Air purification ES of suburban forest in the European part of Russia (TEEB-Russia 2)

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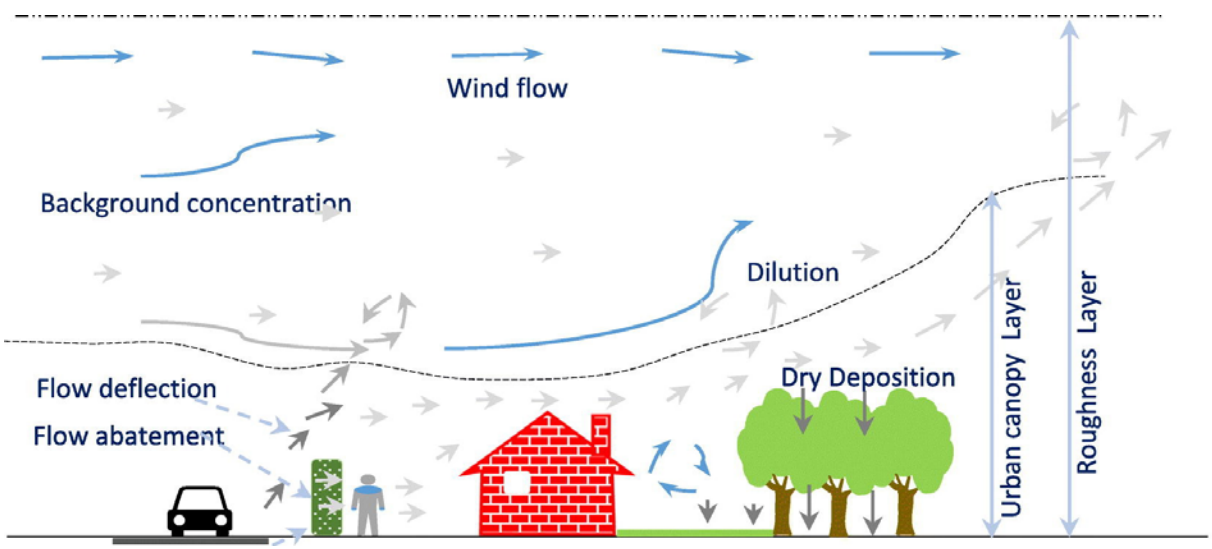
Suburban forest air purification

Forests affect air pollution by:

- Reducing air temperatures and consequently pollutant emissions
- **Directly removing pollution from the air**
- Emitting chemicals that contribute to pollution formation

gaseous air pollutants

dust and other airborne particles

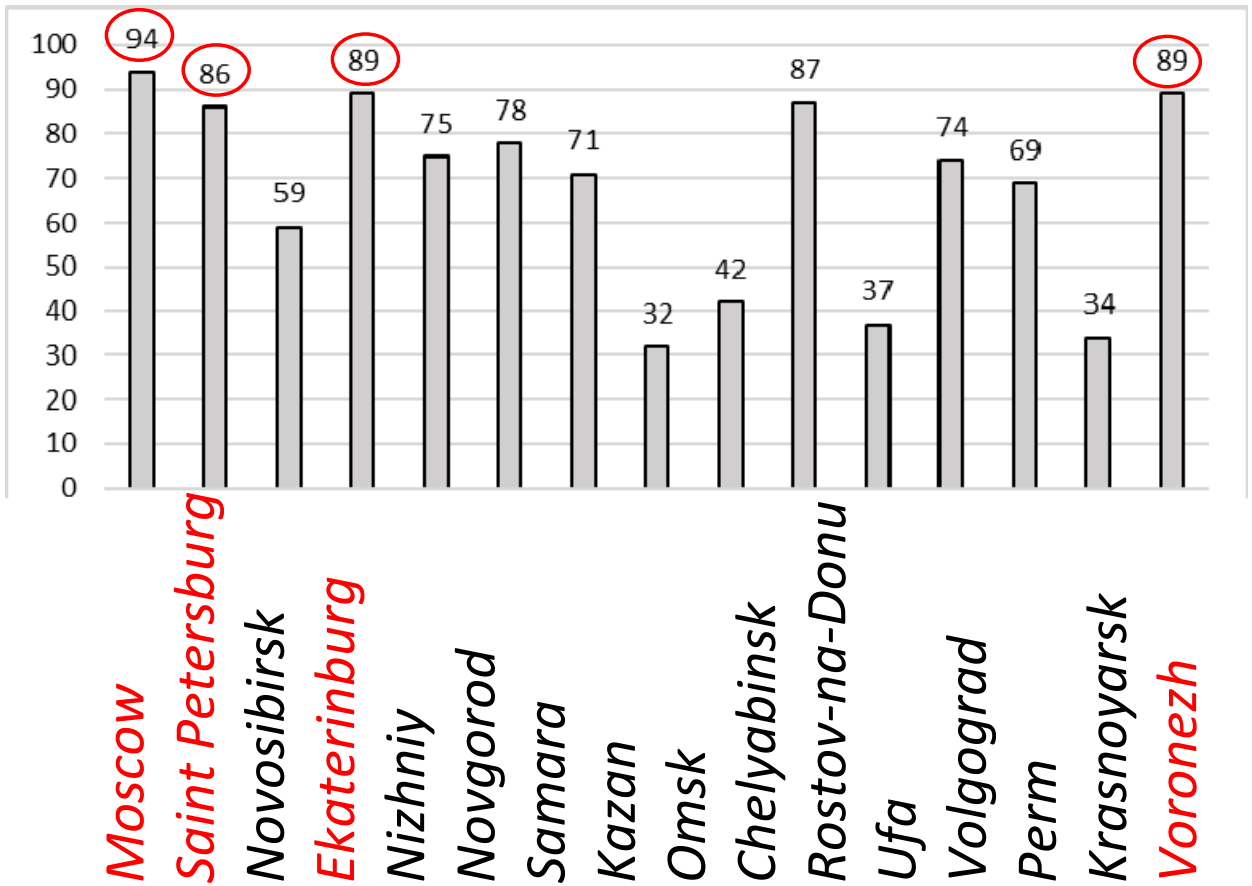


Source: Tiwari et al., 2019

Urban air pollution

Vehicles and transport

Share of air pollutants from automobiles, %



Stationary points

Usually registered pollutants:

CO

SO_2

NO_x

$PM_{2.5}$

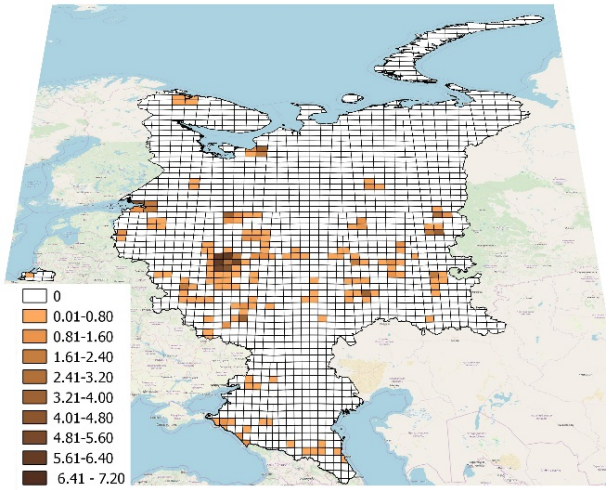
Assessment depends on the available statistics!

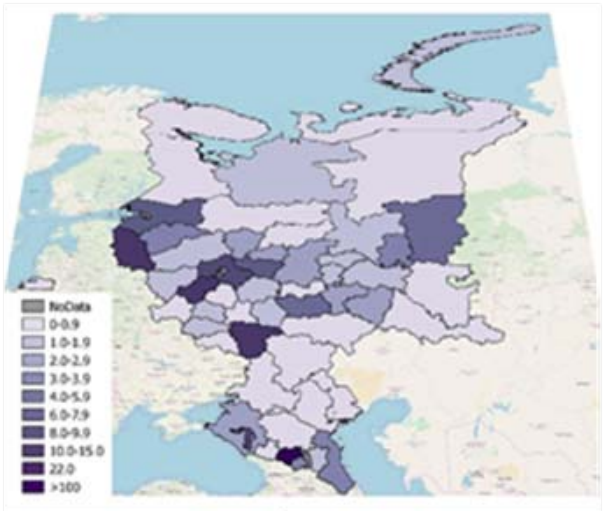
Aims of TEEB-RUSSIA 2

To assess the volume of ecosystem services on three spatial levels, including air pollutants removal by sururban forests of the Russian European part

- Municipal level
- 50-km squares-net

CO NO_x SO_2 $PM_{2.5}$





- The supplied ES volume
- The consumed ES volume
- The demanded ES volume

Buffers for suburban forests

Cities with population over 100 000 people

TEEB-RUSSIA 1:
5-km buffer for all cities

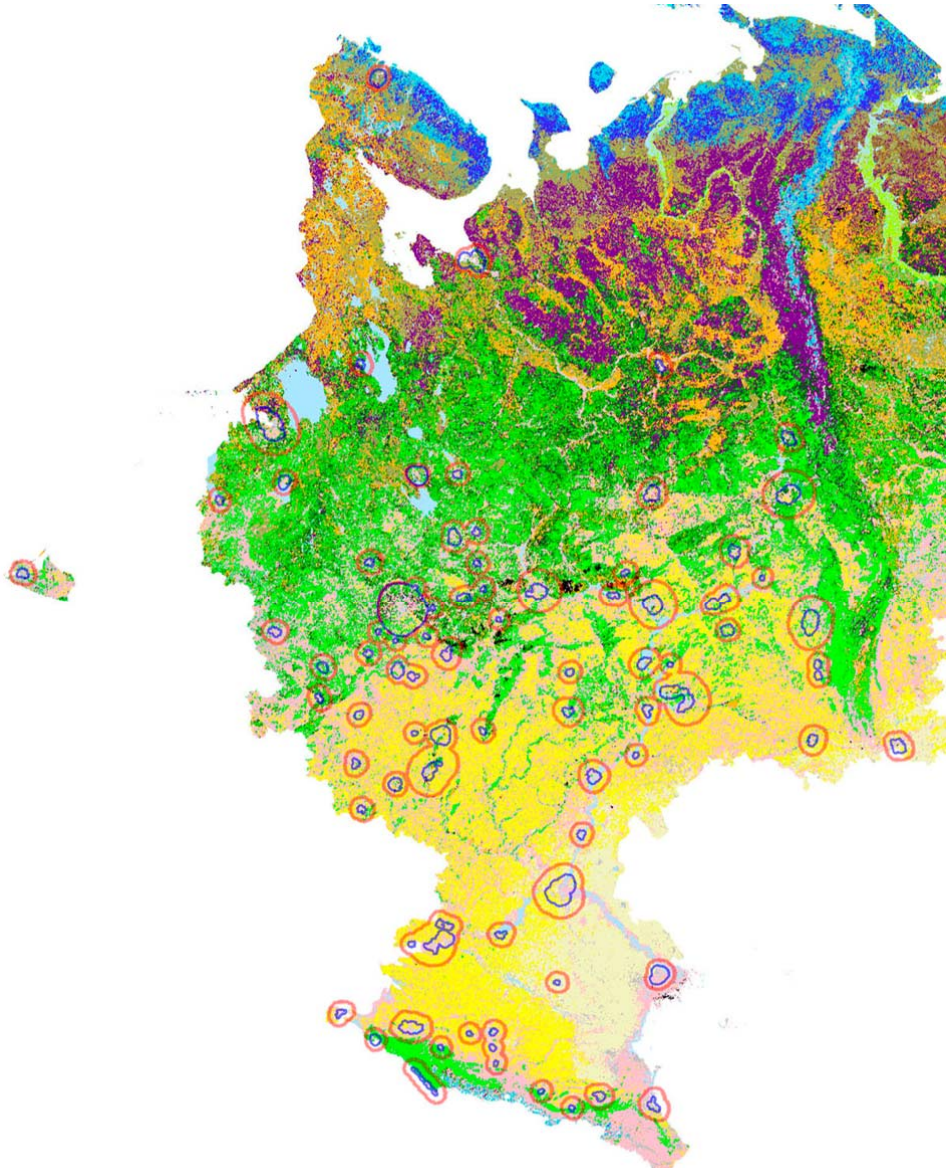
TEEB-RUSSIA 2 – buffer area depends on:

1.emission volume

> 100 000 t – **15 km**
30 000 – 100 000 t – **10 km**
30 000 – 9 000 t – **5 km**
100 – 9 000 – **3 km**

2. potential of air pollution (PZA 1-4)

PZA = 1 (low): buffer area **+ 5** or **3 km**
PZA = 4 (high): buffer area **– 5** or **3 km**



The supplied volume

Basing on D. Nowak studies for U.S. and Canadian cities

TEEB-RUSSIA 1:
0,1 t/ha/yr for all cities

TEEB-RUSSIA 2 – forests' absorption depends on:

- area of different forest types
- mean values of similar forest types absorption in Canada

Forest types	CO, t/ha/yr	SO_2, t/ha/yr	NO_x, t/ha/yr	All gases, t/ha/yr	$PM_{2.5}$, t/ha/yr	Total
Coniferous (spruce, fir)	0,0002	0,0022	0,0072	0,0096	0,0028	0,0124
Coniferous (pine, larch)	0,0002	0,0025	0,0078	0,0105	0,0085	0,019
Broad-leaved	0,0006	0,0033	0,0081	0,012	0,0051	0,0171
Mixed	0,0004	0,001	0,0055	0,0069	0,0067	0,0136
Small-leaved	0,0002	0,0007	0,0047	0,0056	0,0088	0,0144

The supplied volume

Maximum supplied volume:

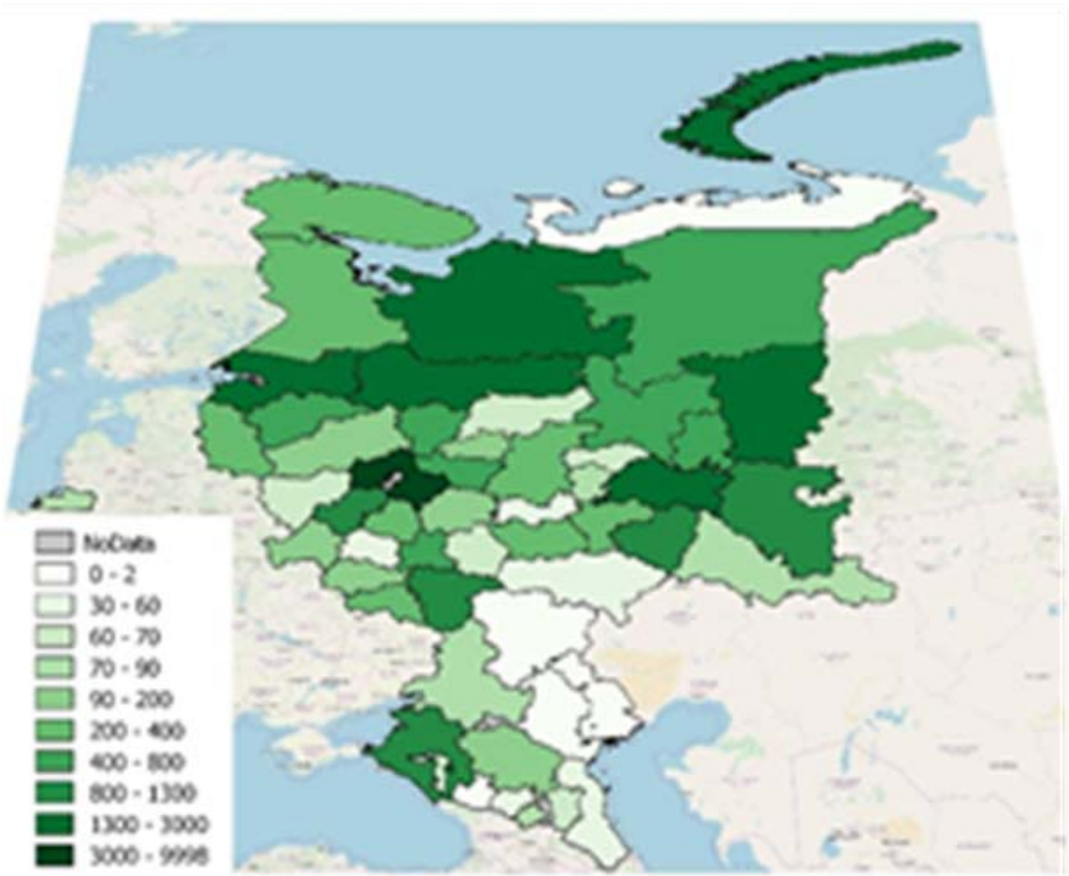
Permskiy – 1218 t/ha PM2.5
– 1484 t/ha gases

Vologodskaya – 738 t/ha PM2.5
– 1146 t/ha gases

Minimum supplied volume:

Astrahanskaya
Volgogradskaya
Kalmykiya
Nenetzkiy

Non-forest natural zones



The demanded volume

Basing on official emission statistics from www.gks.ru

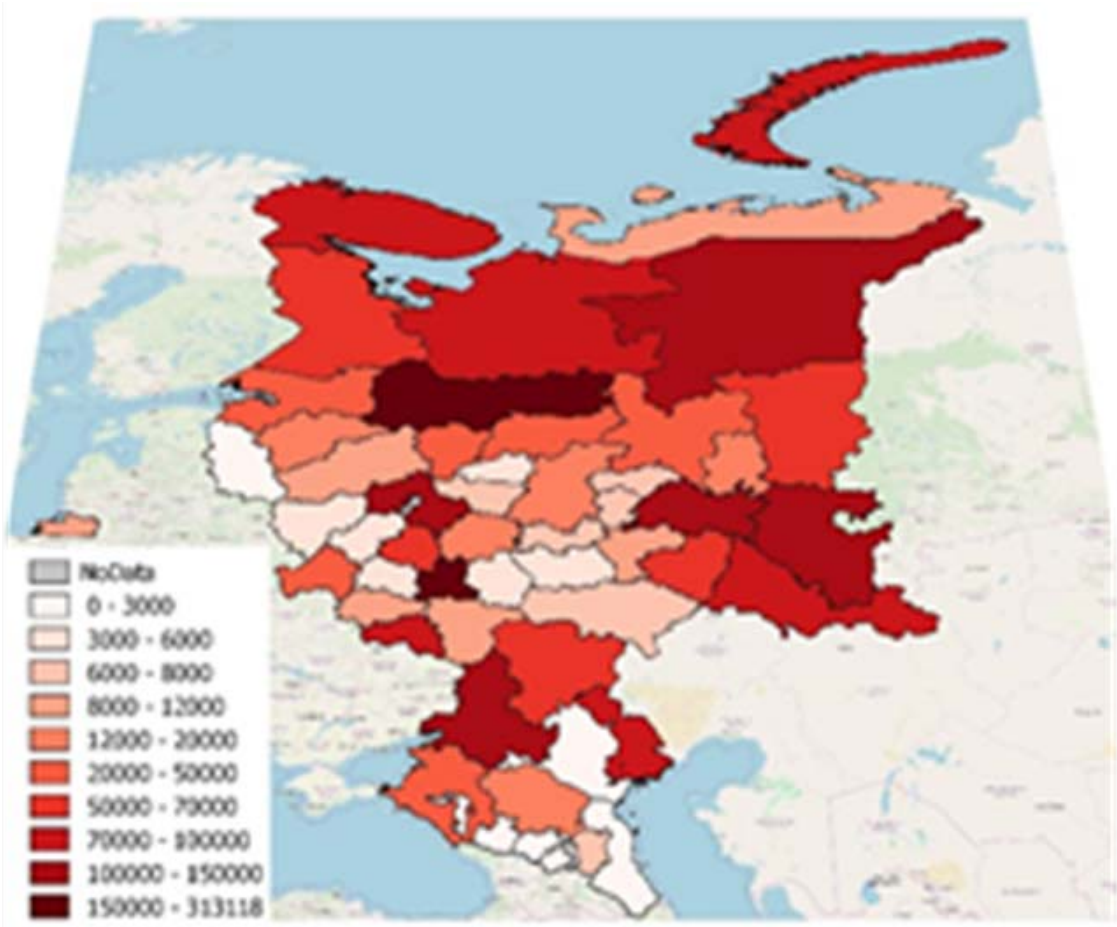
Maximum demanded volume:

Komi – 37 936 t/ha PM2.5
Vologodskaya – 293 554 t/ha gases

Minimum demanded volume:

Kalmykiya – 2 t/ha
Kabardino-Balkaria – 37 t/ha gases

More ES needed for removing gaseous pollutants



The consumed volume

Relation between the supplied and demanded volumes

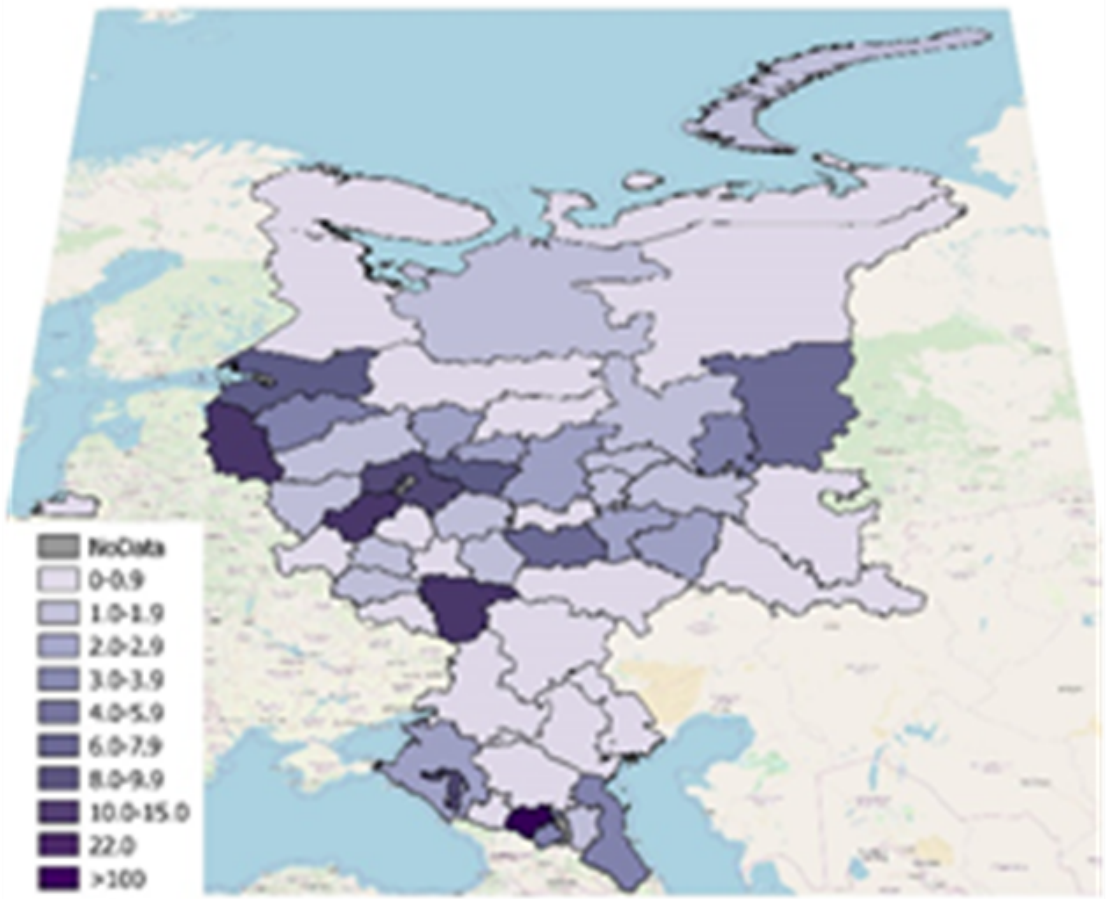
Consumed volume in most cities (mode):

< 5 %

Maximum consumed volume:

Kabardino-Balkaria – 103 %

0 % absorption:
Astrahanskaya
Nenezkaya
Volgogradskaya
Astrahanskaya
Kalmikiya



TEEB-RUSSIA 1 & TEEB-RUSSIA 2

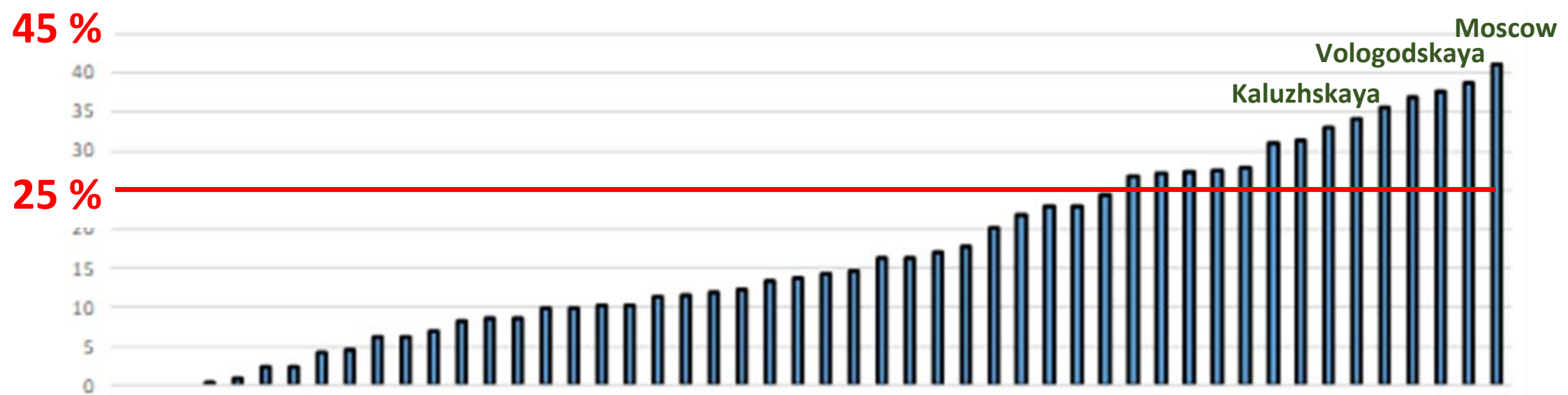
<u>New results are several times lower than the old ones</u>

-More differentiation

-Smaller absorption volumes in new Nowak's work

-Dust deposits in sanitary zone or moves beyond studied buffers

-Forest area in the buffers zones



New challenges and problems to solve

- Emission locations
- Pollutants movement and deposition
- Air circulation
- Urban forests contribution
- More pollutants and more data source