



Contribution ID: 623

Type: **Poster Presentation**

## Digitizing and Exploring 16 Years of the Registry of Contaminated Sites in the state of São Paulo, Brazil

*Thursday, 2 June 2022 15:15 (1h 10m)*

Brazil is a water-rich country with nearly 90% of its freshwater lying on its subsurface[1]. Brazilian groundwater plays a crucial role in the water supply as 16% of the population depends solely on it[2]. However, rising anthropogenic contamination threatens this resource, especially in urban areas, industrial districts, and storage areas[1]. The most prevalent contaminants –petroleum and chlorinated products–have low water solubility and constitute separate phases in the subsurface[3],making remediation procedures in situ a challenge.

The state of São Paulo is the most densely populated in Brazil and is heavily industrialized. It is also one of the most dependent states on groundwater. Its environmental agency, CETESB –The Environmental Company of the State of São Paulo –was the first of its kind to be created in Brazil in 1968 [4] and has contributed to the leap of advances in contaminated sites (CSs) management that São Paulo has on the other Brazilian states.Indeed, it is one of three Brazilian states with a database[5]and a publicly published registry of its CSs.

This registry promotes identifying CSs and yearly monitoring of remediation and controlling measures applied to each site. This study looks into 16 years of this registry and presents an overview of CSs management in São Paulo. The objective is to provide insights on the state of remediation and the efficiency of used techniques and thus lay the ground for future studies planning the use of innovative technologies within the Brazilian context.

To this aim, a computer vision program was developed to digitize the openly available survey forms.An optical character recognition (OCR) engine and edge detection techniques were deployed in a python script to transform the data from a portable document format into a tabular format for data analysis in Microsoft Excel.

This study shows that not only the number of identified contaminated sites has multiplied over the years, but also more sites have been rehabilitated.Indeed, nearly 30% of the 6434 sites of 2020 are classified as rehabilitated and 16% as reused sites, against a meager 1,5% of finished rehabilitation cases among the 1336 cases of 2004. Groundwater has been the most impacted media by the contaminated sites (59%, in 2020). The most-reported polluting activity is gas stations (70%, 2020), causing automotive fuels to be the most detected contaminant and the pump and treat as the most used remediation technique in the sites surveyed. This focus on the gas station's cases surveillance followed a licensing legislation and does not represent the real distribution of the CSs. In fact, industrial activities being responsible for only 20% of the CSs is proof of this bias.

Although the real number of CSs in the state of São Paulo is expected to be around 20 000 sites [5], significant progress has been made over the last 16 years and needs to be acknowledged.Furthermore, in preparation for a future big-data stage, automating data entry of publicly available forms and subsequent data analysis will become an indispensable step toward a more efficient and fact-based communication with stakeholders.

### Acceptance of the Terms & Conditions

[Click here to agree](#)

### MDPI Energies Student Poster Award

Yes, I would like to submit this presentation into the student poster award.

## Country

United Kingdom

## References

- [1] Hirata, R., Suhogusoff, A.V., 2019. How much do we know about the groundwater quality and its impact on Brazilian society today? *Acta Limnol. Bras.* 31. <https://doi.org/10.1590/S2179-975X4419>
- [2] IBGE (Instituto Brasileiro de Geografia e Estatística). Pesquisa Nacional de Saneamento Básico –2000, IBGE, CDROM, Rio de Janeiro (2002)
- [3] T. Pak, et al., Pore-scale investigation of the use of reactive nanoparticles for in situ remediation of contaminated groundwater source. *Proc. Natl. Acad. Sci.* 117, 201918683 (2020).
- [4] Sao Paulo, 1968. State decree n. 50.079 –on the creation of CETESB (in Portuguese). Available at: <https://www.al.sp.gov.br/repositorio/50079-24.07.1968.html>
- [5] Spolidoro Queiroz, A.P., "Overview of Contaminated Site Management in Brazil", Remtech Europe Conference, 2021, Ferrara, Italy.

## Time Block Preference

Time Block A (09:00-12:00 CET)

## Participation

Online

**Primary author:** Ms SAMLANI, Nouha (Teesside University)

**Co-authors:** Dr PINO, Daphne (University of São Paulo); Dr BIANCO, Carlo (Polytechnic University of Turin); Dr ARCHILHA, Nathaly Lopes (Brazilian Synchrotron Light Source); Dr PAK, Tannaz (Teesside University)

**Presenter:** Ms SAMLANI, Nouha (Teesside University)

**Session Classification:** Poster

**Track Classification:** (MS18) Innovative Methods for Characterization, Monitoring, and In-Situ Remediation of Contaminated Soils and Aquifers