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Kobi, Madlen; Istituto di storia e teoria dell'arte e dell'architettura (ISA),
Accademia di architettura, Università della Svizzera italiana, Switzerland

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Warm Bodies in the Chinese Borderlands

Architecture, thermal infrastructure, and territorialization in the arid continental climate of Ürümchi, Xinjiang

Author affiliation

Dr. Madlen Kobi

Accademia di architettura

Università della Svizzera italiana (Lugano)

Institute for the History and Theory of Art and Architecture

Largo Bernasconi 2

6850 Mendrisio

Switzerland

madlen.kobi@usi.ch

Abstract

Architectural research often considers buildings and settlement practices as local material adaptations to climate, particularly when it comes to the analysis of architecture in rural and small-scale settlements. Based on ethnographic data from the rapidly urbanizing oasis metropolis Ürümchi in China's northwestern borderlands, this paper goes beyond such a localized view of climate responsiveness. It analyzes how individual practices of residents for the purpose of creating comfortable spaces in urban settings are linked to the interests of the state and to socio-cultural notions of thermal comfort. Through the classification of Xinjiang as part of China's northern "Heating Zone," the keeping warm of individual bodies becomes part of a territorializing strategy, because investments in urban thermal infrastructures and the inclusion in a national heating grid have anchored these regions within the state. There are, however, clear seasonal differences in how indoor residential spaces are regulated to maintain bodily comfort. In winter, apartment owners and residents enjoy the amenities of the state-financed heating infrastructure. In summer, cooling strategies depend on more neoliberalized, individual, social, and architectural ways to lower indoor temperatures. This paper unfolds the diversity of thermal discourses and practices that characterize Ürümchi citizens' creation of comfortable residential spaces throughout the seasons. The data outlines that houses as infrastructures are far from being simple containers that keep residents' bodies warm. Instead, the socio-technical organization of thermal spaces interferes with territorial strategies and ethnic place-making.

Keywords: Xinjiang, heating infrastructure, thermal spaces, architecture, urbanization, territoriality

Introduction

Winter here in Ürümchi is tough with the freezing temperatures. At least we have heating though. When I was studying in Shanghai in the mid-2000s, we did not even have an air-con [for heating in winter] and it was really cold. In southern China, they wear these quilted pajamas; I didn't like them, because you can barely move [when you have them on].

(Fieldwork interview, January 2018)

Ürümchi is the capital of Xinjiang Uyghur Autonomous Region (Xinjiang) in China's northwestern borderlands. The remarks above about different regulations on heating in different parts of China are from a conversation I had with Yiliminur, a Uyghur white-collar worker in her forties who had lived in Ürümchi most of her life. Weather and climate are prominent topics in people's everyday lives in the region. In urbanized societies, however, the time that residents actually spend outdoors has decreased in recent decades. Ironically, "the more weather we watch on TV the less time we spend in it" (Seabrook in Rayner 2003, 281). This means that the control of indoor climate has gained greater relevance in an urbanizing context. Anyone who has experienced the freezing cold winter months in Ürümchi, with temperatures down to as low as minus 10°C or 20°C, knows the pleasure of entering a heated building and the relief this brings from the cold outside.

Average indoor winter temperatures in residential apartment houses in Ürümchi today are around 20°C. The provision of heated interiors in northern China goes back to a state decision: in the early 1950s, influenced by the Soviet Union, the government began to design and implement the Chinese Heating Demarcation Line (Ch: *zhongguo gongnuan fenjiexian*) as part of its first Five-Year-Plan. This line divides the north of China from the south in terms of thermal management: while the installation of heating systems was prescribed in the construction of new buildings in northern Chinese cities, it was prohibited in the south until the economic reforms of the 1980s. Heating is still not officially included in the design of buildings south of this line, where residents develop more individualized strategies to heat their apartments.¹ In the north, heating must be provided in both state-owned and privately built apartment houses. The grid system for the distribution of heat is organized by the state, with heating plants provided to cover different urban districts. Sixty years after the introduction of the Chinese Heating Demarcation Line, the bodies of Ürümchi residents still benefit from state-provided heating services in winter.

This article argues that through a close analysis of the socio-technical organization of thermal spaces and the role that thermal infrastructures play in the everyday lives of those in Ürümchi, we gain new perspectives on the territorial relation of multi-ethnic borderlands within the Chinese central state. The control of indoor climates and with it the thermal comfort of individual bodies oscillate through complex processes of space-making that range from governmental interests to social norms of comfort, from insulation regulations to continuities in climate-responsive architecture designs. Far from following thermal comfort as a rigid standard implemented by HVAC (heating, ventilation, air-conditioning) experts, this paper engages with the ways in which human bodies as socio-cultural

beings and state subjects respond to thermal infrastructure in Xinjiang. It also inquires into the role of architecture in the provision of thermal comfort. Beyond seeing keeping bodies warm as a localized issue—or as exclusively embedded in the commercialization of indoor thermal comfort (Shove 2012)—I argue that through central state-provided winter heating infrastructure, individual bodies in private residential spaces have become tied to state services. It will also be outlined how thermal regulation of residential spaces through architecture responds to multifaceted ways of place-making. The house is not only a material skin to mitigate outdoor conditions; it also embodies meanings of socio-cultural belonging in a contested borderland. Xinjiang is inhabited mainly by two large ethnic groups, the Han Chinese and the Uyghurs. My analysis concentrates on Uyghur ways of controlling indoor climates, because their discourses and practices are closely linked to the thermal heritage of the region. Further, the tension between vernacular and modern and between independent and state-grid-related forms of thermal control are more evident among Uyghur residents. Nevertheless, I also include some ethnographic and interview data about thermal space-making of Han as residents of Xinjiang's growing cities.

While the role of the Chinese state in defining how borderlands look in architectural terms has been outlined for the likes of state development projects in Tibet (Yeh 2013), monumental architecture in Ordos (Woodworth 2018), spatial transformation in urban Xinjiang (Ross 2012; Pawan and Niyazi 2016), or the appropriation of vernacular housing for tourism in Inner Mongolia (Evans and Humphrey 2002), this paper expands existing research by studying how thermal indoor spaces, individual bodies, and urban architecture in Xinjiang are linked to territorial interests of the Chinese central state. The analysis is based on ethnographic research conducted in Ürümqi and cities in southern Xinjiang during a total of twelve months between 2011 and 2018. The paper juxtaposes governmental and individual strategies to control indoor climates. There are clear seasonal differences in how indoor residential spaces are regulated to sustain bodily comfort: in winter, apartment owners and residents enjoy the amenities of state-financed heating infrastructure. In summer, cooling strategies depend on more neoliberalized, individual, social, and architectural methods to lower indoor temperatures. These are related to socio-economic means, ethnic perceptions of desirable climate, and wider global norms of air-conditioning, among others. Indoor climate control, far from being a universally applicable technique, is embedded in the local socio-cultural and political context. This paper outlines how it is being executed by state institutions and individuals responding to the particular multi-ethnic Chinese borderland situation.

Thermal spaces, warm bodies, and citizen–state relationships

In socialist times, the individual in urban China was conditioned through the work unit (Ch: *danwei*) to become a part of the socialist state (Bray 2005). I argue that the expansion of heating infrastructures since the 1950s in northern China, including Xinjiang, has also controlled bodies through alleviation

of the cold. In today's post-reform socialist market economy, the state maintains power over thermal regulation in and through urban infrastructure management, dividing those in the north who receive heating from those in the south who do not. Heating and cooling in the modern state rely on material elements such as hot water pipes or energy grids, whose installation and maintenance depend on political strategies. Houses, especially in urban areas, are not standalone units that protect the body simply through passive climate control; rather, they are embedded in larger processes of state-controlled urbanization. For my argument here, I draw on the premise that working infrastructures strengthen the governmentality of the state and its territorializing intentions. Providing clean water, a functioning electricity system, or heating services can contribute to legitimate the state's presence. On the other hand, various studies reveal that state power can be infrastructuralized, in the sense that infrastructure's "scrappiness" (Laszczkowski 2015) challenges a strong state presence or "disrepair" (Chu 2014) hints to a deliberate neglect of infrastructure. Yet, ethnographic studies are particularly strong in showing that the relation between infrastructure and political legitimacy is characterized by a certain "opaqueness" (Kinzley and Joniak-Lüthi 2016).

Urbanization in Xinjiang happens as part of a high-modernist development scheme pushed by state interests, where "the development of scientific and technical knowledge, the expansion of production, the rational design of social order, the growing satisfaction of human needs, and, not least, an increasing control over nature (including human nature) [are] commensurate with scientific understanding of natural laws" (Scott 1998, 89–90). Since the economic reforms of the 1980s, the Chinese state and private companies have introduced global and eastern Chinese designs into house construction in Xinjiang. Vernacular solutions to the inclement climate have increasingly been replaced by modern designs and materials including wall insulation, the size and glazing of windows, and mechanical heating and cooling systems. The regulation of indoor thermal spaces thus touches upon the mentioned aspects of high modernism: it is a way to satisfy human needs through "control over nature," and is achieved through the creation of comfortable interiors that mitigate the harsh desert climate dominating large parts of Xinjiang territory.

Changes in the thermal management of urban residential spaces in Xinjiang came alongside shifting state–citizen relationships. We can understand heating systems as "an outcome of an energy-oriented contract between citizen and state" (Johnson 2016, 95). Through the Chinese state-dominated real estate sector providing state-managed infrastructures such as heating, the central state intervenes in the shaping of the locally built environment. A reading of the state–citizen relationship through the materiality of buildings was provided by Laszczkowski (2015), who analyzed the evolving presence of the state from former Soviet Union times to the post-Soviet context. After the dissolution of the Soviet Union, residents of Astana suddenly had to deal with a commodification of most state services in apartment houses and neighborhoods which "left both urban administrators and residents groping for ways to deal with the heterogeneous mass of suddenly redefined material elements: buildings, pipes, wires, and so forth" (Laszczkowski 2015, 143). Approaches to the use and maintenance of these

materials is indicative of relations between individual citizens and the state or, in the case of privatization, to private companies.

In Xinjiang, the growing infrastructuralization of urban areas, where large parts of the population are living today, has increased people's territorial dependency and created material connections between citizens and state institutions. This article reflects on how bodies as subjects figure within strategies of state territorialization and state-encouraged urbanization on a more abstract level. Especially in winter, warming up bodies in Xinjiang through comprehensive heating systems is a way to encompass the multi-ethnic population of these northwestern border regions of China into the infrastructural grids of the state. Collier (2011, 211) outlines similar observations for how individual citizens have been thermally tied to the state since the Soviet period, as "[f]rom the perspective of Soviet heating systems, *anthropos* was a warm body—or a mass of warm bodies, materially aggregated—in a very cold country." In his engagement with the material and social effects of neoliberalization after the break-up of the Soviet Union, Collier conceptualizes heating as an essential part of the biopolitics of the state to guarantee warm bodies. Even if funds for maintenance of heating infrastructure decreased in the post-Soviet 1990s, apartments were still "kept livably—though often not comfortably—warm" (Collier 2011, 212). The state-organized heating grid links macro-infrastructure with the thermal wellbeing of the individual body. My analysis of the situation in Ürümchi aligns with the considerations of Collier in the sense that energy politics are here closely related to biopolitics (see also Gupta 2015, 563). An ethnographic approach to thermal wellbeing highlights that through an analysis of practices of and discourses about the body, social norms and cultural preferences around thermal comfort become apparent. The body is the medium through which humans sense and explore the thermal-material environment and assess thermal comfort. In and through bodily processes and habits, we not only perceive thermal conditions such as excessive heat or humidity but also make alterations to domestic climatic conditions so as to facilitate conviviality and locate ourselves within a social and cultural context. This is evident in conceptual studies that highlight the importance of the body for social space-making. Low emphasizes the centrality of the body as a mobile spatial field for locating oneself and for creating social and cultural spaces within the built environment and urban landscapes. For her, "[t]he movements and meanings of people are critical to understanding, reading, and representing space. This perspective solves many of the problems inherent in a solely material-culture approach that records the built environment and landscape as a container for people rather than a creation of their own bodies, movements, and activities" (Low 2014, 41). Thermal spaces are exemplary for the importance of considering both material and social components in the creation of spaces. Indoor climate is not immaterial or invisible—rather, it depends on the interaction of material entities, as Shove, Walker, and Brown (2014, 115) formulate: "In technical terms, indoor climates are outcomes of dynamic processes of heat transfer through and between air, people, furniture, fans, heaters, walls, objects, etc. and the components and molecules of which these are made." Human bodies are among those components, as they themselves influence room temperature through bodily warmth and at the

same time benefit from thermal regulation. Considering the location and perception of bodies in this context refers to when, where, and under what circumstances people feel comfortable. While Low does not explicitly relate bodily space-making to aspects of thermal comfort, I draw on Shove's (2012) elaboration of the relations between conventions of cooling and heating, globally unifying norms of room temperature, and human bodies as malleable units that conform to these standards. Shove (2012, 63) argues that "[b]ecause the human body is itself part of the comfort regime, strategies of indoor climate management are, in addition, implicated in reproducing specific interpretations of normal performance."

Climate, architecture, and the heating system in Ürümchi

Climate and weather play a fundamental role in informing housing practices, even if considerations of local climate are not as important in modern urban architecture. In urban areas, it is common to install active climatization systems to control indoor thermal conditions. Xinjiang's climate is dominated by its continental location and two large arid areas (the Tarim Basin and the Junggar Basin). The main geographic focus of this paper is Ürümchi, a city in northern Xinjiang with roughly three million inhabitants; it is situated at the foot of the Tian Shan mountains in an arid continental climate zone with large daily and annual temperature variation (Fig. 1). In the hottest month, July, average temperatures reach 24°C, while in January they drop to minus 10°C. Average annual precipitation is only around 400 millimeters (XUARPGSO and XUARSO 2008, 22–25).

Ürümchi has rapidly urbanized since the 1990s. The pace of development increased further following the launch of the "Open Up the West" campaign (Ch: *xibu da kaifa*) in 2000 and the "Belt and Road Initiative BRI" in 2013. In all of Xinjiang, investment in the real estate sector grew nearly tenfold between 2005 and 2015 (Xinjiang Weiwuer Zizhiqu Tongjiju 2017, sections 4–14). This rapid urbanization and infrastructure development has contributed to the introduction of new architectural designs to mitigate the desert climate. Many investors and architects involved in real estate projects come from eastern China and the choice of building materials, the way high-rise buildings are insulated, or the installation of mechanical and energy-dependent techniques such as air-conditioning were only introduced to Xinjiang recently. The gridification of urban areas, provision of a heating network, and its material manifestation in pipes and thermal power stations derive from state investments meant to modernize living conditions. The grid management in the heating sector goes along with gridification in other fields such as social surveillance (Leibold 2013). While the latter is very explicit in its objective to control the bodily movements of citizens in Xinjiang, the provision of a heating infrastructure spans much subtler ties between state and citizens. However, both are of a territorializing nature.

Among the population, we find ambiguous reactions towards the rapid transformation of urban areas. This is related to the fact that until the mid-20th century cityscapes in Xinjiang were predominantly

shaped by the Uyghur population. Even if Xinjiang has historically always been a contested territory, the development of Chinese state infrastructure and the large immigration of Han Chinese since the inclusion of Xinjiang within the Chinese state in 1949 have contributed to a replacement of formerly dominant Uyghur ways of living and dwelling. While the Han only constituted 6% of Xinjiang's population in 1949, they comprised more than half the population by the late 2000s (Joniak-Lüthi 2014, 3). Language, education, and the functioning of state institutions have progressively aligned with other parts of China.

The expansion of state services and the incorporation with the rest of China of all spheres of daily life have caused massive ethnic resentment. The tensions mainly concern relations between Han and Uyghur inhabitants of Xinjiang, which have frequently led to violent outbreaks.ⁱⁱ Steenberg and Rippa (2019) argue that in Kashgar it is mainly the formalization of the economic sector in the last decade that has led to the economic and social marginalization of Uyghurs. This becomes visible in the changing cityscapes with many urban development projects benefitting companies from Eastern China. New architecture and changes to the built environment that attend the urbanization process are viewed critically by parts of the Uyghur population (Kobi 2018; Ross 2012). The destruction of mosques, the increasing number of control checkpoints within urban areas and the replacement of Uyghur-inhabited old town areas with new residential compounds obviously appall Uyghur residents who see their cultural and religious representations vanishing from urban spaces. Apart from built structures, since 2012, ethnic discrimination has culminated in a highly unequal surveillance system mainly targeting Uyghur residents under the pretext of combating terrorism. An extreme outcome of this "state terror" (Smith Finley 2019) is the massive detention of an estimated one million or even more Uyghur inhabitants in internment camps (Zenz 2019). This increase of exerted state control in Xinjiang since 2016 is not in the analytical focus of this paper as most of the fieldwork was conducted before this tipping point. However, heating grids and other subtler forms of territorial infrastructuralization all converge to a built environment being managed by the Chinese central state. Because infrastructural aspects such as electrification, the maintenance of heating grids or a better road network as part of the modernization discourse are considered to improve everyday life, they have caused less turmoil among Uyghurs than the obvious surveillance or deliberate destruction of mosques. Though the fact that voicing out discontent or critique about state practices in Xinjiang was dangerous for both Uyghurs and Han before has surely also affected the ways in which my informants phrased their opinions.

The firm integration of urban houses into larger infrastructural networks subtly cemented the state's presence in residential everyday lives. The installation of heating systems in Ürümqi has been the norm in houses built since the 1950s.ⁱⁱⁱ Since then, state-provided heating runs 24 hours a day during the defined "winter period" from October to April and residents cannot regulate the heating in their apartments themselves.^{iv} In the early stages of the implementation of heating systems in Ürümqi, every work unit had its own coal-fired heating plant, guaranteeing warmth for a certain number of

houses. Later, decentralized solutions provided entire districts with energy from the same plant. Until 2012, the prime energy source for all heating plants was coal.^v The massive amounts of coal burnt for this purpose, together with emissions from traffic and industrial plants, polluted air and water resources in and around the city. During winter, and because of its unfavorable geographic location in a valley with poor air circulation, Ürümqi is one of the most polluted cities in China (German Federal Ministry of Education and Research 2017). In addition, cold Siberian winds cover the valley in winter with an atmospheric lid that keeps pollutants down and does not allow them to disperse (Qi, Fan, and Chen 2013, 86). In 2012, the government initiated a big campaign to replace coal-fired boilers with natural gas in order to reduce the high levels of air pollutants (Liu and Rui 2013). Electric heating has also been supported by governmental programs in recent years, taking advantage of the solar and wind energy abundant in the region.^{vi} According to Zou (2016), within a year more than 76% of the heated urban area in Ürümqi was served by new gas heating and air pollution had been reduced to levels comparable with those of 1995. Air pollution indications are, however, still severe, with pollutants often climbing to health-damaging levels.

The thermal comfort of individual bodies is hence also embedded in urban political ecologies where the availability of resources and ecological considerations influence decisions about the kind of heating that can be provided. Energy efficiency is a current buzzword for thermal interventions in housing in the context of state objectives to lower carbon dioxide emissions. Recent policies stipulate the use of certain building and insulation materials which are crucial contributors to heat preservation and to an economy of energy use. Thermal comfort is hence embedded in larger networks of energy provision. At the same time, there is a generally shared understanding that new architecture should learn from vernacular building in terms of passive climate control and hence less energy-intensive solutions. Also in Xinjiang, urban residents and scholars alike often compare the thermal situation in high-rise apartments with the thermal heritage of regional architecture.

Thermal management in vernacular architecture

Dwelling as a form of place-making is an important part of the weathering practices of individuals (Vannini et al. 2012, 362–63). It is through buildings that cold winters and hot summers are mitigated, a kind of materialized reaction to the natural environment (cf. Rapoport 1969). China's northwestern borderlands are shaped by deserts and mountain ranges; apart from in the growing urban centers, such features have prevented the region from accruing a high population density. The desert climate has been reflected in Uyghur vernacular architecture, which has brought relief from the hot summers through passive climate control such as a house's orientation with regards to the sun, wind or sand storms, or with the preference for using the likes of locally sourced adobe as building materials. In Xinjiang's rural and suburban areas, we find a variety of one- to two-story vernacular houses that employ architectural structures adapted to the climate (Akin 1997; Wang, Yang, and Rozi 1997;

Loubes 1998; Sint 2007; Chen 2009). Without glorifying these housing traditions as the best options to cope with the climate, the previous non-existence of energy-driven technologies led to a broad variety of climate-responsive structures emerging.

Despite the fact that many of my Han and Uyghur middle-class interlocutors live in multistory or high-rise (Ch: *gaolou*) buildings in Ürümqi and other cities, the creation and perception of thermally comfortable conditions in urban buildings is often compared to rural and vernacular architecture in everyday discourses and practices. Depending on their native place, interlocutors would mention different climate-relevant aspects. Liu (2015, 113–18) delineates five main architectural features that characterize regional variations within Xinjiang: underground or semi-underground houses in Turfan; the *aywan* houses that are specific to the area around Hotan;^{viii} the closed courtyards found in Kashgar; the juxtaposed architecture of the northern rim of Taklamakan desert (Aksu, Korla), and garden-style houses in Khulja. Each architectural style has other elements that offer inhabitants relief from the harsh climatic conditions. In the scorching summer heat of Turfan, for example, water from the *kariz* (man-made underground water channels) cools the semi-underground rooms (Zhai 2017, 57–58). In several regions of Xinjiang, architectural structure defines the function of rooms according to the seasons, with a clear separation of summer and winter chambers (Liu 2015, 125–26). I frequently heard from my interlocutors that they consider courtyard houses most appropriate for the hot season—as Adeled, a 45-year-old middle school teacher from Turfan, outlines:

This is the courtyard house of my mother and aunt in Turfan. [She shows photos on her cell phone of a modest, single-story rural house with a courtyard covered in vines.] This courtyard was so pleasant, especially in summer. The house was built out of a mixture of mud and cement, then we added some tiles on the outside as decoration. The thermal mass of the house guaranteed a pleasant indoor temperature in summer and winter. [...] Last year it got demolished to make way for a multistory building. (Fieldwork interview, July 2017)

In Turfan, traditional houses have always been built using the rammed earth/adobe technique combining sun-dried adobe bricks with a mixed grass-mud plastering. This architecture closes the heat out in summer and keeps the interior warm in winter (Sint 2007, 22, 246; Zhai 2017, 56–57). As well as the materials used, the general thickness of the external walls is one of the key elements that have been developed by local builders to cope with the arid and hot summer climate (Loubes 1998).

While courtyards and shaded areas provide pleasantly cool places to be in summer (Fig. 2), the living space in such houses is significantly reduced in winter. When the temperatures drop, the insulating quality of the passive house structure is complemented by active heating. In most cases, only part of the indoor space in a courtyard house can be heated with a coal-fired stove. Sleeping, cooking, and most of daily life take place in the same room, with this stove as the only source of warmth. Usually the stove serves for both cooking and heating. Another common form of heating is the *kang*, an architecturally integrated solution where the warmth of the fire heats a platform through a system of underlying pipes functioning like underfloor heating for this part of the room (Flitsch 2004; Pawan

and Niyazi 2016, 127). Indoor air quality in these houses in winter is, however, often deficient due to the use of coal and the insufficient ventilation of rooms (Liu 2015, 135–36).

Urbanization in Xinjiang often implies a move from single- to multistory buildings and increases the dependency on infrastructural services for thermal regulation, in parallel with a commodification of energy provision. In Kashgar, as elsewhere in Xinjiang, some of this relocation is part of state programs to remove the Uyghur population from the less controllable old town areas. Often, it is due to economic reasons that many tradesmen and residents move away from the centrally located old town areas as rental prices become too expensive (Steenberg and Rippa 2019, 84–86). Pawan and Niyazi have analyzed the effects of an enforced relocation of Uyghur inhabitants in Kashgar. In a large-scale old town renewal project initiated in 2001, many of the former adobe houses were demolished and replaced with similarly old-looking dwellings. The former residents of these houses were moved from the centrally located old town to apartments in the outskirts. Besides the significant implications that this has had on the social life of residents, it also affected thermal practices through the move from courtyard to multistory apartment houses with government-provided heating. Pawan and Niyazi (2016, 127) write that despite official regulations guaranteeing free heating for the first three years after relocation, the heating company started collecting fees immediately. This example shows that living in apartment houses increases dependency on state-provided services, as individually controlled heating is no longer possible. Uyghur residents who have used local wood or coal for heating their former houses (Fig. 3) are now dependent on a commodified heating infrastructure where prices and availability of energy sources are determined by the state. As part of state territorialization, individualized and need-based heating solutions are replaced by state-controlled grids. Furthermore, flexible heating of indoor spaces according to the fluctuating outdoor temperatures is also impeded as state heating runs continuously during a defined winter period (Pawan and Niyazi 2016, 127).

Winter: warming bodies in the high-rise

In winter, active climate control in urban high-rise buildings is the only way to keep warm as architecture alone cannot offer amenable indoor temperatures when it is below zero outside. It is estimated that in northern China heating comprises more than 80% of total energy use in buildings. This is higher than in the West, as Glicksman and Lin (2006, 9: 10–11) highlight: residential buildings in Beijing consume roughly 50–100% more energy than in comparable climates elsewhere. One reason for such high energy consumption is the inefficient insulation employed in houses until the early 2000s. Today, insulation regulations all over China are more stringent, but their implementation is often weak.

The state-subsidized heating infrastructure in the northern regions of China (Xinjiang, the Northeast, Gansu, Inner Mongolia) guarantees warm bodies for citizens but also creates a certain dependency on the state system, as there is no other way to heat urban apartments in winter. Hence, not only the

controlled allocation of natural resources,^{viii} but also the subsidized prices for heating bind the northern areas to the central state. In the pre-reform era, energy products such as coal or oil were allocated directly to power plants and urban apartments through the state. Since the 1980s, the energy market has partially liberalized. "Historically, and often still today, consumers either receive heat as a welfare commodity or are billed for heat based on occupied floor space. They do not pay for the amount of heating energy actually used; therefore incentives do not exist to reduce heat energy consumption" (Glicksman and Lin 2006, 9:15). In Ürümchi, apartment owners only pay some of the costs for heating services. The heating costs of a university work unit apartment of 100 m² are approximately 2 RMB/m² per month, which means 200 RMB per month or 1200 RMB for the entire winter season.^{ix} These costs are much lower than what residents in southern China pay for running their electricity-dependent air-conditioning units to cool apartments in summer, even if electricity there is also subsidized.^x Ensuring thermal comfort indoors during the most extreme climatic period of the year in Ürümchi is thus relatively affordable because of state subsidies for energy.

This strategic assignment of resources aligns with what Collier (2011, 213) experienced elsewhere: "If there was a social sine qua non in Russia in the 1990s, it was the provision of heat, not the protection of industrial enterprises." The provision of heat in Ürümchi can be read as a political strategy where infrastructural grids increase territorial integrity. While the Chinese Heating Demarcation Line was introduced in times of resource shortages, scarcity is still an argument for maintaining this artificial heating divide today despite sporadic claims from southern China where people also want to benefit from state-subsidized heating.

Even if active climate control dominates thermal regulation in high-rise buildings, some passive means are also considered by the building industry and by individual residents. In northern China, the majority of urban residential buildings orient the major living spaces (living room) towards the south in order to benefit from maximum possible solar radiation in winter. Meanwhile, rooms intended for sleeping often face north. The same strategy was applied in traditional housing too: Sint (2007, 300) explains that in many of the courtyard houses in Kashgar, living rooms (where people also sleep in winter) are oriented towards the south to be warmed by the sun in winter. In summer, this southwards orientation protects them from the strong sun, because the sun stands higher in the sky. Adeled, a Uyghur informant, pointed out to me that Uyghur architectural vocabulary traditionally distinguished between spaces exposed to the sun (U.: *küngey*) and those without sun exposure (U.: *teskey*).

The orientation of a building and the height of an apartment are important factors for consideration when an apartment is being purchased. In Ürümchi, buyers prefer apartments in the middle range of a high-rise building, as Nijat emphasized. He lives on the tenth floor of a 24-story building and remembers the process of when they had to choose their apartment some years ago:

The preferred floors on which to purchase an apartment in our building were floors 8–18, because you have a view, but it's not too high and hence not too hot. No one wanted to live in the 24th floor. [...] The 1st to 3rd floors are also unpopular and apartments there were less

expensive. The most expensive apartments are on floors 11–14, above the 18th floor, prices start decreasing again. [...] Solar radiation and wind are also considered when choosing an apartment [...]. Southward orientation is generally preferred [because of optimal sun radiation in winter]. (Fieldwork interview, August 2017)

Nijat rejected my idea that such choices might in any way be related to the Chinese concept of *feng shui*; he rather saw them as embedded in a regional, climate-responsive Uyghur building tradition. Thermal comfort also depends on what floor an apartment is on in a high-rise building: the lowest floors are considered too cold (and also damp) in winter, due to a lack of direct sunlight. The upper floors, on the other hand, are described by informants as being too warm in summer. Therefore, the middle levels are preferred when selecting an apartment. This is evident in a study by Long (2013, 44), who measured indoor temperature in apartments on various floors of a high-rise building in Shanghai, south of the Chinese Heating Demarcation Line. He found that winter temperatures in the middle floors are the highest. During the non-heated winter periods in Shanghai, those floors are preferred due to their higher base temperature generated through passive climate control due to being insulated both above and below. So, rather than being related to *feng shui*, there is a genuine, observed advantage to live in the middle levels.

Summer: cooling bodies in the high-rise

While official policy guarantees heating in apartment houses in Ürümchi during the winter months, there are no state-supplied services during summer when the hot continental estival temperatures significantly affect high-rise living (Fig. 4). Depending on what is considered comfortable, people decide to carry out certain adaptations and socio-material practices in their apartments. The material characteristics of the outer walls, such as their insulation, building materials, and windows, are as important to the creation of a cool indoor space as are objects used to deflect sunlight (such as curtains) or in producing a breeze (for instance, ventilators) (Shove, Walker, and Brown 2014, 115). Dealing with the heat in summer is also embedded in daily habits. Ürümchi residents prefer to spend the hottest part of the day indoors, out of the glare of the burning sun. Indoors it stays reasonably cool because of the significant temperature variation between day and night that comes with a continental climate. Even if daytime summer temperatures can reach 40°C or more, apartments cool down during the night and there is no need for a permanent cooling strategy as in some cities in China's south, where residents use air-conditioning round the clock. Furthermore, encouraging effective ventilation is a vital practice for preventing heat getting stuck in an apartment, as Han researcher Wu Qiulang points out:

We do not have an air-conditioning system in my apartment; normally it is not that hot. This year, it is very hot, maybe because of climate change? I thus open the door to the staircase and create ventilation in my apartment in order to feel comfortable. (Fieldwork interview, August

2015)

Qiulang lives in the sixth floor of a high-rise apartment building. To protect her privacy when opening her apartment door, she hangs a thin curtain over the doorframe.

Until recent years, active climate control, in particular air-conditioning, was not very common in Ürümchi. But both the rise in urban temperatures due to rampant construction activity in inner city areas leading to the heat island effect, and the desire to create a cool, modern, and pleasant indoor space have increased the number of air-conditioning units being sold. In the especially hot summer of 2015, air-conditioning units apparently sold out in Ürümchi. This boom also resulted in a shortage of available installation engineers and experts from other provinces were brought in. Even if people had bought a new air-conditioning unit, and longed to enjoy cool air, they often could not find anyone able to install it. My interlocutor Yiliminur commented in August 2015 on these events:

In the last two weeks it has been extremely hot, up to 44 degrees. In our office we don't have an air-conditioning unit, so it has been terrible. I couldn't wear make-up and when I washed my hair, one hour later I was sweaty again. [...] You need an air-conditioning unit more and more, even if we've never had one before. Now it is so hot that sometimes I have to take a shower three times a day. (Fieldwork interview, August 2015)

Over the last decade, a new appreciation of cool, air-conditioned indoor spaces has spread among the growing middle classes in Ürümchi. However, air-conditioning is not subsidized by the government—unlike in Chongqing (southwest China), where the local government provides air-conditioning units for poor, elderly people because the summer heat is a serious health threat for this vulnerable group. In Ürümchi, the installation of air-conditioning systems is an individual strategy to create thermal comfort in the high-rises, where the steel-reinforced concrete causes the buildings to get hot. The apparent need for cooling is linked to notions of hygiene and bodily practices that have spread globally. Since the 1990s, air-conditioning to guarantee pleasant indoor conditions has become popular in many Asian megacities (e.g. Hitchings and Lee 2008; Shove 2012; Sahakian 2014). My data show that the alignment with global living standards and the enjoyment of cool air in Ürümchi are complemented by other cultural and social discourses on thermal comfort. The bodily perceptions guiding the sensation of hot, comfortable, or freezing spaces are influenced by the wider socio-cultural environment and someone's identification as belonging to a certain socio-economic or ethnic group. For example, while staying cool during excessively hot periods is seen as contributing to stable health, some people on the contrary refrain from using an air-conditioning unit for health-related reasons; in particular, Uyghur women mention that they fear catching a cold or getting rheumatism if exposed to cold air for too long.

Most Ürümchi residents, however, associate air-conditioning with a modern urbanized lifestyle that aligns with living conditions in China's eastern regions. Moreover, air-conditioning is discursively used as a marker of ethnic difference. In the words of Rosagül, a Uyghur middle school teacher:

I never use the air-conditioning system because I am Uyghur and we Uyghurs are used to the heat of the desert as we always lived here. On the contrary, when I lived in a dormitory, many of my Han colleagues used to switch on the air-conditioning unit when temperatures rose above 24°C. (Fieldwork interview, July 2016)

In everyday practices, we find constant emphasis on differences between Uyghur and Han in many aspects of an urban life (Caprioni 2011; Smith Finley 2013). The quote above exemplifies that the use of air-conditioning is part of ethnic boundary-making between Han and Uyghur, with Uyghurs stressing that they are "from the region" and hence adapted to its climate. Still, even if discursively Rosagül clearly distinguishes between Uyghur and Han uses of the air-conditioning unit, her own thermal practices were less clear-cut. In her three-room apartment in Beijing, where she worked for an international company after having completed her studies in Ürümqi, she did use an air-conditioning device in order to cool the bedroom. I was unsure whether she did so because I was staying with her for a few days or if she would have utilized it anyway, but she seemingly enjoyed sitting in the cool breeze it emitted. Notions of thermal comfort are therefore situational and negotiated in complex everyday socio-cultural settings, often not depending only on the meteorologically measurable climate outside.

The rates of air-conditioning use in Ürümqi are still low and one sees few external parts of split-unit systems on the city's housing facades. One reason for this is surely that peak temperature summer days are few and one can easily get through those by exposing oneself less to the outdoor heat during the daytime. Nevertheless, the mobility of global ideas about what constitutes a comfortable residential environment, rising inner city temperatures, and also the compelling advertisements of air-conditioning producers constantly increase the number of air-conditioning units being sold and the desire to control indoor climates.

The social body between cool courtyard and heated high-rise

Summer and winter pose very different climatic challenges for urban living in Ürümqi. The non-existence of state-subsidized measures in summer to combat the heat is not only responded to through the installation of air-conditioning units but is also reflected in the praise for the thermal conditions found in traditional vernacular houses. Green courtyards with options for sitting or lying down under trees, covered open spaces that facilitate ventilation (such as the *aywan* in the region of Hotan), or shaded verandas offer comfortable thermal environments in summer, irrespective of electricity supply. In addition, courtyard houses are mostly located in suburban or rural areas where temperatures are generally cooler than in the inner city.

Some of both my Han and Uyghur interlocutors mentioned that they prefer to move seasonally between courtyard and high-rise apartments, combining the climatic benefits of passive and active climate control in the respective seasons. A female Han landlord in Narat commented on her

apartment in a multistory building:

This apartment was finished last year and it has winter heating which is activated in October. In summer, I live with my family in a one-story building [Ch: *pingfang*] with a courtyard where I also grow some vegetables; in winter, we move to the multistory building [Ch: *loufang*], because it is warmer here. I can even walk around in a t-shirt, just like in summer. (Fieldwork interview, August 2015)

These remarks highlight the climatic benefits of the courtyard house compared to the high-rise, as Adeled did above when praising the thermal comfort of her family's rural house in Turfan. Many middle-class residents own more than one apartment and the entire family benefits from this arrangement both in thermal and social terms. Often, a rural house is inherited while an urban apartment has been bought through the work unit (Ch: *danwei*) or on the real estate market (Ch: *shangpin fang*). Owning a house in the city is necessary because many jobs are located in urban areas. Buying an apartment is also a preferred way to invest one's money, with the expectation of rising real estate prices. At the same time, urban residents enjoy the amenity of a multistory apartment in that it provides a warm dwelling in winter. For many, this is more comfortable than the detached, coal-heated solution encountered in courtyard house, which frequently only warms one room.

While in practice the physical mobility between rural courtyard house and urban high-rise apartment is low, discursive reference to the climatic benefits of each architectural typology and their heating or cooling characteristics is omnipresent. Beyond this thermal evaluation, house types are inherently related to the social groups constructing and inhabiting them: "The house and the body are intimately linked. The house is an extension of the person; like an extra skin, carapace or second layer of clothes, it serves as much to reveal and display as it does to hide and protect" (Carsten and Hugh-Jones 1995, 2). Beyond the wish to regulate the temperature for the physical body, the social body wants to belong to a certain environment. Thermal perception is linked to atmospheres, sensations, and sociality that contribute to thermal comfort. Under this perspective, "feeling comfortable" in the courtyard house in summer can be understood as including a connection between an individual body, Uyghur architecture as material practice, and ethnicity.

Many of my interlocutors in Ürümchi grew up in a suburban or rural setting. They draw on their childhood experiences or visits to rural areas to assess the thermal regulatory qualities of urban apartments. As discussed, when residents choose an urban apartment they consider house orientation and solar radiation, aspects that are relevant for thermal comfort in both multistory and vernacular houses. Praise for the thermal qualities of the passively cooled courtyard house in summer and the actively heated urban apartment in winter does not only emerge from thermal desires, but is at the same time a way of expressing connectedness to an architecture and lifestyle considered part of one's ethnic belonging. It is often interlocutors who self-define as Uyghur or Kazakh that cite the thermal comfort that courtyard houses provide. Temporally locating their bodies in vernacular houses means placing themselves close to what they consider an important part of Uyghur culture (Kobi 2018). This

does not diminish the simultaneous desire to participate in a modernizing urban residential setting, where contemporary furnishing and design unfolds alongside global standards and technologies such as air-conditioning.

Conclusion: individual bodies between state services and thermal comfort

Thermal comfort is frequently discussed with regard to individual house management, including technical aspects such as insulation or heating and cooling systems, or is focused on the physiological possibilities of mitigating heat or cold. This paper complements existing approaches by engaging with bodily sensations of thermal comfort as embedded within larger political settings of state territorialization, biopolitics, and architecture. Rapid urbanization offers beneficial ways for the state to enlarge its infrastructural grid and bind houses and their inhabitants into a state-consolidating project. The connection is physical, through pipes, electricity bills, or the distribution of energy resources, but also happens through the creation of dependencies on these networks for the supply of comfort. I define territorialization here as a process that connects the locale with state institutions through a transformation of physical landscapes, for example through the construction of different kinds of infrastructure. These material investments also tie individual bodies more closely to state politics.

In Xinjiang, like in Heilongjiang or Inner Mongolia, provision of thermal infrastructure is closely related to the borderland situation where the development of infrastructure and the inclusion in state-wide heating grids reinforces connection within the Chinese state territory. While new roads, improved housing, or a better-linked railway system are all means to modernize a region, the intention of "high modernism" (Scott 1998) does not happen in the absence of political interests. The investments in infrastructural developments, the employment opportunities generated, as well as the companies and laborers that migrate to Xinjiang, are all embedded in national endeavors to territorialize the northwestern borderlands. Similar to the situation in the Soviet Union (Collier 2011), the provision of a functioning heating system by the Chinese state can be read as a territorializing strategy to secure Xinjiang as an indivisible part of the Chinese state. A functioning heating grid is both part of a modernizing environment whose effects are enjoyed by both Uyghur and Han residents, but also part of an ongoing territorial consolidation. The reach of the heating grid increases Chinese state presence in everyday lives when it comes to the maintenance of the grid, the provision of energy source or billing as part of state-citizen relationships. Opting for area-wide district heating on the one hand provides individuals with thermally comfortable spaces without the hassle of manual heating with a stove, as is the case in detached rural houses. On the other hand, state-subsidized heating binds individual bodies into a state system, at least in winter. While this state territorializing strategy seems no concern for Han residents, Uyghurs are generally more concerned about the growing presence of the Chinese state in everyday lives.

From a more ethnographic perspective, and beyond treating bodies as neutral entities simply reacting to heat or cold deriving from the larger institutional context, bodily location and thermal perception represent social approaches to space-making. Even if active climate control systems have adjusted residential conditions globally in different climate settings—from Ürümchi to Beijing, from New York to Cairo—individual bodies react differently to thermal conditions in each place, because they are embedded in complex cultural entanglements. Feelings of comfort are linked to memories, cultural norms, and social relations. The creation of thermal comfort is thus not only the result of measurable and controllable indoor variables such as temperature, humidity, or sunshine, but also of socio-culturally shaped ideas of comfortable spaces created in and through the local engagement with architecture (Roesler and Kobi 2018). Uyghur vernacular architecture in Xinjiang, for example, responds to the thermal fluctuations between freezing winter cold and scorching summer heat through passive means of climate adjustment. Aside from the effects of their material structure, these houses form an important part of regional material heritage where notions of thermal comfort are intertwined with socio-cultural identities. In territorial terms, the possibility of grid-independent thermal control in courtyard houses provide a rare space of infrastructural freedom in a region where modernizing the built environment has become closely entangled with an increasing state control.

Therefore, it is essential that we start analyzing thermal comfort not just as a biologically measurable condition of the human body, but consider its complex entanglement within local architectural traditions, expressions of place-making, state strategies, as well as individual heating and cooling practices. Bridging between the broader perspective of the territorializing effect of borderland infrastructures and lived everyday realities of creating thermal comfort on the local scale helps us understand the multiple roles of human bodies as both state subjects and socio-cultural beings.

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Figure captions

Figure 1: Winter impression of the main gate of Xinjiang University in Ürümqi with part of the Tianshan mountains in the background. (Photo by Madlen Kobi, April 2011)

Figure 2: Green courtyard space in a Uyghur house in Kucha offering a pleasant stay during the hot summer period. (Photo by Madlen Kobi, September 2011)

Figure 3: Coal delivery for the heating grid-independent courtyard houses in the old town of Kucha. (Photo by Madlen Kobi, September 2011)

Figure 4: Apartment houses in Ürümqi built in different time periods. (Photo by Madlen Kobi, July 2017)

ⁱ Far from being comfortable, winter temperatures in the "summer hot, winter cold" climate zone—located in the northern part of China's south—can drop to between 0 and 5°C. Further, high humidity levels in these areas contribute to a feeling of coolness in the winter. Due to poorly insulated houses and a ventilation-oriented architecture, outdoor and indoor temperatures are often much the same. Heating strategies south of the line range from warm indoor clothes to the use of small radiators, from warm air generated by air-conditioning machines to the installation of underfloor heating systems. These strategies developed as a reaction to the lack of state-subsidized heating provision and depend on the socio-economic means of individuals.

ⁱⁱ These include the Khulja incident in 1997 (with mass riots and executions), the Ürümqi riots in 2009 (with 197 people killed and 1700 injured according to a PRC White Council Paper) (Millward 2010, 352), and smaller uprisings in different places often labelled as terrorist attacks by the Chinese government.

ⁱⁱⁱ Fieldwork interview, January 2018.

^{iv} The switch-on date for state-controlled heating depends on the place. The heating system in Ürümqi for the winter season 2017/18 ran between October 10, 2017 and April 10, 2018. In Kashgar the "winter season" is a bit shorter, while in Beijing heating only runs between mid-November and mid-March.

^v According to my informant, an average family in the city of Ürümqi used about 1 ton of coal for one season before the changeover to gas. This is lower than the amount used to heat a traditional house in Kashgar. According to Pawan and Niyazi (2016, 127), a family in Kashgar with ten members uses approximately 1.5–2 tons of coal for a single winter season.

^{vi} According to a retired university professor, a newly built residential compound (*xiaoqu*) in Turfan is entirely heated by solar power (fieldwork interview, January 2018.)

^{vii} The *aywan* is a kind of courtyard space in the heart of a house, covered by an elevated roof. It provides shade, enables ventilation through partial openings in the sides of the roof and is brighter than the other rooms. In Uyghur, *aywan* means "bright place" (Liu 2015, 115).

^{viii} Most resources used for heating, such as coal or—more recently—gas, are sourced in northern China. Nevertheless, it is a political decision also to use them in these areas and not divert such fuel to the south.

^{ix} Fieldwork interview, January 2018.

^x According to data from Chongqing, the cooling of a 100 m² apartment during summer consumes about 700 RMB per month (fieldwork data 2017). In winter, due to the mild weather, many residents in Chongqing do not use their air-conditioning units at all, so costs are lower.