# Local wisdom before technology ? Traditional cities' sustainable lessons

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Abstract

Contemporary architecture is often anti-ecological in design, using technological tricks to remedy this. In contrast, the historic city is sustainable by definition. As such, it is interesting to examine how some older urban forms can fuel reflection on the future production of green projects.

The example of terraced housing districts, built in Bordeaux between the late 18th century and the 1930s, offers valuable lessons for the design of cities according to their natural and cultural environment.

First, the implementation of the allotment, established a de facto “public - private partnership” as the new districts were organized by private owners according certain regulations established by the municipality. The streets, as public space allow for social and functional diversity. These single family neighborhoods, a very popular housing option in many countries, have a density at least equal to that of the large highrise housing projects of 1960-1970 in France, leading to an economy of land use and reducing transportation. Depending on the city’s evolution, their land plot structure easily allows densification and renewal. At the rear of the houses, gardens occupy at least 30% of the land and offer the possibility of "urban agriculture" protected from the streets. Finally, as terraced houses share common sidewalls and their building fronts form a continuity along the streets, thermal and acoustic comfort is enhanced.

So, these historic districts meet in many respects the criteria of a sustainable city. They could serve as an example for future projects using the “wisdom and know-how” of the pre-carbon cities’ citizens.

# Local wisdom before technology ?
# Traditional cities' sustainable lessons

If there exists a consensus on the necessity to take the protection of our environment into account, it is first necessary to "find solutions that are not the first stupid basic technical ones..." as Monique Eleb[1], French sociologist and housing specialist, has said. She stressed that the purely technical approaches regarding the application of sustainable development become more and more a source of irritation. This includes the simplistic solutions of transforming houses into airtight "thermos" boxes. She regrets that the social aspect of "sustainable development" is not a priority in the research of new forms of housing, taking into account societal changes. Pierre Pinon, architect, professor and researcher in Paris, expressed a similar criticism by referring to the absurdity of many contemporary buildings, for which sophisticated technical devices compensate for inconsistencies in the design and may lead to a technological collage at the expense of architectural quality. In an interview published recently in the journal "*d'architecture*"[2], he develops a critical argument against the concept of the "sustainable city" by demonstrating that many ideas presented today as new has been intelligently taken into account in the "city that lasts". He treats several points that reveal ecological thinking throughout the history of city-making. He observes first that since ancient times, water management and drainage have been objects of special measures. For example, during the Middle Ages, houses in new towns in the south-west of France, were built so that the water from the rooftops could flow in the "Andronnes", narrow streets between the houses for water collection and evacuation. Also natural slopes were used to channel drainage.

Pierre Pinon reminds us that the transport question is the consequence of urban zoning and functional segregation. It would not be an issue if the distance between work and residential location were minimized. The length of daily commuting trips by car have risen sharply and are directly related to urban sprawl, made possible by the democratization of the private car. In France, the phenomenon of urban extension has led to the creation of residential areas that occupy more and more agricultural land. The agglomeration of Bordeaux (27 municipalities) in the southwest of France (Fig. 1) chosen here as an object of analysis is particularly affected by urban sprawl: in 50 years, between 1950 and 1999, its population increased by 45%, while its urbanized area has grown by 136% and its density decreased from 47.8 to 29.4 people per hectare[3]. On a larger scale, 91 municipalities, within the SCOT (coherent territorial plan), the surface of the urbanized area has doubled, while the population increased by only 14%.

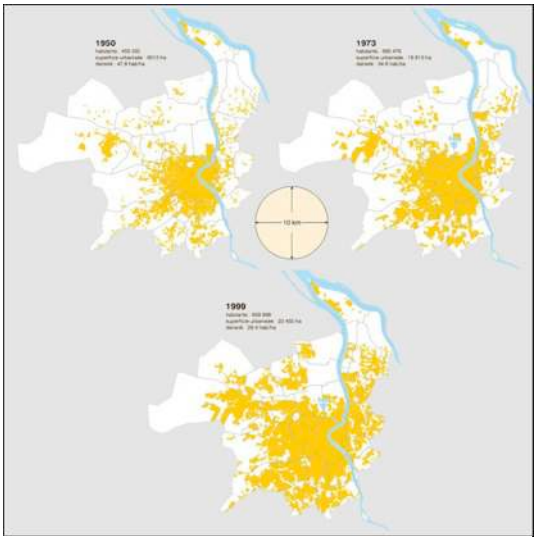

Figure 1 - Evolution of urban sprawl of Bordeaux between 1950 and 1999 (a'urba document, in *Atlas de la métropole bordelaise,* Bordeaux, a'urba/Mollat/INSEE, 2001)

[1] Métropolitiques, "Vu de l'intérieur", Interview with Monique Eleb, by Florine Ballif and Stéphane Bonzani, 22 avril 2011.

[2] Interview by O. Namias and J.-L. Violeau, « Quand la ville dure… Entretien avec Pierre Pinon », *d'architecture*, n°195, novembre 2010, p. 44-47.

[3] Diagnostic of the Bordeaux Metropolis Aquitaine town planning agency (a'urba), 2003.

Low density suburban residential areas are monofunctional, poorly irrigated, with loop road networks or dead ends that limit the possibilities to travel through the area and reduce the possibilities of evolution and functional diversification. The road plan of Bordeaux highlights this: the road network, becoming less dense from the center to the peripheries, shows fringes which disintegrate in a maze of minor non-interconnected roads, reducing their role to the access for only few houses (Fig.2). The land prices in the big cities are nowadays so high that the urban sprawl of the second and third tier suburbs of the cities takes a new dimension, scattering towards agricultural areas[4] at the urban fringe, augmenting more and more the car commuting expenses and related greenhouse gas emissions.

This observation and the imperatives for a sustainable city don't necessarily imply that the construction of freestanding one family homes should stop. Rather it is important to think differently about the way to cluster houses on the land they occupy and the possibility of densification over time. It is not a question of promoting the single-family detached house, nor to give up on collective housing, but to study the possibilities to meet the desire for single family houses, which is the preference of a vast majority of the French and residents of many other countries. Thus the approach demonstrates a certain pragmatism, showing that it is possible to meet a strong social demand and to respect the requirements of sustainable development. It is necessary to examine more sustainable forms of house clustering than those of the suburban single-family types. We propose, in particular, to observe what has been built throughout history in the "pre-carbon" city," the time before the democratization of the private car enabling people to live far from their work.

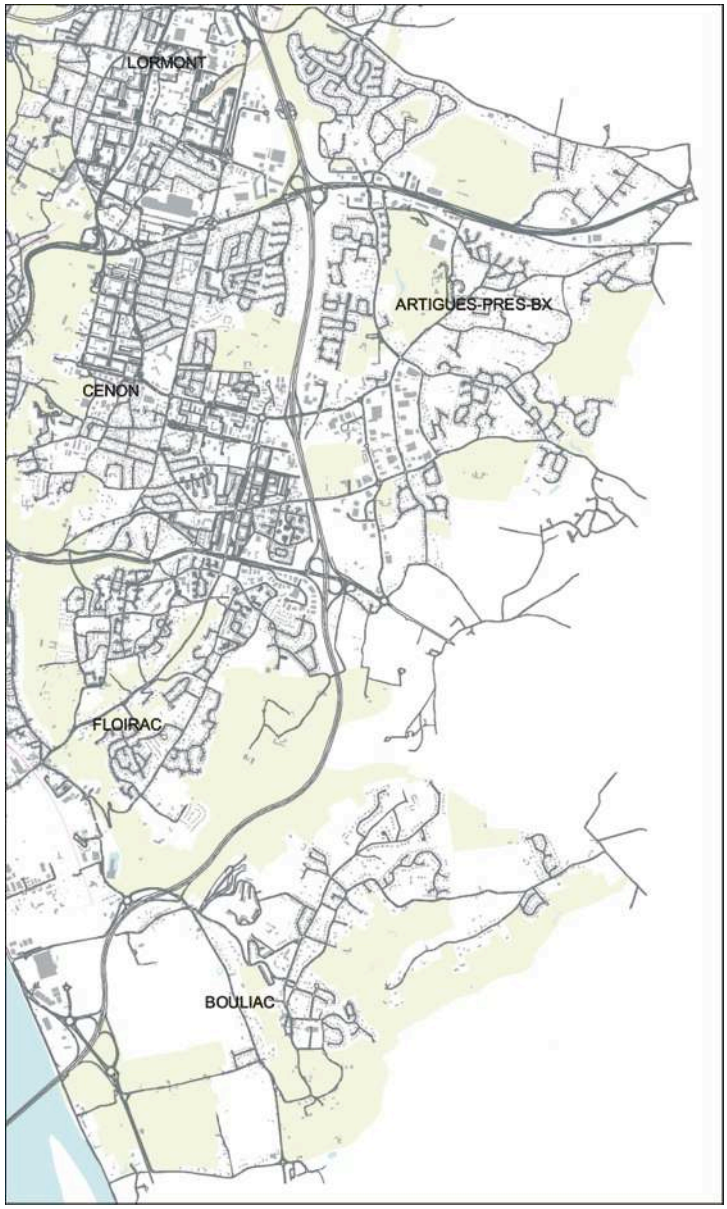

Figure 2 - Excerpt of plan of Bordeaux suburbs (a'urba map)

[4] See Th. Jeanmonod, Ch. Callais, *Maisons individuelles et éparpillement urbain : vers un french sprawl ?*, research report GEVR, « L'architecture de la grande échelle », interdisciplinary research program, Direction générale des patrimoines, Direction générale de l'Aménagement, du Logement et de la Nature, Paris, 2010.

The significant expansion of Bordeaux in the second half of the nineteenth century provides an interesting example to study. From the late eighteenth century till the 1930s, a large area became urbanized, in the form of plots of terraced houses; which became known as a “stone city” in the planning document of the Urban Community of Bordeaux due to their construction in stone (Fig. 3).

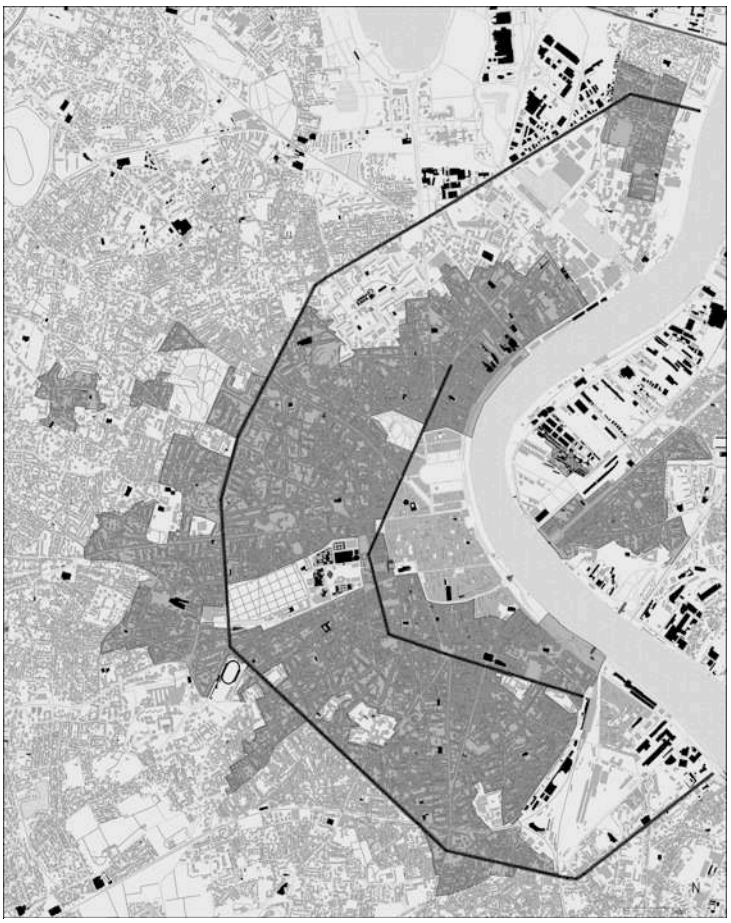

Figure 3 - Bordeaux city plan. In black: the avenues of the eighteenth century and boulevards of the nineteenth-century. Dark gray: the "city of stone", consisting mainly of terraced houses, protected by heritage regulations (plan of Ch. Callais according to geoportail and Bordeaux.fr)

These areas are now included in the perimeter of the city classified since 2007 as UNESCO World Heritage. Their landscapes are protected by specific regulations and part of the local development plan (PLU), which regulates the development of the city. These neighborhoods of townhouses form the first suburb of Bordeaux (Fig. 4 and 5). Their dense form, served by a continuous and coherent street network, developed under specific conditions. If one sifts these districts through the criteria of the sustainable city, one obtains very interesting results: a simple procedure, a sustainable urban form, adaptable housing also in terms of energy saving, high density performance, a potential for functional and social mix.

Figure 4 - **Aerial view of south of Bordeaux residential areas (Bing maps)**

**Making the city by adding subdivisions.**

The first point to observe is that the historic city was made by adding subdivisions. Effectively, throughout history the French cities developed by the process of subdivision. According to the legal definition, a subdivision is a process and outcome of dividing lots of land in one or more estates for sale or lease to create homes, gardens or industrial or commercial establishments. The procedure itself is very simple: No urban project was imposed but the developer, public or private, were facing variable constraints of general interest.

Figure 5 - Residential street scenes of Bordeaux. ©Ch. Callais

Before proceeding with important embellishment works, as is the case in the eighteenth century in Bordeaux, the city elaborated a "specific detailed plan" for public spaces, and then sold the buildable land as building lots, often with specific architectural constraints. When developers are private, as was the case during the nineteenth century for the ordinary areas, each owner becomes a speculator, and , aiming no urban beautification, the urbanization of land is profit driven[5]. The superposition of existing cadastral plans with those of the nineteenth century make this process very readable: each owner plans a street on his or her property, cuts plots and sells them to prospective residents or contractors who build houses for rent or sale (Fig.6). This practice, without a preliminary plan, can lead to a disorganized road network. The strong and rapid population growth in the second half of the nineteenth century led to a rampant real estate speculation and the creation of dead-end streets that recall the current suburban systems. The evolution of a southern part of the city highlights this phenomenon (Fig.7). Moreover the streets are poorly equipped and maintained. The mayors of that time were concerned about this situation. Twice, in 1864 and 1880,


Figure 6 - Land parcel limits of the cadaster of 1851 (in black) copied on the current cadastral plan: one after the other, each owner has subdivided its parcel. (Drawing of Ch. Callais according to cadasters)

[5] For the question how to make the city by subdivision, see Ch. Callais :

« Entre intérêt général et intérêts particuliers : la fabrication de la ville par lotissements. Aspects morphologiques. L'exemple de Bordeaux », *Regards Sociologiques*, n°25-26, *Lieux, espaces, environnement*, revue de la Faculty of Social sciences of the University Marc Bloch in Strasbourg, p. 67-92 ;

« Les quartiers nord du Jardin public à Bordeaux : variations sur le thème du lotissement », dans *Bulletin de la Société archéologique de Bordeaux*, tome XCVII, année 2006, p. 153-175 ;

« Histoire d'une rue ordinaire. La rue Eugène Ténot à Bordeaux», dans *fabricA* n° 3, Travaux d'histoire culturelle et sociale de l'architecture et des formes urbaines, Ladrhaus, École nationale supérieure d'architecture de Versailles, octobre 2009.

they implemented regulations ordering the leveling of the streets, their paving and the installation of a sewer system. And above all they require that every new street be connected to others in order to be classified as public roads. The analysis shows a culture of the "classic" city, in which public space is considered as a circulation space in the interest of all and not only in terms of its access function to buildings.

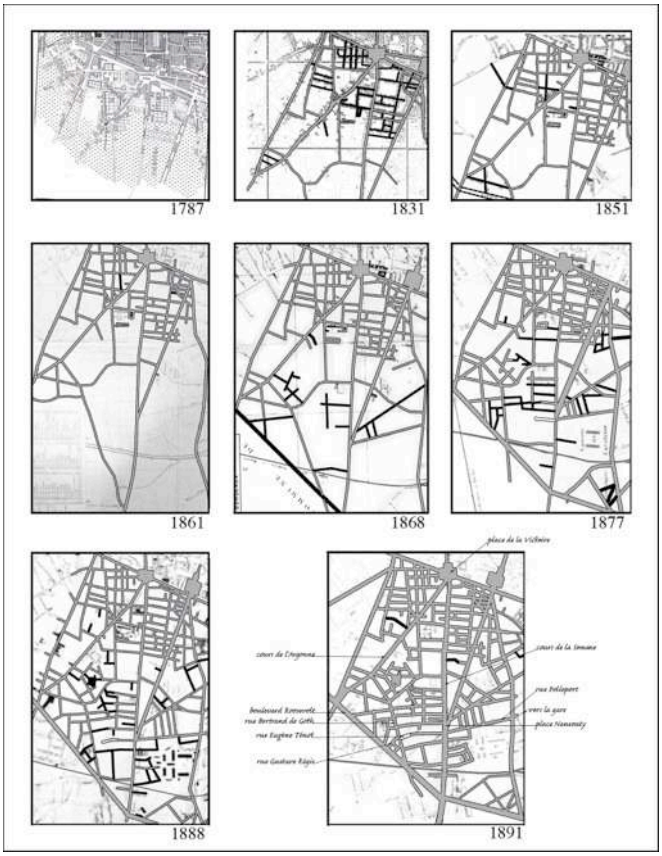


Figure 7 - Evolution of a southern part of the city existing: in gray the already existing streets and in black the new streets. (Drawing by the author based on historical plans of Bordeaux, Municipal **Archives of Bordeaux, Series** XL **A**)

Figure 8 - Greening of residual public spaces by the municipality. ©Ch. Callais

That is how they organized, by newly established control measures, a just balance between the private interests of speculators and residents, and the public interest. Only the continuity of the road network permits circulation and city evolution. Today we could speak in terms of a form of public / private partnership : everyone can speculate provided that it contributes to the “city for all”.

**A continuous road network and 30% planted permeable areas**

Effective government control has resulted in an accessible city, served mainly by a continuous road network. Only archival documents are now able to detect the different subdivisions that are responsible for its formation. But the profit-driven owner/developer deprived these neighborhoods of their gardens and public places, which are relatively rare now. In recent years, the city has begun to plant trees at each large enough intersection and opened a few public gardens in ancient religious properties (Fig.8). The car is still very invasive, but associations are beginning to implement initiatives to reduce its impact, particularly by plantings (Fig.9). It is likely that this process will continue. Although it is positive that residents contribute to the quality of public spaces, it is necessary to ensure that this investment does not lead to a privatization of the streets, or harm the specific quality of the mainly mineral street landscapes, contrasting with the gardens, that form, invisible from the streets, green islands.

Indeed, until the 1930s, houses were built in such a way that they use as little land as possible along the line of the street and in joint ownership. The plots vary in depth and are 5.50 m to 10 m wide that allows a better infrastructure efficiency. At the rear, each house has a garden protected from street noise by the construction itself. Thus these rows of attached houses form green islands virtually imperceptible from the streets of the "stone city", punctuated by a succession of terraced houses. The sum of all the gardens, reserved for family life, represents an average of 30% urbanized area that is planted and permeable (fig.10).

Figure 9 - La rue Paul Camelle, planted at the request of residents. ©Ch. Callais

**Density performance and possibilities for densification**

In order to build multi-functional and compact eco-districts, density is one of the key qualities to take into account. The density of a neighborhood can be calculated in several ways: the ratio of the floor area of the building and the area on which the building is located, the ratio of built-up and non-built-up areas, and the number of inhabitants and dwellings per hectare. The first measures are indicators, but they can be calculated using very different criteria depending on the status of the land (public or private) and the scale of operations (the block or parcel, or a whole area). The most reliable data to compare different operations in residential areas are the number of residents and dwellings per hectare. In 2002, the Bordeaux Metropolis Aquitaine town-planning agency published a very interesting study on the subject, whose results were confirmed by many other publications. It shows in particular that behind

Figure 10 - Bordeaux residential building blocks: a built “crust” to protect a green heart. ©Th. Jeanmonod

equivalent figures, there may be very different urban forms and different housing types, contributing significantly to the quality of landscapes and uses.

Nineteenth-century single family districts, for example, are the same in terms of numbers to the high rise residential buildings of the 60ies, 17 storeys tall : a floor area ratio of about 1, a number of dwellings per hectare between 65 and 104, a number of people per hectare between 113 and 161. The perceived "density" of high-rise buildings is psychological and can be explained by their oversized and often undifferentiated spaces. By comparison, the floor area ratio of recent suburban allotment is around 0.15 and includes nine dwellings and 27 residents per hectare only. (Fig.11)

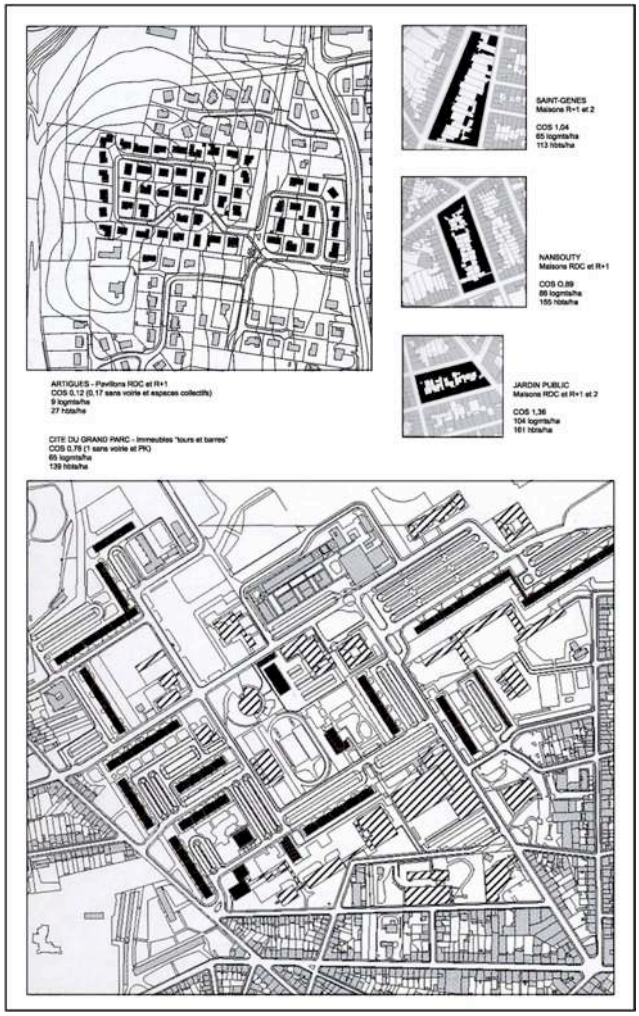


Figure 11 - Comparing densities: suburban freestanding one family houses, downtown residential building blocks, large high-rise residential projects (according to Complex'cité, densités et formes urbaines dans l'agglomération bordelaise, a'urba, No. 1, Bordeaux, January 2002).

Thus, the density performance of the Bordeaux terraced housing districts meet the present criteria for a "sustainable city" (80 to 100 people per hectare). But, as David Mangin[6] says, beyond density that can be high in different urban forms, the compactness (or concentration) criteria and especially that of densification are even more important to consider. The compactness of the built environment will reduce automobile travel and, as history proves, density allows the "natural" evolution of the city over time. Bordeaux residential areas developed considerably over time, in particular by plot densification; by adding a floor on the houses or architectural renewal.

### Grow homes

The construction of the houses is based on common organization fundamentals, corresponding to the conceptual principle of architectural typologies, as explicitly shown in the late eighteenth century architecture, borrowed from the rapidly developing natural sciences in that time. Typo morphological research are developed in France from Italy where they start in the 1950s[7]. Based on his interpretation of the "type" of Antoine-Chrysostome Quatremère Quincy (around 1800), Christian Devillers said that "it [the type] provides the master builder a spatial organizing principle, elaborated by the uses and social values that define the order, the nature and the relationship of the built premises in relation to urban space, and also a realization principle including a construction technology, the use of formal

[6] R. Quincerot, « David Mangin : "La densification est plus importante que la densité" », *Urbanisme, Les valeurs de la ville*, special issue, n°42, mars-avril 2005, p. 36-38.

[7] J. Castex, J.-L. Cohen et J.-Ch. Depaule, *Histoire urbaine, anthropologie de l'espace*, Paris, CNRS éditions, cahiers du PIR Villes, 1996.

procedures (geometry) and sometimes some ornamental systems[8]." Thus, in a given period, a housing type, defined by a set of characters, will always be recognized by all social actors, the designer and (or) the builder, the user and the observer. It would respond to a system of symbolic values, to specific practices, to social codes recognized by all. Far from being fixed, a typology evolves over time by borrowing from other types for various reasons: the identification of a social group with the housing type of a higher ranked one, changing ways of living (the "modernity" of each period), the introduction of innovations from the "learned" culture of architects who are little involved in the housing market, left in the 19th century to contractors.

During the 19th century, Bordeaux developed three types of houses[9]. The one-story house is the first to appear at the end of the eighteenth century. It is first a modest home from which, while conserving its spatial organization, develops later as ground floor house, the so called "échoppe". It also develops into a more fancy residence, often with one more floor. During the nineteenth century, many variations, from the smallest working class house to the mansion, could meet the needs of all social strata. For a long time, the distributive system and some spatial devices serve as constant identity markers of these homes (fig.12). The rooms are distributed by way of a side or central corridor and one or two rooms open onto the street. If the house has a floor, the staircase may be in the center, installed crosswise, or with the first

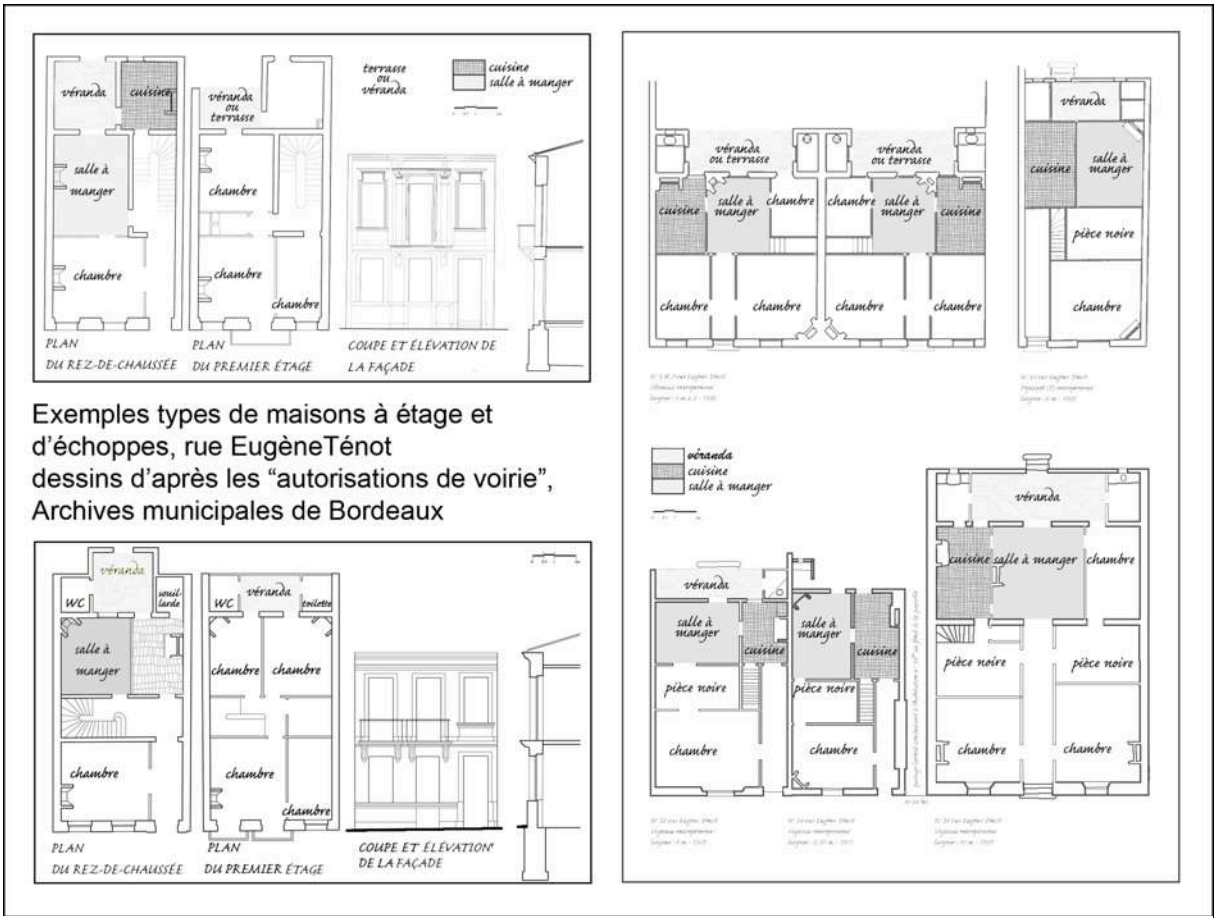


Figure 12 - Classical plans of two-storey houses and ground floor "échoppes" (drawing of T. Rocha-Silva/GEVR, according to the municipal archives of Bordeaux, Series O)

[8] Ch. Devillers, « Typologie de l'habitat et morphologie urbaine », *L'Architecture d'Aujourd'hui* , n° 174, juillet 1974.

[9] See Ch. Callais, « Histoire d'une rue ordinaire. La rue Eugène Ténot à Bordeaux», in *fabricA* n° 3, Travaux d'histoire culturelle et sociale de l'architecture et des formes urbaines, Ladrhaus, École nationale supérieure d'architecture de Versailles, octobre 2009.

flight in view of the entrance. It is illuminated by a glass roof. On the garden side, the kitchen and dining-room have access to the garden by a veranda or covered terrace framed by two brick volumes that house the wet rooms (the “pantry" with sink and toilets) (fig.13). At the center of the house is often a "dark room", that effective increases the useable space, either because the family lacks space or because an owner wants to make a profit from his property, sometimes at the expense of the living comfort. This room tends to disappear in the twentieth century for health reasons. In the rear of the garden, the residents often build sheds or little additional accommodations.

Figure 13 - Traditional veranda on the garden side, here in a very luxurious version ©Ch. Callais

These houses are adaptable. Since the nineteenth century, it is very common that an owner would extend his/her house by adding a floor. The floor additions are today often imperceptible, even for a trained eye. One used the same material, stone, which unifies the whole and by moving the dismantled cornice to the top of the new floor and useing structural elements to connect the two levels. Only the sculpted decorations can reveal the chronology of the work. In contrast, these kind of extensions became aesthetically more difficult in the twentieth century as the different materials used (glass, wood, metal, masonry) and their composition contrasted with that of the ground floor (fig.14). The recent attention being paid to this heritage district leads to a prudent approach of projects to add a floor and permission is often denied unless it is realized in a discreet and aesthetic way, in stone. De facto, the heritage protection policy may actually limit the possibilities of densification, although it is promoted as a sustainable city.

Figure 14 - House heightening by adding a floor: imperceptible in the 19th and first 30 years of the 20th century, diverse and posing aesthetic problems in the twentieth century. The “return of stone”; Today, stone is preferred and reintroduced as construction material. ©Ch. Callais and C. Pascual

The terms and conditions of a total renewal of the buildings on a parcel are less problematic. A complete reconstruction responds to the plot system that punctuates the urban landscape. It is the street that integrates all the buildings whose architectural languages and styles have succeeded each other since the nineteenth century. The contemporary eclecticism fits without too many problems in this system as each house expresses its autonomy. Architects, including many French Buildings Architects (ABF)[10], claim to continue this process, promoting change and invention through a creative contemporary architecture, and protesting against the temptation to "freeze the city" considering it as accomplished[11]. The reality shows the different positions that can always be identified throughout history. If some buildings have a contemporary style, showing that architects try to re-introduce the use of stone (fig.15), others have the status of "contextual architecture" referring to what already exists. In some contexts, the municipal officials promote the practice of pastiche (fig.16).

Figure 15 - Architectural renewal: adapting to the style of each period, examples from 1900 to present. ©Ch. Callais

Figure 16 - Pastiche around a corner building of the nineteenth century, on the boulevards (Agencéa Architectes, 2010). ©Ch. Callais

**Energy assets**

Although the energy performance of the houses can be improved, they already have from this point of view many advantages. Maps published by the city or the Urban Community of Bordeaux (CUB) show that the heat loss of the houses is moderate. The areas with significant loss correspond to the glass roofs that light the stairwells and the verandas on the garden side. As they are terraced, the houses are insulated by the adjoining dwellings on two sides and have only windows in two

[10] The ABF is responsible for the State to control the evolution of heritage sites

[11] J.-M. Blanchecotte, ABF, chef du SDAP (Service départemental de l'architecture et du patrimoine) de Paris, « La ville comme patrimoine : entre fossilisation et modernisation », dans H. Rousso (présid.) *Le regard de l'histoire, l'émergence et l'évolution de la notion de patrimoine au cours du XXe siècle en France*, actes des Entretiens du Patrimoine (2001), Paris, Fayard/Monum, éd. du patrimoine, 2003, p. 193-198.

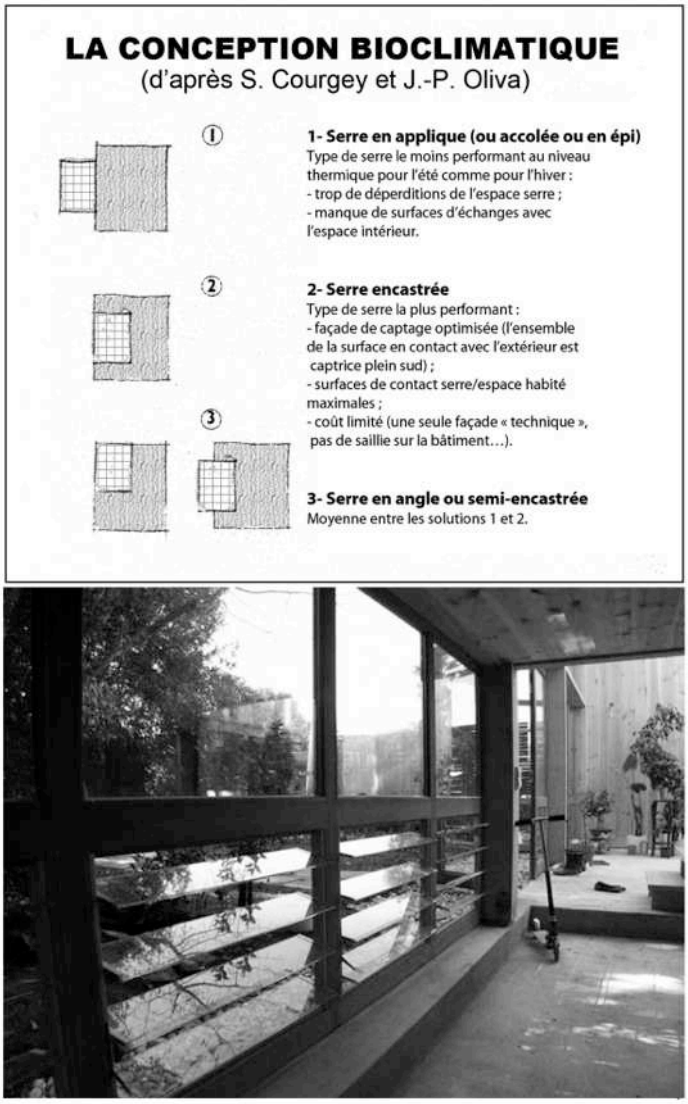


Figure 17 - Contemporary interpretation of a veranda by Pro'che architecture, Bordeaux. (architects-bordeaux.com, in G. Beele, *op. cit.)*

Figure 18 - Wall piercing for the construction of garage doors. ©Ch. Callais

facades. The old windows can be easily replaced by wooden insulating window systems.

The homes are usually compact and the stone walls have a good inertia. Yet should it be necessary to improve the thermal insulation: the walls on the street side can only be doubled from the inside as the facades are in alignment and protected as Heritage. In contrast, on the garden side it is possible to insulate from the exterior as the facades are not decorated and the attics are easy to insulate correctly.

In this type of housing it is the veranda that is the most interesting to exploit. Its position between two masonry constructions is most favorable, if properly oriented to be used as a bioclimatic greenhouse (fig.17). Although the southern orientation is the best, the performance of the greenhouse is reduced by only 5% with a variation of 20° to the west or the east and 40% if the angle is 40°. If the orientation is different, the veranda can serve as a thermal buffer space between the inside and the outside[12].

The final point concerning these houses is the fact that the majority don't have a garage, due to their construction date, which can be regarded today as an asset for at least two reasons. The first is that there is no cold space in the thermal envelope of the house, the second is the observation that people are used to parking their car sometimes several hundred meters from home, particularly in former workplaces,

[12] G. Beele, « Maisons de ville bordelaises et développement durable », master thesis under the direction of Ch. Callais, interim report, 2011.

which allows us to envisage an important reduction of cars in these neighborhoods if one want to confirm the possibilities for an "eco-district". Today, the Heritage conservation officials concerned about the damaging during the 20th century of front facades to construct a garage door, seeks to prohibit this kind of works (fig.18). But the “city of stone” is still dominated by a car-centric lifestyle and beyond a certain surface area extension, it is compulsory to have a garage. Probably, the heritage awareness failed to use the ecological argument to dominate the car-centered thinking.

According to empirical studies[13], the insulation performance required by the thermal regulations to be implemented in 2012-2013 (the "2012 RT") would be difficult to achieve without an almost complete modification of the house. To comply with the energy performance label "*BBC effinergie renovation*", on which the 2012 RT is based would require an significant reformulation of these houses. Obviously this is not desirable, not only because of their heritage and cultural value but also because of their performance in the field of economical commuting and density, and the possibilities they offer to produce a part of their energy (solar panels) and to be heated by wood stoves. As they are located in a region with a mild climate, one lives outside for more than six months of the year.

The French government has developed a system of tax credits and incentives for individual homeowners who undertake energy conservation projects, independent of income level. Between 2005 and 2008, one resident out of seven has done done work to reduce the energy consumption of the house, especially in single-family homes. Although this percentage indicates an awareness of the issue, it is not possible to assess the real energy saving or reduction of greenhouse gas emissions[14].

**A functional and social mix in decline**

Before the private car began to dominate urban thinking from 1930 onwards, it was common practice to live near the workplace. This “natural” process of human settlement not only led to a compact mixed-use city, but also to spatial proximity of different social classes. Residential areas had little factories, whose frontages perfectly fitted into the landscape of public space. The entrepreneurs built their houses in the vicinity of their enterprises and would sometimes build "échoppes" for their workers who didn’t build their own house themselves or took a contractor. Artisans and small shopkeepers associated shop/work/living in one building, the so-called shop/house[15]. Thus there was no important spatial separation between a rich and a poor districts, but rather more or less wealthy streets or sections of streets. The architect Paul Andreu[16], who spent his childhood in Bordeaux, witnesses the socio-spatial mosaic of neighborhoods which combines prestigious streets and modest roads forming the same building blocks [...] "There were houses of all sizes, some tiny, single or double « échoppes », other huge, two or three floors. There were streets of large houses but alongside other, more modest ones. In more remote areas which I didn’t explore for a long time, there were also big mansions or very poor houses." Daily use of public facilities (schools, kindergarten, etc…) and grocery stores was possible as they were evenly distributed.

These qualities of mixed-use and social diversity declined continually over time. The enterprises moved outside the city. From 1980 until today, the abandoned premises are used for two different purposes. The first is the replacement of the workplaces by multi-family

[13] G. Beele, ibid.

[14] G. Debizet, « La rénovation énergétique des bâtiments est-elle possible ? », Métropolitiques.eu, 6 juillet 2011.

[15] In French, the "échoppe" is a small town house in Bordeaux, but also a small shop or workshop.

[16] P. Andreu, La maison, Paris, Stock, 2009, p. 9.

residential buildings and parking places instead of gardens. The second type of transformation is replacing the work premises or warehouses by garages for cars. If there is an under-utilization of storage space, to use these places to park accustoms the residents to park their cars at some distance from their homes and thus to separate the garage from the house. This practice could be an incentive to reduce the impact of the car in these neighborhoods and inspire the design of new green districts. Public facilities such as schools are still present today and rebuilt when they are too old. The shops have suffered the consequences of the implementation of large commercial centers in the outskirts of the city but recently there has been a return of certain small urban commercial establishments.

The spatial integration of different social classes has been disappearing since the 1980s as these residential areas show marked signs of gentrification. In the mid-twentieth century, these houses, although still appreciated by the residents, did not get good press: architects and municipal officials criticized the insalubrious "black room" and veranda, the repetitiveness and monotony of the street scenery and plan[17]. The years 1980-1990 marked a turnaround. Some architects, teachers and researchers, began to be interested in the morphogenesis of these districts[18]. They recognize in this type of housing not only a witness of a rich, local "art of dwelling" but also a potential reference point for contemporary housing, both urban and individual. During these years, as generations pass, the middle and upper classes, which value living near city services, have gradually reinvested in the Bordeaux townhouses. . At the same time developers became interested in these areas and built some interesting terraced housing projects on liberated plots of land. The same process took place in the French historic centers: at first the most disadvantaged populations mix with the privileged social categories and are then driven out to outskirts, more and more distant from the city centers[19]. So, the "échoppes", built for and by the workers, almost totally lost their original vocation and their property value continues to increase, confirming that living in the city is now a luxury in France.

As these residential areas have nowadays a heritage interest they accede to a value dimension which goes beyond its original use and function, in the words of Gilles Nourissier[20]: "une dimension supérieure à l'usage et extra-functionelle". This new and final step introduces the concept of "ordinary heritage" which is probably a logical extension of the gentrification of these neighborhoods. Their inclusion in the heritage inventory is a new element that responds to the emergence and rise of the notion of "ordinary heritage" that develops in France and around the world from the 1960s: "conservation areas" with the Malraux law in 1962, creation in 1964 of the General Inventory of monuments and Art treasures of France, highlighting the local dimension of heritage and its assigned identity value, creation in 1983 of the ZPPAU (area of architectural and urban heritage), and finally, in 2000, the possibility to create a PLU (local development plan) respecting the heritage concept (from 2008, used for parts of the Bordeaux residential areas). Globally, the Venice Charter (1964) was adopted by the ICOMOS in 1965[21]; its first article[22], considering that the

[17] J.-B. Philippon, « L'habitat bordelais », Urbanisme, n° 27-28, 1953, p. 93.

[18] Research directed byr Ch. Callais, GEVR, depuis 1997. Report in 2001 : *Les lotissements de maisons de ville à Bordeaux* and different articles.

[19] Ch. Gulluy et Ch. Noyé, *Atlas des nouvelles fractures sociales en France. Les classes moyennes oubliées et précarisées*, Autrement/mémorial de Caen, 2004, p. 18.

[20] G. Nourissier, *Architecture traditionnelle méditerranéenne*, Corpus, Barcelone, 2002. See also « Le tissu est un milieu en soi, sa transformation est un processus permanent », 2005, online.

[21] Conseil international des Monuments et des Sites.

concept of historical monument can be applied to urban and rural sites, establishes the concept of "ordinary heritage". The analyses of the residential areas conducted by the City[23] and the resulting regulations show an aesthetic point of view that dominates that of the uses. Moreover, these new measures destined to regulate conservation and development have failed to create a synergy between the requirements of "sustainable development" and the heritage qualities being protected. For example, it remains obligatory, beyond a certain additional created floor space, to build a garage on the housing plot, while such a building introduces a cold space in the house and often significantly deteriorates the façade.

The process highlights the progressively changing values - qualitative and financial - assigned to these neighborhoods during the twentieth century, confirming the observations made in many European cities in the 1950s; neglected in the fifties, they became, from the 1980s, attractive for the privileged classes and researchers. Then, in the 2000s, they are considered and valued as cultural heritage by the city officials.

Figure 19 - A street of "triplexes" in Montreal. ©Ch. Callais

If the idea of a house is usually related to a detached house on its own plot of land, it is clear that the nineteenth century terraced houses have conserved a use value and their success is confirmed by their still climbing property market value. Their heritage qualities will certainly increase their value even more. It should be possible to develop the already existing sustainable qualities of these ancient districts, in particular by a more intelligent management of the car and proactive measures to promote the social diversity they once had.

Figure 20 - Detached single-family housing development, Bordeaux, Mazières architectes, 1982. ©Ch. Callais

Of all the indicators of a sustainable city, the technical aspects are often better accepted. But the cultural and urban aspects, the intelligence of the land use, the simplicity of their implementation that characterizes the Bordeaux residential districts of the nineteenth century, are easier and cheaper to implement. They are important with regard to transportation savings and reduction of greenhouse gas emissions. This type of urban form and architecture can serve as a reference for the design of new neighborhoods, dense, able to combine housing and workplaces, easy to mix people from different social levels, sharing the street as a common space. Bordeaux is far from being the only example, in France and elsewhere. In Montreal, where Ecocity 2011 took place, the “triplex” housing type, often multi-family terraced houses[24], for example, represent another highly performing and exploitable model (Fig.19).

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[22] «the concept of 'historic monument' not only concerns the single architectural work but also the urban or rural setting in which is found the evidence of a particular civilization, a significant development or an historic event' It comprises not only great creations, but also modest oeuvres that, over time, became culturally meaningful and important».

[23] Survey on the urban architectural landscape of Bordeaux in 2004. Important inventarization and analysis of the southern part of the “stone city” results in new regulations for this zone, voted in 2008.

[24] See the work of C. Després, professor of architecture, Université Laval, Québec, Groupe interdisciplinaire de recherche sur les banlieues (GIRBa)..

Figure 21 - Examples of row houses. From top to bottom: in Le Bouscat, OPUS Architectes, 1980; in Bordeaux, B. and M. Bühler Architectes, 2005; A. Liquard architecte, 2005. ©Ch. Callais.

Figure 23 - Residential housing area in the Borneo district of Amsterdam (several architects, year 2000). ©C. Vanhooydonck

Yet it remains to imagine processes of dense poly-nuclear urbanization and to conduct educational activities among the population and elected officials, to show that it is possible to live comfortably in houses that do not meet the idealized model of a detached house on its own plot of land.

If there is the political will, it would still be possible today through simple regulations or a more elaborate urban project to implement lots of terraced houses. Today, the measures of nineteenth century mayors reveal tacitly a culture of the city, often forgotten but not obsolete, by organizing a complete and continuous system of distribution of urban territories, in which the street has two functions, that of circulation and of access to buildings. They also show that it is important to have an idea of what kind of city we want to build. Today, land subdivision could still offer an alternative to the detached housing scheme. It could be improved by a project approach and reinterpreted in a contemporary context, for example through the process of a "participatory urban project" combining public and private actors.

In the 1980s, there already had been experiences, at a smaller scale, that are often forgotten today (Fig.20). Already for several years, the awareness of the importance of density, be it for economic reasons, shows that solutions exist, either as part of urban renewal, either through city and village extensions. Mostly, this concerns identical row houses (fig.21), or types of experimental cluster housing (Fig.22). But the principle of dense subdivision, where anyone can build his own house on an independent plot of land, but sharing common dividing walls with the neighboring unit, is not often used today in France. In Europe, the recent experience of the Amsterdam Borneo district, in a contemporary architectural style, is often shown as an example, but remains an isolated case (Fig.23).

Figure 22 - Experimental single-family housing project, “Les Diversités”, Bordeaux, 2000-2008 (as part of the research program "Maison individuelle, architecture, urbanité", 1998, PUCA, Department of Ecology, Sustainable Development, transport and housing). ©Ch. Callais

**Captions for illustrations**

1-Evolution of the urban sprawl of Bordeaux between 1950 and 1999 (a'urba document, in *Atlas de la métropole bordelaise,* Bordeaux, a'urba/Mollat /INSEE, 2001)

2-Excerpt of plan of Bordeaux suburbs (a'urba map)

3-Bordeaux city plan. In black: the avenues of the eighteenth century and boulevards of the nineteenth-century. Dark gray: the "city of stone", consisting mainly of terraced houses, protected by heritage regulations (plan of Ch. Callais according to geoportail and Bordeaux.fr)

4-Aerial view of south of Bordeaux residential areas (Bing maps)

5-Residential street scenes of Bordeaux. ©Ch. Callais

6-Land parcel limits of the cadaster of 1851 (in black) copied on the current cadastral plan: one after the other, each owner has subdivided its parcel. (Drawing of Ch. Callais according to cadasters)

7-Evolution of a southern part of the city existing: in gray the already existing streets and in black the new streets. (Drawing by the author based on historical plans of Bordeaux, Municipal Archives of Bordeaux, Series A XL)

8-Greening of residual public spaces by the city municipality. ©Ch. Callais

9-La rue Paul Camelle, planted at the request of residents. ©Ch. Callais

10-Bordeaux residential building blocks: a built “crust” to protect a green heart. ©Th. Jeanmonod.

11-Compared densities: suburban freestanding one family houses, downtown residential building blocks, large high-rise residential projects (according to *Complex'cité, densités et formes urbaines dans l’agglomération bordelaise*, a'urba, No. 1, Bordeaux, January 2002).

12-Classical plans of two-storey houses and ground floor “échoppes” (drawing of T. Rocha-Silva/GEVR, according to the municipal archives of Bordeaux, Series O)

13-Traditional veranda on the garden side, here in a very luxurious version ©Ch. Callais

14-House heightening by adding a floor: imperceptible in the 19$^{th}$ and first 30 years of the 20$^{th}$ century, diverse and posing aesthetic problems in the twentieth century. The “return of stone”; Today, stone is preferred and reintroduced as construction material. ©Ch. Callais and C. Pascual

15-Architectural renewal: adapting to the style of each period, examples from 1900 to present. ©Ch. Callais

16-Pastiche around a corner building of the nineteenth century, on the boulevards (Agencéa Architectes, 2010). ©Ch. Callais

17-Contemporary interpretation of a veranda by Pro'che architecture, Bordeaux. (architects-bordeaux.com, in G. Beele, *op. cit.)*

18-Wall piercing for the construction of garage doors. ©Ch. Callais

19- A street of "triplex" in Montreal. ©Ch. Callais

20-Detached single family housing development, Bordeaux, Mazières architectes, 1982. ©Ch. Callais

21-Exemples of row houses. From top to bottom: in Le Bouscat, OPUS Architectes, 1980; in Bordeaux, B. and M. Bühler Architectes, 2005; A. Liquard architecte, 2005. ©Ch. Callais.

22-Experimental one family housing project, “Les Diversités”, Bordeaux, 2000-2008 (as part of the research program "Maison individuelle, architecture, urbanité", 1998, PUCA, Department of Ecology, Sustainable Development, transport and housing). ©Ch. Callais

23-Residential housing area in the Borneo district of Amsterdam (several architects, year 2000). ©C. Vanhooydonck