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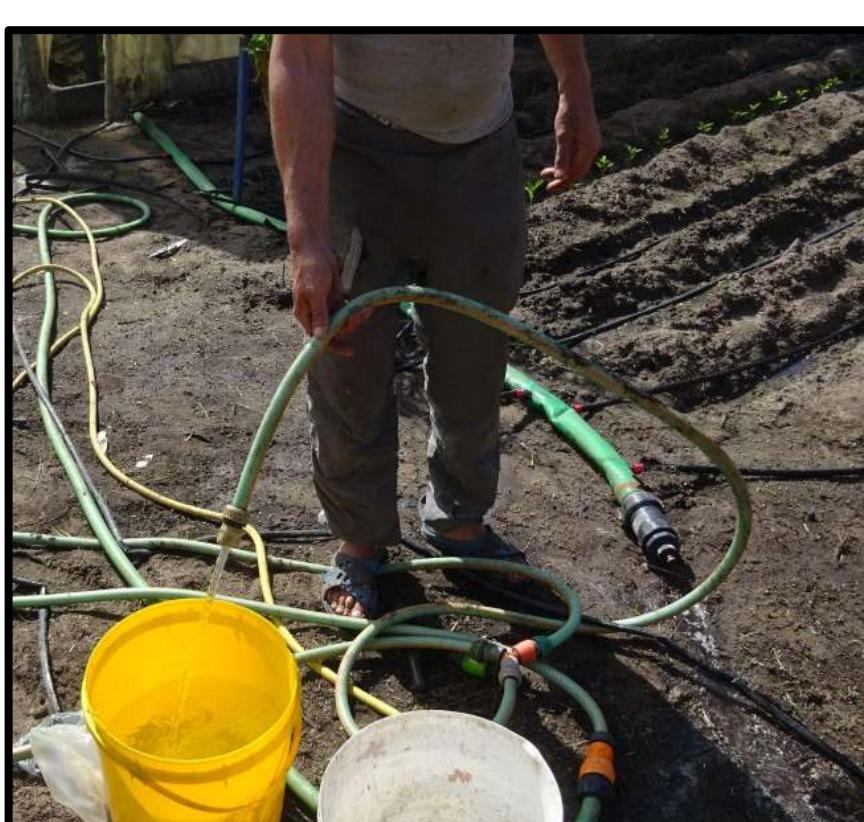
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Invisible pollution and groundwater uses in Estarreja

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Introduction

After pouring the clear water from the well of Dimitri, the chemical contamination of Estarreja groundwater feels invisible to the eye, but is nonetheless present. Can it yet alter individual uses of groundwater? Is its quality really unknown to the inhabitants, or could it just be invisibilized? This poster presents the preliminary results of an internship articulated around the HYDECO project, focusing on specific interactions of Estarreja OHMI's socio-hydrosystem. Between knowledge of contamination, visible infrastructures of past pollution, and practices of irrigation, this study aims to census and understand part of the uses relative to the water table, still contaminated, in a part of the rural zone near the Chemical Complex of Estarreja.



Dimitri and his vegetable garden behind him, fills a bucket with water from his well. April 2023, Póvoa de Cima ©FW

Methodology



Pre-investigation

- Bibliography on pollution in Estarreja and water-contaminated zone



Field investigation

- Ethnography in the field and institutions: Municipal event, conferences, observing daily life...
- Counting and identification of wells in the studied site
- Linking wells to a defined topology and their users



Semi-structured interviews (n=21)

- Elaboration of a question grid
- With the users of groundwater previously identified or encountered fortuitously



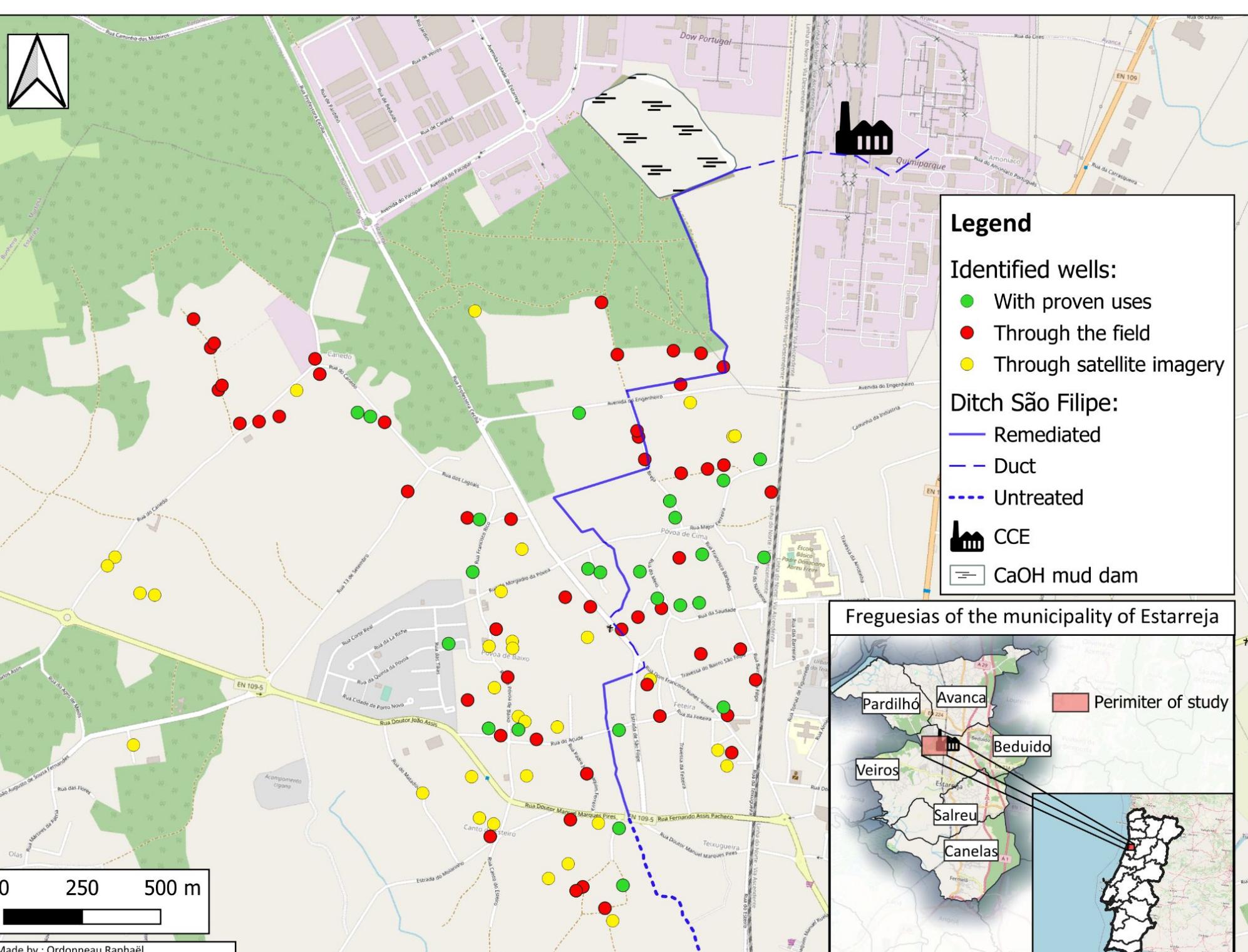
First day on the field in front of the n°9 well. Póvoa de Cima, Mars 2023 ©RO



Interview with João, in his vegetable garden freshly watered with his borehole. Póvoa de Cima, May 2023 ©FW

The wells, visible connection between people and groundwater

Localisations of wells identified near the CCE

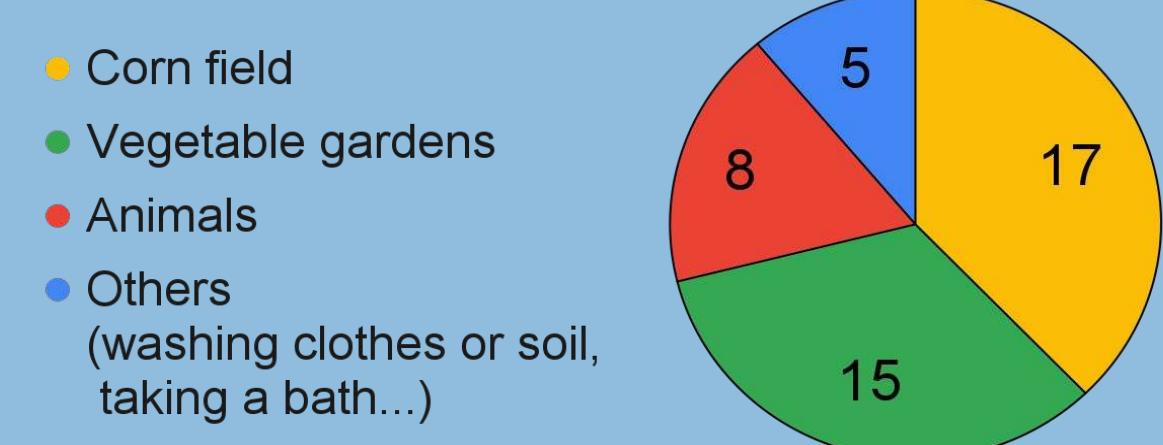


An agricultural area dominated by cornfields.

Irrigation is expected to intensify with the recent increasingly frequent and intense droughts in the region.

- 75 wells identified and visible through the field investigation (by bike or feet)
- 23 of them with proven use (oral or material evidence)
- 31 more identified through satellite imagery
- Untold numbers of boreholes

Overview of the number of wells according to their declared water use



Through the interviews, we note - although it is invisible in the landscape - that **boreholes** are also very common in the area. More profound, efficient and recent, it represent **another connection to the water table** and assert the large domestic use of groundwater.

Context: pollution and remediation work

Chemical Complex of Estarreja (CCE)

1950

CaOH mud dam
320000 tons of wastes were deposited under lime, in a park of about 5 hectares without any type of impermeabilization

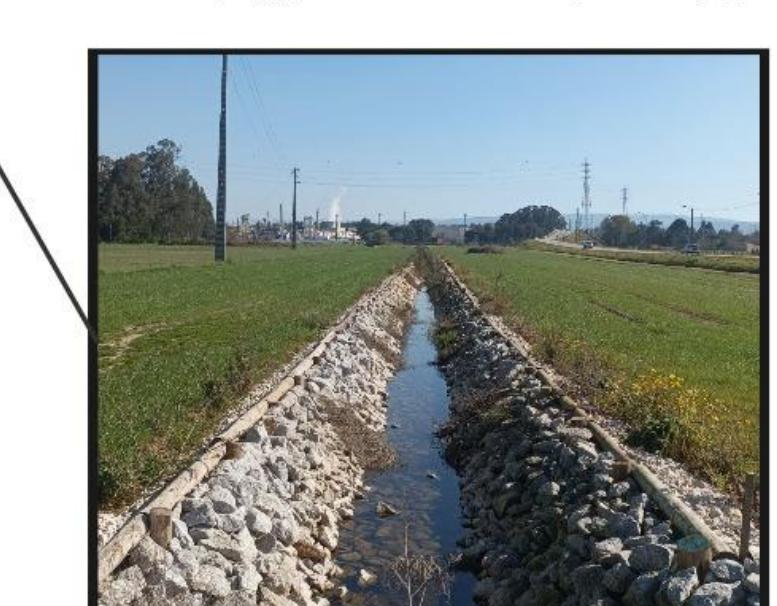
CASTELO BRANCO, Carlos Miguel Miraldo Ordens, 2007, Estudo da contaminação do aquífero superior na região de Estarreja, Master de Geociências (non publié), Universidade de Coimbra



Pollution

Agriculture and farming

680 Agricultural operations in Estarreja
INE - Recenseamento Geral da Agricultura - 2019



São Filipe ditch crossing a field with a well and the industries in the background, Póvoa de Cima, March 2023 ©RO

Environmental remediation (ERASE project)

300000 tons of wastes confined in a landfill

2005

Ditch São Filipe

2021



The São Filipe ditch, formerly used for the CCE industrial drainage until 1975, is now rehabilitated (excavation and paving).

Financial support of 5.646.482 € for a total cost of 6.642.921 €
Camara municipal de Estarreja-2021

Highlights from the interviews

Sample of population surveyed:

10 women

11 men

- mostly over 50 years old;
- 2 farmers by profession, 1 café owner, 1 president of inhabitants' association



Paulo in front of the São Filipe full of grass crossing his field. April 2023, Póvoa de Cima ©FW

- São Filipe Ditch:** The rehabilitation of the ditch is either **criticised or misunderstood**; "they did not finish the work, there are still heavy metals" says Paulo. Nonetheless, it seems that the risk of being in contact with heavy metal is ignored or overlooked, locals can only assume their presence. Indeed, some inhabitants, such as Paulo, still weed out the grass growing in the ditch to facilitate water circulation, a process that has become more difficult for them with the paving of the ditch.
- Groundwater quality :** From what our interviewees answered to us, all of them seem to believe that the **water is good enough to irrigate**, but none of them drink it. Lidia, who uses well water for her vegetable garden, goats and corn field, told us "if the water is clear it means it's good", while some have heard that the groundwater could run yellow or red. A few people said that they carried out analyses of certain components, we do not know the precise extent of those analyses. **No one mentioned being worried** about eating food watered by groundwater. Despite the



António irrigates his corn field with water from his borehole August 2021, Póvoa de Cima ©FW

knowledge of the contamination that some have expressed, there seems to be a **form of resignation** to it "Everything is contaminated, but what can I do?" says a neighbor of Dimitri.

- Drought awareness:** For António, a corn farmer, the **water scarcity** is much **more concerning than the contamination**. A majority of the respondents are concerned about the fate of the water levels.

Discussion : the individual uses of contaminated groundwater might continue

- A lack of communication** from the municipality and the factory appears, concerning the presence of pollutants in areas in contact with the population such as the Ditch of São Filipe or the water table. Lidia, who settled for 8 years next to the CCE, says she has never been informed about the water quality by the town council.
- However, even if the residents would be more informed about the concentration - and if this information would attest some risk - they would probably continue to use groundwater and remove the weeds from the ditch, as long as **better management** of water needs and solutions to rainfall runoff remain to be taken.