The social construction of risks: Storing solid wastes from mills underground (1810-1917)

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How did the 19th century view the mills that had sprung up and the risks of burying their solid wastes? Why was underground storage not seen as a risk? After describing the context and motives for burying wastes, the effort is made to understand how people perceived the responsibility for these wastes; and an explanation of this "social construction of risk" is proposed. Mill wastes were seen in relation to the ordinary reality of rural life; and the ideas formed about them were copied on those about animal excrements. Although mills "denatured" the environment, their production was interpreted as being natural ("things fix themselves") in a rural setting ("everything is put back to use"). In this way of thinking (before modern industrial catastrophes), the surroundings "naturalize" wastes and residues from the mills. Owing to the context and ideological factors, there was no awareness of a specifically industrial risk

Austry in 19th-century France was expanding while spawning inconveniences and nuisances, but the awareness of the consequences and results of production activities did not seem to be keen.[1] Although the effects on "sanitation" were observed, the impact on what would later be called the "environment"[2] was not the subject of learnèd studies, nor subject to special administrative, judicial or political decisions. How to explain this silence and the eventual emergence of an awareness of environmental risks? These questions lie at the center of this article about "burying" solid residues from mills.

Omitted from consideration herein are human and animal excrements, the carcasses of animals slaughtered for their meat, and rags. Liquid wastes have long been studied, at least the evacuation of waste water and sewers. The liquids released by industrial activities were poured on or in the ground, or in a stream. Being a liquid was a property that made this sort of removal appropriate. Liquid wastes from people, the result of biological functions, did not come from using techniques (TARDIEU & ROUSSIN 1869, BROUARDEL *et al*. 1902), unlike the residues left from making dyes and pigments (CARRY 1888a & 1888b).

The harmful effects of these new substances were familiar to the doctors who studied their ravages on the skin, who observed the occupational diseases caused by making them, who warned against wallpaper or food colorings. Apparently no research has been made on the storage of wastes from the mills where dyes or pigments were made.[3]

According to the prevailing idea in the 19th century, danger and nuisances were immediate, while environmental risks were neither perceived, imagined nor socially constructed. For the period under study herein, from the decree of 15 October 1810 to the act of 19 December 1917, texts on hygiene had little to say about solid wastes.[4] Legal provisions only targeted wastewater (Article 7 of the act of 1917) and had

[1] This article, including quotations from French sources, has been translated from French by Noal Mellott (Omaha Beach, France).

[2] P. Vidal de la Blache (1922:103) was "*the first to introduce the term 'environment' in French scientific vocabulary*" (MASSARD-GUILBAUD 2002:65).

[3] The exception is the cases of poisoning in 1864 in Pierre-Bénite: "*The gatesman's house is a short distance from this factory; the gatesman's wife has just died, and the gatesman himself is seriously sick*", a letter from the police (*gendarmerie*) to the senator from Rhone Department, 14 May 1864, ADR 5 METCL/17.

[4] "*We shall be very brief about solid wastes from commerce and 'industry*" (MACE *et al*. 1910: 340-342).

nothing precise to say about solid wastes,[5] This topic has been unexplored.

What are solid wastes and residues?[6] A scrap is something that can undergo a manmade transformation, whereas residues are what remains after the transformation, and wastes are residues (*e.g.*, slag) that human activities can no longer transform. Coke is a residue that remains after the pyrolysis of coal, whereas cinders are a waste product of combustion. Walnut husks are scraps for persons who cultivate walnut trees but a residue for dye-makers. In Lyon and in Rhone Department, France, from which examples will be cited herein, solid residues were produced by soap works (carbonates and sulfates from lime), mills for making phosphorus (sulfates from lime), candle-makers (carbon sulfides and sulfates from lime) and dye-makers (arsenates during the period when fuchsine was made by using arsenic acid).

After describing how people at the time perceived solid wastes, this article inquires into the emergence of an awareness of the risks related to burying such wastes. It will then propose a model about how risks are socially constructed while showing that certain conditions were missing in the 19th century for the emergence of an awareness of the risks related to wastes

A short history

As a preliminary, let us recall what constituted "solid residues", how they were legally regulated, and which administrative and institutional arrangements existed to oversee them.

J. Rollet (1879) distinguished between: solid, inert residues (such as slag); residues that were a cumbersome annoyance owing to their smell (piles of soda ash emitting hydrogen sulfide) or bulk (the solid materials left after decanting the water used to make dyes); and toxic residues (arsenic-laden substances left over from the production of aniline). The distinction between solid and liquid wastes was convenient but not well-founded. For instance, the leaching of solids results in liquid wastes;[7] and the washing of minerals leaves water containing toxic elements.[8]

How residues were perceived

In his treatise on industrial sanitation, C. Freycinet (1870:346-347) defended a certain conception of residues as an "inevitable consequence of manufacturing".[9] Industrialists did not pay attention to the nature of such wastes since treating them would lower profits. They considered wastes to be a necessary outcome, namely the share of nature that the manufacturing process could not transform. Rather than being a natural substance that resisted efforts to transform it, residues were what the manufacturing process itself left over. Residues had less to do with nature than with techniques, which were unable to fully transform raw materials. For L. Poincaré (1886:8), residues were inevitable and worthless: "There is not a single industry that, alongside the wanted product, does not produce substances that, worthless and often harmful, are like the chips of stone that a sculptor is forced to make and throw away in order to give a shape to his work." The figure of the sculptor, with reference to Aristotle's Metaphysics (1981:6, 1048a), showed that there was a creator in the manufacturing process who knew how to bring out what was essential in matter. Accordingly, human activities extracted a useful form from matter, like the sculptor did with the statue; and what was leftover was of no consideration. This remainder was beyond human consideration and without interest or worth for manufacturing. Worthless and cumbersome, residues and solid wastes were byproducts of the intended production process: "An industry always produces, alongside the product intended, worthless substances, wastes and residues, that have to be ridded" (VIGOUROUX 1897-1899:498, volume 2).

The authorities exercising oversight

The ancestor of legal measures on solid residues was the decree of 15 October 1810 as modified by a decree of 15 January 1815. These decrees defined three classes of establishments as a function of their nuisances (BLOCK 1877:903-907). There was also a body of law on the rights of third parties to compensatory damages as decided by courts of law[10]. A judge could award compensation for future damages "provided that they are for sure and inevitable" (RESSICAUD 1877:167) — an extension into the future of a tort committed today, such as dumping water pumped from a mine. This did not, of course, cover future torts that were not clearly linked to a present-day activity, this being evidence of the lack of thought given to the evolution of residues dumped in the environment.

Several authorities were in charge of exercising oversight, while controls upstream in the manufacturing process were neither imagined nor foreseen. Among these authorities was the Advisory Committee

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[5] Apart from deposits of rubble from demolitions. Burot, a mechanic from Villeurbanne, sued Monin, an entrepreneur from Lyon who "*daily dumped the contents of seventy cartloads of rubbish in a depleted quarry, 150 meters from my home*", a letter of 2 October 1910 to the prefect of Rhone Department (ADR 5M/105, pièce 4593).

[6] HARPET (1998:47-75); for a classification of industrial wastes, see pp. 474-477.

[7] "*The factory at Pierre-Bénite, where roadways and backfills had been made with residues that, calcic and arsenical from the making of fuchsine dye, soaked by the waters of the Rhone River, poisoned wells and people*" (LACASSAGNE 1891:344).

[8] The iron pyrite mines in Sain-Bel and Chessy exposed the environment to such dangers (LACASSAGNE 1891:488).

[9] "*There are few industrial establishments that do not occasion solid or liquid wastes*": SEINE (1855:103).

[10] "*We recall that local regulations usually forbid dumping solids or liquid wastes from workshops, factories and mills in streams and waterways and that, in case of an offense, industrialists are liable to a fine and even a prison sentence in case of a second offense*" (RESSICAUD 1902:137).

of Public Hygiene (decree of 10 August 1848), which replaced the High Council on Health (Article 55 of an order of 7 August 1832). In departments, prefectures, subprefectures and sometimes cantons, councils of public hygiene and salubrity exercised oversight (decision of the government on 18 December 1848). According to A. Corbin (1986:155-156), they reassured industry and supported industrial activities in cities. The aforementioned were succeeded by councils of public hygiene (for the first time in Seine Department on 6 July 1802)[11] and a few municipal offices (as in Lyon at the end of the 19th century). Regardless of the size of these councils, two thirds of the members were doctors, pharmacists or veterinaries.[12] These authorities focused on sanitary and social questions, not environmental issues.

Another source of responsibility was scientists and their publications (Annales d'hygiène publique et de médecine légale, a periodical founded in 1829). Scientists served courts and the previously mentioned committees as experts,[13] in particular the special committees set up by councils of hygiene.

Common to all of this was the verticality of decision-making. Decisions were made by persons in positions of authority (politicians) or with sufficient scientific authority to formulate advice and provide expert evidence.[14]

An "environment" at the service of industry

Human activities resorted to nature and natural materials to contain or reuse residues from mills. Limestone, for instance, could "neutralize the acids that have been so easily leaked into a former quarry" (FREYCINET 1870:345). This required very favorable circumstances and foresight since, "for one case where things go well, there are ten where there is a surprise owing to consequences that are infinitely more costly to repair" (p. 345). Another example: shrubbery was planted to absorb and "slowly alter" the "deleterious principles" (p. 347) of wastes. The environment was thus placed at the service of human activities. Everything was put to work: at first, people and then nature.

However no reports were made about the poisoning of plants, nor about what would become of the chemicals absorbed by them. Even in the treatise by H. Napias (1882:184-185), one of the few persons to show concern about this, plant- and wildlife were nothing more than indicators of the purity of water. They were not themselves the victims of the toxic substances produced by mills. Nature was an instrument for measuring human activities, a parameter, among others, of production.

Some solid wastes were fit to be used in a human environment, for instance, to lay the foundation base of a house. These wastes sometimes formed "constructions" independently of human intentions, e.g., the embankments that built up on slag from foundries: "We have seen jetties form from 12 to 15 meters high, one of which had already stretched out nearly 200 meters into the sea" (FREYCINET 1870:340, note 2). Other uses were intentional, e.g., the solid wastes that became part of the urban landscape. J. Rollet (1879:327) mentioned a lot where a slaughterhouse had been built in Givors; E. Dupuy (1881:48), a case study that described the "artificial nature of the ground, formed by cinders from the soap works, where neighborhoods had been built in Marseille"; and H. Napias (1882:188), that the residue of lye-making was used to stabilize sections of railways in England.

The "environment" put up no resistance. It helped alter the toxicity of wastes. Threshold effects were unknown or else overlooked, along with the effects due to mixtures of substances. Water — in large quantities — would eventually dilute or alter residues: "When the mass of water is sufficient, what is unhealthful can be completely destroyed through the milieu's special action" (ROLLET 1879:330). Oxygen in the water would oxidize organic matter. Claiming that the Rhone River regenerated itself despite having received water laden with excrements from Geneva and from the streams Arve and Ain, P. Cazeneuve (1890:7) described the "spontaneous purification" of river water: "The spontaneous sanitization of streams is a constant fact of observation, clearly demonstrated, clearly reported, with causes that can, at present, given the current state of science, be logically assessed" (p. 5). As explanation for this process, which encompassed wastewater from factories (p. 9), he cited many causes: mechanical (water moving), physical (the deposit on the riverbed of the heaviest substances, dilution, the effects of light and heat), chemical (oxygen's antiseptic power, the action of the lime and calcium bicarbonate dissolved in water) and biological (e.g., saprophytes). The river's contents, whether living or not, form a milieu capable of regulating itself and even of limiting toxins: "our sunlit streams will thus be purified "(p. 10), since the plant- and wildlife in the water had a "purifying role" (p. 15). The "environment" was a living "milieu" — self-sufficient, unalterable, cooperative: "the spontaneous sanitization of streams is a very fortunate fact" (p. 15).

[11] On their history, composition and duties, see BLOCK (1877:1082-1084).

[12] Honorariums were paid for attendance at sessions, but the costs of trips were not covered, according to a letter from Rhone Department's Comité de Salubrité to the prefect on 7 March 1838 (ADR 5METCL/16).

[13] Parent-Duchâtelet (LE ROUX 2011:445-446) and Chevreul (MASSARD-GUILBAUD 2010:266-268) served as experts. Created by the decree of 16 October 1791, the Bureau de Consultation des Arts et Manufactures became, in 1806, the Comité Consultatif des Arts et Manufactures within the Ministry of Agriculture and Commerce (BLOCK 1877:502-503). The decree of 18 October 1880 that provided for this reorganization can be found in *Bulletin des lois…* (1881:1095, art. 1).

[14] At the end of the 20th century, attention would be drawn to the limits and shortcomings of this verticality. On burying nuclear wastes, see CALLON *et al*. (2001:29-33): "La couleur des idées".

An anonymous "environment"

The victims of nuisances were not identified. While referring to the factories for making aniline that dumped arsenate in the Rhine, C. Freycinet (1870:340, note 1) wrote that this "resulted in serious accidents" since the arsenate "dissolved slowly in the river and sent the poison onto nearby riverbanks". But what might this arsenate poison? Neither plants nor animals were mentioned — it was a nuisance without damages, a poison without victims. J. Rollet (1879:328) did mention aquatic fauna, but such mentions were few in number, even exceptional.[15] In his report in 1834, A.J.B. Parent-Duchâtelet, appointed as expert, examined the draining of water from a starch-making plant into streams that fed into marshland. He devoted two chapters to the effects on fish and other animals.[16] However these animals had no status apart from their relation to mankind: fish were for fishing. With the exception of frogs, only farm animals (fowls, sheep, dogs) were mentioned.

The "environment" was made by and for mankind. It was not so much an environment as an "ecosphere", i.e., an expansion of the household and workshop. The only environment that counted was the neighboring area around a mill; and this "neighborhood" was human. The classification of establishments in the 1810 decree made this clear. They were intended to protect free enterprise and prosperity. According to a circular from the Ministry of Agriculture and Commerce on 25 October 1851, "the delays [in delivering permits] are even more annoying because they hamper the creation of new workshops that can offer work and thus income to working class people, and because they can cause considerable losses to manufacturers by making capital unproductive for a relatively long period" (ADR 5METCL/4).

The awareness of risks to the environment

At the start of the factory era, the consciousness of risks to the environment was missing, evidence of this coming from the burying of solid wastes. Two reasons account for this: the conception of the environment and the conception of risks. The first, taken under consideration in this section, was related to the conception of the world of industry, which was underlaid by ideas drawn from an understanding of nature. In effect, the environment was an extension of the ecosphere of human production: it was not exterior to, independent of, human activities.

The conception of the "environment" for solid wastes

In his treatise on industrial hygiene, L. Poincaré (1886:9-10) listed the following methods for handling solid wastes: piling them, depositing them in a permanent place of storage, and burying them (VIGOUROUX 1897-1899:509, vol. 2). The 20th century has added other methods for other reasons,[17] even for aesthetics: "As for the huge heaps of inert residues that big industry sometimes makes and that even change the aspect of a landscape, hygiene is in agreement with aesthetics to ask authorities to not let things go that far" (MACÉ et al. 1910:342).

Three approaches were adopted to handling solid wastes:

• The first was negligence. Consequently, public thoroughfares were the first dumping ground for solid wastes.[18] When leaving the mill, wastes left the sphere of ownership to enter the public domain or a domain with no apparent owner. Ridding wastes from mills mattered more than preventing nuisances (SEINE 1855:104).

• The second was to get rid of wastes by having them removed to a place of storage. Under the police ordinance of 5 November 1846, solid and liquid wastes in Paris had to be hauled "*in hermetically closed and sealed barrels*" (BOURGUIGNAT 1858:192, vol. 1 §143); but the ordinance had nothing to say about where to haul these casks. Whereas solid wastes from plants and animals had to be "*removed*" or "*converted to fertilizer*", those of a mineral sort were to be hauled away within a given time, but their ultimate destination was not specified. Apparently no place for discharging them was foreseen; nor any heed paid to safety and health conditions.

• Wastes could also be ridded by "burying" them in or under the ground, whether private (belonging to the mill) or public (natural excavations, local landfills), or under water, whence streams muddled with sludge (NAPIAS 1882:383) that hindered navigation (BOURGUIGNAT 1858:333). The preferred places for burying solid wastes in the strict sense of the word were natural excavations, quarries,[19] sinkholes[20] and deserted mine shafts.[21] "*Some industrialists seem to think that their solid wastes, even those that raise no chemical problems, can be placed without impunity in natural or artificial excavations, in mines, or*

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[15] This mention was in Ferrand's report on the Société Beaujolaise de Sulfure de Carbone (11 June 1885): "*Already, the effects of the water released by the factory are anesthetizing fish, a point I verified. The same fish wake up in pure water, when the experiment does not last too long*" (LACASSAGNE 1891:167). See too: "*If salmon have become for us a rare, sought-for species, whereas they were so abundant in the 17th century that they were worthless and formed a major part of the peasant's food supply, the blame is not to be placed on poaching*" (NAPIAS 1882:183).

[16] See the chapter on the effects of starch-making and of marshland emanations on public health in PARENT-DUCHÂTELET (1836:495-501).

[17] *E.g.*, removing solid wastes should make it easier for water to flow and prevent the formation of marshes (MACÉ *et al.* 1910:148).

[18] "The classified establishments were "*said to be 'unsanitary' or a 'nuisance' owing to the emanations from them or to the solid and liquid wastes they abandon or dump on public thoroughfares*" (SEINE 1855:71).

[19] "*Even less so should solid wastes, which have a very pronounced toxic nature, remain in a heap on the ground, in excavations, or on the banks of waterways*" (LACASSAGNE 1891:492).

[20] "*Lime sulfate, a major residue of candle-making, is a greasy sulfate that, when dumped or buried underground, can have serious inconveniences for groundwater*" (LACASSAGNE 1891:487).

[21] "*They could perhaps be buried in the deep, abandoned shafts of the Chessy mines*" (LACASSAGNE 1891:188).

in abandoned quarries for example, where the ground is apparently leakproof" (LACASSAGNE 1891:491). Other expedients than burying the wastes in the strict sense of the word were added to this range of actions. Solid wastes were used for backfill,[22] foundation bases and compost for farms and gardens (ROLLET 1879:339). Cesspools, the easiest solution, were not exempt from drawbacks and dangers. They had to be periodically cleaned, and the wastes could pollute groundwater, or chemical reactions could have unexpected effects, like the spontaneous fires at the Payen factory (ROLLET 1879:334).

The risks that were recognized were those that cropped up in a very short time. Although Freycinet (1870:345, note 1) cited examples of groundwater polluted "*over time*", dangers normally became apparent, foreseeable and controllable relatively fast — always within a period allowing for solutions or repairs. Risks became visible soon enough for the causes to be identified. They were already well enough known to be anticipated and for damages to be contained. Solutions already existed (for example, deviate water from a spring to supply inhabitants with drinking water). In the 19th-century factory world, wastes never caused an environmental tragedy hopelessly out of control and without any possibility for obtaining compensation.

The conception of risks

While the 1810 decree proposed a classification of "manufactories and workshops that diffuse odors that are unhealthy or a nuisance", the negative effects listed affected not the natural but the human environment. The question was always asked in relation to what was sanitary for individuals or the community. It was never formulated with respect to the risks to the environment. Opening a discussion on the topic of workers' health, the Royal Academy of Medicine asked "how these substances react on workers" and then, at the bottom of the list "if it has been noticed whether the processes used in various manufactories have an influence on the inhabitants of the towns where they are built" (SOCIÉTÉ… 1778: 8).

The principal concern was disputes between manufacturers and landowners: "Workers' health barely came under consideration, and the health of nearby residents was a secondary concern" (CORBIN 1986:154). What mattered was the interests of private property owners (FAURE 1992:309). The decree advocated a "principle broad enough not to hobble industry but precise enough to protect private property" (RESSICAUD 1902:1). Whereas the Rhone Council of Salubrity refused to allow four lime kilns to be built in a "pleasant landscape mostly comprising pleasurable properties" (MONFALCON & POLINIÈRE 1851:40), the Committee of Salubrity, presided by an industrialist (Brunet-Lecomte) would, under a different circumstance (discontent of the neighbors of the plants where sausage casings and tallow were made in Vaise), temper its tone: "As inhabitants of an industrial neighborhood, we will always see […] with the greatest pleasure new industries come to set up operations around us".[23]

Furthermore, "inconveniences" or "nuisances" overrode "insalubrity". What bothered people (noxious smells, noise, the heat from steam-driven machines) was a source of nuisances rather than of toxicity as such. Town-dwellers only indirectly used the 1810 decree as a "tool for protecting their environment" (MASSARD-GUILBAUD 1999:57). Under this decree, risks disappeared when a nuisance appeared — above all, odors and then noise (CORBIN 1986:154), followed by smoke and dust. Such were the criteria for ranking establishments.

The social construction of risks

An awareness of the risks to the environment was missing for a second reason that had to do with the very conception of risks. At the time, waste management was a police matter and then became a sanitary concern before it has ended up as an "environmental issue". In the 19th century, the "environment" was mostly confined to the human exosphere.

Recycling wastes was a reassurance that they were innocuous. An argument was harped on: "*In industry, there must no longer be scraps in the strict sense, and everything must be used either for industry itself or for agriculture*" (ROLLET 1879:339). Residues were scraps with value when reused. Iron or manganese chlorides could serve to purify the gas used for lighting or to make antiseptic powders. The industrial era was seen as an extension and application of the era of nature: everything was recycled, repaired, came back to what produced it. This way of thinking was probably borrowed from the recycling of excrements as fertilizer.[24]

The awareness of risks to the environment did not exist. Burying residues was not perceived to be a risk, because the conditions necessary for the social construction of this risk were missing.[25] The following paragraphs propose a model of this construction.

Stages of construction

The awareness of a risk becomes a social construction in four stages: the bodily PERCEPTION of the risk; a mental REPRESENTATION of the risk that opens onto the imagination; a SHARED UNDERSTANDING of the risk (or a shared intellection about what is happening); and the CONCEPTION of the risk. The perception of a risk includes sensorial elements (odors, vapors) while the mental represen-

[22] "*In England, these residues [from making lye] are strongly tamped and covered with beaten clay for backfill for the spur tracks that serve factories*" (LACASSAGNE 1891: 486).

[23] 8 September 1883, ADR 5METCL/395.

[24] The "*science of economics takes into account excrements*", the "*chemical industry's raw material*" (CORBIN 1986:136 &140).

[25] This phrase "social construction of risk" used herein refers to the distinction between "group" and "grid" made by M. Douglas M. & A. Wildavsky (1983:138-139).

tation shapes this perceived risk through a grid for interpreting it as part of a worldview. The risk thus becomes meaningful. The understanding of this risk that has been endowed with meaning involves using rational methods to confirm that the perceived and represented risk is, from a collective viewpoint, definitely a risk to be contained or eliminated.[26] The conception of the risk then abstracts the risk from shared collective ideas about it and relates it to the conditions of its actual occurrence.

For example, the visual observation that a river is rising is a perception of a risk, while the assignment of meaning to water overflowing is related to the mental representation of the risk of flooding (which might be accepted as something sacred).[27] Establishing a relation between abundant precipitations and rising water is part of a shared understanding; and establishing probabilities about the occurrence of flooding is part of the stage of the conception of the risk. The shared understanding leads to calls for preventive measures (dikes, dams), but which might turn out to be futile or unnecessarily costly if the frequency of flooding is low or if such measures are taken to the detriment of others for coping with more devastating dangers. Another example: the smell of gas is a perception; the representation of the danger depends on the prevalent scientific theory;[28] the shared understanding of the causal relationship requires time and feedback; the conception of the risk will weigh percepts, affects, and the concepts held in common against each other to obtain a distantiated view.

Cultural grids and the authority of discourse

Each stage in the social construction of a risk is complicated by two series of factors, since flexible cultural grids of interpretation shape the factual elements of the risk. Odors might, or might not, be associated with pathogenic causes, depending, for example, on whether they are agreeable or disgusting. This formative process depends on the stratification of individuals in social groups or roles.[29] An odor's meaning or importance (as a warning or as something familiar) varies depending on whether an industrialist, worker, owner of a nearby building, tenant, expert, etc, has perceived, represented and constructed it. A major factor that comes into play is that not everyone has access to the "authorized discourse".

Each register of discourse declares, in its own way, what is, or is not, relevant. It is part of a normative field, of an argumentation. A lawyer, hygienist or journalist does not refer to the same norms and does not muster arguments in the same way. Each of these registers of discourse asserts a power relationship: the right to speak is evidence that one authority prevails over another. O. Faure (1992:300) has drawn attention to the difficulty of hearing the voice of ordinary people in the complaints filed by residents against mills,[30] because the arguments and issues so strongly shaped what was said.[31] The gap between lay and learnèd opinions was manifest: "There definitely exists a clear contrast between the perceptions of the scientific elite and of commoners" (FAURE 1992:303-304).

Other factors also came into play: the nearness of the events or of recurrences of them that were deemed to be a risk, along with the "euphemization" of subsequent risks. The principal obstacle to protective measures was the "indifference of workers, who, careless by nature and familiar with the danger day in day out, spare the least effort to avoid a harm that is not actually present" (COULIER 1878: 740-741). Appointed by the Lyon Council of Hygiene to investigate complaints from residents near the Coignet plant, Ferrand and Raulin did "not perceive the emanation characteristic" of phosphorus factories (LACASSAGNE 1891:143-144). The stage of conception depends on fluctuating cultural grids.[32]

In the case of the burying of solid wastes from factories in the 19th century, risks were not associated with the factory's activities. They arose out of a set of relations with these activities, relations dependent as much on cultural factors (bad and good odors) as on the situation (the mill) and time (the persons present).[33] The social construction of a risk means that the risk has to be related to the ultimate purposes that a culture has given itself, to the values it bears.[34] During the 19th century, it was tolerable for factories to be next to homes, despite the loss of quality (occasioned

(26) "*Risk is not a material thing, it is a very artificial intellectual construction*" (DOUGLAS 1987:56).

(27) "*The causes of floods are thus particularly complex. Users are going to construct a representation of floods from the incomplete information available to them. This representation is, therefore, going to vary, in particular as a function of the social habitus of individuals and of their experience of floods*" (BAGGIO & ROUQUETTE 2006:104).

(28) "*Let us, however, hasten to repeat that the emanations from these factories' high smokestacks [for burning organic matter], though disagreeable and annoying, do not carry miasmas very far, as a few persons have claimed. The vapor and gases in these emanations, after having undergone intense heating in production equipment, are in the end oriented under fireplaces so that the pathogenic germs that they might contain have been destroyed, as shown by the work done by our colleague, M. Pasteur*", *Journal officiel de la République française*, 7 October 1880, p. 10334.

(29) "*The specific characteristic of social representations is that they are socially situated. By definition, they are specific to a group or groups in a society, responsive to a period, a cultural and material context, etc.*" (BAGGIO & ROUQUETTE 2006:103).

(30) "*This source, no more than the others, allows access to a spontaneous popular voice*" (FAURE 1992:300).

(31) "*Through the records, we clearly see the law, the procedures of inquiry and expertise, the hygienist discourse modifying the attitudes of the people. Meanwhile, the people distort, translate and reinterpret norms and sometimes turn them against those who produced them*" (FAURE 1992:301).

(32) In a hierarchical society like India's, the very poor, with neither masks nor helmets, strip asbestos from ships; and this is "*tolerable*".

(33) "*A risk only exists in relation to an individual, social or occupational group, community or society that understands it (through mental representations) and deals with it (through specific practices)*" (VEYRET 2003:5).

(34) "*Culture is the publicly shared collection of principles and values used at any one time to justify behavior. Human behavior itself being channeled in public institutions, the principles and values uphold the forms of institutional life*" (DOUGLAS 1986:67).

by the odors and noise) and of living conditions (health), because progress was a value and prosperity for the group was an ultimate purpose.

Social conceptions of risks

Forming a shared mental representation of a risk — the moment when all parties become aware of the risk — requires that these parties share the feeling that they are menaced and that the knowledge already acquired converges toward a single (and the same) source of danger. When groups (their members or representatives) disagree, a risk is not unequivocally constructed;[35] and groups will no longer share the same mental representation of it. Referring to the magenta dye-making plant in Saint-Fons (opened par Huguenin and Durand), A. Loir wrote that "these important factories are perfectly similar to big, serious scientific laboratories" (LACASSAGNE 1891:172). This social construction of the risk could lead to a convergence of the viewpoints of all parties only if the proposition that science was identical to industry and industry to safety was perceived, represented and understood in like manner by experts, factory owners and residents.

The awareness of the risks related to burying solid wastes did not exist during the 19th century, because the perceptive and representational aspects of the risk had been decoupled. The society's cognitive representation of risks tended to be reassuring, since nature would recycle everything. Under this representation, the only dangers were those perceived immediately. After all, the "environment" was an ecosphere stretching from the household and factory out to all of nature. What was perceived and seen was not consistent with the cultural grid that proclaimed progress and endowed experts with authority.

Conclusion

In the first chapter of his treatise on industrial hygiene, L. Poincaré (1886) distinguished between dangers to the hygiene of workers and to public health; but thereafter, he only focused on the latter, namely fumes and residues, while devoting, by the end of his treatise, only fourteen pages to them. The approach to the environment was an extension of this approach to hygiene. The environment was of interest only insofar as it affected, here and now, the quality of life (odors as a nuisance to nearby residents) and the quality of health (sicknesses blamed on production activities). The environment was not taken under consideration as such. It had neither an identity nor a status of its own. Neither industry nor production in general were enjoined to pay heed to an environment that no one could observe.

The new world of 19th-century industry conceived of its practices by borrowing concepts from the rural world of yesteryear: nature repairs, restores, is reborn. When entering nature, the wastes from mills came under its laws just as they were also fit in with existing conceptions about rural life: reusing materials, fertilizers, scraps…. So, solid wastes from factories were not, it was believed, risky as such. The PERCEPTION of the risk (activating bodily affects) was an adequate warning signal of danger. The perception of a nuisance was identified with the perception of a danger: imperceptible dangers did not exist. A self-sufficient "naturalizing" world-view shaped mental REPRESENTATIONS of the risk. Ultimately, there were no wastes since they were recycled through human activities. The UNDERSTANDING of the risk was shared during a very short period and restricted to the realm of needs. The only sort of toxicity that was recognized concerned drinking water but then during a short, adjustable, reversible period. No theory constructed a causality between diseases years away and perceptible nuisances today (even though a very few surveys did, years later, establish such a distant relation between pathogens and symptoms). Finally, the CONCEPTION of risks placed nuisances and their damages in the perspective of economic progress as a means, value and finality. Reusing wastes was the creed: "*We learn, as science improves, to find in it elements for a new production*" (ROLLET 1879:339). C. Freycinet (1870:396) maintained: "*The problem of sanitation is nearly always solved by the progress of industry.*" Not only would nature repair the excesses of industry, but industrial and scientific techniques would also correct and annul excesses.

This cultural grid vanished during the 20th century, in particular as the nuclear industry grew. The time to be considered is longer; reversibility is not taken for granted; the finalities and values used to assess whether human activities are to be qualified as "risky" or "safe" are different.

[35] For example, the grubbing of grapevines at INRA in Colmar (LOCAL MONITORING… 2010).

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