REPORT by Philippe FICHAUX

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Urban development and potentially polluted sites

The soils pollution could really be, after air and water pollutions, one of the major environmental stakes of the future generations. These last 30 years, some affairs in Europe and USA have known a great impact with tens or hundreds people ill or died because a soil pollution, particularly from cancers.

A lot of modern great cities, and it is the case of Donetsk, have been built with the industrial revolution of the 19th century. It's a very particular type of urbanism. In general, there's been the construction of the plant or of the mine, then all around the construction of housings then of infrastructures (schools, hospitals, city hall, church, ...). In this beginning of 21st century, the cities have changed a lot but the industrial tissue has changed too a lot. We have seen since 1974 the decline of great industries as metallurgy, coal, textile. A lot of plants have closed and have been abandoned, the companies or the owners having disappeared. The city also have changed and the lifestyles of the inhabitants too. The city had to guest more and more inhabitants, the housing has been restructured and the miners' cottages of the 19th century have been razed to let place to flats buildings. Nowadays the commerce asks for more and more spaces. The services to the populations have developed with schools, old people's homes. If in western countries all these changes have spread between 1950 and 2000, the eastern countries have to undergo them harshly since 1991. It's only to see the speed of the urban re-arranging in Donetsk for 2 or 3 years and the upsurge of constructions, of creations of shops. This movement concerns firstly the centre of the cities because it is there that is the major land pressure, there that entrepreneurs want to create new shops, there that the most rich people want to live, and so there that are built new buildings but also new crèches, new schools, and so...

In such conditions, the presence of tens hectares, abandoned downtown by company which disappeared, constitutes a legitimate temptation for the planner, either it is public (city hall) or private (property developer).

The problem is that often these lands are polluted. If only speaking about France on last years, some affairs have shaken the public opinion. On the site of a former Kodak plant, some tens children affected in a nursery school. On the site of a former Bayard plant (making clocks with radium luminescent hands), some tens families living in cottages contaminated.

It has been necessary to regulate but it soon appeared that nobody could manage from one day to the next some tens thousand potentially polluted sites if only speaking about France. Likewise, at this era, who could define if a soil was polluted or not : which limit rate to adopt for each of the tens thousand substances involved ?

The agreed methodology has known some steps.

The first was to dress an inventory of suspect sites on the base of a nomenclature of industrial activities as former IPPC, the facilities of the gas networks, the service stations, dry cleanings, ...

In France as the most of industrialized countries, the 2/3 of industrial pollutions of soils come from hydrocarbons and chlorinated solvents; the rest is pro-

voked by metallic elements, among which 4 distinguish clearly concerning health risks: mercury, lead, cadmium and arsenic. The 4/5 of these pollutions, hydrocarbons, solvents and metals, come from 5 industrial sectors: iron metals; chemicals / para-chemicals / pharmacy; waste treatment; oil / natural gas; coking plants / gas plants.

When one tackles the problems of polluted soils, the first difficulty, and without any doubt the main, comes from the fact that the pollution of soils is inscribed in very long time scales. In very first place, the formation of a soil is a very slow process (100 000 years for 1 meter thickness), which is not at the time scale of human activities: the soil is by nature a non renewable resource. Then the soil is the main recipient of the pollutions of industrial origin (hydrocarbons, solvents, metallic trace elements): it's a "well" of pollution. The soils have accumulated considerable quantities of trace elements close industrial zones and urban zones: it's estimated around 1 million tons the yearly tonnage stored in soils for each of the metals lead, zinc, copper, chromium.

The second difficulty, specific to the approach of the phenomena of pollution of soils, comes from their scientific complexity. The soil is by nature an extremely complex and heterogeneous middle; by nature and from the fact of the history of its constitution, the soil is a dynamic system, interactive, of 5 components – mineral matters, organic matters, water, gas, organisms (micro-organisms, fauna, roots of plants) – inside which develop complex physico-chemical phenomena and above all instable.

Last, the heterogeneity of the repartition in space and the instability of the phenomena in time are characteristics which will always make difficult to establish a reliable diagnosis of pollution of a site on the base of spot samplings. It's always possible to improve the diagnosis by multiplying the sample but it also multiply the costs. A positive audit (concluding to pollution) doesn't allow always to draw with certitude its limits neither to control the evolutions; a negative audit is not always a guaranty of absence of pollution or of future source of pollution.

Some countries as Netherlands, Germany, have believed to be able to solve the difficulty by a normative approach, enacting official tables of limit values, uniformly available on the whole territory; the European commission is still very attracted with this approach. It's unfortunately a way that can only lead to excessive expenses, as Netherlands experienced and came back, or, more naturally, to absurdities: for example, according to some Dutch standards (for arsenic, cadmium, …) the whole territory of Brittany and of Central Massive should be "de-polluted". Last, because this task becomes too heavy as the same it is debatable, this approach leads most often to inaction.

France made the choice to promote the process of risk analysis. The risk study works on a triptych: source of risk, transfer path, target. This approach is much more fitted to the nature of the problems to be solved, because specific to each site, to its particular situation, to the willed use. Even though the normative method is falsely simple and can only lead to impasses, the risk study is well fitted but it is heavy by construction and often long because, as soon as the problem has some size, it must proceed by iterations between a range of remediation programs, their relevant costs and the diverse future uses that can be

searched for the site. It's already understandable that, for a given site, depending the points of view and the interests of each one – industrialist, owner, purchaser, city, planner, etc. – the valuation of the necessary remediation measures and the associated costs can be subject to a large range.

Two major elements have to be considered. From one hand, it must be known the extent of the problem. It's the process of inventory. From other hand, it must be treated "sensitive" situations. France has chosen two parallel ways: the sites identified as the most dangerous (according to the data of the inventory) must be immediately studied and the study must be submitted to the Administration, and when each change of property of a site which have had a suspicious activity a study must be done and annexed to the sale act.

- National inventory

In the middle of the 80s, the DRIRE inventoried a hundred of "priority sites". The first census done in 1994 displayed some 700 sites. Updated in 1996, it inventoried then 896 sites of the on going national inventory.

Among these 896 sites, 90% are in a vulnerable zone – housings close from less than 100 meters, waterway close from less than 50 meters, watertable close to – it's even for that they are censed.

- Historical inventory

This inventory of former industrial sites and service activities has been launched initially in 32 departments (1/3 of national territory). A decree précised the mode of the creation of a database of these ancient sites. These historical inventories, principally based upon the consultation of departmental archives are long and exacting tasks. At the beginning of 2000 only two regions had finished. When the whole territory of France will be covered, it's expected 200 000 to 300 000 censed sites.

- Methodology of the studies

The regulation established the fundamental principle of the treatment fitted to the effective impact of the polluted site on environment, on the base of the notion of risk; the first step of the process is the Simplified Study of Risk (SSR).

The study of the soils includes a documentary phase, aiming to gather the maximum possible information and the more often an investigation phase on the field, aiming to acquire the necessary data for the implementation of the SSR. The procedure of SSR is based upon a method of scoring of each the parameters characterizing the site, then the elementary scores are combined in aim to get a combined quotation allowing to classify the site as:

Class 1: site requiring deep investigations (and automatically inscribed to the National Inventory)

Class 2: site subject to an adequate monitoring (at the initiative of the Administration, these sites can also be inscribed to the National Inventory)

Class 3: site "no problem"

The scoring, and so the final quotation, are done according the on going or the forecast uses of the site in its environment at the time of the study; all modification of the environment or of the use of the site must imply a new study.

So, according to the results of the SSR, it may be necessary to lead a deep diagnosis, even a Detailed Evaluation of Risk (DER). All the methodologies of SSR, deep diagnosis, DER, are described in practical handbooks published by the science centres of the Ministry of Environment.

At the end of that, an administrative decision can be taken about the becoming of the site. According to the importance of the risk for public health, it can be decided authoritatively to make done remediation works. But the notion of remediation bring us back to the question: what is a contaminated soil? The doctrine of the French administration is to bind the acceptable rate of pollution to the use of the land. So we have the case of a former chemical plant where 30 ha are highly contaminated by arsenic; this pollution being neither soluble nor mobile, the administration proposed to do nothing if the site stays as an industrial site under the control of the administration; on the other hand any other use (housing, culture, …) should imply the remediation of the site. Our equation is always pollution = source of risk + transfer path + target. It's possible to remedy by suppressing the source of the risk but also by blocking the transfer path or by moving the targets.

The remediation of an industrial site in urban environment, beyond a technical approach necessarily specific, is only in fact one of the components of the rehabilitation of the city and of the capacity of the conurbation to develop answering to new needs in the frame of a sustainable development. But it's needed to know first of all what are the potential problems and it's about public health and tens or hundreds lives are at stake. Then, case by case, it will be possible to decide on a cost/benefit base the interest to launch remediation works in aim to make acceptable such or such development projects.