



# ***Monitoring programme of exposed population and risk mitigation measures***

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- Venice -



## COMPLEXITY of the PROBLEM

- No international threshold.
- Contamination “detected” in 2013, but existing for more than 30 years.
- Clear environmental disaster, but high uncertainty of effects on humans.
- Enormous costs.
- Leakage of confidential information to media.
- Complex management of response.
- Factory’s financial responsibility.

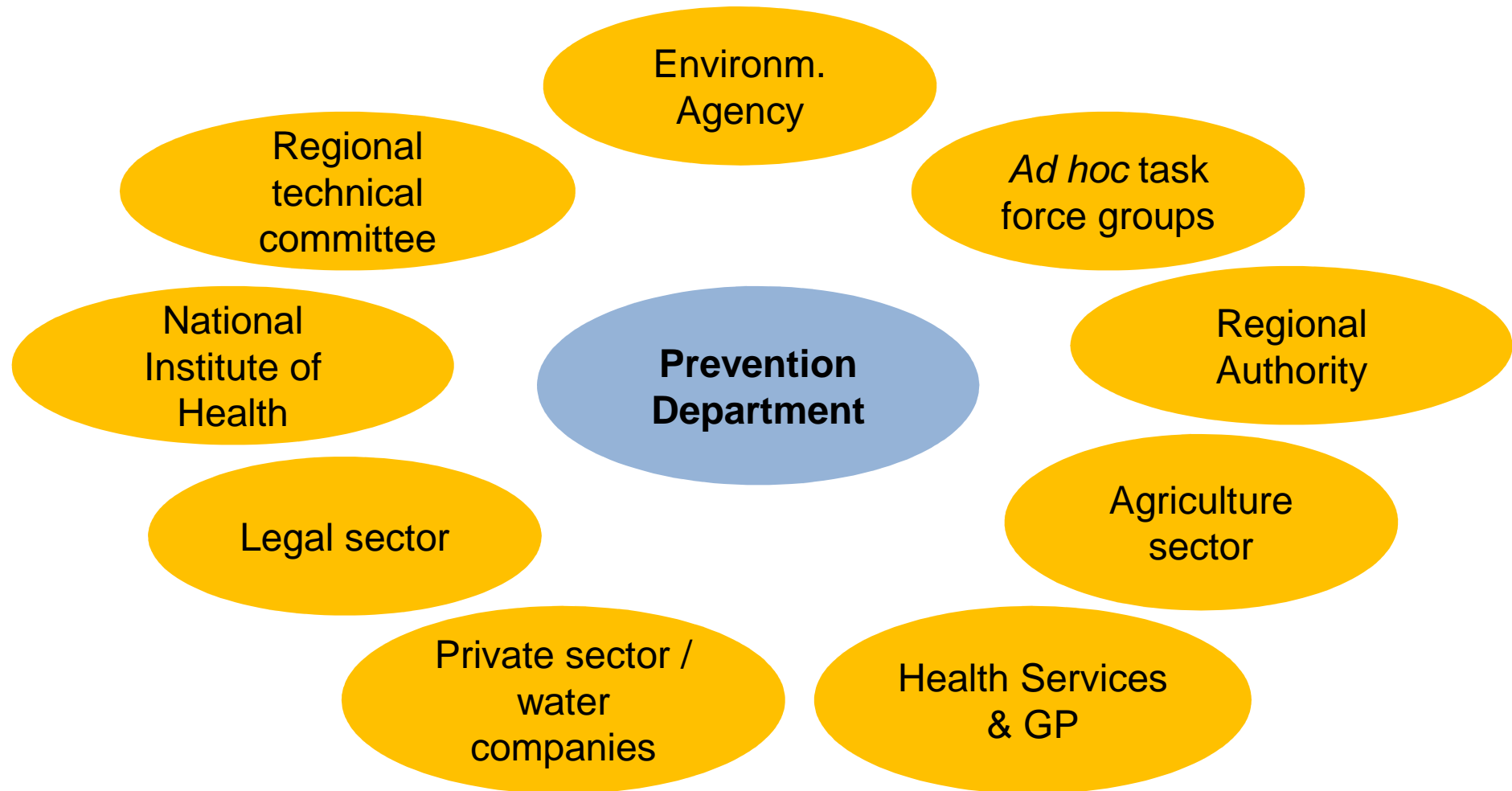


## WHAT we DID

- **Immediate actions:**
  - setting *ad hoc* response committee.
  - institutional action for risk management.
  - informing population.
  - stopping source of pollution.
  - making drinking water safe.
- **Long-term actions:**
  - epidemiological studies.
  - biological and serological studies.
  - setting norms.
  - starting legal trials.



## A MULTISECTORAL response



an INTEGRATED approach



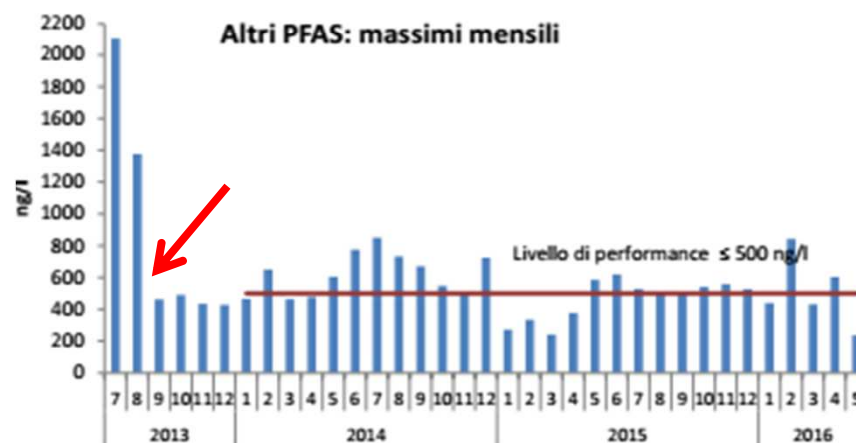
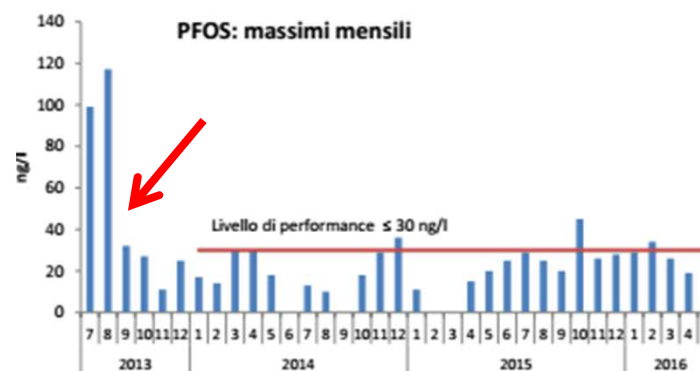
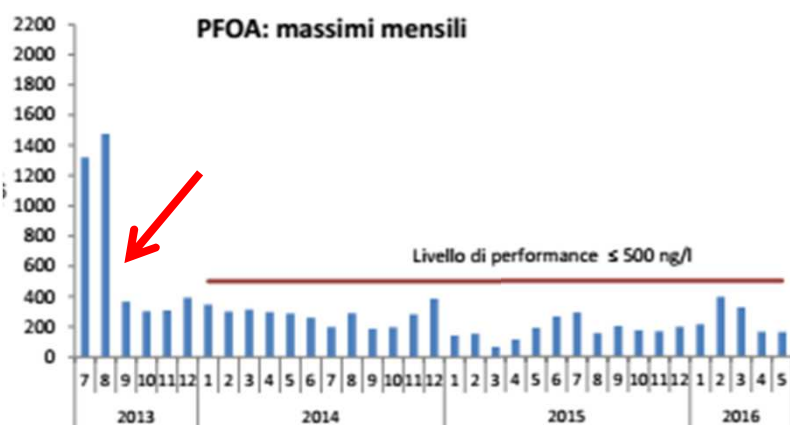
## PUBLIC HEALTH actions

- Making drinking water safe (PFAS free water).
- Identification of contaminated areas.
- Mapping of risk (low- to high-contamination).
- Biomonitoring surveillance.
- Reduction of PFAS in the environment.
- Guidelines for irrigation water and food chain industry.
- Taking care holistically of the exposed population.



## TRENDS drinking water samples

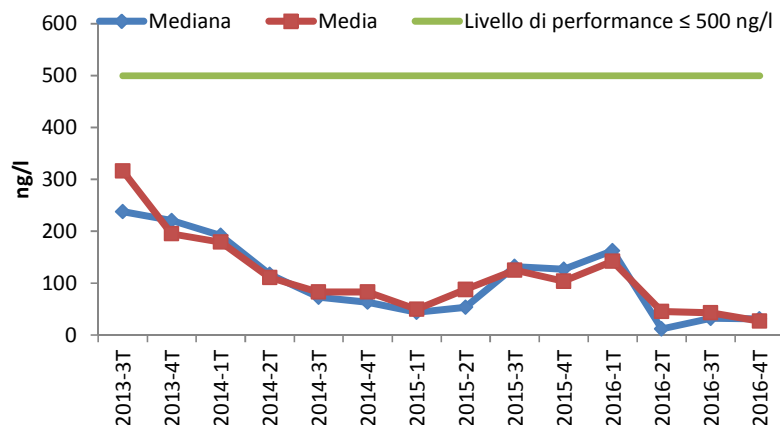
### PFAS in drinking water: *before* and *after* Carbon filters





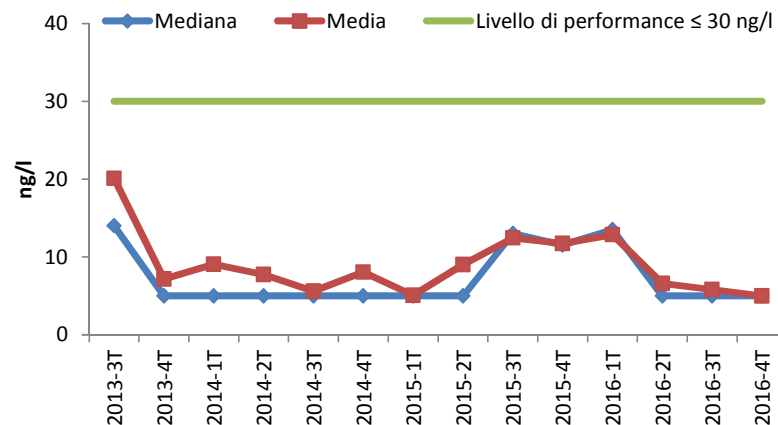
## PFAS - Measured concentrations in water supplied by water network

### PFOA



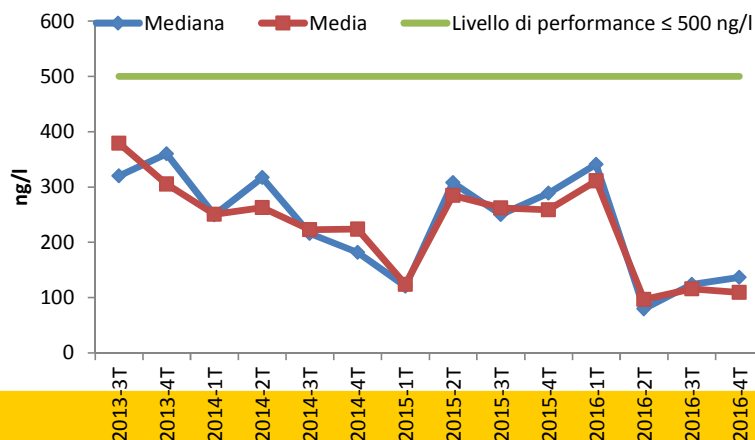
Median and average values (ng/l) for trimester of PFOA detected in water delivered by aqueduct network. Samplings performed from July 2013 to October 2016

### PFOS



Average and median values (ng/l) for trimester of PFOS detected in water delivered by aqueduct network. Samplings performed from July 2013 to October 2016

### Altri PFAS

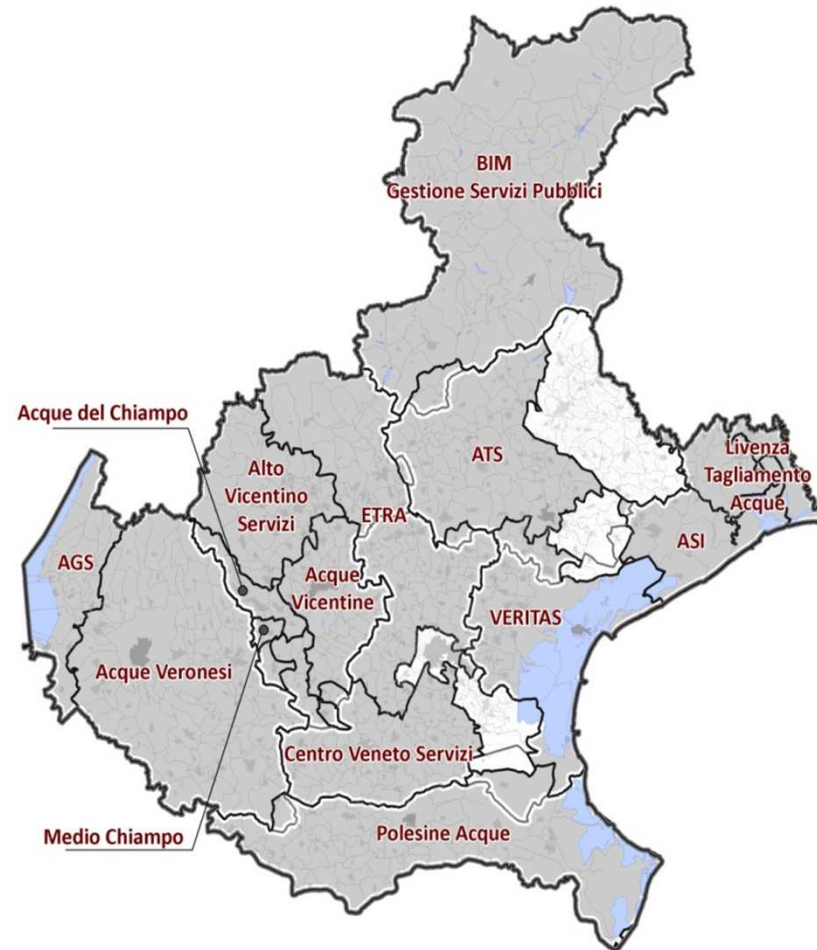


Average and median values (ng/l) for trimester of Other PFAS detected in water delivered by aqueduct network. Samplings performed from July 2013 to October 2016



## The role of Water services Companies

Their role was really strategic.  
In the area they united in a Corporation and cooperated with public control institutions.  
In Veneto Region 581 Municipalities work in 18.400 km<sup>2</sup> area and serve 4,8 millions inhabitants.







## SHARES AND TRIALS BY MANAGERS OF INTEGRATED WATER SERVICE

Shares of analysis and containment of the problem
Analysis of systems for water supply, treatment and distribution
Installing the granular activated carbon in the filters
Implementation of sampling plans (analyzed approximately 40.000 compounds from the family of PFAS)
Creation of the hydraulic model of the network of supply, treatment and distribution for the drinking water plant of Lonigo
Experimentations of the Managers
Search for other kinds of granular activated carbons with higher performance
Use of advanced oxidation
Use of powdered activated carbon
Use of ion exchange resins with University of Padova



## Biomonitoring study

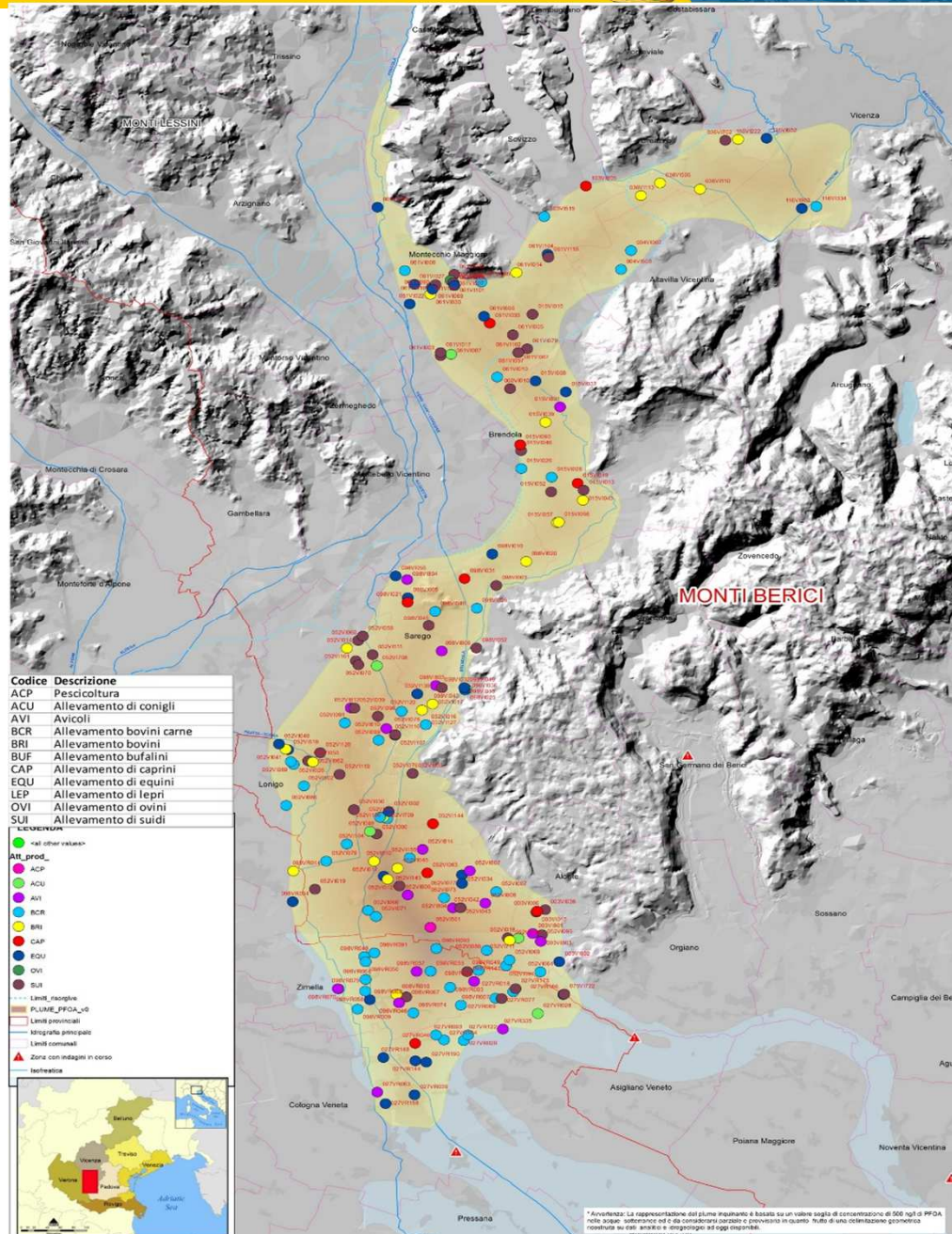
### **Sample of exposed and non-exposed population:**

- Average exposure of the population resident in the impacted area.
  - Average exposure of the population in the control area (background).
  - Average exposure of the population group with more potential risk of exposure (agrozootecnici).
- 
- N° involved Local Health and Social Care Services (ULSS) = 6
  - N° involved Municipalities = 14
  - Expected Samples = 600 people
  - Population resident target 20-49 years old (ISTAT - 2014) = 88.438



## Other public health measures

- Map and control about wells for drinking water.
- The same levels of *performance* for drinking water (for animals) and use of water from wells for the production of food.
- Food sampling.
- Evaluation of water for irrigation.

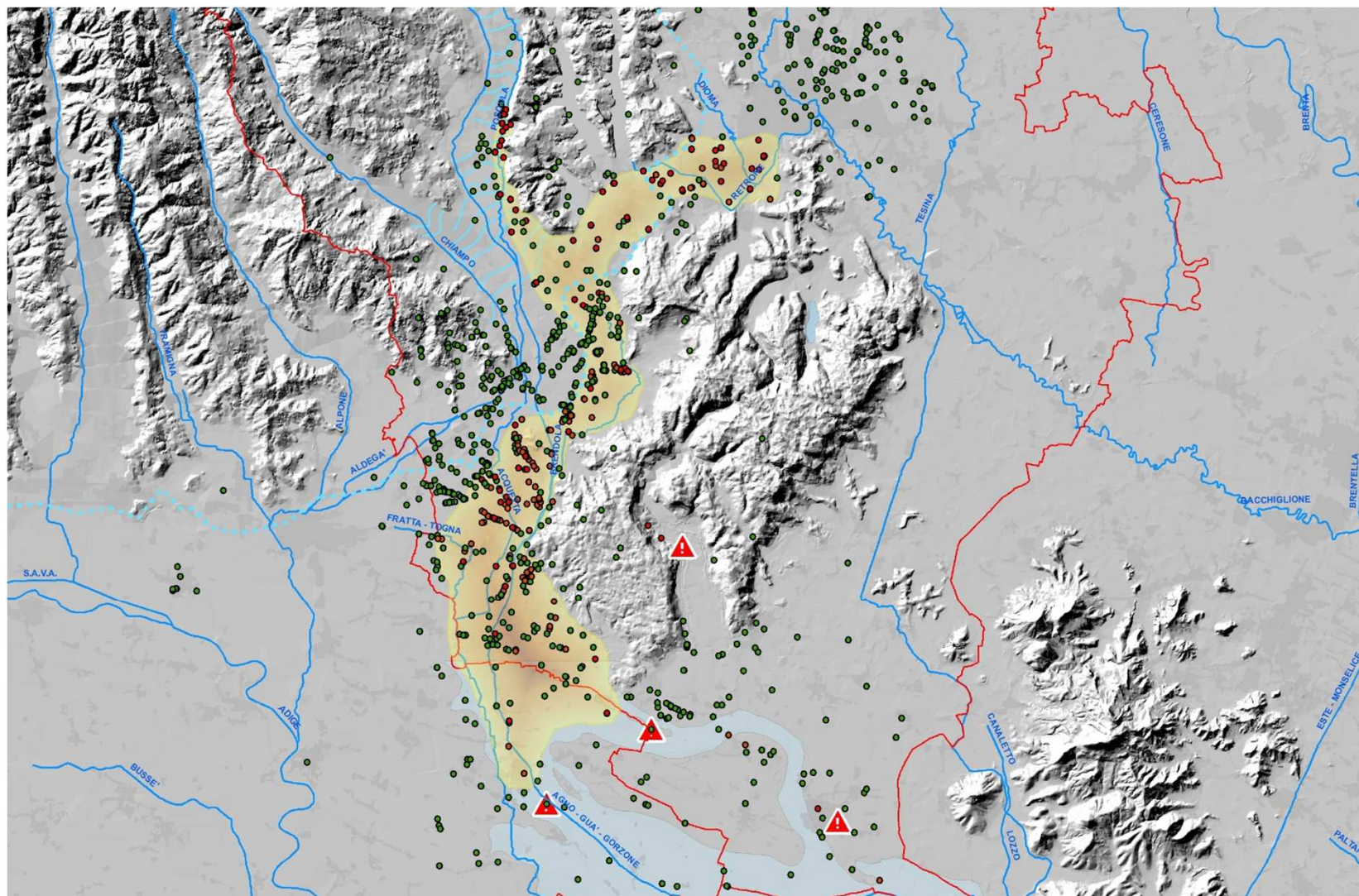


## Mapping agro-livestock Companies





## Determination PFOA

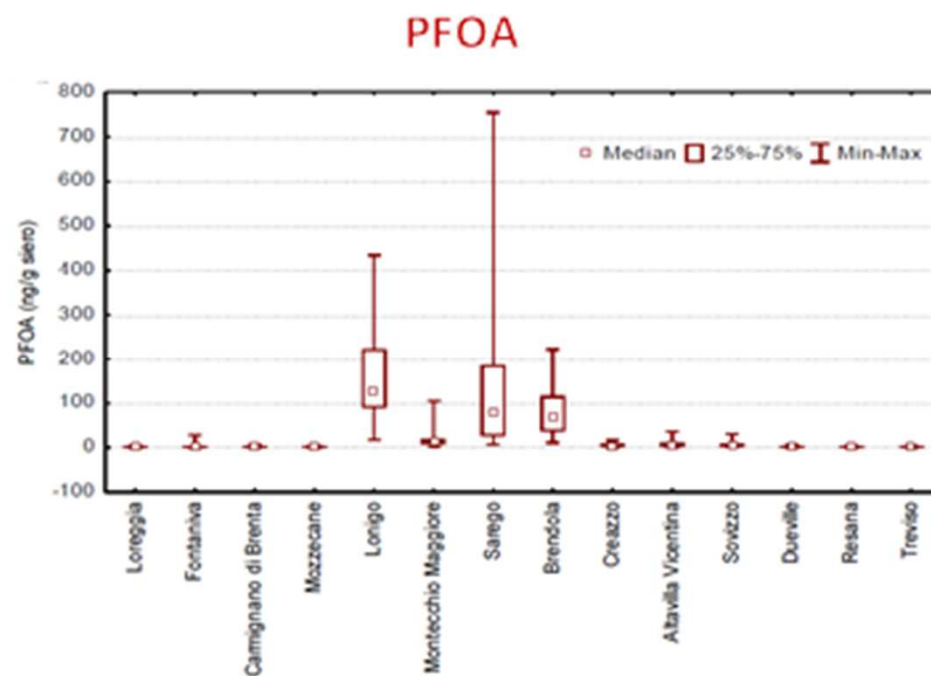




# From Biomonitoring to Plan Surveillance of Exposed Population



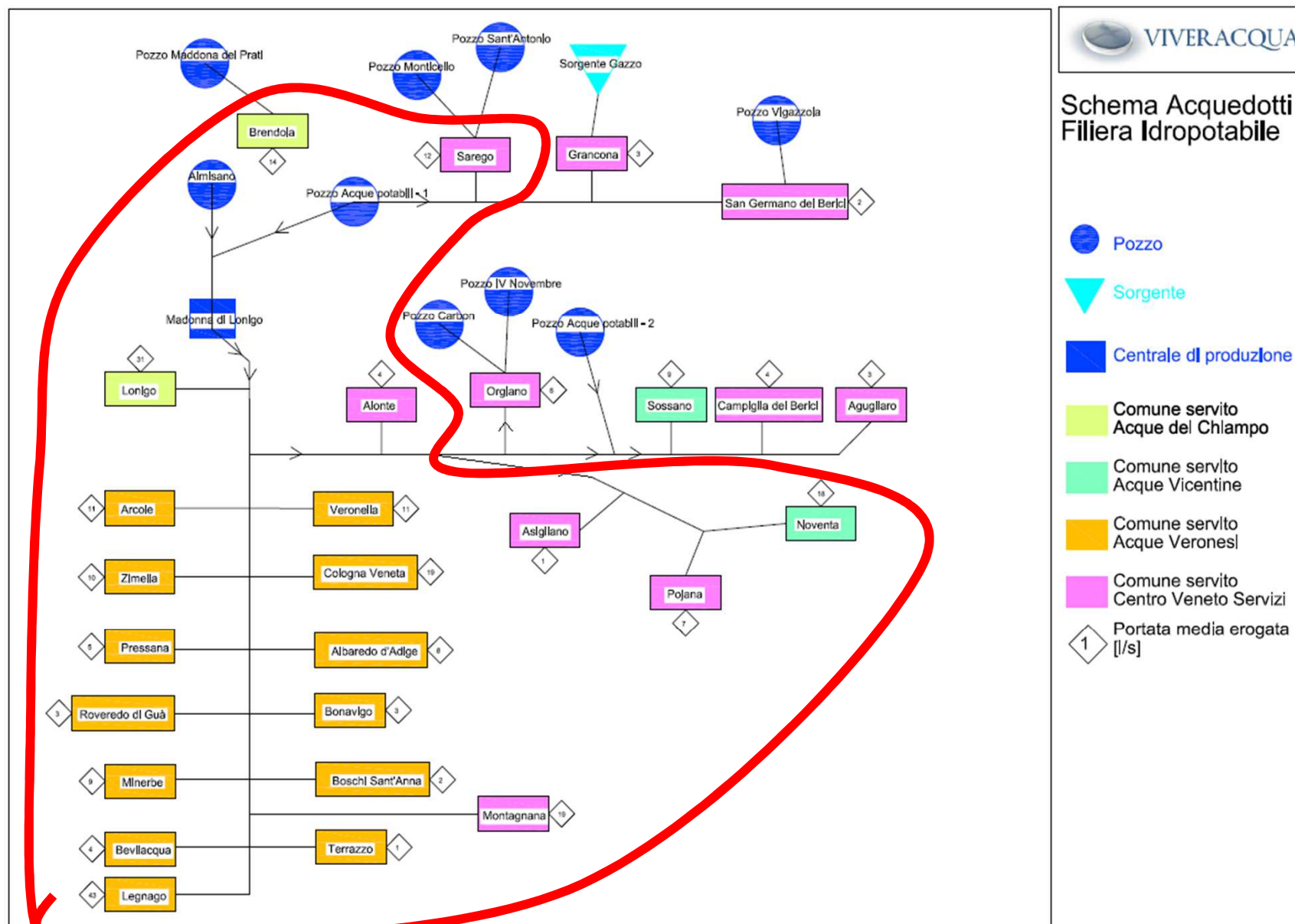
## Representation of the study of biomonitoring



Regione del Veneto - Sezione Attuazione Programmazione Sanitaria - Settore Promozione e Sviluppo Igiene e Sanità Pubblica



# AQUEDUCT NETWORK







## Definition of the area of exposure

The data analysis has allowed the rating of the areas:

- **Maximum health exposure Area (in red):**

referred to the area where there was a high concentration of PFAS (1.215) in 2013 before the application of water filters in distribution and where there are high concentrations of these substances in the groundwater and surface water.

This Area has been differentiated in:

"Red Area A", where there is a greater concentration of perfluoroalkylated substances in all waters;

"Red Area B", where the contamination of surface water and groundwater is less.

- **Autonomous catchment area for drinking (in orange):**

referred to municipal areas where it was detected by the autonomous PFAS overruns catchments surveyed.



- **Attention Area (in yellow):**

refers to the networks of environmental control system for surface water and groundwater.

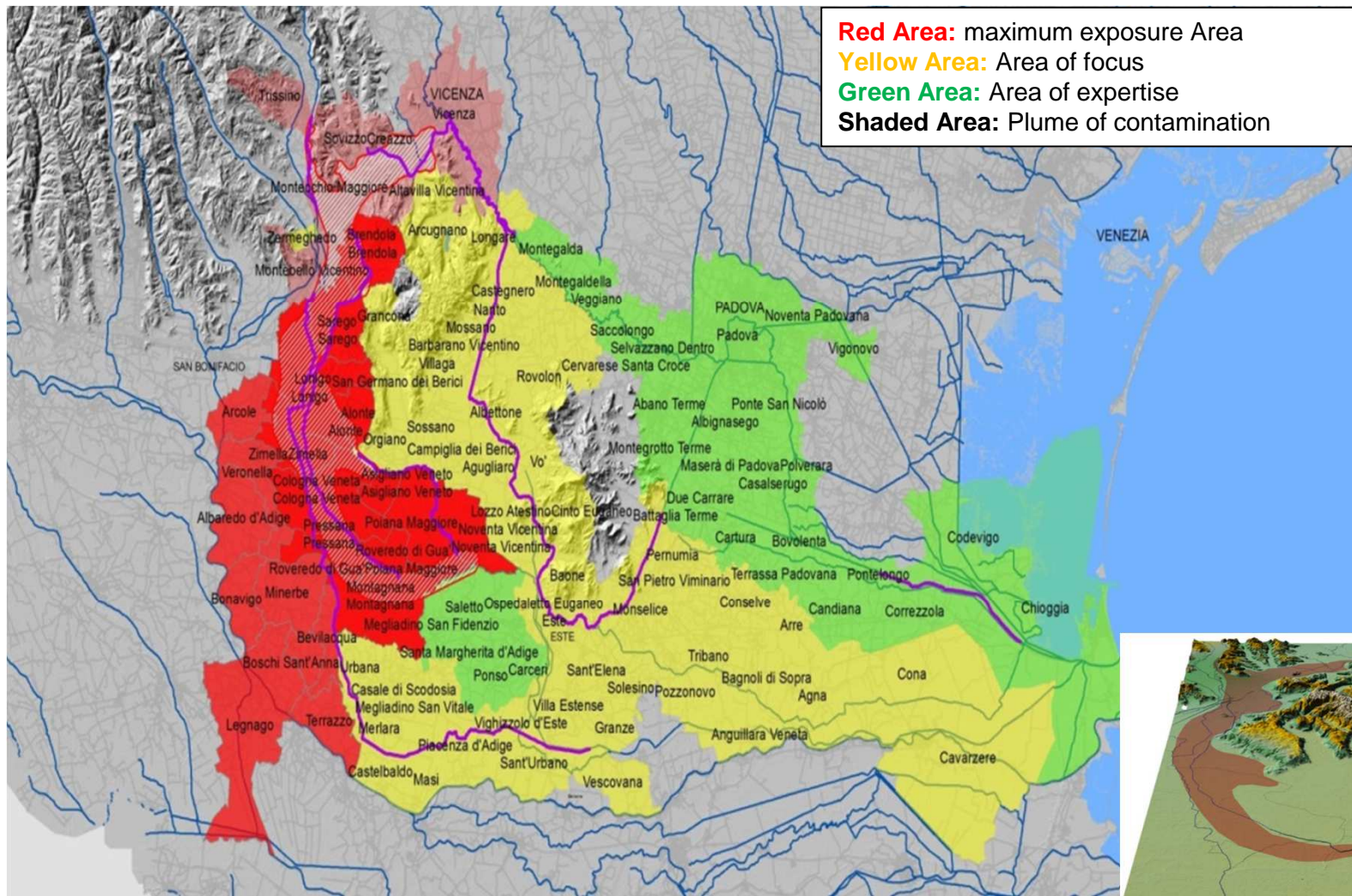
- **Deepening area (in green):**

area with only the presence of PFAS in environmental matrices, it needs further monitoring and studies.

- **Shaded Area:** Plume of contamination.

*Note: This rating is confirmed by the local matching identified with the highest contamination in the environmental media and with the exact delimitation of the "plume" pollutant resulting from source of contamination identified in the technical reports prepared by ARPAV.*

## Area of exposure



## Plume of contamination



## From THREAT to OPPORTUNITY

- NCD known risk factors:
  - tobacco;
  - alcohol abuse;
  - unhealthy diet;
  - physical inactivity.
- PFAS: considering PFAS as **5<sup>th</sup> risk factor for NCD**:
  - *ad hoc* questionnaire and biomonitoring on 84.795 cohort (14-65);
  - tapping on existing screening for CVDs;
  - targeted campaigns on population;
  - equity principle: no one excluded.



# Surveillance plan



## General target

Prevention of chronic degenerative diseases caused by the exposure to perfluoroalkylated substances and by inappropriate lifestyles, taking charge of the exposed population.

## Specific targets

- characterize the exposure to PFAS of people living in contaminated areas;
- evaluate the effects of exposure to PFAS on the health of exposed individuals;
- identify risk behaviors for chronic degenerative diseases;
- ensure the monitoring of the health of the subject was exposed through the treatment offer entrusted to family medicine and activation of prevention tools for modification of incorrect lifestyles, entrusted to the Regional Prevention Departments.



## Active call of the target population

Methods of organization about the cancer screening supported by the “REGIONAL INFORMATION SYSTEM SCREENING PFAS”.

The call of the eligible population at all the Local Health Authorities involved consists in the invitation of those born since 2002 and then those born before, until the year 1951.

A reminder letter is sent within twelve months from the 1st invitation to non-respondent people, who have not gone to the fixed appointment. The reminder letter will contain a proposal for a new appointment. Those who do not take part even in the 2nd round will be excluded from the screening program.

*continue ...*





To all the participants, every two years, the following check ups will be offered:

- A questionnaire (Attachment n. 5) about:  
socio-demographic characteristics, residential and occupational history, family history, pathological and reproductive, medications, smoking habits, physical activity, diet, consumption of local products, source of supply hydro-drinking, height and weight;
- blood pressure measurement;
- venous blood sampling for dosing creatinine, glomerular filtration, uric acid, ALT, AST, HbA1c, total cholesterol, HDL cholesterol, triglycerides, TSH, PFAS;
- urine sample for the determination of microalbuminuria.

*continue ...*





Individuals with unhealthy lifestyles will be informed of the risks to health and supported in behavior modification.

Individuals with higher serum concentrations of PFAS to the range of normal and / or alterations in biochemical tests or in blood pressure will be taken on by their family doctor and placed in a care path II level for the timely diagnosis of any diseases related to exposure to PFAS.



## A MODEL for Emergency preparedness: WHAT we LEARNT

### Enablers

- Intersectorial mechanisms in place.
- Clear mandate.
- Clear priorities.
- Cohesiveness.
- Transparency.
- Political commitment.

### Challenges

- Lack of evidence.
- Highly politicized problem.
- Costs.
- Risk communication.
- Sensationalism.
- Legal responsibility.



**Thank you for your attention**