

Research Article

The heating of buildings and the mental health of their inhabitants: Three buildings in Paris

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Abstract: Today, whether condominiums or social housing, Parisian buildings are concerned by work programmes undertaken within the framework of the Climate Plan initiated by the City of Paris. This renewal process affects the social life of the buildings, which has been consolidated over the years. While a building is built by materials and populations, it is also the result of a history, from its construction to its daily maintenance (or degradation). Our assumption is that people who have no control over their living space are likely to suffer more mental health problems, in most cases without knowing exactly why, due to lack of knowledge about the causes of these problems or lack of health literacy with respect to their living space. The inability to adapt housing or to resolve situations independently makes us wonder: How can residents' mental health be influenced by their ability to control their living space? To show this, we will study three buildings that are affected by the tension between factors that generate dissatisfaction, bad moods, mental stress, anxiety and depression, which have different effects on mental health. The research-action SAPHIR, (Health, Paris, History, Building, Residential), carried out after the Covid crisis and during a period marked by the energy transition policy, illustrates the stress experienced by the inhabitants faced with the necessity to save energy and have work carried out in their homes.

Keywords: mental health, housing, social housing, architecture, heating

1. Introduction: From housing quality to mental health

In the 2000s, climate change became a major preoccupation for public authorities, who strongly encouraged the energy renovation of buildings through numerous subsidy and loan programmes (Giraudet et al., 2020). Since its creation in 2006, the Diagnostic de Performance Énergétique (DPE) has assessed the energy “performance” (from A to G) of homes. It takes into account living space, energy sources (heating, water, lighting, etc.) and heat loss (ventilation, windows, thermal bridges, insulation, etc.). The French Climate and Resilience Act (2021) plans to progressively ban the rental and sale of homes that the French refer to as “passoires thermiques”, which translates literally as “thermal sieves” (due to their capacity to leak heat), i.e., those on the E, F, G scale, by the end of 2030. This law targets the most energy-intensive and “non-standard” housing, in other words, uncomfortable properties that are polluting because they emit high levels of greenhouse gases. Nearly 4 million households out of a total of 37 million are affected by fuel poverty in France, i.e., placed in a situation of thermal discomfort at high cost (ONPE, 2021). Heating has become a central issue for health in housing and notably for mental health. SAPHIR: Santé, Paris, Habitat, Immeuble, Résidentiel, (Health, Paris, History, Building, Residential), is a research action programme set up in this context and which looks into the relationship between

quality of housing and health. It seeks to measure the health-related challenges in this energy transition context.

Today, whether they are condominiums or social housing, Parisian buildings are concerned by renovation programmes undertaken as part of the Climate Plan initiated by the City of Paris. Included in the 2020–2021 Recovery Plan, France is proposing to invest 6.2 million euros to combat climate change, particularly in the construction sector, which is the country's second largest emitter of greenhouse gases. This sector alone is responsible for 27% of CO₂ emissions and almost 45% of final energy consumption. Nearly 5 million homes are poorly insulated ("energy sinks") and 3.8 million households struggle to pay their heating bills. The construction and renovation of the social and private housing stock are objectives of the 2050 carbon neutrality target, and many technical and financial aids have been set in place to achieve these improvements.

The Covid crisis has brought the question of health in the habitat back to the fore. Our research action programme questions inhabitants on the effects of energy policies on their physical and mental health after this period. Reflections dating back to the nineteenth century, which were initiated by the hygienist movement, as well as the assessment of overcrowding and the lighting of rooms (Fijalkow, 1998, 2021) are back on the agenda. For example, the World Health Organisation published several reports: in 1968, a paper on the physiological basis of hygienic standards for housing (including thermal comfort, indoor atmosphere, air circulation, lighting, and insulation); in 1974, a report on the relationship between communicable and infectious diseases and living conditions; in 1989, a report on minimum standards for housing; and in 2013 another document focused on health impact assessment in cities (Goromosov & World Health Organization, 1968). The latter is based on the Ottawa Charter, signed by the WHO in 1986, which advocates for the promotion of health and emphasizes that attention should be paid to living environments and not only to the lifestyles and habits of the population. Up until the 2020s, there were three institutional reports linking quality of housing and health. In France, this hypothesis puts the issue of lead poisoning related to lead paint used in housing (Fassin, 2004), as well as the aging of asbestos (Kirchner et al., 2007) back at the heart of the debate. In dwellings that consume too much energy (due to problems related to thermal insulation, air infiltration through windows, leaks and dampness in the walls), families tend to pay attention to consumption in order to control the level of energy bills (Stojilovska et al., 2021). In many cases, they resort to using additional heating systems, which leads to a series of restrictions, e.g. reducing daily showers, changing food habits [limiting meals or eating only cold meals], or getting used to new practices due to the difficulty of paying the electricity bill. Health seems to be a means of challenging the social inequalities and the poor housing conditions of the population. Especially in degraded or informal housing, it also affects the mental health of its inhabitants. 3.8 million poorly housed people, identified by the Fondation Abbé Pierre. Furthermore, the gap between this type of household and the rest of the population has widened since the 2000s (Fondation Abbé Pierre, 2022). On the one hand, builders are encouraged by public authorities, concerned with combating the climate crisis, to adopt increasingly sophisticated technical energy performance devices that reinforce these gaps. On the other hand, the national housing survey, conducted by INSEE in 2019 on the entire stock, shows that the main defects identified by the inhabitants relate to thermal conditions, directly concerning health (Driant, 2022). Therefore, we can wonder if heating might have become the new most discriminatory variable in terms of housing inequalities? What impact does it have on the inhabitant's mental health? And to what extent is this multifaceted precariousness linked to the low level of control over variables in the habitat? We are interested above all in the heating of the home as this corresponds to the challenge of managing heating during the ten colder months rather than in extreme heat which is easier to manage on an individual basis.

The lockdown episode related to the pandemic has broadened the issue by affecting the uses and design of everyday spaces. The return of the theme of health in urban planning and architecture has led academic reflections to focus on everything from public space (Grant, 2020), spatial inequalities and justice (Jabareen & Eizenberg, 2021), to the emergence of a virtual spatiality based on distancing (Jasiński, 2022), and to a new environmental sensitivity (Cole et al., 2020). It has made it possible to question the segregative dimension of housing (Burgel et al., 2020; Stender & Nordberg, 2022) and the difficulties of governance of multi-family buildings (Izuhara et al., 2022). However, where the thermal question should fit in remains to be determined. Similarly, when it comes to temperature, the

objective conditions of the housing must be studied as well as social and subjective housing factors (Brulé & Maggino, 2017; Fijalkow et al., 2021). This also requires going beyond the housing quality approach that is centred on the inhabited cell. The neighbourhood approach, which is common in health geography (Diez Roux, 2001; Osypuk, 2013), is rich in the sense that it makes it possible to integrate services and facilities (travel, transport, equipment). We therefore propose to study collective buildings whose date of construction, type of population, heating system and architectural characteristics are clearly identified. During the hygienic era, sanitary surveys were based on apartment buildings. Municipalities kept sanitary records of buildings, collecting data on construction, sanitary equipment, and population statistics (Fijalkow, 1998). This approach still seems relevant to us, insofar as the building has a collective life, habits and uses. In France, most inhabitants consider that their “neighbours” are those who live in their building, rather than in their neighbourhood (Authier et al., 2021). Today, social landlords invest in the involvement of the residents’ in their living space to the extent that their “participation” allows tenants to take on management tasks which results in a reduction of their charges (Leclercq & Wilson, 2021). During the lockdown, apartment buildings found themselves confronted with the development of new spaces and rules for living together, regardless of whether they were bars, towers, or more traditional typologies.

In this article, it is hypothesized that people who cannot control their living space are likely to suffer greater mental health problems, in most cases without knowing exactly why, due to a lack of awareness about these topics or a lack of “health literacy” in relation to their living space (Fijalkow & Wilson, 2023). The difficulty of not being able to adapt housing or solve these health-related situations autonomously makes us wonder: How can the ability to control one’s living space have an impact on the mental health of residents? What kind of physical spaces and what kind of psychological and mental conflicts do they generate? Several studies have looked quantitatively at the influence of humidity on respiratory or sleep problems, degraded or cramped spaces and density. We would like to focus on the most “imperceptible” or, in some cases, “subjective” situations in housing, which have a direct impact on the mental health of the occupants: the presence of noise at unusual hours, of pests (bedbugs, rats) or damp, and/or the difficulty some people may have in paying the monthly rent (very common in single-parent families after divorce), and the shame of having to express these unpleasant circumstances, as far as their dignity is concerned.

While a building is built by materials and people, it is also the result of a history, from its construction to its daily maintenance (or degradation). This situation presents a panorama of the new social crisis of the 21st century in France, since the housing sector is one of the most affected, generating difficulties both in the monthly payment of electricity bills by tenants and in the thermal insulation works to be carried out in the buildings or apartments by the owners. It is generally accepted that these variables generate discontent, bad moods, mental stress, anxiety and depression. “Fuel poverty” is expressed by shame, degradation of housing and self-image (Ledésert, 2014) and affects mental health. The awareness of other problems related to physical health, for example safety and living in dangerous neighbourhoods or having bed bugs and not having the financial means to change the bedding strongly affects mental health at various levels.

To summarise, in this article we want to show how inhabitants perceive their housing as a source of anguish when it is not in line with today’s energy transition policies. How do they seek to improve their situation? What is their margin for manoeuvre in their opinion? Addressing the question of heating seems fundamental in answering these questions. To meet this challenge, we propose 1) to demonstrate how the degree of housing-related health literacy reflects the difficulties encountered by the residents in their living space, 2) to explain the SAPHIR research action programme methodology, 3) to show how in 3 representative building case studies, problems raised by heating temperature difficulties can lead to residential stress and mental health deficiencies.

2. Health literacy in housing and the notion of “care” in the way of living

The concept of “health literacy”, originally developed by Sorensen (2012), involves a series of criteria that an individual may use to identify, understand, and evaluate health-related information, such as knowledge, skill, motivation and ability. Mastery of these

criteria can enable them to make better decisions about what is best for their health and what can lead to disease prevention (Sørensen et al., 2013). The point we seek to develop in this research is how one acts to improve one's quality of life, and therefore one's physical environment and housing. Among the different criteria, the concept of "competence" is of strong interest, since it is the basis of other variables such as "having the ability to evaluate" and applying all this information to prevent diseases (Van den Broucke, 2017), as well as addressing the conditions necessary to have a healthier habitat. In a broad sense, we use Tronto's (2015) definition, and suggest that "care" can be seen as a generic activity that includes everything we do to maintain, perpetuate and repair our "world" in order to live in it as best as possible. This world includes our bodies, ourselves, and our environment, all of which we seek to link into a complex, life-supporting network". Thus, we can ask more precisely on each site, to all the inhabitants we met for our survey, what skills do residents have to make the connection between their heating difficulties and health problems, and what are their capacities to intervene and improve their habitat? Can they fight autonomously against the energy difficulties they are confronted with? Do they consider it as an individual or collective activity? What are the risks for their health and the external variables that could influence their decision-making? Is it the cost of these actions, the lack of knowledge of public or technical aids, the judgment of the neighbours concerning these actions... ..

This type of issue was documented by Harrington's team in 2005. They noted that, according to socially mediated processes, "poorer health" can lead to a decline in the economic status of the individual (Harrington et al., 2005). They analysed how living in an energy-precarious household, coupled with a low socioeconomic status, directly influences people's mental health. Among the results, they identified objective conditions that directly impact people's well-being, such as decent heating, air quality or ventilation (Zúñiga-Bello et al., 2019). For example, there is a relationship between the cooling of the body and the ability to close a window properly, whether the issue is controllable by the person or a technical problem. This "ability to control" one's domestic environment has a clear influence on mental health. Similarly, people who cannot control the heat in their homes are more likely to become ill, as low temperatures in apartments increase humidity and therefore indoor pollution (leading to mould and dust mites, inter alia) in addition to more traditional illnesses such as flu or asthma. Among the subjective variables are personal and emotional control, on top of material conditions, such as lighting or sound quality (Bluyssen, 2010), which increase the likelihood of "feeling capable" of controlling a healthy space and having a more sustainable quality of life. Finally, this objective and subjective measurement of housing quality requires the integration of residential trajectories and, more broadly, the history of apartment occupancy, which is fundamental for the analysis of energy consumption and spatial occupation (Shove, 2003). Stress, anxiety, insecurity and the accumulation of several unhealthy factors in housing can lead to suicidal thoughts (Colleville & Kermarec, 2021). The notion of subjectivation can be considered in the field of mental health as a set of social processes that reinforce the subject's point of view, as opposed to the importance attributed to more "objective" elements, of a physical or social nature (Benamouzig, 2011).

The study of residential histories and social morphologies shows that inhabitants appropriate space according to how they perceive it and how they perceive themselves (Halbwachs, 1960), and this allows us to understand why interventions on the built environment affect the well-being and social relations of vulnerable populations (ORS Île-de-France, 2017). It also allows us to understand why, in our pandemic-prone world, the anxiety caused by the use of elevators and the fear of overcrowding fuels residential segregation towards low-income households concentrated in high-rise and high-density buildings: because they are perceived as "riskier" (Halbwachs, 1960). Housing research has extensively demonstrated the importance of the *principle of mobility*, which expresses the possibility of being able to choose one's place of residence as well as having the ability to leave it. It has also emphasized the *principle of proximity*, which allows inhabitants to isolate themselves while being close to places of exchange. The *principle of*

adaptability lets each inhabitant modify, during their lifetime, the layout of their apartment according to the presence of children, their age, along with their occupations and forms of work. For example, in several buildings we studied, noise coming from the heating pipes is a real source of stress for the inhabitants. It induces sleep disturbance, bad moods, and has become a major subject of debate, because people have to choose between either heat or noise insulation. The *principle of narrativity* recognizes the possibility of each inhabitant to develop a narrative expressing their capacity to control their environment and to express themselves in it. This principle, by demonstrating the pragmatic side of the notion of appropriation, describes how it is made possible for someone to identify themselves, i.e. to “take one’s place” (Proshansky, 1978). Its narration is rooted in both a principle of distinction (i.e. being able to represent oneself through the place one inhabits, according to the address, facade and social ornaments (Eleb & Simon, 2014) and the search for recognition. It thus corresponds to the residential history of households as recounted in their trajectories (Fijalkow et al., 2021).

3. A narrative research action and educational methodology

SAPHIR (Health Habitat Paris Residential Stories) is a research-action programme that aims to focus on the topics of health and well-being in the habitat related to the occupants’ residential history and their building. Our programme studies the level of understanding and effort required of the inhabitants to link housing quality and its impact on health through the requirement to achieve optimal energy performance. This research project is supported by the *Agence Régionale de la Santé* (Regional Health Agency) and the Centre de Recherche sur l’Habitat in Paris. Through this programme we are developing a participatory pedagogical methodology to better understand the demand for healthy housing.

3 apartment buildings were selected in East Paris, and its north-eastern suburbs; the buildings were chosen based on the following criteria: year of construction (and therefore of standards, namely thermal and phonic), physical density, location in the city, access to services, occupancy status (co-ownership, social housing) and type of population (age and income groups). The objective of our research was to produce a series of monographs reconstructing the history and memory of these buildings through archives and interviews, by questioning whether or not and how this past intervenes in the spatial crisis caused by successive lockdowns and in adaptations related to the Climate Plan.

In this first phase we propose a series of “educational cafés” where we explain the impact of housing quality on the inhabitant’s physical and mental health. The second phase of the project consisted in studying the plans of the buildings, the apartments, and their reorganisation by the inhabitants through “inhabited surveys.” This was followed by interviews conducted with the inhabitants, allowing us to question them about the notion of well-being. Finally, the organisation of focus group workshops, conducted in each building, aimed to draw up diagnostic and assessment elements on the quality of the habitat. This developed, amplified or minimised the elements collected by the researchers in the previous phases of individual interviews and household surveys.

The results that we present here stem from the three stages of the SAPHIR method studies applied to three buildings. These buildings were chosen based on the date of construction, social class and age. During the educational cafés which lasted about an hour, we presented the inhabitants with a state of knowledge on the links between health and housing. The inhabitants signed up willingly for individual interviews during which they were asked questions about their residential history, any home improvements they have made and their heating problems. The inhabitants were not paid for their time but found some practical relevance in the process. They also came back for the final focus group (Figure 1) during which we presented our analyses and results. We have mentioned the most frequently cited problems as well as the critical situations.



Figure 1. Focus Group at La Maladrerie. 2023

This methodology and all the elements involved make it possible to develop a diagnosis and assessment of housing quality at the building and apartment level, and to unfold residents' literacy, thus applying the writings of Sørensen (2012) and Tronto (2015) to housing. Our hypothesis, in this SAPHIR action research, is that the inhabitant formulates, puts into narrative, mobilises knowledge and values and responds to the problems he or she poses daily. For example: "I always heat the bathroom when the children take their bath, so they don't get sick". The desire to preserve children's health despite temperature restrictions mobilises both values (staying healthy) and representations (ideal parenthood). So, it's from what we call "critical situations", i.e. everyday dilemmas, that a possibility for action emerges. For example: open the windows to maintain air quality after a shower, reduce the noise made by radiator pipes to preserve privacy, protect indoor air quality from outside odours, work at home in a space not designed for this purpose, turn on the heating to dry laundry and combat humidity ... and finally, use the balcony or the proximity of the window despite a vis-à-vis.

When faced with an impasse or a choice, i.e. a "critical situation", the inhabitant must make trade-offs, which will force him or her to change the context (e.g. move or rearrange the space). In the home, the quest for energy efficiency is naturally at the heart of these critical situations and issues.

On the basis of these scientific elements and the fields we have studied, we can hypothesise that if the inhabitants' quest for control over their environment is at the heart of their living system (control over heating, security of people's property, etc.), this need may not be of the same nature as that of technicians and managers, who are primarily concerned with the energy performance of buildings. In this respect, the study of health literacy in the home, which enables us to grasp how residents view their homes through their physiological sensations (being too hot or too cold, having to dress warmly, having to use draught-proofing techniques) is a fundamental indicator. The overall performance of a building is not just a question of thermal performance, but, as our fieldwork has shown, of many associated themes: noise pollution, poor architectural distribution, management practices, and also the day-to-day practices of residents.

4. Results and discussion

We present here three building case studies for which our investigations have now been completed. The cases are contrasting since at the same time we have analysed an insalubrious building built during the same period but inhabited by very precarious residents, a jointly owned condominium built at the end of the 1960s on the outskirts of Paris with a lower-middle class population and a social housing building complex a little outside Paris whose inhabitants are essentially working class. The heating problems are very

different in each building as well as the inhabitants' attitudes faced with the pressure of the current energy policies.

4.1 Letort Street, a substandard building where health is a concern

This building of about twenty apartments was built in 1887 on a narrow plot of 217 m². A few meters from the Porte de Clignancourt, it is in a busy working-class neighbourhood, set at the gateway to Paris. It includes 18 rental units and a service room, over 6 floors, totalling 669 m², which means the average apartment size is 37 m².

In 1891, after its construction, this apartment building was already equipped with 17 toilets for 42 inhabitants. It was a comfortable building at the time, connected to the sewer system in 1900. Nevertheless, in the years that followed, the administrative file for this building grew due to numerous complaints from residents. In 1947, several cases denounced problems with the pipes and the evacuation of the chimneys. In 1950, it was reported that "the roof has a problem of waterproofing and rainwater drainage." =Works were carried out in 1958. After the war, the building was only partially occupied: the tenants were workers (roofers, toolmakers, millers.). In their two rooms, they lived as couples with two or three children. As the building was well equipped for the time (water, gas, electricity), requisition files were sent to occupy the supposedly vacant apartments.

The chronicle of this building's numerous difficulties encountered since its construction attests to its non-conformity with professional standards, or at least its unhealthiness. In 2022, five judgments, in favour of two of the joint owners denounced the "high level of humidity in the dwellings, the degraded state of the communal parts, the defective heating, the defective ventilation system, the odours and mould, the presence of lead and important cracks." Because of the lack of heating, some tenants use oil or gasoline appliances, which pose a fire hazard. Most tenants report health problems for themselves and their children, including respiratory and mental health problems. Physical and moral health was frequently mentioned, often in reference to children who were "always sick." Medical certificates were also produced.

The tenants we met were young, active households with children, comprised of immigrants or people of immigrant backgrounds, who were struggling to find housing independent from their families in the centre of the agglomeration, where they work and study. The residential experience is lived with bitterness. All the inhabitants declare that they did not choose to live there and feel forced to stay, despite their strong desire to move.

Humidity is the first complaint expressed by the tenants. It appears in the form of "black marks" on the walls (mould) and breathing difficulties causing "allergies" and "infections," aggravating asthma attacks and chronic sinusitis. Every winter, tenants report having to throw away their clothes, change furniture and repaint their apartments. This repetition of tasks has been conceived as a tiring practice that leads to mental instability, fragility and the impossibility of appropriating living space. Carrying this moisture with them through the smell of their clothes gives them a constant feeling of shame that affects their dignity in the presence of other people. Air quality is strongly associated with this situation. Tenants practice airing out, when possible, i.e. outside the winter period. Some use air fresheners to dissipate the smell of humidity. However, since they do not have balconies, many of them dry their clothes in their apartments, which aggravates the humidity problem.



Figure 2. (a) Facade of the building (b) Patio from the interior of an apartment

The question of heating, which is individual and electric, is the second topic of the interviews. The inhabitants denounce the fact that it is costly and inefficient. For some, who only heat for a few hours in the evening, it is harmful to the health of their children. Most of the inhabitants declare that thermal insulation is also a problem in the summer. In this building, where the population is of modest social status, health literacy is well developed, which corresponds to the result of a united tenants' advocacy association against their landlords. The history of the building is also well known by the residents as a "problem building," which is also an element of cohesion. "Before we had just one radiator, only in the living room and it didn't work properly. For the last year I've had radiators everywhere and it's good now. But the heating is electric and it's expensive. It was the owner who had them installed". Salva 45 years old, 3 children, housewife whose husband works, living in the building for 5 years. "I have a problem with humidity, so I redid the painting. We redid the painting at least 2 or 3 times. It was damp everywhere. When it rains, it comes right into the middle of the living room. I threw my bed away because it was damp. So we just kept our child's bed. We also had to throw away the furniture because it was damp. There was fungal growth which made the furniture bloat, so I had to get rid of it and buy more furniture". Leila 40 years old, married with 1 child, neither her nor her husband work, arrived in 2017 so 3 years in the building.

4.2 A heritage image for the Maladrerie, rather than thermal insulation of the façade

In May 2022, one of the most prestigious prizes in architecture was awarded to the French architect Renée Gailhoustet, 93, by the Royal Academy, for "her extraordinary contribution and inspiring approach to urban planning." A pioneer in the creation of new systems in collective social housing, this architect invented a new form of architectural writing, guided by the idea of sharing and creating social links in housing. In Aubervilliers, a suburb near Paris, she designed a space comprised of 850 social housing units, all of which are different, in an area of 9 hectares with many private gardens and where the interior spaces are open to the exterior and vice versa. The collective gardens are connected to the transitional or connecting spaces. Built in 1975 by the public housing office, the local authority and a cooperative society, this programme offered 1004 rental units, 53 for migrant workers, 52 for the elderly and 51 units for home ownership, all of which are closely interwoven with business premises, shops, socio-cultural facilities and 40 artists' studios. According to various historical documents, the name of the Maladrerie is due to the fact that there was a leprosarium on this site in the Middle Ages. It is also linked today to the fact that the social construction operation was supposed to reduce the slum housing of the time.



Figure 3. (a) Facade of the building (b) Common spaces

Several adjectives have been attributed to this brutalist architectural building: a bucolic space, an architectural utopia, or a fortress submerged in nature. In 2008, through the DRAC Île-de-France, the Ministry of Culture awarded this building the “20th Century Heritage” and “Remarkable Contemporary Architecture” labels. The great particularity of these apartments is that they are higher than the traditional height—in some cases even double the height—which makes heating very difficult, due to their volume. Another point is that the facade is made of reinforced concrete and the windows have wooden profiles, allowing air to penetrate easily. Finally, the apartments on every floor have a garden which has increased problems of water filtration to the apartments below and humidity over time (Figure 3).

The insulation of the building, within the framework of the Urban Renewal projects, is at the centre of the debate, since the heritage label prevents modification of the façade. The only possibility of abiding by standards is to insulate the interior, the cost of which must be assumed by each tenant or owner and cannot be the object of government aid.

Faced with this situation, our investigation identified two groups of people: on the one hand, those who are better off and prefer to preserve the “heritage” image of the building and who can generally cover the additional electricity costs; on the other hand, those who have more financial difficulties and who do not see the interest of preserving the brutalist architecture of this building when it puts their health at risk. They therefore prefer windows that are better adapted to reduce heat loss. In addition, the infiltration problems with the terrace gardens have prompted the building manager to “mineralize” some of them to reduce leaks and management costs, which has caused some residents to revolt. They have now created the association “Jardin à tous les étages” (gardens on every floor) which proposes to define the functioning of the terraces and, more precisely, to teach “the art of living” at the Maladrerie by running educational workshops to put into practice an eco-citizen charter. They also asked for thermography studies of the whole building to explain how appropriate it is to preserve these green spaces. According to them, the use of tarred terraces will not only harm their individual health, but will also increase global warming, and therefore collective health. For more than twenty years, they have managed to convince the mayors of the city to defend this heritage and even to stop urban planning projects that would involve modifications to the proper functioning of the residence.

In La Maladrerie, some residents have become experts on housing and have a technical vocabulary. We observe a strong literacy with respect to their living space. Some take refuge in the heritage label “to preserve the building at whatever cost” and they continue to value architecture as a social enhancement device. The others make use of the historical reference to an unhealthy habitat to explain “the degradation of their housing and the strong feeling of abandonment by their social landlord” (tenants’ representative). The latter

consider that “major changes must be made to the building and are more aware of thermal rehabilitation projects through state aid” (joint owners’ representative). We have seen some conflicts and situations of stress caused between those who feel abandoned and even resigned, and those who defend the architectural heritage “whatever it costs”. At least, Khadija is a “lifelong resident of La Maladrerie” of Algerian origin, in her fifties, and describes herself as a neighbour who cares about living well together: “I like it when it’s clean. We’ve got a beautiful neighbourhood, and we need to look after it”.

4.3 Owners of “Thermal Flats”: the Diderot residence in Champigny-sur-Marne

The architecture of the building in Champigny-sur-Marne, a few minutes from the centre of Paris, evokes the post-World War II Reconstruction period. In 1955, the Ministry of Housing launched a new challenge to building organisations, with the “Housing Million” operation. While the average cost of building a low-cost housing unit was 1.6 million francs, it proposed to build a three-room unit, the average cost of which (excluding land) was not to exceed one million old francs. It is built on the banks of the Marne River, on land that was floodable (at the time) and therefore inexpensive. It is an R+4 complex built on a rectangular courtyard with its back to the street (Figure 4). The traversing apartments were built to reduced standards for modest condominium buyers, entering the HLM scales.

It is first and foremost an “old building” with very worn and noisy floors, obsolete paint work, and classic room distribution and a very old gas boiler for all the buildings. The heating, which is circulated via cast iron radiators, does not work well and the building suffers from serious thermal losses. However, the new owners say they are satisfied with their apartments, which they have “redone” each in their own way and according to their financial means. Some have simply repainted the rooms, others have changed the layout of the bedrooms and the living room and opened up the kitchen. The apartments have proven to be adaptable to lifestyles other than those of the 1960s. These middle-class families (with minor children) have bought (or are renting private properties) in an area they present as “privileged,” on the banks of the Marne, and “twenty minutes from the centre of Paris,” far from the working-class neighbourhoods of Champigny, which they do not name, except by toponym (“the top”).



Figure 4. (a) Facade and common spaces of the building (b) balcony

In this case, a more recent history is developing with its “new owners,” whose building continues, despite everything, its vocation of welcoming small middle classes looking to become home owners in the Paris region. The only defects, however, are energy-related problems in these buildings which are considered as “passoires thermiques”, where most admit to being cold in winter, except for those who have insulated their apartments from the inside. But, as for sound insulation, many refuse to consider this as a problem insofar as they do not have financing for the work, both at the individual scale of the apartment and at the collective scale of the building. The only downside to these buildings is energy-related, where almost everyone admits to being cold in winter, except Martine (50 years old, recently arrived) who has insulated her apartment from the inside. Ivan, a construction worker and tenant looking for space for his two children, explains, “We add a little bit of heating. I prefer to pay a little bit more for the bills instead of getting sick.”

In this case, several interviewees mentioned stressing and worrying about the noise coming from the heating pipes. They would like to enclose the pipes in order not to hear their neighbours, but in addition to the fact that this is forbidden, their preference is to keep the heat in the apartment. They feel they cannot control their privacy and one block has big problems with an “unbearable” neighbour. They have reported the situation to the police and are in the process of evicting this family who, in their opinion, are “unhealthy, insane and disrespectful”. Some residents express irritation and aggression at the situation. They explain that they recently turned off their neighbour’s water to show their collective anger.

At the heart of the residence, the green space delimited by the four building blocks is nicknamed the “garden.” For the residents, who have often given up on the dream of a single-family home with a garden, this space is a very convincing substitute, especially for the children. Like a second playground after school, the courtyard is the place where children of all ages in the residence gather. It is a stated asset of the residence.

The inhabitants have been able to develop a representation of themselves on the real estate market, and in the social hierarchy of the city (at a distance from the working-class neighbourhoods and close to the wealthy communities). They have adapted their housing even more because they have little chance of being able to leave it in the current context of real estate pressure. In the same way, they invest in local sociability. It remains to be seen whether this will lead them to take the fate of the condominium into their hands. The problem linked to the compliance of the building with the Climate Plan is always dodged as something they do not need to solve immediately, and they will continue to manage according to their own means. This observation is paradoxical, but it appears here that non-standard buildings have the capacity to develop the well-being of their inhabitants.

5. Conclusions

A building is built by materials and people, it is the result of a history, from its construction to its daily maintenance (or degradation). This situation presents a panorama of the new social crisis of the 21st century in France, because the housing sector is one of the most affected, generating difficulties both in the monthly payment of electricity bills by tenants and in the thermal insulation works to be carried out in the buildings or apartments by the owners. These variables generate discontent, bad moods, mental stress, anxiety and depression. What we call residential stress is the inhabitants’ reaction to the difficulty of making their housing a significant choice, of feeling in control of their environment and able to adapt to it in the long run, as well as being capable of managing the requirements imposed by those in charge (collective organisms, condominium association, local government bodies and the state...

These three examples show that the question of thermics is at the centre of the relationship to mental health, because it is at the crossroads of subjective and objective factors, and of the relationship to equipment and uses. The observation at the scale of the building makes it possible to identify a panel of attitudes, which goes from the sobriety (Champigny) to the stress of the occupants (Letord Street), to high technical knowledge of the inhabitants (La Maladrerie). Some residents accept that they need less heating, others are worried, and others are equipping themselves with instruments to monitor their energy consumption. The scale of the building makes it possible to simultaneously observe the energy practices in the dwelling with the use of the collective spaces and those of the district.

There are certain limits to our research. The interviews were held with the residents who took part voluntarily without remuneration. Which means that our panel was made up of people who were available, retired or unemployed. We were unable to implement the same methodology in all the buildings because of specific security issues, at rue Letord. We held qualitative interviews which were therefore subjective, and it would be pertinent to check them against more objective measurement: actual temperature, level of humidity, air quality or medical reports. But the advantage of our educative method is to make the inhabitants aware of health issues in the homes which allow them to speak out and give them greater confidence in the way they express their residential stress and their mental problems faced with the pressure of dealing with energy related issues.

The history of the buildings makes it possible to understand heating practices in relation to health. Inhabitants mobilise this past, either to understand the difficulties encountered (La Maladrerie), to revolt (Letort), or to resign themselves and accommodate (Champigny). The history of the construction of the buildings and their future plans seems important when comparing the dynamism of the neighbourhood. In Aubervilliers, the history of the building, its architectural renewal (20th century heritage) and its privileged location are elements that the inhabitants adhere to and identify strongly with, without prioritising the thermal comfort or the upgrading of the building. However, the lack of knowledge of its history does not prevent the Diderot residence from starting to develop a collective life. The possibility of using individual and collective spaces at the convenience of the inhabitants, as well as their capacity to create strong bonds of sociability, expresses a healthier well-being and habitat. However, the Diderot residence seems to postpone any project and narrative of the future, as shown by the absence, at least temporarily, of a response to the requirements of the Climate and Resilience Act and the investment in the union council. These differences in positioning can be explained by the trajectory of the inhabitants. What each person considers well-being and mental health in their housing and how they appropriate and use spatial elements depends closely on the meaning they give to their residential journey.

The demand for a collective life is perhaps a sign of concern with regards to health and well-being. Depending on the typology of each building, this demand has its place or, on the contrary, is not even conceivable. In the case of the Letord Street building, whose configuration lies in a dense fabric without common spaces, the relationship and communication between neighbours is more limited or even "chosen." We note that the way in which they treat their housing and health concerns is presented in a more individualistic way. In the three other cases (Maladrerie and Champigny), which have large common spaces (green or mineral), the spaces for exchange and life are more important. Even though it may be contradictory with the individualisation of residents' practices, which is manifested by a distancing from housing (with secondary residences), the search for well-being in housing also involves collective public space. The green and private space (Maladrerie and Champigny) is perceived as an advantage and an improvement of their quality of life, and as such of their mental health. It compensates for their financial difficulties in paying the electricity costs, as well as the problems of noise and poor sound and thermal insulation of the apartments.

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