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# Spatial Analysis and Mapping of Potential Wildfires from Landsat Satellite Data

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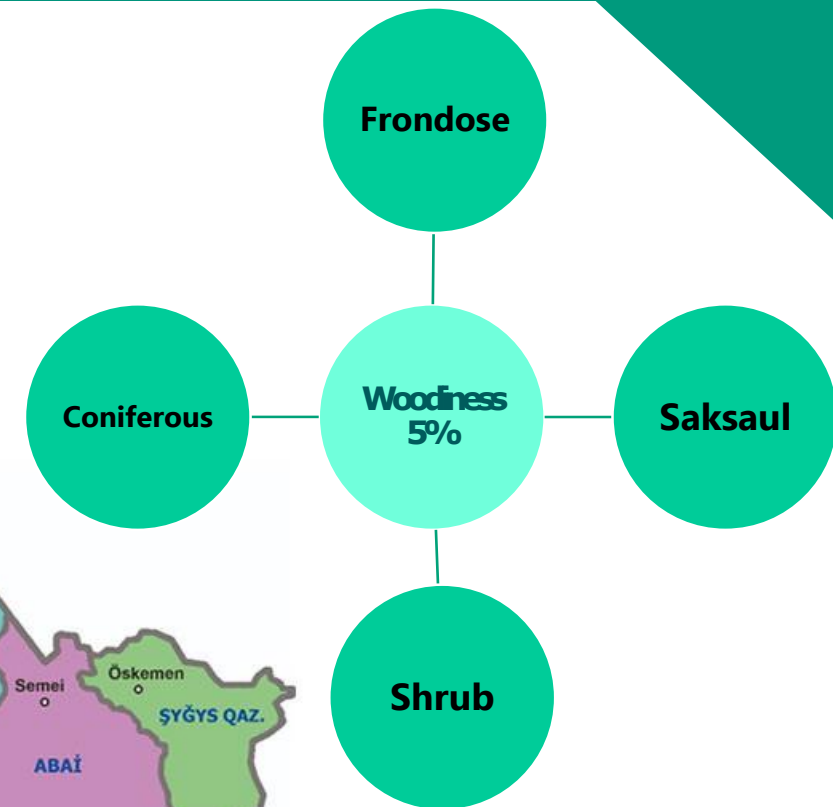
Area – 30.9 million hectares

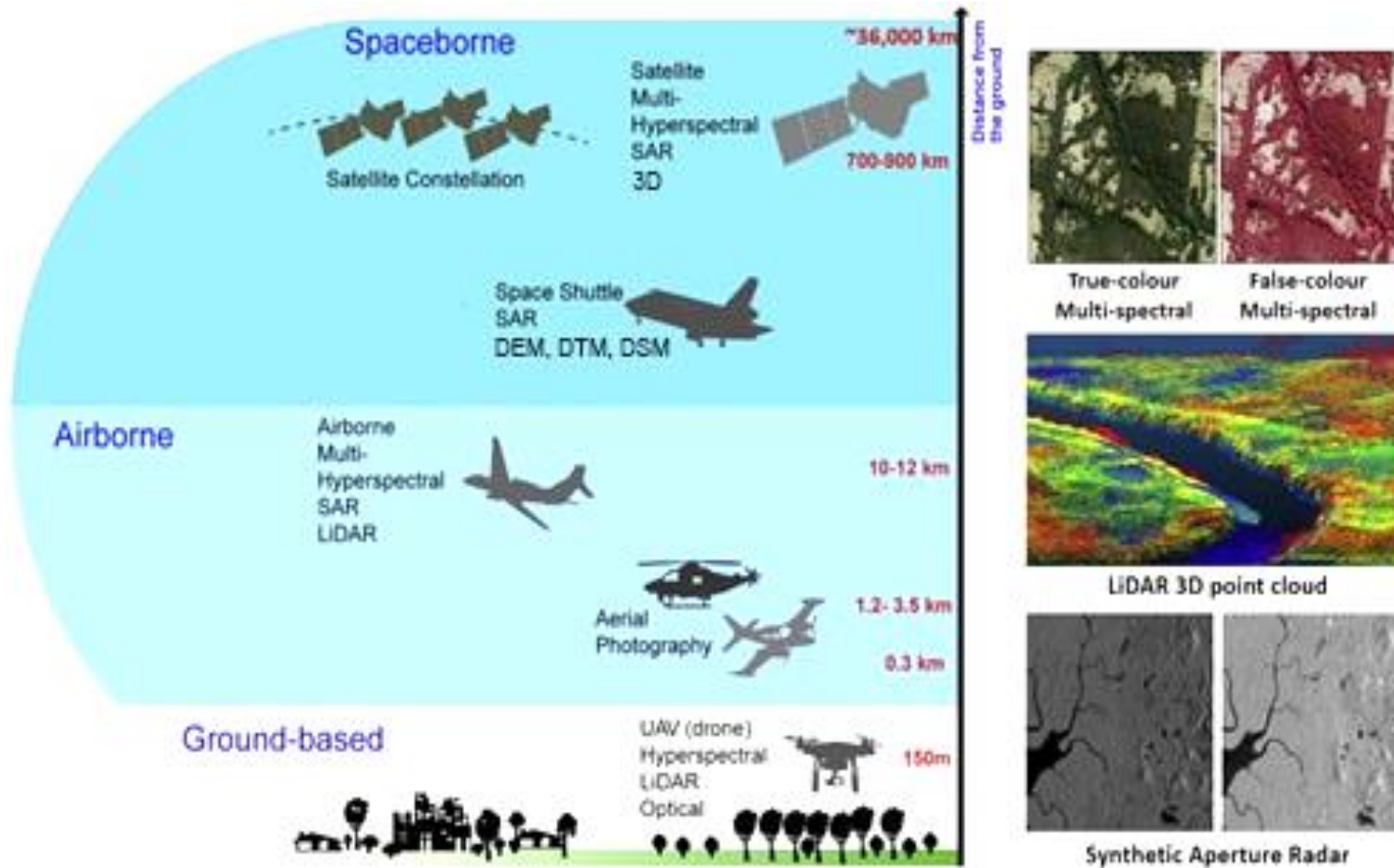


Akimat



Committee of Forestry  
and Wildlife





Forestry mapping.  
Digital elevation  
matrices

Remote methods for  
measuring biophysical  
parameters of vegetation

Classification of forest  
species composition, forest  
vegetation and growing  
conditions

Spot analysis and deciduous  
cover and trunk condition  
of individual trees

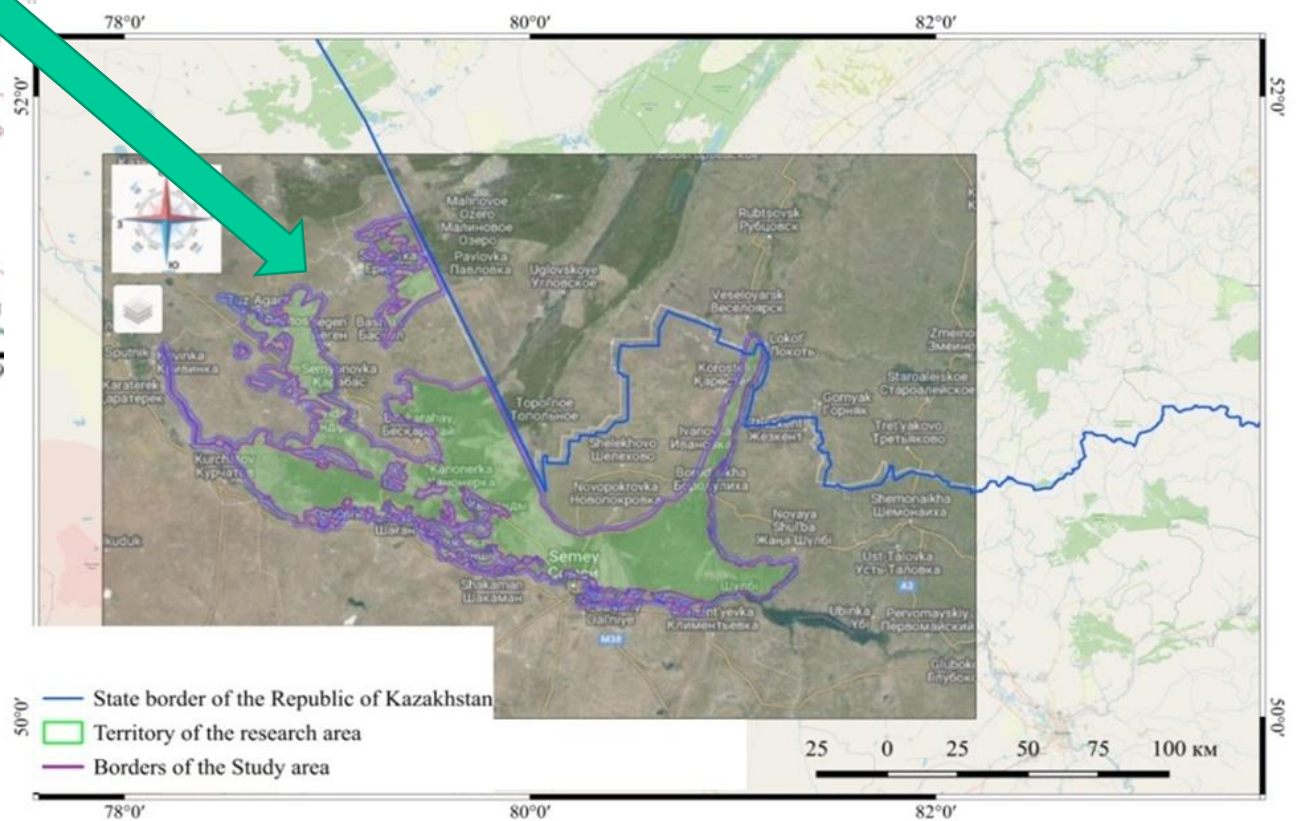
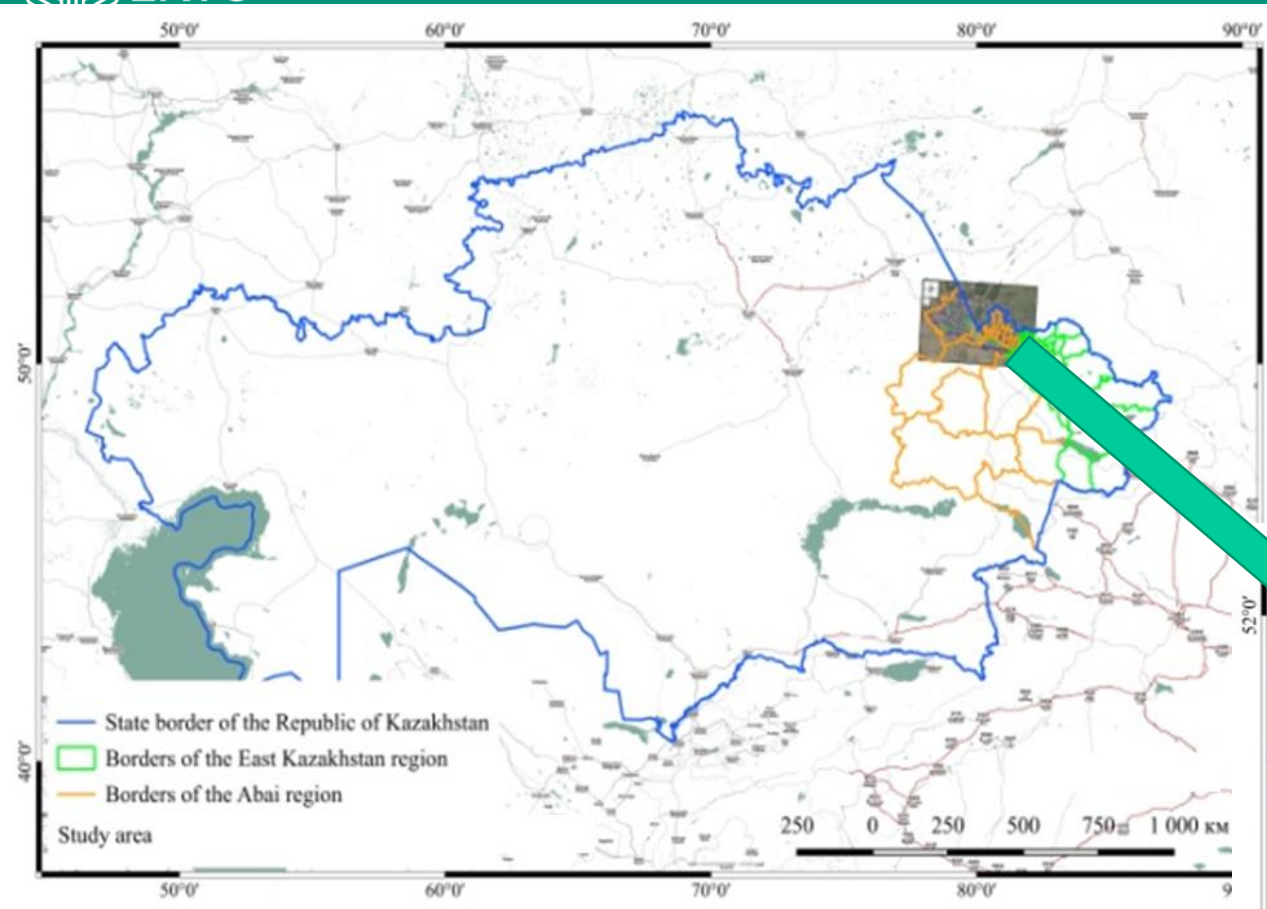
Assessment of the impact of  
fires on forest ecosystems  
condition





14 employees of the  
Uspensky Forestry  
Department died.

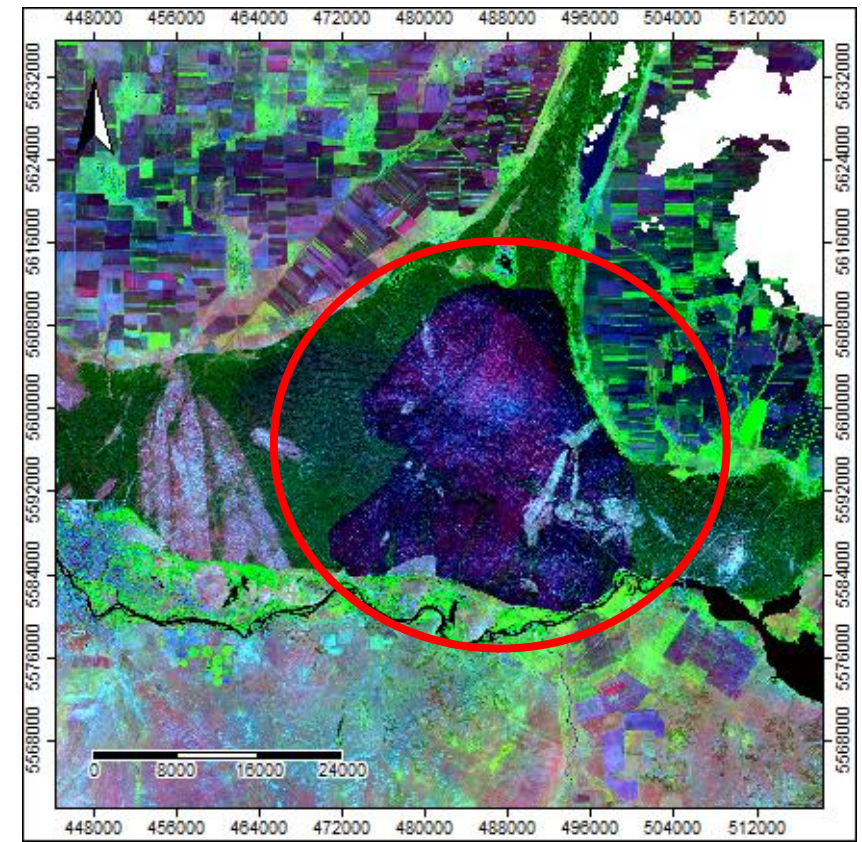






Landsat 8-9 OLI/TIRS	Description	Wavelength (min-max)	Resolution (m)
Band 1	Coastal / Aerosol	0.433 to 0.453 $\mu\text{m}$	30 meter
Band 2	Visible blue	0.450 to 0.515 $\mu\text{m}$	30 meter
Band 3	Visible green	0.525 to 0.600 $\mu\text{m}$	30 meter
<b>Band 4</b>	<b>Visible red</b>	0.630 to 0.680 $\mu\text{m}$	30 meter
<b>Band 5</b>	<b>Near-infrared</b>	0.845 to 0.885 $\mu\text{m}$	30 meter
Band 6	Short wavelength infrared	1.57 to 1.65 $\mu\text{m}$	30 meter
Band 7	Short wavelength infrared	2.11 to 2.29 $\mu\text{m}$	60 meter
Band 8	Panchromatic	0.50 to 0.68 $\mu\text{m}$	15 meter
Band 9	Cirrus	1.36 to 1.38 $\mu\text{m}$	30 meter
<b>Band 10</b>	<b>Long wavelength infrared</b>	10.60 to 11.19 $\mu\text{m}$	100 meter
Band 11	Long wavelength infrared	11.50 to 12.51 $\mu\text{m}$	100 meter

*Classification of the burned area by color*

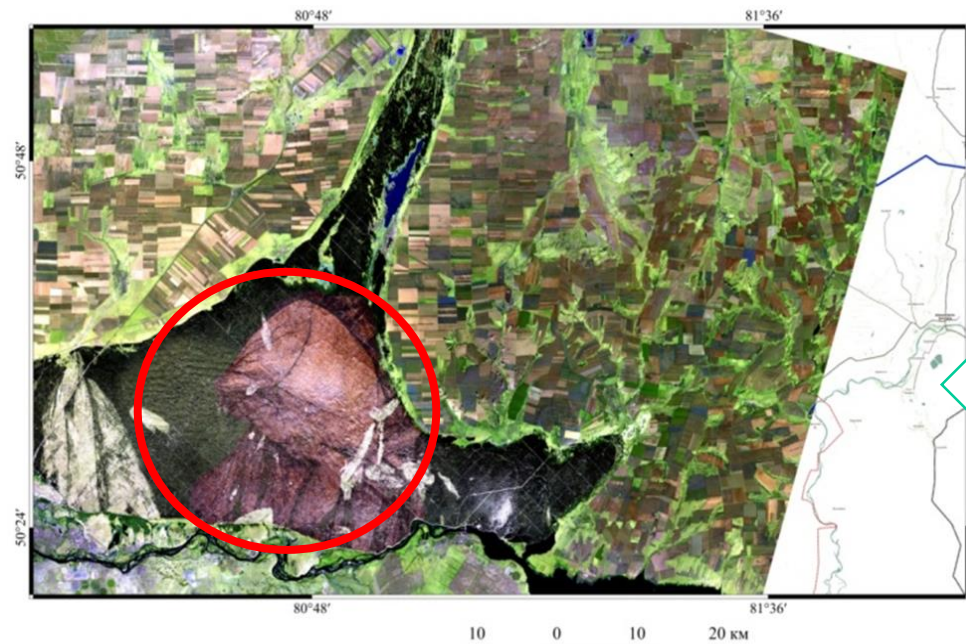




a) before the fire 2022.05.12;

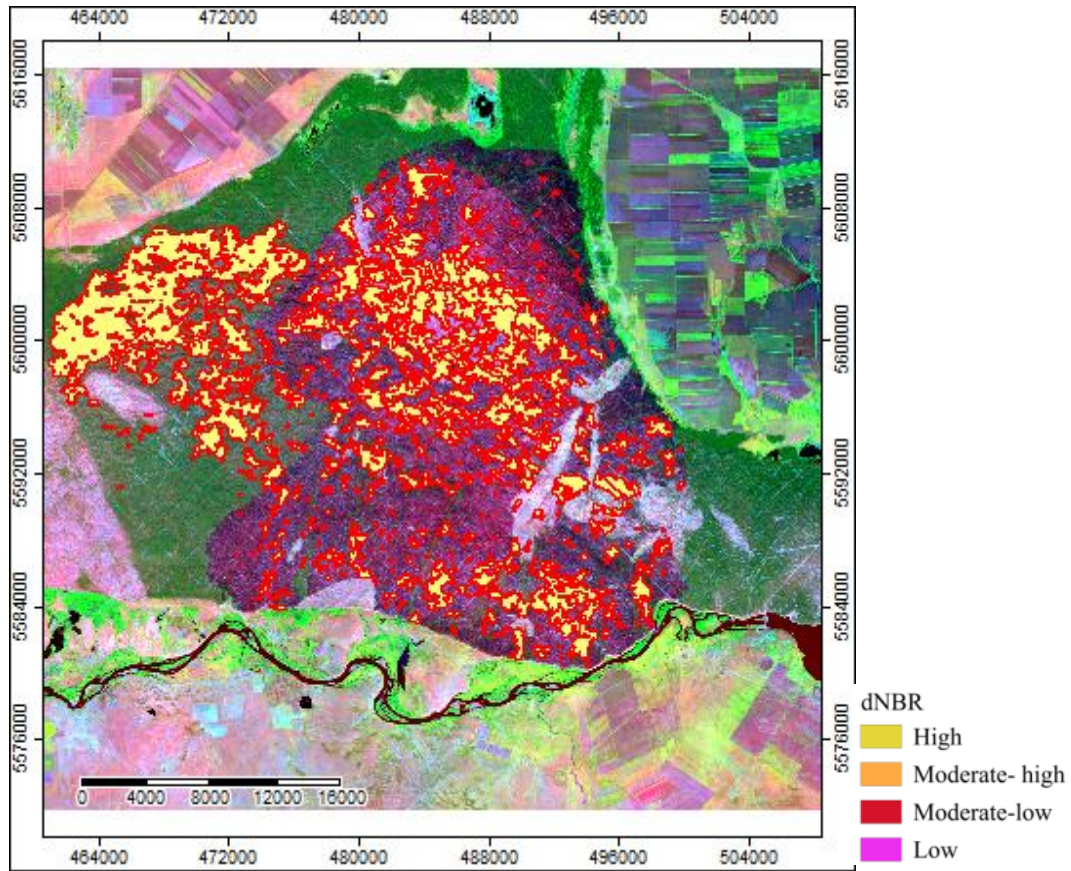


b) burning period 06.15.2023;



c) after the fire  
2023.09.29





*Fire spread rate by segmentation method Object Based Image analysis (OBIA)*

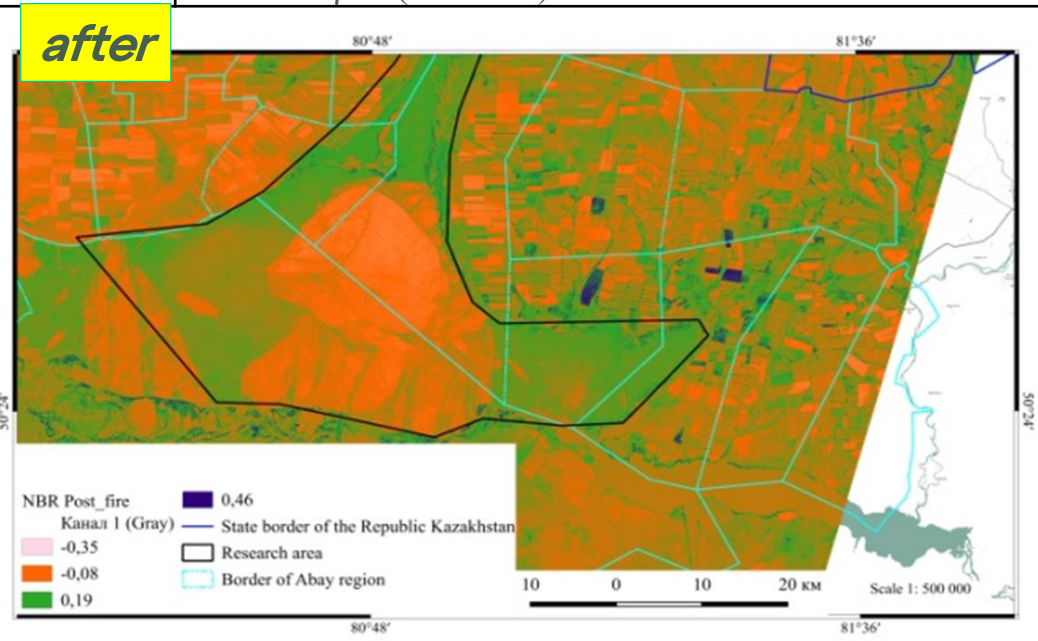
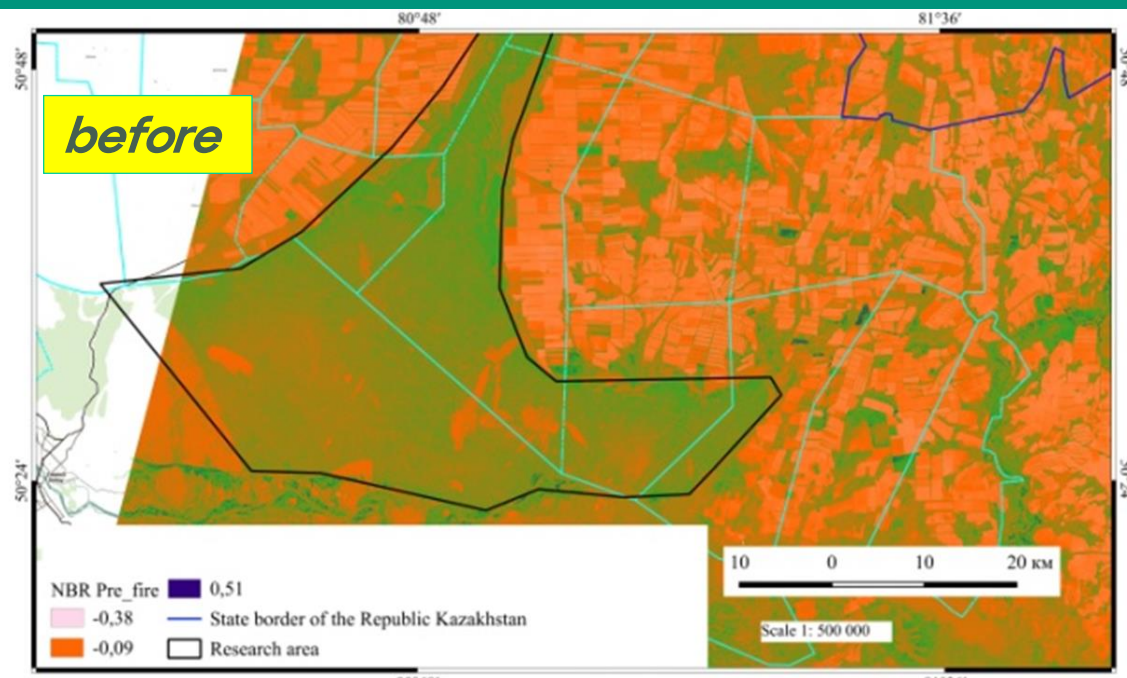
No	CLUSTER	PERIMETER (m)	AREA (Ha)
1	0	1665120,000000	13636,2600
2	1	1499760,000000	18727,8300
3	10	860520,000000	6458,8500
4	11	1178880,000000	9251,1000
5	12	586320,000000	5050,0800
6	13	881400,000000	8282,1600
7	14	503520,000000	3727,1700
8	15	512040,000000	3703,2300
9	16	397680,000000	5881,5000
10	17	698520,000000	5246,2800
11	18	260040,000000	1220,6700
12	19	947700,000000	13910,3100
13	2	2053500,000000	19888,6500
14	20	960960,000000	7017,3900
15	21	1498320,000000	12768,3000
16	22	635280,000000	7624,0800
17	23	1015260,000000	9409,1400
18	24	320040,000000	3082,6800
19	3	912360,000000	6505,1100
20	4	1243440,000000	12477,7800.
21	5	1289580,000000	14902,5600
22	6	1429140,000000	15514,0200
23	7	96180,000000	633,6000
24	8	305280,000000	1889,8200
25	9	848460,000000	7460,1900



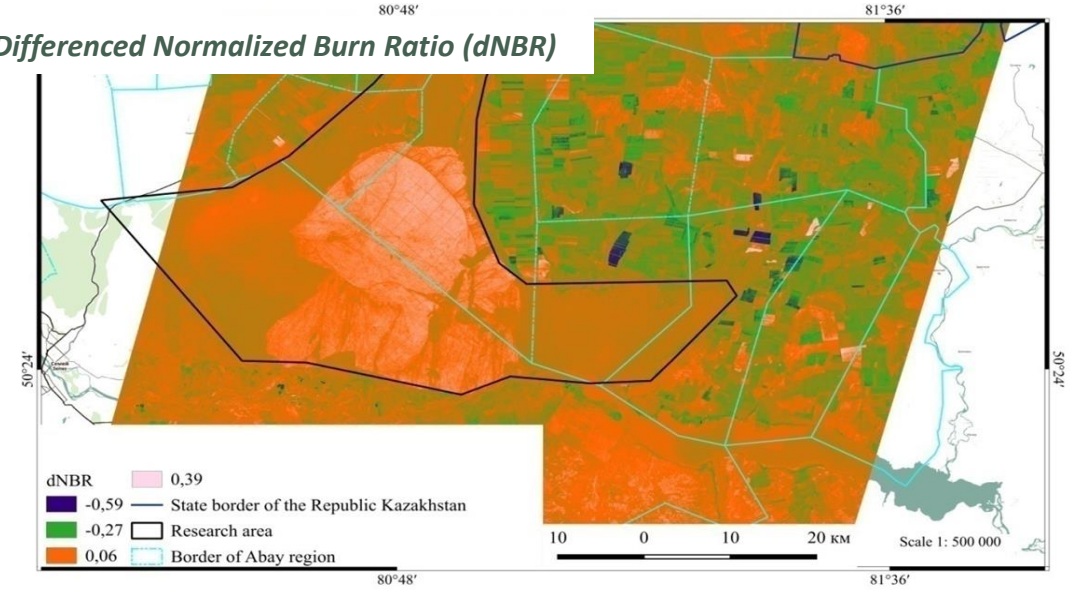
A ratio between bands of fire risk assessment indicators determined from Landsat-8-9 OLI / TIRS images

results NBR:

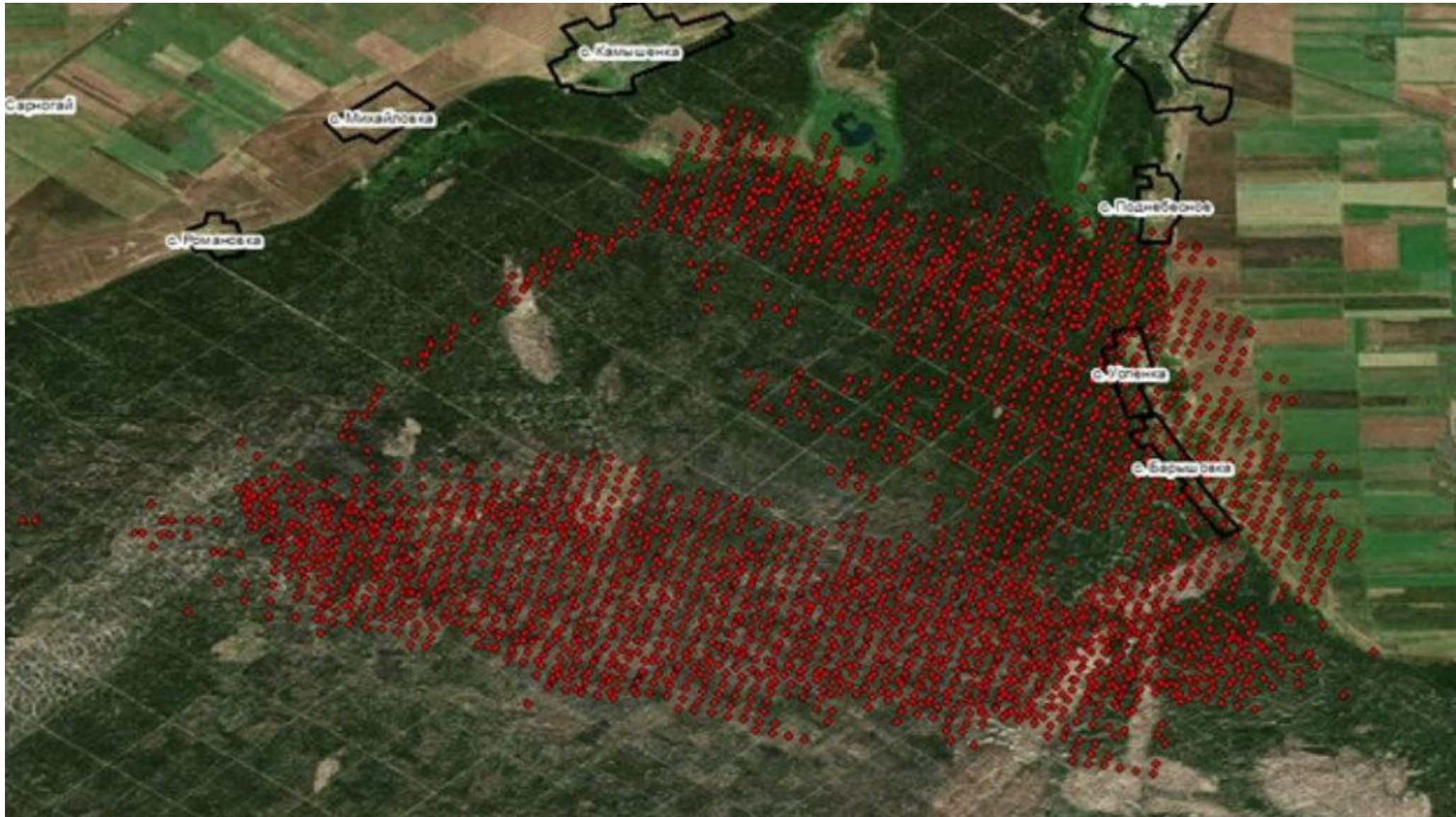
Indices	Landsat-8-9
NBR	$B5-B7 / B5+B7$
NDVI	$B5-B4 / B5+B4$
dNDVI	$NDVI_{pre-fire} - NDVI_{post-fire}$
GNDVI	$B5-B3 / B5+B3$
dGNDVI	$GNDVI_{pre-fire} - GNDVI_{post-fire}$
dNBR	$NBR_{pre-fire} - NBR_{post-fire}$
RBR	$dNBR / NBR_{pre-fire} + 1.001$
BAI	$1 / (0.1 - B4)^2 + (0.06 - B5)^2$
GEMI	$\gamma \cdot (1 - 0.25 \cdot \gamma) - B4 - 0.0125 / 1 - B4$ $\gamma = 2 \cdot (B5^2 - B4^2) + 1.5 \cdot B5 + 0.5 \cdot B4 / B5 + B4 + 0.5$



Differenced Normalized Burn Ratio (dNBR)









Thanks for your attention.

