Environmental damage remediation: the point of view of a service provider

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Part I – Giving soil a second life

Renault's factories former industrial site on the Seine river. 300,000 metric tons of materials were treated by Veolia.

Managing the end of industrial cycles

- In many places of Asia, America, Europe, pollutants derived from industrial activity have accumulated in the soil, posing a threat to ecosystems and to public health via the food chain.
- Veolia, world leader for environmental services, set up in 1990 a specialist subsidiary, GRS Valtech, to draw up proper soil remediation programs and to meet land conversion standards.

- There is a sharp increase in the number of obsolete installations and factories. Public authorities and companies will more and more have to manage the end of industrial cycles.

A great diversity of pollutants and sites

- **Very diversified pollutants:**
  - *Organic pollutants: aliphatic hydrocarbons, aromatic hydrocarbons, benzen, toluene, PCBs, dioxins, furans, persistent organic pollutants, pesticides…*
  - *Inorganic pollutants: heavy metals (eg: arsenic, lead, mercury, cadmium, nickel…), other metals (eg: selenium), ionic species (sulfates, chlorides, fluorides…), complex cyanides…*
  - *Problematic mixtures of pollutants*
- **Very difersified situations:**
  - *Rehabilitation of brownfield*
  - *Rehabilitation of former landfill facilities*
  - *Groundwater and water table treatment*
  - *Remediation of industrial sites*

A progressive reinforcement of the legal framework

1. **Before 1990, it was allowed to build on the site of a former petrochemical or metalworking plant (in France).**
   - *If the site was later found to be polluted, it was considered sufficient to remove surface pollutants, without treating deeper pollution in the ground or water table*
2. **Initially based on a national survey and databases, French site remediation policy was refocused in the late 1990s on managing the risk according to use, making the producer responsible (polluter pays principle).**
3. **In the 2010s, a law was passed specifying that the party that calls for a change of use for the site shall bear the additional cost of remediation.**
4. **Public planners, industry and real estate developers, are now aware of the concepts and consequences of soil pollution in terms of public health and brand image.**

An environmental challenge… and a large market

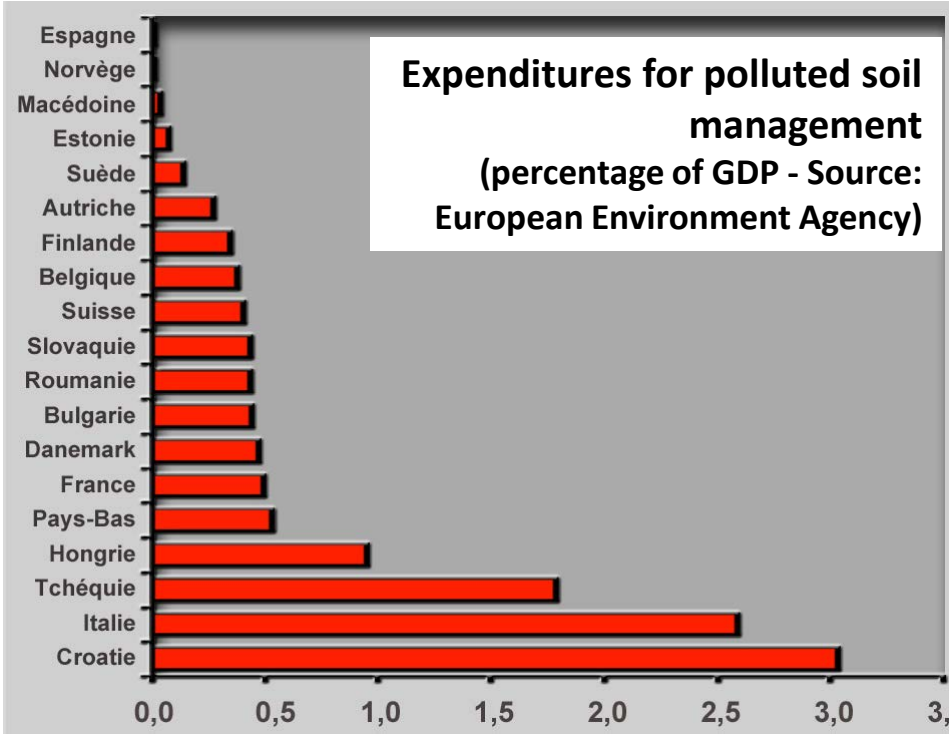
- **In Europe:**
  - *Almost 3 million potentially contaminated sites*
  - *Although industry is the primary instigator of remediation projects, real estate developers represent another major driver in soil remediation, particularly in peri-urban and tourist areas.*
  - *Demand for soil remediation is higher in countries with accurate environmental awareness and strict regulation.*
  - *This business has only been in existence for 25 years and has not yet reached maturity.*
- **Throughout the world:**
  - *For the sake of their reputation, blue-chip industrial firms must develop soil remediation programs in their former active sites.*

Soil remediation issues and environmental services to be provided

- **Numerous sites → Site classification and prioritization**
  - *2 categories of site, according to pollution risks: active zones known to be polluted and passive zones where there is a likelihood of pollution.*
- **Numerous orphan sites → A dedicated policy with specific financial means has to be set up.**
- **Uncertainties about the nature and volume of pollutants → Therefore there is a growing need for caracterization studies: sampling campaigns, pollutants identification and quantification**
- **Soil remediation: an activity at the meeting point of several complementary, complex and high level expertise:**
  - *Combination of in-situ, on-site and off-site treatments.*
  - *Capacity to mobilize mobile units and fixed treatment facilities*
  - *Recovery and separation techniques of any matrix (solid, liquid and gazeous)*
- **Offering a complete package for solid waste, liquid contamination and gas emissions, in order to avoid the transfer of pollutants from a reservoir to another one (eg: from soil to water, from water to the air…)**

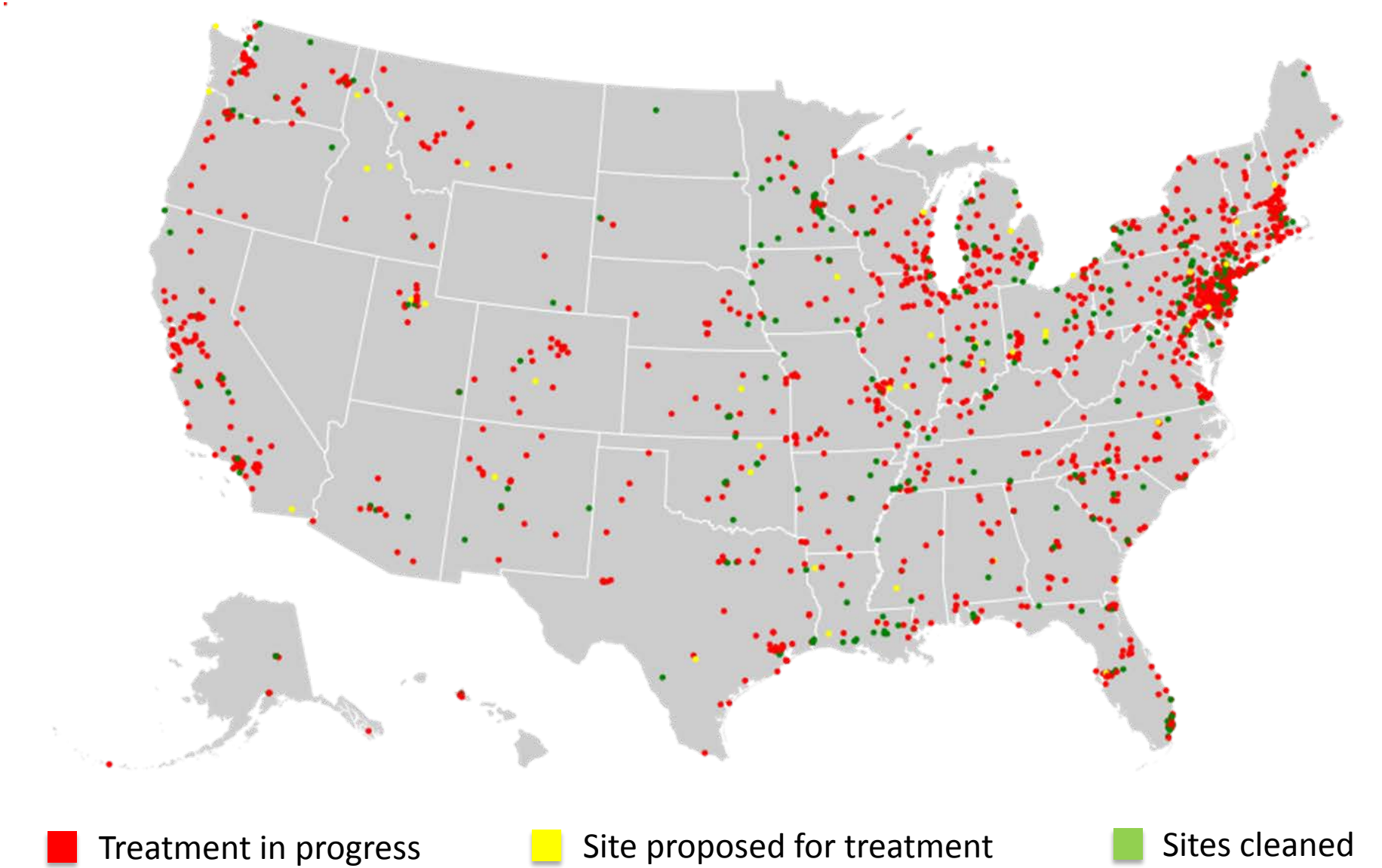
Financing soil remediation

- **The cost of soil depollution can be substantial for large site or in case of highly toxic contaminants (eg: asbestos).**
- **Industrial companies don't want to bear the risk of extracosts:**
  - *In order to overcome their financial reluctance, Veolia is one of the few players to be operating on a turnkey price basis for depolluting a site.*



- **A limited implementation of the *polluter pays* principle**
  - *According to the European Environment Agency, almost all Member States apply the polluter pays principle. However 35% of the money spent on remediation comes from public funds.*
- **Public aid is still very necessary to treat orphan sites (eg: EPA's Superfund in the US), in ordre to restart later new activities on the same site.**

Map of the polluted sites benefiting from the Superfund for rehabilitation



Example of soil remediation technology: in-situ thermal desorption (1)

- **A technique developed by Veolia:**
  - *It uses the thermal conductivity of the soil to avoid excavation work, which is always longer and expensive.*
  - *The treatment consists in heating the soil to a temperature of 400-800° C by introducing heater needles, to convert the pollutants into a gaseous state.*
  - *The gases are captured in a series of sinks and processed in various way (condensation, catalysis, photo-oxidation, scrubbing, activated carbon, etc.).*

- **Advantages of this process:**
  - *90–99% reduction in pollutants depending on the organic compound.*
  - *uniform improvement of the subsoil regardless of the variations in soil type and pollutant distribution.*

  - *a treatment faster than with traditional in-situ techniques.*

Example of soil remediation: cleaning up a former watchmaker factory in Switzerland

- **Context:**
  - *The factory degreased metal parts with chlorinated solvents for 50 years.*
  - *Processed waters were dispersed into the subsoil.*
  - *Chlorine fluids have impacted the soils over 2 000 m² up to 12 m deep. A contaminated plume have spread over 10 000 m² in groundwater.*
- **Solution: Soil Venting Thermal Desorption**
  - *11 venting wells, depth of 8 meters*
  - *13 pumping wells, depth of 14 meters*
  - *43 extraction wells, depth of 5 to 10 meters*
  - *32 hot tips, depth of 7 to 12 meters*
  - *8 gas monitoring wells, depth of 12 meters*
  - *4 gas and water monitoring wells, depth of 14 meters*
- **Results:**
  - *More than 10 million m^3 of treated gas*
  - *1,282 kg of chlorinated solvents extracted and 4,800 m^3 of water pumped*
  - *At the end, the inlet total chlorine concentration of the venting unit was less than 10% of that at the kick-off (contractual target).*

Part II – Tianjin: contributing to the management and cleanup of an accidental pollution

The night of August 12 to 13, 2015, in Tianjin

- **A powerful explosion swept through the chemical warehouses of the port and the surrounding residences.**
  - *111 types of hazardous cargo had been stored within the immediate blast zone, including 800 metric tons of ammonium nitrate and 700 metric tons of scattered sodium cyanide.*
  - *Sodium cyanide is one of the most deadly poisons known to mankind, with a fatal dose measured in milligrams.*
- **Burst water mains brought the fear of the chemicals spreading through the soil, and raised the issue of potential contamination of the city's water.**
- **Authorities then commissioned several trusted firms, including Veolia, with the mammoth task of preventing a major environmental disaster.**

Tackling the toughest jobs

- Veolia offers the most comprehensive hazardous waste treatment facilities in Tianjin, licensed to treat 48 of the 49 hazardous materials classified by the government.
- Although Veolia's Hazardous Waste Integrated Treatment Center in Tianjin has over 15 years of professional experience and its facilities were dealing with cyanide-contaminated wastewater on a daily basis, the scale of the Tianjin cleanup was unprecedented.
- Veolia immediately began planning and making arrangements for related equipment, personnel and vehicles to assist in disaster relief operations.
- The wastewater from the blast site was widely dispersed, and the harsh terrain at the scene added much difficulty to the collection and cleanup work.
- After collection, the cyanide wastewater was transported by dedicated transport vehicles to Veolia facilities for treatment.

Cleanup helps restore confidence in Tianjin

- Each batch of wastewater collected from the blast site needed to undergo in-depth laboratory analyses and tests.
- An action plan was derived from the detailed data obtained from these analyses, and the cyanide wastewater was then treated, according to levels of concentration, by mature technologies, including incineration or physico-chemical treatment.
- In total, the Group collected and treated over 10,000 tons of polluted wastewater.
- The work took around six months and was completed in early 2016.

Tianjin hazardous waste treatment plant

Key Veolia waste management projects in China

- Hazardous Waste Management Contracts
- Landfills and Landfill Gas-to-Energy Contracts
- Waste-to-Energy Contracts

Environmental services to support China's industrial development and environmental policy

Tianjin contract

- *Contract's length: 30 years, since 2003.*
- *Type of contract: BOO*
- *The facility trat hazardous waste produced by 1,500 industrials.*

Contract

- *Treatment capacity of the whole facility: 97,000 tons/year*
- *Integration of all processes, to offer a great diversity of treatment, adapted to each type of waste: physio-chemical treatment (neutralization, reduction/oxidation, precipitation), high temperature incineration (13,500 tons / year), biological treatment, autoclaves for medical waste, secured landfill, recycling unit…*
- *Advanced technologies that meet international standards.*
- *Laboratory units to analyze, test and characterize hazardous waste at their arrival in the facility and during the treatment process*
- *Treatment of 48 over 49 categories of hazardous waste (except explosives).*
- *A rigorous informational management system to assure traceability of waste*

Results

- *Reduction of pollutants discharged into the environment*
- *Compliance with chinese high level regulations*
- *Production of recycled raw materials, saving natural resources*
- *Improvement of industrials reputation*

Environmental services provided to industrial firms

- **For maintaining their license to operate, industrials must comply with tough environmental standards: they need high quality services in order to respect these standards.**
- **We are helping them to address this challenge, by assembling a broad array of know-how critical to the treatment and recovery of hazardous waste:**
  - *We offer them cutting edge expertise, ultra-specialized workers and technologies, a carefully designed organization, flawless logistics on a scale to match the volumes of hazardous waste produced;*
  - *To provide this service, it is necessary to manage the traceability of materials flows of waste from collection to elimination or recycling.*
- **The main objectives of our mission are:**
  - *Avoiding contamination risks in the environment and protecting public health*
  - *Assuring compliance with regulations*
  - *Optimizing materials recycling (locally and at a lesser cost) whenever possible*
  - *Minimizing costs for industrials*

Tianjin hazardous waste treatment facility

Conclusion

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- **Almost all pollutions can be treated.**
- **The scale of sites is less and less a limiting factor.**
- **Restoring soil, depolluting rivers, rehabilitating sites are good; not deteriorating them is better…**
- **Without political will nor appropriate financing, nothing is feasible.**
  - *One cannot apply a strong environmental policy with weak regulatory mechanisms!*
- **The issue of regulation is essential to better protects:**
  - *workers' health and safety*
  - *the public health of neighbors*
  - *the environment.*
- **The linkage between economic and environmental performance is the bedrock of services to industrial customers. It conditions their acceptance to adopt stricter environmental protection measures.**

Thank you for your attention