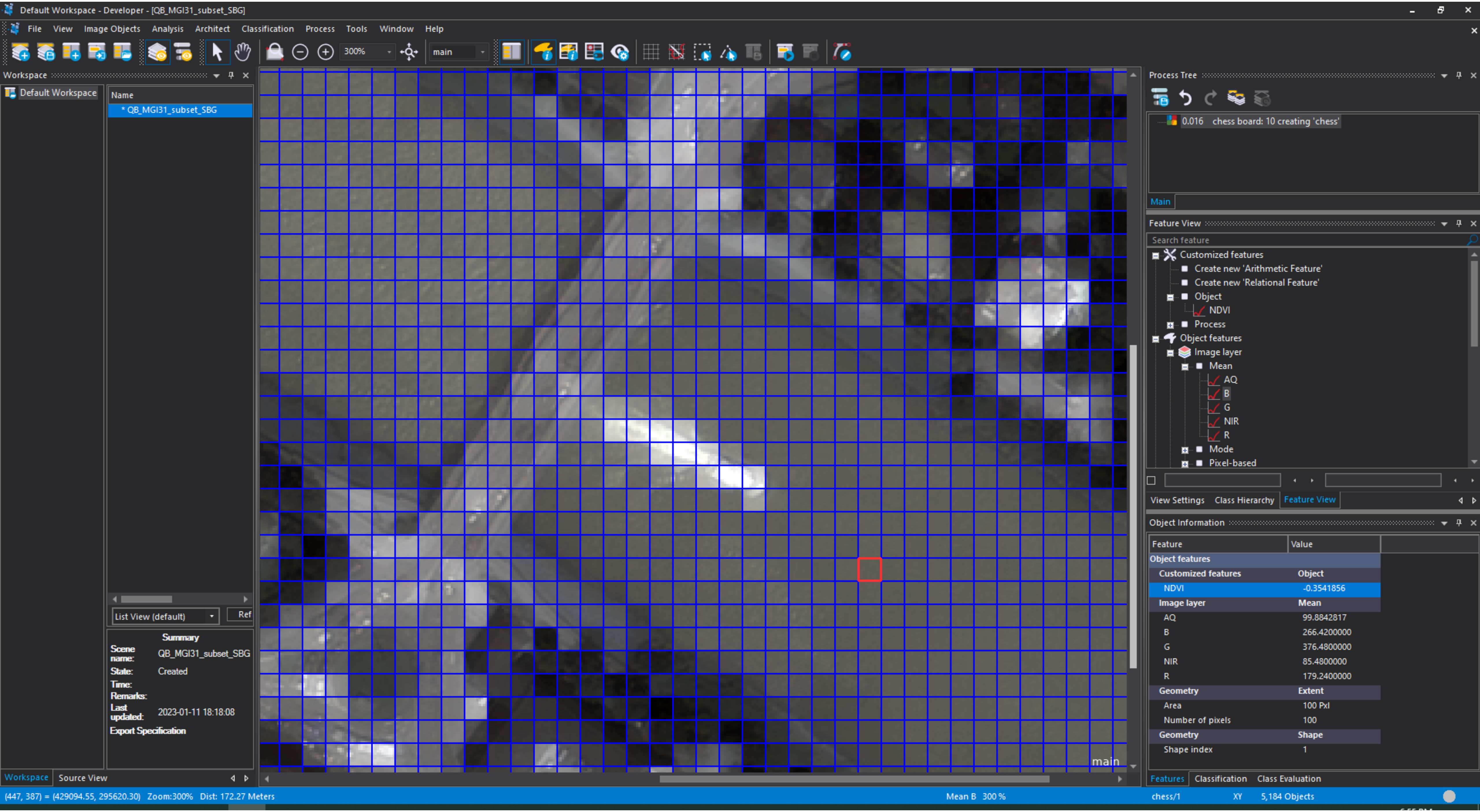
Advanced Remote Sensing

Sample assignments

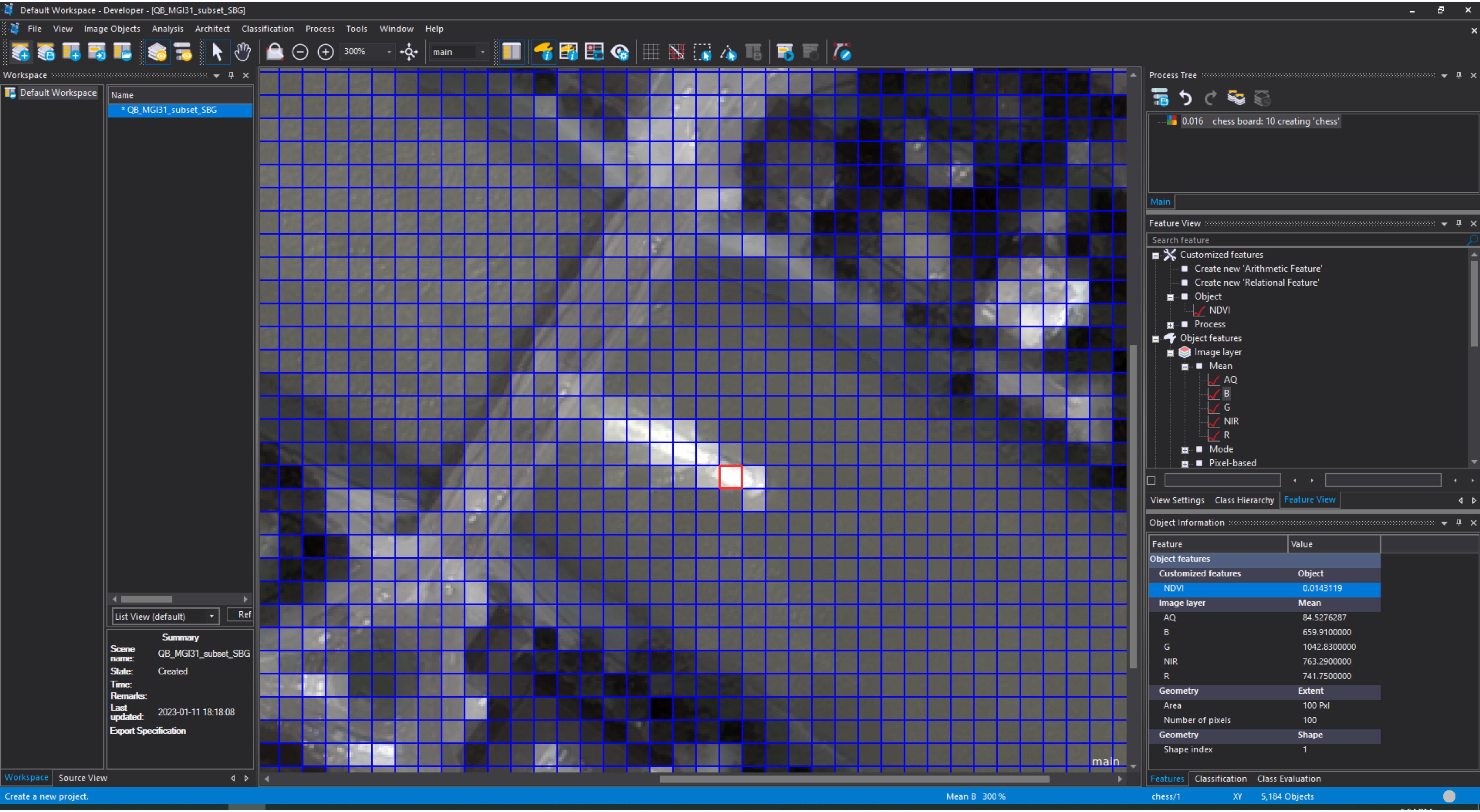
ADVANCED REMOTE SENSING ASSIGNMENT

Part II : Object features for classification

EXAMPLE 1 + 2



Default Workspace - Developer - [QB_MGI31_subset_SBG]
File View Image Objects Analysis Architect Classification Process Tools Window Help
300%
main
Workspace
Default Workspace
Name
* QB_MGI31_subset_SBG
List View (default)
Ref
Summary
Scene name: QB_MGI31_subset_SBG
State: Created
Time:
Remarks:
Last updated: 2023-01-11 18:18:08
Export Specification
Workspace
Source View
main
Process Tree
0.016 chess board: 10 creating 'chess'
Main
Feature View
Search feature
Customized features
Create new 'Arithmetic Feature'
Create new 'Relational Feature'
Object
NDVI
Process
Object features
Image layer
Mean
AQ
B
G
NIR
R
Mode
Pixel-based
View Settings
Class Hierarchy
Feature View
Object Information
Feature
Value
Object features
Customized features
Object
NDVI
-0.3541856
Image layer
Mean
AQ
99.8842817
B
266.4200000
G
376.4800000
NIR
85.4800000
R
179.2400000
Geometry
Extent
Area
100 Pxl
Number of pixels
100
Geometry
Shape
Shape index
1
Features
Classification
Class Evaluation
(447, 387) = (429094.55, 295620.30) Zoom:300% Dist: 172.27 Meters
Mean B 300 %
chess/1
XY
5,184 Objects


Default Workspace - Developer - [QB_MGI31_subset_SBG]
File View Image Objects Analysis Architect Classification Process Tools Window Help
300%
main
Workspace
Default Workspace
Name
* QB_MGI31_subset_SBG
List View (default)
Ref
Summary
Scene name: QB_MGI31_subset_SBG
State: Created
Time:
Remarks:
Last updated: 2023-01-11 18:18:08
Export Specification
Workspace
Source View
Process Tree
0.016 chess board: 10 creating 'chess'
Main
Feature View
Search feature
Customized features
Create new 'Arithmetic Feature'
Create new 'Relational Feature'
Object
NDVI
Process
Object features
Image layer
Mean
AQ
B
G
NIR
R
Mode
Pixel-based
View Settings
Class Hierarchy
Feature View
Object Information
Feature
Value
Object features
Customized features
Object
NDVI
0.0143119
Image layer
Mean
AQ
84.5276287
B
659.9100000
G
1042.8300000
NIR
763.2900000
R
741.7500000
Geometry
Extent
Area
100 Pxl
Number of pixels
100
Geometry
Shape
Shape index
1
Features
Classification
Class Evaluation
main
Create a new project.
Mean B 300 %
chess/1
XY
5,184 Objects

QUESTION 1:

What becomes obvious if you compare the values for the two objects of the chessboard segmentation?

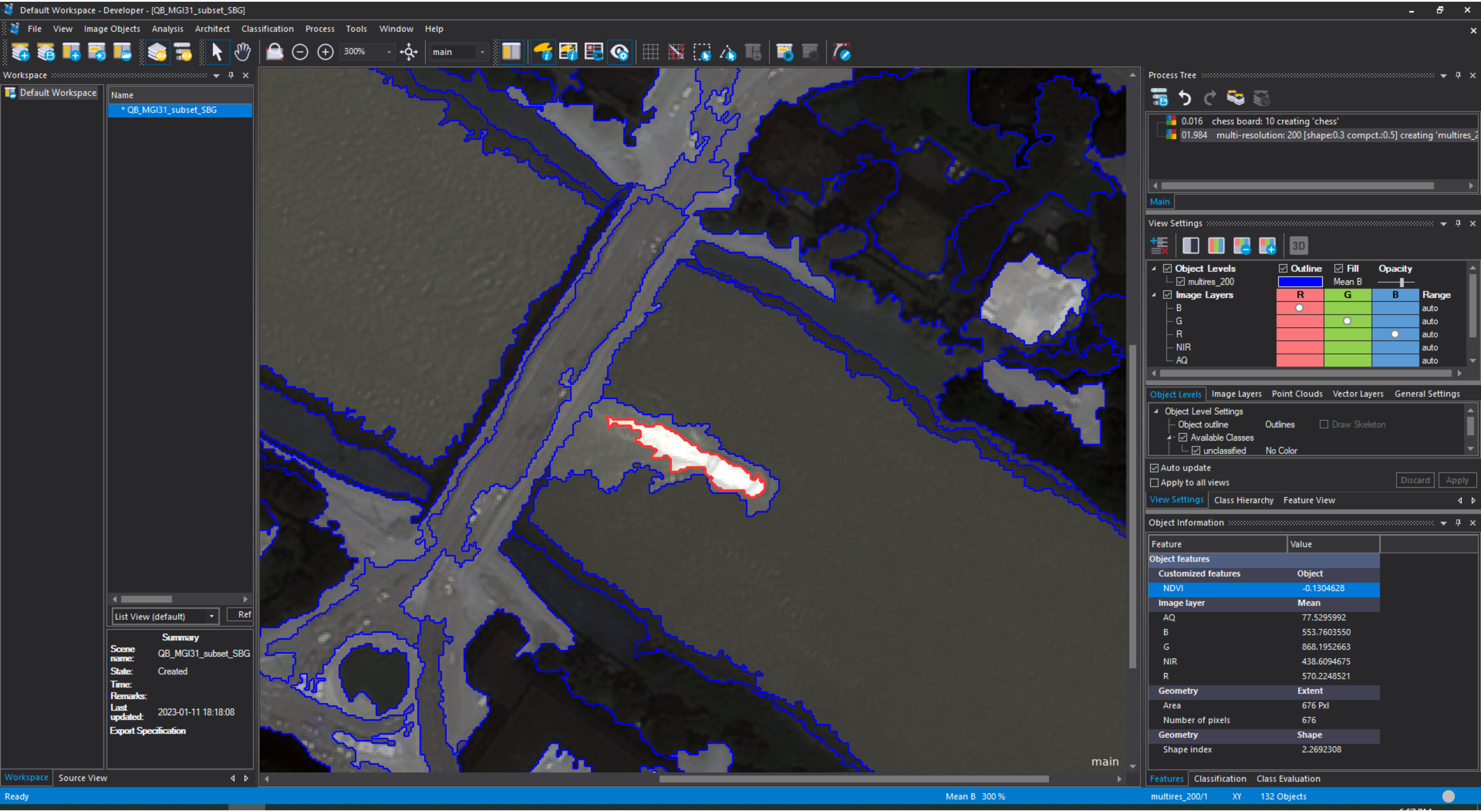
- The object representing a part of the boat is more reflective in all bands than the river which absorbs most wavelenghts

QUESTION 2:

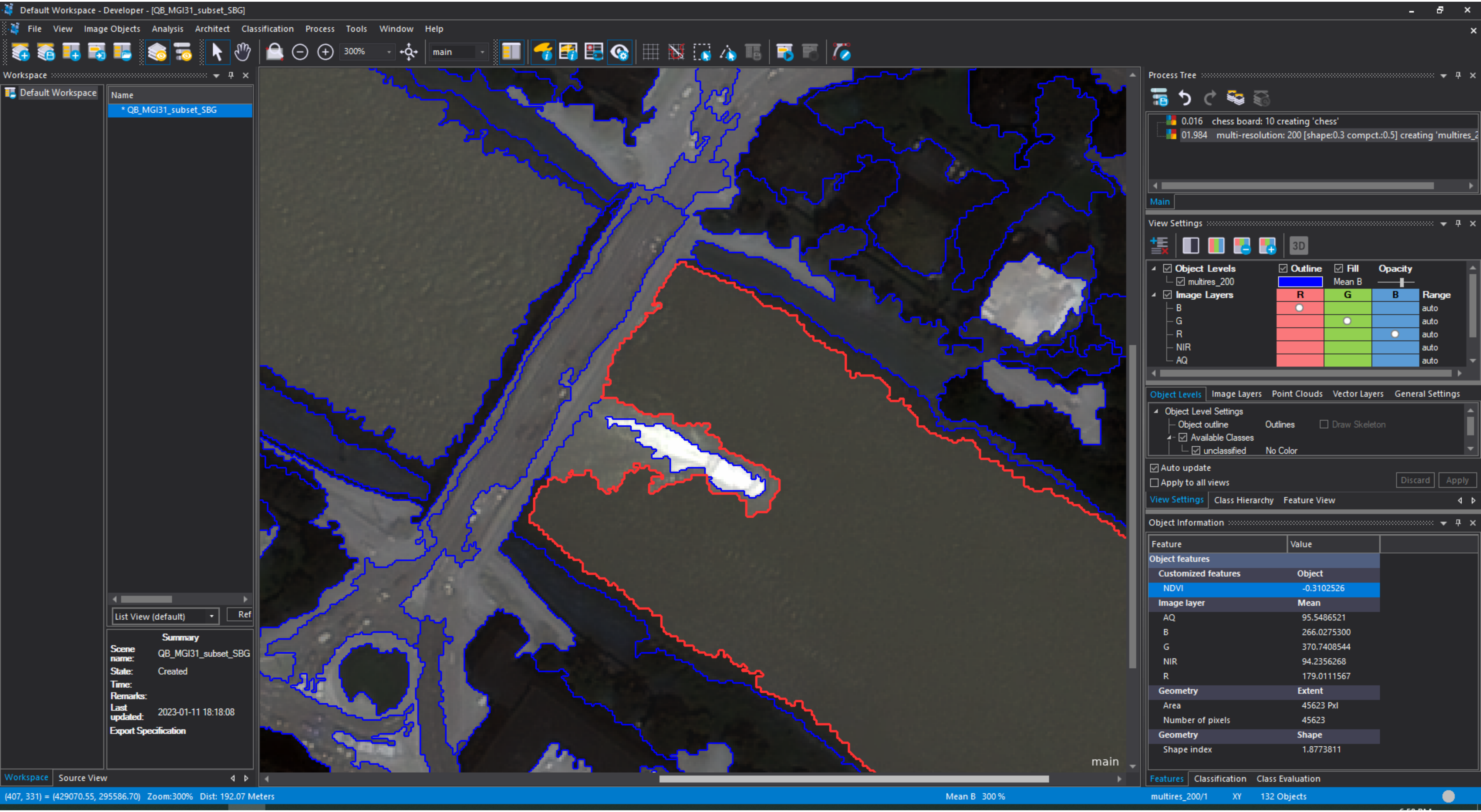
Which features don't make that much sense in the case of the chessboard classification?

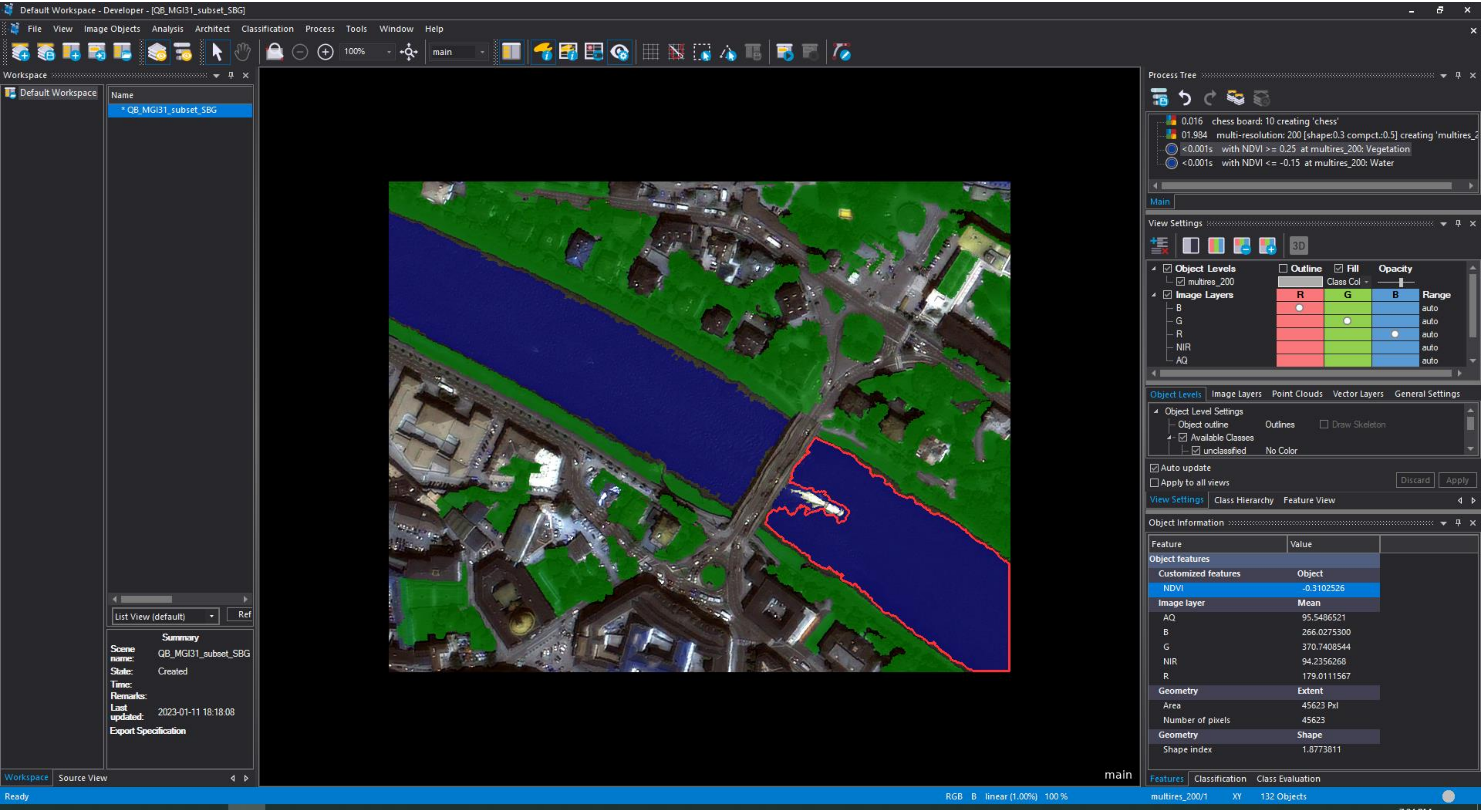
- The geometry , since all the objects have the same geometry.
- The multisegmentation classification gives more meaningful objects since it takes into consideration the shape as well as the spectral properties:

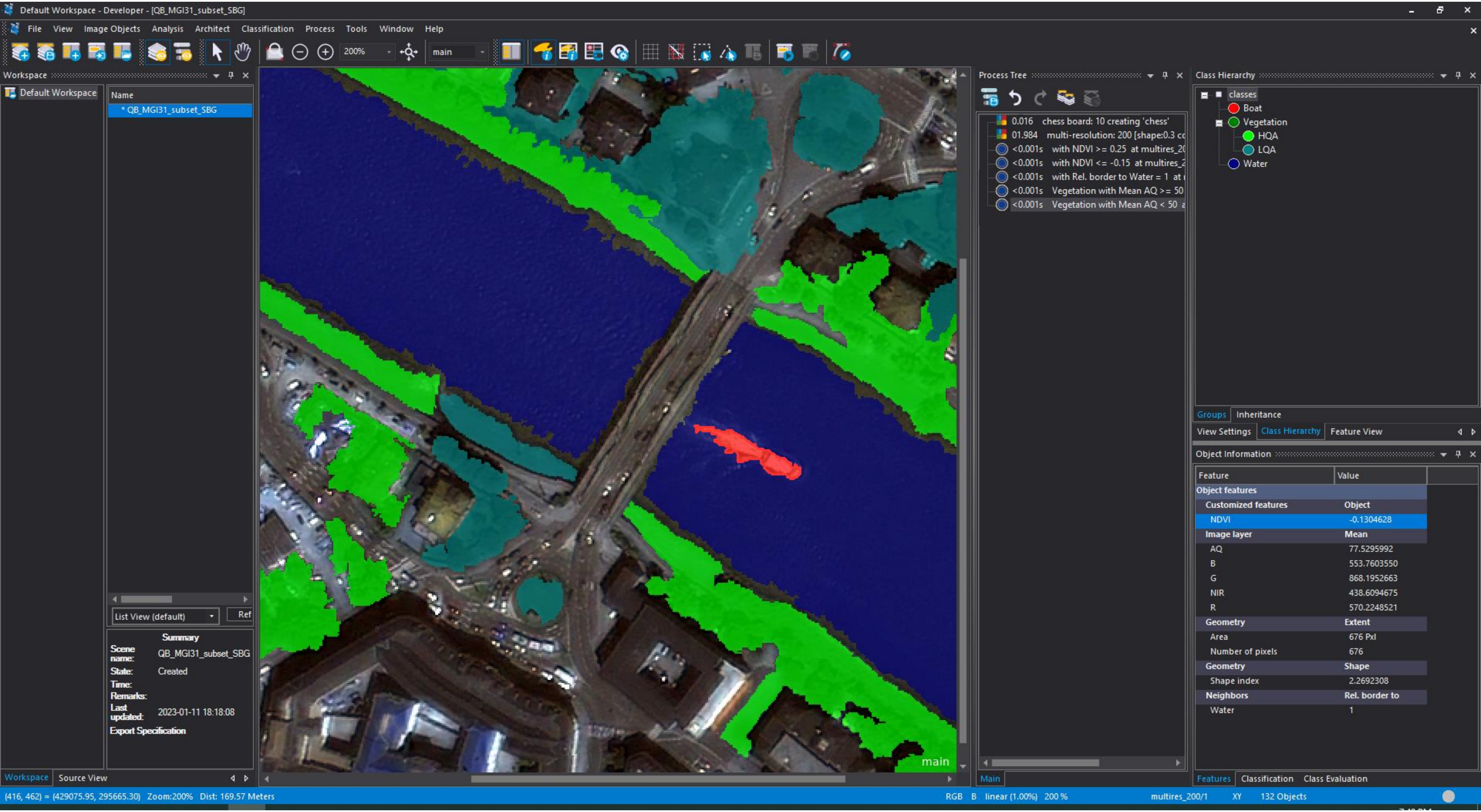
EXAMPLE 3 + 4

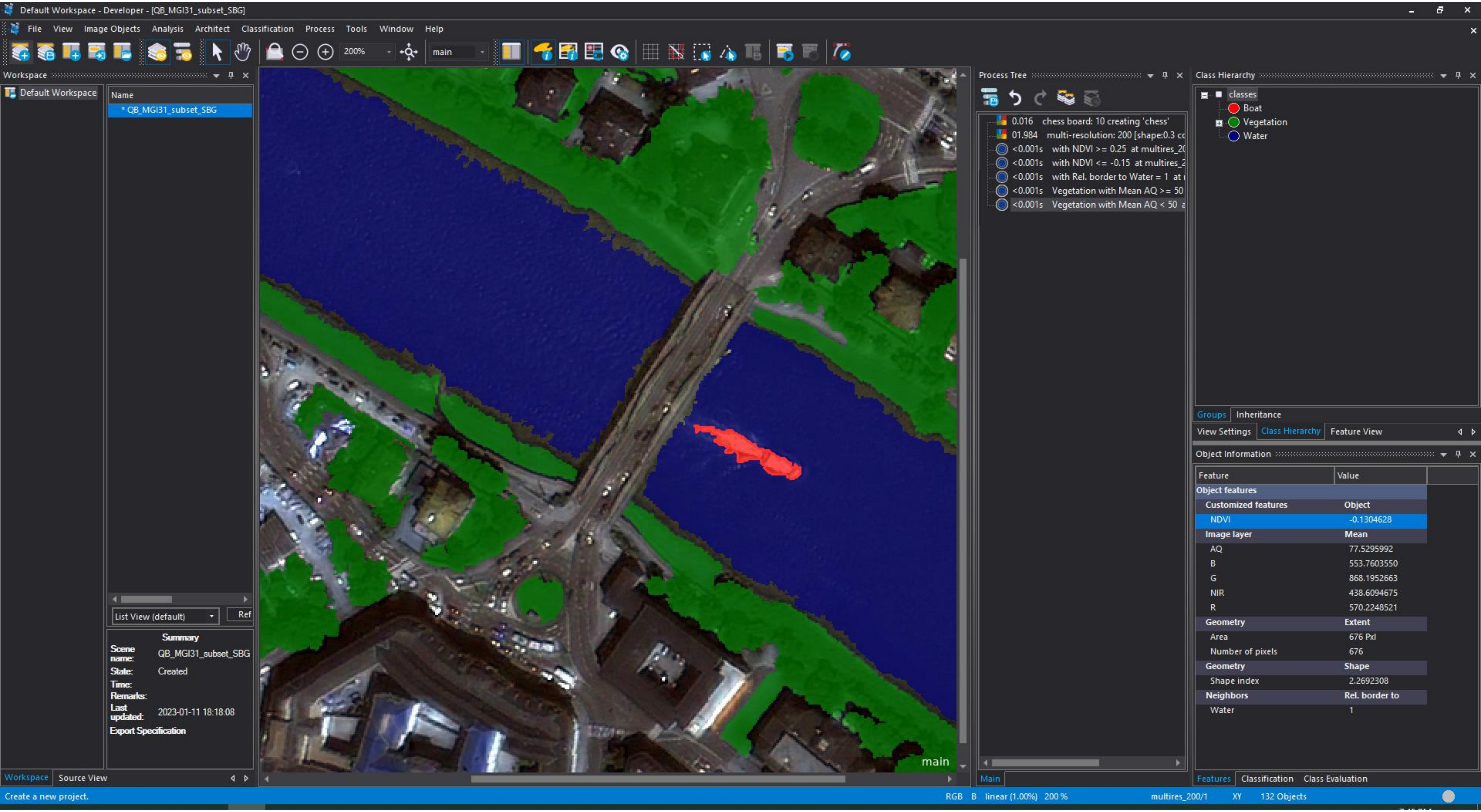


Default Workspace - Developer - [QB_MGI31_subset_SBG]
File View Image Objects Analysis Architect Classification Process Tools Window Help
300%
main
Workspace
Default Workspace
Name
* QB_MGI31_subset_SBG
List View (default)
Ref
Summary
Scene name: QB_MGI31_subset_SBG
State: Created
Time:
Remarks:
Last updated: 2023-01-11 18:18:08
Export Specification
Workspace
Source View
Process Tree
0.016 chess board: 10 creating 'chess'
01.984 multi-resolution: 200 [shape:0.3 compct.:0.5] creating 'multires_2
Main
View Settings
3D
Object Levels
Outline
Fill
Opacity
multires_200
Mean B
Image Layers
R
G
B
Range
B
G
R
NIR
AQ
auto
Object Levels
Image Layers
Point Clouds
Vector Layers
General Settings
Object Level Settings
Object outline
Outlines
Draw Skeleton
Available Classes
unclassified
No Color
Auto update
Apply to all views
Discard
Apply
View Settings
Class Hierarchy
Feature View
Object Information
Feature
Value
Object features
Customized features
Object
NDVI
-0.1304628
Image layer
Mean
AQ
77.5295992
B
553.7603550
G
868.1952663
NIR
438.6094675
R
570.2248521
Geometry
Extent
Area
676 Pxl
Number of pixels
676
Geometry
Shape
Shape index
2.2692308
Features
Classification
Class Evaluation
main
Ready
Mean B 300 %
multires_200/1
XY
132 Objects


Default Workspace - Developer - [QB_MGI31_subset_SBG]
File
View
Image Objects
Analysis
Architect
Classification
Process
Tools
Window
Help
300%
main
Workspace
Default Workspace
Name
* QB_MGI31_subset_SBG
List View (default)
Ref
Summary
Scene name: QB_MGI31_subset_SBG
State: Created
Time:
Remarks:
Last updated: 2023-01-11 18:18:08
Export Specification
Workspace
Source View
main
Process Tree
0.016 chess board: 10 creating 'chess'
01.984 multi-resolution: 200 [shape:0.3 compct.:0.5] creating 'multires_2
Main
View Settings
3D
Object Levels
Outline
Fill
Opacity
multires_200
Mean B
Image Layers
R
G
B
Range
B
G
R
NIR
AQ
auto
Object Levels
Image Layers
Point Clouds
Vector Layers
General Settings
Object Level Settings
Object outline
Outlines
Draw Skeleton
Available Classes
unclassified
No Color
Auto update
Apply to all views
Discard
Apply
View Settings
Class Hierarchy
Feature View
Object Information
Feature
Value
Object features
Customized features
Object
NDVI
-0.3102526
Image layer
Mean
AQ
95.5486521
B
266.0275300
G
370.7408544
NIR
94.2356268
R
179.0111567
Geometry
Extent
Area
45623 Pxl
Number of pixels
45623
Geometry
Shape
Shape index
1.8773811
Features
Classification
Class Evaluation
(407, 331) = (429070.55, 295586.70) Zoom:300% Dist: 192.07 Meters
Mean B 300 %
multires_200/1
XY
132 Objects

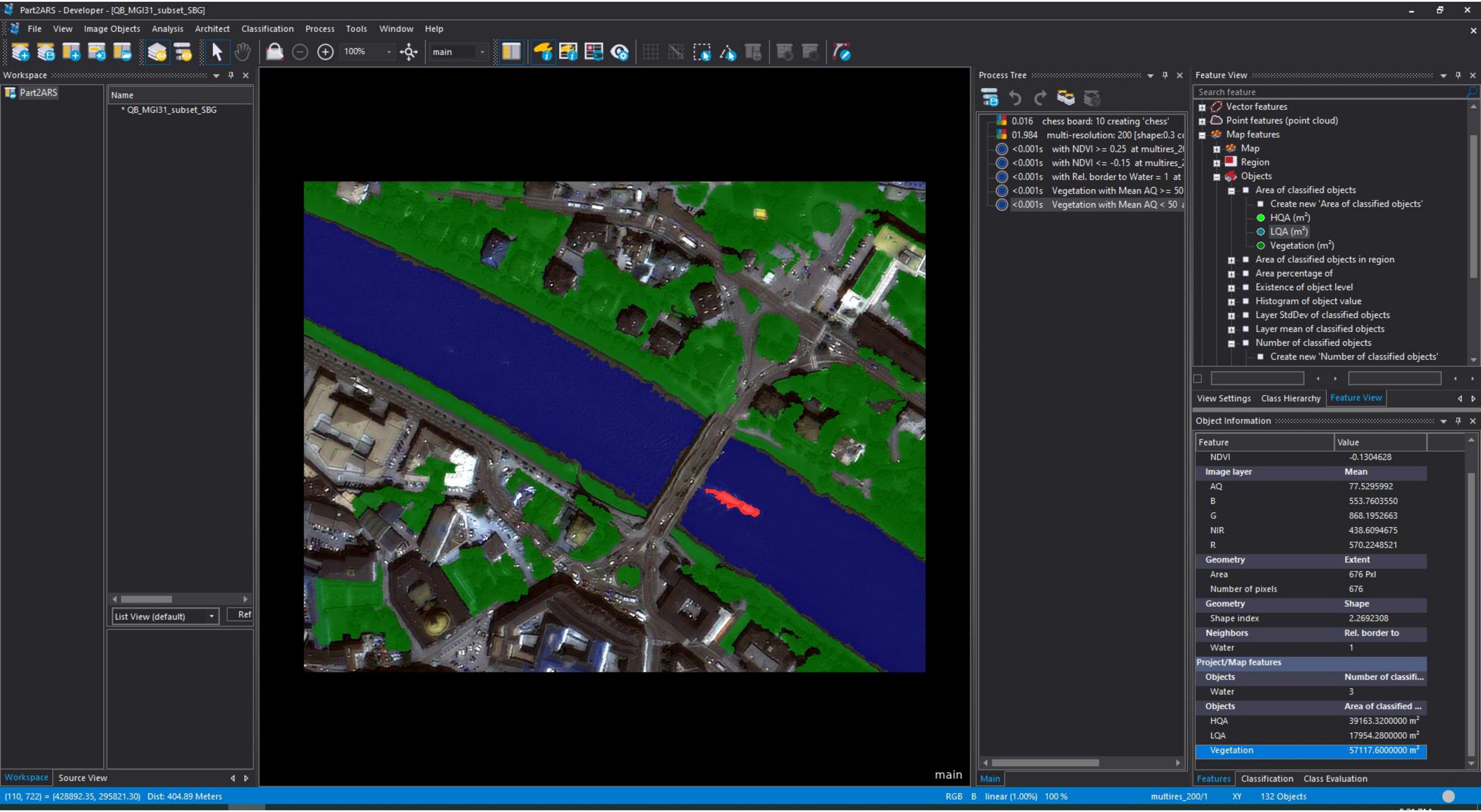

Default Workspace - Developer - [QB_MGI31_subset_SBG]
File View Image Objects Analysis Architect Classification Process Tools Window Help
100%
main
Workspace
Default Workspace
Name
* QB_MGI31_subset_SBG
List View (default)
Ref
Summary
Scene name: QB_MGI31_subset_SBG
State: Created
Time:
Remarks:
Last updated: 2023-01-11 18:18:08
Export Specification
Workspace
Source View
main
Process Tree
0.016 chess board: 10 creating 'chess'
01.984 multi-resolution: 200 [shape:0.3 compct.:0.5] creating 'multires_2
<0.001s with NDVI >= 0.25 at multires_200: Vegetation
<0.001s with NDVI <= -0.15 at multires_200: Water
Main
View Settings
3D
Object Levels
Outline
Fill
Opacity
multires_200
Class Col
Image Layers
R
G
B
Range
B
G
R
NIR
AQ
auto
auto
auto
auto
auto
Object Levels
Image Layers
Point Clouds
Vector Layers
General Settings
Object Level Settings
Object outline
Outlines
Draw Skeleton
Available Classes
unclassified
No Color
Auto update
Apply to all views
Discard
Apply
View Settings
Class Hierarchy
Feature View
Object Information
Feature
Value
Object features
Customized features
Object
NDVI
-0.3102526
Image layer
Mean
AQ
95.5486521
B
266.0275300
G
370.7408544
NIR
94.2356268
R
179.0111567
Geometry
Extent
Area
45623 Pxl
Number of pixels
45623
Geometry
Shape
Shape index
1.8773811
Features
Classification
Class Evaluation
Ready
RGB B linear (1.00%) 100 %
multires_200/1
XY
132 Objects


Default Workspace - Developer - [QB_MGI31_subset_SBG]
File View Image Objects Analysis Architect Classification Process Tools Window Help
200%
main
Workspace
Default Workspace
Name
* QB_MGI31_subset_SBG
List View (default)
Ref
Summary
Scene name: QB_MGI31_subset_SBG
State: Created
Time:
Remarks:
Last updated: 2023-01-11 18:18:08
Export Specification
Workspace
Source View
main
Process Tree
0.016 chess board: 10 creating 'chess'
01.984 multi-resolution: 200 [shape:0.3 co
<0.001s with NDVI >= 0.25 at multires_20
<0.001s with NDVI <= -0.15 at multires_2
<0.001s with Rel. border to Water = 1 at
<0.001s Vegetation with Mean AQ >= 50
<0.001s Vegetation with Mean AQ < 50
Main
Class Hierarchy
classes
Boat
Vegetation
HQA
LQA
Water
Groups
Inheritance
View Settings
Class Hierarchy
Feature View
Object Information
Feature
Value
Object features
Customized features
Object
NDVI
-0.1304628
Image layer
Mean
AQ
77.5295992
B
553.7603550
G
868.1952663
NIR
438.6094675
R
570.2248521
Geometry
Extent
Area
676 Pxl
Number of pixels
676
Geometry
Shape
Shape index
2.2692308
Neighbors
Rel. border to
Water
1
Features
Classification
Class Evaluation
(416, 462) = (429075.95, 295665.30) Zoom:200% Dist: 169.57 Meters
RGB B linear (1.00%) 200 %
multires_200/1
XY
132 Objects


Default Workspace - Developer - [QB_MGI31_subset_SBG]
File View Image Objects Analysis Architect Classification Process Tools Window Help
200%
main
Workspace
Default Workspace
Name
* QB_MGI31_subset_SBG
List View (default)
Ref
Summary
Scene name: QB_MGI31_subset_SBG
State: Created
Time:
Remarks:
Last updated: 2023-01-11 18:18:08
Export Specification
Workspace
Source View
main
Process Tree
0.016 chess board: 10 creating 'chess'
01.984 multi-resolution: 200 [shape:0.3 cc
<0.001s with NDVI >= 0.25 at multires_20
<0.001s with NDVI <= -0.15 at multires_2
<0.001s with Rel. border to Water = 1 at
<0.001s Vegetation with Mean AQ >= 50
<0.001s Vegetation with Mean AQ < 50
Main
Class Hierarchy
classes
Boat
Vegetation
Water
Groups
Inheritance
View Settings
Class Hierarchy
Feature View
Object Information
Feature
Value
Object features
Customized features
Object
NDVI
-0.1304628
Image layer
Mean
AQ
77.5295992
B
553.7603550
G
868.1952663
NIR
438.6094675
R
570.2248521
Geometry
Extent
Area
676 Pxl
Number of pixels
676
Geometry
Shape
Shape index
2.2692308
Neighbors
Rel. border to
Water
1
Features
Classification
Class Evaluation
Create a new project.
RGB B linear (1.00%) 200 %
multires_200/1
XY
132 Objects

What happens if you collapse the vegetation super-class?

- The extra subclasses taking into consideration the air quality aren’t displayed and only the superclass Vegetation (classified from only NDVI values) is shown.


Part2ARS - Developer - [QB_MGI31_subset_SBG]
File View Image Objects Analysis Architect Classification Process Tools Window Help
100%
main
Workspace
Part2ARS
Name
* QB_MGI31_subset_SBG
List View (default)
Ref
Workspace Source View
Process Tree
0.016 chess board: 10 creating 'chess'
01.984 multi-resolution: 200 [shape:0.3 c
<0.001s with NDVI >= 0.25 at multires_2
<0.001s with NDVI <= -0.15 at multires_
<0.001s with Rel. border to Water = 1 at
<0.001s Vegetation with Mean AQ >= 50
<0.001s Vegetation with Mean AQ < 50
Main
Feature View
Search feature
Vector features
Point features (point cloud)
Map features
Map
Region
Objects
Area of classified objects
Create new 'Area of classified objects'
HQA (m²)
LQA (m²)
Vegetation (m²)
Area of classified objects in region
Area percentage of
Existence of object level
Histogram of object value
Layer StdDev of classified objects
Layer mean of classified objects
Number of classified objects
Create new 'Number of classified objects'
View Settings Class Hierarchy Feature View
Object Information
Feature Value
NDVI -0.1304628
Image layer Mean
AQ 77.5295992
B 553.7603550
G 868.1952663
NIR 438.6094675
R 570.2248521
Geometry Extent
Area 676 Pxl
Number of pixels 676
Geometry Shape
Shape index 2.2692308
Neighbors Rel. border to
Water 1
Project/Map features
Objects Number of classifi...
Water 3
Objects Area of classified ...
HQA 39163.3200000 m²
LQA 17954.2800000 m²
Vegetation 57117.6000000 m²
Features Classification Class Evaluation
main
(110, 722) = (428892.35, 295821.30) Dist: 404.89 Meters
RGB B linear (1.00%) 100 %
multires_200/1 XY 132 Objects

QUESTION 3:

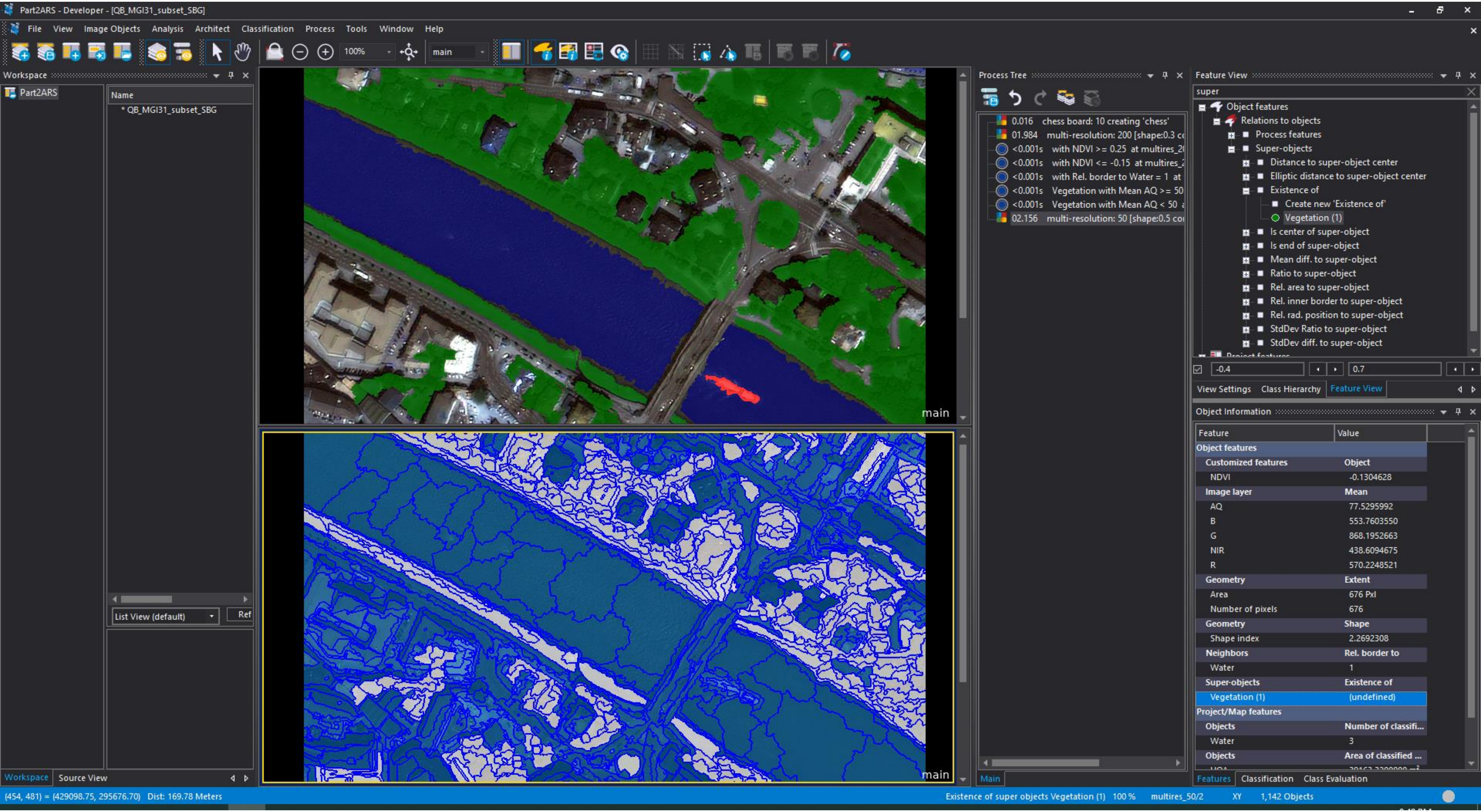
How many objects were classified as „water"?

- There were **3** objects classified as water

QUESTION 4

What is the area of the whole vegetation class (if you select the vegetation class to generate the feature, it will summarize the values from the grouped sub-classes)?

- Yes. If only the vegetation class is selected, its subclasses (High and Low Quality vegetation) will be summarized.


Part2ARS - Developer - [QB_MGI31_subset_SBG]
File View Image Objects Analysis Architect Classification Process Tools Window Help
100%
main
Workspace
Part2ARS
Name
* QB_MGI31_subset_SBG
List View (default)
Ref
Workspace Source View
main
main
Process Tree
0.016 chess board: 10 creating 'chess'
01.984 multi-resolution: 200 [shape:0.3 c
<0.001s with NDVI >= 0.25 at multires_2
<0.001s with NDVI <= -0.15 at multires_
<0.001s with Rel. border to Water = 1 at
<0.001s Vegetation with Mean AQ >= 50
<0.001s Vegetation with Mean AQ < 50
02.156 multi-resolution: 50 [shape:0.5 co
Main
Feature View
super
Object features
Relations to objects
Process features
Super-objects
Distance to super-object center
Elliptic distance to super-object center
Existence of
Create new 'Existence of'
Vegetation (1)
Is center of super-object
Is end of super-object
Mean diff. to super-object
Ratio to super-object
Rel. area to super-object
Rel. inner border to super-object
Rel. rad. position to super-object
StdDev Ratio to super-object
StdDev diff. to super-object
-0.4
0.7
View Settings Class Hierarchy Feature View
Object Information
Feature Value
Object features
Customized features Object
NDVI -0.1304628
Image layer Mean
AQ 77.5295992
B 553.7603550
G 868.1952663
NIR 438.6094675
R 570.2248521
Geometry Extent
Area 676 Pxl
Number of pixels 676
Geometry Shape
Shape index 2.2692308
Neighbors Rel. border to
Water 1
Super-objects Existence of
Vegetation (1) (undefined)
Project/Map features
Objects Number of classifi...
Water 3
Objects Area of classified ...
Features Classification Class Evaluation
(454, 481) = (429098.75, 295676.70) Dist: 169.78 Meters
Existence of super objects Vegetation (1) 100 % multires_50/2 XY 1,142 Objects

QUESTION 5

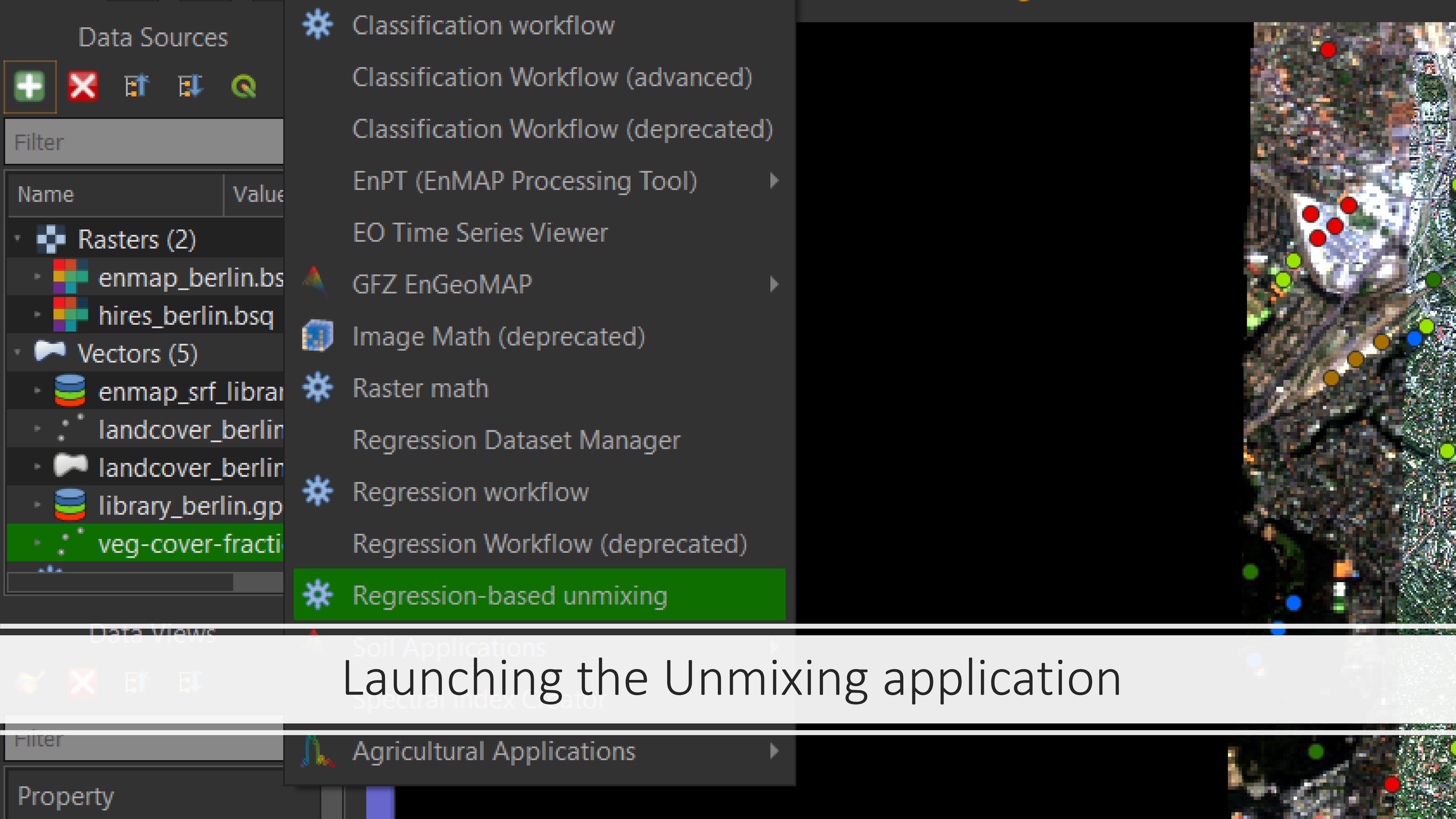
What is the meaning of the distance value when you create the feature?

- The distance value refers to the hierarchal relation between the objects in the finer segmentation (scale 50) and the super objects in the coarser segmentation (scale 200). A distance value of 1 for the vegetation means that if an object from segmentation 50 exists within an object of the segmentation 200, it will be detected and considered as belonging to the same class.

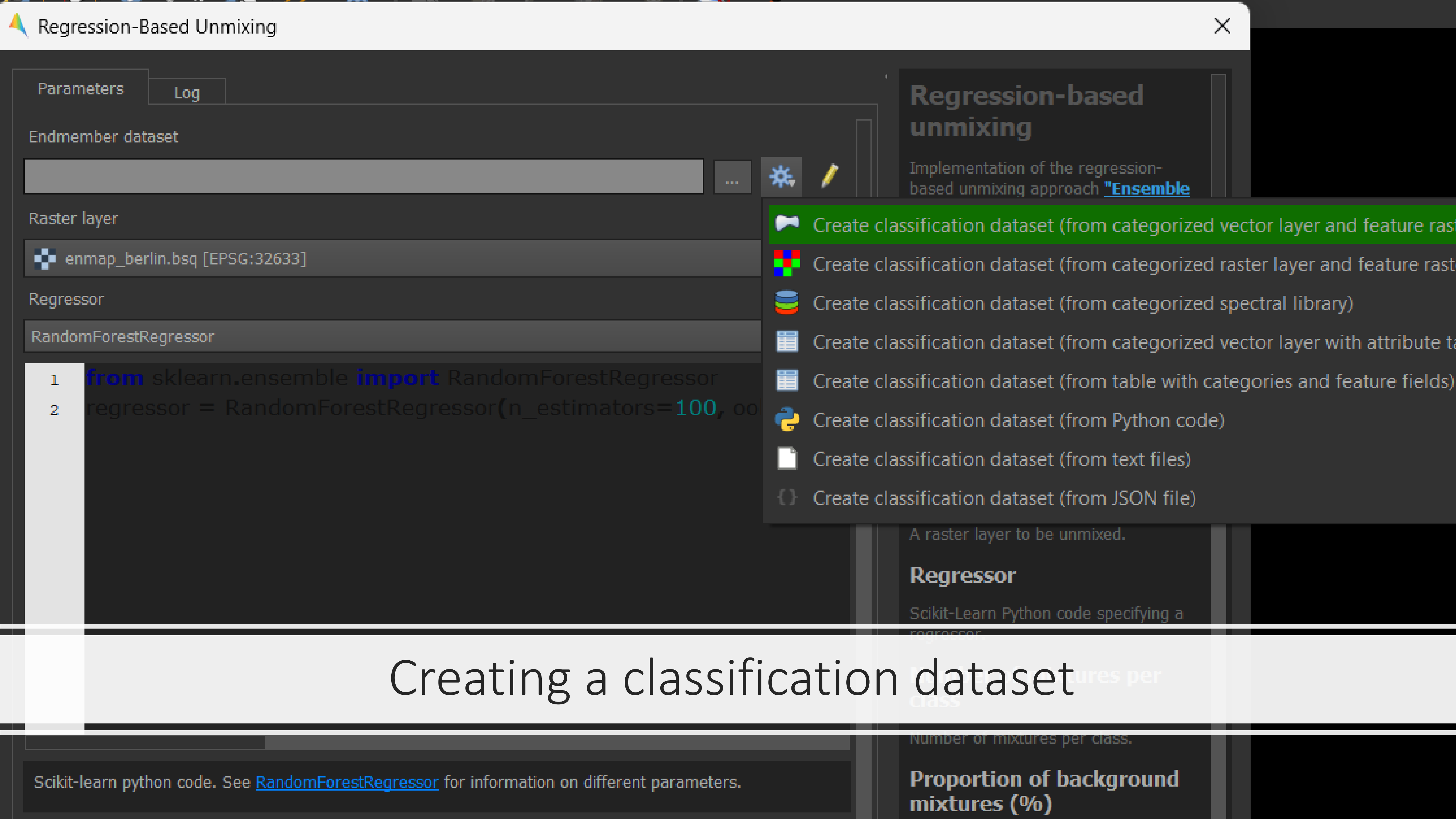
Source

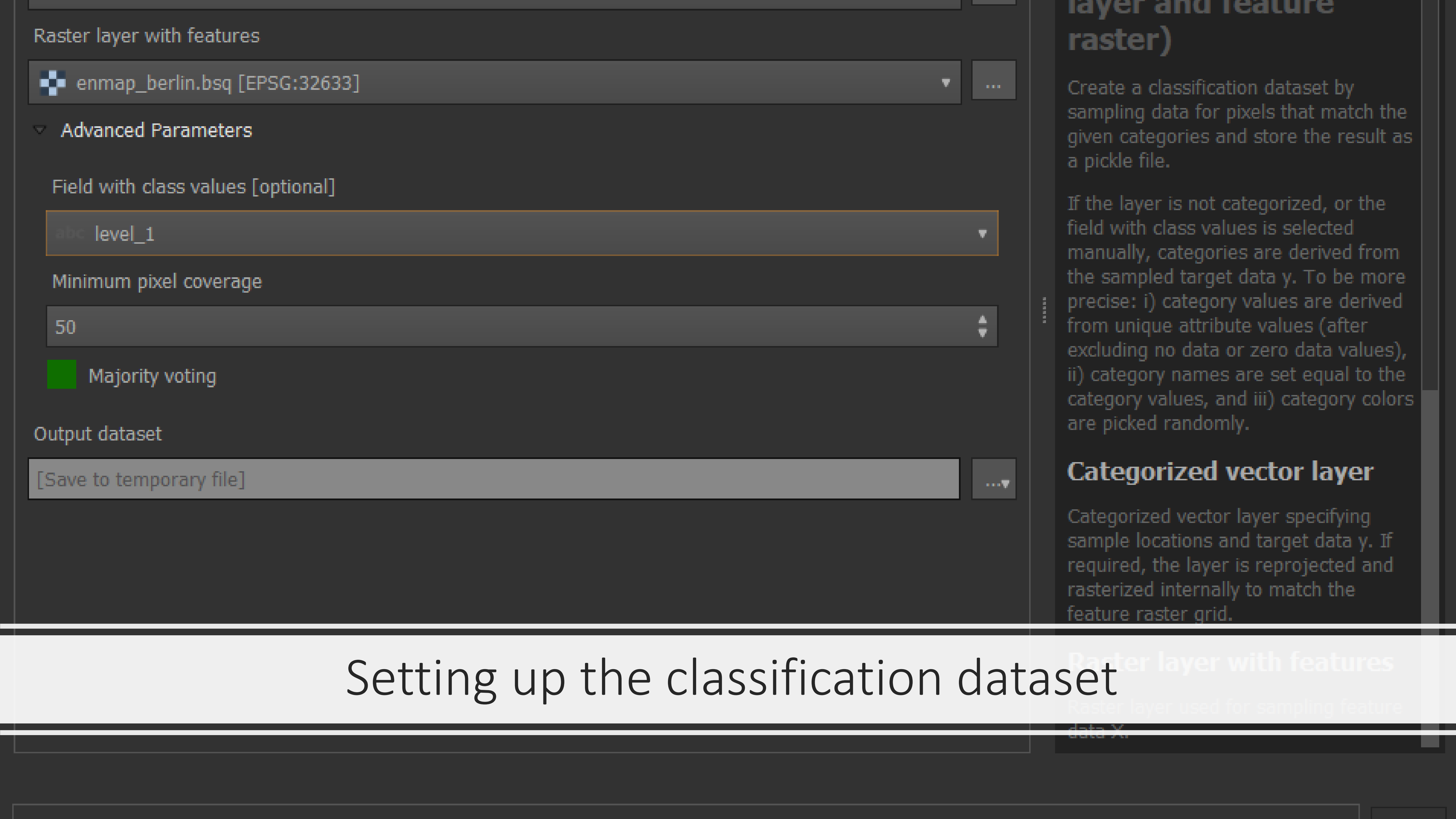
Hyperspectral unmixing

Hyperspectral imagery assignment



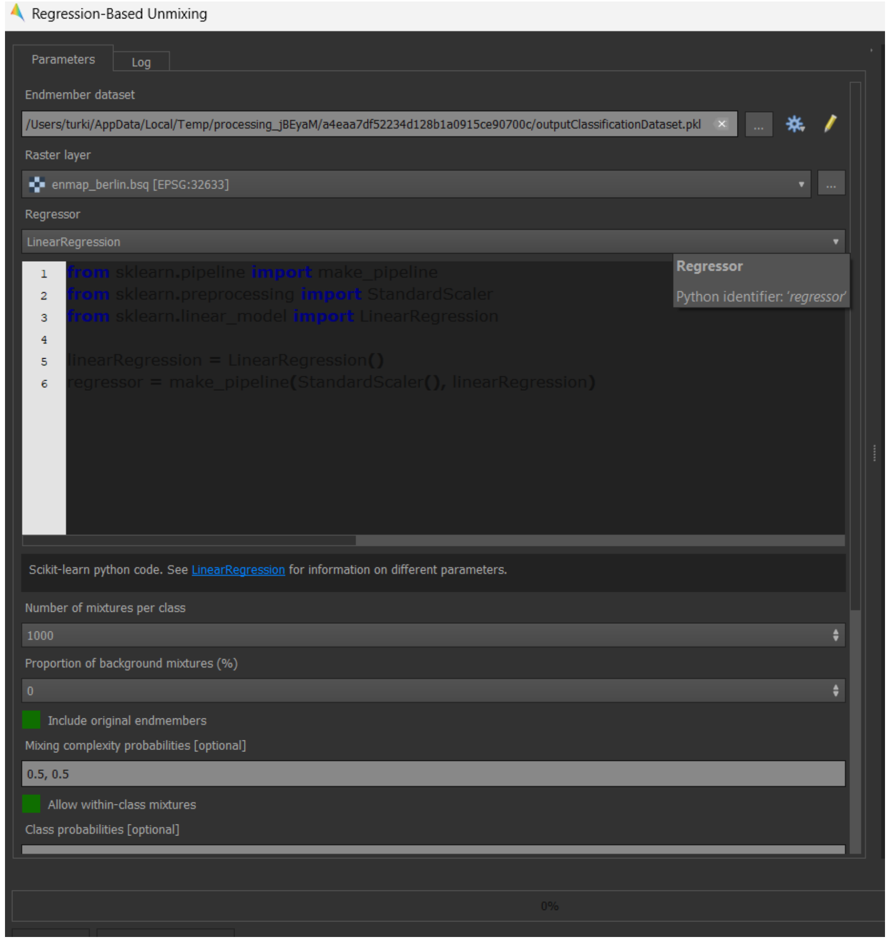
Launching the Unmixing application

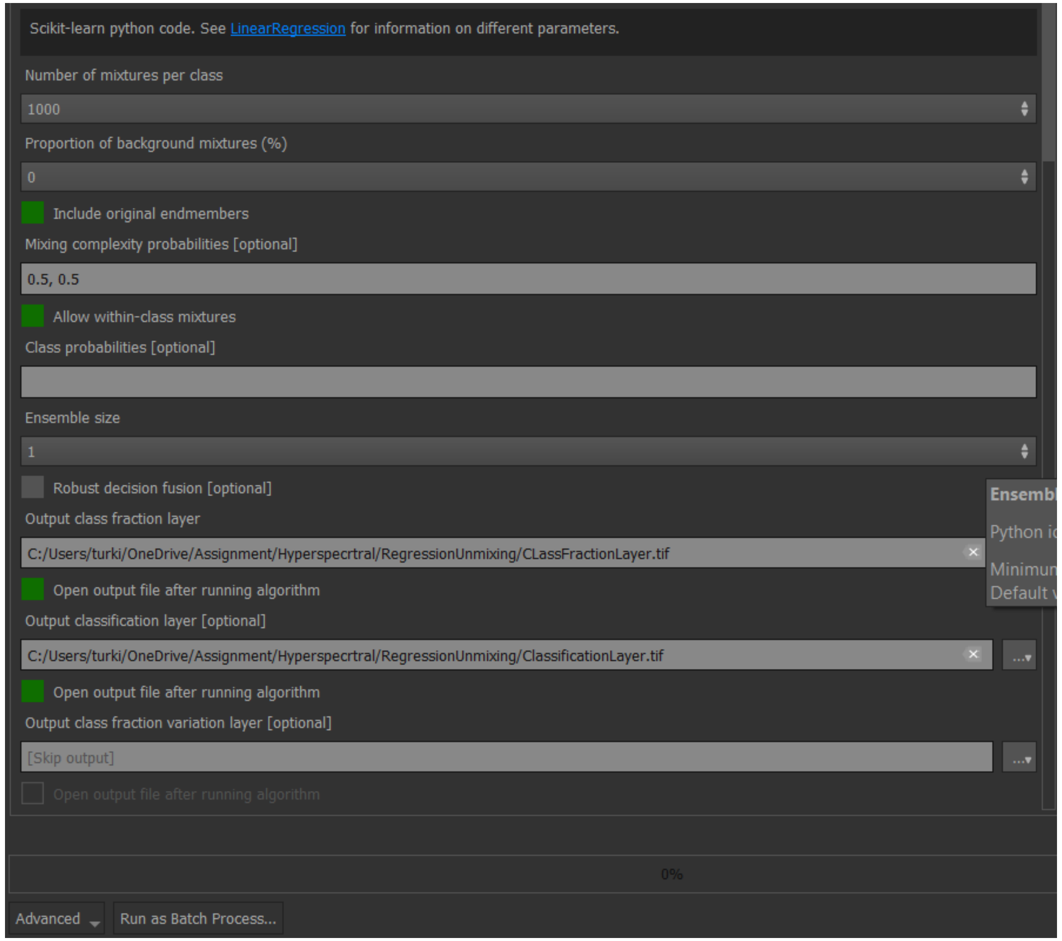

Regression-Based Unmixing
Parameters
Log
Endmember dataset
Raster layer
enmap_berlin.bsq [EPSG:32633]
Regressor
RandomForestRegressor
from sklearn.ensemble import RandomForestRegressor
regressor = RandomForestRegressor(n_estimators=100, oo
Create classification dataset (from categorized vector layer and feature ras
Create classification dataset (from categorized raster layer and feature rast
Create classification dataset (from categorized spectral library)
Create classification dataset (from categorized vector layer with attribute t
Create classification dataset (from table with categories and feature fields)
Create classification dataset (from Python code)
Create classification dataset (from text files)
Create classification dataset (from JSON file)
Regression-based unmixing
Implementation of the regression-based unmixing approach "Ensemble
A raster layer to be unmixed.
Regressor
Scikit-Learn Python code specifying a
Number of mixtures per class.
Proportion of background mixtures (%)
Scikit-learn python code. See RandomForestRegressor for information on different parameters.
Creating a classification dataset



Setting up the classification dataset

Excecuting the Regression model

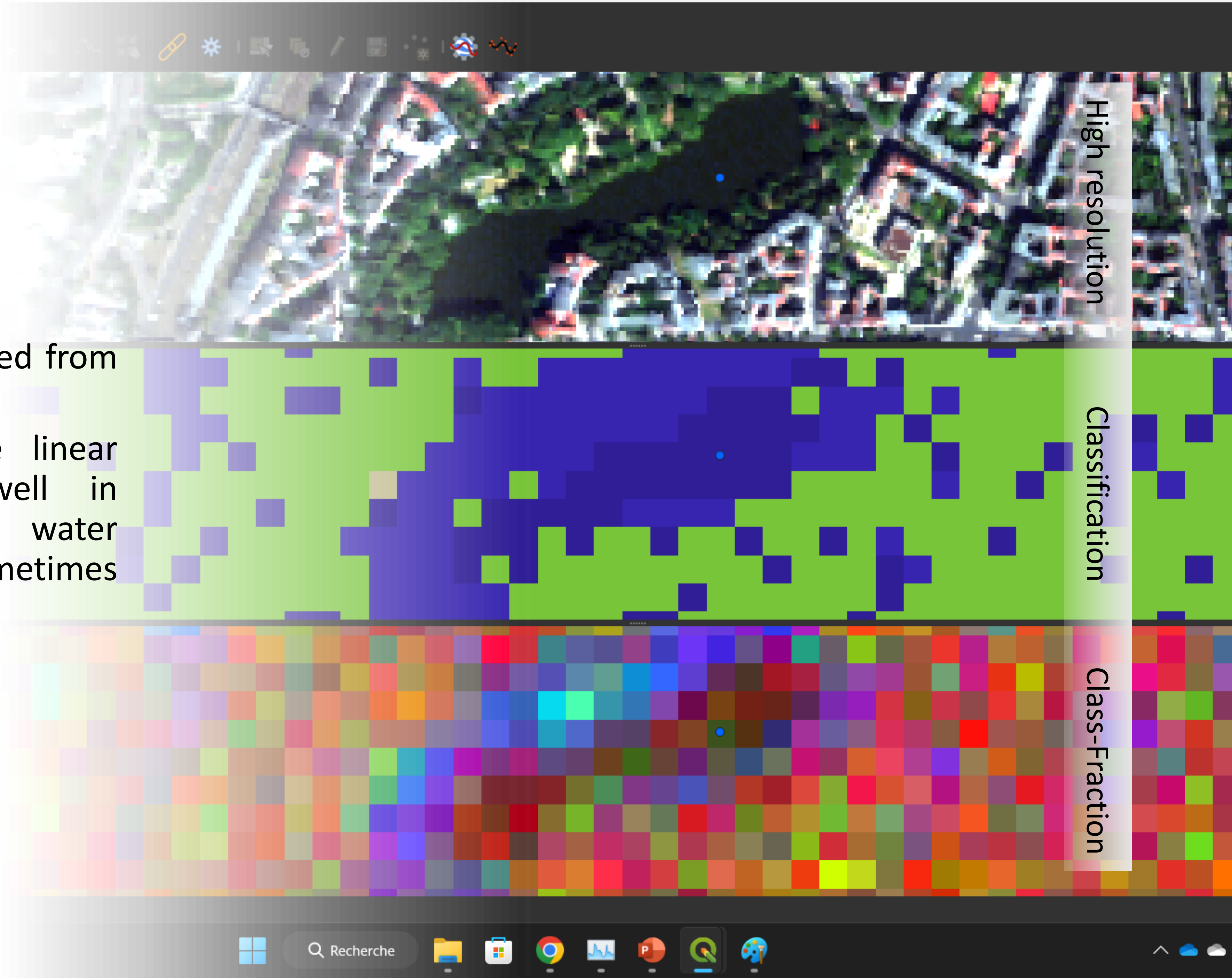


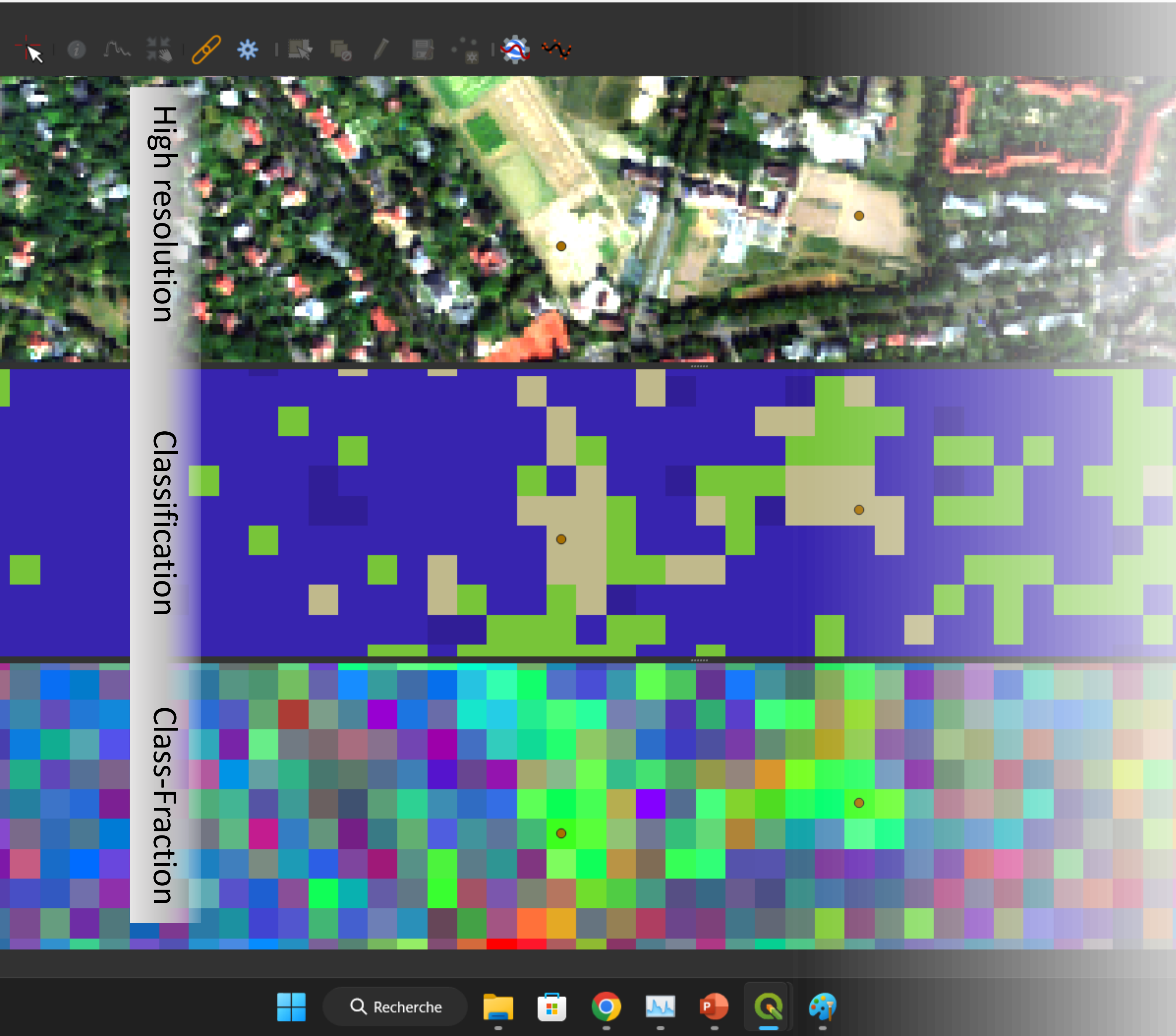


Comparing results

Water

- Water is well distinguished from other endmembers
- We can see that the linear regression performed well in distinguishing water and water fraction, although it is sometimes confused with vegetation



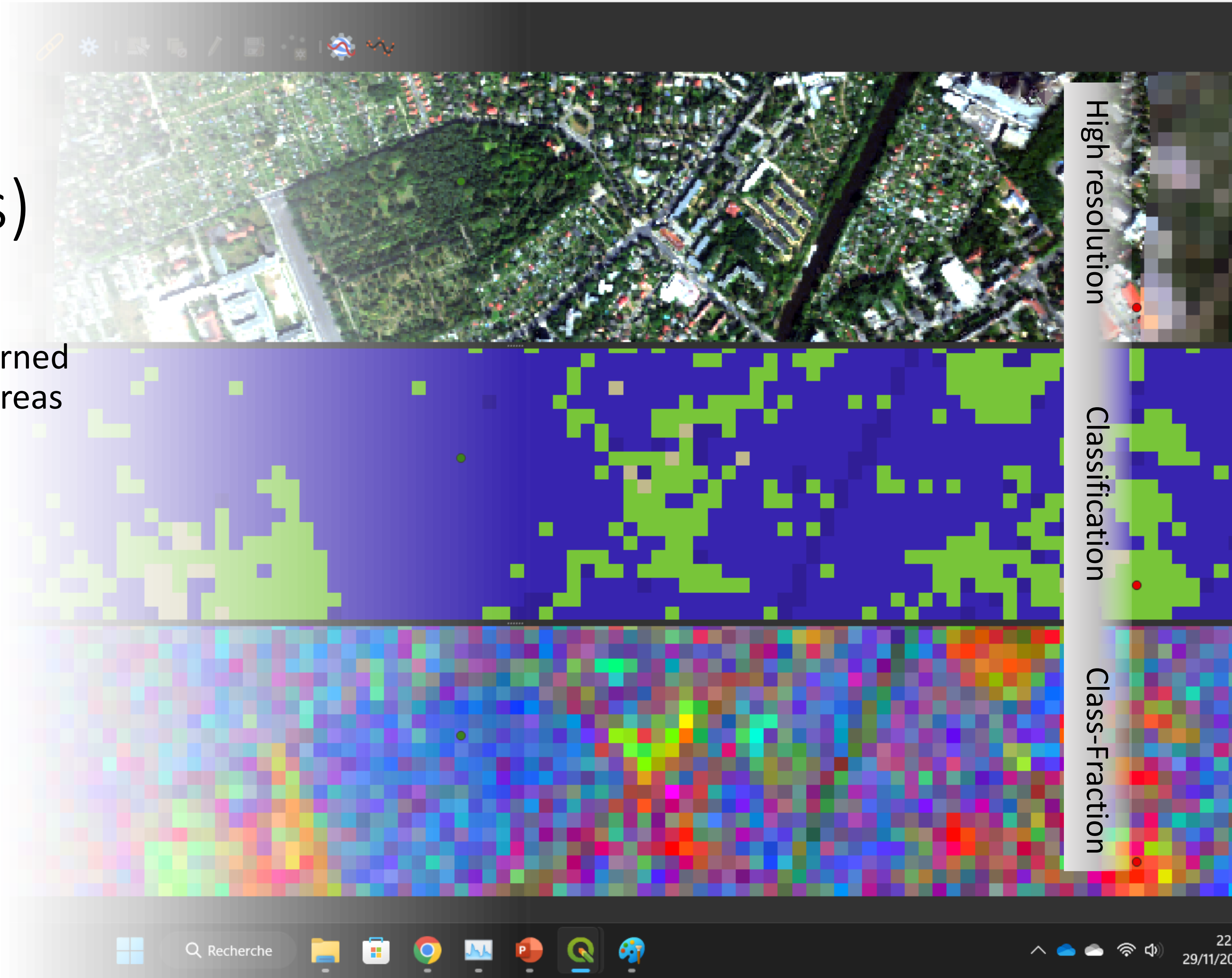


Soil

- The classification performs well in differentiating patches of bare soil
- Bare soil has a predominant fraction and can be characterized clearly

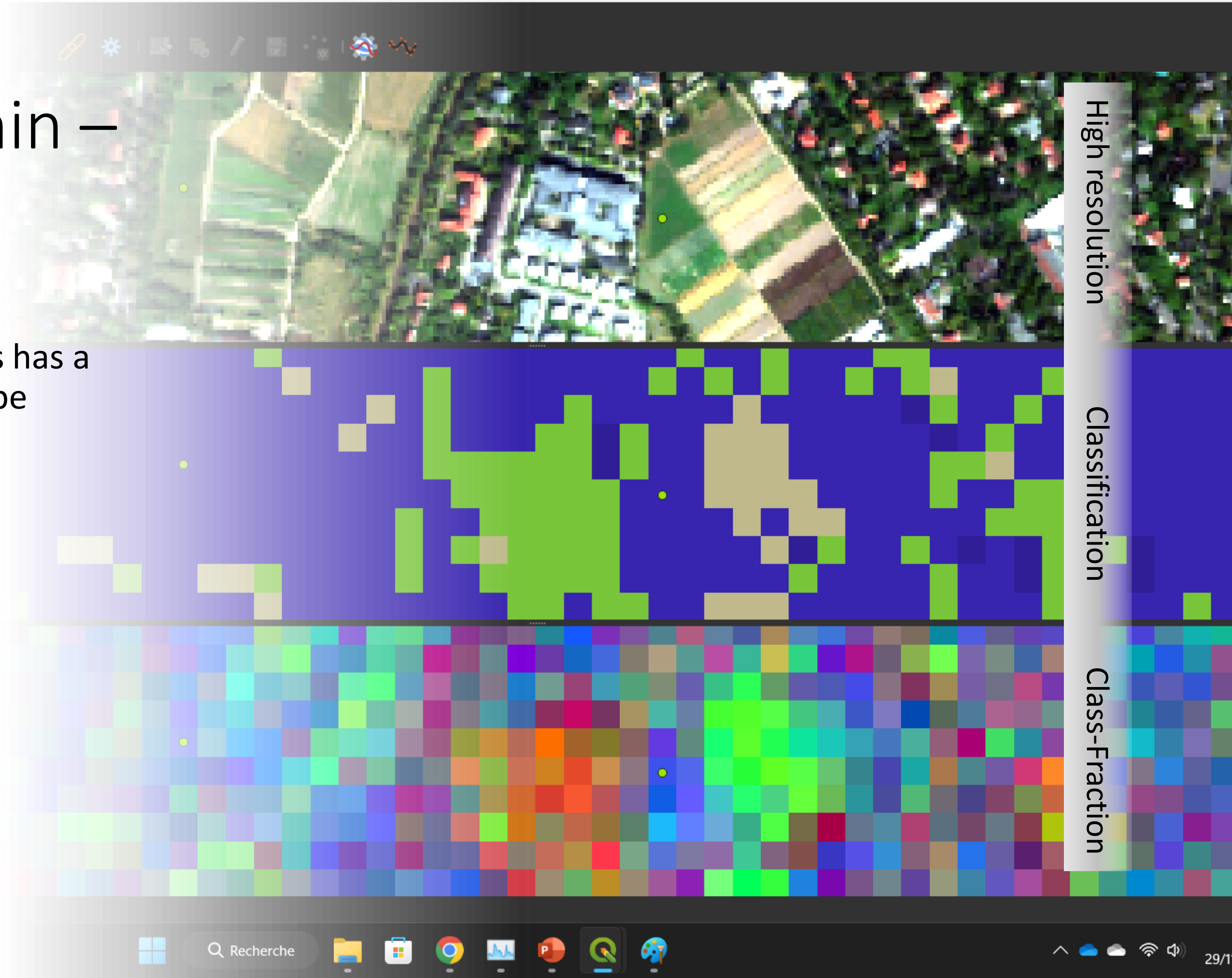
Vegetation (dense – trees)

- Dense vegetation is discerned with fuzzy limits, but with areas with major fraction



Vegetation (thin – grass)

- Thin vegetation and grass has a mixed fraction and cannot be detected simply



Impervious

- Impervious areas have very mixed fractions and cannot be detected clearly