Digital Earth Pacific:
Navigating Climate Resilience in Small Island Developing States

Country Innovations:

PLACE Data and Application in Tuvalu *with the Support of SPC*

May 30, 2024

Tuvalu Department of Land and Surveys

PLACE

A Partnership for Rapid Aerial and Streetview Data Collection & Utilization in Tuvalu

PLACE

SPC/GOVERNMENT OF TUVALU/PLACE A PARTNERSHIP MODEL

- MOU signed - Sept 2023 between Tuvalu and PLACE
- PLACE is a nonprofit data trust working to make timely, affordable, and reliable mapping available for government partners and PLACE Community members
- In partnership, ultra-high resolution (5 cm), precisely geopositioned aerial (PLACE Aerial) and streetview (PLACE Ground) data captured for the capital
- SPC hosted and supported 2 PLACE staff for 2 weeks in March/April 2024
- Lands & Surveys Department advance preparation (clearances, permissions, etc.)

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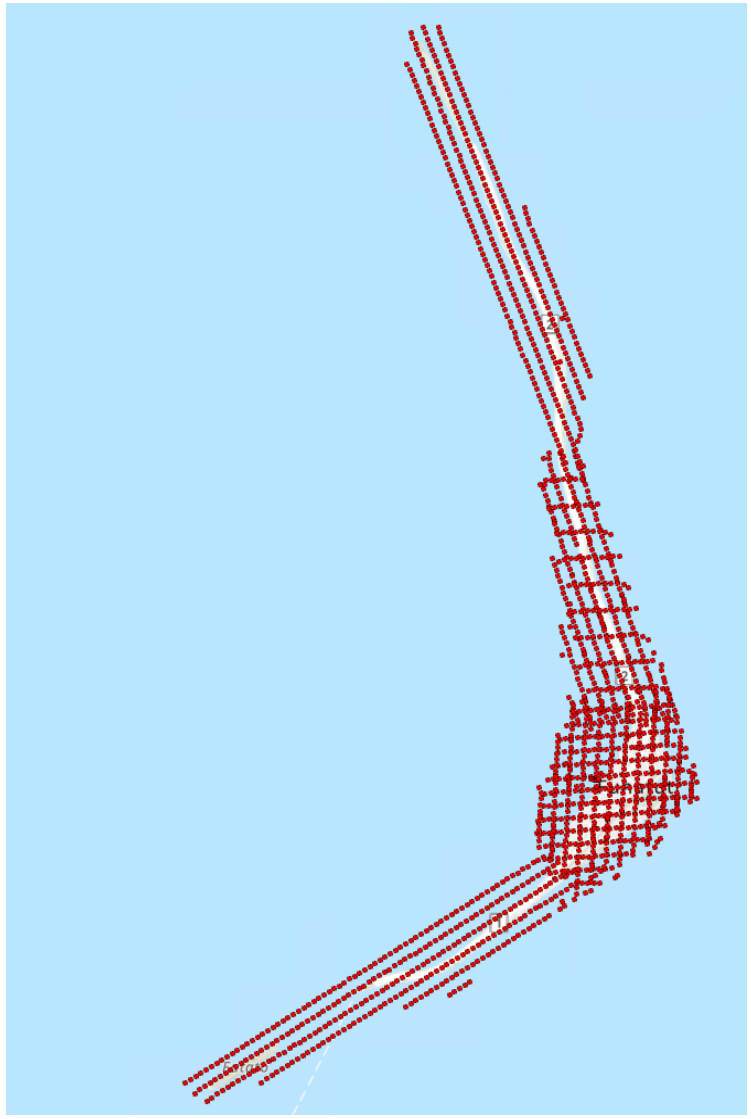
SPC / Government of Tuvalu / PLACE
A Partnership Model

- SPC and Lands & Surveys Department led capture of 39 Ground Control Points (GCPs)
- On the job training to Lands & Surveys Department on use of equipment and processing of data

PLACE AERIAL COLLECTION

- 6 flights in total covering 7.8 sq km
- 1,684 images of 5 cm resolution
- PPK post processed UAV GNSS readings with base station corrections achieving > 95% fixed solutions positionally accurate to within 15-20 cm
- Further corrected with GCPs



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PLACE GROUND COLLECTION

- The final collection is 3,596 images of deidentified 360 images in 6K resolution. Covering a total of **36 km** of road length
- Mosaic-51 camera covering main roads on Funafuti (2,508 images)
- GoPro Max camera on major & minor roads, tracks, beaches & outer islands (1,088 images)

PRELIMINARY RESULTS

- Dept. of Lands & Surveys convened stakeholder workshop prior to departure to review potential uses and initial data products of:
  - True orthophoto,
  - Digital Surface Model (DSM),
  - Preliminary machine Learning (ML) detections shared.

USE CASE DEVELOPMENT

- In a workshop, several primary use cases were identified:
  - Need to visualize island in 3D;
  - Quantify available water storage in case of drought;
  - Solar panel power provision and potential;
  - Land Use change detection;
  - Modeling sea level rise

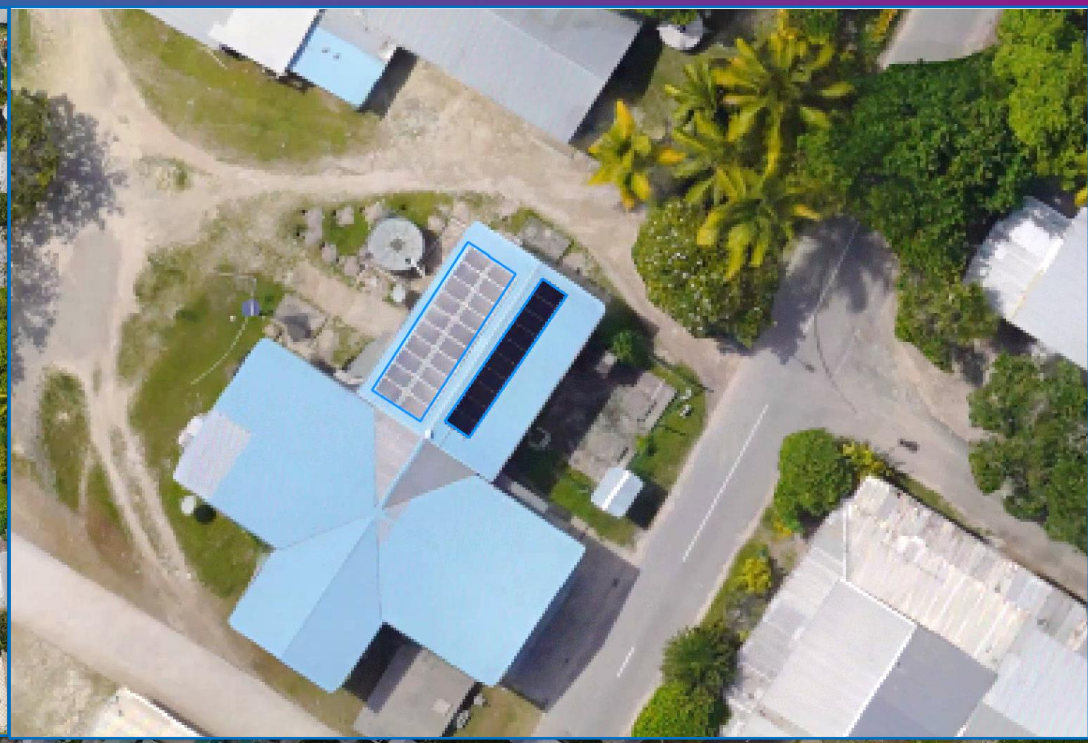
WATER STORAGE

- Tuvalu relies on captured rainwater stored in elevated tanks for its water needs.
- Most of the tanks are 2.3 meters high with a diameter of 2.5 meters.
- Tank capacity is estimated to be about **5 cubic meters**
- The model resulted in a vector layer showing the number and locations of each water storage tank on the island.
- Total number was estimated be **1,890 tanks** equivalent to **9,450 cubic meters of water**

SOLAR POWER DETECTION

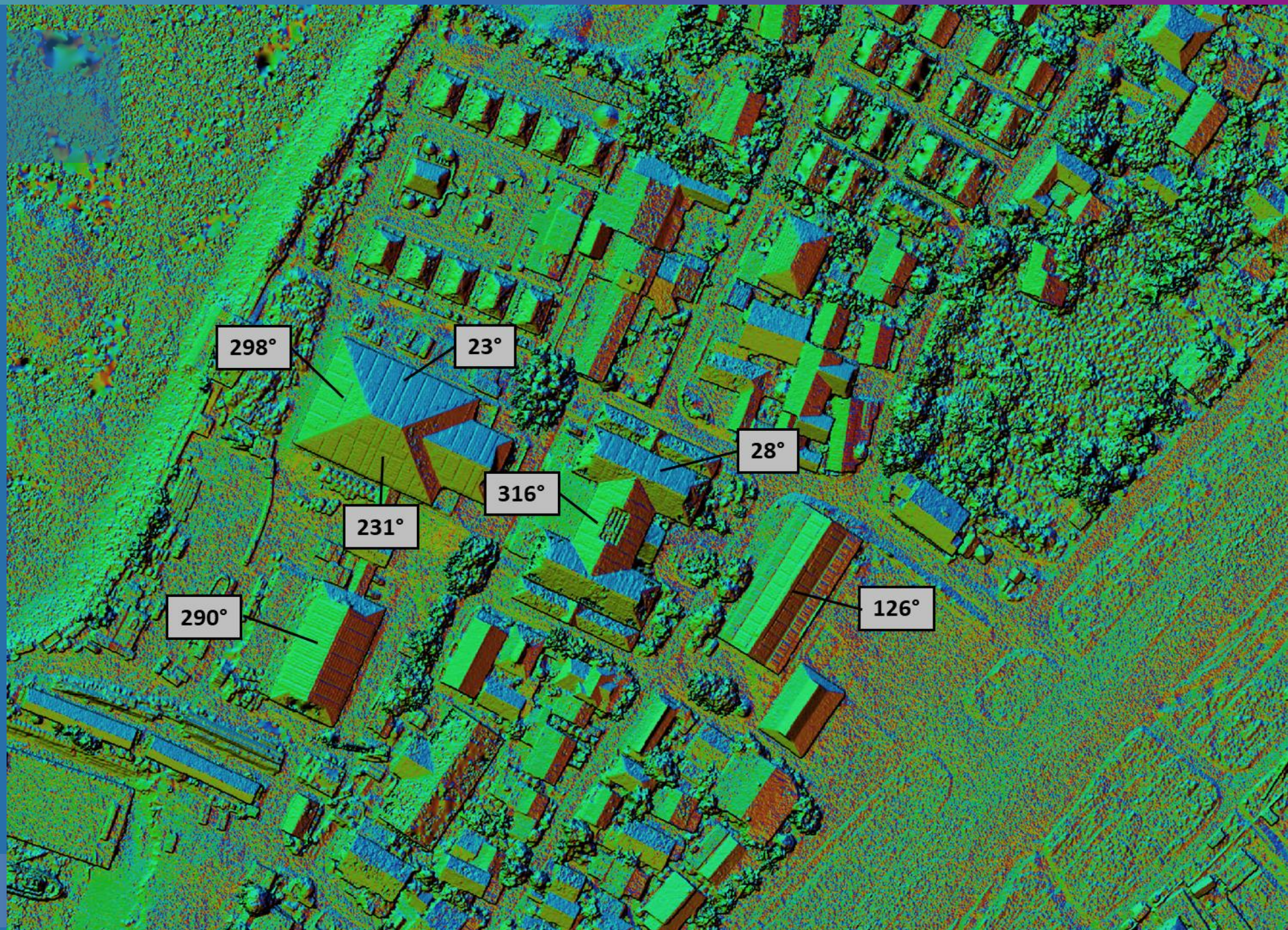
- Number of detected solar panel clusters = 224
- Total area of solar panels = 9,600 sq.meters
- Total amount of installed power = ~ 1,700 kW

* Assuming average a 1 sqm of a solar panel generates 175 watts



SOLAR POWER EXPANSION PLANNING

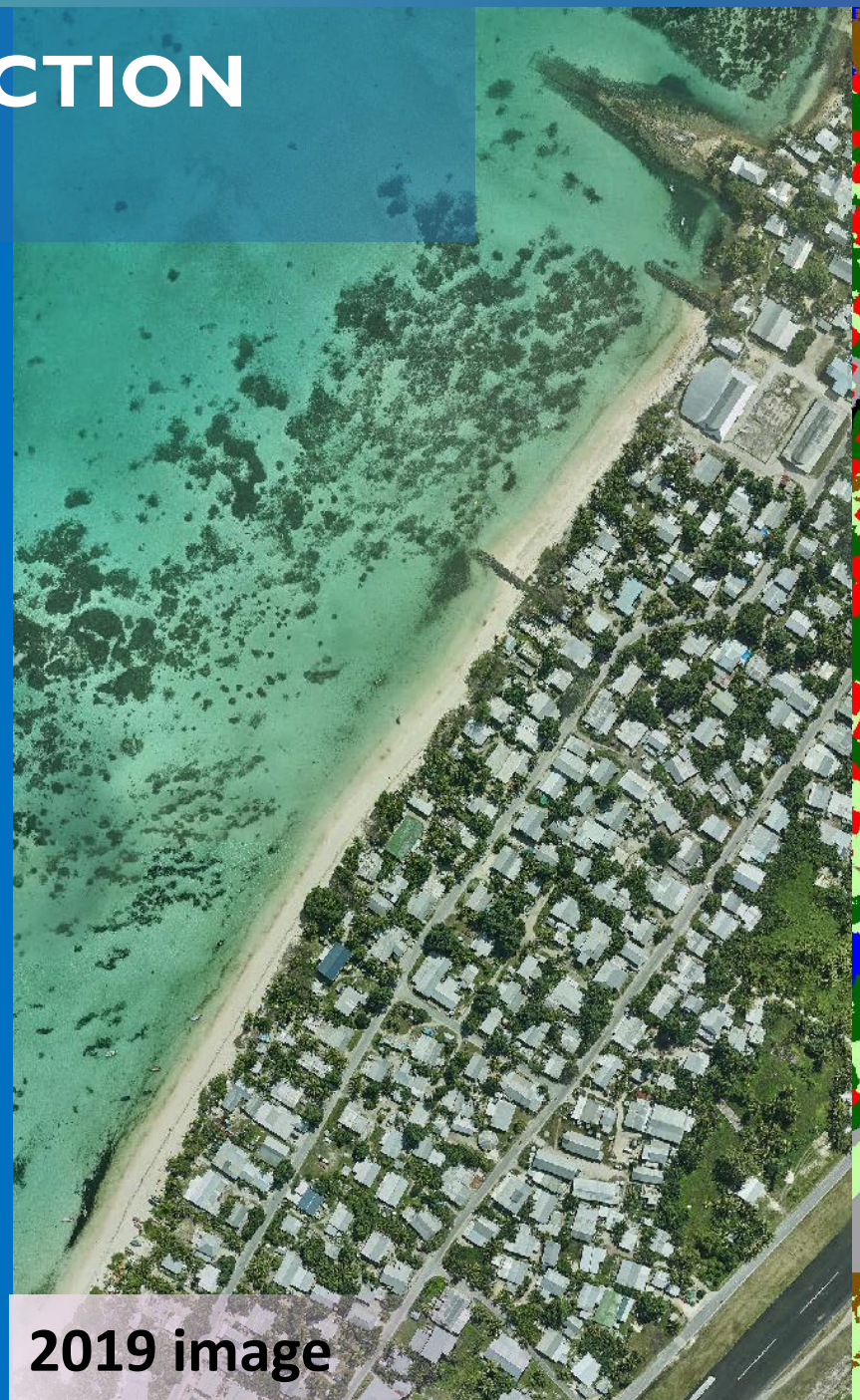
- Machine Learning was used to detect :
  - Building Outlines
  - Building Heights
  - Roof Slope
  - Roof Type and Pitch angle
- Using these combined attributes we can identify the roofs with ideal pitch, condition and exposure to generate solar energy



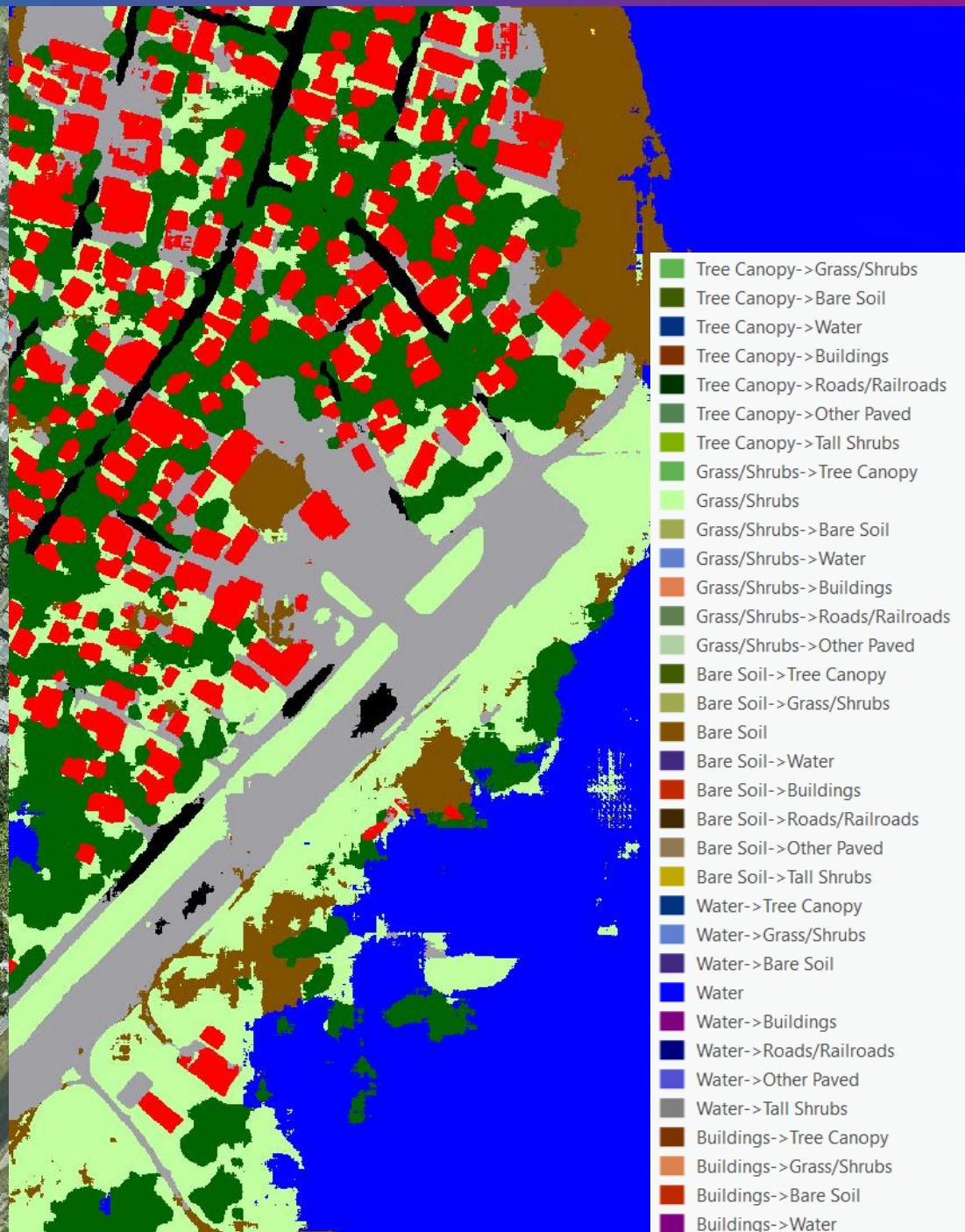
0° is North 180° is South
90° is East 270° is West

CHANGE DETECTION ANALYSIS

- Classification of image pixels according to land use
- Same analysis was performed on 2019 & 2024 imagery
- Total change in area was estimated at 1 square km:
  - 36% changed from “Water” to “Bare Soil” explained by the land reclamation work
  - 6% changed from “Bare Soil” to “Tree Canopy”
  - 1% from “Tree Canopy” to “Building”



2019 image



COMBINED DATA DETAILING IMPACT OF SEA LEVEL RISE

Thank You!!!

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Interest in supporting PLACE?

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