Potentially Toxic Metals and high resolution monitoring at regional and local scale of Persistent Organic Pollutants in the soil, air, and bulk deposition of the Campania Region, southern Italy: Sources and environmental processes

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THE “CAMPANIA FELIX” OF ROMANS

QUALITY MARKS

INDICAZIONE GEOGRAFICA PROTETTA

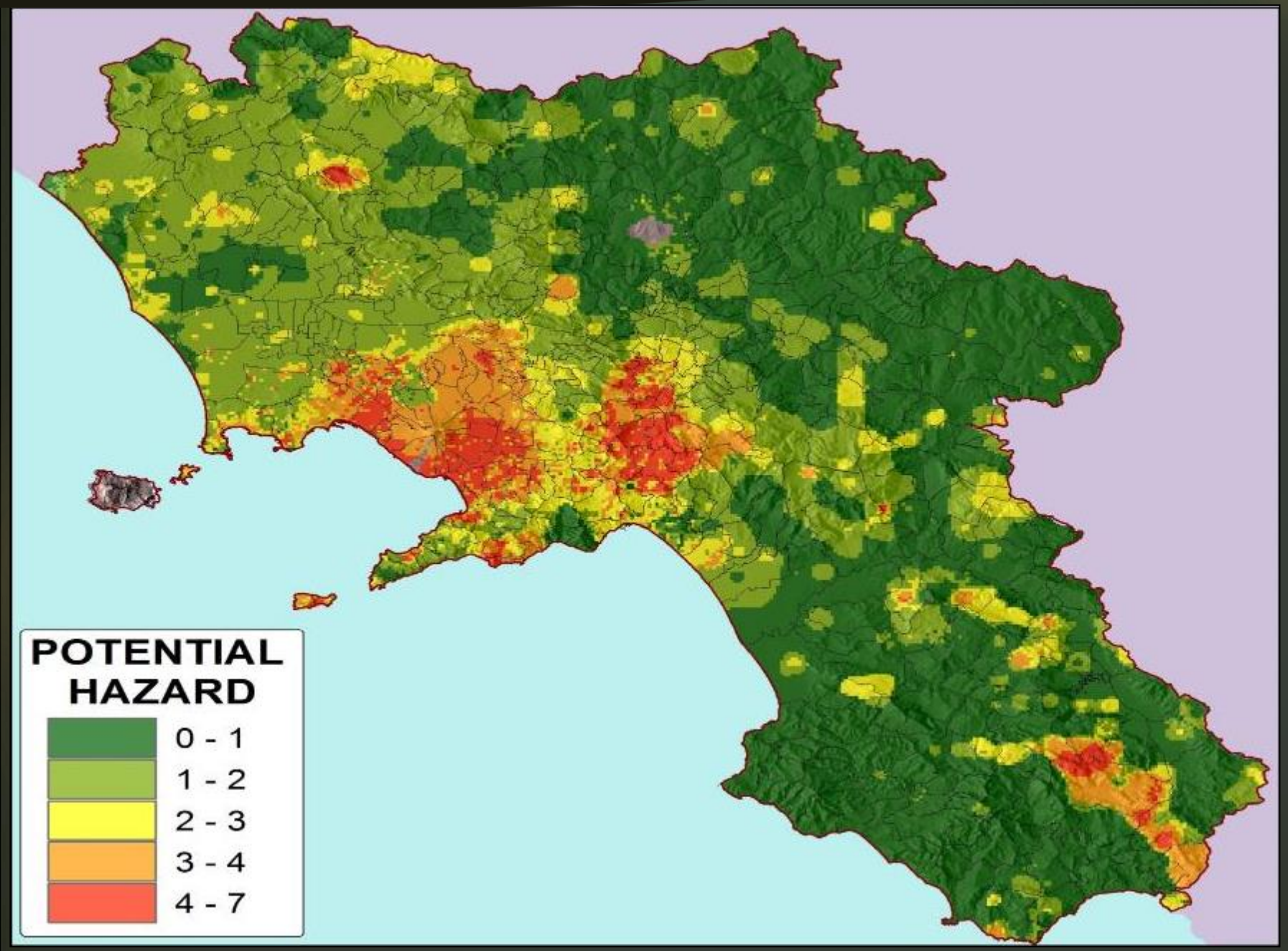
DENOMINAZIONE D'ORIGINE PROTETTA

I.G.T.

D.O.C.G.

The LAND OF FIRES (*LA TERRA DEI FUOCHI*)

SOILS PRELIMINARY SURVEY – METALS/METALLOIDS



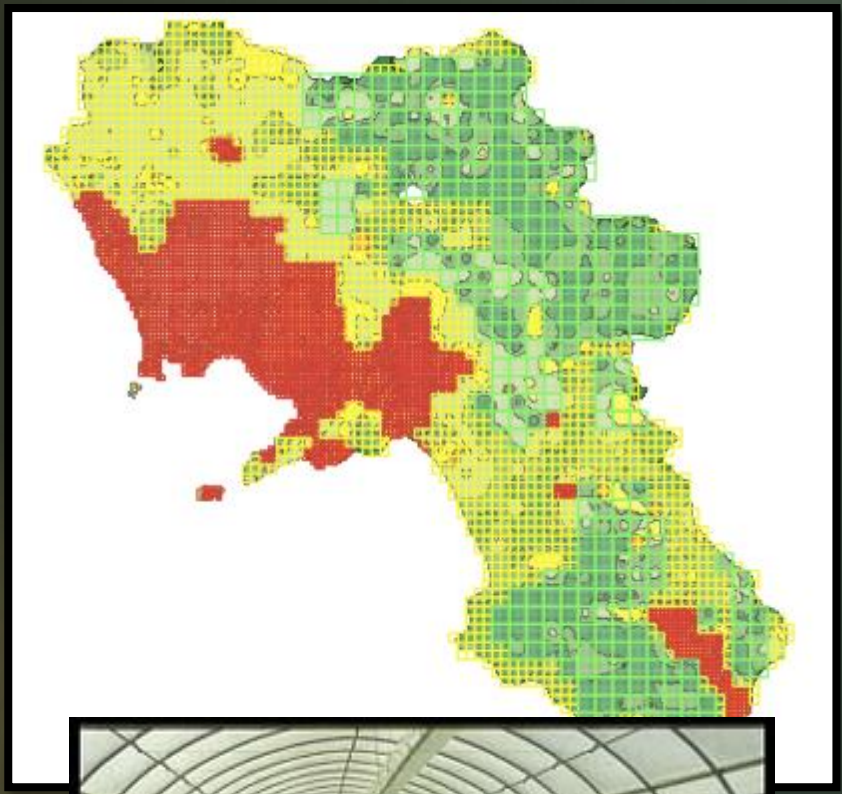
The Potential Hazard (PH) map was generated for potentially toxic metals using the criterion of exceeding (H = 1) or non-exceeding for the residential use of soils (Legislative Decree 152/2006), pixel x pixel.

In the Potential Risk map, each pixel is characterized by a value corresponding to the total number of elements, within its spatial domain, not within the limits of Italian environmental law.

The same evidence we found in soils preliminary survey on POP (Persistent Organic Pollutants: PAHs-PCBs-OCPs), with critical areas occurring mostly in Napoli urban and metropolitan areas.

THE MONITORING PLAN

Soil – Groundwaters - Vegetables



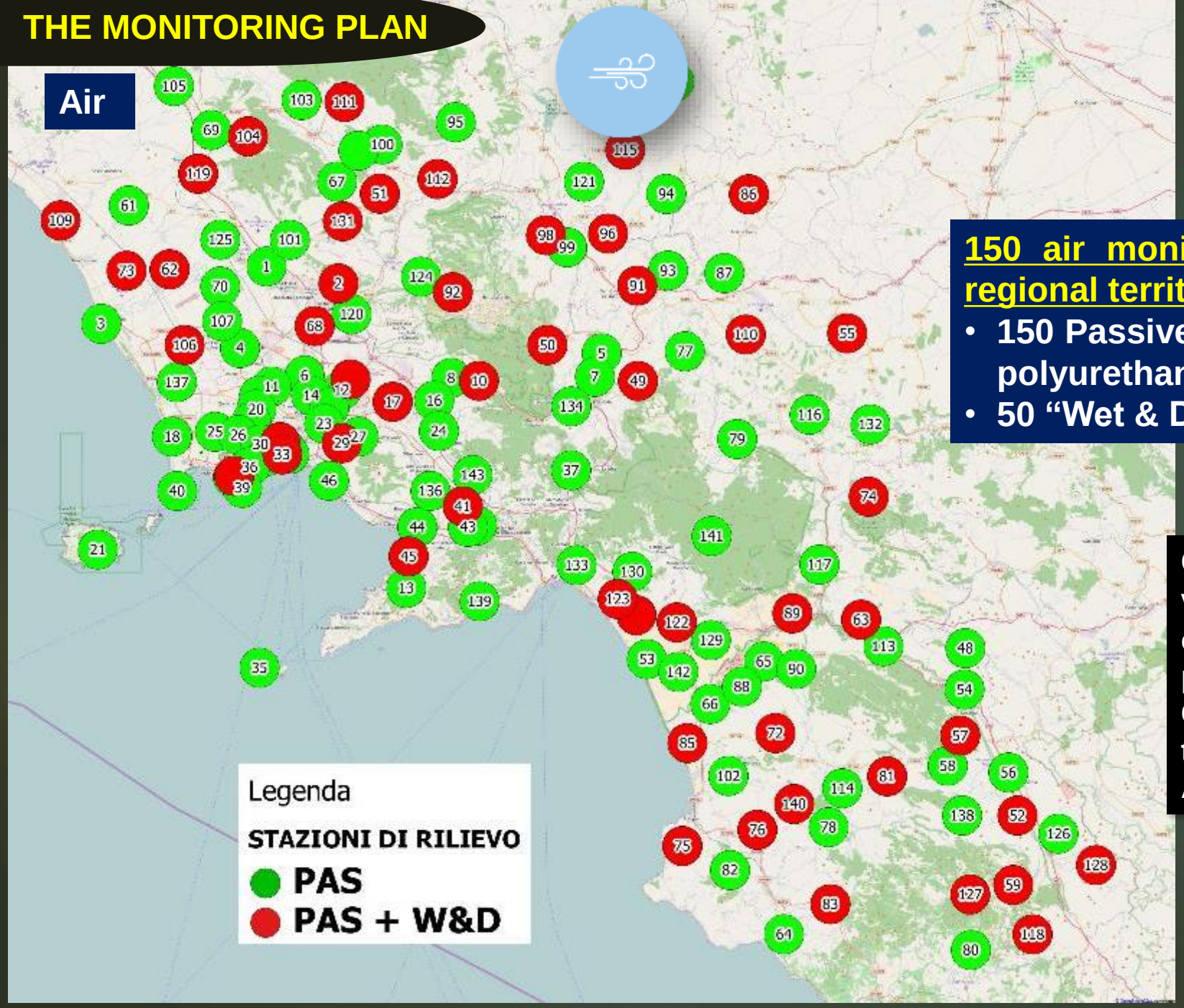
At each cell one sample of soil, water and vegetables has been collected at the location of each farm aiming at receiving a quality mark.

In addition to about 4.000 soil samples already analysed, about 3.200 were collected (total of about 10.000 samples were collected for different matrices(soil, groundwater, vegetables):

- N.333 soil samples from the 4 x4 km cells covering low hazard areas. N. 1553 soil samples from the 2 x 2 km cells covering agricultural productive areas. N. 1250 soil samples from the 1 x 1 km cell covering the high hazard areas.
- At each cell a sample of milk has been collected from the livestocks (cow, buffalo, sheep) living in one of the farm aiming at receiving a quality mark.
- N. 1000 samples of gastropods (each sample made by three individuals); N. 100 samples of bees; N. 100 samples of honey

Metals, PAHs, PCBs, Pesticides have been analyzed

THE MONITORING PLAN



QRCode Campania trasparente

150 air monitoring stations across the whole regional territory.

- 150 Passive Air Samplers (PAS) equipped with polyurethane filters (PUF).
- 50 “Wet & Dry” samplers.

Qu et al., 2015. Spatial and seasonal variations of atmospheric organochlorine pesticides along the plain-mountain transect in central China: Regional source vs. long-range transport and air-soil exchange. Atmospheric Environment, 122, 31-40

RESULTS OF THE CAMPANIA TRANSPARENT PROJECT MONITORING

(in below volumes and different peer review journals):

- 1. De Vivo et al., 2021a. *Monitoragggio geochimico-ambientale dei suoli della Regione Campania. Il Piano Campania Trasparente. Volume 1. Elementi Potenzialmente Tossici e loro Biodisponibilità. Elementi Maggiori e in Traccia. Distribuzione in suoli superficiali e profondi*. ARACNE Editrice, Roma. ISBN: 978-88-255-4036-9, 592 pag. http://www.aracneeditrice.it/index.php/pubblicazione.html?item=9788825540369
- 2. De Vivo et al., 2021b. *Monitoraggio geochimico-ambientale dei suoli della Regione Campania. Il Piano Campania Trasparente. Volume 2. Composti Organici Persistenti: Idrocarburi Policiclici Aromatici, Policlorobifenili, Pesticidi. Distribuzione nei suoli superficiali*. ARACNE Editrice, Roma. ISBN: 978-88-255-4107-6, 320 p. http://www.aracneeditrice.it/index.php/pubblicazione.html?item=9788825541076
- 3. De Vivo et al., 2022a. *Monitoraggio geochimico-ambientale della matrice aria della Regione Campania. Il Piano Campania Trasparente. Volume 3. Idrocarburi Policiclici Aromatici (IPA, Policlorobifenili (PCB), Pesticidi (OCP), Eteri di Polibromobifenili (PBDE), Elementi Potenzialmente Tossici (EPT)*. ARACNE Editrice, Roma. ISBN: 979-12-5994-733-8, 676 pag.
- 4. De vivo B., 2022b. *Sintesi del monitoraggio dei suoli e dell'aria della Regione Campania, a scala regionale e locale. Piano Campania Trasparente. Volume 4: Elementi potenzialmente tossici (EPT) e loro biodisponibilità elementi maggiori e in traccia, Idrocarburi Policiclici Aromatici (IPA), Policlorobifenili (PCB), Pesticidi (OCP), Eteri di Polibromobifenili (PBDE)*. ARACNE Editrice, Roma. ISBN: 979-12-5994-735-2, 240 pag.

RESULTS OF THE CAMPANIA TRANSPARENT PROJECT MONITORING

CONTAMINANTS DISTRIBUTION OF POTENTIALLY INORGANICS TOXIC ELEMENTS

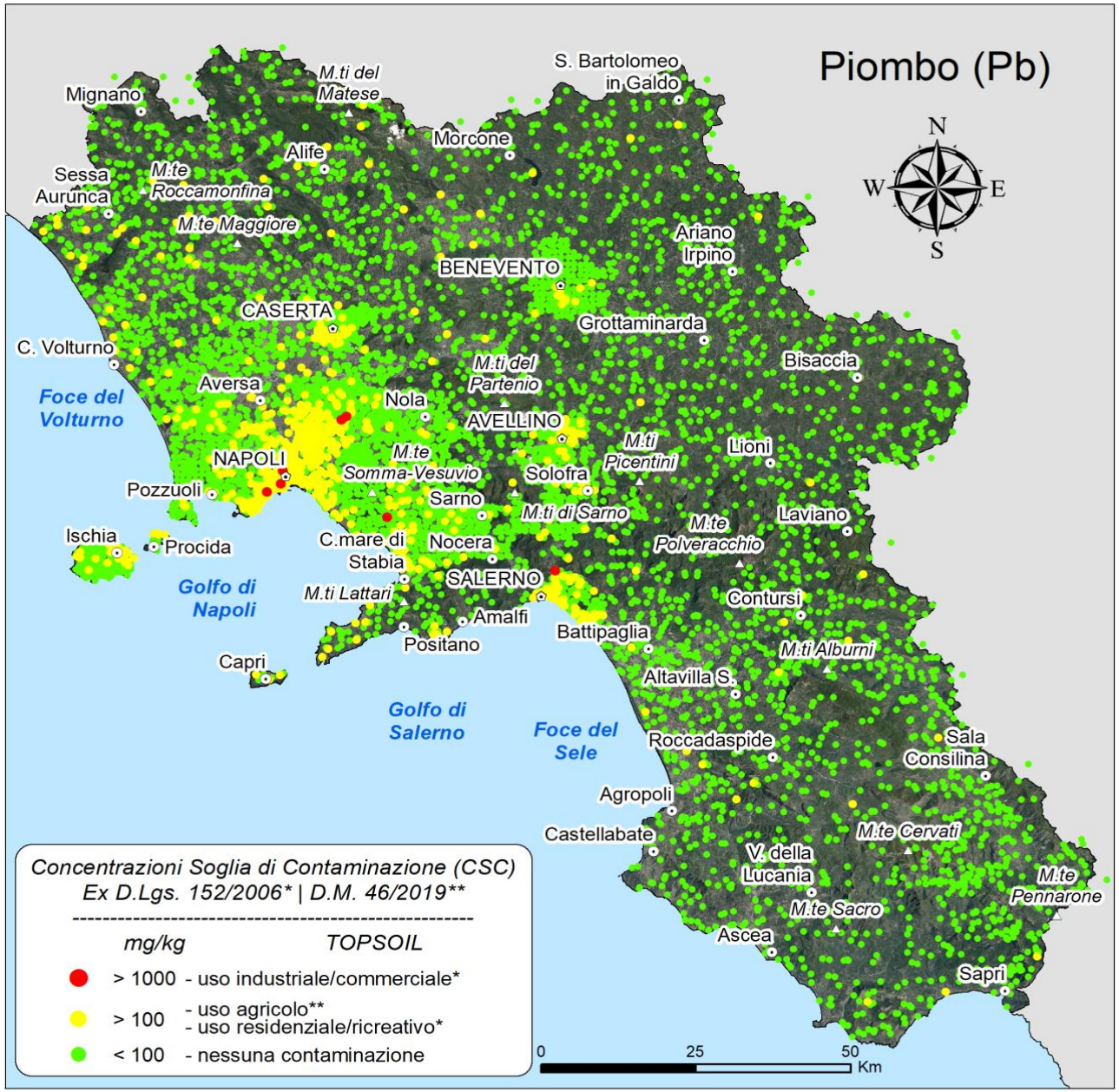
IN TOP SOILS

CONTAMINATION THRESHOLDS (CSC)

D. Lgs 152/06

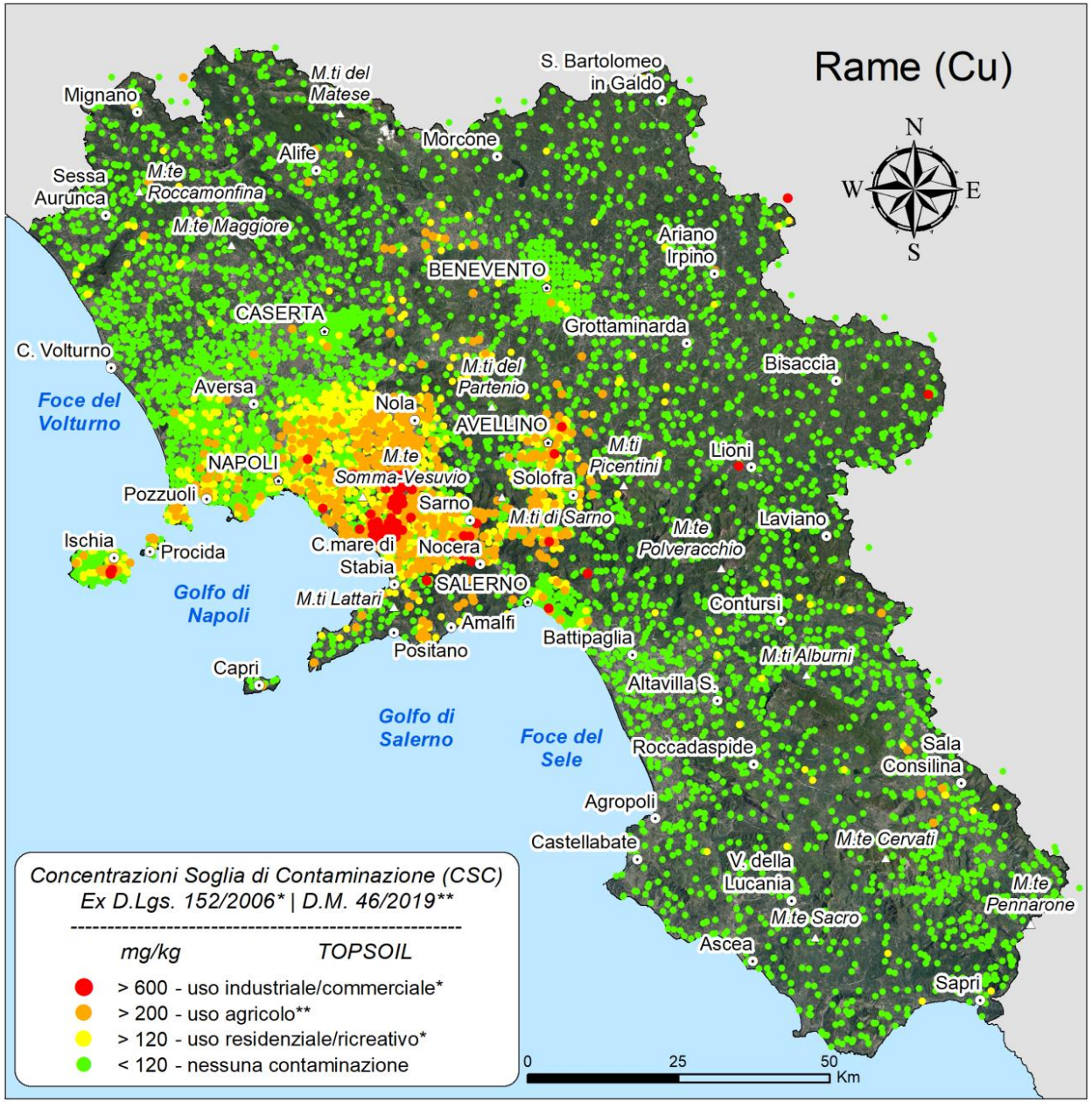
Piombo (Pb)

Distribuzione della contaminazione potenziale
Potential contamination distribution



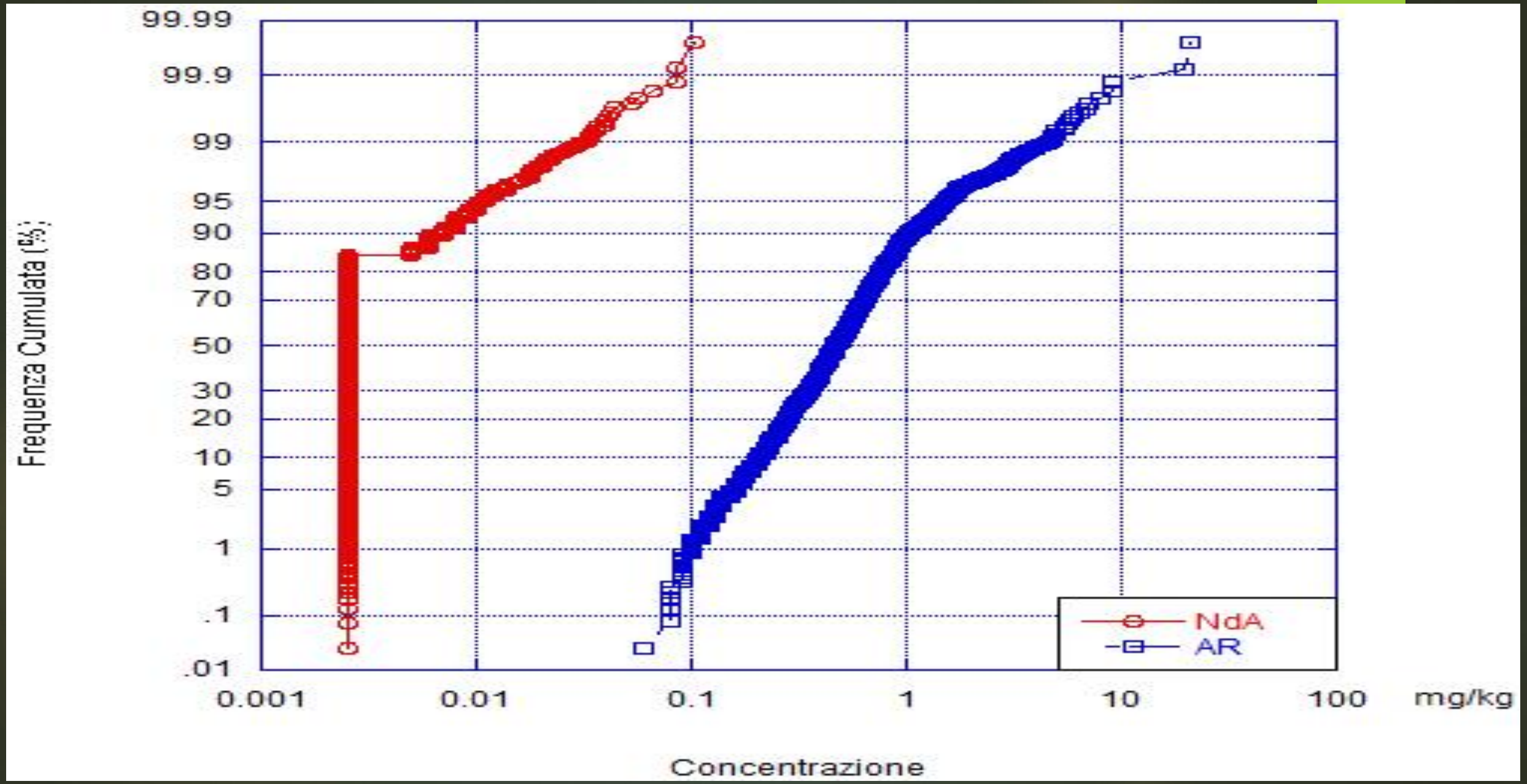
Rame (Cu)

Distribuzione della contaminazione potenziale
Potential contamination distribution



DOT DISTRIBUTION OF BIO-AVAILABLE INORGANICS CONTAMINANTS

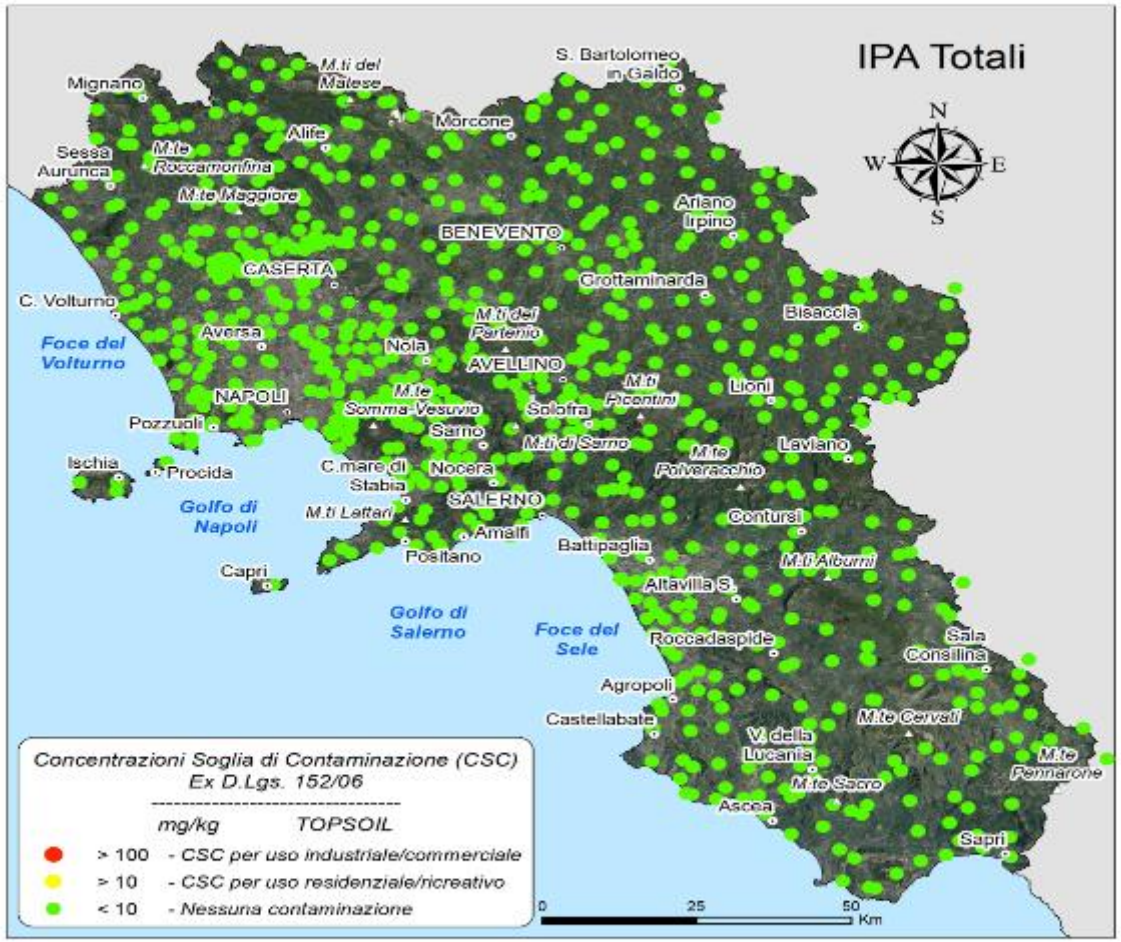
IN TOP SOILS


99.99
99.9
99
95
90
80
70
50
30
20
10
5
1
.1
.01
Frequenza Cumulata (%)
0.001
0.01
0.1
1
10
100
mg/kg
Concentrazione
NdA
AR

POP (PAHs, PCBs, OCPs)
ORGANIC COMPOUNDS DISTRIBUTION
IN TOP SOILS

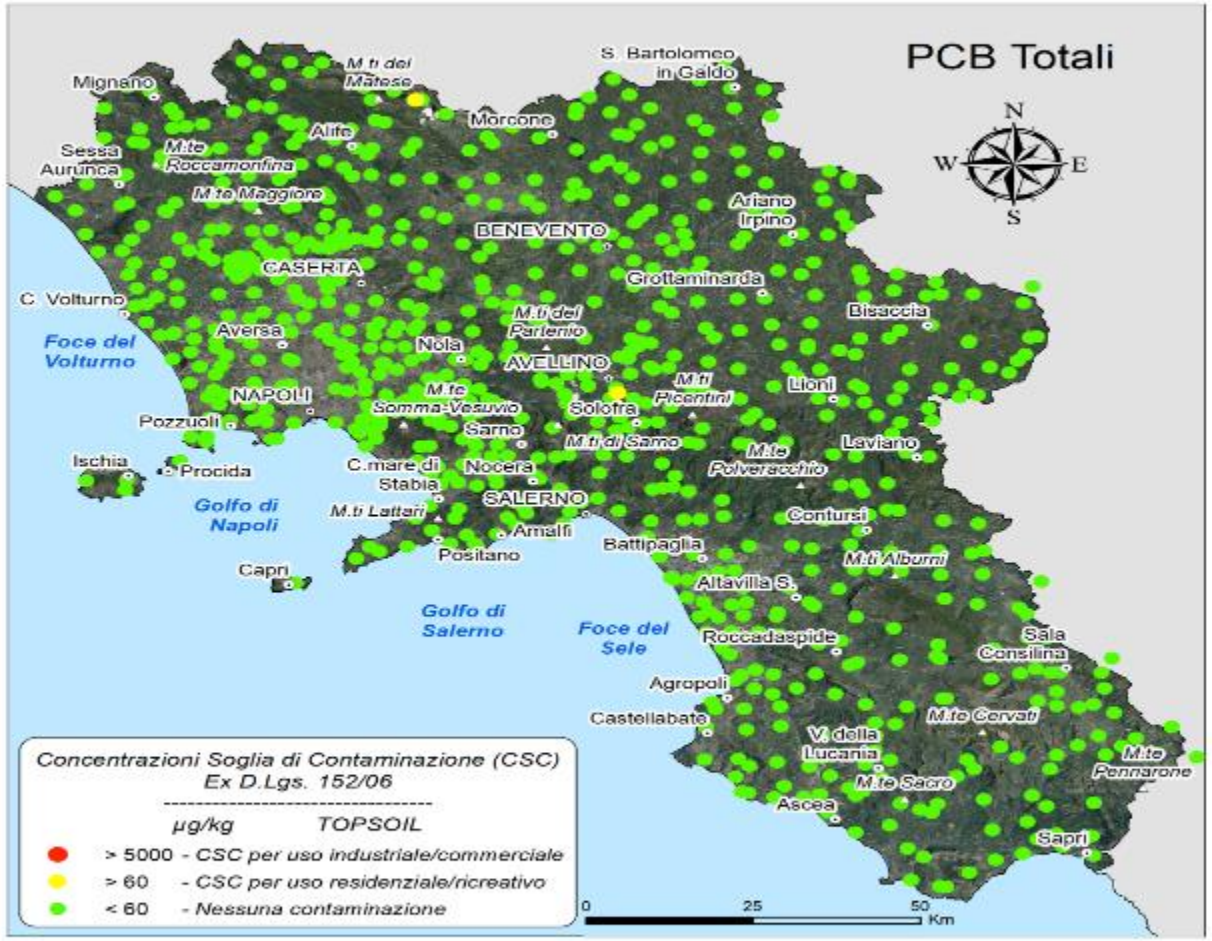
IPA Totali

Distribuzione della contaminazione potenziale (Ex D.Lgs. 152/06)
Potential contamination distribution



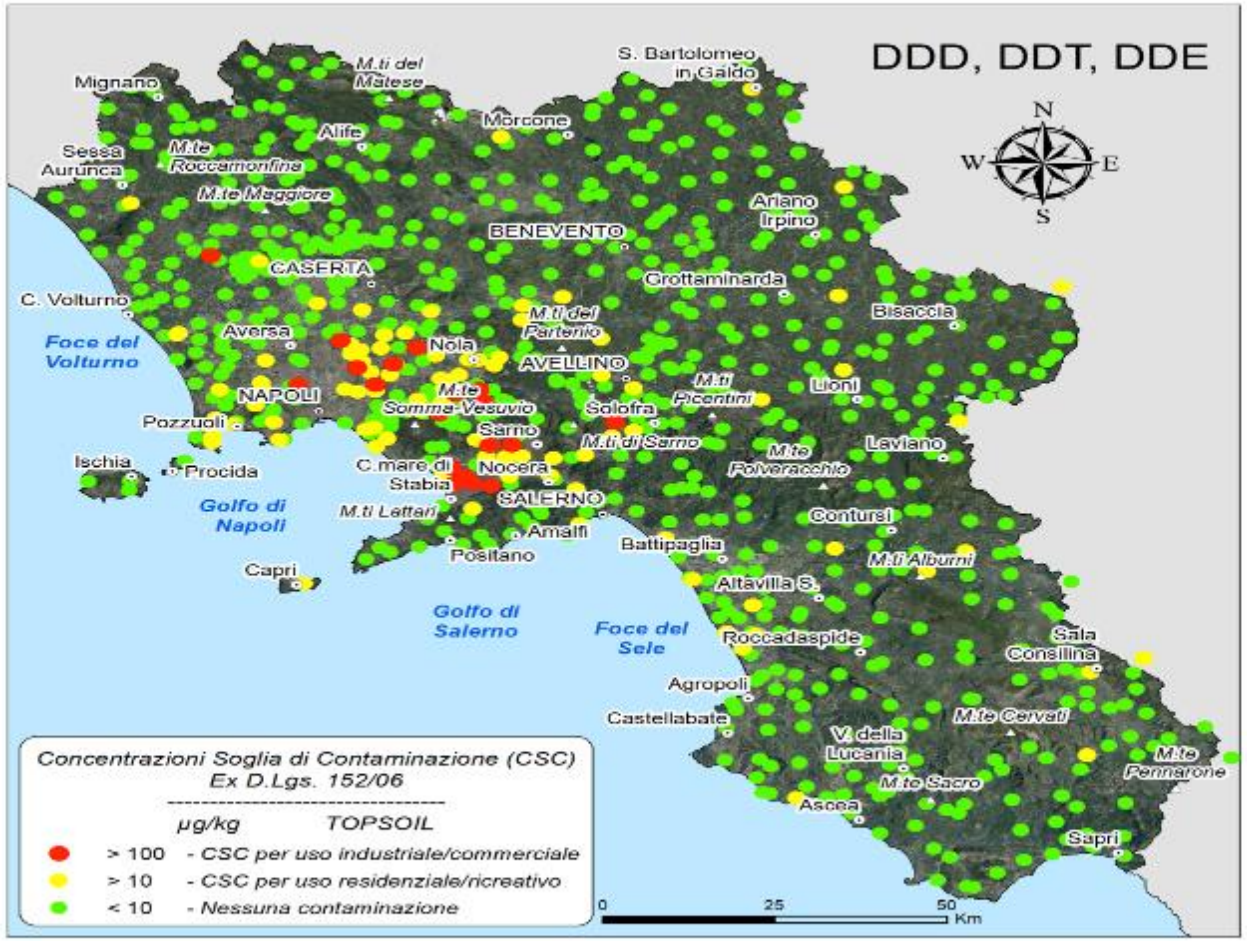
PCB Totali

Distribuzione della contaminazione potenziale (Ex D.Lgs. 152/06)
Potential contamination distribution



DDD, DDT, DDE

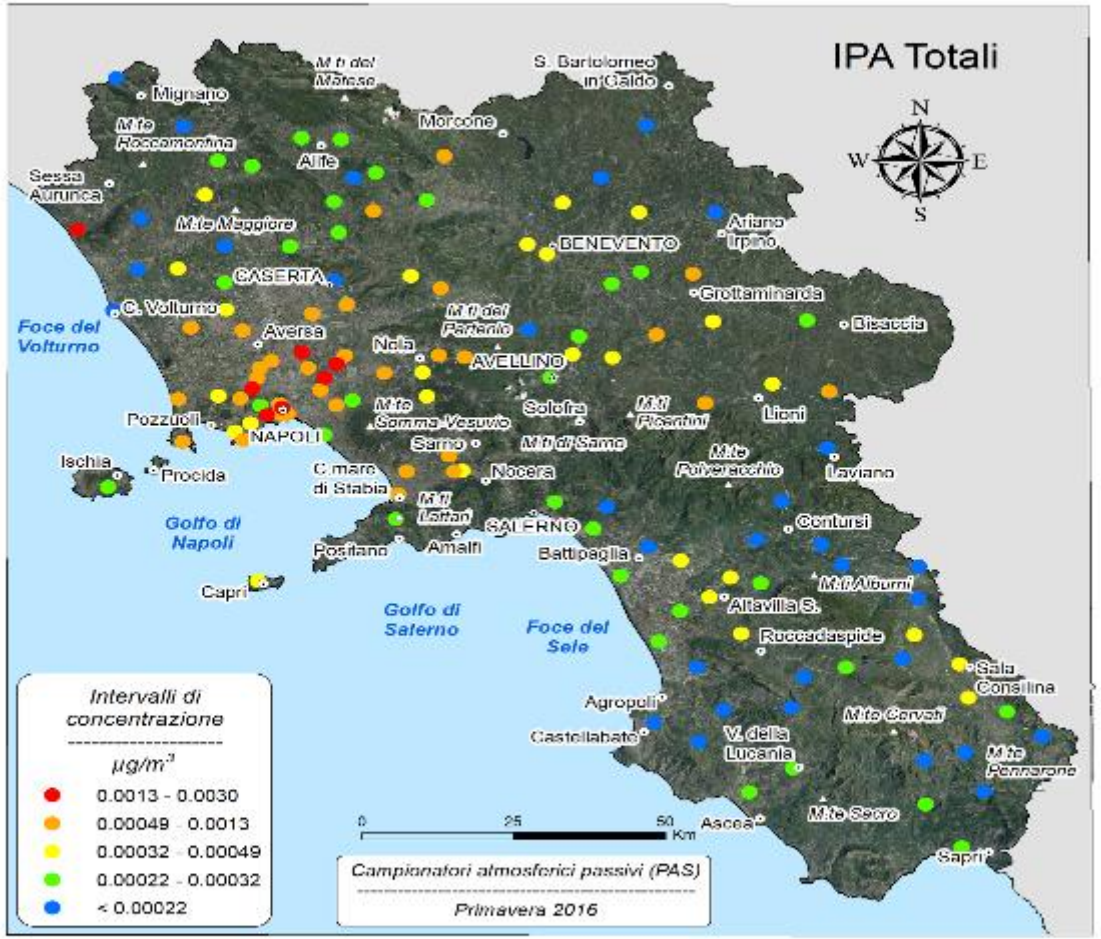
Distribuzione della contaminazione potenziale (Ex D.Lgs. 152/06)
Potential contamination distribution



PAH
IN AIR
(FOR 7 SEASONS)

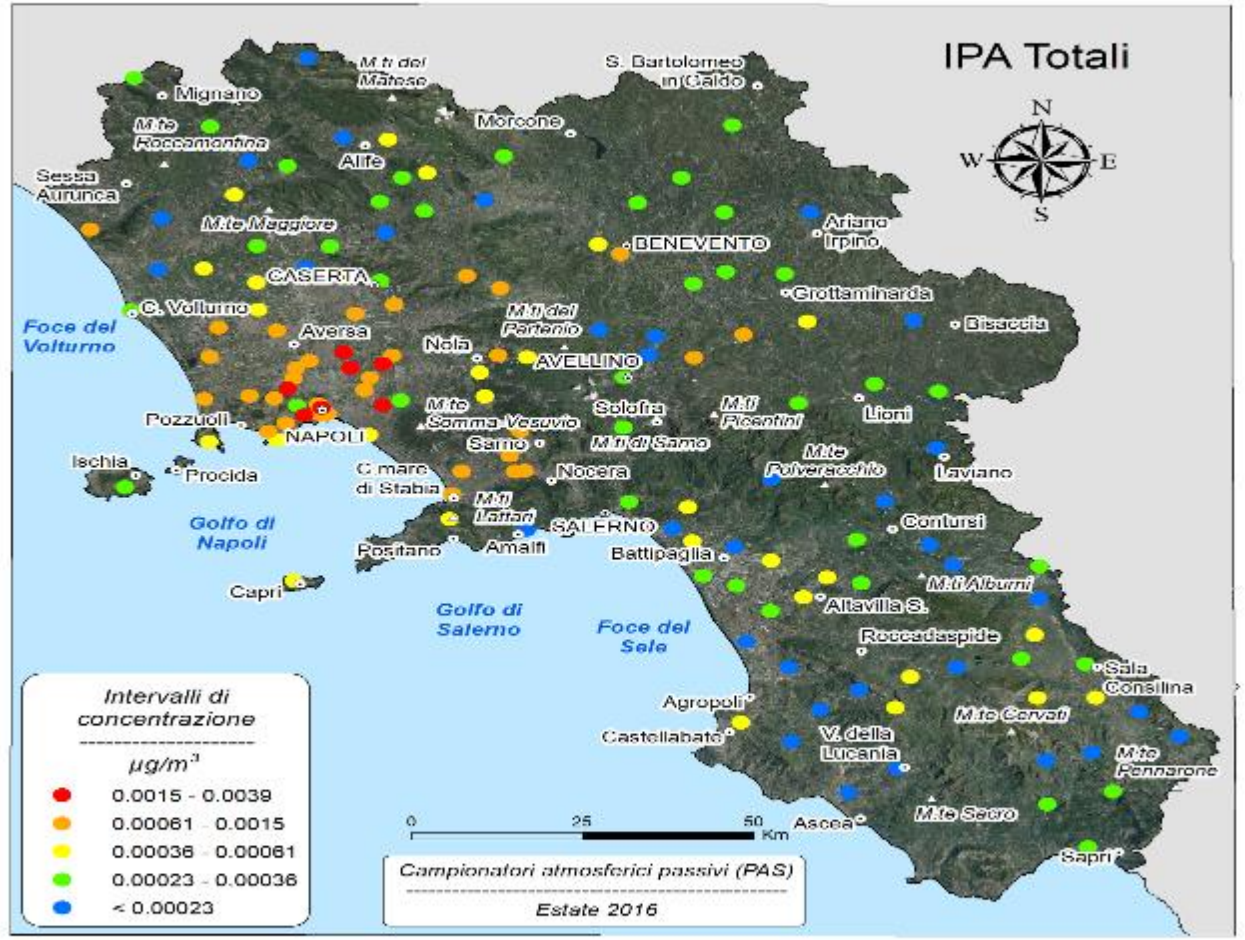
IPA Totali

Distribuzione puntuale delle concentrazioni medie giornaliere
Dot map - Daily average concentrations



IPA Totali

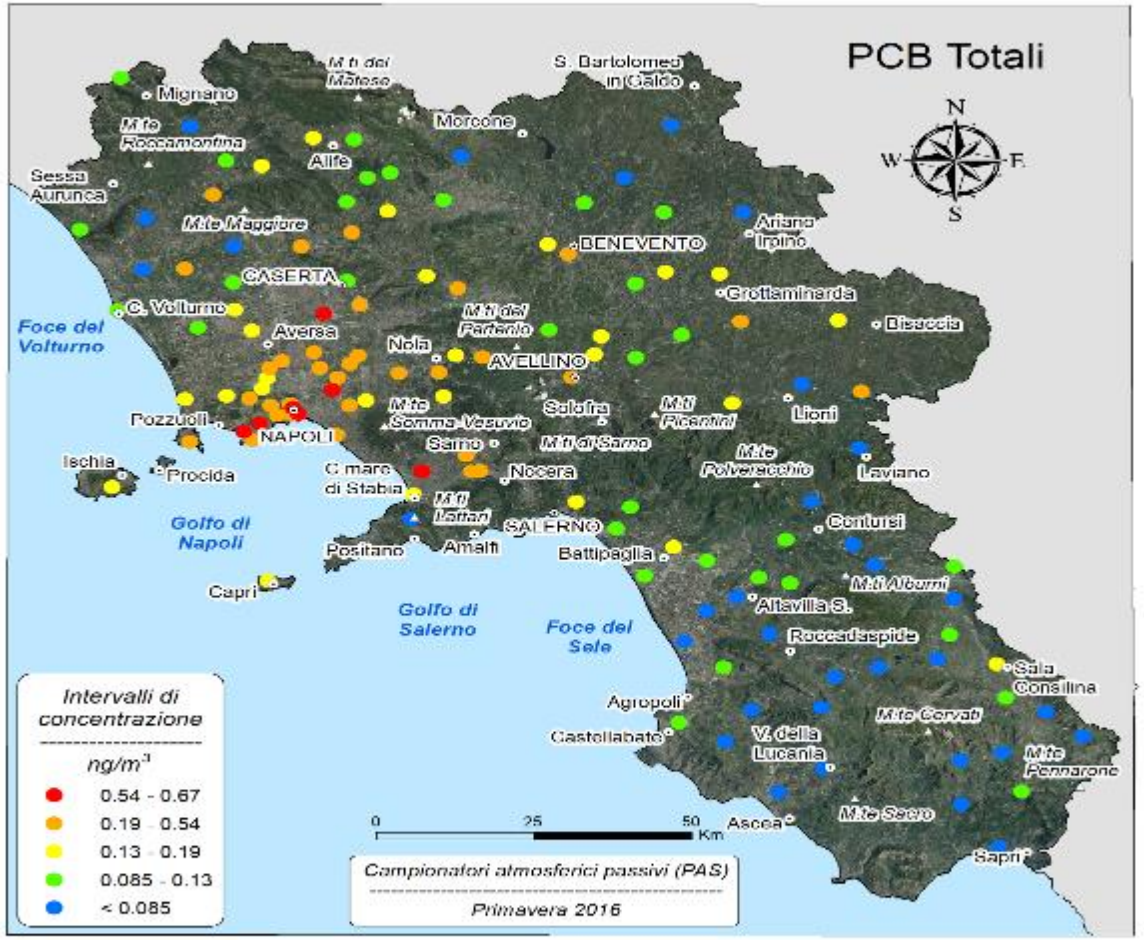
Distribuzione puntuale delle concentrazioni medie giornaliere
Dot map - Daily average concentrations



PCB
IN AIR
(FOR 7 SEASONS)

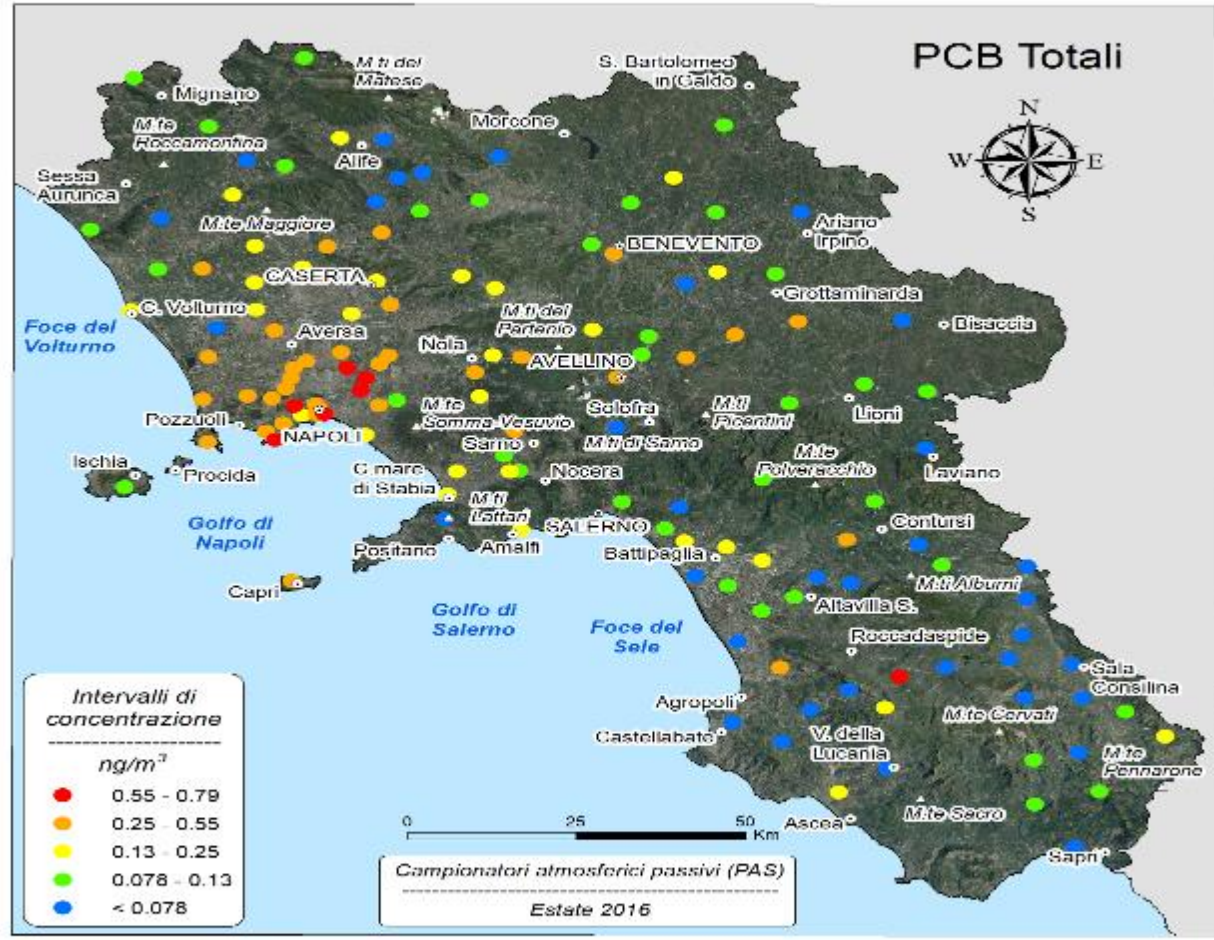
PCB Totali

Distribuzione puntuale delle concentrazioni medie giornaliere
Dot map - Daily average concentrations



PCB Totali

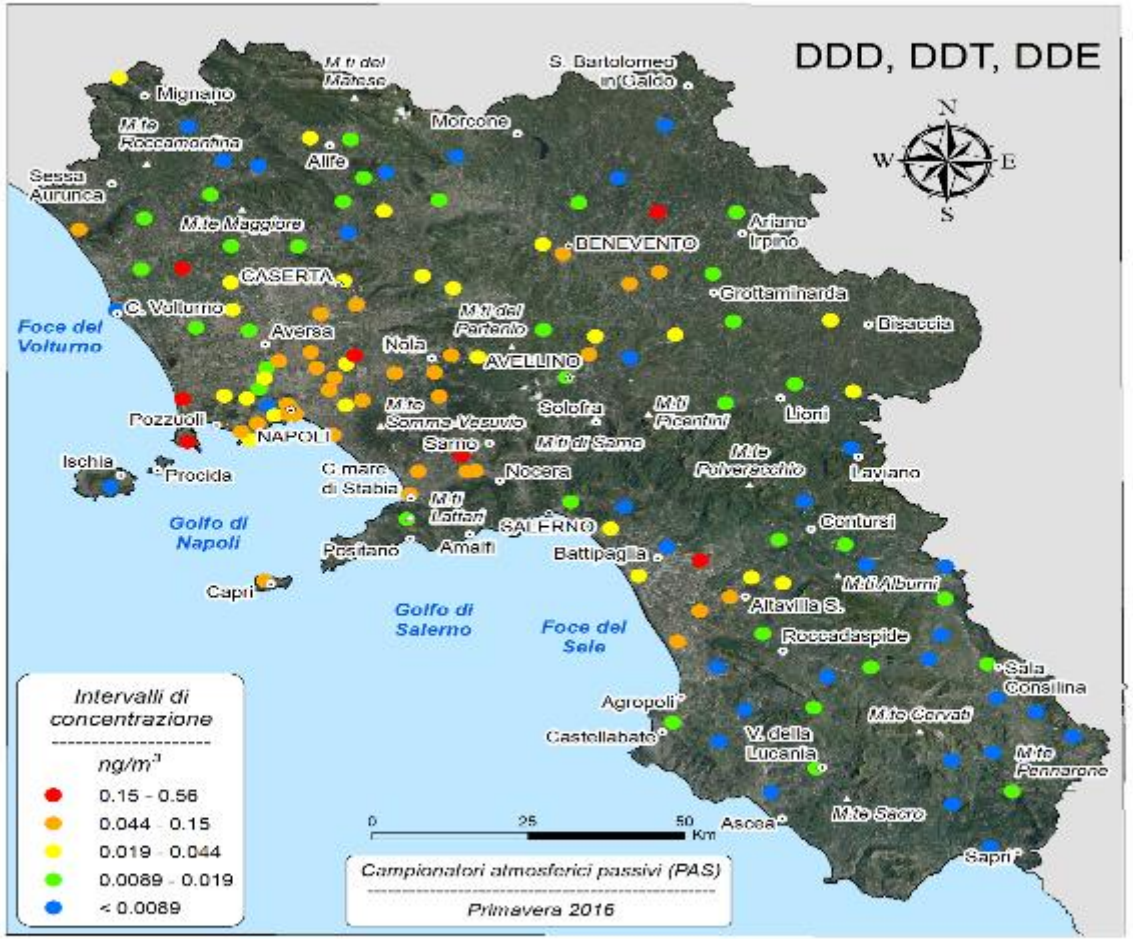
Distribuzione puntuale delle concentrazioni medie giornaliere
Dot map - Daily average concentrations



PESTICIDES (OCP)
IN AIR
(FOR 7 SEASONS)

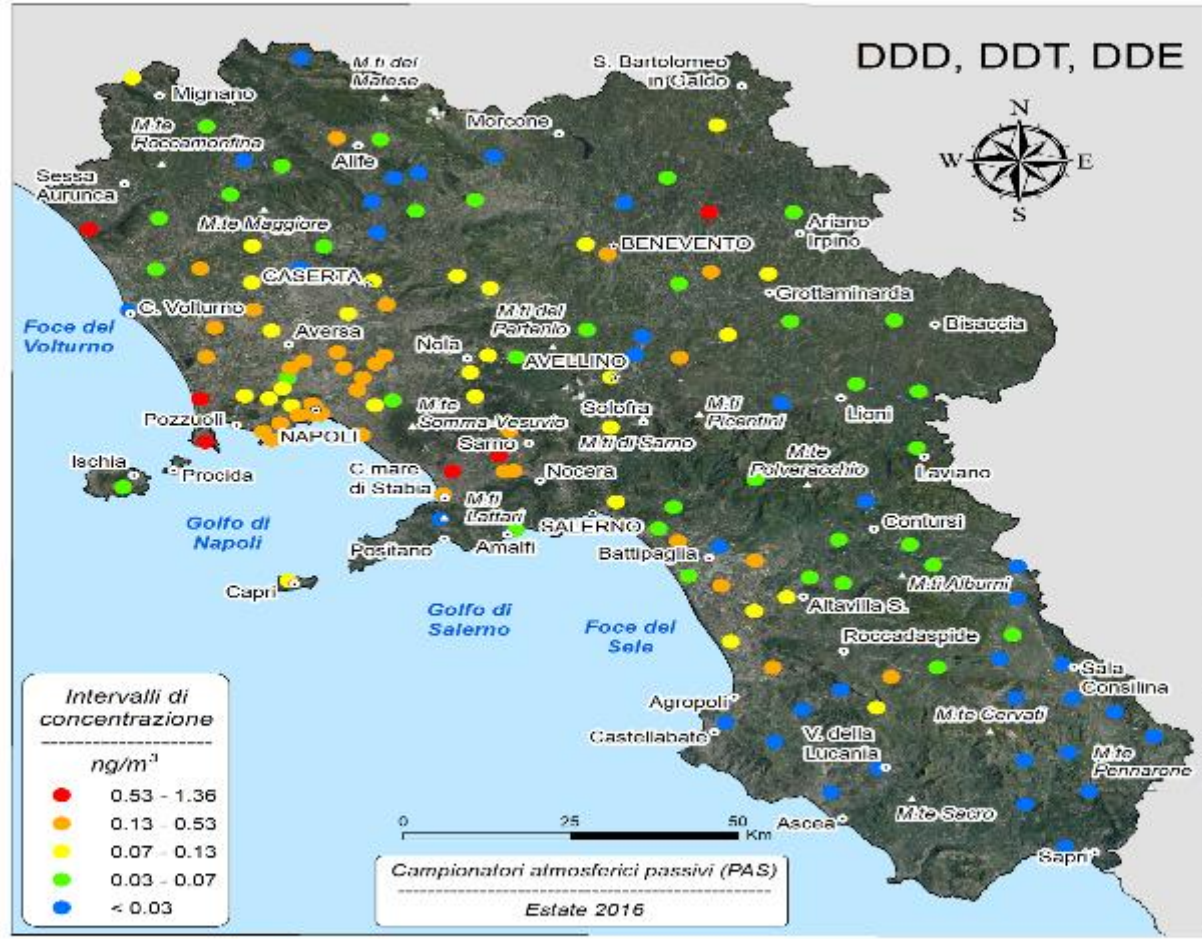
DDD, DDT, DDE

Distribuzione puntuale delle concentrazioni medie giornaliere
Dot map - Daily average concentrations



DDD, DDT, DDE

Distribuzione puntuale delle concentrazioni medie giornaliere
Dot map - Daily average concentrations



The results obtained showed that most of the analysed elements and compounds are pervasive in all the studied environmental matrices, but mostly, for soils, critical areas were found to occur in Napoli Urban and Metropolitan Areas (NMA) and in the Sarno river basin. We found mostly that the area, in the Caserta and Napoli provincial territory, known as *Terra dei Fuochi* (Land of Fires), was only marginally interested by anomalous occurrence of PTMs and POPs. In other words in such area were found only some critical spot areas, as everywhere else within the Campania Region, not justifying the emotional alarms calling for an incidence increase of oncological cases due to diffuse practice of wastes, illegally, disposed underground in the area.

In atmosphere, PCBs and PAHs, were found to be sourced mostly in urban areas, being dissipated in rural areas. The interactional complexity in the atmosphere between metropolitan and the surrounding rural areas was also confirmed, as it is the role that urban areas play in the migration and transformation process of POPs. OCPs residues, viceversa, originated mostly from the nearby agricultural areas, experiencing long-term soil re-emission and continuously influencing conterminous urban environment via atmospheric transport processes.

The volcanism of some areas (Campi Flegrei, Vesuvius, Roccamonfina volcanoes), is generally responsible for high values found in aquifers: As, F, Fe, Mn, B; Reducing environments, which are typical of alluvial areas, are as well responsible of some high values of: Fe, Mn, As.
Only in some spot areas (nearby some industrial activities) has been found anomalous concentrations of Trichlorethylene and Tetrachloethylene.

Environmental geochemistry is an indispensable tool for discriminating the impact of natural and anthropogenic sources on the environment and, to scale, on human health: the example of the "Campania Transparent" Project has provided scientific evidence and elements that demonstrate the groundlessness of many "emotions"

THANK YOU

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