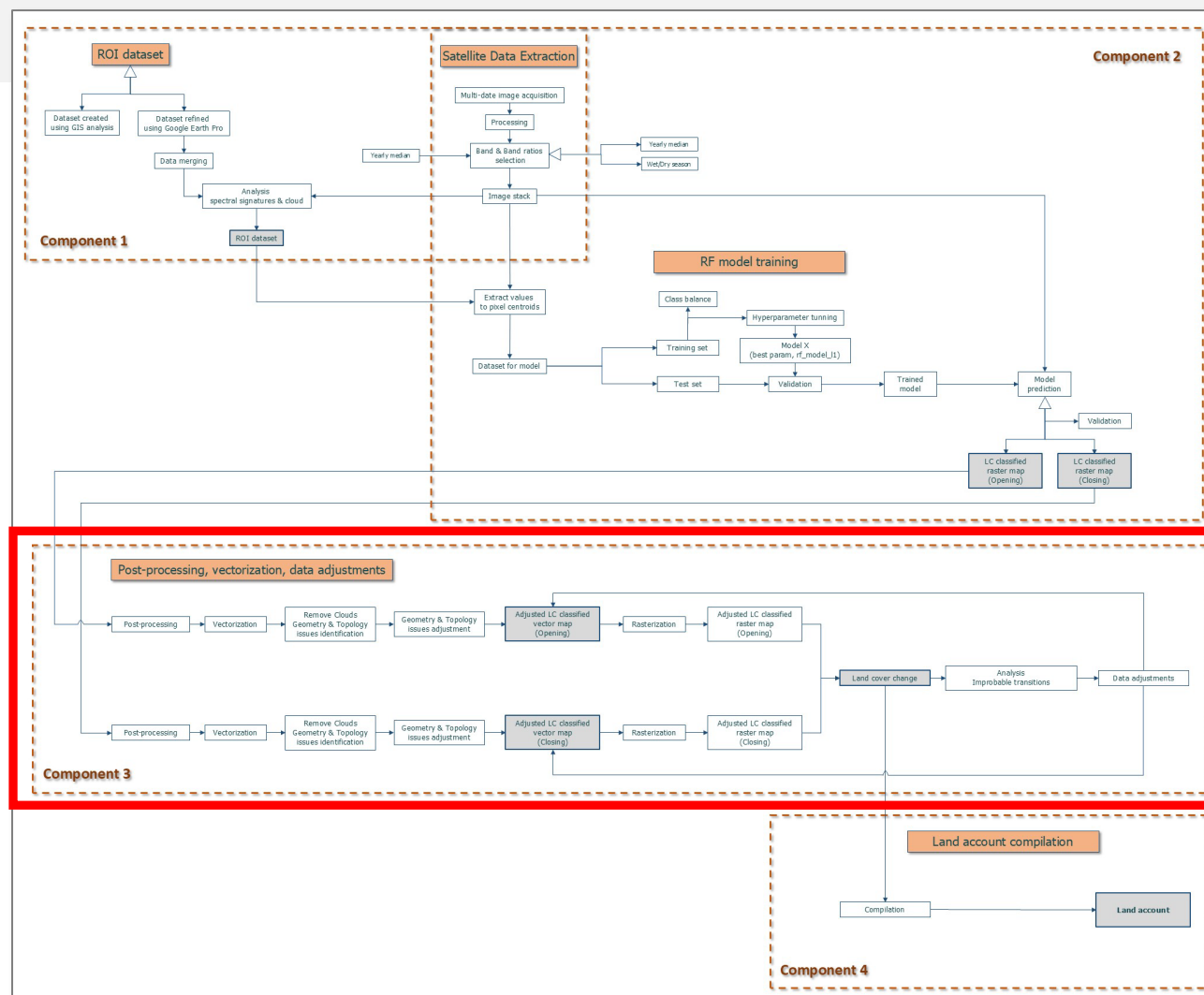# Land cover and land accounting in Vanuatu – Day 4

Component 3

Blanca Perez-Lapena, PhD

April 3, 2025

Pipeline for Agile Estimation of Land Accounts (PAELA)
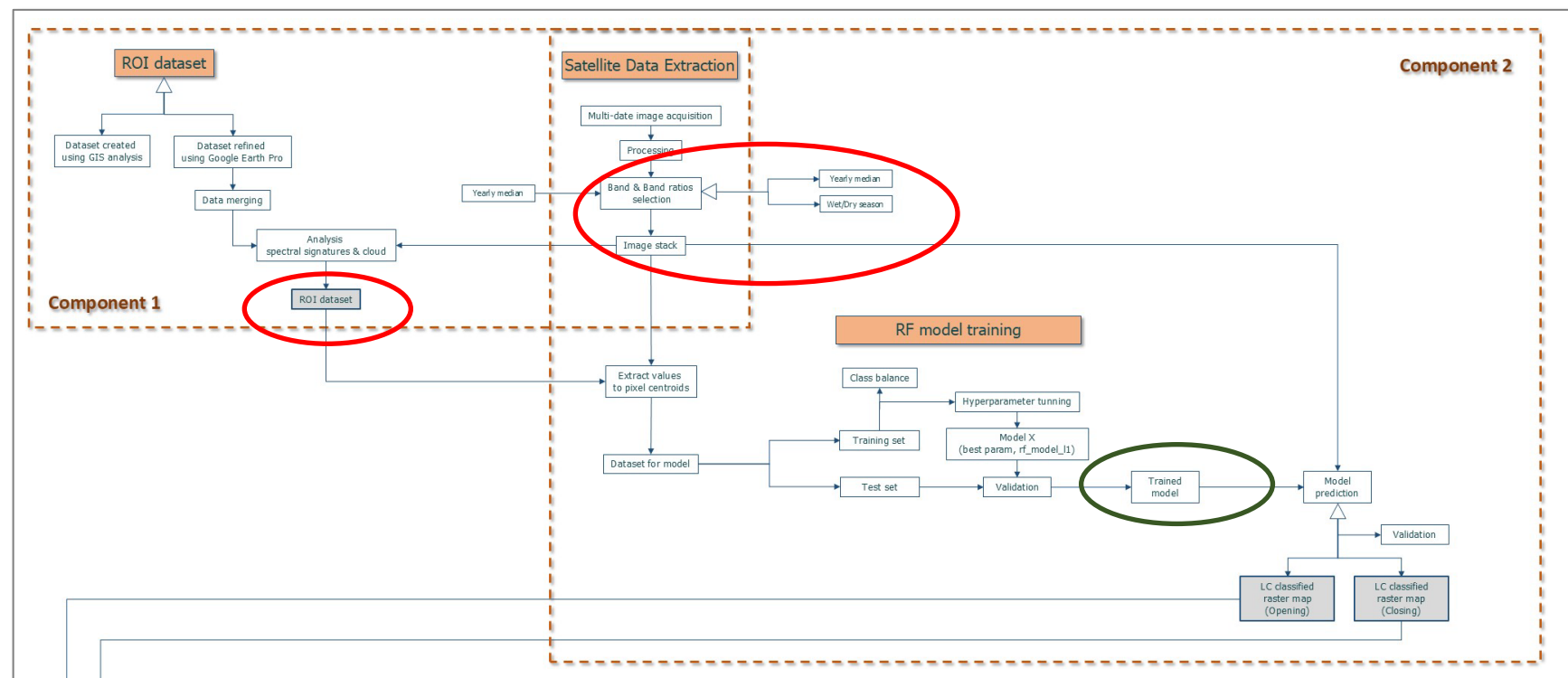
Component 2: Satellite data extraction & RF model training & prediction

- <u>Input</u>:
  - ROIs dataset
  - Imagery stack

- <u>Output</u>:
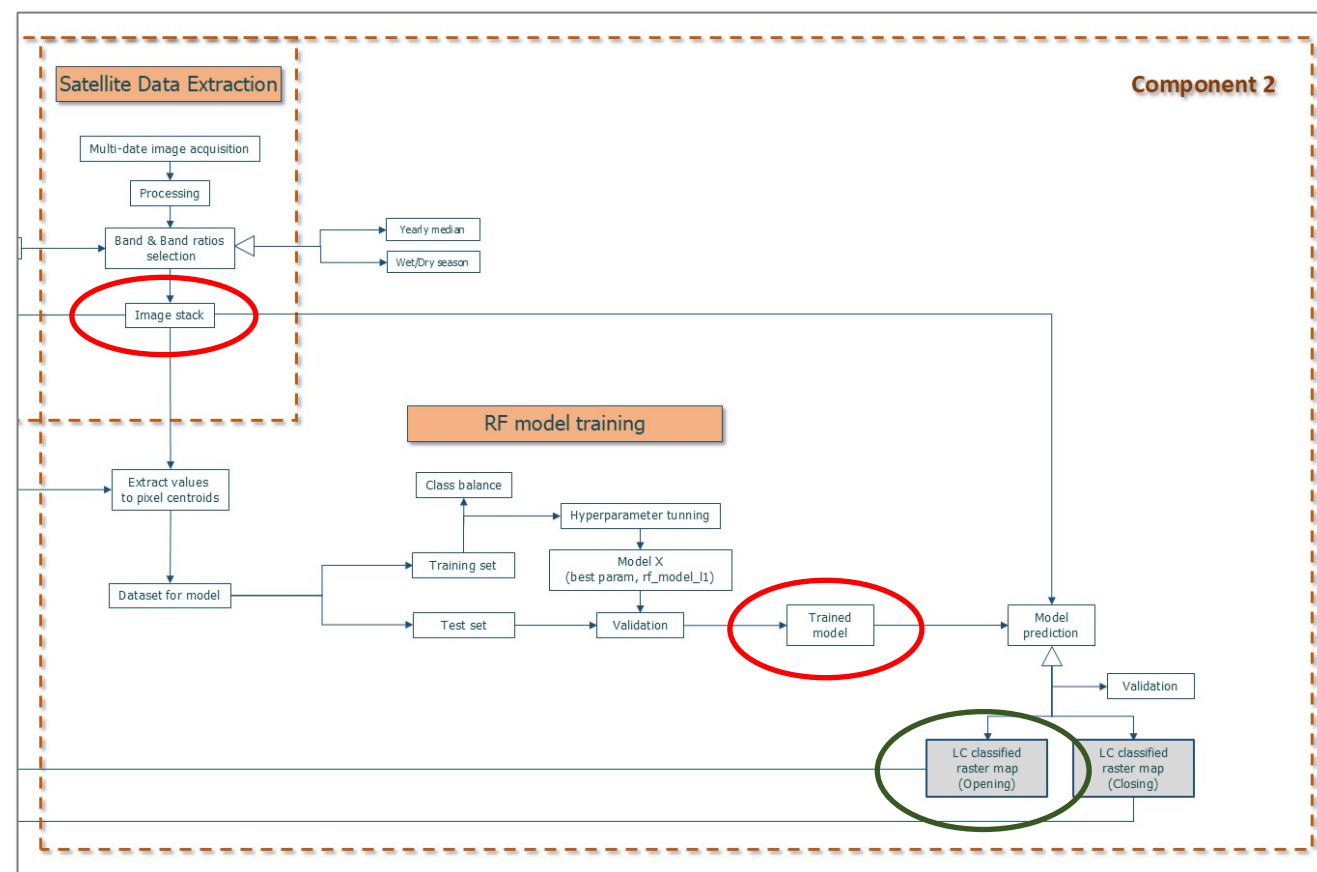 - Trained Random Forest model
    (e.g., Opening year)

Component 2: Satellite data extraction & RF model training & prediction
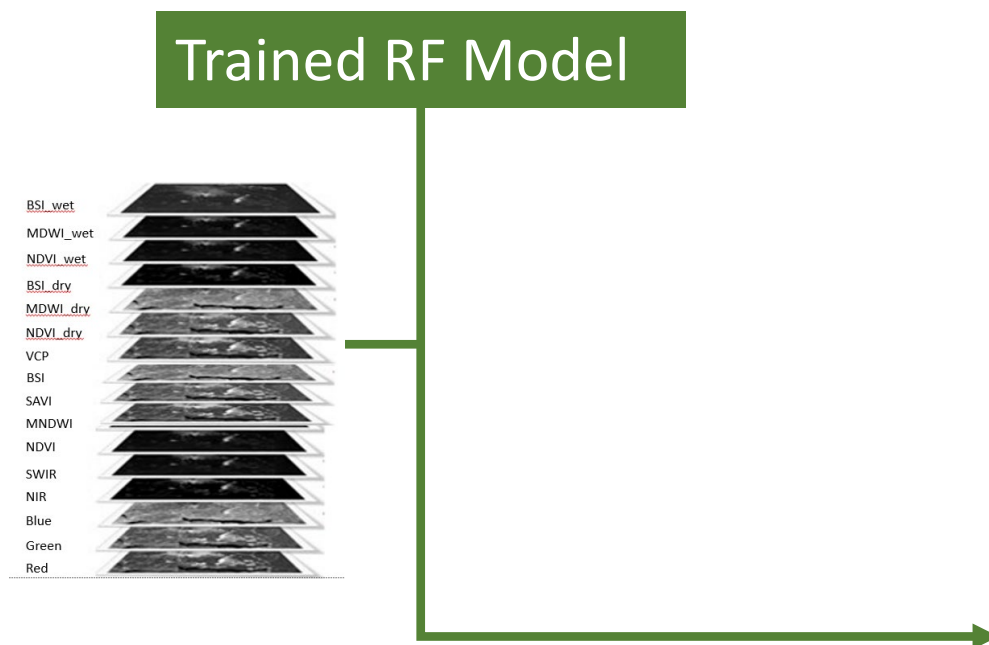
- Input:
  - Trained Random Forest model
  - Imagery stack (e.g., Opening year)

- Output:
  - Land cover classified raster map (e.g., Opening year)

Component 2: Output

Trained RF Model

LC prediction (2020)
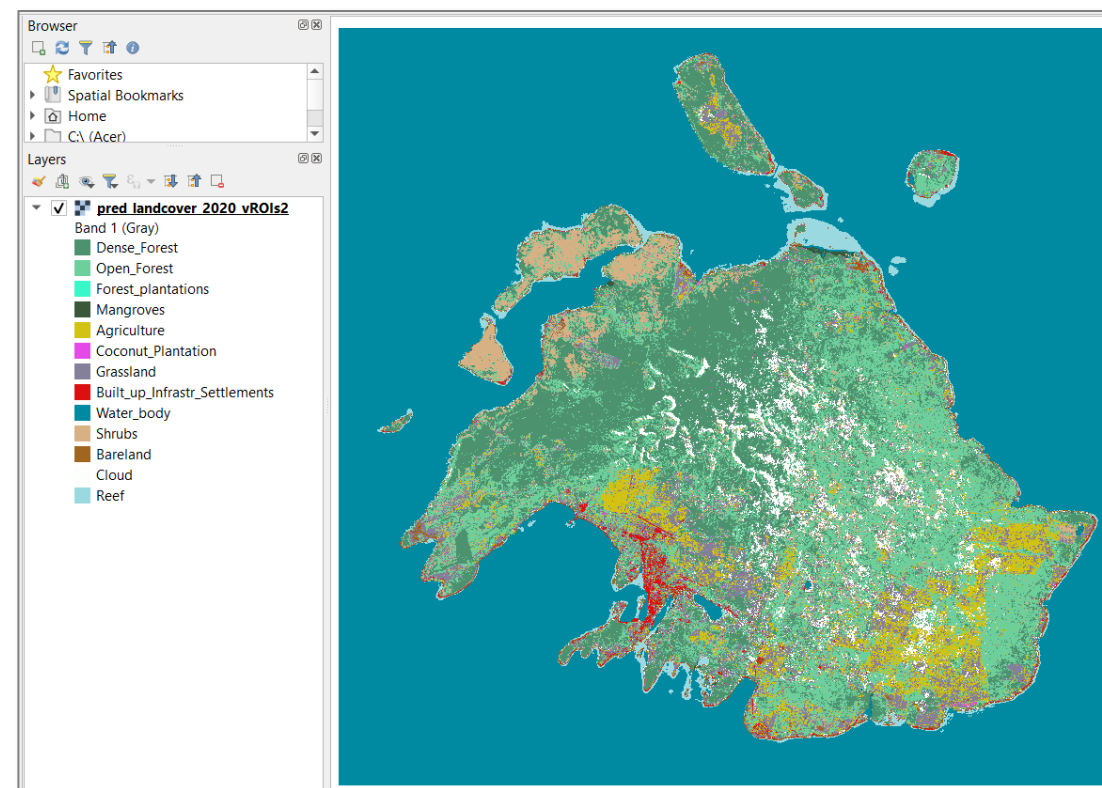
Yesterday – Component 1 & 2 (2023)
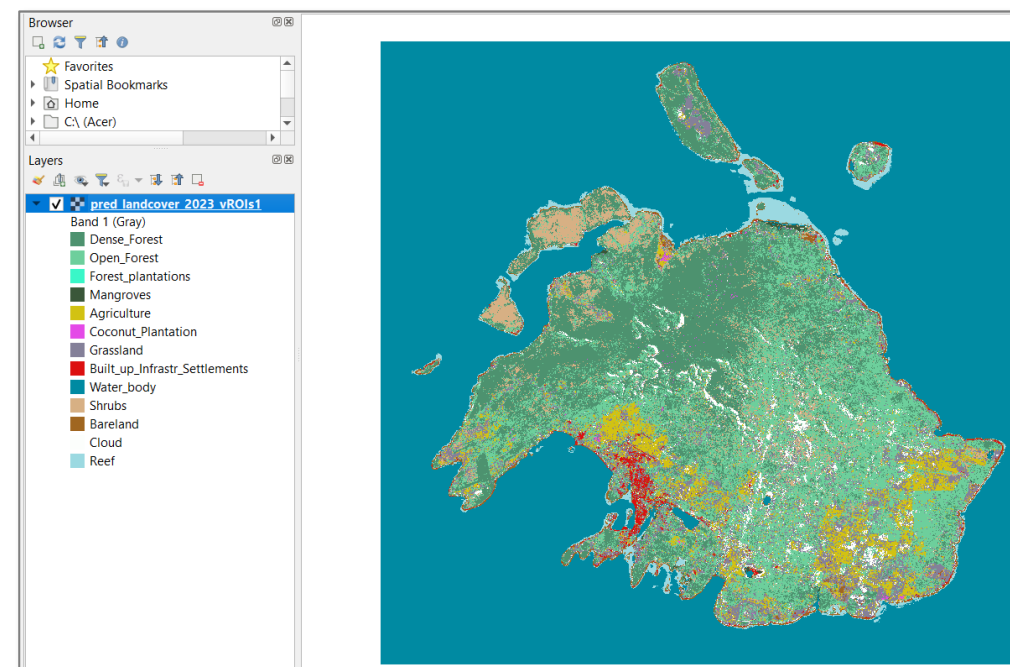
1) Created the ROIs dataset for 2023

- Step 1.2 to copy the files. Did not edit the kml in Google Earth Pro

- Step 1.3

- Step 1.4 (you used the provided stack in Component 1 for 2023 to delineate cloud ROIs)

2) Ran Component 2 to obtain the land cover classified map for 2023

Today − Component 3
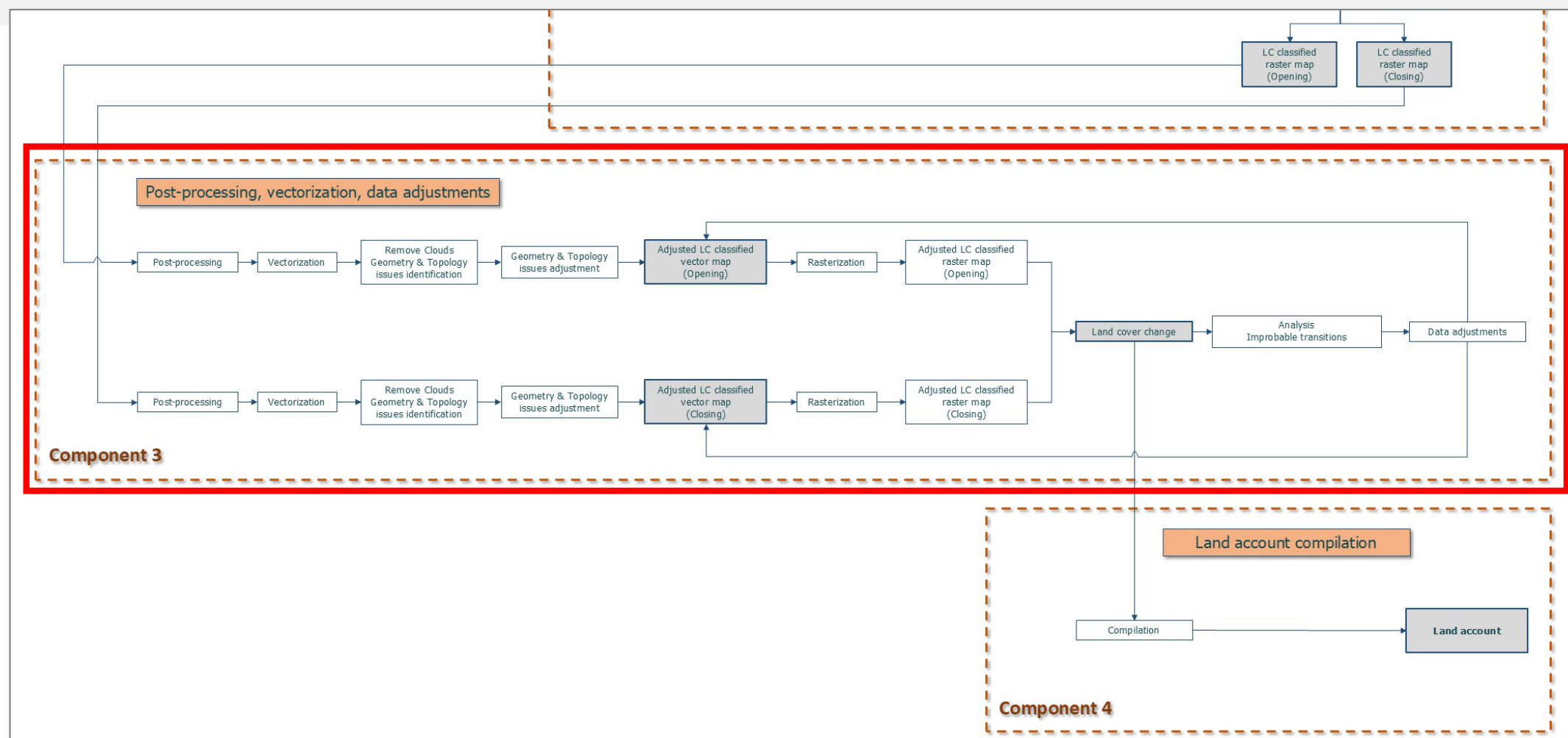
Component 3a

- Post-processing & Vectorization
- Assign descriptions to land cover codes

Component 3b

- Remove cloud polygons
- Identification of geometry issues
- Identification of topology issues:
  - Overlaps
  - Gaps
- Addressing gaps

Geometry issues

- Inaccuracies in the spatial data representation in a GIS often resulting from the presence of invalid geometries.

- Spatial queries and some processing tools within QGIS only possible with objects whose geometry is valid

- Invalid geometries lead to errors or even crashes in calculations

- Example: butterfly polygon
  - a self-intersection generates a positive surface and another negative one
  - the total area of the polygon will be reduced
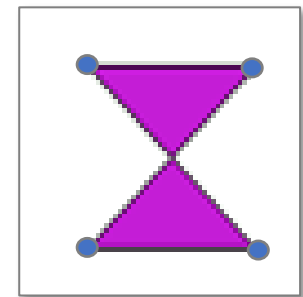
Topology issues

- Manages the relationships between features (e.g. gaps or overlaps between features)

- **Overlap issues:**

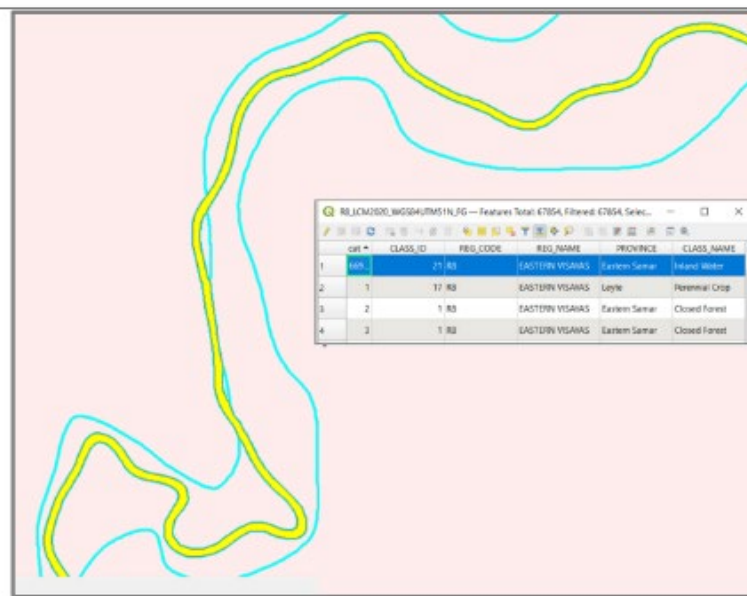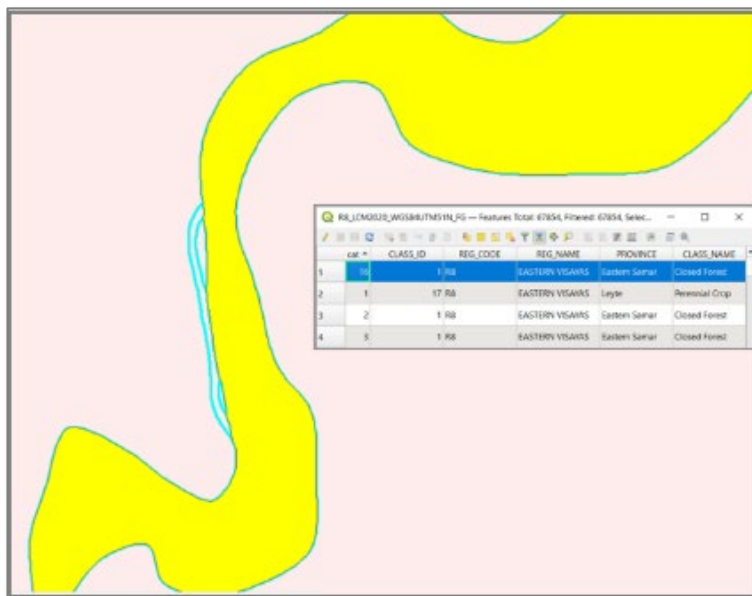When converting from vector to raster, which land cover class is assigned to a pixel?

- **Gap issues:**

When converting from vector to raster, resulting pixels will have NoData values posing transition issues

Topology issues

Overlaps

Gaps

Identification of Gaps in QGIS

GAPS as polygons & merge
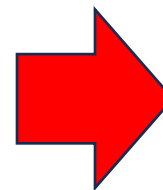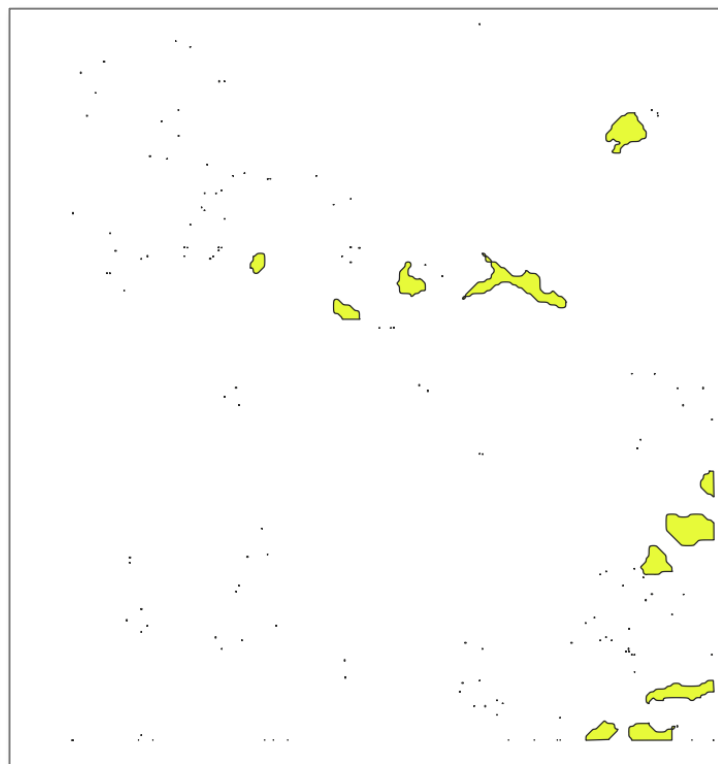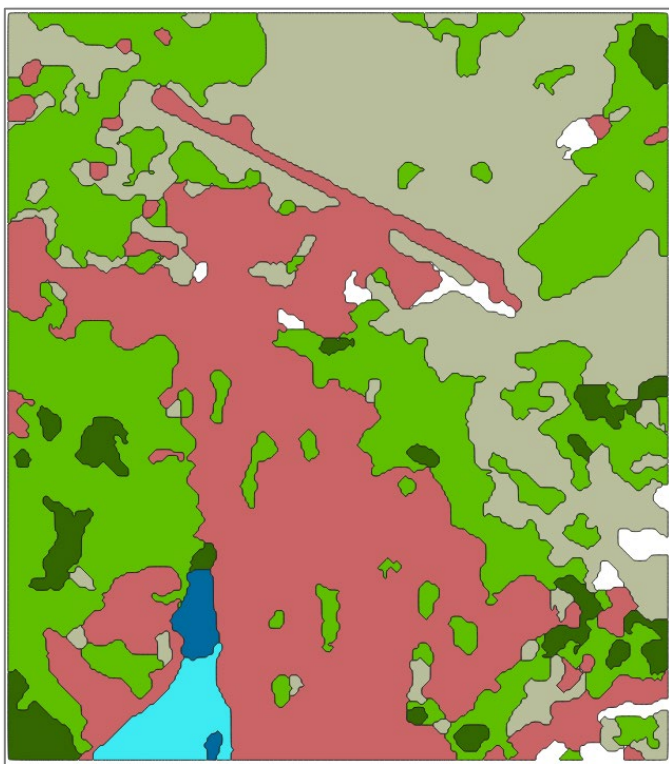
Gap-polygon scenarios and adjustment approaches

Scenario 1 → Scenario 2 → Scenario 3

A newly added gap-polygon is not a gap and should have a land cover class associated to it

A newly added gap-polygon is 'sea and ocean' and needs to be deleted

A newly added gap-polygon is a gap that needs to be filled

Not applicable in your case
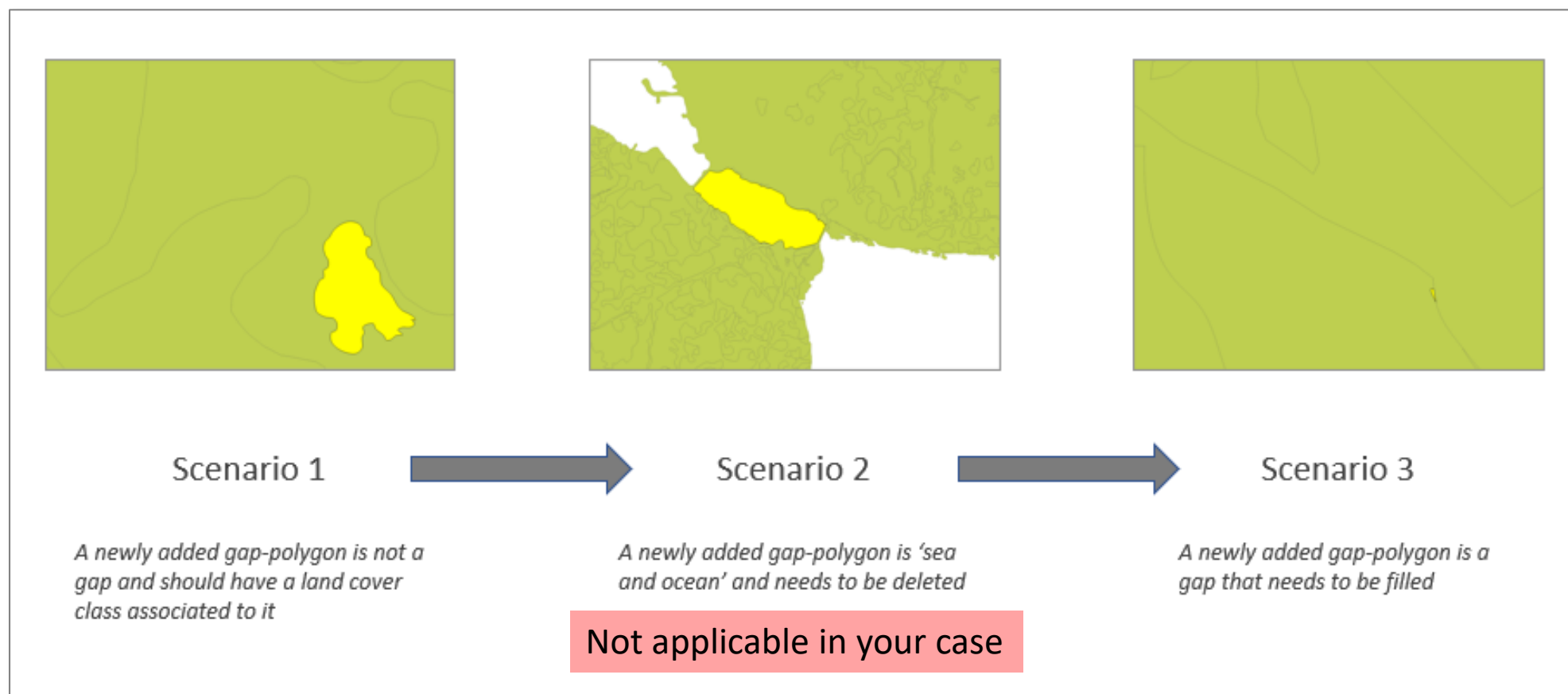
Adjustment of Gaps in QGIS

Adjusted LC 2020 vector data

Today – Component 3

Step 3.1   Step 3.2

Today − **Your turn**

1) Component 3a to post-process the land cover classification rasters (2020 & 2023)

- Go through Step 3.1

2) Component 3b to identify and address geometry and topology issues such as overlaps and gaps (2020 & 2023)

- Go through Step 3.2

Today

Open Forest (code=2)

Dense Forest (code=1)

Area aggregate →

Units: ha

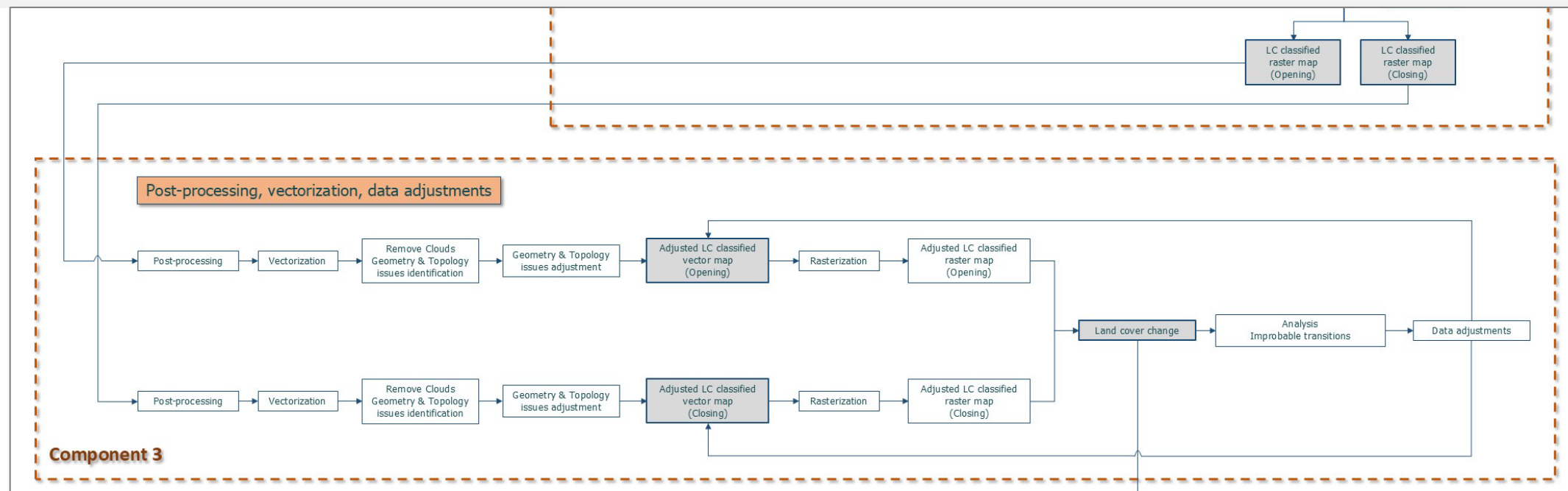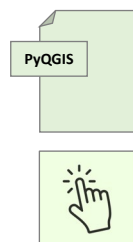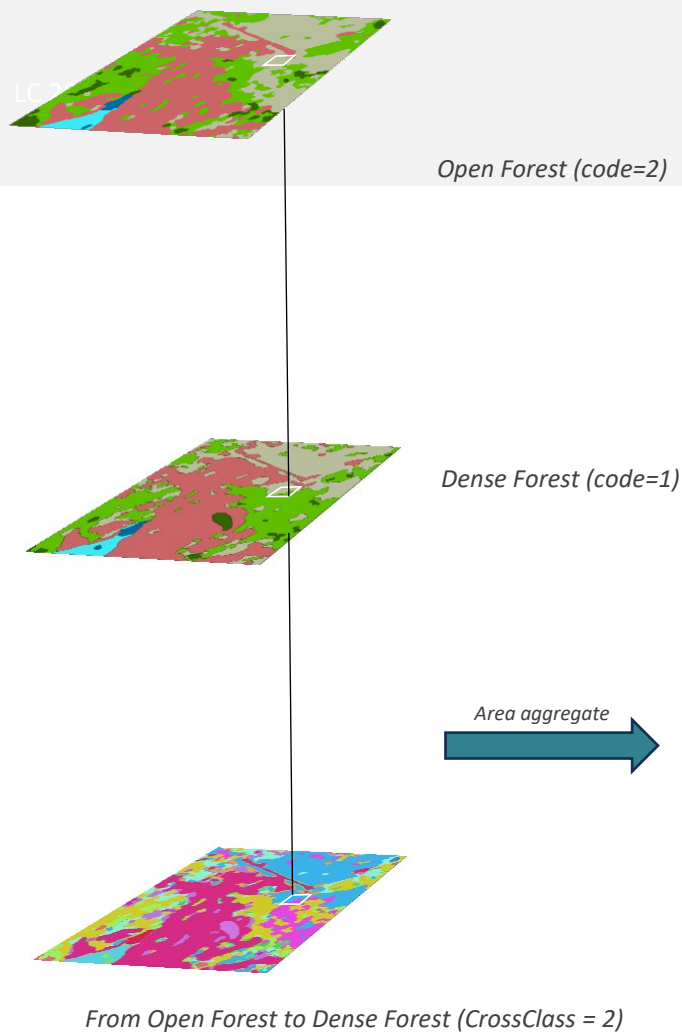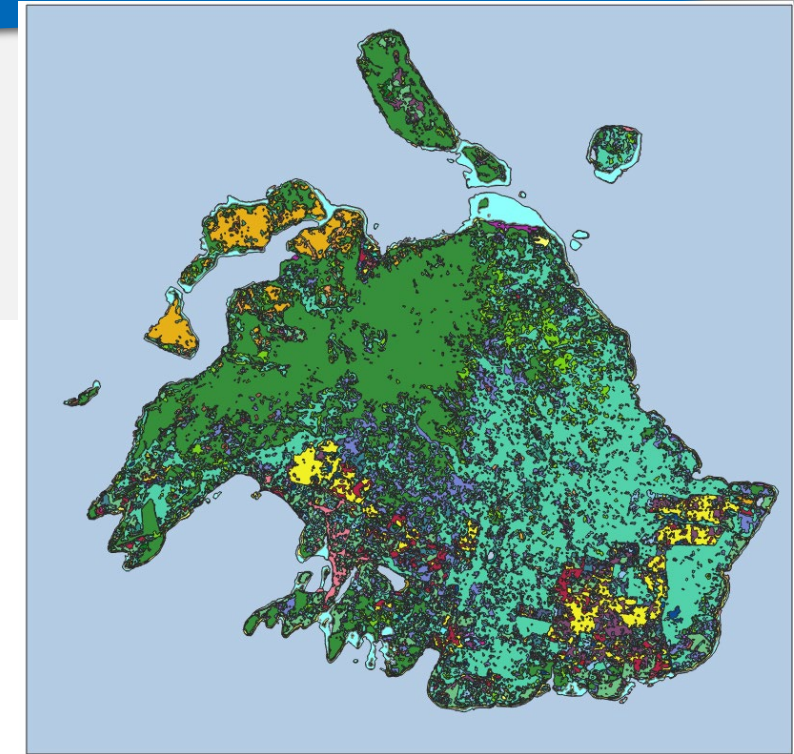|	>_Closing	Dense_Forest	Open_Forest	Mangroves	Agriculture	Coconut_Plantation	Gr
	V_ReferenceClass	1	2	4	5	6	
Dense_Forest	1	25338.3	7153.2	21.4	79.8	3.2	
Open_Forest	2	5335.3	27890.3	8.1	964.2	5.4	2
Mangroves	4	3.2	0.3	124.4	0.0	0.0	
Agriculture	5	41.6	1328.1	12.3	3657.1	7.6	2
Coconut_Plantation	6	2.3	0.6	0.0	3.4	11.3	
Grassland	7	342.6	2256.5	16.8	1995.2	30.2	5
Built_up_Infrastr_Settlements	8	3.7	14.8	0.0	6.0	0.0	
Water_body	9	17.2	4.1	11.9	0.8	0.0	
Shrubs	10	903.1	969.6	4.1	70.2	0.4	
Bareland	11	17.6	17.0	0.6	18.8	0.6	
Reef	13	10.5	3.7	1.5	0.0	0.0	

From Open Forest to Dense Forest (CrossClass = 2)

20

Today – Component 3:
# Land cover change matrix/map

Land cover change matrix

	>_Closing	Dense_Forest	Open_Forest	Mangroves	Agriculture	Coconut_Plantation	Grassland	Built_up_Infrastr_Settlements	Water_body	Shrubs	Bareland	Reef
	V_ReferenceClass	1	2	4	5	6	7	8	9	10	11	13
Dense_Forest	1	253383200.0	71531600.0	213600.0	798000.0	31600.0	4890400.0	279600	165200	6515200	860000	60000
Open_Forest	2	53353200.0	278903200.0	81200.0	9642400.0	53600.0	26790000.0	258000	224000	9696400	491600	22000
Mangroves	4	32400.0	2800.0	1244000.0	0.0	0.0	8800.0	0	5200	13600	4000	2800
Agriculture	5	416400.0	13281200.0	122800.0	36570800.0	76400.0	24437200.0	212000	48400	347200	354000	1200
Coconut_Plantation	6	22800.0	6400.0	0.0	33600.0	113200.0	85600.0	0	0	0	0	0
Grassland	7	3426400.0	22564800.0	168400.0	19952000.0	302000.0	55794400.0	3159200	381200	1824000	1952400	17200
Built_up_Infrastr_Settlements	8	37200	148000	400	60400	0	919200	6214400	90000	12800	670400	11200
Water_body	9	172000	41200	119200	8400	0	120800	135200	1612334000	69200	937600	5506400
Shrubs	10	9031200	9696400	40800	702400	3600	1411600	32400	76400	26516800	200000	22000
Bareland	11	175600	169600	5600	187600	5600	1230800	537600	432000	192800	12324400	656800
Reef	13	105200	36800	15200	0	0	56800	16400	1644000	9200	4612400	32497200

Units: m2

Today – Component 3
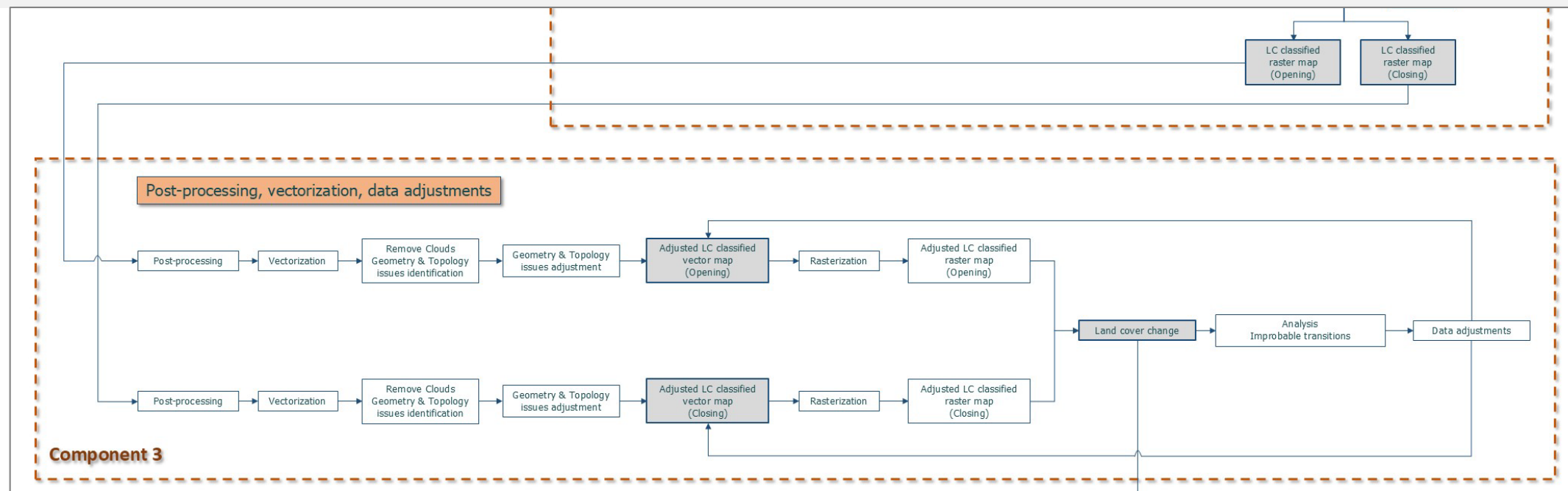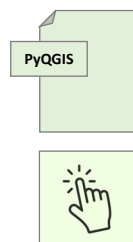
Today – **Your turn**

1) Land cover change and initial improbable transitions analysis

- Go through Step 3.3.1

- Go through Step 3.3.2

- Go through Step 3.3.3

- Discussion to identify improbable transitions

  at the conceptual level

- Go through Step 3.3.4