Imagery applications in forestry. Landscape indices.

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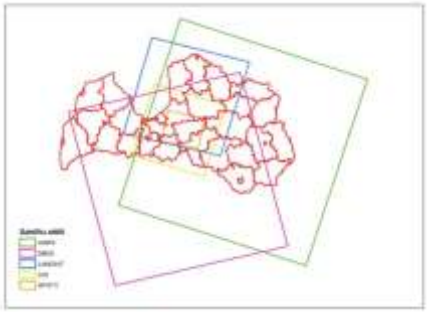
Imagery vs forest maps

- Forest maps:
  - The changing legislation;
  - Compartments;
  - Revisit time.

- Imagery:
  - Look from above witout interpretation.

Data for imagery applications

- LSFRI Silava:
  - Satellite images;
  - Ortophoto;
  - LIDAR.
- Forest data for remote sensing:
  - NFI;
  - State forest register;
  - Topomaps;
  - Rural support service.

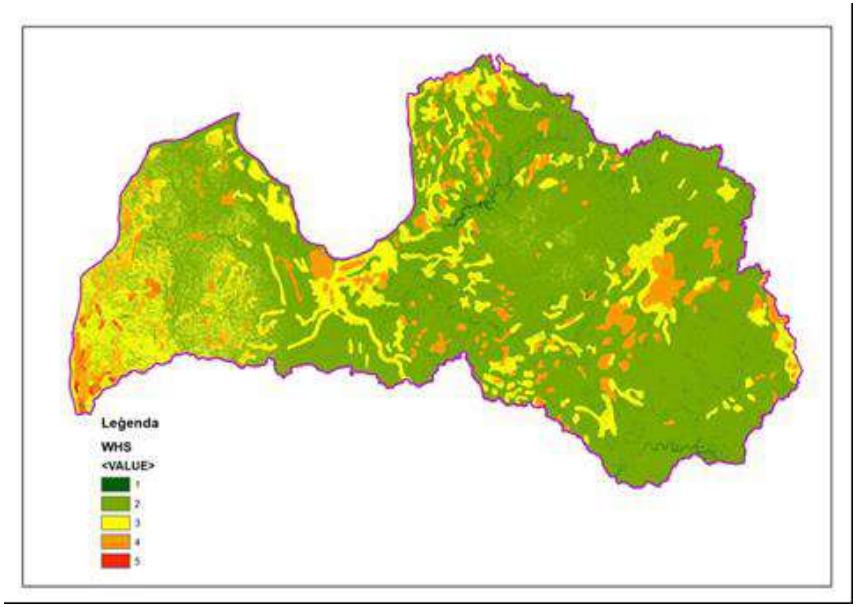


Demand (1)

- Forest resource assesment:
  - NFI data interpolation.
- Landscape indices:
  - Criteria and Indicators for Sustainable Forest Management.
- Land use changes:
  - Global forest watch;
  - FAO, JRC research support.

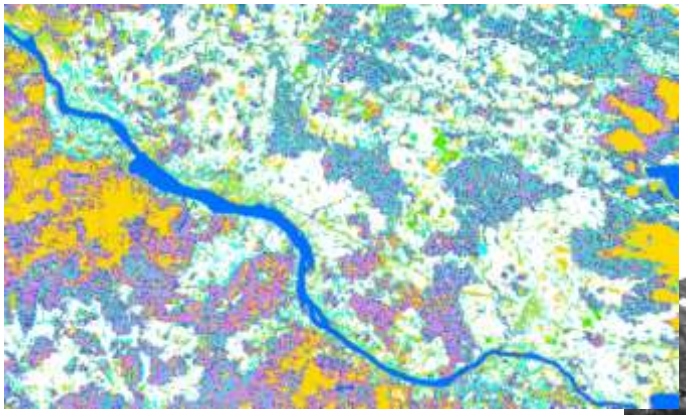
Demand (2)

- Damage assessment:
  - After windfall;
  - After pest outbreaks



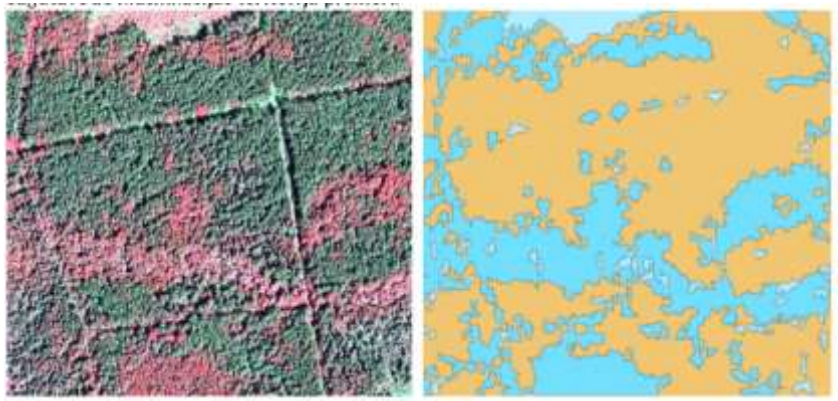
Previous projects (1)

- NFI and different satellite imagery:
  - For data interpolation;
  - For spatial planning;
  - For landuse change.



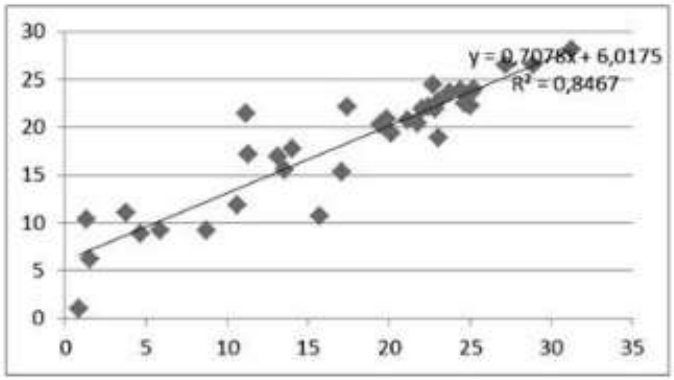
Previous projects (2)

- NFI and ortophoto maps:
  - ortophoto can be used for forest microstand delineation with the help of NFI sample plot ground truth.



Previous projects (3)

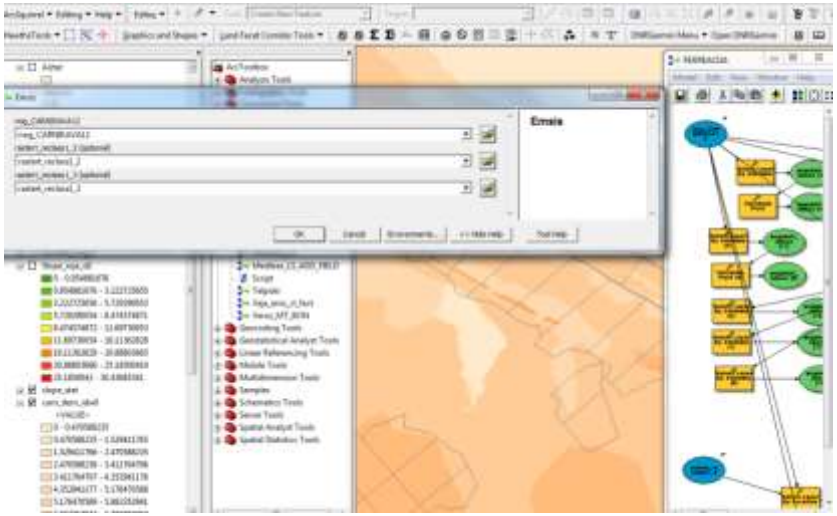
- NFI, state forest register and LIDAR data:
  - public LIDAR data can be used as an additional source of data for forest classification.



CHM and NFI sample plot average height data.

Software selection

- Functionality first;
- Integration with GIS;
- We have ERDAS, eCognition, ENVI.

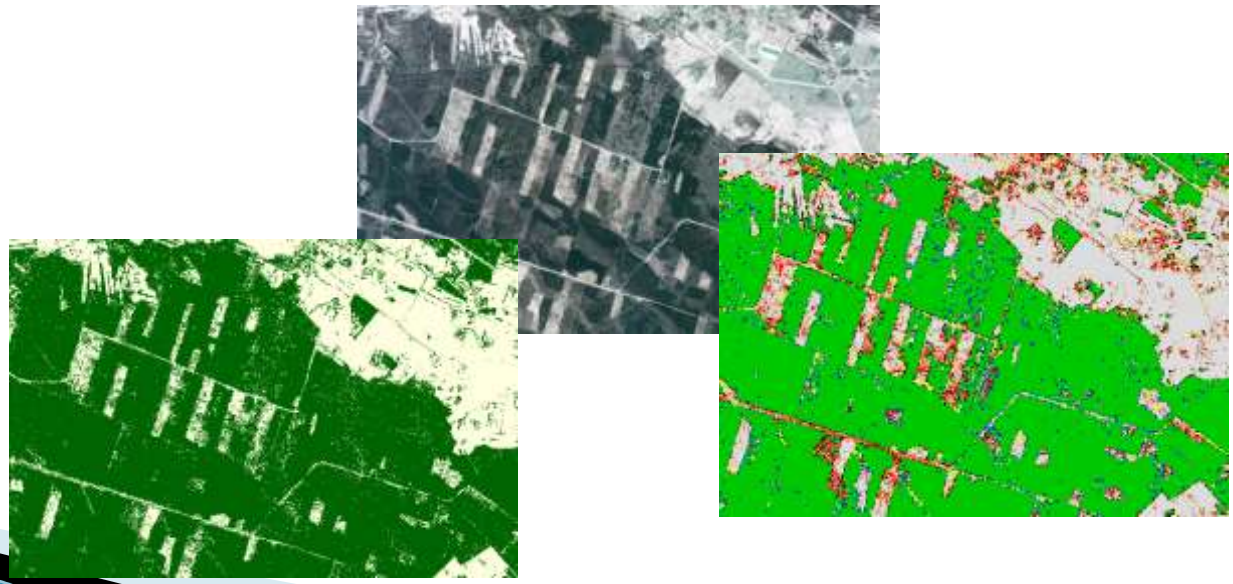


Landscape

- Fragments, corridors, mosaics;
- Size, shape, spatial configuration;
- Landscape indices (LSIM, EDGECON ...).

Data for Landscape analysis

- Topomaps;
- Forest digital map (State forest register);
- Ortophoto.

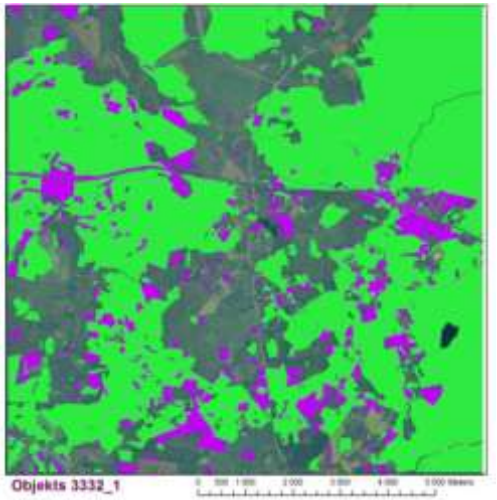


State forest register

- Not all forests are with forest Inventory data;
- Abandoned agricultural land.

Data processing

- Digitizing forests without forest inventory data;
- Ideas to add Rural support service land blocks.



Landscape analysis

- Fragstats, Patch analyst in ArcMap
- Guidos for
  Morphological **S**patial **P**attern **A**nalysis

- Conefor 2.6 for conectivity indices calculation
  - Integral index of connectivity
  - Betweeness centrality
  - Equivalent Connectivity

Results

- Difference of forest cover depending on selection of pixel size, data source and width of bufferzone

Objekts	3134_2		3233_1		3242_1		3332_1		3413_1		4322_1		4344_1_21		4344_1_22		4441_1		4441_2	
Buferjoslas platums,m	50	100	50	100	50	100	50	100	50	100	50	100	50	100	50	100	50	100	50	100
Grad. klase*																				
M005	58.7	39.0	71.6	54.3	69.1	49.7	69.7	50.3	78.8	66.3	37.3	13.4	65.9	43.8	64.3	42.6	82.2	70.3	53.5	32.7
M010	58.3	39.1	71.7	55.1	67.7	48.8	69.1	50.2	78.2	65.9	37.4	14.4	64.7	43.2	64.4	43.9	81.9	70.4	52.8	32.7
M020		38.4		55.3		47.2		50.3		65.2		14.1		42.3		42.4		70.2		32.8
M025	56.7	39.6	71.4	57.0	68.3	51.2	68.4	51.6	76.9	66.0	36.2	15.4	62.0	43.9	62.0	44.1	81.2	71.2	51.8	34.5
M100		43.4		60.7		52.7		57.0		67.5		23.3		45.2		50.6		74.0		41.2
P005	58.2	38.4	71.6	54.3	66.0	46.5	73.3	54.9	78.7	66.2	39.1	14.9	67.8	47.1	64.8	44.0	81.2	69.1	53.7	33.5
P010	58.0	38.7	71.7	55.2	65.2	46.1	72.9	55.2	78.1	65.9	38.6	15.4	67.1	47.2	64.4	44.4	81.0	69.3	53.5	34.1
P020		38.2		55.3		45.3		55.6		65.2		15.1		46.6		45.5		69.3		34.4
P025	56.7	39.5	71.4	57.0	65.1	48.4	72.5	56.8	77.1	66.2	37.2	16.4	64.8	48.2	63.1	45.9	80.5	70.4	52.9	36.2
P100		45.1		61.4		50.1		64.9		67.9		24.1		50.0		53.5		73.9		42.7
Kopā	57.8	39.9	71.6	56.6	66.9	48.6	71.0	54.7	78.0	66.2	37.6	16.6	65.4	45.7	63.8	45.7	81.3	70.8	53.0	35.5

- Landscape elements depending on pixel size, data source and width of bufferzone

	Zars		Tilts		Kodolzona		Mala		Sala		Cilpa		Perforācija	
Buferjoslas platums,m	50	100	50	100	50	100	50	100	50	100	50	100	50	100
Grad. klase*														
M005	3.85	6.70	4.74	13.04	65.11	46.24	21.48	23.17	1.86	5.80	1.92	4.44	1.03	0.62
M010	4.11	6.62	5.49	14.34	64.61	46.36	20.89	21.93	1.99	5.50	1.96	4.59	0.95	0.65
M020		6.72		15.69		45.82		20.81		5.36		4.97		0.63
M025	4.46	6.31	5.95	14.36	63.47	47.43	20.19	21.21	2.50	5.13	2.24	4.84	1.18	0.73
M100		8.66		5.97		51.55		25.93		4.74		2.02		1.13
P005	3.84	6.43	4.87	12.52	65.45	46.88	20.07	21.70	2.35	6.01	2.22	5.66	1.20	0.82
P010	4.10	6.33	5.43	13.41	65.05	47.13	19.58	20.90	2.46	5.97	2.25	5.43	1.13	0.82
P020		6.35		15.91		47.06		19.39		5.37		5.15		0.79
P025	4.56	6.16	5.91	14.28	64.13	48.49	18.62	19.87	2.76	5.25	2.60	5.16	1.42	0.78
P100		8.62		5.69		53.36		24.28		4.68		2.09		1.28

Conclusions

- Results heavily depend on data used;
- Results depend on methodology;
- Remote sensing – just one but important tool.

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Thank You!