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What lessons can be learned from the testing of autonomous vehicles in France?

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Autonomous driving is a potentially "disruptive" technology, for which it remains difficult to predict the industrial, regulatory or mobility impacts. Faced with these uncertainties, industrial actors are initiating experimentation programmes to test technological solutions in the absence of an appropriate legal framework. As a meeting place for the various actors with an involvement in this innovation, these tests also crystallize a certain governance of autonomous mobility, which is crucial because different development patterns for autonomous mobility can be envisaged, which present opportunities and also risks for sustainable development.

This Issue Brief explores the governance of autonomous vehicle testing in France, and shows how it enables (or not) autonomous technology to be directed towards an offer that is compatible with the collective objectives of sustainable mobility.

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KEY MESSAGES

The institutional debate on autonomous mobility focuses on the issues of safety and industrial competitiveness, to the detriment of other strategic issues related to mobility

However, the institutionalization of testing consortia organised around local authorities shows the willingness to move the goal towards mobility needs. Indeed, local authorities have a key role to play in linking autonomous vehicles and territorial mobility issues, mobilizing and organizing the various actors and providing resources (human, financial, infrastructure, etc.).

Nevertheless, some strategic issues relating to the development of autonomous mobility go beyond the competence of local authorities, such as the adaptation of road infrastructure. The State must therefore commit itself to a real co-construction of tomorrow's autonomous mobility with local authorities by setting a course for the objectives pursued in terms of sustainable mobility. Unfortunately, such a strategy currently remains elusive.

1. TESTS FOCUSED ON SAFETY ISSUES

While autonomous vehicles generate considerable enthusiasm among industrial, digital and political actors alike, they are also the source of many uncertainties. Indeed, it is a potentially disruptive technology, the impacts of which remain difficult to predict, in social terms (particularly employment impacts), but also in terms of mobility practices, industrial models and regulations. Faced with these uncertainties, industrial actors sought to trial their technological solutions in real life situations. The first autonomous vehicle testing programmes were initially developed on a European scale (such as the 2006 initiated European project Citymobil), and more recently on the national scale.

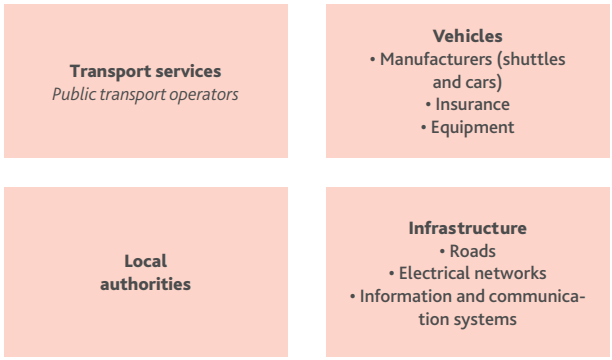
In France, the autonomous vehicle testing policy began taking shape in 2014 with the creation of the Inter-Service Group for the Autonomous Vehicle (GISVA), which brings together various departments from the Ministry for the Ecological and Inclusive Transition (responsible for transport), the Ministry of the Interior, and the Ministry of Economy and Finance. This initial institutional structure was in response to calls from industrial actors to establish a framework that would allow the testing of autonomous vehicles in real life situations, a request that was particularly urgent given that the development of autonomous vehicles is an area of major international competition. Between December 2014 and the beginning of June 2018, GISVA issued more than 60 test authorizations, including 23 in 2017 alone.

This approach is also motivated by regulatory questions that conceal major industrial issues. In a context of international competition, exacerbated by the arrival of digital actors and an escalation in the number of high-profile announcements on autonomous vehicles, the adaptation of these regulations is a strategic issue for all States, including France. The ability to impose standards will indeed be an asset in the race to develop this technology. However, the autonomous vehicle totally challenges the usual approach taken by public authorities in terms of standardization and homologation, since it is not possible to test the "intelligence" of the vehicle in "representative" situations: autonomous vehicles could potentially encounter an infinite number of situations. This is why the institutional debate has focused on safety issues, even though safety is one of the marketing arguments put forward by the industry to promote autonomous vehicles. This focus on safety has overshadowed other issues of public benefit, especially those related to sustainable mobility.[1] This observation is thus reflected in the design of the testing policy: the GISVA procedure for reviewing documents and granting authorizations mainly involves ensuring that proposals from industrial actors would not affect traffic flow or road user safety.[2] In these circumstances, the aim of testing is not to assess how an autonomous mobility solution responds to mobility issues, and nor does it offer many solutions for governing innovation.

2. IS THIS A LEARNING OPPORTUNITY FOR A NEW GOVERNANCE OF MOBILITY?

This testing strategy will, however, be extended from 2018 with the launch of a call for proposals aiming to "support pilot projects for the use of autonomous vehicles, marketable by 2022, in the field of individual, shared or collective mobility, freight and logistics".[3] This call for proposals, managed by the French Environment and Energy Management Agency (ADEME), is organized around a consortium of actors[4]. The development of autonomous mobility indeed requires new forms of mobility governance, and trials will provide the ideal opportunity to learn how to build these new forms of collaboration between actors (Figure 1).

FIGURE 1. Actors involved in the autonomous vehicle testing consortia



Source: IDDRI

Local authorities are called on to play a central role in this governance of autonomous mobility. First, they have the capacity to mobilize the different actors around a territorial mobility project. Thus, Rennes Métropole has gathered and consolidated an ecosystem of industrial actors around digital mobility (inOut initiative), just as Bordeaux Métropole has mobilized Dutch and French companies in the framework of a

1 The importance of the safety issue is also illustrated in the policy paper on strategic orientations for the development of the autonomous vehicle, published by the French government in May 2018. This document mentions the word "safety" 18 times, compared to three uses of the word "social", and one mention of "clean" and "accessible", while the word "sustainable" does not appear at all.

2 This configuration for tests, which involves the creation of a regime of exceptional circumstances allowing the lifting of legal obstacles to innovation, while ensuring a minimum level of experimentation that guarantees safety, is not however specific to autonomous vehicles.

3 ADEME, Call for proposals "Expérimentation du véhicule routier autonome (EVRA)", Investissements d'avenir, Véhicule et transports du futur. https://appelsaprojets.ademe.fr/aap/EVRA2018-64

4 These consortiums of actors had begun to structure themselves during a call for expressions of interest launched a few months earlier.

European project aiming to establish a mobile app to improve traffic conditions by providing advice to users.[5] In general, local authorities can broaden the range of stakeholders in the definition of mobility services. The city of Rennes has thus established a citizen consultation process on this subject, and Paris has similar plans within the framework of the Quartiers d'Innovation Urbaine project.

Furthermore, local authorities bring their knowledge of the territory, its resources and its infrastructure, making it possible to link technological solutions with mobility needs and limitations. For example, the city of Rennes is working on travel ticket data at metro stations near the Rennes II University to gain a better understanding of flows. This data will then be used in the design of a driverless shuttle trial on campus. Beyond the study of flows, local authorities have the ability to integrate autonomous vehicles into their mobility systems: the city of Rouen, for example, is testing an autonomous vehicle service (shuttles and car sharing services) to improve transport options in areas that are underserved by public transport. Local authorities also have the ability to include autonomous mobility trials within a broader ecosystem that involves all aspects of public space sharing. Thus, developing tests for parking and traffic management (inOut initiative in Rennes Métropole) is useful for identifying favourable conditions for shared mobility systems; this knowledge can then be remobilized for the creation of on-demand autonomous vehicle services.

3. DIFFICULTIES OF TESTING

These encouraging examples, however, should not obscure the fact that for many local authorities, testing remains a real challenge, especially when it implies, as is the case for autonomous vehicles, an emerging technology where it is difficult to consider all of the related issues. Some local authorities thus have unrealistic expectations regarding autonomous technology —for example being able to develop autonomous bus lines in sparsely populated rural areas. These expectations, sustained by the claims of the promoters of this technology, who compete with each other over possible deployment dates, reveal the difficulty they have in analysing what could be the real contribution of these technological solutions to their transport provision. However, while it is possible that autonomous technology may meet these expectations in the distant future, in the short and medium term it seems that it can only partially achieve such aspirations: the prospective study carried out by IDDRI (Saujot et al., 2018) shows that autonomous technology can extend the perimeter of relevance of public transport, but only in territories where there is sufficient passenger demand.

On the other hand, some trials are more akin to communication campaigns, as illustrated by a series of very similar tests based on autonomous shuttles that travel distances of a few hundred metres (Charles de Gaulle bridge in Paris, Confluence district in Lyon, Allées Jules Guesde in Toulouse). These initiatives mainly serve as press communication opportunities to promote the "precursor", or even "pioneer" status of autonomous mobility. They are thus a way of attracting the attention of the general public and certain industry actors to a city's efforts to stimulate innovation.

The evaluation and sharing of results are crucial aspects of a good experiment. ADEME has an essential role in this area in the framework of the EVRA call for proposals. While at this stage it is too early to form a judgment on the quality of the lessons that can be learned, it is important to remember the importance of organizing the dissemination of data generated by these experiments in a very proactive way. A common evaluation grid would thus facilitate the sharing of experiences between local authorities, and also at the governmental level.

Finally, the national testing strategy should be discussed. Given the uncertainties around this technology, it seems rational to test various usage types, that are representative of a variety of situations and mobility needs. Such a strategy, however, runs the risk of dispersing the available financial means and therefore the scope of the tests. From this perspective, the development of a political vision of autonomous mobility would enable trials to be particularly focused on the most strategic usages, and to concentrate financial, industrial and human resources on these cases.

4. STRATEGIC STATE INVOLVEMENT IS VITAL

While most of the challenges raised by autonomous mobility relate to the local level, some require mediation at the national level. A good example of this is the issue of the adaptability of autonomous vehicles to the existing road infrastructure, or conversely the minimum requirement for road infrastructure for autonomous mobility. Indeed, the promoters of autonomous mobility have road infrastructure expectations that vary in magnitude and clarity: some assume that additional equipment will be necessary (digital duplication of road signage, road-integrated communication equipment, etc.), while others claim that current road signage will be sufficient (clear ground markings, well-maintained roads, visible signs). However, compliance with such standards is a long way off for a large proportion of roads: one out of every two roads in France has no ground markings, and half of national roads require roadway surface renewal. While human drivers can to some extent adapt to these degradations, this is not the same for autonomous vehicles, the functioning of which will be much more sensitive to the condition of infrastructure. It is therefore likely that the manufacturers and/or managers of these vehicles will demand from those in charge of road infrastructure, and thus public authorities, to have a minimum level of infrastructure quality, to guarantee the reliability of their vehicles. As a result, it is necessary to consider what level of demand will be expected from the road infrastructure,

5 See http://c-thedifference.eu/?page_id=28.

which may vary according to the autonomous mobility deployment paradigm under consideration, and its funding model. We are not suggesting that it would be necessary to have ideal and uniform roads throughout the territory: autonomous mobility must deal with the variety of "real" roads in the national territory, and the reality of their maintenance and financing. Therefore its future cannot solely rely on innovators, whether they are developing vehicles or services.

In this context it is necessary to reflect on the requirements of autonomous mobility regarding road infrastructure. What type of autonomous mobility would be possible on the current road infrastructure? Conversely, what investment should be made in autonomous mobility that would require "augmented" infrastructure? These considerations must be contrasted with the collective benefits that can be expected from these different deployment paradigms, and also from their cost and their modes of financing. What adaptations are necessary? To deliver what collective benefits? And who should pay for these adaptations? These questions, which must be addressed in light of trial data, cannot be left to the sole judgement of local authorities. The road network is indeed managed by a variety of actors, ranging from the national to the municipal level: out of over one million kilometres of roads in France, 98% are managed at the departmental (61%) and municipal (37%) levels, the rest being managed at the national level (motorways representing 1% of the road network). More broadly, the issue of adapting road infrastructure to autonomous mobility invites us to question its funding model, which is today mainly based on the State and local authorities. This funding model is already being challenged due to the decline in public funds allocated to the upkeep and maintenance of the road network. Indeed, financial resources normally mobilized by local authorities for the upkeep and maintenance of the road network are increasingly being redirected to other budget areas, particularly social spending, such as basic social benefit (RSA, revenu de solidarité active) (Crozet, 2017). The arrival of autonomous vehicles therefore serves as an additional reason to launch a debate on the economic model of road transport.

Beyond the issue of the adaptation of road infrastructure, the State has at its disposal other skills and levers that could be strategic for the development of sustainable autonomous mobility: the ability to implement industrial policies, helping different actors coordinate to solve complex problems; investment capacity; and regulatory tools, especially those related to taxation. This means that the creation of tomorrow's autonomous mobility cannot rest solely with the local authorities involved, and that the State, in collaboration with these authorities, must invest in guiding its development. Finally, building an autonomous mobility model does not only involve experimentation: some current mobility practices provide invaluable lessons for the future of autonomous mobility, such as daily carpooling. The organization of a local carpooling network requires the detailed understanding of the mobility dynamics of a territory, which can be useful for determining areas where autonomous shuttle services could have potential.

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