



Grant Agreement 823805 MAIL H2020 MSCA RISE 2018

Identification and classification of marginal lands in Europe



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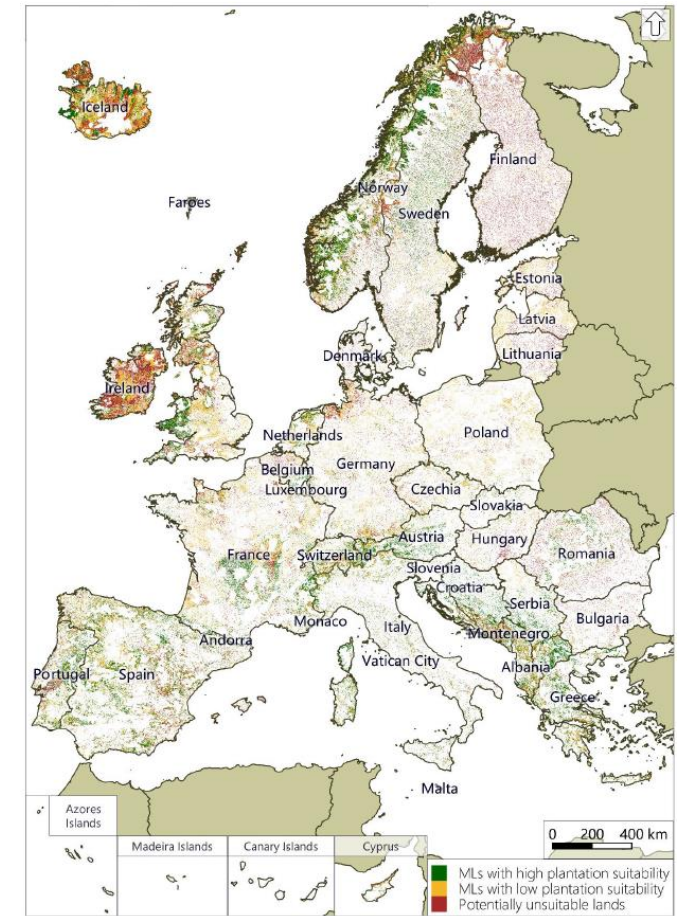
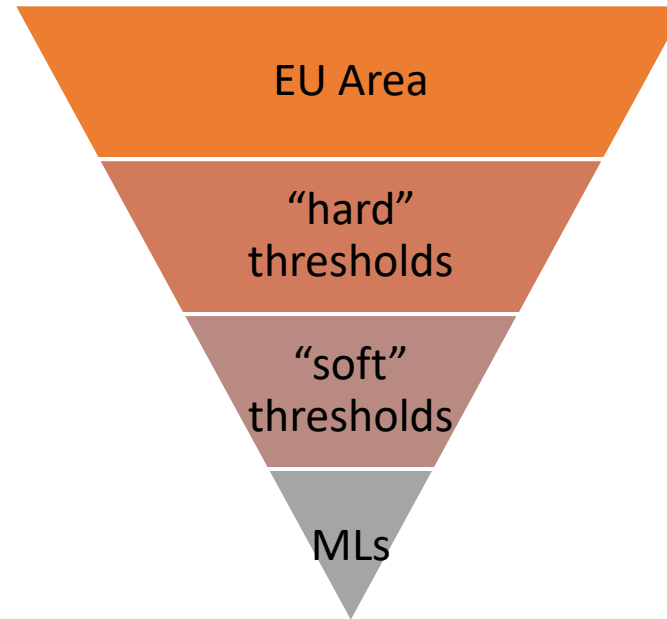
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Overall approach

- Need of common methodology across EU
- Restriction: physical characteristics of each region
- Methodology in two steps:
 - “hard” thresholds (for all EU)
 - “soft” thresholds (region specific)

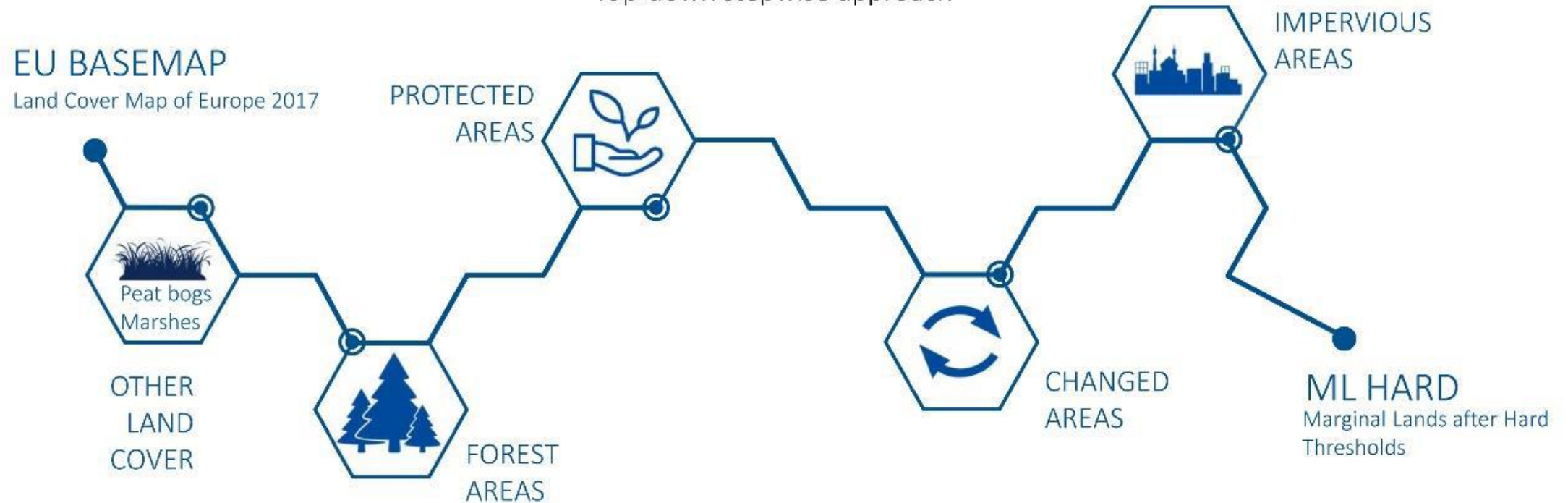


Source: MAIL D2.3

Overall approach

Hard Thresholds

Top-down stepwise approach



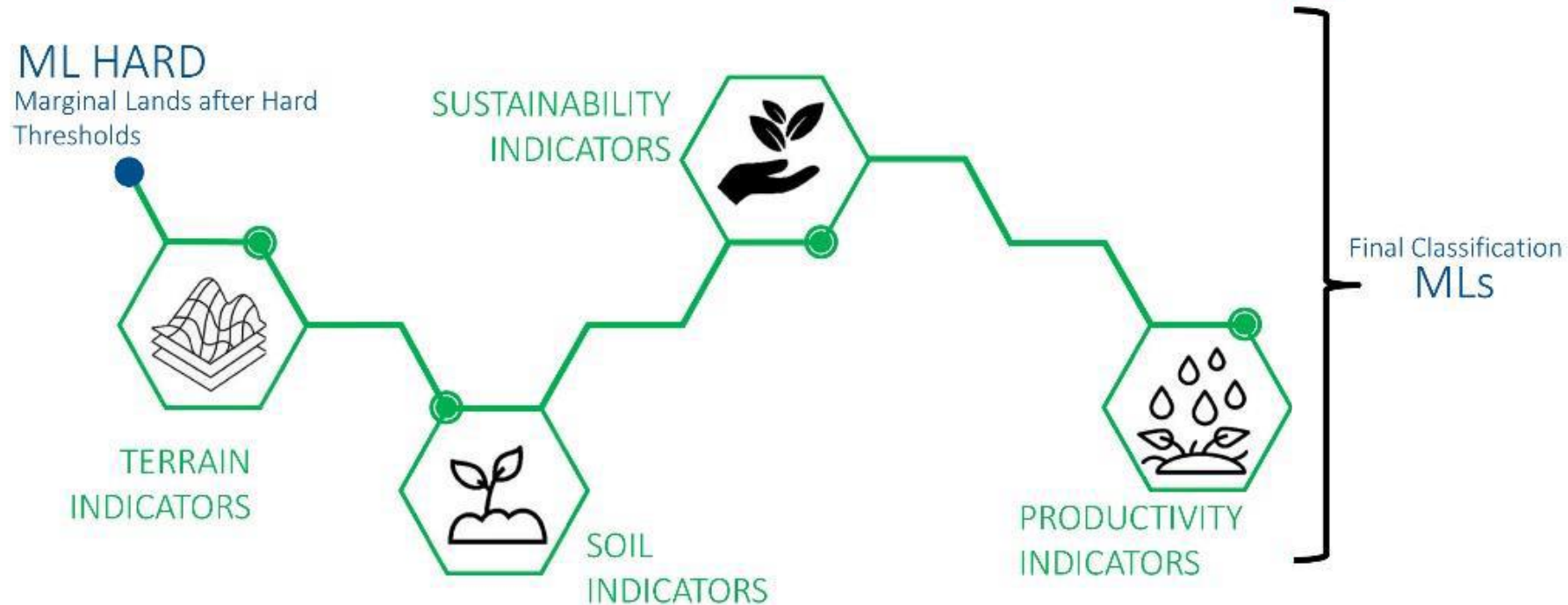
Source: MAIL D2.3

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Overall approach

“Soft” constraints

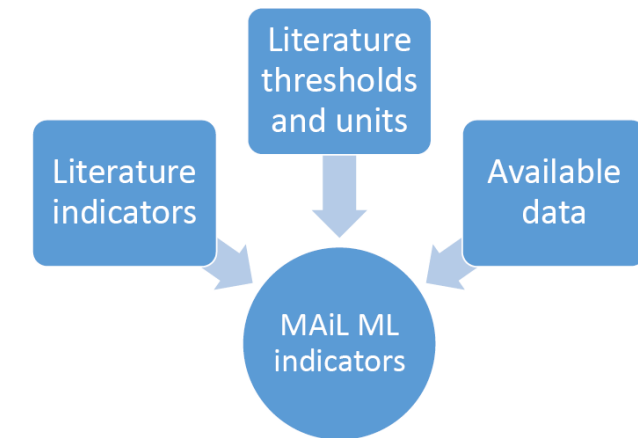
Development of different sets of indicators



Source: MAIL D2.3

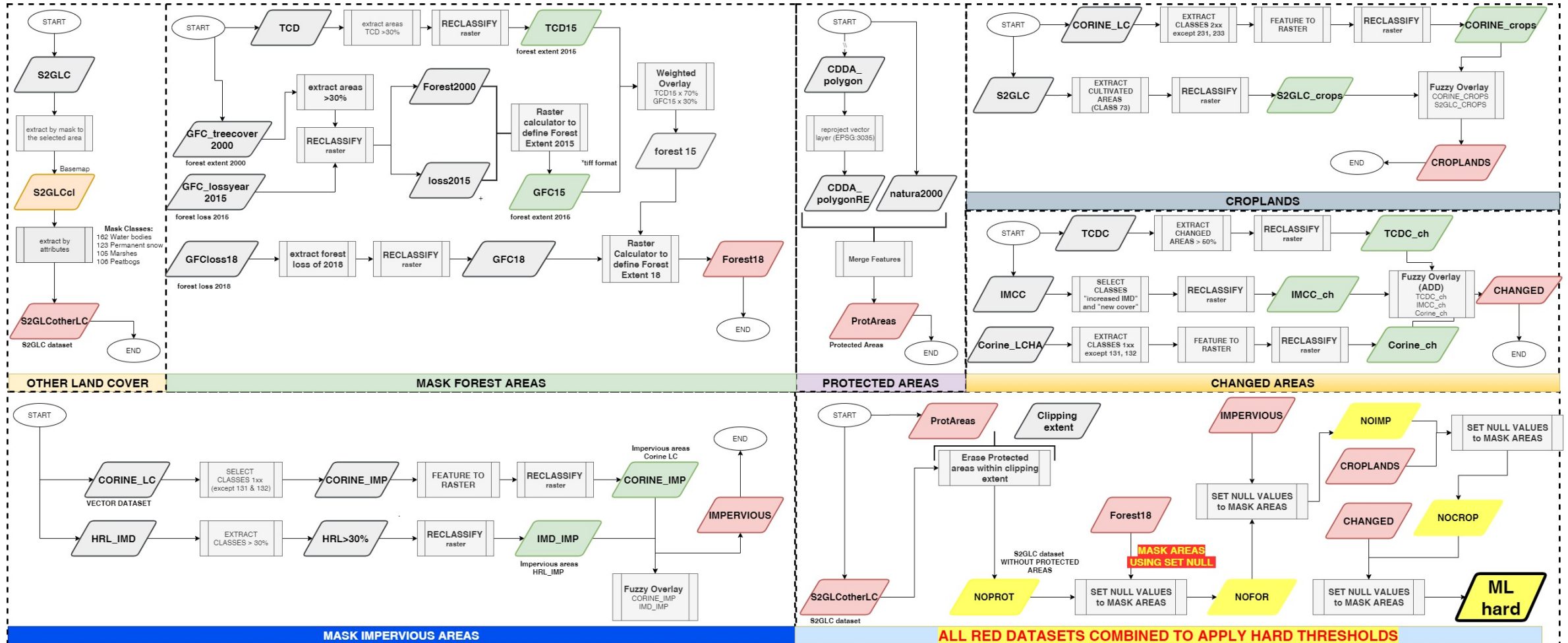
Overall approach

Hard Layers	Soft Layers		
Land Cover	Terrain and soil	Sustainability	Productivity
S2GLC	EU DEM	Soil pH in Europe	Soil Organic mater
CLC	EUROPEAN Soil Database derived data (5 layers)	WISE (3 layers)	Soil biomass productivity of forest areas
CLC change		RUSLE 2015	Soil biomass productivity of grasslands and pastures
HRL imperviousness		JRC Global surface water	SoilGrids250m
HRL imperviousness change		TerraClimate (2 layers)	
Global Forest Change			
Nationally designated areas (CDDA)			
Natura2000			



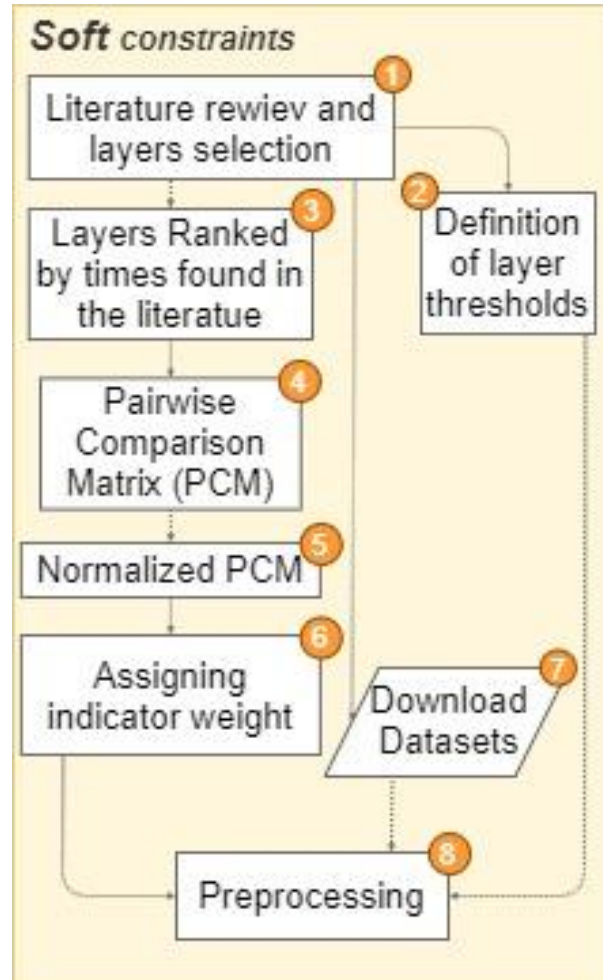
- ✓ **10 m** spatial resolution
- ✓ **European Terrestrial Reference system (ETRS89)**
- ✓ **Lambert Azimuthal Equal-Area (LAEA) projection**

Hard Layers



Source: MAIL D2.3

Soft Layers



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Indicator	Times Found in Literature	Rank
slope	18	1
depth available to roots	18	1
acidity (pH)	9	2
texture	9	2
erosion	8	3
stoniness	8	3
soil organic matter	8	3
water capacity	6	4
flood	6	4
sodicity		
clay		

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	slope	depth available to roots	acidity (pH)	texture	erosion	stoniness	soil organic matter	water capacity	flood	sodicity	clay	sand	contamination	cation exchange capacity	productivity
slope	1.00	1.00	2.00	2.00	3.00	3.00	3.00	4.00	4.00	5.00	6.00	6.00	6.00	6.00	6.00
depth available to roots	1.00	1.00	2.00	2.00	3.00	3.00	3.00	4.00	4.00	5.00	6.00	6.00	6.00	6.00	6.00
acidity (pH)	0.50	0.50	1.00	1.00	1.50	1.50	1.50	2.00	2.00	2.50	3.00	3.00	3.00	3.00	3.00
texture	0.50	0.50	1.00	1.00	1.50	1.50	1.50	2.00	2.00	2.50	3.00	3.00	3.00	3.00	3.00
erosion	0.33	0.33	0.67	0.67	1.00	1.00	1.00	1.33	1.33	1.67	2.00	2.00	2.00	2.00	2.00
stoniness	0.33	0.33	0.67	0.67	1.00	1.00	1.00	1.33	1.33	1.67	2.00	2.00	2.00	2.00	2.00
soil organic matter	0.33	0.33	0.67	0.67	1.00	1.00	1.00	1.33	1.33	1.67	2.00	2.00	2.00	2.00	2.00
water capacity	0.25	0.25	0.50	0.50	0.75	0.75	0.75	1.00	1.00	1.25	1.50	1.50	1.50	1.50	1.50
flood	0.25	0.25	0.50	0.50	0.75	0.75	0.75	1.00	1.00	1.25	1.50	1.50	1.50	1.50	1.50
sodicity	0.20	0.20	0.40	0.40	0.60	0.60	0.60	0.80	0.80	1.00	1.20	1.20	1.20	1.20	1.20
clay	0.17	0.17	0.33	0.33	0.50	0.50	0.50	0.67	0.67	0.83	1.00	1.00	1.00	1.00	1.00
sand	0.17	0.17	0.33	0.33	0.50	0.50	0.50	0.67	0.67	0.83	1.00	1.00	1.00	1.00	1.00
contamination	0.17	0.17	0.33	0.33	0.50	0.50	0.50	0.67	0.67	0.83	1.00	1.00	1.00	1.00	1.00
cation exchange capacity	0.17	0.17	0.33	0.33	0.50	0.50	0.50	0.67	0.67	0.83	1.00	1.00	1.00	1.00	1.00
productivity	0.14	0.14	0.29	0.29	0.43	0.43	0.43	0.57	0.57	0.71	0.86	0.86	0.86	0.86	0.86

Pairwise Comparison Matrix (PCM) of the ranks (Zolekar & Bhagat 2015)

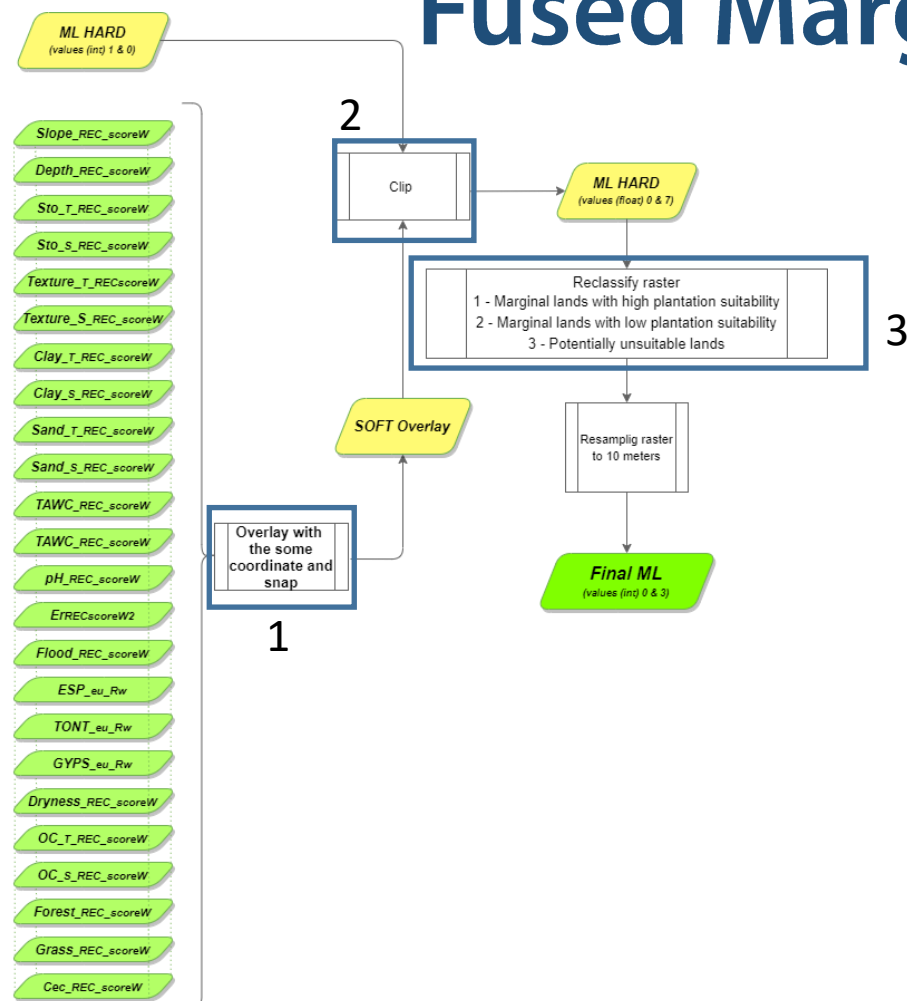
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	slope	depth available to roots	acidity (pH)	texture	erosion	stoniness	soil organic matter	water capacity	flood	sodicity	clay	sand	contamination	cation exchange capacity	productivity	dryness	natural toxicity	Weights
slope	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
depth available to roots	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
acidity (pH)	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
texture	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
erosion	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
stoniness	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
soil organic matter	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
water capacity	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
flood	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
sodicity	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
clay	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03

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Source: Jesús Torralba Pérez

Fused Marginal land classification



1. **Soft** layers fusion
2. **Soft** layers fusion with *Hard* layer
3. **3 MLs classes:**
 - “Marginal lands with high plantation suitability”
 - “Marginal lands with low plantation suitability”
 - “Potentially unsuitable lands”

Source: MAIL D2.3

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Classification results

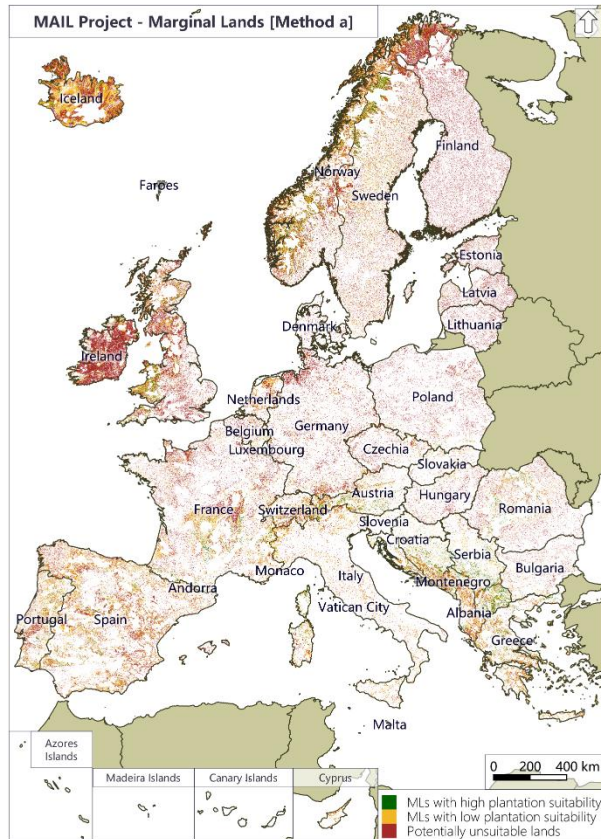
Hard layers marginal land classification



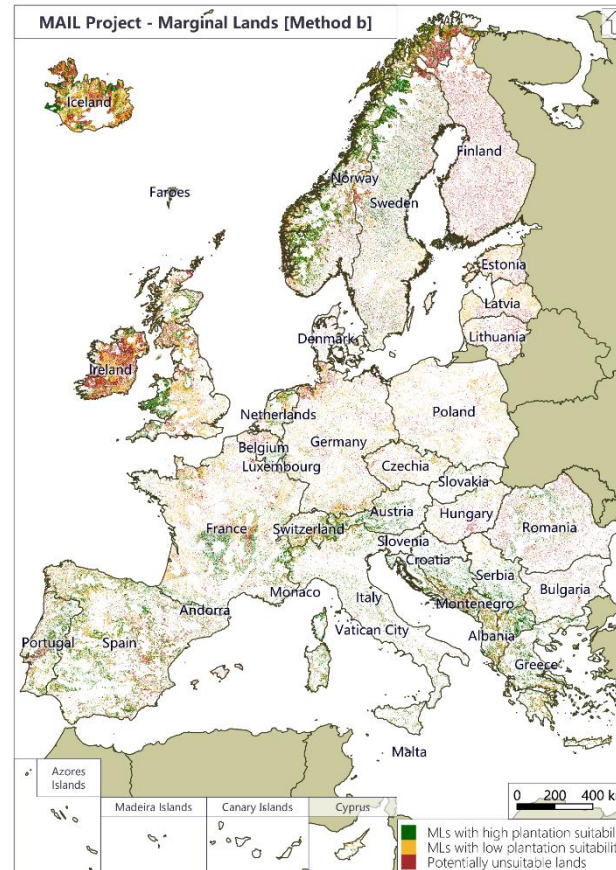
Source: MAIL D2.3

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Classification results

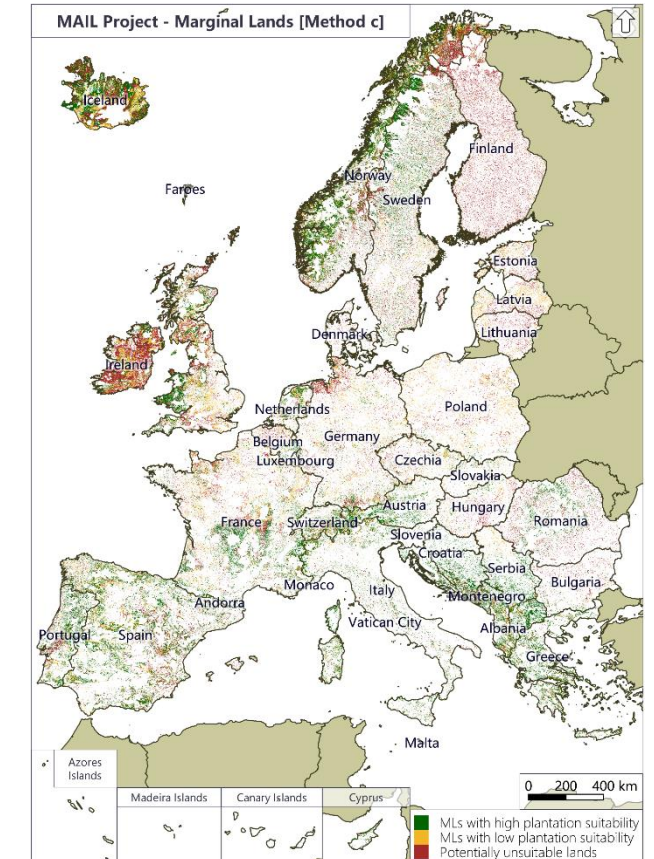


Min max range divided by 3



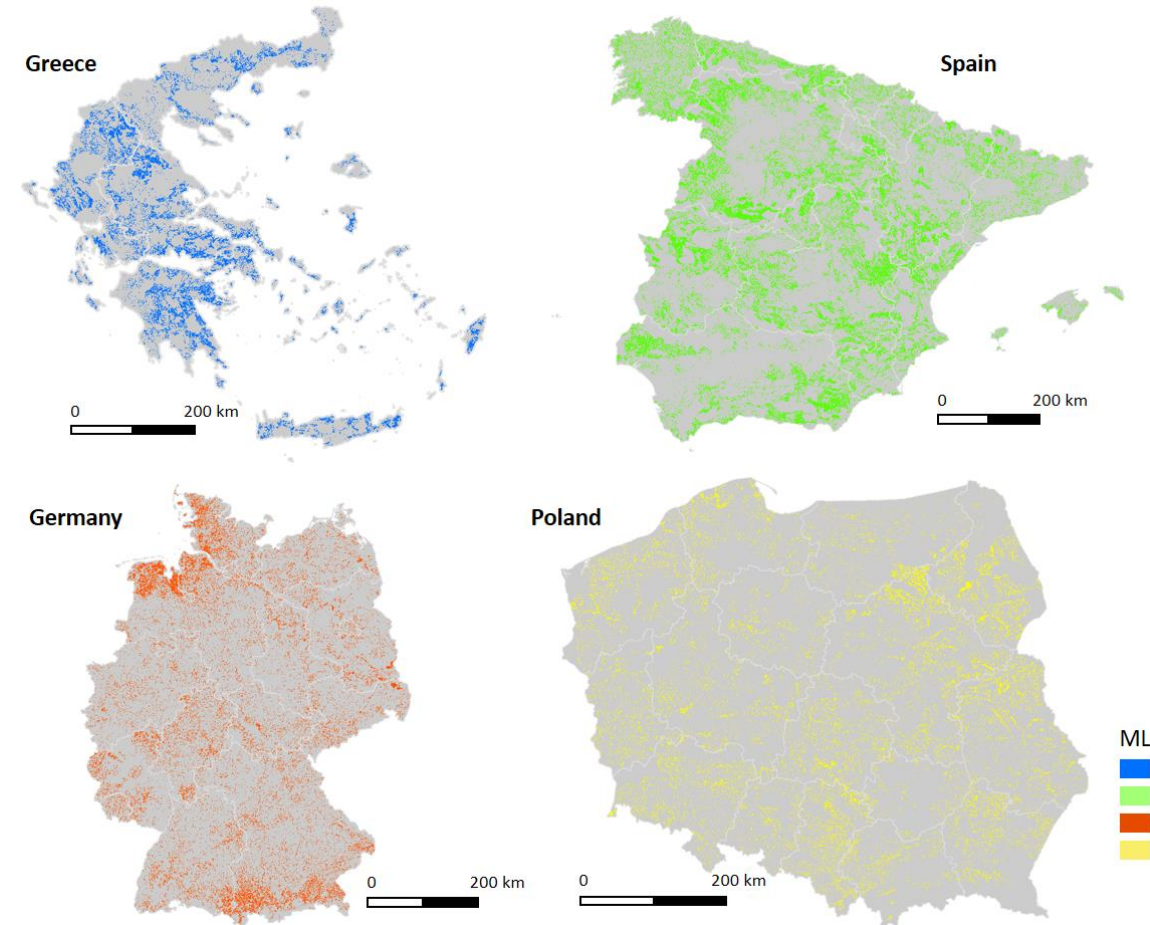
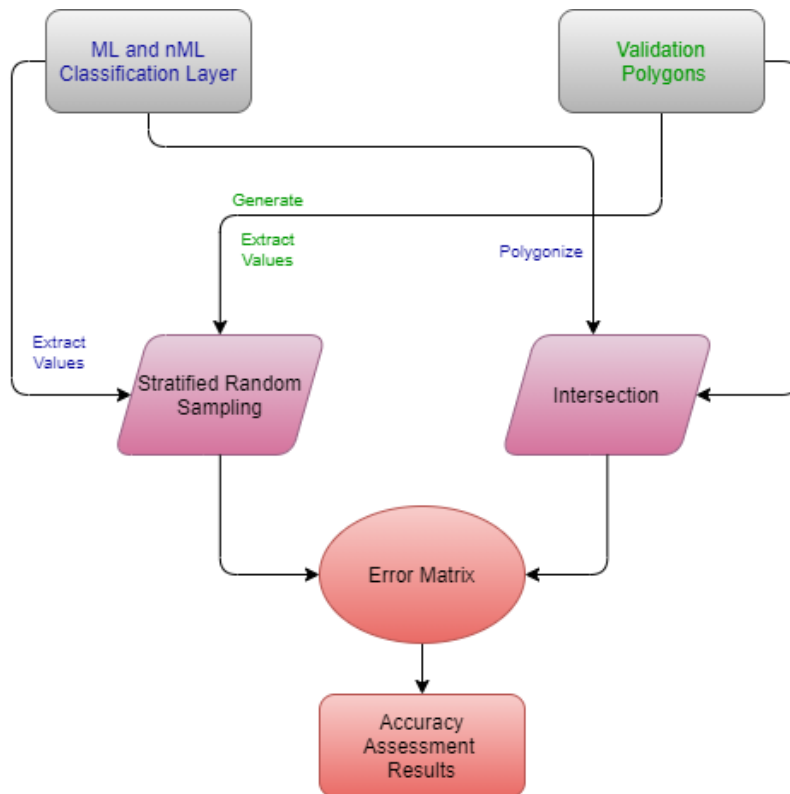
25th and 75th percentile

Source: MAIL D2.3



33rd and 66th percentile

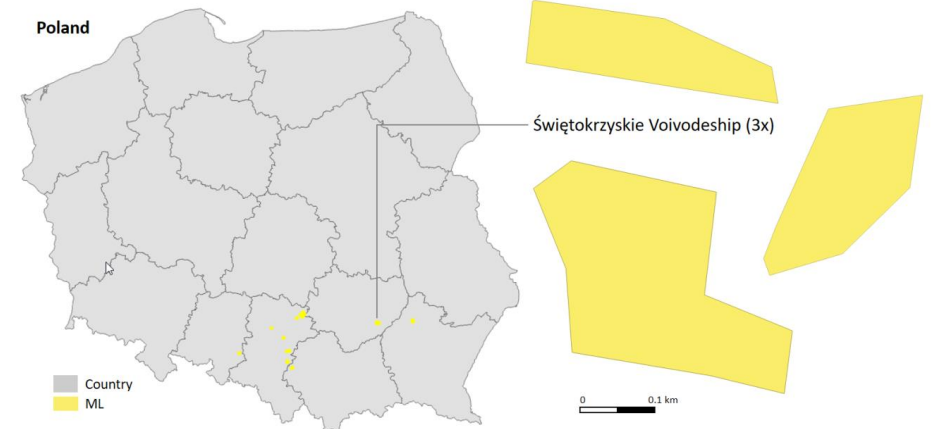
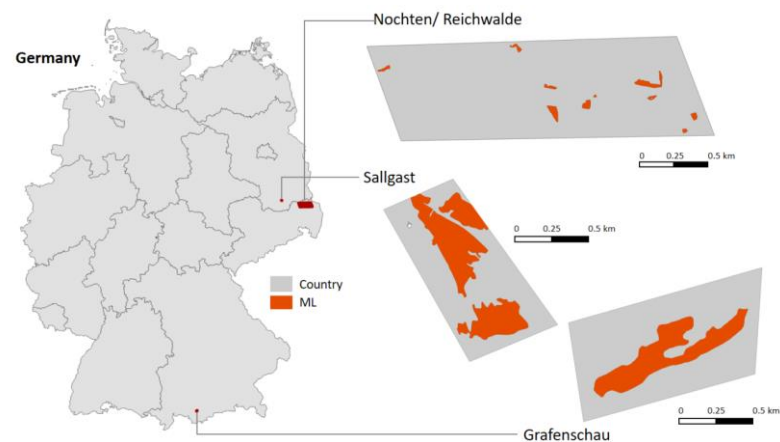
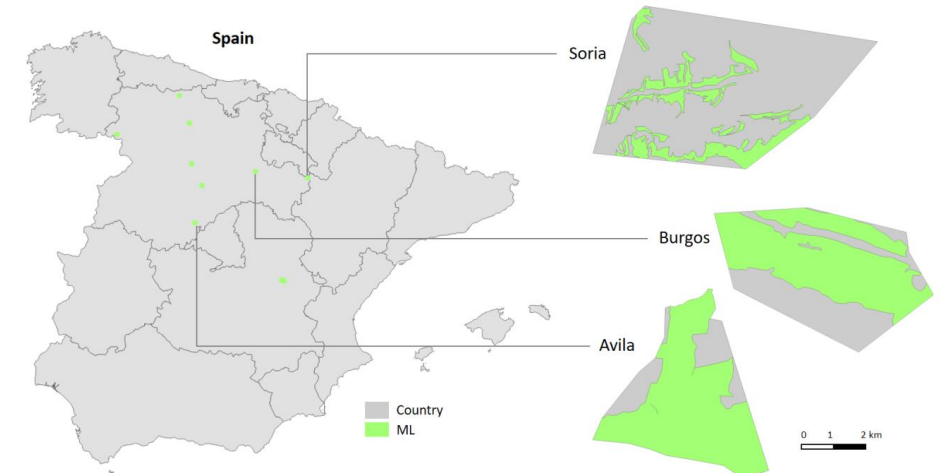
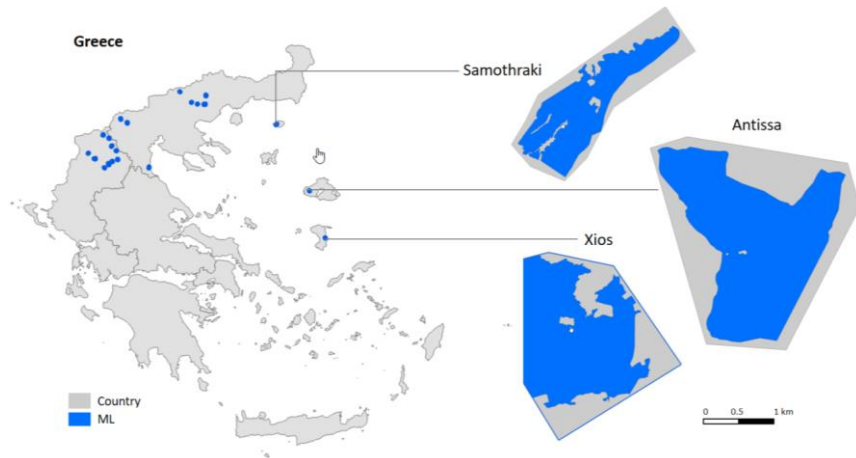
Accuracy Assessment



Source: MAIL D2.4

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Accuracy Assessment



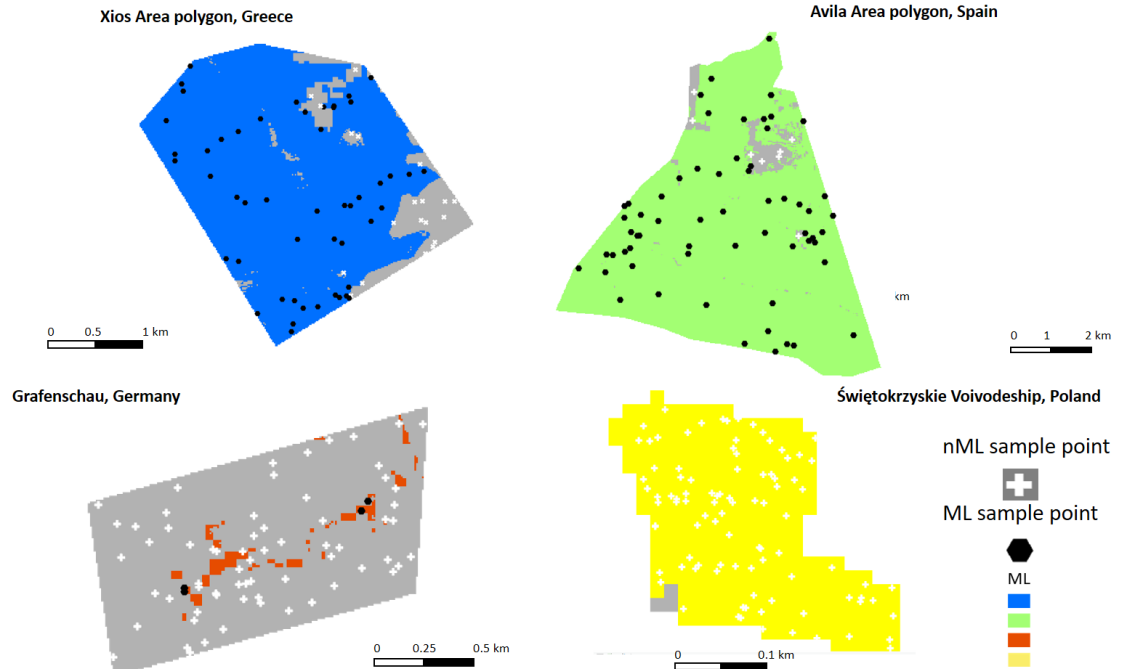
Source: MAIL D2.4

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Accuracy Assessment

	ML		nML	
	Area [ha]	Allocated Points	Area [ha]	Allocated Points
Greece	7988	7988	5274	5274
Spain	1649	1648	2199	2199
Germany	352	352	20,913	20,913
Poland	539	539	2463	2463
Merged	10,529	10,529	30,849	30,849

Area of ML in ha	Greece	Spain	Germany	Poland	Merged
Predicted (area-based)	7,646	1,807	8,820	313	18,589
Reference	7,987	1,649	351	538	10,529



Source: MAIL D2.4

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