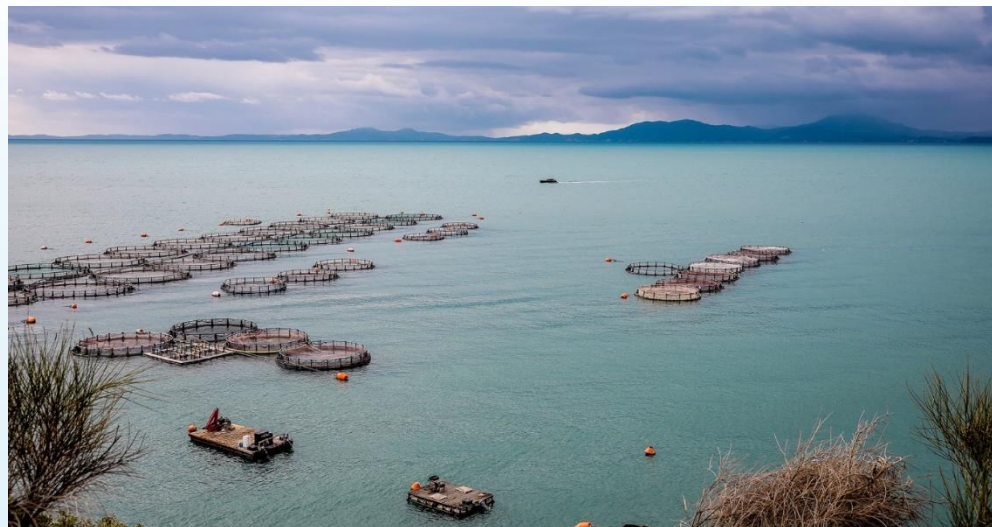


WP3 Aquaculture Detection



Greek fish farms © Greekfood News

CLS: J. Augot, E. Lavergne - FAO: E. Blondel, A. Ellenbroek





Outline

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Offshore Aquaculture

Objective

Automatically detect offshore aquaculture clusters.

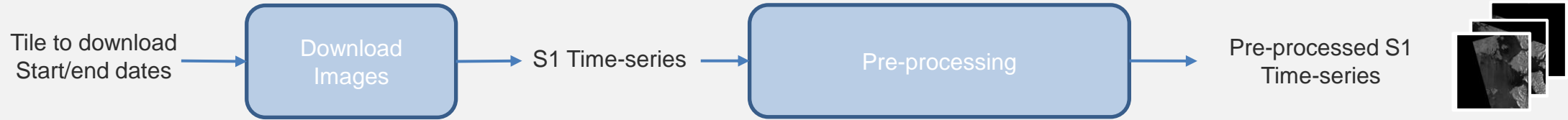


Figure: Aquaculture activity in Puerto Montt, Chile (The background image is issued by Planet)

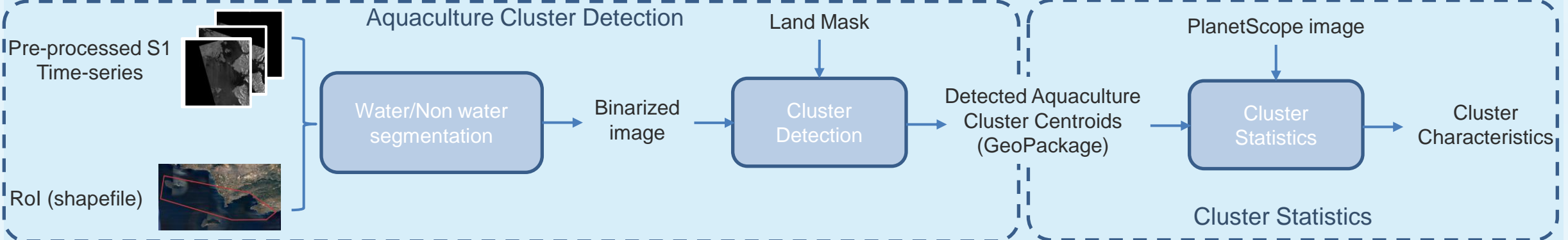
Offshore Aquaculture

Workflow

Pre-processing



Processing



Offshore Aquaculture

Pre-processing

S1Tiling (developed by CNES)

```
# Set the initial and final date (YYYY-MM-DD format) in this line
first_date : 2017-12-18
last_date  : 2017-12-25

# Tiles to be processed
# The tiles can be given as a list
# - tiles: list of tiles (comma separated)
# ex: tiles: 33NWB,33NWC
Tiles : 51STV

# Define the polarisation mode of the products to downloads
# Must be "HH-HV", "VV-VH", "VV", "VH", "HV", or "HH"
polarisation : VV

...
```

Figure: Configuration file extract

Download all S1 images between *start date and end date*, on a given *tile*.

Pre-process the downloaded images

Radiometric calibration

Orthorectification

Tiling

[Introduction — S1Tiling 0.3.2 documentation \(orfeo-toolbox.org\)](https://orfeo-toolbox.org/Introduction%20-%20S1Tiling%200.3.2%20documentation)

Offshore Aquaculture

Aquaculture Cluster Detection

Results

Figure: Results in Monastir (Tunisia)

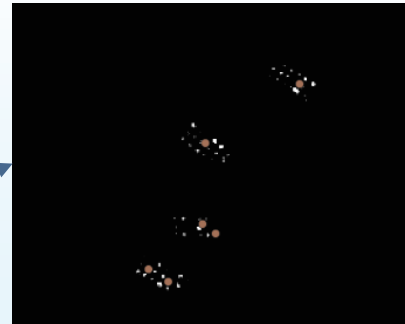


Figure: Results in Puerto Montt (Chile)



Location	Precision (%)	Recall (%)
Puerto Montt (Chile)	76	66
Monastir (Tunisia)	91	91

Table: Precision and Recall for Aquaculture Cage Detection

Offshore Aquaculture

Notebook

More details on how to run the algorithm and tune the parameters.

Inputs

Aquaculture Cluster Detection

This notebook runs the algorithm developed by CLS, which detects aquaculture clusters along coasts in order to monitor aquaculture activities in given areas of interest. It is protected by a license and can be used only for research purposes (no commercial uses permitted).

Workflow

The algorithm assumes that all the input data has already been downloaded and correctly preprocessed to be compatible with the workflow. If not, please refer to the corresponding handbook that go through all the steps.

The workflow is illustrated below:

```

    graph LR
      S1[Sentinel 1 time-series  
(TIFF images)] --> WS[Water/Non water  
Segmentation]
      ROI[Region of Interest  
(Shapefile)] --> WS
      WS --> CD[Cluster Detection]
      LM[Land Mask  
(Shapefile)] --> CD
      CD --> DAC[Detected Aquaculture  
Cluster Centroids  
(GeoPackage)]
  
```

It is divided into 2 steps:

- First, each Sentinel-1 image is binarized and segmented into water/on-water bodies, using statistical measures over the time-series. Aquaculture clusters are detected as non-water bodies.
- Then, some size filters and a land mask are applied to remove lands, in order to keep only aquaculture clusters. **The output file is named farms.gpkg.**

Beware of false positive : islands or non-moving objects which have a size comparable to aquaculture clusters might be detected as such.

+ Visualization of the detected clusters directly in the notebook

```

[35]: # Plot cluster centroids
ax = clusters.plot(figsize=(12, 8))

# Plot the ROI if one was given in roi_dir
shp_files = glob.glob(os.path.join(roi_dir, "*.shp"))
if len(shp_files) > 0:
    roi_path = shp_files[0] # Only one ROI can be considered: the first one that is in the folder
    roi = gpd.read_file(roi_path)
    roi = roi.to_crs(clusters.crs)
    roi.boundary.plot(ax=ax, color='r')

# Add a background map
cx.add_basemap(ax, url=cx.sources.OSM_A, crs=clusters.crs)
ax.set_axis_off()
  
```

Region of Interest

Detected cluster centroids

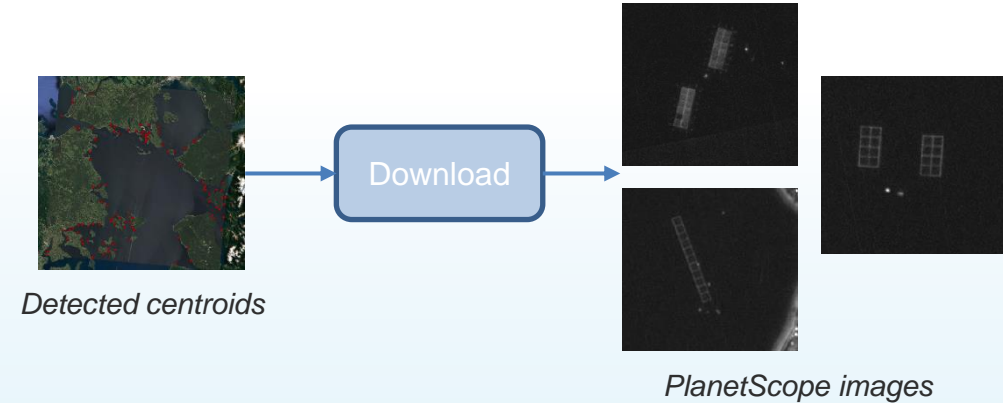
Offshore Aquaculture

[Optional] Cluster Statistics

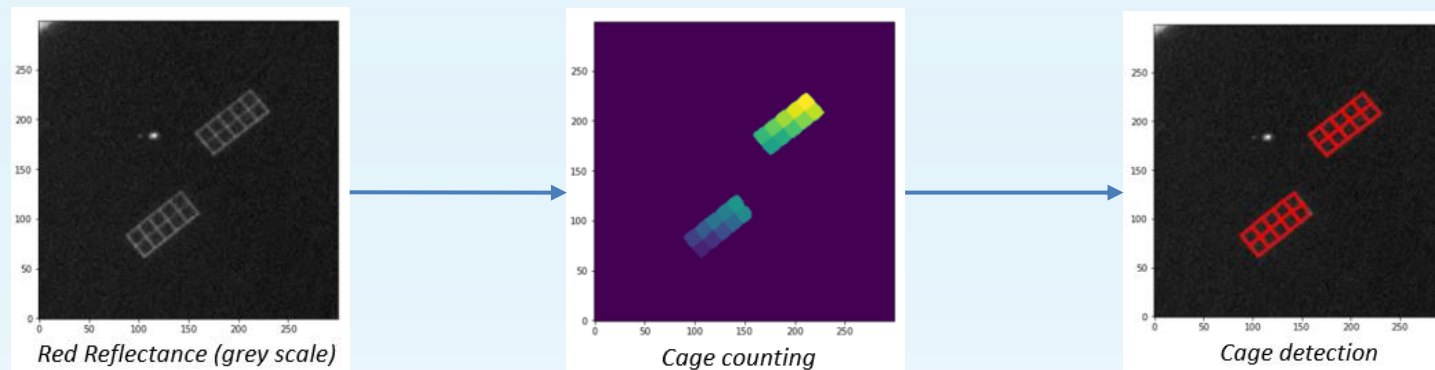
Download PlanetScope Image

Only buffers around the previously detected cluster centroids are downloaded.

! PlanetScope images are not open-source.



Processing:



Offshore Aquaculture

[Optional] Cluster Statistics



Figure: Results Visualization (Puerto Montt, Chile)

Inland Aquaculture

Objective

Automatically detect inland aquaculture ponds and other crops.

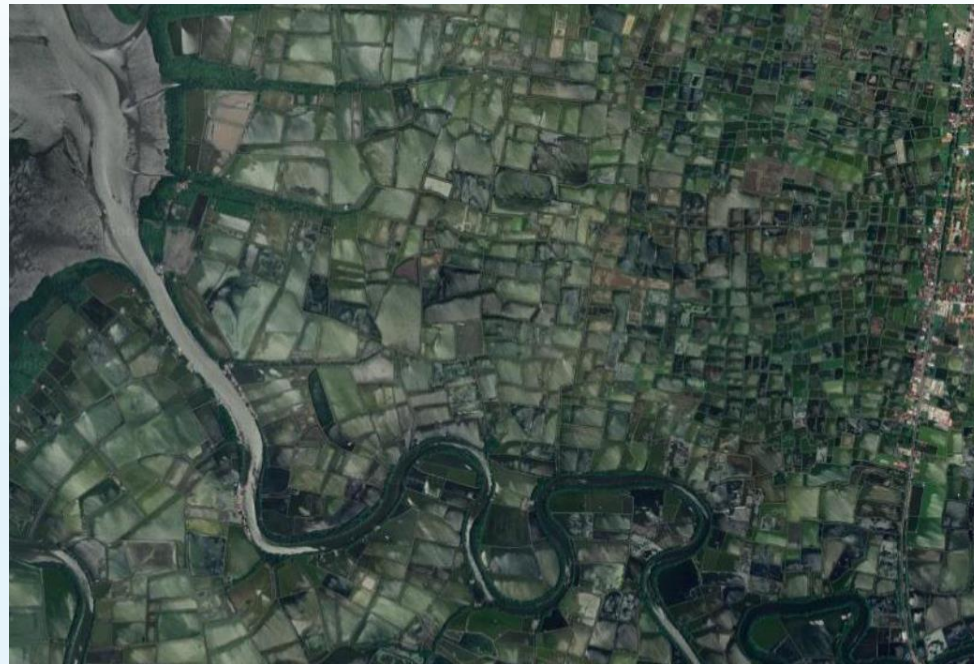
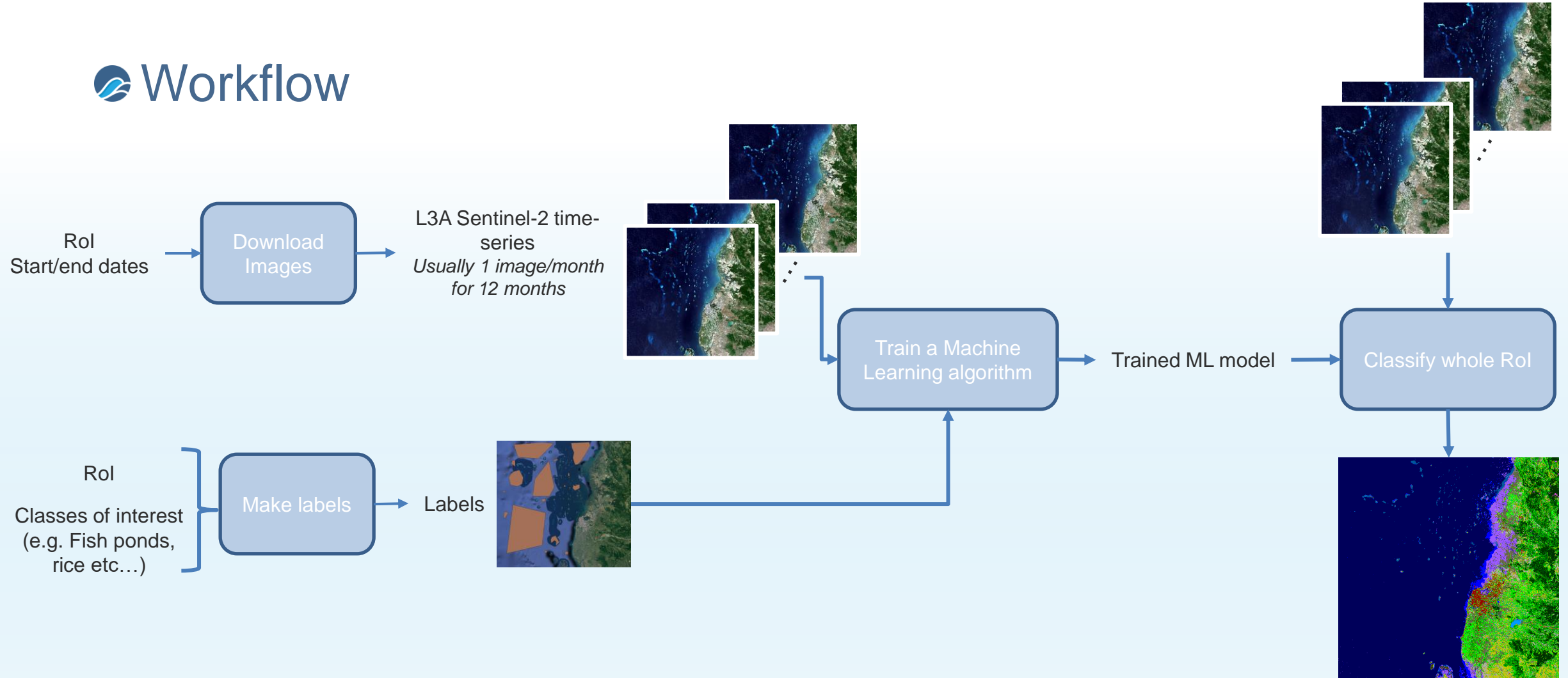


Figure: Google Satellite image in Sulawesi, Indonesia

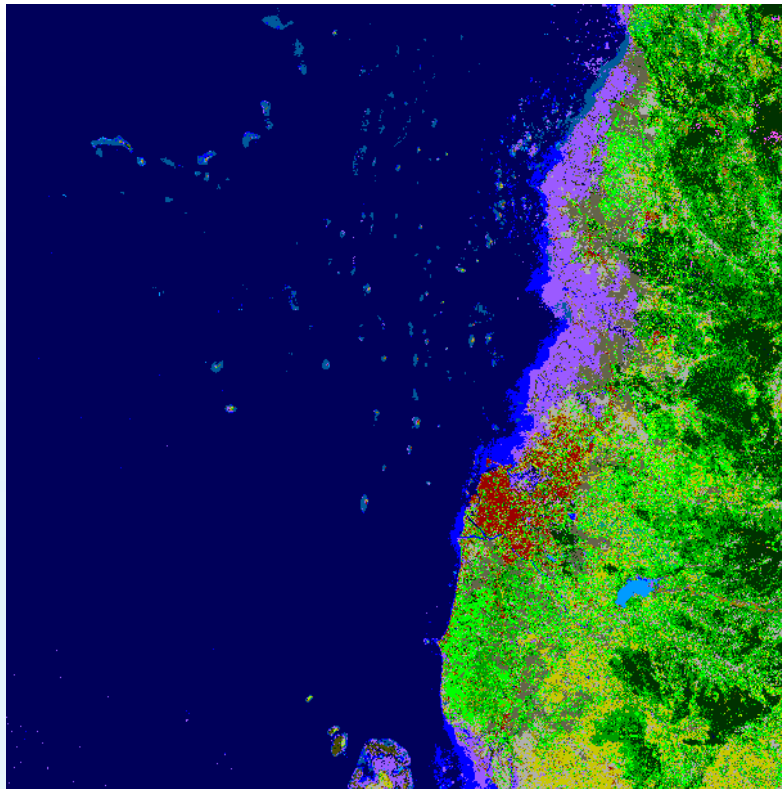
Inland Aquaculture

Workflow



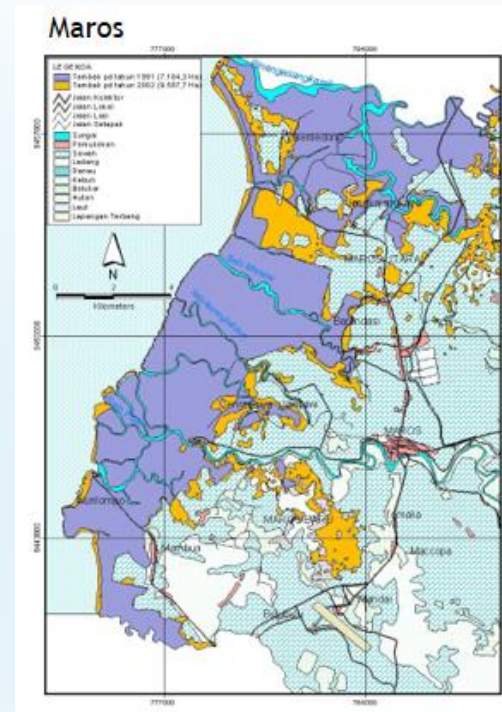
Inland Aquaculture

Results



Natural Forest	Dark Green
Secondary Forest	Light Green
Tree plantation	Bright Green
Bushland	Olive Green
Grassland	Yellow-Green
Fallow / Reed	Teal
Meadow	Yellow
Paddy Rice (lowland)	Light Brown
Rain Fed (Upland) Rice	Dark Brown
Rivers Channels	Blue
Lakes	Light Blue
Fishponds (chanos chanos, ...)	Purple
Swamps	Dark Olive
Mangrove	Pink
Settlements / Built aera	Red
Bare soil (coastal)	Brown
Deep Sea	Dark Blue
Shallow sea	Light Blue

Validation with existing maps+ In-situ experience



Overall Accuracy: 71.6%



Thank You

