# COMPARATIVE ANALYSIS OF TRACE ELEMENT CONTENT IN IVANOVO REGION MOSSES AND SOILS

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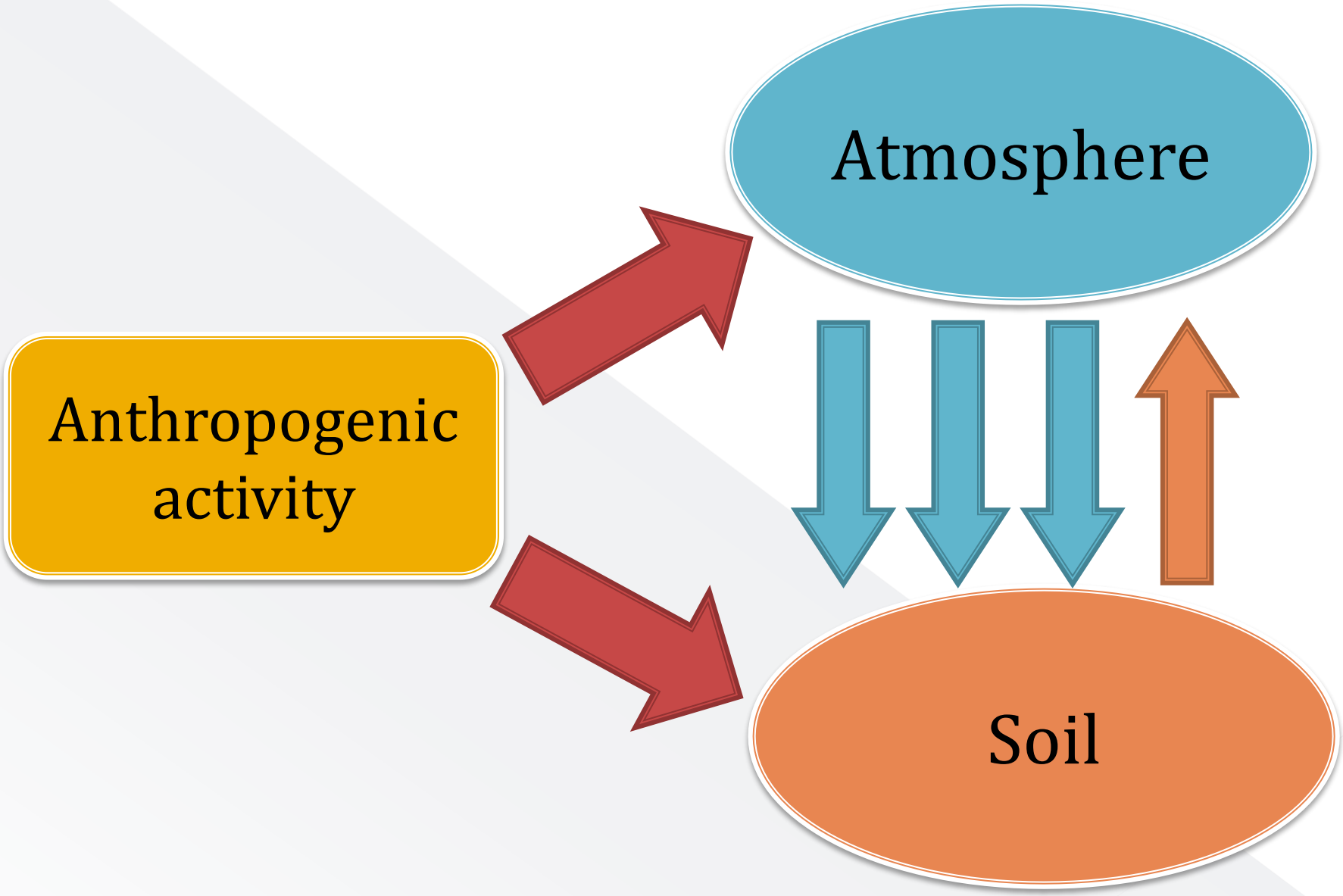
# Atmosphere and Soil Interaction



# Sampling technique

*Pleurozium schreberi*

*Hylocomiun splendens*

*Polytrichum commune*


1. Harmens H. et all. Monitoring of atmospheric deposition of heavy metals, nitrogen and POPs in Europe using Bryophytes. Monitoring Manual. – Bangor: ICP Vegetation Coordination Centre, 2010.
2. Methodological recommendation for heavy metals determination in soils. – Moscow, 1992.

# Ivanovo region. Sampling map




0 80,00

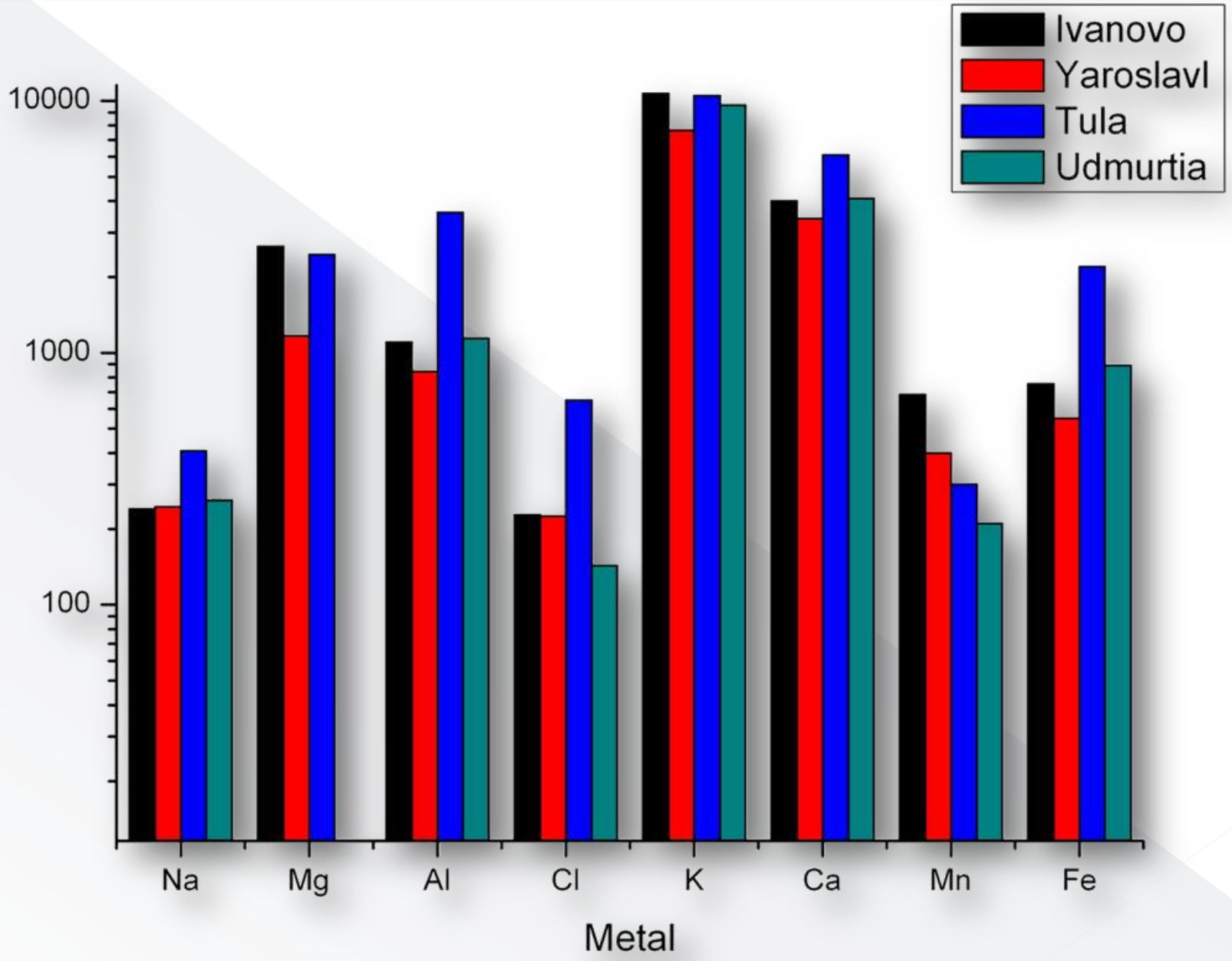
Kilometers

Scale : 1:750 000

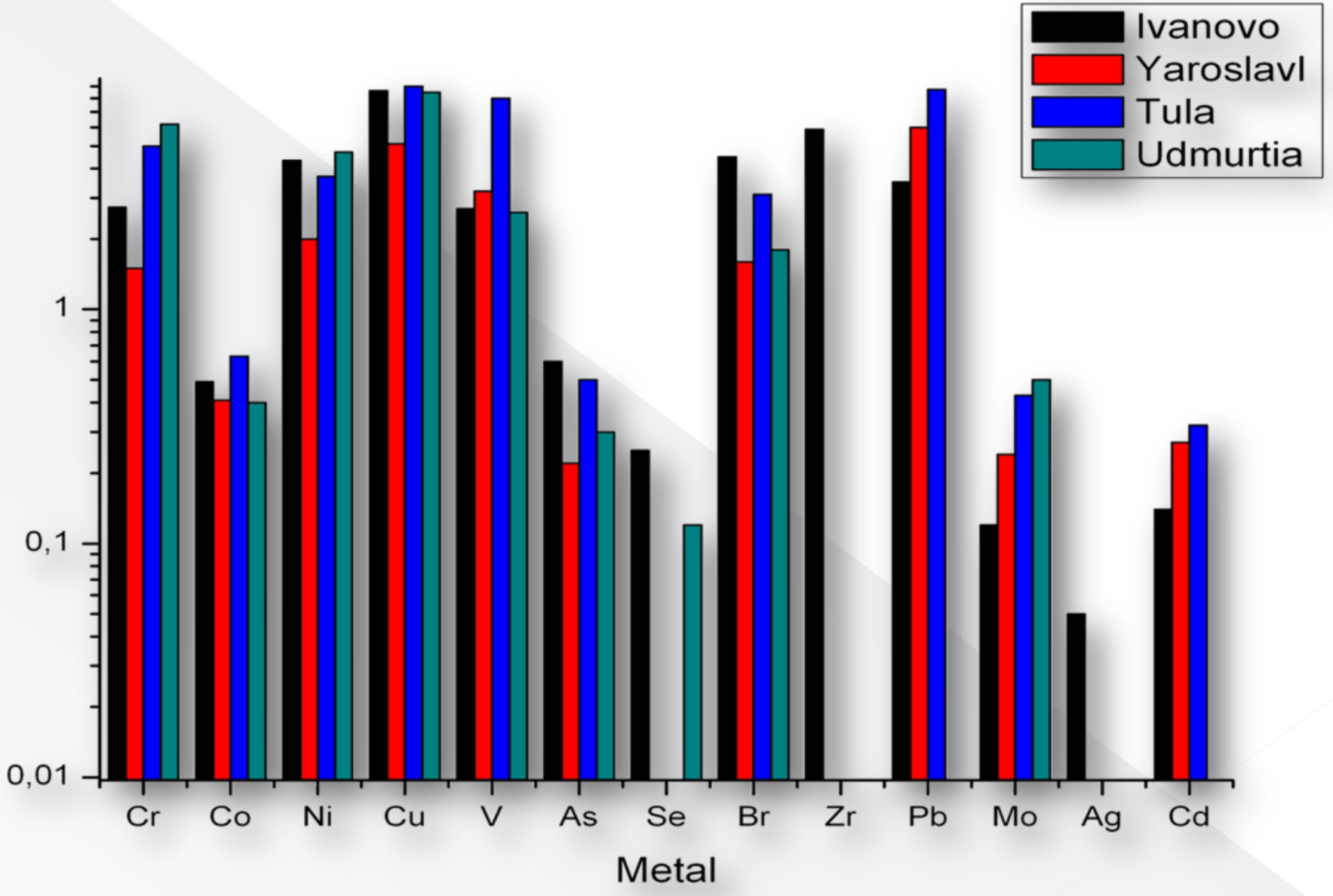
# Elemental analysis


| | FAAS | NAA |
|---|---|---|
| Determined elements | Cu, Cd, Pb, Ni, Co, Mn, Fe, Zn, Cr | Na, Mg, Al, Cl, K, Ca, Sc, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Br, Rb, Sr, Zr, Mo, Ag, Cd, In, Sb, I, Cs, Ba, La, Ce, Nd, Sm, Eu, Gd, Tb, Tm, Yb, Lu, Hf, Ta, W |
| Uncertainties | 20 – 30 % | 5 – 15 % |

# Comparison of elements content (mg/kg) in mosses



# Comparison of some elements content (mg/kg) in mosses



# Comparison of metal content (mg/kg) in soils of Ivanovo region with background concentrations

| | Mean | Min-Max | lbg | $MPC_s$ | bg[1] | bg[2] |
|---|---|---|---|---|---|---|
| **Cr** | 55 | 17-95 | 39 | - | 140 | 70 |
| **Mn** | 750 | 14-1610 | 343 | 1500 | 650 | 750 |
| **Ni** | 16 | 3.3-39.0 | 6.8 | 80 | 51 | 37.3 |
| **Co** | 7 | 1.5-11.2 | 4.5 | - | 7.2 | 15 |
| **Zn** | 39 | 10-74 | 23 | 220 | 49 | 74 |
| **Mo** | 0.6 | 0.2-1.1 | 0.4 | - | 1.5 | 0.5 |
| **V** | 34 | 3-62 | 20 | 150 | 72 | - |
| **Cu** | 6 | 0.2-20 | 1.6 | 132 | 23 | 24.9 |
| **Cd** | 0.028 | 0.002-0.167 | ND | 2 | 0.3 | 0.375 |
| **Pb** | 0.23 | 0.02-3.32 | ND | 32 | 19 | 30 |

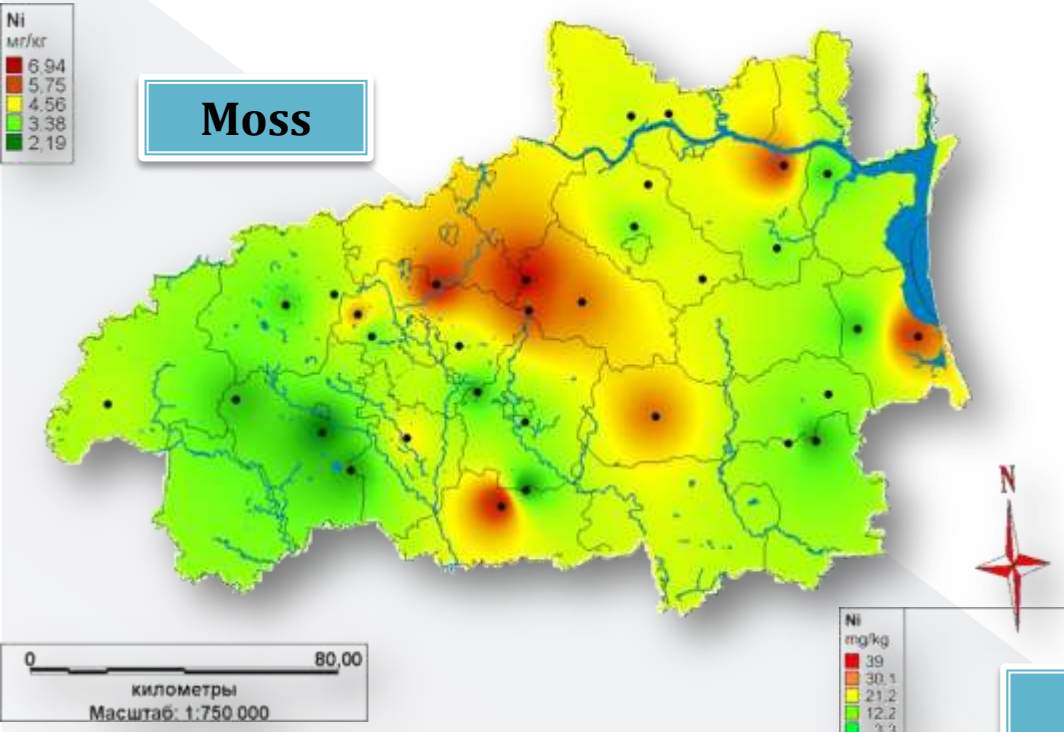
**[1]-** Methodological recommendation for heavy metals determination in soils. – Moscow, 1992.
**[2]-** Pilyugina M.V., Popova L.F. Ecological biogeochemical monitoring: criteria, standards, coefficients

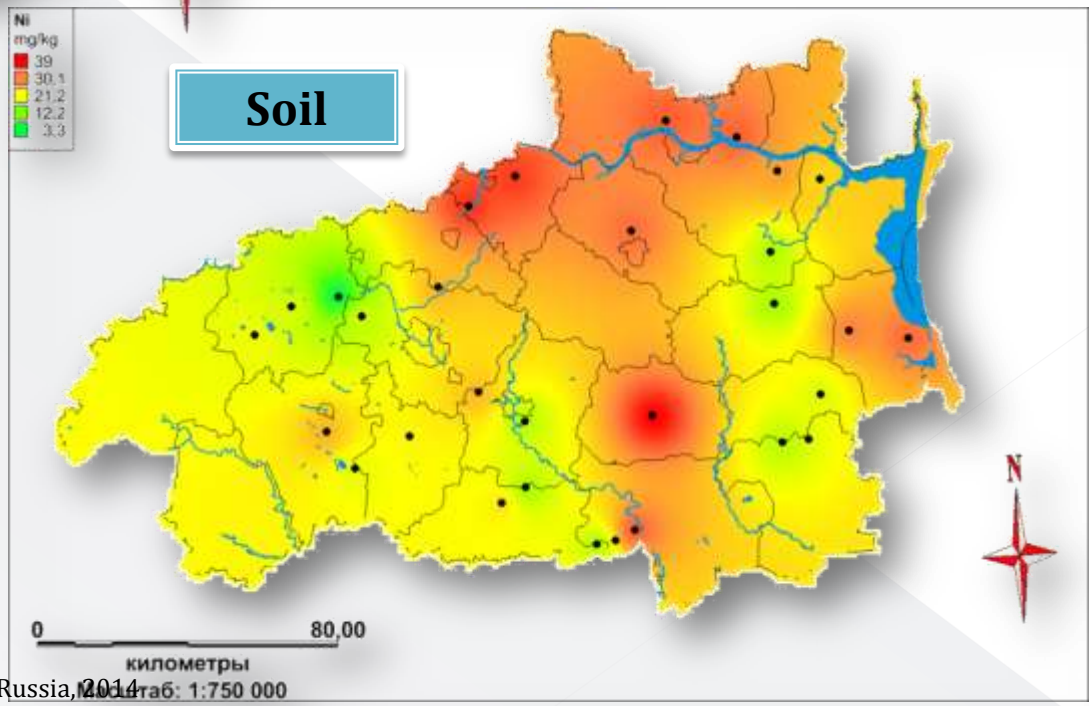
# Comparison of metal content (mg/kg) in soils of Ivanovo and neighboring regions

| Metal Year | Kostroma, 2010 [1] | Vladimir, 2000 [2] | Nizniy Novgorod, 2007 [3] | Ivanovo, 2010 | $MPC_s$ ($APC_s$) |
|---|---|---|---|---|---|
| Cr | 73 | 80 | 12 | 55 | - |
| Mn | 650 | 692 | - | 750 | 1500 |
| Fe | 18000 | 27700 | - | 12100 | - |
| Co | 16 | 6 | - | 7 | - |
| Ni | 23 | 29 | 21 | 16 | (80) |
| Cu | 23 | - | 8 | 6 | (132) |
| Zn | 48 | 47 | 26 | 39 | (220) |
| Cd | - | - | 0,39 | 0,03 | (2) |
| Pb | - | 16 | 6,17 | 0,23 | 32 |

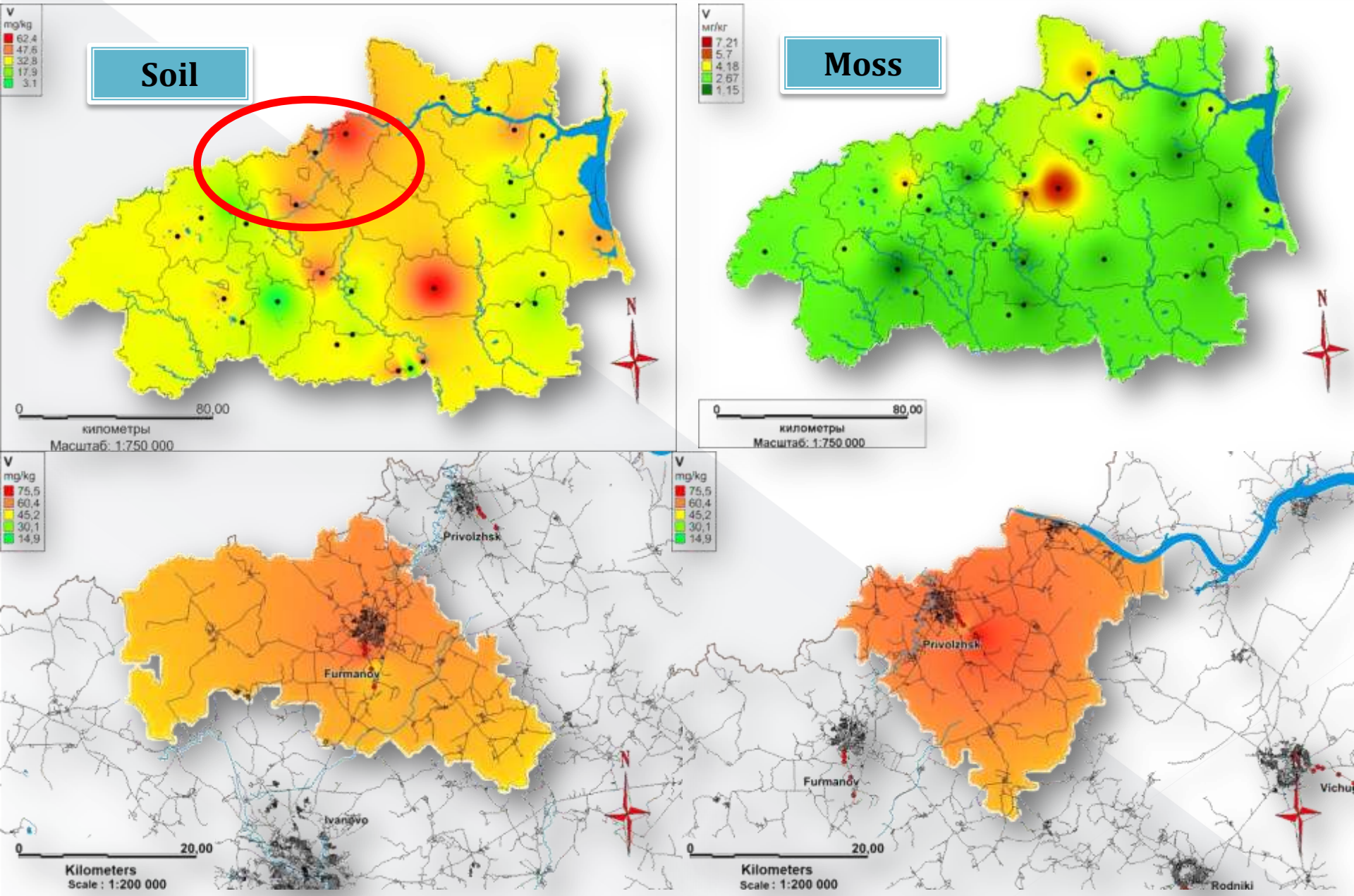

1. Lebedeva O.Yu. Abstract of candidate thesis of geography. – St.Peterburg: RSPU, 2011. 21 P.
2. Karpova D.V. Abstract of doctor thesis of agriculture. – M.: VladRICS, 2009. 55 P.
3. Kuznetsov V.A. Abstract of candidate thesis of agriculture. – Saransk: NNAA, 2010. 21 P.

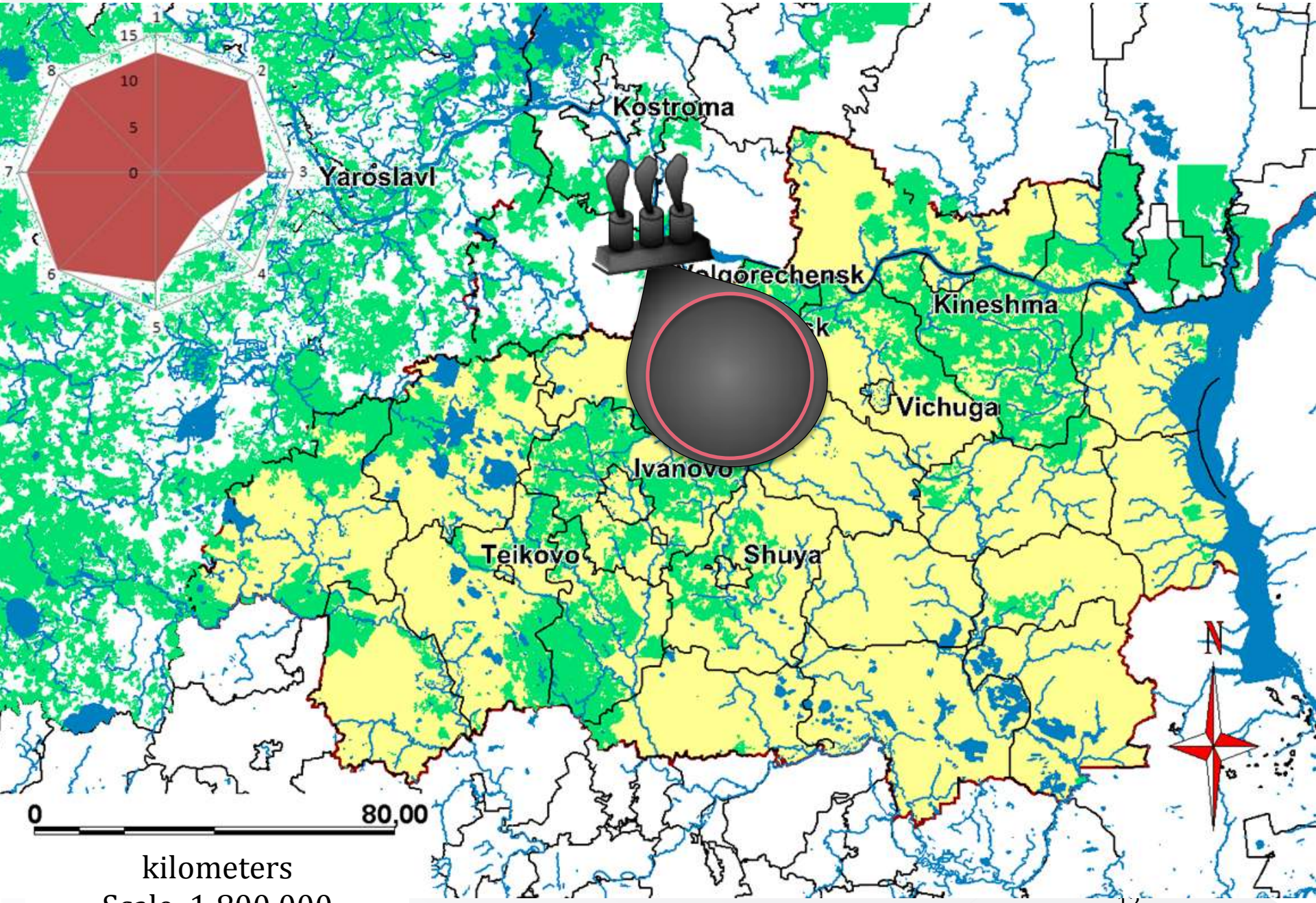
# Nickel distribution in moss and soil of Ivanovo region



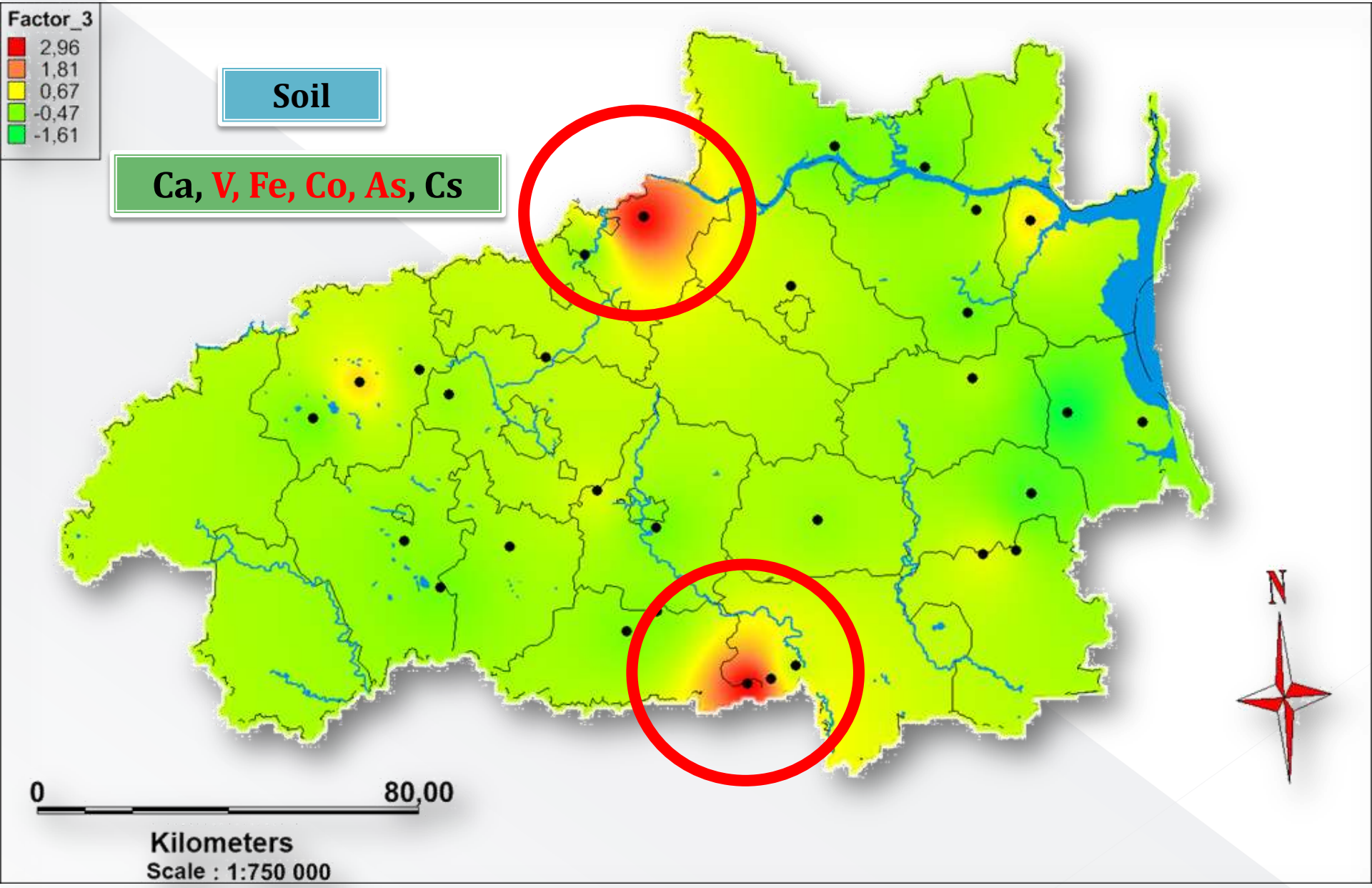



# Vanadium content (mg/kg) in moss and soil of Ivanovo region

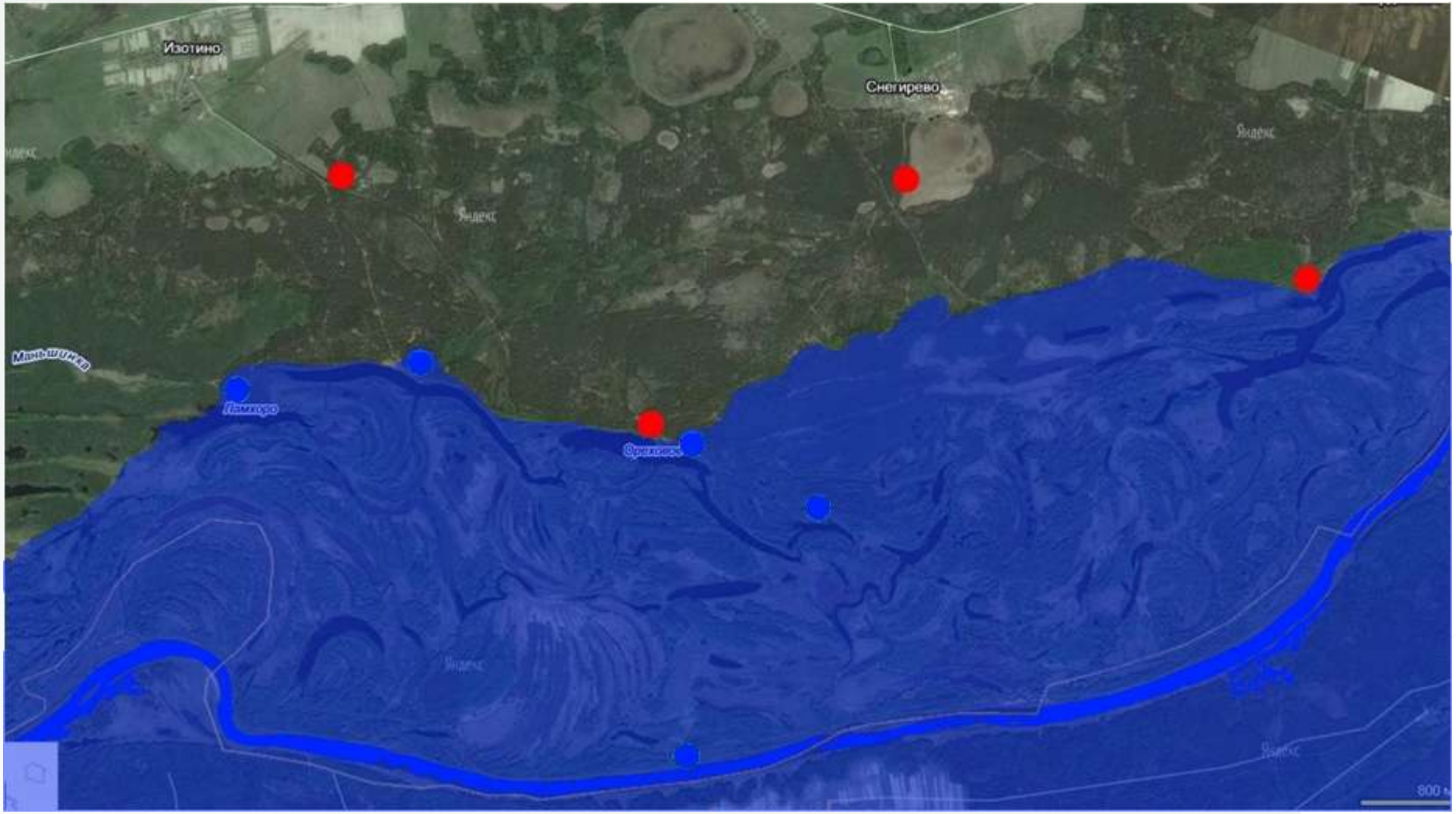



Kostroma
Yaroslavl
Kineshma
Vichuga
Ivanovo
Teikovo
Shuya
N
0
80,00
kilometers
Scale: 1:800 000

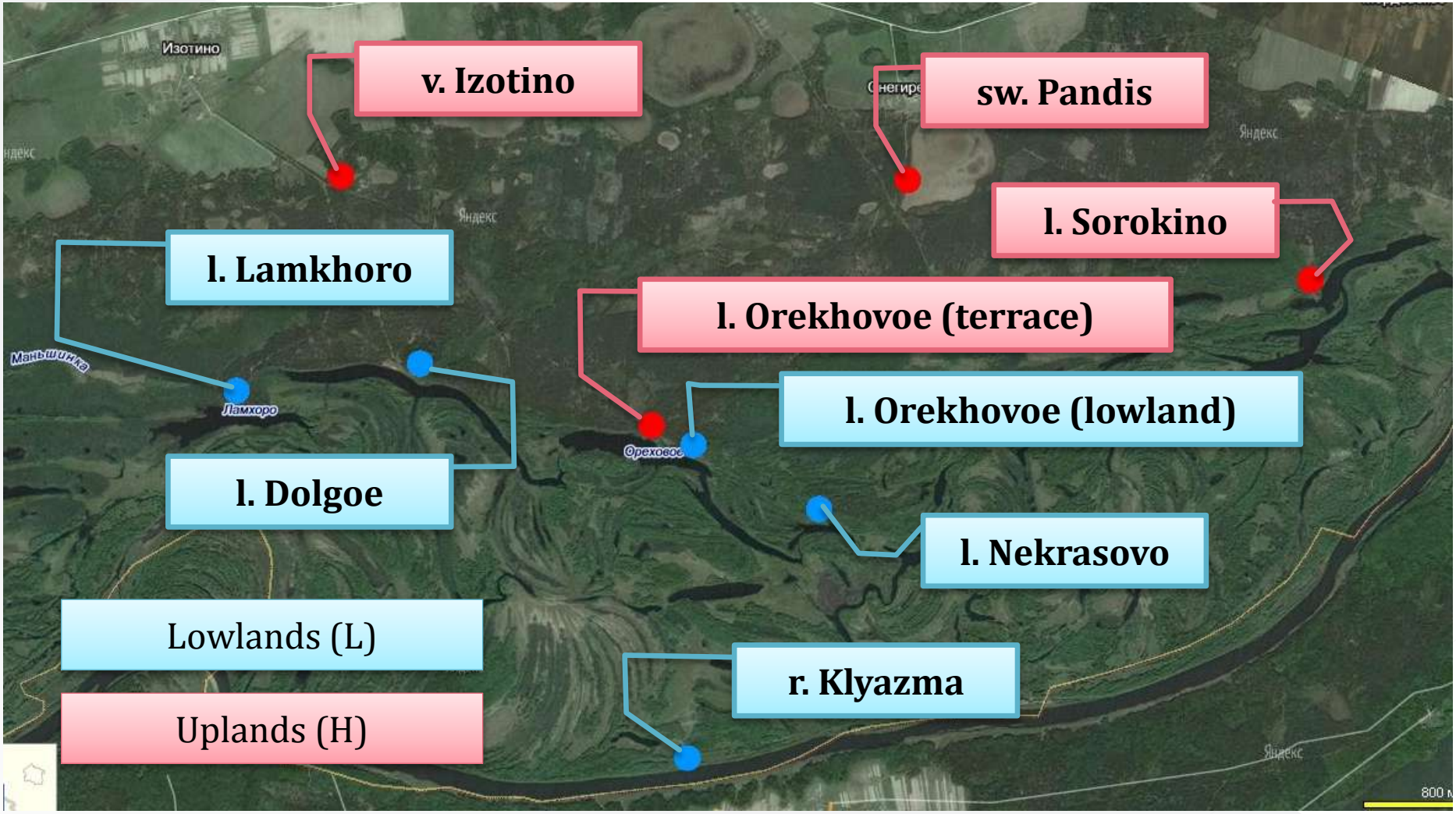
# Distribution of Factor 3 loads



# Flood of river Klyazma



# Natural preserve “Klyazminskiy”. Sampling map



# Metal content (mg/kg) in soil of preserve “Klyazminskiy”

| Metal | Site | Preserve | | $MPC_s$ ($APC_s$) | |
|---|---|---|---|---|---|
| | | Gross | Mov. | Gross | Mov. |
| Cu | H | 5,77 | **3,65** | 132 | 3 |
| | L | 7,55 | **6,20** | | |
| Zn | H | 56,4 | 3,94 | 220 | 23 |
| | L | 46,7 | 4,46 | | |
| Mn | H | 166 | 43,1 | 1500 | 100 |
| | L | 198 | **167** | | |
| Fe | H | 707 | 33,3 | - | - |
| | L | 466 | 95,3 | | |
| Ni | H | <0,3 | <0,3 | 80 | 4 |
| | L | 6,04 | **5,25** | | |

# Metal content (mg/kg) in mosses of preserve “Klyazminskiy”

| Metal | Site | Preserve | Ivanovo | Tver+ Yaroslavl | Tula | Udmurtia |
|---|---|---|---|---|---|---|
| Cu | H | 5,16 | 8,6 | 4,8 | - | 8,5 |
| | L | 4,38 | | | | |
| Zn | H | 37,5 | 31 | 30 | 30,5 | 42 |
| | L | 29,8 | | | | |
| Mn | H | 7,52 | 231 | 315 | 71 | 210 |
| | L | 6,99 | | | | |
| Fe | H | 122 | 262 | - | 438 | 890 |
| | L | 93,8 | | | | |
| Ni | H | 2,72 | 4,3 | 1,5 | 1,15 | 4,7 |
| | L | 0,73 | | | | |

# Conclusions

Analysis of trace element content in soils and mosses of Ivanovo region has been made by NAA and AAS

The high level of environmental quality in Ivanovo region has been determined in comparison with neighboring regions

The potential sources of air and soil pollution have been revealed by factor analysis and environmental assessment


Thank you for attention!