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From Static devices to Shared Data,

Information Issues in the Evolving Relationship between Drivers and Road Authorities in the Cases of Paris and Lyon

Abstract: Focusing on Paris and Lyon, this article interrogates the evolution of the relationship between motor-vehicle drivers and the French road authorities. Based on public archives, it demonstrates that, although the main goal of these agencies remained constant, that is to favor automobiles over other means of transport, a change in the relationship between drivers and traffic managers can be traced. This more specifically translates as how driver information has been designed and implemented, and how it has evolved, in terms of policies, stakeholders and technology. From the 1920s to the 1950s and 1960s, the driver was relatively “free” and his relationship with the authorities quite loose. Around 1960, with the expansion of a real-time traffic data collection infrastructure, the driver-authorities relation evolved into an increasingly control-related relationship between the traffic manager and the driver. Starting in the mid-1990s, this link between the driver and the authorities gradually weakened. As drivers themselves started to generate data, private intermediaries designed an individualized relationship.

Keywords : road history, road signs, traffic engineering, traffic management, urban history, urban planning.

Introduction

Sitting behind the steering wheel, interacting with the vehicle's mechanics, a driver travels through the city, constantly making compromises between its will of movement and the automobile's surroundings. From the very beginning of motor traffic in the early 1900s, this created tension between motorists and other users, as well as among motorists; the meteoric rise in the number of users and motor-vehicles demanded new governance solutions.

This article aims to investigate such frictions, part of the broader history of traffic management, mostly by analyzing the urban upheaval caused by mass-motoring in the twentieth century. These questions have been thoroughly explored since the 1990s by mobility historians. Among others, Peter Norton investigated the political fights between road stakeholders for the control of the street flow capacity.¹ Other transport historians such as Gijs Mom and Clay McShane have studied road use and traffic flow management, as well as the history of signals through national-scale comparisons.² In the case of France, Mathieu Flonneau studied the car-induced transformation of Paris town planning.³ This article is based on a comparative approach, using public city archives on traffic management practices and debates. The focus on changes in the use of technical devices allows to study changes in the public authorities' perception of the user/manager relationship. Drivers' information systems can be considered as "large technological systems" (Thomas P. Huges) with political dimensions, revealed by local particularities in the evolutions and the devices implemented.⁴

The development of new traffic governance and signaling systems were social and political constructions. The way that authorities talked about "traffic flow" was not neutral,

rather they addressed and prioritized the needs of some layers or users above others. In other words, behind the neutral language of management and safety, there was a political and social determination to favor some users, especially motorists. Also, the use of public space for traffic purposes was not a neutral outcome, but responded to particular social and political values, such as speed, efficiency (according to social and political actors) and efficacy. Similarly, the term « congestion » is not neutral and often used in the twentieth century for justifying road-building schemes planned prior to actual demand⁵, although this argument has to be downplayed. In fact, many schemes were designed upon actual congestion measurements, or against forecasted dramatic increase in the number of vehicles. Congestion can therefore both be seen as a social-construct, but also a real daily problem which turned out to be difficult both to quantify and to handle, hence the technical devices we hereby describe. Our investigations showed also how road authorities became more and more “flow managers,” and then “journey managers,” giving preference to motor vehicles for road use, priority and capacity.

This article relies critically on those works, and it focuses on the relation between drivers and road authorities. We argue that the road authorities show a preference for automobilism, and their policies allowed to ease use of motor vehicles. However, we state that the relation between drivers and road agencies changed along the twentieth century and the investigation of this shifting relationship is indeed worth an analysis, so to better understand the history of traffic. In doing so, we focus on the privileged flow of information and exchanges running between the road management (local and national road authorities) and the drivers. Our

sources do not allow us to have the driver's point of view, which we consider here through the eyes of the experts. We focus on the way road authorities consider the car-driver unit and how they communicate with it, with a double goal of information and control. Drivers' information itself is composite: it holds both a geographical aspect (location, routes, speed) and a regulatory aspect (signaling limits, prohibitions, preferential itineraries) for an indirect control attempt of motorist's journeys. At first, drivers' information consisted in punctual devices responding to specific situations. It has gradually diversified and extended across the cities, becoming an important part of global traffic management policies (eventually addressing broader users, like pedestrians). Beside technological shifts and political choices, drivers' information systems are also the result of a stratification of past practices, rather than complete replacements of previous systems.

It is in this overall complexity that road authorities usually defined three main overlapping missions. Their first mission, the most crucial, is ensuring the safety of the various users on their roads. The concept of safety was neutralized, as an abstract concept, in order to avoid political issues. Their second mission is handling traffic (again according to some political value). Their third mission is on a longer term than the two others: it involves planning, designing, and implementing the layouts that serve the policies enforcement. Therefore, informing drivers – as privileged and powerful agents – of the regulations in place became crucial both for the authorities and the users. Meanwhile, traffic engineers soon became aware

of the complexity of behavior-control, and thus devised new means to integrate the “driver-car unit” within the (automobile-dependent) road environment.⁶

Usually road regulations fall into two categories. The first category of regulations consists in prescriptions, e.g. defining one-way streets and authorized standing and parking locations. The second category is the signposting norms, which are essentially addressed to occasional drivers, orienting them towards the city’s landmarks and main parking lots. Signposting has evolved through time, but its main principles have remained the same from the 1920s until today.⁷ The 1968 Vienna Convention on Road Signs and Signals established, for ratifying countries (which includes most of Europe), common grounds on signs. We can rely on two volumes on French road signaling,⁸ while most historical studies focus on the inception of these devices, like Hans Buitter, and Peter-Eloy Staal’s work on the first Dutch traffic signals or Gordon Sessions’ on the inception of “traffic devices.”⁹

Another important aspect we want to assess in the present paper is the autonomy of local bodies over the decision-making process for traffic-related devices, along with the local political stakes, while dealing with an increasing number of national norms and regulations. We therefore would like to define a long-term perspective and thus define the role and the impact of technical devices within the quick-changing traffic policies they were designed to serve. The user position is worth an historical perspective: in transport and mobility history there is increasing scrutiny upon the users’ role, as shown by recent studies on road and traffic safety¹⁰ and congestion.¹¹ This also provides a new insight on the focus on infrastructure-building and

urban transport policies: it shows that these gradually take a wider account of usage, by attempting to route individual trips, whenever the technical innovations allow to reach the individuals rather than a “flow.”

We focus on the two biggest cities in France, Lyon and Paris, whose transportation networks' history is well documented.¹² This study mainly relies on public archives, mostly municipal departments files and traffic engineers' studies and reports. Comparing these two cities allows to assess the role played by the local geographical and political contexts on the inception of devices made to answer similar traffic-related problems from the 1920s to the 2000s. Paris is the capital of France, and hence holds a specific status, whereas Lyon is a key transit node. These two local characteristics significantly influence the traffic devices devised. Moreover, it could be expected that Paris, which has encountered early traffic congestion problems, acted as a role model for other French cities. We will nonetheless show that other major cities, like Lyon, have in fact followed their own paths.

1920s to the 1950s: Drivers informed and guided by static signs

Drivers' information became a serious political problem started in the 1920s, as car traffic caused tangible congestion and safety issues, according to public authorities of numerous western cities.¹³ Nonetheless, French road authorities did not launch information-dedicated policies. Drivers' information relied on static signs, which were considered as complementary devices serving traffic management policies.¹⁴ Public experts mostly saw the driver as a person taking occasional trips in the city, thus in need of guidance on a road network not really

designed for him. According to them, the driver first needs to know which way he needs to drive (left-hand or right-hand side of the road, one-way streets and so on) and where he can park the vehicle. The driver also needs to know how to get to his destination, and perhaps have his curiosity stirred for a specific location he did not initially consider. This image of the “occasional driver,” usually an upper-class user, with tourist interests, was the dominant idea. In the field of tourism, the private sector had commercial interests, especially car manufacturers and suppliers like Citroën or Michelin. They initiated the first signaling schemes in most French cities, which were then backed by the public authorities.¹⁵

Public and private devices for occasional drivers

Signposting is older than motoring.¹⁶ Nevertheless, after the World War I, french local public authorities experienced a change of mind-set. Information to street users, from pedestrians to drivers, was mainly done through signs indicating the main arterials and locations.¹⁷ New thoughts were given on their implementation from the 1920s onward for various purposes, such as to indicate one-way streets that had been set up in numerous French towns like Lyon and Paris, to identify stops on the developing surface transit networks, or to show main locations and routes to foreign (understood here as not from the city) visitors. At the beginning, the municipalities seemed to consider the purpose of orienting foreigners as a non-essential topic. Automobile signs were promoted by drivers’ associations, like the *Automobile-Club* and the *Touring-Club de France*, and by car-related manufacturers like Michelin or Citroën.¹⁸ The car industry was heavily involved in sign production, which it then proposed that budget-tight road

authorities implement both in urban areas and in the countryside.¹⁹ The role of these actors was decisive in the implementation of these first signage schemes, as the municipalities were not interested in paying for them.

The rise of auto touring meant that Lyon and Paris, like many of their European counterparts, received more and more foreign visitors not necessarily familiar with its spatial layout and driving regulations. Lyon had a greater stake in transit traffic than Paris. Nonetheless, the same process for directional signposting schemes could be observed in both cities: a proposal by Citroën, accepted by municipalities without any associated funding.²⁰

The regulations were increasingly complex from the 1920s onward, after the first were voted in by the municipalities (in 1910 for Paris, in 1926 for Lyon). For example, one-way streets could be disorienting for foreign drivers, leading them to commit unforeseeable offences, which in return would both alter their experience of the city and cause incidents impeding local traffic. The first comprehensive signposting scheme in Lyon was proposed by the Citroën Company, which planned 97 enamel signs to be put on municipal streetlight poles to indicate both downtown and the main cities that could be reached from Lyon's main arterials. This scheme was meant to answer "Lyon's signposting problems" (*Problèmes de signalisation à Lyon*) pointed out by the President of the Tourist information office, and was examined during a meeting of State, *Département* and municipal engineers, with representatives from the *Touring-Club de France* and the *Automobile-Club du Rhône*. They all agreed on the need to provide better guidance for car drivers, but public funding for signposting schemes remained

quite low.²¹ It was suggested that the cost of displaying the enamel signs would be shared between the *Ponts et Chaussées* Administration, the authority in charge of the to-be-signposted roads, and the *Chambre d'Industrie Touristique de Lyon* (Chamber of Tourism Industry of Lyon), part of the *Chambre de Commerce et d'Industrie de Lyon* (Chamber of Commerce and Industry of Lyon). This shows how touristic issues prevailed on street traffic management at the time. This reflects the public authorities' lack of interest in these improvements, with consequences for urban traffic management: only the major routes are concerned by these schemes.

In the 1930s, traffic safety seems to be the main goal for public authorities: providing drivers with information, especially to avoid the deadly car-pedestrian encounters, which were the most frequent form of accident.²² In fact, traffic management is the most important purpose, so as to avoid traffic jams. The lack of consideration for pedestrians in urban planning policies proves it. This aspect had already been considered in the previous years: in 1912 the first (static) traffic booth was installed in Paris, at the intersection of boulevard Montmartre and rue du Faubourg-Montmartre. Paris distinguishes itself from other French cities by giving early thoughts on traffic management: the 1910 *Rapport Massard* for the City of Paris Municipal Council promoted signposting infrastructures as a tool for improving traffic flow.²³ Congestion also became a new aspect of drivers' information, especially in the 1930s. Congestion predated the automobile, mostly in downtown areas of Paris and Lyon, but became an increasing concern for public authorities as traffic volumes grew.²⁴

Towards signing policies to fight congestion

The lack of information was often raised as a major factor in the disturbances caused by traffic, whereas the car still held a low modal share in surface, or “on-street” transport. Drivers’ information thus became more comprehensive, with policies then covering the entire city. The need to indicate parking lots, the main sights, administrative and business locations to the occasional or out-of-town driver was growing in importance. This translated into comprehensive signposting schemes in both Paris and Lyon in the early 1930s, supported by drivers and tourism unions.²⁵

The first Lyon signposting scheme was proposed to the municipal authorities in 1931 and implemented in 1934. For its designer, this scheme held three purposes. Its first purpose was to help the driver end his stay in the town, by indicating how to leave the city. The second was to “easily find Bellecour Square, Lyon’s most central location.” The third was to “ease the flow of drivers that do not want to stop in Lyon, by diverting them away from the congested central zone.”²⁶ The strain between the diverging interests of tourism-friendly and congestion-fighting policies can be clearly felt. Tourism and the need to attract people downtown seemed to prevail over important issues raised by transit routes crossing central Lyon.

Figure 1. Arrow signal bearing “Maine only” (referring to the Avenue du Maine, in Paris), at the junction between Maine, Montparnasse and Vaugirard arterials. Picture circa 1950, from the *Laboratoire des Équipements de la Rue* (Paris Street Assets Laboratory) archives

In Paris, congestion issues prevailed over all other considerations, as they were perceived by public authorities as more urgent than in Lyon. Paris was an early adopter of technical innovations in signaling, such as the deployment of traffic lights at several key downtown intersections, starting in 1923. In Lyon, the first traffic light was not installed until 1937, and they did not enter general use there until the 1960s. These devices took part of the growing importance of the automobile in both cities. These city-wide car-oriented schemes were part of broader transport policy changes, in which cars prevailed ever more over other modes of surface transport, mostly tramways. Paris was one of the first major European cities to undertake the systematic discontinuation of its tram system between 1927 and 1938, first downtown and then gradually in the suburbs.²⁷ Congestion was the main argument raised to justify the transition from rail-based to bus-based transit lines, even if it was primarily an economic issue for public authorities and transport companies. In Lyon, the first replacement of trams by buses occurred in 1926, while trams ran until 1957. The process was slower since congestion issues were less staggering than in Paris, but also because of the financial problems of the Lyon's transit companies in the 1930s.²⁸

The first era of drivers' information in cities was marked by the low interest shown by road authorities in this matter: they primarily considered the infrastructural aspect of traffic, and consider drivers' information to be a touristic issue, to be taken care of by private companies, at least to some extent. This era was characterized by the implementation on the streets of technically simple objects, signs, designed to provide regulatory and geographical

(static) information to motorists. In this matter, Paris and Lyon basically followed the same path, Lyon adopting a slightly slower pace than Paris. Nevertheless, the main fundamentals of drivers' information policies still in place today were settled during this period: signposting systems covering the entire city, and technical innovations devoted or adapted to car traffic. Starting in the 1950s, a break point is reached, mostly because of political changes: after this the driver is less and less considered as an individual by the various authorities, but rather as one particle within a flow of vehicles.

1950s-1980s: Drivers in a stream, managed with centralized systems

From the 1950s onwards, information became the keystone of traffic management policies: this included both the information stemming from the data collected by the authorities (through traffic sensors) and the information transmitted. The 1950s-1990s was thus marked by the inception of devices allowing information to be broadcast to the traffic stream. Devices were seen as the means through which traffic management policies were implemented. From the authorities' perspective, deeply influenced by American traffic engineering practices, the individual car driver was now part of a traffic flow. The authorities' mission was to guide and distribute the increasing flow across the existing network, while at the same time designing and constructing new infrastructures.²⁹ During this period, Lyon and Paris relied on the same means of regulation: traffic-actuated synchronized signals, that ordered the network between local streets and main crosstown and bypass arterials and expressways. The time difference between

the Paris and Lyon implementation of the same type of devices is worth noting. The local debates indeed show the need to adapt these to local needs.³⁰

Traffic flow information as a key traffic management tool for roads authorities

Starting in the 1930s, and essentially after the Second World War, new street layouts favored the car over all other surface transport modes, be it in Paris or Lyon. Authorities applied to urban roads rules, arrangements and assets originally designed for interurban roads planning: traffic segregation, widened and paved roadways. Despite this, drivers were not the target of information systems as individuals, but as part of a broader traffic flow traveling in a network that needed to be decongested. Figure 1 illustrates this fact: an arrow signal allows through movement at the signalized junction for part of the red-light time, thus increasing traffic flow capacity across the junction, but reducing pedestrian crossing time. These layouts, greatly inspired by American traffic engineers and adopted by the *Ecole des Ponts et Chaussées*, took little account of the diverse street use habits of its various users.³¹

From the 1950s onward, within drivers' information policies, congestion-fighting, along with traffic safety, were prevailing both in Lyon and Paris.³² Congestion was observed in the 1920s and 1930s's scientific' traffic studies, but it became important in public authorities' minds in the 1940s in America, followed by Europe once the war had ended.³³ The development of drivers' information systems must be put into perspective with the simultaneous generalization of traffic studies, starting in France in the 1950s with American methodology and devices. In that case, changes were due to both political and technological evolutions, in favor of major

arteries planning policies. Routes that needed signposting were the ones that mixed both main interurban routes and local journeys. Becoming the urban network's core, these arterials attracted more traffic and ended up being the most congested.

Drivers' information evolved after the war into a more global approach considering flows instead of individuals: this then became known as "traffic management policies". This terminology appeared in France in the 1950s,³⁴ employed by public authorities' technicians to assert their expertise and knowledge of new technologies. Drivers' information systems left their very local, nearly experimental approaches, for a broader, citywide globalized approach. Paris pioneered the field, but Lyon, although influenced by the Parisian decisions, adopted its own model. These policies relied on two mainstays. The first was infrastructure, through major urban motorway schemes, defined both at State and local levels. The second pillar was the widespread implementation of traffic lights across main arterials and their coordination through "green waves". In Paris, this was done as early as the late 1940s: the first traffic light coordination system was installed from 1948 for the city center. These systems were installed inside control rooms, centered on the synoptic of the monitored junctions: Figure 2 shows the *Poste Maillot* control room in 1956. Lyon followed Paris a few years behind, with a traffic lights deployment policy in the 1960s, followed by their coordination in the 1970s. This more progressive approach in Lyon can be explained by two factors: the lower traffic volumes than in Paris, and the massive infrastructure policy brought forward by the mayor Louis Pradel

(1957-1976), which favored grade-separation over traffic lights for busy intersections, and the construction of a motorway through the city center.³⁵

Figure 2. Poste Maillot control room, circa 1956. Picture from the *Laboratoire des Équipements de la Rue* (Paris Street Assets Laboratory) archives, reproduced by the authors with the kind authorization of Pierre Leroy, in charge of the Traffic and Signals Division of the Laboratoire from 2000 to 2017.

These drivers' information systems took growing room within the cityscape and transport policies, as an answer to issues caused by traffic increase. Infrastructure building policies through the urban cores mostly stalled with the oil crisis in 1973. Important changes in the governance of transport followed, both in Paris and Lyon.

Traffic flow at the core of coordinated policies

Drivers' information systems were also important for the coordination of administrative actors and their traffic management policies. Authorities aimed at a coordinated management between State-managed roads and municipal roads: for example, the State, at the national level, organized traffic information with the Gendarmerie in 1966–1968, which paved the way to the *Centre National d'Information Routière* (CNIR, National Centre for Road Traffic Information) in 1969.³⁶ The *Directions Départementales de l'Équipement* (DDE) linked these State structures with local administrations, to which major parts of the urban State road network (excluding motorways) were transferred, starting in 1973.

The coordination between the different drivers' information parties varied, because of changes on public actors' governance. Debates were centered on the transition issue between local streets and main interurban and urban arterials and expressways.³⁷ The Paris case remains peculiar as the State kept complete authority over most of its arterials. A main arterial network existed there since the 1950s and remained at the core of the successive traffic plans, including the 1976 one. Starting in 1976, the associated signposting scheme was implemented with backlit directional signs. These signs "allow[ed] for the drivers to journey and find their way, based on a directional grid covering the city and highlighting its major traffic nodes", according to 1985 Paris master scheme authors.³⁸ The Paris ringway scheme, or Boulevard Périphérique (its first segment opening in 1960) introduced both a new kind of road within the city's limit, the urban expressway, nonetheless referred to as a "Boulevard." On the ringway and the outermost ring of boulevards that parallels it (Boulevards des Maréchaux), a specific signposting and traffic management scheme, called CORRIDOR, was implemented.³⁹

In Lyon, the city's ringway is much older and started off at its inauguration in 1938 as an at-grade urban road, the Boulevard Laurent Bonnevey. It was excluded from the first signposting schemes of the 1930s. After the war, it became a central part of the network as it was gradually, from 1958 onwards, turned into a grade-separated expressway, and thus included as a top-priority route within subsequent signposting schemes. Classified as a State highway, and then downgraded to a *Département* road, it kept its expressway status and was therefore distinguished from the rest of the urban street network.⁴⁰

For local public authorities, users' information was one of the first means to unify transport mode-based policies. Direction signs started to consider other modes, as the first multimodal policies are instated by all major French cities in the late 1970s. In Paris, the 1976 signposting scheme, complemented in 1985 by the *Schéma directeur de la signalisation d'indication* (Direction Signs Master Plan), was not only focused on car traffic, but also on standardizing pedestrian direction signs, pointing towards points of interest whose access is sometimes difficult for pedestrians, mainly when coming from public transport stops or parking lots. This master plan showed the growing concern for multimodality, and the decrease in automobile pressure: "it is mainly addressed to pedestrians with, when the situation calls for it, some complimentary signs for car drivers."⁴¹ This means it was now accepted that some locations within the city could not be directly reached by car.

Unlike Paris, Lyon's signposting schemes took little account of multimodality issues: the signposting master plan was solely dedicated to cars and did not take other modes into account. The plan launched in 1977 associated two schemes: the signposting of major arterials and junctions, and a centralized traffic management scheme based on traffic lights coordination.⁴² These two combined schemes aimed at concentrating drivers onto main arterials, on which traffic lights management would guarantee free-flowing traffic. The only benefit to drivers would be the time gain obtained by diverting flows onto the larger roads. Lyon focused on cars until the 1990s. Centralized traffic management systems, which in turn

brought up the multimodality issues, were only set up almost twenty years after Paris, hence the associated questions had not been addressed until then.⁴³

Drivers' information policies from the 1950s to the 1980s broke from previous 1920s and 1930s policies, both in Paris and Lyon, for political reasons. To fight the increasing socially-constructed problem of congestion, traffic management prevailed over all other considerations. The prevailing flow orientation policies seems to fade already in the 1970s, with the axing of most urban infrastructure programs and the rise of information and communication technologies. Concerning streetscape, coordinated traffic lights were added to the existing signage, with no desire for harmonization by public authorities of the two cities.

From the 1980s to the present: The driver as client, probe and data provider

The central systems era: public monopoly over drivers

In the 1980s, information and communication technologies in traffic management translated into two simultaneous processes: one was the centralized management systems, the other was differentiated information feeds in line with the traffic manager's concerns. These stirred towards dynamic real-time information, halfway between managing a traffic stream and individually considering each driver making up the flow. The 1980s–1990s period thus marked a turning point in the transport management policies initiated in the 1960s in Lyon and Paris, among the other major French cities. Technological evolutions of drivers' information systems allowed the road authority to more directly reach the drivers and to route them more-thoroughly during their journeys. During this period, changes are driven first by technological developments and then by changes in actors and policies. This backed the focus on individual journeys, part of broader multimodal policies, but did not bridge the coordination gaps between the different public stakeholders, that all primarily served their own purposes. This gave room to the rise of private actors like information and communication technologies companies, that have increasingly relied on crowdsourced data since the 2000s. They gradually became independent of the public authorities' infrastructures, and therefore could give a comprehensive service and bridge the gap for the drivers.

Originally, authorities-backed real-time information primarily relied on Variable Message Signs (VMS) in major cities like Paris and Lyon. These devices were at first dedicated

to bypassing roads (ringways etc.), and then implemented on some major arterials. On the Paris ringway, following a static signs renewal campaign in the 1970s and early 1980s, in 1985 the southern section was equipped with Variable Message Signs (VMS). These first VMS then served several goals, among which to provide more precise information on traffic conditions to the drivers than allowed by the FM radio. Subsequently, Paris' road authorities launched a broader VMS deployment campaign along the entire ringway, to warn drivers of maintenance works, incidents, and inform them on traffic conditions on the radial motorways interchanging with the ringway. In Lyon, the municipality planned VMS deployment in the early 1990s as part of the CORALY program (*Coordination et régulation du trafic sur les voies rapides de l'agglomération lyonnaise*), but was at first dedicated to transit traffic: only the urban motorways and expressways were equipped, with about thirty signs during the first phase.⁴⁴ This translated Lyon's policy to discriminate between transit and local roads and streets, in line with predating policies.

Besides VMS, drivers' information was also broadcasted through FM radio stations and the first experimental on-board guidance systems, like Carminat on some Renault cars. Even though the range of available means for dynamic drivers' information broadcasting was widening, road authorities remained at the root of all information and traffic data.⁴⁵

The INF-FLUX program, part of the CITIES experiment of the DRIVE/ATT European project, is a relevant example of these drivers' information systems, as Figure 3 shows.⁴⁶ Traffic information broadcasting within the CITIES experiment shows the administrative and technical

layout of a system that only relied on public sensors and stakeholders. This meant that four distinct traffic management systems covering distinct sections of the Paris region road network had to be connected: IPER-REPER for Paris ringway, and SURF for Paris traffic lights and urban arterials, SIRIUS for the State-managed motorways and expressways, and PARCIVAL for the traffic lights and urban arterials of the Val de Marne Département. Private service providers were not included in the setup.⁴⁷

Figure 3. Diagram of the planned CITIES traffic information broadcasting system. Document from the Direction de la Voirie et des Déplacements, Ville de Paris, 1995.

Both in Paris and Lyon, in the 1990s, the VMS became part of their respective comprehensive traffic policies, which triggered their deployment within the city. Before the late 1990s VMS remained rare outside the expressway network, mostly for esthetical reasons. In 1993 in Lyon, the parking lots dynamic signposting scheme's first goal was a "breathing city", meaning, according to its author, "reducing the interfering traffic generated by drivers looking for available parking spots". Seeking available parking spots, i.e. "prompting the driver to park his vehicle in a car park"⁴⁸ (Figure 4), only came in second. Moreover, in both cities, the so-called "local" direction signs, static for the most part, were gradually being standardized and simplified, as the municipal administrations ensured that they were well integrated within the existing cityscape and street furniture. This idea was widely shared among the urban road authorities of the major French towns. In Paris, for instance, the 1985 Direction Signs Master Plan stated, about the backlit direction signs implemented across the city, that "the increase in

the number of vehicles ha[d] caused an increase in the number of regulatory signs” and that “the growing complexity of the urban road network brought up the need for signposts for vehicles, as to reduce the time lost finding destinations and to keep traffic flowing.”⁴⁹ In Lyon, for instance, municipal authorities justified the new 1996 Signposting Master Plan by the opening of new roads, the upcoming Local transport plan (*Plan de déplacements urbains*), and “restoring consistency among several historical layers of signposting schemes” through more explicit mentions.⁵⁰

Figure 4. Proposed sign for an Area Entrance Sign, for the dynamic signposting scheme of Lyon’s parking lots, in 1993 (AML 1781W63).

The rise of information technologies changed traffic management policies in the 1970s and 1980s. Nonetheless, traffic information remained for the most part dedicated to the road authorities, whose aim is to set up and manage road capacity to facilitate at best drivers’ journeys through maximizing the flow and lower global congestion across the network. The move towards on-board traffic information terminals only picked up in the late 1990s, while road authorities gave, through the spreading VMS infrastructure, even more numerous and precise information, as we will see below.

Drivers as probes: public and private interactions and competition

Traffic information shifted from traffic flow to drivers, or even more generally transport users, following two main trends. The first trend was the massive technical evolutions, which eased drivers’ access to traffic information, integrating it into their car use habits. The second trend,

deeply linked to the first one, was a shift in transport policies. Authorities now wanted to act on demand, as the available technologies now allowed measuring its whereabouts: journey purpose, traffic dynamics, modal choice. Through these widespread on-board devices, private companies took their share in the relationship between road authorities and drivers.

The first trend of the traffic information transition is the technological availability of on-board electronic devices. Various experimental programs, for some Europe-funded, associated the public sector, the car industry, telecommunication companies. Among the oldest of these, Prometheus (Program for European Traffic with Highest Efficiency and Unprecedented Safety), launched in 1986, labelled among the EUREKA projects, gathered public research institutions, manufacturers, European automobile manufacturers like the French PSA and Renault.⁵¹ By the late 1990s, the Internet Revolution allowed the rise of numerous private stakeholders, which provided drivers traffic information originally based on road authorities' data, and gradually complemented by data retrieved from the users themselves. Traffic information shifted increasingly toward the private sector, with an individualized service relying on users' data, but also for a part on public information, mostly to check the validity of signaled events (road closures, demonstrations, roadworks, accidents). Traffic management systems, until then solely visible to the driver through the VMS, see their sensors information broadcasted on the Internet. The 1996 launch of the Sytadin portal (*Synoptique du Trafic de l'Île de France*) was the outcome of the Paris region public traffic information policy.⁵² Sytadin broadcasts the data and events from the State network, the City of Paris

network (major arterials and ringway), and motorway concession companies within the region. The CORALY system in Lyon, followed up on Paris with a slight delay, as the centralized computer system was only set up in 1998, and its Internet availability in 2002.⁵³

It is somehow a paradox that as the road authorities' traffic data collection systems reached their maturity (comprehensive coverage of major expressways and arterials, extensive broadcasting of the data through the Internet, phones, VMS), the infrastructure they still rely on traffic sensors, begins to cede ground. Some politicians even now complain about it: "the dynamic map of the network shows [...] grey sections corresponding to unavailable traffic data. There are plenty of such zones, often at strategic locations of the network, thus questioning the interest of the system."⁵⁴ Moreover, public portals are restrained to the boundaries of the authorities behind them, and the roads they administer. For the Paris region, the traffic data collection systems of the *Départements* bordering Paris are even not available on Sytadin. At the same time, private companies have based their web portals on the public ones (with the dynamic traffic map and the color-coded traffic conditions), but thanks to their user base they are able to provide a far more extensive spatial coverage of the road network.⁵⁵ This includes roads that do not have sensors, roads whose sensors are out of order, and even local streets. The situation in Lyon seems less problematic, as the various local governments show more union around these issues and congestion is mostly limited to a few major arterials and expressways, plus the Lyon downtown arterials.⁵⁶

Additionally, current drivers' information policies are now part of broader multimodal policies, in line with the public policies implemented in Paris and Lyon since the 1970s. Indeed, VMS messages adapt a common language with other transportation modes, by delivering "journey travel-times" to the traffic (since 1994 in Paris, for example). Nevertheless, a fundamental difference can be drawn between Paris and Lyon's policies, regarding the multimodal approach within the transport authorities' transport information portals. In Lyon, all major modes (transit, car, walking, bike) available for a journey are centralized within the same portal, Onlymoov, which integrates traffic data from the CORALY system. In Paris, the roads authorities' portal Sytadin is independent of the multimodal portals, like the region's portal ViaNavigo. Sytadin remains focused on the car, whereas ViaNavigo, launched by the Syndicat des Transports d'Ile de France in 2011, completely excludes motorists from its route planner.⁵⁷ Political orientations and authorities' range of action seem to outweigh the transport user interest in the display of traffic conditions. Moreover, ViaNavigo is a website of the Regional authorities, who do not have as of 2020 authority over roads, whose management is split between the State, the Départements, the City of Paris and the various municipalities. The Lyon portal evolves in a different context: Onlymoov is one of the outcomes of the Optimod project, which was designed by the Grand Lyon (intercommunal authority) to overcome usual administrative boundaries.

Drivers' information has throughout the 1970s to the 2000s added a dynamic centralized management of traffic flow to static information systems . In both cities, traffic management

systems are still governed by roads authorities but with an increase of private interests. These public systems then get challenged by crowdsourced systems as the drivers themselves become sensors through the growing fleets of on-board units. These crowdsourced systems however remain rather fragmented as each company has its own user base. Routing instructions provided by these private stakeholders do not necessarily follow the public traffic management policies, without limited possibility of action by public authorities.

Conclusion

Focusing on two main French cities, Paris and Lyon, the article shows the evolution of the winding relationship between drivers and road authorities. This evolution is fueled by some technical and mostly political changes, in a three-periods layered development.. From the 1920s to the 1960s, road authorities both managed the infrastructure and the traffic as one same homogeneous set. The driver was rather “free” and his relationship with the authority quite loose and limited to the road and the signs. The said relationship can also be shared with private companies who provide some signs to the authorities.

Around the 1970's, the driver-authority relationship changed radically with the overall expansion of real-time traffic data collection infrastructure, resulting from the industrialization of existing traffic sensing processes. A whole new information network (cables, sensors) was built along the main roads. The road authority gained a real traffic management function, and a two-way connection with the driver. The authority sent information to a flow (and not individuals) and the driver (as an individual) generated information through the road and associated information infrastructures, that only sent flow variables to the authority.

Around the mid-1980s, the centralized systems were mature and traffic information broadcasting circuits were in place, but the exclusive link between the driver and the authority has yielded ground. Information intermediaries have appeared between the authorities and the driver, aggregating data from different authorities and broadcasting them to their clients. These private service providers have been at first exclusively based on public data. Nonetheless, as

drivers (or their vehicles) themselves have gained the ability to generate data on their own, thus self-probing their journeys, while public sensor infrastructure began to decline, private intermediaries were able to design an individualized link with each of their clients.

We argue that this paper and its periodization could open a fertile field of investigation. Though we can count today on an in-depth understanding of the policies and politics regarding automobile in the twentieth century, we need a better appraisal of the traffic management, of its agencies, as much as its control (and surveillance, *à la Foucault*⁵⁸) devices. This leads us to argue that drivers' information management triggered the implementation of dedicated technical systems and public services. In our case-studies, roads authorities of Lyon and Paris had to adapt to a lot of changes in traffic flows, technical innovations and the necessity of coordinated traffic policies. From giving the right direction to occasional drivers fighting congestion, the aims of signposting schemes have changed. They have become integrated in global traffic management policies, both in Lyon and Paris, in the same period.

We also argue that the history of driver's information infrastructures can be a history of adaptations and failures. From the 1930s to the 1970s, technical systems have changed with innovations and changing policies, but the administrative framework of roads authorities remained the same. It is one of the major cause for the overtaking of public driver's information systems by private ones, since the driver him/herself has become a data producer starting in the 1990s. In 2020, the link between drivers and road authorities is now shared with a lot of public and private actors: it increases the differences of drivers' information systems between cities,

as shown by the examples of Paris and Lyon. In terms of policy-making, more particularly regarding transit-incentives, the issue of traffic management through the control of the information that reaches and emanates from drivers is a major challenge for public authorities, in particular for the regulation of public/private partnerships.

Notes

¹ Peter D. Norton, *Fighting Traffic: The Dawn of the Motor Age in the American City* (Cambridge, MIT Press, 2011).

² Gijs Mom, “Building an Infrastructure for the Automobile System: PIARC and Road Safety (1908–1938)”, *Proceedings of the Historical Symposium* (23rd PIARC World Road Congress, Paris, AIPRC/PIARC, 2008). Clay McShane, “The Origins and Globalization of Traffic Control Signals,” *Journal of Urban History*, 25:3 (1999), 379–404.

³ Mathieu Flonneau, *Paris et l’automobile, un siècle de passions* (Paris, Hachette, 2005).

⁴ Mikael Hard and Thomas J. Misa, *Urban Machinery : Inside Modern European Cities*, (Cambridge, MIT Press, 2008), 8-14.

⁵ For a long-term approach of the use of this term, see : Sabine Barles, André Guillerme, *La congestion urbaine en France (1800–1970)* (Rapport de recherche, LTMU/IFU, METL-Plan urbanisme construction et architecture, Paris, 1998) ; available also at <https://halshs.archives-ouvertes.fr/halshs-00280970> accessed on November 26th 2019.

⁶ Clay Mc Shane, “Traffic Control Signals.”

⁷ Hans Buitter, Peter Staal, “City Lights: Regulated Streets and the Evolution of Traffic Lights in the Netherlands, 1920–1940,” *Journal of Transport History*, 27:2 (2006), 1–20.

⁸ Marina Duhamel-Herz, *Un demi-siècle de signalisation routière : naissance et évolution de la signalisation routière en France*, (Paris, ENPC, 1994) and *La signalisation routière en France de 1946 à nos jours* (Paris, AMC, 1998).

⁹ Gordon M. Sessions, *Traffic Devices: Historical Aspects Thereof*, (Washington, D.C., Institute of Traffic Engineers, 1971); Hans Buitter, Peter Staal, “City Lights.”

¹⁰ Mike Esbester, Jameson M. Wetmore, ‘Introduction: Global Perspectives on Road Safety History,’ *Technology and Culture*, 56:2 (2015), 307–318.

¹¹ Sabine Barles, André Guillerme, *La congestion urbaine en France (1800–1970)* (Rapport de recherche, LTMU/IFU, METL-Plan urbanisme construction et architecture, Paris, 1998) ;

available also at <https://halshs.archives-ouvertes.fr/halshs-00280970> accessed on November 26th 2019.

¹² Mathieu Flonneau, *Paris et l'automobile*; S. Gardon, *Goût de bouchons : Lyon, les villes françaises et l'équation automobile* (Paris, Descartes & Cie, 2011).

¹³ Peter Norton, "Four Paradigms: Traffic Safety in the Twentieth-Century United States," *Technology and Culture*, 56:2 (2015), 319-334.

¹⁴ Marina Duhamel-Herz, *Un demi-siècle de signalisation*, 12.

¹⁵ Jacques Nouvier, 'Une histoire de la signalisation en France à travers les numéros de la RGRA', *Revue Générale des Routes et des Aérodrômes*, 658 (1988), 10.

¹⁶ *Ibid.*, 9-15.

¹⁷ Clay McShane, "Traffic Control Signals." 379–381.

¹⁸ Etienne Faugier and Sébastien Gardon, "Le spectacle des transports sur papier : les revues d'un automobile-club comme lieu de l'automobilisme", in Mathieu Flonneau and Vincent Guigueno (dir.), *De l'histoire des transport à l'histoire de la mobilité ?*, (Paris, PUR, 2009), 247–260.

¹⁹ Etienne Faugier, *L'économie de la vitesse: l'automobilisme et ses enjeux dans le département du Rhône et la région de Québec (1919–1961)*, PhD Dissertation, Université Lyon II- Université Laval, 2013.

²⁰ Marina Duhamel-Herz, *Un demi-siècle de signalisation*, 61–62, 92–94.

²¹ Archives Municipales de Lyon (hereafter AML), 1127WP60, *Avant-projet du plan de signalisation de Lyon* (May 23rd, 1931).

²² Peter Norton, "Four Paradigms", 319–334.

²³ Mathieu Flonneau, *Paris et l'automobile*, 75–77.

²⁴ *Ibid.*

²⁵ Etienne Faugier and Sébastien Gardon, "Le spectacle des transports sur papier."

²⁶ AML 1127WP60, *Avant-projet du plan de signalisation de Lyon* (May 23rd, 1931).

²⁷ François Bannat, *La suppression des tramways à Paris*, « L'histoire de la rue, journée organisée par la Direction de la Voirie le vendredi 24 mars 1995 » (Paris, Direction de la voirie et des Déplacements, 1995).

²⁸ Guy Borgé et al., *Les transports à Lyon : du tram au métro*, (Lyon, Ed. J. Honoré, 1984), 73-74.

²⁹ Gabriel Dupuy, *Une technique de planification au service de l'automobile, les modèles de trafic urbain* (Paris, Ministère de l'Équipement, 1975).

³⁰ See, for instance, the specific systems developed in Paris and Lyon for their traffic light management.

³¹ Gabriel Dupuy, *op. cit.*

³² Mathieu Flonneau, *Paris et l'automobile* ; S. Gardon, *Goût de bouchons*.

³³ Arthur Johnson, 'Maryland Aerial Survey of Highway Traffic Between Baltimore and Washington', *Proceedings of the Eighth Annual Meeting of the Highway Research Board Held at Washington, D.C. December 13–14, 1928*, 8 (Washington, D.C., Highway Research Board, 1928), 106–115 ; B. Greenshields, 'A Study of Traffic Capacity', *Highway Research Board Proceedings*, 14 (Washington, D.C., Highway Research Board, 1935), 448–477; Bruce Greenshields, *Traffic performance at urban street intersections*, Bureau of Highway Traffic, Technical Report No. 1 (Washington, D.C., Highway Research Board, 1947); Gijs Mom, *Atlantic Automobilmism: Emergence and Persistence of the Car, 1895–1940*, (New York, Oxford: Berghahn, 2015).

³⁴ Gilles Debizet, 'L'évolution de la modélisation des déplacements urbains en France 1960-2005', *Flux*, 85-86 (2011), 8–21.

³⁵ Christian Montès, *Les transports dans l'aménagement urbain à Lyon* (Lyon, Géocarrefour, 2003).

³⁶ Isabelle Chupin, Nicolas Hubé, "'En direct de Rosny-sous-Bois...' Les transformations du marché de l'information routière (1970–2007)," *Réseaux*, 147:1 (2008), 115.

³⁷ Mairie de Paris, Direction de la Voirie, *Signalisation : boulevard périphérique : raccordement à la voirie locale* (Paris, Direction de la Voirie, 1972)

³⁸ Mairie de Paris, Direction de la Voirie, Service Technique des Études, *Schéma directeur de la signalisation d'indication* (Paris, Direction de la Voirie, 1985).

³⁹ Mairie de Paris, Direction Générale de l'Information et de la Communication, *L'exploitation du boulevard périphérique* (Paris, Direction Générale de l'Information et de la Communication, 1985).

⁴⁰ Sébastien Gardon. "Pouvoirs urbains et ingénieurs de l'État. La construction d'infrastructures routières dans la région lyonnaise au vingtième siècle." *Métropoles*, no. 2 (2007). <http://metropoles.revues.org/462> (visited on November 26th 2019).

⁴¹ Mairie de Paris, *Schéma directeur* (1985).

⁴² Archives du Grand Lyon (AGL), 1973WM1-1, *Délibération du Conseil de Communauté Urbaine*, (November 17th, 1980).

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- ⁴³ Pierre Laborie, 'Coraly', *Transports, Environnement, Circulation*, 101 (1990), 46–48 ; François Ricard, 'Coraly : où en est-on?', *Transports, Environnement, Circulation*, 129 (1995), 49–51.
- ⁴⁴ Pierre Laborie, 'Coraly', *Transports*,
- ⁴⁵ Yves Boutin-Desvignes, Michel Gironde, *L'information routière, Que sais-je 3117* (Paris, Presses Universitaires de France, 1996).
- ⁴⁶ G. Baudez, P. Georges, A. Henriot, 'Mise en œuvre du concept Inf-Flux(R)', *Transports, Environnement, Circulation*, 126 (1994), 40–43.
- ⁴⁷ *Ibid.*
- ⁴⁸ AML 1781W63, 'Avant-projet simplifié de jalonnement dynamique des parcs de stationnement de Lyon', Lyon Parc Auto/ Communauté Urbaine de Lyon, 1993, 12.
- ⁴⁹ Mairie de Paris, *Schéma directeur de la signalisation d'indication*, (1985), 57.
- ⁵⁰ AML 1795W27, *Document de travail sur le Plan de jalonnement de l'agglomération lyonnaise* (August 19th, 1996).
- ⁵¹ Yves Boutin-Desvignes, Michel Gironde, *L'information routière, Que sais-je 3117* (Paris, Presses Universitaires de France, 1996).
- ⁵² Stéphane Leroy, Jean-Claude Santucci, 'L'information routière en Ile-de-France. De nouveaux services à l'utilisateur pour lutter contre la congestion', *Transports, Environnement, Circulation*, 142 (1997), 12-15.
- ⁵³ "Découvrez Coraly", <http://www.coraly.com/Découvrez-Coraly/Historique> (visited on November 26th 2019).
- ⁵⁴ Oral question, without subsequent debate, 0533S by Senator Mme Catherine Procaccia (Val-de-Marne - UMP), published in the Senate Gazette (*Journal officiel du Sénat*) of August 1st, 2013, 2228 <http://www.senat.fr/questions/base/2013/qSEQ13080533S.html>
- ⁵⁵ This can easily be seen when comparing the coverage of the road network offered by the Paris area *Sytadin* portal, funded by the State, and the coverage offered by V-Traffic of the same area. Research also investigated the issue on a technical aspect, for example: Anthony D. Patire, Matthew Wright, Boris Prodhomme, Alexandre M. Bayen, 'How much GPS data do we need?', *Transportation Research Part C* (2015), 325-342.
- ⁵⁶ Pierre Laborie, 'Coraly', *Transports, Environnement, Circulation*, 101 (1990), 46–48.
- ⁵⁷ Since late 2017, ViaNavigo includes an experimental car-sharing option.