

Mapping former industrial and service activities to anticipate contamination issues for urban planning and redevelopment



EGU2020-13838

Context

No net land take by 2050 (7th EU Env. Action Program)

➔ New residential, commercial and recreational (green areas and collective gardens) urban projects on soils potentially contaminated by past industrial and service activities (e.g. gas station).

➔ How to anticipate contamination issues for urban planning and redevelopment?
By mapping former industrial sites at parcel scale.

Presentation

- How to map former industrial and services activities?
- Results/Limits
- Conclusions

Contact : b.clozel@brgm.fr or c.leguern@brgm.fr

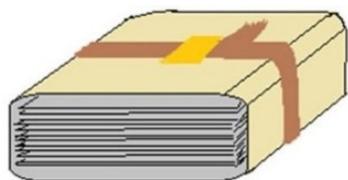
How to map former industrial and service activities?

1. Historical approach

Are you ready to spend days (weeks, months, or years) in **archives**?

related to past industrial activities since middle of 19th century, e.g.

- Decree of 15 October 1810 : “the creation of factories and workshops that spread an unhealthy or uncomfortable smell request for authorization”
- Law of 19 July 1976 on installations registered for the purposes of environmental protection



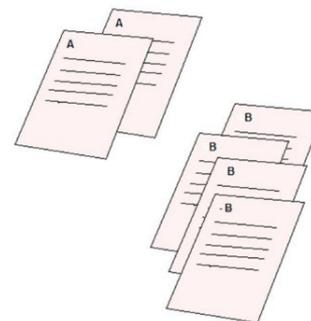
Open administrative file

May the activity have an impact on soil ? If yes ...



Identify the relevant information

Corporate name
Operator (s), Owner(s)
Activities :
- Creation date/duration
- Products used/generated :
nature and quantity
Known accidents/complaints
Address and any location items
Plans (photos, scans...)



Reconstruct the site's history

Gather information related to a same site



How to map former industrial and service activities?

2. Geographical approach

Locate the sites



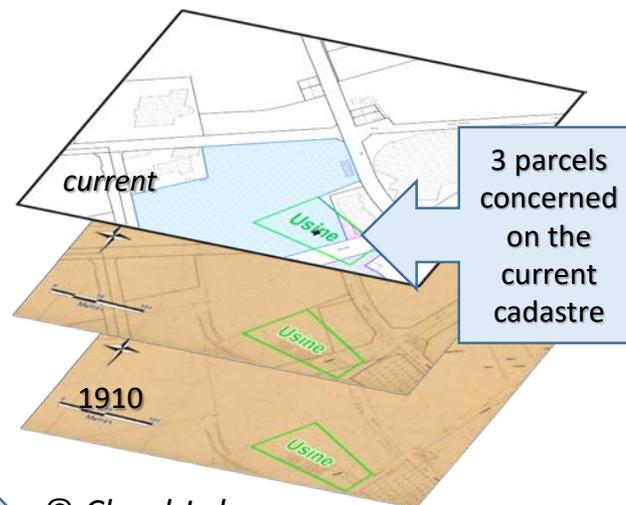
Iterative process, as with time
Corporate names have changed
Addresses have changed
Parcels have changed ...



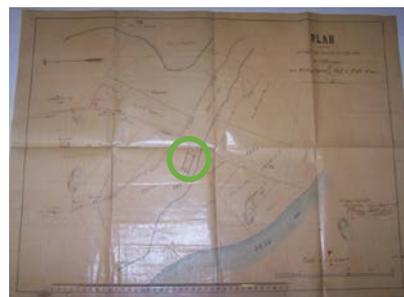
Contour industrial sites at parcel scale

- 1) Identify precisely past site contour, with collected maps
- 2) GIS superposition, contouring on actual cadastre ...

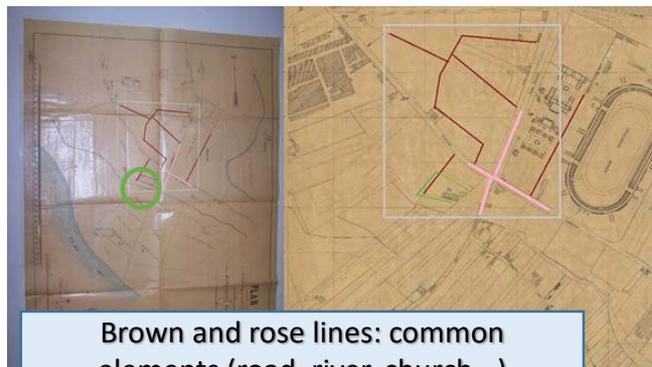
Not so easy, because some plans are old, not oriented, not detailed and the urban environment changed drastically



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Map from the administration file
(middle 19th century)
Site at the center of the circle



Brown and rose lines: common elements (road, river, church...) between the site map and an ancient cadastre (1910)



How to map former industrial and service activities?

3. Fill in databases with attributes and georeferenced information

- **National database**

Basias



- Essential informations
- XY coordinates



French database* related to past industrial and service activities

- **Local GIS**

- Site history updated
- Historic contour
- Parcel scale (or even more precise)



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* <http://www.georisques.gouv.fr/dossiers/pollution-des-sols-sis-et-anciens-sites-industriels>

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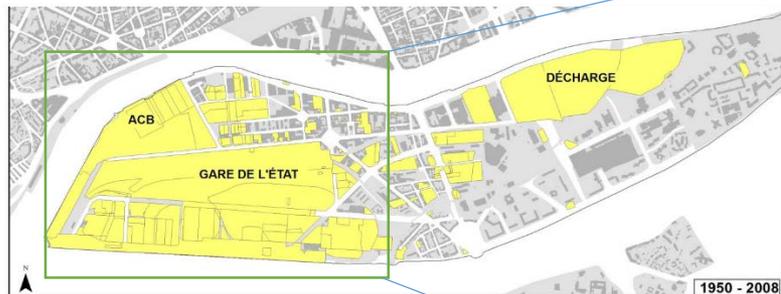
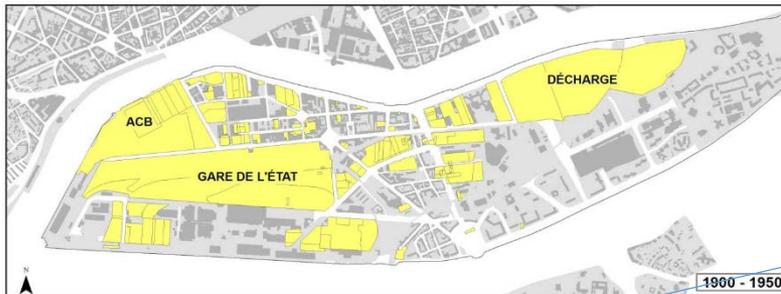
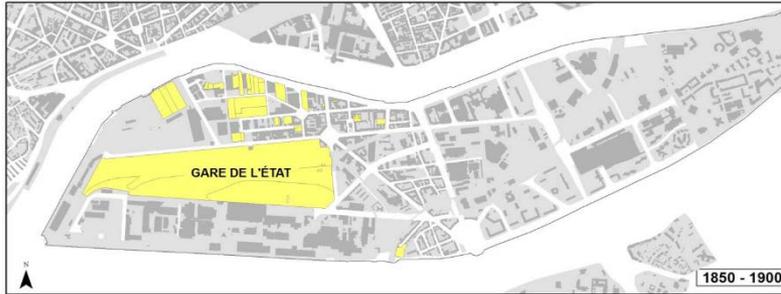
Results

Example 1: Evolution of industrial sites during the 20th century - district of the city of Nantes (France) (parcels with industrial activities are yellow)



Zoom on the west part of this area

- intra sites details (building, waste storage area...)
- Depending on nature and significance of activities, **assigning a rating for likelihood of pollution** (for lead in this example, from green to red)
- Comparison with soil measurements (dots, from green to violet) are quite good
- Hopefully not polluted everywhere



0 500 1 000 2 000 Mètres

Le Guern et al. RP-66013-FR



Inventaire Historique Urbain (IHU) de l'île de Nantes
Activités industrielles et de service potentiellement polluantes
Présence de sources potentielles de plomb

A l'échelle des intrasites

- Absence présumée
- Présence présumée - matrice 1 ou 2
- Présence présumée - matrices 1 et 2

Synthèse à l'échelle des contours de sites

- Absence présumée
- Présence présumée - matrice 1 ou 2
- Présence présumée - matrices 1 et 2

Caractérisation des terres
Teneurs en plomb sur solide (mg/ka MS)

- 0,1 - 54
- 54,1 - 148
- 148,1 - 500
- 500,1 - 1 000
- 1 000,1 - 15 000

Contours de l'île
 Bâti

Results

Example 2: Likelihoods of arsenic presence – Metropolis of Lyon

In progress

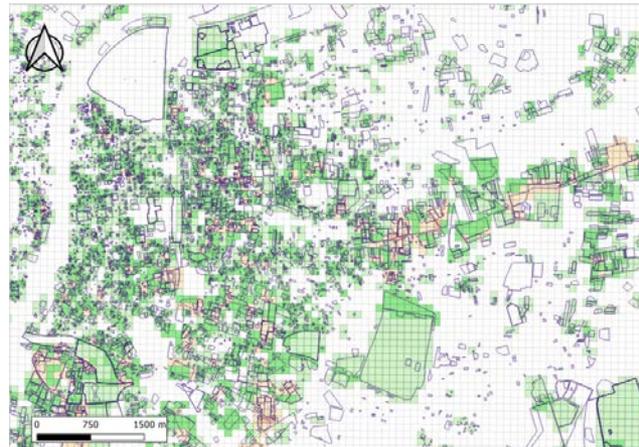
Maps made on areas ranging from 2 hectares to 538 km²

On a 100x100m basis, depending on nature*, duration of activities and number of sites
To be compared to soil measurements to validate and if so, to calibrate the As content that may be expected

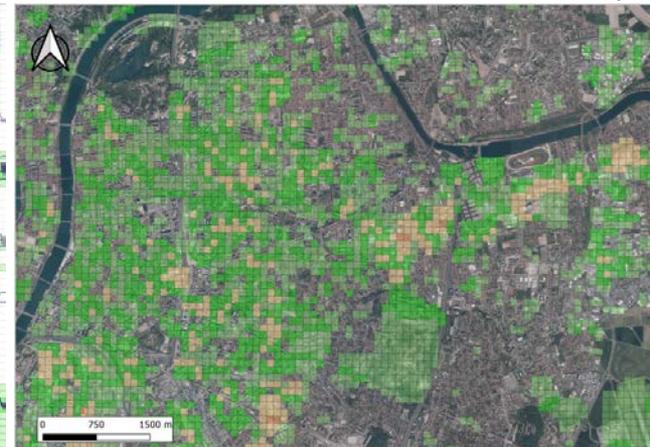
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Contours of sites (yellow)



Attribution of a color code (from transparent to brown) in relation to sites



Prospective map for As presence

* <http://ssp-infoterre.brgm.fr/matrice-activites-polluants>



Limits

The archives source can't guarantee that all sites are identified (and localized)

- Possible loss of archives

- Some activities didn't comply with regulations

- Some activities were not subjected to regulations (evolution of the regulation)

- No information about military or nuclear activities

- Human errors during collecting information

The possible pollution is not limited to site area

Other sources of soil pollution:

- e.g. anthropogenic deposits due to city evolution

- Deconstruction and removal and loading of debris (or spoil)



In conclusion

Even if some limits exist, the common and possible applications of GIS Maps (and related information) of former industrial and service activities help operationally local authorities (land, technical and urban planning services), urban planners and engineering offices to :

- anticipate potential pollution,
- contribute for mapping soil multifunctionality, see presentation EGU2020-11491
- guide and size field investigation programs,
- help in possibly reposition and reconfigure the right-of-way of sensitive areas such as green spaces,
- assess a maximum volume of excavated land,
- ...

Local authorities and urban planners save money on the financing of historic sites studies (and this free up more resources for field investigations). They may also use this knowledge in the negotiation phases when purchasing land.

And you, what kind of application would you have of these maps?

We would be pleased to discuss with you. You have already the possibility to exchange with us by e-mail : c.leguern@brgm.fr or b.clozel@brgm.fr

We will have the opportunity to chat on Friday 8th of May between 16:15–18:00, please save the date !

Mapping former industrial and service activities to anticipate contamination issues for urban planning and redevelopment



Abstract

Anticipating soil contamination problems is a key issue for urban redevelopment and planning. Indeed, it is important to avoid unexpected delays and costs as well as bad image in case of unexpected pollution problem. It is also useful in order to optimize soil functions and services. In this frame, we show the interest of mapping historical (potential) sources of contamination, based on the example of (former) industrial and service activities (eg. gas station) that are a main source of contamination in the urban environment of (former) industrial countries. In particular, we present a detailed geographical information system developed in France and its several possible options.

The methodology uses the public existing inventories on (potentially) contaminated sites (basic site knowledge and point localization), completed by deeper archives searches. In this frame, we gather administrative details such as the nature of activities, their date of beginning and duration, the nature of the chemical products/materials used/created by the activities, their address and maps that are collected with great care. We then use a GIS to contour the geographical area of each site after maps adjustment and fill in the associated database. We then adapt the interpretation and visualization options according to the needs of the operating partner (urban developer, planners, city...) and the size of the studied territory. One option for instance consists in digitalizing all the known potentially contaminated sources within each site. Another option proposes an interpretation of the potentially contaminated surfaces in terms of potential contaminants.

The results consists in interactive maps synthetizing information spread in various archives since the 1800s about industrial and service activities. The territorial historic synthesis allows a gain of knowledge compared to the site-to-site approaches usually applied. We will show how this information, easily available thanks to GIS application, is already applied to set up in situ investigations programs preliminary to large redevelopment projects (eg. at district scale) or to anticipate contamination issues during street work (eg. buried infrastructure) and how it begins to be also applied for management of excavated soils.

Although it is impossible to map 100% of the former sites, the knowledge is very useful to limit contamination problems in the way it helps localizing precisely potential point-source contamination sources linked to (former) industrial and service activities. It is complementary to other knowledge on source contamination such as anthropogenic deposits that are another main source of urban soil contamination.

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