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EDITED BY
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URBAN HERITAGE AND SUSTAINABILITY
IN THE AGE OF GLOBALISATION





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5. Tackling Sustainability in Bordeaux: Bridging Modern and Traditional Neighbourhoods

*Fanny Gerbeaud, Aline Barlet and
Caroline Mazel*

Introduction

Bordeaux embodies the traditional European heritage city. Like many cities on the old continent, it is a palimpsest that has witnessed several currents of thought on urban development patterns, comfort, modernity and ecological awareness. Today, the city comprises several urban elements reflecting these diverse perspectives as well as major societal changes that are transforming our understanding of these testaments of the past.

This chapter aims to explore the debates and periods of rehabilitation, both moral and physical, that have successively affected multifunctional districts. These districts, encompassing both traditional neighbourhoods (from the eighteenth and nineteenth centuries) and modern neighbourhoods, are now confronting the challenges of ecological transition. By elucidating the principles that governed the construction of these neighbourhoods, subsequent viewpoints, particularly those of the modern movement, and contemporary perspectives, we will demonstrate their significance in current discourses and their alignment with the goals of creating sustainable cities in the twenty-first century.

This chapter shares the results of a two-year joint research programme (2017–2019) conducted by the PAVE and GRECCAU Research Centres (ENSAPBx) and the University of Cincinnati (DAAP). The project focused on the perceptions of stakeholders—inhabitants, landlords and experts—of what constitutes sustainable heritage in the context of the energy transition with regard to modern housing. The research entailed stakeholder interviews, housing measurements (including hygrothermal and natural light assessments) and socio-spatial analyses, focusing on the modern neighbourhoods of Mériadeck and Pontet-Lamartine. These two neighbourhoods, despite their contrasting dimensions, typologies and locations, share urban qualities and a strong potential for change. Mériadeck (1951–1980), in the centre of Bordeaux, is characterised by deck-and-tower structures with separate circulation systems and cross-shaped towers overlooking one of France's first protected heritage areas. Pontet-Lamartine consists of twenty-eight patio row houses (1970–1971). The owner-residents of this neighbourhood are proactive in promoting their Modernist heritage and developing civic life, for example, joining forces to safeguard amenities like shops, services, shared public spaces and a park open to a rapidly densifying surrounding area.

In sharp contrast with their environment, these two neighbourhoods recently merged with the traditional city centre and the suburban fabric of the growing metropolis. Both have contributed to Bordeaux's sustainability through their distinctive designs and facilities.

This chapter first discusses the spatial and urban qualities of the traditional stone city and modern post-war neighbourhoods, as envisioned by their designers, which can be described as sustainable today. Combining both objective metrics and subjective evaluations, this research identifies specific urban features in these districts that, rather than confirming their obsolescence, demonstrate the value of these areas in terms of quality of use. It argues for an adapted definition of the sustainability goals and strategies in heritage neighbourhoods dating from and before the twenty-first century. Finally, we highlight the inhabitants' commitment to achieving the physical and moral rehabilitation of the heritage they value while addressing the challenges of sustainability on a metropolitan scale.

Bordeaux, a Heritage City with Two Faces

France's largest port in the eighteenth century, Bordeaux built its fortune on the triangular trade between France, Africa and the West Indies. The Age of Enlightenment was also the golden age of Bordeaux, marked by its quay facade, places and courtyards 'à la française' (like the Place de la Bourse) connecting riverbanks with the typical long and narrow wine cellars of the Chartrons district. All of these developments showcased its rich stone architecture¹ and led to the city centre's designation as a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site in 2007.

This 'stone city' is also characterised by a low skyline on the outskirts of the city centre,² made of one or two-storey buildings and *échoppes*,³ typical ground-floor terraced houses built in large numbers in the nineteenth century for employees during the era of industrialisation (see Figure 5.1).



Fig. 5.1 Echoppe housing in Pannetier street, Bordeaux. Author's photograph, 2021, CC BY-NC-ND.

These archaeological typologies were shunned in the 1970s and 1980s as households pursued homeownership and modernity, moving to pavilions in the developing suburbs of the Urban Community of Bordeaux. A series of revitalisation and renovation projects began in 1995 under the mayorship of Alain Juppé. These projects emphasised delicate architectural details, enduring construction quality and density,

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- 1 Robert Coustet and Marc Saboya, *Bordeaux : le temps de l'histoire, architecture et urbanisme au XIX^e siècle, 1800–1914* (Bordeaux: Mollat, 1999).
 - 2 Gwenaël Querrien, *Portrait de ville* (Paris: Cité de l'architecture et du patrimoine, IFA, 2006).
 - 3 Chantal Callais, *L'échoppe de Bordeaux* (La Crèche: La Geste, 2018).

and several sustainability characteristics, such as green spaces and gardens, urban facilities and nearby transportation, which breathed new life into these areas. The stone buildings also represent a great heritage value, being both expandable and aesthetically pleasing.

This model of 'conservatory upgrading'⁴ was opposed in the early twentieth century by the hygienists, who sought to eliminate substandard and unsanitary housing, such as existed in the old Mériadeck neighbourhood of Bordeaux. The Second World War and the influx of migrants arriving to help with the country's reconstruction exacerbated the housing crisis. In this immediate economic and demographic context, the state initiated new urban planning and housing solutions to alleviate the housing crisis, resulting in suburban urbanisation. Along with the country's modernisation and increased private vehicle ownership, transportation infrastructures, airports, car parks and commercial and tertiary areas were built. These developments were more or less inspired by the Modernist architectural experiments conducted since the 1920s, including the establishment of social housing estates in 1951 and Urbanisation Priority Areas (ZUP) in 1958.

After the war, slab neighbourhoods developed, influenced by Chicago's superimposed city concept, which incorporates networks and infrastructures both above and below ground. This urban form drew inspiration from utopian projects like Sant'Elia's *Città Nuova* (1914), Richard Neutra's *Rush City* (1923), Ludwig Hilberseimer's *Hochhausstadt* (1924) and Le Corbusier's *Plan Obus* for Algiers (1930). These slab neighbourhoods increased the number of floors to enhance density, efficiency and security by separating pedestrian and car traffic. Beyond the historical area, the slab represented a new level of reference, a 'concrete island' conducive to all manner of experiments. Modern architecture within a controlled environment formed the essential basis for the advent of a new era of humanity.

In this context and benefiting from the national prominence of Bordeaux Mayor Jacques Chaban-Delmas, the city underwent major transformations to secure its place as one of France's major metropolitan centres and to enhance its citizens' well-being in a modern world.⁵ This modern urban environment embodied the progress and development

4 Patrice Godier, Claude Sorbets and Guy Tapie, *Bordeaux métropole, un futur sans rupture* (Marseille: Parenthèses, 2009).

5 Kent Fitzsimons and Fanny Gerbeaud, 'Mériadeck et les Aubiers à l'ère de la ville durable: vie et survie de deux quartiers modernistes à Bordeaux', in *Racines*

of the ‘Trente Glorieuses’⁶ and complemented the outdated yet majestic historic city centre in terms of functionality and mobility. Multifunctional slab neighbourhoods flourished on *tabula rasa* terrain (see Figure 5.2), while smaller, dense row-housing projects reflecting a ‘reasoned modernity’ took root in the first ring of the emerging metropolis (see Figure 5.3).

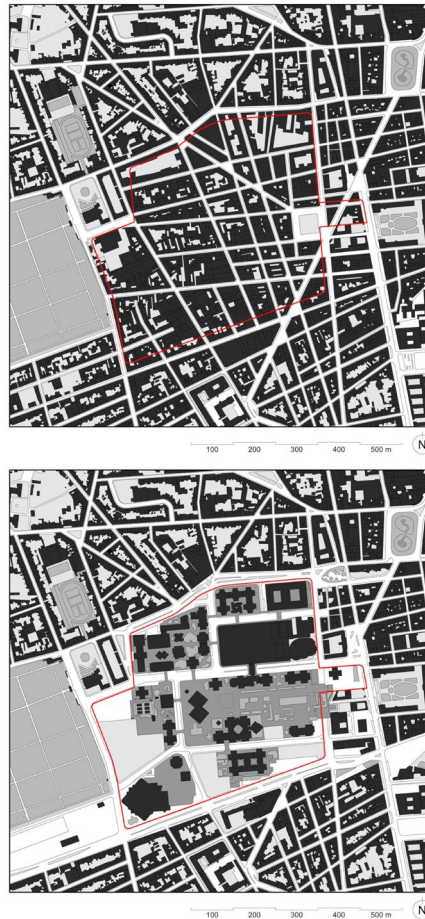


Fig. 5.2 Mériadeck before and after construction, respectively, in 1930 and 1984. Illustration by Louise Jammet, 2021, CC BY-NC-ND.

modernes de la ville contemporaine. Distances et formes de résilience, ed. by Panos Mantziaras and Paola Vigano (Geneva: Métis Presses, 2019), pp. 157–76.

- 6 The Mériadeck and Pontet-Lamartine settlements were developed in the context of the ‘Trente Glorieuses’, a term coined by economist Jean Fourastier to describe the period during which France sought to address the shortages of housing and amenities resulting from the war and the human consequences of decolonisation and globalisation.

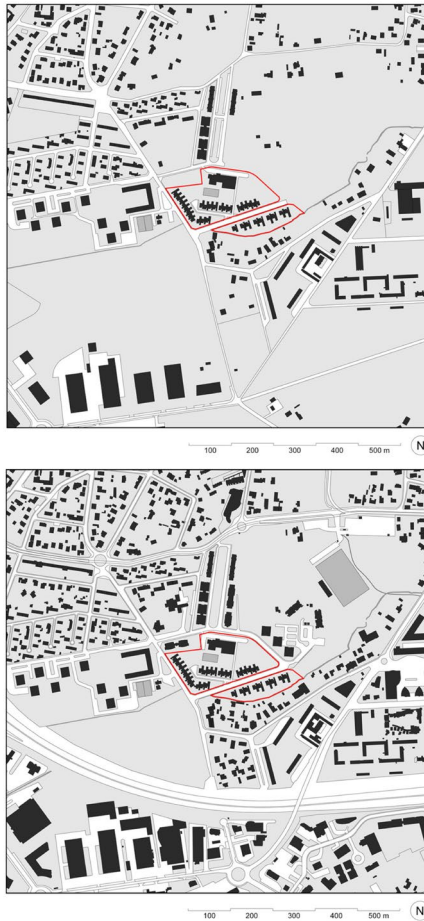


Fig. 5.3 Pontet-Lamartine in 1976 and in 2018. Illustration by Louise Jammet, 2021, CC BY-NC-ND.

These automobile-centric neighbourhoods subsequently witnessed the growth and densification of the Bordeaux metropolis. The areas are now generally regarded as cautionary examples while the elder housing districts of the stone city inspire designs for the sustainable city of the future. Indeed, Bordeaux has recently reclaimed its splendour with programmes for the renovation of ancient buildings, the return of the tramway and soft mobilities, the landscaping of the Garonne riverbanks and a strong ambition to promote high-density housing development. As a result, the modern housing neighbourhoods are commonly

described as energy thieves, hampered by their brutalist architecture. As urban sustainability paradigms evolve, the traditional urban fabric has regained its prominence on account of its compact, multifunctional and picturesque old quarters. Nowadays, eco-neighbourhoods at the 'human scale' are developing on the city outskirts, based on the traditional urban design, with streets and lower buildings in smaller housing estates. Thus, the question naturally arises: does this indicate that modern urbanisation is now outdated and unsustainable?

Mériadeck and Pontet-Lamartine: Diverging with the Past to Create 'the City of the Modern Man'⁷

During the 'Trente Glorieuses', France embraced a policy asserting housing as a right for all. This marked a decisive shift, as little importance had been given to housing since the creation of *Habitation à Bon Marché* (inexpensive housing) (HBM) companies in 1889 and the adoption of the Loucheur law of 1928. To achieve this ideal, architects had at their disposal theoretical models developed by hygienists during the nineteenth century. Following Camillo Sitte and Ebenezer Howard, the culturalists referenced the irregular composition of medieval and small-scale garden cities. The progressists expanded on the scientific approach of Georges-Eugène Haussmann, Ildefons Cerdà and Tony Garnier, with large urban blocks and their abstract composition influenced by Neoplasticism.

In 1933, the Fourth Congress of International Modernist Architecture (CIAM IV) led to the Charter of Athens, which effectively banned traditional architecture and town planning in favour of regularity, geometry, separation of functions and flows, space, clean air and

7 The term 'modern man' is frequently used in reference to the artistic and avant-garde dimension of Bordeaux, with its urban space presented as particularly conducive to 'his' fulfilment. The excerpt below on Le Corbusier's architectural work is particularly eloquent: 'Between 1910 and 1960, by taking up the challenges of modern society, the modern movement aimed to stimulate an exceptional debate of ideas on a global scale, invent a new architectural language, modernise architectural techniques and respond to the social and human needs of modern man' (UNESCO, 'L'oeuvre architecturale de Le Corbusier, une contribution exceptionnelle au Mouvement Moderne' (2016), UNESCO, <https://whc.unesco.org/en/list/1321/>).

sunlight. The aim was to create functional cities and housing fully conducive to the development of modern life in this period of societal renewal.⁸

Technologies and amenities emerged that further influenced changes in housing designs. This included air-conditioning and mechanical ventilation set back from the facades, and large glazed panels which let more light into other rooms, ensuring a healthy environment.⁹

Few cities in France adhered to these principles strictly, with the exception of Firminy Vert, where Mayor Eugène Claudius-Petit, the Minister of Reconstruction and Town Planning (1948–1953), praised Le Corbusier's ideas. However, the influence of the Charter of Athens became a major reference point for architects and building owners, as attested to by the Mériadeck district, with the earliest sketches of Jean Royer and Jacques Willerval dating back to 1951. The mixed housing and tertiary and commercial esplanades, elevated on a high slab reserved for pedestrians, are detached from the historic city and the traffic. The master plan, divided into squares linked together by footbridges, comprises cruciform buildings based on a functionalist approach and solar and thermal considerations. Mériadeck, comprising 800 flats and 1300 inhabitants, faces one of France's first safeguarded historical districts. This clear break from the classical city reinforces the insular character of this new district, although both have been included within the UNESCO perimeter since 2007.¹⁰

In addition to this large urban and architectural complex, criticised for its extreme density and disproportionate aesthetics, detached housing extends to the periphery, contributing to urban sprawl. Mixed housing settlements with small collective and individual units are seen as an alternative. The Pontet-Lamartine neighbourhood in Pessac, designed by Pierre Calmon (architect, AUA studio), addresses this concern for urban development on a human scale with small terraced residential buildings

8 Ignacio Requena-Ruiz, 'Thermal Comfort in Twentieth-century Architectural Heritage: Two Houses of Le Corbusier and André Wogenscky', *Frontiers of Architectural Research*, 5.2 (2016), 157–70, <https://doi.org/10.1016/j.foar.2016.02.001>

9 Ignacio Requena-Ruiz, 'Building Artificial Climates. Thermal Control and Comfort in Modern Architecture (1930–1960)', *Ambiances*, 2 (2016), <https://doi.org/10.4000/ambiances.801>

10 UNESCO, 'Bordeaux, Port of the Moon' (2007), *UNESCO*, <https://whc.unesco.org/en/list/1256>

and row houses with patios centred around green recreational areas. This layout contributes to the experiments of the period by combining intimacy and density while adopting modern architecture characterised by flat roofs and purist designs.

Initially, these modern creations garnered more criticism than praise, but over time, their functional quality and heritage value have become evident. While the majority of Bordeaux citizens consider them second-class heritage, this research reveals that the inhabitants of these neighbourhoods, constructed between the 1960s and 1980s, are, on the contrary, keen to promote their Modernist environment.

Mériadeck's central location is all the more noteworthy in today's expanded Bordeaux. Surrounded by shops, services and cultural life, its tree-lined slab offers a unique urban promenade devoid of streets, avenues or squares. In the truest sense, it has the city at its feet. The typology of the towers, with their vast balconies, enables residents to stay connected with the park's green canopy and enjoy a splendid view of Bordeaux's traditional districts (see Figure 5.4).



Fig. 5.4 Mériadeck, J. Royer, J. Willerval and P. Lagarde, architects 1951–1980 (2007), Bordeaux (France). Photograph by Denys Carrère, 2019, A'urba, CC BY-NC-ND.

Despite the encroachment of urbanisation over time, Pontet-Lamartine has managed to preserve its outdoor collective spaces, thanks to its

non-ædificandi buffer zones. These unbuilt and intimate areas, though less expansive in recent developments, foster social interactions among inhabitants, while the spacious halls and patios facilitate transitions between public and private life and opportunities for personalisation.

Using an assembly and offset arrangement akin to a checkerboard pattern, the urban layout ensures the houses' privacy while bringing sunlight and openness to the landscape, in line with the architects' persistent hygienic concerns. Based on a few typical housing units, repetition has become a means of integrating diversity and uniformity.

The abundant housing typologies and functionality proposed by the Modernism movement appeal to different profiles, including families with young children, disabled or older people, and students. This represents a first step towards social diversity and inclusion, in contrast to other typologies and locations which unintentionally exclude these profiles.¹¹ Moreover, the adaptability of these neighbourhoods to new users and functions, with the capacity to transition between residential and commercial activities, adds to their sustainable qualities. Modern housing districts generally offer open areas, natural light and expansive views of the surroundings. The partition between day and night spaces and the numerous storage areas, cellars or garages are also distinctive features of this period's architecture that are still considered valuable by residents. The structural flexibility of the beam and column design is amenable to modern needs and desires, such as open kitchens, wide living rooms and large bedrooms. Compared to the eco-neighbourhoods currently being built in Bordeaux, Mériadeck and Pontet-Lamartine are more easily modified and expanded due to these elements. The material quality and strong concrete structures align these two modern districts with Bordeaux's historic sustainable neighbourhoods.

Recently, city councils have taken an interest in how inhabitants adapt their modern neighbourhoods, especially since some are gaining recognition as examples of 'Remarkable Contemporary Architecture'. These post-war districts are thus joining the ranks of traditional *échoppes* and stone buildings in the sustainable design database, enriching the future of housing developments and better preparing for climatic and social changes in the years to come.

11 Guy Tapie, *Habitat, vieillissement et filières de production, vers des innovations sociales ?* (Research Report for the Nouvelle-Aquitaine Region, 2020).

A Sustainable Living Environment for Residents

The conceptualised modernity challenges the daily activities of inhabitants, encompassing their roles as neighbours and citizens but also addressing issues that were unimaginable at the time of their construction, like energy transition, the era of soft mobility and urban densification. Nevertheless, the living environments in Mériadeck and Pontet-Lamartine continue to exhibit quality in terms of mobility, amenities and atmosphere.

In Mériadeck, property prices have long remained lower than in the historic centre due to the neighbourhood's architecture, which is considered brutal and outdated in design. However, the district benefits from its larger flats and access to numerous amenities, making its modern architecture an appealing opportunity for living. With its covered car parks, convenient pedestrian access and multiple public transportation options in the congested city, residents experience urban life without the usual inconveniences. The automobile slab and urban layout in general effectively complement the historic centre.

In Pontet-Lamartine, the inhabitants' satisfaction is related to the amenities and numerous transportation options more than the location of the neighbourhood itself. The metropolitan ring road, tram system and cycle paths contribute to its sustainability.

Modern post-war districts have found different ways to manage parking without eliminating it. In Mériadeck, underground car parks are used by residents, shoppers and local businesses with company vehicles. Pontet-Lamartine offers garages and street parking options, easing city traffic and complementing evolving family lifestyles. In contrast, parking in traditional districts is challenging and expensive. Current urban policies tend to encourage public transportation and pedestrian areas over personal vehicles. However, not all citizens are ready—or able—to transition away from cars in favour of soft transportation (non-motorised means) like walking, cycling, roller-skating, etc.

Modernist architecture is characterised by expansive-built spaces and highly structured unbuilt surroundings, which prove complementary. These areas offer commercial or recreational facilities that enhance the residents' quality of life. The open spaces facilitate the emergence of innovative uses: green islands, slab ends and planted alleyways create

transitions between private and public spaces, conducive to gatherings and individual use. One Mériadeck resident expressed appreciation for being able to find ‘everything you need: car parks, much larger apartments than you wanted, a caretaker, elevators, a garden... the most extraordinary effect here is that you enter via a garden’. The fully built-up old districts and trendy neighbourhoods rarely offer such green public spaces, accessible to passers-by or even inhabitants. While many private planted areas can be found in traditional *échoppe* lots and new housing estates, only residents are able to enjoy these enclosed green areas. In Pontet-Lamartine, people enjoy the best of both worlds, as the resident noted: ‘coming from a farming background [...] we like to stay in a green setting, to be at home while having close neighbours’.

The amenities, spatial and structural flexibility and high-quality urban atmosphere are favourable for local life and proved highly efficient during the isolation measures imposed in 2020 due to the COVID-19 crisis. Free from the usual drawbacks of urban life like noise and heat, the location of these districts near or in the heart of the city centre makes them a resource. Bordeaux is known for its urban landscape dominated by stone and concrete, a characteristic that modern districts seek to balance—both in the old centre and its suburban districts—by preserving extensive green spaces within these neighbourhoods. The dense buildings of the 1970s and the abundance of vegetation limit the heat island effect, a concern not foreseen when these Modernist districts were conceived. Mériadeck and Pontet-Lamartine, with their summer comfort, are ideal for outdoor activities, even in periods of high heat. Studies conducted by the Bordeaux metropolis show that the stone compounds in the old city centre contribute to a heat island effect, particularly due to the materials used, the solar orientation of the streets and the lack of vegetation.

Moreover, the centres of the modern districts offer very quiet environments, protected from one of the main sources of urban noise—traffic (see Figure 5.5). As one flat owner in Mériadeck observed, ‘the slab urbanism concept concerning the street is very clear: no cars, no noise, that’s for sure; it’s a real comfort’.

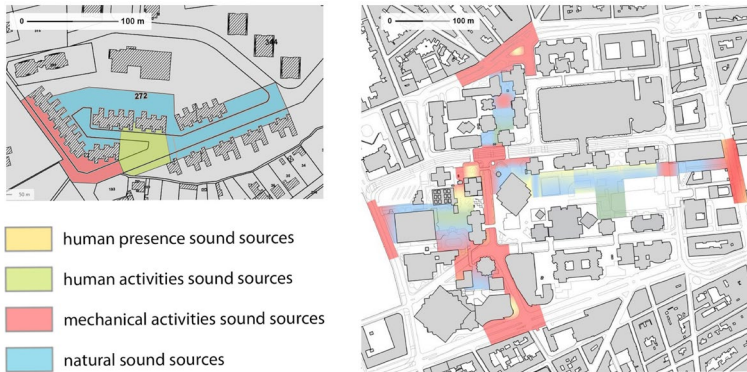


Fig. 5.5 Characterisation of sound sources at Pontet-Lamartine and Mériadeck. Author's illustration, CC BY-NC-ND.

This sound level can be found in certain parts of the traditional city, especially where the urban fabric is particularly tight, characterised by narrow streets with little traffic, or in the heart of a city block. In other ancient housing lots, the sound environment is strongly marked by traffic noise, increased by the sound reverberations on the stone facades.

Bordeaux comprises diverse parts—the picturesque stone city and the contemporary ecological settlements—where the Modernist districts' architectural and urban land reserve contribute to the city's sustainability, fluidity and functionality. On the architectural level, the patio-house typology, gardens, free-plan layouts and modular designs offer flexibility, allowing, for example, the concrete skeleton and slab of a tower in Mériadeck to be recycled for new office space or flats (see Figure 5.6).



Fig. 5.6 A view of a cross-shaped building in Mériadeck renovated into a bioclimatic office block (2017), Bordeaux. Photograph by Louise Jammet, 2021, CC BY-NC-ND.

When considering comfort at the scale of housing, there is a noticeable contrast between objective data obtained from onsite measurements and the inhabitants' perceptions and discourses. These constructions are often subject to thermal problems, such as overheating and humidity in summer and uncomfortably low temperatures in winter, mainly resulting from defects or deteriorating insulation systems. Moreover, while many dwellings lack sufficient natural light, this is mitigated by the level of visual comfort achieved through the treatment of openings (such as large glazed facades), which establish a strong relationship to the outdoors, and the clarity of the walls (often in white concrete). In short, the hygrothermal or visual discomforts measured in some dwellings are offset by the appreciated architecture and the overall sense of well-being among the inhabitants. Therefore, it can be inferred that the comfort and atmosphere perceived by inhabitants are more related to heritage aspects—such as market value, attachment to place or cultural significance—and a sensitive approach that considers the feeling of space and openness, rather than strictly measurable physical living conditions, which often do not correspond to sustainability issues.

At the same time and contrary to popular belief, the overall energy consumption of the modern dwellings studied is very close to that of more recent dwellings of comparable size and meeting current requirements. Mériadeck and Pontet-Lamartine, thanks to their urban organisation (including vegetation) and their architectural details and typologies, limit thermal exchanges. This prevents houses from overheating in summer, shields against the 'cold glass effect' in winter and reduces energy consumption (see Tables 5.1 and 5.2).

Table 5.1 Dwelling measures in eight Pontet-Lamartine houses.

Summer measures	1	2	3	4	5	6	7	8
Temperature (°C)	25-25.5	22.3-22.8	23.3-24.7	23-24	24.8-28	24.1-25.6	23.5-24	22.1-22.6
Humidity (%)	60-72	60-71.9	51-62	74-84	61-74.7	70-89	59.4-69	51-73
Sound level (dB)	26-38	23-41	25-47	36-54	34-36	32-50	30-38	24-38
Lighting (lx)	30-990	120-1500	85-850	20-552	60-1040	21-450	47-1200	30-1000
CO ₂ (ppm)	874-1052	580-874	597-880	568-874	940-1139	780-1158	545-619	529-811

Winter measures	1	2	3	4	5	6	7	8
Temperature (°C)	18.8-21.2	18.3-20.9	18.8-20.3	18.8-20.4	19.8-22.5	16.5-19.1	18.3-19.9	21-24.5
Humidity (%)	26-62	53.7-63.5	30.4-49	52.6-56	32.2-43.2	48.6-60	37-48	31.5-44.8
Sound level (dB)	27-45	27-43	30-47	36-53	28-44	28-40	32-44	33-40
Lighting (lx)	34-800	40-1380	10-1780	40-1750	15-440	0-12	3-1120	12-2160
CO2 (ppm)	936-1250	719-908	798-877	714-1083	747-864	787-977	869-974	655-859

Table 5.2 Dwelling measures in ten Mériadeck flats.

Summer measures	1	2	3	4	5	6	7	8	9	10
Temperature (°C)	26.3-27	22.3-23.6	26.1-26.4	25.7-26.9	23.8-24.5	21.9-22.9	28.2-29	23.4-25.2		23.7-24.2
Humidity (%)	48-52	63-71	46.3-48.1	54.8-63.6	51.5-56	71-74.9	45-49	49.2-58.9		54-63
Sound level (dB)	52	32-42	37-43	34-37	33-39	33-53	35	34-48		34-47
Lighting (lx)	1-2630	0-422	150-1400	60-1890	62-568	4-834	42-1453	47-2090		36-2180
CO2 (ppm)	547-692	925-1347	527-580	1081-1381	936-1295	1054-1259	1199	904-1125		966-1189
Winter measures	1	2	3	4	5	6	7	8	9	10
Temperature (°C)	20.2-22.7	17.9-20.3	17.4-18.7	20.5-21.5	19.1-20.1	18.3-19.2	19.3-20.9	17.3-22.4	16.6-18.5	18.3-20.7
Humidity (%)	45-56	31.2-37.4	47.7-58.9	31-42.5	31.5-45	42.1-54	39.4-50.9	22.9-31.6	45.9-59	46.7-52.6
Sound level (dB)	32-42	37-41	29	37-38	34-45	36-37	30-41	32-51	33-45	38-52
Lighting (lx)	18-400	0-212	--	144-2100	20-647	--	1.5-80	9-540	9-1116	1-467
CO2 (ppm)	532-1482	680-917	688-789	861-1027	713-952	1025-1474	691-977	719-1022	1114-1223	859-1040

In the case of traditional buildings, thermal and visual discomforts, notably due to urban density and stone-bearing walls, add to the discomforts associated with urban noise. However, it is often difficult for inhabitants to offset these discomforts given the constraints of the architecture and its environment. The choice to live in such buildings is influenced by their central location in the city rather than an attachment to the architectural style. Although these dwellings share similar typologies and insulation problems, they exhibit significantly higher energy consumption than the aforementioned average for modern housing estates. Summer comfort in these dwellings is much more challenging due to the heavy mineral composition of the traditional urban fabric.

Our study shows that for inhabitants, 'sustainability' does not refer to strictly measurable criteria but encompasses qualitative issues like appropriation potential, the housing experience and unique architectural features that can contribute to sustainability on a broader scale. Mériadeck and Pontet-Lamartine are appreciated for these urban and architectural features, which serve as a safeguard against the obsolescence seen in many modern districts. These features are rare in contemporary constructions and not widely recognised by urban services. Nevertheless, residents generally maintain the urban and architectural homogeneity and details. Renovations are carried out, for the most part, in keeping with original designs that are perceived as genuinely high-quality. How this post-war heritage is viewed and understood is essential to the potential sustainability of the modern legacy.

Inhabitants as Guardians of Sustainable Modern Heritage

Modern town planning is increasingly mobilising inhabitants not only through its physical spaces but also through its cultural and social value. While the unconventional architecture and urban design may have initially been the default choice for many, our interviews demonstrate that people discover the qualities of modern urban planning and ideas over time through their own experiences. Depending on their culture, interest in architecture, life choices and residential trajectories, residents maintain and adapt their housing by respecting and optimising the

existing architecture and urban plan. Our interviews allowed us to identify four attitudes towards sustainability and architectural heritage among inhabitants, from the less interested 'consumer' to the more engaged 'evolutionist' and 'conservative'. Although archetypal, these attitudes highlight a tendency to rehabilitate these often-overlooked areas. These attitudes can change according to the opportunities provided for residents to actively engage in heritage or urban matters, such as public participation processes, architectural mediation and shared management regulations. They reveal how inhabitants progressively become proactive agents in heritage preservation, through both passive and active methods.

The 'consumer', or the materialistic inhabitant, is particularly appreciative of the comfort and practical location of their modern home. They take no real interest in architecture but value the functionality and accessibility of their trendy neighbourhoods, making these post-war areas desirable places to live and reside.

Old buildings are beautiful, the facades and stone walls... but it is really poorly arranged inside [...] For me, Mériadeck was probably Bordeaux's ugliest district, but it has inner use qualities, a good price/surface ratio, and these specific urban and functional facilities. What I find here, on the slab, it's all the services! I am an urban person; I want all the services without being annoyed by cars. So, all in all, there's a real quality of life. (Flat renter—social housing building, Mériadeck)

As inhabitants are 'awakened' to architecture through life in their modern districts, some endeavour to maintain and optimise the amenities, staying true to the original design and concept embedded in these modern urban elements. These 'awakened' inhabitants appreciate original spaces and perspectives but are also concerned about sustainability issues in housing. Buying a modern house or flat represents a commitment to respecting and preserving the specific features of this post-war architectural production. While these inhabitants may not have precise knowledge about architectural movements and trends, their sensitive approach reflects careful consideration when adapting existing buildings, be they modern or older constructions. The period of lockdown experienced during the pandemic heightened their awareness of the inherent qualities of the mixed modern neighbourhoods. In the

words of one ‘awakened’ homeowner in Pontet-Lamartine, ‘we were all the happier to live in Pontet-Lamartine when confined. And many inhabitants from the surroundings came to walk the dog or relax outside, in the park, as there are no other open green spaces around’.

Finally, the ‘conservative’ (or ‘heritage ambassador’) and the ‘evolutionist’ (or ‘eco-modern’) inhabitants are part of the same group of ‘engaged inhabitants’. The former aims to strictly preserve the original modern architecture and layout as a cultural and societal testament to what was considered progress at that time. Both the ‘conservative’ and the ‘evolutionist’ residents view the climatic features of their 1970–1980s buildings as appropriate for addressing the energy transition issue. However, while the former prefers to adapt their needs to preserve the architecture, the latter is inclined to transform the built environment to improve the house’s energy efficiency.

Whether you like the result or not, the first thing is to recognise the quality of this neighbourhood. The architectural quality, the architects’ design precision, its homogeneity [...] This really is the Charter of Athens. It’s not too bad, especially when you look at the new districts, like Ginko [a new sustainable neighbourhood in Bordeaux].’ (A ‘conservative’ flat owner—Mériadeck)

Houses must evolve, though we have to keep the architectural unity. Thermal insulation from the outside and photovoltaic panels or solar panels are good as long as they cannot be seen from the street. (An ‘evolutionist’ house owner—Pontet-Lamartine)

They nonetheless unite to promote the ‘quality of life and construction’ of these neighbourhoods, a defining feature of sustainability in modern heritage. Moreover, the intangible modern heritage inspires inhabitants to maintain and expand the generous open and accessible spaces to a larger scale. They vitalise these neighbourhoods, sometimes challenging experts or urban professionals, to draw attention to the moral and physical imperative of rehabilitating the modern districts in order to anchor them more securely in the metropolis.¹² Some residents are co-organising a debate on sustainability and modern housing with

12 Fanny Gerbeaud, *Living Modern Architectural Heritage in the Age of Sustainability. Ambiances and Use Quality* (International Workshop Synthesis, 2018), <https://pave.hypotheses.org/files/2017/10/LIVRET-VERSION-FINALE-compress%C3%A9e.pdf>

our research team to reach a wider audience and share experiences pertaining to these districts' specific management issues.

Beyond maintaining these neighbourhoods, the purpose of mobilising residents is to initiate collective projects focused on heritage or sustainable development, directly related to the modern conception of space. These social, cultural or ecological projects are led by the most committed inhabitants of the modern districts, such as representatives of district co-owners and experts in the urban history of Bordeaux. For instance, some projects launched by the residents' association 'Safeguarding Mériadeck' promote modern heritage as a model and source of inspiration for building the appealing city of tomorrow. The organisation's founder, a Bordeaux UNESCO council member, even registered Mériadeck's heritage features to help the district's identification in the DOCOMOMO database (an organisation dedicated to twentieth-century Modern district and building preservation).

Other projects aim to optimise the sustainability assets of modern heritage in an 'evolutionist' manner, even if it entails incorporating contemporary technologies or practices that harness modern potential. These initiatives include creating a fifth facade for renewable energies, establishing planted areas on the slab to grow community vegetable gardens and organising activities for the surroundings. Defenders of modern urban planning highlight the original collective dimension of energy management (geothermal energy, waste collection) and the generosity of the current project, which continues to operate, although undermined by a strict regulatory framework and the perceived disinvestment of public authorities concerning this urban planning. As articulated by a flat owner in Mériadeck, 'when they made Mériadeck, they thought of collective management of energy, waste, traffic and parking. That's what's interesting: today, what's left of that?'

Indeed, in a context where city stakeholders are often perceived as reluctant to make greater use of modern urban planning, our research underscores inhabitants' pivotal role in recognising these complexes. Their detailed knowledge of what makes modern districts interesting and their commitment to action in and around these neighbourhoods make residents indispensable resources for propelling these areas and

the city itself towards greater sustainability. Most of the inhabitants we interviewed have previously resided in a traditional urban setting (such as the stone buildings of the city centre, the *échoppes* or suburban cottages or pavilions) and are now getting involved in modern heritage preservation precisely because they believe its contribution to sustainability is 'vastly under-exploited', in the words of one Mériadeck inhabitant.

Raising awareness and supporting these inhabitants in managing their neighbourhoods are essential if they are to effectively lead these areas towards a brighter future. Although recognising the value of this tangible and intangible heritage, they are ill-equipped to carry out large-scale projects focused on cultural and energy-related aspects, like building insulation or renovation, or social issues, such as mediation or neighbourhood development. This results in decisions to close down these districts—as in the case of the closure of the Mériadeck's 'esplanades'—or in the fragmentation of responsibilities for maintaining common spaces, as it is difficult to identify the leading authority on these matters. Without a consensus on which aspects should be preserved or the methodologies to utilise in these operations, post-war modern housing neighbourhoods are threatened, regardless of their recognition or the commitment of their inhabitants. Like the historical *échoppes* neighbourhoods that are now protected and appreciated, modern districts are at risk of losing elements integral to their sustainability and heritage value in the eyes of their inhabitants, notably the concrete slab, the buildings' design and the spacious open parks. Raising awareness without ensuring that all stakeholders can engage in discussions together may prove futile, as indicated by one flat owner in Mériadeck: 'this is the third year that we are fighting, [that] we are working with the organisations to restore this water basin. And there's no question of turning it into a grassy area again!'

Conclusion: Towards Several Expressions of Sustainability

Like most European cities, Bordeaux has experienced several urban and architectural paradigms, comprising disparate historical elements that have avoided the neglect or erasure of past heritage to make way for new eras and ideas. However, over time and through daily practices, what was once considered outdated is gradually being rehabilitated.

The energy transition is at the heart of contemporary concerns, inviting us to rediscover the unique contributions of two major components of Bordeaux's skyline and heritage: traditional stone residential districts and emblematic post-war modern districts.

While traditional neighbourhoods tend to inspire today's eco-housing estates, characterised by streets, densely built lower-scale houses and equipments as well as private green spaces, there is growing interest in restoring post-war modern housing neighbourhoods, which also offer operable features for the sustainable city. This chapter demonstrates that while the modern project certainly did not materialise as originally imagined, it has brought specific amenities that enhance the well-being of today's citizens. With its densification and environmental preservation issues, the contemporary city has caught up with these modern districts, which must now prove their worth and qualities to endure and exist within the urban fabric.

This research has shown that the values of modern districts are appreciated by their primary stakeholders—the inhabitants and users. With their accessibility and functionality, they appeal to specific populations that the metropolis might otherwise struggle to maintain, including families with young children, people with disabilities and the elderly. These post-war neighbourhoods thus embody a quality of life and specific sustainability that require a re-evaluation of the quantitative and normative criteria used to renovate and optimise the existing housing stock, regardless of preconceived notions about modern or older architecture. Like the *échoppes* neighbourhoods, Mériadeck and Pontet-Lamartine are examples of modern districts worthy of preservation to enhance the resilience of the metropolis. Leveraging the characteristics of each piece of the urban fabric has the potential to create what Chaban-Delmas once envisioned when describing Mériadeck: a functional complement to the old and majestic city centre that would bring Bordeaux into the twenty-first century.

Constructing a sustainable city requires considering the contributions and advantages of architecture and urban planning models resulting from design practices, be they traditional, vernacular or modern. Achieving this complementarity between all the disparate urban patches demands better integration of inhabitants' work and expertise, acknowledging their legacy in the city of tomorrow. In this sense, the modern project continues beyond the avant-garde: Mériadeck and

Pontet-Lamartine serve as a starting point for new uses that can revive the Modern movement's spirit. They also help us reconsider what 'sustainability' could mean if defined on a broader scale, with a more environmentally conscious and holistic conceptualisation of progress.

Bibliography

- Callais, Chantal, *L'échoppe de Bordeaux* (La Crèche: La Geste, 2020).
- Coustet, Robert and Saboya, Marc, *Bordeaux : le temps de l'histoire, architecture et urbanisme au XIX^e siècle, 1800–1914* (Bordeaux: Mollat, 1999).
- Fitzsimons, Kent, et al., *Les mouvements modernes rattrapés par la marche du durable : Leçons, adaptations et inventions des lieux du quotidien* (Redivivus Research Report for the French Ministry of Culture, Programme Interministériel de recherche 2016–20, 2019).
- Fitzsimons, Kent and Gerbeaud, Fanny, 'Mériadeck et Les Aubiers à l'ère de la ville durable : vie et survie de deux quartiers modernistes à Bordeaux', in *Racines modernes de la ville contemporaine. Distances et formes de résilience*, ed. by Panos Mantziaras and Paola Vigano (Geneva: Métis Presses, 2019), pp. 157–76.
- Gerbeaud, Fanny, 'Living Modern Architectural Heritage in the Age of Sustainability. Ambiances and Use Quality' (International Workshop Synthesis, 2018), <https://pave.hypotheses.org/files/2017/10/LIVRET-VERSION-FINALE-compress%C3%A9e.pdf>
- Godier, Patrice and Tapie, Guy, *Un futur sans rupture* (Marseille: Parenthèses, 2009).
- Querrien, Gwenaél, *Portrait de ville* (Paris: Cité de l'architecture et du patrimoine, IFA, 2006).
- Requena-Ruiz, Ignacio, 'Thermal Comfort in Twentieth-century Architectural Heritage: Two Houses of Le Corbusier and André Wogenscky', *Frontiers of Architectural Research*, 5.2 (2016), 157–70, <https://doi.org/10.1016/j.foar.2016.02.001>
- Requena-Ruiz, Ignacio, 'Building Artificial Climates. Thermal control and comfort in Modern Architecture (1930–1960)', *Ambiances*, 2 (2016), <https://doi.org/10.4000/ambiances.801>
- Tapie, Guy, *Habitat, vieillissement et filières de production, vers des innovations sociales ?* (Research Report for the Nouvelle-Aquitaine Region, 2020).
- UNESCO, 'Bordeaux, Port of the Moon' (2007), UNESCO, <https://whc.unesco.org/en/list/1256>

UNESCO, 'L'oeuvre architecturale de Le Corbusier, une contribution exceptionnelle au Mouvement Moderne' (2016), *UNESCO*, <https://whc.unesco.org/en/list/1321/>

