

# ○ Recommendations for ensuring air quality

Adele Manzella – CNR

All WP4 partners

---

March 2, 2021



2 /

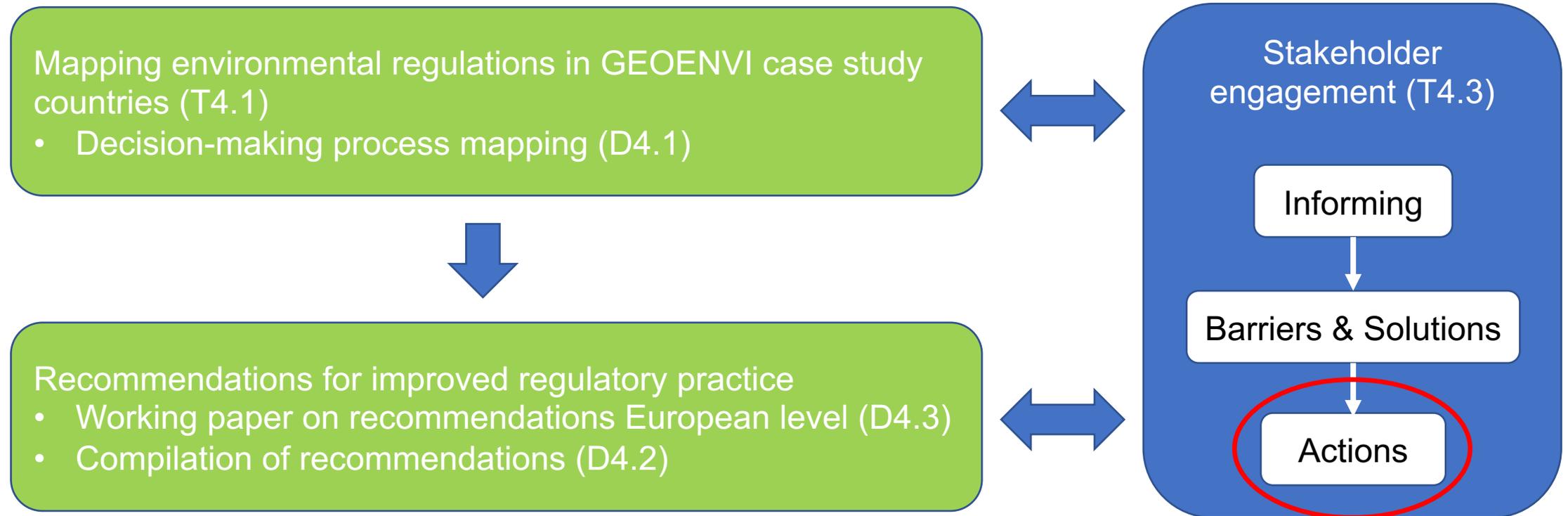
## ○ Ambition

GEOENVI Work Package 4

- Map and analyze the current status of environmental regulations and practices for deep geothermal energy development
- Develop recommendations for improved regulatory practice
- Engage with and decision-makers and other stakeholders in developing recommendations



## ○ Work package structure



## ○ Recommendations on environmental regulations

[Deliverable 4.2](#) / [Deliverable 4.3](#)

Technical topics:

- Seismicity → **March 9**
- Aeriform emissions → **Today**
- Aquifers' interferences and physical disturbances
- Discharge of geothermal fluids

**March 18**

Process topics:

- Complex licensing and delays
  - Environmental Impact Assessment (EIA)
  - Information sharing
  - Local Benefits
  - Public participation
- March 16**
- +
- Life Cycle Assessment and finance → **April 13**

**February 23**

 Policy briefs to be published on the GEOENVI website

5 /

- **Technical topics**

## AERIFORM EMISSIONS TO THE ATMOSPHERE

## ○ Challenges

*How to guarantee and prove air quality control during both the well drilling phase and the operation of geothermal plants?*

European and national environmental and mining laws cover most issues, including reporting of accidental emissions. But some potential impacts are regulated mainly through best practices of operators and national/regional guidelines.

Harmonization and best practices are required for:

- Monitoring and reporting frequency
- Establishing air quality thresholds (differences for H<sub>2</sub>S in France, Italy, Iceland, and Turkey, and for CH<sub>4</sub> in Belgium-Flanders, France and Hungary)
- Mitigation technologies (abatement, re-injection)
- Monitoring data availability

7,

## ○ Recommendations regarding the geothermal well drilling phase

### ○ Air quality monitoring during well drilling

at least when drilling potentially gas-bearing formations, air quality monitoring should be enforced in the bounds of the drilling yard.

### ○ Air-quality monitoring during well flow tests

Outside the drilling yard, gas monitoring should be enforced during flow tests

### ○ Installation of BOP at wells

### ○ Enforce mitigation plan to prevent accidental emissions during drilling

including: trained personnel and safety exercises during drilling activity, well design and implementation to face the risk. Maximum flow test overall duration or total emitted volume, to be defined case by case depending on the gas rate

### ○ Data reporting to the Authority

## ○ Recommendations regarding the geothermal plant operation phase

- Set air quality standards for pollutants currently not covered by EU regulations (H<sub>2</sub>S, Hg, ...)
- Air quality baseline
  - before plant operation starts, at the plant site and additional locations in the surrounding area
- Continuous or frequent air quality check
  - at sites surrounding the plant, and their location defined in the emission containment plan. Frequency should be decided case by case, depending on the level of risk assessed by using state-of-the-art air quality models
- Monitoring and abatement plans to contain emissions

### *In case of **predictable significant emissions***

- Total reinjection or adoption of abatement system to reduce emissions
- Continuous monitoring

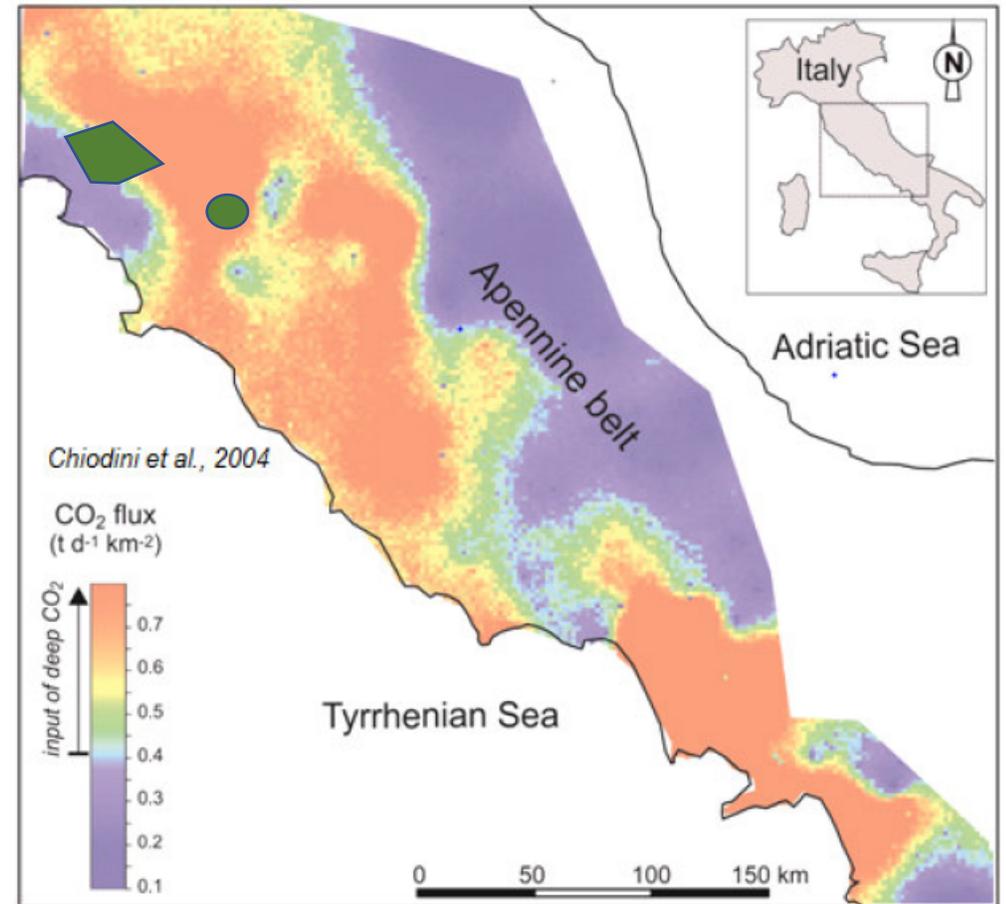
- **Main recommendation of Promoting Research and Innovation on strategic topics**
  - Further research for **zero emission plants and total reinjection**, to increase the environmental performance of some geothermal applications
  - Further understanding of **natural emissions allowing to evaluate the real contribution of the emissions at the power plant** during operation and the effect on natural emissions in the area hosting the geothermal plants.

## In case of natural soil degassing

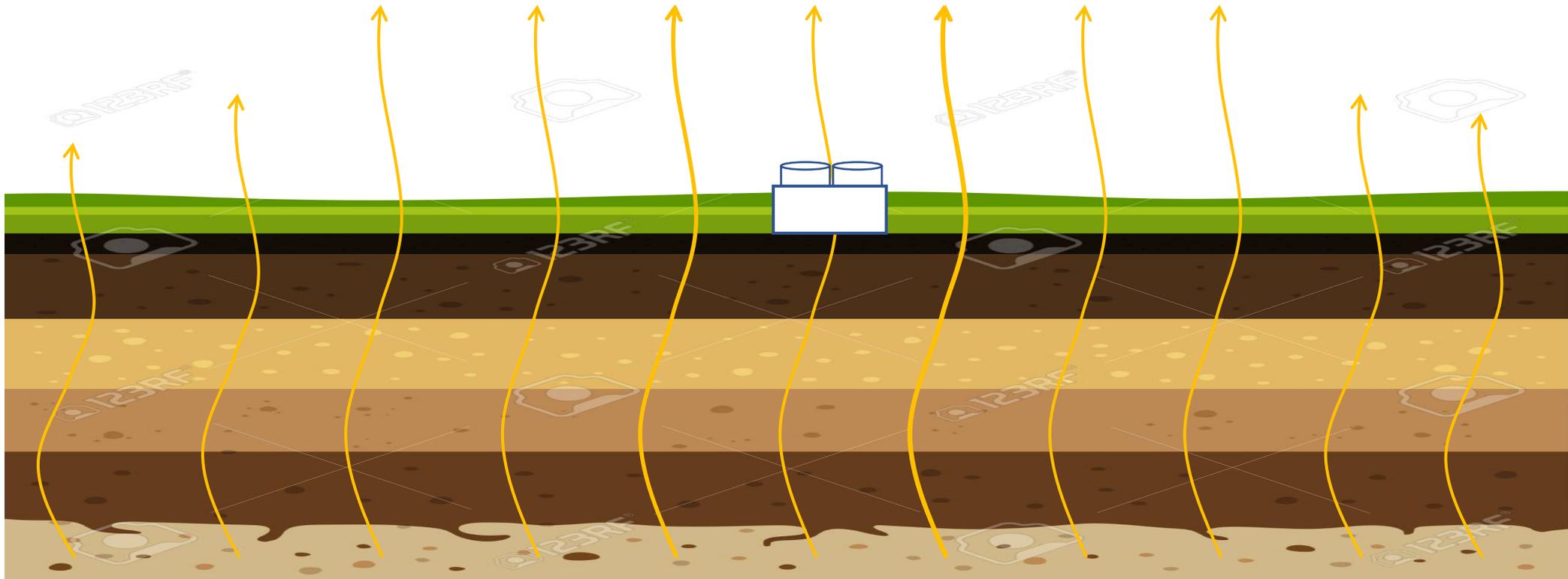


**Plate 3.** Smoke bomb ignited next to the Umbertide gas vent (~2 m in diameter). Note how the smoke does not rise into the air above the layer of high CO<sub>2</sub> concentration (see text for details).

from Rogie et al., *J. Geophys. Res.*, 2000



## A crucial issue: GHG emissions



It remains to be understood if and under what conditions when a geothermal plant begins development in an area of natural soil degassing (typically CO<sub>2</sub>), gases are:

- 1) simply emitted, even *concentrated*, at the plant but the overall contribution does not change
- or 2) increased as a result of industrial development

1) → GHG in LCA = 0

2) → GHG in LCA = recorded value, corrected if necessary

- **Main recommendation of Promoting Research and Innovation on strategic topics**
  - Further research for **zero emission plants and total reinjection**, to increase the environmental performance of some geothermal applications
  - Further understanding of **natural emissions allowing to evaluate the real contribution of the emissions at the power plant** during operation and the effect on natural emissions in the area hosting the geothermal plants
  - The definition of **Best Available Technologies (BAT) for abatement systems** at European level
  - Further understanding of **health effects of long-term exposure** to a low concentration of hydrogen sulphide emissions
    - even though monitored concentrations are well below the limits given by the WHO and short-term effects of these emissions on human health are excluded in the European context, this aspect has created some concern, is complex and requires a large and coordinated effort and a harmonised design of studies



**G E O E N V I**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No [818242 – GEOENVI]

