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(1890s-1940)**

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The diffusion of innovations to improve the French urban environment (1890s-1940)

The circulation of information and knowledge about sanitary engineering (water supply, sewage and solid waste disposal and treatment) from the late nineteenth century to WWII highlights a specific process of urban innovation diffusion. This process worked inside the French urban network without any strong hierarchical pattern but in a rather horizontal way, Paris being rather an exception than a replicable model. A transnational dimension appears clearly, especially in the pre-1914 period. It underlines the ability of some local governments to implement technological facilities in a context of relatively weak state expertise and intervention. A careful study of several dozens of decision-making processes, from the documentation phase to the opening ceremonies of new facilities, enables us to perceive the complex path through which modern technology penetrated cities.

“Nowadays administrations in large cities around the world are preoccupied by the same issues. Solutions given by one of them can be used by others, if not as they are, at least after making the necessary adaptations. It follows that all those concerned with the improvement of towns, their plans, public services and municipal life have a growing interest in sharing their experience and discussing solutions in the light of extensive comparisons.”¹

This excerpt from the invitation sent by the organizers of the *International Congress of Cities of Ghent* in 1913, which took place during the World Exhibition held in that city, reveals a reality that the recent rise of transnational history has brought into focus again: the first years of the twentieth century had been a period of intense international co-operation in many fields of local government, from urban planning to public health policies.² Dozens of municipal ad-

¹ Congrès international de l'Art de Construire les villes et de l'Organisation de la vie communale, Ghent 1913, S. VIII, translated by Stéphane Frioux. All English translations from French in this text were made by the author.

² For an example of a pioneering work, see Anthony Sutcliffe, *Towards the Planned City*:

ministrations (elected officials and civil servants) took part in this congress, which resulted in the creation of a specific association: the *International Union of Cities and Local Authorities* (IULA).³ IULA devoted itself to the search for techniques to improve municipal administration, and issues like city cleansing and sanitation were one of the fields of experiment for the diffusion of information to city leaders and to their civil servants.

This practice of exchanging information between municipalities was not new. Already in the Middle Ages, the leading towns maintained intensive exchange on technical matters, as the case of Nuremberg proves.⁴ However, the nineteenth century triggered an increase in correspondence about the adoption of technical innovations, in a context of cities emulating one another and inventors or urban service companies marketing technological innovations (gas lighting, new paving materials, drinking water supply materials).

From the beginning of the nineteenth century until the First World War, European cities experienced remarkable demographic and spatial growth. They consumed large areas of land for industrial functions, transportation and warehouses. These changes raised many challenges for the authorities: housing the urban population, equipping the city with networks supposed to bring new elements of comfort (water, gas, electricity), ensuring public health. American historian William Cohen also observed this practice in his comparative study of five large provincial French cities in the nineteenth century.⁵ Marjatta Hietala highlighted the search for information and comparative surveys as a customary practice of Finnish municipalities, especially Helsinki.⁶ In a similar approach, I will examine how French cities addressed technical solutions for hygiene and environmental issues that were quite common in cities of the industrial age. To do so, I will focus on innovations that helped to control urban pollution and to prevent the epidemics linked with the contamination of water by

Germany, Britain, the United States and France, 1780-1914, Oxford 1981. Among various publications, see Akira Iriye/Pierre-Yves Saunier (Hrsg.), *The Palgrave dictionary of transnational history: from the mid-19th century to the present day*, Basingstoke 2009. Shane Ewen/Pierre-Yves Saunier (Hrsg.), *Another Global City. Historical Explorations into the Transnational Municipal Moment 1850-2000*, New York 2008.

³ Oscar Gaspari, *Cities against States? Hopes, Dreams and Shortcomings of the European Municipal Movement, 1900-1960*, in: *Contemporary European History* 11:4, 2002, S. 597-621.

⁴ Laurence Buchhozer-Rémy, *Une ville en ses réseaux: Nuremberg à la fin du Moyen-Age*, Paris 2006.

⁵ William B. Cohen, *Urban government and the rise of the French City. Five Municipalities in the Nineteenth Century*, London 1998.

⁶ Marjatta Hietala, *Transfer of German and Scandinavian Administrative Knowledge: Examples from Helsinki and the Association of Finnish Cities, 1870-1939*, in: *Yearbook of European Administrative History* 15, 2003, S. 109-130.

human waste such as water purification plants, sewage treatment plants and garbage disposal facilities. From the 1890s to the end of the 1930s, exchanges between cities took on a particular importance with regard to these problems of improving the urban environment.⁷

To understand how technical devices designed to solve these urban problems have been chosen within the “banal” framework of provincial France requires a closer approach to the relationship between municipal leaders, either elected officials or prominent civil servants, and innovation. My investigation was guided by a twofold perspective: examining the local decision-making processes that led to the adoption or refusal of a particular sanitary engineering technique, and, secondly, reconstructing the diffusion of these innovations within the French urban network.⁸ This study combining local and national scales has been completed by attention paid to the international level.⁹ A majority of the cases studied clearly showed that innovations were spreading across borders, through both the exchange of experiences between local authorities and through the publicity orchestrated by the firms that marketed these innovations. This article will attempt to summarize the main results of a doctoral dissertation carried out on several dozen cities for a period (1890s–1950s) in which the national state as an actor for economic development, pushing towards technical innovation, was still relatively little present¹⁰ and in which French municipalities had more room for manoeuvre than expected, to act or not to act.

Improvement of the urban environment and urban hygiene before 1914: the dynamics of borrowing

From the middle of the nineteenth century on French municipalities – like their counterparts in the major European countries – had been facing serious

⁷ For a complete survey of the problem, see Stéphane Frioux, *Les batailles de l'hygiène. Villes et environnement de Pasteur aux Trente Glorieuses*, Paris 2013. For surveys about another country, e.g. the United States, see the works by Joel Tarr and Martin Melosi.

⁸ On the concept of urban framework, Bernard Lepetit, *Les villes dans la France moderne (1740–1840)*, Paris 1988.

⁹ For a more detailed approach to this international scale, see Stéphane Frioux, *Sanitizing the City: The Transnational Work and Networks of French Sanitary Engineers (1890s–1930s)*, in: Bernhard Struck/Davide Rodogno/Jakob Vogel (Hrsg.), *Shaping the Transnational Sphere. Experts, Networks, and Issues from the 1840s to the 1930s*, New York 2015, S. 44–59.

¹⁰ It would become more proactive after the Second World War. See, for example, Danièle Voldman, *La reconstruction des villes françaises de 1940 à 1954: histoire d'une politique*, Paris 1997.

challenges which transformed the urban environment and even the interior of the most comfortable houses. What they experienced was the arrival of modernity resulting from industrialization. This was effected by gas lighting, the railway, later the electric tramway, as well as the supply of water to houses whose owners subscribed to the urban water service.

This rise of the “networked city” was made possible by a complex meshing and collaboration between public expenditure and private investment.¹¹ A market for urban infrastructural technology was created, and local authorities were often confronted with a choice between competing technologies and companies. Making a decision was therefore sometimes a lengthy process, during which the politicians and their technical services struggled to come to an acceptable degree of certainty. Using the experience of other cities was, if not almost obligatory, at least very common. The comparative approach could take different forms:

One customary form was to send a questionnaire to a whole set of municipalities (in this case, it is not always easy for researchers to decipher how the panel of cities was compiled). Another approach was the careful survey of professional periodicals for hygienists or municipal engineers such as *La Technique Sanitaire*, in the French-speaking world, created in 1906.

Third, the use of professional associations, which seem to have been set up later in France than in other countries. In Britain and the US, highly specialized associations existed which brought together the directors of sewage treatment plants or garbage disposal facilities, whereas there was apparently no equivalent to these in France, the AGHTM, which edited *La Technique sanitaire* gathering very broadly “hygienists” at its beginning.

Lastly, the study mission entrusted to an engineer or a municipal delegation to various cities deemed interesting for their achievements.¹²

Municipal archives keep track of these trips, regularly carried out by the city councillors of Paris or Lyon (who went, for example, to Germany in 1898), but also by the elected representatives of smaller towns. At the beginning of the twentieth century, the government of the French capital was studying the improvements to be made to street cleaning and the collection and destruction of household waste. Two committees of Paris city councillors travelled across Europe: between September 15 and October 2 in 1905, the first one visited Geneva and Zurich in Switzerland, Munich, Frankfurt and Cologne in Germany,

¹¹ Joel Tarr/Gabriel Dupuy (Hrsg.), *Technology and the Rise of the Networked City in Europe and America*, Philadelphia 1988.

¹² For a case study surveying various modes of enquiry, Pierre-Yves Saunier, *Changing the city: urban international information and the Lyon municipality, 1900-1940*, in: *Planning perspectives* 14:1, 1999, S. 19-48.

and Liège in Belgium. The journey of the second delegation took place in the spring of 1907 and passed through the cities of Brussels, Cologne, Hamburg, Berlin, Dresden, Prague, Vienna and Budapest.¹³ Meanwhile, in 1906, Paul Tur, Chief Engineer of Roads and Lighting in Paris, had travelled to the United States to study the collection and disposal of garbage in American cities.¹⁴ During a 1908 trip to Great Britain, councillors inspected incineration plants in Liverpool, Glasgow, Greenock and Edinburgh, in addition to a survey of sewage treatment plants.¹⁵ In the same year, the municipality of Rouen showed itself very proud of the two-week European tour by three councillors, organized to inspect waste treatment facilities in Great Britain, Germany, Switzerland and even in the Empire of Austria-Hungary.¹⁶ These examples were not isolated.¹⁷ At the same time, the missions of Helsinki delegates could last several months in the health and hygiene sectors. Some trips were financed from personal funds, or with the help of the State or the Senate. From 1919 onwards, a special budget was set up by the municipal council of the Finnish capital.¹⁸ Thus, before 1914, setting up or improving the evacuation and treatment services for solid or liquid urban wastes led to trips abroad, with Great Britain and Germany in the forefront, and to a lesser extent Belgium and the Netherlands. Study trips to the major world fairs were, in this case, often less efficient than expositions dedicated specifically to urban affairs. German cities organized such an exposition in Dresden in 1903; it made a strong international impact. Inspired by German slaughterhouses and hospitals, Lyon municipal authorities

¹³ Rapport présenté au nom des délégations chargées d'étudier en France, Suisse, Belgique, Allemagne et Autriche-Hongrie les questions de revêtement de chaussées, d'éclairage, de nettoyage et d'ordures ménagères, Paris 1908, Archives de Paris, box VONC 1484.

¹⁴ Préfecture de la Seine. Direction administrative des travaux de Paris. Service technique de la voie publique et de l'éclairage. Les ordures urbaines en Amérique. Rapport de mission de l'Ingénieur en chef des ponts et chaussées, Paris 1906.

¹⁵ Conseil municipal et conseil général de la Seine. Rapport au nom des délégations de la 6^e commission du conseil municipal et de la commission départementale des Eaux et de l'Assainissement chargées d'étudier l'épuration biologique des eaux d'égout et les fours d'incinération en Angleterre et en Ecosse présenté par MM. Paris et Carmignac, Paris 1909.

¹⁶ Proceedings of the city council meeting of January 29th, 1909, Municipal Archives of Rouen, 5M 1.

¹⁷ Extensive study tours and inspections in foreign cities were a typical feature of international exchange on planning and housing reform before 1914. For German and British examples, see Dieter Schott, *Die Stadt als Thema und Medium europäischer Kommunikation: Stadtplanung als Resultat europäischer Lernprozesse*, in: Ralf Roth (Hrsg.), *Städte im europäischen Raum. Verkehr, Kommunikation und Urbanität im 19. und 20. Jahrhundert*, Stuttgart 2009, S. 205-225.

¹⁸ Hietala S. 125-127.

decided to organize an event on urban hygiene and planning in 1914, but the international political situation drastically limited the impact of this exposition.¹⁹

The circulation of information also involved entrepreneurs and individuals who were interested in improving the urban environment. Inventors competing for the municipality market presented their products in different articles and newspapers. In the case of Pau, for several years in the early twentieth century, the municipality hesitated in choosing a water purification process for its drinking water. The mayor even spent his summer holidays in 1903 visiting Zurich and Annonay (a small city in the Ardèche *département*). On 10 November 1903 a British engineer named Andrew Howatson sent an issue of London's *Daily Mail* along with a letter: "On page 3, you will find an article on the microbes in the water network of London. Dr Klein found 50,000 bacteria per cubic centimetre in raw water, and in filtered water, 2,017. It should be noted that the sand filters of the East London Company are the most advanced that exist."²⁰ The article might therefore have aimed to discredit its French rivals Puech & Chabal, specialized in sand filters. Four years later, Henri Chabal – writing from his hotel in Berlin, in a letter dated to 1st of October 1907 – took up his pen to inform the mayor of Pau that "the short news item in *Le Temps* (issue of 30 September) reporting that the Hygiene Convention in Berlin had, following a French proposal, adopted the wish to sterilize drinking water with ozone [another rival technique], was erroneous."²¹ The pages of the trade press, including *Revue d'hygiène et de police sanitaire* and *La Technique sanitaire et municipale*, were filled with articles carrying on such battles. The authors frequently used foreign examples that could support their arguments.

The historiographical renewals brought about by transnational history made it possible to highlight the formation of an "urban international" before the First World War in the same way that there was an international world of scientists and transnational networks of reformers.²² Within these circles reflecting about the future city, we can identify the first French urban planners, close to groups interested either in the social question and in the management of problems arising from industrial growth or in urban hygiene. Influenced by

¹⁹ Maria-Anne Privat-Savigny (Hrsg.), *Lyon, centre du monde ! L'Exposition internationale urbaine de 1914*, Lyon 2013.

²⁰ Municipal Archives of Pau, Box 20 2/9, letter of Howatson, 10 November 1903. A newspaper clipping entitled "Microbes in London Water" is stapled to this letter.

²¹ *Ibid.*, letter from Chabal to the mayor of Pau, written from Berlin's Savoyhotel, 1 October 1907.

²² Daniel Rodgers, *Atlantic crossings. Social politics in a progressive age*, Cambridge (Mass.) 1998. For more recent studies, Struck/Rodogno/Vogel, 2015.

foreign examples, notably the policies of land control and the extension of German cities, or the park policies in Vienna and London, they defended the idea of legislation regulating the extension of cities.²³

The period before the First World War can be considered a "learning age" when it comes to sanitary engineering, where one out of every two study trips in this field was carried out outside France (Figure 1). Depending on the subjects studied, there were places which served as models, or "sanitary Mecca", as the German city of Wiesbaden was called in 1911 on account of its "remarkably elaborate" development and extension plan, as well as its sewer network.²⁴ Around the year 1896, *Ecole des Ponts et Chaussées* engineer M. Dupin drew up a sanitation project to create a modern sewage system for Montluçon, a middle-sized provincial and industrial French city. Dupin's hundred-page report contained more than one hundred references to other European cities, including Berlin, Brussels and London.²⁵ When a city was interested in adopting a foreign system, writing letters was the easiest and cheapest way of getting information. Around 1905, Annecy – then a small town on the banks of an Alpine lake with fewer than 15,000 inhabitants – was studying the possibility of filtering its water. After reading an article written by Dr Jules Courmont, a French public health specialist in Lyon, about a system called "American" filters, the town administration contacted the cities of Alexandria in Egypt and Fiume in the Austrian Empire (today Rijeka, Croatia), cited as having adopted this system.²⁶ Study tours on drinking water and urban clean-up issues, however, remained much more focused on France: the country appears to have been more innovative in this area, perhaps less thanks to its municipalities than to its water-works firms, which crossed borders and seas to conquer colonial and foreign markets.

²³ See, for the case of Paris, Marie Charvet, *Les fortifications de Paris. De l'hygiénisme à l'urbanisme, 1880-1919*, Rennes 2005. For a more general perspective: Jean-Pierre Gaudin, *L'avenir en Plan. Technique et politique dans la prévision urbaine 1900-1930*, Seyssel 1985.

²⁴ Georges Risler, *Les plans d'aménagement et d'extension des villes*, in: *Congrès de l'Alliance d'hygiène sociale*, Roubaix 1911, S. 14. The city was also cited in French periodicals for its choices in the fields of water purification and garbage collection.

²⁵ *Projet d'assainissement général dressé par M. Dupin, ingénieur des Ponts et Chaussées, Montluçon 1902* (Municipal Archives of Montluçon).

²⁶ Municipal Archives of Annecy, box 4N 87.

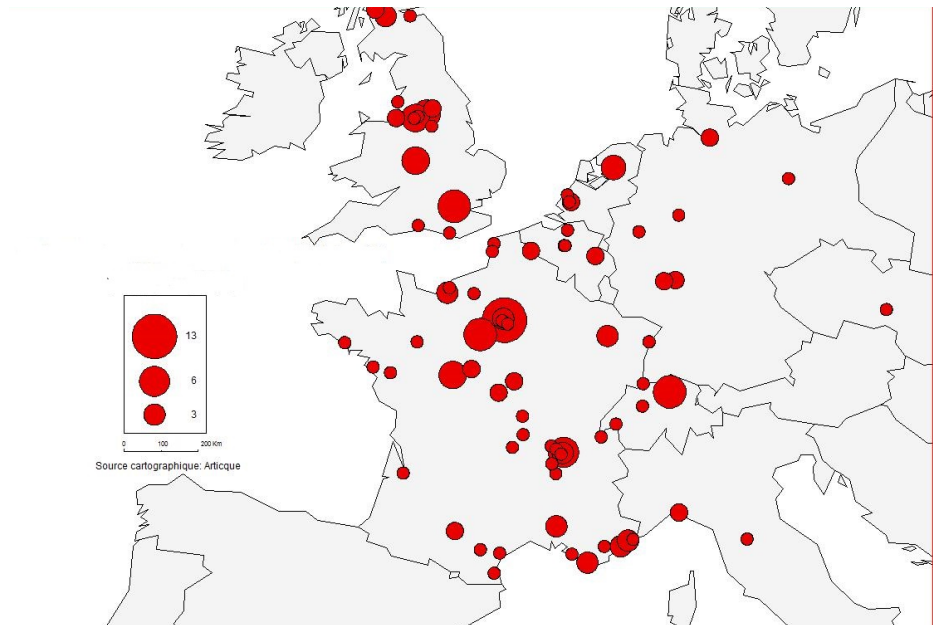


Abb. 1: Map of visited cities (recorded in the author's database) and number of visits (1892-1971).

The interwar period: towards nationalization of sanitary engineering?

After the war, which paralyzed and partly disrupted knowledge exchange networks, a reconfiguration of the geography of dissemination on sanitary engineering techniques and knowledge took place. The characteristics of experts also changed slightly. French specialists were more often engineers and less often hygienists. Documents contain fewer indications of their transnational activity than for experts from the previous generation. Of course, international congresses remained an important moment for the profession: at these events, engineers from Paris and Lyon presented national reports. Nevertheless, it is hard to find any evidence of a local repercussion of this type of manifestation. Study trips were restricted in terms of both the number of participants (quite often, the city engineer was the only one to actually make fieldtrips), and geographic distance.

The interwar period marked the affirmation of a distinctly “French” technology with national companies capable of satisfying the urban demand. For instance, a very similar Francophile discourse can be found in the reports and brochures produced by the municipalities of Biarritz and Toulouse concerning

their incineration plants, as if suggested by their common bidder, the CAMIA.²⁷ There was also an explicit reticence towards foreign processes. Domestic companies won markets abroad but, with few exceptions, their foreign competitors were of little interest to French municipal councillors, who in many cases prohibited them from participating in competitions. The municipality of Rennes even specified in the competition notice for the treatment of its drinking water that applicants would have to “use equipment or devices made in France for any facilities that they may propose”.²⁸

The city of Lyon was a notable exception. Since his election in 1905, its mayor Édouard Herriot paid a great deal of attention to the town planning experiments, both in terms of slaughterhouses and hospitals, and wastewater treatment, in the Germanic “model” he considered together with the hygienists of his city. In 1929, Antoine Joulot, engineer of the CAMIA, the main French incineration company, argued several times during the competition organized by the municipality of Lyon, that a legitimate preference should be given to national industry. During his hearing in front of the Committee of Experts, he mobilized strong national emotions by claiming that “on one side is Europe and on the other, France; I hope that in this international competition we will not have our Waterloo”.²⁹ Proponents of garbage treatment for agricultural use ventilated the same nationalist rhetoric and condemned incineration on the ground of its English origin: “This system imported from England cannot be adapted to our needs. What is adequate in England is no longer so in France”.³⁰ Notwithstanding this nationalist pressure, the city of Lyon, while requesting that the construction work of unpatented devices be reserved primarily for the Lyon industry, nevertheless decided to make a deal for the equipment with the Berlin company Bamag, licensee of English patentholders Heenan & Froude. Eventually, in late 1930, the German firm transferred the license of the patents for France to the Union des Services publics (USP), a competing company of CAMIA. USP later wrote in a brochure that “it was not logical for the French cities to have recourse to a German house in order to benefit from the English methods Heenan & Froude Ltd., so the USP intervened”. Once this purchase had been made, international competition was transformed into a form of co-

²⁷ Brochure Ville de Toulouse. La Cité Industrielle Municipale du Ramier-du-Château (ca. 1932-1933), Municipal Archives of Saint-Étienne, box 40 1. *Examen succinct des procédés actuels d'incinération d'ordures ménagères*, rapport dactylographié, date unknown, Municipal Archives of Biarritz, box 1M 41.

²⁸ Revue municipale, January 1939, S. 3353.

²⁹ Proceedings of the municipal commission about waste incineration, 28 December 1929, Municipal Archives of Lyon, box 937 WP 157.

³⁰ Letter from Société de Grands Travaux et d'Assainissement Général Urbain to Mayor of Chambéry, 11 October 1935, Municipal Archives of Chambéry, box 10 93.

operation, since the brochure on the Lyon's waste incinerator stated that "from now on, the USP benefits from the experience of the three major industrial nations of Europe: England, Germany and France".³¹

Anti-Germanism and patriotism in the fields of incineration and purification of wastewater can explain the general failure of proposals made to the councilors to receive benefits in kind from the Dawes plan, which was part of the war reparations. Lyon was an exception to this trend – possibly due to the experience of the mayor and former prime minister at the time the Dawes plan was negotiated. The beginning of the 1930s, however, marked the resumption of solicitations for German companies or processes: this was the case for the "Kuka" refuse collection system, which was advertised by one Luxembourg company and then an Alsatian company. New firms appeared as serious incineration competitors, such as the Frankfurt-based LURGI-Gesellschaft, which built the new Hamburg plant in the early 1930s and even boasted to have built one in Shanghai.³²

The 'nationalization' of sanitary engineering resulted in the divergence of technical choices between French cities and their foreign counterparts. While the British "activated sludge" process was spreading throughout the Anglo-Saxon world in sewage treatment plants, projects considering this technique remained unrealised in many cities in France. The technology was used only at an experimental stage before 1940 for treatment of a part of the Paris sewage. It is likely that the lack of conclusive experience on French soil prevented this technology from spreading for several decades. As before 1914, local debates remained structured by the competition between leach fields (advocated by agronomists) and biological sewage treatment plants, invented in England in the late nineteenth century and promoted by the famous bacteriologist Albert Calmette. Further evidence of this withdrawal within national borders lies in the very small size of the French delegation sent to an international workshop, in Glasgow in 1938, devoted to the purification of wastewater.

This national introversion was paradoxically accompanied by persistent critique by the most qualified observers about a "French backwardness" in relation to other countries. In order to explain the difference in the rate of equipment in towns and cities, which was highlighted in 1909 by the water engineer Edouard Imbeaux on the issue of water supply and sewerage infrastructure,³³

³¹ Typed note presenting the Union des Services publics [1934] and brochure *L'usine d'incinération des ordures ménagères de la ville de Lyon* (U.S.P, 1933), Municipal Archives of Aix-les-Bains, box 10 295.

³² Letter from A. Rolland, 30 June 1931, Municipal Archives of Biarritz, box 1M 40.

³³ Edmond Imbeaux, *Comparaison de la situation des villes françaises et des villes allemandes au point de vue de l'assainissement*, *Revue d'hygiène et de police sanitaire*,

the lack of political determination was pointed out very often. According to a report by Professor Vaillard at the Academy of Medicine, in Germany “public authorities were struggling more vigorously than in France against the negligence of the local communities, to push them towards the supply of drinking water to their citizens [and] have already achieved very satisfactory results by obliging the municipalities to provide their citizens with pure water”.³⁴ He confirmed earlier testimony from Professor Paul Brouardel: “In Germany, an order from the superior authority addressed to the municipalities is immediately executed, the incriminated water is immediately replaced by pure water”.³⁵ On the French side, the lack of impetus from the state left municipalities free to postpone or abandon their promises of sanitation, perceived as unnecessary, unproductive expenditures. It is necessary to keep a critical distance from all these disapproving discourses of politicians: the recurring praise of the Anglo-Saxon and German models before 1914 reflected perhaps less a reality, according to the environmental history available on these two countries, than a discursive structure whereby urban hygiene actors in France used references to foreign exemplars to legitimize themselves.

As regards the purification of drinking water, many French cities resorted to ozone treatment, which differed from chlorination often adopted in the United States by the absence of bad taste of water. The other innovations of the sanitary engineering were also characterized by the double phenomenon of patriotism and preference for a French specificity: a chlorination method of water called “verdunisation” after 1926 carried the first objective even in its name chosen from a famous battle of the First World War. The system started a kind of conquest of the world.

“We see it applied in Spain, at Seville; Portugal, Lisbon; Switzerland, Geneva; Senegal, Dakar. In Cochinchina, in Saigon. We see it leaving behind it, everywhere it passes, a groove of blessings and a chorus of gratitude in all parts of France, and in very important points abroad and in the Colonies, blessings which have begun for the country during the anguishing struggle of the battle of Verdun, keeping the health of the heroic fighters intact”.³⁶

The nationalist and public health propaganda merged in many articles published in the daily *Le Matin*, whose majority shareholder was the brother of the system’s inventor, Philippe Bunau-Varilla. Thus, while the oldest innovations

october 1909, S. 993-1002.

³⁴ *L’eau*, 15 February 1910, S. 17.

³⁵ L’hygiène. Discours prononcé à la séance d’ouverture de la session de l’Association française pour l’avancement des sciences tenue à Boulogne-sur-Mer le 14 sept 1899 par Paul Brouardel, Paris 1899, S. 5.

³⁶ Philippe Bunau-Varilla, *Guide pratique et théorique de la verdunisation*, Paris 1930, S. 14.

began to spread more quickly in the French urban network, this process was clearly hampered by a reluctance to continue the policy of borrowing from foreign experiences.

The complex history of the diffusion of sanitary innovations in urban France

In a context in which the central government did not pass laws on the issues of water and sanitation, French municipalities remained the main agents of environmental change, for water and cleanliness issues, throughout the first half of the twentieth century.³⁷ Their activity took place in a context of weakness or lack of state expertise capable of advising them and promoting technical processes. Which were the pioneering cities, and how did the diffusion of innovations in the French urban network come about?

A careful study of more than forty cities reveals complex paths for the diffusion of health innovations. Size does not work as the major explanatory factor, assuming that larger cities with more financial clout were more innovative. The rationale was more diverse. Let us summarize the main characteristics of the decision-making process in this domain:

The first one was environmental: improving water quality, treating wastewater, incinerating waste, responded to local situations such as a lack of sufficient drinking water to supply the city, or the proximity of a small stream that could no longer serve as a receptacle for untreated sewage. Small and medium-sized towns therefore had to look for innovative technical processes at an early stage. This was the case in Lectoure (south-western France), Cosne-sur-Loire or Chartres in the Paris Basin, which did not have groundwater sources and had to create a water supply system using river water. Although the specialists were not very supportive of innovation in this type of city, as they feared in particular the lack of maintenance of the technology after its installation, this phenomenon is not specific to France and can be found in Great Britain.³⁸ Paris, which was still run by two prefects and could rely on extensive technical services, remained a reference much sought after by sanitary engineering companies. Nevertheless, it is not possible to speak of a systematic "Parisian model". The size of the city made it difficult to adopt certain techniques that were still under development for the whole city. Therefore smaller

³⁷ For the US situation, Martin Melosi, *The Sanitary City. Urban Infrastructure in America from Colonial Times to the Present*, Baltimore 2000.

³⁸ Nicholas Goddard/John Sheail, *Victorian sanitary reformers: Where were the innovators?* in: Christoph Bernhardt (Hrsg.), *Environmental Problems in European Cities in the 19th and 20th Century*, Munster 2001, S. 87-103.

cities could more easily act as full-scale test laboratories.³⁹ Water and sanitation specialist Edouard Imbeaux warned that it was better to have some reservations in considering “the often hypnotizing example of the capital”, and his colleague Edmond Bonjean stated that in terms of drinking water, Paris was not at the head of the innovation movement, merely implementing the new purification techniques at the experimental stage in one of its filtration plants.⁴⁰

A second criterion relates to the economic functions of the city: thermal spas and seaside towns were more likely to adopt sanitary engineering technologies, in order to attract or retain the English clientele (Nice, Aix-les-Bains, etc.) or to face German competition, like those from Wiesbaden for hydrotherapy. Several small incineration plants were located in Le Touquet Paris-Plage, Cabourg, Biarritz, while most larger cities such as Marseille continued to send their garbage to landfills. Military cities were another type of place where special emphasis was put on reducing mortality from “avoidable” diseases such as typhoid fever which frequently struck young soldiers. Prominent hygienists reported on epidemics in the port of Cherbourg, Toulon which was hit hard by a cholera outbreak in the late nineteenth century, or in the garrison of Avignon. Political allegiance of the council majority was not decisive: while radical or socialist cities innovated, so did Chartres or Nancy, both governed by conservative politicians. On the other hand, choices and debates permeated political life, and in certain cities such as Dijon and Montluçon sanitation projects aroused the hostility of local landlords and caused the defeat of the governing party in the following elections.

Let us analyze this development of sanitation techniques in spatial terms: it largely corresponds to French urban geography, with most of the innovation centers located to the northeast of a Le Havre-Marseille line, with the exception of the cities corresponding to the characteristics mentioned above. In the departments regained after 1918, sanitary engineering companies, especially garbage collectors, played the image of cleanliness attached to towns influenced by German modernization, as if towns in the East were dominated by the “genius of cleanliness”. In Alsace, more original methods could be found than in the rest of France because they were imported from the Germanic world: the Kuka drum for the compression of household refuse in Strasbourg, the competing “Faun” system in Colmar, etc. The companies that contracted with Alsati-

³⁹ This is the case of Cosne-sur-Loire, where a Parisian delegation visited the ozone water purification plant for several years before the First World War.

⁴⁰ Edmond Imbeaux, *L'alimentation en eau et l'assainissement des villes*, 2/1902, S. 391. Report by M. Bonjean, in: *Compte rendu imprimé des travaux du Conseil supérieur d'hygiène publique de France pour l'année 1906*, S. 508.

an cities used the argument of their supposed hygienic superiority to try to convince the municipalities of the rest of France, especially the southern cities. This perception is captured well in a letter to the Mayor of Biarritz:

“The cities of the East are remarkable for cleanliness. All the housewives have their trash bins. It would be as difficult for them to do without them as for any other object necessary to the household. Lyon, Nancy, Strasbourg, Mulhouse, etc. have been equipped for a long time.

This issue is on the agenda. The towns of Calais and Moulins – and others, no doubt – have just decided to distribute garbage cans to their inhabitants.”⁴¹

The reasons why the north-east part of France adopted sanitary engineering innovations more rapidly were probably not all just cultural and would deserve particular investigation. These cities nonetheless showed that a general mindset for innovating could exist across borders.

Conclusion

The history of city-to-city exchanges can contribute much to urban history and to the history of municipal policies in particular, in order to understand how urban administrations and their technicians have innovated or delayed innovation in certain branches of town planning. Almost all cities, regardless of their size, simultaneously performed the functions of receptor, innovative agent, or imitator, as Marjatta Hietala has noted.⁴² For France the study allows to demonstrate the initiative role of cities in this field and shows that even deep in the provinces, some local authorities were able to anticipate the desires of the state, which legislated only in 1964 about water quality issues. One example for this anticipation is the fact, that already in the first decade of the twentieth century the mayors of Oullins, a small working-class community in the suburbs of Lyon, and Mâcon, a small town that is home to the Prefecture for the Saône-et-Loire *département* (70 kilometres north of Lyon), choose to invest in water purification projects for their municipalities.

These exchanges did not stop at state borders: each city developed its own space of action, which could extend as far as Scotland (Glasgow) and Prussia (Berlin) for innovations in urban sanitation. Before 1914, these often spread from abroad to France, thanks to international exchanges between cities. The opposite direction (exportation of French technologies) also existed, especially in the Interwar period, particularly to Eastern Europe or the colonial world. Documents produced by the dissemination of information on innovations in

⁴¹ Letter from Louis Blanchard to Mayor of Biarritz, 11 November 1923, Municipal Archives of Biarritz, box 1M40.

⁴² Hietala, *Services*, S. 395.

health engineering since the 1880s make it possible to write an urban environmental history that not only traces local situations, but also shows the long and winding paths of modernizing urban space, and reflects the transnational dimension of this process.⁴³

⁴³ For a recent work about this process, in the post-1945 European context, with the example of pedestrian streets, see Cédric Fériel, *L'invention du centre-ville européen. La politique des secteurs piétonniers en Europe occidentale, 1960-1980*, in: *Histoire urbaine* 42, 2015, S. 99-122.