Door to door

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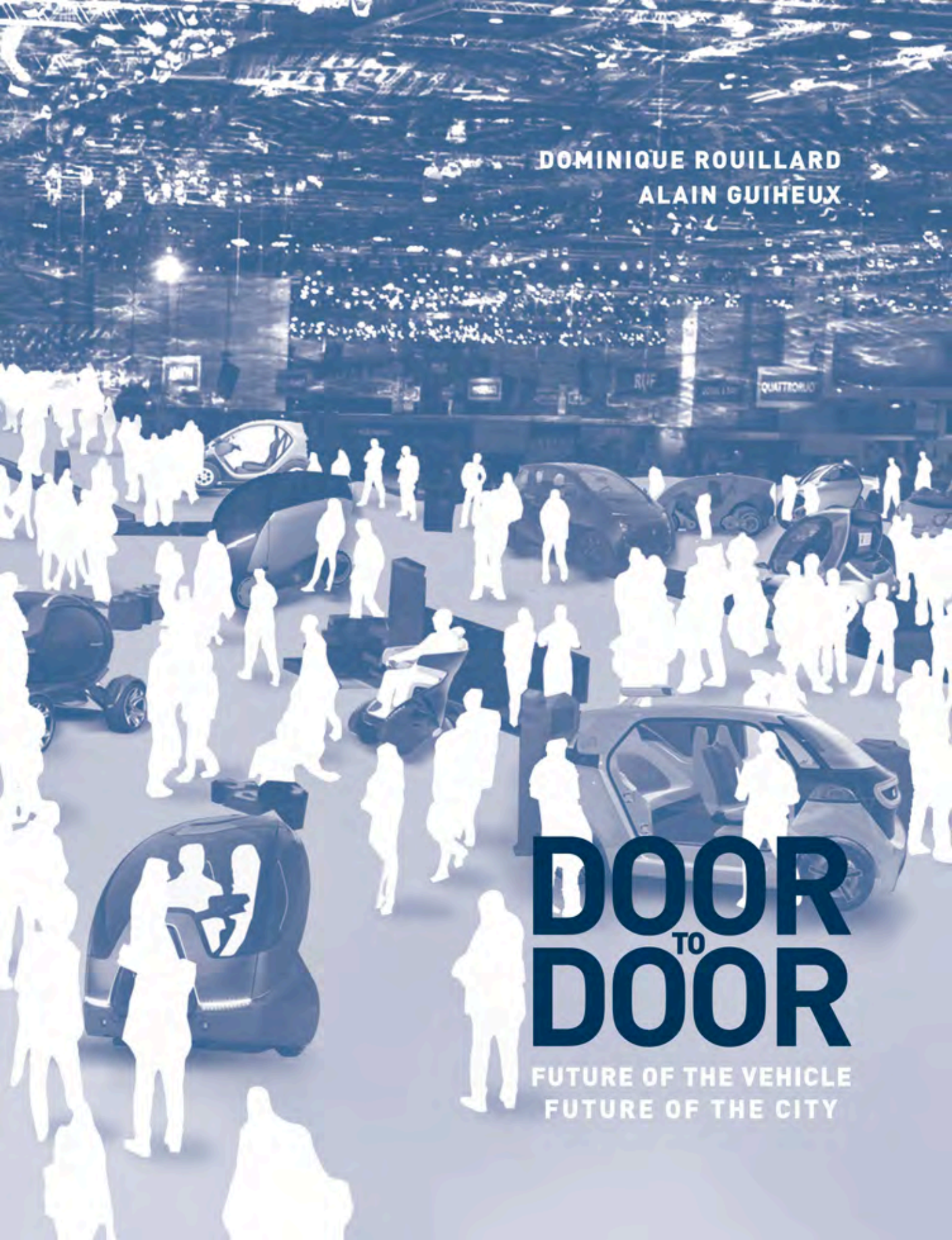

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DOOR TO DOOR

FUTURE OF THE VEHICLE
FUTURE OF THE CITY

Electric/environmentally friendly vehicles that are equipped with embedded digital communication, in the era of intelligent flows and the Internet of Things, are transforming contemporary architecture and the city. *Door to Door, Future of the Vehicle, Future of the City* rethinks urban situations, theorizes and imagines future development models and the new architectural programs that stem from them. It proposes and presents "access spaces," the extension-multiplication of "door-to-door" accessibility in six European metropolises and the repair function of these new tools of connected "auto-mobility," solving urban dysfunctions through their use. The parking facility becomes a program of the future for architecture, while the Electric/Environmentally friendly Connected Vehicle (ECV), a tool soon to be automated, neither noisy nor dirty, moves alongside humans, nature and animals in buildings – the sharing of presences and activities in a "large common space."

The ECV is the most powerful example of the interaction between the practice of urbanized territories and the ICTs. It is the most incisive marker of the return of the flow model to reflect on the urban space, in a form that is coherent with demand or the commands of the society of exchanges and sharing that has been set in motion: mobility-accessibility has once again become the leading program, the structure of the future. What does the urban space become when access is the most dominant feature? "Accessibility and exchange poles" are transformation systems of urban life, which they reconfigure for more comfort and efficacy. The arrival of these new vehicles consequently accelerates the interference between the urbanism of uses and services and spatial urbanism. On this level, vehicles are the equivalents of buildings.

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This work is the publication of the results of the “Future of the vehicle, urban future” research project conducted under the direction of Dominique Rouillard, director of the Laboratoire Infrastructure Architecture Territoire (LIAT), of the ENSA Paris-Malaquais, and with Alain Guiheux, architect, professor at the ENSA Paris-Val de Seine and research director at the CERILAC. This research is part of the interdisciplinary program “Ignis Mutat Res. Looking at Architecture, the City and the Landscape through the Prism of Energy” of the Ministry of Culture and Communication, Heritage Division/Architecture Department, Office of Architectural, Urban and Landscaping Research – Ministry of Ecology, Sustainable Development and Energy, Atelier International du Grand Paris - Veolia Environnement - Institut VEDECOM.

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INTRODUCTION

A technical, societal and architectural transformation is underway as we write this text. It originated in the association of electric, environmentally friendly or less polluting vehicles[1] and embedded digital communication. It is being developed by a society of intelligent flows and sharing; it is bringing about an immediate modification of urban and architectural concepts by increasing the importance of accessibility. Accessibility dominates mobility as well as proximity and forces us to rethink urban situations. Accessibility theorizes about future development models.

Auto-mobility: the term designates all modes of individual or personal travel, as opposed to "public transportation." It is not limited to individual transportation in a car, a private vehicle, in the traditional meaning of the term. It is understood as the leading quality of automobile transportation: the very competitive "door-to-door" transportation whose unsurpassable advantage was put forward in the Buchanan Report.[2] Whether the vehicle is personal in its use and no longer only in its ownership (a car as a service), whether it is pooled through car-sharing or, not as efficient for the door-to-door, carpooling, or being driven in a taxi in all its forms, defines the auto-mobility of today.[3]

The new tools of connected auto-mobility – electric/environmentally friendly connected vehicles, the ECVs – are vectors of energy savings, open communication and sharing. They organize a different kind of city and urban life and modify our practice of proximity. Reciprocally, architecture and urbanism, permeated by the new ideals on communication and sharing, fertile terrains for these new tools, accelerate, in return, development. The connected or interdependent strategic tracks or transformations of auto-mobility developments are now in place.

This creative research deals with the future, that is already being shaped. In 2012, the first self-driving car was authorized to circulate in Nevada. Eight Google

Cars drove 800,000 km in 2013 and they will marketed in this state in 2017, and elsewhere in 2020. It is not a question here of a breakthrough technology,[4] or of forecasting. We develop well-argued plans that cross technologies and dominant schools of thought, while keeping in mind that automakers are proposing prototypes or vehicles in limited numbers with advanced propulsion methods, for example Honda and GM for hydrogen.[5] Electric bicycles, the Solowheel, mopeds, scooters, revisited cars that can be driven without a license and monospace or one-box design cars, adapted vehicles, small Japanese cars (the Kei[6]), the success of the Fiat 500...: the proliferation of individual mobility of proximity is continuing the transformations initiated for several decades, which have seen scooters and bicycles invade our streets, before the Smart and other "urban" and "ultra-urban" cars became omnipresent. What has been added today is the electricity that makes travel clean and quiet in the city[7] and the emergence of "trendy" and convincing products on one hand, and the communication that these transportation modes incorporate on the other.

The societal context is promoting the enhanced human, driven by exoskeletons that enable him to move or to carry heavy loads. The acceptance of these vehicles can consequently be rooted in this idealization of the enhanced or post-human man,[8] as opposed to the image of disability that accompanies these too small vehicles.

The oldest city and the urban space since the end of the 19th century owe their existence to the possibility of exchange – of goods or information – and its maximization in a minimum of time.[9] This primary element extends over all of urban life that is above all comprised of the movement of people and objects and the reception of information, as readable and visible as it is sensorial.[10] However, since the last oil crisis, urban models have been based on a planetary New Urbanism in an enormous spread between a futuristic dreamland and a dreamland that looks to the past. The flow model has made a comeback today, in a coherent form with the demand or the injunctions of the society of exchanges that has been set in motion: creating an urban project will mean first drawing up a plan of potential for accessibility to attractive or necessary polarities.

Mobility-accessibility is no longer a parallel element of architecture and urban development. It has once again become the primary program, the structure of the future, the concept of the contemporary urban space.

Transporters, Toyota, Renault, General Motors, PSA Peugeot Citroën, General Motors, Nissan

Mobility immediately refers to an approach to travel in terms of speed and thus of infrastructures, whereas accessibility is defined by what can be reached (work, leisure, home) generally located on an ordinary road or street. This distinction puts ECVs – environmentally friendly or electric connected vehicles – in competition with basic public transportation, whether the question is one of time or investments in infrastructures.[11]

The new societal imagination associating sustainable development and sharing is now in action. Favorable to the spread of car-sharing, it will also be propitious to the development of new vehicles. This self-realizing model is opening onto the city of auto-mobility, which is being disseminated and concretized. Narrative research, output scenarios, function on a "safe mode": they will become a reality, here or elsewhere, once or many times, now or in 30 years. They help produce the trend and its criticism simultaneously. Narrative research disseminates ECVs and establishes their consequences for architecture and urbanization: the future is invented in producing it. The idea is therefore not forecasting or anticipation: technological innovations have been developed, with "products" that can be variable, succeed or not, but that exclude any idea of a technical utopia. On the other hand, a "production" situation must be maintained, and no longer solely one of "technological watch": production has completed the watch.

We have already forgotten how computers and smartphones have changed us. We no longer remember the modifications they introduced into our behaviors and our uses of the city. Narrative research symmetrically shows what material and theoretical changes the new vehicles that travel on our roads have introduced.

The introduction of ICTs has transformed, since the 1980s, the behaviors of the urban planet's inhabitants much more than regional development and buildings. De facto, the architecture of information networks was superimposed on the city and on its physical networks, then information was integrated – "embedded"[12] – in its objects, without modifying the ground and walls of cities. This is clearly the first and massive transformation: in this hybridization, the city and its buildings can become a "neutral surface"[13] on which the new architecture of communication deploys. Digital networks have superimposed on the old strata a new layer of reality that has no need to modify the earlier geology, and therefore has superimposed itself on it without disturbing it. The material city then becomes a simple

inert support for events. It is not asked to take part in the new technological upheavals, except for transforming itself even more totally into a communicating tool. To this position that we proposed in the mid-1980s,[14] we are adding a "material analysis," namely the study of the concrete transformations propelled by the evolution of ECVs, the most powerful example of the interaction between the practice of cities and ICT. What does the urban space become when access becomes one of its most dominant features?[15] The immense growth in data that measure the city has both increased our knowledge of the urban space, and most particularly in what comprises its heart – movement and exchanges – on which the ICTs have focused attention.

After urban storytelling

With the invention of the shopping center in the 20th century, the highway or the housing development, and now the new vehicles, architecture and urbanism have undergone "real" transformations that can be understood and guided. It is this evidence of programmatic evolution that can be followed with accessibility, a configuration in which one can escape the advertising claims of the ambient "futurism," that sort of contemporary communicating unreality.[16] "Future of the vehicle, urban future" accompanies the transformations started, "feeds them," in an approach that is light years away from the advertising utopias, fashions and trends that appear like an automatic reflex, which quite naively associates new digital tools and new architectural forms or décors. Extremely present today, anchored in our mindsets, the call to the future is there to ward off the fact that architecture, more than design, is out of sync, kept on the sidelines of technical and societal transformations. Architecture and design then reappear as support media.

Architecture had dreamed of transforming itself, of catching up, by clinging to the new techniques, to biology, information technology or cybernetics, then techno-sciences and subsequently the virtual. However, the cybernetic or "Computer (Aided) City,"[17] projected in the 1960s, not only has remained a forgotten moment of architecture's past futures, but had still not returned when the architects "discovered" the digital, on a daily basis, as a reality and no longer as fiction or future. Cybernetic architecture and virtual architecture were barely more than sculptures to be consumed and quickly became boring. The future here was only a symptom of backwardness, sometimes completed by images, comic books that architects were asked to create and that presented the way that the automobile medias imagined the city to come. The imagination of the urban future was relaunched by the return of travel as an architectural theme, giving rise to the invention of "urban products." The car on roofs or rising in the heights of skyscrapers in a labyrinth of ramps would become a reality in a few megalopolises. This "trendy" imagery helped forge the spirit of the time and therefore to establish it in the conscience of architects and their clients. But the situation created by the arrival of communicating individual vehicles directly concerns the urban space. Just like the 20th-century automobile, auto-mobility will affect both urbanization, building programs and life-styles on a daily basis. It is a question of thinking about the upheavals of our environment above and beyond the creative agitation that is reborn each time that a technological transformation appears. Creative and narrative research is our answer.

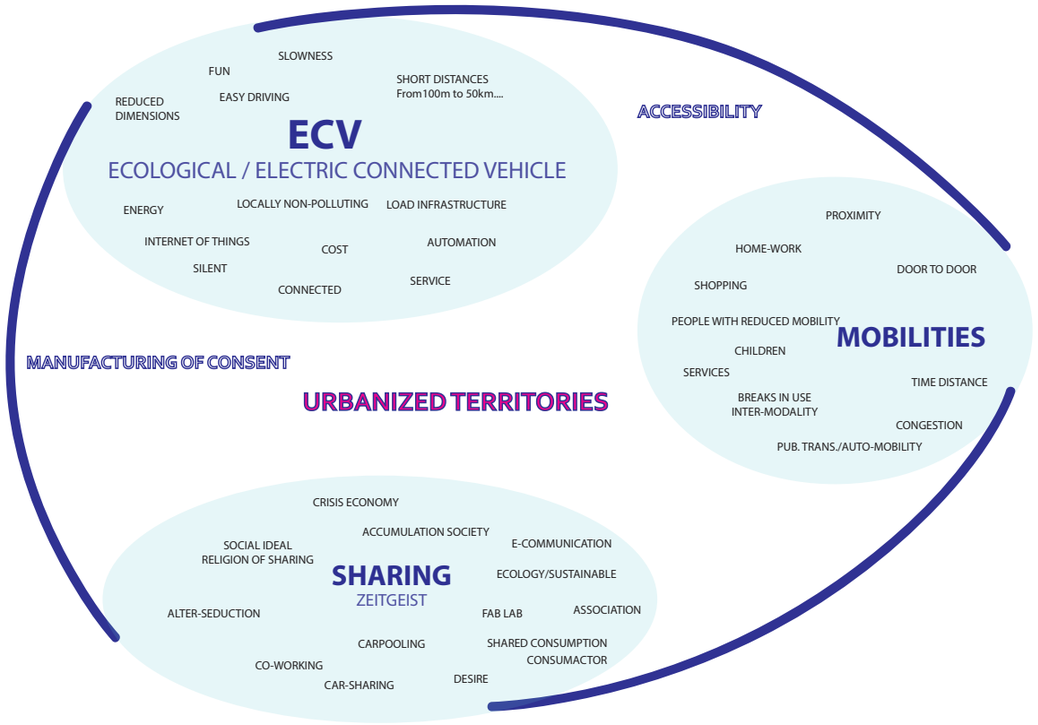
The central determination is therefore the following: mobility has accompanied the changes in territories since the appearance of the railroad and the car; with electric/environmentally friendly and connected vehicles, it is access – accessibility – that has become the central actor in the transformation of behaviors.

A major paradigm of urbanism as an urban project has been based for over a hundred years on the opposition and the various homologies and reversals between a relational approach in terms of "networks" and a "spatialist" approach. They are two opposite representation structures that are transcribed on maps and diagrams. Thought via distinct networks of scales describes the reality of how contemporary metropolises function, whereas the spatialist approach refers back to political-administrative and symbolic controls, the territories' real estate markets and the zoning of the past. Within the Internet of Things, the new intelligent and interconnected vehicles are accelerating the shift to the urbanism of networks, and even further to a radical change in approach that is now rapidly occurring.

Research is de facto in opposition to the "spatialist" visions of the territory,[18] which do not take into account the incredible diversity of the web of movements. Ultimately, they are maintained in a reassuring tradition of common sense, but we must also refer to the reasons of real estate developers and promoters that urban planners reinforce. The urban that we experience is that of the trips we make in our everyday life. The trips define "each individual's city,"[19] which is different for each of us. They determine our relationships and our exchanges, our life network.

The major characteristic of the urban space is the exceptional spread of scales of connections, flows, people and things, of energy, water and, of course, food.[20] The "spatialist" tradition is always ready to rise again and assert its need for unity and form, solids and voids, when it is the fragmentation of mobilities that characterizes the contemporary urban space. The "spatialist" approach endures because it is deeply rooted in common thought, that of elected officials, administrators

"La ville de chacun", Architecture Action, Planète urbaine (2004)



The research determines the modification of urbanized territories by ECVs, sharing and mobilities

and architects. We will note that among the practices of officials, developers and promoters and urban planners, we finally end up in operations on marketable land. From the urban zone to the lot, we always talk about land to delimit and cut it up. An immediate critical impact of the return of the approach to the urban space in terms of flows and networks consequently questions the project approach in the totality of its development: where to begin, what to think and to program?

We show theories, anticipatory proposals that stimulate more than they simulate the evolutions underway in urban territories. It is research that functions through stimulation as an interpretation tool; a reflective position that protects itself from utopia by seeking to grasp what makes things happen in the project. Architects have produced all the utopias, or all the visions of the future, and in a certain way, they have not been mistaken. Kurokawa[21] totally described the Japanese city with its architectural neurons, and introduced the concept of "Metapolis," in the same way as Archigram described the network city that we know. The scenarios that follow are consequently in sync with contemporary life that invents its narratives through "the spirit of the time." Phantasmagoria drives transformations of the urban space, which is created by modifying the earlier imaginary dimensions, in the form of a "soft futurism."

All the automakers produce electric vehicles, none dares take the risk of missing out on the energy breakthrough. The diversification of types of vehicles – from the electric car to the personal transporter – is obvious worldwide, led by the states, or for example by the La Poste Group in France, which organized the production of 20,000 electric vehicles.[22] Electric car-sharing has been adopted by every large city and promoted by the car companies. The "electromobile cities"[23] are ensuring and confirming the success of the zeitgeist.

The system formed by the ECVs, the zeitgeist of sharing and mobility, is based on three interdependent areas (See diagram):

• The development of the ECV market is partially technical-financial (battery capacity, vehicle weight, dimensions and design, charging points, production costs). The Chinese government's objective is to put over 5 million entirely electric vehicles into circulation by 2020, that of Germany to launch 1 million, etc. By 2030 we could optimistically image that 50% of all vehicles sold will be electric or ecologically equivalent (in fact, a small percentage of vehicles in circulation). By 2025, it is likely that under the social pressure of defending the environment only electrically powered trucks will be allowed to enter Paris. This outlook is temporally in phase with the design and execution of urban planning operations, for redevelopment and architecture programs. The projects designed today will be in use in the era of new mobilities.

• The strength of sharing and the "manufacturing of adhesion" or "consent," or what participates in the "manufacturing of the desirable thing,"[24] in other words, the development of ECVs through sharing. The question has been treated by economists, publicists who create consumer mythologies and their critics.[25]

• The development of the mobility of proximity – accessibility – through ECVs. If the transformation of the zeitgeist means that Parisians, Los Angeles residents or New Yorkers use, de facto, more bicycles than before, if scooters have made their comeback whereas mopeds had disappeared in Europe, it is then reasonable to envisage the urban transformations that the demand for accessibility is going to create.[26]

The dynamics of these three poles determines the rhythm of the urban events that will emerge from them or favor them. The urban space and architecture will be modified to welcome ECVs and produce new programs; but in a symmetrical manner, the urban

space's welcome of these new vehicles favors the presence of ECVs.
The ensemble composed of the Plateau de Saclay, Versailles, Saint-Quentin-en-Yvelines, with in particular Satory, which was the subject of a regional development project of national interest south of Paris (OIN, 2009), is one of our study sites.

The project-concepts that we are presenting are often linked to the assembly of programs. Multi-programming has become a life-style. Waiting for the train, commuting, traveling are no longer primary activities and take place simultaneously with reading, work, eating, smartphone purchases or other activities. The change in transportation mode during trips is an occasion to do other things. From bus stops to the international hub, each station is a location for developing other compatible activities. The repercussion is instant: smart-building is above all a sequence of programs. These program assemblies are installed on inter-multimodality stations, including, in the first place, car-sharing, the incorporation of car-sharing as a full-fledged means of public transportation.
Urban transformations often rely on earlier mental or spatial configurations that had not been more developed before, which they strengthen or bring to life again. Abandoned Darwinian branches are awakened by ECVs. The nature-city is an age-old archetype and is always reborn. In the urbanism of atmospheres, speed, noise and pollution are transformed into powerful rules for the creation of the urban space and generate immaterial urbanism plans. The new hubs that are appearing also develop preexisting themes. Transformations have also been carried out in the shift or extension of practices that sometimes existed earlier, in specific environments, for example, electric vehicles in airports or warehouses, which will be called on to be generalized. There are many sources and parallels to be established, as much in unbuilt projects as in the urban continent. In the end, a "large common space" for vehicles and human beings, quiet and nonpolluting, floating, total and neutral, hyper-sensitive and hyper-readable is being revealed as the renaissance of the urban space of the immediate future. "Car zoning" no longer exists either in the cities or on ordinary roads, or between the highways that will no longer be "outside territories."
Internet purchases produce their effects on the conception and presence of stores in the urban space that become places "of experiences" (the most-sold product in the world) and events. What will become of empty stores? We have thought of their reuse by the public space, as an argument of the public space. In parallel, the large hypermarkets and their hectares of parking have begun their obsolescence. What will become of these new urban wastelands, the commercial wastelands that replaced industrial wastelands?
Within architecture, the entrance of vehicles as a full-fledged function in buildings causes a total shift in conception. The parking facility becomes the heart of projects, the internal logic in its own right of their organization. The parking facility as a project becomes central: parking facility-museum, parking facility-office, parking facility-link, parking facility-public space, parking facility-business, parking facility-promenade, parking facility-housing.
Another implication of the transformations underway, the epidemic capacity of ECVs to spread into the environment and extend reachable distances modifies in depth our conception of proximity, which can no longer be limited to circles of 500 meters. These are broad poles that must now be imagined, with major modifications in how we make and program the city, both more dispersed and more concentrated, ever more rhizomatic. Our perceptions of the peri-urban space are also being challenged. Proximity is an idea

that becomes more distant within a homogeneous territory. Integrated highway networks, like the vehicles in the Internet of Things, calmed down and made safer, will be incorporated into the generalized urban space, abolishing the break that these major infrastructure arteries constitute. ECVs confirm the victory of the territory's spreading and global urbanization. It is likely that we are going to see negative discourse on its subject disappear: urban sprawl is no longer a relevant element when every service is reachable in under 10 minutes.
ECVs repair the urban space, they rectify urban errors. They are henceforth infrastructure tools, in the same way as highways, bridges and other engineering works. And consequently, they advantageously replace them. The ECVs' capacity to repair the city is a painless treatment of the urban space: we will build increasingly fewer infrastructures. The homeopathy of the ECVs will be economical compared to what comes out of the most prestigious engineering schools. The new vehicles within the connected urban space practice an art of the stratagem; they have an intelligence of infrastructure saving.
The transformations introduced are often inventions that modify how we think about architecture and urbanism. With the ECVs, an equivalence is introduced between a building and a vehicle, these two productions becoming inter-replaceable, calling into question our categories of how we think about the urban space.

It is another type of city that automated vehicles and other delivery or taxi robots will bring about, as intriguing as the "Real Human" of Lars Lundström, both calmer and more experiential in city centers where consumption has given way to entertainment. The smart city, informed and transformed by data, and the city constantly crossed by automated vehicles and robots circulating without a driver, create a new urban ambience that will have partially lost its "essentialist" mythology. In gradually distancing itself from "development plans," the city that is formed becomes itself a service tool comparable to our daily technical objects that are nevertheless increasingly more attractive.

ECV, SHARING, ACCESS

The new vehicles made their (re)appearance in motor shows and promotional films, then in experimentation sites, and will become widespread throughout cities in societies that place more value in the smartphone than in the speed of large sedans.

From the bicycle to the scooter, from the kick scooter to the personal transporter, micro-cars or ultra-urban cars, electric vehicles are being produced everywhere. New models appear each season, renewed by each firm.[27] They occupy every mobility that can be envisaged, from 20 m to 200 km, but it seems that their greatest efficiency is that of urban worlds. They establish a total mobility, both inside and out, which concerns motion devices like elevators and escalators as much as 20th-century cars.

If their small size, their silence and their absence of pollution during use are their primary features, they are also connected, informed objects that inform the urban space. The potential of these programmable vehicles can be seen with the introduction of autonomous vehicles and, in the near future, delivery and taxi robots into circulation.

Since the automobile race between Ford and Edison, the internal combustion engine has always been ahead of the electric vehicle. The many attempts to market electric vehicles have ended in failure. The balance of power is evolving with new-generation batteries and the environmental awareness expressed in the new regulations and incorporated into individuals' sensitivities and behaviors. To this should be added "sharing," the new behavioral habit that the recent economic crisis has helped spread: the new vehicles will often be shared objects.

In the same way as scooters and motorcycles glide along the roads, ECVs reveal themselves as machines that circumvent infrastructures and invade all the existing road networks.

The new vehicles and "sharing" form the solution to most of the problems of daily commuting, namely the break in mobility between the pedestrian and the bus, or between the bus and rail transportation.

VIRAL MARKETING

Not a month goes by without new projects and new vehicles appearing. The Shanghai General Motors[28] pavilion at the Shanghai Expo proposed, in 2010, a science-fiction journey in the city of the future, very far from the hyper-polluted megalopolis, but the personal automatons and technologies had nothing fictional about them. The future becomes a reality while research is being conducted and simultaneously. In other words, research is constantly being surpassed by the present. Real time is more rapid than the near future. Cadillac is coming out with its driverless car in 2015. BMW, which tested its prototypes between Nuremburg and Munich in 2011, has set the date of 2025, Audi has turned over its cars to a traffic jam driving assistant since 2012 and all the automakers will mass market their totally autonomous vehicles before 2030.

Energy, infrastructure, connectivity, digital or physical mobility, urban life and, what is essential, the users' very desire for mobility, combine and are inextricably mixed in the production of sustainable mobility. An energy-based conception of the connectivity of space has taken over.
Electric/environmentally friendly connected vehicles (ECVs) are singular. It is not their energy that characterizes them as such, but the consequences of the use of energy; not their energy per se but its immediate effects, namely that this energy does not create pollution in the immediate environment (in their use) or noise. The absence of (ambient) air and noise pollution enables other activities to be combined with them. Their dimensions and their lack of bulk, the fact that they are easy to drive inserts them in the city. Between electric bicycles, scooters and four-wheeled vehicles, there is no question that their dimensions, at the outside, are those of "ultra-urban" cars.

The separation of the internal combustion engine car from other human activities is linked to safety and strongly to noise and exhaust fumes, to traces or pools of oil and dirt. The city has been "zoned" from every angle by the car: where it can go, where it can't go, where it disturbs us or prevents us from going.
This is no longer the case with ECVs that move in human and interior spaces, those we are familiar with in utilitarian uses on activity and warehouse sites, golf courses, private towns and secure sites, university and research campuses, airports, exhibition halls and now supermarkets. The technical transformation underway will generalize the earlier uses limited to specific sites that are not spread out. The dissemination of ECVs produces an immediate effect on the environmental ambience. Reciprocally, the decrease in speeds, the disappearance of noise and ambient pollution and the short distances to be covered come to the fore and bring about, in return, the development of these vehicles known for decades but technically improved. The development of the electric vehicle is moreover a response to the worries of automakers who understood that the "danger" did not come as much from the disappearance of oil as their obligation to limit CO_2 and particle emissions. For the city as much as for the car, speed, noise, exhaust and particles are agents of the transformation of life-styles (and our health, poisoned by carbon dioxide),[29] and in the near future, tools for the urban planner.

The values linked to speed are rapidly changing, in a Europe where speed limits are being generalized.

Unlike speed, favorable to the earlier internal combustion vehicles, the present promotes slowness, which enables electric vehicles, with two or three wheels, or even a single wheel (electric kick scooter, Segway, Solowheel, etc.) to ride alongside the other "soft" means of transportation (bicycles). The manufacturers have integrated the change in our social representations, in which the smartphone has replaced the car perceived as a travel tool.[30]
Automated cars will introduce drivers to practices reserved for passengers or public transportation users: reading, working, eating and other activities.

It is in accessibility that the contributions to the urban space are to be found and generated. Accessibility does not conflict with forecasts of the increase in mobility (1.7% per year for the entire world from 2000 to 2050). Let us not set slowness against mobility, and very much to the contrary, it is the entire travel chain whose development access permits.
Major transformations of daily life were brought about by the car, but also by the invention of the department store, the elevator, the refrigerator, the washing machine and now the smartphone. It is a societal transformation that is perhaps underway, and architecture is being transformed by it. The car developed the 20th-century city, it will generate the 21st-century city; and as the car created the long-distance city, it is in the process of engendering the city of reduced (time)-distance. The car is already no longer the same, and the city will not be either. There will not be an "After the Car."

ALL THE MOBILITIES

The cars of the last century were designed to go faster and farther, themselves producing the possibility of urban sprawl and the demand for new networks. The development of today's ambience is transforming our relationship to the car: there is no longer a need to go fast, to accelerate, to change lanes, to pass and also to drive. Accessibility transporters make it possible to go from the pedestrian's speed (4 km/hr.) to that of the enhanced human, 15 km/hr. (bicycle), then to 30 or 60 km/hr., a mobility multiplied by four, five or 20. These ultra-urban vehicles, mini-cars, urban buggies, with one, two, three or four wheels – "clean, economical, quiet, sober, with little bulk, safe for users as well as other road users"[31] – are major transformers of contemporary urban life. There are a great many of them today and they encompass types that oscillate between the "covered scooter" and the ultra-urban car. The manufacturers (and the engineer-inventors![32]) occupy all the available systems. Under what conditions will a solution appear particularly convincing to users? A model close to the scooter or close to the car? Passengers one behind the other or side by side? Straight or inclined? At what price?

In the Paris region, 20% of all trips are made over distances between 1 and 3 km, and 65% of all trips concern distances under 3 km,[33] an optimal distance for the bicycle and the electric scooter and for all the ultra-urban electric vehicles.

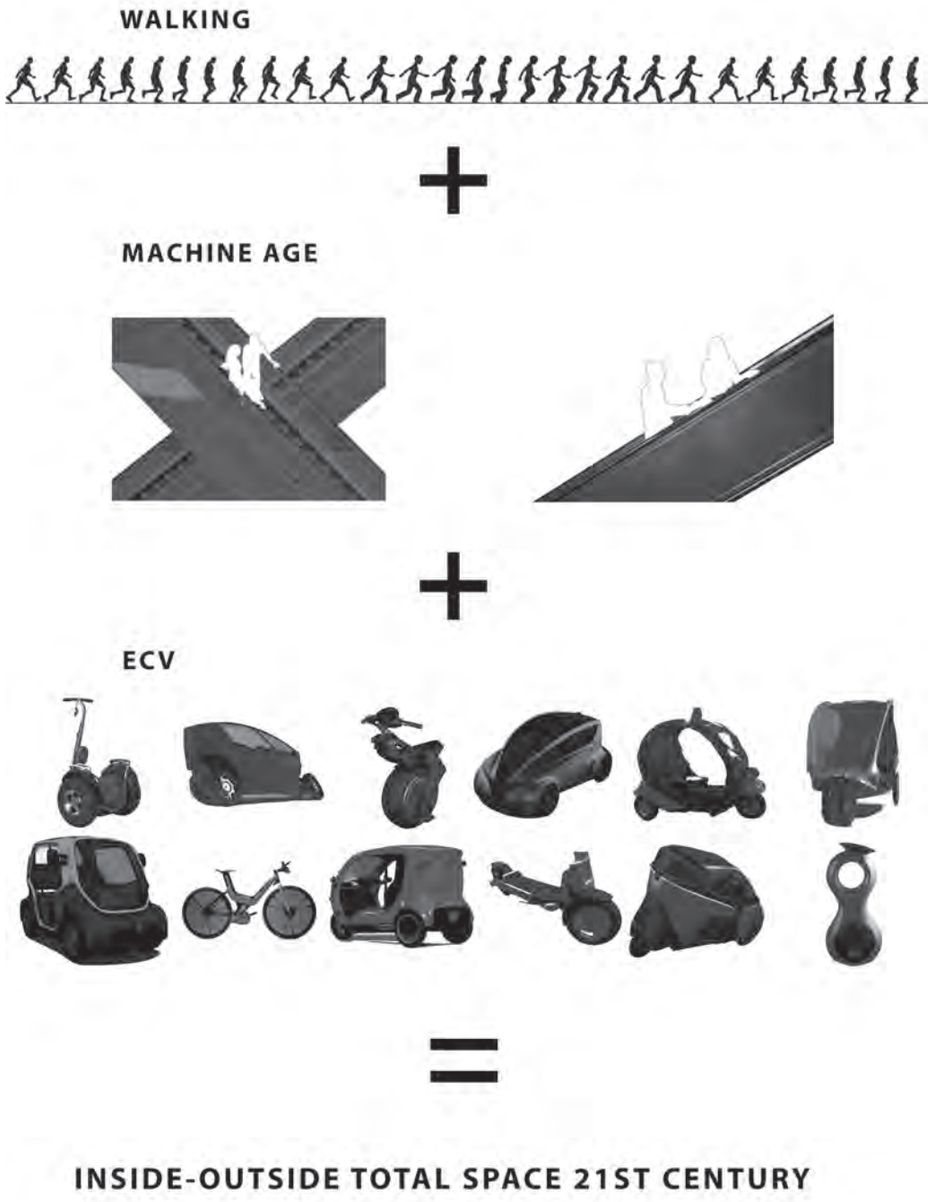
Travel modes are not static and we can observe changes in practices over relatively short durations. The travel

Peugeot concept cars: Moovie and Zippy

survey in the Île-de-France (2010) thus shows that behaviors changed between 2001 and 2010:
- The number of trips/day continued to increase.
- Public transportation was clearly increasingly used (0.78 trips per person per day in 2010, against 0.68 in 2001).
- The use of the bicycle was increased twofold.
- The use of motorized two-wheeled vehicles rose by 34% between 2001 and 2010, with 0.6 million daily trips.
- The use of the car decreased (from 1.54 to 1.46 trips per day in 10 years).

These observations show that travel modes have been very directly impacted by congestion, circulation restrictions, the development of public transportation, the economic crisis and environmental awareness. In the same way as the use of two-wheeled vehicles, motorized or not, has very strongly risen in 10 years, thinking about the development of the ECVs over a comparable period can be envisaged.

Thirty years after the success of the Honda Gyro with its two rear wheels, the Piaggio MP3 has been joined by the Yamaha Tricity, the Peugeot Hybrid3 and innumerable variations, from the marketed series – the i-road by Toyota, Hiriko in service in Berlin with the Deutsche Bahn, Twizy by Renault – to more singular and experimental formulas.[34] These hybrid vehicles, somewhere between a motorcycle and a car, can potentially handle most daily trips, including from the home to the office and back. Let us recall that in large American cities, half of all trips are under 3 miles and 28% under 1 mile. And over 85% of vehicles have only one occupant.
These ultra-light vehicles, some of which can resemble toys, considerably increase personal mobility in urban uses: shopping, accompanying children. The mobilities possible with these transporters have broadened: an e-bike for Ford, the equivalent of a pedal scooter for adults for the Segway, and even less so for Honda's Uni-cub, which is scarcely more than a wheelchair, stripped of its disability dimension. Micro-mobility uses individual mobility assistants, as much with the Segway-type personal transporters as with the Honda MC-beta, mobility scooters and lastly the Solowheel. Certain developments are close to an exoskeleton on a wheel (Toyota i-Real) or are limited to travel for one person (Toyota Coms). Micro-mobility encounters the



From walking to ECVs, the same mobility universe

enhancement of the pedestrian through moving belts and escalators and we will see that it must deal with it. A continuum of mobilities is being established from the staircase, the elevator, the moving belt, the ECV to the long-distance vehicle or the high-speed train.

The presence of sharing, ideas and behaviors such as "generosity" or the "cross-generational" city is conducive to the introduction of these vehicles. Older people and children will be the first beneficiaries. The increase in personal mobility is the extension to everyone, and in any type of weather, of trips that were reserved for bicyclists and motorcyclists. From the bicycle to the more recent ECVs, the new vehicles awaken mobility, and the urban space as a whole. The multiplicity of products favors the market's emergence: 60 or so models of electric scooters produced by Chinese companies are already in circulation. Electric mobility will never stop surprising us with inventions that are increasingly spectacular. Manufacturers (Ryno, Bombardier) created the first scooters able to automatically balance on a single wheel. These vehicles seem to have come straight out of science-fiction comic books. An autonomous system takes control of the scooter in the event of excess speed or a dangerous incline for a sharp turn. As for performance, these machines have an autonomy of over 50 km and can reach a maximum speed of 40 km/hr. Parking these vehicles is the subject of several studies, in order to decrease the bulkiness of these new machines. The City Car, developed by MIT's Media Lab in 2010,[35] manufactured and marketed by Hiriko (2013), owes its media success to the solution to the parking problem: these vehicles fold like a chair and fit into their fellow cars.

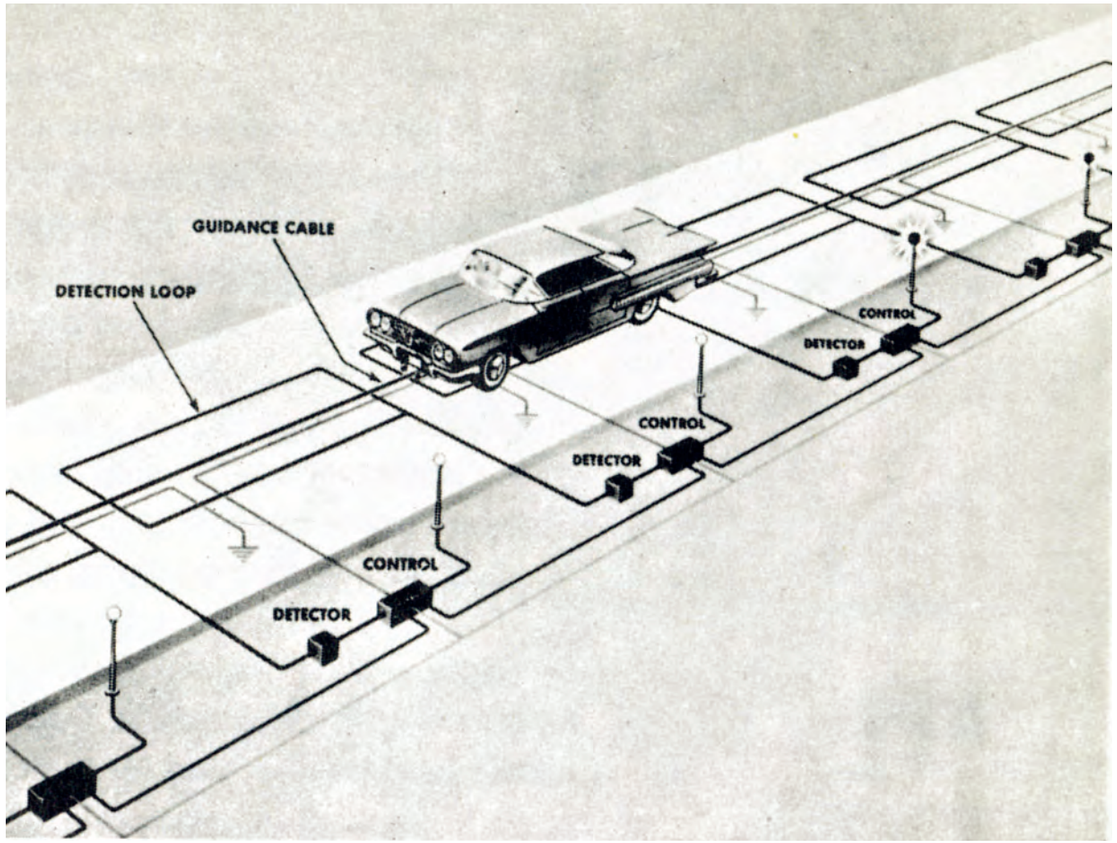
A European or North-American viewpoint, as we have just expressed, does not fully take into account a mutation that began with the production of electric bicycles in China (mainly with lead batteries): by 2018, 60 million two-wheeled electric vehicles (bicycles, scooters, motorcycles) will be manufactured there each year.[36] There are 10 million of them in circulation today.

CONNECTING

Alliances (Open Automotive Alliance) have been created between Google and the automakers (GM, Honda, Hyundai, Audi) to incorporate Android in their cars, principally for entertainment and geolocation purposes (enabling locally targeted ads to be sent). Apple also did likewise with the iPhone "iOS in the car."

Systems communicating with cars have long remained limited to not very active information (signaling, traffic lights, sometimes the radio). ITS (Intelligent Transport Systems) have developed communication between vehicles and the road (enhanced by sensors and emitters) to improve the safety of truck transport but also to bill users of urban toll roads without the vehicles having to stop.[37] The vehicles themselves have laser cameras capable of avoiding objects, people, animals or other vehicles and are therefore new tools of automotive safety.[38]

The history of the driverless car perhaps began at the 1939 New York World's Fair in General Motors' Futurama. The first experiments were conducted in the United States by the Radio Corporation of America and General Motors and in England by the Road Research



Electronic highway for autonomous and "connected" cars (Radio Corporation of America, Brian Richard, *New Movement in Cities*, 1966)

Laboratory in the 1950s and 1960s.[39] The English architect Brian Richards took an early interest in the relationship between the city and urban transportation. His book *New Movement in Cities* (1966) shows the topicality of international research in this field. His next three works (1976, 1990, 2001) updated this first work, while providing an account of 40 years of research on and beliefs in the possibility of an alternative mobility in the urban, intelligent and ecological milieu.[40]

Technological advances in the field of autonomous vehicles have been exponential, thus all the automakers are aiming at their rapid marketing (2020). Autonomous vehicle today means the range of levels of "delegated driving," going from the car that parks itself to the car that circulates in the city without a driver.[41] In 1987, the Prometheus research project was launched. In 1995, Mercedes Benz was the first manufacturer to have an autonomous vehicle drive 1,600 km. Between

2004 and 2007, DARPA, the Pentagon agency responsible for advanced research in the United States, held a competition on driverless cars that would lead to the Google Car. Volvo initiated the first large-scale worldwide test, with 100 autonomous cars to be turned over to individuals in the Gothenburg region in 2017. Nissan-Renault has announced that it will market their autonomous vehicle in 2020, and all the automakers will come together on this technology in 2030. Connected vehicles are becoming major elements of the "The Internet of Things," going as far as replacing it with "The Internet of Cars."[42]

Connected cities

The "smart"[43] presents for the most part two important dimensions: the optimization of the city – the large network – and the optimization of the inhabitants' involvement. Effective metaphors are the ones that describe cities as living organisms, arterial-venous or neuronal systems of networks and flows. The capture of the collective use of all the city's data aims at the optimal use of all the networks in place, but also development projects.[44] The management of the city becomes the principal task of urbanism. It is therefore particularly notable that this urban future through data does not tackle the elaboration of the future that usually results from the actions and projects on the urban space.

Concerning car travel, information is exchanged between vehicles, naturally including through shared applications,[45] and to the vehicles, the data transmitted by sensors and information networks.[46] Most of the innovations expected in transportation concern the modeling of traffic, (dynamic) planning of routes and parking facilities, management of changes in transportation mode, reservations, payments and of course automated steering. The app[47] enables the user to choose the means of transportation and the most efficient route under real-time conditions and not on a static vision of transportation and congestion. It provides the opening hours of stores in real time. In Singapore, the open platform LIVE Singapore![48] compiles all the information generated and used by the city, its infrastructures and also it inhabitants via their smartphones or tablets.

The distance between interconnected vehicles is decreased to form a fluid, less crowded and safe vehicle convoy. This advantage was one of General Motors' major arguments to promote its "Autoline" system (1965) that enabled vehicles to safely drive in a group at 70 miles/hr., and especially to save on the building of five additional highway lanes. The car connected by Internet now makes it possible to do without the connected structure (burying of circuits).

Vehicle convoy

Optimizing travel, limiting urban congestion, limiting stress

The apps developed promote mobility and limit congestion and loss of time. Open Data collect information that makes it possible to diversify the transportation offering (bus, tram, bicycle, electric car, individual public transportation) and to strengthen the development of new uses (carpooling, e-stop, short-term vehicle rental, exchanges of services between inhabitants). Centralizing the data between different means of transportation favors multimodality (metro arrival time, bus departure time, time between when the vehicle leaves its parking place to the carpooling space). The intelligent metropolis can make available, for the motorist and transporters, the frequentation level of roads in real time, as well as reliable traffic forecasts, and therefore transportation time, by also proposing alternative routes and times. The informed and informing city anticipates problems and blockages due to weather conditions, it manages, in real time, flows according to pollution rates, it establishes urban toll periods... It enables parking places to have sensors so that places available in real time can be viewed on a smartphone, for the driver's comfort but also to help decrease traffic.[49]

Optimization of parking

It is not possible, given the extent of examples worldwide, to draw up a list of projects completed or underway.[50] Here are a few of them:
In Berlin,[51] the Deutsche Bahn launched a payment card for the city's public transportation and for all its offerings. The transportation company proposes self-service bicycle rentals (Call a Bike) and rental or car-sharing vehicles. Its fleet of car-sharing vehicles, e-Flinkster, is comprised of electric vehicles. It has set up car-sharing with the Hiriko vehicle. A smartphone app is also available to easily find these electric vehicles and available parking places.
In London, the City Dashboard[52] proposes a dashboard of the city accessible on PC, which presents the use rate of self-service bicycle stations in real time, as well as disturbances on the underground and the state of road traffic, the weather, the latest news or local trends on Twitter. Since 2010, the underground company Transport for London (TfL) has published, freely available, its data on the use of the network.
Along the same lines, Handimap, a smartphone app and website, uses data from the city of Rennes on the amenities for the disabled or those with reduced mobility. The two interfaces enable the calculation of routes for those concerned taking into account amenities and displaying reserved parking places and accessible places (bus stops, public buildings), as well as intersections with audible traffic signals. The project started in November 2010 in the framework of a competition on Open Data 95.
Optimod'Lyon[53] centralizes, in real time, on a single platform, all the mobility data related to the movement of people and goods in the Lyon metropolitan area and makes them accessible. The project consists in providing users with the means of optimizing their choice of travel modes, the use of their networks or their fleet of vehicles. Based on this platform, SmartMoov' is an Android app that optimizes the user's route according to his personal travel preferences on all the existing offerings: public city transportation, regional trains, car, parking, walking, bicycle, etc. SmartMoov' takes into account in its calculations the state of traffic in real time, earlier traffic conditions and their predictable evolution within the hour. During the traveler's trip, he will be warned about possible disturbances and, if necessary, an alternative route will be proposed so that he can make the right choice at the right time. With congestion comprehension and analysis tools and now dedicated apps, the users can manage their routes and their travel in metropolitan areas, as well as choose their means of transportation. This will result in congestion being modified. As for the vehicles, this will lead to the proliferation of the number of vehicles available, either rentals or car-sharing vehicles and consequently to the opening of new programs, as well as for dedicated parking places. As for ride-hailing cars, whether legal or illegal, they are spreading as is the opposition of taxi drivers everywhere.
The repercussions of this "eco-systemic" approach to travel are, for the urban space, a much more extensive and diffuse occupation in the time spent on activities, of whatever nature. The urban space will be occupied on more extended phases. This concerns practically all traditional activities and will lead to extending the travel phases, whether they concern routes linked to working time or free time. The precision obtained on the knowledge of travel modes will also enable other vehicles, notably electric ones, to use dedicated corridors, even train tracks.
For architects and urban planners, the territory is being transformed by a piece of information – traffic, congestion – that becomes an architecture element, in other words, a site element.

Urbanism of the immaterial

In the most congested urbanizations, flow management informed by data from vehicles as well as from the road can be organized based on immaterial procedures or those close to the ones used by air traffic controllers. We have imagined not only that red lights, speed, the number of usable lanes are managed in real time from a central software program, but the software becomes the travel plan itself. The immaterial travel plan does more than increase the drivers' ability to select the best road, it becomes the general driving rule by choosing the right road in the morning and a different one in the evening, and it adapts the right route for each vehicle based on the traffic encountered. Trips in the city, those sets of quantifiable data, are then managed by a software program that guides autonomous vehicles and calculates the cost of each trip. The vehicle, whose driving is delegated to and managed by an "itinerary center" or by "centralized mobility management," is a horizon that the quantifiable and informational city will reach. This precise logic is the immaterial dimension's entrance into urbanism.

CONTEMPORARY SHARING

The present has established an original constellation, the contemporary zeitgeist: energy sources and constraints, environmental urgency and awareness, economic models undergoing a crisis, technological evolutions, the development of information technologies and social networks, the transformation of life-styles, relational sensitivities, values and services, recreated exchanges and solidarity summed up in "sharing,"[54] the generalization of collaborative practices[55]: peer-to-peer, shared custody and blended families, couch-

The electric egg, Paul Arzens, 1942

Isetta (Iso, 1953), BMW version 1954

surfing, carpooling, car-sharing, co-working, Slow Food Collaborative, Super-marmite and co-lunching, cup of teach, co-conception of products, do-it-yourself,[56] 3D printers, habitat cooperatives, individual or shared rentals, gleaning, second-hand purchases and swapping (the Bon Coin), bank loan club or crowdfunding, peasant associations, e-commerce and smart cities, smart choice, participatory self-building, open data, e-demonstrators, hybrid forums, digital citizen, digital canteen, deflection of urban hacking, collective intelligence, Wikipedia, Wiki... networked democracy, society and collaborative consumption, economy of the link, society of empathy and co-revolution, association revival, BlaBlaCar, reliance and the "age of access"[57]... Sharing[58] is a societal ideal that has found its place in the city and has become the new action and thought mode on urban space and life, between the participatory city[59] and self-promotion, appropriation and hacking. Other terms could fit this new urban thinking, as well as that of common goods.[60]

This linking of the whole, which aggregates contemporary sensitivity, is decisive for understanding today's trends and evolutions. It is neither the energy crisis, and the transportation costs that result from it for people who have no choice other than the car, nor the new vehicles, nor the competition between manufacturers, nor the Internet, the GPS of the car with delegated driving nor even the insistence with which "mobility" occupies the media landscape, that, alone, have created the contemporary configuration. A global ambience must emerge and this is what is happening today. A shared sense of belief and acceptability is decisive in this mutation. As soon as the societal ambience pushes each individual to believe in it, the transformation can develop.

This sharing ambience has spread throughout the entire world society, all the more rapidly as digital communication has accelerated and social networks proliferated. Sharing has become one of the few values of time (the sustainable is part of it) that occupy the ideological voids by quietly reintroducing a virtuous ambience of charity, mutual aid and collectivity, even of a generous utopia. The sharable, that the culture of the networked society expresses, sums up the adherence to the synergy of exchanges, the return of a gift exchange culture: we give and we expect to receive. In this sharing of the world, the idea is to put an end to the "ancestral fear of the other."[61] A globalized ambience corresponds to a globalized car production: sharing, this new project that replaces consumption or the "system of objects."

Cars that can be driven without a license or small Japanese vehicles have existed for over 50 years,[62] but they hadn't conquered the market, which they are currently in the process of doing. In Europe, these vehicles had been reserved for people who did not have a "license" or those whose license had been taken away. A mark of success, in this context of rediscovering short-distance vehicles, the "ancestors" have become "vintage" for hipsters...[63] The electric car did not convince users for many decades. The development of efficient batteries has now dealt with these problems. It is the values linked to electric vehicles, however, that are decisive. Speed and power have not disappeared from the Tesla in the process of replacing the Ferrari, but the electric and its values are structuring the difference.

The vehicles developed by Toyota, Peugeot and Renault, General Motors and other automakers are not conceptually new, but they are from the viewpoint of the imagination. BMW's Isetta (1953) and Renault's Vespa

Comuta, Ford 1967

Vesta 2, Renault 1987, world record for road consumption: 1.94l/100 km

(1987) met the objectives of money and energy savings. Ford with its Comuta (1967) had identified the problems of congestion and pollution in city centers. Electric and compact, the Comuta represented the ideal car for the commuter. It even saw itself as a couple's second car, but in a form of "car-sharing": at a "service" station, the main car was parked and exchanged for the day with a rental Comuta.[64]

The 1960s were particularly rich in inventions of urban mini-cars, electric or hybrid ultra-light compacts that took up little parking space,[65] to rent or also to share because the cost of these machines was immediately perceived as being prohibitive. That is why whether they were produced by the major automakers (Ford, General Motors, etc.) or by a host of inventors fascinated by them, they would remain in the state of quasi-prototypes (six Comutas for the first version), below any performance faced with the period's success: the very economical Fiat 500 1.5 million of which were sold in 1965.[66]

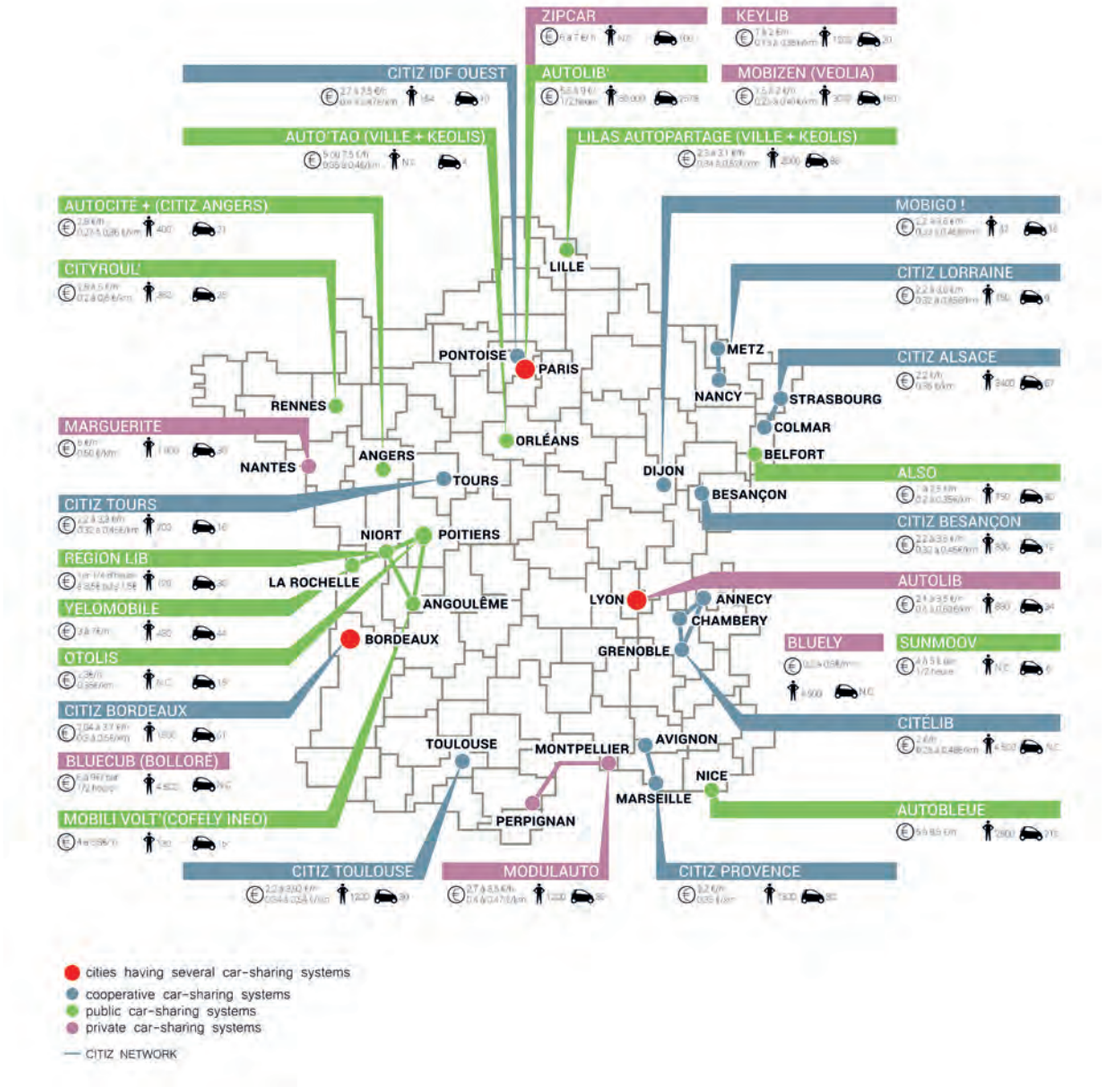
Sharing is as old as the concept of the urban mini-car. The engineer and architect Jacques D'Welles proposed, in 1951, creating a "individual public transportation company" of "city cars" (and not an "all-purpose" car), "mono-place, limited speed, without a horn, without burned gas, silent," the VIBEMMP: "electro-mono-minima-place ordinary individual cars."[67] In looking for the solution to the parking problem, D'Welles directed his thinking to the urban space and not to technology: with station-garages built at a regular distance, like bus stops, the company's subscribers could practice one of the first forms of car-sharing of the public service vehicle.

However, like the VIBEMMP dream, the Isetta, with its access via the front of the vehicle (as in MIT's City Car), was an end-of-the-war vehicle, fated to disappear with economic growth. Likewise, Renault's Vesta did not have any outlets due to a lack of "sustainable" ambience. Consequently, the company never produced the Vesta that however only consumed 1.9l/100 km. The market wasn't ready. In other words, the manufacturing of consent was not yet there.[68]

The market would not be ripe in 1995 either, with the TULIP (Transport Urbain Libre Individuel et Public), a world first of a "free individual private or public means of transportation." This electric car, to be shared and accessible via a personal electronic box with stations for charging and return/pickup of the vehicle, would not find its clientele, despite it's designers' energy in promoting its purchase by cities throughout the world and convincing its target of the scope of its uses.[69]

The organization of spaces resonates with this great upheaval of "sharing" that reactivates models of continuous and extended spaces, fluidity and neutrality, as well as vagueness. The sharing "scheme" extends to spaces and streets that are called "shared" and more

The TULIP check-out counters in a hypermarket



Map of 30 car-sharing companies created in France since 1999 (source: M. Wable, 2014)

generally, it resonates with the period and its spirit. The distinction of uses, services, programs and spatialities has been abolished. Architectural spaces will evolve toward this absence of distinction to become an ideal of the period.

With the new types of public transportation, the distinction between architecture and urban design is disappearing. The vehicles and their stations are becoming the form of the city.

A car ideal appropriate for sharing is manifesting itself: serene driving that respects the environment and others. More generally, it is the transformations of imaginary dimensions and behaviors that in the end are decisive. The believe, self-maintained by the networks, automatically creates its self-realization or its self-manipulation of each individual's thoughts and emotions.

The shift to a society of services and uses and no longer of products and possession,[70] which has so strongly manifested itself with car-sharing, has considerably changed the situation. Car-sharing, a key example of the vehicle as a service, has become widespread,[71] and will undergo new developments with the service startup of autonomous vehicles. However, what was once called the "age of access" also clearly resonates in terms of "accessibility." The spirit of the time is proliferating by contamination.

Sharing functions through association. It associates and multiplies uses. This society of "and" or "severally" finds its equivalent in the smart building, not understood as the recipient of digital technologies but as the building's intelligence of multiple uses or programs. The multiplicity and possibility of a programmatic indetermination, or the pooling of spaces, is making a comeback in the sharing society. Sharing slips into a rupture process of "separation" categories or the breaking down of traditional oppositions, codes or paradigms: city/nature, human/animal, private/public, inside/outside, open/closed, leisure/work, customer/seller.[72]

CUNNING: SAVING ON INFRASTRUCTURE

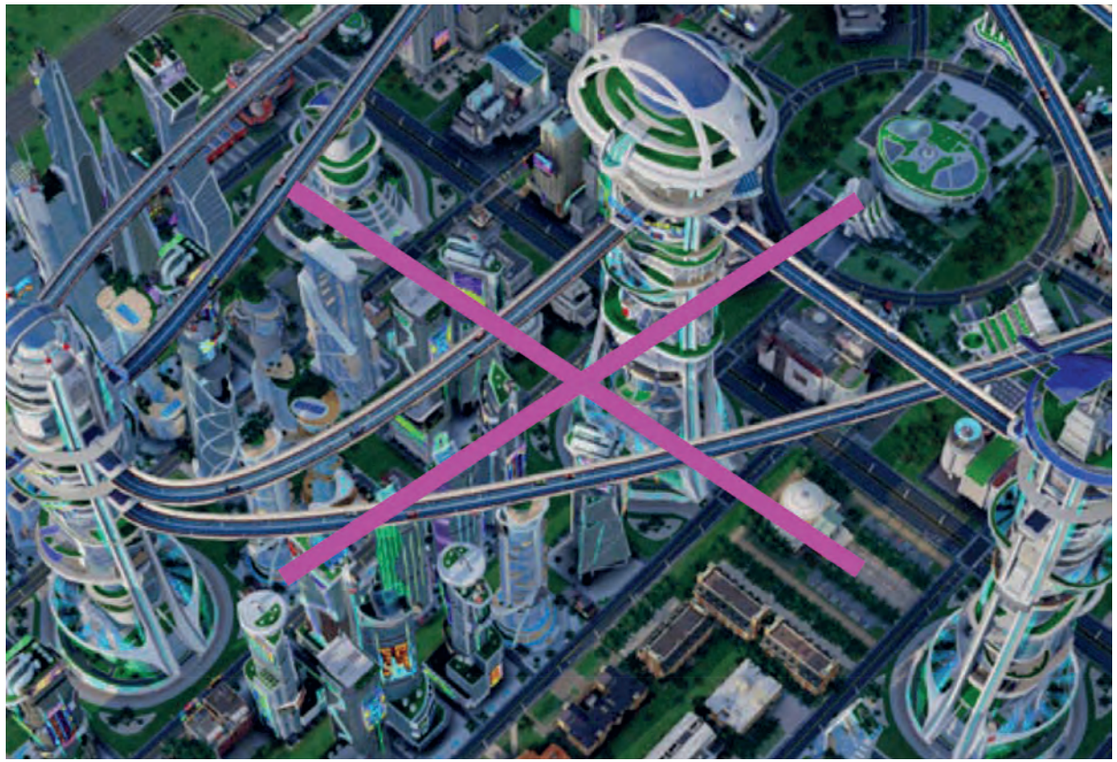
The European context of a crisis economy favors sharing, which is the intelligence of stratagem and circumvention. Sharing tends to maintain the living standard during a crisis period. For its part, environmentally friendly auto-mobility, because it decreases congestion, limits investments in road infrastructure. Let us develop these two points.

The management of the city calls on a collective intelligence. The infrastructure of the entire urban space has become a digitized platform that notably includes self-sharable vehicles. This collective intelligence is largely mobilized today through the use of public and social networks and participatory sites.[73] It is no longer a question of innovating "alone" but "together."[74] Hence one of the recurring themes in studies on the new mobilities, that of the users' acceptance of other modes or models of urban "driving."

The conscience of the period, sharing promotes public goals such as health, the environment and safety that will lead to overwhelmingly supporting lower-consumption, lighter, slower, safer vehicles. The sustainable commitment has been introduced into everyone's minds and its empathetic dimension makes it a decisive ally of sharing: resources, as the generous

consideration of others. Environmentally friendly individual vehicles are integrated into sharing and are sustained by the internationally stabilized strategies of actors who support the development of this common reference.

The new environmentally friendly vehicles, due to their small size, engender a new savings: the capacity to infiltrate every urban fabric, including the narrow alleys of Asian cities. They favor the use of the existing roads and do not create new ones, unlike traditional vehicles that keep demanding more. With ECVs, the infrastructure to be built will at the most be a new gangway, scarcely more resistant than a pedestrian footbridge. However, in almost all cases, and considering their small dimensions, individual accessibility vehicles occupy the existing roads and there is no need to invent a "superhighway" for bicycles. In other words, the ECV replaces the road infrastructure and makes up for its failings.
As they do not have to confront the weight of the creation of new infrastructures, problems encountered in railroad or even tramway development, these new vehicles are "compatible" and adapt to what exists:



Sim City canceled

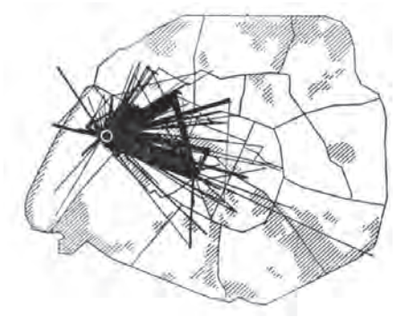
they enhance it, they use traditional roads or back roads. It is the technologies that use cunning to trick the infrastructures and that are consequently developing rapidly, inversely to their predecessors (50 years for the car, for example). ECVs are the opposite of 20th-century engineering. We therefore will no longer see the Grand Paris viaduct projects, those science fictions that only theme parks or Las Vegas were able to build. The 21st-century imagination will separate itself from the "spatial" world that had invaded it as of the late 19th century, from the Paris of the Future to Metropolis and Sim City.

Independent of infrastructures, the new mobility technologies depend on the creation of their credibility on the market, which also requires the necessary "charging infrastructure": widely distributed car-sharing stations and electrical outlets, on a self-service basis, on streets, in buildings and facilities, on the land.

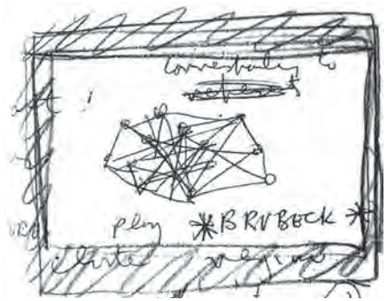
ACCESS AND THE RUPTURE OF MOBILITY

If long-distance mobility has considerably increased throughout the entire industrial adventure, short-distance mobility – a few kilometers in individual transportation or public transportation – proves to be frustrating: loss of time, poor conditions, while representing the great majority of travel.[75]
Traditional public transportation is by nature limited to locations in dense urban zones, where there are many potential users. Everywhere else, with very limited usage, it meets needs with much more difficulty. Efficient collective transportation (i.e., frequent, with dedicated lanes or tracks) will therefore be for the most part limited to urban centers, where the car is increasingly less accepted, or will function like a feeder station, but will be forced to cover a radius of 500 m around their stations. The distance to be covered to reach the closest station, but also changes in transportation mode and frequencies, remain problems for most users. Public transportation does not succeed in reabsorbing the many isolated areas.
Outside the large, dense metropolises, public transportation has almost totally reached its limits. It is increasingly used and saturated, often unsatisfactory. The development of new mobilities – tramways, buses with dedicated lanes, river shuttles, etc. – have not fundamentally modified the situation. New transportation principles must therefore be created that are neither traditional public transportation nor the private car and its congestion.

A singular alternative to the car, in the urban milieu, is the two-wheeled vehicle, electric or not, or the rickshaw. Accessibility maps at 2 or 4 km show its importance for short-distance trips, as a complement to collective transportation. We will see that a probable transformation is the broadening of the market of motorized two-wheeled vehicles, being set in motion with a modification of our life-style.
The search for new solutions, which will complete the range of other means of transportation, is particularly relevant in urban zones in which 60% of the world's population live. A large part of our narrative project treats immediate proximity. This is no longer a revolution of mobility, but of accessibility.



P-H. Chombart de Lauwe, diagram of a student's routes in the 16th arrondissement of Paris, 1952 (reprinted in *L'Internationale Situationniste*, Feb. 1958)



A&P Smithson, Brubeck, Ideogram of the human relations network, 1958

We will build on the thinking that Melvin Webber introduced in 1964 by analyzing how accessibility, as an interaction system via telecommunications systems, was in the process of replacing the proximity of the "place."[76] Webber himself had extended his analysis in the context of Los Angeles whose means of mobility is dominated by the car, and found in the future of connected car-sharing and the development of means of travel that would keep the advantages of the car, territorial equity for the inhabitants of suburbia who did not have a car. He shifted the lament: not too many cars, but empty cars; not to (uselessly) attack the disastrous effects of the car that supposedly generated suburbia and so many other suburban regions in the world, but on the contrary, to recognize and grant to each individual the quality of life of exurbia by inventing "ways of extending the benefits of a means of transportation to auto-like transportation to those who are presently carless." [77] And to conclude: "Our central challenge is to invent ways of extending the equivalent of automobility to everyone."[78] In other words, finding solutions for the carless is not done by means of the car-free city but by the promotion of a public means of transportation of a new age: the accessibility of free automobility.

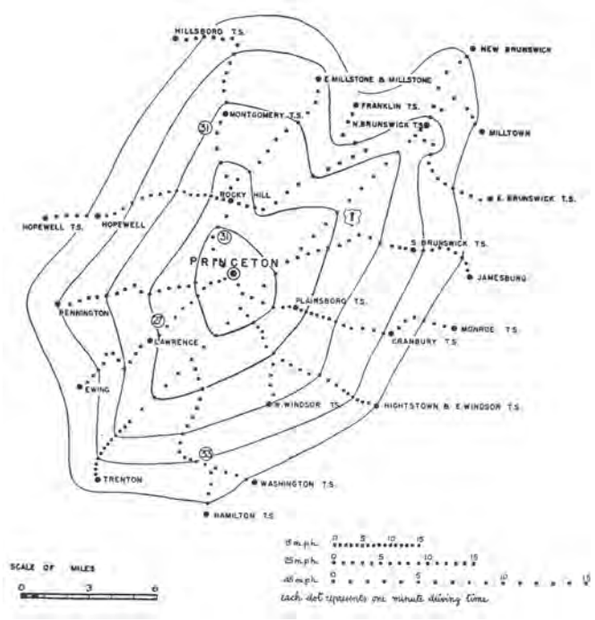
What Webber would not have thought of, beyond the preference for dispersion as opposed to density, with the car-sharing and digital solutions that would have reduced the need to travel, as is also imagined today by Max Grünig – who heads the POCACITO (Post Carbon Cities of Tomorrow) research program at the Ecological Institute of Berlin[79] – are the repercussions on the very organization of cities and architectural programs that results from such a generalization of auto-mobility to everyone.

As for the Buchanan Report, it defined accessibility as "the ease of accessibility for vehicle users."[80] It is based on two requirements: a) "vehicule users should be able to move from one part of a town to another – or beyond

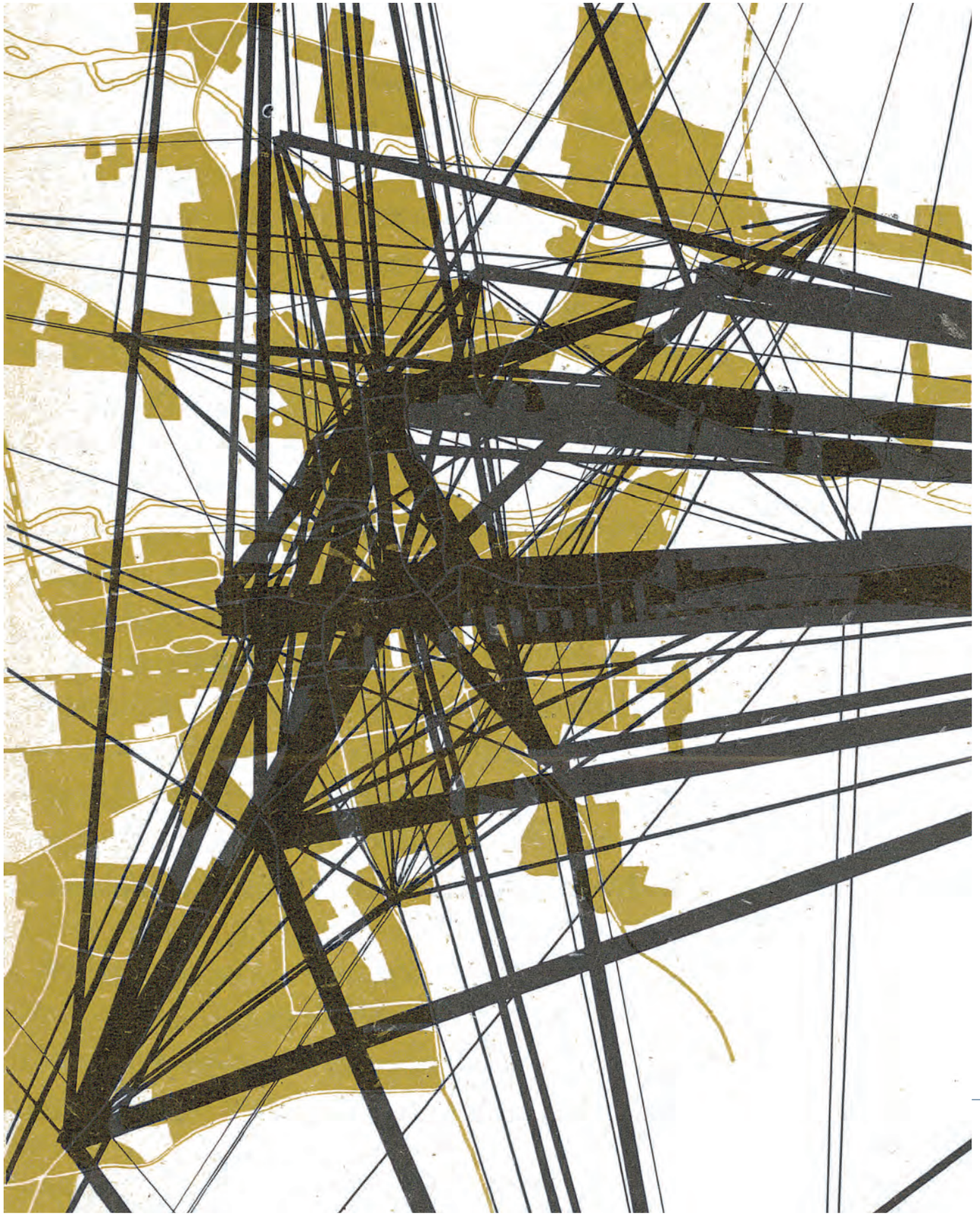
– in safety and with reasonable speed, directness and pleasantness for the driver's eye view; b) "the driver should be able to penetrate without delay close to his final destination and to stop there without restriction." For Buchanan, the idea was to study all "the possibilities of adapting towns to motor traffic before there is any question of applying restrictive measures."[81]

We will compare it with how the Rapport Setra (2008) currently defines accessibility: "Accessibility is the quantity of goods, jobs (or relationships) that an individual can reach from a given point, taking into account the level of offerings of transportation infrastructures, his travel behavior and the attractiveness of his possible destinations. The opportunities that the territory offers only become meaningful through transportation conditions that make it possible to access them, and inversely, the transportation conditions offered by the network are only of interest vis-à-vis the destinations served. [...] The accessibility level of a point could be measured according to the time required to reach it and therefore the travel speed."[82]

From Buchanan to Setra, we can see how accessibility has gone from an absolute requirement of speed and comfort (including visual and for parking, to a relative element, to choices, opportunities and decisions that will be made by the individual depending on transportation offerings, in common or individual. On one hand, the city must be "liberated" of personal vehicle pollution while keeping it as the first and irreplaceable means of transportation, and therefore giving it the place – slab infrastructures, urban highways, separate lanes, etc. – that it demands ("a problem of design"); on the other, they are means of transportation that meet in varying degrees the travel necessities of the users who adapt the city to their needs (attractiveness of places). In other words, we are going from a reflection on the city of the future modeled for and by one



Market analysis by Kenneth Welch to delimit the commercial zone and the siting of a shopping center using an isochrone map. Each dot represents one minute of driving time (Geoffrey Baker and Bruno Funaro, 1951)



Buchanan Report, "A desire line diagram for work-journeys in a small town", 1963

means of transportation (the car and its future[83]), to research on the future of the vehicle (auto-mobilities) that will design each individual's city. The city is no longer determined by its infrastructures, but by what we do in the city.

This city or this urban space of each individual is not reduced to commuting transportation (which is still the Buchanan Report's basis of reflection): starting with Pierre-Henri Chombart de Lauwe, Alison and Peter Smithson or the Situationnists,[84] we know that the city is a constellation of places of desires or necessities. In the slow evolution of travel motives observed between the 1980s and the years 2000 to 2010, it is the decrease in trips to workplaces and schools, to the benefit of those for leisure and purchases, that accounted for the difference.[85]

The real estate market has included accessibility information in the calculation of the value of properties, as well as the "walkability" criterion (walkable city), even if it often limits accessibility to proximity. A place's accessibility[86] is a value quantified by companies like Walkscore – whether it is on foot, in a car or on public transportation. Since Victor Gruen's work on shopping centers, with notably the introduction of the decisive parameter of the "driving time distance" for the choice of the placement of a shopping center[87] – a method that he systematized based on the work of Geoffrey Baker and Bruno Funro in 1951[88] – the managers of major facilities use accessibility data when they make investment decisions.

According to Melvin Webber, Robert Fishman had understood the city itself as "time-distance" (distance measured by time):

"...each family home becomes the central point for its members. They create their own 'cities' out of the destinations that they can reach (usually traveling by car) in a reasonable length of time. Indeed, we customarily conceive of the new city in terms of time rather than distance. A supermarket is not four miles away but ten minutes in one direction, a mall thirty minutes in another direction, and a job forty minutes by yet another route. The pattern formed by these destinations represents the city for that particular family of individuals. The more varied the destinations that one chooses to reach or is able to reach, the richer and more diverse is one's personal 'city'."[89]

The mobility rupture therefore exists within the family: should it buy two vehicles, rent one of them and which one? The mobility choice will also be an evolution that will continue: should I take my bicycle, my electric scooter, the tramway, the car?

CHANGES

It is a reversal of perspective to once again think of auto-mobility whereas we had focused on development through public transportation. At the junction of the technology of new vehicles, mobility and the sharing society, several modifications in behaviors, cultural models and traditional classifications are appearing and will transform urban actions. These transformations concern the eventual replacement of public transportation that has a low use level by environmentally friendly connected vehicles that are shared, and therefore will mark the dominance of the “door-to-door” route model. This ideal, which people believed had been abandoned to the benefit of public transportation, has once again become very topical. De facto, we are replacing collective public transportation by individual public transportation: the taxi, most often used by one person, is a public transportation mode; car-sharing and the bicycle are “self-service” public means of transportation. The opposition between the car and public transportation will gradually disappear, without, however, one replacing the other. The ramping up of the car as a service that communicates with the data of smart cities eliminates the owner’s vehicle.

Two other changes are moreover considerable, one concerning our perceptions, the other technical: the appearance of new mapping and therefore of the visibilities of the data city, and the repair function of ECVs, solving urban dysfunctions through their use, without creating new infrastructures. Lastly, the ECV, or the soon-to-come automated vehicle, will be neither noisy, nor dirty; it will be appropriate for use alongside humans, nature and pets, within a natural continent.

DOOR-TO-DOOR SERVICE

The service in individual transportation the most difficult to do without is the "door-to-door," the ability to take us from one point to the other without changing vehicles, a genuine "service." Buchanan wrote: "The characteristic which distinguishes the motor vehicle from other forms of mechanical transport is its ability to offer a door-to-door service."[90] Melvin Webber recalls its unique performances, "no-wait, no transfer, door-to-door service": "No other transportation mode comes close to meeting that standard of service."[91] The personalized bus of the 1960s remotely ordered by telephone and radio-tracked (Dial-a-Bus, or Dial-a-Ride), had the same objectives: "WHERE you want to go, WHEN you want to go, FROM any place TO any place."[92] The difference then makes no sense between a traditional bus "enhanced" by radio waves captured by the users dispersed in suburbia and the various systems of mini-self-drive cars that, in the current absence of a geolocation via the Internet, require a track system supporting these cars. People wanted to believe in the search for alternative solutions to the car, and imagine as much the suburbs served by a form of public transportation on demand as "the autoless city core."[93] Brian Richards writes: "In the early 60s, popular student projects in the engineering department of any American university were often concerned with finding ideas on systems of transport which might conceivably supplement the traditional private car in the far distant future."[94]

The contemporary zeitgeist, between economic crisis and sharing, is not heading toward the return of these public transportation systems that accompanied the handicap of a necessary heavy infrastructure, as much for the tracks supporting the system as for the detachable compartments of a bus or train. The current "My

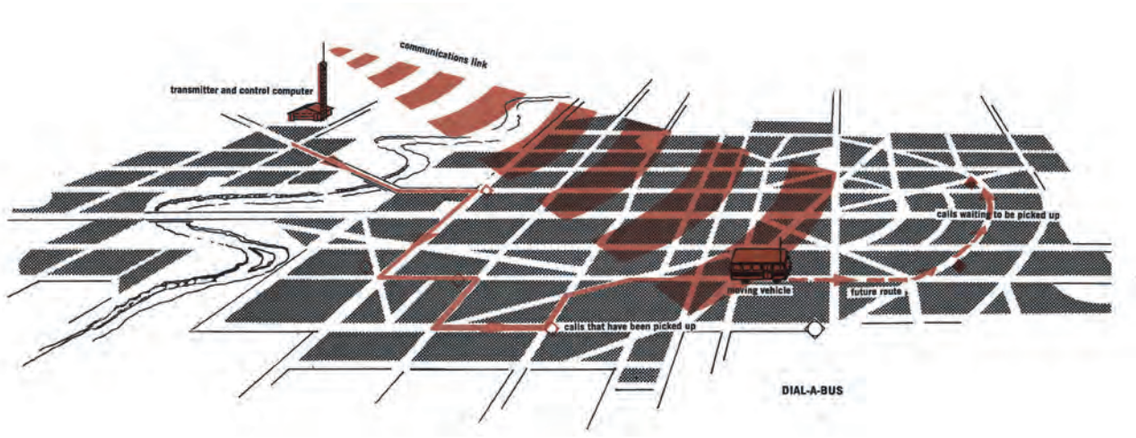
Customers desiring Dial-a-Bus service could telephone the controller from home and indicate their desired starting time, origin and destination. A signal on the panel might announce the approach of the Dial-a-Bus.

"Dial-a-Bus", *Tomorrow's Transportation. New Systems for the Urban Future*, 1968

Bus"[95] project will perhaps still remain on the shelf, like its early 20th-century ancestors[96] that were already functioning on the principle of a "train that never stops (Continuous Transit System in New York, 1905; Never-stop Railway in London, 1923) or that did not stop to save time and the flow of transported passengers (this is the aim sought by the "surface metro" of Curitiba, which almost totally resembles a bus except that the ticket payment and control are done before the passengers board. The Personal Rapid Transit (PRT) systems, from the many variants of the 1950s to today, by way of the failure of Aramis (1967[97]) and its recurring resurgences (Skytran 1990, 2014),[98] are positioned between several transportation modes that have the same objective, the same sought-after ideal of "Transportation on Demand" (TOD): personalized travel reached the peripheries, guaranteeing traffic fluidity. The PRTs borrow from the metro its dedicated tracks, from the taxi its availability, from the bus its predefined stops[99], all three of them in one, without any savings in infrastructure.

More prosaic in its aim to limit changes in transportation modes, the door-to-door solution set up by the French national railroad system (SNCF) consists in pairing a train ticket and a taxi with a prepaid set price that picks up the customer at the train station (and waits for him if necessary!) or at home to take him to the station. It is a kind of makeshift solution if we compare it to the sophistication and infrastructural ambition in times past of the Aramis or My Bus projects. In comparison, Dial-a-Bus already represented a form of automated vehicle on demand, minus the ubiquitous connection.

The "door-to-door" model therefore remains a central question of accessibility that has come back to us today with the new connected vehicles and their developments, including in the various forms of car-sharing. The new vehicles answer de facto most of the questions concerning transfer or changes in transportation mode, often at least two for each city-dweller in the almost boundless urban space. At under 2 km from a



"Dial-a-Bus," *Tomorrow's Transportation. New Systems for the Urban Future*, 1968

station, and more for an ECV, the feeder system using any two or three-wheeled vehicle is efficient. However, when the user has to change lines three times to get from point A to point B, the question is then raised as to the transportation mode, which remains favorable to the private vehicle. The car is still most often twice as fast as public transportation on the majority of study sites. As an example, to go from Satory to Pontoise in the Île-de-France, it takes between 1 hr. 30 min. and 2 hr. 13 min. via public transportation as opposed to 45 min. in a private vehicle, taking traffic congestion into account.

21st-CENTURY PUBLIC TRANSPORTATION

New mobility services on the car-sharing principle, the associations of transportation modes in hubs or stations, transform the private vehicle into a collective mobility tool, a new type of public transportation, the public transportation of the 21st century.
When a person goes from the high-speed train to the electric scooter with the same ticket, the public transportation/collective transportation distinction is blurred. This travel integration logic is being produced by automakers, for example Toyota with the Ha:Mo (Harmonious Mobility Network) project and soon by all the rail networks. The user chooses his means of transportation (available bicycle, ECV, car-sharing, taxi, ride-hailing car, etc.) and his route depending on traffic flow, whose information is sent to him on his smartphone, concurrently with the time the trip will take. The user is no longer limited to a single travel mode. He can take a bicycle, then the train (and no longer solely the bicycle on the train). His vehicle will often be individual, but leased from a company or public organization.
The limits and blockages of inter-modality nonetheless persist: in Lausanne, with one ticket you can take all types of public transportation, metro, bus, train, for an hour... but you can't use Mobility, the car-sharing system. In Paris, it still isn't possible to go from an SNCF train to the bus without buying a new ticket.

The electromobile city is heralded by the city of the bicycle, the electric bicycle, the scooter. Just as we have seen the development of the urban scooter,[100] likewise micro-urban vehicles will spread if we can judge by the investment of all the automakers on this niche – and in fact we are seeing them...
Various types of aid from the administrations for purchasing vehicles (electric bicycles here, electric scooters there) are collective investments in improving air quality. Taiwan subsidizes electric scooters for up to 40% of the machine's price,[101] other cities distribute, free of charge, bicycles to inhabitants.[102] People will surely criticize us and our research setting out the argument of the traffic jams of two-wheeled vehicles in Asian metropolises. That would mean however forgetting that the place occupied by cars (most of which only have a single passenger) and two-wheeled vehicles is not the same.

Vehicle fleets

The cost of new-generation vehicles (relatively high today) will imply multiplying rental systems, availability, car-sharing as well as adapting practices to a new type of vehicle. Pooling is particularly effective

Taipei

for areas that concentrate activities (service districts, activity zones) or companies that have "fleets" of vehicles,[103] but also for neighborhoods that are being created, such as eco-districts or the equivalent or that will include car-sharing in their programs[104]. The pooling of fleets is spreading, because it optimizes the number of vehicles between those that are most often underused and others that are overused.

The use of vehicles differentiated according to the types of travel is likely. Not only won't we take the same vehicle to go on vacation as the one we use every day, but each day we will use different means of transportation. Mobility is the use of a continuum of vehicles.

Instead of bus stops, we will find, as in large cities, self-service vehicles that will deal with most of the ordinary uses of public transportation. Car-sharing vehicles can be distributed near homes or grouped together in different size hubs, which constitute new architectural programs.

Another track consists in replacing buses by smaller automated buses at a rapid frequency, intended for students and the elderly who, for different reasons, prefer this type of transportation.

Consequently, if on one hand the private vehicle is being transformed into collective transportation, on the other, different automated vehicles are increasing in public transportation.

The car as a service

Car-sharing has brought the car into the paradigm of services and no longer ownership.[105] The car will henceforth not be an object owned but a service, a transportation mode that comes to you. Car-sharing that is moved to the home has the advantages of both the car as a service and the private car. These developments are rapidly modifying purchasing behaviors. The second car is no longer seen as a necessity. The proportion of parking facilities in buildings is being immediately modified (in China, the percentage of parking places per residential building has already been decreased, to less than one per apartment).

In Satory, the Hub/PEM (multimodal exchange pole) will be particularly important because several public transportation lines will cross each other (metro line 18, the Les Matelots station, the army's railroad tracks) and a north-south expressway that intersects the site and the major ring road that comprises the expressway, the A 86. The hub will also be the assembly point for ECVs.

The multiplication of types of vehicles also implies the multiplication of parking facilities. Consequently, the parking facility brings together and has a large number of people with expanded motivations cross each other. It becomes possible to incorporate new uses into it.

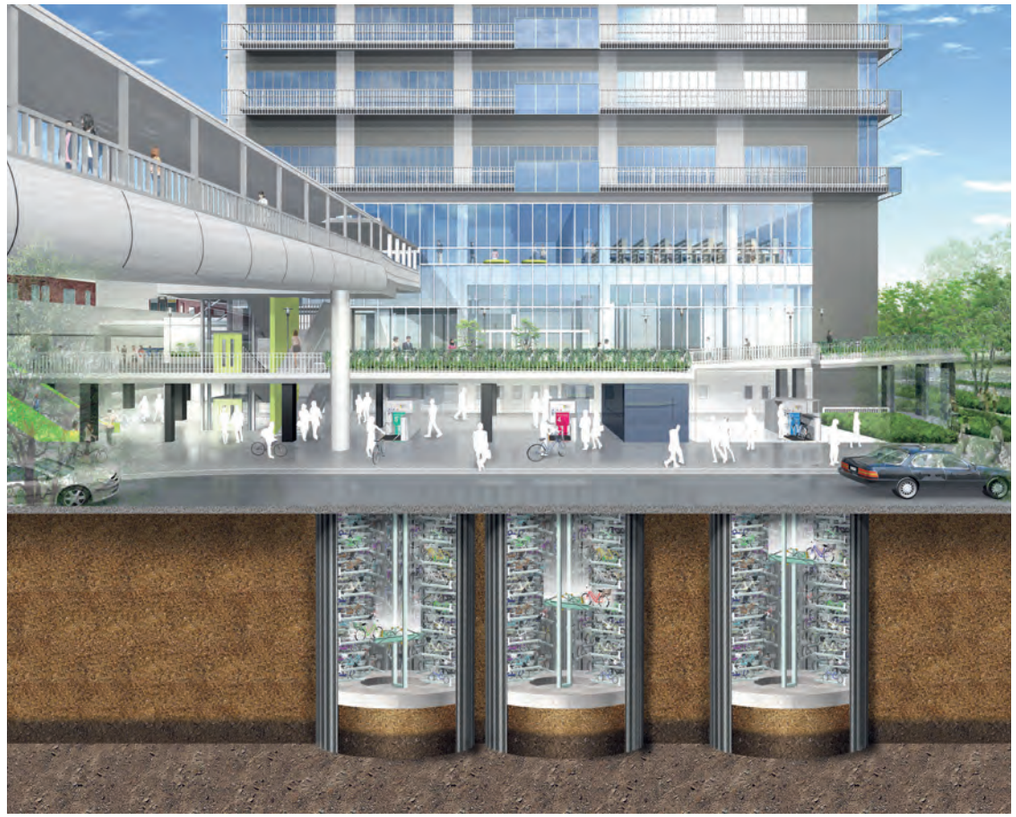
Bicycles

The bicycle interests us as much as a vehicle taking part in auto-mobility, and from the fact that it can be "enhanced" (electric) as because it incarnates "soft" circulation. The "agile" cyclist uses it for all his urban

Bicycle parking in Kawagoe, Japan

trips, 65% of which under 3 km for the Paris region. The evolution introduced by ECVs is that they make, at the minimum, comparable trips, this time for all traveling individuals.
ECVs will encounter the problems shared as much by cars as by bicycles. As soon as we consider the bicycle on the scale of mass public transportation, it generates infrastructures that concern parking, the vehicle's safety, its accessibility, sharing, etc.
In Amsterdam, 40% of the inhabitants use the bicycle before or after a train trip, to the same degree as public transportation. There are 490,000 cyclists for 750,000 inhabitants, which the train station's bicycle parking facility – 10,000 bicycles on three levels – gives some idea of. The Zutphen (Amsterdam) underground bicycle parking area holds 3,000 bicycles and 50 scooters.[106] Amsterdam is aiming at 17,500 places in 2020 for a need estimated at 20,000 by the associations.

Utrecht planned the construction of a bicycle parking facility with 12,500 places on two levels for its new station. Ghent is projecting an underground parking facility with 10,000 places. Japan has 86 million bicycles. The Kasai[107] station parking silo is the largest in



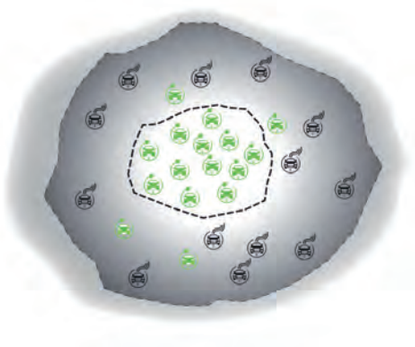
Giken underground eco-cycle parking system, Tokyo

Japan, ahead of the one at the Nishi-Kasai station, also located in Edogawa-ku (Tokyo). It can hold as many as 9,400 bicycles, each tube containing 180 of them. The "Biceberg" installed in Stockholm or in Barcelona is an integrated bicycle storage system that is built on site, the capacity varying from 46 to 92 bicycles.[108] The Millennium Park bicycle facility (Chicago), installed on several levels, also has showers and facilities for repairing your bicycle. In the historic Santa Monica Place shopping mall in Los Angeles, a bicycle station was installed on the ground floor of the parking garage, giving direct access to the street, with lockers to keep a change of clothing between work and cycling. In Beijing, there are 1,000 bicycle rental points near metro stations.

These first-level examples of inter-modality are "gear shifts" that start up the hub's creation. In the end, the development of these access spaces, which are among the major tools of contemporary urban projects, can be represented.

AN URBANISM OF QUALITY AND SENSATIONS

The increasingly perceptible consideration of a vehicle's speed, noise and various other types of pollution, and the regulations that have resulted from it, is notably developing in urban centers. Environmentally friendly vehicles are particularly adapted to these demands that lead to limiting the access of these privileged urban sectors. The sharing society favors these regulatory interventions, going as far as the disappearance of internal combustion engine vehicles in the city center. It is a question here of modifying the urbanization of urban centers, organized in this manner on the principles of perceptible quality.



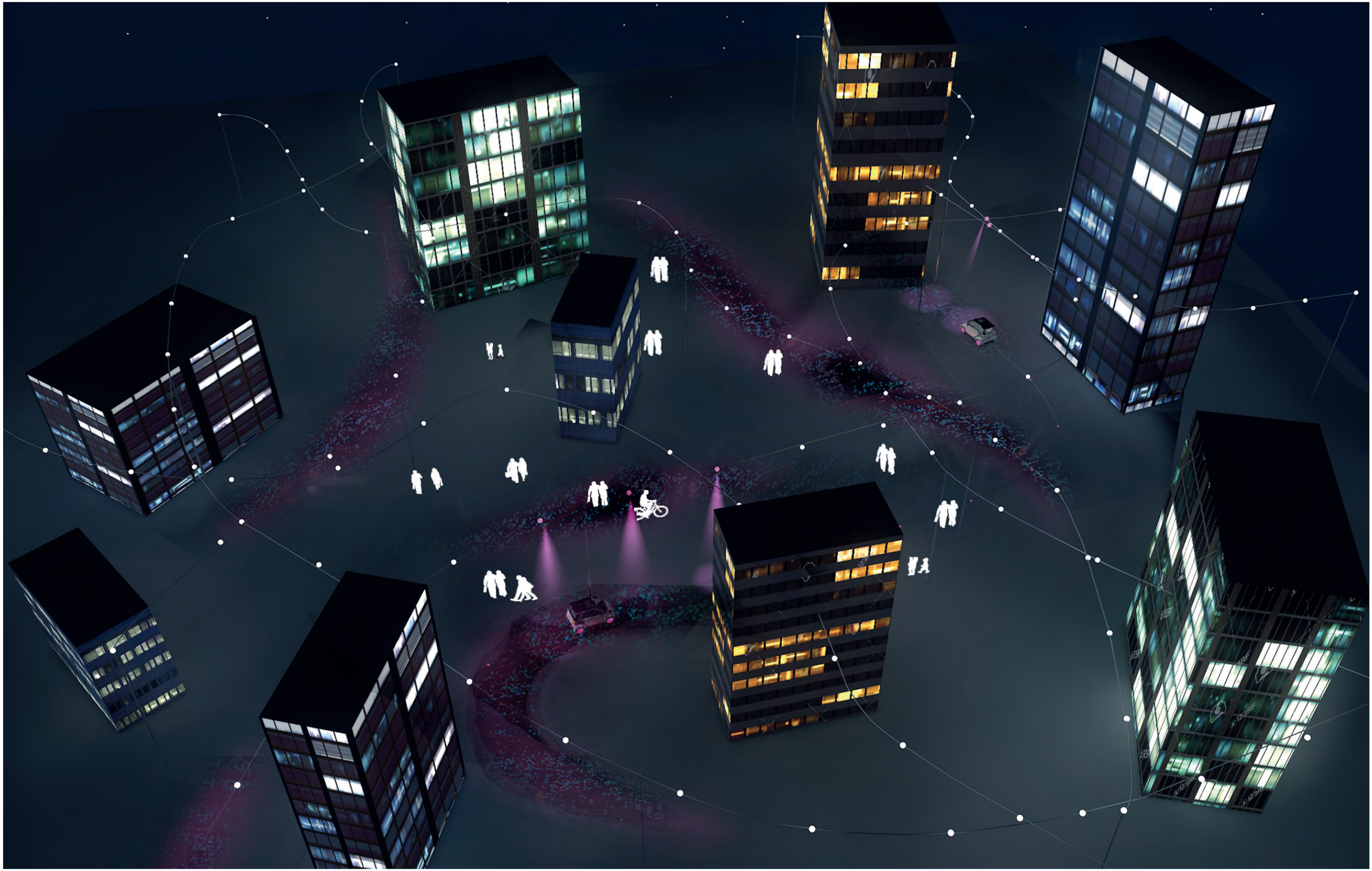
Noise and pollution

Speed zoning

Ambient pollution is not the only grievance that engenders more or less restrictive regulations, but it also generates truly new criteria and new urbanism tools of the society of flows. They will be broadly applied, including for delivery trucks and their offloads. This development of the urbanism of ambiences and situations[109] favors ECVs. The urbanism of ambiences favors ECVs that can circulate in increasingly numerous low-speed spaces (20 or 30 km/hr.), shared spaces and meeting spaces. Speed zoning is succeeding function zoning.

"The meeting space" (20 km/hr. zone) is extremely well adapted to the ECV. The absence of road markings and the traditional separations between vehicles and people, as well as the vehicles' silence create the need for presence and directional signs to inform passersby. Either LED or laser type, these warning systems will be present on the vehicles or embedded in the roads or on poles, connected to the vehicles.[110] The ECVs will be in communication with public lighting, indicating their presence and their direction and path.

Directional signage

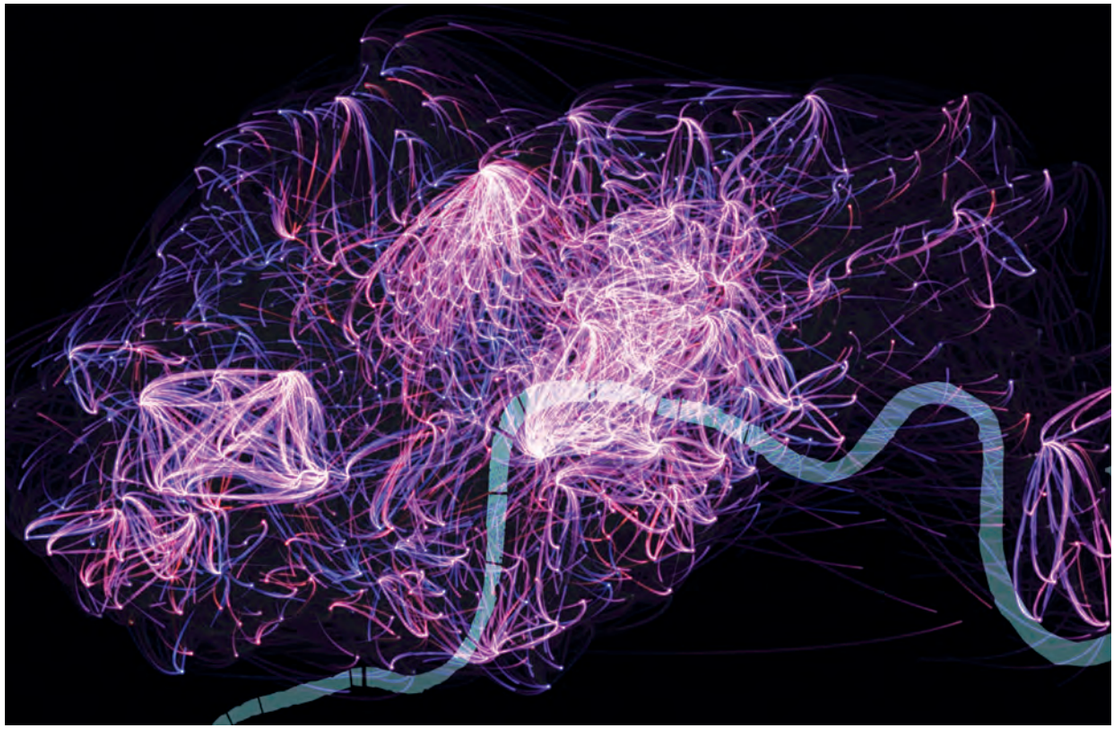


These signing systems are building the ambience of the 21st-century city, just as urban lighting in the 19th century and advertising in the 20th did.
The embedded signage systems that will develop, and with them the generalization and miniaturization of mobile technologies, transform individuals into connected "devices," cars into communicating machines and cities into a three-dimensional interface.[111] We can theorize however that, far from bringing about the disappearance of the physical reference points of urban mobility – for example, the bus stop replaced by "direct negotiations between the bus and the passenger,"[112] as the "Dial-a-Bus" project proposed in its way and in its time by radio –, embedded signage systems will on the contrary reinforce the stopping, waiting and exchange points, which will no longer be, moreover, exclusively multimodal, but service places and the urban attraction itself (see Chapter 5, Access Spaces).

THE INCREASINGLY VISIBLE CITY

The representation of the city based on its data has constituted a new mapping and diagrammatic imaginary dimension.[113] The virtual is making the city increasingly visible[114] while being ever further from an earlier perception. The proliferation of data sources has considerably increased our understanding of urban functions while shifting our perception. Our mapping of the city has been greatly augmented by data, going as far, for example, as building a weather mapping of the urban space.[115]
Simon Chignard has pinpointed these representations of mobility.[116] London's transport operator, Transport for London (TfL) has put a file on line comprising the first million routes of the capital's self-service bicycle system, Barclays Cycle Hire (known by the nickname Boris Bikes, after the mayor's first name). These historic data have given rise to several representations: the effect of a underground strike on the use of the bicycle service, the pinpointing of the principal circulation hubs or the service's record use days.
The city of Melbourne in Australia has a series of 28 pedestrian sensors disseminated in the city center.[117] They record in real time the number of pedestrians who take a specific route. These data have generated an interactive representation. Pedestrian flows can therefore be viewed hour by hour or a day with exceptional crowds (the annual parade for example) "replayed." It should be noted that Melbourne proposes raw data available for downloading, which makes it possible for an individual to create his own visualization or, better yet, use these data as raw material.

In the framework of the "Rennes Métropole en accès libre" competition, the Isokron company created a very interesting video, "Un lundi à Rennes" [a Monday in Rennes][118] that visually answered the question: how far can you go in 10, 15 or 30 minutes using only public transportation? This last visualization is clearly more entertaining than informative.
We now have travel and activity maps in real time in cities. Smartphones are privileged supports for these mappings. It would be difficult today to say that the city of data technologies is invisible. In fact, the opposite has occurred: the data, the satellite and ground views and the mappings have invented new images of the urban space.



London Pedestrian Map (Citydashboard, London)

The value and originality of these new cartographic representations lies in the fact that they measure trips, information exchanges, data, and provide an efficient vision of the contemporary space, unlike the traditional maps that present the use of the ground or programs (housing, facilities, etc.). However, as soon as they are representations, they can also be interpreted as surfaces and comprise a gear shift in reverse to return to an old form of thinking about the urban space (thus "the urban zone" or the "life basin"). The challenge is to learn to think about urbanism apart from any "spatialization" and any "retinal" pleasure, that optical illusion, the map as aerial photo, even if it were digital. To avoid spatializing effects, images in motion enable trips and exchanges to be identified, as in the series of videos and maps of Mapping London.[119]
Digital applications have replaced the map and the plan in a very short time, returning these documents that immediately "spatialize" to the curio cabinet. It is therefore the new tools that are replacing them, in the era of the urbanism of data.

THE ECV REPAIRS THE CITY

Electric/environmentally friendly connected vehicles (ECVs) repair the city. In other words, with the ECV we can create a poor urbanism plan, but no matter what the case, the ECV will repair. This is somewhat the situation with Saclay/Satory. An enormous site far from everything was chosen to develop the greatest concentration of expertise, research and higher education in France, with very little public transportation, but the ECV will make up for it all. This is a question we will find in the thinking on the project approach. Where do we begin?

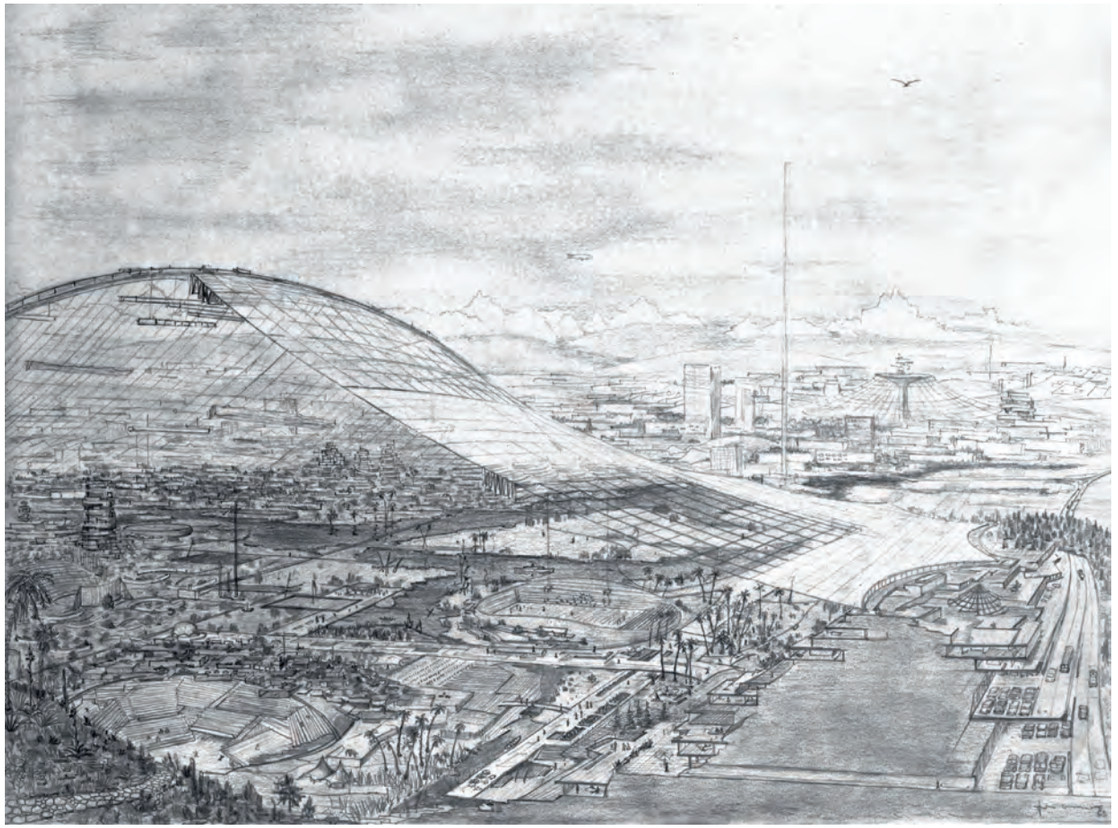
Because it will enable extended and distant sites to be linked, the ECV gives the connections they lack back to remote university campuses and activity parks, service centers and companies located far from connections. It provides access to "local facilities" (school, daycare, etc.) but that are not accessible by foot.

The transformation of architecture created by the arrival of the elevator was obvious: the invention of the skyscraper. However, information and digital technologies have not had any specific repercussions on the form of architectures or cities, other than in terms of a short-sighted imaginary dimension (blobs and other decorations). We will consequently theorize that ECVs adapt to the city, but do not contribute in the very short term to changing its form. Their intervention is elsewhere. The new vehicles and sharing modes change schedules and life-styles. They modify accessibility, and therefore the frequentation of places and consequently their future programming. Their immediate impact is programmatic.

FLOATING SPACE

"The floating or total space" covers the fact of being in a space while looking at our smartphone, and consulting it can be the map of another territory. This form of double involvement in the real and the virtual is known as the floating space.[120] We will find definitions that come close to what we call "floating space" in the "third space" approaches, sometimes associated with nature in the city, elsewhere in the peri-urban, or in the creation of alternative places. The third space corresponds more recently, and rather well, to sharing ideals. The third space is always somewhat elsewhere, nearby, it refers to a thinking and behavioral attitude. The floating space is a hybrid, the creation of a permanent interface between the geographic space and digital communication, from which a modification of our relationship to the place results. We are here and elsewhere, without that ubiquity needing to be theorized, but simply felt. The floating space introduces a form of detachment from the immediate environment. Connected on the smartphone, we are always here and a little elsewhere, like anyone of whom it is said that he is "elsewhere," that he is dreaming.

If we tried to represent the floating space, it would introduce the blurry, the cloudy, the misty, the indefinite, it would be floating like the spaces of the "Visions of Japan" exhibition held at the Victoria and Albert



An entire life under the same envelope (Frei Otto, *The City of the Future*, 1960)

Museum of London in 1991. Toyo Ito had used 130 video projectors in the exhibit to recreate Tokyo's urban environment. The floating space adds and connects everything that was separated. In the same way that we always do several things at once, the floating space brings together all the programs. Mono-functionality is impossible for it, in such a way that we can no longer do just one thing on a train station platform: wait.

The floating space is continuous in all points: it is the total space of the 21st century. It is the realization of the large spaces imagined by the 20th century in which all human activities are brought together under the same elevated and transparent layer, from Bruno Taut to Frei Otto: "free urban architectural landscapes under the large spatial envelopes."[121] The most connected built representations are the Rolex Center of Lausanne, an open space whose undulations of the floor and the reference to a liquefied universe created by Archizoom turned the universe of the floating space into a reality: no distinction between the indoors and the outdoors,

Northern lapwings, Plateau de Saclay (photo Robin Panvert)

the absence of interior walls, private space, privatized and public space totally united and inseparable, local and global, comfortable, welcoming and open, secure, calm, monitored. The floating space is today's version of paradise. The secure waiting rooms of airports also approach the atmosphere of the floating space with their white, almost medical, lighting.

The smartphone blends into the real when it provides information on a meeting place, when it indicates the route to follow: it doubles reality, it is a specter that accompanies each individual.[122] The software can coordinate our daily planner in such a way as to establish our meeting places on variable locations according to the minimal global distance, congestion, road conditions, delays, cancellations. We understand that the interference of the software and the space creates a sort of indifference to the immediate environment. Airplane pilots and sailors have long been familiar with these doubles of the real – the GPS.

The floating space also ties in with the fact that our perception for several decades has been in the process of evolving from a direct visual and geographically oriented perception to a directional perception (billboards[123]), then in the form of data, or virtualized (GoogleEarth) and negotiated (smart cities). The geographic or geometric perception of the city, in the same way as "directional" perception, or the fact of knowing how to locate where we are, is no longer necessary. The GPS takes each individual to where he has to go, without any relationship to a space, except for his own, that of the flat space of the screen. What results is a form of possible indifference to the immediate environment. It is probable that the city must, to physically and visually exist, increase its communicative and emotional capacity. The city will therefore be even more communicative through its architecture, probably increasing its signage capacity, either through "captivating" architectural design forms or by developing advertising architectural forms, known from the Maison de la Publicité (Oscar Nitzchke, 1935) to the most recent screens. Sharing's equivalent in the world of architecture is a homogeneity, a mixture of data, functions, a unified space. Advanced technology and nature form an inseparable couple in this new universe. This coming together, improbable but present in the collective unconscious since the last century, is one of the drivers of our current feeling about the future. The temptation isn't new, from the Crystal Palace to radical architectures: Archizoom's neutral space, to which we will return, is that unified space in which elevator, bathroom, furniture, animals and humans co-inhabit. In the city, the neutral space will bring the pedestrian and the car closer together, it will eliminate the sidewalk.

THE NATURAL CONTINENT

The period is reactivating this promising opposition between nature and technology that is heading toward blurring their frontiers and toward imagining scenes of life in the space where they come together: hybridization or confusion. The electric vehicle moves silently through the forest, it does not disturb the animals and reassures them through its silence. The stag looks at the car as though it were a regular visitor.

Electric vehicles glide on the forest paths. The heart of this reconciliation is the infantile passion for nature in the city, this rediscovered Eden. More than ever before, the perception of an urbanized territory in its entirety, of an urbanized continent has never been so present.[125] All the natural landscapes are becoming as easy to spend time as urbanized zones; and reciprocally, the new vehicles are transforming the street and permitting nature to reinvest the city.

If architects' traditional imagination consists in greening the city, ECVs protect the natural space, turning it into a continent and respecting its frequentation, while transforming it into a country "stroll."

Georges Montorgueil, the place de la Concorde in the City of Tomorrow, thanks to collectivism, 1906[124]

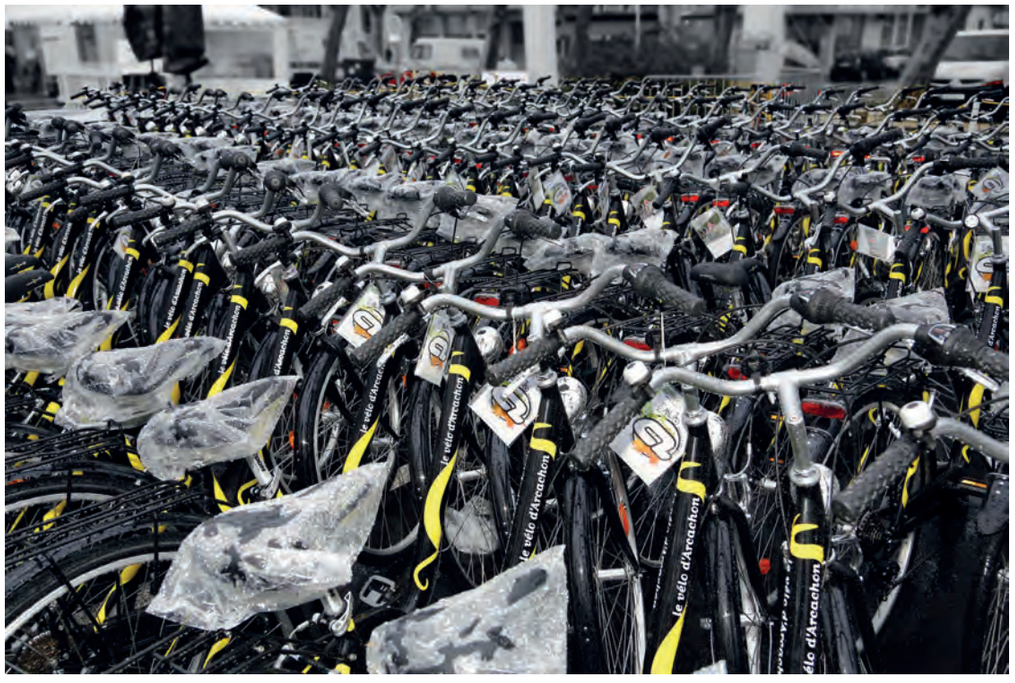
Taking the byroads, Satory site

BUILDINGS AND VEHICLES ARE EQUIVALENT

When a community distributes to its residents, sometimes free of charge, bicycles, electric bicycles and, in the near future, three or four-wheeled vehicles, in order to decrease congestion or pollution, what is it doing? Transportation remains individual but the approach is collective. Many cities will be led to practice this, and it is one of the first modifications of the reflection on the urban space that is now occurring.

Beyond the question of the congestion of city centers, ECVs are more largely urban devices used by elected officials and urban planners. The general principle remains that of improving accessibility, permitting us to arrive more rapidly at the service we are trying to reach. The cities of every country are quite familiar with those lines of cars that wait for or drop off children at school.

We are showing another mechanism here: the equivalency between an urbanism of travel and spatial urbanism. The example of schools with too few or too many children, or a teaching staff without a school is

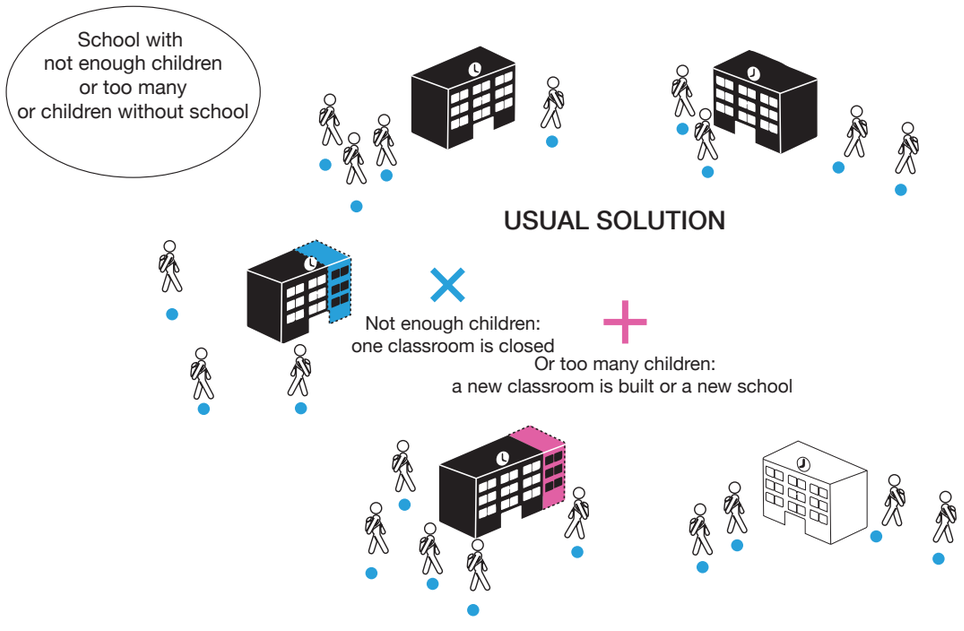


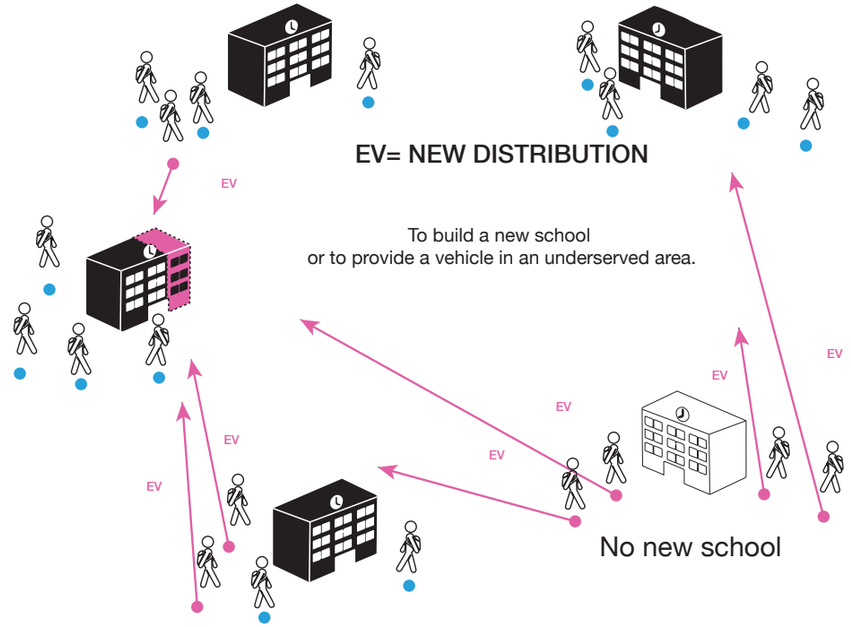
Free and definitive distribution of bicycles to the inhabitants of Arcachon (January 2013)

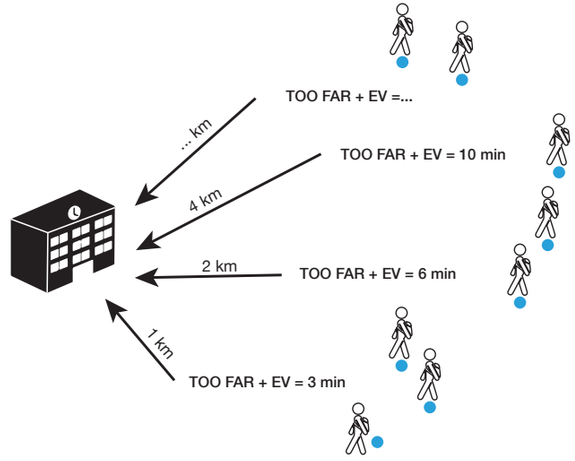
common to ever city. The usual solution is to close or build a classroom, or to build a new school if enough children manage to be found. However, rather than opening (or more certainly closing) a classroom or envisaging (with difficulty) building a new classroom or school, why not supply (free of charge?) an efficient transportation mode to families so that they can go a little farther, to the school that has fewer children in the classes?

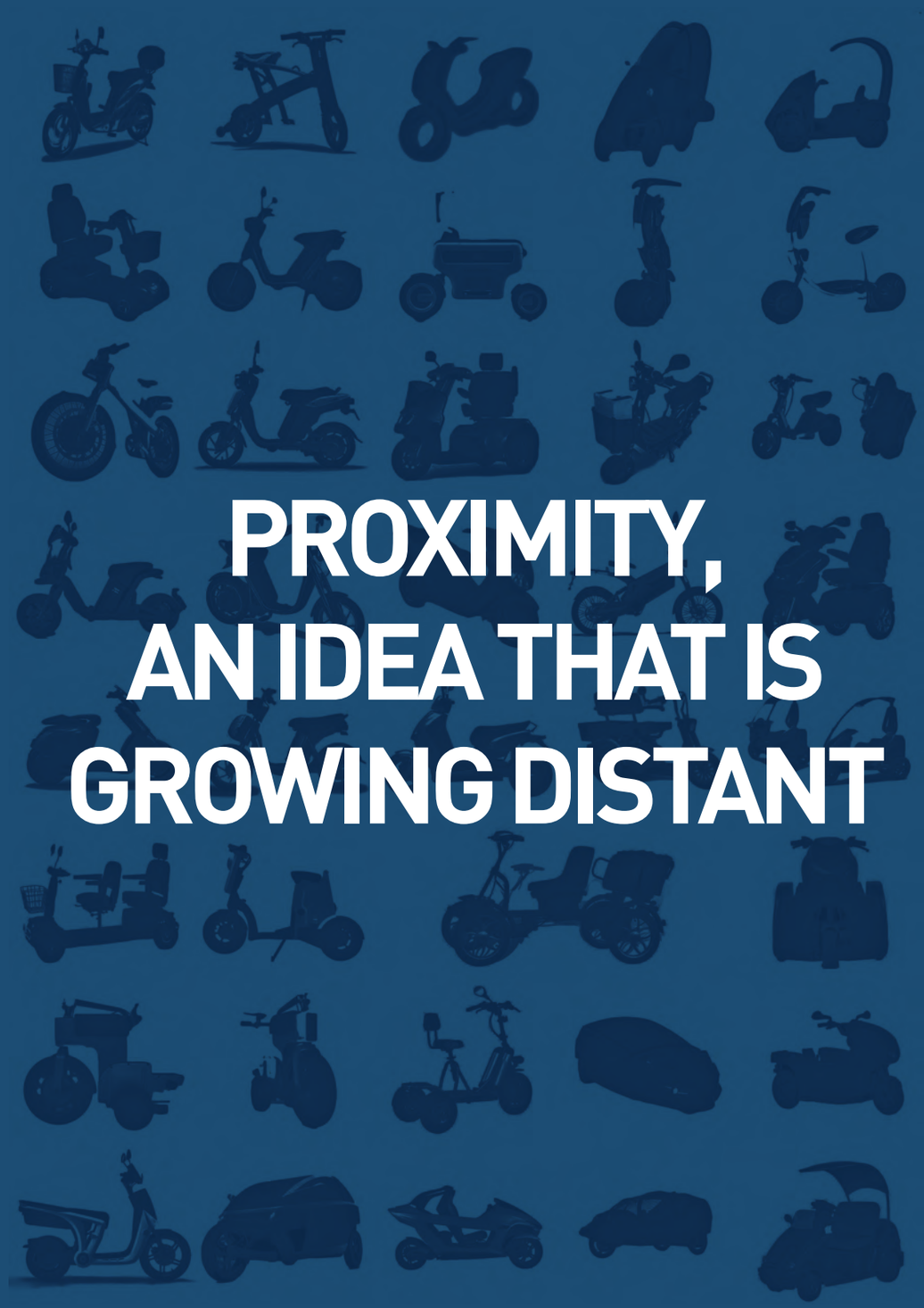
The arrival of new vehicles accelerates the interference between the urbanism of uses and services and spatial and programmatic urbanism. Service and space are solutions and equivalent systems. At this level, vehicles are equivalent to buildings. This is a considerable change. These two interiors, one mobile, the other immobile, are interchangeable.

The way the city is programmed is changing and acquiring an adaptabiity that it is unaware of. For architects and urban planners, the action is becoming global and is melding with that of an organizer of the urban world, where all the questions on urban management are brought together. Urban project management here takes on its broadest but also its most precise meaning. It is the evolution of a profession and, of course, its teaching.









PROXIMITY, AN IDEA THAT IS GROWING DISTANT

Urbanization is most often approached as a surface, a visible stain described as urban sprawl – typified by North American megalopolises – whereas the urban project delimits lots according to a geometry. Contrasting with this tradition is a vision of the urban space in terms of travel and not contrasting territories according to their physical form or appearance, but according to their interrelations, the number of exchanges they maintain.[126] Population density, the scope of economic activities and income levels have been made possible and achieved through a very high level of exchanges, and traffic and information flows.

If the car was the primary instrument of urban sprawl, how are the new vehicles going to modify urban and suburban uses and programs?

ECVs produce a growth in the accessibility of poles or activities, which is increased by two, three, four or fivefold. For the same distance measured in time, the inhabitant can reach a much larger number of polarities. After individual or small-size transporters – bicycles or scooters – ECVs are transforming the use of cities, and in particular the definition and extension of their centralities. This transformation has been verified for all the metropolises that we studied. One result is the concentration of activities, a hub effect of a local character

The city of the near future will be created by proximity poles of time and exchange, more concentrated than before, whereas urban sprawl will no longer be negatively perceived as it is today. With ECVs and proximity and exchange poles 10 minutes away, urban sprawl will be victorious for all to see.

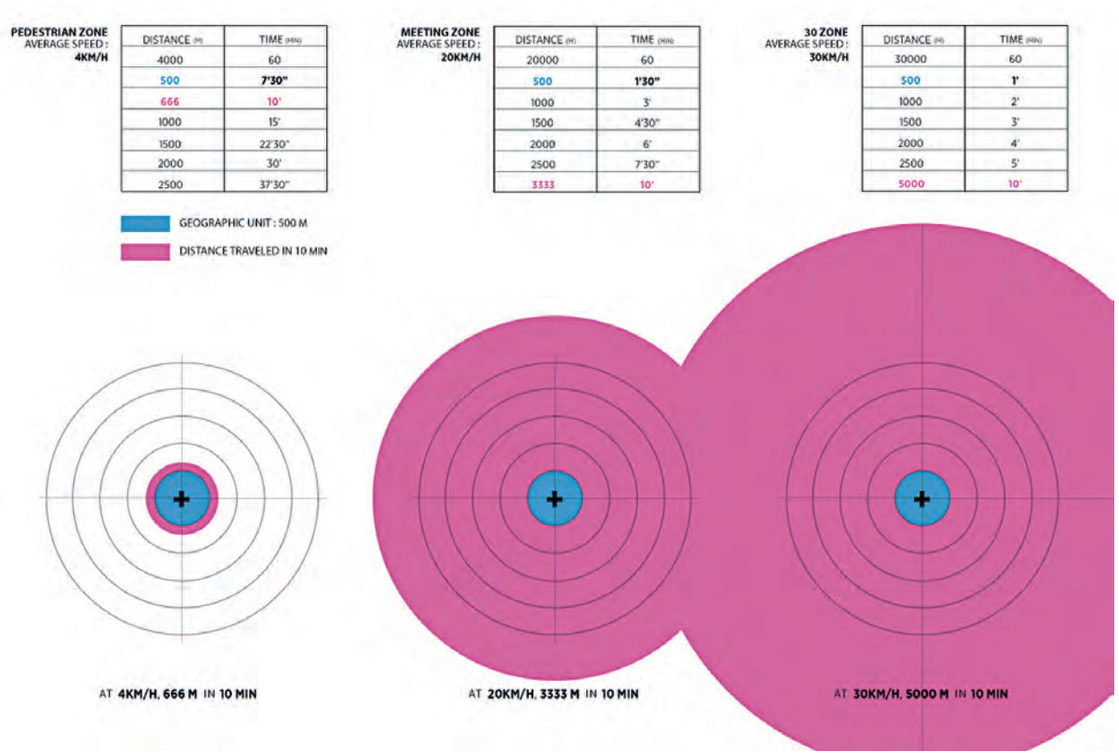
The growth of centralities produces a new, painless urbanism and brings calm to the city and eliminates the suburbs. Traffic separation that creates a two-tier city or the elimination of car zoning are two solutions that can coexist. ECVs can be thought of as vehicles, but also as devices that enhance the pedestrian's performance, as escalators and moving belts do.

The advent of auto-mobility is also inseparable from the e-commerce that has been transforming urban spaces. What does a city center become when it no longer has any commerce? What does a hypermarket being turned into a commercial wasteland become?

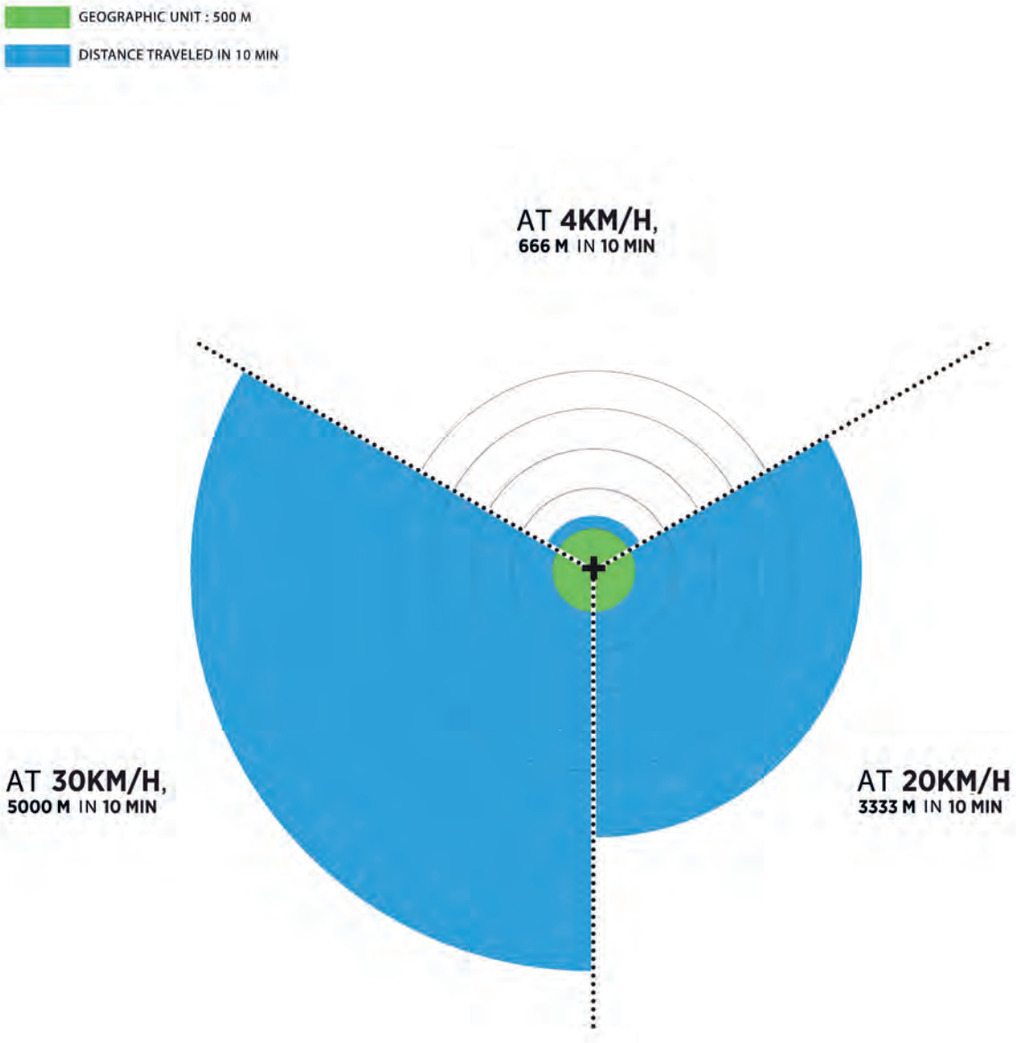
THE TERRITORY UNIFIES EVERY TYPE OF MOBILITY

Proximity in terms of distance measured by time has been imposing itself slowly – since the end of the 19th century – and is now doing so on short times. It is a variable idea that in our minds today is a distance in terms of time of 10 minutes by foot, or of 500 to 800 m, or of 2 km by bicycle.

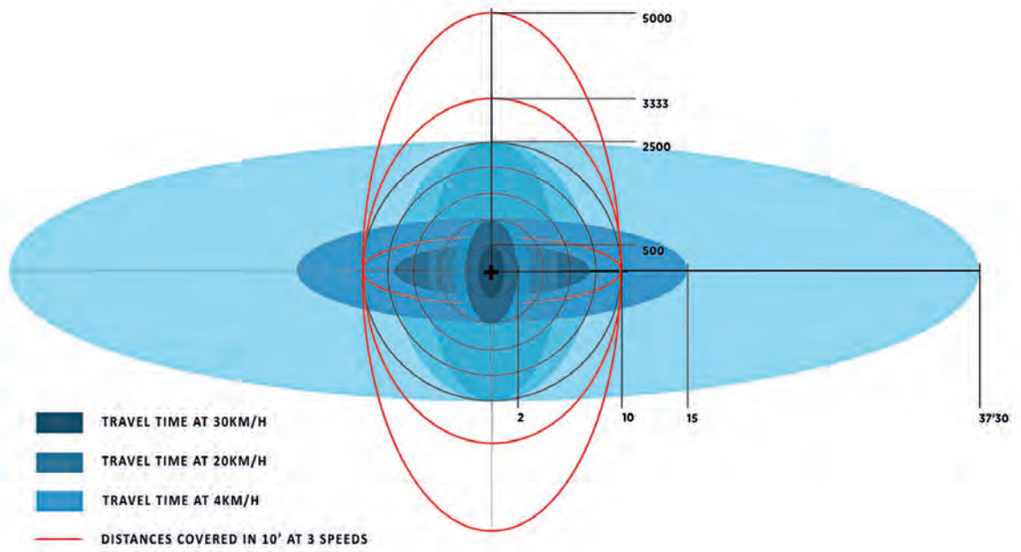
ECVs will considerably modify the situation on the 10 traditional minutes. Over 3 km are reached at 20 km/hr. and 5 km at 30 km/hr. At 20 km/hr., the traditional 500 meters are reached in 1 min. 30 sec., which also modifies the perception of this extreme proximity.



Synthesis of the time-geographic distances covered at 4 km/hr



Synthesis of the geographic distances covered in 10 min. at different speeds



Superimposition of time-geographic distances at three different speeds

These circles do not take into account the distances really covered (666 m in 10 min., hence the fact that, for simplification's sake, we have limited our radius to 500 m), but they are sufficient to understand the extent of the transformation of accessibility underway.

The future of motorized individual transportation (one, two, three or four wheels) appears as a major transformer of the city, suburbia and exurbia included. The extension of auto-mobility could produce, in the end, another "reachable" city with the help of a mechanized locomotion mode. The connectivity of proximity is two to five times greater. Pedestrian proximity was the grail for supporters of the sustainable city, the 500 m that the DIVATs ["disks for the enhancement of transit axes"] theorized. Taking ECVs into account, these disks will no longer have a radius of 500 or 600 m, but 2,500 m, 3,333 meters or even 5,000. This transformation is decisive because physical proximity can no longer be an unquestionable criterion of the good city.[127]

Inversely, it is accepted that the dynamic of wealth creation remains inseparable from the concentration of innovation and talent, with a proximity that is measured in time and no longer in meters. At equal time, is walking preferable to the moving belt, the electric kick scooter? Is wealth creation different if we take a kick scooter to go to our appointment?

Environmentally friendly vehicles are transformation accelerators and project creators.

SCENARIOS FOR SIX CITIES

This section is devoted to scripting the developments in the introduction of vehicles of accessibility. For this simulation, we have considered vehicles whose speed is around 15 km/hr., a distance measured in time of 10 minutes. Initially, communities could supply neighborhood electric vehicles to the inhabitants the farthest from a proximity pole or an "accessibility pole." The introduction of ECVs is linked to safety, that is, the transformation of the public space and public transportation itself.

Six European cities took part in this "time-geographic accessibility" experiment, comparing accessibilities with or without the ECV, started from public transportation stations with dedicated tracks or lanes and using the existing road network: Riga (the capital of Latvia, whose area is about three times that of the city of Paris), Grand Paris in 2025 with the creation of 24 stations envisaged that will form the Grand Paris Express (and a focus on Versailles-Satory-Plateau de Saclay), Hanover, Lille, Berlin and Warsaw.

This approach to accessibility (vs. proximity) creates new mappings. Consequently, for each city, there are two maps:

Map 1: shows the extension of accessibility, for the same distance measured in time of 10 minutes, going from walking (approx. 650 m, 4 km/hr.) to the ECV (approx. 2,500m, 15 km/hr.), from public transportation stations with dedicated tracks: train or tramway stations.

Proximity (walking, 4 km/hr.): in red; accessibility (ECV, 15 km/hr.): in blue.

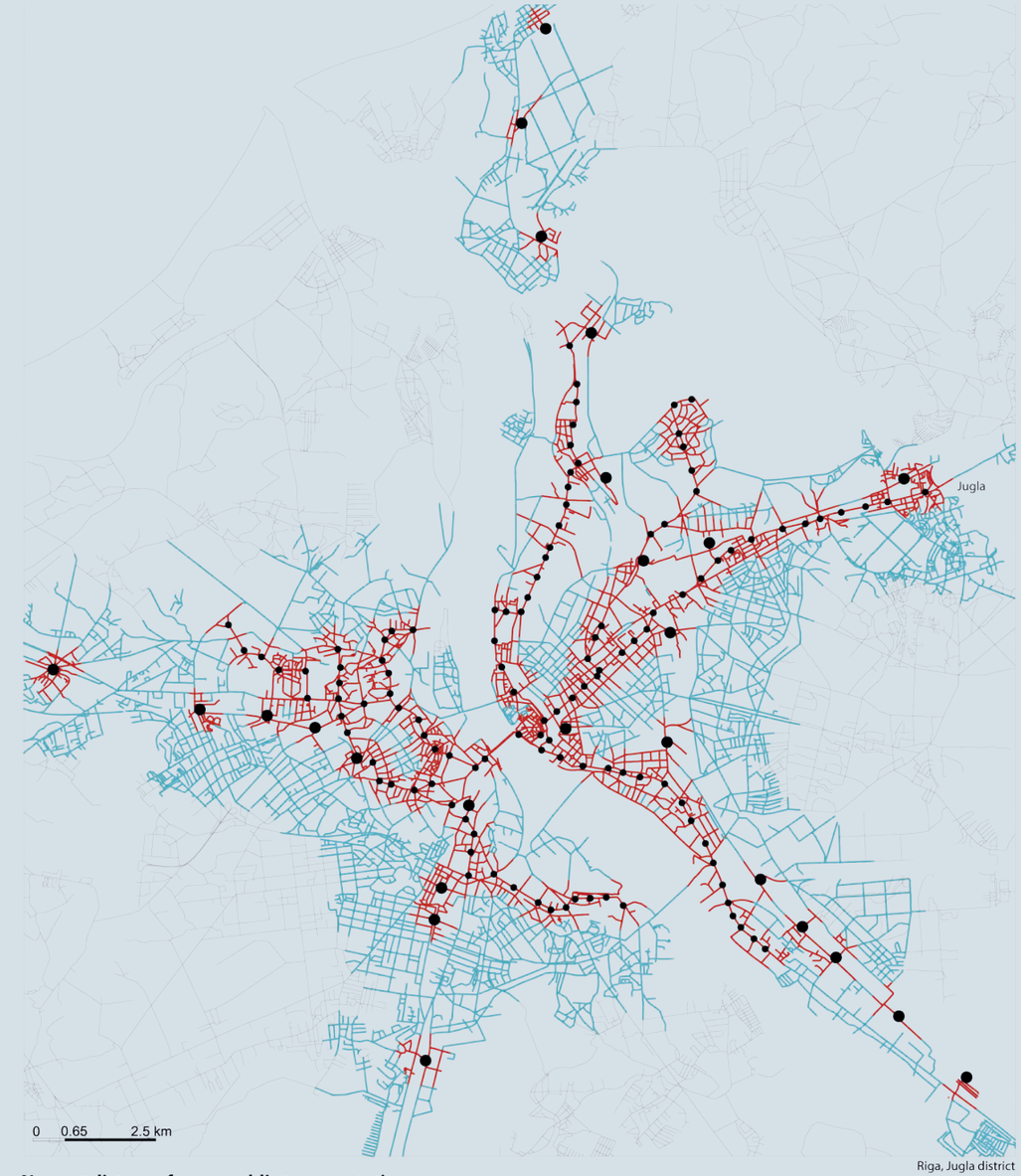
Map 2: shows the details of a neighborhood with the indication of the urban fabric, nearby facilities, stores and services accessible in 10 minutes, from public transportation stations with dedicated tracks (train or tramway stations).

Proximity (walking, 4 km/hr.): in red; accessibility (ECV, 15 km/hr.): in blue.

The "gain" in proximity obtained is established by comparing the areas covered by the current proximity (in red: approximately 650 m starting from the public transportation stations with dedicated tracks) and the areas covered by the potential accessibility via ECVs (in blue: approximately 2,500 m starting from the public transportation stations with dedicated tracks). We obtain the following multipliers:

Riga: 2.82
Île-de-France: 3.03
Metropolitan Lille: 2.83
Warsaw: 2.14
Hanover: 2.28
Berlin: 1.74

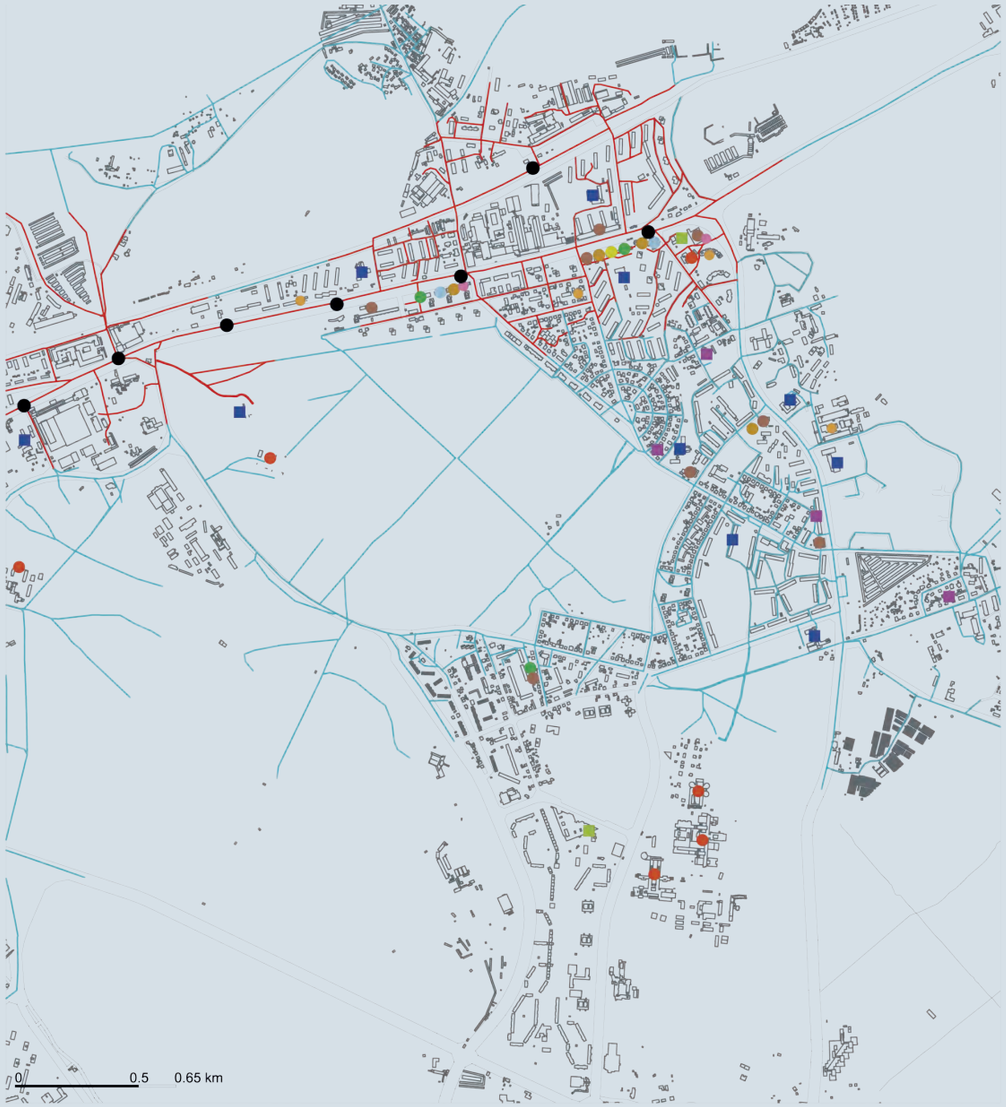
In Berlin, which is the city best covered by public transportation, ECVs multiply by 1.74 the territory's accessibility. In Paris, which is the region the least served by public transportation, ECVs triple the accessible territory.



Riga, Jugla district

Nearest distance from a public transportation station, operating on an exclusive right-of-way

Proximity
Metric distance and walking time distance, at 4 km/h
650 m - 10'
Accessibility
Time distance with a vehicle, at 15 km/h
2500 m - 10'
railroad stations
tram and metro stations



Nearest distance from a public transportation station, operating on an exclusive right-of-way

Riga, Jugla district

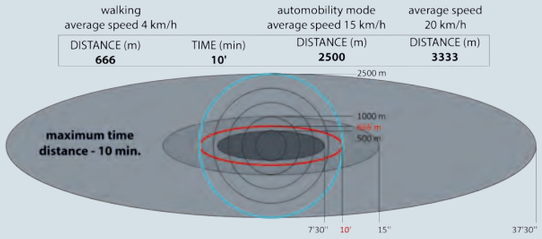
Proximity
Metric distance and walking time distance, at 4 km/h
650 m - 10'

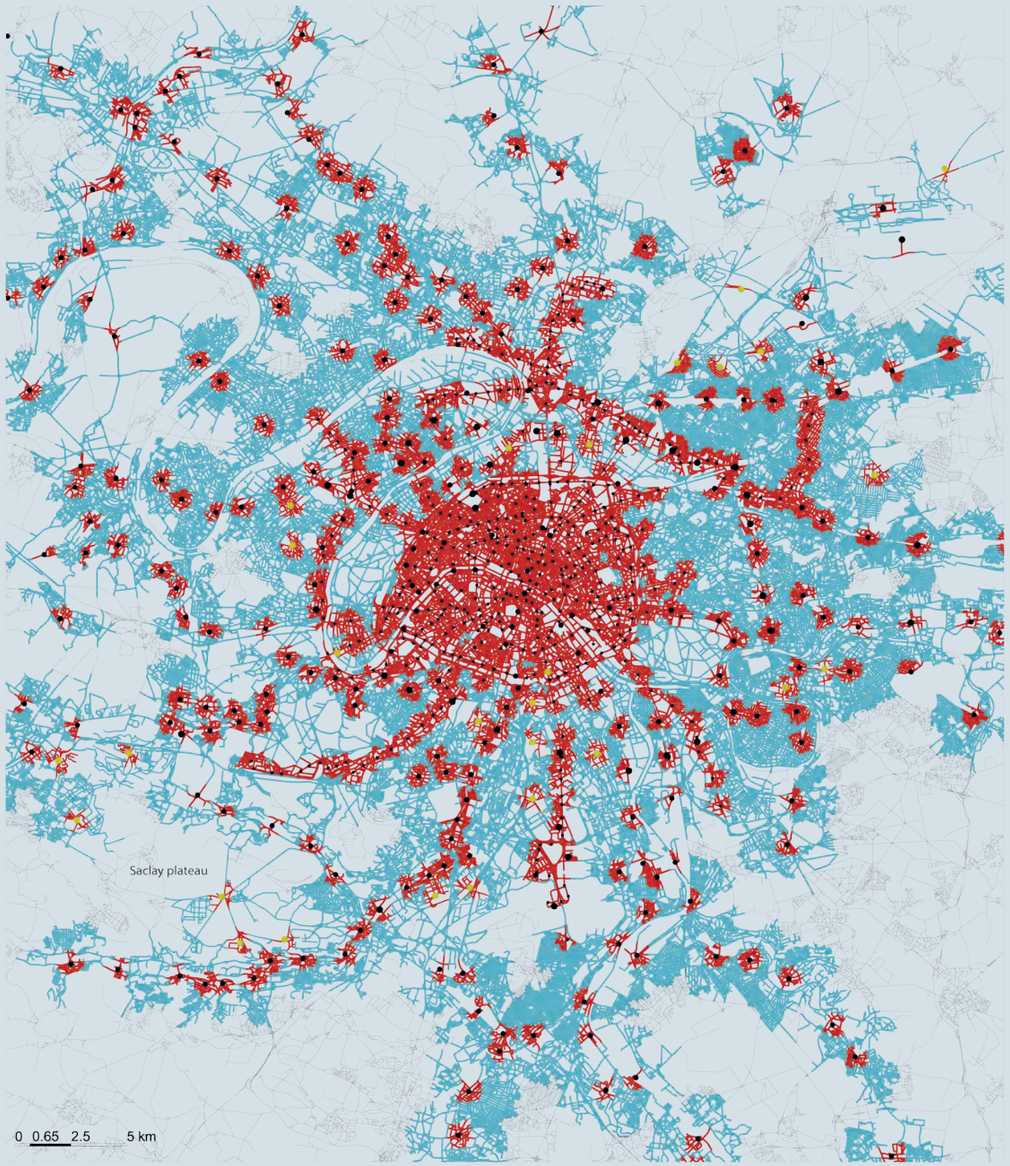
Accessibility
Time distance with a vehicle, at 15 km/h
2500 m - 10'

Amenities
- 10 schools
- 04 childcare centers
- 00 local community centers
- 02 sports facilities

Stores and services
- 01 post office
- 02 tobacco stores
- 08 groceries
- 03 pharmacies
- 04 general practitioner's offices
- 06 hospitals
- 04 banks or cashpoints
- 02 restaurants

Public transportation operating on an exclusive right-of-way





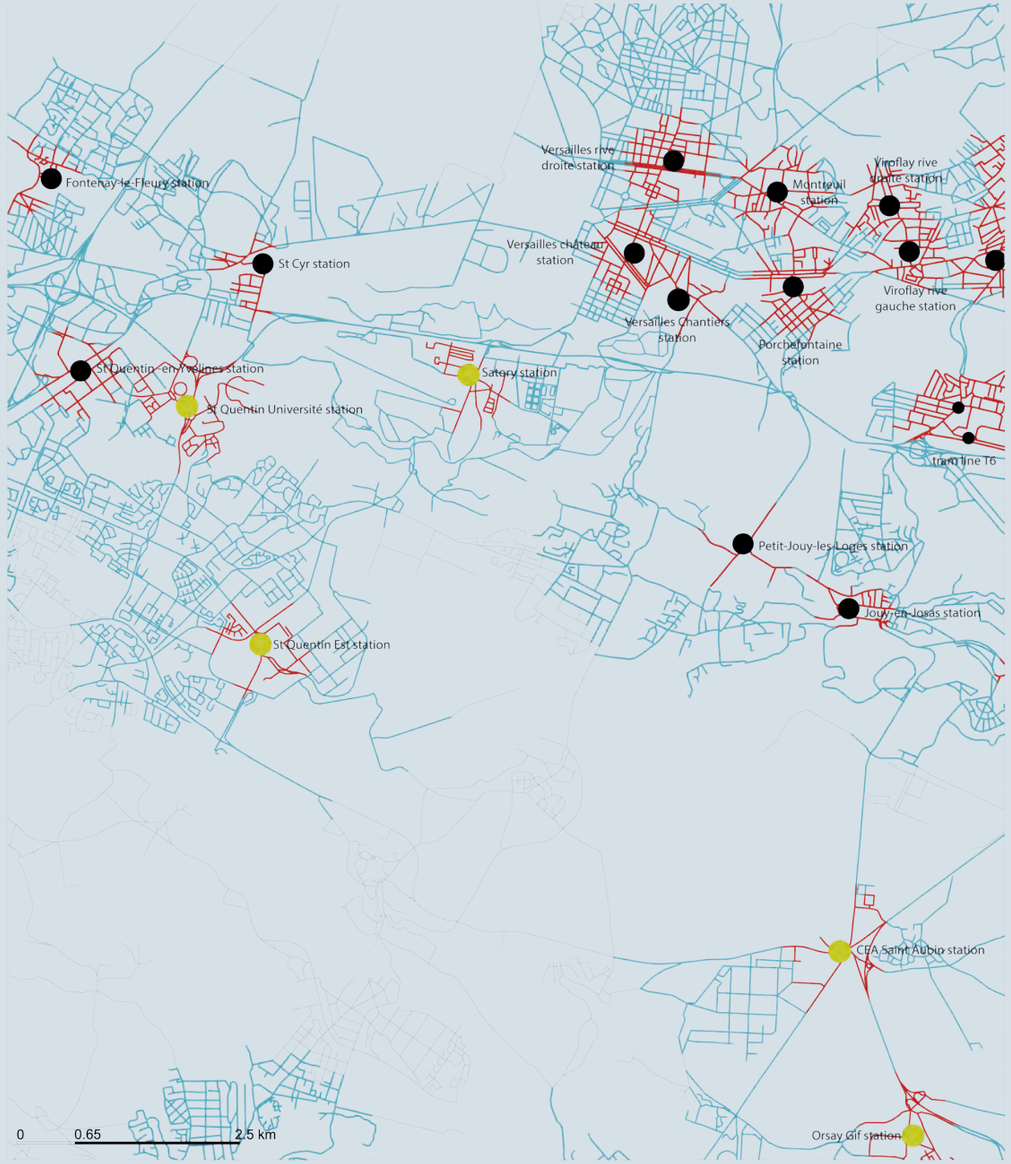
Paris region, Versailles, Satory, Saclay

Nearest distance from a public transportation station, operating on an exclusive right-of-way

Proximity
Metric distance and walking time distance, at 4 km/h
650 m - 10'

Accessibility
Time distance with a vehicle, at 15 km/h
2500 m - 10'

- existing railroad stations
- 72 Grand Paris Express stations among which 24 create new options for accessibility



Nearest distance from a public transportation station, operating on an exclusive right-of-way

Versailles, Satory, the Saclay plateau, Saint-Quentin-en-Yvelines

Proximity
Metric distance and walking time distance, at 4 km/h
650 m - 10'

Accessibility
Time distance with a vehicle, at 15 km/h
2500 m - 10'

existing railroad stations

72 Grand Paris Express stations
among which 24 create new options for accessibility

Nearest distance from a public transportation station, operating on an exclusive right-of-way

Versailles, Satory, the Saclay plateau

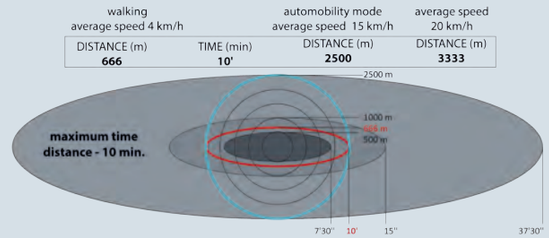
Proximity
Metric distance and walking time distance, at 4 km/h
650 m - 10'

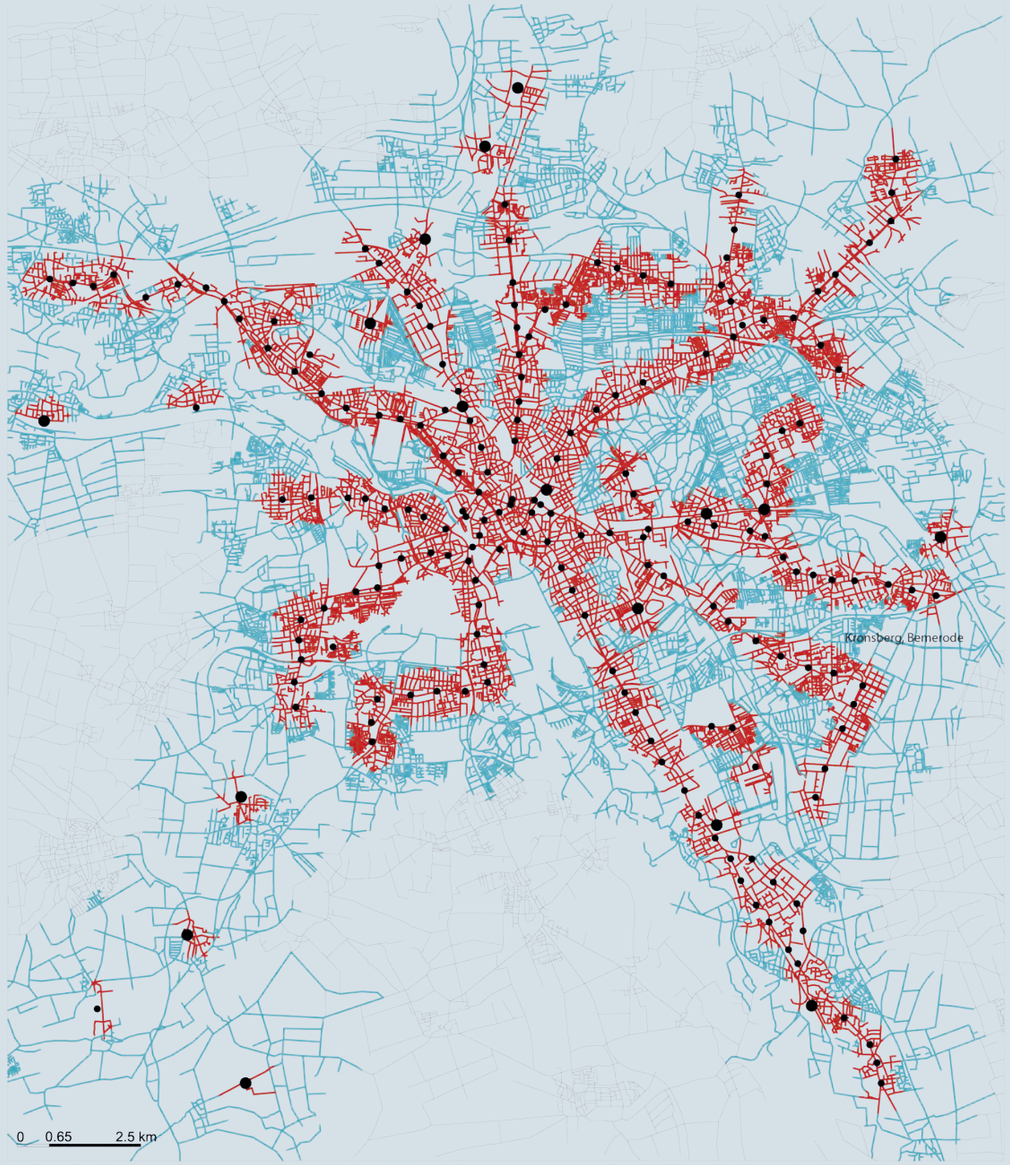
Accessibility
Time distance with a vehicle, at 15 km/h
2500 m - 10'

Amenities
13 schools
07 childcare centers
02 local community centers
10 sports facilities

Stores and services
04 post offices
00 tobacco stores
09 groceries
13 pharmacies
26 general practitioner's offices
01 hospital
09 banks or cashpoints
15 restaurants

Public transportation operating on an exclusive right-of-way





Nearest distance from a public transportation station, operating on an exclusive right-of-way

Proximity
Metric distance and walking time distance, at 4 km/h
650 m - 10'

Accessibility
Time distance with a vehicle, at 15 km/h
2500 m - 10'

railroad stations
tram and metro stations

Hanover, Kronsberg - Bemerode district

Nearest distance from a public transportation station, operating on an exclusive right-of-way

Hanover, Kronsberg - Bemerode district

Proximity
Metric distance and walking time distance, at 4 km/h
650 m - 10'

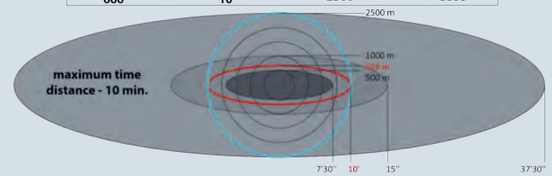
Accessibility
Time distance with a vehicle, at 15 km/h
2500 m - 10'

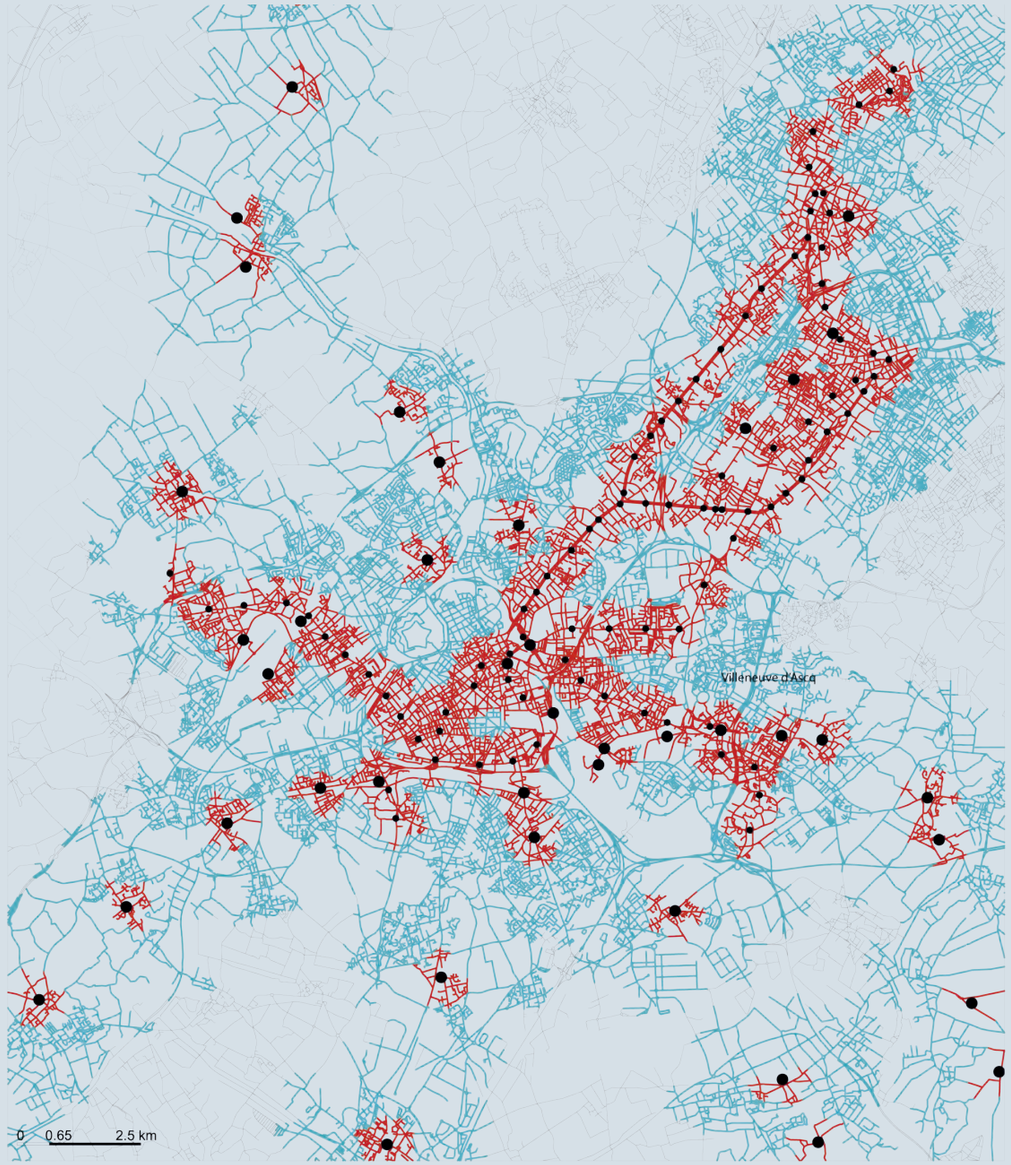
Amenities
15 schools
15 childcare centers
01 local community center
14 sports facilities

Stores and services
03 post offices
00 tobacco stores
07 groceries
07 pharmacies
27 general practitioner's offices
01 hospital
18 banks or cashpoints
03 restaurants

Public transportation operating on an exclusive right-of-way

walking average speed 4 km/h		automobility mode average speed 15 km/h	average speed 20 km/h
DISTANCE (m)	TIME (min)	DISTANCE (m)	DISTANCE (m)
666	**10'**	**2500**	**3333**





Lille Metropolitan area, Villeneuve d'Ascq

Nearest distance from a public transportation station, operating on an exclusive right-of-way

Proximity
Metric distance and walking time distance, at 4 km/h
650 m - 10'

Accessibility
Time distance with a vehicle, at 15 km/h
2500 m - 10'

railroad stations
tram and metro stations

Nearest distance from a public transportation station, operating on an exclusive right-of-way

Lille Metropolitan area, Villeneuve d'Ascq

Proximity
Metric distance and walking time distance, at 4 km/h
650 m - 10'

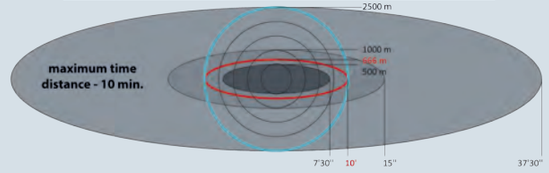
Accessibility
Time distance with a vehicle, at 15 km/h
2500 m - 10'

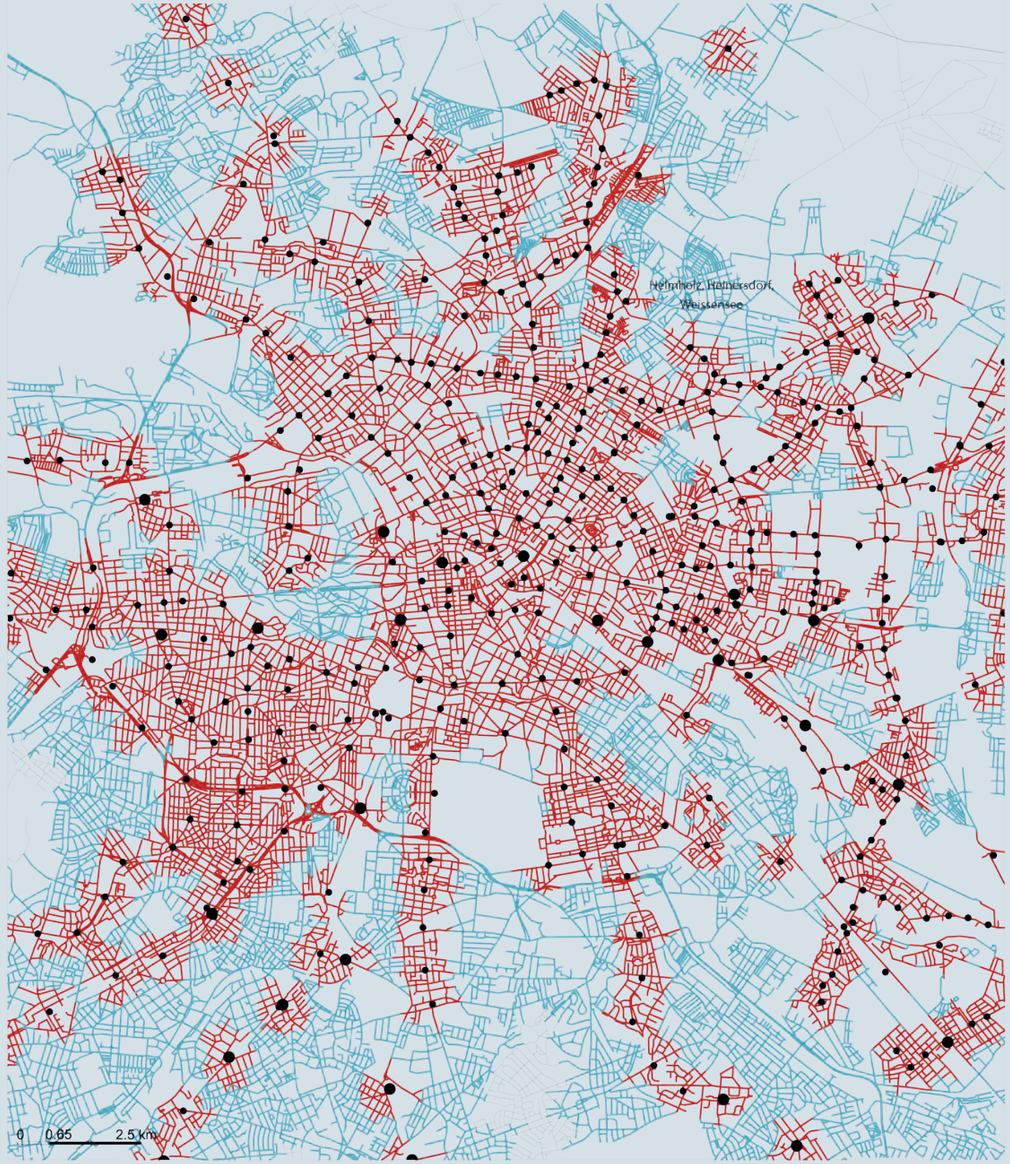
Amenities
16 schools
10 childcare centers
03 local community centers
23 sports facilities

Stores and services
04 post offices
03 tobacco stores
20 groceries
16 pharmacies
33 general practitioner's offices
02 hospitals
11 banks or cashpoints
35 restaurants

Public transportation operating on an exclusive right-of-way

walking average speed 4 km/h		automobility mode average speed15 km/h	average speed 20 km/h
DISTANCE (m)	TIME (min)	DISTANCE (m)	DISTANCE (m)
666	**10'**	**2500**	**3333**





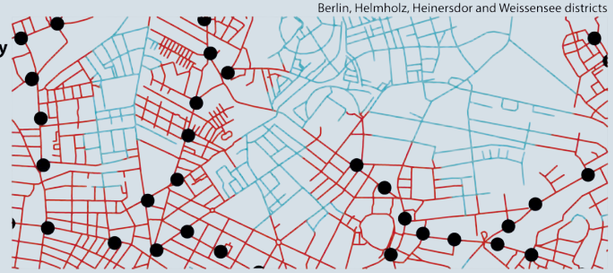
Berlin, Helmholz, Heinersdor and Weissensee districts

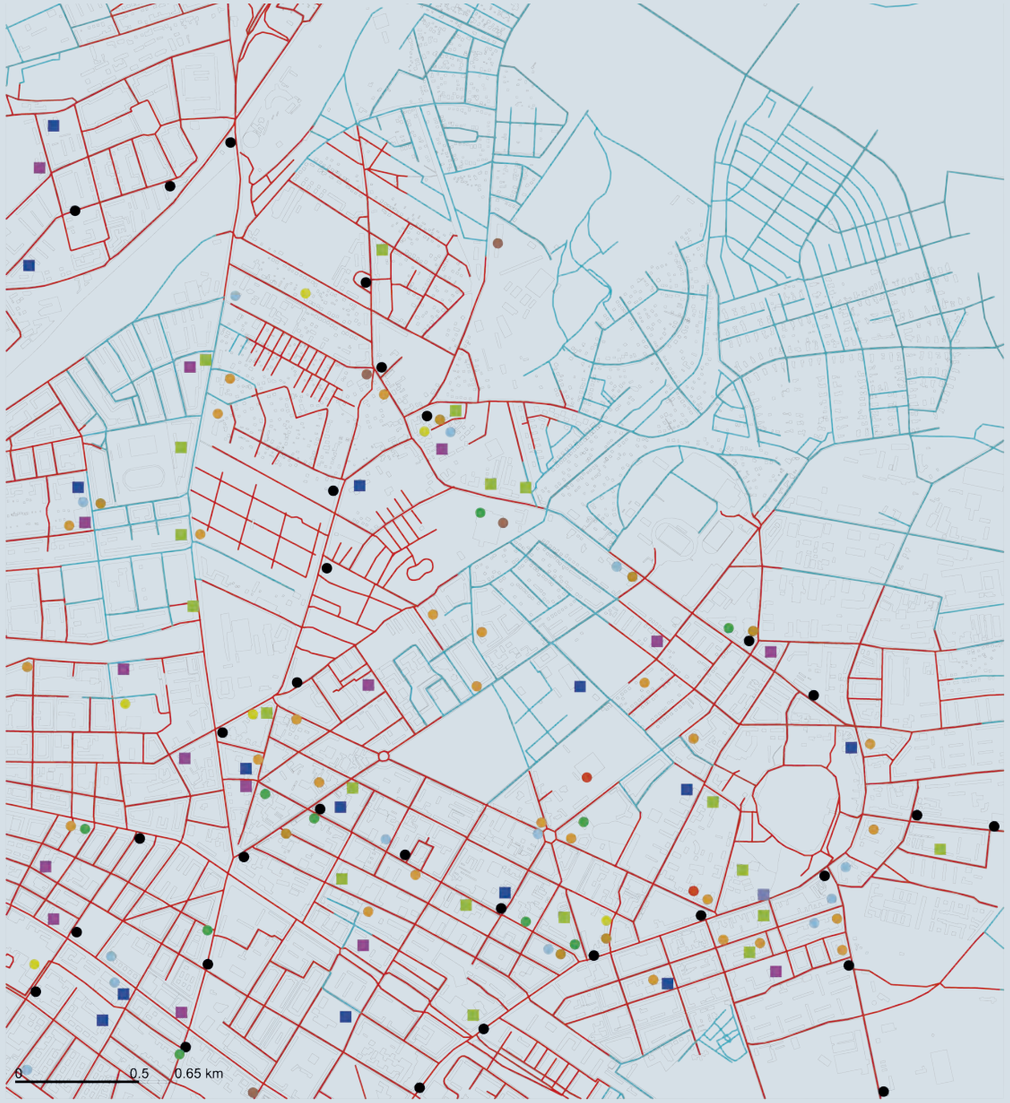
Nearest distance from a public transportation station, operating on an exclusive right-of-way

Proximity
Metric distance and walking time distance, at 4 km/h
650 m - 10'

Accessibility
Time distance with a vehicle, at 15 km/h
2500 m - 10'

railroad stations
tram and metro stations





Nearest distance from a public transportation station, operating on an exclusive right-of-way

Berlin, Helmholz, Heinersdorf and Weissensee districts

Proximity
Metric distance and walking time distance, at 4 km/h
650 m - 10'

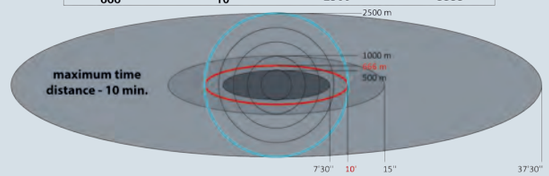
Accessibility
Time distance with a vehicle, at 15 km/h
2500 m - 10'

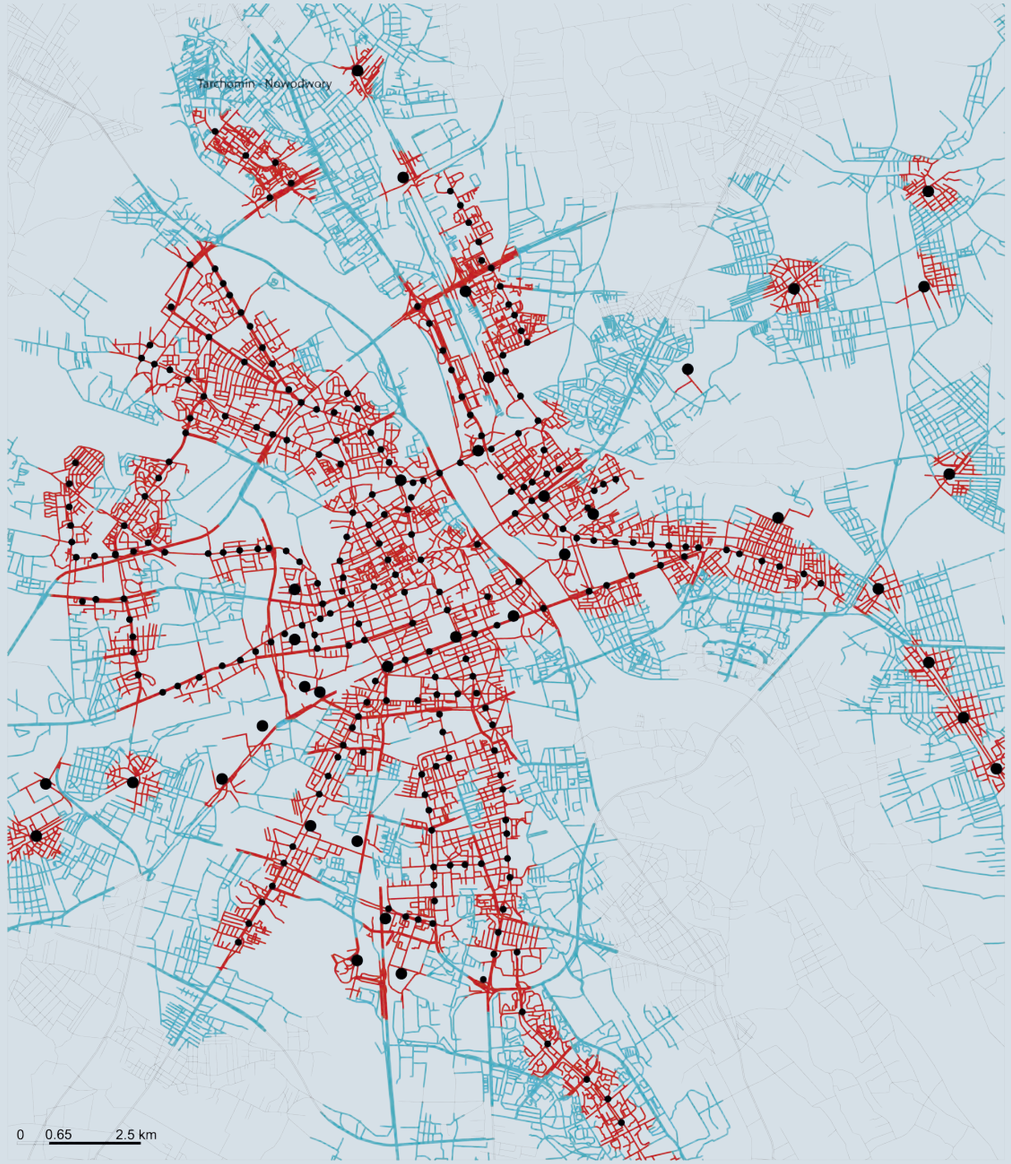
Amenities
14 schools
15 childcare centers
01 local community center
18 sports facilities

Stores and services
06 post offices
00 tobacco stores
04 groceries
10 pharmacies
27 general practitioner's offices
02 hospitals
07 banks or cashpoints
13 restaurants

Public transportation operating on an exclusive

walking average speed 4 km/h		automobility mode average speed 15 km/h	average speed 20 km/h
DISTANCE (m)	TIME (min)	DISTANCE (m)	DISTANCE (m)
666	**10'**	**2500**	**3333**





Nearest distance from a public transportation station, operating on an exclusive right-of-way

Proximity
Metric distance and walking time distance, at 4 km/h
650 m - 10'

Accessibility
Time distance with a vehicle, at 15 km/h
2500 m - 10'

railroad stations
tram and metro stations

Warsaw, Tarchomin - Nowodwory district

Nearest distance from a public transportation station, operating on an exclusive right-of-way

Proximity
Metric distance and walking time distance, at 4 km/h
650 m - 10'

Accessibility
Time distance with a vehicle, at 15 km/h
2500 m - 10'

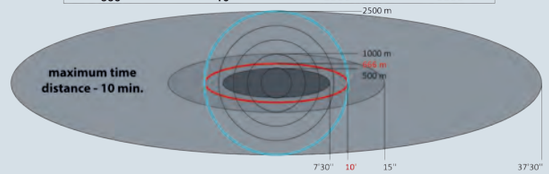
Amenities
19 schools
30 childcare centers
01 local community center
24 sports facilities

Stores and services
03 post offices
00 tobacco stores
25 groceries
23 pharmacies
26 general practitioner's offices
03 hospitals
11 banks or cashpoints
13 restaurants

Public transportation operating on an exclusive right-of-way

Warsaw, Tarchomin - Nowodwory district

walking average speed 4 km/h		automobility mode average speed 15 km/h	average speed 20 km/h
DISTANCE (m)	TIME (min)	DISTANCE (m)	DISTANCE (m)
666	**10'**	**2500**	**3333**



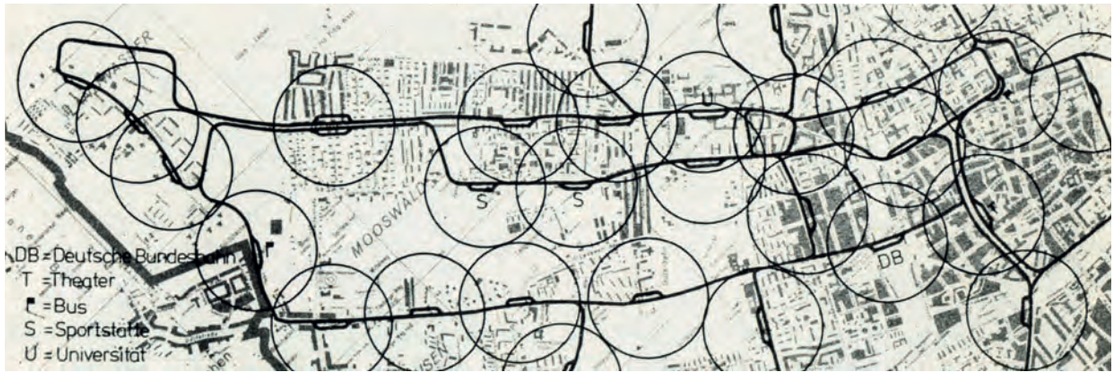
THE CITY THROUGH ACCESSIBILITY AND EXCHANGE POLES

In the scenario that he thought feasible in the context of the first energy crisis of the 1970s, Brian Richards imagined that the cities would invest in an "urban mini-systems" infrastructure as an alternative to the car (for example, on the German model, the Cabinen-Taxi system with stations every 350 m).[128] However, this was without counting on the indirect consequence of the drop in oil prices that would discourage any research and investment in this area and, as was mentioned, on the stratagems of the ECV, which creates infrastructure savings (except for charging stations).

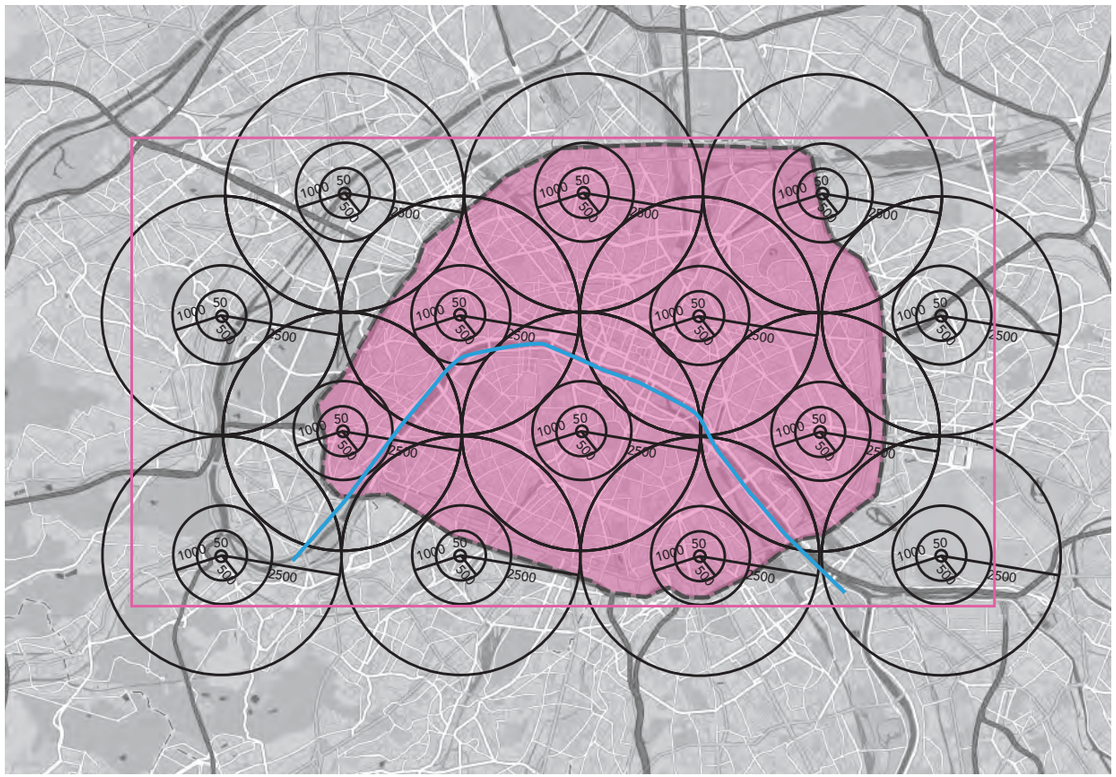
In a different way, the approach to urban life based on the "enhanced" travel of each individual will lead to designing the urban space around time-based proximity poles and public transportation hubs. Ideally, a new city, in which there would no longer be any earlier means of transportation, having equipped all its inhabitants with a electric mobility tool of proximity, would therefore have a very small number of accessibility and exchange poles. A dozen of these poles would suffice for a city whose area is equivalent to that of Paris and its inner suburbs. This would engender the following diagram:

On the map of an average-size city, on nearby sectors, we can precisely delimit the zones that would need to be equipped with ECVs. We notice that either the school (blue line) or the daycare center (pink line) are not accessible in under 10 minutes (by foot). Only the dotted blue-pink lines meet this proximity criterion.
Like the city of Laval (Mayenne department, France), every city has these zones in which the facilities are poorly distributed. ECVs function here as repair tools for the city. In Laval, it is estimated that at least one third of all families need an ECV, a potential need for 5,000 ECVs, or perhaps 1,500 through car-sharing.

Laval, detailed maps of current proximities: the school (blue routes) or the daycare center (pink routes) are not accessible in under 10 minutes by foot. Dotted blue and pink line: accessibility in 10 minutes.



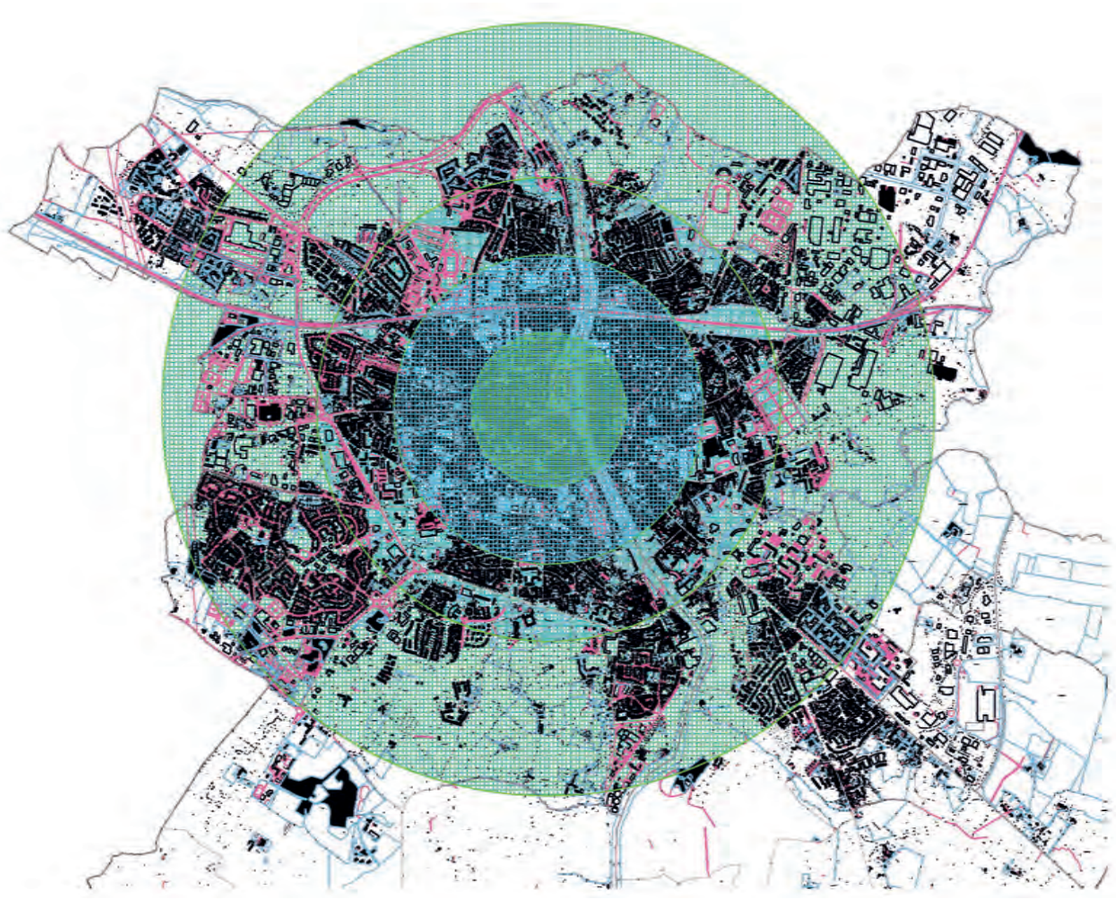
Cabinen-Taxi, Deutsche Budensbahn: radiuses of 350 m to reach a station by foot (B. Richards, *Moving in Cities*, 1976)



Accessibility and exchange poles to cover Paris and its inner suburbs

THE GROWTH OF CENTERS

Following the preceding mappings, we can imagine that over a radius of 1 km, then up to 2.5 km around an urban center, vehicle speed is limited to 20 km/hr., which is already almost standard today. This principle places a very large share of European cities of 50,000 inhabitants into the category of the "soft" or "slow city." This safe accessibility zone "at 10 minutes away" permits all the environmentally friendly vehicles to circulate on the same common space. It offers vehicles that have very little protection the possibility of circulating: "golf vehicles," cars for people with reduced mobility, the elderly, transportation of children. In the average cities of 50,000 inhabitants, a scenario of this kind, one of whose qualities will also be to eliminate transit circulations, vastly increases the size of meeting zones, and therefore potentially augments customer catchment zones. In other words, the city with a large fleet of ECVs broadens its city center.



Broadening of the Laval city center. Three accessibility circles at 500, 1,000 and 2,500 m

It is a total transformation of the public space and a "soft" revolution of urbanism. The urban atmosphere is reconsidered in its entirety. The soft fluidity of vehicles becomes a habit that characterizes the urban space. Nothing has changed, no modification of the city in terms of its architecture has appeared, except for the arrival of new vehicles. It is a painless transformation of urbanism that modifies in depth both the use and the ambience of places, and afterward their programming

The presence of ECVs, linked to the increase in meeting zones, contributes to the enlargement of city centers. The effect of this transformation is a considerable enlargement of the centrality pole itself. At 2.5 km, reachable in 10 minutes by the largest number of people, the entire city becomes a city center and there are no longer any suburbs. The utopia of the unified city, without suburbs, becomes a reality.

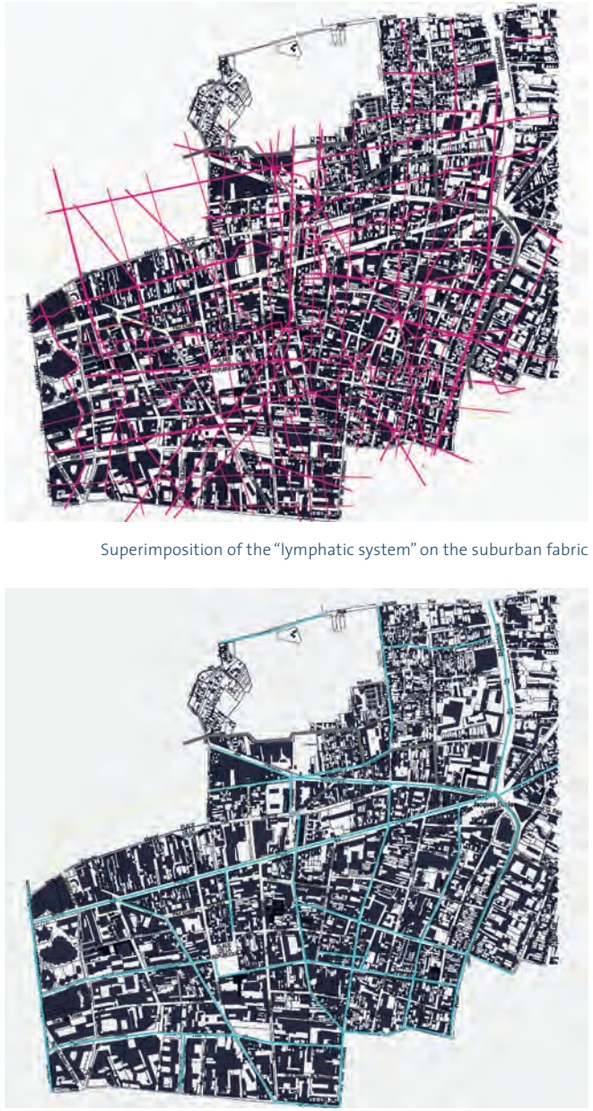
CAR ZONING NO LONGER EXISTS

The advent of ECVs heralds the end of car zoning: everyone is together and no longer separated. Here once again, we are already familiar with these ambiences where everything is mixed, as in Asian cities.

The city is consequently organized according to travel speeds. From 0 to 20 km/hr., all the vehicles are together, including very slow ones: kick scooters, rickshaws. It is the space of total safety, for children and the elderly. It is the meeting space that we are familiar with in many European city centers, but this time it has a much larger dimension. Its size is doubled or quadrupled. Its radius can be on the order of 2,500 m.

The car zoning typical of European cities no longer exists

THE TWO-TIER CITY



Superimposition of the "lymphatic system" on the suburban fabric

Traffic separation has not said its last word. We imagine a city irrigated by both a traditional road network and a new network dedicated to pedestrians, bicycles and ECVs that is superimposed on the preceding one, interconnecting the entire urban space. In a certain way, it is the equivalent of our circulatory and our lymphatic system.

The concept consists in developing independent routes in the city guaranteeing traffic separation. It takes into account the need to keep or restore crossing routes. To establish their continuity in the city, they will go through the blocks of the old city as in 20th-century urbanism. The large blocks of the 19th-century suburbs and their passages are conducive to welcoming soft crossings.

On a basis of 20 km/hr., the city is organized as a double network, one for traditional vehicles, the other for soft or compatible travel. In the example above, we have assigned one existing road out of two to the new network.

The two preceding principles can coexist and negotiate their circuits with preexisting soft lanes (bus lanes, emergency lanes, existing bicycle lanes, malls and sidewalks, pedestrian lanes). The second city is a world parallel to the first, which it can avoid crossing. They are two worlds that can exist side by side without disturbing or ignoring each other.

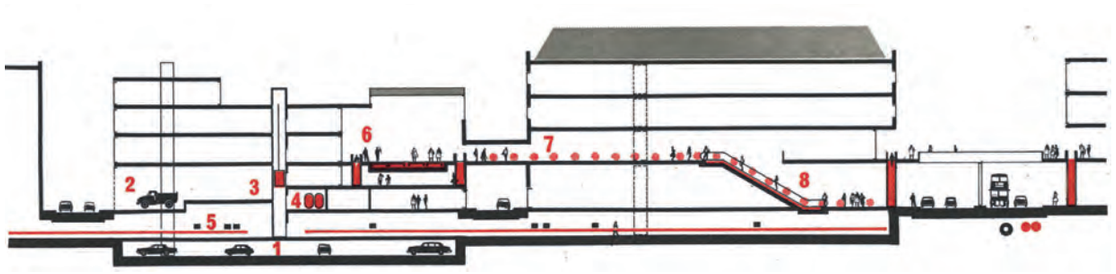
The two-tier city: one existing road out of two for soft or compatible travel

THE ENHANCED PEDESTRIAN

There isn't a single city in the world today that would think of presenting its future without projecting walking within all the mobilities of the "shared space." The inhabitant is now represented by the pedestrian, close to the experience of the city, its atmospheres, sensitive to crowded and dirty roads, and who crisscrosses and consumes it as a new hedonistic object in daily tourism. Walking is the spirit of the time of the sustainable future, in a balance of well-established marketing: the energy consumed by the walker = public health and fuel savings.[129]

The "comeback of walking"[130] is part of the larger issue of the "comeback of the future" that is expressed once again, after future perspectives came to a halt from the mid-1970s to the end of the 1990s.[131] The environmental awareness that began in the libertarian context of the 1960s, and that the 1973 oil crisis magnified, generated at the time a first passion for a return to walking and bicycling, as opposed to the car and an aggressive management of the city. However, the failure of prospectivists and other urban futurologists also paradoxically led to abandoning the issue of the city as a sum of flows – and with it the practice of urban walking – which led to rediscovering history, strongly supporting protection (of heritage) and the city as an architectured form.[132] During these three "stopping the future" decades, walking was above all the discovery of the "pedestrian street." It appeared in Bologna in 1968, as one of the status quo actions, "zero growth": walking to show one's opposition to urban highways and to lay claim to the "right to the center." It became a shopping area of a city center to be reconquered faced with the development of department stores. Walking (an urban stroll) then considered itself cut off from other travel modes.

It was in this context of new attention paid to the existing city that Brian Richard continued his investigation of alternative systems to car travel, coming as close as possible to "door-to-door service." He eschewed the modernist principle of the separation of pedestrian/car traffic – and its different expressions: from the "interior street" to the "pedestrian street," by way of the "slab" and the "linear center" – to direct reflection on the



Section through route building, a "servant building" for the surrounding development. 1. Storage and essential car parking. 2. Truck unloading. 3. Goods elevator. 4. Horizontal roadway for electric service vehicles. 5. Storage and service basement, access to other development. 6. Pedestrian mall with movement system. 7, 8. Access through existing or new stores at certain points. (B. Richards, 1966)

The immobile walker. Speedaway links crossing the Thames. "Interior view along system, which can carry up to 10,000 people an hour in each direction..." (B. Richards, 1976)

means of "equipping," "improving" and "redynamizing" the existing urban centers, based on the pedestrian. All the transportation systems in the dense urban milieu were inventoried: individual, semi-collective and automated, existing, projected, forgotten or experimented on, surrounded by a rich linguistic invention: Urbmobile, Carveyor, Dashaveyor, Peoplemover, Minirail, Guide-o-Matic Train, Transit Expressway, Speedaway, Teletrans, Transveyor, Overground, Gravity Vacuum Transit...[133]

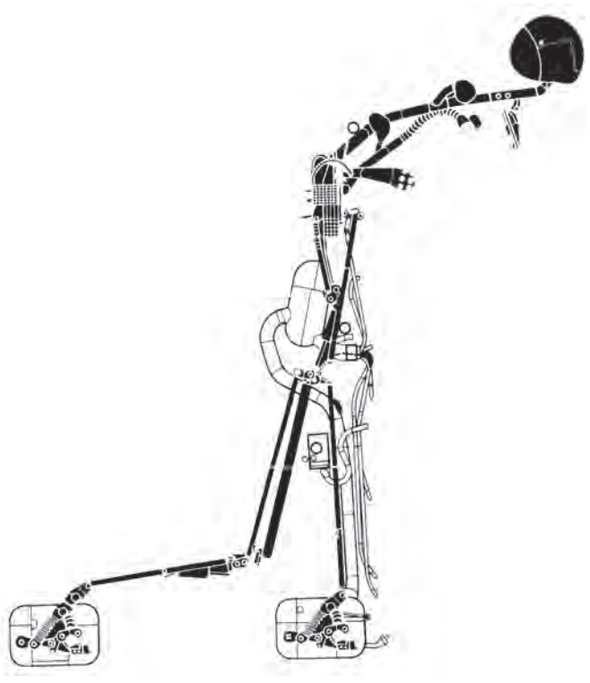
The "future city," henceforth, does not change image or place, it is only more efficient, studded with "car-free" mechanical mobility systems, collective prostheses that cross interconnected buildings. Pedestrians use enormous "transit" networks – "route buildings," or "action buildings"[134] – unsuspected from the outside, that sections in the architecture's thickness reveal. The pedestrian is no longer isolated in a pedestrian zone. Theo Crosby stated it with an almost Situationist tone: "We must propose an incredible experiment: the revival of city life, the survival of social man." [135]

Moving sidewalks (pedestrian conveyors, horizontal elevators[136]) are captivating technological objects, flushed out as much in history (1900 Paris Universal Exposition) as in the present, on the other end of the planet. The walker does not move himself, it is an immobility ideal, an urban ecstasy. It is therefore not surprising to read in the first comparative tables on the different urban transport systems that walking is faster than the pedestrian conveyor or moving belt: 4.8 km/hr. for the former, compared to 2.5 to 3 km/hr. for the latter. In other words, the idea is to offer movement without fatigue with the moving belt, even if the pedestrian moves more slowly: another vision of life or transportation in the city, without regretting the car. In short, this is the meaning of progress. No longer walking while moving: the slow movement of the immobile body for an immobile stroller, the city as experience every day, a permanent world's fair (where these mechanized movement are often born). Hence the importance of positioning these systems outside, suspended in air, but not too much, to limit the access itinerary, and to bury faster travel modes.[137]

Horizontal movement is the absolute luxury of the modern city, effortless, without any "demonstrativeness." Walking and not going up: the close-up photo of the pedestrian's immobile feet on the moving belt according to three acceleration speeds described urban happiness of the 1970s.

It is not uninteresting to compare the very concrete and obstinate research conducted by Richards on movement systems in the city and the utopian imaginary dimension that is being simultaneously rolled out around the planetary nomad. The cushicle – a contraction of cushion and vehicle (David Greene, 1967) – is the clearest demonstration of this ecstatic mobility research: the structure that bears the shell and the

The urban happiness of the 1970s. Variable speed conveyor using system of overlapping plates, gradually extending during acceleration. (B. Richards, 1976)



Closed *Cushicle* (David Greene, Archigram, 1966-1967)

survival equipment rests on air cushions so that the person who wears it moves by gliding. When he stops, a sort of chaise longue is deployed to snuggly hold the body that lays down, listens to music, watches television, etc. A representation of the cushicle with its frame, without its deployed shell, identifies it with a walking human skeleton, from the skull to the tibias and the "feet's" phalanges, slightly curved with the effort, walking "on its knees"... The cushicle walks for the human being, it is his technological shadow and replaces every transport system imaginable.

Today's version of the "enhanced" pedestrian is more simply conveyed by forms evolved from existing systems: pedal scooter, skateboard, bicycle, tricycle, motorcycle, micro-car... all electric. Undoubtedly only the Solowheel, with the balance it requires, more than the Segway that imposes a somewhat ridiculous and blocked position, preserves the character of a tremendous "invention." The embedded accessories of info-mobility[138] – cell phone, Walkman, i-Pod, i-Phone, etc. – , a guarantee of the traveler's autonomy and a move toward individual public transportation, have added new technological paraphernalia of another mobility. It is even more information, digital data exchange, than the mobility systems that are cleverly physically interlinked that would handle the "connection."

GRAND PARIS

One of the uses of the ECVs is to access a rapid transit station (intercity train, metro, suburban train). This use will be promoted for sectors little or poorly served by slow and infrequent public transportation, generally buses or coaches. This situation de facto exists in most of the world's metropolises.

What we have shown on the mappings of European cities is confirmed in the case of the Grand Paris of 2025. Public transportation with dedicated tracks or lanes in fact covers very limited disks around their stations. The map of Grand Paris 2025/1 shows the unsolvable difficulty that any public transportation project must overcome: heavy public transportation, which in addition is radial in Paris, serves the city very badly outside the capital's center.

The creation of the Grand Paris Express (GPE) will certainly improve mobility in the metropolis, and will increase the number of feeder stations, but the sectors far from a public transportation station with dedicated tracks or lanes beyond a theoretical acceptable walking distance (10 minutes or 650 m) will remain in the great majority. In other words, it will leave the accessibility problem practically intact, and very few new users will have direct access to the stations. Consequently, they will be forced to use another means of transportation, bus, car or ECV to get to the feeder station. The ECV will be the most efficient means to reach an RER [Paris suburban railroad] or GPE station in this sector, more than an inefficient public transportation mode. As a result, the ECV will be the indispensable complement to public transportation with dedicated tracks or lanes. In the end, the principle of using one ticket for both public transportation with dedicated tracks or lanes and various modes of car-sharing will be added, which will cause inefficient bus service to disappear.

Will the ECV stop at the station? Or will it be tempted to go directly to the final destination? The question of the "door-to-door" will be raised for a long time, including with ECVs.

If the new station has major services, if it also concentrates activity, it will then be able to function as an accessibility hub, in a mobility exchange space (see chapter 5 "Access Spaces").

In a work with a particularly significant title, Un changement de culture pour considérer le vélo comme un mode de déplacement à part entire ["a change in culture to consider the bicycle as a full-fledged travel mode"], the APUR (Atelier Parisien d'Urbanisme) created maps of bicycles feeder stations, on the basis of a radius of 2,000 m. Most of the metropolitan area then becomes accessible by using two locomotion modes: bicycle + public transportation. The entire territory will become accessible with ECVs, including electric bicycles, as referred to by the APUR.[139] This simulation by the APUR is coherent with our analyses.

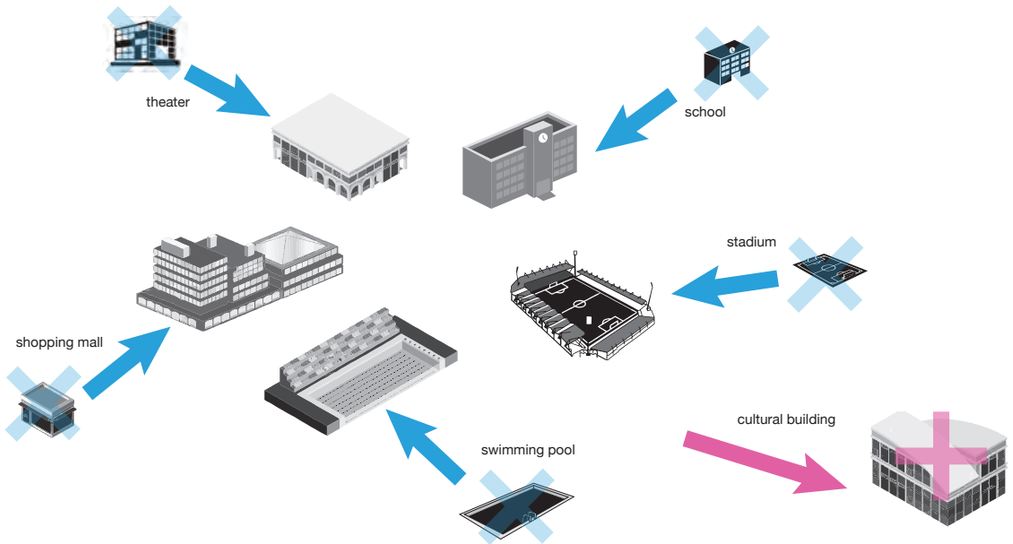
As we mentioned, the ECV is the "door-to-door" tool par excellence, and will also be used for direct routes that avoid changes in transportation modes. Paris commuters, who have to change public transportation modes several times, are particularly concerned. Moreover, routes from periphery to periphery will continue to be favorable to individual travel for a long time: in the Île-de-France, to go from one point to another, public transportation with dedicated tracks or lanes takes twice as long as a private vehicle.

CONCENTRATION OR DISPERSION?

The increase in the disk of (driving) "time distance" could generate a concentration of facilities. Using this extreme schematization of a world without either public transportation or individual cars, but whose exaggeration makes it possible to visualize trends, we then observe that the number of inhabitants concerned by an accessibility pole will be much greater. The inhabitants who are the farthest from city centers will reach, much more quickly, central activities, which will be reinforced, because they can attract a greater number of users: as many as 25 times more, in an absolute situation. The central poles become denser in activities by welcoming more users and visitors who arrive from farther away. In contrast, it is the least attractive existing proximity poles that will be gradually and slowly disinvested to the benefit of the more attractive poles. We can suppose that their frequentation will be limited to local everyday uses. However, it is to be feared that losing or having to share their attractiveness, their economy and renewal will be compromised.

The increase in accessibility locally produces an effect similar to the hub effect strongly implied in metropolization: it favors the development of the most powerful poles. In other words, ECVs create de facto a hub effect, the concentration of travel and activities on the most attractive poles.

It is possible that the enhanced capacity for movement due to ECVs will favor the choice of schools, cinemas and theaters, youth centers, sports clubs, but also consumer catchment zones... However, we can also note that the most well-known but farthest places will keep their appeal, which will be strengthened due to better accessibility. However fictional they may be, these theories are nevertheless extremely plausible relative to the polycentric behaviors of the great majority of populations.

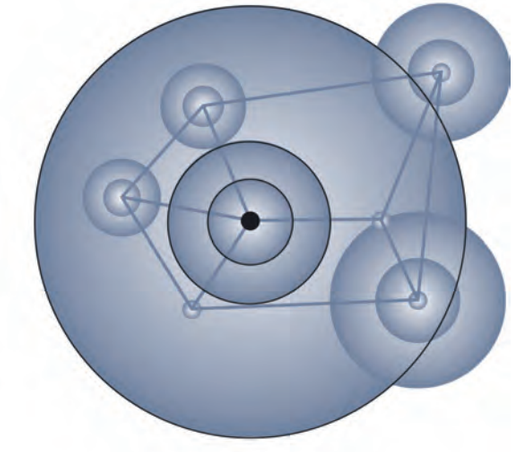


Concentration-dispersion: the hub effect

Will cities tend to head toward this model?

It is likely that we are witnessing phenomena to be compared to the construction and frequentation of shopping centers on the periphery, namely their positioning on disks of 20 minutes travel time. The question that is raised would then be the "resistance" capacity of existing services in the long term. Will the situation of public finances lead to concentration?

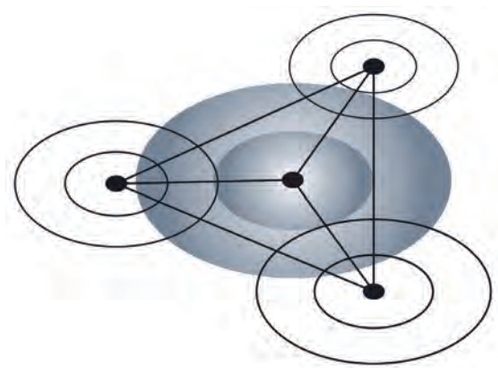
The elected officials of the communities will have to chose their redevelopment plans: concentration or dispersion? Concentration is the "natural" trend in the long term of the development of accessible distance: it is economical in terms of building as well as personnel management. A community will tend to strengthen certain existing poles, but in all likelihood not all of them.



A pole more attractive than the others

Can we imagine a plan that would not aim at concentration?

It is then possible that electric vehicles of proximity will make it possible to increase exchanges between neighborhoods, between accessibility poles, going from one school to another, from one neighborhood center to a cultural center. This hypothesis is likely, but this increase in relationships is a consumer of minor changes in



To the barycenter with an ECV

transportation modes and then of discomfort when it concerns going from a store to a distant facility.
ECVs enable the urban territory to be covered, as well the farthest accessibility poles to be reached. It is the repair effect of ECVs, which replace here, over these short distances, traditional cars. The plan that follows shows a much more easily attractive pole. We will agree to go 2.5 km, especially if the ECV is available. Is this pole going to be developed more than the others? The state of public finances, a choice of political orientation can lead to strengthening the central pole, accessible to everyone, and bring about the abandonment of poles that have become secondary. The losers are those who don't have access to ECVs.

The victory of urban sprawl

This hypothesis is having access to new places that are more often frequented because they are more accessible. We then consider that the development of ECVs creates a more extended relationship and that they will not only repair the city, the periphery, the suburbs, but that they will legitimize it, extend it, enlarge it. There is then every reason to think that ECVs will perpetuate the model of the continuous city, the "urbanized continent." In other words, ECVs confirm the victory of the extended and global urbanization of the territory. This likely hypothesis contrasts with the negative visions of urban sprawl.

ECVs, used in particular by inhabitants who don't have a car today, extend the possibilities of choice of destination in the cities. With the increase in access, an inhabitant in an ECV can for example access three or more accessibility poles. His positioning on the territory is no longer the same. From a marginal position, he repositions himself in the center of a favorable position for all his activities. The "victory" of urban sprawl will be accompanied by the creation of proximity centers of various sizes, ensuring all the services of daily life, denser than the current places, ideally at a distance of 500 m.

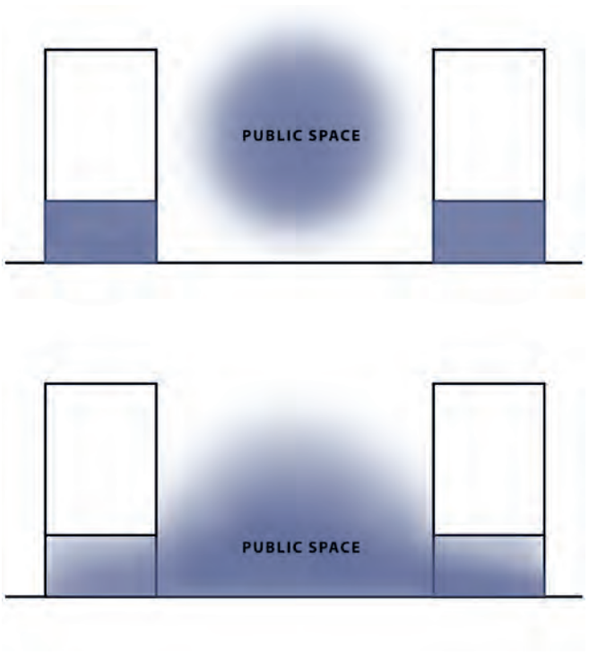
It is thus a new breakdown of the territory that will be organized, sometimes in opposition to the principles of the dense city that has prevailed these last few decades.[140] The spread-out city, or what we have called for over 20 years "the urbanized continent," is nevertheless not less sustainable. The "dense city = sustainable city" formula is henceforth to be relativized, even to no longer exist.

The polarization of urbanization

Large urban developments are most generally poorly served by local public transportation whose low efficiency is moreover known, even with feeder stations. ECVs and other automated vehicles will gradually replace these old public transportation modes, but they will also help transform the urban structure by favoring the proximity of peripheral urban poles that will become more accessible. We will thus witness the strengthening of the different urban poles that are the largest in the urban regions, and for very centered ensembles (such as the Île-de-France), a major development of various second-tier urban poles.

THE HYPERCENTER, A CENTER THAT CREATES RECREATIONAL EXPERIENCES, TRYING-OUT AND PERFORMANCES

What does a city become when all the exchanges and purchases are done via the Internet and delivery by automated car? The city center is first transformed into a shared public space without cars. What becomes of the stores in the city center? We can ponder their future, when necessity no longer seems obvious. The delivery of products or purchasing on the Net have become extremely powerful in a certain number of consumer sectors; we are familiar with the closing of bookstores, music stores, the difficulties of household appliance vendors.
We can of course imagine that "pleasure" consumption will always have its place in large cities and certain mid-size ones. However, we also imagine that commerce will have to mutate while preserving its show, festival or "festivalized" dimension. What is missing with Internet commerce? Not really the fact of seeing the object but rather that of seeing it worn and trying it. Trying-out might be the brick and mortar store's future. It is obvious for sports stores. Decathlon will be transformed into a test track, into a stadium, into an Asian golf practice area upstairs.
The same could be true for luxury boutiques. It is in the end the possibilities of trying on a Balenciaga, Chanel, Céline or Marc Jacobs dress. Self-transformation becomes real with trying-on, it goes beyond identifications with icons, it transforms each of us into an icon. Society and the show are definitively reunited. The store is transformed into a showroom, into an art gallery, into a performance venue or theater. The boutique that no longer has anything to sell can nonetheless exhibit its products (that it sells on the Internet) and transform itself into an "events boutique" and create its messages from its productions on the store's stage. In the same way that ads can exist without showing the product to be sold, the store can keep just the name of the brands, without needing to deliver the product on site.
As soon as trying-out or trying-on or the show replaces the purchase, it is the entire global logic of the city center that is shifted. The distance is short between trying-out and learning. The trying-out city becomes welcoming for the consumer-actor, the consumactor. A thread, a meshing of activities is put in place from the delivery to the consumactor. The city center will only be able to survive if it provides a consumer experience. The experience,[141] perhaps the most-sold product in the world, has subsequently become the economic value of city centers.
The city center that is reborn as a trying-out, learning and improvement center would therefore be saved by the introduction of the distinction between the purchase (on the Internet) and the delivery, and the handling of the desired product. However, for stores to continue to be the show of the city, they will have to be reinvested by a good number of lively spaces – display windows of fitness clubs, galleries, ad agencies, artists or craftsmen associations –, commercial wastelands sometimes relaunched with aid from the city. Unquestionably in many cases, it is the very idea of the city center that disappears and becomes a neighborhood like any other, a little more elegant and calm or a little less rich with its closed stores, or a place for strolling that has kept its cultural and historical calling and is



The extension of the public space

treated as a well-looked-after public space. In the end, the city centers have mutated.

This mutation from the purchase to the experience has already been perceived by shopping center promoters who are now also convinced that an experience must be sold to the consumer and who consequently call on (the best) architects to do so.[142] Since Georges Bataille and Antonin Artaud, the experience has turned into living art, and naturally commerce, and in particular tourism. The experience economy[143] has supplanted the production and marketing of products.

The extension of the public space

Saving the city center will be giving the public back its commercial spaces, now closed; in other words, extending the public space to inside buildings.

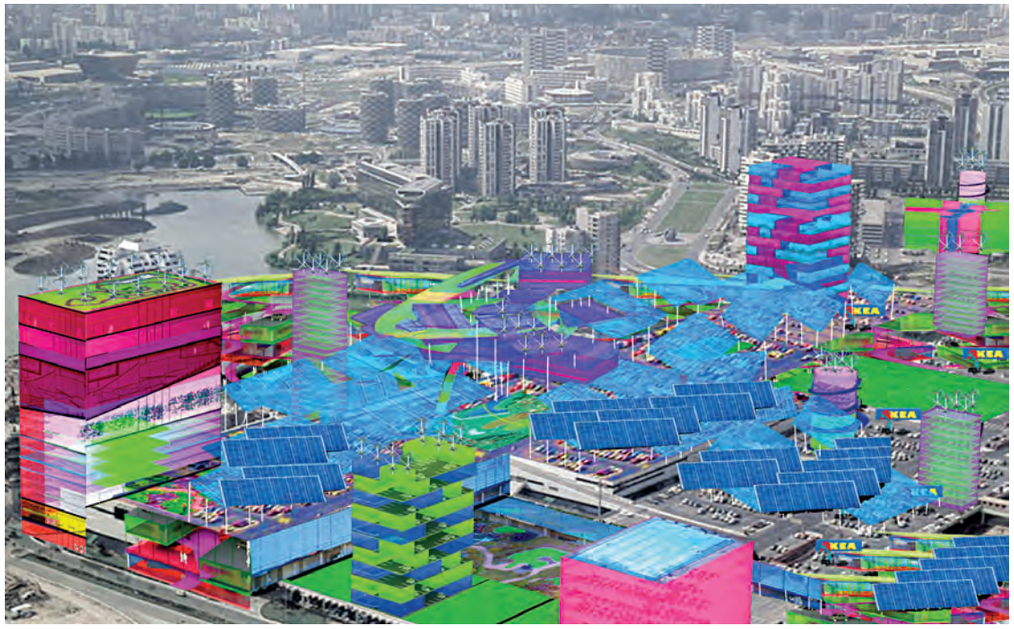
There are many occupancies possible, open, free or with exchange and work functions and expressions of every culture. The extension of the public space becomes the solution to the city's elimination of stores. No city will be able to escape the reuse of commercial facilities after commerce, which will be used as public or business parks.

The extension of the public space is one of the most paradoxical consequences of the disappearance of stores in a society that is being privatized.

Hypermarket – hypercenter

The development of e-commerce, and the commercial competition that leads to the unlimited increase in the construction of surfaces – a real estate bubble that has arrived at maturity –, are producing today, worldwide, the closing of hypermarkets, which are so many wastelands being renewed for new developments and new life-styles. These sites, now incorporated into the urban space and sometimes in their very center, are privileged places for the deployment of activities. Rid of their "gondolas," these enormous malls and their elevated parking facilities will be able to welcome every type of activity: teleworking, co-working, fab labs, indoor/outdoor sports, recharging and car and bicycle distributors, urban logistics centers, new mobilities, hill plot cultivation for urban agriculture, itineraries and strolls, revisited tourist catchment zones, daycare and various services, virtual shopping, energy production and undoubtedly also some housing, traditional service activities and... a few stores. The Créteil shopping center (Île-de-France) – Créteil Soleil, one of the largest in Europe –, which saw it enlargement projects fail, but still in the race for new stores, will redevelop itself, producing its own self-conversion or self-rehabilitation. The shopping center is an archeological stratum, a new natural geology that welcomes vegetation as well as the imaginary dimension.

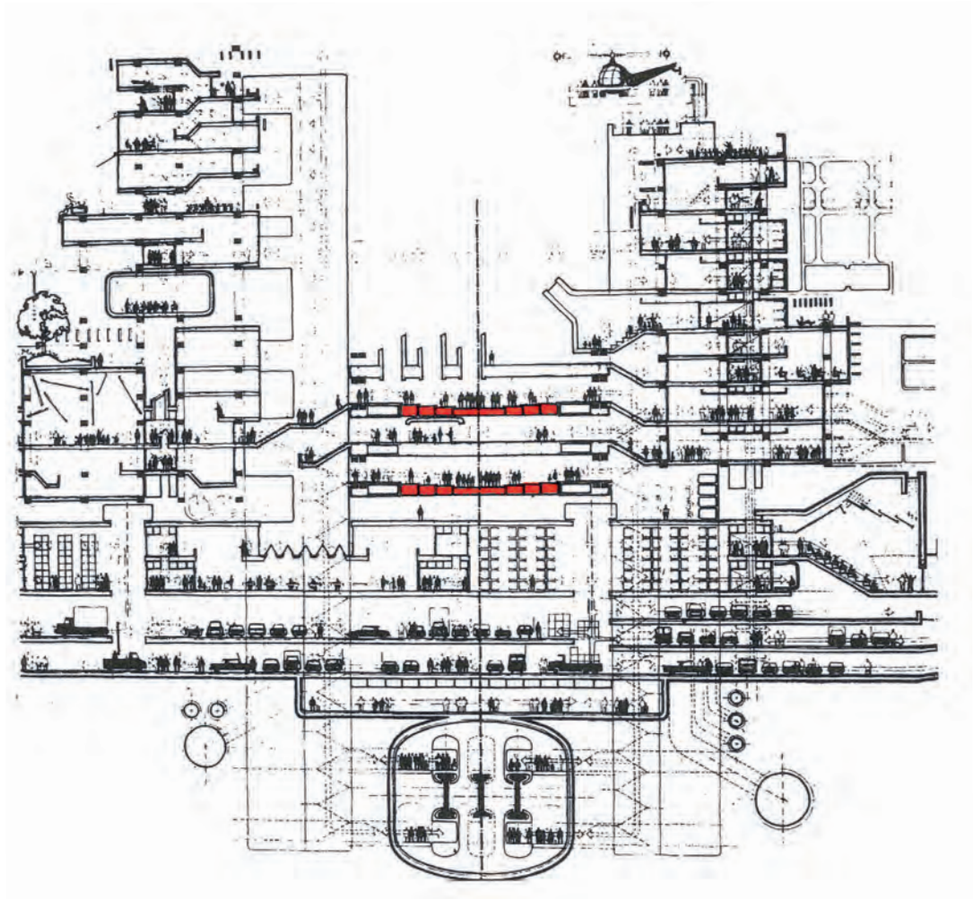
The budding commercial wasteland is being reinvested by very young companies and is becoming both an entrepreneurial wasteland, a hatchery, a small-scale production site, and, for new industries, a "new chance" training center, a learning center for all high school and college students, an open space for all the activities to come and for each individual's free expression. The large size of the freed surfaced reintroduces a value that has disappeared from 21st-century architecture: everyone together, the large shared space is enormous, it offers the spaces of the new city-ambience generosity.



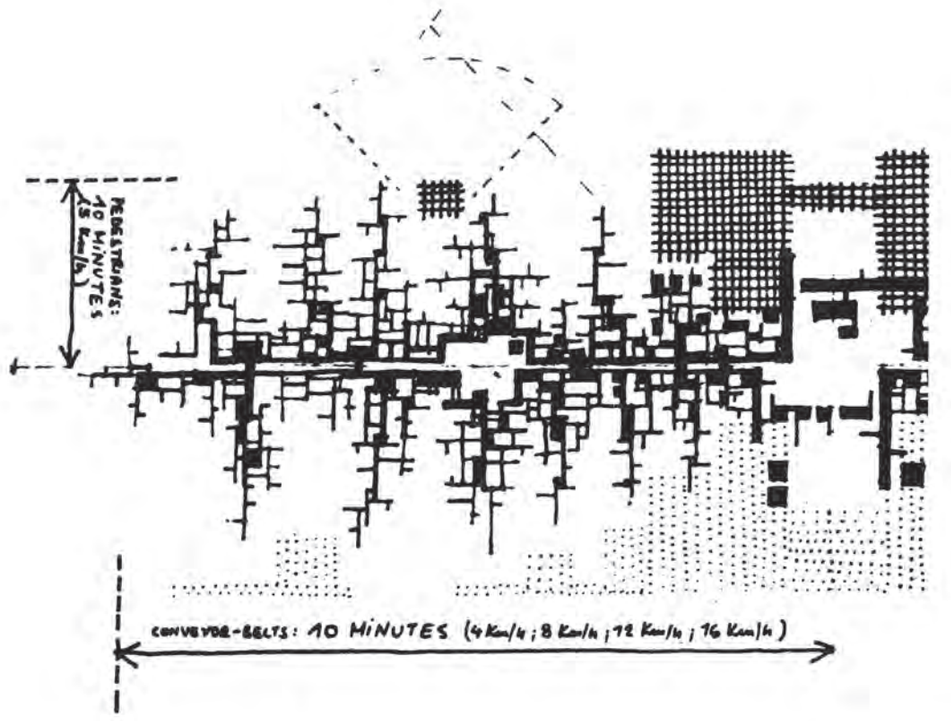
Créteil revisited 2020

THE INTER-URBAN NETWORK

The "center accessible to everyone," supposed to eliminate the "pyramidal" effect (from the center to the suburbs) and urban dispersion, was one of the major objectives of the research conducted on structural-urban systems in the 1950s and 1960s, and which would indirectly give birth to "megastructure" projects. The concept of the "linear center" or "stem" is the response contributed by the Toulouse-le-Mirail competition (Candilis, Josic, Woods, 1962). More generally, all the megastructures would propose the concentration



Pierre-Joseph Weber, Zehnminutenshaft ("The city in 10 minutes"), 1965. Section of the four conveyor belts installed on two levels (B. Richards, *New Movement in Cities*).



Pierre-Joseph Weber, "The city in 10 minutes" in length (by four conveyor belts) and in width (walking at 5 km/hr.)

of activities, for example, the project by Pierre-Joseph Weber, of a "city in 10 minutes" (1965). By means of a concourse of a battery of four conveyor belts of different speeds, the city is densely rolled out in its linear central part, whose length can be covered in 10 minutes at 4, 8, 12 or 16 km/hr., while crossing its width, with its low density, does not take more than 10 minutes on foot.

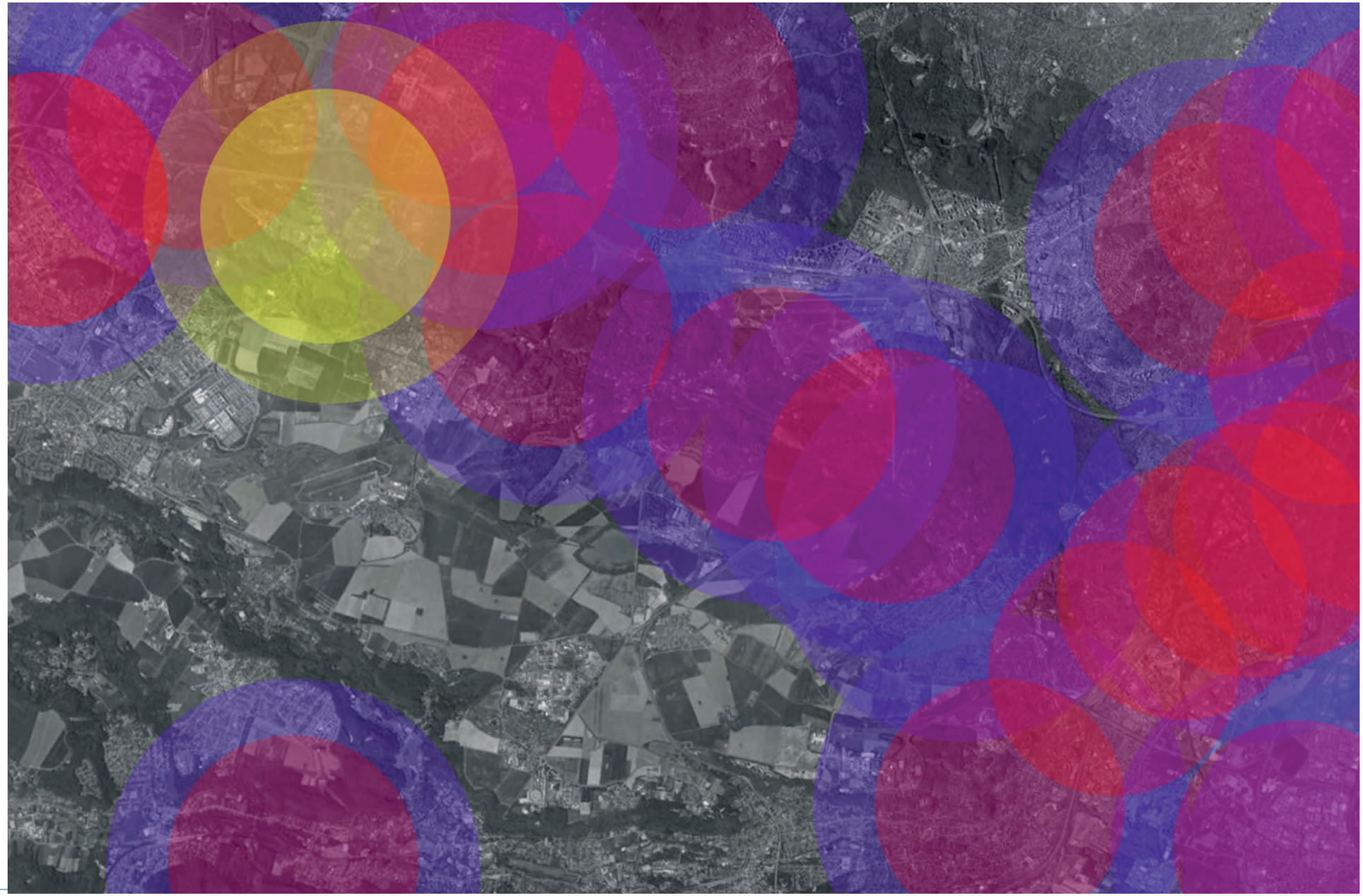
A travel techno-structure of this size, an integral part of the city-edifice, is no longer appropriate today – if we can imagine it ever was – and no longer constitutes the constantly reactivated dream of the architect-engineer controlling the future of the world. Quite the contrary, the user of auto-mobility is at the controls of his mobility and his city, in every direction, making the "sysmographic" representation of Weber's city totally obsolete. The ECV has replaced the linearity of conveyor belts.

The mobility of short distances measured in time makes it possible to link far-off sites built most often in the extensive urban space. The connection of these sites through ECVs increases exchanges and interrelationships within large distended urban zones. ECVs bring partners, companies and the scientific world closer together.

Satory

On the Satory site, the accessibility and exchange poles created based on public transportation stations form a continuous carpet from Satory-Saint-Cyr to Guyancourt, Versailles and Vélizy. However, this would also be true for all the urban developments that we studied. The result is a city of over 100,000 inhabitants that has been consequently put together. It has a major centrality, accessible in under 10 minutes. Therefore, the perception of the peri-urban space has been strongly modified by this element.

From Satory, ECVs reach the Renault technical center in Guyancourt as well as the Bouygues Challenger site. To the north, the château of Versailles and the train stations can also be reached in 6 minutes. To the west, the Saint-Cyr RER [suburban line] station is still within the 6-minute circle, just like Buc to the southeast. The use of individual proximity vehicles brings these companies, too spread out today, into the same space, in the same work campus. In other words, ECVs make the cluster credible, whereas it still remains improbable today.



The Plateau de Saclay. Accessibilities in ECV at 2 and 3 km: Satory - Guyancourt - Saclay from today's metro stations (Satory in yellow)

ACCESS SPACES

The demand of Homo mobilis is concentrated on points of exchange and the creation of activities that are constituted by hubs of various scales and accessibility poles.

Hubs have every level of complexity, from the bus station, then the feeder pole, to the inter-regional or broader hub. Most of the new service and delivery activities and new work and collaboration forms are found in the hub. The development of hubs is the first challenge of urban organization because it is the intersection and exchange location of the various mobilities as well as where most purchases are made for daily needs. The exchange of mobility holds a leading place in the hub: going from an express train to the ECV, finding a rental scooter or carpooling, an automated transporter.

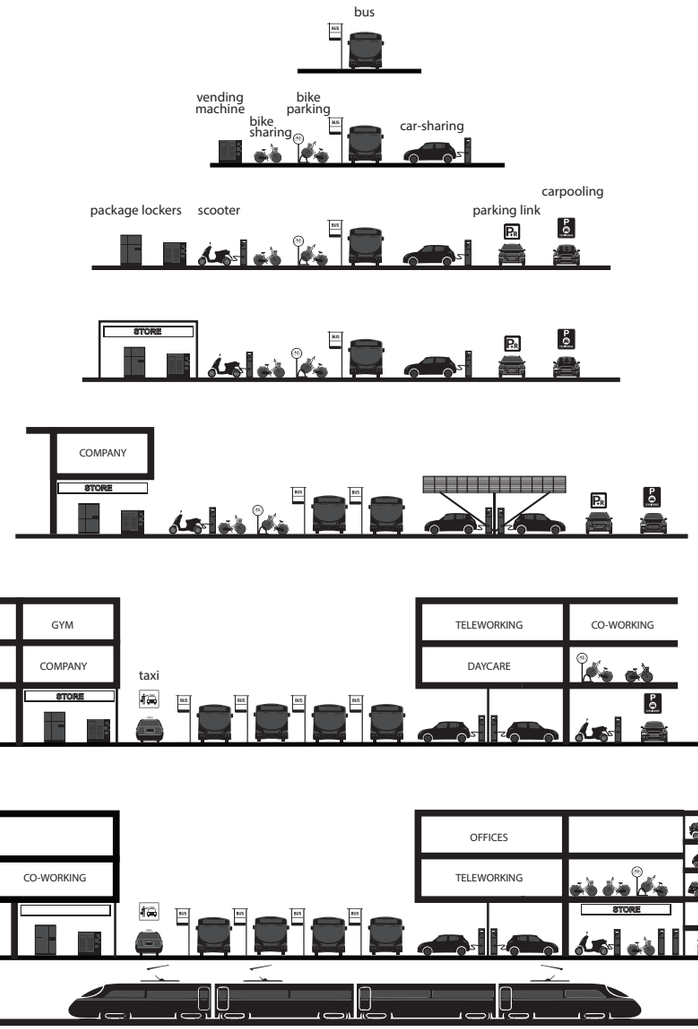
Concurrently, the accessibility pole is constituted first of all by existing services. It will be reached from longer distances at a constant travel time. We imagine that it can be strengthened and also welcome mobility exchanges. Hubs and accessibility poles are powerful systems in the transformation of urban life that they reconfigure for more comfort and efficacy.

Each trip in the city, apart from those on foot, is made with accessibility vehicles: bicycle, scooter, quad, electric rickshaw, ECV, public transportation. Accessibility or exchange poles will therefore be more spread out and also much denser in terms of the services they offer. Don't they then define a city that will be tidily broken down by poles? Each medium-size or large city becomes multipolar. Polycentrism distributes flows over the entire territory. The ECV strengthens the cities' multi-polarization and links the poles to each other.

This gradual transformation is possible because it is positive as much for those who finance the city (cities that no longer have to open new neighborhood centers, daycare centers and schools), private individuals who gain more independence (thanks to auto-mobility), intermediaries and merchants who find a more numerous grouped clientele.

What will an exchange pole be like in the era of auto-mobility?

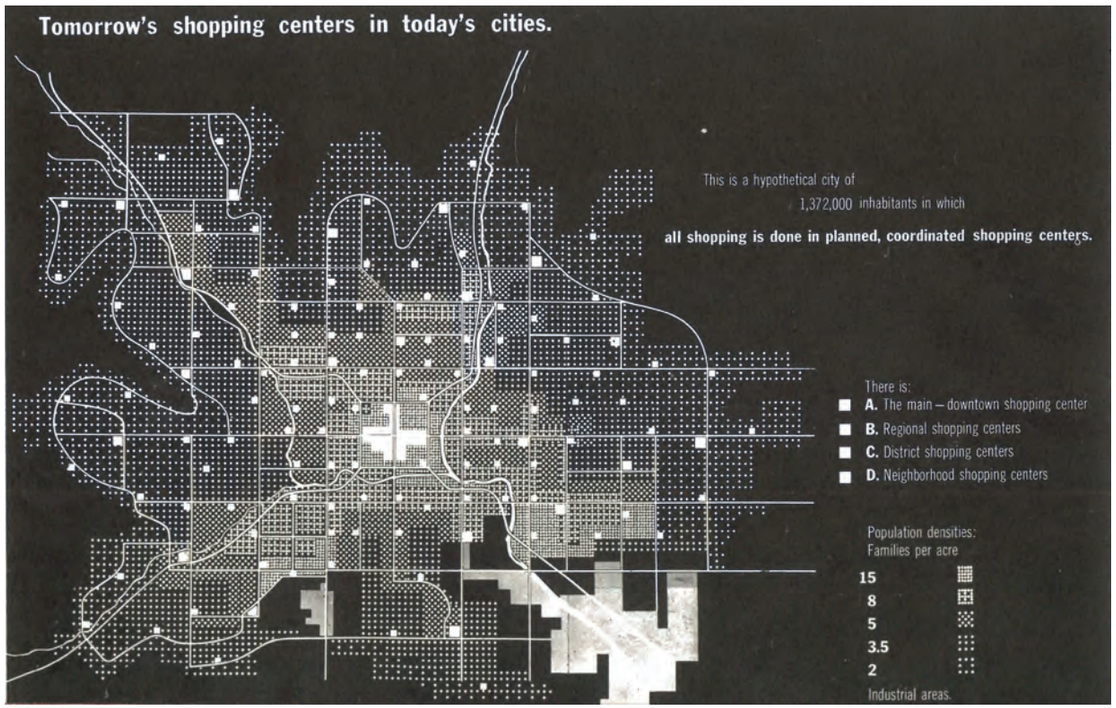
THE NEW HUBS



Level 1, 2, 3 and 4 hubs

Today, public transportation stations, exchange poles or existing hubs with the introduction of a certain number of services, convenience stores or dispensers, sometimes including in a mostly rural environment, make it possible to discover the transformations underway. With the development of a sustainable personal mobility via the ECV, we can then imagine four hubs or accessibility poles, from the simplest (H1) to the most complex (H4). The categories are not immutable, stable or verifiable either, but we can comprehend their connections that combine the change in transportation mode and activities, stores and of course parking, and the number of people concerned by its attraction. The mobilization of the traditional waiting time is in every case an addition that increases the quantity of services proposed in every size hub.

During the 1950s, this flow and activity pole approach to urbanization was thought of by architects fascinated by the new highway flows discovered in the United States and in the work of Victor Gruen and Alison and Peter Smithson. They imagined a territorial punctuation for England of "pressure points" with an "attraction" force equal to their capacities to concentrate "events" (from shopping to leisure), therefore cadencing life and the space covered by an alternation of stopping and flow points, road infrastructures and

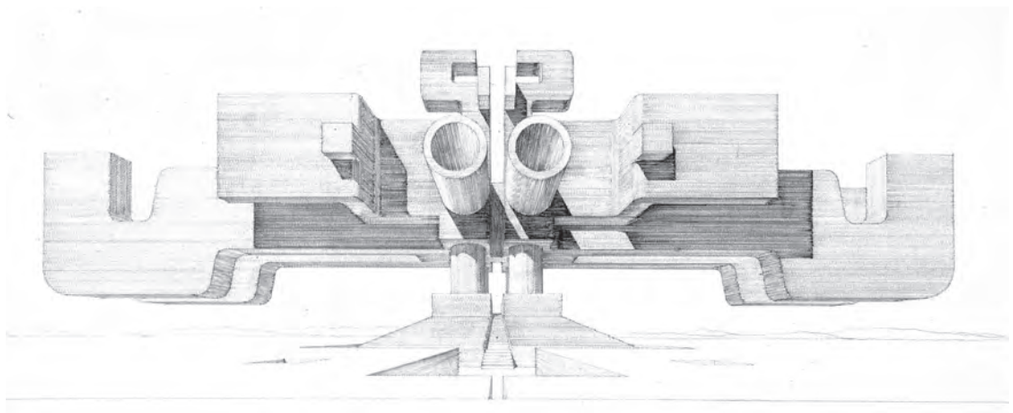


Hypothetical map of shopping center distribution in a city of 1,371,2500 inhabitants (Victor Gruen, 1960)

(relatively) long-lasting shopping malls and transitory elements to fill the spaces, including housing (the fixed vs. the transient couple). The digital revolution proved them both right and wrong: right, because it is clearly this territory constantly covered by personal mobility that designs "everyone's city" comprised of exchanges and places for consumption and unforeseeable activities (cf. fig. Brubeck sketch); wrong, because the smartphone, with its instantaneous information, makes travel modes and motives more complex, and therefore makes possible the proliferation of pressure points, on several scales. Victor Gruen's "final" vision of a total urbanization of the entire United States by a balanced positioning of four scales of shopping centers would be closer to our hypothesis, replacing the shopping mall as the project's focal point by multi-mobility itself. We are therefore closer, in contrast with the urbanism of the shopping mall, to the construction principle of the "road town," presumed anarchic, gradual growth, starting from a gas pump, of associated services: motel, convenience store, fast food restaurant...[144]

Another parallel with the same period sheds light on the newness of the approach via the EVC and its accessibility issue. City projects brought back or reduced to transportation hubs and their "interchanges" (today's inter-modality), were one of the major megastructure fixations, whether positive or parodical, as were the different variants of the Interchange City projects by Hans Hollein, Raimund Abraham or Archigram. When the transportation hub and the transportation modes themselves are at the heart of the project, engendered in a single (monumental) gesture, the hub approach as we have envisaged it takes an interest in the services and activities that will be generated by the frequentation of the inter-model site and reciprocally, how this activity will set off the gradual growth of the hub with the new practice of accessibility. There will therefore be no need for the technological imagination, as the example of the Cultural Center of São Paulo shows.

We will intuitively describe the four hub ranks, whose dimensions and programs are not absolutely



Hans Hollein, *Communication-Interchange of a City*, 1960

São Paulo cultural center (CCSP, 1976-1982) at the Vergueiro metro station (Enrico Prado Lopes, Luiz Telles, architects)

determined, without attempting to further focus on quantitative measures – considering that the linking between the levels is more important, their order in a certain way.

HUB 1

Hub 1 can begin with the simple stop of a high-service-level electric bus. This is the first inter-modality level: the pedestrian encounters the bus. The electric bus is recharged at each Watt-type station, supplied by a supercapacitor buffer station whose energy can come from wind turbines or solar panels.[145] The bus' charging station triggers the "natural" possibility of adding a second inter-modality level, bicycle-sharing and electric bicycle-sharing. It can be combined with a car or scooter-sharing station. Automatic goods dispensers and a concierge service are often present in this hub (the French post office administration, for example, which is looking for locations to host its services, in supermarkets recently). A secure parking area for bicycles, a maintenance point for two-wheeled vehicles, showers and so on can also be found in this hub.

The high-service-level electric bus is accompanied by a parking lot with electrical outlets so that the user can leave his personal vehicle. At these stations,[146] you park your ECV, you recharge it, but you also pick up your deliveries, you make purchases, on the model of Japanese automatic dispensers, but also in Los Angeles and Bretagne. Thus, for example in the "Bretagne mobilité augmentée" (BMA) program, two experiments underway would find locations favorable to their development in the new hubs: "Mamie-Bus" [grandma bus] in urban areas (the users, notably the elderly who are much in favor of it, choose the stops themselves) and "Klass" in the peri-urban milieu (a carpooling system intended for students and employees for the first and last kilometers).[147]

HUB 1: The high-service-level electric bus is recharged at a station, a car-scooter-bicycle-sharing station, a dispenser (drinks, meat, bicycles, pizzas, vegetables or milk, etc.), a concierge service

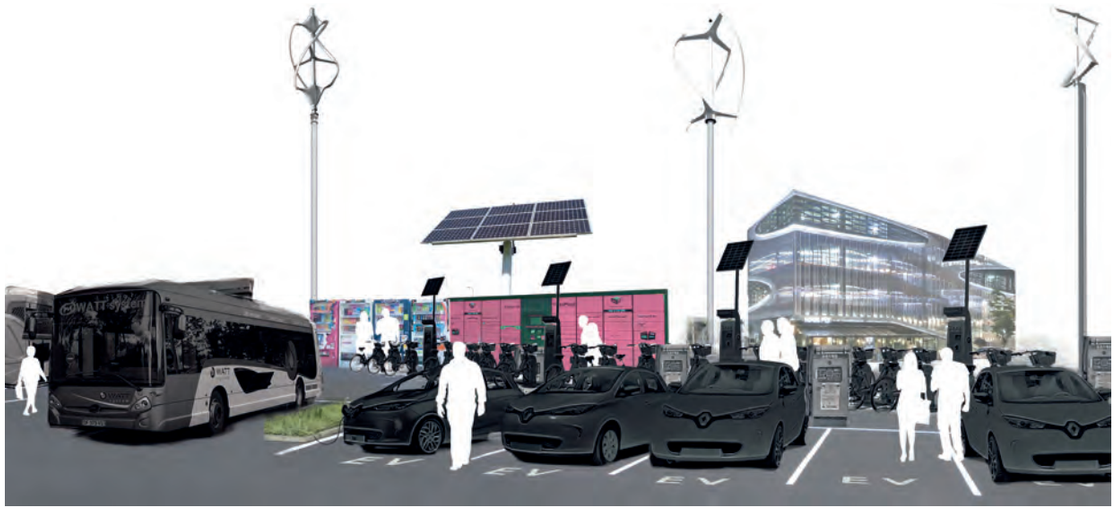
We can also theorize that not only these bus stations but also stopping points for cars and buses will have, in certain situations, bicycle-sharing stations. The hubs have fluctuating dimensions depending on the contexts into which they are inserted. Complexity comes into play when a service (automatic dispenser or concierge service, stores, etc.) is added, or a new transportation mode available at this stop: bicycle, tricycle, quadricycle and so on. This can also be a park-and-ride station, a site favorable to the rollout of new hubs.

HUB 2

The Hub 2 station/local pole is linked to the existence of a bus station, a car-sharing parking area on which activities to create a program hosting rapid sales, a concierge service, daycare, co-working, a meeting place but also a telecenter are grafted. Starting with 800 user families, Hub 2 welcomes a traditional store: a bakery or small grocery store. It is also here that a mobile law firm branch is set up.[148]
In Hub 2, the activities have some autonomy vis-à-vis travel. They are favored in their placement by the transportation, but they could exist without it.

HUBS 3-4

Like Japanese train stations, metropolitan stations (Grand Central in New York, Montparnasse or Saint-Lazare in Paris, or in Lyon or Lille), and the Zurich central station, revamped as Rail City Shopville, the largest hubs have developed worldwide around large train stations and greatly increase service offerings. This evolution will very particularly affect vehicle rentals and carpooling functions.
Consequently, Hubs 3-4 combine groups of schools, services and stores and are served by public transportation or car-sharing stations. They include administrative

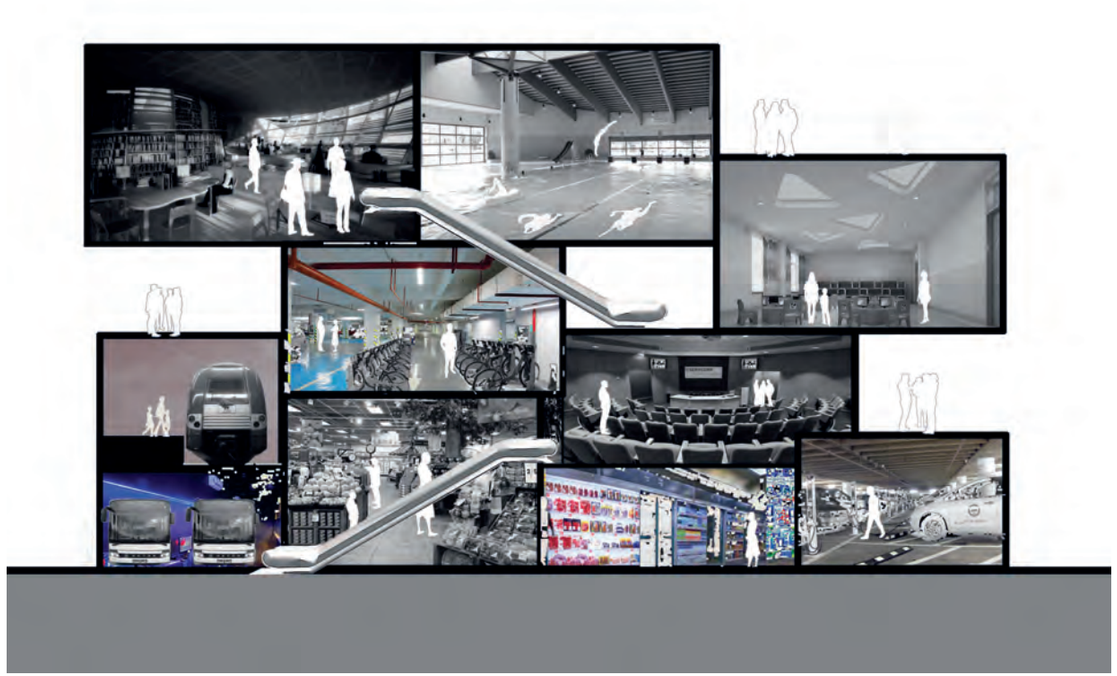


HUB 2: general view of the installation of stores and convenience stores

services, a crèche or daycare center, a shoemaker, a croissant store, a pharmacy, a doctor's office, one or more supermarkets, a web café, a newsstand, a dry-cleaners, meeting and exhibition spaces, a sports facility... They have telecenters, collaborative spaces and fab labs. They house buses, trams and regional transportation.

Hubs 4 bring together the large national and international hubs but also concern the multimodal exchange poles of medium-size cities accessible to high-speed trains. These hubs are complex multimodal platforms. They are linked to very large facilities and service areas. They include collective interest programs on the scale of an agglomeration, educational and cultural institutions and exhibition galleries. Activities are simultaneous and numerous in these new hubs.

Level 4 Hubs are representative of a massive shift of activities to exchange poles. The Hub is more specifically the development, on the Hub itself, of the multimodal exchange pole, services, offices, commercial and cultural programs, even housing. It is here that investments, in a dense fashion (in a radius that does not exceed 400 m) are made, with a minimum number of changes in transportation mode in inter-mobility. Housing can be located farther away thanks to individual auto-mobility vehicles. The smart city is the one that assembles all these functions. In the opposite case, a train station or an exchange pole has very little impact.



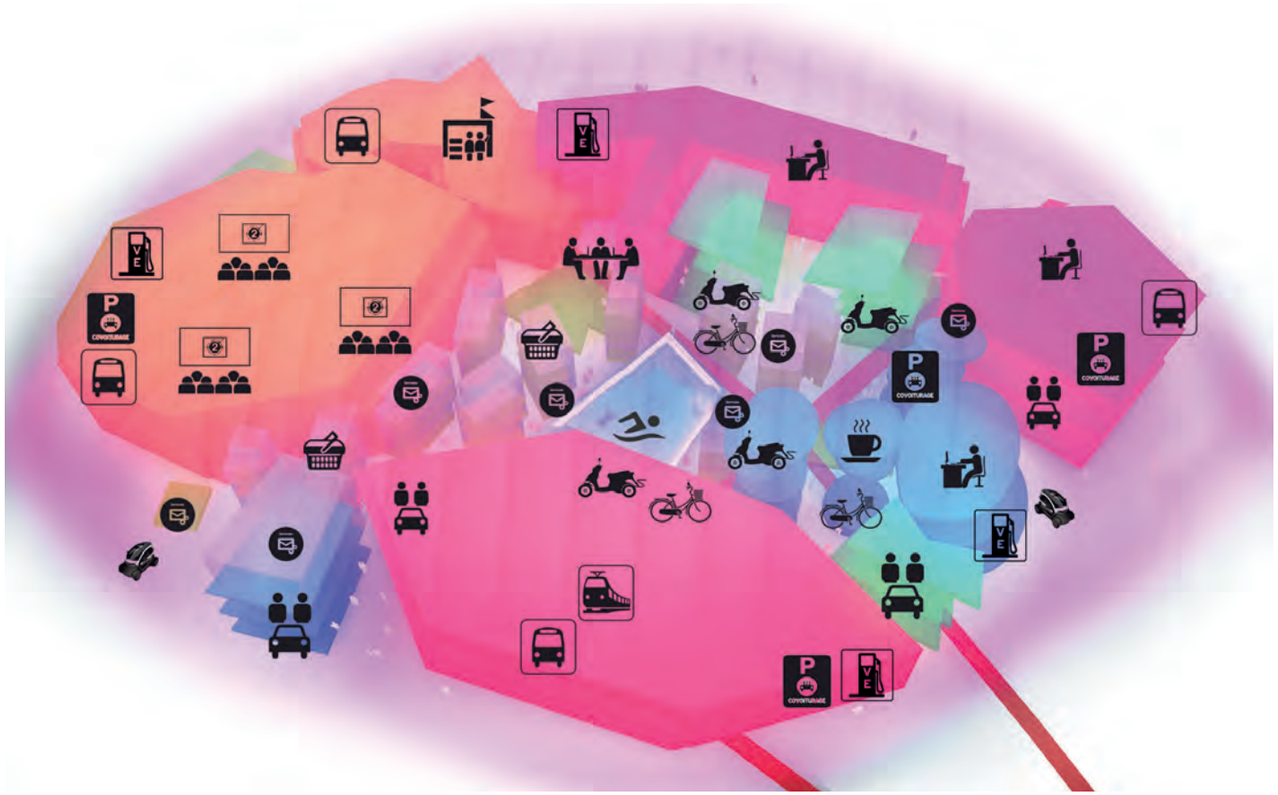
Accessibility poles are reconfigurations of the city, of a region

The accessibility pole defines the neighborhood, four times more spread out than the current 500 m, through its presence. There are more stores, more attractive activities with better facilities. Movie theaters are opened with the equivalent of a neighborhood center and at least one restaurant.

The cities are reorganized based on exchange and accessibility centers/poles. Collective life is recreated, the accessibility center is frequented at any time of the day and even in the evening. The neighborhood concierge service where you pick up purchases made during the day is found there. In São Paulo, we can see how a metro station generates the anchoring spot and development of a multi-activity cultural center, which is itself crossed from one end to the other like a parallel pedestrian lane and has a public garden at the station's exit, as though the station were a city neighborhood.

De facto, it is the global circulation speed that is decreased, a new way of circulating together, with greater safety and freedom.

All the medium-size cities that see the arrival of the high-speed train, or those that dream about it,[149] are very close together, between 20 minutes and an hour apart. Between them, they are building an urban region, a "multimodal exchange pole city" or a "city



Hub 4: the hub, central neighborhood

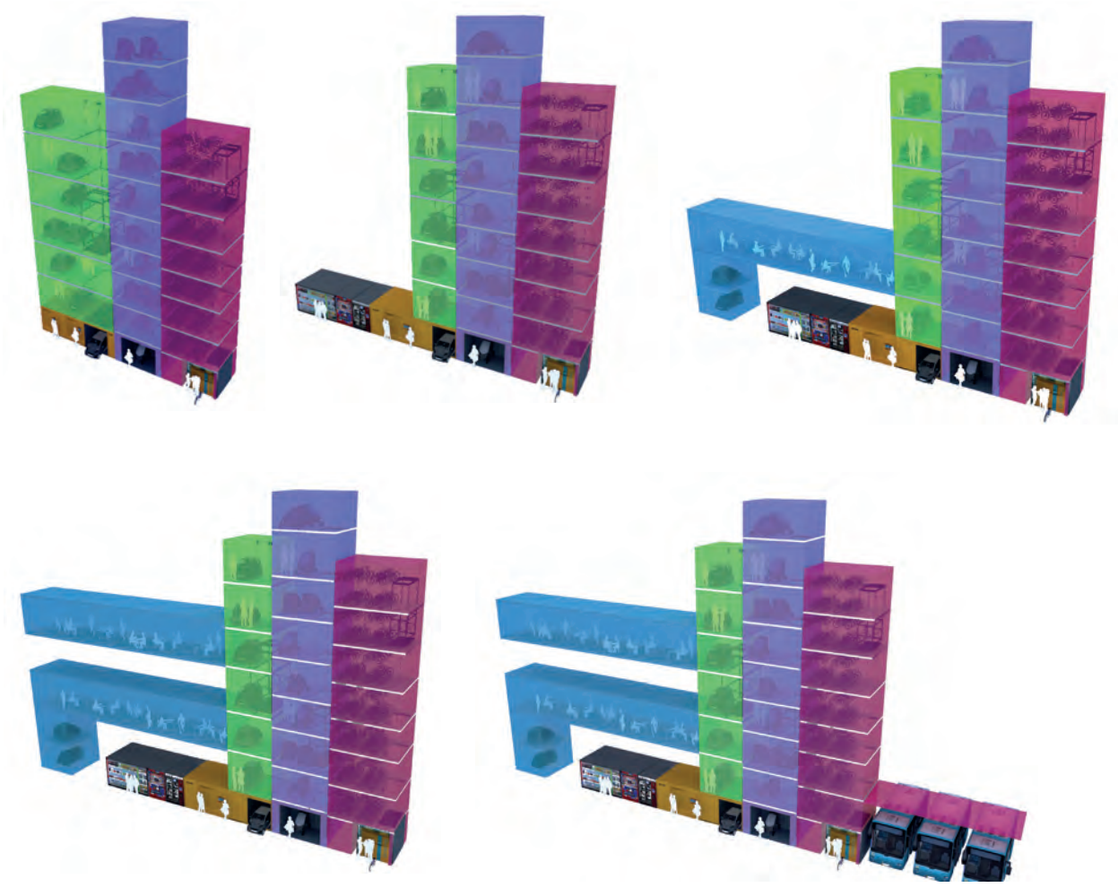
of hubs," and a life is imagined in traveling from one multimodal exchange pole to another, studying in one, working in another, consuming in a third.

The growth of hubs

The new generation of hubs is a new program that will also be introduced into sectors whose urbanization is to be created or confirmed. The idea is less that of a building than of a technical tool, a dispenser of everything we need, the generalized distributor. We will break down its organization:

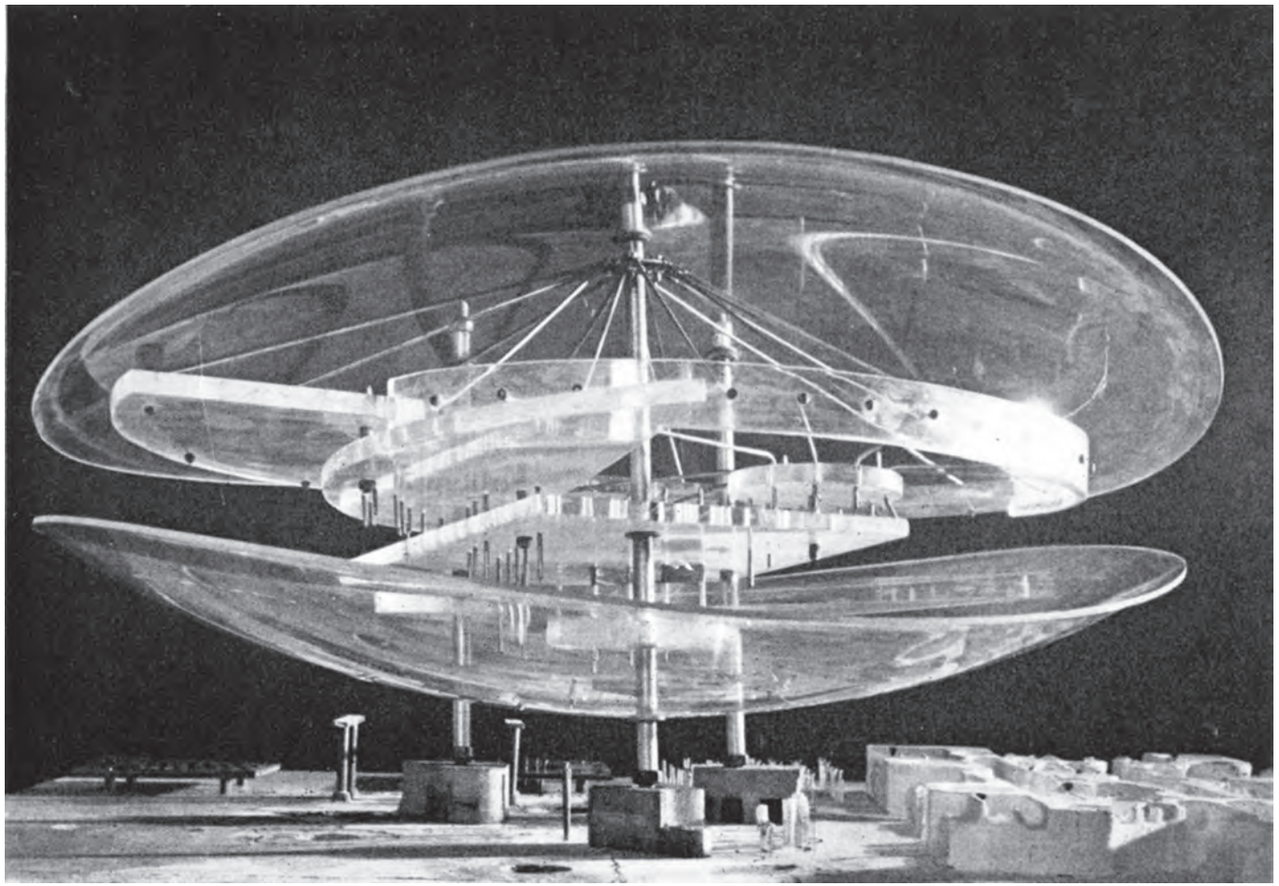
Heritage

This project by Constant Nieuwenhuys helps us imagine what the hubs that contain an imaginary dimension of networks might be.

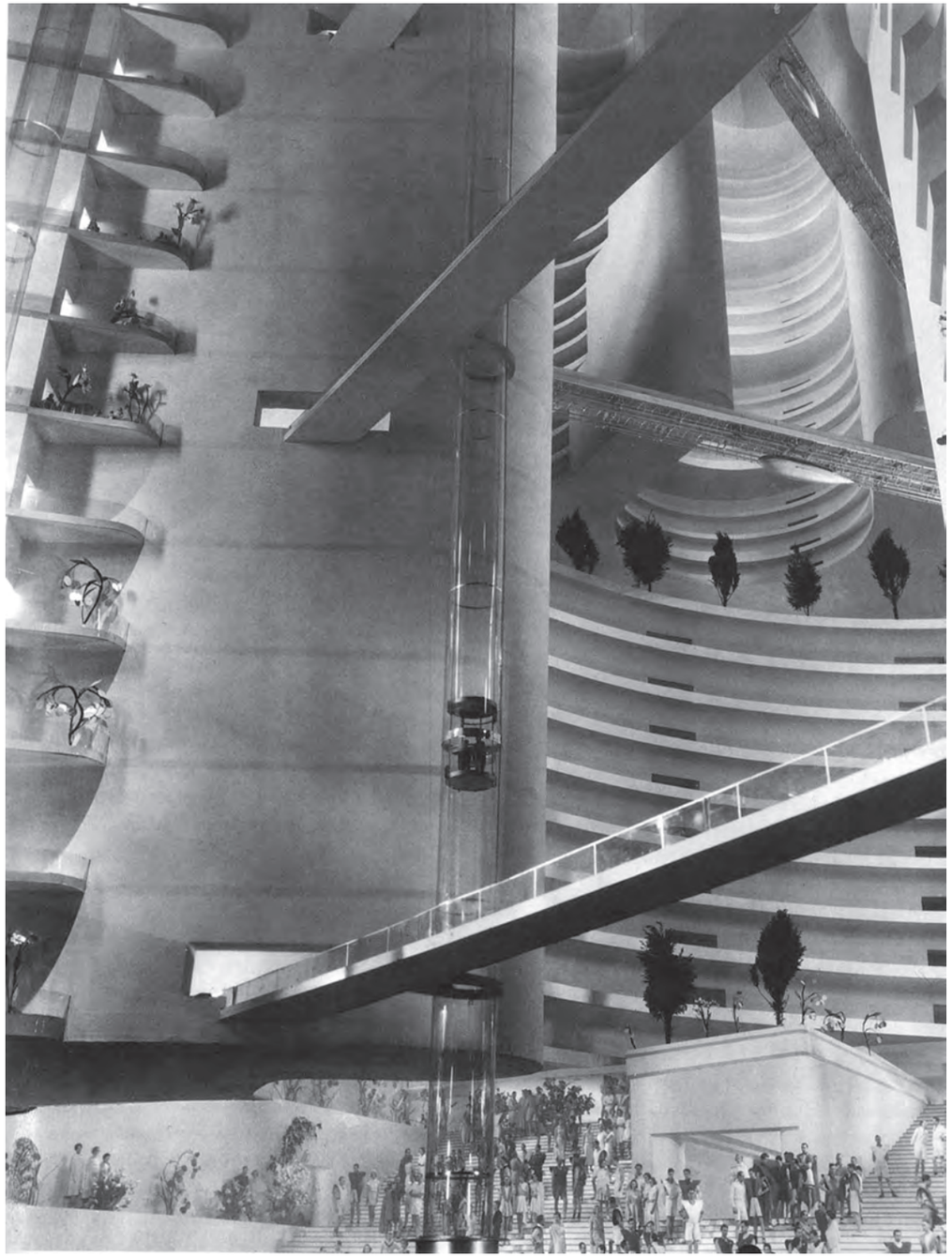


The growth of hubs, the generalized distributor: bicycle and car distributor, concierge service, virtual store, co-working, teleworking and bus station

The imaginary dimension of the large interior halls of the futuristic movie theater is also to be updated to understand these hubs to come.



Future hub: Constant Nieuwenhuys, *New Babylon*, 1960



Future hub: *Things to come*, 1936

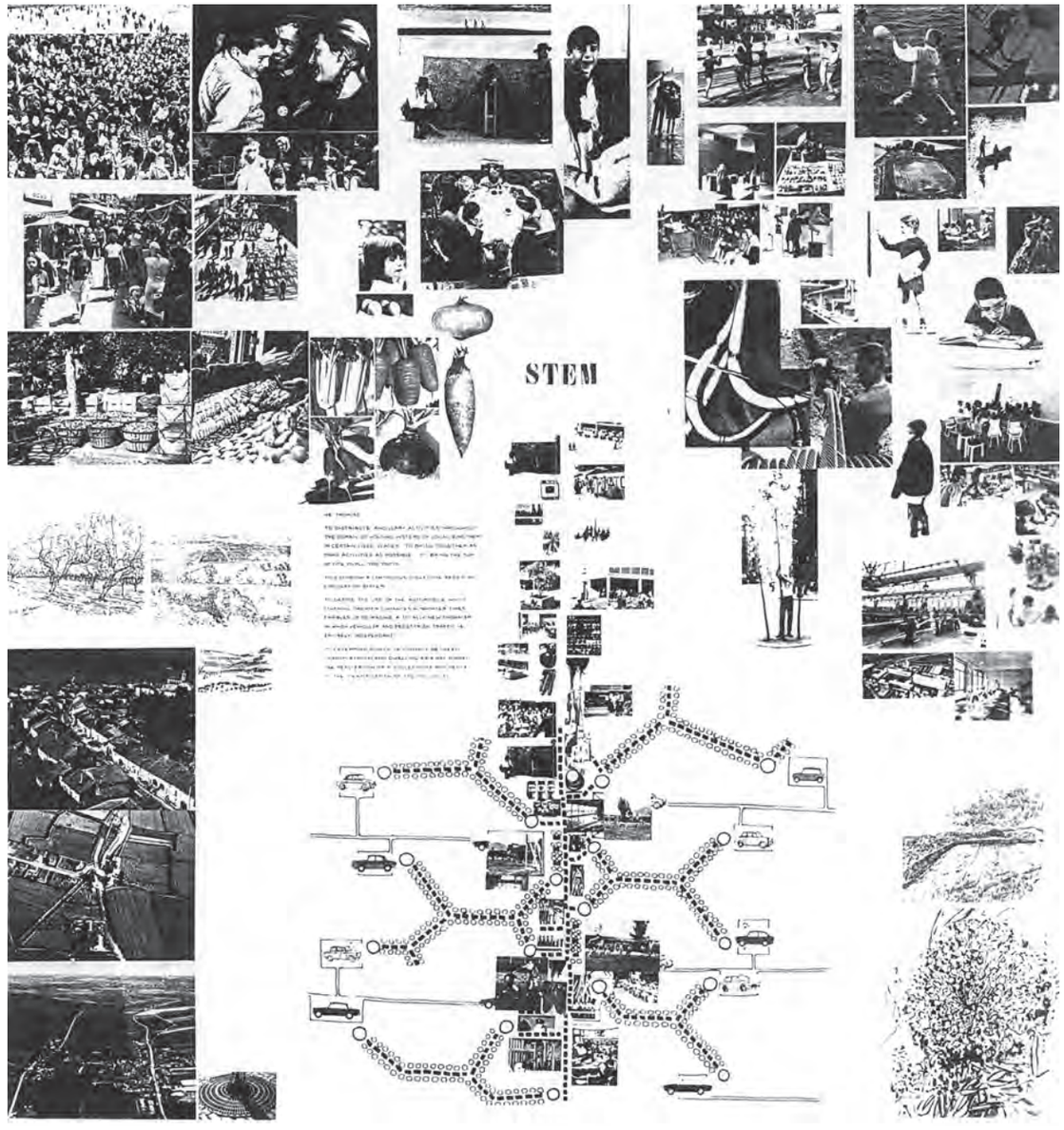
EXCHANGE

The interface between transportation modes is a decisive challenge for the multimodal exchange poles currently being built. These mobility exchange spaces will make it possible to access all the available vehicles: various kinds of bicycles, Segway equivalents, traditional car-sharing vehicles, taxis, ride-hailing vehicles, vehicles with delegated driving, car-sharing with a passenger arrival/drop-off point, public transportation, urban and ultra-urban cars, ECVs of all types and public parking facilities and their services (recharging and maintenance of vehicles). The hubs are also privileged places for concierge services and package distribution.
The new hubs will transform the programs they are linked to. We may think that one of the trends will be to consider these activities in a more or less identical manner, as services that are much more than symbol-laden buildings. The concept of "stem" (linear center) contained the same idea as the services, the activity itself, taking precedence over the building, which did not have "an image." The hub also receives, without any distinction, all the activities, in particular, spaces for reading and relaxation, spaces for cultural activities and associations, as well as fab labs. This "progressivist" methodology that organizes the urban space based on travel should make its comeback with the development of ECVs and sharing.

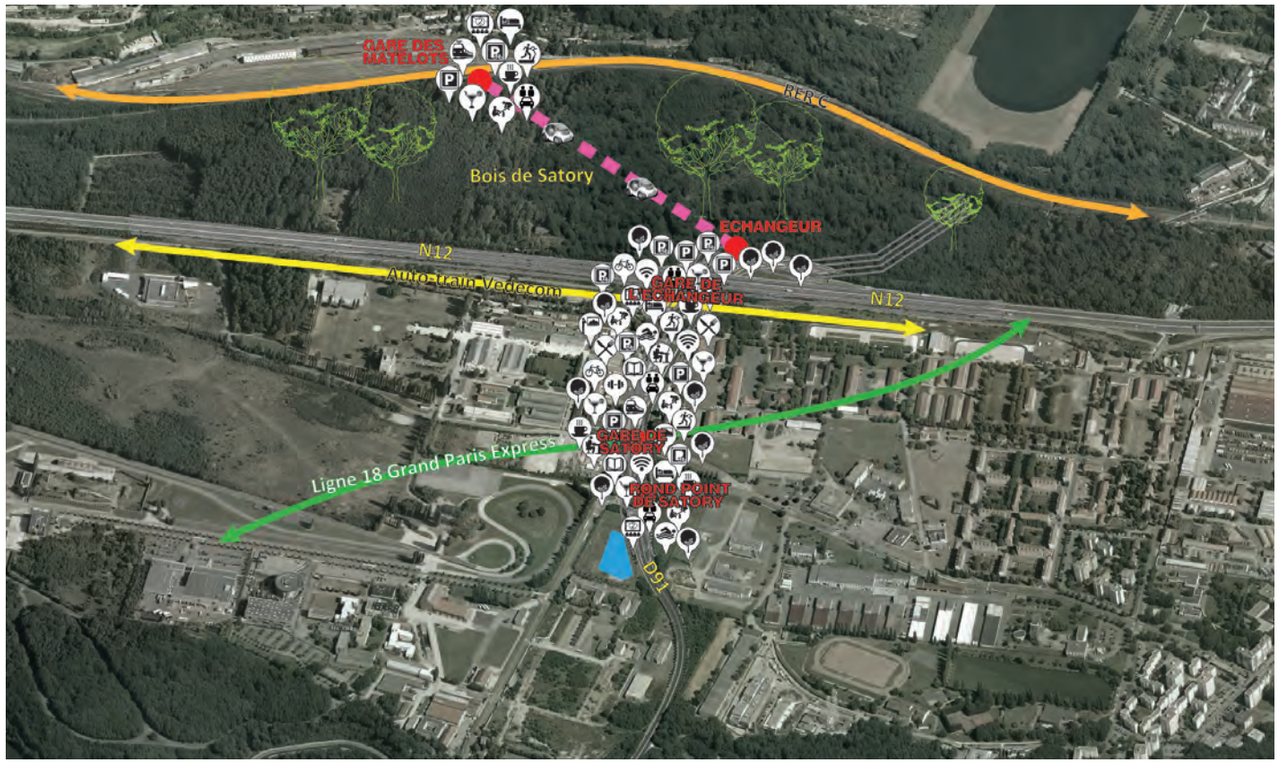
The Plateau de Saclay, a strategic placement?

One of the difficulties of auto-mobility is the break in use between various accessibility vehicles and longer-distance vehicles or other means of transportation. On the Plateau de Saclay, many of the managers use five transportation modes: service car, personal car, motorcycle, suburban train, inter-city train. This multi-mobility is not slated to decrease with the development of ECVs.
These traditional vehicles handle all urban and peri-urban commutes, but they circulate in very heavy congestion. In our narrative, the Plateau de Saclay is covered by all types of environmentally friendly vehicles, consequently, for example, for the vehicles that are currently marketed:
- Electric vehicles of the Leaf, Zoé, Ion, Blue-car, I-miev type and other C-zeros, which reach traditional speeds of over 130 km/hr.
- Urban accessibility vehicles, 50 km/hr. and sometimes more. They are ECVs: Twizy (Renault), I-road (Toyota), VeLV (PSA prototype vehicle, Hiriko, Coms EVS (Toyota), etc.
- For very great accessibility vehicles, the reachable distance at 20 km/hr. in 6 minutes is 2 km. Assisted bicycles or rickshaws or other very great accessibility systems enable easy trips for the elderly,[150] those with reduced mobility and adults with children.

All these vehicles are very well adapted to central meeting zones at 20 km/hr. Some of them, as we will see, can use bicycle lanes. Between all these vehicles, including those with internal combustion engines, exchanges are to be planned. Parking, recharging and exchange and rental, will create specific places. This is a priority in the hubs in which these exchange parking facilities will be located, but also in parking facilities shared between companies, schools and accessibility poles.
The hub is linked to a rapid transit station: metro, suburban train, high-speed train, inter-city train. In Saclay-Orsay, it would naturally be preferable to locate



Stem, activities as services and not buildings (Candilis, Josic, Woods, 1960)



Satory, new hub and activity cluster

the scientific cluster on a common high-speed train-suburban train (line C) – the future metro (line 18) of the Grand Paris Express – and not on "isolated stations" (Polytechnique-Palaiseau or Gif-Orsay). If this difficulty is not overcome, the site's attractiveness and use will be considerably diminished for a long time to come.

Satory, a large-scale relay

The Satory site is difficult to access, principally due to the traffic congestion on the large ring road, the A86 highway. It would be desirable to give drivers the possibility of leaving their car at the station of the future metro line 18 and then taking the Grand Paris Express. From the parking area, they can then take the metro or shop, or reach the Saint-Cyr-l'École station,[151] or wait for an appointment or simply go to the office.

Consequently, in Satory, the hub, positioned on the stations of the Grand Paris Express line, would bring together bus lines, parking facilities, a group of stores and entertainment , culture and relaxation spaces, shared offices and conference rooms, in the end a very considerable cluster of activities.[152]

PARKING FACILITIES AND CO-WORKING

The "third space" is a generic feature of the 21st century, an ambience of the period that is spreading to all companies. It is entering every project, action and behavior. Working is increasingly less tied to a particular place and in many situations can develop more or less anywhere as soon as there is a table and Internet access. Stations and cafés are work sites, offices in a certain way. Co-working sites, both work space and network, are privileged venues for people who travel and need to settle down somewhere.

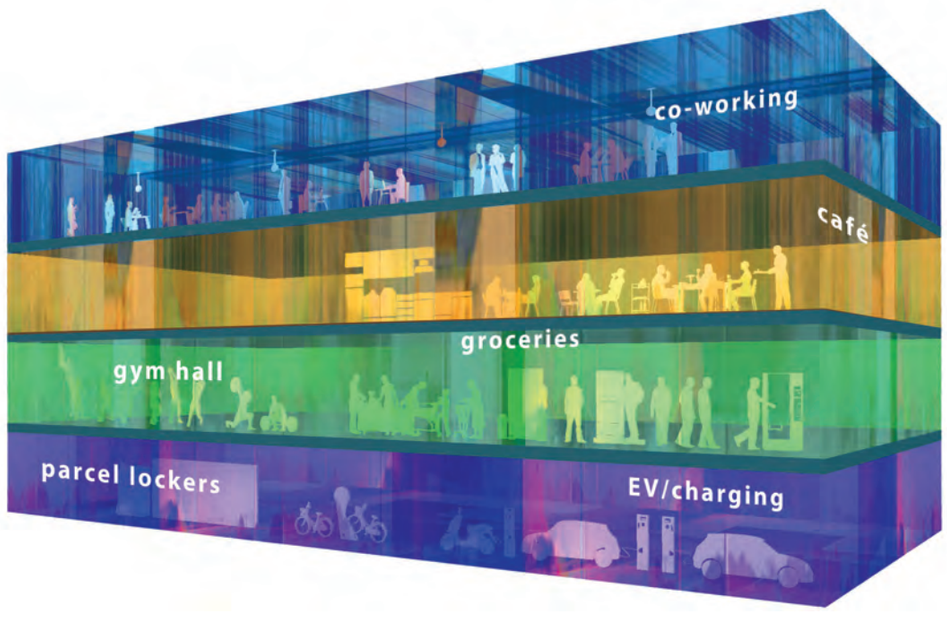
This need to make a stop had appeared as a moment of rest, a pause for a few hours in the turmoil of the city, on the roofs – "halt, stopover, but not a dwelling properly speaking., let us even say: nothing of a dwelling" (Ettore Sottsass, 1968) –, or for the "nomad women" of Tokyo (single), a possible isolation in the fragile shelters of the Paos, also built on the roofs (Toyo Ito, 1985). Today, it is a work time in a place whose advantage lies in being shared and well equipped.[153] It will be found more and more frequently at every point on the urbanized continent. It amounts to deciding to get together with others somewhere. The program is like the café, the library, the workroom. This example clearly shows the interaction that the zeitgeist produces: facilitated

Co-working swimming pool in Satory

travel favors the creation of meeting places, it creates the demand for them. Congestion creates the neo-nomad, the neo-office.
There is no direct and simple relationship between the vehicle and co-working, but they both belong to the sharing and collaboration society. They both save on travel, and in a certain way, one carries along the other.

There is a trend toward the new generation's work modes being practiced together in the same company: work from home, localized work in a co-working space, work in a group of workstations to be occupied (to be reserved) according to the needs of one or more companies, spaces made available to companies... They will mostly be positioned in the immediate accessibility of exchange and accessibility places, but also places of cultural, sports or associative exchanges.

Shared spaces, for meetings, an associative crèche, a gym, but also cafés and of course collaborative work are being amassed. They are places where do-it-yourself tools, which can be stored and visible in boxes at the concierge service area, are shared. The hub concentrates these programs and provides the services of a fab lab. These programs act as personal or professional development places; sometimes their effect and functioning is that of company incubators. They also have their place in sectors that are poorly equipped and linked, such as disadvantaged neighborhoods. The presence of a public transportation station with dedicated tracks or lanes is by definition favorable to the establishment of these programs.



Activities and co-working in a hub

Park-and-Ride and activities

DISPENSERS

On the metro platform, in the train station hall, at the bus stop, or just in the street, we shop by clicking on the bar code of the product chosen. It will be delivered directly to our home. Tesco in Brussels and Pickbe in Barcelona, like the South Korean Home Plus distribution chain, propose to public transportation users to make their purchases in a totally virtual supermarket. Large panels presenting the sections replace the traditional billboards of metro station corridors, on the platforms themselves in Seoul. The users scan the QR code of the products of their choice with their smartphone. The order, paid online, is then sent directly to their home. These virtual stores blend into the consumers' daily life and transform waiting time into occasions. The time usually lost in public transportation becomes "profitable." Virtual stores must nevertheless accept that connected refrigerators will one day make these purchases themselves...

Mongrandquartier.com is an experiment initiated with the Grand Quartier shopping center in Rennes and its 90 independent stores by the "Bretagne Mobilité Augmentée" group mentioned above. The aim of this experiment is to gather together an object to be sold, for example, a dress, through "enhanced interaction": rather than going into all the stores to find the dress and try it on, the first choice/sorting is made via the Internet, to next make an appointment at the store selected, "to be received like a VIP," and to buy it, or not. The savings are environmental, having limited the number of visits to the different stores to find the desired object.

The dispenser – of bicycles, chickens, pizzas, cosmetics, umbrellas, milk, eggs and vegetables, packages (picked up or deposited) – is already a hub in itself. Delivery boxes (Amazon, Darty, Monoprix, Neopost,...), will be able to be installed in it.

Well.ca, subway (Toronto)

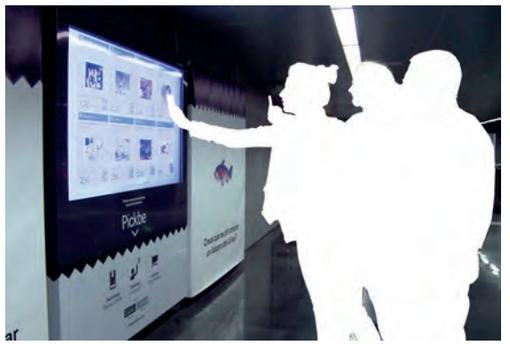
Tesco, Home Plus Subway (Seoul)

Tesco, bus station (Seoul)

Woolworth, bus station J.-C. Decaux (Melbourne)

Gare du Midi, Cube Delhaize (Brussels train station)

Well.ca, subway (Toronto)



Pickbe, subway (Barcelona)

Kate Spade (London)

Virtual Books – hop-coop

Cityssimo, La Poste (Sceaux, France)

Paczkomaty (Poland)

Pickup station, La Poste (Lagny, France)

Fresh vegetables (Sommereux, France)

Lait cru du jour (France)

Œufs frais 24 h/24 (Burgundy)

Benefits Store (San Francisco)

Umbrella stand (Japan)

Lagny's Pizza (France)

Underground bicycle dispenser (Springtime, Amsterdam)

Shibuya (Tokyo)

EVERYONE TOGETHER

The presence of vehicles in the heart of buildings is becoming widespread. Vehicles are no longer present only in motor vehicle shows, but also in supermarkets, where they are creating a new program, the multi-drive. Commercial developments above the ground floor receive vehicles on every level. The heroic “modern” architecture examples of vehicles entering buildings is proliferating, making the urban world more porous, diluting the distinction between buildings and the exterior space. In the same way that escalators were built in exterior spaces and enhanced or repaired them, vehicles are entering interior spaces to improve their functioning. ECVs circulating on footbridges are becoming liaison tools, in particular between 20th-century buildings isolated from each other, such as college campuses.

A large common space, the heir to the Crystal Palace, like the city-ambiences of the Situationists, is created through vehicles entering buildings. This space-ambience is the perception of the environment that is being established, truly in the spirit of the time.

The multi-programming of buildings and their capacity to evolve tends to produce architectural morphologies that resemble each other and consequently to produce neutralized environments. However, inversely, this neutrality of architecture makes it more favorable to welcoming information tools, making the architecture even more hyper-readable or hyper-sensitive.

The elimination of the limits between buildings and cars is also typical of the new uses of the public space. In shared spaces where pedestrians are a priority, the large common space is the concept that describes the new public space. The contemporary dreamland – the “soft city” – is becoming a reality. The cities’ new silence characterizes the ambience of the large common space, it offers real estate opportunities while reintroducing road and highway spaces into the urban space. The street here is dominated by the sharing of presences and activities, both public and private. Comfort characterizes it.

MULTI-DRIVE, THE CAR IN THE SUPERMARKET

The motor show is the space of the future in the present, the natural place for the non-polluting quiet car. The car is completely at its ease in a large “salon” heavily frequented by visitors on foot. The motor show becomes a model of public space, a venue for a festive encounter.

Paris Motor Show, 2014

Ideal public space

Walmart supermarket

The establishment of the motor show or, another version, the car museum, is comparable to both the museum itinerary around works and the commercial itinerary around supermarket displays. The supermarket itself has electric wheelchairs that become electric cars, as in Walmart stores and Tesco hypermarkets. The elderly, but also consumers who buy large quantities of products, are its leading users.

The extension of this practice will be favored by the elimination of the double change in transportation mode linked to parking in front of the store. We are familiar with one of its initial forms: the drive-through and a more recent permutation, the “click and collect.” A new program has appeared, the multi-drive, in which the hypermarket and its parking facilities are brought together in the same building, sometimes totally enclosed in a large hall, sometimes half open, half closed, closer to the market fair.

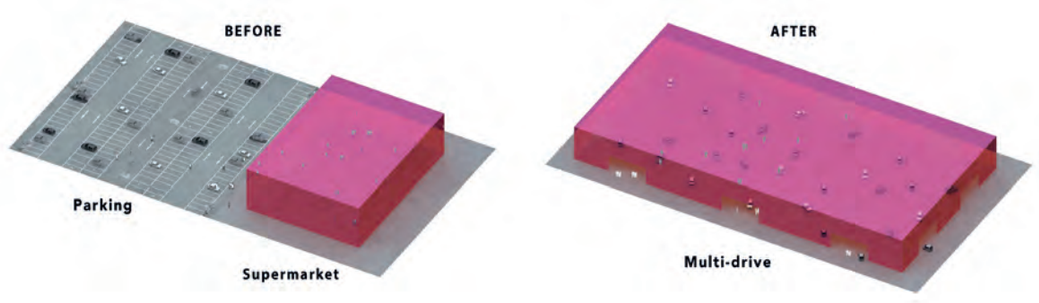
As in the traditional shopping center, the placement of this new program is linked to the earlier presence on site of a parking area that is transformed into a commercial hall.

Escalators go out, vehicles come in

The separation as human as it is traditional between inside and outside has disappeared with escalators. And in the same way as escalators have conquered outdoor spaces, from Hong Kong to Medellin, reciprocally vehicles are entering buildings

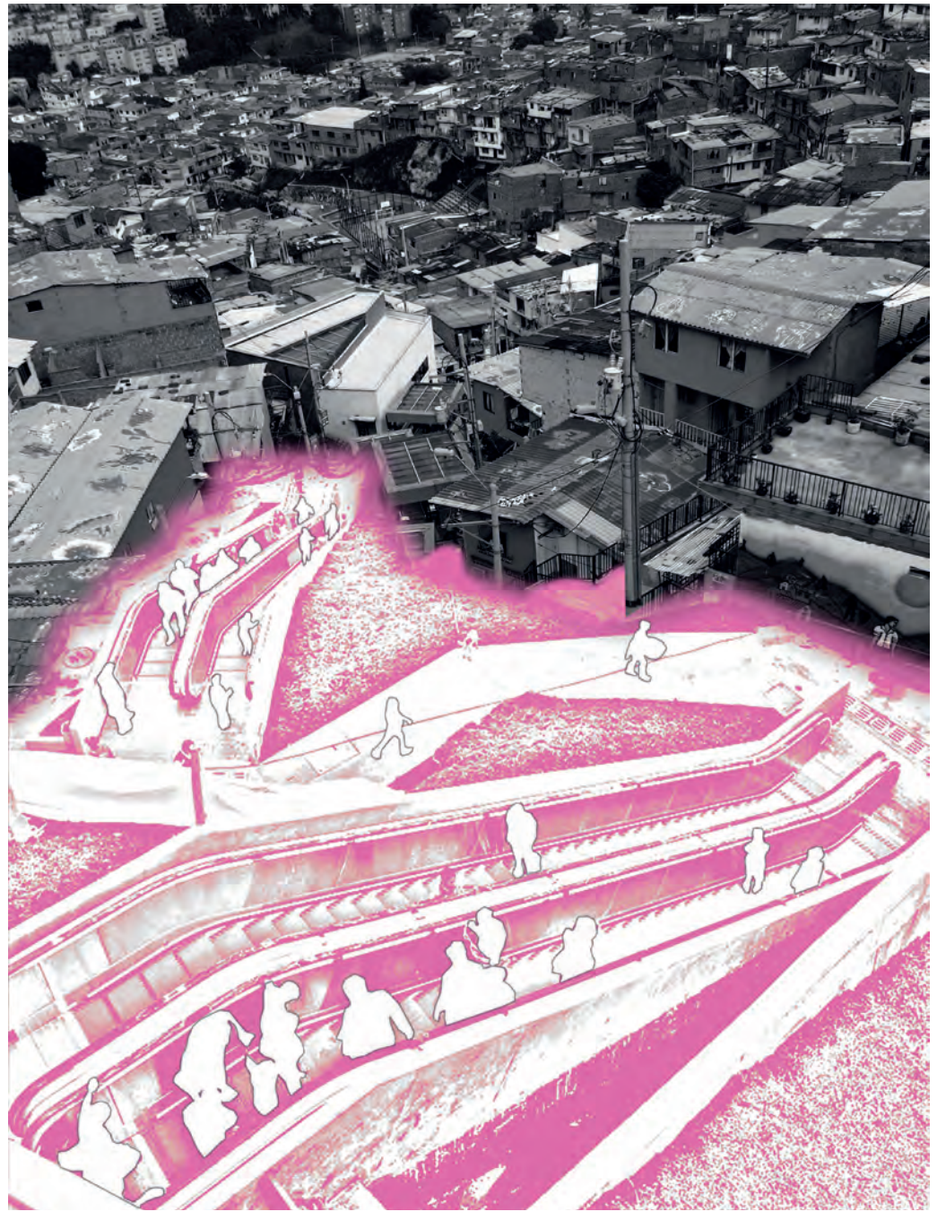
The street can henceforth genuinely enter the building and continue above the ground level. Parking facilities or circulation on the roof (Lingotto, Plan-Obus, Roissy, etc.) are no longer an exception used as a

The multi-drive

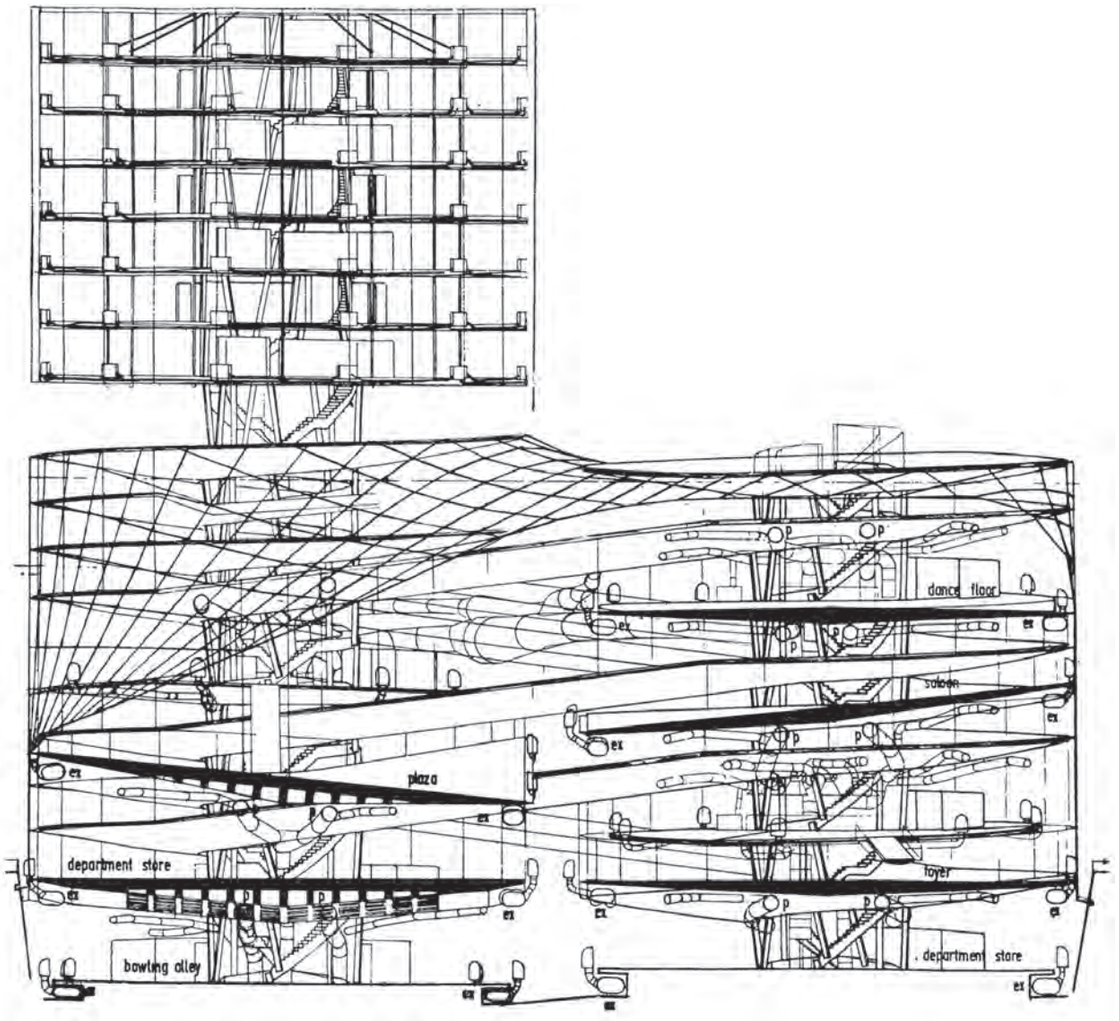


Passage from the supermarket to the multi-drive hall

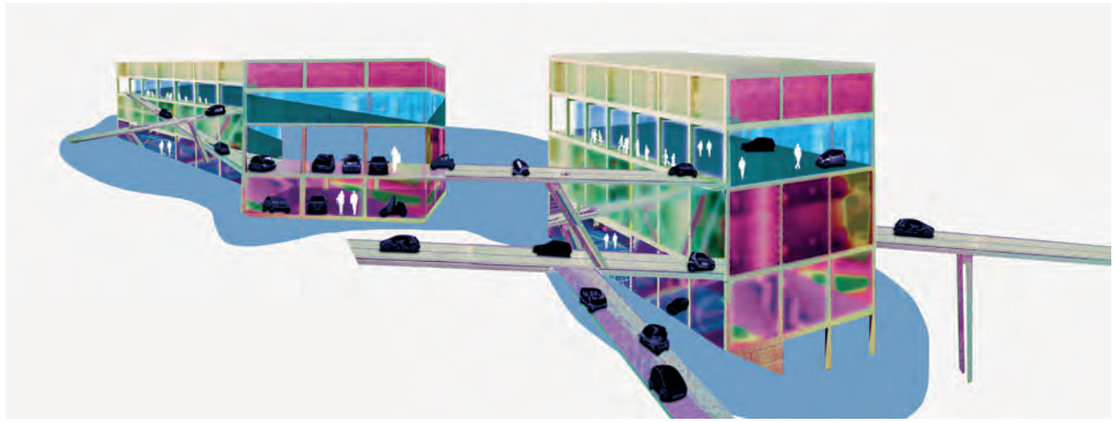
Hong Kong



Medellín



Sin Center (Mike Webb, Archigram, 1959-1962)



Orsay repaired

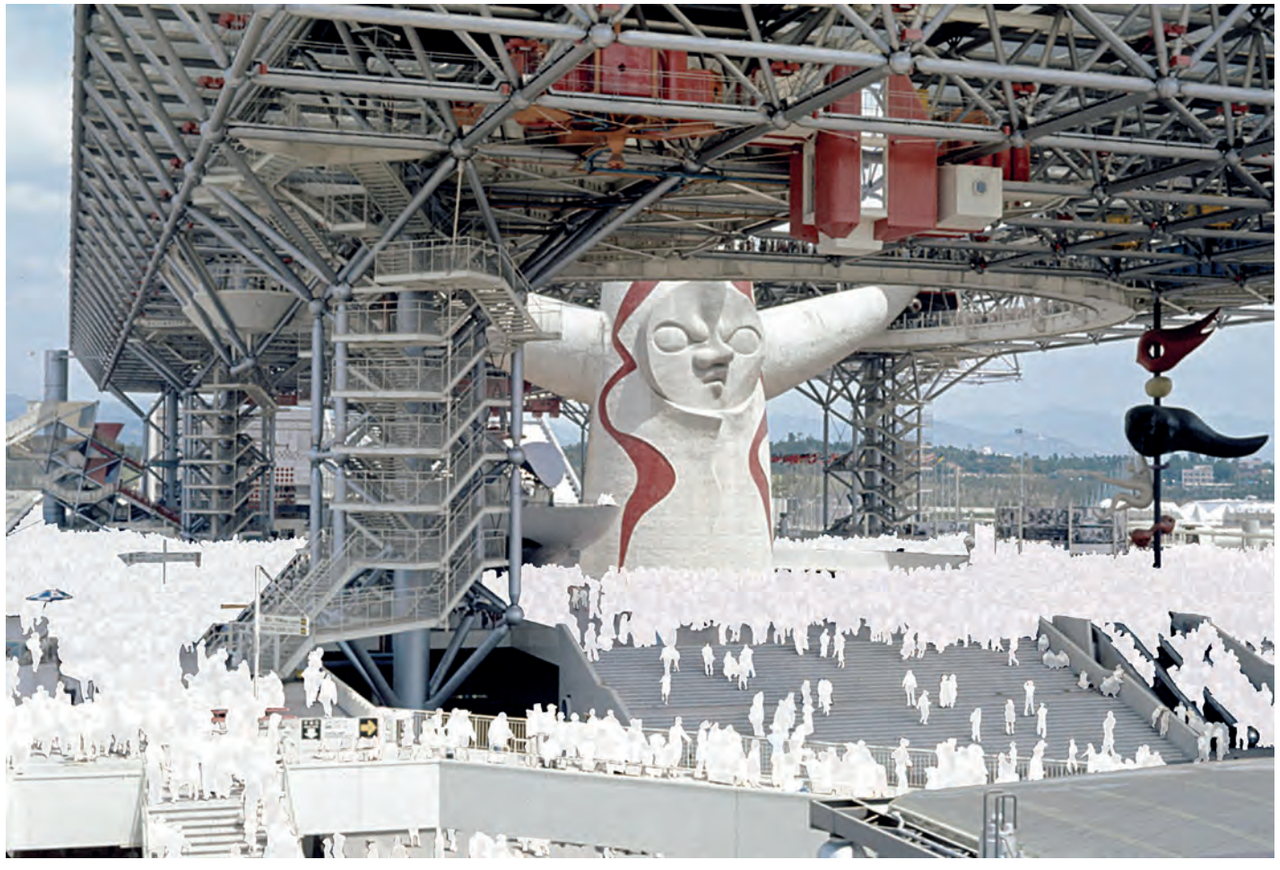
demonstration. The new vehicles will "secularize" these sacred figures of the architects' architecture.

If we are familiar with vehicles being raised above the ground floor, electromobility makes this even more obvious and increases the perception of accessibility: the clean vehicle has the right to go up and be parked. The gain in efficiency and simplification can prove to be effective for shopping centers, even for service buildings: we no longer have to take the elevator, there is one less change in transportation mode. Very large commercial areas are presenting zones that welcome ECVs. Outside, ramps become rehabilitation and liaison tools between programs that are too far apart or separated by a difference in level.
The crossing of the escalator and the car provides a tool for repairing sites and campuses. The escalator and the moving belt are replaced by the ramp accessible to ECVs that link the buildings.

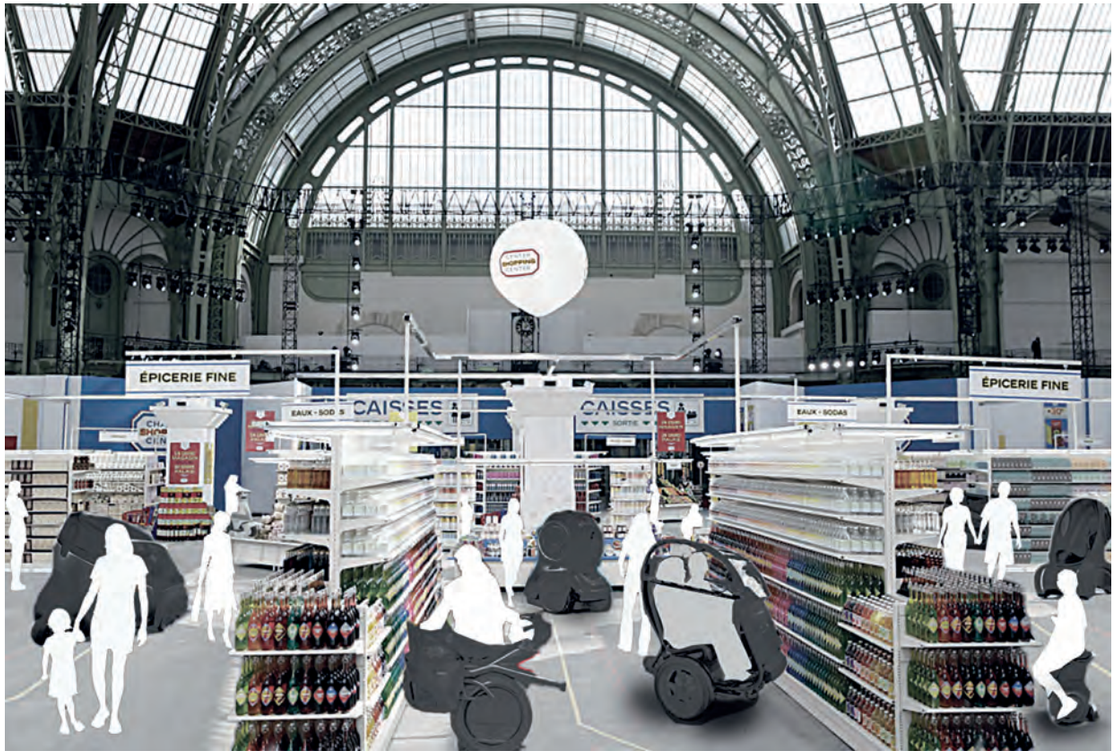
Examples of this type have been spotted in the Japanese city by the Bow How collective, fascinated by the programmatic intricacies of Tokyo buildings, and in particular the presence of vehicles above the ground floor.[154] ECVs will increase and "naturalize" this osmosis between vehicles and buildings, both through the new value acquired by slowness and the elimination of different types of pollution.
The decrease in speeds on express roads – totally or on lanes reserved for ECVs – will enable direct access to buildings from the lanes to be created, a rare practice, as much in Japan as in Europe.
We can also envisage that the use of express roads by ECVs will globally bring about a drop in the authorized speed in urban zones in order to limit the risk of accidents between traditional vehicles and ECVs.

THE LARGE COMMON SPACE

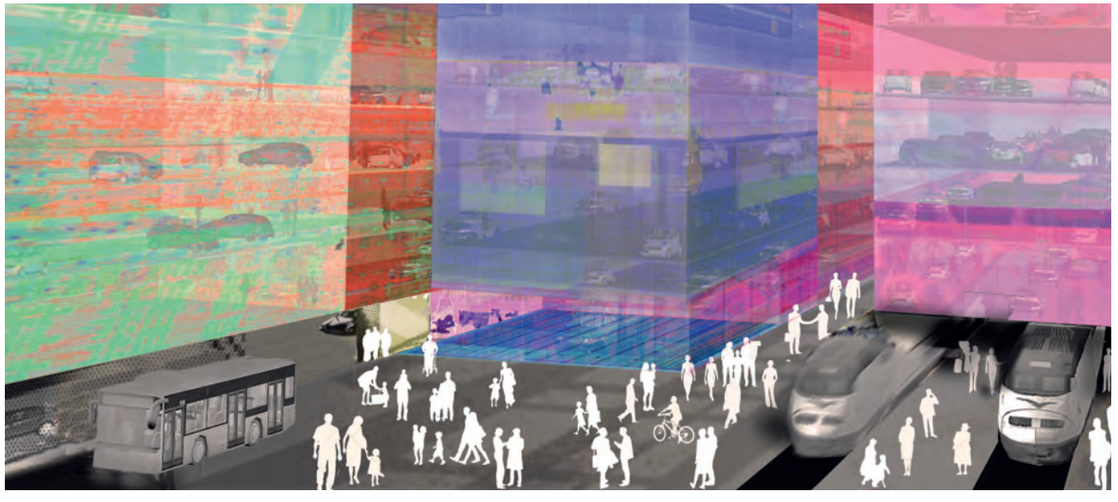
The model of the large common space was presented by the Crystal Palace in Brighton, the Grand Palais in Paris and 19th-century train stations, but also by the covered esplanade at the Osaka Expo in 1970, and the São Paulo cultural center, which combines a metro station, paths and all the contemporary activities, between the Learning Center and the cultural center. The large common space is enormous, it provides the generosity of spaces. “The large common space” defines, in Constant Nieuwenhuys, the very essence of his Babylonian utopia, a “city-ambiences.”



Large common space (Osaka ‘70)



Shopping center, Chanel fashion show, Grand Palais, 2014



The station, pedestrians, roads, brought together without any border in the large common space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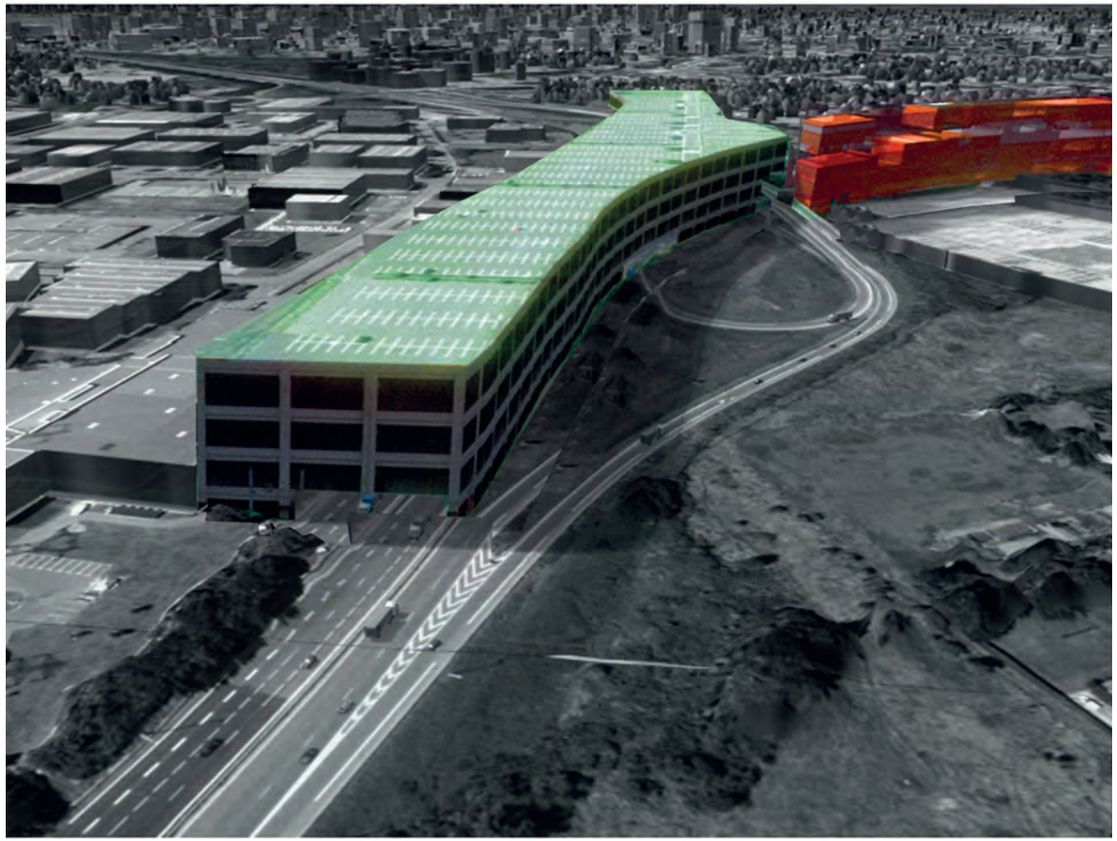
QUATTRO4U

Complex bus stations are models of inter-relations between the car and architecture

NEUTRAL OR HYPER-SENSITIVE

Many places in the hubs will resemble each other: the parking area with a high level of services will be in a shopping center that itself will be a station hall and a jogging path, adjoining a rather new type of multiplex theater, and a sports-entertainment complex. On the platform, we click on the bar code of a product that will be delivered to us. There is a configuration here that seems to confirm a type of space that we have thought of for a long time, an extremely neutral space, specified by what happens in it and by the information that is provided in it. This neutral space needs everything; it is a simple support.

Large covered parking facilities, large warehouses and concrete halls provide an image of interchangeability and co-presence typical of the near future in their neutrality.[155] The space of the near future will be flexible, able to welcome, in the long term, both vehicles and offices beneath a uniform ceiling height. The programming over time of buildings, and particularly the shift from parking to the service sector, and vice versa, will create this intertwining and the neutrality that results from it.

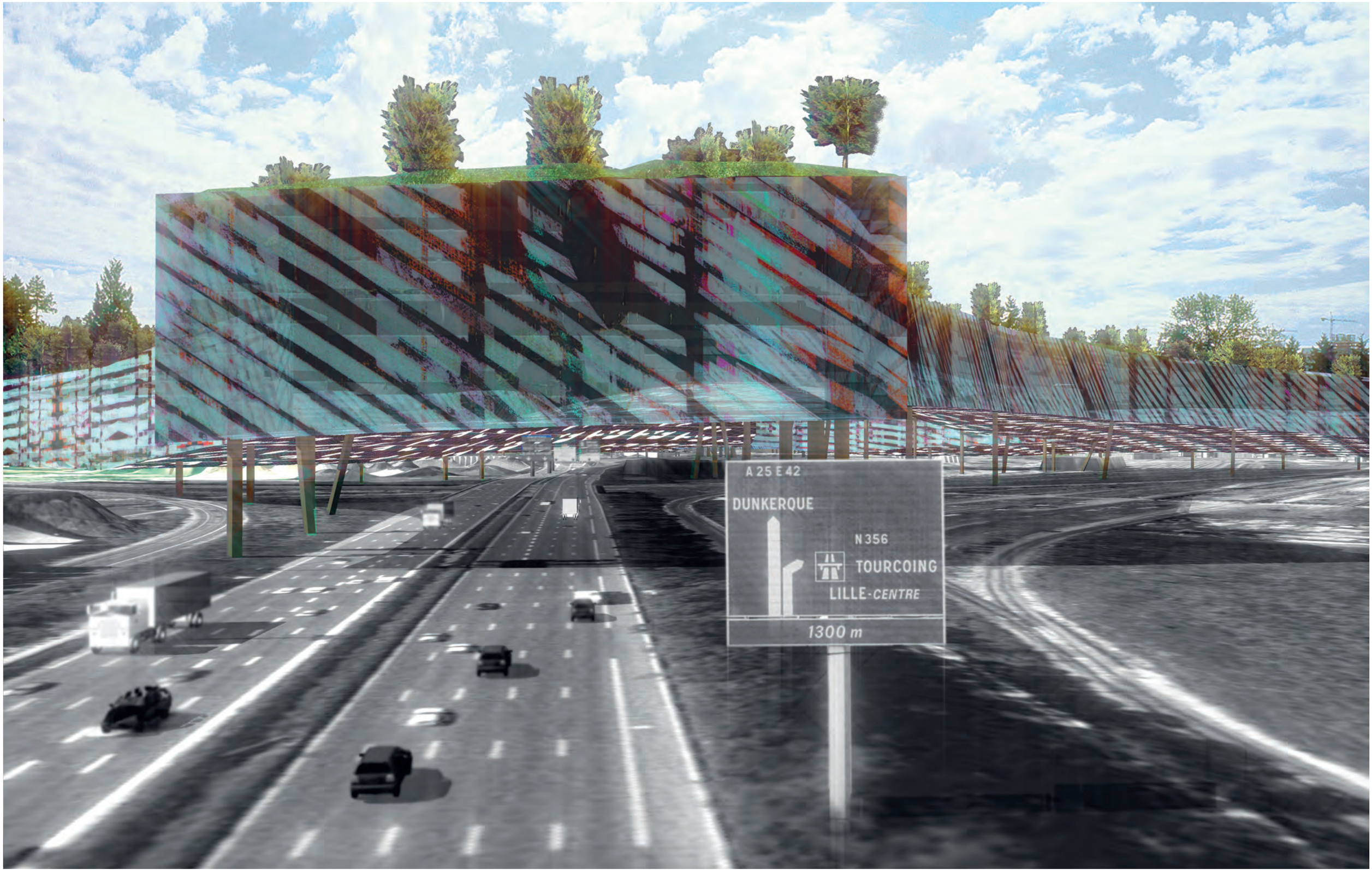


Lille 2004 - Architecture Action

Another constant, that of communication itself, can be put forward or added to this neutrality of the space. As soon as communication is dominant, all the objects fabricated conform to the communicating model. For architecture, there are not that many communication modes, between information, formal captivation and seductive experience:

- The hyper-readable space: the occupancy of buildings by signs, advertising logos or other decorations, screens.
- The hyper-visible space: the form itself as visibility, sign or signal.

Hyper-readable, hyper-visible and hyper-sensitive: Porte de Bagnolet - Architecture Action, 2003


A 25 E 42
DUNKERQUE
N 356
TOURCOING
LILLE-CENTRE
1300 m

Hyper-sensitive: Lille 2004 - Architecture Action

Hyper-readable, hyper-visible, hyper-sensitive: concert, Monaco, 2011

• The hyper-sensitive space: the creation of perceptions or an itinerary of experiences.

The three communication modes are brought together, as in this example for the Porte de Bagnolet.
The hyper-sensitive space creates surface or color movements, perceptible for drivers.

These three visibility modes can be virtually expressed as much by light projections or movements as creations of objects or virtual spaces. Fireworks are then the movements of LEDs in the space, comparable to a star-studded vault or an overdeveloped Times Square.

MEETING

The enhancement of public spaces by the creation of pedestrian or soft mobility zones can be combined with the creation of cultural events, temporary or not. Reciprocally, the quality of public spaces is an invitation to leave behind an internal combustion engine vehicle to stroll through an environment pleasant to cover on foot or in an ECV.
Since the advent of the car, streets and boulevards have been transformed and are only fully reinvested during demonstrations and revolutions.

In a dense metropolis such as Paris, the average speed of vehicles, all types taken together, is 10 km/hr. and 95% of the time, the vehicles are not moving. The electromobile city will be soft and fluid within the shared space. The first electric car users and pedestrians were amazed at the silence of the vehicle, one that no longer makes noise (and de facto to have sound added). Public transportation modes and light vehicles that share the street can have light or sound warnings, or even alerts painted on the ground before the vehicles go by.[156]
The comfort of the public space will considerably increase. It is a homogeneous ground surface that will arrive, unified "from façade to façade" without any sidewalks – as is already sometimes reclassified – on which all the vehicles cross each other and share the ground with pedestrians.
ECVs encounter a new urban model here: the green city gently reconquered that will be institutionalized in operations like Paris Plage (with its beach along the banks of the Seine, 2002), on the model installed in 1996 in Saint-Quentin. The use of the city as a "beach" has been instituted in all the capitals. This urban organization is similar to events such as "parking days" (temporary transformation of paying parking places into convivial places) or examples such as the "Sunday Streets" of San Francisco, or the ciclovias created in Bogota at the end of the 1970s. A hundred or so large cities in the world have created their "car-free Sundays." The international event "Ecomobility" requires excluding cars from an urban space for a month. It will lead to rehabilitating a neighborhood in Suwon (South Korea). The inhabitants of Berlin, however, rejected this event, which was supposed to be held there in 2015.

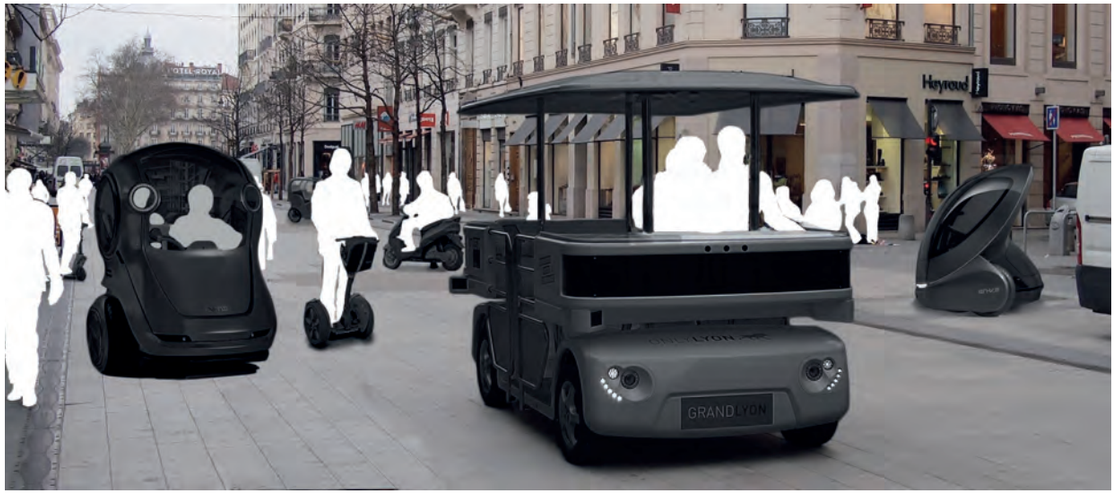
These occupancy examples show what the public meeting space that characterizes the "soft city" will be. This new dreamland is a city that erases the distinction between the public space and the private space. The exterior space is reappropriated by the inhabitants and

Beach in front of the Saint-Quentin city hall, 1996

Tahrir Square, Istanbul, June 2013

users, in an approach that is more or less apolitical. The city occupied by pedestrians, the pedestrian zones as well as the city of events, the city of the 19th century too, are images that point to the urban future.

In this new public space, the "transported" behaves as though he were in public transportation, he reads, he looks at the landscape that can become a show. Thus, the automatic vehicle at 20 km/hr. contributes a calm and a tranquility of travel, on the model of the Navia, the robotized urban shuttle dedicated to the transportation of the "last kilometer."[157] Vehicles of this type are particularly adapted to the existing city, pedestrian districts and meeting zones, as well as to programs such as university campuses and "Science Cities," hospital centers, industrial sites or business centers, airports and the large halls of exhibition fairs. They are already accepted on islands where the balance of biodiversity



Scene of today's urban mobility with the robotized electric Navia shuttle

is fragile, where the internal combustion engine vehicle is prohibited.

Surfaces are recuperated in the city: those of parking places (10 m^2) and a part of the road reduced from 6 m to 4 or 5 m. When the road is narrow – and we can imagine that 3 or 4 m are enough for pedestrians and the new vehicles – the organization of every neighborhood is transformed. Certain buildings can be enlarged by extending toward the road.

The "disabled" access, for example, is in the process of reconfiguring the city and is becoming one of the indispensable input data. For the Tokyo Paralympic Games of August 2020, reflection is now underway on "a universal access for everyone to the different spaces," targeting all the populations requiring mobility assistance: the elderly or disabled, pregnant women or those with strollers, young children, tourists (who always get lost!), and the hearing, visually or intellectually impaired.[158] The visually impaired in particular are solicited in scenarios (not seeing, but being tactilely linked to cross a street, or, on the contrary, no longer having to do so...[159]).

The perception of the public space has been transformed with 30 km/hr. zones, meeting zones (20 km/hr.) and the circulation of cyclists in the opposite direction of traffic. These appropriations of the public space follow the desire for an increase in comfort, underway since the 1980s. The sharing of the public space and the remodeling of the public space, like interior renovation, anticipated the meeting zone then car-sharing.

The projects on "façade-to-façade" squares are markers of this current transformation. A utopia of the elimination of the fragmented or the earlier (1960s) "function-divided" space is being established. Today's shared spaces have made it possible to "really" represent this unified meeting space. They continue an earlier paradigm, the meeting of the city and the countryside that was represented in the popular imagination. With the

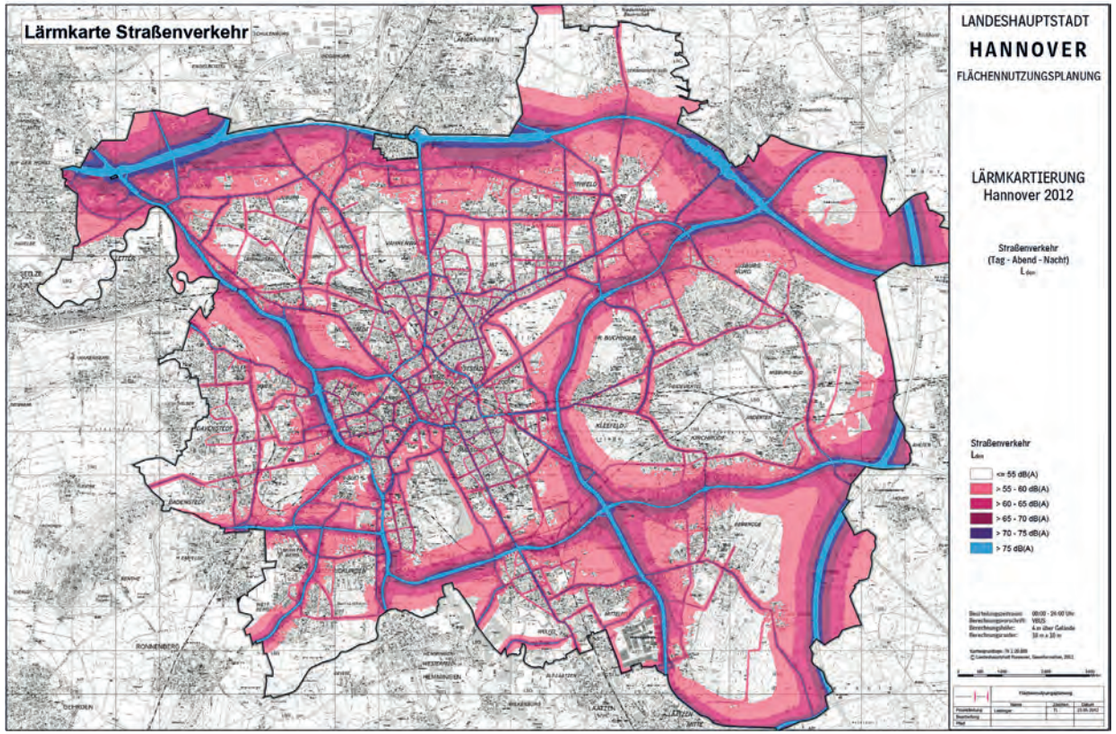
Ecomobility Parade, Suwon 2013

smartphone, the public space has improved its function as a meeting place or venue for fêtes.
Teenagers, children and those who accompany them safely use the roads, first calmed by a protected road and street network: broadened bicycle lanes, generalized bus lanes or a city organized into zones of 20 and 30 km/hr. Depending on the configurations, the seamless street and a meeting zone is extended. On a dedicated site or a shared spaces, automated cars arrive to pick up children at home and take them to school. Amazon delivery trucks will have been replaced by automated cars.
The automated car, the electric car, two-wheeled vehicles of all kinds are connected like extensions and accelerators of the transformation underway for several years or even decades. The shared space means that all functions are no longer separated but brought together in the same space, a large hall in which every activity is found. In other words, we don't imagine that these new auto-mobility tools have invented a new reality by themselves. They are being put in place and incorporated into an ensemble that they help modify. They act more like stimulants that permit behaviors, life-styles and trends to develop. New configurations will see new uses, new programs, new social and technical machinery emerge. Lastly, let us recall that mobility itself is in the first place one of the values of our time.[160]

THE (SOUND OF) SILENCE OF THE CITIES

The electric car is inaugurating the disappearance of noise in the city. The silence of the city will be a strange perception, both futurist and backward-looking: the city without noise, the science fiction of spaces without any atmosphere, the large photographic city of the 19th century, devoid of noises that photography did not capture. The idea here is of an incredibly powerful deep modification of our environment, which will be extended to the rhythm of regulatory changes.

The end of noise pollution is also the end of zones where building is prohibited along express roads or unused land on either side of highways. The silence of travel will in the end enable these unusable spaces to be put into service, real estate that the territories will reappropriate and reevaluate. The surfaces concerned are considerable in cities crossed by express roads with heavy traffic. In France, it is impossible to build on the first 75 m on either side of these roads. The land beneath express roads, less subject to noise, provides examples of efficient reappropriations.



Noise map – Hanover

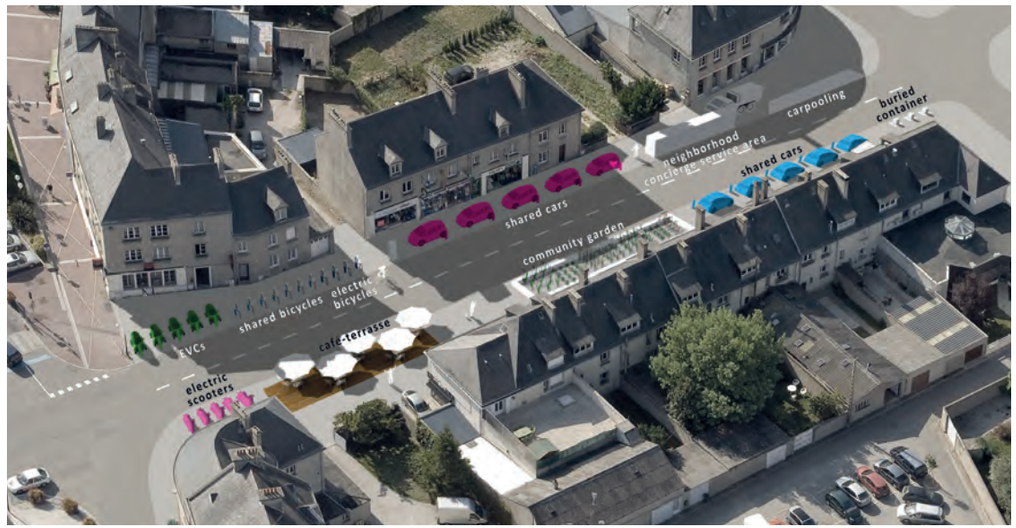
Taipei (Taiwan, 2011)

THE ECV STREET

Cities are installing recharging points in the public space.[161] This installation also guarantees, moreover, that the parking place will be used by an ECV.

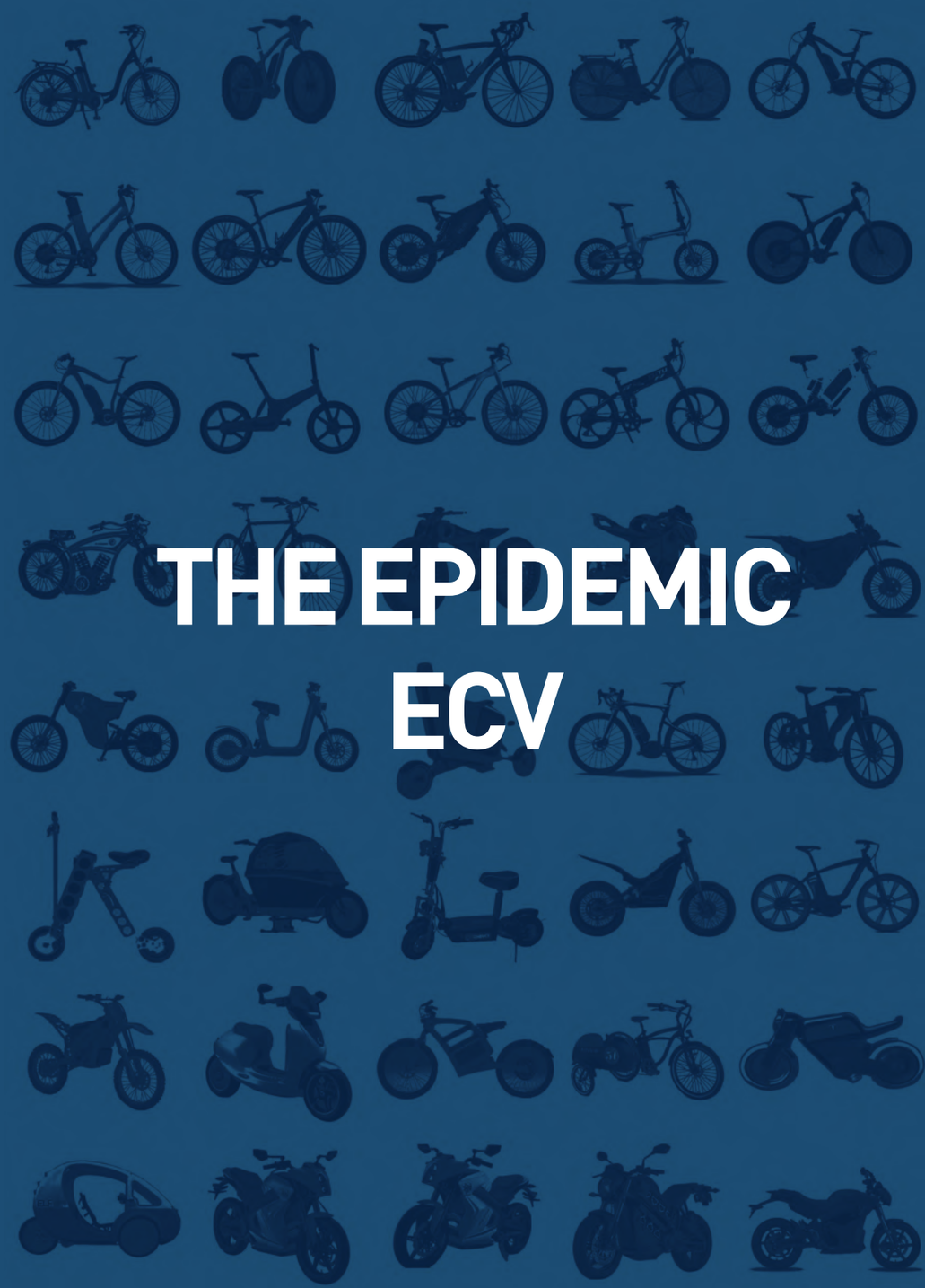
Private parking has practically disappeared on the ECV street. What is mostly found on it are parking areas for various types of car-sharing, the neighborhood concierge services, urban agriculture points, spaces for relaxation and games permitted by the street and the vehicles' safety (patios, playgrounds) and finally a carpooling and electric bicycle recharging station. The street of the immediate future becomes a space for technical exchange.

The frequency of parking areas dedicated to shared vehicles makes it possible to put your vehicle where you want without having reserved a parking place. The ECV street has a large number of recharging points, as many as the places available; it cannot do without them. This major question is a powerful curb on the development of electric vehicles. The ECV city will therefore take on a rather different appearance from what we are familiar with today, with the generalization of charging points on the streets. In a general fashion, the road becomes one of the important places for the integration of the digital technology that will make the city "smart," starting with its roads (e-road). What differentiates the "road of the future" from its predecessors is its shallowness. "The fifth-generation road" (R5G)[162] no longer stretches out in depth but shallowly to receive the many types of mobilities and information sensors/producers.



The street of the near future and its uses

The car looks for its electrical outlet ... (Paris, 2014)



THE EPIDEMIC ECV

ECVs are infiltrating the urban world and contaminating it. They use the dedicated tracks of public transportation, bus lanes,[163] bicycle lanes and byroads and emergency lanes. They circulate with the bus or cyclist, and according to their speed, they are in one or the other or create their own road.

Faced with widespread congestion, because of their small dimensions, they pirate and short-circuit the traditional networks and take over back roads. ECVs are epidemic invaders that introduce a new way of traveling in urban regions. Their routes are diverse, mobile and multiple during the day. In the peri-urban world, they weave their new network, that of each individual's trips. They don't respect the hierarchy of the roads. They modify meeting points in real time, they propose meeting in welcoming places rather than in the standard office. Their success is rapidly being recognized and approved by the increase in productivity of all the employees who commute. Companies are their leading supporters. In the end, they will have replaced traditional vehicles for which only a single lane will henceforth be reserved. Connected, automated, they will no longer need signage: the highway landscape will then be solely a memory.

Driverless vehicles silently and safely drive children to school, they take then to appointments and to all their activities, they have replaced taxis and ride-hailing cars. They are safe, comfortable, likable, punctual and reassuring for people with reduced mobility.

In the same way that traditional public transportation created its own design, automated shuttles design the city and make it visible.

CONGESTION

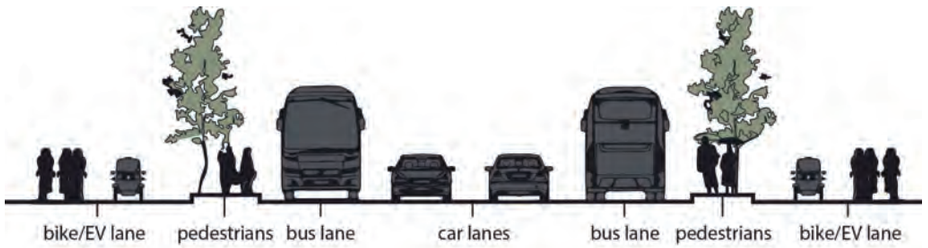
Car congestion is the common lot of almost every major urbanization. Saturation is obvious and known in every city, whether in Asia with the occupancy of the roads by cyclists and motorcyclists, or in Europe where scooters weave in and out of traffic. The disaster announced for 2030, namely, the total saturation of cities, is a promotional argument for automakers who will stress the small size of their new vehicles, which multiplies the occupation of the road.

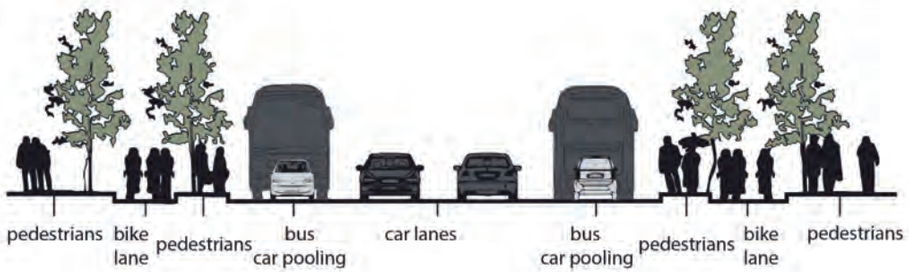
The list of the most congested cities is a genuine ad slogan for two and three-wheeled vehicle manufacturers. A worldwide classification would be the following[164]: -1-Istanbul; 2-Mexico City; 3-Rio; 4-Moscow; 5-Salvador de Bahia; 6-Recife; 7-Saint Petersburg; 8-Bucarest; 9-Warsaw; 10-Los Angeles. The painfulness of urban transportation will provide another classification, as well as the "pain" indicator created by IBM: 1-Mexico City; 2-Shenzhen; 3-Beijing; 4-Nairobi; 5-Johannesburg; 6-Bangalore; 7-New Delhi; 8-Moscow; 9-Milan; 10-Singapore.[165] Congestion and "pain" are therefore two evils among the most popularized in the criticism of urbanization.

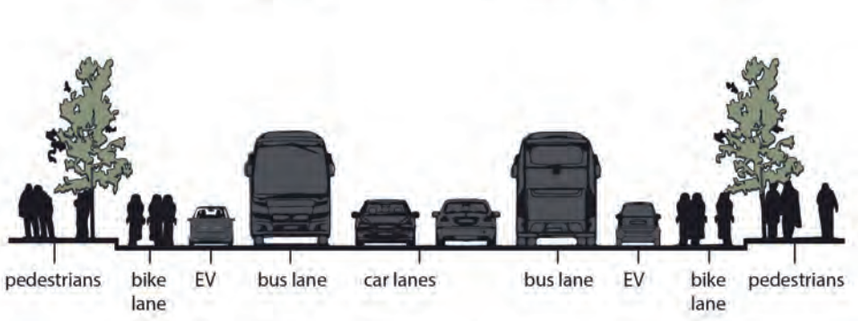
Our narrative encounters rather simply common proof here: the new protected scooters and ECVs will decrease congestion due to their smaller size. The width of these vehicles is considered in all reflections. Under 1.40 m in width, two vehicles can travel in parallel on the same lane. We moreover know that the "convoy" trips of self-driving vehicles manage congestion and economize road occupancy while reducing the distance between each vehicle and lastly economize energy in this closer configuration.[166]

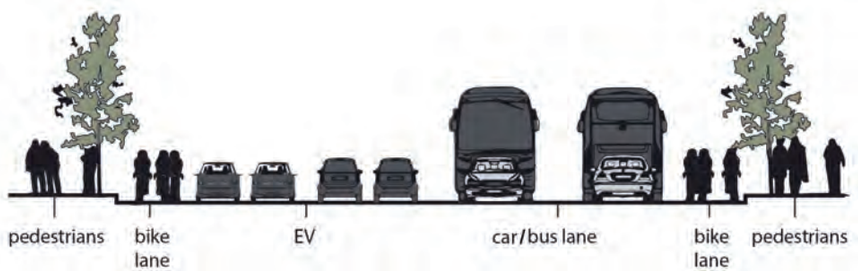
It is likely that dedicated lanes for ECVs that are not very wide can be created on express roads. Emergency lanes could be used by these vehicles by creating a

ECVs in traffic



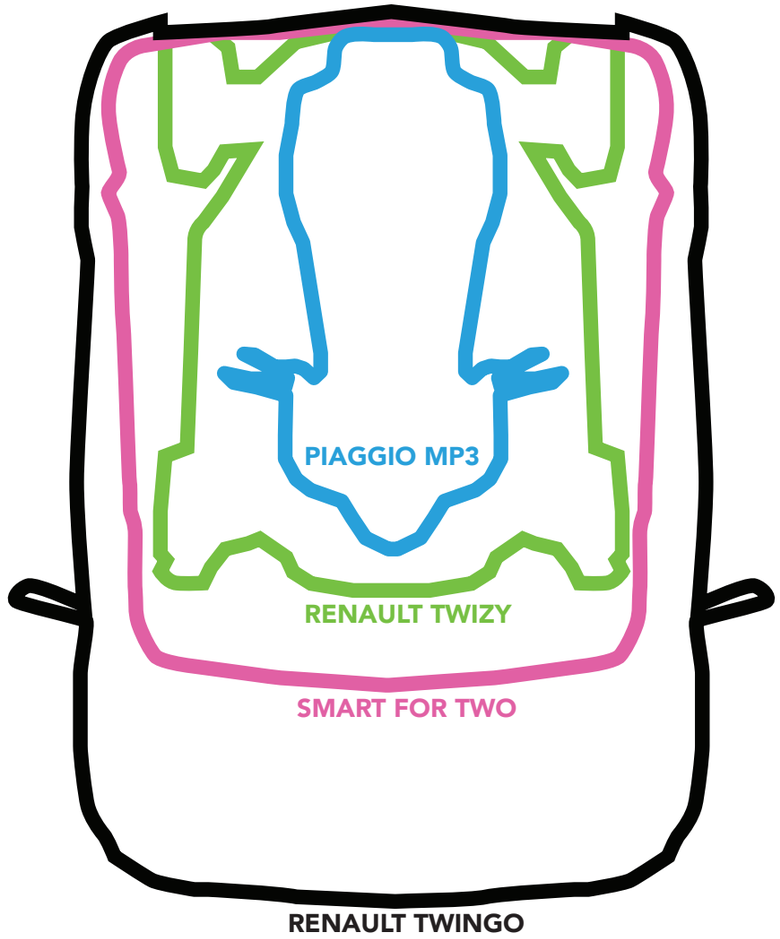






Multiplication of dedicated ECV lanes or lanes shared with ECVs: dedicated ECV lane shared with cyclists, ECV on dedicated bus lanes, dedicated ECV lane in circulation, ECV occupying the entire road

2 m-wide lane. An ECV road of this width can coexist with a bicycle lane or itself comprise a widened bicycle lane. Another useful hypothesis is the division of a two-lane road (about 7 m wide) into three or even four lanes for ECVs. ECVs will travel at 20, 50 or 60 km/hr., they will then take 20 minutes to travel 20 km. This comfortable daily travel time is much more efficient than the car (polluting and noisy) and more comfortable than unassisted bicycles. It is this vehicle that over these distances will tend to replace the traditional car and even further compete with public transportation.



Size comparison for Twingo, Smart, Twizy, Piaggio MP3

EPIDEMIC

A hypothesis to be tested is the use of small roads by these electric vehicles. These form an extremely dense network that is adapted to slow speeds: from 20 to 50 km/hr. This hypothesis is particularly relevant for electric scooters, vehicles of the three or four-wheeled-equivalent type, small vehicles that can take narrow roads or country lanes or travel through forests.

ECVs in the company

What could the impact of companies that use ECVs be on urban developments? Companies influence their employee's commuting and business travel modes. They make available parking facilities at the workplace, they have fleets of service and sometimes company cars, they cover certain costs.[167] Some companies use vehicles (utilitarian or not) for their activity itself (rental, delivery activities, taxis, etc.).

The company can, on its sites, encourage the deployment of electromobility by making charging points and vehicles available to its employees and visitors. It can intervene with the public authorities in favor of the rollout of collective or semi-collective electric mobility services (compensating for example for the shortage of public transportation). The company, on account of the use modalities of vehicles (foreseeable uses, urban and semi-urban zones) and the infrastructures it has (parking facilities with the possibility of deploying electric charging points), appears as an ideal candidate for adopting the electric vehicle. It can therefore play a driving role in the emergence and establishment of this new mobility choice, knowing that company vehicles represent about a third of global registrations of private and utilitarian vehicles.

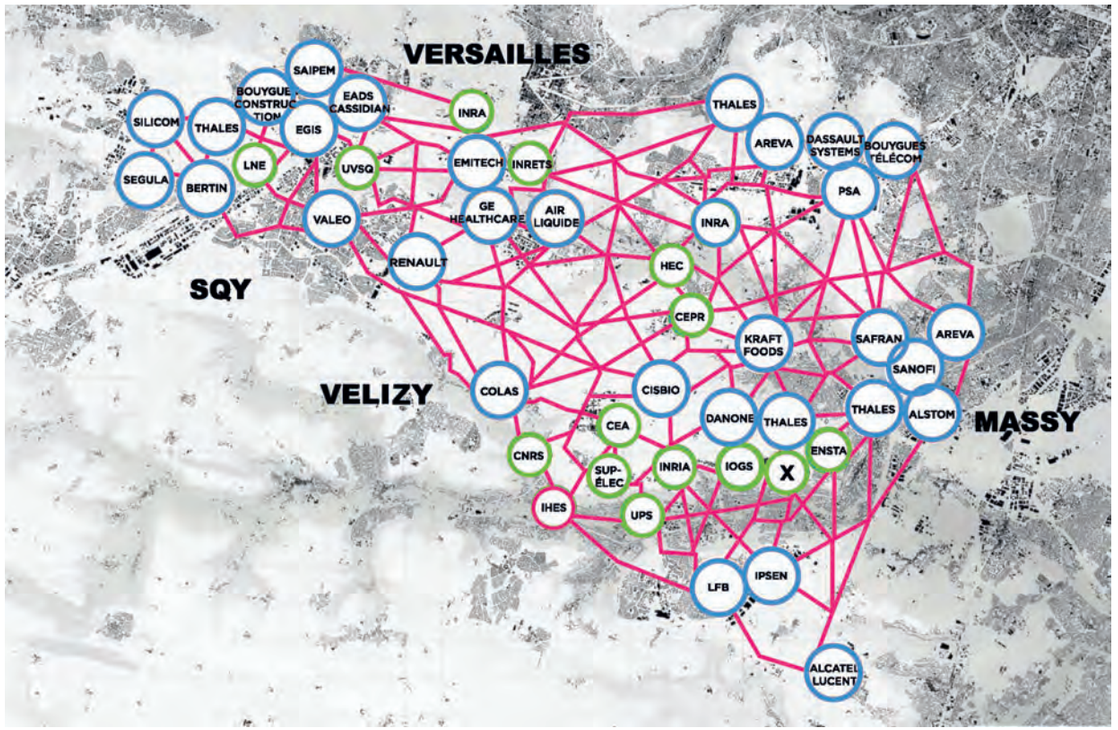
On the Plateau de Saclay, the companies, public authorities and administrations can set up pooling and car-sharing that is distributed over the entire territory. We propose to extend its road network for it.

ECVs and back roads

On the Plateau de Saclay, distances are great, liaisons are few, disorganized, not very practical and saturated between the companies dispersed over the site. There is very little public transportation. A diffuse, rather random or rhizomatic network could be put in place in order to reconnect the largest number of companies with each other.

By examining the theoretical network of orthophotography, and by focusing for example on the Satory site, we can see that travel could be largely done on stabilized roads based on old and often country lanes. Narrow vehicles and ultra-urban electric vehicles will have easy access to this new network. From Satory, these vehicles can travel through woods and forests without creating any pollution to reach Challenger or Renault Guyancourt, or any other company. In other words, ECVs capture an old network that is no longer or little used, or not yet used for this purpose. The ECV cannibalizes the existing networks, and colonizes them, as well as pedestrian or forest paths in the woods.

We will encourage this type of network development, favoring links, by reweaving road continuities. The paths are made a little more suitable for vehicles, but with limited widths. The network will then resemble a new web that improves narrow and slow roads by superimposing and interacting with the rapid network,



Network of companies on the Plateau de Saclay

in liaison with dedicated lanes. This network doubles that of the current roadways.

ECVs use the existing bicycle and pedestrian networks. Their development, in incorporating country lanes and forest paths, goes hand in hand with the introduction of ECVs.

The site was the subject of the Praxitèle and Twizy Way experiments. One proposal would be to extend them and broaden them to the entire Plateau de Saclay, while upgrading the lanes and paths that we just mentioned. All the companies have an exceptional opportunity to implement auto-mobility that goes beyond the earlier experimentation,[168] demonstration and promotion effects. The VeLV prototype of PSA Peugeot Citroën would have the same function as the Twizy and other similar ECVs on this site.

Accessibility to the Plateau during rush hours?

Faced with the access congestion on the Plateau de Saclay site, the ECV epidemic is being rolled out on the entire road network, each ECV looking for a more efficient route. The driver naturally adapts to the

Existing paths, new road web for ECVs – Satory

Bicycle lanes are adapted to ECVs – Plateau de Saclay

congested car traffic by looking for alternative routes. ECVs enable him to radically modify his usual itinerary. Faced with this multiplication of "emergency itineraries," the authorities are obliged to install traffic signals and favor some of them.
The departmental roads are used first, then the secondary routes, and in the near future, rural roads that the authorities must successively adapt and signal. A reticular model replaces that of travel in a tree-like configuration built around express roads.

Meeting

Where can people meet each other? According to our hypothesis, inhabitants, students, employees and managers will be able to decide to create new meeting places for themselves, for example, in a forest or on the edge of ponds, present on the Saclay-Satory site. The multiplication of travel possibilities engenders the multiplication of needs for meeting places, professional or not. Management software programs for meetings and the new vehicles will generate the creation of new places, located in the barycenters of a group of companies and partners who need face-to-face meetings.
The new mobility will doubtlessly create "halfway" meeting points for people. On the Plateau de Saclay, we can imagine setting up random meeting places, on sites to be determined, at public transportation stations as well as on farmland. On a site like Saclay-Satory, their distribution would be about once every 3 km. However, the location choice can be linked to the quality of the site: a pond, a remarkable vista, a hub... Ease of travel enhances the quality of the place itself, as well as its accessibility. Picnic spots are meeting points. The idea would be in fact a co-working place. The locations of these places can be decided collaboratively, on a proposal approved by the users. We think that they can be placed on the main ECV road junctions.

AUTOMATED CARS

The Google Car circulates on California roads; the state of Nevada authorized the circulation of automated trucks on highways. The city of Singapore started to test, in January 2015, lanes reserved for driverless vehicles. It plans to put the automated car into service in 2017. Great Britain is testing vehicle models with the Gateway project in Greenwich,[169] and has declared that it will change its regulations in order to authorize the circulation of these vehicles in 2017. The city of Milton Keynes, a model of an English new town for generations of urban planners at the heyday of the car as king, will put 100 self-driving vehicles into service in 2017. Nissan, Toyota, Daimler and BMW are showing their projects and demonstrators,[170] like the Institut VEDECOM at the Intelligent Transport Systems world congress in 2015,[171] etc.

A certain number of advantages of the automated car appear, such as the improvement in traffic fluidity (bumper-to-bumper cars), the decrease in energy consumption or the disappearance of traffic accidents, the elimination of bumpers and the lightening of vehicles, and consequently the decline of the profitability of car insurance companies, around 2025. The states should accelerate this arrival of driverless vehicles for the savings in healthcare costs that result from it. The last change, but not the least, concerns congestion and its perception. Congestion is negatively felt by the drivers and passengers of the vehicle caught in traffic jams. However, automated vehicles, designed in their interior layout to circulate without a driver, let their occupants, all "passengers," do other things. Congestion disappears as a perceived nuisance, its duration being replaced by an activity. Moreover, many automated vehicles will circulate empty, either to look for their parking place or their customers. So, in the middle of a traffic jam, the road paradoxically becomes the ECV's mobile parking place; it is like a taxi waiting line.
The safety of the dedicated lane will make the use of driverless cars easy. Automated transportation modes of the mini-bus type or individual vehicles will proliferate, first on dedicated lanes. Calmed or controlled sites, such as campuses, can also quickly welcome these vehicles and tame them. The AKKA company has launched a demonstration of its driverless car in the residential fabric of an urban outskirts. North Americans who have at least two vehicles per family are ready today to abandon one of them if a self-driving car arrives at their home within 15 minutes.[172]

In parallel to automated individual vehicles, travel by bus, in the same way as taxis or some road transport vehicles, should be concerned. The automated bus in a dedicated lane can be envisaged in the near future, which will be accompanied by the creation of new professions. These will be transformed: taxis will look for their customer, without a driver, the driver will work in a dispatching-storage-maintenance center. The same holds true for accompanying children, to daycare, to school, travel for the elderly or simply those without a personal vehicle... or for deliveries made by automated transporters. The "drone deliverer" will also use the

NAVYA ARMA: an electric, intelligent and autonomous shuttle, 2015

Catapult, "driverless pod" two-seat automated transporter being demonstrated in Greenwich, 2015

AKKA technology automated demonstrator: the passenger compartment can be transformed into a living room to surf the web, work or watch television, 2013

Highway adapted to ECVs: elimination of signs and replacement by vegetation

ground surface. This is once again not a technological fiction: Uber created a research center on the self-driving car, and its partner – Google – is trying to form a driverless transport company.[173] This transformation has spread to logistics: all the transport that can be parametrized can be automatically managed by deliveries, in "neighborhood concierge services," "baggage rooms" between blocks or buildings.

Expressways without signage?

The automation of vehicles, now driverless, the decrease in traffic accidents and the general slowing down bring about an "infrastructural reaction" relative to highway signs that gradually disappear because they have become useless. In the same way, protection railings are no longer replaced, or replaced by vegetation.

THE VEHICLES ARE ARCHITECTURES THAT MAKE THE CITY VISIBLE

The development of tramways has shown that they have helped create a rehabilitation of the entire urban space they cross. New-generation tramways have redesigned the shape of cities. The same phenomenon will happen with automated urban transportation networks.

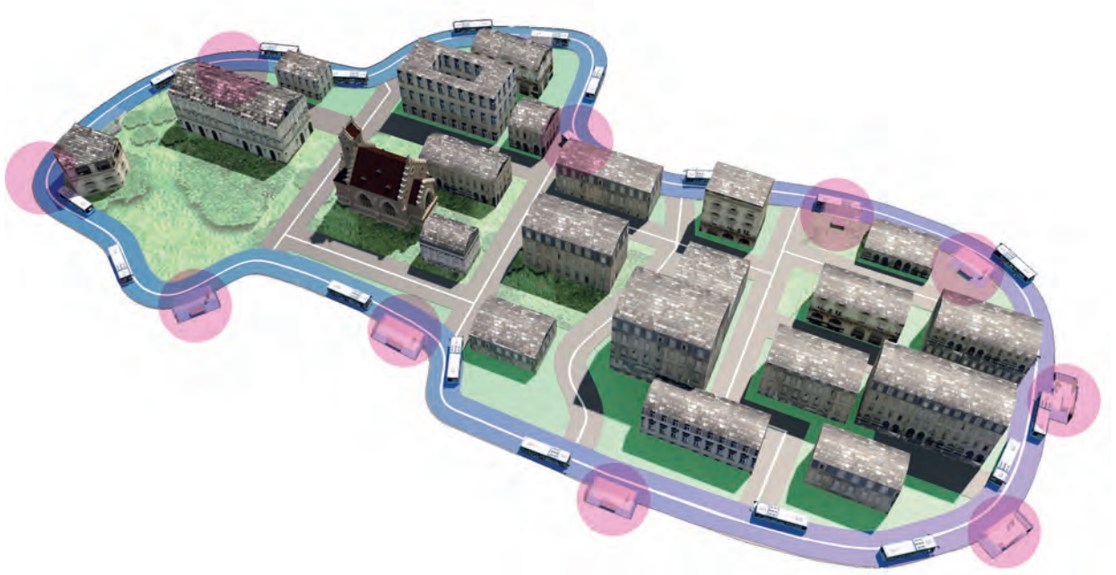
Public transportation modes of the "bus" type are transformed by connected automated vehicles. The driver no longer drives but now manages a group of vehicles from his logistics center. The vehicles, in greater number and smaller in size, run much more often, with a doubled, tripled or even quadrupled frequency. The presence of the vehicles creates their visibility, in the same way as tracks or expressways marked the urban space, but this time without creating a specific break.

The visibility of the network provided by the persistent presence of the passing of vehicles replaces the grid made up of stops. The line or the loop that defines the visible landscape of the city, is added to the spatial punctuation of stations and stops.

Multiplied vehicles and stops define a new urban form, a morphological type that competes with the usual vocabulary of architects. The multiplication of vehicles and stops transforms them into a permanent, almost immobile form, that is, into architecture.

The visibility of the form of transportation, the stops and their related services, the uses created, the real estate developments that follow from them, establish the identity of the new territory. Automated transportation lines become forms, architectures that mark out the city and in particular the hearts of cities, they identify centralities.

Béthune project: the ring of the new center defined by the automatic transportation loop, 2010 (Architecture Action)



The visible city: the automated networks and their stations redesign the shape of the city

INVADING INFRASTRUCTURES

If the new-generation environmentally friendly vehicles are colonizing the territories of the existing city, they are also investing infrastructures: on the sidelines on highway emergency lanes, or by using reserved lanes, but also the railroad networks over short distances. This is their viral cunning.

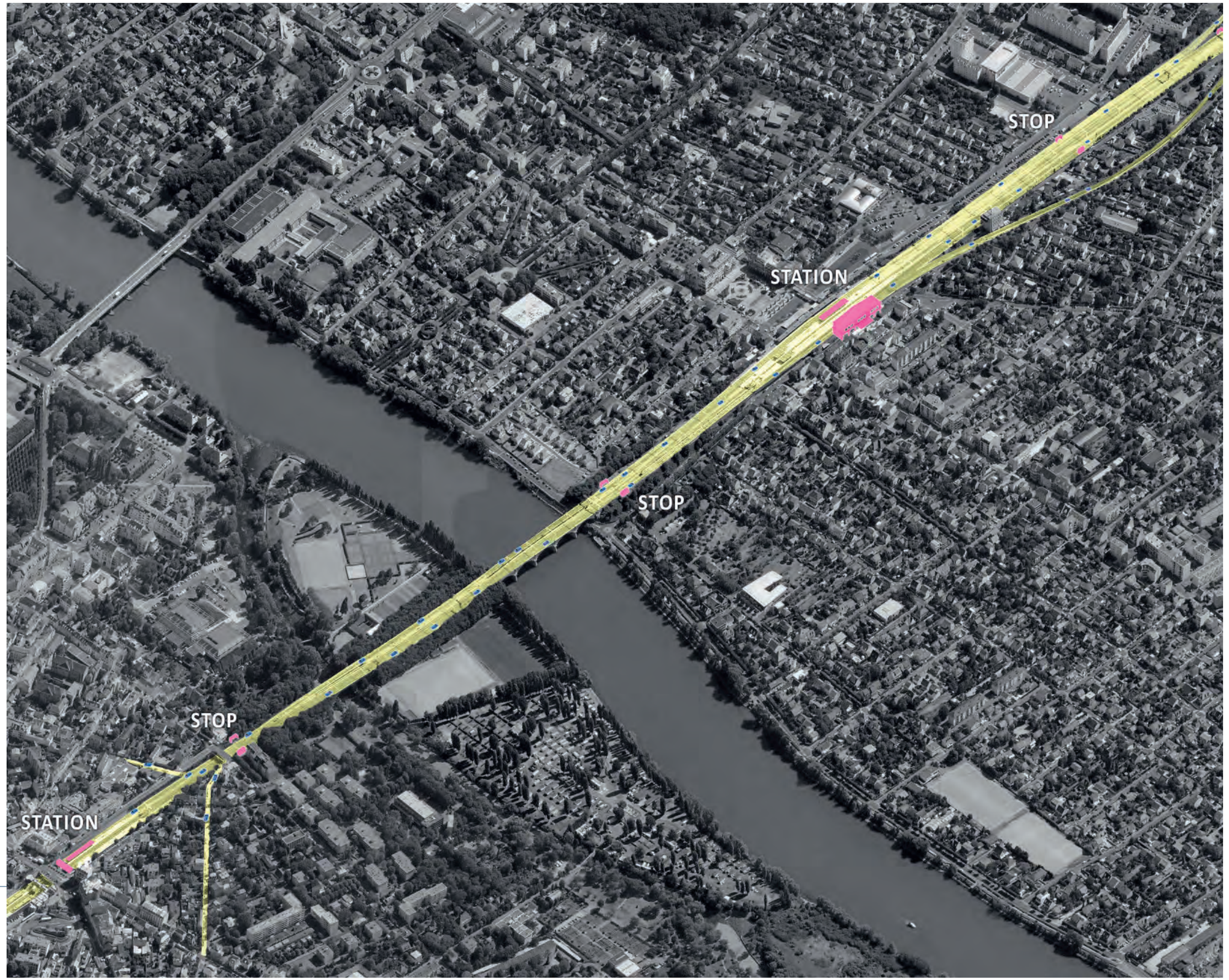
Unlike the Citroën draisine (a 2 HP equipped to roll on tracks), the "auto-train" consists in keeping the tires of the car and moving on revamped train tracks. For example, on the Satory site, Jean-Laurent Franchineau[174] imagined the "VEDECOM auto-road train" taking a little-used railroad track belonging to the army between Saint-Cyr and Satory, which was made accessible to autonomous vehicles by pouring a circulation strip between the railroad tracks. This network-pooling project, on the urban tramway principle, costs infinitely less than the purchase of three trams. This is an old practice in which trams and cars share the road, which naturally exists in our cities today.

The development of an increasingly efficient traffic management software program enables public transportation vehicles on wheels to use the railroad lines in alternation with their "track" uses. The application of the urban tramway principle to the railroad network (the auto-train) will induce the increase in railroad stops over short distances in most cities. This principle, which introduces a mixture of transportation modes on railroad tracks, has a considerable development potential in all the cities that have a station, both large and small alike. This strategy will be frequently used in the years to come.

Reciprocally, abandoned railroad tracks, or those already transformed into pedestrian paths, can welcome new public transportation modes. The famous example of the Petite Ceinture [little ring] line in Paris, a railroad network 32 km long that circles the capital, abandoned in the 1930s due to the advent of the metro, and 60 years later concerning merchandise transport, would have recovered an essential service function with automated vehicles on wheels. By doubling the Paris ring road, it would have proposed a type of public transportation while remaining accessible to pedestrians, and not only in the form of a "stroll."

Auto-train station

Car and tram de facto together: Prague, Bremen



Stops served by trains, ECVs and automated electric buses

SERVICE PROJECT

The arrival of the new vehicles generates the production of new programs, new relationships, new architectural desires. Technology engenders the creation of narratives and icons that are being built.[175] ECVs offer new potentialities but also mean that past, even improbable imaginary schemes can be turned into reality. What is the purpose of bringing your car up to your apartment's floor? Social signals and constructions are created to look more closely at this hypothesis. Didn't the Petrobras company build, in the 1960s, its corporate headquarters, a very high tower with hanging gardens? So why not have housing units with their cars brought up to the apartment's floor by elevator or along a spiral ramp?

The future has many faces. It concerns the inter-relations between housing, offices and parking facilities. Elsewhere, the energy question will be dominant and the neighborhood must become autonomous especially to power vehicles: this is the city dominated by the need to supply its own energy, the charging city. The need for charging also creates parking facilities equipped with photovoltaic panels. The development of concierge service areas, car-sharing stations and carpooling pickup places, which are being located very close to homes, is likewise modifying the ambience of neighborhoods. Parking has once again become the focal point of architecture, it organizes all the housing or workplace projects. This new reception space – the heart of the projects – links the building's different functions, it distributes them. The parking facility-reception area is the link between the programs, the buildings, the stores: it assembles. Le Corbusier's street on the upper floors of the building is no longer empty, as in the Cité radieuse, it is a genuine distracting stroll.

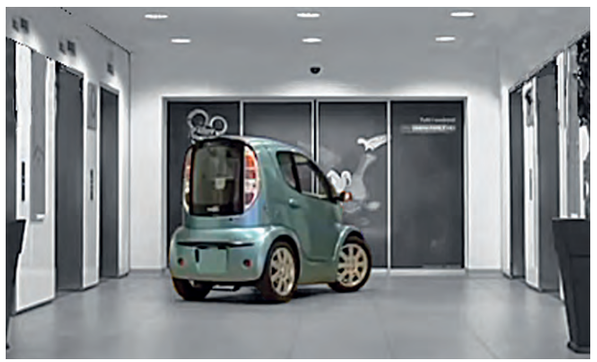
THE VEHICLE IN THE HOUSE

The electric car isn't polluting, doesn't emit any exhaust fumes or leave any traces of oil. It can therefore occupy the same spaces as humans. A room can hold a clean vehicle, even more so if it is small. The vehicle can find its place in the house as soon as it is no longer dirty and noisy. Once the vehicle has left, the room can have another function, as a den but also as an enlargement of the living room.
Will new cultural models of the house be created, affecting the inhabited niches – of the wealthy?

Individual homes can now in fact be superimposed. The ramp goes up to the terrace level, which receives the vehicle. The utopias of superimposed villas have a long history, which is materialized here, with, in addition, the car. Without being able to entirely explain it, it is now accepted and desirable to have vehicles brought upstairs. This proposal, a priori without any foundation and very old in the collective imagination, has reemerged, consequently at Expo 2010 Shanghai at the General Motors booth, with the fictional story of a blind young woman whose apartment is directly accessible from her car, a car that itself took the elevator.

Multi-mobility will also develop in each family and in condominiums or in a block, or further in a hailed automated vehicle. However, despite sharing, in the end, will the number of vehicles per household decrease? Would we need fewer parking places? An inverse hypothesis, with the growth in personal mobility machines, is simultaneously feasible, in the regions of the world with strong development (or with strong inequality) where housing and the car are still powerful social markers. The access of vehicles to the apartment, by elevator or possibly by ramp, is almost obvious

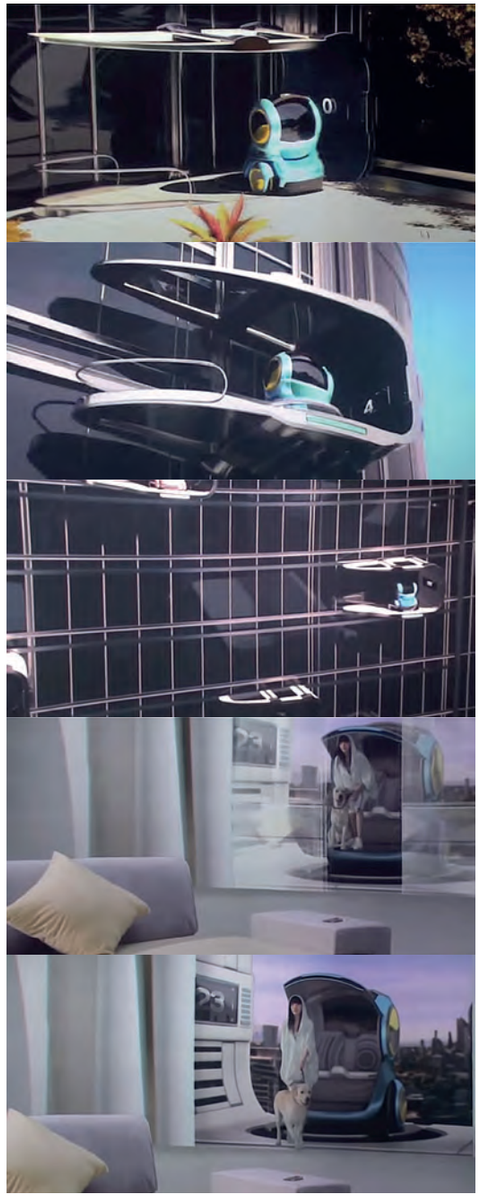
The car upstairs, at home



Volpe: an electric car that takes the elevator up to the office

Elevator Garage, Chicago, 1936. Photograph by John Gutmann

Elevator Garage Full, Chicago, 1936. Photograph by John Gutmann



"Shanghai 2030": Electric Networked-Vehicle (EN-V) for a blind young woman, General Motors, 2010

in the programs that already exist for superimposed villa towers.

Real estate

Housing that welcomes sharing favors "grouped purchases" or subscriptions to "grouped rentals" of cars. It is in sharing that the interaction between the living environment and ECVs must be found.
Housing cooperatives constitute 40% of housing production in Norway, and 30% in Zurich. The inclusion of shared vehicles in the cooperative is to be taken into account in a period that is favorable to the development of co-housing. Pooling activities encourage pooling vehicles. The eco-district is also a place propitious to the emergence of sharing travel and vehicles.
The car-sharing vehicle has become an important lifestyle element as such. It is therefore clear that a real estate developer or a co-owners association will take hold of the idea and propose, in each residence, vehicles for several housing units to be shared, located in the residence itself. More simply, subscriptions to a shared fleet accessible via the Internet, a smartphone or badge can be proposed, or the purchase or rental of a share of the same vehicle, on the model of time-sharing. The real estate developer is also a stakeholder in the development of ECVs. The sale connected to apartments and the availability of car-sharing vehicles means developers do not have to deal with the question of parking, which they no longer have to provide.

Housing organized around parking

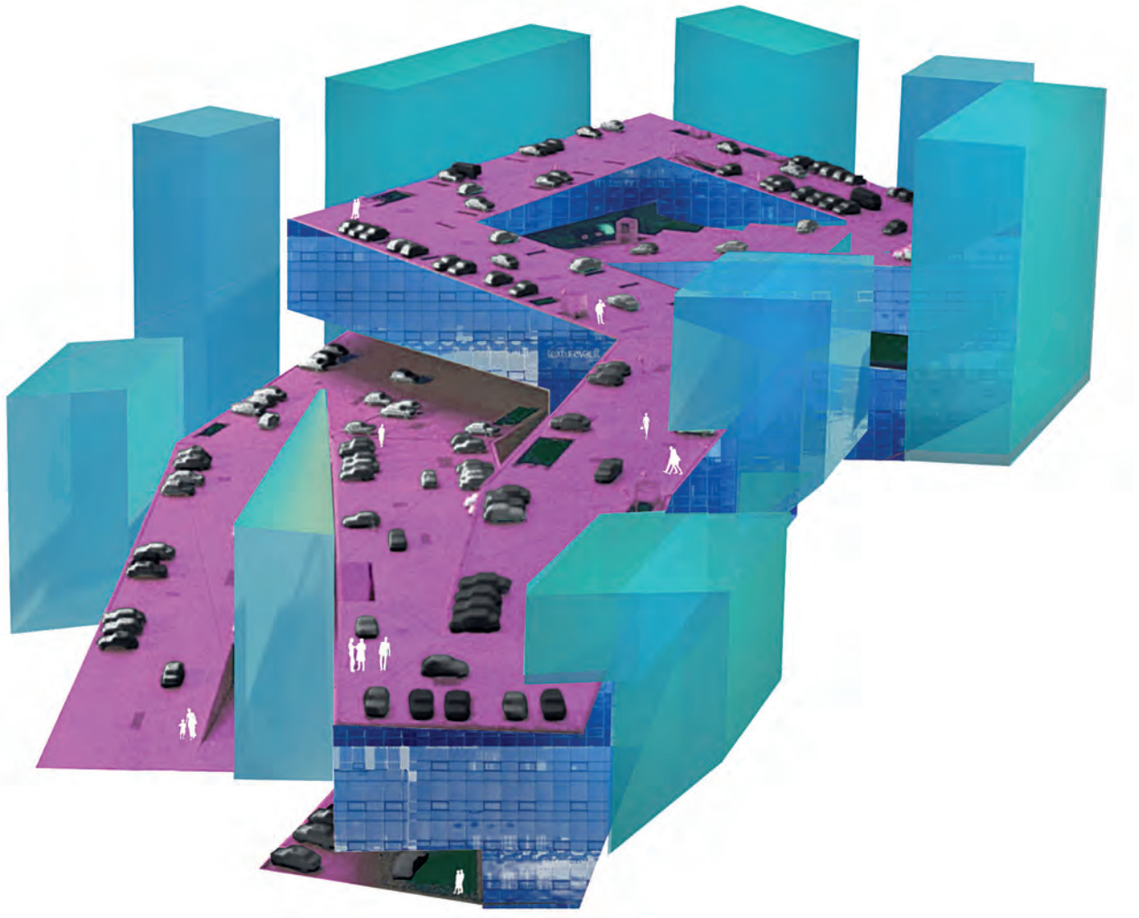
One possibility is the increase in the number of vehicles whose parking becomes a dominant functional program, and central in the design of housing units.

Villa tower today

Apartments, but also stores or the service sector are then organized around parking and the activities that are grafted onto it. A parking project can be engulfed by housing and other programs.

The house without a garage...

For a subdivision with car-sharing vehicles, the individual house without a garage must now be reflected on. Either this space saved is used to increase the area of the houses, or to decrease building costs, enlarge the garden... or reduce the size of the lots, and in this way favor the densification of suburban single-family neighborhoods – according to its supporters' doctrine.



Parking distributes the programs

...or the charging city

The relationship between the house and the car can be developed by means of the power supply, either through outlets (the "right to an outlet") or through photovoltaic panels and wind turbines. Energy autonomy is then an ideal paired with mobility. The SolarCity company (Los Angeles), founded by friends of the owner of Tesla, proposes to any inhabitant, via leasing, to install solar panels on the roof of his house that will supply, among other things, his vehicle(s). His electricity bill then decreases by 10 to 20%. Multiplied, in the Fujisawa pilot city (Japan), solar panels will produce an environment that has become technical, or imagined in this way by their promoters.

The constant improvement in photovoltaic performances, and the development of an approach based on the consumption site and no longer on the production site,[176] makes the generation of photovoltaic cities likely today.

Autonomy and mobility: Fujisawa, pilot city created by Panasonic, inaugurated on November 27, 2014

VALET CITY

The urban condition is increasingly that of a user consumer-actor, who demands economical management, safety and efficient services. This demand is partially handled and amplified by the management of the city as a "smart city," strengthening this service character of the urban space. We could wonder here if the urbanism of the film *Her* (Spike Jonze, 2014), in its homogeneous banality, doesn't best correspond to this city thought out as closely as possible in terms of its functionality: the domination of operating systems makes the real, human as well as urban, flow back. It is the neutral space or the floating space.

In this service ensemble, in which the transport and delivery function becomes primordial, what does the city become? A delivery service. Cityssimo or Packstation, an automatic checkroom developed by DHL in Germany, delivers packages that can be picked up at any time on a self-service basis. Packstation will be supplied by an automated car. The nature of the road system is then modified to receive a group of automated vehicles. If the regulations or the safety conditions are not adapted, dedicated lanes must be generalized for automated buses, automated taxes and perhaps more particularly for deliveries via automated vehicles.

The city's distribution channels are modified by automated vehicles. Many solutions are possible:

- automated deliveries to concierge service areas, the unloading being made by the recipient;
- quasi-individualized home deliveries by small moving robots, with unloading by the recipient;
- quasi-individualized deliveries, with unloading by the automated vehicle from an adapted "mailbox." The mailbox will become a delivery box... with its size depending on the package. The automated vehicle chooses its box according to the size of the package and provides the code for the recipient to pick it up.

Where do these automated vehicles come from? From a warehouse near a freight station? From a distant logistics platform? Where do they deliver the package? To the recipient's home? To a "giant" mailbox, in the building, to the neighborhood concierge service area, to a public square...?

E-COMMERCE AND URBAN LOGISTICS

In the eco-city of distance measured in time, urban logistics[177] (10 to 15% of urban traffic) have become decisive, as much for distribution ("the last kilometer," "neighborhood concierge service area," "store-warehouse," "click-and-collect" and "Chronodrive") as for managing travel for children or the elderly.[178] The move of logistics sites to the distant outskirts of the city has taken place. Logistics are in this way relocated far from city centers, increasing kilometers (and pollutants) and decreasing the productivity of transport operators, as well as that of the city itself. Distribution through "city-hubs" or "logistics hotels," combining loading and unloading closer to the heart of the city, has been tested.

Internet purchasing, the lack of availability, the aging of the population, the low rate of car ownership of households in dense zones, the bulkiness of packages, have increased home delivery. The arrival of e-commerce and the revival of local stores increase the number of packages to be delivered. As a result, urban logistics need stations that are intermediate between logistics centers on the outskirts and the delivery destination, in an organization that must be controlled up through the final delivery. Short-distance deliveries are (and will be) handled up to the end recipient by electric vehicles but also by autonomous vehicles. In the same way as taxi trips, home deliveries will be able to be made by autonomous vehicles[179] that will wait for the customer at the foot of the building after making sure that he is there, or that will drop off his purchases at a concierge service location.

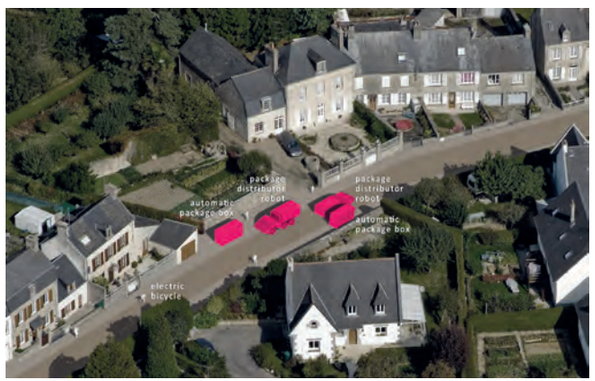
The streets are largely occupied by pooled concierge services for several apartments. With automated delivery, the number of stops is no longer a handicap and delivery is always in this way practically "at home" (concierge service area).

The delivery chain is to be thought through again. We can imagine that urban logistics of proximity (the last kilometer) could be performed by small vehicles that consume little energy and have limited autonomy. The three-wheeled vehicles that have reappeared in deliveries give some idea of the possible size of these delivery robots. The distance to be covered between battery charging becomes a priority criterion for the location of logistics hubs as much as the placement for vehicles that silently circulate night and day (the question of the logistical change in transportation mode is also raised as soon as it is robotized). Continuous delivery is added to 24/7 consumption.

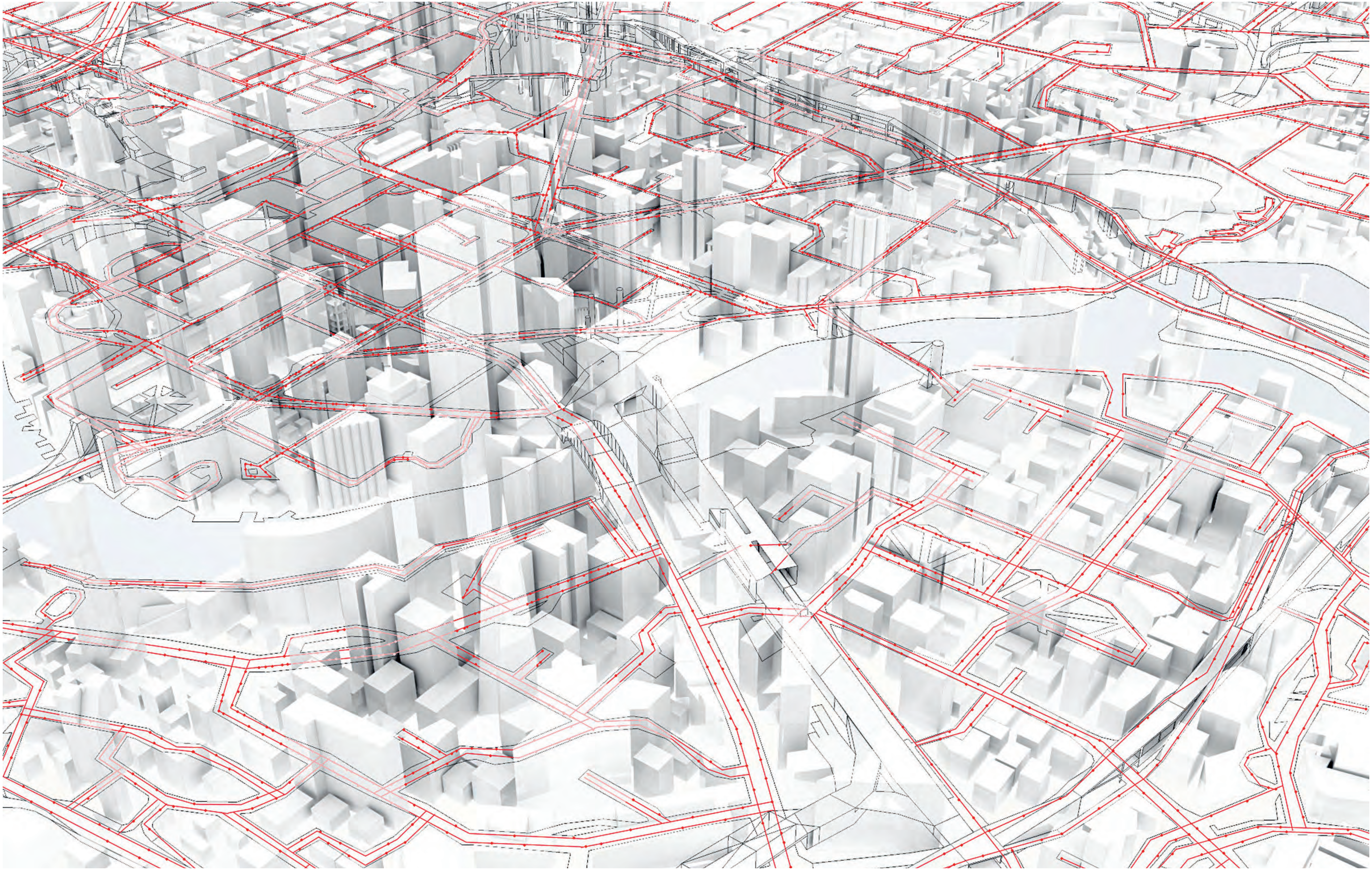
What remains is the limit that delivery to the workplace, a taboo, represents today...[180]

Amazon delivery boxes

Delivery boxes the size of a... car?



Dropping off packages in a mailbox adapted for a delivery robot



Automated robots making deliveries in a dense zone

In a neighborhood of townhouses near Brussels (Saint-Agatha-Berchem), the concierge service approaches home delivery.

Without parking?

Urban planning regulations today tend to limit the number of parking places in real estate operations, connected to the desire to see the number of cars in a dense urban zone decrease. Car-sharing can also limit individual car needs in the urban zone.

Under these conditions, for the zones served by car-sharing networks, 1) parking needs decrease and eventually disappear in the longer term in apartment houses and office buildings, replaced by car-sharing silos that distribute the vehicles; 2) parking facilities are replaced by distant parking (valet parking); or 3) are transformed into “charging lots,” marketed, maintained or increased because the local authorities have not made available a sufficient number of charging points, or because the street’s surface is occupied by a large number of services dedicated to other travel modes. When the street is organized to gradually replace parking for private vehicles by extended car-sharing stations, charging these vehicles reverts to private parking lots.

These three contradictory hypotheses are developing side by side. However, in each hypothesis, real estate operations are impacted by the disappearance of the parking constraint or, on the contrary, by the need to keep a very large number of charging places in the building.

Real estate developers are very largely the beneficiaries of this new freedom:

- Either they no longer have to building parking garages because the inhabitants no longer have personal vehicles,
- Or they market their places as charging stations or lots. Underground parking facilities can also have stores.
- Lastly, in a state of uncertainty, they can imagine the transformation of parking spaces, positioning them on the ground floor, or on an upper story, and transformable into surfaces for stores or activities.

The three future possibilities for parking: without parking facilities (car-sharing), charging station, transformable parking facilities

Urban planning regulations will probably no longer exclusively address parking but car-sharing stations, no longer only parking places per housing unit but the number of charging points.

New subdivisions

Suburban subdivisions of single-family homes are reorganized following car-sharing developments that create a decrease in needed parking surfaces. Parking lots are regrouped, not leaving an individual house more than 60 m from a vehicle (or less than one minute on foot):

- Car-sharing parking lots are spread out over the site.

A suburban subdivision with car-sharing, with a distribution at 60 m (1 min. on foot) maximum: San Fernando Valley (California): in pink, car-sharing parking lots; in green, vegetation in former parking places

- Streets are reduced in width, from 6 m to 4 or 3 m.
- Streets are landscaped.
- Streets are used for new leisure activities.
- Parking places in front of each house are replaced by the traditional lawn or constructions /extensions.
- Garages become living rooms.
- Roads, cul-de-sacs, free spaces are used as collective car-sharing lots.
- The space saved is transformed into public space.

These are the most common and immediate uses created in cities that have rid themselves of a number of parking places.

THE PARKING FACILITY AS FUTURE

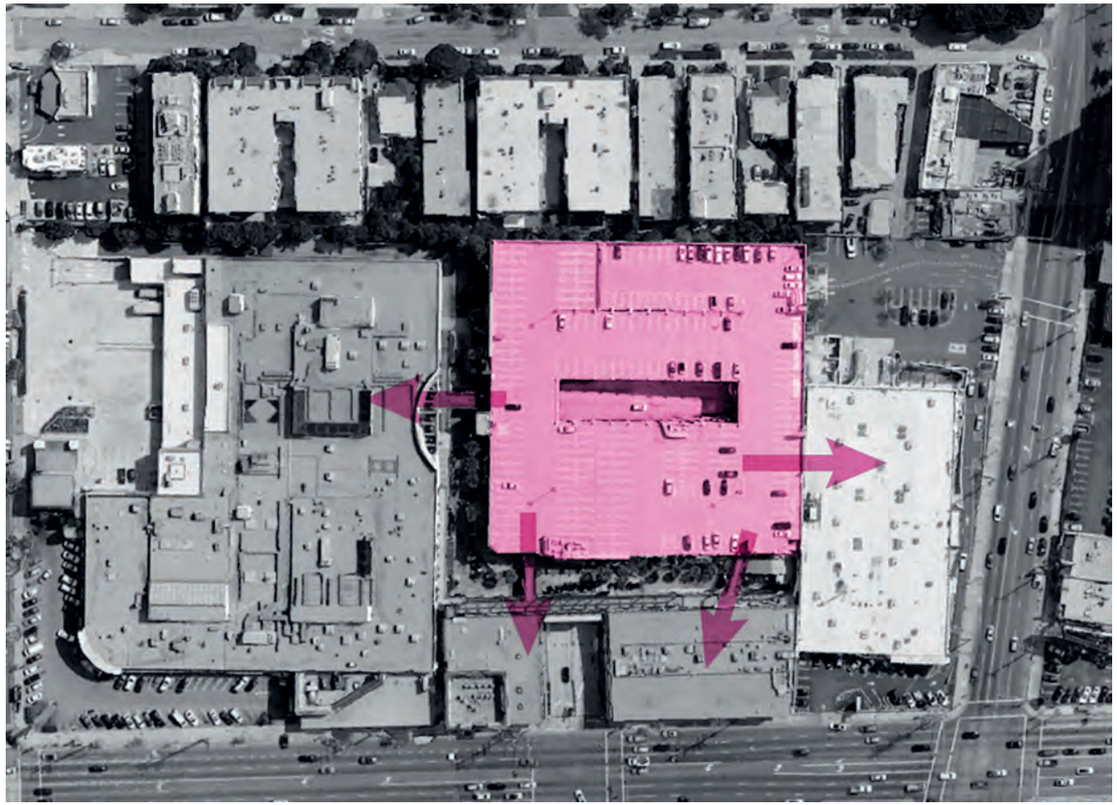
The parking facility henceforth effectively becomes a museum. Frank Lloyd Wright, Hilla Rebay and Solomon R. Guggenheim at the unveiling of the museum model, Plaza Hotel, New York, September 20, 1945 (Solomon R. Guggenheim Archives, New York)

Despite the aesthetic displacements created since the 1960s in the spirit of Ed Ruscha, the parking facility has remained a non-program, to hide, embellish, wrap or turn into something else. However, whatever the position, it is a program whose functionality is nevertheless secondary, a program that has remained dependent on others, most often below it. We think that the parking facility has become a central program of architecture, a program that attracts other activities. In other words, the idea is an inversion of the relationship between the parking facility and what is not the parking facility. The parking facility becomes that focal point that feeds all activities. We will witness the development of programs that will be parking facility-museum, parking facility-office, parking facility-store, parking facility-housing, parking facility-public space, parking facility-promenade, parking facility-link.

Bringing cars up on roofs is a rhetorical inversion characteristic of architects. The parking garage is a 20th-century classic, regularly relaunched as an architectural theme,[181] as a program that must be embellished. Beyond finding locations and doing inventories and keeping up with topical subjects, these projects can be extended through the addition of more complex programs. In the 1940s, in the United States, parking facilities offered waiting rooms (Union Square Garage, San Francisco Garage) and daycare. The Downtown Parking Center of San Francisco proposed services, stores, advertising spaces, telephones, etc.

The demand for parking will be decreased by the fragmentation of travel modes and types of vehicles. We could then witness a typological mutation of the parking facility, which will be called on either to welcome new activities (distracting, commercial, collaborative) and new services, or will link functions that were not previously connected: the parking facility acts as a link.

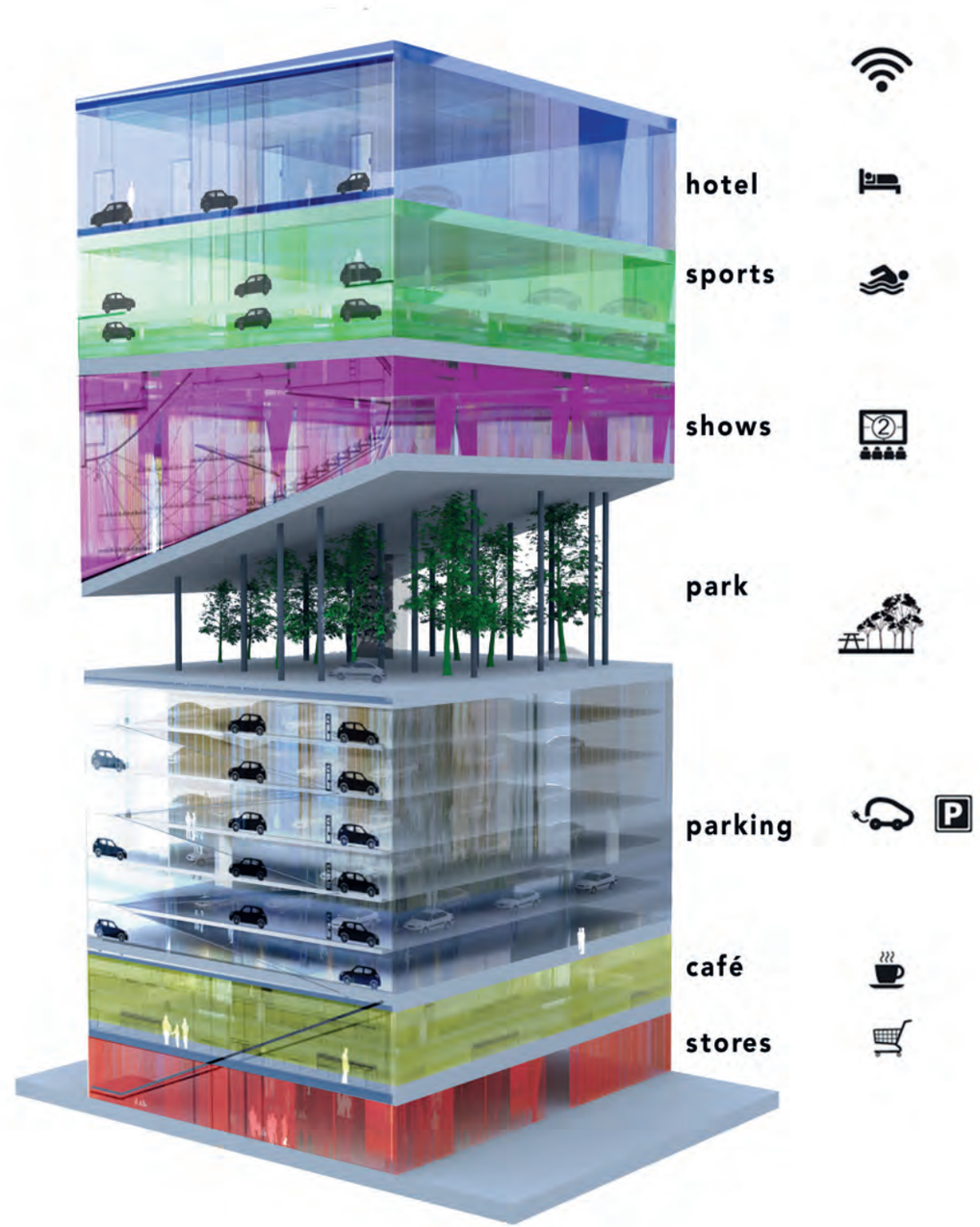
The parking facility will attract body care stores – manicure, hairdresser... Lobby of the Downtown Parking Center in San Francisco, 1953



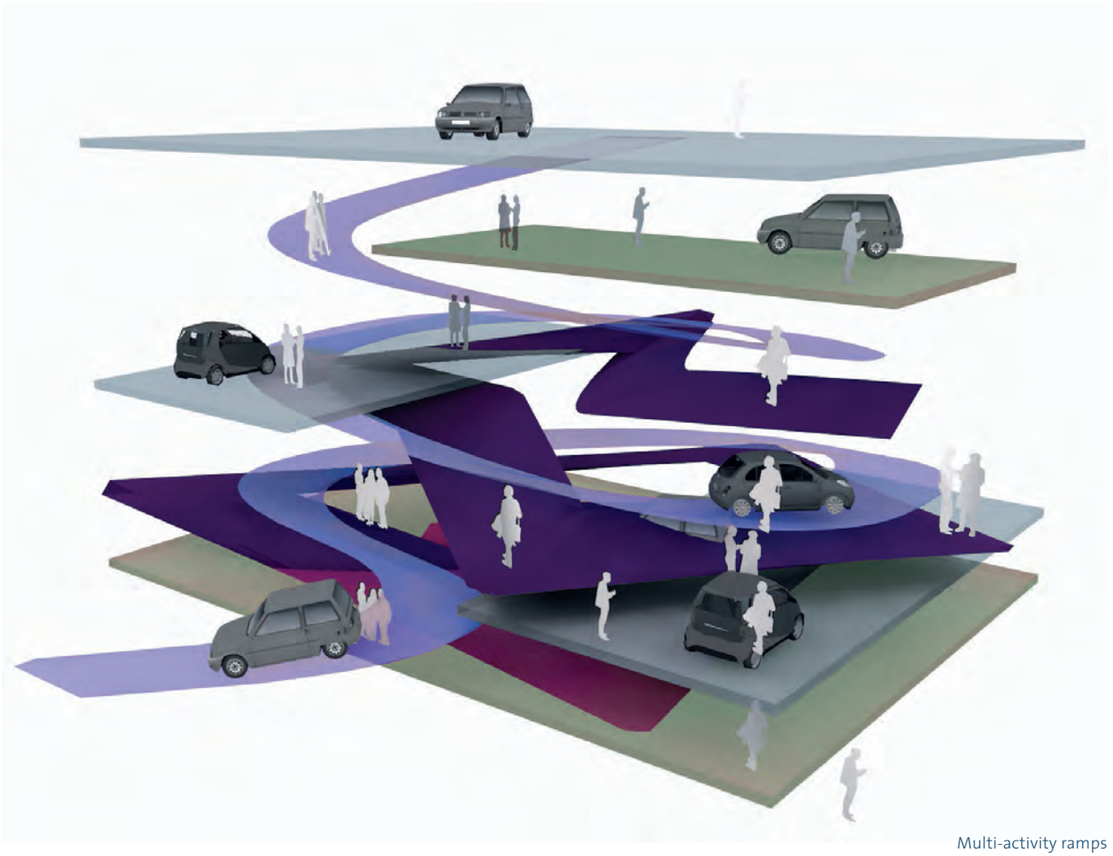
Beverly Connection, shopping center in Los Angeles: the parking facility at the center distributes the stores located around it by footbridges

Different types of parking facilities will be disseminated, in shifting configurations, the parking facility being combined and intertwined with other functions or being transformed at the heart of a new programmatic hub.
The mutation of the parking facility into a centrality point can be seen in spread-out megalopolises where it becomes the hub serving stores that are connected to it. The Beverly Connection is one example, with a central parking facility that commercial groups open onto, linked to the parking facility by footbridges or directly adjoining the facility.

These concrete examples show a new conviviality between the car and the building, which the silence and cleanness of the new vehicles will further increase. All sorts of activities and distractions will be added to stores, the superimposition of programs giving rise to the appearance of new icons combining the parking facility, vegetation, sports, the hotel, the theater... ECVs



Multi-activity tower



Multi-activity ramps

turn the dreamed-of building at the beginning of the 20th century into a reality, superimposing the levels of the most disparate activities. ECVs now slip into them on every floor, whereas the airplane or any flying object was until this point the only vehicle compatible with skyscrapers, able to reach the summits.

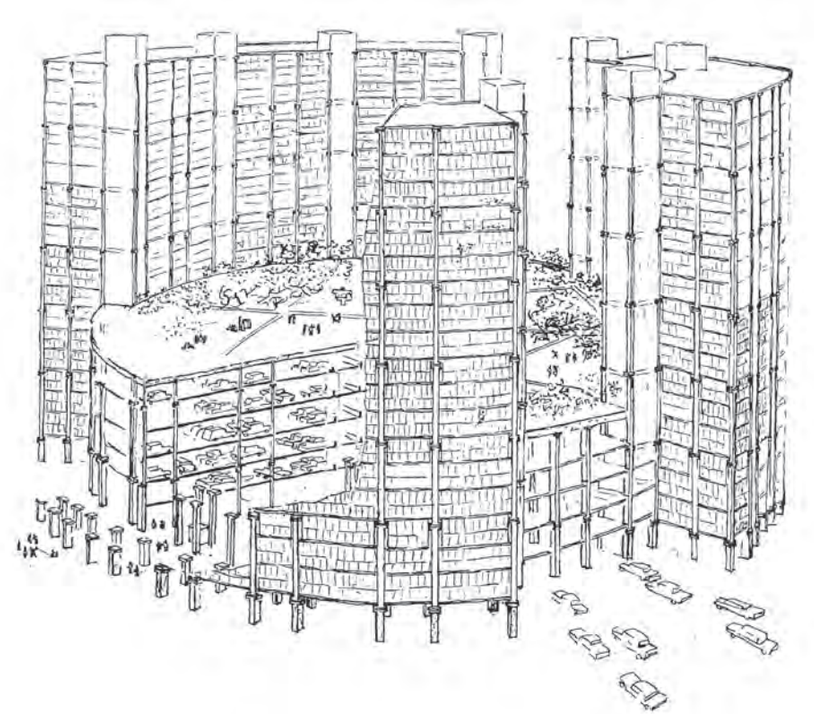
Ramps or parking facilities on continuous inclines, characteristic of North American parking garages, are tools of this transformation. Projects that raise vehicles to upper floors, just like architectures that promise to raise the street above the city, are part of this imaginary dimension that is making a comeback, and is recurrent. These elevated street programs already exist for parking garages and multi-story industrial buildings where trucks have access. With the addition of activities or stores, they are the marriage of a parking silo and a service or activity program. The elevated street makes it possible to increase the line of stores "on the street" and avoids the configuration of stores on upper floors and their changes in level, never simple to carry out.

Hybrid parking facility

The question was raised, in the last century, by Louis Kahn's project for Philadelphia in which the parking facility in the center of the space connects the programs located around it.

Distinct urban and architectural forms will emerge from the development of new parking facilities that generate activity: in a spiral around activities, parallel to activities, in their center... or superimposed. In existing commercial sites, we can inversely foresee that the development of parking facilities is what will connect dispersed stores.

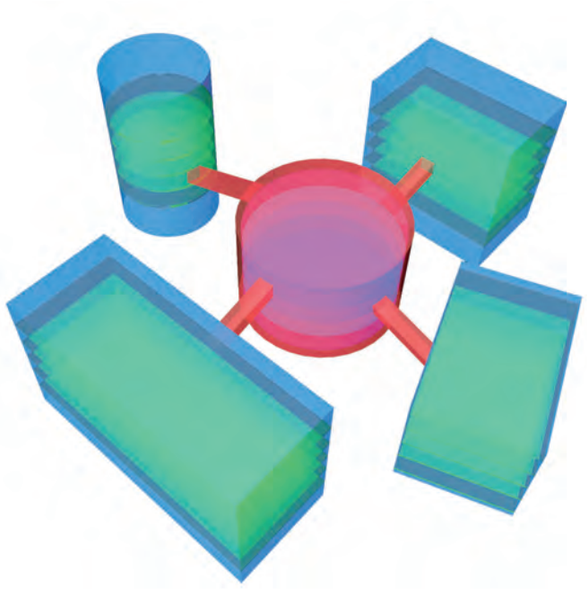
The already-existing solution of the central parking facility around which activities radiate, which was created, for example, in the large parking facilities of the Porte de Bagnolet (Paris), seems to be developing in contemporary shopping centers. It permits direct access to stores on the same level as the parking facility. The latter is at the center, becomes the distributor of all the programs. The parking facility is the leading element. Even rolled out on the periphery, in an inverse

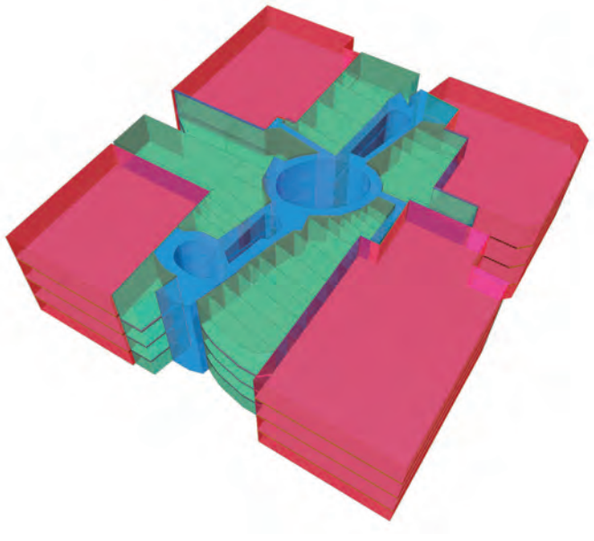


Louis Kahn, parking silos, Penn Center, 1957

New architectural and urban typology: parking facilities parallel to activities/in a spiral around activities

Parking tower





The principle of the Santa Monica Place parking facility-hall and parking facility-showcase, Los Angeles, 2010 (pink: parking facilities; green: stores; blue: circulations)

position, it forms a showcase. In this way, the Santa Monica Place shopping mall (Los Angeles), renovated to provide access to the parking facilities directly from the central space, has the parking area take part in the centered presentation of the entire mall.

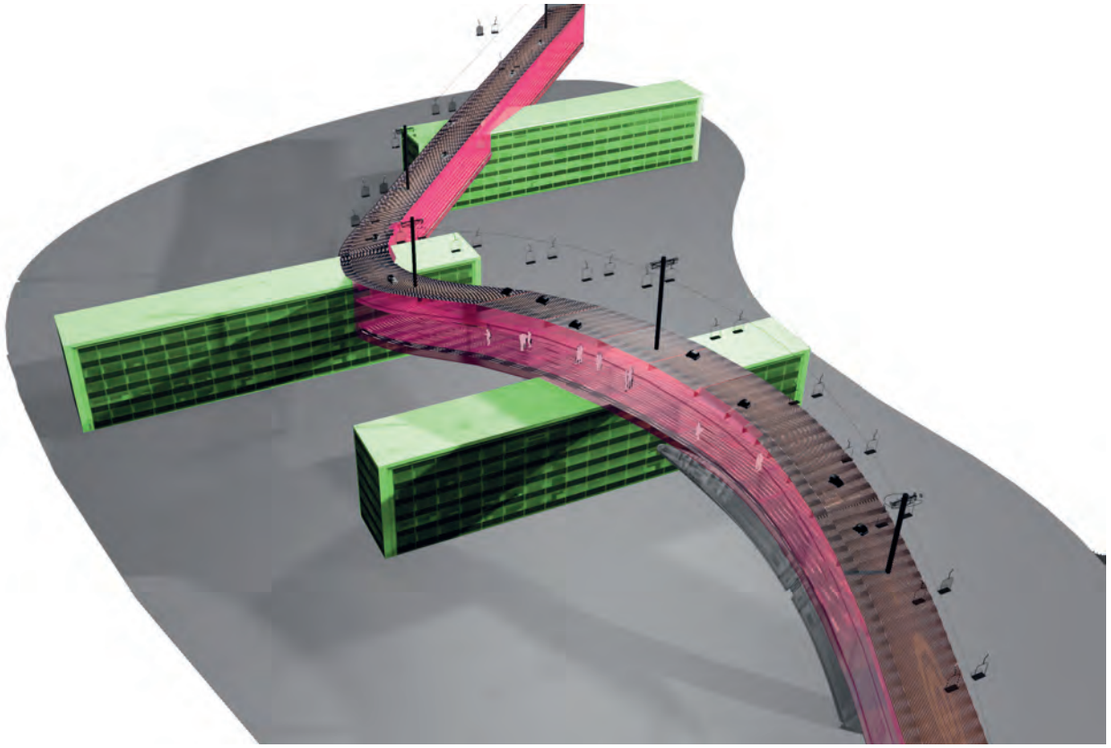
How do you park the growing number of these vehicles? ECV and scooter parking facilities on upper floors will be multiplied. The congestion of Asian cities will lead to the building of genuine parking towers, in which parking will henceforth be the sole function.

Parking lot-link

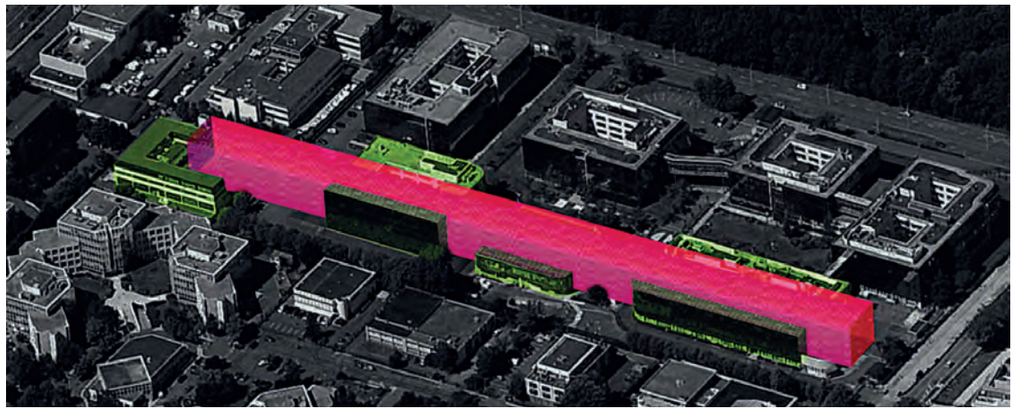
The need for parking facilities generates, in neighborhoods or company campuses, the need to link the buildings and programs through parking lots. The parking lot becomes a dynamization tool through the connection of separated programs. It then activates other programs and consumption possibilities, from the automatic dispenser to the daycare center or hairdressing salon.
In university rehabilitation programs, an activity strip is fed by an access road connected to its parking lot. The electric vehicle incorporated into the architecture becomes an interior public transportation mode. For example, on the Orsay University site, the strip links the site's top and bottom via a group of activities. This strip is a hybrid combining the functions of a conveyor belt, a monorail and a funicular or cable car.

Parking facilities are an urban restructuring tool, they become the link that activates service and commercial programs. As a restructuring element, they combine elements.

Parking lot-link between the programs



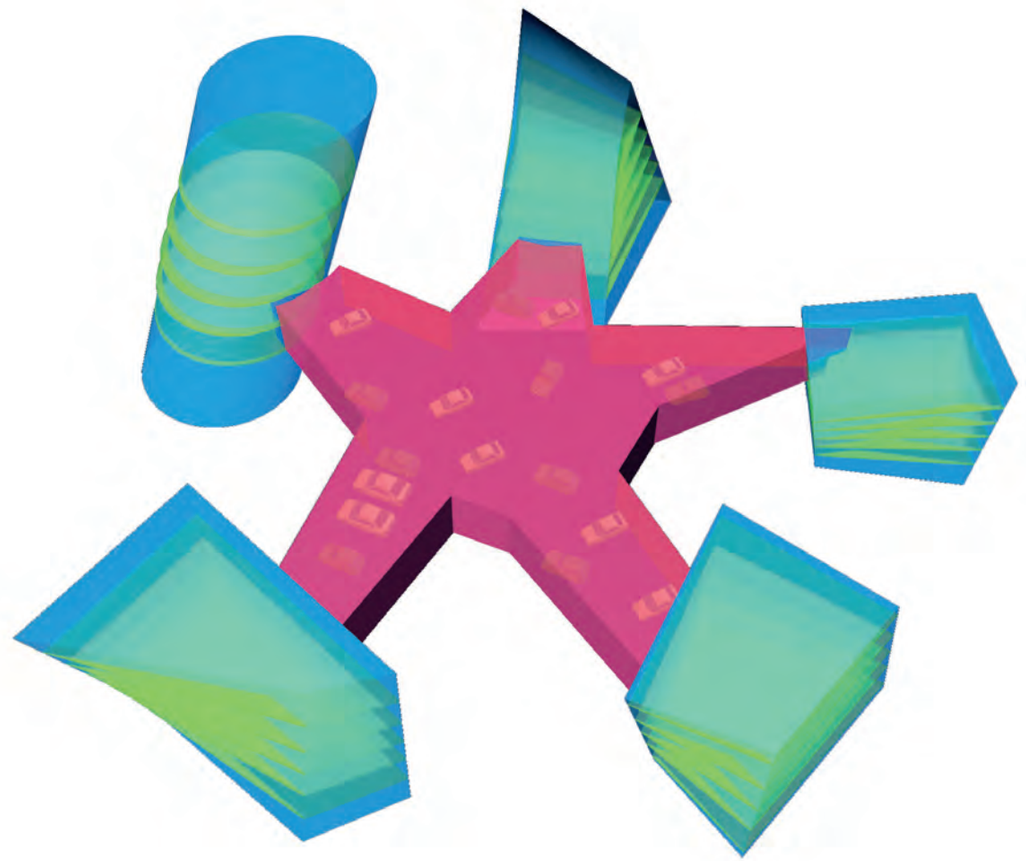
Strip-link: conveyor belt, monorail, funicular, cable car...



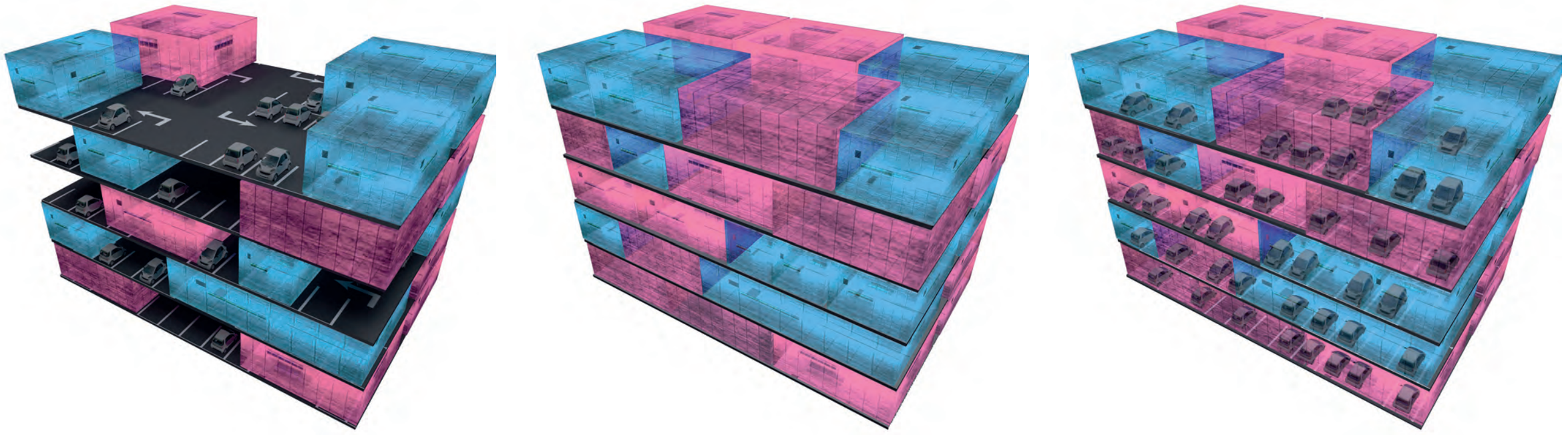
Parking lot-link in Vélizy (pink: parking facilities; green: service buildings

Office-parking facility

The extreme volatility of today's programs generates the flexibility of buildings. Consequently, they can be both and alternatively offices (service sector), stores and parking facilities on the same floors.
The linking function can be created in spread-out commercial or service programs that the parking facilities bring closer together.



Parking facility-star: bringing the programs closer together



The office, store and parking facility building; the building becomes offices and stores; the building becomes parking facility

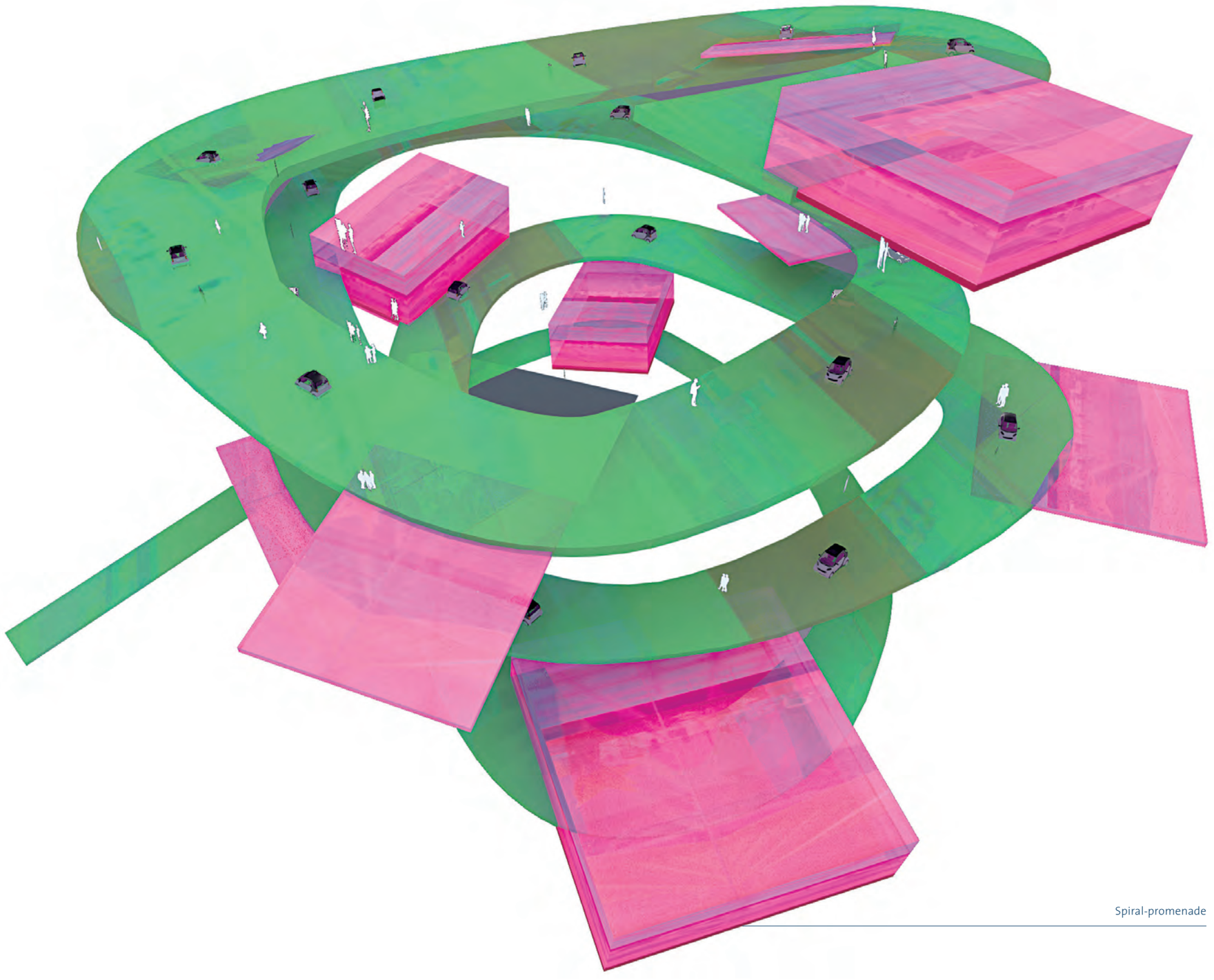
A distracting promenade

Parking facilities welcome different types of vehicles and publics. They generate the arrival of new activities: art exhibitions, sports activities, a restaurant, a café, green spaces. The unification of human activities has arrived at its finality here. The ultimate program is the creation of a hybrid between the urban road trip and entertainment. It is an architectural drive-in "in the air," a producer of new emotions.

Park-and-ride

The park-and-ride is a mobility exchange place because it will permit the arrival of internal combustion engine and electric vehicles, ECVs and all the changes in travel mode. It is also a carpooling station for dropping off and picking up passengers. The motorist can get on a bus or train or take an ECV, a bicycle or a shared electric bicycle, or even an automated vehicle. It is however possible and more than likely that ECV owners will try to bypass the park-and-ride station and go directly to their destination. The ECV, like the scooter with a conventional combustion engine today, is a very powerful travel tool!

The park-and-ride brings together de facto the charging of electric vehicles, car-sharing stations and a carpooling site. We can easily imagine that the dispensers, stores and, in the near future, activities will be grafted onto it. The parking lot and the hub programs will grow closer together. The parking facility becomes a "hub" for multi-modality and will be called "high-service-level parking facility."



Spiral-promenade

Automatic dispenser of electric rental vehicles. Kandi Technologies, Guangzhou (China)

Parking facility-automated vehicle

The valet parking facility associated with car-sharing is a situation in which the vehicle picks up its passenger, drops him off and then parks and charges itself. Thus, the vehicle of the PAMU project (Renault) has been equipped with sensors that enable it not only to be guided in the parking facility, but to drive itself to look for a parking place.[182]

The electric car-valet parking facility combination helps solve the problem of parking spaces located in urban zones. Parking facilities can in this way be far from destinations, whether they are homes, work, distraction or consumption sites. Secondarily, this robotization of the vehicle brings with it a parking place savings of about 30%.[183] The repercussions on the feeling of congestion, real estate prices and therefore on urban development are decisive.

Parking facility-hub

The parking facility at the entrance to a city, on the old model of parking facilities on the Parisian periphery (Porte de Paris, Porte de Bagnolet), is a complex program. It is a parking facility in which you store your "long-distance" car and then take public transportation or an electromobile form of transportation. It is linked to other activities, both commercial and service-oriented, and has a bus station. In parallel, there is the valet parking facility where the automated vehicle will park itself outside the hypercenter. It will however not be linked to other functions.

Parking facility and subdivision

For private vehicles, parking can be far from the home, at the entrance to the subdivision, for example, or even farther. "Garages" or the parking places that occupy the subdivision lots of individual homes are no longer necessary.

The vehicles are stored at the entrance to the eco-district. This facility is an inert building.

Parking facility-"dispenser" above ground level

The Kandi Technologies company in Guangzhou, the city with the highest rate of bicycle-sharing in the world, built a parking facility for electric vehicles above ground level, a "dispenser" where 120 electric rental vehicles are parked, for $3 an hour. Like other products, the car-service, or car-product, is handled by an automatic dispenser.

CHARGING AND RECHARGING

The shopping center is a privileged program for the installation of charging points. As the time needed to completely recharge the vehicle is currently 30 minutes (with the superchargers), it is compatible with the time it takes to make a purchase or the time spent in the shopping center.
Moreover, the location of hypermarkets corresponds to distances measured in time of about 20 to 30 minutes. The hypermarket network covers almost all of France over these time distances.[184] Along with the workplace, the home and parking lot, the commercial space is therefore very favorable to the installation of recharging stations. It is likely that shopping centers will propose recharging free of charge, at least for their consumers.

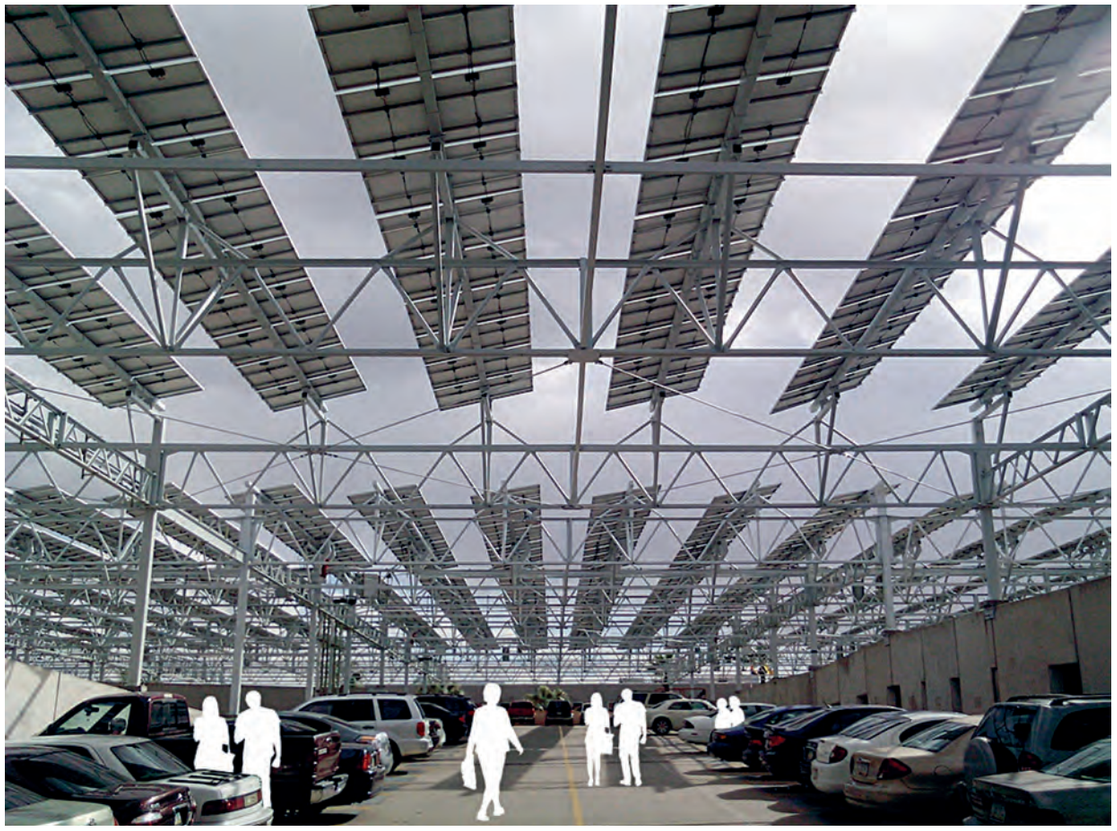
The station-recharging-living room

What do you do while the car is recharging? You do something else. The charging point, as it is presented today, tends to become a genuine service station.

Silo-recharging station

Charging point at Ikea

Charging point-Parasol



Parking facility-solar recharging station

Support functions are developing: newsstand, food, café, free-access office, concierge service area... At the supercharger station, drivers meet, have a coffee and read magazines during the charging time, hardly longer than the wait at the doctor's office.

The relative increase in waiting time is used and filled by new activities that are brought together at the charging station, in the end more favorable to the installation of services other than those offered by the station that came into existence around gas pumps. In fact, unlike the traditional service station, at which activities succeed each other – the café or toilets after filling the tank that immobilizes the driver –, the charging time allows parallel activities. This logic is symmetrical with that analyzed for shopping centers, or possibly for any store that could itself propose charging. (Personal care could be a little more of a precursor on this proposal). Charging and consumption are therefore two interdependent and symmetrical actions.

Charging points and waiting room of the Supercharger Tesla, with a roof equipped with solar panels. Hawthorne Airport, Los Angeles.

Rather than having a charging installation on an entire public space, we think that vehicles that need to be recharged would consume less space and require fewer cables if they were superimposed. This implies going from the charging point to the silo-recharging station.
The program becomes even more innovative when it includes electricity provided by photovoltaic panels, which will have to be spread over larger surfaces than that occupied by a traditional station. The parking facility is one of the privileged recharging places as the charging time is coherent with the time spent in the shopping center or at work.

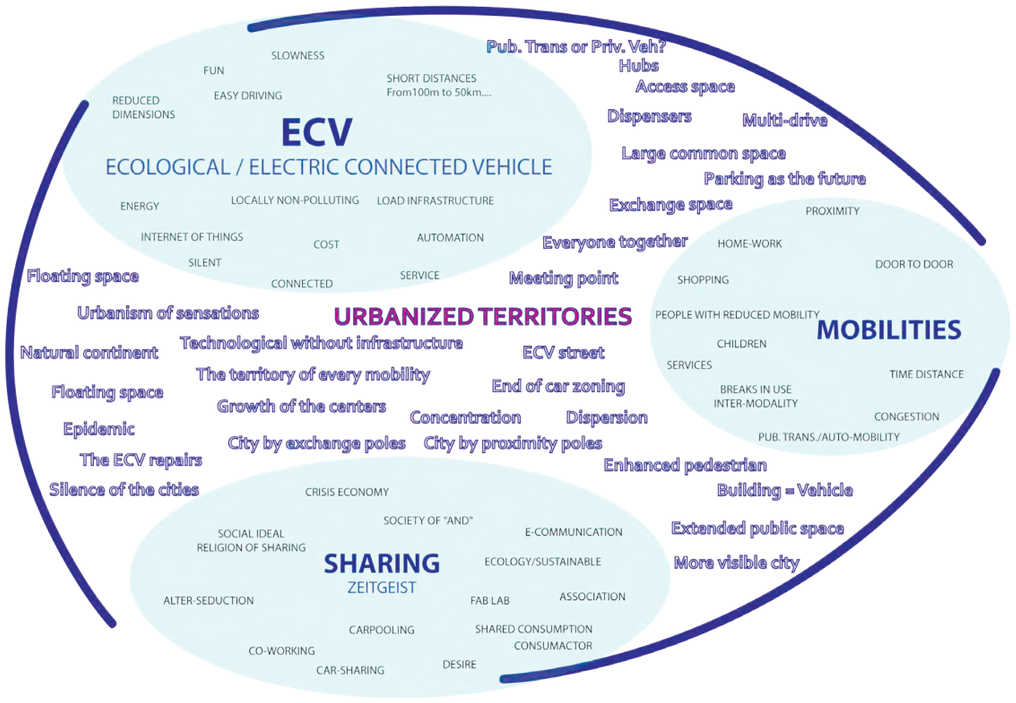
The electric bicycle also needs recharging points. In their turn, they transform the nature of the traditional street, adding an additional furniture element. The bus also recharges at a station, which implies more elaborate street furniture, with recharging via induction.

WHERE DO WE BEGIN?

The 20th-century approach to urban planning was focused on identifying and answering its questions – urban sprawl, housing "the largest number", noise and industrial pollution, travel, etc. – through the separation of functions and zoning. In the post-industrial society, the dominant element has become communication. The transport of goods, information and people appears as the central question of societies in which mobility is synonymous with inhabiting. The metropolitan territory experienced is therefore that of exchanges, communications and travel on a daily basis; they determine relationships, life and sociability networks, our world as our accessibility.

The urban form is generated by "time-distance" (distance measured in time), and as an information or exchange system, it must therefore first be approached from the viewpoint of accessibility and mobility, which are decisive factors in the society of flows and networks. This is not however the approach being used at this time. Accessibility, mobility and urban development are treated in parallel without any real connection. On one hand, we think development, on the other, travel, and we then observe that there are travel problems to solve. The opposition between exchanges/travel and development is the first paradigm of urbanism. It sets a vision of the urban space conceived in terms of the exchange of goods and information against another that uses a spatial conception of the urban space.

The analyses and proposals developed in this work contrast with the "spatialist" tradition of the territory. Always ready to be reborn, this vision of urbanization persists because it is determined by the "interests" of developers and promoters, and afterward by urban planners who relay and legitimize them; that is, definitively determined by their end purpose: resulting in a maximization of the areas of real estate operations cut into the most quickly marketable lots, whatever their perspectives in the longer term. Naturally,



Futur du véhicule, futur urbain

the approach to the urban space via exchanges and networks is that of contemporary complexity, thereafter even less reassuring than the spatial approach, hence the latter's success, and that today still almost entirely reigns unchallenged for clients and government representatives.

This approach however, almost always causes more congestion on a territory with a poor network system and one that is already saturated. In this context, ECVs can fill in the gaps. The flexibility of these new vehicles' mobility "abolishes" distances and as a result, compensates for the difficulties encountered. We have shown that ECVs are clever, cunning and intelligent.

ECVs that tend to repair the city also limit the need for transportation infrastructure; but reciprocally, they bring about the shift in urban polarities to a development of other infrastructures that are the hubs. Thus, the ECV favors the strengthening of hubs to the detriment of a distribution that considered itself "egalitarian," more evenly spread, but at the same time makes the territory even more rhizomatic because the EVC is epidemic.

The urbanism of access, still to be promoted, is achieved by a global approach to "door-to-door" travel, or through a feeder system from a high-service-level station, whatever the means of transportation.

Where do we begin? With travel or the urban form? Priority is to be given to access and travel because they are the dominant feature of contemporary human activities, from the closest to the farthest. The form that we have evoked is a system of relationship creation: an exchange structure in an exchange society. Starting with travel determines the entire development of urbanization projects.

NOTES

INTRODUCTION

1. This can concern energy such as compressed air (vehicle produced by the AirPod company), the fuel cell or very-low-consumption combustion... Let us recall that vehicles that consume less than 2 liters per 100 km have existed since the 1980s. In 2011, Volkswagen presented a vehicle consuming 0.9 l/100 km at the Geneva show. At the Paris Motor Show (2014), Renault was marketing the Eolab, the "sober" vehicle at 1l/100 km.

2. Colin Buchanan, *Traffic in Towns. The specially shortened edition of the Buchanan Report*, Harmondsworth, Penguin books, 1963. The Buchanan Report, named after Colin Buchanan who ran the working group at the Ministry of Transport of Great Britain, was, for urban planners and administrative authorities in Europe as well as in the United States, the indispensable reference for urban planning in the 1960s and 1970s based on the problem raised by the growing use of the car.

3. An approach to auto-mobility close to the acceptance retained here will be found in Melvin Webber. Webber spoke of "auto-like transportation," auto-like vehicles, " "auto-like systems," etc., hoping for future technological developments or referring to the small vehicles in the Third World. Melvin Webber ,"The Joys of Automobility,» in *The Car and the City* (ed. Marvin Wachs & Margaret Crawford), Ann Arbor, The Michigan Press, 1992, p. 274-284.

4. The fuel cell is, for example, mounted in a limited number of the ix35 FCV by Hyundai. Let us also note that there are solar-powered vehicles on the Shell Eco-Marathon.

5. http://www.chicagotribune.com/classified/automotive/chi-fuel-or-electric-vehicles-story.html.

6. Kei in Japanese means something that is light, cute. The Kei car "is practical, inexpensive and small. And it consumes very little." See the article by Philippe Jacqué and Philippe Mesmer, "Le Japon à l'ère de la "smart mobilité," in *Le Monde*, Nov. 21, 2013.

7. We consider electric connected vehicle of small size, low weight, moving at reduced speed over short distances, with little energy consumption. These travel machines are not locally polluting where pollution is the greatest, in the urban or suburban milieu.

8. Trans-humanism or post-humanism, post-cyborg, nanotechnology, biotechnology, information technology and cognitive sciences (NBIC) have been part of the intellectual, scientific and media landscape since the 2000s.

9. "The search for cheap connectivity is indeed the only reason cities were ever built. (...) Were it not for these costs, there would be no cities." Melvin Webber, "The Joys of Automobility", art. cit., p. 276.

10. We initiated research on "an urbanism of sensations": Alain Guiheux, "Le retrait de l'architect" in *Traverses 43*, Feb. 1983; Preface to the French translation of Collage City (Centre Georges-Pompidou, 1993); "Tract pour une ville contemporaine somptueuse," in *La ville. Art et Architecture en Europe. 1870-1993* (dir. J. Dethier and A. Guiheux), Paris, Centre Georges-Pompidou, 1994.

11. For questions on the efficiency of infrastructures, notably roads, see the work by Yves Crozet and the interview: http://www.millenaire3.com/uploads/tx_ressm3/Yves_Crozet_mobilite_2012_01.pdf.

12. See notably the idea of "pervasive information technology" in Jean Danielou, with François Ménard, Gabriel Dupuy and Dominique Lorrain, *L'art d'augmenter les villes* (for an inquiry on the smart city), Paris, PUCA, Sept. 2013, p. 90.

13. Dominique Rouillard, *Superarchitecture. Le futur de l'architecture 1950-1970*, Paris, Éd. de la Villette, 2004.

14. Alain Guiheux, "Neutralité," in *Lieux de travail*, Paris, Centre Georges-Pompidou, 1986, p. 15-25.

15. "The mobility of Île-de-France residents for one business day rose, between 2001 and 2010 rose from 3.50 to 3.87 trips per person and per day. This evolution is moderate (2.31 to 2.37 trips per person and per day), if we exclude trips on foot. *La mobilité en Ile de France*, Institut d'Aménagement et d'Urbanisme (IAU), global transportation survey no. 1, Sept. 2012, p. 5. http://www.iau-idf.fr/fileadmin/NewEtudes/Etude_941/Enquete_globale_transport_HD.pdf.

16. On this new futurism, see D. Rouillard, "Le futur au travail," in Imaginaires d'infrastructures, Paris, L'Harmattan, 2009 and "Futur was back," in *Action Architecture* (dir. A. Guiheux), Paris, Éd de La Villette, 2011.

17. Computer City (Dennis Crompton, 1964), Computer Aided City (Isozaki, 1972). Before them, megastructure projects had introduced the new digital technology, but it remained marginal and not essential to the interactive functioning of the city, disincarnated, without any image. See D. Rouillard, *Superarchitecture. Le futur de l'architecture 1950 – 1970*, op. cit., chapter "L'ordinateur de la mégastructure ."

18. "Why is the metaphor of the basin so resistant to the reality of the mobile society and what good is this mythification through an outdated geography?", Martin Vanier, "Des bassins, encore des bassins, toujours des bassins," in *Cahiers de l'IAU*, "Coupes et découpes territoriales - Quelle réalité du bassin de vie ?" http://www.iau-idf.fr/savoir-faire/nos-travaux/amenagement-et-territoires/les-bassins-de-vie/des-bassins-encore-des-bassins-toujours-des-bassins.html

19. A. Guiheux, D. Rouillard, *Planète urbaine*, Paris, Cité des Sciences et de l'Industrie de La Villette, 2004.

20. This is also the track chosen by John Urry's team. See *Living in cities*, Foresight, Government office for sciences, 2014 (www.gov.uk/go-science).

21. A. Guiheux, *Kurokawa*, Paris, Centre Georges-Pompidou, 1997.

22. See "3 questions à Christelle Chabredier" in *Les voix de la mobilité durable. Une démarche inédite*, Paris, Éd. Le Groupe La Poste, 2012 , and *Les voies de la mobilité durable. Le livre blanc* (dir. Vanessa Chocteau), Paris, Greenovia, 2012. Also Anne Michel, "La poste veut faire évoluer ses bureaux dans les villes" (Le Monde, Mar. 27, 2014), on the transformation of offices into "mail outlets" in the digital age.

23. Since 2010, the AVERE has organized "Trophées des villes électromobiles." The national association for the development of electric mobility, founded in France in 1978 under the impetus of the oil crisis, it slumbered until the launch of the promotion of the carbon-free vehicle by the French government in 2009. A European branch of AVERE was created and since 2013 the association has been encouraging the development of "Regional AVEREs." The promotion and visibility of electric mobility and the vehicles that go with it is a major part of the AVERE's activity. Motto: "Knowing how is good, but transmitting know-how is better," (Joseph Beretta, president of AVERE France, 4th Trophy, Lille, Dec. 11, 2013).

24. See Edward Bernays, *This Business of Propaganda* (New York, 1955); *The Engineering of Consent* (University of Oklahoma Press, 1955); *Edward Herman and Noam Chomsky, Manufacturing Consent. The Political Economy of the Mass Media* (1988).

25. Companies work on influencing demand through an art of persuasion in which advertising is only one tool among others. ECVs have the specificity of taking part in an ideology of the "least consumption," which is part of the general evolution of perceptions and aspirations.

26. The use of 2-wheeled motorized vehicles and bicycles has increased in the Île-de-France, whereas the use of the car is stable or has decreased. Trips on 2-wheeled motorized vehicles increased by 34% between 2001 and 2010. Travel survey 2010, source IAU.

EVC, SHARING, ACCESS

27. See "Future of Mobility," a study by Frost & Sullivan 2014. 115 models of ultra-mobility vehicles (or at Peugeot, the VeLV project: light electric city vehicles) would be in the process of being manufactured, half of which on the market before 2018.

28. Shanghai General Motors Company is a joint venture between General Motors and SAIC (Shanghai Automotive Industrial Corporation), the largest Chinese automaker.

29. The Baupin/Keller Report stressed the impact on health of pollution due to CO_2 emissions (nearly 42,000 premature deaths due to urban pollution). See Denis Baupin and Fabienne Keller, *Les nouvelles mobilités sereines et durables: concevoir et utiliser des véhicules écologiques*, Report on behalf of the Office parlementaire d'évaluation des choix scientifiques et technologiques, Assemblée Nationale, Jan. 16, 2014.

30. The research on "ambient mobility" is being developed in research laboratories, in other words, the capacity of connection systems to "talk" to each other via interfaces, and in real time (i.e., "Ambient Mobility," MIT in association with the University of Stuttgart, 2014).

31. Keller/Baupin Report, op. cit., p. 20

32. After Paul Arzens in the postwar period (the electric egg, 1942), Patrick Tonnelier, among many others today: inventor and promoter of a tilting quadricycle with two tandem seats and adjustable bodywork. It is very narrow: 1.10 m wide and 2.50 m long (UMEIC: Ultra Mobile Etroit Inclinable Carrossé; Ultra mobile narrow tilting bodywork vehicle in English). www.rainbowsystem.fr.

33. Global transportation survey. "Mobilité en Ile de France," 2010. Source IAU, STIFF-DRIEA. art. cit.

34. All the industrialized countries are leaping into the competition: France, Germany, Switzerland, the Netherlands, the United Kingdom, the United States, Canada, Australia, China, Israel, Japan, South Korea...

35. William J. Mitchell et al, *Reinventing the Automobile. Personal Urban Mobility for the 21st Century*, Cambridge, MIT Press, 2010.

36. Pike research, *Electric Vehicles: 10 Predictions for 2013*. www.greencarcongress.com/2012/12/pike10-20121218.html.

37. The interactive infostructure powers the connected objects and systems, and de facto, the "city 2.0," with for example the machine-to-machine (M2M) technology, where connected mobility serves road safety (e-call, b-call, preventive maintenance, etc.), or the Car2Road platform, an infrastructure that tests ecosystems of connected cars in a closed environment, or with the creation of a "social network" for cars that are connected to each other and to other elements of the road infrastructure (vehicle-to-vehicle [V2V] and vehicle-to-X [V2X] system, or vehicle-to-communication infrastructure [V2I], etc.). Daimler AG experimented with this with 120 vehicles in the Frankfurt metropolitan region, under the name of C2X (car-to-X communication). The FING (Fondation Internet Nouvelle Génération) conducts a continuous watch on evolutions in this field in which research is very active. See the publications by the FING, *La ville 2.0*, Limoges, Éd. fyp, collection La fabrique des possibles, since 2008 (www.villes2.fr).

38. Example: the BMW Vision Connected Drive: the vehicle will be capable of showing nearby restaurants when the driver enters a city, finding parking and starting the car's air-conditioner ahead of time. More useful yet, medical assistance: in the event of a heart attack, the car takes over, stops on the emergency lane and calls for help by itself.

39. The 1930s to the 1950s were rich in visions of and experiments on driverless cars. A 1930 Chevrolet ad, "The Safest Place," had already connected delegated driving and road safety: "The car knows what it has to do when it is on the road."

40. See D. Rouillard, "La marche, marketing du corps," in *Marche et espace urbain de l'Antiquité à nos jours*, Clara no.1, Recherche /Architecture, ULB/La Cambre, Brussels, Mardaga, 2013.

41. See Rémi Bastien, research director at Renault /Nissan, "Voiture autonome et voiture connectée: où en est-on?," Atelier Mondial de l'automobile, Paris, 2014 - http://www.sia.fr/evenement_detail_voiture_autonome_voiture_connectee_compte_rendu_1239.htm. Also the "34 plans de reconquête de La Nouvelle France Industrielle" (July 10, 2014), four of which have been initiated by the automotive industry and equipment manufacturers: the car consuming less than 2l/100 km, electric charging points, battery autonomy and power, the electric vehicle. (HYPERLINK «http://www.economie.gouv.fr/files/la-nouvelle-france-industrielle.pdf» http://www.economie.gouv.fr/files/la-nouvelle-france-industrielle.pdf).

42. Thilo Koslowski,"Forget the Internet of Things: Here comes the 'Internet of Cars'." http://www.wired.com/2013/01/forget-the-internet-of-things-here-comes-the-internet-of-cars. "The Internet of Cars," a colloquium that was held on September 24, 2014 at the University of Southampton, closed a three-year research program whose aim was to understand the potential of the new forms of transportation networks through the ubiquity of digital technology. http://www.internetofcars.org.uk/talks/symposium.

43. The "smart city" concept was approached by William J. Mitchell in *E-Topia* (MIT Press, 1999). There was the further development of the idea of a "teleserviced city" composed of "smart" places equipped with sensors, smart service or anything that could be one (from the vehicle to the former spaces served by Kahn). Simultaneously, Dominique Boulier spoke about *Urbanité numérique* (Paris, L'Harmattan, 1999). The bibliography is now immense. A good synthesis of the thinking was made by Eudoxe Denis, Laetitia Strauch, dir. Julien Damon, *Smart Cities. Efficace, innovante, participative. Comment rendre la ville plus intelligente?*, Paris, Institut de l'Entreprise, Nov. 2013. For a critical look, we will cite: Adam Greenfield, *Against the Smart City* ("The city is here for you to use"), Dec. 2013 [Kindle edition], and for the highlighting of the dynamism of medium-size cities in terms of smart technology in relation to large metropolises, Rudolf Giffinger's work since 2007 on the classification of smart cities in Europe according to six criteria, including that of mobility (http://smart-cities.eu/). On a cyborg city, its future and its self-realization, see Antoine Picon, *Smart city* (Paris, B2 2014). The site inria@siliconvalley brings together the work of many research teams. See also http://www.smartgrids-cre.fr/index.php and the Lyon smart communities site. Let us recall that the first "digital city" (very intelligent and interactive!), as a concept and urban project, was the fruit of the imagination of the British group Archigram: Computer City (1964). Here, a triple network of sensors composes a digital infrastructure that, according to Dennis Crompton, represents "the shadow of the Plug-in City" without which the city could not function.

44. The cities are consumers won in advance for the companies (Cisco, IBM, Intel, Microsoft, Oracle, Siemens, Toshiba...).

45. Waze is a traffic and community navigation app that has one of the largest communities in the world. With its 40 million users, Waze compiles their coordinates to find out where there are traffic jams and where there aren't. It started via crowdsourcing and is now a navigation and map service. (Source BFMTV).

46. Smart cities aim at saving money, and limiting public expenditures in a crisis economy. This approach penetrates an existing organization and tends to avoid heavy investments.

47. L'*Open data dans le domaine du transport : analyse des premières initiatives et recommandations*, Apr. 2013. Agence Française pour l'Information Multimodale et la Billettique (AFIMB), Ministry of Ecology, Sustainable Development and Energy.

48. See SENSEable City Lab, MIT. On Singapore, also see Fabrice Casciani, "City modeling: A decision support in the process of planning" (Inria, Stanford Workshop, June 2014).

49. See for example the SFpark site that shows the availability of parking places for San Francisco.

50. See the "Vademecum, Innovation et villes durables: repères pour l'action," Advancity 2015. Study conducted by CMI, Seban & Associés and IFSTTAR.

51. Sophie Laurent, "Veille sur les transports à Berlin," Sept. 2012 (http://www.iau-idf.fr/)

52. http://citydashboard.org/london/

53. The Optimod'Lyon project, launched on December 2, 2012, is the leader of a European-level project, OptiCITIES (2013-2016), which aims at improving urban mobility. Partner cities: Birmingham, Gothenburg, Turin, Madrid, Wroclaw and the Eurocities network. Its innovation lies in the partnership formed with automakers (Renault and PSA/Vedecom) to create a link between the smartphone's GPS and the car's GPS, in order to create a continuity of mobility services and the establishment of multi-modal platforms (http://www.economie.grandlyon.com/projet-europeen-europe-lyon.397+M58c89617b6e.0.html).

54. The bibliography is considerable and sometimes humorous: *La vie share*, by Anne Sophie Novel; the name of her site: "Ouishare" [pronounced "we share"]. Rachel Botsman and RooRogers, *What's Mine Is Yours: The Rise of Collaborative Consumption*, New York, Harper Collins Publishers, 2010. Sharing is an industry that has its billionaires: Airbnb, Lending Club, Etsy, Zipcar...

55. Eric Luyckk and Delphine Masset, L'économie collaborative, une alternative au modèle de la compétition, Etopia, Mar. 2014 (www.etopia.be/publications).

56. The "Do it Yourself " of the 1970s was an incentive to tackle things on one's own, more in a reactive position against anything that was a matter of the decision of a higher order (the system, the state, etc.) than a vision of sharing. Example: the "Do it Yourself City" project (B. Tschumi and F. Montes, 1970).

57. Jeremy Rifkin, *L'âge de l'accès, La nouvelle culture du capitalisme* (2000), Paris, La Découverte, 2005. Also see John Urry, "After the Car" in *Urban Age Electric City Conference*, London School of Economics, Dec. 6-7, 2012 (http://files.lsecities.net/files/2012/12/the-electric-city-newspaper.pdf). Urry imagines four futures of the "post-car system," today in the hands of the oil and steel industries, and considers, following Rifkin, the shift from ownership to access to service determining.

58. See Thanh Nghiem, *Des abeilles et des hommes. Passerelles pour un monde libre et durable*, Paris, Bayard, 2010.

59. See the site "The Participatory City: 100 Urban Trends."

60. "The digital awakened the sense of common goods and made the city the digital place par excellence. Vélib' and Autolib [bicycle and electric car-sharing systems] are emblematic of this happy combination of the bit and the atom. Shared gardens and the associations for the maintenance of peasant agriculture (AMAP) are an organization and a development facilitated by simple Wiki pages. It is certain that open data, open source and collaborative networks are improving the urban democracy through more participation, more ascending innovation." Translated from a post by Sophie Pène, http://www.rslnmag.fr/post/2013/11/26/Ville-numerique-et-experience-democratique.aspx

61. Manuel Castells, *Communication et pouvoir* (2009), Paris, Éd. des Sciences de l'homme, 2013, p. 72.

62. The Japanese Keijid sha (light vehicles) or K-cars distributed since the 1950s.

63. "Drivers of small cars that do not require a license are no longer solely the elderly and those who have lost their driver's license, but trendy young people and teens for whom driving this type of car no longer means you are old-fashioned or a loser." Translation of an extract from the *Challenges* website (http://automobile.challenges.fr/dossiers/20130228.LQA4229/l-electricite-l-avenir-des-voitures-sans-permis.html).

64. See its appearance in a film of the period on https://www.youtube.com/watch?v=9NU_5-E_lNg

65. The ground surface area for parking was evaluated at three times less than the commercial car for two passengers, two times less with two children in the back.

66. On this subject, see the pioneering works already cited by Brian Richards in *New Movement in Cities*.

67. Jacques D'Welles, "A propos de circulation urbaine...", *Urbanisme*, no. 11-12, 1951. D'Welles was moreover the architect of the city of Bordeaux. See also Marguerite Wable, *La voiture partagée*. Laboratoire de la ville en libre service, master 2 thesis, dir. D. Rouillard, ENSAPM, Jan. 2015. See the chapter "Door-to-Door" below.

68. It is today. See, on the Eolab concept, notably on the gains made on the manufacturing/conception of the vehicle to make it affordable as well: "Leviers et Ambitions nationales du Plan Industriel - Le véhicule pour tous consommant moins de 2L/100 km," by Gaspar Gascon, Renault EVP, director of engineering, communication in Panorama 2015 IFP Energies Nouvelles, Paris, Feb. 5, 2015.

69. Many thanks to François Chéry, former director of the TULIP program at PSA-Peugeot-Citroën, for his account.

70. "L'automobile dans 10 ans, l'automobile autrement", *Observatoire Cetelem de l'Automobile*, Dec. 19, 2013. 90% of the French people on the panel studied do not envisage life without a car. The IFPEN has been analyzing the relative diversification of means of transportation that have arrived since the 2010s, notably the development of the shared use of the car, showing a generational effect. Amandine Chevalier, Frédéric Lantz, "Changements de comportement des Français dans les transports: effet générationnel et nouveaux services de mobilité", Panorama 2015 communication IFP Energies Nouvelles, Paris, Feb. 5, 2015. For a sociological analysis of the effects of the growth in trips, see Vincent Kaufmann, *Les paradoxes de la mobilité*, Lausanne, PPUR, coll. Le Savoir Suisse, 2011.

71. There are about 30 car-sharing operators in France today. See Marguerite Wable, *La voiture partagée. Laboratoire de la ville en libre service*, op. cit.

72. Walmart transformed its customers into delivery people by inviting consumers to make a detour to deliver to another consumer through the distribution of reduction coupons.

73. The cities are creating software programs addressed to each elector to permit him to simulate and view on the "entertaining and interactive" mode, digital tablet in hand, the image of his city and his mobility, his square, his street, etc., in an ideal "co-construction." The "Cities without Limits" software in Rennes: "Pedagogic and without an overarching position, 'Cities without Limits' makes it possible to compose a personal vision of the future of a neighborhood corresponding to one's desires and uses" (brochure of the UFO group presenting the interactive app to the forum "Futur en Seine," June 13-23, 2013). See also HYPERLINK «http://www.Urbanfab.org»www.Urbanfab.org and one of the slogans: "Hacking architecture to infiltrate collective intelligence into it." Also, in the same line, www.futuringcities.org (Institut Mine Telecom).

74. See www.icommunity.fr (INRIA), the hub of digital innovation.

75. IAU 2010 travel survey, op. cit. Also, Hélène Jacquot-Guimbal (IFSTTAR), "Révolution numérique et évolution des mobilités", Panorama 2015 communication, IFPEN, Paris, Feb. 5, 2015. On the "challenge of local mobility": 60% of km, 70% of CO_2 emissions (+17% since 1994), stability of trips, increase in distances; the car: 65% of trips, 83% of km, 75% without passenger; trends: rise in the number of cars per household, each vehicle, on average, is used less frequently. The phenomenon was analyzed by Jean-Pierre Orfeuil, *Je suis l'automobile*, Paris, Éditions de l'Aube, 1994, pp. 35-52.

76. "it is interaction, not place, that is the essence of the city and of city life", Melvin Webber, "The Urban Place and Nonplace Urban

Realm", in Explorations into Urban Structure, Philadelphia, University of Pennsylvania Press, 1964, p. 147.

77. M. Webber, "The Joys of Automobility", art.cit., p. 284.

78. Ibid., p. 284

79. For Max Grünig, "The risk is that the major mobility service providers (they will in fact be the major automotive industries) shape our cities [...] the development of new communication technologies, and especially the arrival of the Web 4.0 should make it possible to simplify daily tasks, especially those that earlier required the movement of people." Interview during the 4th Trophée des Villes électromobiles, Lille, Dec. 12, 2013. For POCACITO: http://pocacito.eu

80. Colin Buchanan, *Traffic in Towns*, op. cit., p. 55.

81. Ibid., p. 34

82. Study report by the Setra (Services d'Etudes techniques des routes et autoroutes), "Accessibilité des territoires et des services, notions et representations" (dir. Émilie Jeannesson-Mange, June 2008, p.8 (http://www.infra-transports-materiaux.cerema.fr/IMG/pdf/0837w_rapportAccessibilite.pdf).

83. For Buchanan, the "future of the motor vehicle" is still and always will be the car. After a review of all the inventions and narratives that would permit other transportation systems to replace the car, and there are many of them these years (individual jet propulsion, vertical takeoff aircraft, monorails, carrying by air cushion, "small personal machine" and a whole range of moving staircases/sidewalks), he concludes that "it is difficult to see any new method of movement coming along which will be seriously competitive on a big scale with the motor vehicle" (p. 33).

84. For the connection between A. and P. Smithson and L'IS, see D. Rouillard, *Superarchitecture...*, op. cit. , p. 56-59.

85. A. Chevalier and F. Lantz, art. cit.

86. "Données ouvertes", site of Simon Chignard (donnéesouvertes.info), author of *L'Open Data*, comprendre l'ouverture des données publiques, Orléans, Éd. fyp, 2012.

87. See on Victor Gruen and the connection with Melvin Webber, D. Rouillard, ""La ville à 10 minutes" La distance de temps dans la théorie de la vie mesurée" in *Le temps des infrastructures* (C. Prolorenzo, D. Rouillard), Paris, L'Harmattan, 2007.

88. Geoffrey Baker and Bruno Funaro, *Shopping Centers. Design and Operation*, New York, Reinhold Publishing Corp., 1951.

89. Robert Fishman, "Metropolis Unbound: the New City of the Twentieth Century", in Flux no. 1, 1990 p. 50. See also, J.-M. Benoit, Ph. Benoit, D. Pucci., *La France à 20 minutes*, Paris, Belin, 2002. On the concept of "each individual's city," see A. Guiheux and D. Rouillard, *Planète urbaine. L'exposition, Architecture Action*, Cité des sciences et de l'industrie de La Villette, Paris, 2004; A. Guiheux, "Un urbanisme des sensations", *La ville qui fait signes*, (A. Guiheux), Paris, Le Moniteur, 2004.

CHANGES

90. Colin Buchanan, *Traffic in Towns*, op. cit., p. 21.

91. Melvin Webber, "The Joys of Automobility", art. cit., p. 274.

92. Announcement of aid for a door-to-door personal means of transportation, Dial-a-Ride, tested in New Jersey on the model of "Dial-a-Bus" studied by the Department of Housing and Urban Development in Washington in 1968. *Tomorrow's Transportation. New Systems for the Urban Future*, Washington DC, US Department of Housing and Urban Development, 1968.

93. Brian Richards, "Personal Rapid Transit. The Horizontal 'Elevator'," *Architectural Design*, June 1971.

94. B. Richards, ibid.

95. François Chéry (promoter of the TULIP), in association with the designer Pascal Bertrand Bélanger, designed, in 2013, a personalized public transportation system to deal with the largest number of people, with convoys that could be reconfigured during operation. Mr. Webber could have replied: "We now have enough front seats in the nation's automobiles to carry the entire American population at the same time, plus enough back seats to carry everyone from the Soviet Union as well. The trouble is that many of these seats are being driven around empty." (art. cit., p. 281).

96. On the different public transportation systems for personal and/or non-stop mobility, see Brian Richards, *New Movement in Cities*, op. cit.

97. Bruno Latour (*Aramis ou l'amour des techniques*, Paris La Découverte, 1993) analyzed the brilliant technological invention of the French version of the PRT and its failure: a type of train that could adapt to the urban fabric crossed, provided that it was equipped ahead of time with an appropriate rail network. The success (today relative) of Curitiba's metro-bus is that it mainly concerns a superbus for which only the stations had to be built.

98. See J. Edward Anderson, "Some Lessons from the History of Personal Rapid Transit (PRT)", 1996 (HYPERLINK «https://faculty.washington.edu»https://faculty.washington.edu); on its future: Julien Dechanet, *Vers l'idéal du transport urbain. Le retour du Personal Rapid Transit*, master's thesis, dir. D. Rouillard, ENSAPM, June 2014.

99. On the parallel between these different systems and "inventions," see Brian Richards' tables, then those of Elodie Castex, Didier Josselin in "Temporalités éclatées: la réponse des transports à la demande aux nouvelles formes de mobilté", in *Espace, populations, sociétés*, 2007/2-3, p. 30 (http://eps.revues.org/2292).

100. In the Paris region, the use of motorized two-wheeled vehicles was very significant in the last decade, partially corresponding to a decrease in car use. The ECV is an intermediate vehicle between the car and motorized two-wheeled vehicles.

101. Taiwan has 14 million scooters. In collaboration with the ITRI (Industrial Technology Research Institute), the Taiwanese government set up a national strategic program called "Electric Scooter Industry Promotion Program" with the aim of improving air quality but also reducing its dependence on oil products. Each purchase of an electric scooter (light electric vehicle [LEV] or e-scooter) is subsidized by the government and the local province (http://www.avem.fr/actualite-taiwan-investit-dans-le-develop.ent-du-scooter-electrique-2172.html). Taiwan has 15 e-scooter manufacturers today.

102. Since January 2013, in Arcachon, each family that asks for one is given a bicycle, free of charge and with full ownership. Other cities have limited themselves to lending bicycle free of charge (one year in Bordeaux, Blagnac, Rodez and Nantes, from one week to four months in Angers, etc.).

103. See the sections of *Le Monde* regularly devoted to "company fleets" (Oct. 24, 2013, Apr. 9, 2015...).

104. Until the end of the 2000s, eco-districts remained little interested in the development of a sustainable mobility, apart from the traditional bicycle or public transportation solution. See for example the model district of Kronsberg, inaugurated for the 2000 Hanover fair, focused on the question of recycling and the insulation of buildings and accessible via an aerial metro line.

105. The theme is largely treated in numerous studies. The site www.mobilitytechgreen.com can be consulted on this subject.

106. See the bikeoff site and www.zutphen.nl.

107. The company is Giken. On this theme, see the site www.innovcity.fr.

108. www.Biceberg.es.

109. A. Guiheux, "Tract pour une ville contemporaine somptueuse", art. cit.

110. Automakers are working on these signposting solutions for the ECV, and a European project specifically concerns the "acoustic detectability" of electric vehicles ("eVADER" project: Electric Vehicle Alert for Detection and Emergency Response - http://www.evader-project.eu/public.html).

111. Our thanks to Joanna Wlaszyn of our team for her research analysis on this theme.

112. See Axel Kilian, Ben Fry and Saul Griffith, one of the prizewinning teams of the 2014 Audi Future Award, "Next Leap in Mobility".

113. See A. Guiheux, "Ce qui vient après le storytelling urbain", *D'Architecture*, no. 206, Mar. 2012, pp. 20-23.

114. And not invisible. For this position, see Bruno Latour and Emile Hermant, *Paris ville invisible*, Paris, La Découverte, 1998.

115. Florence Castel (Advancity) shows the development of pollution mapping in Paris.

116. The site of Simon Chignard, author of *L'open data, comprendre l'ouverture des données publiques*, Limoges, Éd. fyp, 2012 [http://donneesouvertes.info] et Data Love(r).

117. https://www.melbourne.vic.gov.au/AboutMelbourne/Statistics/Pages/PedestrianMonitoring.aspx

118. "Un lundi à Rennes", Data Keolis Rennes and OpenStreetMap 2014 to view travel time in Rennes as the day progresses (http://vimeo.com/20368797).

119. http://mappinglondon.co.uk/category/visualisation et Spatial.ly

120. See Ray Oldenburg, *The Great Good Place* (1989); also see on Michel Foucault's intuitions on heterotopy, Edward Soja, *Thirdspace* (1996).

121. The expression was coined by Justus Dahinden, *Structures urbaines de demain* (1971), Paris, Éditions du Chêne, 1972, p. 31. Frei Otto explained that to build envelopes to cover an entire urban space, "one can launch, using steel cables, spans of 25 to 40 km according to their solidity" (*Bauwelt*, no. 16, 1953).

122. See Georges Teyssot and Samuel Bernier-Lavigne, "Forme et information. Chronique de l'architecture numérique", in *Action Architecture*, op. cit.

123. See A. Guiheux, *La ville qui fait signes*, op. cit.

124. Georges Montorgueil, "Ce que serait la société de demain", *Je sais tout*, Oct. 15, 1906.

125. A. Guiheux and D. Rouillard, *Planète urbaine. L'exposition*, op. cit.

PROXIMITY, AN IDEA THAT IS GROWING DISTANT

126. The capital work of Jean Gottmann, *Megalopolis* (New York 1961), was the earliest and most representative of this comprehension of the total urbanization of the territories.

127. As is claimed by one of the extreme forms of the New Urbanism, the New Pedestrianism, which excludes any form of the mobility of proximity other than walking.

128. See Brian Richards, *Moving in Cities*, London, Studio Vista, 1976.

129. Or, summed up by Jacques Lévy: "By walking, we fight obesity and the greenhouse gas effect at the same time." Jacques Lévy, "Ville pédestre, ville rapide ", *Urbanisme*, no. 359, Mar.-Apr., 2008.

130. See Jean-Marc Offner, "Trente ans de pas perdus !", *Urbanisme*, no. 359, Mar.-Apr., 2008, and Sonia Lavadinho, Jacques Lévy, "Marcher avec les transports et la ville", *Prospective*, Ratp/ Epfl, no. 160, 2008.

131. See D. Rouillard, "Le futur au travail", 2009, art. cit. and "Future was back", 2011, art. cit.

132. What is added to this falling back on the theory of flows and walking is the political and social factors recalled by Jean-Marc Offner: competition of collective transportation, preference for shopping centers, loss of the monopoly of neighborhood facilities, danger felt outside leading to preferring the car to walking... (Offner, "Trente ans de pas perdus !", art.cit)

133. B. Richards, "Minisystems in the city", *Architectural Forum*, Jan.-Feb., 1968

134. "Each dwelling must be easily serviced, near to motor vehicles, and above all by a comprehensive pedestrian network of walks,

bridges and galleries to a central area." Theo Crosby, *Architecture: City Sense*, London, Studio Vista 1965, p. 85.

135. Ibid, p. 83.

136. B. Richards, "Personal rapid transport. The Horizontal 'Elevator'," 1971, art. cit.

137. Mechanized pedestrian circulation systems or slow but regular transit had, on the surface, to replace, according to Richards, rod networks and not add to them. (B. Richards, 1971).

138. S. Lavadinho, J. Lévy, art. cit.

139. "La trame viaire du cœur d'agglomération", APUR, June 2013, p. 5. http://www.apur.org/sites/default/files/documents/trame_viaire_synthese.pdf

140. Gérard Brun (dir.), *Ville et mobilité. Nouveaux regards*, Paris, Economica, 2013, p. XI-XIII.

141. On the concept "of experience," see Pierre Macherey, presentation of the work by Michel Foucault, *Raymond Roussel* (1963), Paris, Gallimard 1992, p. VII-XV. On the themes of the experience as product: Gilles Lipovetsky, *L'esthétisation du monde. Vivre à l'âge du capitalisme artiste* (Gallimard, 2013), Yves Michaud, *Ibiza mon amour. Enquête sur l'industrialisation du plaisir* (Nil, 2012).

142. Philippe Journo (promoter of the Phalsbourg company): "At the time of e-commerce, the public can only be attracted to shopping centers by offering it a genuine experience. And the experience is not decreed, it is experienced! For us, it is first of all a function of the quality of the place... What counts for us is that when the public frequents our shopping centers at night, it discovers a magical ambience..." in *AMC* no. 230, Feb. 2014. Also and especially see Yves Michaud, *Le nouveau luxe. Expériences, arrogance, authenticité*, Paris, Stock, 2013.

143. Joseph Pine and James Gilmore, *The Experience Economy* (1989, 2011), the first work on the subject. For the authors, "the value of a product or a service depends on the sensations, the emotions that it gives to an individual." Experiential marketing has constituted a major bibliography today.

ACCESS SPACE

144. See Marie Bernard, *Roadtown. La genèse d'une forme d'urbanisation du territoire : Etats-Unis 1914-1955*, doctoral dissertation (dir. D. Rouillard), University of Paris 1 Panthéon Sorbonne, Feb. 22, 2013.

145. The supercapacitors will be supplied by the 380V low-voltage network between the passage of two buses. We can also envisage something similar to Bombardier buses with dynamic or static recharging. This is the case in the PRIMOVE project or the European FABRIC project in which VEDECOM is a stakeholder.

146. See Wolfsburg's "e-Mobility" station (2013) built in a former "traditional" service station with a multi-electromobility charging infrastructure.

147. These two experiments, among 19 others, were conducted by the research group "Bretagne Mobilité Augmentée" (BMA) at the University of Bretagne in the framework of the "daily mobility of people and goods" research in the Vehicle of the Future of future investment programs (budget: €12 M – aid from ADEME: €4 M). Steered by Fanny Dufour, it aims at co-building mobility solutions in order to make each individual the author of his own mobility.

148. Thus, the Varades-Saint Florent station itself, at the halfway point between the Nantes and Angers stations on the SNCF railroad line, a branch of a Nantes law firm was set up, in a space adjacent to the station itself, proposing, on an appointment basis or at the office once or twice a month, legal aid services for the inhabitants of the surrounding villages.

149. In France, "the arrival of high-speed lines," or the cities' demand for a high-speed train stop, multiples the creations of stations and multimodal exchange poles.

150. See below, the valet city for those who are less mobile.

151. Today, VEDECOM is working with the EPPS and the Community of the Versailles Agglomeration Grand Park (CAVGP) on a service provision project using autonomous shuttles between the Saint-Cyr-l'École station and the Plateau de Saclay.

152. See on the cluster concept, Dominique Rouillard, "La théorie du *cluster* : généalogie d'une métaphore", in B. Fayolle Lussac, R. Papillault (ed.), *Le Team Ten et le logement collectif à grande échelle en Europe*, Toulouse, Maison des Sciences de l'homme d'Aquitaine, 2008.

153. Given the daily rate sometimes asked, we can wonder if it isn't the sharing of the participants' network that is invoiced in the rental of a co-working space, in the same way as membership in a club.

EVERYONE TOGETHER

154. Momoyo Kaijima, Junzo Kuroda, Yoshihara Tsukamoto, *Made in Tokyo*, 2001. Also on the case of a mythic encounter between the building and the network, D. Rouillard, "Un hybride métropolitain à Tokyo", in *La métropole des infrastructures* (C. Prelorenzo, D. Rouillard, dir.), Paris, Picard, 2009.

155. See A. Guiheux, D. Rouillard, "The Future has long been here", in *Athens 2002. Absolute Realism*, Venice Biennale 2002, Hellenic Ministry of Culture, 2002.

156. See above, "Un urbanisme de la qualité et des sensations."

157. A Navia (100% electric and autonomous, manufactured by a French SME in robotics, the Induct company) was put into circulation under real conditions in Lyon in March 2013, in the framework of the Lyon City Design event. The Induct company has since been bought by the NAVYA company, which rebaptized the shuttles of the same name.

158. Masayuki Kawamoto, "A Concept of SIP-adus for the Next Generation Transport", communication of the workshop "Connected and Automated Driving System", Toyota, Innovation of Automated Driving for Universal Services, Nov. 17, 2014, Japan.

159. See further along the video fiction by General Motors for the automated car of "Shanghai 2030," and the account of a visually impaired person on her use of e-commerce ("Have you already wondered what the Internet looks like for the blind?" Nichonsnous: http://rue89.nouvelobs.com).

160. Between prospective and trends, Georges Amar defined the contemporary subject: *Homo mobilis. Le nouvel âge de la mobilité*, Paris, Éd. fyp, 2010.

161. This approach is also being used by automakers in order to break down the reticence of possible buyers.

162. See the feature article of the magazine *Le Moniteur et des Travaux publics*, Sept. 25, 2014 and "R5G, route de 5° generation" on http://www.ifsttar.fr/

THE EPIDEMIC ECV

163. We can imagine that the RATP [Paris transit authority] will have to accept sharing "its" lanes, which is not its position today, arguing that the multi-frequentation of bus lanes will make "commercial speed" drop.

164. Classification created by TomTom in 2015 (http://tomtom.com).

165. IBM classification: http://www-03.ibm.com/press/us/en/pressrelease/35359.wss

166. See for example the European SARTRE project in which the Volvo Car Group is participating.

167. Shadi Sadeghian, *Développer la mobilité électrique. Des projets d'acteurs au projet de territoire, doctoral dissertation*, University of Paris Est, École Doctorale Ville, Transport, Territoire/ laboratoire LVMT, 2013.

168. From March 2011 to December 2012, the Seine Aval territory was the birthplace of an experiment that provided a glimpse of the future "low-emission" mobility. The territory was equipped with the largest density and variety of charging points. In all, 130 charging points, including 48 accessible to the public, were installed in the framework of the experiment, with 65 electric vehicles. At the conclusion of the project, 45 charging points accessible to the public were maintained and incorporate the latest technical evolutions. They can be found on the parking areas of shopping centers, on the roads, in public parking lots and garages and service stations. Wherever it is in Seine Aval, an electric vehicle is never more than 15 km from an electric charging point accessible to the public. Cf. *Bilan de l'expérimentation SAVE (Seine Aval Véhicule Électrique)*, July 8, 2013: http://media.renault.com/global/fr-fr/alliance/Media/PressRelease.aspx?mediaid=49711

169. http://www.digitalgreenwich.com

170. See Arnaud de La Fortelle and Michel.Parent@inria.fr - www.lara.prd.fr; www.citymobil-project.eu.

171. ITS world congress, Bordeaux, Oct. 5-9, 2015.

172. "Self-Driving Cars. Are we ready?", study report of the KPMG company (USA), 2013, p. 30. (kpmg.com).

173. Uber was initially going to buy 2,500 Google Cars. The information, already old, reappeared in February 2012, but this time more in the form of competing projects (bloombergsnews).

174. Jean-Laurent Franchineau is director today of the Programme Eco-Mobilité of the Institut VEDECOM, after having worked on information systems and transportation management at Veolia, then at Transdev on public transportation.

SERVICE PROJECT

175. See the Hong Kong Alternative Car Park Tower architecture competition, 2011

176. See the theme of auto-production, Fanny Lopez, *Le Rêve d'une déconnexion , De la maison à la cité auto-énergétique*, Paris, Éd. de la Villette, 2014.

177. See Laetitia Dablanc, "Des innovations de logistique urbaine à travers le monde - Projet SUGAR", ifsttar.fr and APUR's bibliography on urban logistics.

178. Raphaëlle Ducret, Bruno Durand,"e-Commerce et logistique urbaine: la consigne automatique, une alternative d'avenir ?", 9th International Research Conference on Logistics and Supply Chain Management (RIRL), Aug. 2010, Montreal, Canada.

179. See the automobility.ideo.com projects

180. Thanks to Anaïs Bouvard for having noted this element in *Quand la marchandise vient à moi. Stratégies de livraison en milieu urbain*, master's thesis (dir. D. Rouillard), ENSAPM, Jan. 2015.

181. Shannon S. McDonald, *The Parking Garage: Design and Evolution of a Modern Urban Form*, Washington DC, Urban Land Institute, 2007.

182. The PAMU project was developed with several partners, the UTC, the IFSTTAR, the INRIA, etc. The system was tested on the premises of the Renault Group in 2013 with Fluence ZE sedans.

183. Induct: http://www.youtube.com/watch?v=weZvZ-g-3HA

184. See J.-M. Benoit, Ph. Benoit, D. Pucci, *La France à vingt minutes*, op. cit. Hypermarkets at 20 min.: 79% of the population; at 30 min.: 89% (2002).

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DOOR-TO-DOOR

Future of the Vehicle
Future of the City

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He heads the research, architecture and urban planning office Architecture Action, which conducts missions on studies and the urban execution of large-scale projects, extended beyond urban planning – architecture, development and transportation, urban sociology, the history of architecture and urban planning, the marketing and sociology of trends, scenography and architectural criticism. Contemporary urbanization and the problems it crystallizes have led Architecture Action to develop methodological and strategic projects, presented at major international events such as the Venice Biennale, the Rotterdam Biennale and the Lisbon Triennale.