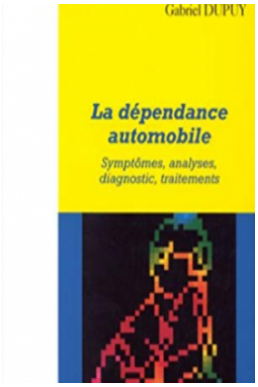
1. Essential Reading



Automobile dependence Symptoms, analyses, diagnosis, treatment, by Gabriel Dupuy (1999)

By Caroline Gallez (Urban planner)
04 September 2018

Why and how has the car become an indispensable mode of transportation in most countries of the world? The book's goal is summed up by the key words in its title: it is to conceptualize the notion of automobile dependence, to characterize the social and spatial dimensions of this phenomenon and to discuss what leeway and tools public authorities have in seeking to regulate it.

Gabriel Dupuy, an engineer from École Centrale Paris and professor of urban planning, is one of the pioneers in France for research on transport and communication networks related to urban planning. Referencing the works of historian Joel Tarr on the relationship between cities and technology, as well as those of geographer Claude Raffestin on territory, Gabriel Dupuy defined the concept of *network urbanism* . By changing how places are connected, technical networks (communication, transport, water distribution, sanitation, etc.) play a part in the transformation of territories. One of the challenges for urban planners is to understand how much they can leverage the opportunities provided by these networks in terms of connectivity in the spatial organization of residential and business areas [1].

In 1999, he published *La Dépendance automobile. Symptômes, analyses, diagnostic, traitement* , after two other books on the history of the automobile and its relation to urban transformations [2]. Why and how has the car become an indispensable mode of transportation in most countries of the world? The book's goal is summed up by the key words in its title: it is to conceptualize the notion of automobile dependence, to characterize the social and spatial dimensions of this phenomenon and to discuss what leeway and tools public authorities have in seeking to regulate it.

Defining automobile dependence from network effects

The term “automobile dependence” was first introduced in the early 1990s by two Australian researchers, Peter Newman and Jeff Kenworthy. In a book entitled *Cities and Automobile Dependence* (1989), they argue that cities depend on automobiles to varying degrees depending on their density. Their claim is based on the creation of a curve showing that the annual fuel consumption per inhabitant is even higher when the average density, measured in number of inhabitants per hectare, is low. In this respect, North American and Australian cities are in a much less favorable position than European cities, which are themselves less energy efficient than Asian cities.

For Gabriel Dupuy, the main point of this research is to emphasize the growing spatial influence that cars have on cities. While this is a strong idea, the use of the term remains fuzzy. Does the dependence apply to individuals or spaces? At what scale? For him, the dependence cannot be reduced simply to a person’s attachment to cars, nor to an addiction to driving. It also includes a societal, structural dimension. According to him, a good way to measure the true scope of the phenomenon is to assess it in relation to a particular scale, that of the system of automobility. This system refers to the idea that the generalization of the personal car is based on a set of "auxiliaries" (Sauvy, 1968) making this generalization possible: oil resources, tires, road infrastructure, etc. Peter Hall (1988) defines it as the conjunction of a process for the mass production of vehicles, a set of traffic rules and regulations, a network of roads and facilities or services specifically for motorists.

Gabriel Dupuy’s premise is that the automobile market has a "club effect” comparable to what can be seen in the development of other technical networks, such as telephones. The more people own a phone, the more opportunities there are to communicate remotely, and the more it becomes advantageous for people who are not yet equipped with a phone to acquire one. When applying this reasoning to automobiles, it is easy to see that the increase in motorists is accompanied by an increase in dedicated services and facilities, thus providing users with increasing benefits. It is like a collective "bonus" on top of the individual benefits motorists can derive from their particular use of the car. Automobile dependence is the consequence of this bonus and of a virtuous circle by which the advantage for each new entrant increases when the number of motorists increases. In other words, "it is through the behavior of others that we are encouraged to use a car and that we are, thereby, dependent on it" (Dupuy, 1999: 14).

The automobile system has a major specificity: it generates negative externalities such as increasing atmospheric and noise pollution, causing accidents, contributing to greenhouse gas emissions, or causing traffic congestion. Nevertheless, in societies where positive externalities are considered to be much higher than negative externalities [3], there is a considerable ripple effect on the growth of motorization.

If we take this logic further, automobile dependence does not affect motorists themselves, who gain from the benefits of the system, but those who are excluded from it or who leave it. As the benefits of being part of the system increase as the system grows, so does the gap between motorists and non-motorists, leaving the latter group worse off. It is in relation to the disadvantages and/or losses incurred by those who are excluded from or who have left the system that Gabriel Dupuy wishes to define the concept of automobile dependence.

Measuring the spiral of automobile dependence

Contrary to Newmann and Kenworthy's approach, dependence is not, in this sense, limited to a geographical area, such as a city or an urban space [4]. It corresponds to the whole area covered by an automobile system. Because of this vast geographic scope, sub-national or geographic comparisons are difficult, with some areas in more or less advanced stages of the dependency process. To illustrate it, Gabriel Dupuy talks of a "spiral" of dependence that grows as the automobile system develops.

In order to assess the strength of the spiral's ripple effect, he assumes that each new motorist receives a bonus from the combination of three effects corresponding to three successive stages of one's membership in the automobile system:

- a club effect, upon getting one's driving license;
- a stock effect, when acquiring a vehicle;
- a network effect, related to one's use of the road network.*

The benefits for new drivers at each stage of their membership are measured in terms of accessibility, that is, an increase in the number of locations and localized services that can be reached in a given time. This increase in potential accessible opportunities results either from an increase in speeds, making it possible to reach more distant locations in a given time, or in the spatial density of opportunities. For example, the number of accessible jobs at a given time from a person's residence will be greater for a motorist than for a person who travels by public transport or on foot. At equal speed of movement, one's ability to access employment opportunities in this limited time is greater in central areas, where the job density is high, than in suburban areas.

The benefits for motorists are assessed against the situation of those who aren't part of the club, non-motorists. To provide a relatively homogeneous point of comparison, Gabriel Dupuy compares the situation of motorists to that of drivers of small cars ("voiturettes" or 'micro-cars', L-Category cars) that don't require a driver's license and that are only allowed to be driven at speeds of up to 45 km/h on roads.

- The **club effect** corresponds to the accessibility differential between licensed drivers and non-licensed drivers, estimated from the difference in maximum authorized speeds for each. This accessibility gap is theoretical, in the sense that it does not take into account the actual use of the road network. The higher the number of motorists, the greater the gap, due to the pressure exerted by club members to increase the maximum authorized speeds.
- The **stock effect** is estimated from the increase in the density of supply of facilities and services (dealerships, maintenance and repair services, car accessories, etc.) available to motorists who chose a particular brand of vehicle. This offer increases in a manner that is approximately proportional to the number of existing vehicles in the stock.
- Finally, the **network effect** is based on the dynamics of the "magic circle [5]", highlighted in the 1960s by North American road engineers. Unlike the club and stock effects, the network effect is not independent from the considered area and varies from one spatial area to another depending on the characteristics of the road network. The network effect is all the more consequential as the road traffic is concentrated on a few structuring main roads: this local concentration of traffic indeed encourages the construction of express ways that drain the traffic, and so on. In the absence of sufficient data to isolate precisely the impact of the network's

structure, Gabriel Dupuy's approach is to evaluate it in a global way, based on the relationship between the evolution of the traffic and of the speed on the road network.

The conjunction of the three effects, based on the French data, means that the development of the automobile system produces a 1.9 ripple effect on accessibility: all things being equal, an 1% increase in the number of motorists provides an almost 2% increase in accessibility. This figure, which is much higher than the usual estimates for the revenue or cost effects associated with auto use on traffic, highlights how attractive the automobile system is. And yet this figure is most likely a conservative one. It is limited (for measurability reasons) to the internal effects of the automobile system, it does not take into account the impacts of increased speeds on the spatial reorganization of places of residence, work, businesses, services, etc. However, the spatial dispersion enabled by the improved conditions of displacement weakens the accessibility of non-motorists, thereby worsening their existing disadvantage.

Gabriel Dupuy provides many concrete examples of automobile dependence and how it varies from one geographical scale to another or from one country to another. For two countries where the automobile system is comparably well developed, the differences can be explained by the kind of public policies carried out in favor of those who are "excluded" from the system. Some countries are adopting proactive policies to offer alternative modes of transportation (particularly in Germany and Switzerland, where the rail network and service is greater than in other European countries) or land planning (such as land regulation and activity-type localization policies in the Netherlands) in order to limit the diminished accessibility of non-motorists, and to thereby control the dependence levels of the most disadvantaged. At the international level, diversity remains important. Despite trends towards the standardization and normalization of the automobile market, as well as progress made in the interconnection of networks, geographical, historical, cultural, ideological and political specificities hamper the homogenization of the dependency phenomenon.

How to curb automobile dependence? Some public policy suggestions

The last part of the book reviews existing policies aimed at curbing automobile dependence and outlines several possible public policies. Limiting automobile dependence refers to any policy aimed at reducing the gap between the advantages of motorists and non-motorists, encouraging those who have not yet entered the system to renounce it or even enticing some motorists to leave it. Remember, the point here is not to assess the effects of these policies on regulating automobile use.

For Gabriel Dupuy, the inefficiency of existing policies is explained by the fact that these policies are implemented outside the automobile system and do not act directly on the causes of dependence.

He reviews these policies implemented "outside the system:" those that, according to him, reveal ideological biases (whether laissez-faire policies that oppose any restraint on accessing automobiles, or policies aimed at completely eradicating the use of cars within cities), that are not firmly anchored in reality, that are condemned to never be anything more than utopias; policies pursued for the development of telecommunications or public transportation face a low degree of substitutability between cars and these alternative

modes of transportation or communication; and lastly, urban planning developments that are intended either to compensate for the diminished accessibility of those excluded from the system, or to incite existing motorists to leave it, are restricted to certain social groups or certain areas, and carry with them the risk of leading to bottom-up or top-down forms of segregation.

To effectively curb dependence, it is therefore necessary “to go back to what constitutes the essence of the process” (p. 115) by acting on the circular interaction mechanisms within the automobile system. To do this, three strategies are discussed, all of which are based on the reduction of speed differences, and therefore on accessibility differentials between motorists and non-motorists.

- The **first strategy** is to control the club effect by diversifying the vehicles. The idea is to divide it into different sub-clubs according the performance of the vehicles, in order to reduce the speed differences between members and non-members. Allowing the development of low-speed motor vehicles that can be driven without a license (for example, different categories of small urban automobiles, two- and three-wheeled vehicles, small electric cars, etc.) or with a cheaper license offers greater access for more people to slower vehicles, all the while providing roughly the same accessibility as a motor vehicle. Doing so greatly curbs the effect of the club effect. This reasoning can be extended to non-motorized vehicles, to walking or to cycling, provided that the implemented policies can ensure enough space and protection for everyone on the road.
- The **second strategy** consists of limiting the network effect by favoring greater connectivity within the network and avoiding road hierarchies. Drawing the road network closer to the “desire lines," which are the desired routes for the greatest number of possible trips, reduces the associated ripple effect (in terms of road investment). In a highly connected network with little hierarchy, traffic is better distributed and the effects of adding a new road are much smaller (in terms of increased traffic). Indeed, the speed differentials on the roads of a low hierarchical network are less than when the traffic is funneled on a few structuring main roads where the authorized speeds are usually higher. In addition, the financial investments required to do this are lighter than they would be to increase the capacity of some major traffic-concentrating main roads. While this gridding policy leads, on average, to lower speeds on the network, it does not decrease the level of service offered to motorists, nor does it entail further prohibitive investment or maintenance costs.
- The **third strategy** , finally, is to limit the stock effect by generalizing the increase in the one service which is the most directly associated with the development of the automobile system: parking. Reducing the proportionality factor between the total amount of cars and the parking area limits the capillarity of the road network and therefore also limits the advantage gained by motorists in accessibility. The powerful effects of this restrictive policy on reducing automobile use have been proven, but to be effective it must be generalized. However, Gabriel Dupuy believes it will only be accepted socially if the loss of accessibility for motorists is somehow compensated. For instance, losing free parking at the workplace could be counterbalanced by financial compensation. In the case of parking at other places of activity, the ubiquity gained by the improvement of the network’s gridding can be an effective compensation: in other words, policies aimed at improving the interconnectivity of the road network and those aimed at systemizing parking habits will have to be implemented simultaneously.

Reception of the book, debates and new perspectives

When it was published, Gabriel Dupuy's work sparked many debates, in the academic world, among experts in urban planning and transportation as well as among activists. For many people concerned about the environment, automobile dependence refers to a negative phenomenon that increases the problems caused by an extensive use of personal cars. This position is also defended by Newman and Kenworthy in their promotion of dense cities. Other discussions were focused on the distinction between addiction to psychotropic drugs and the societal phenomenon of dependence. Gabriel Dupuy distances himself from these two common meanings by claiming that automobile dependence is not a pathology [6]. While he doesn't subscribe to any radical critique of the automobile system, he does condemn the domination of the automobile, the strength of its spatial influence and the scope of the automobile system on the entire social organization. He feels that the "automobilization" of society is an inevitable process and that it would be illusory to think we can reverse the effects of the spiral without changing its foundations. This is why, in his analysis, he focuses purely on sectorial effects of automobile dependence, meaning those that are internal to the automobile system.

Let's consider, for instance, the impact – that he deems relatively small – of densification or city planning policies geared towards public transportation. If density strategies are effective for walking or cycling or for living without a car, they are only accessible to a small number of people who have sufficient income to live in dense areas, and they only concern movements within these areas. These policies will have no moderating effect in encouraging the better-off to give up the benefits of the automobile club, as they have no trouble living in low density areas with one or more vehicles because the costs to use and maintain these vehicles aren't challenging to them.

Thirty years after the release of his book, Gabriel Dupuy believes that the advanced strategies to limit the spiral's ripple effect are still valid [7]. Clearly, though, there are still few actual policies implementing these strategies.

With regards to the club effect, the low support for the development of license-free cars shows that the diversification strategy is rarely used. For the time being, the recent boom in self-service bicycles, motorized scooters and kick scooters is raising serious regulatory problems for public authorities and remains limited to dense areas, where the alternatives to individual cars are already the most diverse.

In terms of speed limitations, the implemented policies are once again insufficient, mainly limited to the densest areas (with the exception of the recent lowering of the speed limit on French departmental roads to 80 km/h) with the aim of reducing accidents, air pollution and noise. The only wider experiment in speed limit reduction on urban express ways was carried out in Grenoble, where the goal was to moderate the impact of better travelling conditions on the spread and dispersion of residences, jobs and localized services. This attempted "chronoplanning" ("chronoaménagement"), written in the city's regional planning project (SCoT, Schéma de Cohérence Territoriale), did not have many tangible results and its effectiveness was questioned [8]. Finally, the implementation of a proactive and large-scale parking policy faces wide opposition from local officials. Despite the decriminalization of paid parking, which aims to encourage the generalization of paid parking and increase the deterrence effect, the implementation of restrictive measures generates strong push-back from motorists. These issues were the subject of intense debates in some cities during municipal elections (such as was the case, for instance, in Roubaix).

To this day, Gabriel Dupuy's book remains an important reference in the field of mobility. Given the context of increasing environmental emergency, his work calls for further inquiry into how public policies and global economic organization keep enabling the factors of the automobile dependence spiral. This is why a more systematic use of the concept of accessibility, applied beyond the limits of the automobile system, seems more necessary than ever for a broader debate on the *mobility dependence* of our contemporary societies [9].

Cited bibliographical references

- Dupuy G., 1975, *Une technique de planification au service de l'automobile : les modèles de trafic urbain* , Paris, Ministère de l'Equipement.
- Dupuy G., 1991, *L'Urbanisme des réseaux. Théories et méthodes* , Paris : Armand Colin.
- Dupuy G., 1995, *Les Territoires de l'automobile* , Paris : Anthropos, 1995.
- Dupuy G., 1995, *L'Auto et la ville* , Paris : Flammarion.
- Dupuy G., 1999, *La Dépendance automobile. Symptômes, analyses, diagnostic, traitements* , Paris : Economica-Anthropos.
- Dupuy G., 2002, « Cities and Automobile Dependence » revisité : les contrariétés de la densité, Revue d'Economie Régionale et Urbaine, 2002(1), 141-156.
- Dupuy G., 2008, *Urban Networks – Network Urbanism* , Amsterdam: Techne Press.
- Newman P., Kenworthy J., 1989, *Cities and Automobile Dependence* , Aldershot: Gower.
- Tarr J., Dupuy G. (eds), 1988, *Technology and the Rise of the Networked City in Europe and America* , Philadelphie: Temple University Press.

Notes

1 He published many articles and reference works on these questions, including *Technology and the rise of the networked city* (with J. Tarr) in 1988, *L'urbanisme des réseaux. Théories et méthodes* , in 1991 and *Urban Networks-Network Urbanism* in 2008.

2 This book was published after *Territoires de l'automobile* (1995) and *L'Auto et la Ville* (1995).

3 This is indeed a societal estimation: we could imagine that if, for instance, environmental impacts became much worse, the weight of negative externalities would be seen as greater.

4 See our conference: https://fr.forumviesmobiles.org/meeting/2017/02/13/mobilite-vertueuse-atouts-ville-dense-remis-en-cause-3481.

5 The increase in circulation leads to a strengthening of the road network, which in turn encourages drivers to drive more and attracts new motorists, thus leading to a new increase in circulation, and so on. The circle is then seen as virtuous, particularly from an economic standpoint, as taxes on petroleum goods can be immediately reinvested into new road projects.

6 See the author's interview of Gabriel Dupuy in the journal Flux, 2018, n° 111-112, p. 104-110.

7 Ibid., see the interview in Flux.

8 See Pflieger G., 2006, *Apaiser les autoroutes pour rétrécir la ville Grenoble et les illusions du « chrono-aménagement* , Flux, n°66/67, pp. 137-139.

9: Fol S., Gallez C., 2017, Fol S. and Gallez C., 2017, Évaluer les inégalités sociales d'accès aux ressources. Intérêt d'une approche fondée sur l'accessibilité. [On line] Riurba 2017/4, URL : http://riurba.net/Revue/evaluer-les-inegalites-sociales-dacces-aux-ressources-interet-dune-approche-fondee-sur-laccessibilite.

Movement

Movement is the crossing of space by people, objects, capital, ideas and other information. It is either oriented, and therefore occurs between an origin and one or more destinations, or it is more akin to the idea of simply wandering, with no real origin or destination.

En savoir plus x

Mobility

For the Mobile Lives Forum, mobility is understood as the process of how individuals travel across distances in order to deploy through time and space the activities that make up their lifestyles. These travel practices are embedded in socio-technical systems, produced by transport and communication industries and techniques, and by normative discourses on these practices, with considerable social, environmental and spatial impacts.

En savoir plus x

Associated Thematics :

Lifestyles

- Cars / motorcycles

Policies

- Cars
- Cities & Territories

Theories

- Concepts

Caroline Gallez

Urban planner

Caroline Gallez is a researcher at the IFSTTAR (French Institute of Science and Technology for Transport, Development and Networks) in the City, Mobility and Transport Laboratory. She is director of the "City, Transports and Territories" doctoral program at the University of Paris-Est. She is a member of the Mobile Lives Forum' steering and strategic foresight commitee.

The same author See all publications

The automobile city

Video by Caroline Gallez

To cite this publication :

Caroline Gallez (04 September 2018), « Automobile dependence Symptoms, analyses, diagnosis, treatment, by Gabriel Dupuy (1999) », Préparer la transition mobilitaire. Consulté le 09 May 2025, URL: https://forumviesmobiles.org/en/essential-readings/12645/automobile-dependence-symptoms-analyses-diagnosis-treatment-gabriel-dupuy-1999