest moments



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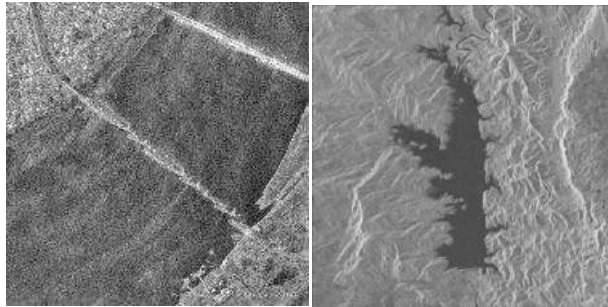


UNOOSA: the UN for peaceful uses of outer space, based in Vienna (Navigation, Communication, and EO)
UN-SPIDER: our programme connecting space technology to disaster management

*One promise: get the right satellite information
to the people responding on the ground*

*Not a data provider. A bridge between space agencies,
governments, and the field*

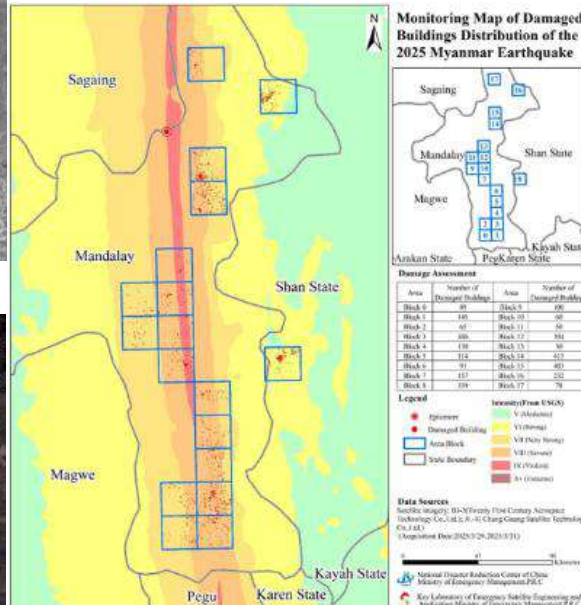
Ava Bridge Collapse (Left) and Daily SAR
imagery for Se Daw Gyi Dam



Example of Damaged Buildings Distribution



Monitoring Map of Damaged Buildings
Distribution of the Earthquake using Very
Higher Resolution Satellite Imagery



Technical Advisory



Capacity Building



Fostering Cooperation



Knowledge Management



Emergency and disaster management encompass **three main post-disaster phases**



Agenda



Welcome Remarks

*Brad Eichelberger,
Chair, Pacific GIS and Remote Sensing
Council*

Project Deep-Dive: Pacific Digital Twin

*Jumpei Takami,
UN-SPIDER/UNOOSA*

Beneficiary Perspective: Cook Islands

*Stephano Rampling-Tou,
Senior Technical Coordinator, EMCI*

Regional Context: Digital Earth Pacific

*Andiswa Mlisa,
Programme Manager, SPC*

Q&A and Closing

All

Housekeeping

- ✓ This session is recorded; the recording and slides will be shared with all registrants
- ✓ Please post questions in the chat at any time; Q&A at the end (15 minutes)

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Recent years in the Pacific



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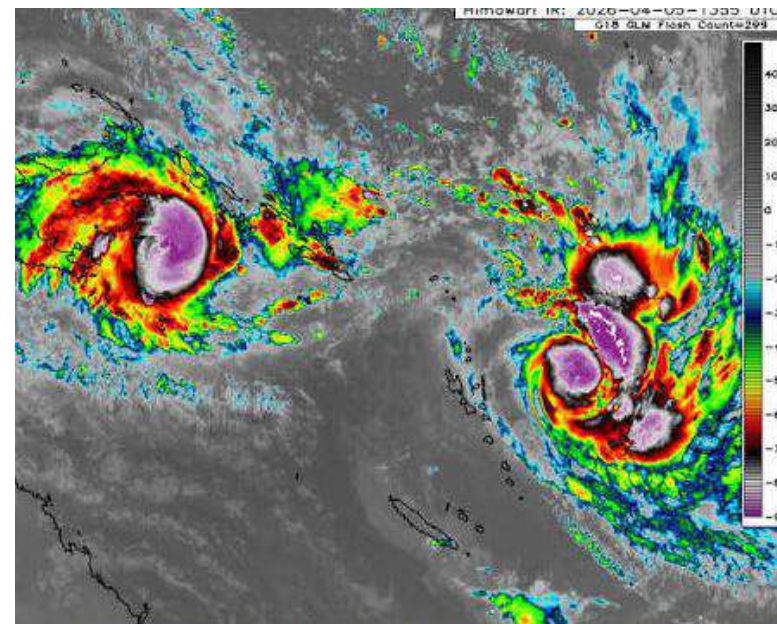
*2021: Typhoon Surigae
(Palau)*



*2022: Hunga Tonga–Hunga
Ha'apai eruption and
tsunami (Tonga)*



*2024–2025: Successive
cyclones (Cook Islands,
Tonga) , earthquake near
Tonga*



- ✓ *Climate change is making disasters more frequent, more intense, and less predictable.*
- ✓ *The question: do we have the data to plan for them?*

Global datasets skip the Pacific or less accurate...

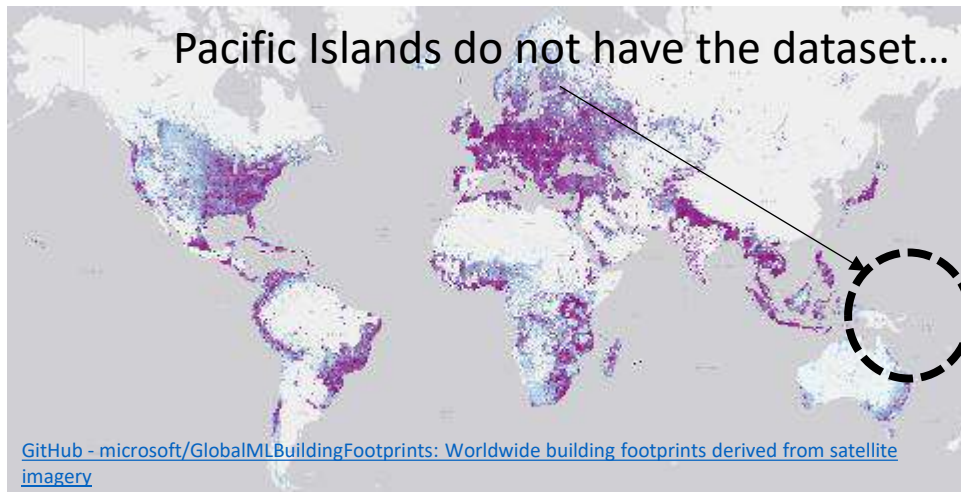


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- ✓ **Building footprints:** major global databases cover the Americas, Africa, much of Asia, but not most Pacific Island countries
- ✓ **Elevation:** what exists is often 10 m to 30 m resolution, too coarse to model flooding street by street
- ✓ **Imagery:** the latest national basemaps are often 5 or more years old

You cannot simulate what you cannot see.



PCRAFI

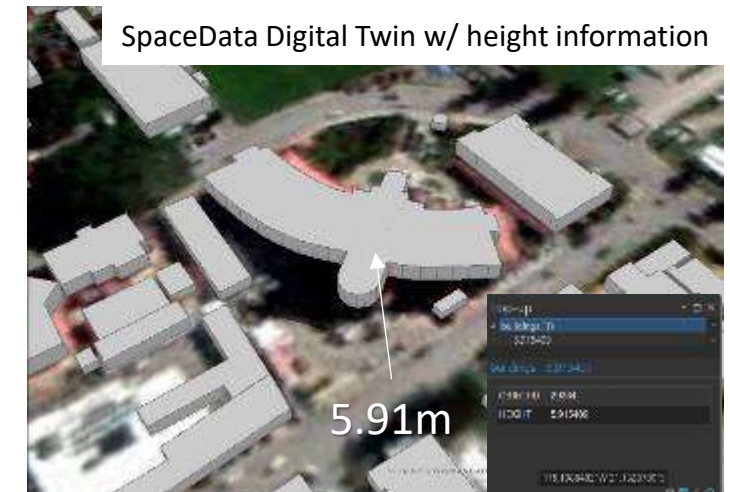
Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI) does not have much information for building footprints



SpaceData



Open Street Map (w/o height information)



SpaceData Digital Twin w/ height information

5.91m

Launched Project for Digital Twin for Tonga, Cook Islands, and Palau funded by Japan



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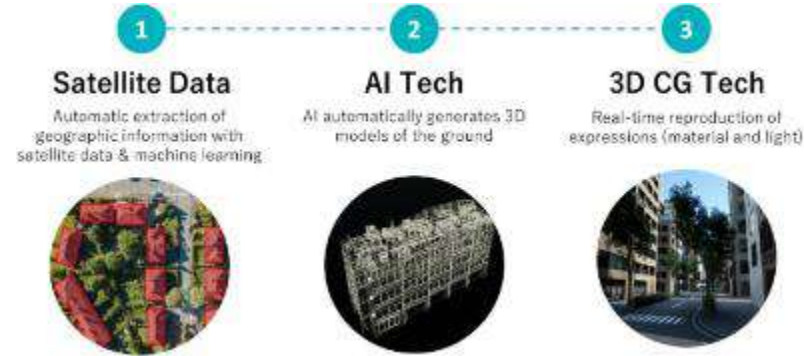
Install weather stations at public facilities (etc. schools or stations)

Install IoT weather stations at public facilities (etc. schools, police stations)



Create Digital Twin from Satellite Data and Simulate Disaster Events

Create Digital Twin from Satellite Data



Simulate Disaster Events such as Sea Level Rise



3D Digital Platform for Disaster Risk Management with Evacuation Route

Early Warning Alert with sensors and 3D data



Digital Platform or Dashboard for Disaster Risk Management with Optimized Evacuation Routes



3D Digital Platform for DRM with Optimized Evacuation Route



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In this project, it collects required information to optimize the evacuation route depending on the flooding depth such as building footprint, national and local roads, and evacuation spots or facilities which might be discussed with stakeholders if it should be renewed with data driven approach.



Deliverables under this project



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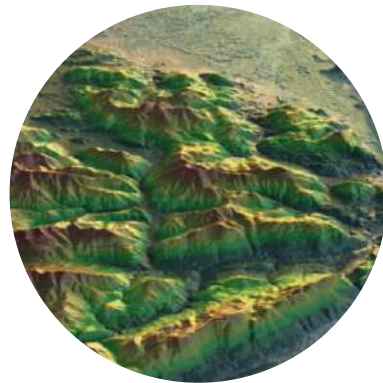
VHR satellite imagery

15 cm satellite imagery: the sharpest view of your islands ever procured



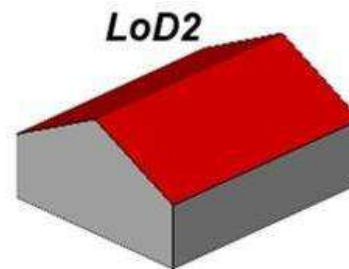
DSM/DEM

1 m elevation models (DSM/DTM) from satellite stereo and validation with LiDAR dataset



Digital twins

LOD2 3D buildings with roof texture and colors



Real-time rainfall

IoT pilots + connection to existing national networks



WebGIS platform + training

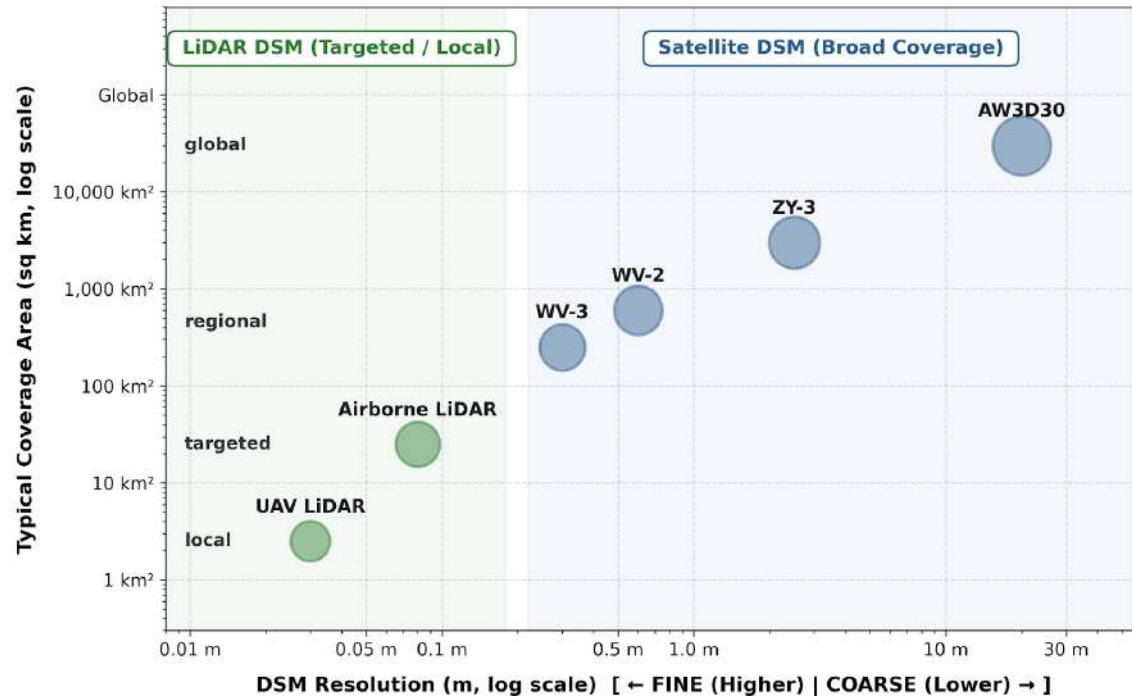
flood simulation, and GeoAI training using ArcGIS Pro and Python (ArcPy) + QGIS LOD1&2 Dev.



Coverage and Resolution comparison

- ✓ LiDAR provides much denser 3D observations
- ✓ Satellite DSM resolution depends mainly on image pixel size and stereo matching capability

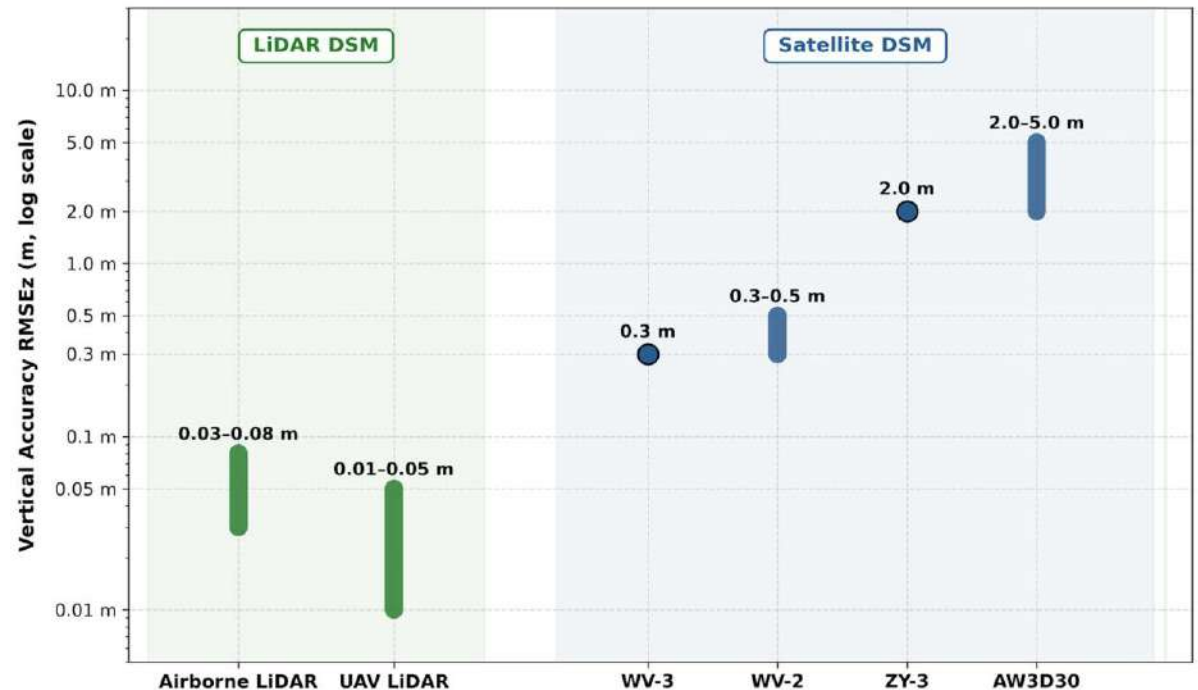
Platform Coverage Scale and DSM Resolution



Accuracy comparison

- ✓ LiDAR DSM provides superior elevation accuracy
- ✓ Satellite stereo DSM offers a more cost-effective solution when sub-meter accuracy is sufficient

Vertical Accuracy (RMSEz) Comparison: Satellite vs. LiDAR DSMs



Geodetic Foundations: Why Elevation Data Needs a Reference



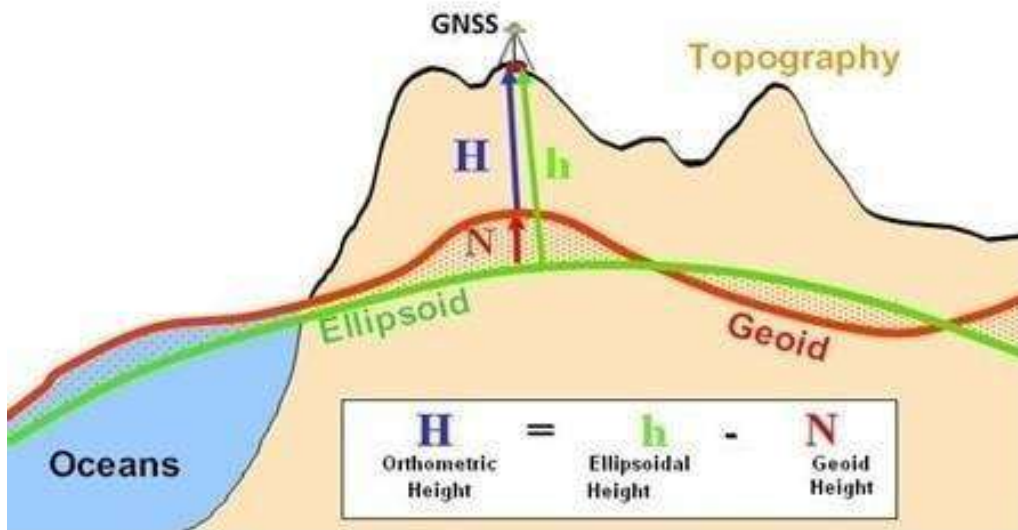
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Two kinds of height

GNSS, satellites and LiDAR measure height above the ellipsoid; floods follow height above the geoid (mean sea level). Converting one to the other requires a geoid model.

- ✓ A DSM is only as reliable as the reference it stands on
- ✓ Without a geoid model, satellite heights and national heights disagree, sometimes by tens of meters

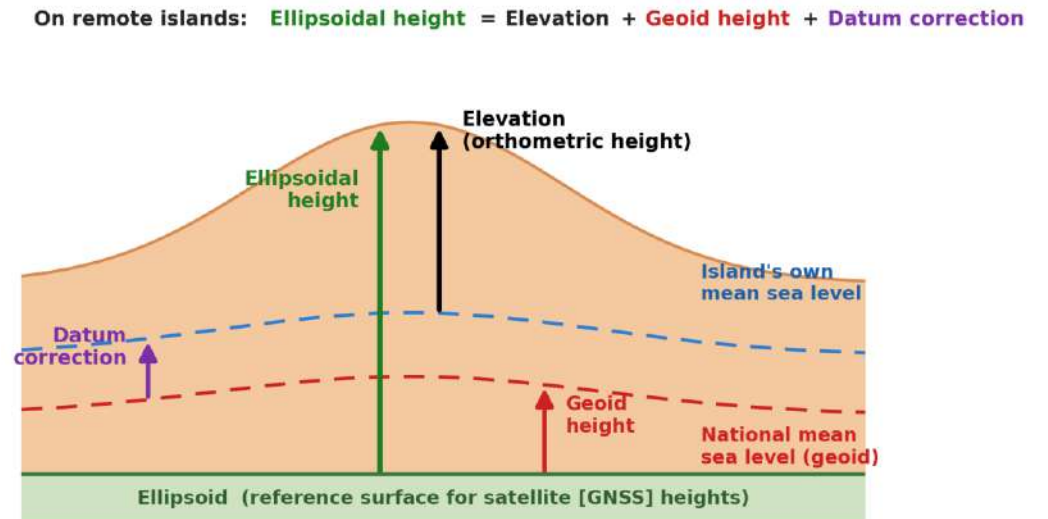


*The relationship
between orthometric
height, ellipsoidal
height and geoid
height*

https://www.researchgate.net/figure/The-relationship-between-orthometric-height-ellipsoidal-height-and-geoid-height_fig1_288115418

On remote islands: Ellipsoidal height = Elevation + Geoid height + Datum correction

Island datums reconciled: Pacific islands keep their own mean-sea-level datum, often observed decades ago; heights cannot be carried from one island to another. A national geoid plus a per-island datum correction ties them together, the foundation for consistent flood modelling.



December in Suva One Learning Journey



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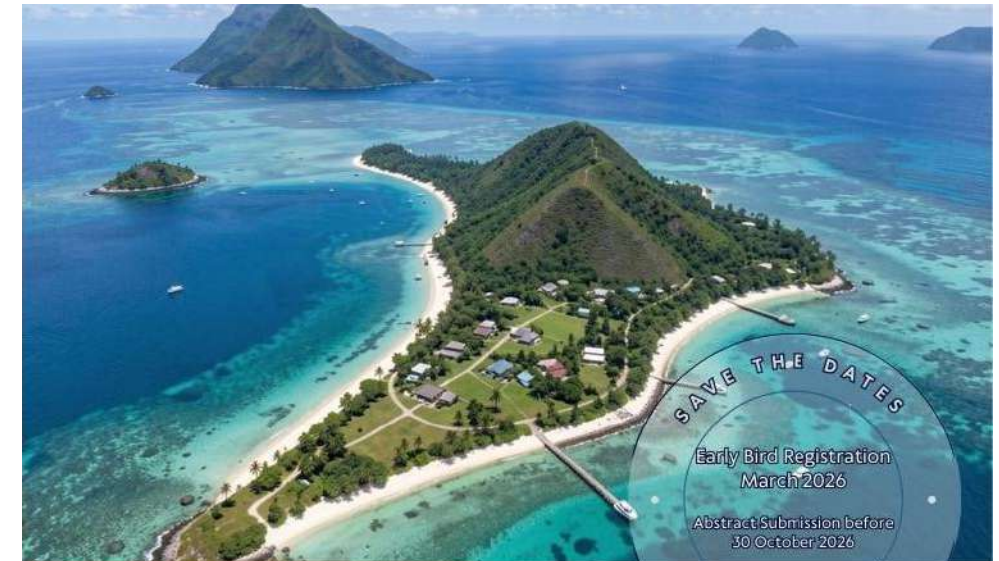


- ✓ **Learn from the whole region:** Pacific Islands GIS and Remote Sensing User Conference, hosted by PGRSC | 30 November – 4 December | Japan-ICT USP Hall, Suva | 300+ practitioners from government, science and industry
- ✓ **Get hands-on with real data:** UN-SPIDER workshop, 4–5 December - satellite elevation data, digital twins, GeoAI, JAXA tools. Bring your laptop
- ✓ **Act now:**
 - ✓ Abstracts due 30 October: bring your island's story to the region's stage
 - ✓ Registration open at pgrsc.org
 - ✓ Project countries: sponsorship nominations by end September - UNOOSA supports 30+ Pacific participants

You won't be alone

120+ of today's registrants are already registered, planning, or considering the trip to Suva.

Are you planning to attend PGRSC 2026 (30 Nov – 4 Dec, Suva, Fiji)?



30 Nov. - 04 Dec. 2026

JAPAN-ICT USP HALL | SUVA | FIJI ISLANDS



Pacific GIS and
Remote Sensing Council

Regional Member of ISPRS for Pacific
Island Countries



CONTACT US

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Email: conference@pgrsc.org

www.pgrsc.org

2026 Pacific Islands GIS & Remote Sensing User Conference

Strengthening and Expanding
Geospatial Networks in the
Pacific Islands

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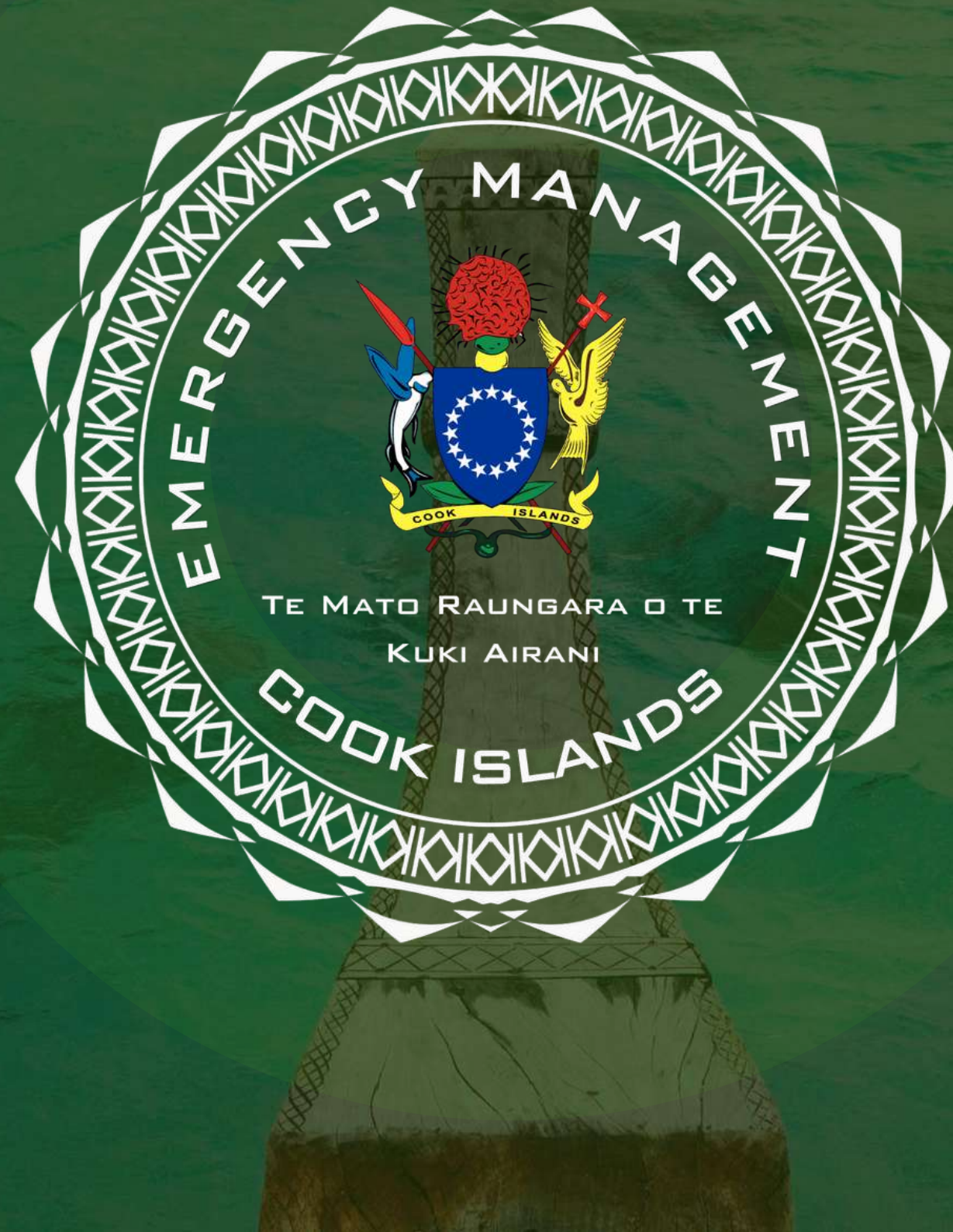
All

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COOK ISLANDS

SPACE TECHNOLOGIES, GEOAI, AND DIGITAL TWIN FOR DISASTER RESILIENCE

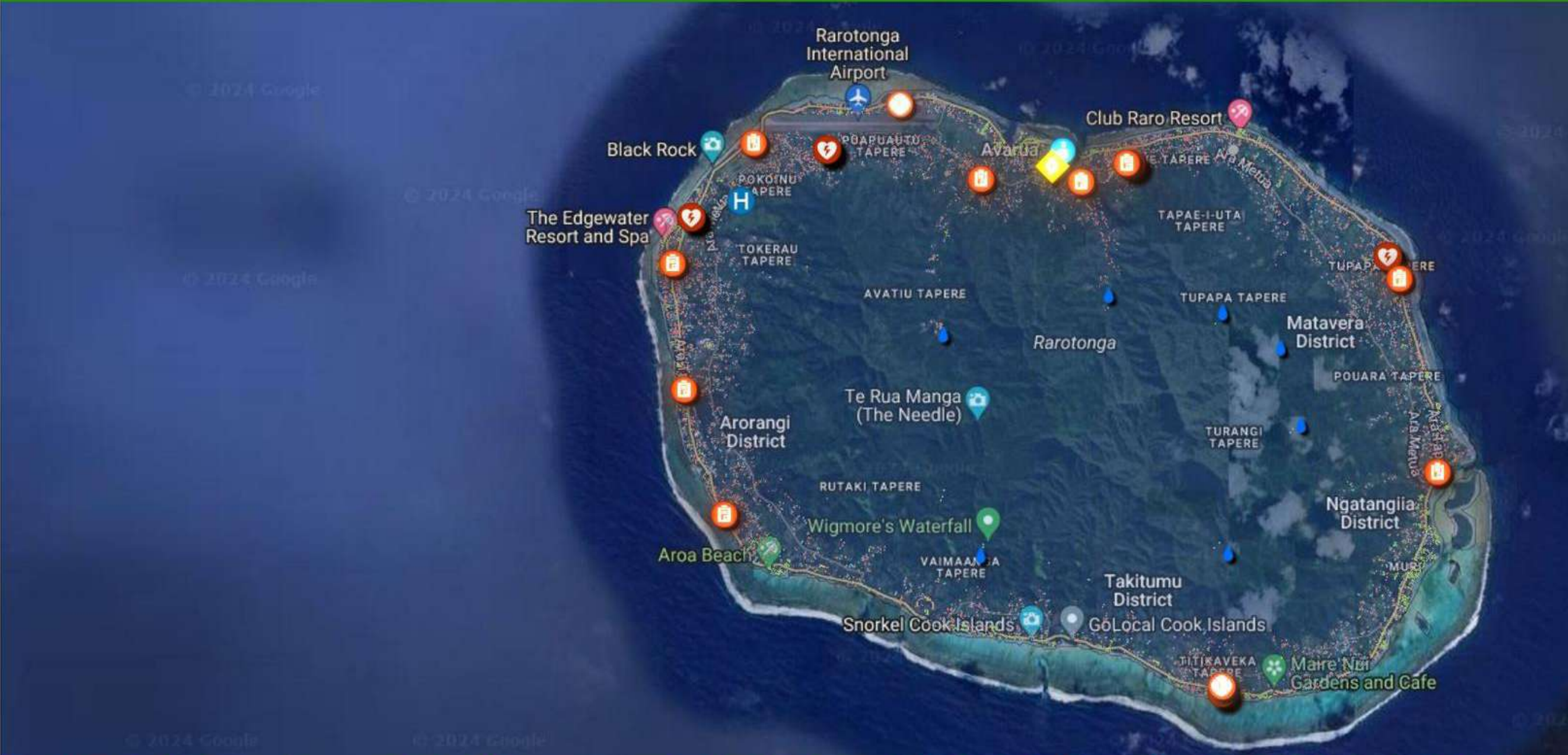




EMCI GIS DEVELOPMENT JOURNEY

EMCI Disaster Risk Management Dashboard

EMCI Disaster Risk Management map

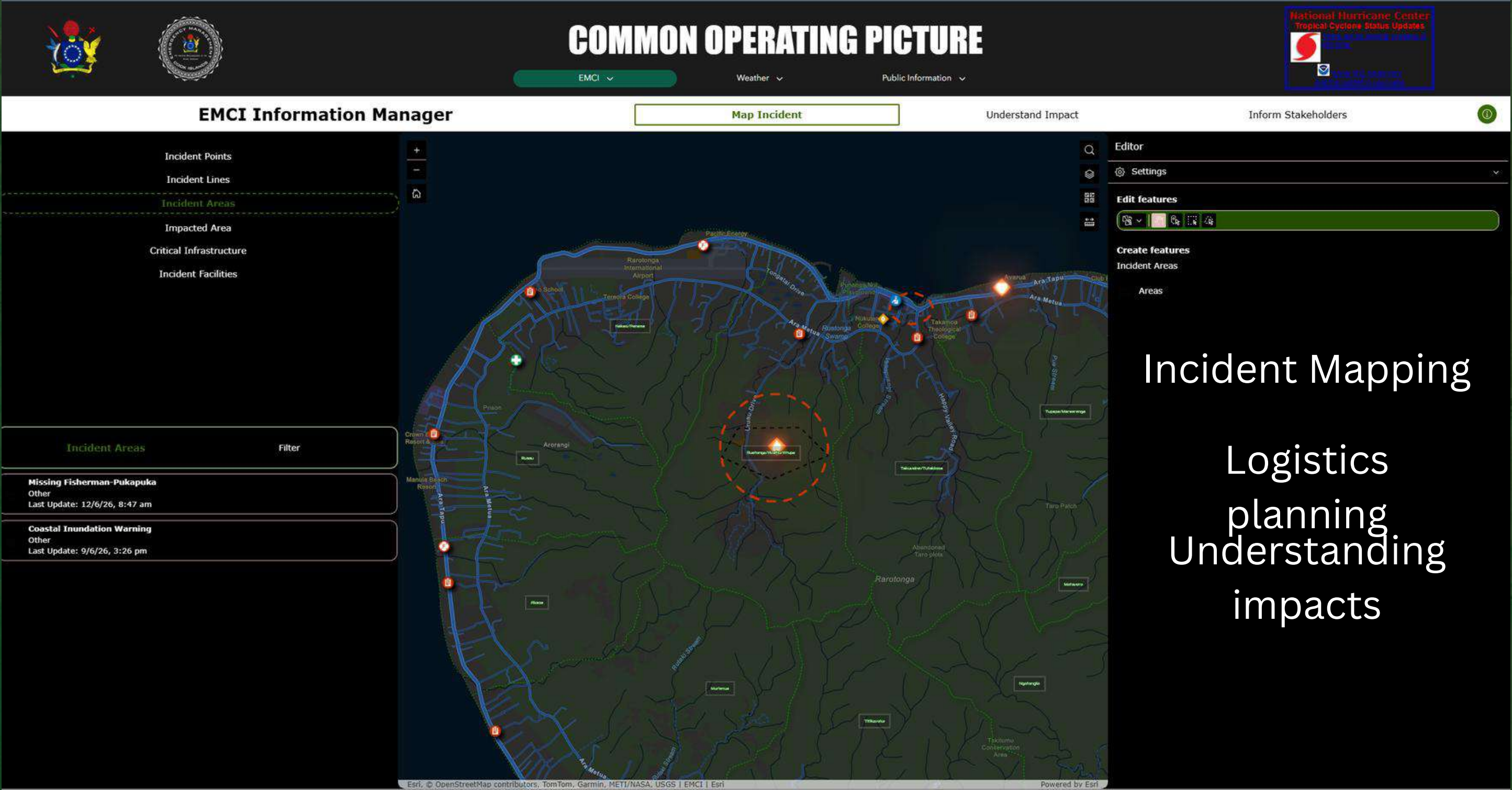


**SPECIAL ACHIEVEMENT IN GIS AWARD 2024
INTERNATIONAL ESRI CONFERENCE
SAN DIEGO, USA**

Google | NHC, JTWC, Esri | Emergency Management Cook Islands | Emergency management Cook Islands. Coordinated by Stephano Rampling-Tou | Emergency Management Cook Islands. Coordinated by Stephano Rampling-Tou | Esri | Esri, EMCI
For Disaster Management purposes of EMCI - Highlighting safety shelters within Puna boundaries with Covid-19 household surveys (All of Cook islands) and PCRAFI building survey (Mapped infrastructure, utilities in Rarotonga and Aitutaki)



NEOC COMMON OPERATING PICTURE

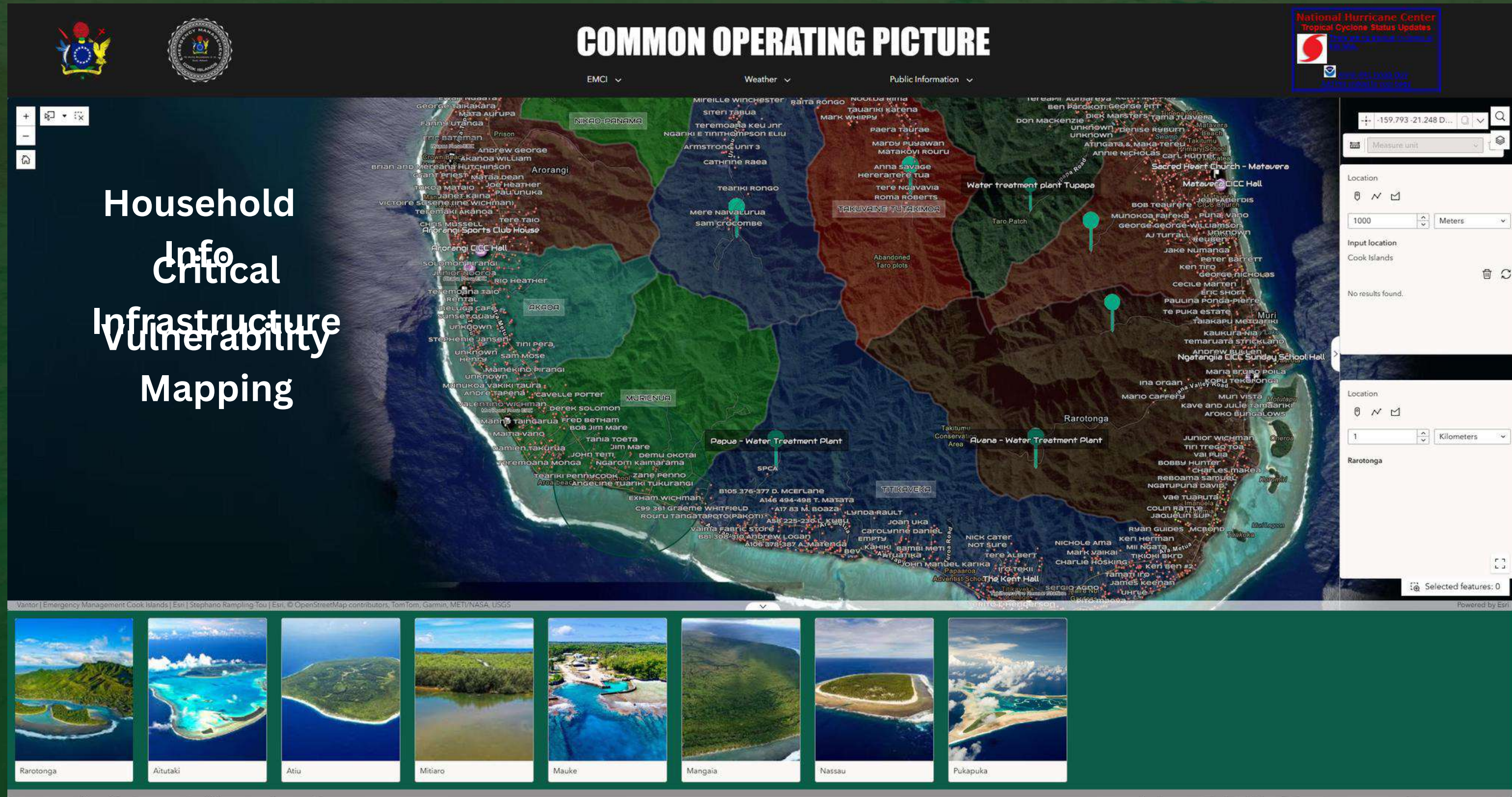


Incident Mapping

Logistics
planning
Understanding
impacts



Household Info Critical Infrastructure Vulnerability Mapping





Fuel response Dashboard

COMMON OPERATING PICTURE

EMCI

Weather

Public Information

National Hurricane Center
Tropical Cyclone Status Updates

Cook Islands Oil

Overview

Rarotonga

Aitutaki

Shipments

Results

Data Monitor

☒ Auto refresh on file change

Where we are now

Data current as at: 18 June 2026

Current setting: Prepare
Tightening conditions. Prepare options and update stakeholders.

40 days
Rarotonga petrol supply

76 days
Rarotonga diesel supply

29 days
Rarotonga jet fuel supply

54 days
Rarotonga days of electricity

Awaiting update
Aitutaki petrol supply

Awaiting update
Aitutaki diesel supply

Awaiting update
Aitutaki LPG supply

42 days
Aitutaki days of electricity

Fuel supply summary

Measure	Petrol	Diesel	Jet Fuel	LPG	Electricity Diesel
Number of days on island	40	76	29	92	54
Number of days to next shipment	13	3	4	-	3
Number of days in next shipment	10	7	75	-	27
Number of days effective supply	37	81	100	-	78



PACIFIC OCEANS PORTAL INTEGRATION

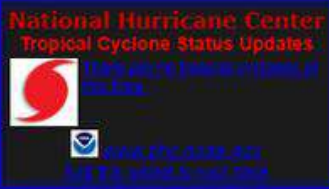


COMMON OPERATING PICTURE

EMCI ▾

Weather ▾

Public Information ▾



 Pacific Ocean Portal

Explorer

Collections

Library

About Us

Logout



Dashboard Collections

Become a contributor [Learn how](#) →

 Search dashboards by title...



RealTime Monitoring

Project: OPM
Maintainer: Pacific Community

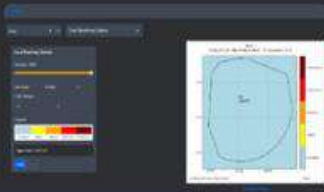
 [Explore Dashboard](#)



Ocean Experts

Project: OPM
Maintainer: UNESCO/IOC

 [Explore Dashboard](#)



OCOF

Project: OPM
Maintainer: Pacific Community

 [Explore Dashboard](#)



Sealevel Realtime

Project: COSPPac
Maintainer: Bureau of Meteorology

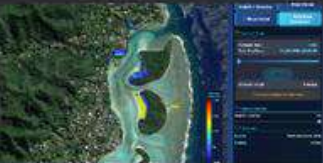
 [Explore Dashboard](#)



GEM Data Management System

Project: OPM
Maintainer: Pacific Community

 [Explore Dashboard](#)



CK Hi-Res Wave Forecast

Project: CIS-Pac5
Maintainer: Pacific Community

 [Explore Dashboard](#)



SLR - PaRTner-2

Project: PaRTner 2
Maintainer: Pacific Community

 [Explore Dashboard](#)



TC - PaRTner-2

Project: PaRTner 2
Maintainer: Pacific Community

 [Explore Dashboard](#)



Climate Change Indicators

Project: COSPPac
Maintainer: Pacific Community

 [Explore Dashboard](#)



LIVE REGIONAL TIDE GAUGE MONITORING





COASTAL INUNDATION FORECASTING



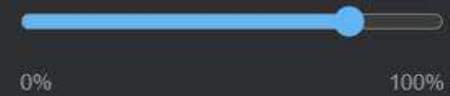


PARTNER2 SLR — Cook Islands

FILTERS

Southern ▼ / rarotonga ▼

HAZARD OPACITY: 80%

▶ **PLAY SIMULATION**

RETURN PERIOD:

5 Yrs

10 Yrs

25 Yrs

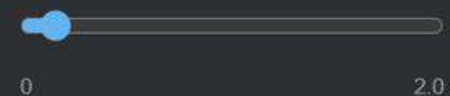
50 Yrs

100 Yrs

250 Yrs

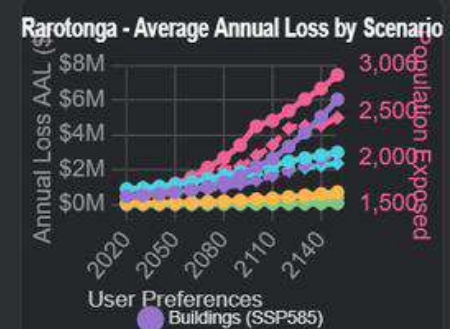
MHWS

SEA LEVEL: 0.1M



- **Activate Compare Layer**

RAROTONGA LEVEL



CURRENT PROJECTION

Flood Depth at 100 Year Event
with 0.1m Sea Level Rise



FLOOD DEPTH



IMPACT

EVENT IMPACT



BUILDING
IMPACT



ROAD IMPACT

 BUILDINGS

View building footprints, structural information, and flood risk assessment.

RETURN PERIOD:

100 years

SEA LEVEL: 0CM

Search buildings or use type

COMMERCIAL

EDUCATIONAL

INDUSTRIAL

INFRASTRUCTURE

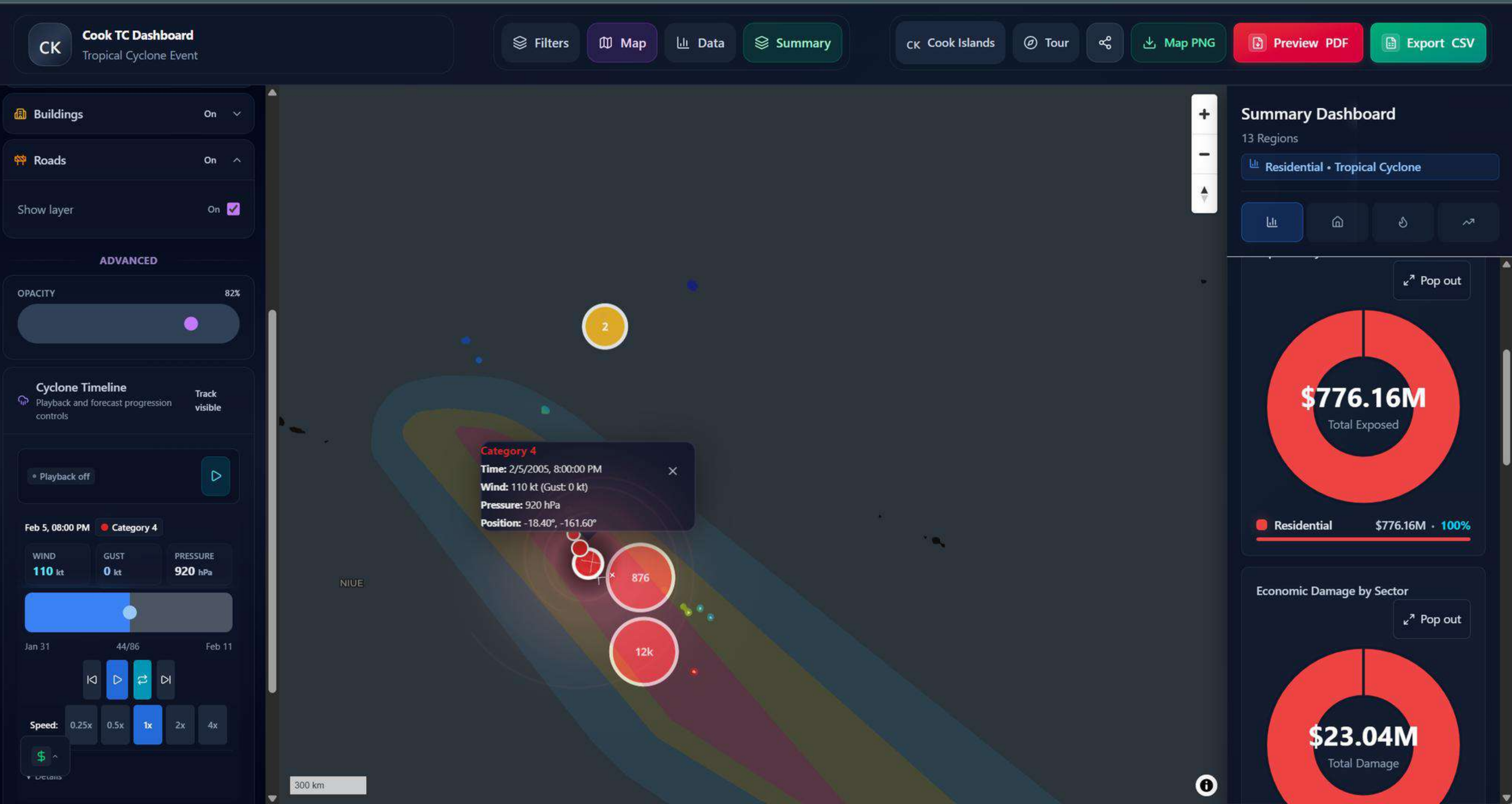
INSTITUTIONAL

PUBLIC

 Export PDF Report



TROPICAL CYCLONE DASHBOARD





LIVE WEATHER SATELLITE IMAGERY AND LIVE CYCLONE MONITORING



COMMON OPERATING PICTURE

EMCI

Weather

Public Information

Forecast Position

Observed Position

Forecast Track

Observed Track

Forecast Error Cone and Danger Area

Watches and Warnings

Hurricane Force (64kts+)

AWS Locations

OBJECTID	Storm Name	Storm Type	Advisory Date	Advisory Number	Storm Number	Forecast Period	Basin	Shape_Length
1	Mekkhala		21/6/26, 10:25 am		7.00	72.00	WP	10.68
2	Mekkhala		21/6/26, 10:25 am		7.00	120.00	WP	17.9

Pukapuka

Nassau

PUKAPUKA

Total431

Male224

Female207

Elderly 70+9

Seniors 60+42

Adults 25+132

Young Adults 15-2575

Children 5-14131

Infants 0-4224

Weather Station Dashboard

14.46 V 2026-04-22 12:12:00

Air Temperature24hr min/max

28.8degC

RH

Wednesday 22

Thursday 23

Friday 24

Saturday 25

Sunday 26

Monday 27

About location

510°51'14", W160°50'27"

Pacific/Rarotonga (-10:00)

Sunrise: 7:09

Sunset: 18:56

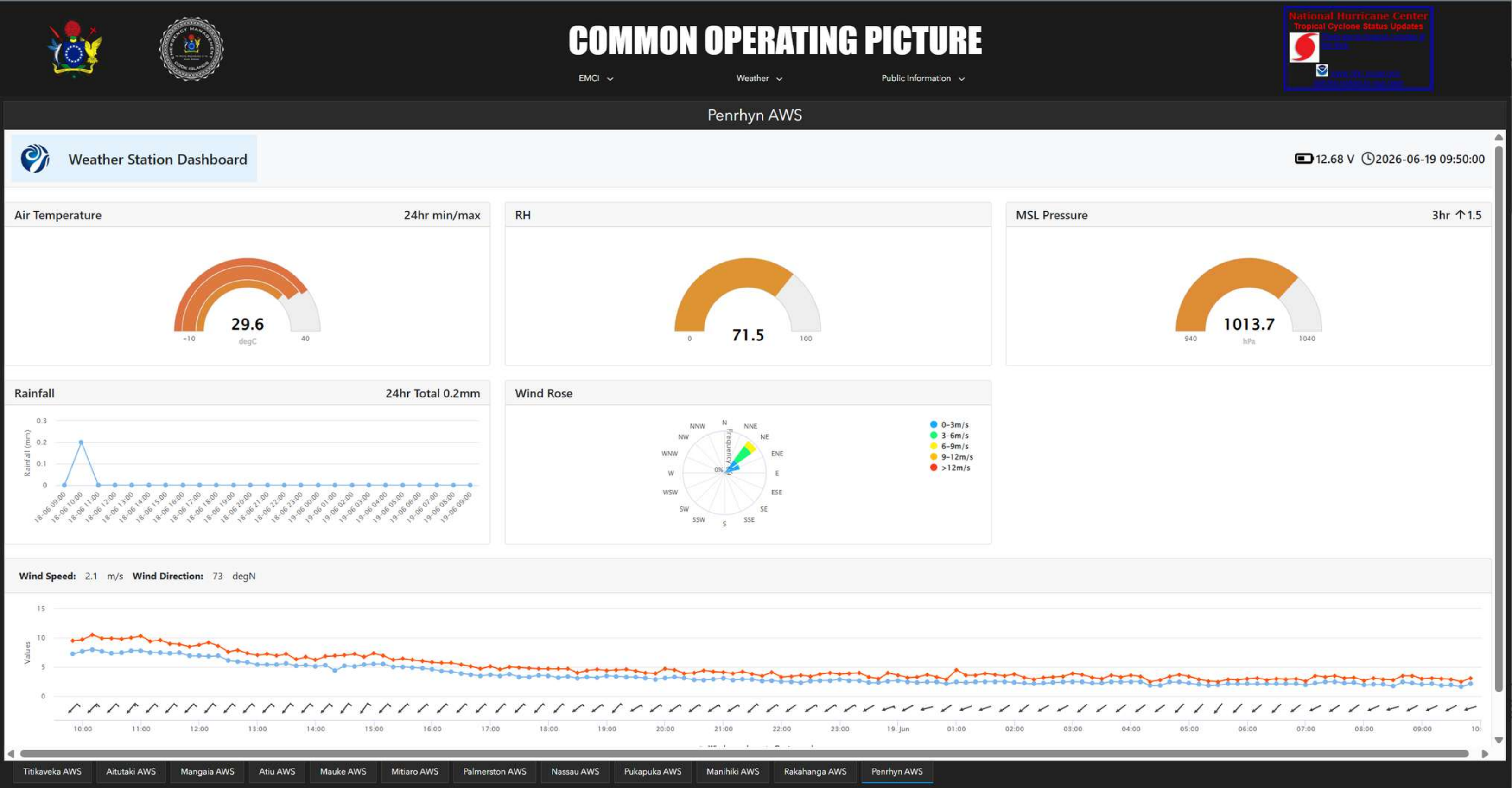
Dusk: 19:18

Elevation: 9m (29ft)

INDIVIDUAL OUTER ISLAND SPECIFIC DASHBOARDS



LIVE AUTOMATIC WEATHER STATION INTEGRATION





PUBLIC WARNING INTEGRATION



EMCI

Weather

Public Information

Stephano

Public Message Editor

Use this form to update the public information and messaging that will appear on the Emergency Management Information site.

This information will be visible to the public.

Is there an emergency or incident?*

When you select yes, you will be prompted for more information about the emergency.

No

Yes

Summary*

Enter a summary of the emergency or current situation.

Details

Use this message for additional details about the current situation or action to take.

1000

When the form is updated, the public information and messaging is changed on the Emergency Management Information site and the previous public information and messaging is moved to the Past Notifications page.

Update

EMCI PUBLIC INFORMATION DASHBOARD

ACTIVE EMERGENCY: TEST

Coastal Inundation Alert TEST

ACTION REQUIRED

Move people inland

Coastal inundation forecasted for the western side of Rarotonga

See Met Office for details- TEST

Last update: 5/12/26, 3:52 pm

Notices and Evacuations

Search for an address

National Hurricane Center

Tropical Cyclone Status Updates

There are no tropical cyclones at this time.

05/12/26 15:00 UTC

05/12/26 15:00 UTC

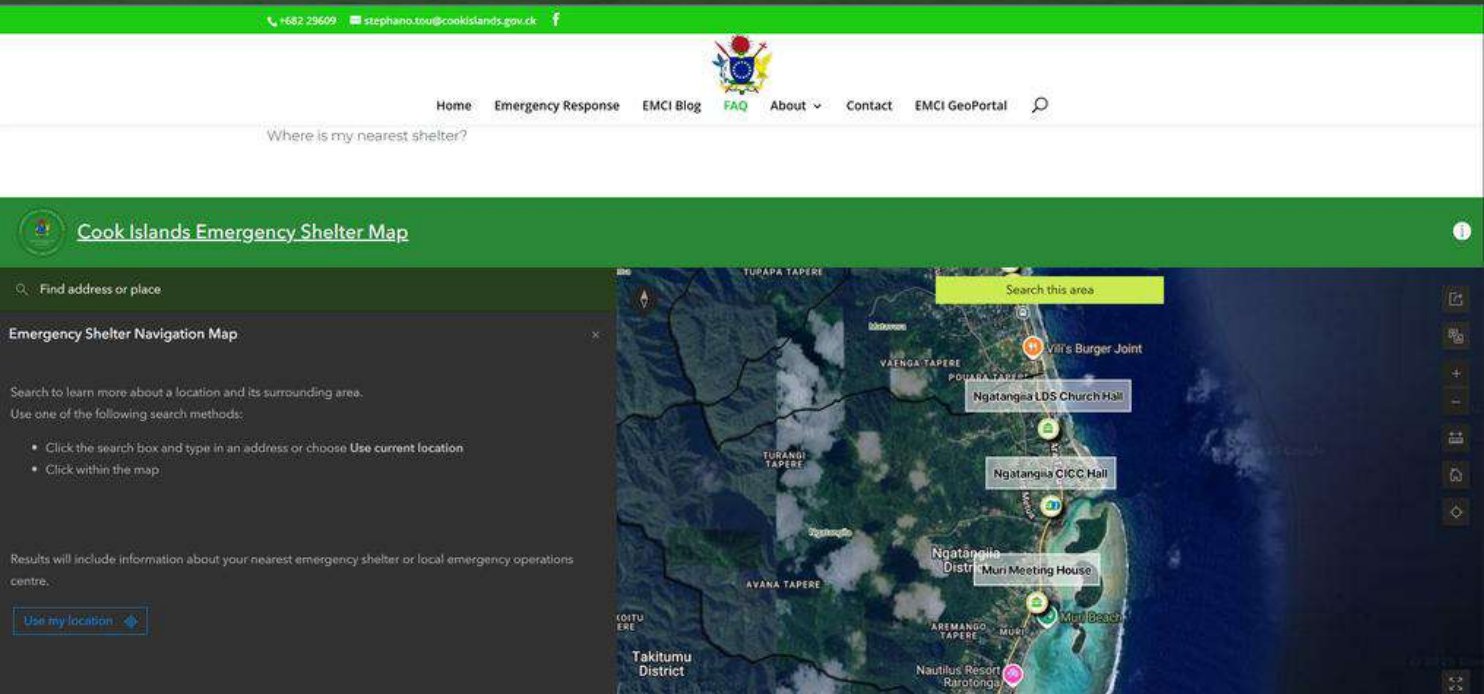
Powered by ArcGIS Survey123



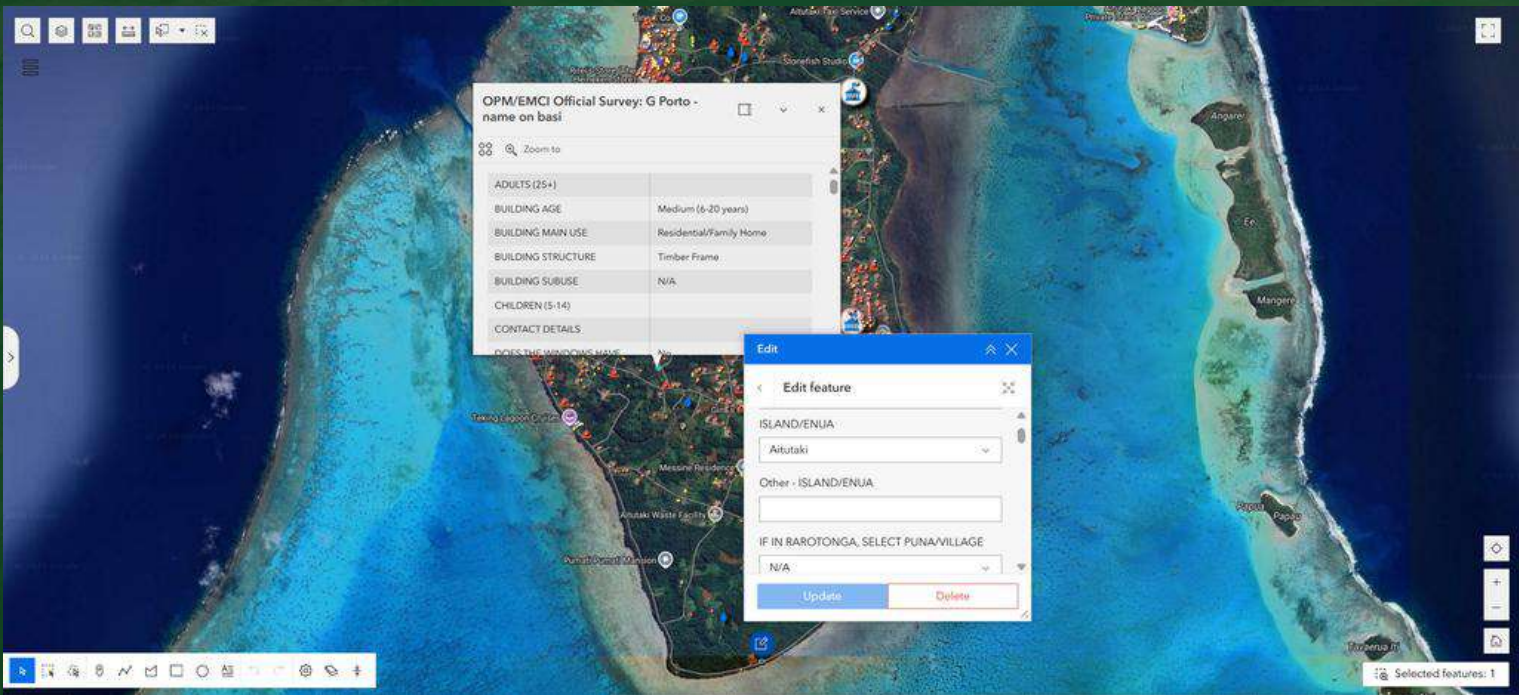
EXPLORING ESRI TOOLS



FLOOD EXPOSURE MODELS



SHELTER NAVIGATION (PUBLIC VIEW)



LIVE EDITING/VERIFICATION TOOL



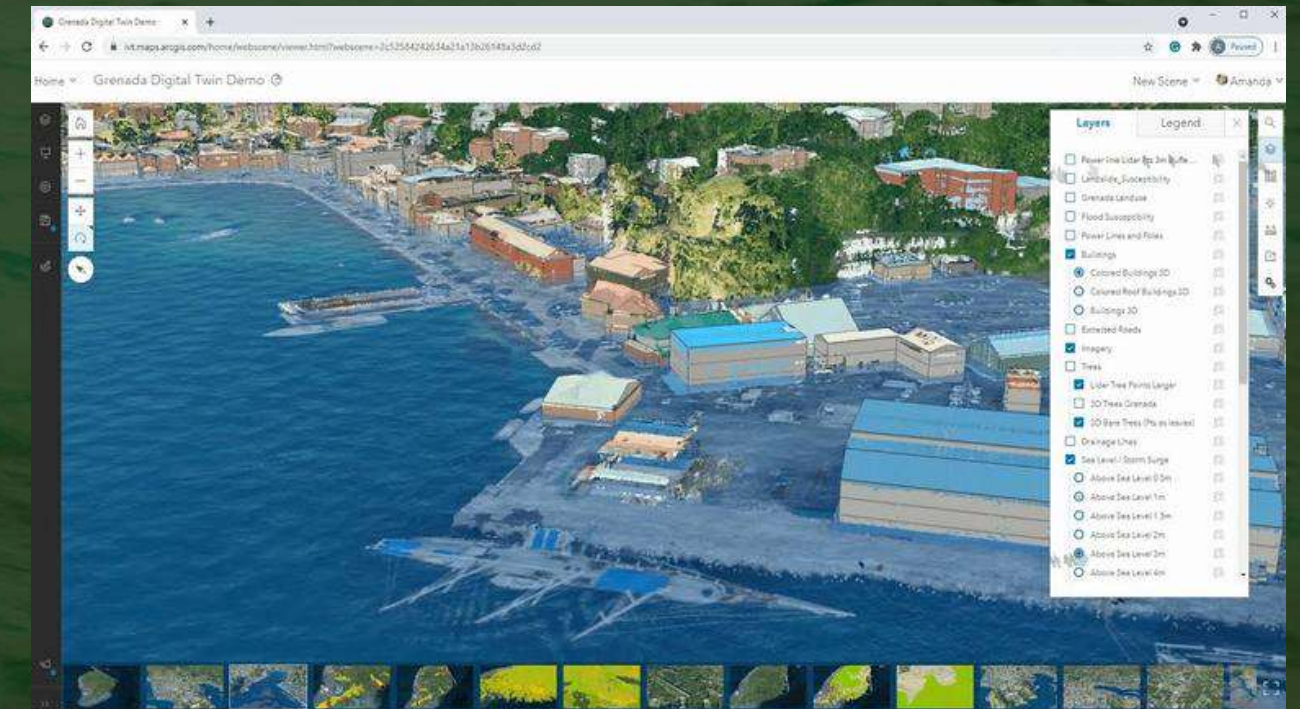
FIRST RESPONDER NAV TOOLS



FUTURE DEVELOPMENTS: DIGITAL TWIN SUPPORTED BY UN-SPIDER



FLOOD EXPOSURE MODELS



FLOOD SIMULATIONS

- SATELLITE IMAGERY + LIDAR DEMS & BUILDING OUTLINES
- COOK ISLANDS EXPOSURE DATASETS
- NATIONWIDE RAIN GAUGE INTEGRATION

OUTPUT CONTRIBUTIONS:

PUBLIC AWARENESS
RISK PROFILES FOR CRITICAL INFRASTRUCTURE
DRM PLANNING, PREPARATION & RESPONSE COORDINATION
IMPACT BASED FORECASTING
ANTICIPATORY ACTIONS
AUTOMATED ALERT SYSTEM



MEITAKI MAATA

“ D I V E R S I T Y I S H A V I N G A S E A T A T T H E T A B L E ,
I n c l u s i o n i s h a v i n g a v o i c e ,
a n d B e l o n g i n g i s h a v i n g t h a t v o i c e b e h e a r d , t o e n s u r e
t h a t n o o n e i s l e f t b e h i n d ” .

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Digital Earth Pacific

A Pacific-owned, regional public good: an Earth observation and analytics platform that turns decades of satellite data into decision-ready information for all 22 Pacific Island Countries and Territories.

Analysis-ready data

Decades of satellite imagery, calibrated and continuously updated on cloud-native infrastructure.

Decision-ready products

Coastlines, mangroves, vegetation height, GeoMADs, water observations and more — built for Pacific priorities, at high resolution.

Pacific capacity

Training, co-development and university partnerships so Pacific institutions run the analysis themselves.

Pacific-led governance & partnerships

Steered by member countries with regional and international partners

22

Pacific countries and territories served

9

regional products released

400+

practitioners trained (42% women)

10+

case studies of products in real-decisions

One satellite image, many applications — a shared regional infrastructure delivered by the Pacific Community (SPC) for climate resilience and sustainable development.

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