BREATHING UNCERTAINTY:
POLITICS OF HARM IN MONGOLIA'S AIR POLLUTION CRISIS

by

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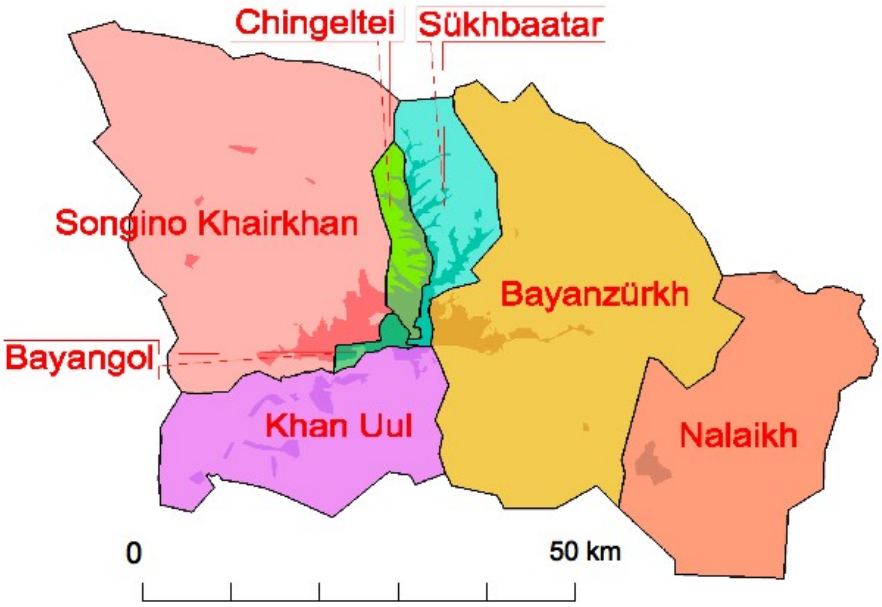
ADMINISTRATIVE MAP OF MONGOLIA

Source: http://www.drben.net/

ADMINISTRATIVE MAP OF ULAANBAATAR



Source: Commons by Latebird. Created by Bogomolov, PL.

LIST OF ACRONYMS

ADB	Asia Development Bank
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GoM	Government of Mongolia
JICA	Japan International Cooperation Agency
MoH	Ministry of Health
MCA-M	Millennium Challenge Account – Mongolia
MNUMS	Mongolian National University of Medical Sciences
NAMEM	National Agency for Meteorology and Environmental Monitoring
NGO	Nongovernmental organization
UB-CAP	Ulaanbaatar City Clean Air Project
Unicef	United Nations Children's Fund
UBAQA	Ulaanbaatar City Air Quality Agency
UNDP	United Nations Development Program
UN-HABITAT	United Nations Human Settlements Program
WB	World Bank
WHO	World Health Organization

MONGOLIAN LANGUAGE TRANSLITERATION

Cyrillic	Roman Alphabet
а	a
б	b
в	w
г	g
д	d
е	ye
ё	yo
ж	j
з	z
и	i
й	ii
к	k
л	l
м	m
н	n
о	o
ө	ö
п	p
р	r
с	s
т	t
у	u
ү	ü
ф	f
х	kh (pronounced "h")
ц	ts
ч	ch
ш	sh
щ	shch
ъ	ı
ы	î
ь	ĭ
э	e
ю	yü
я	ya

SELECT MONGOLIAN TERMS

Airag (айраг): Fermented mare's milk

Aimag (аймаг)*:* Province

Agaariin bohirdol (агаарюн бохирдол): Air pollution (formal, used in scientific and policy-level discourse)

Argal *(*аргал): Dried animal dung – used for fueling stoves in the countryside

Baganuur (Багануур): A town located 130 km east from Ulaanbaatar. Also refers to the type of brown coal mined in this town.

Dolaahan Amdral (Долаахан амьдрал): "Warm life" – pseudonym for a stove-replacement program implemented in Ulaanbaatar

Duureg (дүүрэг)*:* District

Dzud (зуд): Winter disaster which often results in drastic loss in livestock

Ger (гэр): Mongolian felt dwelling

Ger horoolol (гэр хороолол): *Ger* district – neighborhood areas surrounding Ulaanbaatar, disconnected from the city's heating and water infrastructures

Khaashaa (хаашаа): Fence or personal property

Khor (хор): Poison, harm

Khoroo (хороо): Municipal bureau

Khortoi (хортой): Poisonous, harmful

Nalaikh (Налайх): A town located 40kim southeast of Ulaanbaatar. Also refer to the type of brown coal mined in this town.

Negdel **(**Нэгдэл): Union or association – refers to the collectivized pastoral economy system during Soviet period in Mongolia.

Nüürs (нүүрс): Coal

Soum (сум): Village

Toos (тоос): Oil – refers to oily properties

Tortog (тортог): Stain or deposit

Tugrug (төгрөг): Mongolian currency

Utaa *(*утаа)*:* Smoke, pollution – informal

Zuuh (зуух): Household stoves

CHAPTER 1

INTRODUCTION: TRACING THE ATMOSPHERE

Figure 1: Thick smog coats the city like a dome. Smokestack emissions peer *above* the pollution line. Photo by author.

In Ulaanbaatar, Mongolia's capital city, air pollution is a seasonal and predictable part of life. From early October to late March, a dense smog scatters across the urban landscape, engulfing the city's residents in a misty dome. As shown in Figure 1, the smoke peers *above* the pollution line. This is because the pollution does not come from industrial smokestacks, but from household chimneys. In order to endure prolonged winters when temperatures can plummet to negative 40 degrees, over 800,000 residents burn raw coal in their household stoves to heat their

bodies and their homes. These city dwellers, locally referred to as *ger* district residents, live in neighborhoods that are disconnected from the pipelines attached to Soviet-era central heating plants.

"You see all those dark spots?" Nasaa pointed along the wall of her home. "Those stains weren't there ten years ago." Nasaa and her husband moved to the *ger* districts in 2001 from a rural area in Dornod province, the western-most province of Mongolia, to have access to better university education for their children. They brought their *ger* (Mongolian yurt dwelling) with them and settled in a neighborhood northwest of the city center. As long-term residents, Nasaa and her husband came to realize that there is no escape from the toxic smog – not even inside their home.

"*Khortoi utaa* (poisonous smoke) has been finding its way into our home for many years now," Nasaa explained. "[The] smoke tricks you. It sneaks in and soot settles here and there. It lives with us." Nasaa remarked that pollution stuck to things – to her floors, the walls, and ceiling. She showed me the canvas cover of her *ger*, smothered in dark gray. She explained to me that the cover was pure white when they first moved into the city. "Why does it stain like that?" I asked. "Could it be dirt?" I asked for clarification. "No, it's *not* dirt. None of this is dirt. Our *ger* is clean. We clean the floor with a wet broom and we wipe down the walls. It's the *utaanii tortog* (smog stains). We can't do anything about it. It's out of our control." She sighed, slightly annoyed with me for not fully grasping her articulations.

The entrance door swung open as Nasaa's daughter stepped outside to use the latrine. A bitter gust of wind blew straight inside the home and a musty odor of coal followed. Nasaa bent over toward the stove and picked up a piece of coal from the metal bin. She broke off a piece and rubbed it in her gloved hands. The brittle shale crumbled into pieces.

"See all this *toos* (oil)? It's infused into the coal that we burn," she handed me a piece and paused while I inspected the coal with my hands. The coal left a dark grey residue on my fingertips. Nasaa was one of the many residents that I spoke with who was aware that burning coal was vital, but hazardous.

Muugi, a woman who lived a few houses down from Nasaa, claimed that she had to regularly hand wash the curtains. She complained that no matter how aggressively she scrubbed and regardless of using all types of detergent, even the expensive kind, the stains didn't wash out. She suspected that the stains had built up over the past few years because of the growing cracks along the window and the draft from the door. She kept a towel pushed underneath on the ground to seal the cracks under the doorframe. Toxic vapors invaded the intimate spaces of her home.

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Air pollution was a product of slow accretion. The stains inside Nasaa and Muugi's homes were visible markers of how pollution accumulated. With every swing of the door and hole in-between the walls and windows, air seeped through. Some stains manifested in the walls, some manifested onto curtains or mattresses. The accumulation of soot and stains were reminders that they lived in toxic neighborhoods and inside drafty, poorly insulated homes – infrastructures that they could only partially control.

Ulaanbaatar citizens had been actively making sense of toxic air and its effects on their bodies, homes, and the urban landscape for over a decade. What began as "toxic confusion" (Auyero and Swistun 2009: 11) slowly evolved into seasonal pattern making, as smog seeped into the air with winter's cold temperatures and dissipated during warm, summer months. The

violent effects of pollution on the human body were nuanced. What started as sensory nuisance slowly evolved into a public health disaster.

Residents detected air pollution as early as the late 1990s. They described a dense, grey "smoke" (утаа) that hung in the sky, and pungent odors that lingered outdoors and on their clothes and hair. These visual and olfactory manifestations of air pollution were a nuisance, but not seen as a threat. Residents started to sense subtle changes in their bodies, tracing seasonal patterns in their symptoms such as coughs, headaches, sniffles, itchy and watery eyes, and swollen throats. In late fall, children would contract colds that wouldn't leave their bodies until spring. These subtle reactions varied, as there was no universal standardized body in air pollution exposure. All bodies absorbed, digested, and reacted to pollution differently, and how pollution manifested inside bodies over time also varied. Despite these variations in bodily reaction, pollution bound these bodies together in a shared temporal state of bodily harm. Air pollution was a predictable part of everyday life, and urban dwellers were continually making sense of air pollution's toxic effects, year after year. These symptoms quickly became a predictable part of everyday life – urgency laid dormant.

Over the course of several years, smog worsened in certain areas of the city. Apartment residents started noticing an increase in the number of chimneys in the *ger* districts, peri-urban neighborhoods cut off from basic infrastructure. In 2011, a World Bank Study confirmed their visual tracings, claiming that the main source of Ulaanbaatar's air pollution was coal-burning stove emissions among 170,000 households in the *ger* districts[1]. This study was followed by other public health reports that concluded that smog was caused by domestic heating among the

[1] The *ger* districts are urban communities along the peripheries of Ulaanbaatar's city center. *Ger* communities are disconnected from the Soviet-era central heating grid, and most families burn raw coal, wood, and garbage for heating and cooking purposes.

capital's urban poor (Allen 2013; Enhmaa and Toru 2013; Guttikunda et al 2013; Warburton et al 2013).

By 2012, Ulaanbaatar was ranked among the most air-polluted cities in the world (WHO 2012). International rankings and the conclusions of the World Bank study led to the formation of a more robust air quality monitoring network and formed an air pollution governance structure, which included the establishment of the National Committee for Air Pollution Reduction, the Ulaanbaatar City Air Quality Agency, and the Clean Air Fund. Both the Ulaanbaatar municipality and state government began partnering with World Bank, ADB, JICA, GIZ, and other international donor organizations to set up projects to monitor and manage air pollution concentrations in the city. A multi-phase Clean Air Project that focused primarily on replacing traditional stoves with fuel-efficient alternatives, urban development plan to replace *gers* with apartments, and public transparency with air quality data were underway.

Despite government efforts, Ulaanbaatar's air was not getting any cleaner. In fact, during winter 2016, air pollution concentrations were among the highest in the city's history. The Air Quality Index (AQI) regularly read over 1500, which is considered "beyond index"[2]. By 2017, the Mongolian government had spent more than 80 million USD on air pollution reduction efforts, but most residents did not feel there were any improvements in the air quality. "The government has been poisoning us," urban residents explained. Among *ger* district residents in particular, lack of improvement of air quality indicated politicians' apathy toward the urban poor. State officials held an extensive record of corruption cases, and air pollution was no exception. Most residents I spoke with saw air pollution as a profitable venture for politicians. In

[2] I discuss the Air Quality Index (AQI) in detail in Chapter 3 of this dissertation.

2012, a corruption scandal with the Clean Air Fund[3] exposed politicians for embezzling millions of MNT[4] from Mongolian taxpayers. Furthermore, the subsidy project of the Baganuur coal mine allowed for low-quality coal to be circulated in *ger* district communities, which led to worsened air quality, despite an improved stove intervention that took place from 2011-2016. A series of corruption scandals, mismanagement of funds, and lack of improvement in air quality fueled urban citizens' distrust toward the Mongolian government.

In Ulaanbaatar, the term air pollution (*agaarin boxirdol*) was a term developed for scientific and legal purposes. The direct translation of the word is, "the air's pollution" and people who were in government, research institutions, and journalism discussed pollution employing this term to explain the environmental phenomenon in more scientific terms. However, most urban residents that I engaged with referred to pollution as *utaa* (smoke) or *xortoi utaa* (poisonous smoke). Living and working with *ger* district residents in particular exposed me to the various interpretation of *utaa* in everyday contexts: *utaa* could mean could mean various kinds of smoke, from car emissions, stove emissions, cigarette smoke, to fire smoke. Similarly, residents used the term "*hor*", a term with multiple overlapping meanings: "harm", "poison", "toxin", and "fatal". Air pollution was considered to be harmful or poisonous, referred often as "poisonous smoke". Similarly, residents would describe their own bodies as poisoned from the smog. According to urban dwellers, not everyone in Ulaanbaatar was exposed or harmed in the same way to the same kinds of air pollution. This dissertation is an ethnographic study of these uneven spaces and exposures of air pollution-induced harm.

[3] Clean Air Fund was established as a "Special Government Fund" that collected air pollution tax from Ulaanbaatar residents. These funds were allocated to supplement air pollution mitigation projects managed by the Mongolian government and its multinational partners.

[4] Mongolian Tugrug (MNT) is the local Mongolian currency. At the time of this research, the exchange rate was approximately 1800 MNT – 1 USD.

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This dissertation attends to the following research questions: What counts as evidence of harm for those living in the midst of an air pollution crisis? How is evidence produced and negotiated and for what purposes? Who gets to make these claims and under what kinds of rationales? This dissertation is organized around different techniques of evidence-making – maps that spatialize harm, marketing strategies that commoditize harm, bodily attunements that detect harm, and body facts used for public health activism. I adopt Marilyn Strathern's (2008) definition of evidence, "[evidence] is a construct pointing to practices… that imply the ability to reduce, digest and otherwise summarize information in such a way [that] other information can be judged, proved or verified" (Strathern 2008:22). As Adams and Biehl (2016) contend, evidence-making is not only in the domain of global experts, but knowledge can come in many forms. Thus, rather than focusing on a singular type of harm or knowledge-making process, I employ a multi-actor methodology that allows an ethnographic study of how a wide-range of actors from medical doctors, government officials, urban planners, pregnant women, to coal workers engage in the knowledge-making process.

In examining different techniques of evidence-making, I am not interested in making claims about their effectiveness in policy or program interventions. Rather, I am interested in examining the processes through which particular definitions of harm are formed, negotiated, and implemented. In particular, I examine important moments of conflict, negotiation, and consensus that arise out of these interactions. Focusing on the techniques of evidence-making allows for an analysis away from binary distinctions such as polluted/non-polluted, healthy/unhealthy, and risky/non-risky. This allows for the possibility of multiple forms of harm that interact within the context of air pollution exposure. This analysis calls for a broader definition of harm that

encompasses the urban environment and politics of place. For example, rather than focusing on metrics as a sole method for understanding harm, I show how different kinds of knowledges come together – metrics, ecological, sensory, bodily, market, imaginary practices– to create what it means to have to live with harm.

CONTRIBUTIONS TO RESEARCH

This dissertation contributes to three bodies of scholarship: risk and expertise, bodily knowledge in environmental health, and responsibilization and public health.

Risk and Expertise

Since Ulrich Beck (1992) coined the term, "risk society" there has been a proliferation of social science scholarship that examines the distribution and management of risks (Barry 2001; Dean 1999; Lash 1993; Wynne 1992, 1996). Beginning with "risk society" scholars, Beck (1992) argues that postindustrial modernity marks a new era that is characterized by the emergence of "manufactured risks" or dangerous outcomes of modern industry and advancements in science and technology, such as nuclear fallout, GM foods, and chemical warfare (Beck 1992: 98). Because risks such as chemicals in the water supply and radioactive particles are no longer traceable or observable by the human eye, Beck argues that knowledge about risk is increasingly *dependent* on experts who can calculate risks using assessment tools (Beck 1992: 22-23). My research among doctors and patients in Ulaanbaatar reveal a different pattern, wherein patients were becoming less dependent on their doctors. As I describe in Chapter 5, many patients, who were suffering from reoccurring illnesses during air pollution season were losing trust in their doctors' abilities to provide a clear diagnosis of harm and proper treatment. Doctors, who were unable to pinpoint exactly how air pollution was damaging the human body, began to alter their

medical practice to encompass non-biomedical forms of treatment. Uncertainties around air pollution-induced harms have increasingly undermined medical expertise in contemporary Mongolian society.

Other scholars have discussed how "calculability" plays a central role in the production of risk rationalities (Castel 1991; Dean 1999; Ewald 1999). In his analysis of psychiatry, Castel (1991) examines how new strategies dissolve the notion of the individual and replaces it with a combination of "risk factors" that could be calculated statistically to produce probabilities at the scale of population. For instance, he explains how health administrators began collecting patient records containing demographic information such as age and gender to create "risk profiles" of their patients. These calculative efforts facilitated the shift toward illness *prevention*, to anticipate all possible forms of danger, in place of traditional practices that corrected individual behavior (Castel 1991: 288). As a result of this preventative strategy, risk became more precise and narrow. If a patient's records indicated a certain number of risk factors, for instance, the person was deemed more "at risk" of developing a mental illness.

Dean (1999) takes on a similar approach to risk as Castel, but applies it to disease management. He shows how epidemiological risk is calculated through correlating a number of abstract factors to health outcomes of a targeted population. This approach involves the use of statistics and screening to track illness and disease in specific populations and then linking them in their causes in an attempt to predict future health outcomes. By doing so, the aim is to reduce risks on the population level. Public health practices include efforts to identify high risk individuals and groups, inform them of their ''risk status'' and to offer interventions for ''managing'' their risks, based, varyingly, on one or more of these definitions of risk.

My research contributes to scholarship on the calculability of risk by revealing how these calculative practices apply to environmental contamination and health risk. Rather than screening to track a specific illness or disease, monitoring health amidst air pollution in Ulaanbaatar requires knowledge about air pollution levels. As I show in Chapter 3, health risk is correlated with varied levels of air pollution. Using an Air Quality Index (AQI), health risks are estimated based on the average concentration of toxic substances such as Sulfur Dioxide (SO2), Particulate Matter, and Nitrogen Dioxide (NO2). For example, an AQI of 300 is shown as a hazardous level for "sensitive populations, particular children and elderly". In such ways, the AQI uses generalizations about a population's "risk status" based on age and level of sensitivity to gauge potential health outcomes from air pollution exposure. As I will show, however, these risk status generalizations were shaped substantially by political concerns and by ideas about robust Mongolian bodies.

Further, social science scholars have shown how what counts as expert knowledge is highly contested (Wynne 1992; Petryna 2002). For instance, Brian Wynne (1992) aims to denounce the distinctive boundary between "experts" and "lay public". Wynne (1992) shows how Cumbrian sheep farmers actively resisted expert claims that radiation contamination did not reach their pasture lands after the Chernobyl nuclear fallout in Ukraine. These farmers were experts on local farming ecology and sheep behavior, understanding how sheep should be fared to minimize the impact of radioactive contamination. However, government-employed scientists ignored this local expertise, instead relying on outdated soil testing methods that ultimately provided inaccurate data about social contamination.

My analysis extends Wynne's (1992) case study by problematizing the expert vs. non-expert boundary. Despite area of expertise and access to technologies, "experts" in Mongolia –

medical doctors, air pollution scientists, and urban developers – still drew on their lived experience with air pollution to produce knowledge about harms. For example, in Chapter 3, I demonstrate how urban developers employed sensory and ecological knowledge about air pollution to pinpoint "safe" residential neighborhoods and develop real estate in these areas. Urban developers claimed that the Tuul river served as a shield that blocked out the pollution from entering the southern region of the city. Similarly, they argued that the color of the air was a "lighter gray" compared to the dark-colored smog that lingered in the city center. Thus, unlike Wynne's (1992) ethnographic case study, which distinguishes knowledge of experts from knowledge of sheep farmers, my analysis shows that this distinction is less obvious in Ulaanbaatar. My study demonstrates how experts actually drew on cultural, sensory, and ecological knowledges in order to create "expert" maps.

Adriana Petryna (2002) provides an important ethnographic example of how instrumentation influences the making of calculative, expert knowledge about risk in post-Soviet Ukraine. During the Soviet regime, Ukrainian health practitioners used X-rays to visually detect necrosed lung tissue caused by radiation after the 1986 Chernobyl nuclear accident (2002: 43-54). These experts relied on X-rays to make predictions about whether or not an individual patient was at risk of radiation. However, with the dismantling of the Soviet health care system, new diagnostic techniques and instruments emerged. In particular, biodosimetry was introduced as a new measurement technique to detect biological dosage of radiation. This technique was considered particularly novel because it could help predict the time course and severity of illness as well as assess the risk of various long-term consequences from radiation exposure. Much like the shifts from face-to-face interaction to more statistical norms echoed in Castel's (1991) case study of psychiatry, post-Soviet Ukraine's medical system adopted statistical methods for

measuring radiation in patients. As such, risk knowledge was no longer constructed based on X-rays of the body or symptoms of a patient. Rather, risks were made calculable. Another consequence of this shift in radiation-detection instrumentation was that Soviet-era experts were no longer experts in post-Soviet medicine. Soviet-era scientists did not have expertise in biodosimetry. Thus, they had to acquire new knowledge and expertise. Techniques to measure risk, in such ways, correlated with political regimes and larger medical infrastructure changes.

My analysis extends Petryna's case study by providing an example of how medical doctors navigated uncertainties related to measuring, diagnosing, and treating air pollution-induced risks. Unlike Ukrainian doctors, however, Mongolian doctors did not have access to new diagnostic tools to pinpoint an illness or disease. To the contrary, doctors continued to use Soviet-era medical technologies such as X-rays to detect infections and diagnose their patients. As I describe in Chapter 5, both doctors and patients began to question the accuracy of these diagnostic tools, catalyzing non-biomedical forms of treatment.

Lastly, cultural theories of risk shift attention away from the rational-technical probability and calculation of risk and toward a cultural framing of risk in terms of its social function. Cultural notions determine what is potentially dangerous and harmful and what is not, providing explanations that tell us why people behave as they do as well as why some actions are good or bad. Risks are embedded in shared culture and given specific meaning that is constantly being shaped and negotiated (Douglas 1985:80). In other words, knowledge about risk is produced through cultural symbols, not institutions. The cultural-symbolic approach to risk stems from Mary Douglas's seminal works on purity and contamination (1966) where she argues that pollution transgresses cultural boundaries and threatens social order. Douglas (1992) extends this analysis into a critical examination of risk, arguing that risk acts as a similar political tool to

construct and uphold physical and moral boundaries between Self and Other (Douglas 1992; Douglas and Wildavsky 1982).

Douglas (1992) shows how individual responsibility manifests and reinforces *already existing* divisions of blame. Thus, for example, the cultural approach ascribes danger and misfortune to individuals or groups that are already marginalized in society, rendering them "human derelicts" (Douglas 1992: 41). Douglas and Wildavsky (1982) develop a functional structuralist analysis of risk utilizing the "grid-group" model in order to illustrate how risk creates categories that correspond to individual's commitment to particular social structures. A high-group, high-grid way of life conforms closely to collective control or group norms and responses to risk, in which people place their trust in institutions. By contrast, a low-group, low-grid approach exhibits a highly individualistic, self-regulatory approach to confronting risk. Douglas and Wildavsky's approach does not emphasize individuals' cognitive or psychological perceptions of risk but rather focuses on the *sociocultural contexts* in which individuals are situated and how these contexts influence their approach to confronting risks. Regardless of the emergence of new kinds of risks, culturally embedded assumptions and moral boundaries are still central to people's understandings about risk.

This dissertation provides a pertinent example of how air pollution-related risks are culturally embedded and reinforced preexisting divisions of blame. I show how contemporary air pollution-related blaming practices in Ulaanbaatar were rooted in inequalities that persisted long before the air pollution problem. As I describe in Chapter 2, *ger* district residents and rural households were considered backwards and uncivilized compared to modern city dwellers. The hygiene campaign enforced by Soviet authorities while Mongolia was a Soviet satellite state institutionalized these claims, dividing society into "hygienic" and "unhygienic" Soviet citizens.

My ethnography of mapping practices in Chapter 3 also contributes to this discourse, as urban developers construct new high-rise apartments far away from *ger* district areas, and middle-class families avoid *ger* area neighborhoods at all costs. Furthermore, in Chapter 4, I show how *ger* district residents become the focus of air pollution mitigation efforts, while apartment-dwellers are absolved from blame. Only "off the grid" households that burn raw coal inside their homes are at fault, despite the fact that apartment-dwellers rely on coal-burning for their centrally-heated furnaces.

Taken together, my ethnography contributes to literature on the social science of risk by extending works on risk society, risk and calculative practices, and cultural theories of risk. In what follows, I show how my analysis extends scholarship on bodily knowledge in environmental health. I highlight scholarly works in medical and environmental history and anthropology.

Bodily Knowledge in Environmental Health

Ever since Nancy Scheper-Hughes and Margaret Lock's (1987) groundbreaking "prolegomenon", medical anthropologists have examined how the body is at once a tripartite construction – an individual body, social body, and political body (Scheper-Hughes 1992, Martin 1994, Lock 1993; Lupton 1995; Haraway 1991). This catalyzed a breadth of scholarship on the body, encompassing reproductive technologies (Strathern 1992); infectious disease (Koch: 2001); and genomics (Franklin 2007; Rabinow 2002). For example, Margaret Lock's (2001) concept, "local biologies" demonstrates that there is not "universal standardized body" in physical symptoms of disease. In her study among women in Japan and the United States, she found that women had varied responses and experiences with menopause and hormone replacement therapy. Thus, she argues that the body was informed by both the social and biological (2001: 69). My study highlights the ways in which urban residents experienced

various symptoms from air pollution exposure, from eye irritation, sore throat, wheezing, to headaches. I extend Lock's analysis by incorporating how these varied symptoms were a product of human-environment interactions. Residents that I describe in Chapter 3 and Chapter 5 traced their seasonal symptoms and serious health effects by attuning to their bodies and changes in the climate, air pollution levels, and urban environment. These attunements served as important knowledge-making moments for urban residents in Ulaanbaatar.

Scholars of environmental and medical history have focused extensively on how lived experience shapes evidence-making in environmental health. As Michelle Murphy (2013) explains, "Acts of breathing, drinking, and smelling can become knowledge-making moments in chemical infrastructure". In particular, historians have shown the various ways in which communities employed bodily ways of knowing to contest scientific claims. For instance, in her case study of an E. coli outbreak in Walkerton, Ontario, Joy Parr (2010:171) demonstrates how residents used bodily experience with local water – pain in the gut and off-putting smell of chlorine – to contest scientific readings that deemed water quality "safe". Michelle Murphy (2006:83) explains how middle-class women attempted to leverage their symptoms to multiple chemical sensitivity in order to contest scientific instruments that failed to detect chemical presence. Further, edited volumes such as Mitman, Murphy and Sellers (2004) "Landscapes of Exposure" demonstrate the wide range of historical accounts on how landscapes are products of human-environment interactions.

Medical and environmental anthropologists have broadened this field, showing how bodily ways of knowing coalesce with scientific instruments and strategies that detect harm. For example, in his ethnographic study of domestic chemical exposures, Nicholas Shapiro (2015:369) describes how some FEMA trailer residents used their "chemically aware body" to

track subtle changes in their bodies in conjunction with formaldehyde detection instruments. He argues that material detection cannot be separated from bodily knowledge about the environment. Other anthropologists have shown how odors become primary indicators of environmental contamination (Auyero and Swistun 2009; Brant 2008; Fletcher 2005; Jackson 2011; Reno 2011). Coining the concept "olfactory epistemology," Joshua Reno (2011) demonstrates how residents and county inspectors relied on their olfactory senses and odor intensity measuring instruments to detect and document a landfill's harmful presence. My research extends these anthropological accounts by showing how sensory and bodily attunements play a crucial role in detecting, diagnosing, and treating air pollution-induced harms. As I show in Chapter 2, harms associated with air pollution are not limited to disease-related manifestations. *Ger* district residents who rely on coal-burning inside their homes suffer from social harms caused by air pollution odors. Families that are unable to wash out these odors frequently become subject to discrimination, as these odors become social markers of poverty. Thus, my ethnography combines both Shapiro (2015) and Reno's (2011) study by revealing how olfactory senses lead to a more socially-aware body. Ulaanbaatar residents employed their "body meters" (Shapiro 2015), not only to detect harm inside the body, but also social harms that required them to be attuned to pollution odors that attached onto their clothes, skin, and hair. Similarly, "olfactory epistemology" (Reno 2011) is not limited to sensing landscapes, but also sensing and differentiating bodies.

Other scholars examine how bodily knowledge is connected specifically to chemical infrastructures (Murphy 2013; Nading 2016). Michelle Murphy explains:

> [Chemical infrastructure] are distributed and translocal, connecting moments of production and consumption, moving across national borders, traversing scales of life. They are temporally uneven, as some chemicals break down quickly and others refuse to decompose, and thus are present for long durations. Some chemicals cause immediate

> responses in organisms, others provoke effects that take generations to see, as they slowly injure organisms, ecologies, or even planetary atmospheres (Murphy 2013: 1).

Alex Nading (2016) extends Murphy's concept by attending to the lives of chemicals. Following abate and other chlorine-based substances, Nading examines how these chemicals shape and are shaped by global health practices. In what he calls "sensory leakage", Nading argues that Nicaraguan health inspectors, community health workers, and urban dwellers engage in sensory practices – such as paying attention to the color scale for pH levels in chlorine, minimizing the submersion of skin in abate, and washing vegetables with a little bit of chlorine to prevent ingesting parasite eggs.

My analysis extends Nading's ethnographic approach by focusing on different knowledge-making moments and how different material properties of air pollution (and air pollution-causing agents) play an important role in knowledge-making. As I demonstrate in Chapter 4, *ger* district residents understand the variation in coal quality and smoke. For example, coal that is left outside in the snow absorbs more moisture, which leads to more multiple lighting attempts, more smoke, and the release of more toxins when burned. Similarly, residents detect different colors of smoke (light gray, black) to pinpoint "polluting" neighbors. Nading shows how chlorine-based chemicals span a wide spectrum from beneficial to hazardous to human health. Similarly, *ger* district residents understand that burning coal causes air pollution, but also recognize that it is a vital source of heat during long winters. Taken together, a "place-based" approach to knowledge-making necessitates a study of how ideas about the environment reinforce physical degradation, poor health, and social harms.

Responsibilization in Public Health

In public health, neoliberal health regimes have shifted the responsibility of risk protection away from state agencies and into the hands of individuals and communities (Dean 1991, Petersen and Lupton 1992). This responsibility expects citizens to become informed and responsible consumers, members of communities, actors of social movements, and agents capable of controlling their own risks (Dean 1999:167-168).

Medical anthropologists have long examined the unintended consequences of national and international protocols that employ responsibilization in public health (Biehl 2005; Chapman 2003, 2004; Janes 2004; Maternowka 2006). For instance, in her study of tuberculosis (TB) control in post-Soviet Georgian prisons, Erin Koch (2006) examines how the Directly Observed Treatment, Short-Course (DOTS) program operated as a protocol under the premise that every "rational" individual will "make the right choice." In particular, this protocol required the collection of sputum for TB testing. Koch shows how incarcerated men developed an informal system that allowed them to pass off infected sputum of others as their own, in an attempt to appear TB positive and secure proper healthcare. For these individuals, sputum samples held economic value and the system was a survival strategy. However, for medical program administrators, this exchange of sputum was referred to as "cheating" the system. "Cheating" was considered an immoral behavior that threatened the management of rational TB control (Koch 2006: 57). Koch argues that efforts to control TB were entangled with making individuals more responsible, rather than focusing on improving infrastructure and politico-economic conditions that contribute to the spread of disease.

My research extends Koch's (2006) study by highlighting the ways in which post-Soviet Mongolian citizens are governing themselves in new ways in response to air pollution: they are

altering their household management practices, becoming more attuned to their sensory and bodily responses to air pollution, or altering their family planning strategies to cohere with less polluted months. In most cases, citizens do not adhere to health interventions as "responsible" citizens. As I show in Chapter 4, many *ger* district residents did not passively purchase and use the fuel-efficient stove technology. For example, some families resold their newly-bought stoves to countryside households or the black market at full-price. This allowed them to make a short-term profit so that they could use the money to cover other daily expenses. Other families purchased the new stove, but did not layer the coal, wood, and paper "properly" as dictated by the behavior change campaign. Many families actively resisted these changes, as they believed that their stove conduct was the most effective way to burn coal. In such ways, urban residents actively resisted interventions that aimed to alter their household practices.

In his study of AIDS patients in Brazil, Joao Biehl (2000) argues that despite the increase in new antiretroviral drug therapies that were saving lives, the politics around "care of self" created new social inequalities. In what Biehl describes as "zones of abandonment", many AIDS sufferers were left to die. These sufferers were understood to be responsible for their deaths because they were incapable of "living up to the new requirement of market competitiveness and profitability" (Biehl 2000: 139). In his ethnography of AIDS sufferers in Côte d'Ivoire, Vinh Kim Nguyen (2010) argues that only those who were able to employ "confessional technologies" by providing testimonials of suffering were able to access long-term anti-retroviral drug treatment. This required sufferers to engage as "therapeutic citizens" that could confess their disease status and tell their stories in order to gain access to antiretroviral therapies. My research extends both Biehl (2000) and Nguyen's (2010) study by highlighting the stark inequalities that have been propelled by public health efforts. As I describe in Chapter 6, international

organizations and middle-class social justice movements have unintentionally excluded *ger* district residents from efforts to reduce air pollution-induced harms. *Ger* district children's ailing bodies were appropriated to represent suffering and justify program objectives. However, solutions to alleviate the air pollution problem oftentimes failed to improve the daily lives of these children. In such ways, I contribute to scholarship on responsibilization and public health by revealing the unevenness of responsibility and the ramifications particular actions have on the most marginalized communities.

RESEARCH METHODS

This dissertation is based on 18 months of fieldwork I conducted between December 2014 and June 2016 in Ulaanbaatar. My research methods aimed to capture the diversity of actors involved in the air pollution discourse. I selected the following actors as research participants in my project.

Air Pollution Policy Makers and Programmers

During this segment of my research, I sought to understand the national and international strategies of air pollution management. I used interviews, participant-observation, and data analysis with air pollution policy makers and project management staff in Ulaanbaatar. At the national level, I worked with the National Agency for Meteorology and Environmental Monitoring, National Committee for Reduction of Air Pollution, Ministry of Health, and Ministry of Environment. At the municipal level, I worked with Ulaanbaatar City Air Quality Agency and the Ulaanbaatar Municipal Office. I also met with several representatives at international organizations including UN-HABITAT, UNICEF, GIZ, JICA, and ADB. I also interviewed members of nongovernmental organizations (NGO) including the Mongolian Red Cross, *Ger* District Mapping Project, and Zorig Foundation. These interviews provided me with the context

of previous and on-going air pollution mitigation efforts in Ulaanbaatar. In order to understand air quality monitoring technologies and scientific studies, I interviewed air pollution scientists at local universities and research institutions. I also collected policy documents, project documents, and news articles that provided me with valuable information on ongoing interventions and policies on air pollution management in Ulaanbaatar.

I participated in weekly meetings at the Ulaanbaatar City Air Quality Agency, the municipal branch air quality monitoring branch. I agreed to facilitate these meetings because my colleagues found them to be a useful time period to practice their English speaking and presentation skills. The staff at this organization were primary technicians and program staff that were in charge of testing and monitoring. During these meetings, we each began with a short update on current work, followed by an open discussion on pending or emerging issues, and ended with one person practicing a presentation in preparation for upcoming workshops. I was joined by six colleagues, including the chief air quality technician in-charge of monitoring and maintenance of the agency's four air quality monitoring stations. Primarily, I participated as an observer, but also engaged in these conversations and raised questions. Oftentimes, I raised questions in of clarification, while once in a while, I would interject with critique. My colleagues were very receptive to my feedback, and this relationship provided me with an opportunity to reciprocate with a community that supported my own research over the course of 18 months. Methodologically, these meetings served as an important tool for understanding the context of ongoing work as well as important internal dynamics among staff members without disrupting the flow of work schedules.

I also accompanied the air quality technician team at the Ulaanbaatar City Air Quality Agency on several air quality monitoring trips to various parts of the city. During these visits, I

observed technology maintenance and data extraction methods. I also accompanied the team on the air quality monitoring bus to collect mobile, real-time data on air quality. I supplemented these observations with visits to the alternative fuel-testing laboratory. Coal briquettes and other synthetic materials were being tested as potential replacements for raw coal at the time of this research. I took observational notes as well as participated in the process of testing each fuel type.

I also followed a stove development company, Royal Ocean, LLC, that developed the "Dul" model stove that was marketed as a fuel-efficient stove in the "Dolaahan Amdral" or "Warm Life" campaign. I met with the company director and staff to learn about how their work coincided with the Ulaanbaatar Clean Air Project. I augmented in-person interviews with visits with the Royal Ocean staff to various *ger* district communities where the stove and stove parts were being sold. I learned how the company was aligning their inventory and marketing practices to align with the government and international organization's objectives to reduce air pollution in *ger* district areas.

Ger District Residents

This segment of my research took place in a *ger* district community located in Songinokhairkhan district, northwest of the city center. I selected a neighborhood (which I will refer to as *khoroo* A[5]) in Songinokhairkhan district primarily due to its reputation as the most air-polluted district in Ulaanbaatar.[6]

It is important to note that I did not receive support from my colleagues for my interest in living in the *ger* districts. For many months leading up to my homestay period, middle-class Mongolian families, Mongolian government officials, and American and European expatriates

[5] *Khoroo*, or sub-districts in Ulaanbaatar are named by number. In using alphabetical letters such as A, B, and C will allow me to protect the identity of the neighborhood as well as my research participants

[6] According to many air pollution management project reports, PowerPoint presentations, and city news articles consistently referred to Songinokhairkhan as the most "dangerously polluted district" and "most air polluted part of the city"

discouraged me from living in the *ger* district areas as it could threaten my emotional and physical well-being – including theft, rabid dogs, alcoholic household members, rape, extreme cold, and air pollution – in an attempt to deter me from conducting my research in a *ger* district community. These potential setbacks ended up becoming valuable data for my research on class-based stereotypes that hinge upon *ger* district residents and the air pollution discourse.

I lived with a family in *khoroo* A[7] for over four months (October 2015- January 2016) and conducted participant-observation on daily household activities. I selected this time period for my homestay for a few reasons. First, this time period was understood as the most heavily air-polluted months. Most people that I surveyed in the *ger* districts in Songinokhairkhan and Gandan area leading up to the homestay identified these months as the most difficult time of the year due to high levels of air pollution and extremely cold outdoor temperatures. Secondly, this season was an important transition period for collecting fuel among families. During October, coal prices began to rise due to demand, activities in coal processing sites started to increase, and families began to store coal on their *haashaa* plots. Thirdly, it was important to understand how households dealt with air pollution in conjunction with other winter-related challenges including extreme cold and frozen dirt roads, which inevitably shaped their daily engagement with air pollution.

[7] Finding a *ger* district family to host me involved a long process. I interviewed the governor of the *khoroo* during the first few months of my fieldwork. When I first expressed to her that I was interested in living with a *ger* district family, she did not grant me approval. She explained to me that she was not willing to take on the responsibility of a foreigner in case something were to happen to me during my homestay. I received a similar response the second time that I approached her. The third time, during June and July 2015, I visited her with a U.S.-based documentary film crew that was interested in interviewing *ger* district families about air pollution. I served as a volunteer cultural consultant on this film, and accompanied them to visit three families. At the end of filming, the governor agreed to allow me to do a homestay for up to four months in her *khoroo*. Later that week, she introduced me to a family, whose head of the household worked as a staff member in her office. I was able to visit the family in late September to introduce myself, explain my research objectives, and express my interest in living with them. The family consisted of six members: my host mother, who was 60 years old, my host sister who was 30 years old, her husband who was 31 years old, and their three children who were 3, 7, and 10 at the time of this research.

On a day-to-day basis, I engaged in household activities with the family including collecting water from the well stations, purchasing coal at the coal depot, burning coal in the stoves, and cooking meals. While engaging in these errands, I learned about the challenges they faced including financial stress and social stigma and isolation. Air pollution compounded these issues. For example, when my host sister and brother-in-law lost their jobs, they had to switch from using Nalaikh coal (a higher quality coal with less particulate emissions) to Baganuur coal (a lower quality coal that is sold for a cheaper price) to fuel their stove for heat. I also learned that the smog stains and odors from air pollution do not wash out of hair and clothes. My host family understood air pollution as having social effects that may not be experienced by apartment-dwellers. In such ways, engaging in daily activities broadened my ethnographic interpretation of "what counts as air pollution-induced harm" to include things other than just physical health.

During evenings, I did not conduct research outside in the community, but rather engaged in activities inside the home for safety reasons. My host family (as well as most other *ger* district families I visited) had the TV on at all-times a family member was home. Television-watching served as a particularly useful observational point. News channels would frequently discuss air pollution issues (ranging from health concerns, air quality levels, stove intervention commercials, to housing markets). This oftentimes prompted discussion among family members.

During the homestay period, I also accompanied family members to local clinics and hospitals. For four months, there were at least two family members that were sick at any given time. These visits allowed me to observe interaction between doctors and patients (which I continued to do after my homestay) and get a deeper understanding of how bodily harm was understood, diagnosed, and treated in both clinical and at-home settings. It was not uncommon

for me to be asked if I had "special medicines" from Japan or the U.S. At-home self-medication was common, as many drugs were accessible and affordable at local pharmacies without a doctor's prescription.

I also completed over 70 interviews with other *ger* district households throughout the *khoroo*. I went door-to-door in many cases, but other times, my host family introduced me to their friends and extended families. I also met various people through attending community events including election campaigns, office parties, and birthday gatherings. In addition to interviews, I distributed 200 surveys on local perceptions of air quality and the role of coal in the air pollution discourse. In many cases, these surveys served as entry points into discussion about air pollution. Households were used to filling out surveys and questionnaires from the government since the Soviet period. After a resident completed a survey, I would oftentimes follow up with follow up questions that prompted longer discussion. While I visited these homes for interviews and surveys, I took notes on the surroundings of the house and the interactions I had with other family members. Most of the people that I met with were middle-aged to younger women. This was the case for a few reasons: Women were the primary caretakers of children. Men, unless they were older, were generally not home during my day-time interviews.

Although my intensive immersion in the *ger* districts took place during the winter for four months, I continued to visit the same *khoroo* in Songinokhairkhan throughout the year. I regularly visited my host family, continued interviews and surveys, and stopped in to observe coal work. I took the bus to and from the fieldsite on a weekly basis. This was advantageous for several reasons. First, commuting to and from the fieldsite allowed me to experience a typical commute for *ger* district dwellers. Riding the bus, observing changes in air quality on the bus, and navigating the bus system was very much a part of *ger* district dwellers' lives. Secondly,

visiting on a weekly basis allowed me to observe how seasonal changes affected the infrastructural conditions of the *ger* district communities. During the winter, the dirt roads were frozen. During the summer, the snow thawed and produced thick, muddy paths in the neighborhood. Thirdly, visiting the *ger* districts during the spring and summer months allowed me to take note of any infrastructural issues that emerged in the non-polluted season. I learned that new challenges emerged, such as sanitation issues and water-borne diseases that were not the case during the winter season. For example, I found that organizations and community members alike did not like to discuss air pollution during this period. I learned that this is because most Mongolians like to "forget" about air pollution during the non-polluted months and enjoy the summer months.

Coal Workers

For a duration of three months, I conducted 12 hours per week of participant-observation among coal workers at a coal processing depot.[8] The coal processing depot was located 15 minutes-walk from my host family's home. During this time, I worked alongside ten coal workers, and participated in all aspects of raw coal processing and distribution including unloading, hammering, sorting, shoveling, packing, loading, selling, and delivering raw coal to *ger* district residents. This was the most physically arduous work I had ever been involved with. Despite subzero temperatures, the coal workers would work with only two layers of clothing and no gloves. While engaging in these various activities, I learned about how integral each process was to the final selling of coal to community members. I also learned about the structure of the informal coal economy and the "day in a life" of a coal worker in Ulaanbaatar. In order to

[8] I was able to establish connections with the coal workers at the site because my host sister and I would frequently buy coal from them. I explained to them that I was conducting research on coal quality as part of an air pollution project. They did not express hesitation toward me working with them. Quite the contrary, they were very interested in having me involved in their work.

augment my fieldnotes on my participant-observation, I conducted seven in-depth interviews and recorded four informal group discussions with the coal workers.

Eager to understand the process of circulation of coal, I also visited the informal mining concessions in Nalaikh (located approximately 40 km southeast of Ulaanbaatar) three times to observe work. I conducted three interviews with coal workers (one head of mining operations and two coal workers) in Nalaikh. I also interviewed municipal staff at the Nalaikh municipality to learn about the history and cultural context of the Nalaikh mine and its impact on the development of the capital city.

Health Specialists

From February – June 2016, I spent five months conducting interviews with doctors at the maternal health hospital, traditional medicine hospital, and local clinics in the *ger* districts. I interviewed 25 doctors at the following hospitals in Ulaanbaatar: First Maternity Hospital, the Child and Maternal Health Research Hospital, and district clinics in Songinokhairkan, Sukhbaatar, and Bayangol district. As I described above, my experience observing doctor-patient relationship began with my visits to the local clinics with my host family. I returned to these clinics and introduced myself as a researcher in these settings. This enabled me to make connections with other clinic staff.

In addition to healthcare providers, I worked extensively with public health specialists in Ulaanbaatar. I conducted 10 interviews with public health researchers. I was primarily interested in the type of air pollution research that was being conducted at university institution. Due to institutional ethical issues, I did not have permission to conduct participant-observation on on-going research projects at the public health department. However, I participated in weekly and monthly meetings, journal clubs, and social events at which time I gained information about

research projects. During the research process, however, I learned that the more valuable data was on personal air pollution mitigation and protection practices. I also learned about the contextual information about the history of public health in Mongolia, through the actors that were involved during the Soviet period.

METHOD OF ANALYSIS

Upon returning from the field, I uploaded all of my ethnographic data – observational field notes, policy document notes, meeting minutes, audio recordings of interviews, transcriptions of interviews, completed survey forms, excel spreadsheet of survey results, [9] press clippings, photographs, and video clips – onto AtlasTi qualitative research software. The qualitative analysis process consisted of several steps. First, I read through all of the collected ethnographic data to identify broad topical categories that may be useful in the framing of the dissertation. Secondly, I grouped all of my ethnographic material into folders based on social group category (ie: state officials, *ger* district residents, air quality scientists). This grouping method allowed me to evaluate how many interviews I conducted with each social group. Thirdly, I coded the material with key words with reoccurring themes in my research findings. For example, "Soviet-era public health", "Nalaikh coal", and "air quality metrics" were some of the codes that I used to categorize my research findings. In doing so, I was able to group my findings based on specific topics and contexts, which proved useful in conceptualizing my dissertation chapters. In most cases, one interview would comprise anywhere from 6-30 codes, depending on how many topics I covered during the interview. Fourthly, I began drafting

[9] I compiled 200 survey responses into Microsoft excel in order to evaluate my research findings. Although these survey results were useful for identifying major air pollution-related challenges, they did not provide the in-depth background that I was able to find out through immersion.

potential dissertation chapter topics that would allow me to draw on ethnographic material from various stakeholders. I found that organizing my chapters based on specific air pollution-based evidence making techniques enabled me to highlight the various kinds of interventions taking place to understand air pollution at the time of my research. I then carefully selected ethnographic material that I coded under each chapter category. When selecting this material, I was cognizant of the type of responses, comparisons, and overall arc of the argument I would make. Once I had categorized the data into chapters, I read through the ethnographic material to find patterns in interview responses, survey data, and fieldnotes. Using these patterns, I built a sequence of events that highlighted particular informants' stories. I proceeded to use this method for each chapter. During the process of writing, I was able to build a stronger framework around notions of harm.

DESCRIPTION OF CHAPTERS

Chapter 2, "Ethnographic Orientations" describes the cultural, economic, and political conditions under which *ger* district communities formed and became the epicenter of the air pollution crisis in Ulaanbaatar. I focus on how the post-Soviet transition affected three areas – land reform, coal economy, and public health – during the period between 1924-1990 when Mongolia was a Soviet satellite state known as the Mongolian People's Republic and the period after 1990 when Mongolia was declared an independent nation as Mongolia's Democratic People's Republic. In the first section, I describe the shift in Mongolia's regulation on land and pastoral economies, highlighting how these shifts increased rural to urban migration into the capital city. In the second section, I illustrate the significance of the coal economy in establishing Ulaanbaatar as a Soviet-satellite capital. I show how the dismantling of the Soviet state-supported mine and the emergence of a new market economy altered coal distribution and

household coal consumption practices in *ger* district communities. In the third section, I discuss how Soviet-era hygiene campaigns shaped contemporary class-based stereotypes toward *ger* district communities as a backwards and uncivilized population. I illustrate how contemporary air pollution mitigation interventions mirror Soviet-era campaigns that aimed to both discipline and marginalize specific households and hold their practices accountable.

Chapter 3, "Pollution Maps: Spatializing Harm" is an ethnographic study of how air pollution was mapped onto specific geographical locations. I focus on three types of maps – an air-quality-monitoring map, body map, and residential-zoning map – to show how air quality programmers, city dwellers, and urban planners constructed harmful spaces employing quantitative, sensory, cultural-political, and socio-ecological knowledge. I argue that these spatializing practices both reflected and reinforced pre-existing class-based hierarchies, placing blame for air pollution onto the most socially and spatially marginalized populations. The first section describes a digital air-quality monitoring map that employs administrative boundaries to demarcate different levels of air pollution-induced harm. Urban dwellers, however, map dangerous areas differently, drawing from their lived experience with air pollution. The second section examines the production of body maps. I show how city dwellers located harm along particular moments and routes of exposure as they employ sensory and spatial knowledge of the urban landscape. The third section focuses on residential-zoning maps. In this mapping practice, harm is spatialized onto larger polluted and non-polluted regions of the city, rendering some zones safe breathing spaces while other places are deemed hazardous. I conclude by suggesting that uneven spaces of harm are not solely created by air pollution itself, but are formed through place-based interactions among metrics, markets, bodies, ecologies, and classes. This chapter contributes to anthropological scholarship on urban stratification by highlighting how various types of

knowledge – metric, sensory, ecological, market, discriminatory – combine to create socio-spatial hierarchies.

Chapter 4, "Marketing Strategies: Mitigating Harm" provides an ethnographic case study of a market-based stove-replacement intervention. I argue that this intervention encouraged a unique form of conduct by tasking the urban poor to govern themselves in particular ways in relation to air pollution. In the first section, I situate the Ulaanbaatar Clean Air Project within anthropological literature on responsibilization and public health. In the second section, I describe what I call the *dolaahan amdral*, or "warm life" campaign, which promoted a neoliberal marketing strategy and financial mechanism that targeted individual households to become responsible consumers to reduce air pollution. These mechanisms were developed in collaboration with the state, multinational organizations, and microfinance institutions that promoted the sale of fuel-efficient stoves first and foremost as a consumer product. I show how the intervention's failure to reduce air pollution emissions backfired and de-legitimated the state. In the third section, I describe a shift in marketing strategy to a behavior change or "proper stove conduct" campaign, which rendered all *ger* district residents responsible for altering their household practices. This chapter contributes to anthropological scholarship on responsibilization and public health by asserting how strategies and subjectivities revolved around household conduct.

Chapter 5, "Bodily Attunement: Detecting Bodily Harm" focuses on how two techniques of evidence-making – bodily attunement and medical diagnosis – coalesce and conflict to create knowledge of respiratory and gestational harm. Examining knowledge-making and practice among city dwellers and biomedical doctors, I reveal how evidence of air pollution-induced harm is not fixed or uniform, but rather highly contested. In the first section, I discuss scholarship in medical anthropology and science and technology studies that focuses on

evidence-making of bodily harm. Despite the emergence of visual and metric-based technologies, I show how bodily knowledge plays an integral role in negotiating uncertainties about chemical exposure. The second section highlights the uncertainties surrounding diagnosing respiratory harm. While patients sought diagnostic testing as a means to secure biomedical diagnosis, doctors oftentimes provided short-term treatment and medical advice without identification of disease. The third section focuses on emerging concerns about gestational harm caused by air pollution exposure. Women traced patterns in their gestational cycles, asserting that pregnancy loss was most frequent during polluted months. Doctors, who lacked scientific expertise on the relationship between air pollution and gestational harm, were faced with the challenge of adapting their medical practices to provide sufficient patient care. This chapter contributes to medical anthropology literature by showing how uncertainties around air pollution increasingly undermined medical expertise in contemporary Ulaanbaatar.

Chapter 6, "Body Facts: Appropriating Harm" examines how and by whom bodily harm was mobilized to advance environmental health struggles. In the first section, I describe a trend in environmental health justice scholarship that examines how lay citizens employed their bodily harms to contest scientific claims and to make health inequalities visible in social justice movements. While this literature highlights citizen participation as an empowering endeavor, it overlooks the relationship between bodily burdens and their socio-political positioning. In the second section, I provide a case study of how a child's suffering body is mobilized as a "poster child" in an international public health campaign. I argue that appropriating bodily harms does not always advance social injustice struggles. In the third section, I trace how pneumonia was mobilized as a "poster disease" in an anti-air pollution movement among middle-class Mongolians. This chapter contributes to social justice literature by asserting how environmental

justice movements can marginalize and even victimize people who are unable to participate in those movements.

Chapter 7, “Conclusion” highlights the value of ethnographically examining different techniques of evidence-making. This dissertation contributes to social science scholarship on risk, bodily knowledge in environmental health, and responsibilization and public health. In doing so, I show how air pollution-induced harm should be examined in relation to histories of inequality, hierarchies of knowledge production, and politics of place. I conclude the chapter outlining significant contributions to policy and future interventions.

CHAPTER 2

ETHNOGRAPHIC ORIENTATIONS

"We need more coal," Amraa remarked.

She flipped the scrap metal bin upside down and dumped a load of coal ash onto the yard. I watched the black particles disperse in swirls across the icy ground. A forceful gust of wind pulled the ashes upward. They vanished into the thick, gray smog. Decembers were always the most brutal time of year. With subzero temperatures saturating the dense, toxic haze, every breath of air felt like swallowing a frozen lump of gases. Inhaling the coal fumes triggered an alarming sensation. My throat burned and my eyes watered instantly. Each half breath prompted a choking reflex and a series of coughs. Amraa and I buried our faces into our scarves and prepared for a long walk down to the coal depot. She closed the *khaashaa* (the fence surrounding the home property) behind us and we started strolling down the uneven slope with a metal cart. The wheels on the cart wobbled and squeaked as it slid across the frozen dirt ground. I felt my hands going numb in my pocket. The moment I pulled them out to adjust my scarf, my fingers started to ache and burn as if the air was scraping my skin.

"There's so much smoke in the air. Our city wasn't always like this," Amraa sighed.

From the top of the hill, the horizon looked as though someone had sliced the sky into halves. A pale blue layer floated on top of a heavy, gray bottom. I walked alongside Amraa, making small talk as we passed the long rows of scrap metal and wooden *khaashaas,* all connected to each other, yet clearly separating the plots of land. Dark smoke puffed out from inside the fence-line. The whole neighborhood was awake, getting their morning tea ready on the stovetop. As we made our way slowly down the hill, we had to be careful not to slip. The

monochromatic smog engulfed the whole neighborhood. The *gers* (traditional Mongolian dwelling) and *khaashaas* looked like they melted into the gray cloud, suspended in midair.

We reached the coal depot and headed toward the coal piles loaded onto the back of porter trucks. “We have fresh [new] Baagnuur today. We just got it in from the mine early this morning,” a middle-aged man mumbled with a cigarette in his mouth. He leaned his body against the truck and waved his arm, pointing to the yellow and white burlap sacks lined up across the ground. Amraa peeked into the bags and nodded. “I’ll take three bags,” Amraa pointed to her cart. The man spat his cigarette out onto the ground and started loading the bags onto the metal cart.

The walk back to the house was uphill. And the coal would last us two days. Buying coal was an everyday errand for many families living in the *ger* districts. Amraa, whose car had broken down a few weeks ago, had to buy coal regularly by foot. Others drove their cars to the coal depot, pulled up onto the side of the road, and loaded up their trunks with bags of coal. Coal delivery was also a common option for families who were open to storing a few tons of coal inside their *khaashaa* plot. Amraa was one of nearly 800,000 people whose lives depended on heat from raw coal. She was also one of the many urban dwellers who were blamed for polluting the city’s atmosphere.

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In Ulaanbaatar, air pollution is a product of long-term coal burning, eroding infrastructures, and rapid urbanization. Coal use in the *ger* district areas is estimated to emit 60-80% of the capital city’s air pollution (World Bank 2009). As more and more people come to settle on the hilltops and hillsides of the city’s peri-urban slums, air quality will become an increasingly hazardous problem. In order to survive cold winters, the average family burns

approximately 4.2 tons of raw coal and 4.7 cubic meters of wood every heating season that lasts from September to May each year. As I will show in this chapter, these urban conditions formed as a result of large economic and infrastructural changes that occurred during Mongolia's post-Soviet transition.

Historians and social scientists claim that the transition from socialism to a market economy was more difficult in Mongolia than anywhere else in the post-Soviet world (Buyandelgeriyn 2007, Humphrey 2004, Sneath 2002). As an isolated, land-locked country with a population of less than three million, Mongolia entered post-socialism with an economy much weaker than its former socialist counterparts (Rossabi 2005). During the second half of the 20th century, Mongolia's economy was heavily dependent on the Soviet Union. Mongolia's main resources— minerals (uranium and copper), meat, and other livestock products— were exported to the Soviet Union. And in return, Mongolia received gas, oil, machinery, equipment and consumer goods provided by Soviet aid. As a Soviet "satellite state", Mongolia followed the political, economic, and social order of the Soviet regime.

The year 1990 marked the end of seventy years of socialism in Mongolia and the beginning of neoliberal economic reforms, known among Mongolians as "the age of the market" (*zah zeelin uye*). Since the dismantling of the Soviet Union, various changes have taken place in Mongolia. The macro-economic reforms that ensued were referred to as "shock therapy", which aimed to quickly dissolve the socialist past (Rossabi 2005). One of the most noticeable changes was the immediate withdrawal of Soviet aid. To replace Soviet aid, foreign donors such as the World Bank and the IMF began providing substantial loans to the country. These macro-structural institutions not only altered the politics and economy of Mongolia but also affected the city's class divides.

Anthropologists who have studied Mongolia have examined the various uncertainties brought upon by the "age of the market." In particular, anthropologists have examined the "unmaking" (Humphrey 2002) of Soviet life by investigating the changes in social relations and economic activities since the collapse of the collective economy and the emergence and development of the neoliberal market. As Humphrey and Mandel (2003) contend, the effects of marketization and privatization cannot be examined solely at the macro-institutional level, but also understood at the household level (Humphrey and Mandel 2002: 22). In this chapter and throughout the dissertation, I illustrate how these shifts in Mongolia's economy and political order have had serious ramifications for families' livelihoods throughout the country.

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In this chapter, I explore how the post-Soviet transition affected three areas – land reform, coal economy, and public health – and how these shifts created the contemporary atmospheric and social conditions of Ulaanbaatar. I focus on the period between 1924-1990 when Mongolia was a Soviet satellite state known as the Mongolian People's Republic[10] and the period after 1990 when Mongolia was declared independent as Mongolia's Democratic People's Republic. The first section of this chapter provides a brief sketch of the shift in Mongolia's land regulation from a collectivist state to a market economy. I illustrate how shifts in the pastoral economy altered migration patterns to and from the capital city. The second section focuses on the significance of the coal economy in establishing Ulaanbaatar as a capital city. I show how the dismantling of Soviet state-supported mines and the new market economy has altered coal distribution and consumption practices in *ger* district communities. In the third section, I discuss

[10] In 1921, the independence of Mongolia from Chinese rule led the Bolshevik government to maintain influence over Mongolia. In 1922, the Mongolian government requested that Soviet troops remain in Outer Mongolia.

how public health – under the rubric of hygiene – shaped contemporary stereotypes toward *ger* district communities as a backwards and uncivilized population. I illustrate how air pollution mitigation interventions mirror Soviet-era campaigns that render marginalized households and their practices accountable. Taken together, this chapter describes the cultural, economic, and political conditions under which *ger* district communities formed and became the epicenter of the air pollution crisis in Ulaanbaatar. Thus, this chapter sets the background for understanding the subsequent chapters on air pollution management strategies in everyday life.

LAND OF FENCES: REGULATING LAND

Zoloo and I traveled to Songinokhairkhan district to oversee a meeting with *ger* district community members on infrastructure development. Zoloo was a program coordinator for UN-HABITAT's community-based decision-making program. She had ten years of experience working with various communities on issues ranging from public health outreach, neighborhood infrastructure, to local use. This particular meeting we were attending was focused on improving sanitation and garbage disposal practices.

On the way to the meeting, we drove past what Zoloo called a "model community" that served as the poster child of UN-HABITAT's program on community-based decision making. This neighborhood received generous funding to help make improvements in their neighborhood's infrastructure. Lined with shiny metal *khaashaas* and paved sidewalks, this neighborhood stood in stark contrast to its surrounding neighborhoods that were marked by uneven, wooden *khaashaas* and dirt roads. The playground was also very modern, equipped with new swing sets and a plastic jungle gym. "This is what the community decided on," Zoloo explained as she pointed out different improvements throughout the neighborhood.

Chisato: Has it been hard to work the community members on community-based decision making?
Zoloo: At first it was very difficult. There isn't a strong collaborative mentality in these neighborhoods.
Chisato: What do you mean?
Zoloo: Well, here [in the *ger* districts] there is a strong individualistic mentality. It's always about my *khaashaa*, my rules. They think, "once you enter my property, it's my rules". This kind of attitude.
Chisato: But that can be good in some ways, no? Households show ownership over their home and their plot of land?
Zoloo: Yes, this is true. But they can't think outside of their *khaashaa*. Like, "I wonder how I can help my neighbor?"
Chisato: How does this kind of mentality affect your work?
Zoloo: It makes it really hard to discuss things that require community thinking and collaboration... Like anything related to the environment. Households only care about maintaining their own *khaashaa* plots. Families use it for gardening, building a small business like selling tires or recycling, and so on.
Chisato: Can you give me an example?
Zoloo: Have you seen all the trash in the river? You see garbage everywhere here. People don't care about property outside of their own.
Chisato: Yeah, I have seen a lot of trash piling up. Especially in the winter. Have you seen some steady changes?
Zoloo: With some of our groups, yes. We try to do that. But you can't break down the fence overnight.
Chisato: Break down the fence?
Zoloo: It's hard to change the "*khaashaa* to *khaashaa*" mindset.

Figure 1: Geographical layout of a *ger* district community in Songinokhairkhan, Ulaanbaatar. Photo by author.

Ulaanbaatar's urban landscape is composed of several thousand *khaashaas* plotted throughout the *ger* district areas of the city. Each *khaashaa* marks a household's property. During my fieldwork, I also encountered *khaashaas* with two or more *gers* or one *ger* and one detached house to accommodate several family members on one property. Most families that moved into the *ger* districts identified as being Khalkh Mongol (or "pure" Mongolian), while those from the nearby town Nalaikh identified as Kazakh. Families built their *khaashaas* out of various kinds of material – some families nailed together pieces of scrap metal, while others linked together thick pieces of wood. The *khaashaa* demarcates personal property and the dwelling and activities that take place inside. Families that erected their *gers* in the *ger* districts did not move their dwelling outside of the city. However, among families who lived in Ulaanbaatar for several years, it was common to "upgrade" their home from a *ger* to a one-story

house. Additonally, it was common for university students who migrated from the countryside to rent out a *ger* and property for the duration of their studies.

In this section, I show how land regulation in rural regions of Mongolia during the Soviet period and the transition thereafter have gradually catalyzed an increase in *ger* district communities in Ulaanbaatar. Similarly, I will demonstrate how urban Mongolians' mentality has toward community building have shifted as a result of the land privatization and rapid rural-to-urban migration. I argue that the "*khaashaa* to *khaashaa* mindset" that Zoloo described is a product of a drastic shift from collectivist to privatized practices brought upon by the post-Soviet transition.

Soviet-era Land Regulation (1921-1989)

During the Soviet regime, almost every Mongolian herding household in the countryside was a member of a local collective called a *negdel*[11], in which livestock production was managed jointly with the state[12]. Households specialized in herding one specific type of herding animal (sheep, goat, camel, horse, or cattle). Sheep and goat were used for their wool, cashmere, meat, and milk products. Camels were used for transportation and wool. Horses were used for riding but also for horse hair and the production of fermented mare's milk called *airag*. Cattle were used for milk and meat products. The dung from all five animals was essential for making *argal*

[11] In 1991, 255 *negdels* were registered and controlled 115 million hectares, corresponding to 73% of the Mongolian territory. Average population of the *negdel* was 2,000 people (Bruun 1996: 66).

[12] During the pre-socialist feudal period in Mongolia, pastoral land was divided into administrative units called *myangad* (thousands) and governed by the feudal lord. As administrators, lords were not "owners" of the land in the sense that they claimed land as property, but were understood as masters (*ezen*). Herding households (*hot ail* or *ail*) were part of a patrilineal system that controlled access to pasture an
d animals. Buddhist monasteries, territories, and smaller land units were all controlled by land nobility. These noble lords managed the distribution of animal products and managed labor practices. They also controlled the seasonal migration of herders and animals to minimize risk of livestick loss due to drought or winter disasters (Humphrey and Sneath 1999). Some scholars argue that the Soviet *negdel* system is similar to the feudal system that aimed to operate and provide measures of security to individual households in harsh environment (Janes 2010: 238).

(dried animal dung), which was used to fuel the fire in heating and cooking with the Mongolian stove inside the *ger* (Bruun 1996:69).

Under the *negdel* system, the state managed the transportation of animal products to urban and foreign markets, and *negdel* households received wages and essential commodities in return. The *negdel* served as a comprehensive unit that attended to every aspect of a herding household's social and economic needs. For example, the system provided veterinary services to ensure healthy livestock, animal shelter during winter months, hay to feed livestock, as well as trucks for transporting live animals and animal products to and from the provincial towns. In addition to herding assistance, the system provided important benefits to herding households including free education, healthcare, and pensions (Bruun 2006: 66-67). During this time, the state also developed towns and provincial centers in the countryside into order to facilitate the movement of livestock products to and from provincial towns and the capital city (Humphrey and Sneath 1999).

According to Soviet political ideology, nomadism was understood as a primitive way of life. In order to "civilize" and "control" Mongolian nomadic herders, Soviet authorities enforced sedentary ways of life in the Mongolian countryside by building town centers with new structures such as schools, offices, and apartments. The development of towns altered the rural landscape of Mongolia as well as local practices around land demarcation. In the countryside, nomadic families built their *gers* and livestock shelters in open space without the need to demarcate their property. However, in the provincial and district towns that were more densely populated, families had to demarcate their property by building *khaashaas*. As I will show in the following section, the fall of the Soviet Union and the sudden privatization of herding practices

and land parcels led to an increase in these property demarcation practices both in rural towns and urban areas.

1990 Land Privatization

With the dismantling of the Soviet Union, state-supported collective farms were abolished and replaced by the privatization of land. As a result of privatization, Mongolian herders became domestic-level subsistence herders, lacking access to a cooperative institution that provided important institutional support to members of the household[13]. In other words, resources that were formerly under the control of both feudal and socialist institutions were suddenly available to anyone who used them (Janes 2010: 238). Without access to state-supported equipment, transportation, water, veterinary services and emergency land and shelter, herders were faced with risks associated with unpredictable weather, disease, and market conditions (2010: 238). Additionally, the new livestock system required more herding skills because herders (who specialized in one herding animal in the *negdel* system) needed to learn how to herd all five herding animals (horse, goat, sheep, cow, camel) in order to maximize their profits. In addition to livestock products such as wool, milk, and cheeses, selling live animals for slaughter also became essential for household cash income. Herders had become equipped with the knowledge of market value of their animal products in order to sustain regular household income. Decreased (and eventually complete withdrawal) of Soviet financial aid in the pastoral economy also led to the collapse of road infrastructure. The quality of roads, bridges, and telephone lines deteriorated. Road conditions that connected the *sum* (village) and *aimag*

[13] According to Janes (2010:240), it is difficult to say whether the *hot ail* system during the feudal period reemerged. Individual and household private property was more important than the social ethic of cooperation that was once instilled in the feudal system. Economic uncertainty and failure led to the disintegration or weakening of these groups – households engaged independently without help from neighbors.

(provincial center) affected the flow of animal goods into Ulaanbaatar, which affected meat and flour prices. As Bruun explains, "In 1994, when the road conditions between Ulaanbaatar and Dundgobi were bad, consumer goods in Dundgobi were found to be 25-300 percent higher priced that in the capital" (Bruun 1996: 85-87).

While most scholars contend that the privatization of land was a sudden transition, Bruun (1996) argues that reform of the *negdel* system formed more gradually. The privatization process was catalyzed with a public voucher system and public auction of *negdel* assets, with the aim to privatize *negdels* as quickly as possible (Bruun 1996: 17). The process started in 1987, at which time negotiations between the *negdel* administration and herding families took place. During that time, the state still paid herders their wages. By 1989, a livestock lease system was introduced, which made herders responsible for generating their own income. In 1990, the *negdel* was separated from the *sum* (village) administration, which cut the flow of livestock goods to and from the countryside. The final step in the privatization process was carried out in 1991 and 1992, at which time herding families were encouraged to become self-supporting in livestock production. At this time, the state-based quota for livestock delivery was removed altogether and the government eliminated all restrictions regarding the number and type of animal that families could own (Bruun 1996: 67). In 1991, new private companies were introduced as an intermediary between public and private ownership of herds. There were three types of companies: share-holding company, limited company, and cooperative. The first two types were companies under private control, while cooperatives were run jointly by herders. However, all three types were based on a cash economy, and sales prices of livestock, transportation, and herding equipment were no longer provided by the state, but families needed to purchase them on their own.

Land of Fences: Ulaanbaatar's Ger Districts

In 2003, the Mongolian Land Law dictated that Mongolian citizens were entitled to one parcel of free land in their place of residence. The Land Law incentivized rural dwellers to move into the capital city, as most households believed that property value in or near Ulaanbaatar was higher than property value in the countryside. Citizens who desired to obtain land in Ulaanbaatar were required to officially de-register as a resident of their previous district and province, and re-register as a citizen of Ulaanbaatar. After the registration process, families received permission from the municipality and their district to build a *khaashaa* around their property. Over the past decade, most families that migrated into the capital city had to build the *khaashaa* plot on the hillsides of the four surrounding mountains farther away from the city center, as land closer to the city center was already occupied.

Today, over 60% of the urban population in Ulaanbaatar reside in *ger* districts (Ulaanbaatar Statistics Office 2014). *Ger* districts stretch across the nine districts of Ulaanbaatar, with particularly high concentrations in Bayanzurkh and Songinokhairkhan districts. These areas are disconnected from infrastructures such as the central heating grid and running water. Households burn raw coal in their household stoves for warmth and collect water at the water well kiosk typically located 400 meters or so away from their home. Other limited resources include transportation. *Ger* district dwellers must walk up to 400 meters of unpaved, dirt roads to reach the nearest bus stop. During the winter season, ice and snow make it difficult to walk, while during the summer, heavy rains make the roads muddy. These infrastructural challenges are part of *ger* district dwellers' everyday lives.

Urban sprawl in Ulaanbaatar is drastically increasing. Today, rural households are faced with further challenges that force them to resettle in urban areas. First, many herders lose their

livestock due to malnutrition or complete loss due to climatic conditions (which I will elaborate on below.) Beginning in the early 2000s, natural disasters throughout the Mongolian countryside have reduced the number of families that could live off of the land through pastoral herding[14]. The lack of grazing land due to *dzud* (winter disaster) are now main drivers of rural to urban migration into Ulaanbaatar. I sat down with a climate specialist, who explained the three main types of *dzud* that are formed through distinct weather phenomena. The *xar dzud* (black winter disaster) is characterized by frozen grounds that trap the grass beneath thick sheets of ice. This typically occurs after an exceptionally hot, dry summer leaving low-lying grasses weak. The *tsagaan dzud* (white winter disaster, also called *tuurain dzud* which translates to animal hoof) is caused by unusually heavy snowfall, which prevents animals from reaching fodder. The ice *dzud* occurs after freezing rain that covers the ground, which makes grazing impossible. Families that lose their livestock due to these climate disasters do not receive long-term compensation for their losses, and most migrate into Ulaanbaatar after selling any surviving animals. According to program staff at UN-HABITAT and the Mongolian Red Cross, most of these families bring their *ger* and other possessions with them and settle in *ger* district communities. Both increased summer aridity and increased winter snowfall have been linked to global climate change, explaining the exceptional recent series of natural disasters.

In addition to climatic factors, many households move into the city to seek better healthcare, particularly if they have family members that are suffering from serious health conditions. Given the greater number of hospitals and health clinics in the capital city, many

[14] Sneath explains that the Mongolian word for economy (*ediin zasag*) translates to "governance of property." Thus, the notion of property is inextricably linked to the inner workings of the economy (Ibid. p. 202). In his later work, Sneath (2003) Sneath speculates that pastoralist ways of living will eventually disappear, given the economic hardships that have ensued to the decollectivist period.

families relocate to live in closer proximity to these resources. Families also move to allow their children to attend better quality high schools and universities.

Unwelcome Newcomers

The rapid increase in the *ger* district population has led to worsening air quality over the past decade. There are currently over 800,000 residents that live disconnected from the central heating grid. New migrants not only affected the city's air quality, but also overwhelmed other infrastructures such as roads, schools, and healthcare. This pattern exacerbated blame discourse, which rendered newcomers into the district residents responsible for air pollution. Among long-term *ger* district residents that I worked with, most blamed the newcomers into the city (within the past two to three years) causing catastrophic levels of air pollution into their neighborhoods. "The air has gotten worse over the past three years, it's because of all those new households coming into our neighborhoods," Baagii, a long-term resident of Songinokhairkhan district complained. The blame discourse was not limited to the neighborhood level, but also reached national discourse "We need to punish those criminals who are using the traditional stove. We need to enforce a ban on coal and punish those who use it!" a politician yelled at an air pollution conference that I attended. Apartment-dwellers in the capital city shared similar sentiments.

COAL ECONOMY: REGULATING FUEL

Ganbaa pushed the metal shovel into a hefty pile of coal. Bending forward, he thrusted the shovel into the air. The black shards fell heavily onto the back of the porter truck. Tiny soot particles dispersed into the air, sparkling in the sunlight. Ganbaa let out a deep, aggressive cough. He hit his chest with his fist a few times to clear his throat and proceeded with his machine-like shoveling. I spent many months working alongside Ganbaa and his colleagues.

About a 15-minute walk from the house, the coal-processing depot was off a main road in one of Songinokairkhan's ger districts. During the coldest months, January and February, Ganbaa and his colleagues worked under negative 30 degree conditions with no gloves or hat. "They [gloves and masks] get in the way of our work," explains Ganbaa. He is one of hundreds of coal workers supplying coal to local residents of Ulaanbaatar's *ger* districts.

A 22-ton truck off loads a mountain of coal. The coal looked like it was rising from beneath the earth. Alongside Ganbaa, Bolormaa and her husband Gerlee worked on hammering, sorting, and packing the coal into burlap sacks. I could hear the steady metallic sound of the hammer hitting the coal surface. With every clank flew an explosion of small shards out into the open. It is a miracle how they didn't suffer from eye injuries. Her husband sorted through the coal, coal pieces crumbling to the ground. I smelled the soot lingering in the air and saw that the grounds were covered in coal shards. As the wind blows, the soot was lifted off the pile and across the depot in spirals under the sun's rays. With every bag of coal processed, the mountain of coal looked like a glacier slowly melting by the hour.

Ganbaa took a break. He sat next to me on a pile of coal-packed burlap sacks and takes out a cigarette. His hands were stained in charcoal, his skin blackened beneath his fingernails. He took his cigarette and took a smoke. "Do you have anything as beautiful as Mongolian coal in your country?" He asked with a smile. Working alongside Ganbaa and other coal workers, I learned that coal work not only served as an important source of livelihoods but also a sense of national pride. "The government will never stop our work. As long there is coal, we will work. Without us, Ulaanbaatar wouldn't survive."

Ganbaa and Gerlee taught me about the different qualities and types of coal. In particular, Nalaikh and Baganuur were processed, sorted, and sold in this district. Nalaikh had a "shiny,

lustrous surface and breaks cleanly," Ganbaa stated. "Baganuur, on the other hand is full of oils that stain everything. When burning it, it produces a lot of smoke." All of the workers at the depot claimed that Nalaikh is the best quality coal in the whole country. They explained to me that there is a reason why it was subsidized by the government during the Soviet time and there is a reason why it is so popular among residents today.

Today, coal workers are the backbone of Ulaanbaatar's *ger* districts. They supply coal to over 800,000 peri-urban dwellers whose homes rely on burning raw coal in household stoves for warmth. Coal is the only source of fuel sturdy enough to provide warmth for families enduring prolonged winters that last from September until late April. While there are different types of coal circulating the informal heating market, Nalaikh coal remains the most in demand among peri-urban dwellers. The coal obtained its name from the town where it is mined, Nalaikh, located 30km southeast of the capital. The town is now home to hundreds of mining families.

The Nalaikh Mine

During the Soviet era in Mongolia[15] from 1924 to 1990, the country's labor was divided into two classes: *Ard*, or the rural lay herders and *ajilchin*, the urban working class proletariat. Beginning in the late 1950s, the national economy started to move away from animal husbandry and began building industry and extracting mineral resources as its main economic activities. With this economic shift, the urban *ajilchin* who helped industrialize the capital city gained recognition as the more 'valuable' and 'progressive' class of dedicated Soviet citizens. Monthly wages were also higher – coal miners, who were *ajilchin*, earned approximately 1,500

[15] Mongolia declared itself independent from the collapsing Qing dynasty in China in 1911 and during this time, Bogd Khan ruled over a Buddhist theocracy. However, the Bolshevik Revolution quickly led to Mongolia become a pro-Soviet "People's government" in 1921, which was then called the Mongolian People's Republic in 1924. By 1940, Mongolia was turned into a Communist-regime satellite state. It remained a state-socialist nation until the collapse of the Soviet Union in 1989-1991 (Dierkes 2012: 5-6)

Mongolian *tugrug* (MNT), equivalent to 500 US dollars a month (Bulag 1998: 50-55). Because coal work was considered crucial to industrializing the capital, mining was the highest paid profession during the Soviet era; university professors ranked second. Drawn to the prestige of urban living and the promise of a better livelihood near the capital, Davaa's grandfather and many Kazakh men moved from their homeland in Bayan Olgii in the west to settle in Nalaikh to work at the mine. "My grandfather helped build the capital with his bare hands!" he exclaimed as he threw his coal-stained palms into the air. "My grandfather moved here in 1962 to work at the mine. He was a hardworking Kazakh." The bell rang, signaling that the coal container was filled and ready to be pulled up to the surface. Davaa walked over to the cable and started to tug it gently and we watched the cable roll in a big container.

"People nowadays say our [coal] work is 'black' work. That it's dirty business. But during communism, our work was honorable." Davaa gestured me toward the coal pit. I looked down the dark, hollow grounds and listened to the clanking sound as the cables were drawn up. The Nalaikh Mine provided the local fuel required to build Ulaanbaatar into the industrial center of Mongolia (Bruun and Odgaard 1996: 100).

According to a Mongolian legend, a Chinese merchant witnessed a marmot digging coal from underneath the earth in Nalaikh over a century ago. The merchant called this earthy material "black gold" and quickly made use of its energy properties. While there is some evidence of coal use during the early 20th century in Mongolia, formal mining operations with machinery and state-run regulations did not begin until 1923 when the Mongolian People's Republic was formed. In 1924, the population of the capital city was 60,000 with the main industry a printing factory powered by coal supplied from the Nalaikh deposit. In the 1930s, the state built a railroad that connects the Nalaikh coal mines to Ulaanbaatar's power generating

station. Nalaikh's coal deposits were carried into Ulaanbaatar by train to generate electricity to supply the factories and supply heat to apartment blocks. There was centralized heating in Soviet states. According to Collier (2011), the heating system in the Soviet Union symbolized a step toward "social modernity" while simultaneously upholding the Soviet ideological underpinnings of centralization (203). There were heating plants that distributed heat to the city center. The Nalaikh coal mine was proclaimed a state-owned mining operation in 1953 and the Ministry of Energy recruited nearly 1,500 workers from the countryside. 75% of the mine was machine-operated and over 600,000 tons of coal were extracted. Machinery was imported from the Soviet Union and the mine was subsidized by the centralized government. The expansion of the Nalaikh coal mine production led to the construction of felt rolling mills, a water supply plant, and leather processing factories in the capital city. Coal was central to Soviet-era modernization of Ulaanbaatar.

Collapse of a Soviet Legacy

"What happened to the mine?" I asked. Davaa picked up a shovel and asked me if I wanted to chat inside. "It's too cold out here for long chats," he remarked. We walked into the coal stained *ger*. There were four empty stools scattered across the room. I sat down and stretched out my legs. I couldn't feel my toes. I could not believe that coal workers were working under such brutal winter conditions. Davaa's wife Erdenzul pulled large lumps of coal out from the metal bin, one-by-one, and placed them carefully into the stove sitting in the middle of the *ger*. She caught me looking at her and smiled, "this is Nalaikh coal!" It was if she suspected I would ask. I watched her light a match and toss it in the pile of coal and paper. Within minutes, the stove began to roar with heat.

"In 1992, everyone lost all their jobs. The government didn't have any money and had no choice but to shut it down. We had no more equipment, no machines, no salary. Nothing."

The collapse of the Soviet Union in 1990 brought economic devastation to laborers in Nalaikh mine and all sectors of industry. In 1992, the state withdrew machinery and other mining equipment and stopped subsidies. The Nalaikh mine officially closed down in 1994. Left with no choice, many miners looked for informal ways to continue working in mining. With the introduction of the 1997 mining law, mineral resources emerged as an alternative for economic development. Oyu Tolgoi, a substantial gold and copper deposit in the Gobi Desert, as well as Tavan Tolgoi, a coal deposit in the Gobi became large mining corporations in Mongolia in the late 1990s into the 2000s.

Figure 2: The crumbling ruins of the Nalaikh mine administration building. Photo by IBT.

Figure 3: Coal miners at an informal mining concession in Nalaikh. Photo by author.

Figure 4: Coal miners unloading coal from the coal pit. Photo by author.

Five of Davaa's miners joined our conversation inside the *ger*. "There was an explosion in 1991. Some kind of accident. A lot of miners died that day," one man explained. Nearly 40 miners died that day and the state realized that it would be a huge political liability if more miners lost their lives under state control. Some claimed that it was this liability that catalyzed the mine's official closing. Nalaikh residents no longer had state-sponsored equipment, healthcare, or income to sustain mining life. But those who stayed continued to work underground, digging in areas that were not yet exploited. Miners explained to me that from late September to May, over 2,000 coal workers dug beneath the grounds to supply more than 70% of the million tons of coal burned in the *ger* districts.

Today, the informal coal workers supply the *ger* districts with raw coal in an elaborate system. There are four types of labor, although in many cases, the work overlaps: coal miners, coal transporters, coal sorters, and coal sellers. The coal miners spend their entire working day digging coal underneath the ground. Miners spend up to 12 hours underground breaking and shoveling large pieces of coal onto a metal bin which is then pulled out from underneath with long ropes. The metal bin is then unloaded onto the ground, and the other coal workers create piles that are ready for pick up. During early morning hours, coal transporters come to the mining site in porter trucks and load the coal onto their trucks. The coal transporters drive the coal to various coal sorting sites throughout the *ger* districts. According to Davaa, these transporters have connections with specific locations that supply the coal to them. At the coal sorting depot (where I worked), the workers break the coal into manageable pieces and package them into burlap sacks. The head of the sorting team sells the coal on the side of the road directly to *ger* district families.

The informal coal economy stemmed from Nalaikh's "ninja miners." Davaa himself oversaw 12 workers. He and his wife owned this small-scale operation. With no proper safety measures, the shaft opening is supported by soggy wood, and danger of collapse is a concern for his workers every day. His workers dig in 12 hours shifts. Digging over 20 meters and then they start to dig at the coal seam. "We're digging every day because people need coal. It's not the safest job but we get a steady income. That's why we continue this work," a coal miner explains to me.

"The market determines the value of the coal. There is a lot of demand with the growing *ger* districts. The more people move to live in these areas, the more coal we have to dig." During the time of my research, the price of one full porter truck is an estimated at 120,000 MNT in Nalaikh. Once the truck reaches Ulaanbaatar, the price accrues to 180,000 MNT. The price goes up in Ulaanbaatar to accommodate petrol prices for transportation and workers' wages. Depending on the production of each concession, miners could make up to 1 million MNT a month (500 USD), higher pay than most Mongolians.

"The prices really fluctuate depending on the season. December and January will have the highest prices," Davaa explained. As Davaa instructed the men to tip over the metal boat, the workers pushed the cart to the side. A mountain of coal spilled out onto the ground. "Three of these containers fills one porter truck," he pointed at the blue truck at the side of the *ger*. According to Davaa and other concession owners I met with, the informal mine consisted of both miners who dig and porter truck drivers that come to the mine to get coal to sell in the *ger* districts.

Baganuur Coal Project

While until recently, Nalaikh was the main type of coal circulating the informal coal market, Baganuur has become more and more prevalent in the *ger* districts. In 2012, the Mongolian government introduced the Baganuur coal project. Most residents I spoke with explained to me that this project was a disaster. "We know Nalaikh is better quality coal. We have been using for years. But Baganuur is on the market for cheaper. We want to save money on fuel so we buy Baganuur now. It's no good. But what can we do?" explained one resident who had been living in Songinokhairkhan for nearly 15 years. According to an air pollution expert, burning Baganuur coal increases the air pollution three-fold. "I tried to advise the Minister of Environment. I provided all the evidence. But it was out of her control. The Baganuur coal project was the Prime Minister's decision, not hers," Lodoysamba explained. "I told them that Nalaikh is the best coal, but they didn't listen. They went through with the Baganuur project intentionally. They should know that it's more polluting but they are doing it anyway. I suspect that it's corruption. It's the PM's company," he sighed.

The Mongolian government on the other hand, claims that the *nuurs xuturbul* or "coal program" would help establish more jobs for Mongolians living in remote regions. However, the program resulted in large-scale corruption cases and locals accusing politicians for *munh idsen* or "eating the money" and putting the cash in their pockets. In these ways, the coal circulating the informal coal market is tied to politics and discourses of blame.

I sat down with Narantuya to discuss her household expenses and the Baganuur coal project. "It may be a 500 MNT or 1,000 MNT difference between Nalaikh and Baganuur. But it adds up when you buy in bulk. For many families, saving money is the most important. If Baganuur is cheaper, they will buy it." One bag of yellow Nalaikh is priced at 3,000 MNT and

one bag of Baganuur is 2,500 MNT. During the winter, one porter truck of Nalaikh amounted to 150,000 MNT and Baganuur was 120,000 MNT.

The regulation of "poor quality" coal, Baganuur, and the informal coal mining operations in Nalaikh pose important questions about air quality. How do governments justify air pollution mitigation interventions like the stove-replacement program when the coal that households are burning is Baganuur – the most pollution emitting? How is air quality linked to material understandings of coal and the coal market? As I will show in the following chapters, the mobility of coal as a fuel type and a commodity plays an important role in the air pollution story.

HYGIENE CAMPAIGNS: REGULATING HOUSEHOLDS

Amraa and I crouched down, hovering over a large plastic wash bin that we placed on the concrete kitchen floor. She scooped up a pitcher of boiling water from the stove top and stirred in cold water from the water barrel. She poured a half cup of detergent into the wash bin and mixed it up with her hands. Pulling clothing from the pile, one-by-one, we lathered T-shirts, pants, and underwear in the lukewarm, soapy water, rubbing the wet fabrics with our finger tips. We let the clothes soak for about ten minutes as we collected the dry clothing from around the house and folded them neatly onto the bed. Amraa and I were chatting about preparations for her mother's birthday feast, listing all the things we needed to buy at the market in the afternoon. "Your sister-in-law is coming to help with the cooking, right?" I asked as I glanced over at the wash bin. The water had transformed into a dark, murky, black color. Amraa, who caught my stunned facial reaction remarked with a touch of humor, "This is how we know the smog sticks to us!" As we squeezed the soaked fabric, the black water splashed beneath, and I could smell the stench concentrated inside the wash bin.

"This odor is the biggest problem," Amraa explained. "Even if I wash my clothes or

wash my hair, I can't get rid of the smell." Amraa was concerned and frustrated with the difficulties of maintaining proper hygiene and a clean physical appearance, particularly during winter months when she could not keep the smog from staining her clothes. Amraa's family and most households in the *ger* districts relied on hand washing clothes inside the house since their homes did not have running water. She would wash her hair twice a month using a small basin filled with warm water that she heated on the stove. Her husband did the same. This was typical among families in *ger* district neighborhoods. Other families would visit a bathhouse once a month where they paid money for a small room for washing. Smog odors that seeped into hair, skin, and clothes were daily reminders of the stark social inequalities embedded in the capital city.

During the spring and summer months, city dwellers complained about the muddy roads that connected their neighborhoods. With thawed snow and rainfall, dirt roads frequently turned into mud. Amraa scrubbed her shoes meticulously in the evenings and mornings to remove the mud that got stuck on the soles during her commutes. "You can tell who lives in the *ger* districts by smelling their body and looking at their feet," Amraa explained. Cleanliness of footwear stemmed back to Soviet-era hygiene practices wherein individuals carried a handkerchief and shoe polish to keep their shoes polished throughout the day. According to Billé (2015), both cleanliness and quality of footwear was an indicator of an individual's moral character and financial status in Mongolia (Billé 2015: 138). While middle-class families walked on concrete streets and lived in centrally-heated apartments with washing machines that operated on running water, *ger* district families walked on muddy pathways and lived in homes cut off from the central heating grid, where clothes were washed with water collected at the water kiosk and warmed on a coal-burning household stove. Amraa and many other *ger* district dwellers worked

hard throughout the year to maintain their physical appearance in order to avoid "looking poor."

In this section, I show how the dichotomy of "polluted", "unhygienic" bodies vs. clean, modern bodies played a particularly salient role in Soviet-era public health interventions that attempted to discipline Mongolians into becoming responsible Soviet citizens. Mary Douglas (1966) conducted a structural analysis of how notions of purity and pollution were embedded and upheld in everyday life. I argue that the Soviet-era hygiene campaigns manipulated this type of dichotomy to create *social inequalities* in society.

Household Hygiene in Soviet Mongolia

Beginning in the 1930s[16], the Mongolian Revolutionary Party enforced a country-wide hygiene campaign across the Mongolian People's Republic (1924-1990). The hygiene campaign was part of a larger Cultural Campaign[17] (*Soyoliin Dovtolgoo*), which aimed to educate and discipline rural herders and urban dwellers into becoming responsible Soviet citizens. Within Soviet ideology, proper hygiene was understood to promote healthy bodies and rational thinking (Kirshenbaum 2000: 143; Starks 2008: 4). These campaigns were not introduced solely to "save lives". Rather, hygiene[18] became a symbol of "cultured-ness" (*soyoliin hemjee*) and modernity itself (Bille 2015: 118).

Bayankhuu, currently a professor of public health at the National University of Medical Sciences, used to work for the Soviet-era Ministry of Health's Department of Hygiene where he trained students to become hygiene inspectors (*baitsaagch*) to conduct inspections in Mongolian homes throughout the country. "Before this campaign, there was no hygiene culture in

[16] Scholars have divided the Soviet-Mongolian cultural interventions into two phases. The first phase, which took place in the 1930s, was called *Ikh Jagsaal,* and focused on promoting literary in rural and urban areas. The second phase, which took place in the late 1950s until the 1980s was called *Soyoliin Dovtolgoo,* and focused on health, hygiene, and literacy. For more details, see Kaplonski 2014; Natsagdorj 1981; Marzluf 2017: 139-142.
[17] Through propaganda, Cultural Campaigns promoted "clean bodies, clean blood, and clean scripts" (Marzluf 2017: 143).
[18] The Soviet hygiene intervention echoed practices during 19th century Europe (Elias 1994; Laporte 2000)

Mongolia[19]. There were lots of people with syphilis and all sorts of infectious diseases. For 60 years, administrators made sure that every family washed their hands, brushed their teeth, and cleaned their bodies," Bayankhuu explained. The public health campaign employed a door-to-door strategy, wherein administrators from the provincial level Cultural Campaign commission and State Hygiene Inspection office had permission to enter into the homes of herders to discipline them on how to properly manage their household and bodily practices (Tsendoo 2007: 140). Soviet ideology was reminiscent of 19th century public health discourse, wherein maintaining a clean household was understood as essential for creating hygienic bodies (Petersen and Lupton 1996: 92-94; Foucault 1984: 280).

The hygiene code was strictly regulated, with hygiene inspectors visiting homes every week to check cleanliness and maintain proper records of their inspections. Hygiene inspectors distributed a range of public health information based on seasonal relevance. For example, pamphlets provided guidance on how to manage a cold, trace symptoms of the flu, and how to brush teeth properly. Inspectors' weekly check-up included thorough inspection of the interior of the house from flooring, bedding, kitchen utensils, clothes, to towels. They also examined whether families disposed garbage, discarded waste water, and maintained their pit latrines properly. Each hygiene inspection concluded with a written evaluation of the inspection that rated families using criteria excellent (*onts*), good (*sain*), average (*dund*), and poor (*muu*), and signed by the head of the household (Marzluf 2017: 145).

[19] Prerevolutionary narratives written by Westerners often remarked on the "unhygienic lifestyle of Mongolian nomads" (Perry-Ayscough and Otter-Barry 1914, 70; Bulstrode 1920, 74) and the Chinese also commented on cleanliness and associated thm with smelly food and lack of personal hygiene (Robert 1903, 87; Lattimore 1962: 68) Quoted in Billé 2015: 118.

Figure 5: Colgate was introduced in Mongolia for the first time in 1922. Embassy of Mongolia.

Hygiene codes were upheld by publically commending obedient families and shaming families that failed to abide by the "clean" ways of living (Marzluf 2016: 143). If a household performed poorly in their weekly inspection, their household name and hygiene status was made public inside the collectivist brigade office, at party meetings, and at provincial or village centers. "The government would publicize their filth and shame this [kind of behavior]. This was their way of punishment," Bayankhuu explained. Families with poor evaluations were also obligated to hang a wooden plaque of a "filthy animal" such as a pig, frog, or crocodile, which would be visible to visitors passing by their home. In contrast, families that successfully passed their inspections were awarded a "Cultured Family" or "Star" commendation symbolized by a modern image such as an airplane. Matters of the private household were purposefully made visible, transparent, and public in such ways to discipline rural herders to abandon their Mongolian ways of life and adopt the "modern Soviet" ways of living. By employing shaming

tactics and surveillance and documentation techniques, Soviet authorities upheld their authority of the modern state (Giddens 1985).

Matters of hygiene were not only limited to altering household conduct, but also involved adopting new household materials. As Billé explains, "the ideal of modernity portrayed through hygiene [was] inseparable from the structure itself: modernity is both the cleaning process and the structure being cleaned" (Billé 2015: 142). For example, authorities required all Mongolian families to cover their felt dwellings with a white canvas sheet (*tsagaan burees*). Bayankhuu began to ask me questions to test whether I understood the connection between this new household material and Soviet ideology.

> **Bayankhuu:** Do you know why we Mongolians had to start using the canvas?
> **Chisato:** To cover and protect the felt?
> **Bayankhuu:** Yes. It protected the *ger* from becoming too humid. Soviets thought humidity was unsanitary.
> **Chisato:** Interesting…
> **Bayankhuu:** Why do you think [they chose] white? Why not another color?
> **Chisato:** Because it symbolizes purity…?
> **Bayankhuu:** That's exactly right! It's clean and looks nice. It's hygienic… It's modern. If you looked from above, you'll see all these brightest white mushrooms! That's why everyone called Mongolia the "White King".

Under the hygiene campaign, Mongolian families were required to maintain the white canvas by cleaning it a minimum of three times a year. If the canvas was white and clean, the family living in the *ger* was considered healthy. If the canvas was stained with a darker shade, the family was labeled unhealthy and dirty. During the 1960s, families were also required to replace their open-fire stoves with chimney stoves (*tonotoi zuux*) inside their homes. The Soviet regime rendered Mongolian open-fire stoves backwards, uncivilized, and unsanitary, as they relied on animal dung as a source of fuel and produced smoke that was considered unsanitary. Chimney stoves were considered a modern technology that not only relied on "modern" fuels (coal and wood), but also eliminated smoke that lingered inside the home. Similarly, maintaining

proper airflow and humidity levels inside the home was deemed important for maintaining a healthy household. Bayankhuu explained:

> Opening the window was really important. It's still really important now... You see families opening windows even with pollution outside. It's because stale air is considered dangerous for human health. It can cause headaches, nausea, and sleepiness. Ventilation is the remedy for this. It balances the air. Not too humid. Not too dry. Also, [it] gets the dust out. Women had to sweep to make sure that dust didn't accumulate on the floors. Dust is not good for health.

The domestic environment, from housing exteriors, household appliances, to indoor air quality became matters of surveillance and discipline under the Soviet hygiene campaign. Domestic space was constructed as an extension of the self[20] (Krishenbaum 2000: 67; Petersen and Lupton 1996: 94; Starks 2008: 3-4). If one's home was dirty and smelly, this became a reflection on one's personal characteristics as well as a potential danger to one's health (Petersen and Lupton 1996: 94). Household cleanliness was not adopted without hesitation or resistance, however. The hygiene campaign marked a "rupture from the past" as Mongolians prior to the interventions showed a "cultural preference for a layer of grime" as dirt indicated that an object or home had been well-used (Billé 2015: 143).

It is important to note that the hygiene intervention was a gendered initiative, holding women responsible for maintaining proper hygiene in the household. When Soviet doctors came to teach hygienic practices and introduce Soviet biomedicine, women became the pupils of these medical teachings. Women were chosen as they were considered the head of the household and the person most suited to teach proper hygiene techniques to their husbands and children. Men, on the other hand, were responsible for keeping their livestock in order. Upholding a clean

[20] Billé (2015) elaborates on a 1957 film called *Serelt* (Awakening), which was produced by Mongol Kino and directed by S. Genden. The film follows the journey of a female Russian doctor who travels to the Mongolian countryside to train local women on Soviet biomedical practices. The film portrays how medical training in the villages were first and foremost about learning how to clean properly (Billé 2015:141-143).

household continues to be gendered in contemporary Mongolia, where women like Amraa have the responsibility to clean their family's shoes, clothes, and floors of their home.

Lastly, the hygiene campaign had ramifications for class divisions in Mongolian society. Dirt and uncleanliness became associated with the rural herding class (*ard*) who were often called dirty (*bohir*) and uneducated (*bududuleg*) while urban dwellers (*ajilchin*) became associated with purity and cleanliness (Billé 2015: 119). This Soviet-era social hierarchy permeates contemporary Mongolian attitudes toward rural dwellers. During my fieldwork, I encountered many office workers who complained about the state of their office bathrooms. It was not uncommon for toilet seats to be covered with shoe prints made by people squatting on top of the toilet. Rural dwellers, who were used to going to the bathroom outside on the open plains or in pit latrines (made of two planks of wood and a deep pit), ncontinued to practice this bathroom method in the city. City dwellers frequently blamed rural dwellers for continuing these kinds of "polluting" (*bohirdordog*) practices in their "civilized" city. *Ger* district communities suffered greatly from these class-based stereotypes. As discussed earlier, muddy shoes, stained clothes, and the smell of smog and body odor were physical indicators of poverty in the capital city. Although *ger* district dwellers associated challenges to uphold proper hygiene with lack of infrastructure, apartment dwellers in the capital city discriminated against them as being backwards, ignorant, and polluting *former* rural dwellers. In other words, *ger* district dwellers were understood as "matter out of place" (Douglas 1966) They were neither rural herders living in the countryside, nor were they "civilized" apartment dwellers in the capital city. Amraa expressed a deep sense of "not belonging", as she faced social and financial challenges due to her socioeconomic status and place of residence.

Disciplining Households in Post-Soviet Mongolia

With the collapse of the Soviet Union in 1990, hygiene campaigns abruptly ended and public health infrastructure diminished with the withdrawal of Soviet financial support.[21] The social stigma of rural pastoralists vs city dwellers persisted and exacerbated after the fall of the Soviet Union, and Soviet ideologies of "hygienic" vs. "polluted" continue to permeate social life in Ulaanbaatar. Despite so-called "transitions" to a post-Soviet life, for many communities, letting go of Soviet values and economic ways of life do not easily disappear (Humphrey 2002). Rapid urbanization has reinforced these hygienic practices to make sure that there is a clear distinction between indoor and outdoor environments. For example, as Billé (2015) explains, apartment-dwellers customarily take off their shoes when entering an apartment, while ger dwellers leave their shoes on while indoors, only to take off their shoes at bedtime (Billé 2015: 138). Amraa's response to social stigma and body odor (in the introduction of this section), is connected to these interventions, and the ramifications continue to permeate today in air pollution management interventions.

As I will discuss in Chapter 4, the stove-replacement program focused on not only altering household technologies, but also disciplining human conduct around stove use. *Ger* district residents became target of these interventions, as they were the subpopulation that relied on coal-burning household stoves during the winter months. Thus, I argue that the stove-replacement program combined both Soviet ideologies and disciplining strategies as well as neoliberal approaches to human health.

[21] In response to the crisis in the health sector, and following the World Bank's prescription for health development (World Bank 1993), the Mongolian government shifted from hospital-based secondary care to primary care.

ULAANBAATAR'S ATMOSPHERIC STATE

Privatization of land, unregulated coal economies, and increased household coal use have culminated into creating Ulaanbaatar's current atmospheric state. The social ramifications of air pollution were embedded in the everyday lives of peri-urban dwellers of the city. Coal, stoves, and fences are not only material infrastructures that peri-urban dwellers engage with day-to-day, but they are entangled with the very sources that have shaped the contemporary toxic atmospheric state. While urban dwellers were already aware of changes in their atmosphere since the early 2000s, the Mongolian government did not begin investing in research and interventions until 2007. Institutional responses to the air pollution as an environmental health problem only began after a multinational organization-sponsored assessment study was conducted to verify the pollution levels and pollution sources.

Policy and Practice in Contemporary Ulaanbaatar

In 2007, the World Bank published an assessment of the current situation and effects of air pollution in the capital city. This study was based on air quality data available from 2006 to 2008 monitored by the National Center for Meteorology and Environmental Monitoring. The study focused primarily on the concentration and health effects of particulate matter (PM). The World Bank study became the baseline study of Ulaanbaatar's atmospheric state, and multinational organizations and state donors began to invest in various air pollution mitigation strategies.

In 2012, the Mongolian government passed the Law on Air, a national legislation that established procedures and protocols required for specifically governing air quality issues. Prior to 2012, air was regulated under the 1995 Environmental Protection Law of Mongolia, which rendered air a "conservation resource" alongside other environmental matter: land and soil, minerals, water, plants, and animals. Article 5 in the legal framework stated, "in order to ensure

the human right to live in a healthy and safe environment, the State shall prevent adverse environmental impacts and maintain ecological balance" (March 30, 1995. Chairman of the State Ih Hural of Mongolia). While the 1995 law categorized air as an environmental phenomenon that needed to be conserved and protected, an amendment under the 2012 legislation called for air quality to be controlled and regulated. Increasing levels of air pollution catalyzed legal definitions of air pollution-related matters, which relied on the setting of national standards.

"Air quality standard" was defined as "the *allowable* concentration in the ambient air of pollutants and of components that do not cause negative effects on human health and the environment, as defined by and certified by the state administrative central organization in change of standards" (2012 Law on Air Article 3.1.12. Author's emphasis). Applying this broad definition to pollution, the legislation defined air pollution as "any polluting substance concentrations in the air exceeding the air quality standards as a result of direct emissions or of changes due to physical and/or chemical reactions" (2012 Law on Air Article 3.1.2).

Institutionally, the Mongolian government began forming an air pollution governance structure and policies that address the air quality issues. The Law on Air was drafted in 2010 and passed in 2012. The law of air pollution payment was enacted in 2010. The Law on Air provided guidelines on permissible pollution levels as well as air as a commons. Then in 2011, the National Committee for Air Pollution Reduction (NCAPR), headed by the Prime Minister, was formed to facilitate high-level decision-making on air pollution issues.

During the same year, the Clean Air Fund, a special government fund, was formed to allocate funds to combat air pollution issues. This fund was used to support the supply of subsidies that were used to implement the stove-replacement program in 2012. With donations from the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), Japan International

Cooperation Agency (JICA), and Asia Development Bank (ADB), Ulaanbaatar expanded its air quality monitoring network from two stations to 11 monitoring stations throughout the city. JICA continues to engage in air quality monitoring technician training and capacity building in partnership with the Ulaanbaatar City Air Quality Agency in the municipal office.

Thus, my research took place during a crucial moment in air pollution management, as air pollution governance was set in place and monitoring and stove replacement was already underway. In other words, my research was situated at the country's turn from policy level to on-the-ground work. Local discourse on the stove-replacement program were developing, blaming practices were taking place, and discontent with the national and municipal governments were rising among *ger* district residents.

However, it is important to note that the air pollution interventions that were implemented in Ulaanbaatar did not unfold in a vacuum. For example, the stove-replacement program in Mongolia stemmed from a global response to replace cookstoves through the "Global Alliance for Clean Cookstoves" initiated by the United Nations Foundation, which aimed to improve health, livelihoods and empower women through better cooking devices. The goal of the foundation was to disseminate 100 million clean cookstoves by 2020. While this program promotes its mission as a humanitarian cause, these newly developed stoves were not distributed for free, but were sold at a cost. The stove program was a market-based intervention that involved for-profit incentives for companies that designed and developed fuel-efficient stoves. In order to increase sales at the beginning of the program across the world, local governments and multinational organizations subsidized the stoves so that consumers could purchase the stove at a lower cost.

In Mongolia, the stove program operated under the Millennium Challenge Corporation (MCC) funded United States Agency for International Development (USAID) project that promoted energy efficiency. Under the same basic principles as the Global Alliance for Clean Cookstoves, the MCC project in Ulaanbaatar placed market-based strategies at the forefront to engage local Mongolian businesses with investments in fuel-efficient stove technologies. The idea behind this was that creating a local market would make an intervention more "self-sustaining." By increasing the number of fuel-efficient stoves, the intervention aimed to reduce air pollution emissions. However, since these fuel-efficient stoves still relied on coal, the intervention was not able to eliminate coal emissions altogether. In contrast, the rapid increase of Baganuur coal (which was established by scientists and coal workers alike as poor quality coal) circulating in the *ger* districts worsened the air quality in Ulaanbaatar. As I will discuss in Chapter 4, the fuel-efficient stoves were tested in the laboratory using Nalaikh coal. However, the sudden use of Baganuur coal (which has a different moisture content and burning properties) led to a rapid increase in air pollution emissions in *ger* district areas.

In this chapter, I have demonstrated how air pollution is a product of longstanding political and economic shifts brought upon by the Soviet period and post-Soviet transition. Land regulation laws shifted pastoral economies that led to drastic changes in rural livelihoods, causing rapid migration into the capital city. This has catalyzed the rapid expansion of *ger* district areas. The Nalaikh coal industry, which once stood as a Soviet legacy, now exists as an illegal operation that provides fuel to the city's peripheral population. Coal continues to play an important role in the making and unmaking of air pollution in Ulaanbaatar. Lastly, Soviet-era public health campaigns created social hierarchies based on hygienic practices. Rural pastoralists were understood as backwards and uncivilized, while urban dwellers were understood to be

modern and civilized. The introduction of air pollution has created further divisions in class, with *ger* district residents the unclean culprit of pollution and the apartment dwellers the more modern citizens. In the following chapter, I will explore how urban dwellers understood the relationship between air pollution and spatial inequalities across the capital city.

CHAPTER 3

POLLUTION MAPS: SPATIALIZING HARM

From Beijing's "Airpocolypse", to New Delhi's "Deadly Air", to Mongolia's "Toxic Smog," air pollution has recently made headlines across Asia as a public health crisis. In addition to morbidity and mortality statistics that quantify air pollution's effects on bodies, air pollution concentration maps have become pervasive epistemic tools that spatialize air quality across different scales and geopolitical boundaries.

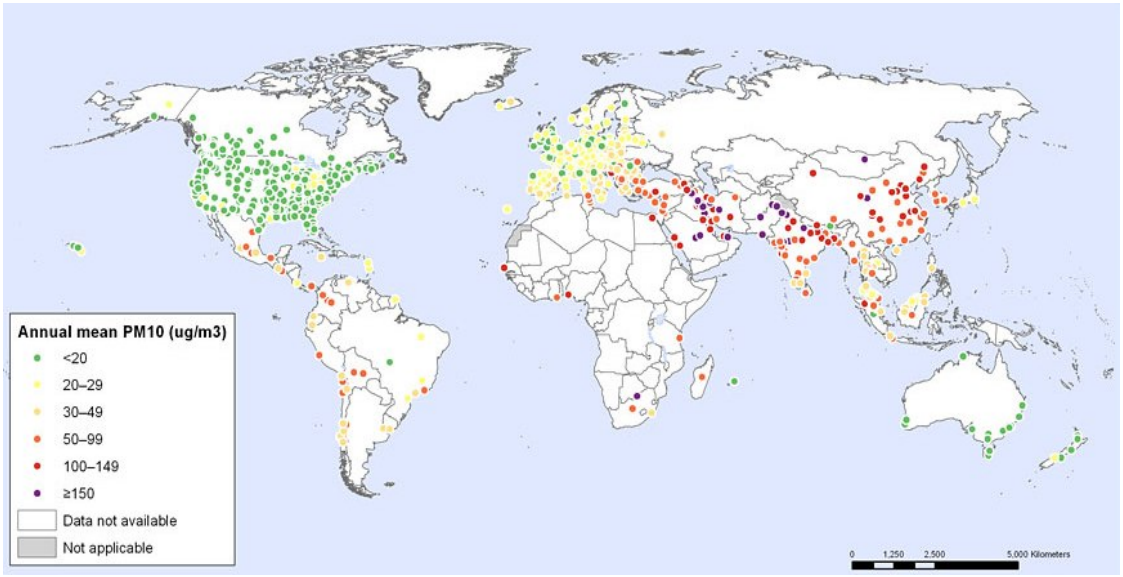


Figure 1: PM10 concentrations worldwide. World Health Organization 2012

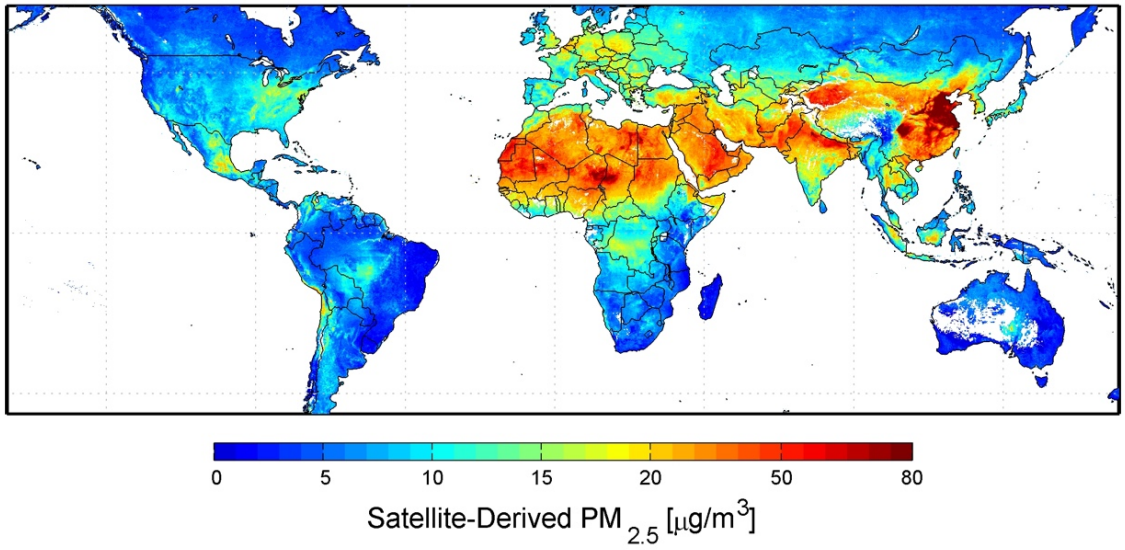


Figure 2: 2001-2006 estimation of PM2.5 concentrations. Dalhousie University, Aaron van Donkelaar

Figures 1 and 2 illustrate some of the ways experts map air pollution concentrations onto specific territories around the globe. The first figure employs a specific air quality metric, PM 10[22], as an indicator of air quality levels in different regions. Each dot represents the location of an air quality monitor that tracks PM10 as well as the average concentration of PM10 traced from these monitors. Green dots, concentrated mostly in the United States, Australia, and Europe, represent healthy breathing spaces with PM10 concentrations lower than 20 micrograms per cubic meter. In contrast, areas in Asia, Africa, and parts of South America are marked as more dangerous breathing spaces with PM10 concentrations above 50 micrograms per cubic meter. Notably, Mongolia's PM10 concentration is marked as above 150. As this map relies on data derived from air quality monitors, this spatial configuration also shows the global discrepancy in the availability of air quality data. For example, the United States is portrayed as having a more robust air quality network, while continental Africa has very few monitors available for air quality data collection.

Figure 2 provides a very different spatial configuration of air pollution concentrations

[22] PM10 is an acronym for particulate matter that is 10 micrometers or less in diameter. PM2.5 represents particulate matter with 2.5 micrometers or less in diameter.

around the world. Rather than employing specific data points, this map uses satellite imagery of PM2.5 concentrations to depict a broader pattern of particulate dispersion across territories. This map draws from heterogeneous, incomplete data sources to produce a global image (Edwards 2010: 272). Canada, southern Africa, and Australia are rendered clean regions and northern Africa and Asia are illustrated as regions with the dirtiest air. Both maps correlate higher air pollution concentration to higher health risk.

***

In this chapter, I discuss how pollution maps have spatialized harm by graphing pollution-induced risks onto specific geographical locations. Focusing on three types of maps – an air-quality-monitoring map, body map, and residential-zoning map – I show how air quality programmers, city dwellers, and urban planners constructed harmful spaces employing quantitative, sensory, cultural-political, and socio-ecological knowledge. I argue that these spatializing practices both reflected and reinforced pre-existing social hierarchies, placing blame for air pollution onto the most socially and spatially marginalized populations.

This chapter consists of four sections. The first section highlights anthropological literature on the social stratification of urban space. My ethnography extends this literature by focusing on diverse air pollution mapping practices. In the second section, I discuss the formation and usage of a digital air-quality-monitoring map. I argue that while official air pollution maps used administrative boundaries, urban dwellers mapped unsafe places differently, drawing from their lived experience with pollution. The third section examines the production of body maps. I show how city dwellers located harm along particular moments and routes of exposure drawing from their sensory and spatial knowledge of the urban landscape. The fourth

section focuses on residential-zoning maps. In this mapping practice, urban planners divided the city into larger polluted vs. non-polluted zones based on physical distance from the *ger* districts, in order to bolster real estate development. I conclude by suggesting that uneven spaces of harm were formed through place-based interactions with metrics, markets, ecologies, and class divisions.

SPATIAL HIERARCHIES

Over the past two decades, there has been a marked increase in scholarship that examines the correlation between geographically uneven spatial distribution of toxic harms and larger structural factors such as race, class, and gender.[23] For instance, in his ethnography of Hong Kong's ecological landscape, Tim Choy (2011) claims that the city's atmosphere is stratified into "air spaces" occupied by city dwellers with different socioeconomic and racial backgrounds (2011: 159-161). High-income households, mostly of European descent, have the means to live in the mountainous region to escape roadside pollution, while lower-class working families live in urban areas live in the midst of smog. Choy contends that Hong Kong's British colonial history has shaped the city's real estate and urban design. Homes in the mountains provided colonial elites protection from discomforts such as heat and humidity. Today, with glass-cased escalators that provide safe commuting routes to and from work, Choy explains that the city is designed to protect middle-to-upper class workers from daily exposure to pollution (161).

In contrast to Choy's discussion of safe breathing zones, Michelle Murphy (2008) is concerned with how chemical dangers concentrate in "zones of dispossession" or regions often occupied by vulnerable populations that are already "disenfranchised and devalued in the larger

[23] See Auyero and Swistun 2009; Bullard 2001; Checker 2005, 2007; Choy 2011; Dillon 2014, 2016; Fiske 2017; Lincoln 2014; Lora-Wainwright 2013; Mitman, Murphy and Sellers 2004; Nash 2006; Sze 2006; Walker 2010

political economy" (Murphy 2008:698). Murphy argues that these communities were already part of a wider, deeper history of harms that preceded chemical harm. For example, Tar Sands oil operation in Sarnia, Ontario, is home to First Nation communities such as the Aamjiwnaang, who have a deep history with colonial forces. Murphy offers what she calls "chemical regimes of living" (Murphy 2008:701) as a conceptual framework for thinking about toxicity, not as an end product of production or consequence of consumption, but rather as an entanglement between chemicals, histories, and political economies.

My analysis builds on both Choy (2011) and Murphy's (2008) work by situating class-based inequalities within the spatial topographies of Ulaanbaatar's "air spaces". While Choy describes socio-spatial stratifications in Hong Kong, he omits the actual processes through which understandings of harmful spaces are being made. My analysis extends Choy's study by providing an ethnographic account of the diverse mapping practices that inform and reinforce the spatial stratifications of air pollution. As I will describe in my analysis of residential zoning maps, I posit that it is not solely the housing market that generates safe and unsafe places. Mapping practices reveal that a diverse set of knowledges including ecological, sensory, and discriminatory practices come together to create uneven spaces of harm. My research contributes to Murphy's (2008) study by providing a case study of how historically embedded class-based discrimination continued to play a critical role in contemporary air pollution mapping practices and discourse.

Scholars have also shown how the emergence of new contamination threats reinforce preexisting social orders. For example, Lincoln (2014) illustrates how a series of cholera outbreaks in Vietnam reified cultural norms around food consumption: food prepared and consumed inside the "private" home was considered safe, while food sold by strangers and eaten "publicly" outside the home was considered dangerous. Under this framework, rural migrants, and in particular, street

food vendors, were often blamed for spreading cholera into their communities (2014:350-351). Food vendors (both the people selling and the practice of selling) were conceptualized as poor, ignorant, and unsanitary public health risks. This fits within Mary Douglas's notion of pollution as "matter out of place" (2002 [1966]: 44). Because food vendors transgressed social boundaries (leaving the 'traditional' feminized role of cooking in a rural household to make business profit in the city), these women were treated as threats to the social order of Vietnamese society (Lincoln 2014:352). In the midst of cholera outbreaks, Lincoln argues, it became evermore crucial to maintain a social hierarchy and boundaries of blame. Similar understandings of social order apply in the context of air pollution in Ulaanbaatar. *Ger* district residents, many of whom recently migrated from rural areas, were blamed as the culprit of air pollution. Much like Lincoln's (2014) case, this blame emerged through preexisting class-based stereotypes about *ger* district residents as being poor and ignorant former herders. As I will show in the discussion of residential zoning maps, the threat of air pollution has catalyzed a reification of these social boundaries.

In the following analysis of mapping practices, I show how spatial understandings of air pollution co-produced spaces of harm. According to Beck (1992), in the age of a "risk society", risks are no longer contained in geographical spaces, as they can be everywhere at once. However, my study shows that spatial aspects of air pollution remain directly relevant to toxic harms. By highlighting various kinds of maps, I show the diverse ways in which people constructed spaces of harm.

POLLUTION MAPS: SPATIALIZING HARM WITHIN ADMINISTRATIVE BORDERS

Mapping Air Pollution Numbers

Otgonbaatar and I sat in front of the computer monitor, watching the long stream of blue numbers flow onto the screen as the computer downloaded real-time air quality data from the

monitoring equipment. “Look at how high these number are,” Otgonbaatar pointed to the PM2.5 concentrations on the right-hand side of the screen. I watched the numbers carefully as they fluctuated between 450-550 μg / m^3.

> **Otgonbaatar:** It’s going to be a very polluted winter this year.
> **Chisato:** How do you know?
> **Otgonbaatar:** It’s only November and we’re getting such high numbers. Imagine when the temperature drops even more… [pulls up the agaar.mn website onto the screen] I predict that Songinokharkhan [district] is going to be disastrous.
> **Chisato:** Bayanzurkh [district] looks like it’s pretty bad right now, too.
> **Otgonbaatar:** It does. Those two [districts] are always the worst. The numbers there are always above 500.

Since the inception of Ulaanbaatar’s air quality monitoring network in the mid-2000s, air quality surveillance became an integral part of air pollution management. Air quality monitors were installed in each of the six municipal districts, managed by both the National Agency for Meteorology and Environmental Monitoring (NAMEM) and the Ulaanbaatar City Air Quality Monitoring Agency (UB-AQMA). Otgonbaatar was integral to these operations, as he served as the head of the air quality technician team UB-AQMA. He was responsible for visiting the air quality monitoring stations, downloading air quality data, and fixing equipment. November through March was the busiest period for him, as he was responsible for fixing frequent malfunctioning of monitoring equipment due to freezing temperatures and for meeting demands from international donors who relied on the availability of air quality data for seasonal analysis. Monitoring equipment maintenance was particularly important during the winter season in order to maintain a steady stream of air pollution data on agaar.mn, a government-sponsored real-time air quality data map.

The agaar.mn digital map was developed by the Mongolian government as a transparency tool to showcase the state’s long-term commitment to informing and engaging the public with air quality information. This initiative was reminiscent of a particular trend in democratic societies

wherein the availability of information was becoming a "moral good" and a way to deal with complex problems such as pollution, biodiversity, climate change, and other ecological problems (Fortun 2004a:288). In her ethnography of a U.S. Environmental Protection Agency (US-EPA) website, Fortun (2004b) argues that in the United States, information technology that addresses environmental problems developed out of the 1986 "Community Right-to-Know Act", a response to the 1984 Bhopal disaster in India. This legislation was adopted by the World Bank and UN programs, which led to an emergence of new, information-oriented programs around the world. These information systems provided an accessible way for grassroots organizations and citizens to locate and interpret environmental data that would otherwise be unavailable or difficult to understand. As Fortun describes, "[information technologies were] built around a conception of the user as a citizen, and around a conception of democracy that requires ongoing participation by citizens, even in matters that are extremely complex, both scientifically and politically" (2004b:65). In Mongolia, the government invested in a right-to-know initiative by creating a digital platform that provided more information to more people, city-wide.

The agaar.mn air pollution map was divided across administrative boundaries, highlighting the six municipal districts. The map was developed using 11 air quality monitors that were positioned in specific locations in each district. Programmers at NAMEM and the UB-AQMA selected popular landmarks familiar to Ulaanbaatar residents as places to install the monitoring equipment. In Ulaanbaatar, city dwellers navigated the city by referring to specific landmarks, rather than street names, since addresses were not commonly used during the Soviet era. Rather, households were designated a box in the Central Post Office for mailing purposes. "The monitors were placed along popular commute routes and city hubs… Like near universities, statues, and bus stops," Otgonbaatar explained. For example, an air quality monitor was placed at MNB, the

Mongolian National Broadcasting station, a landmark that was familiar to most Ulaanbaatar residents.

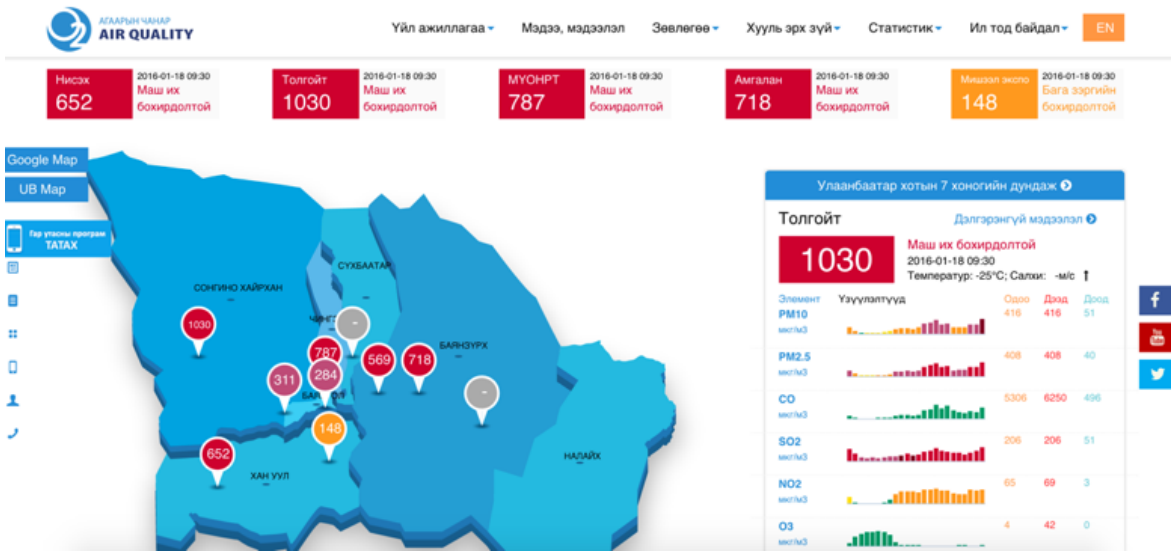
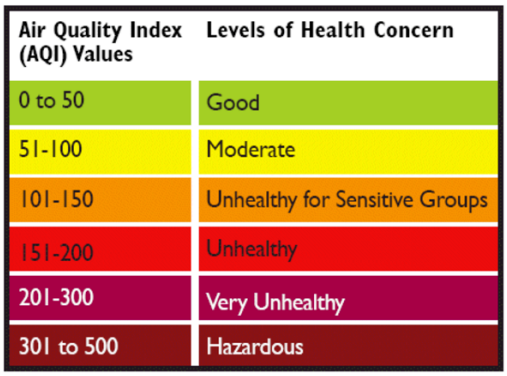


Figure 3: agaar.mn real-time air quality monitoring interactive map with color-coded air quality concentrations

The air pollution map was divided administratively, marked by municipal district lines that separated each administrative border. The map consisted of the district name, borders, and pins filled with color-coded numbers fixed onto specific locations. These pins represented each of the 11 air quality monitors that comprised the air quality monitoring network. These pins were labeled based on their specific regional landmarks with labels such as “Tolgoit”, “Amagalan”, and “Niseh”. The numbers and their associated colors represented the Air Quality Index (AQI), or thresholds of harm. For example, the number 1030 with the color red on the right-hand side was attributed the status “extremely polluted”. The box labeled 148 with a yellow color on the top right-hand corner reads “very little pollution”. According to this particular map in Figure 3, Songinokharkhan district is identified as the most polluted district with an AQI of 1030. In order to understand the significance of air quality thresholds, I will briefly explain the context and method through which the Mongolian AQI was developed.

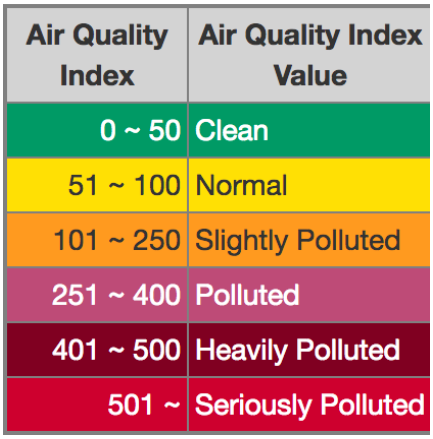
Developing Thresholds of Harm

Mongolia's Air Quality Index was developed in 2012 in collaboration between the Ministry of Environment and the Ministry of Health in consultation with air quality and international organizations, primarily the World Bank. In order to develop the categories and risk thresholds, the Mongolian government employed the United States Environmental Protection Agency's (EPA) index. Each pollution-level threshold was color-coded to indicate the hazard-level of air pollution. The index provided an enumerated threshold in 50 to 100 increments to signify the pollution levels. The AQI was developed as a tool to promote national transparency, and the Mongolian government invested in real-time air quality data websites, incorporating AQI into televised weather forecasts, and displaying air quality data on monitoring boards throughout the city sidewalks.



Air Quality Index (AQI) Values	Levels of Health Concern
0 to 50	Good
51-100	Moderate
101-150	Unhealthy for Sensitive Groups
151-200	Unhealthy
201-300	Very Unhealthy
301 to 500	Hazardous

Figure 4: U.S. Air Quality Index, EPA



Air Quality Index	Air Quality Index Value
0 ~ 50	Clean
51 ~ 100	Normal
101 ~ 250	Slightly Polluted
251 ~ 400	Polluted
401 ~ 500	Heavily Polluted
501 ~	Seriously Polluted

Figure 5: Mongolia Air Quality Index (AQI)

The Mongolian government amended the U.S. EPA AQI risk thresholds to encompass a broader range of numbers. While the "seriously polluted" in the U.S. EPA threshold stood between 301 to 500, the threshold for Mongolia was raised to "501 and above". The 301-500 range was compartmentalized into two separate categories of "polluted" and "heavily polluted." According to members of the Ministry of Environment and Ministry of Health, close attention to

air quality trends between 2012-2014 revealed a "standard" air pollution level that exceeded that of the United States. The AQI was ultimately adapted to these air quality patterns. Erdenzul, a member of the Ministry of Environment, stated, "we needed to find an index that suits UB's condition the best." Flexibility of the numbers promoted an "apolitical" or "objective" reading, despite being inherently political (Hacking 1990). While the 201-300 threshold was deemed "very unhealthy" according to US EPA standards an overlapping threshold, 101-250 was deemed "low pollution" according to Mongolian standards, with health advisories stating that "Unusually sensitive people will be negatively affected." Thus, here, the locus of blame shifted to "sensitive" people, not pollution. Similarly, while hazardous levels were considered to be at the 301-500 threshold in the US EPA index, the Mongolian index marked 501and above as "seriously polluted".

The flexibility of AQI's metric thresholds resonates with Shannon Cram's (2016) work on producing "permissible" levels of exposure among nuclear facility workers. Cram argues that exposure standards in nuclear work (which inevitably requires *some* exposure to radiation) relied on bureaucratic definitions of "safe injury". In the case of developing the metric thresholds for AQI, the Mongolian government, in collaboration with inter and intra-governmental partners, had to come up with permissible levels of air pollution, knowing that the public-at-large was exposed. Otgonbaatar explained:

> Air Pollution thresholds and AQI readings vary based on nation-state or city. In Mongolia, the government has adapted the AQI to suit the specific context of the city based seasonal and annual air pollution concentrations. For example, while U.S. EPA standards consider 201-300 threshold as "very unhealthy", Mongolian standards claim 251-400 threshold as "moderate pollution."

The Air Quality Index Value risk thresholds varied, not as a result of scientific reasoning, but as a result of administrative decision-making. Barry (2001) claims that air quality data is not a

reflection of the "natural state" of urban air. Rather, air quality data is an expression of the correlation between air and the government of an urban population (Barry 2001:169). However, my study suggests that the presentation of air quality data depended both upon scientific measurement and on political interpretation. In Ulaanbaatar, bureaucrats employed assumptions about the relationship between air quality and development to justify the risk thresholds under the Mongolian AQI. An official at the Ministry of Health proclaimed that it would be irresponsible and illegitimate to compare air quality standards with the U.S. due to the wide gap in industrial and energy development. While gas use had proliferated among industries and residential housing in the U.S., the Mongolian energy economy was still very much reliant on coal. "Gas-based countries have much better air quality. That's obvious. We're not there. Mongolia is so different. So, how could you compare? Of course air from coal is worse!" he stated. Other officials echoed similar sentiments, claiming that "the AQI needs to reflect our [city's] condition" and that "risk is different here." In such ways, officials were making claims that economic and development conditions should alter the scale and risk threshold for air quality in Mongolia.

In addition to justifications based on development trends, Mongolian officials also turned to biological and geopolitical reasons for creating a distinctly Mongolian AQI standard. Erdenzul explained, "Ulaanbaatar citizens have been living with poor air quality for more than a decade… It's not healthy [for us] but our bodies have adapted to these conditions."

> **Chisato:** Can you explain a little bit more what you mean by "adapted to these conditions"?
> **Erdenzul:** Mongolians have stronger lungs, so they can adapt to high pollution.
> **Chisato:** Stronger lungs than who?
> **Erdenzul:** The Chinese! [laughs]
> **Chisato:** Interesting… So, are you saying that high pollution levels are safe for Mongolians but not for Chinese people?

> **Erdenzul:** Well, I can't say for sure. We [Mongolians] have stronger immune systems that can support us through the year. But you know… This is a cultural thing. We're always competing with China on things. Economy, politics, even air. We have bad pollution in the winter, but our air's cleaner than China in the summer. They have it [smog] all-year-round!
> **Chisato:** Well, it's interesting that you mention China because I've been reading a lot in the news about Beijing's airpocolypse and the "red alert" emergency. What do you think about that? Why doesn't Mongolia have a system like that?
> **Erdenzul:** Personally, I don't think the [emergency] system is a good thing. The government should never cause panic among its people. No good things come from that.
> **Chisato:** But if pollution levels are really dangerous, isn't it better to shut down schools and warn people not to go outside?
> **Erdenzul:** The people have the information [referring to agaar.mn]. They can monitor themselves. Like, "Is today too high? Maybe it's better to keep the children at home." Emergency alert systems are too much. Citizens will be scared. Then the journalists start to come in, politicians get interviewed, news goes around the world… Then all the [different] governments start to point fingers, and everyone gets angry. It creates too much noise.

My conversation with Erdenzul revealed how political understandings of air pollution governance were tied to biological, cultural, and geopolitical justifications. Firstly, claims that Mongolian bodies were superior to Chinese bodies against polluted living conditions were commonplace. This stemmed from

other culturally-rooted notions that differentiated between Mongolian and Chinese bodies[24]. According to Billé (2015:3), "Sinophobia is intimately connected to Mongolian notions of wanting to distinguish themselves from China and Asia as a whole. In addition to corporeal distinctions, other Mongolian officials I met with emphasized that Mongolian lungs were "robust", "adaptable", and "strong" enough to live amidst heavy air pollution. They explained to me that the Mongolian nomadic tradition produced strong, resilient bodies that could survive freezing temperatures. This resilience was pertinent to adapting to polluted, urban settings. In

[24] Mongolian infants are born with a "blue spot" (*xux tolbo*), a birthmark that gradually fades away during the first five years after birth. According to Mongolians, this is a uniquely Mongolian physical trait and a symbol of Mongolian genetic legacy. Chinese infants, on the other hand, are understood as not having this mark, serving as evidence that Mongolians and Chinese are genetically unrelated (Billé 2015:100-103).

such ways, biological identity was very much part of the Mongolian political imagination, connected to "character and constitution, of blood, race, and nation" (Rose 2007:138).

Secondly, Mongolia-China relations played an important role in distinguishing "Mongolian air" from "Chinese air". Air was understood as something that could be contained within national borders. In part, these atmospheric distinctions stem from nationalist anti-Chinese sentiments that have been embedded in Mongolian culture for more than a century.[25] When I brought up the World Health Organization's 2012 air pollution ranking that listed Ulaanbaatar as the second most air-polluted city in the world, Erdenzul replied, "That [is] clearly wrong. China has the worst air pollution. The Chinese have poisonous air all-year long." The distinction between Mongolian and Chinese air was similar to the way Mongolians differentiated Mongolian and Chinese goods. Fruits and vegetables imported from China into Mongolia were considered "poisonous foods". At Mercury Market, a local food market in Ulaanbaatar, I frequently encountered women selling goods by claiming that their fruits came from Mongolia "*Mongoloos irsen*" or Russia "*Orosoos irsen*" to assuage any fears that the fruits at their stands were from China. Similarly, most fruit and vegetable sections had signs that read "Mongolia", "Russia", "America", or "Korea" to showcase the food's origins. I observed very few "China" signs during my trip to the market. Bawden (1961) claims that in Mongolia, cause of illness from an "impure" food was oftentimes connected to the nature of the person who sold it or the country of origin of the food (1961:234). Mongolians were continually differentiating themselves and their resources, including air, in an attempt to maintain "Mongolian-ness".

Thirdly, upholding stable governance was important in air pollution management. According to Erdenzul, the implementation of an emergency alert system was not beneficial to

[25] Mongolian national ideology encompasses differentiating Mongolians from the Chinese from how people walk, talk, dress, or present themselves. For more information on Mongolia-China relations, see *Sinophobia* by Billé 2015.

Mongolian society because it would catalyze fear or unrest among the city public and unnecessary media coverage. He believed that the individual citizen responsible for determining whether or not the air quality levels were hazardous for their families. In such ways, in creating thresholds of harm, air quality numbers and politics were reciprocal and mutually constitutive (Rose 1999:198). Air pollution governance in Ulaanbaatar drew upon cultural, biological, and geopolitical understandings of harmful air pollution levels.

Detecting Places of Harm

Returning to the agaar.mn air quality monitoring map, this spatial representation failed to capture the diversity of air pollution exposure. The map omitted people, ecological forces, political economy, and human experiences that comprised Ulaanbaatar's polluted landscape. As Choy (2011) notes, land-based pollution maps "divert us from the movement of air and breathers alike – not to mention mobile pollution sources" (2011: 159). Similarly, Barry (2001) contends that the ways people breathe, cough, or experience air pollution are not factored into air quality calculations (2001:170). Fixing air pollution onto specific geographical locations provided a limited and singular way of understanding air pollution's effects. High pollution concentrations correlated with higher risk of exposure and possibility of bodily damage. But city life is far from fixed— it is mobile, fluid, and changing. Thus, this map did not provide a holistic representation of how pollution can affect people's health through different scales of time and space. Following Choy's (2011) affective and phenomenological approach to studying air, I suggest that Ulaanbaatar's "airscape" must account for wind patterns, density, color, and smell (2011:160).

As a user of the interactive air pollution map, you could click on specific pins to learn more about the different air quality measurements and contents such as NO2, CO2, and PM2.5. Much like Fortun's (2004) discussion of the Environmental Defense Fund's Scorcard.org, the

website encouraged users to "wander through" different kinds of environmental and public health information (Fortun 2004a:293). The product was designed under the assumption that city dwellers would incorporate real-time air quality data into their everyday routine. For example, the map could provide a visual cue to help citizens avoid specific commute routes or locations during peak pollution levels. However, Barry (2001) asks whether accessibility to air quality data can "produce subjects who are capable of making calculations of health risks of living, driving, and walking in the city? Can it lead to rational action?" (2001:169). My ethnographic research among middle-class Mongolians suggests that metric-based readings did not directly correlate with self-regulation or air pollution-protective behavior. As one resident, a university student in the School of Journalism explained to me, "The website shows us that the air pollution is horrible during the wintertime, but there's no information about what we can do about it. The government is trying to place all the responsibility on us. Like we are responsible for ourselves. But what can *we* do?"

Despite the "availability" of air pollution information on the internet-based platform, it is important to note that this information did not "reach" the whole Ulaanbaatar population. Firstly, the demographic of internet-users and non-users varied across class. Even though many *ger* district neighborhoods had access to internet, they did not regularly visit to the agaar.mn website. When I asked *ger* district residents why they did not visit the site, most responded, "It doesn't tell us anything" or "We don't need numbers to tell us that the air is bad!" As I will describe in the next section, families understood spaces of harm, not in relation to metrics, but through everyday engagements with polluted air. AQI readings and pollution maps were not integral to their daily routine. In contrast, some middle-class Mongolians and many American and European expatriates incorporated daily agaar.mn "check-ins" as part of their daily routine during the

winter season. Secondly, there was a variation in digital platform usage across ages. Middle-class university students, Mongolia "re-pats" (Mongolian citizens who were educated overseas and returned to Mongolia for employment), and middle-class Mongolian families who had young children checked the status of the city's AQI from time-to-time. This was in part because the website required some level of "fluency" in interpreting the air quality data. For example, users needed to be able to understand what the numbers represented and how they corresponded to different thresholds of harm.

Based on my conversations with people across a range of demographic categories in Ulaanbaatar, the website users were mostly middle-class Mongolians who attended university overseas in the U.S. or Europe and returned to Ulaanbaatar to work in the environmental or public health sector. Rather than using the information to improve their own daily lives, many young, middle-class Mongolians used the air pollution map to hold informal discussions on how to approach air pollution policy and push for government action. For example, Altangerel began using the agaar.mn platform as an advocacy tool to show how air quality levels have not improved since implementation of the stove-replacement program, a multi-year intervention that attempted to curb air pollution by switching domestic stoves in the *ger* districts for more fuel-efficient ones. I watched him give a presentation to a small group of anti-air pollution activists, which included urban planners, university students, and small company owners. Altangerel began his presentation with an introduction to the sources of air pollution in Ulaanbaatar. He attributed 80% of coal emissions to household stoves in the *ger* districts. He showed a screenshot of two air pollution maps, side-by-side. One map was from 2014 and the other from 2016. "These maps are from the same date and time of day," Altangerel explained. "Do you see a difference?" he asked the audience. Enke, a university student replied, "It's the same! The

numbers are the highest in Songinokhairkhan." Altangerel nodded and paced around the room. He explained that despite a five-year stove replacement program, the government has failed to improve the air quality. "The truth is in the numbers," he repeated, over and over throughout this presentation. For Altangerel and many other activists in Ulaanbaatar, the agaar.mn platform served as an invaluable source of spatial evidence that the same areas of the city, notably municipal districts with the highest *ger* district population density, remain highly polluted.

Taken together, air pollution maps spatialized harm onto specific geographical locations based on administrative demarcations and metrics. Programmers sought to link particular municipal districts with specific thresholds of harm. However, these maps were not objective representation of air quality. Behind the color-coded metrics and municipal map lay a deeply political process that encompassed comparisons with other countries' air quality and stage of development, differentiation in biology, and advocacy.

BODY MAPS: SPATIALIZING HARM THROUGH TEMPORALITIES OF EXPOSURE

Amraa and I walked her three children to school, just fifteen minutes from the house, and then headed to the bus station at the bottom of the hill. The smog mixed with the bitter cold air was alarming. I had made a conscious decision to not wear my pollution mask during my homestay, in order to prevent suspicion among my host family and the neighborhood community. This particular morning, I worried that I was sacrificing my lungs for my ethnography. We both buried our faces into our scarves as we reached the end of the street. We were engulfed by the sound of the cars zooming past and honking. There was no traffic light – the road was at a fork – and there were many buses and trucks driving past in this industrial section of town. I could make out the cars, but I didn't trust that they saw us. Amraa grabbed my coat and we sprinted across the street

after the line of trucks passed. It was a short sprint, but my lungs felt heavy from all the pollution I swallowed in my short breaths. We waited for the bus for 10 minutes (which felt like an hour) with our hands stuffed into our coat pockets. No one at the bus stop was talking. Amraa, who is usually very chatty, was quiet the whole time we waited. Every time a bus stopped at the station, I had misread the numbers. From a distance, the number 30 looked like 20, and the color of the buses looked faded. "This is the most dangerous place," Amraa muffled through her scarf as she pointed to the ground.

Body-Environment Sensors

Air pollution maps marked by administrative borders and metrics did not represent how most *ger* district residents understood the spatial distribution of air pollution-induced harms. Rather than correlating air pollution concentration numbers with municipal districts identified on the agaar.mn website, urban residents employed their bodies as sensors to connect specific spaces of harm with particular moments of exposure. Residents produced knowledge of exposure through their daily routines such as waiting outside for the bus to arrive, walking to school through polluted neighborhoods, sitting on a bus with drafty windows, or working outdoors in the smog for prolonged hours. Residents' knowledge of harmful spaces was informed and shaped by lived experience.

Out of 200 surveys that I distributed to *ger* area households, 172 surveys did not identify specific administrative district names as places of high exposure. During the beginning stages of distributing this survey, I expected residents to identify one of the six administrative districts in Ulaanbaatar as geographical locations of high exposures with answers such as "Songinokhairkhan

district" or "Bayanzurkh district"[26]. However, most residents identified particular pathways and landmarks such as "the way to school", "the bus stop", and "water kiosk". As part of my interview, I asked residents to identify areas with high pollution on a print-out of a city map marked with district borders. On numerous occasions, residents explained to me that an administrative map was not an accurate spatial portrayal of the distribution of air pollution's harms. Baagii, a neighbor who lived down the street from my host family's home explained to me, pointing to the print-out map:

> This is how the government talks about air pollution. Using high numbers and things we can't understand to talk about what we can already see and smell. Our bodies tell us things that numbers can't. Chisato, pollution is sensitive to us. We live with it [pollution] differently than people with power and money. It's not a science – it's life.

For Baagii, my approach to understanding residents' perspectives on the spatial distribution of harms was not only ill-conceived, but insensitive to the people who were both harmed by and blamed for pollution. Administrative maps reminded residents of pollution mitigation projects that rendered them responsible. Following the responses indicated in my surveys, I further inquired about the different types of landmarks that residents described. While these landmarks were understood as areas of high exposure, they also served as indicators for evaluating pollution levels in other parts of the city. One woman living in Songinokhairkhan district, northwest of the city center explained to me:

> The first twenty minutes walking through my neighborhood is difficult. I can barely see [through the smog] and my nose and throat sting from all of the smoke. Then, I have to cross the street to the bus stop, which really scares me. I can't see how fast the cars are moving, it's all a blur… Once I'm on the bus, it's a little better. And the closer the bus gets to the city center, the smog gets lighter and lighter. By the time the bus passes Sukhbaatar Square, it's like someone lifted a curtain. The air is still gray. But the air just isn't as *thick* as where I'm from.

[26] As discussed in the first section of this chapter, during the first phase of this project, I worked primarily with air quality technicians and air pollution reduction programming staff whom identified Songinokhairkhan and Bayanzurkh districts as locations with the highest air pollution. concentration. They made this correlation, not solely based on air quality metrics, but also through estimating population density. These two districts were identified as the most densely populated district of the city, which led programmers to conclude that these districts had the most coal-burning stove use population.

Other residents with whom I spoke explained that the bus stop in their neighborhood was the most harmful place, due to the high volume of traffic and the long period of exposure. Vehicle exhausts were understood as particularly harmful to children whose mouth and nose were directly at "street level", making them more vulnerable to car exhaust than adults. This provides a stark contrast to birds-eye-view spatial maps: pollutant concentrations were not the same at street level and skyscraper level. Depending on the frequency of the bus lines, some residents explained that they need to wait for over 45 minutes in the "cold, smoggy outdoors" until their bus arrives. Parents were also concerned with the rising number of traffic accidents that led to the death of young children. Due to decreased visibility from smog, drivers were known to hit children with their cars during morning traffic.

These spatial understandings reveal a few important characteristics about the relationship between air pollution and harm. First and foremost, these different spaces of harm were determined through lived experience. This meant that rather than drawing from metrics that determined an air quality concentration, urban residents used sensory attunement to evaluate certain locations as harmful and other areas as less harmful. The color, smell, and thickness of the air served as indicators of different levels of harm. By attuning to how their bodies felt within these moments of exposure, they distinguished locations of harm. Second, air pollution-induced harm was not only understood as internal harms (such as respiratory effects) but also with other bodily harms such as car accidents, obscured visibility, slipping on the street on the way to the kiosks, among others. Thus, toxic harms were not understood in isolation from other kinds of harms. Rather, they were entangled. Third, the temporality of harm was understood with specific locations having different air qualities depending on the time of day. Residents correlated high air pollution with early morning and evening, which correlated with household stove use in the *ger* districts. This

kind of pattern-making illustrates how inequalities embedded in these exposures were not determined solely by where one lives but *how long* one lives in that location. Fourth, the aesthetics of air and air qualities played an important role in how city dwellers detected spaces of harm. Harmful spaces were associated with different kinds of air properties such as thickness, dark color, and imbued with poisonous matter. The ways in which sensory attunement played a role in residents' understandings of air qualities resonates with Mrazek's (2002) study of road infrastructure in Dutch colonial Indonesia. Mrazek (2002) examines people's connection with infrastructure in deeply aesthetic terms. In contrast to the muddy, soft, dirt paths of pre-colonial Indonesia, Dutch influence brought a new sensory and political experience with the hardness of the road, intensity of black-colored asphalt, and its smooth finish. In Ulaanbaatar, residents became aware of the dark color of the air and its smoky properties. These material aesthetics of air played an important role in dictating poisonous places.

Disputing Metrics

Residents also employed their body maps to dispute AQI numbers that attempted to spatialize air pollution onto specific locations. Air quality information boards were stationed in different parts of the city along popular commuter routes. A color-coded AQI number was displayed on the screen to indicate the level of harm a particular location had at a given point in time. The information board was calibrated to the nearest air quality monitor, which updated the board based on air quality levels detected by the monitoring machine. During my observations of commuter behavior near the information boards, I rarely encountered people who glanced at the screen. Rather, most people walked passed the screen without looking up, and continued to walk on the sidewalk. However, I noticed many commuters on the bus glance at the information board, and it aligned at eye-height of people sitting down on the bus.

During one of my many bus commutes into the city center with my host sister, Amraa I learned how urban dwellers employed sensory knowledge to dispute scientific claims about air quality. While we were sitting on the bus, Amraa tugged at my coat and pointed at the air quality information board. “It says 430. That can’t be right,” she stated. “The air is so light grey [here] compared to where we got on the bus,” Amraa continued to explain how she coughs less along the sidewalks of Peace Avenue and that air doesn’t sting her eyes as much as the air back in her neighborhood. Amraa’s body served as a sensor for different kinds of harm that she encountered throughout the day in different locations. *Ger* district residents were informed about spatial distribution of air pollution-induced through sensory, bodily, and phenomenological experiences.

Scholarship in science and technology studies refers to this kind of knowledge as a “public understanding of science”. For instance, Brian Wynne (1992) in his case study of Cumbrian sheep farming demonstrates that local farmers drew upon local farming ecology and grazing behavior in order to detect radioactive contamination on their farmland. Because this knowledge did not “count” as evidence among district authorities and scientists, their responses were dismissed. While Wynne’s analysis attempts to break down the expert/lay divide in knowledge production, my ethnographic case study illustrates the blurring of what counts as expert knowledge and lay knowledge. As regular commuters and long-term residents of the city, *ger* district residents not only employed particular kinds of sensory pattern-making, but also interacted with scientific knowledge of air pollution in their experiential production of air-quality knowledge and its associated harms. Amraa, who spent many hours commuting by bus, understood that air quality levels differed between her neighborhood and the city center. While the numbers on the AQI board outside rendered the air quality 430, her body and her experience navigating the city’s air quality told her something else. Amraa suspected that the air quality was much worse.

RESIDENTIAL MAPS: SPATIALIZING HARM WITHIN REGIONAL ZONES

In the previous sections, I have shown how pollution maps distributed metric-based harms along administrative borders and how body maps located spaces of harm through sensory knowledge of the urban landscape. In this section, I will examine residential zoning maps that demarcated distinct pollution zones along class lines. Housing and urban development starkly divided the urban landscape into rich and poor regions. In this section, I will show how air quality was employed by urban developers and real estate companies to justify these spatial disparities.

Zones of Harm

At the time of this research, Zaisan was developing as the most high-demand residential area in Ulaanbaatar. Zaisan, located in *khoroo* 11 of Khan Uul district, south of the city center, became a residential area for middle-class Mongolia families and foreign expatriates. Zaisan was part of the Bogd Khan Uul National Protected Area, a region historically considered a place of spiritual significance and off limits to any form of development[27]. The only way to gain permission to build is to obtain approval from the state. However, due to the absence of a zoning code and the municipality's loose regulation of the land permitting process, several land developments were implemented in the region. Urban developers, politicians, and business leaders began acquiring the land and building residential complexes and business centers in the area in the mid-2000s. All the buildings were built illegally, but no regulations were in place to prevent or prosecute those

[27] Today, Bogd Khan Uul is a Strictly Protected Area. This is the oldest protected area in Mongolia, which was first established in 1778. Bogd Khan Uul continues to hold historically and cultural significance for Mongolians as a spiritual place of worship. In 1995, the area was formally designated the title of "a strictly protected area" in accordance with Mongolian law.

who developed the land. As one developer explained, “Due to the lack of interest and investment in long-term urban planning, the city municipality distributed land permits in exchange for bribes. There really weren’t any residential complexes 5-6 years ago. It’s a recent development.”

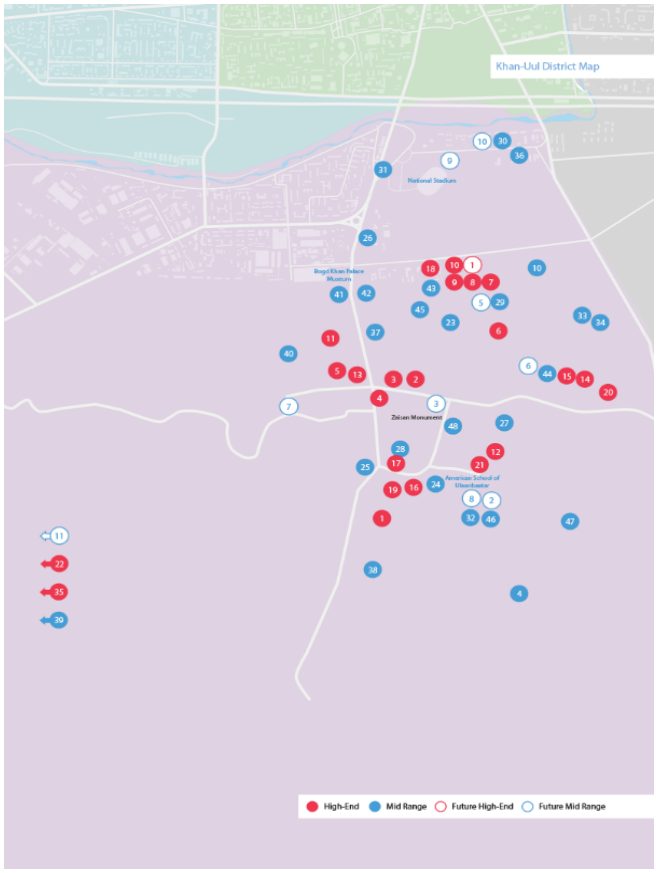


Figure 6: Apartment complexes in Khan-Uul district. The Mongolian Real Estate Report 2015.

The driving force behind the Zaisan area’s development was the city’s air pollution. Middle to upper-class families began investing in luxury apartments being constructed in “cleaner” air zones. According to urban developers, due to the increasing air pollution, residents preferred to live in the Zaisan area and that there will always be a demand for developing these areas. The mining boom and the rapid growth of the Mongolian GDP put many Mongolian families in financially secure positions. Others were attracted to the Zaisan area because it was located in Khan Uul district, a city area with the smallest *ger*-dwelling population. According to a real estate

report conducted by M.A.D, only 7486 of the district's 39,189 families reside in *gers*. Fewer *gers* meant less coal smoke.

I conducted interviews with urban planners and real-estate developers, many of whom were focusing on apartment developments in the Zaisan region. Bat-Erdene, an urban planning expert for a private company, SmartGrowth, explained to me how land value increased as one moved farther away from the *ger* areas and the city center. Since 2005, many middle-class families began to move into newly-built apartment complexes located in the southeastern part of the city. In comparison with previous decades when the city center was the epicenter of middle-class families, recent trends had families opting to live farther away from the center, and in neighborhoods closer to the mountains. I sat down with Bat-Erdene to learn more about the relationship between air pollution and the Zaisan neighborhood:

> **Chisato:** Why are more and more middle-class families moving to the Zaisan area?
> **Bat-Erdene:** People know that Zaisan has much cleaner, fresher air. Families understand that they can be safe there.
> **Chisato:** What do you mean by safe? Safe from what?
> **Bat-Erdene:** The smog. The apartments in Zaisan are built far away from the smoke, so families don't have to worry about exposing their children to smog on a daily basis. Wealthier families have drivers to send their kids to the international schools nearby. They don't need to deal with walking through all the smog in the city center.
> **Chisato:** So, families [in Zaisan] are safe because they live far away from smog? How do you know that smog isn't reaching Zaisan?
> **Bat-Erdene:** I told you, the air is much cleaner in Zaisan.
> **Chisato:** But how can you tell?
> **Bat-Erdene:** The air is clearer. Not that dark gray color like in the city center. You can actually see the difference in color.
> **Chisato:** So you're saying that being surrounded by dark smog is hazardous to health.
> **Bat-Erdene:** Of course! Think of all the poison that combines to make that [dark] color. We shouldn't be breathing that kind of air. The farther away from it that you can go, the safer you'll be.
> **Chisato:** Are there other areas of the city that are considered safe?

Bat-Erdene stood up from his chair and walked over to an administrative map of Ulaanbaatar hanging on his office wall. He pointed out the city center and waved his left hand over

the northeastern and central regions of the city and explained, "this whole region here has become one, big pollution zone." He then pointed to the right-hand corner of the map and stated, "This portion is safe, the air quality is much better." Bat-Erdene continued to explain how the city's pollution levels have evolved, asserting how Zaisan is now "the only place protected from smog." He paused and continued, "Of course, the moment you leave the city, the air is the clearest and freshest of them all!" According to Bat-Erdene, the city's spatial configuration of air pollution was divided into two distinct spaces: 1.) an air pollution zone that comprised of the *ger* district areas and city center; 2.) a clean air zone in Khan Uul district near Bogd Khan mountain, including Zaisan. "Dark smoke" was understood to permeate the atmosphere of the majority of the city, with the southeastern corner of the city as an exception.

During a focus group discussion, Zaisan residents shared a similar spatial understanding as Bat-Erdene on the distribution of air pollution-induced harms. The focus group consisted of five participants: Munhjargal (46) and her husband, Bold (48)— residents of Buddha Vista, Enkhjargal (38), a resident in Zaisan's Buddha Vista, Muugi (48), a resident of the city's newly established Marshall Town, and Bat-Erdene, an urban planner.[28] I began the discussion by asking participants to explain what factors contributed to their choice of residence. Munhjargal explained that she did not want to raise her children in a place that unsafe. Both Munhjargal and Bold did not want to raise their children to grow up surrounded by toxic air.

> **Chisato:** How do you know that you're more protected from pollution in Zaisan?
> **Bold:** There is not a lot of smoke around Zaisan compared to other areas. If you go to the northern side of the city, the air is black. Like, when I drive through Zuun Ail, the smog is so thick, I can't even see the cars in front of me.
> **Munkhjargal:** The air is much lighter around Zaisan. You can see the difference.
> **Muugi:** I live on the 14th floor of my apartment building and I always see a thick smoke in the morning from far away. There's a straight line that divides the sky. Dark gray at the bottom and white [on the top].

[28] I purposefully refrained from recruiting *ger* district residents joining this focus group, as the discussion of pollution and spatial aspects of smog could have potentially caused conflict or emotional harm to focus group participants

Munkhjargal drew an image of her building and the pollution line. "I live above the line," she remarked.
Bold: Yeah, that's well said. The higher up you live, the safer you are, too. The smog always hangs low.
Chisato: What do you mean by "the smog hangs low"?
Bold: Well, you see, all the smog comes from the *ger* chimneys. All those [chimneys] are around 8 feet high. The pollution never rises. It stays at the same level.
Chisato: How about winds, though? Can't winds carry the smog to different elevations?
Bold: The winds blow from the northwest to the southern corner of the city in the mornings. But this doesn't affect the elevation. Have you climbed up the Zaisan memorial? You'll see the distinct line from up there.
Chisato: Okay, but if the wind moves the pollution, then wouldn't it reach Zaisan?
Enkhjargal: No, not really. You have to cross a bridge over the Tuul river to get to Zaisan. The river acts like a curtain to prevent the pollution from seeping across to the south.
Bold: (chuckles) There's a saying in this city – the more bridges you cross, the wealthier you are. The more rivers between you and the city center, the more protected you are from smog.

Bat-Erdene drew a map in his notebook, marking the city center with a dot, *ger* districts as an abstract space, and the Tuul river as a demarcation of line for pollution. The arrows in the image reflected the ecological patterns of winds. Munkhjargal and Bold chimed in, explaining that the river was an important ecological feature in the landscape. These maps illustrated air pollution as a containable phenomenon with both stratified and uneven spaces. Residents living in higher up buildings were understood as safer than lower floors. And residents living on the other side of the river were more protected than residents that were living outside of this zone. Bat-Erdene initiated a mapping exercise, where residents had to pinpoint the most polluted to cleanest part of the city. Middle-class Mongolian families living in the Zaisan area saw their place of residence as protected against the toxic pollution that permeated in other parts of the city. Their spatial understanding of air pollution was divided into two regions, polluted and non-polluted. The demarcation of polluted vs. non-polluted was also distinctly topographical. The Tuul River marked the threshold of polluted and non-polluted regions of the city. Therefore, the most southern region of the city was understood as the least polluted.

In such ways, urban Mongolians stratified the capital city by different elevations, and proximities to the city center. Today, real-estate values continue to be high for properties on the mountain because people can remove themselves more from vehicle pollution and congestion (Choy 2011:160). High-rise apartments were also understood to reduce exposure to the soot below. Unlike Hong Kong's case, however, real estate in the Zaisan area of Ulaanbaatar is a recent development, and properties were built with air pollution particularly in mind. As Bat-Erdene explained, "the wealthy don't want to live in smoggy places."

Matter Out of Place

While city dwellers discussed the spatial geography of pollution, these stratifications were not solely about air pollution. Their responses were embedded within a political economy of place: spatial proximity to the *ger* districts. Ideas about harm extended into the realm of safety and well-being. Stereotypes about the *ger* district residents and their position as "matter out of place" came out during the focus group and interviews. In other words, social divisions that were pre-inscribed onto the city landscape played an integral role in middle-class families' spatial understanding of air pollution.

> **Chisato:** What are some other reasons that attracted you to the Zaisan area?
> **Bold:** It's cleaner and safer for our kids. We didn't want to expose our kids to the poor *ger* district people.
> **Chisato:** What do you mean?
> **Bold:** They [*ger* district people] are poor, desperate, and uncivilized.
> **Enkhjargal:** People living over there are not good for children.
> **Chisato:** So, you mentioned before that pollution was one reason for moving, but safety and well-being was another also served as reasons?
> **Bold:** Of course, they're completely related.

Contamination extended beyond the contents of air pollution as hazardous particles. For middle-class families, pollution was attached to the bodies of the city's marginalized population and the political economy of the informal coal industry played an important role in understanding

these cultural stereotypes. In other words, *ger* district dwellers were considered "matter out of place" (Douglas 2002 [1966]: 44) in Ulaanbaatar, as they were formerly rural herders to settled in informal places throughout the city. Preexisting stereotypes about *ger* district areas and residents played an integral role in the spatial demarcation of the city landscape. Residents were concerned about harm, not in terms of health but also safety in the *ger* districts more broadly. They explained that rabid dogs, theft, alcoholism, domestic violence, and street crime were commonplace in *ger* areas, rendering places "over there" as dangerous spaces. However, these knowledges were not formed through direct experience in the *ger* areas, but rather through long-term stereotyping of the social lower-class. In my interviews with residents, I asked about their opinions about the *ger* districts and reasons why they upheld these views. Some could not articulate clearly where their opinion came from, often accompanied by a long stretch of silence. From my observations, these silences were often followed by caveats or reflections on how such stereotypes were formed. In other words, these moments of silence served as valuable insight into how saturated the stereotypes of the *ger* districts were in local discourse. Stereotypes existed, but people could not identify why, how, or where these judgements came from. Out of the 60 interviews I conducted with middle class residents, only 14 people revealed that they had actually spent time in the *ger* areas. One informant, a university student, explained that she visited her aunt during Tsagaan Sar, the White Moon celebration, to greet the new year with her older relatives. She explained to me:

> If you don't have a relative living there, there's no reason to visit the *ger* districts. The pollution's horrendous, the people are poor, and the streets are dangerous, especially at night. It's not a place for women to walk around and it is certainly not a place for children.

In addition to interviews, out of 200 surveys, 197 responses identified household stoves in *ger* district areas as the main cause of air pollution in Ulaanbaatar. My analysis of municipal newspapers revealed scores of articles concluding that anywhere from 40-80% of the air pollution

stemmed from coal-burning stoves. In the years spanning 2012-2016, I found over 26 articles in the municipal newspapers correlating air pollution to the *ger* districts. Over the course of two years, I attended six international consultation meetings on air pollution and urban development where *ger* district residents were explicitly called criminals. For example, as I describe in Chapter 6, at an international conference on air pollution sponsored by UNICEF and Public Health Institute, a ministry official from the Department of Energy exclaimed, "We must punish these coal-burning criminals! It is their fault that we are breathing this poison. We must strictly enforce a fee on those who burn coal!"

This negative sentiment toward *ger* district dwellers echoed in the production of real-estate marketing and broader classism. Literature on gentrification and urban flight parallels these narratives on the making of desirable and undesirable residential areas. For example, Melissa Checker (2011) examines the deeply political nature of "environmental gentrification" of urban space in a neighborhood in Harlem, New York City. She argues that what appeared as politically-neutral, consensus-based planning was actually in practice, environmental gentrification that subordinated equity to profit-minded development. Further, Sze (2007) shows how zoning in Manhattan was employed to protect residents from noxious industries, but also worked to protect high property value and reinforce the city's social stratification. As the city grew, these unrestricted districts came to house increasing numbers of both industries and residents. "Many poor and working-class areas like Harlem were classified as unrestricted" (Sze 2007: 43).

Sociologists Park and Pellow (2011) reveal how the development of the elite ski resort in Aspen, Colorado depended on low-wage immigrant labor to fuel its service economy. In response to federal government restrictions on immigrant labor, the county used environmentally-friendly living as a justification for continuing to employ immigrants from Latin America to sustain

Aspen's nature-friendly community. Their study describes two different Aspens: one catered to the American elite and one where low-income immigrants are cooking, cleaning, and building the town for the white privileged class. Slum areas were often perceived as being polluted and blamed for the pollution, even though it was the residential market of the elite class that was driving the pollution.

Residential Hierarchies

Zaisan, an area designated as a National Protected Area, was now reconfigured as a living space for middle-class Mongolians and expatriate families. Clean air became an amenity that could be obtained by those who could afford it. Living in the "safe zone" came at a price. Developments ranged from high-end luxurious 2-3 floor townhouses to duplex apartments (such as in Buddha Vista). The developments have thus far proved extremely popular with locals and expats alike, maintaining very high occupancy rates since their launch. Rent in the residential compound, Buddha Vista ranged from $2,000 to $5,000 a month for a two-bedroom apartment. According to urban developers, most Zaisan dwellers were wealthier families with family members that were politicians or coal mining executives. Many explained that the boom in Oyu Tolgoi (Turquoise Hill) gold mining investments catalyzed a spike in middle to upper class families in Ulaanbaatar.

Marketing the "quality" of land, ie: distance from the *ger* districts, these areas were becoming more lucrative. Future development in Khan Uul district focused on high-end apartment complexes that sprawled from the southern end of the Tuul river. As the 2015 Mongolian Real Estate Report states, "Apartments in Khan Uul are the best quality and best location, due to its distance from the *ger* districts." In order to both accommodate residents and attract newcomers, real-estate developers built new private elementary and high schools such as the British School of Mongolia and the American School that had an English-speaking core curriculum. Clean air was

not the only amenity in Zaisan neighborhoods. Swimming pools, restaurants, international grocery stories, and cafes were as much part of the neighborhood feature as were the apartment buildings themselves. By creating a "safe bubble" where residents could dine, shop, play, learn, and dwell, real-estate developers focused on creating communities so that they didn't have to leave the bubble.

Projections for the city's real-estate market follow the trends moving away from the northern region of the city. During a personal interview with Bat-Erdene, he explained, "I think that there will be more [residential] properties built away from the city center in the future." He revealed how wealthier households were building summer homes away from the pollution zones. He explained that north of the city, Beleg has become a popular area for building summer homes. People working in government or the private sector built their homes in these areas. The safe, clean air areas were now either further north or south of the *ger* areas. He pulled up the agaar.mn website on his laptop to pinpoint on the administration map, the areas of the city with the better air quality. "As the population of the wealthier Mongolian grow here in UB, there will be a greater demand for new, modern homes in these areas, cleaner air neighborhoods."

Evan Hastings, an urban developer working for Mongolian Properties, explained that apartment-dwelling has become associated with proper urban citizenship. He explained:

> At this point, I think air pollution has become just another reason to justify why they should develop it – why you should live there – like a cleavage point for social difference – clean air vs. dirty air residences. You have to live in one of these spaces that are prescribed as appropriate for city's future development.

Wealthier urban citizens rationalized their decisions to move into luxury apartments employing knowledge of air quality. These knowledges focused on ecological factors, air flows, and spatial knowledge of their urban landscape, identifying landmarks that distinguish these territories.

CHAPTER CONCLUSION

In this chapter, I have shown how uneven distribution of air pollution-induced harms was formed through a combination of factors from residential dwellings, ecologies, sensory attunements, markets and class-based stereotypes. First, I showed how air quality monitoring maps sought to order air pollution within administrative boundaries of Ulaanbaatar. Municipal districts with a high population of *ger* district dwellers were regularly represented as the most polluted spaces in the city. Thresholds of harm through the AQI were not objective measurements of air quality, but deeply political ones that involved administrative decisions. Economic development trends, distinctions in biology and air quality, and local understandings of governance played important roles in justifying the creation of a Mongolian AQI. I also showed how while these pollution maps correlated high air pollution concentration with higher risk of exposure, they failed to account for the diversity of air pollution exposure.

I then continued to describe body maps as tools for placing harm in particular moments and pathways of exposure by employing sensory and ecological knowledge of the urban landscape. Rather than distinguishing places of harm based on administrative borders, I showed how urban dwellers articulated spaces of harm based on lived experience of air pollution in their everyday routine. Spaces to-and-from home during errands, route to school or work, and places of long-term exposure (like bus stops) were identified as the most hazardous spaces. Oftentimes, these types of knowledges clashed with the air quality monitoring maps, as metric-based understandings did not resonate with city dwellers' understanding of toxic exposure.

Thirdly, I demonstrated how residential zoning maps spatialized harm based on more regional approaches to demarcating polluted and non-polluted zones. Class-based stereotypes, ecological factors, and market dynamics shaped the ways in which urban planners and middle-to-

upper class urban Mongolians understood and constructed spaces of harm. Beck (1992) famously claimed that in a "risk society" class ceases to be relevant in toxic exposure and that the hierarchical logic of class is replaced by a more egalitarian distribution of risks. However, my case study of mapping practices reasserts the importance of class in the physical and spatial distribution of toxic harms. As I showed in my discussion of residential zoning maps, class plays a critical role in determining areas of real estate development. The most desirable places to live were the farthest away from *ger* district areas.

Furthermore, these air pollution spaces reified preexisting social boundaries of marginalization and blame, wherein *ger* district residents are not only at risk of the most harm, but also blamed as the culprits for the city's worsening air quality. Douglas (1966) and Lincoln (2014) remind us that social boundaries are erected particularly in response to environmental health hazards that attempt to threaten social order. In the wake of pollution disaster in Ulaanbaatar, the city's most marginalized population may continue to be blamed for pollution, despite other factors such as the coal industry and corrupt politics also contribute to this public health disaster.

CHAPTER 4

MARKETING STRATEGIES: HARM AND RESPONSIBILITY

"The problem is, *ger* district residents aren't using the [fuel-efficient] stove properly. This proper conduct campaign is designed to discipline them by giving them step-by-step instructions on how to layer the fuel inside the stove, how to ignite it, and how to properly dispose of coal ash… If everyone follows this procedure, the stove emissions should go down this winter."

- Enkhbat, Ulaanbaatar Clean Air Project

"We've been following the [correct] stove use procedures. It's always on the news and on flyers in the *khoroo* office… It's everywhere. My kids are reading the comic book that Royal Ocean [LLC] distributed in October. Our neighbors over there are not following the rules. They're burning garbage and all sorts of polluting things because they're too poor to buy coal… Politicians who thought the air pollution will go down with stoves are insane. They are completely disconnected from reality."

- Baagi, *ger* district resident in Songinokhairkhan district

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In this chapter, I discuss two marketing strategies that aimed to mitigate air pollution by altering household heating practices in *ger* district communities. This chapter consists of three sections. In the first section, I situate the Ulaanbaatar Clean Air Project within anthropological literature on responsibilization and public health. The second section focuses on marketing strategies that promoted clean stove adoption. I describe what I call the "dolaahan amdral" or "warm life" campaign, which employed a financial mechanism and marketing strategy to target individual households to purchase fuel-efficient technologies. These mechanisms, developed in collaboration with the state, multinational organizations, and microfinance institutions, promoted the sale of fuel-efficient stoves first and foremost as a consumer product. I show how the intervention's failure to reduce air pollution emissions backfired and de-legitimated the state. In the third section, I describe a shift in marketing strategies from stove adoption to behavior

change that rendered all *ger* district residents responsible for adopting proper stove conduct. By following the Ulaanbaatar Clean Air Project's marketing strategy from its inception until final stages, I reveal how the program aimed to combine individual rational choice with state-based responsible citizenship.

MARKETING RESPONSIBILITY

The Ulaanbaatar Clean Air Project's focus on stove replacement as the primary strategy for air pollution management stemmed from a global discourse on the relationship between domestic stove use and public health. According to the World Health Organization (WHO), emissions from cookstove fuels lead to four million deaths annually (WHO 2009). In response to these staggering statistics, in 2010, a public-private partnership called the Global Alliance for Clean Cookstoves began a campaign to promote a global market for clean, efficient household cooking solutions. Clean cookstoves were marketed as a "miracle product" that would "save lives, improve livelihoods, empower women, and combat climate change" (Global Alliance for Clean Cookstoves 2016). This ambitious humanitarian program tackled both indoor and ambient air pollution to improve the lives of the marginalized. Hilary Clinton, the figurehead of this global initiative, explained that cookstoves "could be transformative as bed nets or even vaccines" (Washington Post 2010). Drawing in over 400 million USD from governments, foundations, and corporations, clean cookstoves were the all-in-one solution to many of the world's problems. Specialists from climate science, global finance, gender studies, to epidemiology were recruited to become part of this initiative and interventions began to take place in various communities throughout the developing world.

In Ulaanbaatar, the stove program was developed in response to ambient pollution levels that reached disastrous levels during winter months. The stove program was launched following

a World Bank study that concluded that stove emissions were responsible for at least 60% of the city's air pollution. Despite the fact that heating pipes, boilers, and radiators were hard-wired into the spatial construction of Soviet cities (Collier 2011: 208), a growing number of residents that were disconnected from these material infrastructures. Rather than focusing on large-scale infrastructural changes, the program promoted the circulation of "life technologies" (Redfield 2012) that focused on the fuel-efficient stove as a global health commodity developed by the state, multinational organizations, and private sector interests. Initial stove emissions reduction projects consisted of three main institutions, the Asian Development Bank, GIZ, and XacBank. Local Mongolian stove producers partnered with these organizations to help produce and distribute their stove models into the market comprised of *ger* district households. Despite selling 2,000 stoves, the initiative failed due to lack of funding. The Mongolian government introduced the Clean Air Fund (CAF) a special government fund that focused on air pollution mitigation initiatives. This fund was made through the collection of city pollution taxes, which were collected from car purchasers and users. In 2012, the World Bank launched the Ulaanbaatar Clean Air Project (UB-CAP) as a project supported by the municipality of Ulaanbaatar to oversee the stove program.

Recent scholarship in medical anthropology has examined "responsibilization" as a new form of self-governance and subjectivity, where individuals are tasked with intervening on health-seeking behaviors (Rose 1996, 2001; Castel 1991; Petersen and Lupton 1996). For example, in *Republic of Therapy*, Vinh-Kim Nguyen (2010) describes how HIV/AIDS sufferers in West Africa found avenues for treatment through projects of self-making. According to Nguyen, "confessional technologies" are testimonials and practices of disclosure that initially emerged as international aid organizations sought to give a "public face" to AIDS in order to

demonstrate programmatic effectiveness and keep money invested in their treatment programs (Nguyen 2010: 31). By disclosing their status of having a highly stigmatized disease and providing a good "story" of suffering, AIDS sufferers transformed themselves and others into "therapeutic citizens" to secure material resources, including medical care, money, and participation in HIV-related clinical trials to secure a better life. In place of an insufficient government, the AIDS treatment programs offer benefits and responsibilities including social networks, food, and hope of access to antiretrovirals that citizens would not receive otherwise.

Instead of becoming responsible for providing testimonials, the Ulaanbaatar Clean Air Project attempted to make urban residents "responsible consumers" of fuel-efficient technologies that were designed to save fuel cost, provided more heat, and mitigate air pollution. When the first phase of this stove adoption campaign failed, the state reconfigured their campaign toward a "proper stove conduct" behavior change campaign. This second phase attempted to discipline households to manage their fuel-efficient stoves "correctly". Therefore, similar to Nguyen's case study, government strategies shifted away from investments in larger infrastructures. Citizens were held responsible for regulating their own health, fuel usage and stove conduct in the midst of an air pollution disaster.

Other anthropologists have examined how government strategies often targeted the poor for environmental contamination and disease problems. For example, Briggs and Mantini Briggs (2003) show how in response to a cholera epidemic, the Venezuelan government under structural adjustment aimed to control the spread of the disease. They argue that the government intentionally deflected the blame for cholera outbreak from institutions to the victims, or poor, "unsanitary" citizens. My research traces a similar pattern, wherein the Mongolian government continued to target household stove users in *ger* district neighborhoods, not for outbreak of

disease, but as the culprit of the air pollution problem. Unlike Briggs and Mantini Briggs' (2003) study, however, the issue was not limited to discourse in the media. Rather, blaming practices toward marginalized communities in Ulaanbaatar manifested in the actual design and implementation of air pollution mitigation interventions. As I will show throughout this chapter, marketing strategies and program design focused on rendering the *ger* district residents responsible for altering their household technologies. This resonates with cultural theories that claim that risk plays an important role in maintaining social order. (Douglas 1992; Douglas and Wildavsky 1982). In particular, Douglas (1992) shows how individual responsibility manifests and reinforces already existing divisions of blame. In the case of Ulaanbaatar, *ger* district residents were easy to blame as they were already marginalized in society.

Rather than focusing on the materiality and the development of the fuel-efficient stoves as global environmental health objects, I am interested in the social and financial mechanisms through which the stove became a commodity in the poorest segment of the city population. In the following two sections, I focus on the relationship between a set of household practices (new stove consumption and stove use patterns) and ideal states (a comfortable, healthy household and a smoke-free city) and how these instruments attempted to alter the attitudes and behaviors of *ger* district residents toward air pollution mitigation.

MARKETING TECHNOLOGIES

In this section, I examine how the Ulaanbaatar Clean Air Project promoted fuel-efficient stoves as household products that could improve quality of life in the *ger* districts. Drawing from interviews with program staff, state officials, and stove producers, I show how financial mechanisms and social marketing strategies came together to draw attention to fuel-efficient stoves as a method to mitigate air pollution in the *ger* district communities at-large. While the

program successfully sold over 175,000 fuel-efficient stoves under the Millennium Challenge Account-Mongolia (MCA-M), the program failed to improve the city's air quality, catalyzing new efforts to meet the program's objectives to reduce air pollution.

Commoditizing Heat Value

The Clean Air Project and its stove-replacement program was developed in collaboration with the state, multinational organizations, microfinance institutions, and stove producing companies. This "global assemblage" of actors produced financial incentive mechanisms to foster the stove market in the *ger* district communities. The success of the project was contingent upon maximizing product sales.

In 2007, the Millennium Challenge Corporation (MCC) and the Mongolian government signed a five-year project agreement to increase Mongolia's economic growth and reduce poverty. Within the 285 million USD compact budget overseen by the local implementation institution, Millennium Challenge Account – Mongolia (MCA-M), 47 million USD was allocated to the Energy and Environment Project (EEP), which focused on improving the city's worsening air pollution. In 2011, the MCC introduced a stove subsidy, which was intended to financially incentivize fuel-efficient stove purchases.

Figure 1: Energy and Environment Project Financial Model for Stove Subsidies

As Image 1 illustrates, the EEP's financial model for the stove subsidies employed a linear, unidirectional framework, rationalizing subsidies as the pathway toward increased fuel-efficient stove sales. In this diagram, subsidies are projected to increase sales and use of fuel-efficient stoves, and in turn, decrease PM2.5 emissions from fuel-efficient stove use, improve overall human health, and improve economic stability within households. Within this financial model, air pollution mitigation, health outcomes, and poverty reduction were contingent upon successful distribution of a new household commodity. By adopting these new technologies, particulate matter in the atmosphere was projected to decrease up to 50% in certain regions of the city.

MCA-M financed 76% of the cost of fuel-efficient stoves, enabling stove consumers to purchase stoves at 24% of the original cost. A stove with a retail price of 320,000 MNT with the support of subsidies were reduced to a cost of 76,800 MNT, or approximately 75 USD. The Mongolian government's Clean Air Fund, which was a special fund formed through the collection of citizen pollution-tax, supplemented MCA-M funds, extending stove subsidies through 2014. With these financial mechanisms in place, XacBank, a Mongolian microfinance

institution oversaw the implementation of the stove distribution process since its inception in 2011.

I met with Tuul, the head of XacBank's Eco-banking department, who had been involved with the Clean Air Project as the head of overseeing the stove program. According to Tuul, the MCA-M and CAF subsidies improved sales of fuel-efficient stoves drastically, with over 84,000 stove sales during the 2012 winter season, compared to 2,000 stoves during 2011, a 42-fold increase in stove sales. Tuul attributed the success of increased sales mainly to the stove subsidies. She explained:

> *Ger* district families can't afford expensive appliances. No matter how great a product is, no one will buy it if it costs a full month's salary. They already have a working [traditional] stove in their home. Why would they buy a new one? What will they gain from a new one? So, our first challenge was to secure ways to make the stove more affordable and appealing to residents. The CAF and MCA subsidies helped reduce the cost by a lot.

According to Tuul, promoting a "long-term savings" rationale was equally as important as reducing the cost of the stove itself. According to the MCA-M, the fuel-efficient stoves were not only designed and tested to reduce air pollution emissions by 85-90% but the combustion mechanism within the stove chamber maximized heat capacity so that a household could save up to 30-40% on fuel costs. Tuul explained, "Marketing cost effectiveness of stove use was equally important. Basically, after purchasing the stove, families would save money on fuel costs, which would then allow for the stove to "pay for itself" within the first couple of months."

Figure 2: Marketing cost saved using fuel-efficient stove

While Clean Air Program managers worked to develop the "long-term savings" rationale in their project documents, stove producers employed this rationale to market their own stove products to various *ger* district communities. For example, Royal Ocean, LLC, a Mongolian stove company that sold the highest number of new stoves, highlighted stories of families that used money saved on fuel costs to buy other household appliances and furniture such as kitchenware, a shelf, and a new couch. Their brochures featured testimonials from Royal Ocean customers who expressed gratitude for the amount of money they were able to save since adopting the new stove.

Many families that I met with expressed satisfaction over financial savings as a result of new stove use. Families claimed that they saved at least 50% on fuel costs per month, which has helped them save money for school tuition and school supplies for their children. Amraa, my host sister, explained to me that saving money on fuel costs has been the biggest advantage for her family. She explained, "It's really important to be able to save as much money as possible. I gave birth to Temuulen two years ago and I was really concerned whether we had enough money

to raise him properly. My mother was the only one with a stable income at that time, and with three kids all of a sudden, it seemed impossible."

For Amraa, the promise of saving money was a key factor in her decision to purchase the new Royal Ocean Duul stove. During my homestay with her family, Amraa and I would run all the house errands together, including grocery shopping at the local market, collecting water at the kiosk, and purchasing coal at the coal depot. Wherever we went, Amraa would bring her "accounting notebook" with her to write down the amount of money spent on each item. When we went to the market to buy vegetables and meat in bulk, she would write the weight of the produce in kilogram and the amount of money spent. She flipped through her entries on fuel costs and pointed out the numbers to me. The numbers ranged from 50,000-60,000 MNT per month. Having worked in the coal depot with coal workers in the neighborhood, I knew that one porter truck full of Baganuur coal cost 120,000 MNT and a truck full of Nalaikh coal was 150,000 MNT during winter months. Amraa pulled out her neatly stacked, worn-out notebooks from the bookshelf and flipped through the pages to show me what she used to pay per month. "You see, look how much I'm saving now," she dragged her finger across the pages to point out the numbers. Just as I predicted, the numbers read in the 120,000-150,000 MNT range.

Acknowledging that Amraa's meticulous accounting was most likely not a common practice among households in the *ger* districts, I met with other families to learn about how the new stove use has affected their household finances. I specifically asked whether they were satisfied with the stove performance and heat capacity alongside financial gain. They explained to me that the stove provided the same duration of heat (6-8 hours) with half the amount of coal burning in their stove. These families did not show me their accounting notebooks (this was not a question I wanted to ask families that I was meeting for the first time), but they showed me their

coal storage sites in their yard or inside the vestibule areas of their homes. One family living in the same neighborhood as me in Songinokhairkhan showed me the large pile of coal that they had delivered from a porter truck the week before. The woman explained to me that she used to use the whole pile in just one month, but now they can use the coal for almost two months, as long as they kept it dry under the tarp covering.

Marketing Warmth

In 2012, the Clean Air Project launched what I call the *dolaahan amdral* or "warm life" campaign, which served as the campaign slogan of the stove-replacement program. This campaign was formed in collaboration between the Municipal Government of Ulaanbaatar, World Bank's Ulaanbaatar Clean Air Project and stove producers in an effort to market the new stoves as a solution for a warmer, more comfortable life in the *ger* districts. New stoves[29], they argued, were made of superior ceramic materials that maximized heat capacity for longer periods of time. Compared to the traditional stove, which required more fuel and several rounds of lighting, the new stoves required only one lighting period, producing heat that lasted for more than six hours at a time. Prolonged hours of heat were vital, as most *ger* district families were most concerned about keeping their homes warm during night hours when temperatures could plummet to 40 degrees below zero[30]. As I discussed in Chapter 2, warmth and the sensation of heat has significant cultural meaning as a sign of wealth, good health, and prosperity. Heat also had social significance for Mongolian families, as a warm home was essential for expressing hospitality toward guests that visited their homes. Focusing on heat value, the stove program

[29] In contrast to the traditional stove, which had a large combustion chamber in which air flowed *across* the coal bed, the new stoves had a smaller combustion chamber that directed air flow *through* the coal bed from underneath. This mechanism facilitated a more complete combustion, which meant that it emitted less pollutants. One of the rationales behind this new design was that it would prolong the burning cycle, thus reducing the amount of coal consumed per household.
[30] Celsius and Fahrenheit overlap at -40 degrees

marketed new, fuel-efficient stoves as a solution for mitigating air pollution-induced harms. Improved household heating practices became associated with improved atmospheric and health conditions of the city at-large.

I sat down with Bold, the director of UB-CAP in his centrally-heated office in the heart of downtown Ulaanbaatar. Like most offices in the city center, Bold's office was heated from coal burned in the central heating plant, not stoves. He began working with UB-CAP in 2013, a few years after the first official launch of the stove program began with funding from the U.S.-funded Millennium Challenge Corporation in 2010. He was the figurehead of the stove program, making regular appearances in television interviews, promotional films, and national workshops on urban energy development and green growth. I had met him on numerous occasions at conferences and working groups, but this was the first time I got to speak with him specifically about UB-CAP and the stove program's marketing strategies. I asked him to explain the vision and objective behind the *dolaahan amdral* campaign. Leaning forward, placing his elbows against the desk, he clasped his hands and explained:

> Heat is the single most important infrastructure for *ger* district residents. Without heat, they can't survive. We need to be sensitive to the *ger* district people's living condition. We all recognize that stove emissions are the main cause of air pollution. We've known this for some time now. But we can't directly blame them [for the pollution]. This would be wrong, not the right way. They will just get them angry and [they will] not act. What's the solution? Find ways into their heart. Gain their trust. We need to show them that we empathize with the difficulties of surviving the winter. The beauty of the [new] stove is that it really improves their quality of life. They get more heat for less cost and it produces less smoke. It's the perfect product to combat pollution.

Strategies to "gain trust" among *ger* district residents involved marketing a new household product, promoting the cost-effectiveness of the new product, and refraining from overtly blaming residents for the air pollution problem. As I will show later in this chapter, program staff drew on Mongolian cultural beliefs and understandings of heat and hearth to market the new

household product.

I went to my neighbor Baagi's home to meet with his mother to learn about their family history. Baagi's mother Munkhjargal formerly lived a nomadic life in the countryside of Arkhangai province. They moved to Ulaanbaatar in 1975 and brought their *ger* with them. It was lunch time. When I say down inside her *ger,* Munkhjargal lit the stove and smoke started to rise. She wafted the smoke and placed the large colander on top of the stove. She made traditional Mongolian milk tea. It was customary to make tea the moment any guests arrive inside a person's *ger*. As she stirred the tea with a large ladle, pouring from high above, she started talking about the fire. "Fire is part of our everyday lives. Fire cleanses everything. Smoke from the fire is a beautiful thing. We have a saying, "a smoky *ger* is a warm *ger*"

Many Mongolians believed in the significance of the *gal golomt*, or the fire hearth that stood at the center of the dwelling. The *ger* itself symbolized the four directions or elements – fire, earth, water, and air – and the hearth sits in the middle, the most sacred place in the dwelling. Prior to the 1960s, the traditional Mongolian stove was an open stove with a two metal rings. The *argal*[31]*,* or dried animal dung, would be placed in the center of the rings and lit for heat. The smoke produced from this ignition had spiritual significance. The smoke produced from the hearth symbolized the dwelling place of the daughter of *Tenger*, the Heavenly Father or blue sky deity and Mother Earth, both important deities in Mongolian shamanism. The smoke that rises from the stove represents the "upper world" and the smoke is the gateway to the upper world.

Much like Munkhjargal's saying that "a smokey ger is a warm *ger*", I found that good smoke and the burning of *argal* were connected with cultural ideologies of wealth and stability

[31] *Argal* has been used by Mongolian herders for centuries as the main source of fuel for stoves in the countryside. Horse dung is among the most common among rural households.

in the household. A popular refrain tells the story of a sage and two young boys:

Урьд нэг цагт баяны хүү, барлагийн хүү хоёр эрдэм ном заалгахаар нэг мэргэн хүнд очжээ. Тэр мэргэн хүн хоёр хүүд “Маргааш өглөө намайг ирэхэд энэ гэрийг дүүргэж чадсан хүнд л ном заая!” гэжээ. Баяны хүү гэрийг дүүргэх гэж цагаан идээ, өрөм, бяслаг, архи, мах авчирсан байжээ. Харин барлагийн хүү бага зэрэг аргал авчирсан байжээ. Мэргэн хүн алинд нь эрдэм ном заах ве?	Once upon a time, a wealthy boy and a poor boy came to visit the sage in order to study the book of wisdom. The sage told the two boys, “I shall teach the book to the person who can fill this *ger* by the time I arrive tomorrow morning!” The wealthy boy brought white dairy products, cheese, vodka, and meat to fill the *ger*. However, the poor boy brought just a little bit of dried animal dung. Which boy did the sage choose to teach?

The moral of this riddle is that *argal* produces heat in the *ger*, and therefore the family residing in it is wealthy and well. Material possessions did not measure wealth but heat, or *ilch* or *galiin ilch* did. *Ilch* translates into heat, temperature, hotness, warmness, or heat of a fire. Most residents that I met with would use *ilch* as a means to explain the different qualities of coal. The heating properties are based on how quickly the fuel ignites, how much initial heat it gives off after lighting, and the duration of heat emitted from the stove.

In order to “find ways into their heart,” the *dolaahan amdral* campaign employed various outreach methods, from campaign posters, television commercials, to radio broadcasts. Campaign materials were prevalent in many spaces and places integral to *ger* district life. During my visits to *ger* district *khoroo* (sub-district) administrative offices, I saw campaign posters posted on the walls of entryways. *Khoroo* administrative offices were focal points for community gathering in many *ger* district neighborhoods. From Ulaanbaatar newcomers seeking land registration to long-term residents seeking employment support, *ger* district residents went to these administrative offices to fill out paperwork and obtain permits. Beginning in fall 2014, these offices also became spaces for fuel-efficient stove product centers. Three to five stove models were showcased in the adjacent space alongside informational brochures and price

posters. Most stove product centers had one representative sitting behind a computer to answer questions, fill out stove purchase contracts, and explain terms of agreement. Campaign materials were strategically posted in these spaces to reach the *ger* district public and connect the message of a "warm life" with tangible products in the same space.

I took notice of one such poster in every administrative office that I visited. At the top of the poster, it reads, "Let's live a smoke-free life in our country's capital," followed by "Families with fuel-efficient stoves are spending less money on fuel and are living a more comfortable life. How about your family?" inscribed at the bottom. The poster connects the stove program to the air pollution discourse without explicitly blaming the *ger* district residents for the air pollution. Rather, it employs warmth and comfort as strategic tools to draw in *ger* district residents toward new stove consumption. By highlighting discrepancies between comfortable and uncomfortable living, the poster demonstrates what kind of life one (who has yet to buy a new stove) could potentially live.

The poster itself also features the most important elements of *ger* district life: a *ger* and coal. The illustration on the left is a representation of an "unhappy" life. It shows a shivering animated *ger* dwelling producing black smoke. This image caricaturizes a freezing cold home, despite the amount of coal used to burn inside the stove. This home has a traditional stove, which requires more coal and produces shorter time periods of heat. Because the traditional stove inside the *ger* requires more coal, it produces more pollution (represented by the black smoke emitted from the chimney). The image on the right, to the contrary, represents a "happy" life. The cartoon image is of a confidently smiling *ger* dwelling with a thumbs up, symbolizing the good and correct way to live life. On the *ger*'s side sits one bag of coal, showing how a new stove provides comfortable heat for long periods with less coal. Due to the small amount of coal

required to fuel the stove, this *ger* is shown producing gray-colored smoke, which although is in itself an emission, is morally justified as cleaner than the black-smoke alternative. This poster presents a marketing strategy through which stove program managers placed value on heat as a commodity that residents could potential gain by purchasing a new stove technology.

Figure 3: Clean Air Project campaign poster

The *dolaahan amdral* marketing strategy placed social and economic value on heat and a comfortable life, promoting the new stove as a good investment for families living in the *ger* districts. According to this campaign, comfortable living did not require large-scale investments or drastic changes to their daily lives. Families did not have to take out large loans or uproot their life in their neighborhoods to enjoy a comfortable life. Rather, a simple "switch" to a more fuel-efficient stove technology promised the amenity of reliable heat at a fraction of the cost of a

traditional stove. In other words, new stoves were the key to an improved quality of life in the *ger* districts.

UB-CAP and its stove producing partners supplemented campaign posters with television commercials that attempted to make more explicit connections between new stove use and improved quality of life. Television watching was an integral part of *ger* district life. From 2014 to 2016, all of the families that I visited in the *ger* districts had TVs in their home. It was very common for the TV to be turned on during all hours that residents spent indoors. During my interviews with residents, the TV was left on to accommodate young children that stayed home during day hours with their mother or grandmother. TVs were ubiquitous and a constant in the background most these households.

Having spent many evenings with my host family, it was not uncommon for to see a "dolaahan amdral" campaign commercial or new stove pitch broadcasted in-between evening news reports. One promotional film that played quite frequently on Mongol TV was that of two different families living in the *ger* districts. The film begins by following a day in the life of a "struggling" *ger* district family using a traditional stove. The images cast in black and white, accompanied with a melancholy tune, a woman coughs violently as a large cloud of smoke spews out of the traditional stove. Her children are wearing thick layered clothes, shivering inside their home as she struggles to light the stove. The frame then shifts to an upbeat, uplifting music showing a family enjoying the benefits of a new stove they recently purchased. The children are smiling, doing their homework and their mother happily making *suu tei tsai* (milk tea) on the stove top. The film concludes with the first family visiting the second family and admiring the new stove. The same message as the promotional poster appears in writing and a

voice over, “Families with fuel-efficient stoves are spending less money on fuel and are living a more comfortable life. How about your family?”

These promotional commercials targeted three key messages. First, it polarized *ger* district life into matters of class distinction. While socioeconomic inequalities existed within *ger* district communities prior to the stove intervention, households were “unified” under the same heating infrastructure of the traditional stove. Social marketing strategies of the Clean Air Project differentiated quality of life by putting a new, and fuel-efficient stove technology at the forefront of modern, comfortable living. Families of all socioeconomic backgrounds, duration of residence, and type of residence were targeted to re-evaluate their quality of life as something that could be improved through consumption. Bourdieu (1984) argued that class distinction was “more marked in the ordinary choices of everyday existence, such as furniture, clothing, or cooking, which are particularly revealing of deep-rooted and long-standing dispositions because, lying outside the scope of the educational system, they have to be confronted, as it were, by naked taste,” (Bourdieu 1984: 77). Families could now “buy class” by purchasing a new household technology. As I discussed in Chapter 2, providing bodily warmth was a key marker of hospitality inside the ger. Families that could provide warmth inside their home were considered to be wealthy (both financially and in terms of generosity).

Secondly, these commercials market stove purchase (and improved quality of life) as a *choice*. Contrary to a top-down approach that required new regulations, households were responsible for making proper choices for their families on their own. Families, not the state, were expected to govern themselves in rational and responsible ways in order to optimize household living conditions. Families could either choose to live a less cost-effective, comfortable life, or choose to live as usual.

Thirdly, the focus of these messages was on consumption – the purchasing of a commodity. The *dolaahan amdral* campaign attempted to empower citizens to improve their quality of life through responsible choice. Rather than focusing on *ger* district residents as poor, helpless receivers of aid from the government, the campaign explicitly addressed responsible consumerism and "purchasing power" as means through which families could improve their daily lives.

These campaign materials and television advertisements narrated the ethical aspects of proper conduct. As Rose contends, "this embodies a shift away from emphasis upon morality – obedience to an externally imposed code of conduct and values in the name of the collective good – and towards ethics – the active and practical shaping by individuals of the daily practices of their own lives in the name of their own pleasures, contentments, or fulfillments." (Rose 1999: 178-179).

It is also important to note what the campaign *did not* explicitly address. Air pollution was in the backdrop of this campaign. While a "smoke-free city" was implicit in posters and television commercials, an explicit connection between new stove consumption and pollution reduction was lacking. However, during my meetings with UB-CAP program staff, the rationale of air pollution mitigation was key to our conversations. Enkhtuya, the program manager of UB-CAP was particularly pushing the stoves as the most effective short-term solution for reducing pollution levels. I asked her why air pollution mitigation did not seep into the campaign more directly, she responded:

> You must understand how sensitive this [air pollution] issue is. We need cooperation on all parts and all people to tackle this air pollution problem. We know that [new] stoves can improve the air, so our goal is to get households to adopt them. That's our primary concern. Focusing on dolaahan amdral is the best way to get cooperation. By creating an immediate need for these [ger district] people. They are poor. They want a better life.

"But isn't it important to address the hazards of air pollution more thoroughly?" I asked. She answered, "*ger* district residents don't care about the bigger problem. They don't have time for this. It's more important to address their immediate concerns like money, heat, and quality of life." My discussions with Enkhtuya among other program staff at UB-CAP confirmed that the "success" of the campaign was first and foremost to get as many households to purchase new stoves as quickly as possible.

Consumer Choice

Flipping through the project brochure, I noticed that it was full of new stove models. Ten pictures of different stove models were printed on the pages, listed by stove name, company name, cost, and important features. While Tuul at XacBank's Eco-banking department and I began discussing the purpose behind providing so many choices to *ger* district residents, she explained:

> You may be thinking, why not just test one stove model and distribute that, right? Well, the "one size fits all" approach just doesn't work. This is too much of a Soviet way of doing things. We need to offer options. We need to offer a variety of solutions to consumers and provide options to consumers. Providing choice actually empowers the consumer to find the right fit for their and their household. That's what we're trying to do here.

The model of "choice" was not only entangled with neoliberal ideology and practice, but conceptualized as more progressive than its Soviet-era counterpart. Having lived through the communist era in Mongolia, Tuul reflected on the top-down Soviet interventions that were regulated by the state. "You know, Chisato, the traditional stove isn't actually traditional," Tuul remarked. "The Mongolian stove was open fire, correct?" I asked for confirmation. Tuul replied, "Yes, the chimney stove was actually an introduction from the Soviets who were strict about

managing the household and education. Every family was required to change their stove[32]. Just like they were required to put white sheets over their felt. Everything was required by law. You had no choice, you had no say. We just followed orders." Tuul and other partners of the Ulaanbaatar Clean Air Project expressed pride in the stove program as an economic, environmental, and public health intervention that altered people's relationship to the state. She explained, "During the Soviet era, there was always just one way. One newspaper. One radio station. Everything in life was singular and we never questioned it. It's new, you know, this [concept of] choice. People take more ownership with choice, though. They can think about what's best for them. What's good for their situation. What [stove] fits in their house? What [stove] saves them more money? Which [stove] looks nicer?"

Product Centers

Product centers served as the most ethnographically engaging site for observing the processes through which stove purchasing was made. These spaces brought the financial mechanisms, social marketing, and stove product together to promote the fuel-efficient stove as a solution for improved living and an improved urban environment. As I described briefly in the section above, the Clean Air Project launched product centers for potential consumers to check out the new stove models. In 2013, the product centers were inside *gers* in order to allow potential consumers to test out the different stove types. There were 42 *ger* product centers total. Due to high costs for maintaining the product center *gers*, staff, equipment, and security, UB-CAP scaled down and altered their marketing strategy to working with *khoroo* administrative buildings to attract potential customers.

[32] As part of the cultural revolution in the 1950s, the stove, *ger* covering, among other household materials were replaced with improved versions to enhance hygiene and cleanliness. The chimney stove eliminated indoor smoke from open fires and prevented staining on the walls and the white *ger* covering symbolized cleanliness

I joined XacBank staff to visit a product center in Songinokhairkhan district. The room was equipped with five different stove models. On the walls, there were posters that showed the different stove models, company names, and subsidized prices of the products. Slogans such as "Purchase Project Reduced Stoves" and "Let's live a pollution-free life in our nation's capital" embellished these campaign posters.

Figure 4: Stove models and their prices

From the moment we arrived at the product center, there were visitors in the room, talking with the product center representative, discussing stove models, and collecting informational brochures in the entryway. It was midafternoon, and many parents were stopping by the administrative building on the way home from picking up their kids at school. Mothers carrying their infants walked over to the product center, peering their head in and walking out. An elderly man and a middle aged man came in to examine the Royal Ocean Duul stove.

Figure 5: *Ger* district residents examining different stove types

"Is this the big Dul or the little Dul?" The son asked the product center representative.

"That's the small one," she remarked, sitting up from her desk.

"Does it produce a lot of ash?" he asked.

"No, it's very good. The coal burns completely so you don't get a lot of ash. At the bottom there, there's a lock system so the ash doesn't spill out," the representative pointed and told them that they're welcome to move the pieces.

The man turned the lever and pulled the ash grate out. "Ohh, that's nice, that's nice," the elderly man remarked. He ran his hand against the different parts of the stove, and knocked on the sides with his knuckles. He gently tugged on the chimney stem with both hands and grunted with satisfaction.

"This would look nice. Very clean and polished," the elderly man commented to his son. His son nodded.

"So, this is 40,000 total, right?" The son asked the representative.

"That's right, and you'll need to sign a contract," she replied.

I got permission to take a look at the contract form at the end of the day. It stated that customers agree to replace the traditional stove with the fuel-efficient stove, agree to abide by the stove installation guidelines, and stove maintenance and agree to the warranty. Representatives of Royal Ocean, LLC and other stove companies installed the new stoves for the families. The stove installation process was accompanied by a 10-minute stove use demonstration at the home in which the stove was installed. Because removal of the old Mongolian stove was not strictly enforced until half way through the first phase, there were many families that ended up with two stoves in their homes.

As this ethnographic material demonstrates, the implementation of the *dolaahan amdral* campaign involved various actors from Xacbank, a Mongolian bank that handled the finances, stove producers that developed the stove models, and representatives that were appointed to provide information on new stove models. Secondly, as the interaction between the two men in this section show, air pollution mitigation or environmental awareness was not part of most people's reasoning for buying a new stove. Residents were more concerned with the product's aesthetics, it's low-maintenance properties, and cost-effectiveness. As I will show in the following section, the technology-focused aspect of this intervention led to some unexpected failures.

Program Failures

The Clean Air Project successfully sold over 175,000 fuel-efficient stoves in the *ger* districts at-large. As I've shown in the above section, the project employed a variety of project strategies, from financial mechanisms, social marketing doctrines, to product display sites to

encourage urban citizens to purchase new technologies. Because this market-based project focused heavily on the volume of product sales, the program failed to account for other factors that might have influenced the sustainability of the intervention.

Despite initial projections, the Clean Air Project's stove program did not improve overall air quality in Ulaanbaatar. While some media reports suggested a 20% decrease in particulate matter emissions based only on one air quality monitoring reading, the middle class public began to scrutinize multinational and government spending on the stove program, claiming that it was a state failure and wasteful spending of state and multinational donor money. Clean Air Project managers expressed frustration with the claims that the public were making. "They just don't understand how air pollution mitigation works. It's gradual. It takes time. We can't get rid of pollution all at once. The public expects it to disappear overnight. That's just not going to happen." According to program managers, there were three main reasons behind the program's failure: 1) increase in the number of stoves; 2) Circulation of poorer quality coal; and 3) Improper stove use behavior.

First, an informal market of fuel-efficient stoves was also considerered a reason for program failure. In order to take advantage of the high retail value of new stoves, many families resold their stoves to retailers at the Narantuul market and families in the countryside. During my first visit to the market in December 2014, there were approximately 70 resold stoves of various models for sale. By my second visit to the same marketplace in Spring 2015, the number of stoves had doubled. When I spoke with stove retailers, they explained to me that many of the families preferred to keep their traditional stove and sell the new stove because it was worth more money. Many families did not see the value of the "long-term saving" model promoted by UB-CAP and recognized the full retail price of the stoves they purchased at a highly subsidized

price. Some families even sold the newly bought stove in parts, disassembling the chimney, grate, and handles, and combining them with older models. The mutability or adaptability of the stove technology resonates with Marianne De Laet and Annamarie Mol's (2000) study of the Zimbabwean bush pump. De Laet and Mol (2000) explain how if the water pump broke, villagers replaced the broken components with other materials they had in hand, such as rubber ties or wooden sticks so that the device could maintain its function of providing clean water. While the circulation of fuel-efficient stoves related to short-term profit, my research shows how the stove became a "mutable mobile", or an object that changed physical shape as it moved through different sites and was handled by different users" (De Laet and Mol 2000: 613). The reselling of stoves demonstrates how regardless of how "clean" or "fuel-efficient" the technologies were, the fact that there were more stoves being used than before the intervention led to increased air pollution.

Secondly, program managers blamed the increased air pollution on the circulation of poor quality coal in the *ger* districts. According to the laboratory scientists who tested the fuel-efficient stoves prior to mass-production, the stoves were designed to burn Nalaikh coal. However, the government's launch of a coal project that subsidized Baganuur coal, a poorer quality coal that produced more smoke than Nalaikh coal, was known to have affected meeting program goals of curbing air pollution. Program managers underestimated how the type of fuel would affect the production of pollution.

Lastly, and most importantly, program managers blamed the *ger* district residents for using the fuel-efficient stoves incorrectly. While the technologies themselves were designed to burn coal efficiently, stove developers and government officials began to scrutinize the stove use conduct of residents. As the above explanations demonstrate, none of the major explanations for

the program's failure focused on the malfunctioning or ineffectiveness of the fuel-efficient stove itself. This is emblematic of a shifting trend toward more technological solutions for global health problems. As I suggest in the next section, a focus on a technology-focused global health "solution" had ramifications for the subpopulation in Ulaanbaatar. Rather than focusing on new solutions for the air pollution problem, the government and program managers of the Ulaanbaatar Clean Air Project reconfigured their marketing strategies to focus on a behavior change campaign that attempted to discipline *ger* district residents to use fuel-efficient technologies in a "correct" manner.

PROMOTING DISCIPLINE

In this section, I examine a shift in marketing strategy from "dolaahan amdral" to promoting disciplinary measures for air pollution mitigation through proper stove use techniques. After replacing 175,000 traditional stoves with fuel-efficient alternatives, the program reconfigured their campaign to make more explicit connections with air pollution mitigation. The campaign no longer focused solely on improving quality of life among *ger* district residents, and pushed for community-level responsibility to reduce stove emissions through proper stove conduct. By focusing on social marketing campaigns and community reactions to these efforts, I show how the campaign attempted to reshape attitudes and behaviors toward air pollution.

Promoting a Smoke-free City

In winter of 2015, the Ulaanbaatar Clean Air Project (UB-CAP) launched a promotional film, "Let's live a pollution-free life in our nation's capital." The film opens with triumphant classical music and stark black and white aerial videos of Ulaanbaatar's polluted airscape, zooming in onto the smoke appearing out of several chimneys in the *ger* districts. The film then

introduces Mr. Bold, an official at the Ministry of Environment, sitting in his office with a Mongolian flag pinned to his black suit lapel. He declares: *I believe that we can fight against smoke as we have produced it.* Images of "everyday" *ger* district home life flash one-by-one from a woman making *suu tei tsai* (milk tea) over a fuel-efficient stove smiling ear-to-ear, an elderly woman counting her prayer beads peacefully over the new stove, to a father cradling his happy child inside the *ger*. Mr. Bold continues: *For our loved ones, we should bear the responsibility together, making the right choice as a city resident and as a community. This choice starts from an easy step – using clean stoves according to its proper procedure by placing the coal at the bottom, then adding the wood, finally putting the paper on the top. These are the proper ignition steps. As a result, we can contribute to air pollution reduction. Let's fight against the air pollution together!*

News channels such as Mongol TV reinforced proper stove igniting techniques through broadcasting these methods routinely as part of the nightly news. These media features displayed a time-lapse video demonstration of stove use, with two stoves, side by side: the right side showing improper stove use, and the left side showing proper stove use. The stove emissions from proper stove use displayed a lighter color smoke and less emissions. This campaign encouraged families to spread the word to friends and family, and to help promote a community around responsible stove use. The rationale behind this community approach around "caring for our loved ones" was that increasing the number of households using the fuel-efficient stoves properly would decrease the air pollution at a faster rate.

The state implemented various campaign strategies to promote proper stove use. For example, the Ministry of Environment encouraged stove companies to disseminate informational materials to their customers to provide guidelines for proper stove use. For example, in 2015,

Royal Ocean, LLC distributed a comic book-style stove use manual to their customers. The manual is titled, "We can reduce air pollution with Tsondooloi and Zuvkhuu's help," and the cover features a young girl in a floral dress and a young boy in an engineering uniform and work goggles showcasing the Royal Ocean Duul stove in the middle of the house. In the top-right corner of the cover, a small bubble features a note, "instructions on how to use the stove safely." The comic book opens with a story of Tsondooloi's *ger* district family. Her brother is suffering from high fever, coughs, and the doctor recommends that he is admitted to the hospital. In the next scene, Tsondooloi and her father discuss the air pollution issue.

> **Tsondooloi:** Father, the *ger* district stoves emit the most smog, right?
> **Father:** Yes, that's correct, my daughter. There will be more efforts to distribute stoves that emit very little smog to the *ger* districts by the end of the year. If these stoves are used, then the city's smog will get much less. So, there's no need to worry.
> **Tsondooloi:** Usually if the families use these stoves then the smog will be reduced by a lot then, right?
> **Father:** Yes, that's right Tsondooloi
> **Tsondooloi:** Father, what can I do?

The curious young girl then accompanies her father on a visit to a family friend's home in a different district. She meets with the family friend's son, Zuvkhuu (which means "correct son"), who begins to teach them about the new stoves. He instructs them on the proper processes of stove use and installation: how to properly layer the types of fuel in order, how to ignite the stove, and how to properly dispose of coal ash after complete combustion. In addition to proper procedures, the brochure highlights what not to burn (plastics, rubber tires, and other garbage) and how not to burn (refueling while coal is burning). The story concludes with Tsondooloi and Zuvkhuu actively engaging with their *ger* district communities by handing out proper stove use flyers in a less smoggy city environment.

This comic-book style stove use manual promotes three key messages. First, air pollution is promoted as a governable object through altered household heating practices. It is no longer

sufficient to purchase a new stove, but rather required to use the new stove in a disciplined manner in order to reduce stove emissions that contribute to the city's air pollution. Similarly, there is a more explicit connection to the air pollution discourse, as the story begins and closes with the city's atmospheric conditions. Air pollution mitigation is also made into a *ger* district problem, with the responsibility in the hands of ger district dwellers. Secondly, children are promoted as responsible citizens in the wake of air pollution disasters. Rather than marketing toward the head of the households during the first phase of the program, the marketing strategy shifted to gain the attention of a younger generation. According to Erdenbulgan, the head of Royal Ocean, LLC, the manual specifically targets children because they are the "ambassadors of the household" in that they can teach their parents how to use the stove correctly. Clean stove use was now entangled with moral underpinnings of proper conduct and citizenship. Children are expected, not only to share information to their parents and family members, but also promoted as community leaders who have the capability to bring their *ger* district neighborhoods together on a mission to reduce air pollution.

Figure 6: Proper stove use techniques

While door-to-door monitoring was not a strategy employed by the Clean Air Project, state, multinational partners, and stove producers worked to alter the message of air pollution management from consumer choice to citizen responsibility. It was no longer enough to purchase and use the fuel-efficient stove. It was now required for citizens to later the ways in which they governed themselves in relation to air pollution management by altering their stove use practices. These behavior campaigns reinforced a dichotomy of proper stove users and improper stove users based on family units.

Von Schnitzler (2008) describes how the *Masakhane* or "Let us build together" campaign aimed to hold citizens responsible in post-Apartheid South Africa. Specifically, she examines how the government connected payment for water services with notions of civic responsibility. Acts of payment became a way to recognize one's obligation to the state (Von Schnitzler 2008: 907). In similar ways, the Mongolian government and program managers of the UB-CAP aimed

to change *ger* district residents into becoming responsible citizens who abided by proper stove conducting behaviors. However, rather than foregrounding the disciplinary aspects of this intervention, the UB-CAP campaign reconfigured proper stove conduct into a tool of "empowerment". Von Schnitzler explains how the prepaid water meter served as an "empowering mechanism" that would enable residents to calculate water use, switch off the water tap, reuse bath water, and become more conscious of water usage on a daily basis (913). As the underlying message in the comic book illustrates, proper stove use behavior was depicted in a way that encouraged being a positive influence to others.

Blame as Community Disciplining

The majority of the households that I interviewed claimed that they were using the new stove properly to the best of their ability. During our discussions on stove use, women oftentimes demonstrated the process in front of me, layering the coal and lighting the fire. This may be because they saw me, the ethnographer, as a monitor as well. One woman articulated that the lighting process was of utmost importance. She explained, "If the coal is too wet, the fire doesn't catch. So, I don't leave the coal out in the yard. I leave it inside, where it's not exposed to rain or snow. Dry coal is important. And if you don't layer the wood on top of the coal properly, the fire doesn't burn all the way through. This means you'll have to light [the fuel] again and again. This produces a lot of smoke." She claimed that most *ger* district residents did not follow instructions carefully because some households were too careless or ignorant to abide by the guidelines.

My interviews and surveys with over 80 *ger* district households confirmed that since the behavior change campaigns, residents criticized stove use patterns of others. These judgements were made, not from witnessing stove use of other households firsthand, but rather through sensory knowledge of their surrounding neighborhood. Some claimed that they regularly saw

black smoke coming out of the chimneys of some of their neighbors. Residents correlated black smoke with improper stove use. They explained that if the coal, wood, and paper was layered and lighted correctly, the stove would emit a light gray smoke. Echoing Narantuya's comment, many residents also claimed that burning wet coal produced black smoke because it required many more lighting attempts. Meanwhile, many residents that used Nalaikh coal (a brown coal that is slightly more expensive but better quality than other coal types) argued that residents who burn Baganuur coal produce high volumes of black smoke because the coal they use is poorer quality.

Figure 7: Layering coal and wood inside the fuel-efficient stove

Furthermore, *ger* dwellers blamed single and two-story house dwellers for emitting the highest volumes of black smoke. *Ger* dwellers argued that *ger* stoves were easier to monitor because they were located in the middle of a more compact living space. For example, detached houses oftentimes had two to three rooms that required different kinds of monitoring. Heating smaller quarters also required less coal. *Ger* dwellers claimed that house dwellers were less responsible with their stove use because they needed to heat multiple rooms. This violated an "egalitarian" ethos promoted by the stove program as they consumed double the amount of coal than other households. House dwellers, on the other hand, blamed *ger* dwellers for burning poisonous materials including plastic, rubber, and other waste residue. Some noted that the newer houses had two chimneys, which indicated that one household could be using *two* stoves. In such ways, black smoke served as an indicator of improper stove use practices that connected to various factors such as coal type, ignition process, and type of dwelling.

Figure 8: *Ger* district residents walk back from the water kiosk back to their homes. Photo by author.

Residents also traced improper stove use through detecting stove residues that circulated in the air and piled on the grounds of their neighborhoods. Strong gusts of winds regularly carried large wafts of coal ash into the air. These dusty residues signaled that some households did not properly discard the coal ash from their stoves into tightly sealed bins. Others witnessed loose piles of coal ash dumped onto trash piles alongside the frozen river. Finally, residents complained that fringe areas of the *ger* districts smelled of potent toxicants. Stinging odors served as evidence of burning plastics, rubber tires, and other waste products – all prohibited materials. Households that burned garbage were understood to be poor families that couldn't afford coal on a regular basis or newcomers to the city who traditionally burned *argal* (animal dung) in the countryside. "It's because of *those* people that the pollution won't go away," Narantuya explained. According to the residents I spoke with, wealthier house dwellers were too

reckless with their fuel usage and consumption and poorer families were considered more polluting by burning toxic waste materials. In such ways, residents like Narantuya attempted to absolve themselves of blame and point blame onto other people in their community.

While at first glance, these practices may seem solely to be practices of blame, I suggest that they are also forms of gossip. And gossip, akin to witchcraft, had a function to exercise collective will and power. While *ger* district residents rarely confronted one another over stove use issues, rumors about polluting others were commonplace. Like smog got swept up with the wind, gossip traveled on the currents of social relations, flowing in unpredictable directions with different effects.

Gossip played an important role in disciplining community members around stove use. For example, residents whose children regularly read the stove conduct comic book discipline their stove use behavior so that they do not get called out by their children. As Amraa once explained, "My children are always helping around the house and they're very observant. If I do something wrong with the stove, they will tell me." Others monitored their behavior when guests came over to visit. Discussions around the fuel-efficient stove and heat-emitting properties were commonplace in households, and it was important for some families to prove that they were responsible stove users to family members, friends, and visitors. Informal discussions that took place at the water kiosk also played a role in community monitoring. During my visits to the water kiosk with Amraa, neighbors who waited in line to collect water frequently complained about their neighbors who discarded soot incorrectly or emitted black smoke. In such ways, micro-pressures from both family members and community members played an important role in the collective effort to reduce air pollution that the government failed to achieve through a top-down approach.

CHAPTER CONCLUSION

The Clean Air Project's stove program encompassed two phases for air pollution management. The first phase of the program focused on marketing the fuel-efficient stove as a desirable consumer product. Through campaign posters, promotional films, and stove commercials, the campaign targeted individual households and promoted consumer choice. Failure to improve air quality after this first phase resulted in a reconfiguration of the campaign around behavior change that aimed to discipline proper stove conduct among *ger* district communities. Among program developers and stove producers, the UB-CAP program's failure was not due to technological or infrastructural issues, but due to the incorrect behavior of *ger* district communities. This was emblematic of a neoliberal form of governance, wherein individuals were tasked with the responsibility to alter their behavior and household practices in order to improve the city's air quality.

Medical anthropologists have focused on the pharmaceuticalization of health through the circulation of biomedicines and biomedical technologies such as antiretroviral therapies to fight HIV/AIDS in Brazil in Africa (Biehl 2006; Nguyen 2005). Very few anthropologists have focused on the circulation of non-biomedical technologies as a central focus of "global health". Redfield (2012) employs the term, "life technologies" to illuminate a shift in medical humanitarianism from biomedical to low risk and low-cost technologies to improve the bare minimum of biological life. For example, the "life straw filter" can be manufactured in large quantities at minimum cost to assert safe drinking practices without improving the water infrastructure (Redfield 2012: 170-173) Redfield argues that medical humanitarianism asserts a "minimal biopolitics" wherein minimalist interpretations of life are based on the bare essentials of biological survival. In the case of air pollution management to improve health conditions, the

circulation, consumption, and adoption of stoves as "life technologies" (Redfield 2012) shaped public health efforts at the household-level of responsibility. In place of large-scale infrastructural changes that could improve heating in these marginalized neighborhoods, the market-based stove enterprise prioritized small-scale, "quick-fix" alternatives to improve the lives of urban residents at the most rudimentary levels.

My ethnography of the stove program also contributes to the anthropological study of urban infrastructure. Recent scholarship in cultural anthropology has foregrounded infrastructure as a political space for negotiating belonging and citizenship (Anand 2011; Bach 2010; Collier 2011; Larkin 2008 2013; Mains 2012; von Schnitzler 2008 2013). For example, Anand (2011) employs the concept, "hydraulic citizenship" to describe how urban dwellers in Mumbai mobilized political and material pressure to access the municipal water supply. Contrary to Anand's passive articulation of citizenship where citizens conform to existing structural frameworks, my ethnographic study among *ger* district residents reveal how urban citizens actively resisted the stove-replacement intervention by reselling stoves or choosing not to purchase a new fuel-efficient stove.

Finally, my research extends cultural theory and ethnography on the role of risk in forming new subjectivities in response to environmental hazards (Douglas 1992; Douglas and Wildavsky 1982; Lash 2000; Lupton 1999; Oliver-Smith 1996). For example, Petryna (2002) offers an ethnographic account of how exposure to risk after the Chernobyl disaster provided radiation sufferers an avenue for financial compensation and medical care. Similarly, Kim Fortun's (2001) ethnography of the Bhopal catastrophe foregrounds victims' narratives to illustrate how critical responses to disaster become a way to chart a range of systemic failures. This chapter extends the work of Petryna (2002) and Fortun (2001) in a different environmental

context by placing subjectivities within the context of air pollution management. As I showed in the last section of this chapter, in response to the UB-CAP program's failure and a shift toward disciplining households of proper stove use, *ger* district residents began to blame others in their community for not abiding by proper guidelines. I explained how these blaming practices were also forms of gossip that played a role in community-level monitoring of stove use behaviors. Residents were not only aware of the various "polluters" in their neighborhood, but they were able to differentiate these polluters by detecting odors, smoke, and type of dwelling in their urban environment. Taken together, this ethnographic case study reveals how blame can be a productive tool for disciplining polluting others.

CHAPTER 5

BODILY ATTUNEMENT: DETECTING BODILY HARM

It starts in October.
The air gets cold and heavy. It's thick.
My eyes sting when I put contacts in.
The soot sticks to the lenses.
The air clogs up my lungs.
I wake up dizzy in the mornings.
My throat swells up some days.
It's hard to swallow food…
But other days it's fine.
Then I have a fever for a few days.
It doesn't really go away until late spring.

Like many urban dwellers in Ulaanbaatar, Amraa actively "listened" to how her body felt and connected to the polluted environment. During my four-month stay with her family, Amraa would frequently list different physical symptoms as she experienced them day-to-day. With the shift in seasons, she felt the cold air seep into her skin. Her vision was impaired by the lingering smog stinging her eyes. Breathing the cold, smoggy air triggered sharp pain inside her throat. Mundane tasks like putting contact lenses in or eating food served as signals that pollution was causing bodily harm. As the cold winter winds swept through the streets, Amraa's chest tightened with discomfort. In contrast, during summer months, she felt she could breathe with more ease. It was through detecting such minute bodily attunements (Shapiro 2016) that Amraa was able to trace air pollution's harms as a seasonal phenomenon. Of course, Amraa's experience with pollution was different from others, as there is no "universal standardized body" (Lock 2001) in air pollution exposure. Some people experienced migraines and itchy eyes, while others suffered aggressive coughs and wheezing. All bodies absorbed, digested, and reacted to pollution differently, and how pollution manifested inside bodies over time also varied. Despite

these variations in bodily reaction, pollution bound these bodies together in a shared temporal state of bodily harm.

Amraa was one of many *ger* district residents who understood their air pollution exposure as entangled with the rhythms of everyday life. “Those [apartment] residents have no idea what it’s like to breath in coal fumes inside their home. It’s poisonous but [the coal] keeps us alive.” Amraa was aware that direct exposure to coal smoke while igniting the stove may cause some form of bodily harm. She explained to me that she always coughed when she lights the stove. “It’s my body’s way of telling me that the smoke is not welcome inside [my body].” I had observed Amraa coughing while igniting the stove on numerous occasions, as I helped load the stove with raw coal during my stay with her family. There were times when the coal would not light, which led to multiple ignition attempts and more smoke. Oftentimes, we would both cough and waft the smoke away from our faces. During our errand runs into the city center, Amraa reminded me that not everyone took the bus to work. We waited for bus number 23 at the bus station across the main street from her neighborhood during freezing, smoggy mornings. The buses in Ulaanbaatar were second-hand vehicles that were donated from South Korea. They ran on diesel, the fumes a dull brown that stood out amidst the gray smog covering the city air. Each time a bus passed, Amraa and I would cover our nose and mouth with our scarves. “I hold my breath as long as I can,” Amraa explained to me one day, as she squinted. I could tell that smog was already irritating her eyes. When Amraa and I would walk back with her children from their schools, we would take three to four “breath breaks” along the way. The dirt road home was an icy, uphill obstacle course. Amraa would place her hand on her chest and close her eyes, which signaled that we needed to stop to take a break. She stopped to calm her wheezing and catch her breath and explained to me on multiple occasions that her chest would tighten and her heart-rate

would skyrocket. It was difficult to watch her suffer like this on a daily basis. “During the winter, my whole body is polluted,” Amraa sighed.

Many other *ger* district families that I met with explained their air pollution-induced harms by tracing their everyday engagements with the urban environment. Symptoms provided valuable information about what was going on in the environment as much as they served as indicators of deteriorating health, a dual purpose that Murphy (2006:173) has also described for Sick Building Syndrome sufferers of chemical sensitivity. Women explained to me that the highest pollution hours were in the morning between 7:00am-9:00am, and evenings from 6:00pm-9:00pm were also of high concern. These time periods correlated with household stove use patterns. In the majority of households, the stove was ignited in the morning and evening to warm up the home and prepare tea. The fumes from tens of thousands of chimneys created a dense smog that lingered in *ger* district neighborhoods. According to some women, morning hours were the most dangerous for their children because they had to walk to school during peak pollution hours. Because their bodies were smaller and shorter, children were exposed to vehicle emissions, both cars and buses on the road, more than adults. This was why many parents carried small children instead of having them walk. The higher above ground you were, the lower the chances of exposure to vehicle exhaust.

Small children were perhaps more vulnerable, but women also experienced substantial exposure to air pollution. Women were responsible for tending the stove, which left their exposures to coal fumes higher than men who did not have the responsibility to ignite the stove or discard coal ash. However, most women did not recognize smoke inside the home from stove use as the biggest threat to health. Rather, smoke lingering outdoors was understood as the most harmful for a number of reasons. Residents believed that they were exposed to a higher

concentration of stove emissions because of the number of chimneys emitting smoke. They were also aware of the multitude of toxins circulating outdoors, from stove emissions to dust and vehicle exhaust. Further, they believed that they breathed in more pollution when walking or running outdoors. Women spent a significant part of their weekly routine running errands such as collecting water at the water kiosk during morning and afternoon hours while men were away at work. It was during these moments of outdoor exposure that women felt the most vulnerable to air pollution's toxic effects. As Amraa explained, "the smoke enters directly (*shuud irdsen*)" into bodies, triggering a variety of reactions such as coughs and shortness in breath. In such ways, *ger* district residents understood their exposures, not as singular interactions with air pollution, but as a dynamic engagement with different kinds of "smoke" in different areas and at various points in time.

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While previous chapters discussed techniques that spatialize harm and marketing techniques that mitigate harm, this chapter focuses on detecting bodily harm. I focus on how two techniques of evidence-making – bodily attunement and medical diagnosis – coalesced and conflicted to create knowledge of respiratory and gestational harm. Examining knowledge-making and practice among city dwellers and biomedical doctors, I reveal how evidence of air pollution-induced harm is not fixed or uniform, but highly contested.

This chapter consists of three sections. In the first section, I briefly discuss scholarship in medical anthropology and science and technology studies that focuses on evidence-making of bodily harm. Despite the emergence of visual and metric-based technologies, I show how bodily knowledge plays an integral role in mediating uncertainties about chemical exposure. The second section examines the ambiguities surrounding diagnosing respiratory harm. While patients

sought diagnostic testing as a means to secure biomedical diagnosis, doctors oftentimes provided short-term treatment and medical advice without identification of disease. The third section focuses on emerging concerns about gestational harm caused by air pollution exposure. Women traced patterns in their gestational cycles, asserting that pregnancy loss was most frequent during polluted months. Doctors, who lacked scientific expertise on the relationship between air pollution and gestational harm, were faced with the challenge of adapting their medical practices to provide sufficient patient care. This analysis asserts the need for a closer examination of how notions of harm become entangled with bodies, notions of temporality, infrastructure, and uncertainties of everyday life.

DETECTING HARM AND ENVIRONMENTAL HEALTH

Scholarship in medical anthropology and science and technology studies has examined the role of visual technologies in creating biomedical evidence in clinical settings. From X-rays (Street 2014), sonograms (Gammeltoft 2014), to biodosimetry (Petryna 2001), anthropologists have shown how these technologies become entangled with medical infrastructure, moral dilemmas, and the broader political economy. For example, in her ethnography of hospital care in postcolonial Papua New Guinea, Street (2014) demonstrates how Melanesian patients sought X-rays, blood tests, and other forms of diagnostic testing in pursuit of *painim nem* (find the name or diagnosis) so that they could secure proper treatment from doctors (2014:131). For doctors, however, these diagnostic tools were oftentimes inaccurate due to infrastructural failures such as poor calibration of equipment, lack of diagnostic chemicals, or regular power outages. Inconsistency in infrastructure and resource availability made it difficult for doctors to rely on diagnostic testing to make concrete and concise diagnoses. This difficulty mobilized a particular kind of medical care, where doctors often prescribed broad-spectrum antibiotics to cure patients,

despite the multiple possibilities of diagnoses (Ibid:106). Similar concerns seeped into medical discourse and practice in local clinics in Ulaanbaatar. Patients sought diagnostic tests like X-rays, not only as proof of bodily damage, but as a means to secure proper long-term treatment from doctors. However, doctors faced with pressures to diagnose air pollution-induced disease often turned to broader forms of treatment and medical advice to ameliorate anxieties among their patients. The use of visualizing technologies did not always bring clarity, but rather revealed uncertainties surrounding disease, disease causation, and treatment.

Techniques for detecting harm were not limited to clinical settings, however. Historians of science and anthropologists have demonstrated how bodily attunement plays an integral role in everyday evidence-making within the built environment. For example, Parr's (2010) historical case study of an E. coli outbreak in Walkerton, Ontario examines how different kinds of evidence of safe and unsafe drinking water led to everyday uncertainties. Sudden outbreaks of diarrhea among children in a local school and among senior citizens in nursing homes led to an investigation that connected increased diarrhea cases to the town's contaminated water source. While local residents had associated good taste and "softness" of drinking water as proof of good quality water, the municipality pushed metric-based evaluations and made claims for a need to chlorinate the water. Safe water was no longer associated with taste, but rather measured through imprecise scientific instruments. Despite efforts to scientifically persuade residents that the highly chlorinated water was safe for consumption, most residents refrained from drinking the local water because their bodily experience with chlorinated water – sensations of pain in the gut mingled with the smells of chlorine – kept them from trusting new kinds of expertise about the safety of drinking water (Parr 2010:171). This case study shows how bodily ways of knowing can prove more powerful than scientific understandings of contamination. Similar to residents in

Walkerton, city dwellers in Ulaanbaatar relied on their bodily sensations and symptoms to trace the severity of air pollution-induced harms for more than a decade. What counts as evidence of respiratory and gestational harm was not determined in hospital settings alone, but rather through daily engagement with air pollution, seasonal pattern-making, and knowledge about the urban environment.

Other scholars have shown how bodily attunement plays a role in challenging technologies that failed to detect bodily harm. In her historical account of Sick Building Syndrome during the 1980s in the United States, Murphy (2006) examines how middle-class women began to notice and trace subtle changes in their bodies to make sense of chemical exposure inside their workplaces. Women suffered from chest tightening or lingering headaches during hours of the workday. Despite office worker complaints, air samplers brought in by government hygienists failed to detect chemical presence (2006:83). Murphy employs the concept "body-ecologies" to explain how in the context of asbestos detection, "bodies were understood to be so intimately tied to the environment that every symptom could be interpreted as a reaction to the constantly shifting nexus of body-building-ecology" (Ibid:169). In other words, women were attuned to their bodily symptoms as material signs to trace patterns in their everyday work spaces. These bodily complaints served as the foundation for legal and scientific investigations into harmful exposures in the workplace and in the establishment of Sick Building Syndrome as a medical condition. Shapiro's (2016) ethnographic work on formaldehyde exposures similarly illustrates how FEMA trailer residents in the U.S. detected chemical exposure by tracing subtle changes in their bodies. Since formaldehyde was an odorless chemical, residents had to rely on their "body meters" as precise evidence-making instruments that accurately detected the volume of chemicals being absorbed into their bodies. Shapiro

reveals how residents collected data from chemical-detecting technologies and testimonial evidence of formaldehyde exposure from trailer residents in an attempt to take legal action.

In the case of air pollution in Ulaanbaatar, residents did not have access to material instruments that could read exposure levels. Rather, residents relied on their own "body meters" to detect different levels of harm. In order to detect different kinds of bodily harm, Ulaanbaatar residents relied on their knowledge of different kinds of pollutants in the atmosphere and duration of exposure on a daily basis. Bodily harm was understood in interaction with the larger urban environment.

As I will show in the following sections, urban dwellers negotiated bodily harms in conjunction with insurmountable medical care costs, technological failures, conflicts over the authority of bodily evidence versus visible evidence, and unrealistic hopes that diagnosis will produce effective treatment. Both doctors and patients had to weigh different kinds of evidence and engage in different practices. In response to Kim Fortun's (2012) call for further ethnographic inquiry into understanding the "late industrial present" marked by deteriorating sociotechnical systems and economic and infrastructure instability, this analysis highlights the ways in which evidence-making of air pollution-induced harms was highly contested among urban dwellers in Ulaanbaatar.

ATTUNING TO RESPIRATORY HARM

Tracing Polluted Lungs

Amraa felt the cumulative effects of air pollution over time. She suffered from shortness of breath, wheezing, and coughing several times throughout the winter seasons, year after year. During my homestay with her and her family, Amraa began suspecting that she may have

developed asthma. She complained that the pollution during the winter was particularly bad over the past few years, and that it was affecting her breathing more seriously. She wanted to have a fourth child, but she was concerned that her deteriorating lung health would prevent her from being a good mother to a newborn child. For Amraa, an X-ray of her lungs and proper diagnosis from her doctor would provide her with medical evidence of whether she was healthy enough to give birth to and raise a fourth child. In Amraa's case, X-rays served both as a diagnostic tool for determining her current health condition and as a prognostic method for evaluating possible pregnancy outcomes.

One afternoon, we visited the family doctor near her neighborhood, whose office was full of children and women standing along the corridor. At the entrance, we put on clear plastic slip covers over our shoes to prevent contaminating substances from staining the hospital floors. But there were dirt stains everywhere, and a cleaning woman was mopping the floors from corner to corner as more and more people rushed inside. As Amraa and I waited for the doctor, we started discussing her frustrations over the Mongolian medical system. Amraa was concerned about health insurance and how many families could not afford to have diagnostic testing conducted.

> Diagnosis is more expensive than medicine. That's why people are always sick. There are just not enough doctors, hospitals, or clinics in the city to accommodate everyone. I can get medicine at the pharmacy, that's easy and cheap. But you need to pay big money and bribe doctors if you want to get good testing done. I need to pay the doctor some extra money if I want to get an X-ray today. There's no other way of knowing if [my condition] is serious. I know something's wrong with my body, but I don't have proof yet.

Amraa continued to explain how diagnosis should be more readily available at a lower cost, and that medicines were already accessible to families. Amraa was engaged with self-medication practices in her household to manage her children's colds, flus, and other symptoms. Her mother had diabetes, which required more proper care and good medicine. Amraa did not

wait for diagnosis on common illness like colds and allergies, and relied on self-diagnosis and self-medicating. This kind of care was common among most *ger* district families that I met with. The pharmacies throughout the city offered very inexpensive over-the-counter medicines from antibiotics, creams, birth control pills, to pregnancy tests. Diagnosis, on the other hand, was time-consuming and expensive. Even though Amraa did not regularly go to the doctor, she knew that the air pollution was affecting her body in many ways. For Amraa, a biomedical diagnosis was the only way to "confirm" the seriousness of her health condition. She sought biomedical evidence that would prove that she was suffering respiratory damage.

After we had been waiting for nearly two hours, the doctor called on Amraa into the doctor's room. Amraa had to push her way to get the doctor to agree to "diagnose" Amraa as having a condition that required an X-ray. The family hospital was not equipped with these diagnostic technologies, and thus Amraa had to go to another hospital facility to request a test. But she received the referral sheet that was required to get an X-ray taken. I could not accompany Amraa on her visit to her X-ray the following week because I was responsible for watching her three children in the house during their winter break. But Amraa came home that night to vent about her hospital experience and the X-ray that she had taken by the doctor.

"The doctor asked me if I smoked!" Amraa exclaimed. I stopped helping her daughter with her math homework to listen more attentively to her health concerns. "I never touched a cigarette in my life!" Amraa continued.

> The doctor said that my lungs looked like a smoker's lungs. I didn't know that the pollution could be that bad. I knew that I was sick, but I thought maybe [I had] asthma. She didn't give me a proper diagnosis. She just said that my lungs were unhealthy. I'm living in a place that is slowly killing me.

Having spent money on the X-ray and doctor's consultation, Amraa expected a specific medical diagnosis that would ensure her proper long-term treatment. Instead, she received a series of broad spectrum antibiotics and medical advice to refrain from outdoor activities and to stay indoors as much as possible for the duration of winter. Amraa pulled the X-ray from a folder and pointed to the white splotches covering a skeletal image of her ribcage.

Amraa's doctor explained to her that the white spots were infections, and that she was most likely suffering from bronchitis, but that it could also be a bad infection caused by a prolonged cold. She was told that her symptoms will go away after a few days of taking antibiotics and that her lungs will clear up in the summer. For Amraa, however, the X-ray image was not a snapshot of a temporary lung infection. Rather, it was a visual representation of her body's permanent state of damage. Amraa explained to me that the white spots on the X-ray were traces of smoke that had accumulated into her lungs from breathing polluted air for over a decade. She let out a deep sigh and stated, "This is the pollution inside of me, and it's not going to leave me." For nearly four months during my homestay, Amraa regularly used the phrase, "*minii bii totorxoi boxirdolson*" or "my whole body is polluted" to refer to her body's gradual wearing down from constant exposure to air pollution. While Amraa had been attuned to bodily symptoms as she went about her daily routine and traced seasonal cycles and yearly patterns, these kinds of attunements were temporary. Coughs would come and go with the seasons and headaches would manifest only in the mornings and early evenings. However, the X-ray provoked a particular kind of permanence.

> **Amraa:** My lungs must be really bad. I still can't believe she asked me if I smoked.
> **Chisato:** But she gave you medicine. I'm sure you'll feel better after a little while.
> **Amraa:** How will I know I'm feeling better?
> **Chisato:** I don't know… You'll be able to breathe more easily. Less coughing. I don't know…

> **Amraa:** But am I ever really going to get better with lungs like this? [points to the X-ray]
> **Chisato:** The doctor said that's temporary. It'll go away soon. It will clear. The white spots will gradually disappear.
> **Amraa:** No. My lungs are polluted. My *whole body* is polluted. No medicine can fix that.
> **Chisato:** But the doctor said…
> **Amraa:** No. The doctor didn't know! She couldn't give me any answers. She couldn't even tell me what caused this. She said probably air pollution. If it was bronchitis, pneumonia, or another disease, she would have told me. Obviously, it's something that she couldn't pinpoint.

Symptoms such as coughing and wheezing served as indicators that Amraa was suffering from air pollution's effects. However, X-rays revealed that Amraa was not only closely "attuned" to the atmosphere's chemical presence (Anderson 2009; Sloterdijk 2011; Stewart 2011), but that her body was *embodying* the pollution. Her comment, "my whole body is polluted" blurs the boundary between the "exterior" polluted environment and the "interior" polluted body. In other words, Amraa became aware of her own body's porosity and vulnerability to the urban environment's toxicity. While Amraa was aware of potential hazards of burning coal and living in the midst of heavy air pollution, the X-ray image of her lungs confirmed her fears that she was "living in a place that was slowly killing [her]."

For Amraa, visibility and medical evidence played an important role in understanding her state of bodily harm. Alice Street's (2014) ethnography explains how Melanesian patients employed X-rays as a means to secure long-term healthcare (2014:131). Patients who feared "becoming invisible" or neglected by doctors desperately sought diagnostic testing in hopes that they would become "medically visible" and compel doctors to treat them. Similarly, Amraa sought X-rays as relief from the uncertainties of her respiratory condition and a means through which to secure proper long-term care. However, the provocative image of her X-ray and her doctor's ambiguous response to the image left Amraa more frustrated, confused, and hopeless about her overall health. Although she sought "medical visibility", she left the hospital with less

clarity – an unclear diagnosis and an ambiguous explanation that air pollution *may* have caused her respiratory damage. Even though the doctor explained to her that the bodily harm on the X-ray image was temporary, for Amraa, both the doctor and the X-ray image gave her little confidence that the "pollution inside her" would disappear or that she could control what enters her body.

I met with several other women like Amraa experiencing frustrations with results of diagnostic testing. During the winter season, pneumonia cases were common among children under six, and mothers frequently visited the local clinic for testing, diagnosis, and treatment. Echoing Amraa's comments about the accessibility of pharmaceuticals, women explained to me that the cost of medicine was not the obstacle in receiving care. Rather, women needed to wait for many hours in long lines with other sick children, often bribe the doctor for same-day treatment, and get referred to other doctors who can conduct the necessary diagnostic testing. Munkhjargal, a woman living in the same *khoroo* explained, "We can get medicines anytime… [There are] pharmacies everywhere in the city. Even in our neighborhood…. [But] we don't know what we're treating. Is it a cold? Is it pneumonia? Is it asthma? Doctors are the only ones who can tell us what they are sick with." Munkhjargal explained that she takes her daughter to the local clinic several times during the winter every year. In the past, her daughter had been diagnosed with pneumonia twice, and was afraid that she would have to suffer from pneumonia for the rest of her childhood.

> The lung specialist [doctor] listened to my daughter's breathing with a stethoscope and said that she was wheezing. It was affecting her heartrate. She suspected that it was asthma, but she wanted to double check… [She] took an X-ray of her chest… She explained that inside her lungs were cloudy. She told me that she has pneumonia.

In Munkhjargal's case, her doctor made a clear diagnosis. However, this was the third time that her daughter was diagnosed with pneumonia in less than one year. In other words, the frequency of the same, specific diagnosis made Munkhjargal skeptical about the doctor's ability to treat patients properly and provide medical advice. "I'm thinking… Is this right? Is it really pneumonia? It could be something more serious," Munkhjargal stated, expressing concern. The doctor prescribed her daughter antibiotics and recommended that she rest at home instead of attending school for at least three weeks. This kind of patient care was insufficient, from Munkhjargal's perspective, because it failed to provide her with answers about strategies to minimize the frequency of respiratory harm. Inability to diagnose was not only in the hands of the medical provider, but spoke to the wider medical system at-large.

Promoting Healthy Bodies

With worsening air pollution, doctors in local clinics were faced with the challenge of treating large numbers of patients suffering from respiratory illnesses. While X-rays were routine in specializing hospitals, diagnostic testing and pharmaceuticals alone were not sufficient in providing patients with care. Doctors were overworked and underpaid, and most expressed frustration over the health care system[33]. Not only were clinics understaffed with doctors and nurses, but hospitals lacked equipment and resources to sustain large number of patients. For example, most hospitals lacked a sufficient number of hospital beds, which led to regular overcrowding of lobbies and hallways. I frequently witnessed patients being treated in the hallways rather than in a proper patient room. Within these contexts, diagnostic tools were

[33]When Mongolia was a Soviet satellite state, the state provided stable salaries to physicians and kept medical facilities equipped with medical supplies and technologies. After the fall of the Soviet Union, Soviet financial aid for healthcare (along with education, pastoral economy, among others) diminished, catalyzing fast deterioration of medical infrastructure across Mongolia. Stocks of drugs and medical supplies were depleted and the lack of heat and electricity inside facilities forced many hospitals to shut down (Billé 2015:146-147; Janes and Chuluundorj 2004:236-237; WHO 1999).

oftentimes deemed inaccurate or unreliable due to infrastructural concerns. Much like Street's (2014) ethnography, doctors began to focus less on diagnoses and more on prescribing medicines such as broad-spectrum antibiotics and providing medical advice that would cover multiple possibilities of diagnoses (2014:106). In order to attend to the multitude of possible physical effects of air pollution, doctors increasingly turned to providing medical advice that focused on improving daily habits.

Doctors that I met with explained to me that air pollution had drastically changed their interactions with patients and their approach to diagnosis and care. According to a lung specialist, diagnosis was no longer sufficient for proper medical care:

> Families always talk about *utaa* (the smoke). They say that it's causing their disease, worsening their symptoms, or making life difficult. I understand that it's a problem, but they won't settle for just an injection or pills. They want medical advice. But it's hard because there's no proven methods. There aren't enough studies that show the best way [to reduce harm]. So, I recommend them to boost their immune system to improve their chances of reducing infection during the winter.

Prior to the air pollution problem, doctors were able to diagnose and treat patients with less concern about the validity of their patient care. For example, a doctor explained to me that the accumulation of a particular bacteria into the air sacs inside the lung leads to bronchitis. However, worsening air pollution brought uncertainty and panic among health practitioners who were unable to clearly define the correlation between the presence of bacteria and air pollution. Rather than relying on diagnostic instrumentation alone, doctors turned to traditional Mongolian medicine and local remedies that were understood to improve the body as a whole.[34]

[34] When I refer to "traditional" Mongolian ways of knowing or practices, I am not implying that these practices are archaic, backwards, or unchanging. Rather, I employ this term because my informants used this term to refer to certain bodily understandings and health practices.

Boosting the body's immune system was the most common medical advice that doctors gave to their patients concerned about reducing bodily harm from air pollution. Advice on how to boost the immune system varied, from taking natural supplements and vitamins, to spending an extended period of time in the countryside. In comparison to symptom-based care that did not assuage parental fears about air pollution's toxic effects, doctors found that providing parents with more "lifestyle" based medical advice provided parents with a stronger sense of control over the pollution problem. As a family doctor in one of the most densely populated *ger* district communities explained, "This pollution causes stress in people. Life in the city in general is stressful. Adding pollution makes it much worse. People aren't satisfied with just treatment anymore. They want answers. They want to feel they can control the situation." While most parents sought immediate treatment to cure their children's respiratory infections such as pneumonia, they demanded more preventative measures that could decrease the frequency of hospital visits and improve their children's overall health.

Family doctors advised families to take *chatsargan* (seabuckthorn) supplements that were rich with vitamins and other nutrients that could boost their immune system. One doctor "prescribed" his patients to take one spoonful of *chatsargan* juice every morning. Although it was a more expensive alternative to medicines that could be bought over the counter at the pharmacy, families enthusiastically shared this information with their extended families and friends. Doctors understood that this kind of medical advice was not medically proven, but since it cohered with traditional Mongolian ways of understanding the body, many families accepted these kinds of advice as legitimate forms of care. Other doctors claimed that the best way to boost immune systems was to spend time in the countryside. Nergui, a doctor that lived in the

ger district, explained that traditional Mongolian healing methods were the most effective in preventing long-term harm. She explained:

> You can wash the body with *airag* (fermented mare's milk) and let the children run naked. This is a traditional way to promote good immune system. In the summertime, we [Mongolians] wash the children's bodies with *airag* and let them go outside naked and walk out and soak in the sun. The combination of these things is good for their health. It will prevent lung diseases during the winter time. It's a traditional way of boosting immune system. The *airag* absorbs into the skin. The skin color changes brown or black, it's amazing. It's like a detox.

Most families believed in humoral balance, which derived from Mongolian traditional medicine-based understandings of human health. Within this framework, "hot" foods were considered to be rich in vitamins and minerals that would boost the body's immune system and promote good blood flow. "Cold" foods and "cold" drinks on the other hand disrupted the humoral balance of the body, and increased the chances for sickness. Thus, properly dressing with layers of warm clothes and covering the skin were considered important mechanisms through which to stay healthy during the winter season. These everyday practices were reinforced in both medical practice and everyday life. Due to the myriad diseases that air pollution could potentially cause, doctors were turning to non-biomedical treatments and medical advice, despite uncertainties about their effectiveness.

Both bodily ways of knowing and medical practice shed light on the ambivalence and ambiguity of disease governance in contemporary Mongolia. But the question is not limited to what counts as evidence of air pollution-induced bodily harms, but also extends to what constitutes medical expertise. Patients attempted to read their X-rays to fill the void of doctors' insufficient analyses, while doctors no longer provided only treatment-based care but tailored medical advice to encompass preventative measures. This trend in Mongolian medical care demonstrates a shift away from what Clarke et al (2010) calls "biomedicalization" of healthcare.

Clarke claims that clinical care has transformed toward more technology-based care with the introduction of new computer-based visualization technologies, telemedicine, among others. In Ulaanbaatar, however, while doctors continue to rely on X-rays and other diagnostic technologies, patient care has shifted away from diagnoses to broader medical advice without clear identification of disease. An example of shifting relationships between medical technologies, medical expertise, and political regimes is Petryna's (2002) ethnography on medical care in post-Chernobyl Ukraine. Petryna (2002) demonstrates how during the Soviet regime, Ukrainian health practitioners used X-rays to visually detect necrosed lung tissue caused by radiation after the 1986 Chernobyl nuclear accident (2002: 43-54). These experts relied on X-rays to make predictions about whether or not an individual patient was at risk of radiation. However, with the dismantling of the Soviet health care system, new diagnostic techniques and instruments emerged. In particular, biodosimetry was introduced as a new measurement technique to detect biological dosage of radiation. This technique was considered particularly novel because it could help predict the time course and severity of illness as well as assess the risk of various long-term consequences from radiation exposure. Much like the shifts from face-to-face interaction to more statistical norms echoed in Castel's (1991) case study of psychiatry, post-Soviet Ukraine's medical system adopted statistical methods for measuring radiation in patients. As such, risk knowledge was no longer constructed based on X-rays of the body or symptoms of a patient. Rather, risks were made calculable. Another consequence of this shift in radiation-detection instrumentation was that Soviet-era experts were no longer experts in post-Soviet medicine. Soviet-era scientists did not have expertise in biodosimetry. Thus, they had to acquire new knowledge and expertise.

In Ulaanbaatar, rather than a new technology and new set of expertise shifting medical discourse and practice, air pollution has destabilized patient care. Doctors who were not versed in air pollution science were increasingly questioned by patients who claimed that air pollution caused regular respiratory harms. Much like Ukrainian doctors who lacked expertise in biodosimetry, Mongolian doctors had little-to-no training or scientific understanding of air pollution's effects on the body. Despite this lack of expertise, doctors were faced with the challenge of providing medical advice that would assuage patient fears while maintaining medical authority. In other words, doctors were no longer faced with the problem of diagnosing a single disease or examining breathing patterns of patients. They were also becoming responsible for providing patients with information on how to maintain health in a polluted environment. As a whole, this trend is a larger reflection of how air pollution left both patients and doctors struggled to find answers and means to control a seemingly uncontrollable personal and public health disaster.

ATTUNING TO GESTATIONAL HARM

Tracing Pregnancy Loss

While most city dwellers had been attuned to respiratory harms for several years, concerns about gestational harms emerged during my fieldwork. Evidence of the correlation between pregnancy loss and air pollution was not well-established in epidemiological studies or in clinical diagnoses. Pregnant women employed pattern-making through the seasons to link their gestational harms with highly polluted months. In other words, here too, bodily attunement played an integral role in evidence-making.

Nasanjargal and I spent many hours together discussing public health issues. She was a public health researcher and lecturer at the National Medical University of Mongolia. She was

raised in Ulaanbaatar, and grew up in a middle-class family with a father that was an air pollution scientist who worked on project-based contracts with many transnational organizations. Nasanjargal and I attended journal club meetings together, spent time in the office, and even joined in a dancing competition for the department's New Year Party. I had met her for the first time in 2012, when I came to meet the department head and establish affiliations. At the time, the department was going through a planning phase of a gestational health research project, an internationally-funded study that was headed by a Canadian scientist. Air pollution was a large concern among the researchers who were trying to grapple with how to do the research. Nasanjargal employed everyday strategies like avoiding the air pollution during peak times to minimize her exposure to toxic smoke. While the seriousness of the air pollution was made clear, she showed no sense of urgency or deep personal connections to the air pollution and her body.

By the time I returned to the field in 2014, Nasanjargal and her colleagues shared some startling news. The same research scientists revealed a very different attitude to air pollution. Pollution was no longer just a research topic to them; it was affecting their personal lives in profound ways. Nasanjargal revealed to me that she had suffered three miscarriages since I had last seen her. During the first two miscarriages, her doctor dismissed it as a "side effect" of being pregnant at a later age (she was 36). But following her third miscarriage, the same doctor explained that the pattern could be linked to air pollution.

I quickly found that other women were experiencing pregnancy loss. When I asked women what the most serious health effect of air pollution was, most answered pregnancy loss and developmental issues in children. In fact, in 2014-2016, out of the 70 women that I interviewed, 61 women mentioned that they personally had a miscarriage or knew a close relative or friend who had. I was surprised, as just a couple years prior, residents either did not

articulate such a concise answer or responded with prolonged cold and bronchitis as their biggest concern.

Women were closely attuned to the process of pregnancy loss. One woman explained that her abdomen would stiffen, her back would ache, and that she would bleed heavily. She reiterated many times that "something just didn't feel right." Other women shared very similar experiences, claiming that they could "feel" when a miscarriage was going to happen. They felt not only bodily symptoms, but an overwhelming sense of grief that they had suffocated their baby to death. This loss was extraordinary because it was a loss that many women were suffering. A loss that pushed air pollution into crisis. "I didn't think the air could be *this* bad. But it killed my baby. Now, I'm afraid I'll never get pregnant," Nasanjargal cried.

Women were becoming more attuned to their bodies, not only understanding that air pollution may be affecting their pregnancies but *when* it was affecting their bodies. Women explained to me that they noticed that their pregnancy losses occurred during the winter season and the most polluted months.[35] During the winter months, women were more likely to miscarry compared to during the summer months. This kind of bodily attunement differs from Tine Gammeltoft's (2014) ethnography on Vietnamese women turning to sonograms as a specific kind of visual evidence to seek reassurance about health of their fetuses (2014: 30). Mongolian women did not employ evidence from sonograms or clinical care. Rather, they drew on their own speculations that derived from their bodily experiences and others' gestational experiences. During winter 2016, I encountered many women who were forming communities of care among family members and friends. I noticed a shift in the ways that gestational health was being discussed. A few years prior, doctors, nurses, and mothers associated pregnancy loss with

[35] An epidemiological study conducted by Enkhmaa et al 2014 concluded similar findings.

women's age. Women in their thirties were considered to be at high risk of spontaneous abortion. But now, air pollution as an explanation for spontaneous abortion emerged, and women began to change their behaviors and practices in order to protect their bodies and minimize the probability of suffering from pregnancy loss.

Nasanjargal found out that she was pregnant in October, and upon receiving a recommendation from her doctor that the only way to improve chances of a successful pregnancy was to carry out her term outside of the city, Nasanjargal moved to Nalaikh, a town southwest of Ulaanbaatar to live with her father. She took a leave of absence from the School of Public Health and worked as a consultant to an internationally-funded project from home. During the same period, another public health colleague, Nandia, moved to the countryside in Tuv province for the duration of her pregnancy. "Clean air is the only solution. There is no guarantee, but it's important to take precautionary measures," Nandia explained to me a few weeks before temporarily moving out of Ulaanbaatar.

In addition to relocating, some women also started to consult internationally-funded private clinics and began altering their family planning strategies in an attempt to time their pregnancies around less polluted months. Women started advising one other, suggesting that June to October was the optimal time period to get pregnant because they felt strongly that air pollution exposure during the first few weeks of pregnancy posed the biggest risk to pregnancy loss. Women felt that they were increasingly responsible for regulating and maintaining their own gestational health (Petersen and Lupton 1992). Unlike Mansfield's (2012) case study of pregnant women becoming "biopolitical subjects" of government regulated seafood consumption advisories targeting childbearing women, Mongolian women were "policing" their own bodies in response to the lack of sufficient clinical guidance and the seasonal occurrence of air pollution.

In other words, guidelines for "good motherhood" (Mansfield 2012: 597) were being constructed amongst pregnant women themselves.

Rapp (2000) poignantly illustrates the lived experience of pregnant women confronted with difficult decisions about whether to undergo prenatal procedures to screen fetuses for genetic anomalies. Rapp describes these women as "moral pioneers" (1999) who weigh the possibility of bearing and raising a child with Down syndrome or other anomalies against the agony of having to discern what kind of human life is worthy or unworthy of entry into the world. Rapp's ethnographic analysis serves as a powerful case study of how, in the genetic turn in reproductive health, interactions between women's bodies and genetic technologies produce morally fraught situations and subjectivities. She shows how pregnant women draw upon long-standing cultural and religious values as well as generational knowledge and social class ties to navigate through this challenging ethical dilemma. Pregnant women living amidst air pollution have had to deal with similar ethical dilemmas, where risks of giving birth to children with birth defects, neurological disorders, or respiratory issues were understood as being high in the capital city. One woman explained to me, "I've seen it in the news frequently during winter. The journalists interview families inside the hospital room or inside people's homes. They show crying babies with twelve toes and abnormal heads. It's frightening." Out of the 70 women that I interviewed, 65 correlated the rise in birth defects to air pollution. Uncertainties about the gestational effects of the toxic environment elicits difficult decisions and practices among pregnant women.

Uncertain Doctors, Responsible Mothers

Among doctors that I met with, the evidence connecting air pollution and pregnancy loss was contested and varied, depending on which doctor I spoke with. Many doctors that I met with

explained that the *utaa* (smoke) could stiffen the womb, which would prevent the infant from developing properly during pregnancy. They explained that a prolonged lack of oxygen could have caused hypoxia and kill the infant. Based on the local biomedical framework, regular airflow of clean oxygen was required to prevent the womb from "hardening" and suffocating the infant. The only medical advice Nasanjargal received from her doctor was to carry out her term and give birth in the countryside, as far from the capital city as possible. The doctors that I interviewed at First Maternity Hospital, the Child and Maternal Health Research Hospital, and district clinics made similar causal links to pollution:

> The poison sits in your body and the effects come later. Pregnant women have the most difficulty here [in the city]. You breathe this air for 10 months and pass [it on] to your baby. [There is] no clean oxygen here. Your womb can stiffen and your baby can stop growing inside or die instantly.

While air pollution science and epidemiological concerns with air pollution focused on the presence of particulate matter and noxious gases, gestational harm was understood as a lack of clean oxygen that prevented life from developing inside the womb. An emphasis on "clean oxygen" was common among the doctors that I met with. Rather than rendering air pollution as particulates and gases, they made a clear distinction between *xortoi* (poisonous) and *tsever* (clean) air. Countryside air was considered to be the healthiest kind of air, and urban air, particularly in Ulaanbaatar was considered to be the "most polluted in the country." This distinction was made, not through air quality monitoring technologies or scientific studies, but rather through their own medical practice of treating countryside and urban patients throughout their medical careers. "In the countryside, mothers are healthier in general. Their babies don't suffer from jaundice for two weeks like babies in the city do. There isn't a high pregnancy loss rate [in the countryside]," a maternal health doctor at the Child and Maternal Health Hospital in

Ulaanbaatar explained. The guidelines that doctors would provide their patients would range from "carry the child a few meters off the ground to prevent the child from breathing in car emissions" to "use a scarf to cover the mouth and nose area."

Many expecting mothers and pediatricians believed in a correlation between air pollution and birth defects. Medical diagnoses such as *tarxnii daaralt*[36] or brain pressure and autism were becoming more commonplace. "Polluted wombs" not only increased the chances of pregnancy loss, but also increased the risk of giving birth to an unhealthy child or a child that would develop health complications in the future. The focus on the womb was a different kind of "womb-centrism" from Pashigian's (2009) use of the term in her analysis of IVF and motherhood in Vietnam. Pashigian claims that the sharing of blood and nutrients between the mother and fetus is understood to create physical and emotional closeness called *tình cam*. Because gestational surrogacy required the infant to grow inside the womb of a different woman, this threatened the biological mother-infant bond (2009:44-45). In Mongolia, reproductive technologies did not threaten the physical and emotional closeness between mother and infant, but air pollution threatened the health and well-being of the next generation of the Mongolian population. Because maintaining the purity and robustness of the gene pool[37] was central to debates about reproduction in Mongolia, air pollution increasingly became the culprit blamed for "tainting" the Mongolian blood line with unhealthy and polluting genes.

[36] *Tarxnii daaralt* or "brain pressure" is a local Mongolian diagnosis wherein the infant or child suffers from severe pain inside the skull.

[37] In his book, *Sinophobia*, Billé (2015) describes Chinese blood and semen as contaminating the Mongolian bloodline. He recounts rumors about Chinese men carrying syringes filled with AIDS virus contaminated blood and Chinese men impregnating Mongolian women to expand the Chinese population (2015:20-21).

But not all doctors believed in the correlation between air pollution and pregnancy loss. Some doctors blamed the mother for pregnancy loss. Some doctors attributed pregnancy loss to the increased stress and anxiety promoted by the everyday patterns of urban life. "The mothers who are stressed are not giving breast milk to their newborns. They end up sleeping and not caring for their newborns. Not enough breast milk is caused by stress, tiredness after birth, and constant worrying and thinking," one doctor stated. "Since there are no guidelines on how to be a good mother, women often find themselves working and holding stressful jobs instead of taking care of their bodies and thinking about their infants," explained a maternal health doctor. Particular kinds of mothers-to-be were blamed for not providing the bodily and environmental conditions for a safe pregnancy.

This conceptualization of urban mothers living in a high-stress environment came from urban Mongolians' imaginaries about health and rural life. Doctors claimed that mothers were healthier and babies were born without complications in the countryside, where people followed a much more natural way of life that followed ecological patterns and stress-free day-to-day. As one doctor explained, "women in the city carry too much stress. They are working different jobs and not relaxing at home when they should be. The urban environment is no good for pregnancies." Thus, gestational harm was embedded in the "built environment" of the city, rather than the chemical toxicities that permeate the urban atmosphere. Economic strain, unemployment, rapid pace of city life, traffic noise, and infrastructural uncertainties were all causes of women's stress, but it was ultimately the pregnant woman's responsibility to regulate her own stress-levels.

Obstetricians and pediatricians were in a particularly sensitive position with their patients because expecting mothers were faced with a lose-lose situation. As one doctor explained, "there

is just no sure way to be healthy and pregnant here." Doctors expressed that they did not have the expertise or control over the situation so all they could provide was advice on lifestyle choices and to carry out their pregnancies in the countryside. With limited epidemiological research or medical guidance, doctors were increasingly resorting to medical advice in the form of "lifestyle changes" and recommending expecting mothers to carry out their pregnancies in the countryside where the air is understood to be much cleaner and healthier for the body.

In their study of maternal mortality in post-Soviet Mongolia, Janes and Chullundorj (2004) argue that many rural women died as a result of a wide range of direct and indirect factors from economic transformation of the rural economy, social marginalization of women in their communities, to financial instability in rural households. In their discussion of medical care, they claim that a "cascade of failures" on the part of medical care providers and health infrastructures to provide adequate emergency care had a direct impact on maternal deaths (2004:251). My study emphasizes how medical expertise and patient knowledge intersect during these moments of failure brought upon by larger infrastructural changes.

Reproducing Hierarchies

Ginsburg and Rapp (1995) employ the term, "stratified reproduction[38]" which explains how "some reproductive futures are valued while others are despised" (1995:3). In other words, society puts pressure on "preferred" members of society to reproduce, while discouraging "undesirable" Others from reproducing. In the case of pregnant women in Ulaanbaatar, there was a clear stratification of women who had access to the resources necessary to carry out a "safe"

[38] The term "stratified reproduction" was first coined by Shellee Colen (1986) on her study of West Indian women who work as child care providers for white American families. Colen argues that white mothers have the socioeconomic stability to hire nannies to take care of their children while they work, while West Indian mothers are unable to participate in raising their child because they must immigrate to America to find work to financially support these white families. Thus, some reproductive lives are deemed more valuable than others.

pregnancy. For example, Nasanjargal, who moved to Nalaikh to carry out her pregnancy in the safety of a countryside home, had the financial stability and social network to do so. Her father, a university professor in the nearby town of Nalaikh, lived in a home that could accommodate his daughter, and was able to care for her during her term. Having grown up in a middle-class family with financial stability and a strong social network, Nasanjargal's reproductive future was connected to the social ties she had access to in the present. Most women living in the *ger* district, on the other hand, could not afford to leave their household during pregnancy, as they bore the responsibility of working a full-time job to support their family. Additionally, with families dispersed through other *ger* district neighborhoods, they did not have family members or friends with whom they could stay during their pregnancy. Thus, for women like Amraa who wanted to have a fourth child, carrying out a "safe" pregnancy outside of the capital city was not a possibility. In such ways, bodily attunement and stratification of reproductive bodies became entangled with not only medical and toxic uncertainties, but also with socioeconomic challenges.

The stratification of reproducing bodies is also connected to larger infrastructural changes marked by Mongolia's post-Soviet transition. According to Janes and Chuluundorj (2004), the privatization of pastoral land catalyzed stark inequalities in the countryside. While under the Soviet regime, households were provided with financial and infrastructural stability in the form of cash and herding equipment. As a member of the pastoral collective, or *negdel*, families were also guaranteed free healthcare. Until 1992, all districts in Mongolia had maternity waiting homes that provided women with medical care. Pregnant women were encouraged to move into the maternity waiting homes in advance of the expected delivery to ensure a safe delivery. In most cases, family members took on the responsibilities that the expecting mother would otherwise be required to do while pregnant. In other words, the collective system provided

pregnant women with the resources and "peace of mind" to focus on her own health and give birth to a healthy infant (2004:240-242). Upon the dismantling of the Soviet Union, these maternity waiting homes and the medical system eroded with the disappearance of financial support for these infrastructures. Herding families were also left to transition into a subsistence economy, wherein state salaries were no longer available and households were left to sell livestock and animal products on their own (2004:240-252).

Transitions in the pastoral economy, vulnerability to climate change, and the insecurity of a subsistence economy continue to have ramifications for families living in the *ger* districts of Ulaanbaatar. As I discussed in Chapter 2, the main driver of population growth in the capital city, particularly in the *ger* districts, is instability in the pastoral economy due to loss of livestock due to winter disasters. Because families in the countryside were no longer able to survive off of their animals, they moved into the capital city to seek alternative forms of employment. As these families settled into the rhythms of urban life, they not only lacked a social network with other city dwellers, but they were also faced with the challenge of navigating bureaucratic systems such as hospitals and clinics. Compared to long-term residents of Ulaanbaatar like Amraa, women who have only recently moved into the capital city were the most vulnerable to medical uncertainties. Therefore, women's reproductive lives were stratified – middle-class women had the socioeconomic resources to access reproductive care, long-term *ger* district residents had the knowledge of medical care in the capital city, and recent rural migrants in *ger* district communities typically had neither knowledge nor resources. In such ways, my ethnography extends Ginsberg and Rapp's (1995) work on stratified reproduction by revealing how rural-to-urban migration, in addition to race and class, shaped accessibility and inaccessibility to resources in reproductive decision-making.

CHAPTER CONCLUSION

While the trend in medical anthropology literature turns toward a focus on technological methods of evaluating health – such as big data and global health metrics – my analysis demonstrates how attention to bodily ways of knowing is still critical to medical anthropological scholarship. In Ulaanbaatar, bodily attunement was not only a means through which to detect harm, but also a divergent method from diagnostic technologies that visualized harm in particular ways. Bodily attunement played an important role in challenging existing biomedical models that failed to provide sufficient explanation for air pollution-induced exposure.

Evidence-making of bodily harm was not uniform, but highly contested. In the case of respiratory harm, I have shown how patients grew impatient and frustrated over the ambiguity of diagnostic tests that showed little evidence that bodily harm was temporary. City dwellers who were faced with reoccurring respiratory illnesses sought alternative explanations and guidelines to prevent recurrent episodes of bodily harm. Doctors, on the other hand, faced with the challenge of providing patients explanations for illness without scientific or epidemiological knowledge of the correlation between air pollution and the ailing human body, altered their medical care to include non-biomedical forms of treatment. Augmenting pharmaceutical treatments, doctors "prescribed" dietary supplements and extended stay in the countryside as remedies against air pollution's noxious effects. A similar pattern of uncertainty played out in tracing gestational harm. Patients did not rely on technologies to determine whether they were suffering or were going to suffer from pregnancy loss. Rather, they drew on their bodily knowledge and formed communities of care among women that were undergoing similar bodily experiences. Doctors, who could not provide medical clarity, as they did not have knowledge of air pollution's gestational effects (for example, unable to share with patients which trimester is

the most "risky" or which month was the most dangerous) turned to medical advice that encompassed lifestyle changes. Providing advice such as to relocate to the countryside was the only way to ensure some degree of certainty over minimizing gestational harm. The countryside was not only thought of as having "clean" air but the pace of life was understood as more peaceful for carrying out pregnancies. Bodily knowledge about air pollution-induced harm was not understood to have binary effects such as acute/chronic and short-term/long-term. Rather, evidence was created through bodily attunement, or an entanglement with the urban environment and its degrading material infrastructures. Air pollution-induced harm was thus not a linear process, but a dynamic and complicated one that stemmed from everyday engagements with air.

The shifts in practices with the emergence of air pollution also have important implications for what counts as medical expertise. Doctors who are not equipped with scientific knowledge about the relationship between air pollution and bodily effects omitted identification of disease in place of more ambiguous diagnoses and non-biomedical advice for patients. Patients, on the other hand developed their own understandings of bodily harm by attuning to their own bodies and examining their own diagnostic tests. In Street's (2014) analysis, Melanesian patients sought X-rays in order to make secure healthcare. However, her ethnography does not highlight the ways in which doctors alter their medical practice. Therefore, my analysis is distinct from Street's ethnography in that I highlight how Mongolian doctors turned toward alternative methods of explanation and practices to adapt to the uncertainties of air pollution-induced harms. This blurring of expertise demonstrates the struggles of both patients and healthcare providers in finding answers, treatments, and prevention methods in the midst of uncertainties.

Finally, navigating uncertainties brought on new understandings of self-responsibilization toward health. In what Michel Foucault (1988) calls "technologies of the self", individuals conform their behaviors by themselves or with the help of others in order to transform themselves to reach a state of happiness, purity, wisdom, perfection, or immortality (Foucault 1988: 18). Foucault's formulation stems from his analysis of Greco-Roman philosophy and Christian spirituality to illuminate how in order to live happily, the cultivation of the soul, or care of the self and knowledge of the self is necessary. Within this framework, individuals are continually trying to improve their lives by becoming ethical subjects. Thus, the notion of power rests not on forces from the outside through repression, coercion, or domination, but rather, internal processes through which individuals can make themselves the object of their own technical practices. In this chapter, I have demonstrated how city dwellers take a more "neoliberal" approach to health where "health itself and proper management of chronic illnesses are becoming individual moral responsibilities to be fulfilled through improved access to knowledge, self-surveillance, prevention, risk assessment, the treatment of risk, and consumption of appropriate self-help and biomedical goods and services" (Clarke et al 2010: 48).

Rather than universalizing the health effects of air pollution on the human body, this analysis reveals the importance of examining the "local biologies" (Lock 2001) of Mongolian women's bodies. In her ethnography on cross-cultural comparisons of menopause symptoms among women in Japan, Canada, and the United States, Lock (2001) argues that symptoms and post-menopausal risks are not the same. She argues that these responses differ based on the different social and physical conditions of women's lives. Thinking alongside Lock, I argue that bodily harm is not solely a pathological event with distinct set of symptoms that can be applied to all human bodies across the globe. Rather, bodily experience is situated in the particularities of

a given cultural context. In Ulaanbaatar, uncertainties embedded in the medical systems, medical practice, diagnostic technologies, bodily attunement, and degrading urban infrastructures all came together to produce varied evidence of bodily harm.

CHAPTER 6

BODY FACTS: APPROPRIATING HARM

"It's important to raise global awareness around how air pollution is affecting children's health. Especially in the *ger* districts, this is a huge problem. Children need to walk to school every day in the smog, and they are exposed to smoke inside their homes. This is an urgent problem. We really need to push the government and scientific community to tackle this [issue] as quickly as possible."

- Unicef staff member

"Everyone… the government, international organizations, even the middle-class Mongolians don't know anything about our living situation. They talk and talk and nothing gets done. They don't care about improving our lives… When will *we* get to speak?"

- Enkhee, resident of Bayazurkh district

EVIRONMENTAL JUSTICE MOVEMENTS

A growing body of environmental justice literature examines how local communities respond to chemical exposures caused by petrochemical and agribusiness pollutants.[39] Scholars have shown the range of community responses to contamination, from "toxic frustration" wherein people understood the serious health effects of living in a toxic place, yet felt powerless against industries surrounding their communities (Aureyo and Swistun 2008, Lora-Wainwright 2013; Singer 2011) to collective push-back against the state and industries to demand compensation (Checker 2005; Murphy 2007; Petryna 2002).

Within this literature, scholars have examined how citizens actively deploy their health problems in order to advance environmental justice struggles. Examples of this kind of citizen-engagement include community-driven environmental monitoring (Checker 2005) and women's

[39] See Allen 2003; Aureyo and Swistun 2008; Bell 2013; Brown 2007; Bullard 2000; Checker 2005; Fortun 2001; Hoover 2016; Little 2010, 2014; Lora-Wainwright 2010, 2013; Murphy 2006; Petryna 2002, 2004; Singer 2011; Tilt 2013.

health movement to raise awareness of Sick Building Syndrome (Murphy 2012). For instance, in her work on DDT exposures in California's Central Valley, Nash (2007:144) shows how farmworkers, whose bodies were exposed to pesticides on a daily basis, drew on their health burdens to push against laboratory science that claimed pesticides were safe for humans. She illustrates how embodied knowledge can contest dominant structures of science. Other scholars have shown how marginalized communities came together to fight against large-scale industries. For example, Melissa Checker (2005) illustrates how hundreds of black families in Hyde Park employed their health problems to publically protest chemical industries that had been dumping toxic waste into their neighborhoods for decades.

While this scholarship focuses on how bodily knowledge is used to *empower* citizens to contest dominant structures such as science and capitalism in the wake of social justice movements, it fails to highlight the ways in which bodily knowledge could be used to make citizens more vulnerable. My case studies on air pollution in Ulaanbaatar show how bodily knowledge was leveraged in ways that *marginalized* and *victimized* people who did not or could not participate in social movements in the same way as middle-class Mongolians. I provide two case studies that show how international actors and middle-class Mongolians employed children's bodies to represent, appropriate, and leverage harm in ways that furthered inequalities, even in their roles to advance public health justice.

Before moving on to describe these case studies, it is important to note how efforts to improve public health in Mongolia differ from movements that took place in the United States. As Nash (2007) and Checker (2005) among others have demonstrated, most of the American community activism centered on fighting against mega-industries such as pesticide, chemical-processing, and oil companies, whose industrial activities contaminated their neighborhoods. In

the case of air pollution in Ulaanbaatar, most Mongolian citizens did not blame the coal industry – despite the proliferation of coal available in communities in the capital city. Rather, as I have demonstrated in previous chapters, Ulaanbaatar residents blamed the coal-*burners*, *ger* district residents as culprits of pollution. Many middle-class, apartment-dwelling residents that I spoke with believed that there would be little to no air pollution in their city if the *ger* districts did not exist. At the same time, *ger* district residents were also the most vulnerable to air pollution's effects because they are exposed to pollutants inside their home and in their neighborhoods for longer periods of time. Unlike in U.S. movements where the victims of environmental contamination came together to engage in community activism, I argue that in Ulaanbaatar, those that were most vulnerable to air pollution's effects were erased from these social movements.

WITNESSING CHILD HARMS

The Poster Child

Nine-year-old Nandin-Erdene became the face behind the United Nations Children's Fund (Unicef) campaign against air pollution. She was interviewed in a film sponsored by Unicef, first shown as an introduction to the "International Air Pollution and Child Health" campaign conference held in Ulaanbaatar in January 2016. The film was shown to a room full of 150 participants representing several ministries, research institutions, NGOs, and universities, who would work "collaboratively to accelerate actions to reduce air pollution-induced harms among children in Ulaanbaatar" (Unicef 2016).

In the film, Nandin-Erdene is shown hugging her little brother and helping her mother do chores inside her home. "When I go to school, it's very smoggy and I can't see anything," she remarks. "When I cross the road in the morning on the way to school, I can't tell if the light is

red or green. I'm scared of the [stray] dogs, [because] they might bite me since I can't see them." The camera follows her as she steps outside of the *ger*, closes the door, and walks slowly down the icy, snow-covered street. She buries her face in her scarf and keeps her hands firmly inside her coat pockets. The camera zooms out, showing Nandin-Erdene's body fading into the thick, grey smog. "The smoke makes my throat burn," she sighs. "I hear it's very bad for your health and it causes many illnesses." The film ends with the Unicef representative for Mongolia, Roberto Benes stating, "The future of Mongolia is in the air they breathe. The pollution is limiting their opportunity for a good life." Following a long pause from the audience participants, the organizer of the conference walked up to the podium and remarked, "Nandin-Erdene's bodily harms represent the suffering of all Mongolian children in Ulaanbaatar. We must work together to fight this injustice."

Figure 1: Nandin-Erdene walks through her polluted neighborhood. Photo by Enkhzul Altangerel/UNICEF

Nandin-Erdene became the poster child for this campaign, not only to raise awareness, but to provoke empathy toward the social injustices brought on by air pollution. At first glance,

this awareness-raising technique may come across as a moral good. After all, this child was given an opportunity to give a verbal testimony of her sufferings – she was able to tell her story. Without arguing against the possibility that international actors enlisted Nandin-Erdene for the purposes of doing a humanitarian good, I address a few concerns that emerge out of how this campaign appropriated Nandin-Erdene's bodily harms.

First, Nandin-Erdene was barely representative of "all" Mongolian children living amidst pollution. Her daily engagements with pollution were nothing close to the experiences of children living in apartments in the city center. Children of the conference participants –many of whom were taken to private school by car or slept in rooms with properly-sealed windows and air filters – certainly did not know what it was like to live in a *ger*, to walk for several miles along icy, dirt roads, or to sleep with a coal-burning furnace next to their bed, like Nandin-Erdene. As a non-relatable "character", Nandin-Erdene was cast as a vulnerable, helpless victim of toxic contamination. Similarly, visual documentation of Nandin-Erdene's "polluted" neighborhood was in stark contrast to high-end, gated communities in Buddha Vista (as I explained in Chapter 3). Although conference participants may have expressed empathy toward her sufferings, their concern was from a distance, having never stepped foot in a *ger* district community themselves. Leslie Butt (2002: 10) argues that global health campaigns need both the emotional appeal of creating closeness to a "suffering stranger" as well as an emotional "distancing" that creates a distinct "us" and "them" dichotomy. In Ulaanbaatar, there was a similar dichotomy, as conference participants frequently used terms such as "they" and "those people" to distinguish themselves from the suffering "Other." As I will discuss later in this chapter, I suggest that this "Othering" practice had serious ramifications for the types of policies and interventions that developed as a result of this conference.

Secondly, this campaign puts in question the role of *representation* in public health campaigns. During the conference, there were no participants in attendance that were either from *ger* district areas or representative of *ger* district communities.[40] Thus, Nandin-Erdene's body and verbal testimony served as representative of the whole *ger* district community. Can a pre-recorded film about bodily harms serve as fair representation of public health injustices? What kind of social justice is called for when whole communities are prevented from participating in program building?

Leslie Butt (2002) argues that images and stories of the "suffering stranger" or marginalized others play a critical role in "sustaining the illusions of global morality" (2002: 3). Butt claims that global morality is "tainted" and that local voices are merely made to "seem real." The air pollution conference employed the video footage and testimonials of Nandin-Erdene in order to justify global health claims. Rather than advancing social justice, I argue that the erasure of *ger* district residents from active participation worsens social inequality in the capital city.

In her study of asylum seekers in France, Ticktin (2011) examines how the suffering body becomes the object of humanitarian intervention. In order to be *seen* as worthy of receiving humanitarian assistance, women needed to prove, through medical and scientific means, that they had been physically tormented. She argues that suffering subjects become "Other" – bodies that are best spoken for by representatives, rather than as witnesses who can speak (Ticktin 2011, 15-16). Contrary to asylum seekers that needed scientific and medical evidence to prove that they were sexually violated, Nandin-Erdene's video served as "enough" visual evidence that she was worth fighting for in social justice struggles. However, similar to Ticktin's case, despite

[40] According to conference organizers, the air pollution conference was reserved for "experts" on air pollution science and policy.

Nandin-Erdene's testimony on camera, she was not able to represent her sufferings by presenting or participating in the conference. As I will show in the following section, her body, her state of health, and her community were still "spoken for" by middle-class Mongolians and international consultants.

Voiceless Representation

After a day and a half of scientific presentations on air pollution-induced diseases, the conference called on participants to sign up to participate in "solution break out groups". Participants were tasked with discussing potential solutions to reduce the rate of child harms. Program and policy suggestions were then submitted as part of a report to the Prime Minister of Mongolia for potential consideration.

My discussion group consisted of six members, including Richard Green, an American environmental health scientist, an urban planner named Enkhee, a public health researcher named Enkhjargal, and two journalists named Azjargal and Otgongerel. Richard led the discussions, as he was deemed the "expert" on environmental health issues as the international consultant. He had been involved with the development of fuel-efficient stoves, and had worked on projects with the World Bank and ADB, among other organizations.

The first half of the discussion focused on how children in the *ger* districts could protect their health inside the home. HEPA filters and mask usage were discussed as potential solutions to mitigating symptoms and reducing chances of disease. Participants came to a consensus that hospitals would benefit the most from HEPA filters because they treat many patients in one building. During the second half of the group session, the discussion shifted toward ways to reduce air pollution emissions. "What can we do to get them [*ger* district residents] to reduce their coal use?" Richard asked, looking directly at the Mongolian participants. There was a long

pause. “Come on, I’m asking you guys, you are Mongolians, you know what is best. We [international consultants] don’t know everything.” Richard’s comment, and the discussion that ensued, highlighted the hierarchy of knowledge production. Richard, as an international consultant with little knowledge of Mongolian culture and the sociopolitical landscape of Ulaanbaatar turned to *middle-class* Mongolian participants for advice on issues that were specific to the *ger* districts. Whether it was out of ignorance or a tactic to get answers, Richard made an assumption that middle-class Mongolians were representative of Ulaanbaatar as a whole. “I don’t think they will do it out of will. We need to give them an incentive,” Enkhjargal responded. “Okay, great, what kind of things? What is the carrot at the end of the stick?” Richard asked her. “Maybe a new TV,” Azjargal chimed in. Two other participants nodded. “Okay, that’s one possibility. What else? What kinds of things do they need? How about medicines? Their children are always sick. This could be a solution,” Richard continued. In such ways, *ger* district families were not only “spoken for”, but were represented as constantly ill and vulnerable through the voices of international consultants and middle-class residents who were far removed from the day-to-day engagements of *ger* district communities.

> **Chisato:** Do you really believe that changing stove use behavior will improve health and quality of life?
> **Enkhjargal:** It’s the only way! There is pollution because they burn coal inside their stoves. If we decrease the amount of coal burned, of course that will improve air quality.
> **Chisato:** But I’m asking about quality of life.
> **Enkhjargal:** Of course. Less smoke, easier to breathe. Less diseases. All bad things will disappear.
> **Chisato:** So, do you think people’s health will get better?
> **Enkhjargal:** Yes, yes. But we need to first *change* their behavior. They need to learn to reduce coal use. Right now, they’re not doing it because they don’t care. They don’t know any better. It’s polluting our city!

While the Unicef campaign was aimed to reduce air pollution-induced burdens among children, the policy-making and intervention recommendations failed to address these health concerns

directly. Instead, discussion focused on how to "alter" the stove-use behavior of *ger* district residents like those of Nandin-Erdene's family. Conference participants were not dedicated to discussing what kinds of changes may improve the quality of life for Nandin-Erdene and her family, but rather focused on things that would add *more* burden onto families that already live amidst infrastructural uncertainties. I argue that these recommendations were not advancing social justice, but rather putting the burden of air pollution mitigation onto the most vulnerable population.

I reflected on the conference with my host family and neighbors in Songinokhairkhan to learn their perspectives on international programs that aimed to mitigate air pollution-induced harms. One particular conversation with Baagii, my neighbor who was a long-term resident of the *ger* district revealed the ways in which appropriating Nandin-Erdene's body and bodily harms would not improve living conditions or child health in his community.

> **Baagii:** It's all nonsense. [the campaign] is just a bunch of rich people coming together to talk for the sake of talking.
> **Chisato:** So, when they started, they showed this video of a young girl living in the *ger district*…
> **Baagii:** Hah! [interrupted me] Of course they did. They always do things like that. Interviewing children, talking to mothers, showing the inside of the *ger,* the smoke from the neighborhood. They either blame us or make us look poor and helpless.
> **Chisato:** Who do you mean by "they"?
> **Baagii:** Everyone! The government, journalists, scientists, everyone. They think they can come in here for one hour, take pictures and write a story. It's all a political act. Make them look good. They don't really know what it's like [to live here]. Nor do they want to know. They really just don't care.
> **Chisato:** Could that change though? What do you think can change that?
> **Baagii:** I don't know. Politicians only think about themselves. Maybe when *their* child suffers, they may do something. But we probably won't see their child in a video.

Baagii's response revealed how the repeated narration and documentation of residents in the *ger* districts have perpetuated inequalities brought upon by air pollution-induced harms. Even though the conference was introduced by highlighting Nandin-Erdene's experiences of suffering, the

discussions and actions that followed did not focus on how to improve the health and lives of sick children. Rather, participants focused on how to change the behavior of their families. Because Nandin-Erdene's testimony was short, limited, edited and prerecorded, it was easy to shift focus away from her bodily harms for the rest of the conference. I argue that these acts of documenting and witnessing testimony from those who are most at-risk, while doing nothing to alleviate this violence, does not advance struggles for justice. International consultants and middle-class Mongolians appropriated a child's air pollution-induced harms into a justification for advancing public health interventions. Nandin-Erdene's body was not an agent for that change, but rather treated as an object. This campaign victimized a population by highlighting their vulnerabilities at one point, and erasing their struggles at another.

COMMUNITIES OF HARM

"Нэг ч Монгол хүүхэд шалан дээр хэвтэж эмчлүүлэх ёсгүй.
Нэг ч Монголураг утаанаас болж эндэх ёсгүй.
Нэг ч Монгол ээж улсдаа гомдож уйлах ёсгүй!"

"Mongolian children shouldn't receive medical treatment while lying on hospital floors.
A Mongolian fetus shouldn't die from smoke.
Our Mongolian motherland shouldn't need to cry!"

The Booj Ukhlee Movement

During winter 2017, thousands of protestors marched onto Ulaanbaatar's historic Sukhbaatar Square[41] in a series of demonstrations against air pollution. Enduring temperatures that regularly plummeted below negative 25°C, the social movement called *Booj Ukhlee (*Боож Ухлээ), which has a double meaning, "we are suffocating" and "we are extremely furious,"

[41] Sukhbaatar Square, (named in honor of the leader of the 1921 revolution, Damdin Sukhbaatar), is a historical, public space where thousands of Mongolians held hunger protests to overthrow 70 years of socialism during the Mongolian Revolution in 1990. On the square stand the government palace, Mongolian Stock Exchange, Opera House, and other political institutions and landmarks.

gained momentum over the course of several months. The protests were organized by the Union of Mothers and Fathers Against Air Pollution (Утааны Эсрэг Ээж Аавуудын Холбоо), an organization formed by parents concerned about the health effects of air pollution and fed up with the government's inaction. Protesters took to the streets wearing gas masks, holding signs that read "we can't breathe" and "we are suffocating", and hanging hundreds of black balloons on the gates of the Parliament building to symbolize the blackening lungs of young children. What started as a hundred demonstrators in late December grew to a few thousand in a series of protests by the end of January. Hundreds of Mongolians living across the globe from New York to Virginia, Chicago to Paris also joined in on the cause, using social media hashtags #BreatheMongolia and #mongolsaresuffocating to call for immediate government action to combat air pollution.

At first glance, these images of men and women collectively protesting against government inactions seem like a movement toward social justice. In this analysis, I am not taking a stance on whether the movement was effective or ineffective in achieving social justice. Rather, I am interested in critically analyzing whose bodies were represented, by whom, and the consequences of bodily representation. Through examining these processes, I show how movements for social justice can marginalize populations and reinforce preexisting inequalities.

The Poster Disease

Munkhjargal's four-year old son was admitted to the hospital for the third time due to a serious case of pneumonia. This was not the first year that she had to take him to the hospital. "My son's lungs were weak from the very beginning of his life," she explained to me. She grew frustrated with the doctor's uncertainty in diagnosis, poor conditions of the hospital, and the rising medical costs that she accrued over the years to treat her son's illness. She decided to

"break the silence" and started to write public posts about her child's condition on her social media accounts. "I just exploded," she said. One of the first posts she wrote stated, "My child has been suffering from pneumonia and has been in the hospital for weeks now, and he is not getting any better. I have had enough with this pollution, this government, this medical system. Join me if you have children who suffer from pneumonia."

Pneumonia was ranked the third biggest cause of death among children under five in Mongolia. Report data was televised on news channels, discussed in popular nightly news shows, and posted on social media. UNICEF released a report that also showed statistics of the number of children dying from the disease. In contrast to Petryna's (2002) case study where citizens made a wide range of disease claims against radiation, in Ulaanbaatar, citizens targeted pneumonia as the "poster disease", the primary disease associated with air pollution-induced harms. This was the case for a few reasons. First, pneumonia was a disease that many parents and their children were familiar with. Secondly, pneumonia was easy to "prove" through medical diagnostic tests that would (as I will show in the next subsection) leverage public health activism. Thirdly, pneumonia was an infection that was "preventable" and could be cured. Parents who leveraged pneumonia as the poster disease could therefore demand material outcomes – increase in vaccines and proper medical treatment in hospitals.

Over the course of several weeks, Munkhjargal gained over 7,000 followers on Twitter and Facebook, and many parents joined her in sharing their stories about their children's ill health. Parents joined the movement by editing their profiles to their parent-status first, followed by their occupation. For instance, "Dari – mother, journalist at EAGLE TV". Topics that social media followers discussed ranged from the financial burdens of not being able to cover diagnostic tests to medicines for pneumonia.

Mothers who claimed that they have spent thousands and millions of MNT to diagnose and treat pneumonia in their children started to form separate discussion groups. “I have spent more than 100,000 MNT on my children’s medicines, and they don’t seem to get any better” one post read. As the movement progressed, parents began to think critically about the amount of money they spent on healthcare to treat pneumonia.

Collecting Evidence of Air Pollution-Induced Harm

In response to the overwhelmingly large reaction to her posts, Munkhjargal formed the Union for Mothers and Fathers Against Air Pollution (Утааны Эсрэг Ээж Аавуудын Холбоо), an organization that aimed to put air pollution back onto the political agenda. The organization consisted of women activists, primarily journalists and public health specialists who would convene around how to advance environmental justice struggles and demand the state improve air pollution. The organization formed its own Facebook page and encouraged parents to share their bodily experiences with air pollution-induced harm, focusing primarily on the health of children. It became Munkhjargal’s mission to gain traction on children’s harms. These political demands reconfigured the local discourse on air pollution-induced harm from “what is pollution doing to our bodies?” to “how can we use our children’s bodily evidence to hold the government accountable?”

In her study of women’s movements, Murphy (2006) explains that working class white women drew on their gender roles as mothers in order to catalyze the movement on behalf of their children. For example, the Citizens Clearing house for Hazardous Waste, an organization founded in 1981, engaged women activists who would record various tracing of toxic harm like changes in odor in the air, changes in water quality, pests in backyards, illegal dumping of waste, and various symptoms and illnesses. Personal anecdotes of failed gardens also played an

important role in creating a collective evidence that their neighborhoods were in fact toxic (Murphy 105-107). In contrast to American women who traced pollution's effects on both human bodies and the environment, middle-class Mongolian women specifically employed the somatic place of their children's bodies in order to make political claims that air pollution had become a disaster.

Testimonials from the Ulaanbaatar public were integral to this movement. While these testimonials took the form of written complaints and descriptions of bodily harms, they also included visual evidence of children's bodily harms. Parents posted images of their children's lung X-rays and their children wearing air pollution-protection masks on their way to school. These images posted on Facebook, Twitter, and Instagram were accompanied by taglines such as "our children are slowly dying" and "end smog before it ends us." For example, in Figure 2, a father posted a collage image of his daughter's body – three X-ray images of an infection and the image of her back. His caption states, "Breathing Ulaanbaatar's air is equivalent to smoking cigarettes for 20 years." Unlike the ambiguities associated with medical diagnostic tests that I described in Chapter 5, bodily harms expressed through X-rays served as solid evidence of the seriousness of air pollution-induced harms. Intimate images of children's bodies were leveraged for the sake of raising awareness.

Figure 2: A Twitter post of a young girl's infected chest X-ray

I suggest that public forms of evidence (through the means of social media) reconfigured what it meant to be an active participant in the public health injustice movement. In his ethnography on HIV/AIDS programs in postcolonial West Africa, Vinh-Kim Nguyen (2010) describes the role of "confessional technologies" – testimonials and practices of disclosure that initially emerged as international aid organizations sought to give a "public face" to AIDS in order to demonstrate programmatic effectiveness and keep money invested in their treatment programs (Nguyen 2010: 31). By disclosing their status of having a highly stigmatized disease and providing a good "story" of suffering, AIDS sufferers transformed themselves and others into "therapeutic citizens" to secure material resources, including medical care, money, and participation in HIV-related clinical trials (2010:132) to secure a better life (108). In place of an insufficient government, the AIDS treatment programs offer benefits and responsibilities including a social network, food, and hope of access to antiretrovirals that citizens would not

receive otherwise. In Ulaanbaatar, I argue that similar "confessional technologies" in the face of air pollution-induced diseases were deployed which involved publicizing and mobilizing children's harms in very public ways. While there was no guarantee of a better life, disclosing their children's harms and their vulnerabilities became the means through which parents could potentially secure a political advantage.

At first glance, these visual testimonials of children's bodies seem like "tools of empowerment". But if citizen activism required these public forms of protest, then it only advanced the movement for some and not others. Not everyone in Ulaanbaatar had access to material evidence or was comfortable with sharing these forms of proof with the public. Secondly, not all parents in Ulaanbaatar had the material infrastructure (internet and electricity) to access these public forms of protest. X-ray images were not medical evidence of harm among *ger* district children, but of middle-class children whose parents possessed the financial means to obtain diagnostic tests and to display them on social media. I suggest that this form of "biological citizenship" (Petryna 2002) around notions of air pollution-induced harms involved the erasure of those most vulnerable to the disease.

Legitimizing Harms for Compensation

The Union developed a plan to collect evidence to make claims for financial compensation from the state. Munkhjargal hired a lawyer to represent "the citizens of Ulaanbaatar" to make a legal case against the Mongolian government. In contrast to post-Soviet Ukraine (as in Petryna's (2002) case) where the state had already promised recompense, in Mongolia such promises or practices were yet to be set in place. Rather than relying on the government to set standards, members of the Union mobilized collective action to demand that the government declare specific bodily burdens on children a violation of human rights.

In order to make their public claims a legitimate case, the Union had to prove that 1.) hundreds of children were suffering from air pollution-induced health burdens; 2.) families were financially burdened from frequent and accumulating medical costs; 3.) the state ignoring these claims was a violation of human rights. The Union began to encourage parents to collect hospital and clinic receipts, to keep stringent records of any medical expenses, medicine labels, X-rays and any other evidence that could prove bodily harm. Families were instructed to brings these forms to the Union meetings. Thus, these financial and visual instruments served as important tools to demand compensation from the state.

Biehl and Petryna (2011) provide a case study of how Brazilian parents employed their right-to-health litigation as a pathway through which to access expensive medicines and therapeutic treatments for their children suffering from mucopolysaccharidosis, a disease that affects the neurological and physical development of the child. In order to file a lawsuit against the government, parents needed to have a diagnosis and medical documents proving the benefits of costly treatment. In contrast to the Brazilian constitution that affirms health as a right of the people and a duty of the state, in Ulaanbaatar, no such law existed to protect the health and quality of life of Mongolian citizens. With no system set in place, Mongolian parents collected evidence of pneumonia in hopes that it could be used as evidence of injustice.

Although mobilizing this kind of evidence enabled some families to make claims and gain credibility for suffered bodily harms, not all families had access to medical records or connected to these social justice dialogues. For instance, Odnoo, a woman living in the *ger* districts of Bayazurkh (southeast of the city center) was concerned about her three children suffering from respiratory and cardiovascular illnesses. During the winter, her children would suffer from “colds” that she could never get properly diagnosed. But she had recently lost her job

as a retail clerk in the city center. Her husband, who was a carpenter, was also unemployed due to the lack of company projects during the winter. Within the same month, her mother, an accountant for the *khoroo* (sub-district) office lost her job and pension due to the changing administration. Under immense financial pressure, keeping her children healthy meant maintaining their nutrition. "I'm looking so hard for jobs, just so I can keep feeding my kids," she sighed. She had electricity and internet in her home, but she explained to me her reasoning for not being involved in the anti-air pollution movement.

> **Odnoo:** Honestly, I don't have time for this kind of thing. I can't be sitting on my phone all day posting complaints [about pollution], pressing "like" buttons, and hope for some kind of action. It's a waste of time. *This* is real life! [she looks down at her one-month old baby swaddled in her arms].
> **Chisato:** Who do you think is mostly involved in the movement?
> **Odnoo:** I hear it's all journalists. Middle-class people… You know, people who have connections. They want to make a big deal out of it [air pollution] for media attention. That's why they are always on TV, yelling at the camera, saying this and that.
> **Chisato:** Have you ever felt like you wanted to participate?
> **Odnoo:** Why would I do that? Joining them doesn't make any difference in my life. They can make money off of these types of things.
> **Chisato:** What do you mean? Like, interviews?
> **Odnoo:** Yes! Interviews on camera, in the newspaper… They can become famous and make lots of money. Why? Because they know people. They have a job. That's their life.

Odnoo was not only aware of the class difference between her family and the internet-using protestors, but understood that the movement was advancing the quality of life of some people and not others. In other words, the anti-air pollution movement did not represent or advance social justice for all Ulaanbaatar citizens (even though their objective and message claimed so). Rather, this was a particular kind of movement that continued to exclude over half of the city's population – those who did not have the time or the resources to dedicate to online activism or amassing medical evidence.

Similar to their responses to the air pollution conference, *ger* district residents did not feel like they were part of discussion, movements, or actions aimed to improve their health and

quality of life. Rather, they strongly believed that their children's testimonies of suffering and images of bodily harms were being manipulated in ways that separated them from those were actively participated in these movements. Whether it was intentional or not, in both the Unicef public health campaign and the community of protesters, *ger* district residents were omitted from social justice movements.

A Fight to Breathe: Protesting Pollution's Toxic Effects

In addition to legal claims against the government, bodily harm played an important role in facilitating public demonstrations. In order to make protests salient and relevant to the wider international community facing environmental and public health injustice, protesters took to the street with striking images and slogans. From black balloons symbolizing the blackened lungs of children, hundreds of protestors wearing pollution masks, to large signs with slogans "we are choking to death" and "end smog before it ends you", these sensory materials provoked urgency. The sheer number of "damaged" protestor bodies on Sukhbaatar Square also revealed the dire state of Mongolia's air pollution crisis. Protestors covered the faces of major statues across the city, a tactic that had been used in other protests around the world.

While these protests certainly made headlines around the globe, including news stories in *The Guardian*, *BBC*, and *The New York Times*, it is important to critically examine who was represented in these demonstrations. The protests consisted mostly of middle-class families who were connected to the *Booj Ukhlee* movement catalyzed on social media. These citizens were not only connected to social media outlets, but they were also living in close proximity to Sukhbaatar Square, where the demonstrations were being held.

Creating a spectacle out of bodily harm also had serious material consequences for Mongolian citizens. Amraa, my host sister in Songinokhairkhan's *ger* districts and I discussed

the potential policy changes and interventions that could result from these series of public protests.

> **Chisato:** Do you think the protestors will make a big difference in the fight against pollution?
> **Amraa:** Protestors are going to demand big things. Big changes. They will probably demand that government ban coal-use again. You know the government tried to fine people who burned coal in Gandan, right?
> **Chisato:** I heard about this, this was a couple of years ago… But I also heard that it didn't last long.
> **Amraa:** Of course it didn't. Did they [the government] really think we could stop burning coal? It's the only way to survive out here!
> **Chisato:** So what makes you think the government will try to enforce it again?
> **Amraa:** Because the government will do anything to take the blame off their shoulders! If they ban coal, it will make them look good. Like they did something. But then *we* suffer. *We* get fined. *We* lose money. *We* suffer more. None of these air pollution interventions improve our quality of life.

Amraa's response demonstrates how even though protestors are working collectively to put air pollution mitigation back onto the political agenda, the consequences of these protests often fall in the hands of lives of the most vulnerable to air pollution's effects. Middle-class Mongolians will not be affected by a ban on household coal-use, as they do not need to burn coal in household stoves to stay warm. Instead, they reap the benefits of living in centrally-heated apartments (which still relies on the burning of coal in distant power plants but not at the household level) that provide consistent warmth throughout the winter season.

In response to the protests, air pollution was reframed as a national security issue in Mongolia, taking precedence as a major topic in the National Security Council. Raising air pollution as a national security issue mobilized urgency and stood as a political recognition that smog exposure was a major threat to the well-being and stability of the population. The result was a new policy dictating that rural residents of Mongolia, "excluding those who require long-term medical care or those with apartment ownership" were now restricted from moving to Ulaanbaatar. This policy, effective January 2018, was sanctioned by the Mayor of Ulaanbaatar,

Batbold Sundui, who claimed that this was "in the best interest of UB residents. Smog, and our right to live in a safe and healthy environment has been violated." But whose "rights" are being protected? And at what cost? According to the Mongolian Law on Land, every Mongolian citizen had the right to move and reside in any territory of Mongolia. This right was revoked by the government, having huge ramifications for Mongolian citizens outside of Ulaanbaatar. As recent migrants, many *ger* district families that I spoke with explained to me that this was devastating, as their extended families would no longer be able to join them to live in the capital city. As my host sister, Amraa, who had lived in the *ger* districts her whole life explained, "My husband's parents live in the countryside, in Dornod, far away from here. They are getting old and we're always worried. We were planning to have them come live with us so that they have access to better medical treatment. This may not be possible anymore." In such ways, this drastic policy change potentially affected families and made important resources, such as medical care, inaccessible for households living in the countryside. The pursuit of a "right to breathe" had serious consequences for those who suffered the most from uneven burdens of harm.

CHAPTER CONCLUSION

In this analysis, I have shown how both international actors and Mongolian citizens drew on the somatic place of children's bodies to make political claims of social injustice. In other words, investment in their biology *became* political (Rose and Novas 2004: 149). In the case of the international public health campaign, a *ger* district child's body was appropriated into the "face" of a program that aimed to alleviate all children's air pollution-induced harms. While this appropriation may have leveraged empathy for a humanitarian mission, *ger* district residents were not able to participate in a campaign that aimed to alleviate public health harms in their communities. This omission had serious consequences, as middle-class Mongolians and

international consultants spoke "on behalf" of *ger* district residents, and brainstormed solutions on stove use behavior that did not address health directly.

I also showed how middle-class Mongolian citizens employed their children's toxic burdens as a "poster illness" to catalyze a "city-wide" movement to make claims about public health injustice. While this movement attempted to connect middle-class Mongolian families to the international activist community through social media hashtags and poignant news stories, those who suffered the most damage were marginalized from these acts of political participation. This movement also had serious ramifications for *ger* district residents, as most policy demands consisted of interventions that would worsen their quality of life.

In the modern era characterized by the proliferation of environmental and technological risks (Beck 1992), citizenship has become "de-territorialized" and deeply situated in relation to and in interaction with biological bodies (Rose and Novas 2004: p. 441). But this study shows how important it is to study the politics of place and the social-political positioning of the bodies that are being leveraged and appropriated to condemn environmental and public health injustices. The ethnographic work presented here shows how environmental justice movements can marginalize and even victimize people who are unable to participate in those movements.

CHAPTER 7

CONCLUSION: NEGOTIATING UNCERTAINTIES

Contributions to Theory

"Risk society" scholars contend that postmodernity marks an era of proliferating manufactured risks such as air pollution and nuclear fallout. Because many of these new threats are not detectable by the human eye, citizens are increasingly dependent on experts to make these calculations for them (Giddens 1994). My research reveals a different pattern. As I argue in Chapter 5, what counts as "medical expertise" is highly contested in Ulaanbaatar. Doctors, who were faced with the challenge of providing patients with explanations for illness without adequate scientific knowledge of how air pollution was affecting the body, altered their medical care to include non-biomedical forms of treatment. For instance, doctors prescribed dietary supplements and recommended bathing in *airag*, fermented mare's milk, as remedies against air pollution's toxic effects. City residents who were faced with reoccurring respiratory illnesses, on the other hand, began to self-evaluate their diagnostic tests, as doctors failed to provide them with sufficient explanations. In such ways, my analysis shows how uncertainties around air pollution's effects undermined biomedical expertise.

My dissertation also extends literature in medical anthropology on reproductive health. Medical anthropologists have examined how reproductive technologies become entangled with medical infrastructure, moral dilemmas, and the broader political economy (Franklin 1993; Gammeltoft 2014; Rapp 1999, 2000). Rayna Rapp (2000) poignantly illustrates how in the genetic turn in reproductive health, interactions between women's bodies and genetic technologies produce morally fraught situations and subjectivities. Rapp studies the lived experience of pregnant women confronted with difficult decisions about whether to undergo

prenatal procedures to screen fetuses for genetic anomalies. She describes these women as "moral pioneers" (1988, 1999) who weigh the possibility of bearing and raising a child with Down syndrome or other anomalies and decide on human life's worth. Pregnant women drew upon long-standing cultural and religious values, generational knowledge, and social class ties to navigate through this challenging ethical dilemma As I show in Chapter 5, despite limited access to technologies that could "forecast" potential birth outcomes, many Mongolian women who were attuned to their bodies understood the potential dangers associated with carrying out a pregnancy in a heavily polluted city. Thus, pregnant women in Ulaanbaatar faced morally fraught decisions, not in response to reproductive technologies, but in response to the uncertainties brought about by environmental degradation. Pregnancy loss, neurological disorders, and congenital defects were among some of the many fears and uncertainties that women had to confront as they negotiated ways to "reduce" their chances of gestational harm. Some women altered their family planning to cohere with less polluted months, while others carried out their pregnancies in the countryside or abroad. These practices link to Ginsburg and Rapp's (1995) concept, "stratified reproduction." In Ulaanbaatar, there was a clear stratification between women who had access to the resources necessary to carry out a "safe" pregnancy and those who did not. For example, only women who had family connections in the countryside or abroad, a stable household income, and no social responsibilities to family were able to carry out their pregnancies in "safe" places.

Further, my research contributes to social justice literature by critiquing the ways in which the voices of marginalized communities are appropriated in public health campaigns. In her critique of medical anthropologist-activists, Leslie Butt (2002:10) argues that narratives of the "suffering stranger" are used to strengthen claims of collaboration and further the theoretical

agenda of global health. Suffering becomes "a form of theater – immediate and affecting but also detached" when it is used by third parties (Butt 2002:9). As I argue in Chapter 6, Nandin-Erdene's testimony in a Unicef campaign does not further social justice. Despite her verbal testimony, Nandin-Erdene was still "spoken for" by air pollution scientists and government officials who were far removed from her living conditions. I also show how social justice promotes the advancement of middle-class people and the exclusion of others. Specifically, I critique social justice scholarship that presumes citizen-engagement to be a tool of empowerment (Checker 2005; Murphy 2012; Nash 2007). In the case of the *Booj Ukhlee* anti-air pollution movement in Ulaanbaatar, newspaper media and social media render the movement as a positive step toward citizen-controlled efforts to hold the Mongolian government accountable for air pollution-induced harms. However, a closer examination of this movement reveals that those who are participating in this movement were middle-class families that have access to particular kinds of "evidence" of harm such as X-ray images, access to time to actively engage in these broader discussions on internet-based platforms, and capacity to form a "biosociality" (Rose and Novas 2004). I argue that a social justice movement in the hands of middle-class families had ramifications for those most vulnerable to air pollution's effects. Rather than alleviate harms, changes to government policy once again put *ger* district residents' lives at risk. Taken together, my analysis reveals how this kind of social justice movement can marginalize and even victimize people who did not or could not participate in the movements in the same way.

My research also makes an important contribution to the anthropology of climate change. As I have demonstrated in Chapter 2, there is an increasing rate of winter disasters (*dzud*), drought, and desertification, which is resulting in drastic loss in livestock among households in the countryside. Unequipped with alternative sources of livelihood, many families migrate into

the capital city to seek employment. This has increased the rate of rural to urban migration, resulting in the expansion of the *ger* districts, and increasing the number of coal-burning stove users. Climate change discourse is also connected to the geopolitics and coal economies between Mongolia and China. While Mongolia is relatively omitted from global climate change discourse as a culprit of climate change, they are a large exporter of coal to China, which raises questions about the capacity to which Mongolia is connected to fueling China's economy.

This dissertation also provides an important case study of peri-urban communities in post-socialist states. Erik Harms (2011) studies how Vietnamese citizens living on the outskirts of Ho Chi Minh City strategically draw on their position on the rural-urban edge to carve out livelihoods. Harms illustrates how these residents blur the lines between rural and urban, traditional and modern, inside and outside, and wealthy and poor as they situate themselves between both. In Ulaanbaatar, *ger* district residents lived "on the edge" of Ulaanbaatar, constantly negotiating their place in urban society. While they were already considered outcasts of urban "modern" society, air pollution had brought upon them new layers of stigma and blame. These communities were blamed for the air pollution problem, which led to numerous interventions that aim to alter their household practices and individual behaviors. Thus, in contrast to Harms' ethnography that focuses on how peri-urban residents negotiate urban development, my research focused on the *tensions* between *ger* district residents and state programs that aim to "discipline" them. As I show in Chapter 4, not all *ger* district residents purchased the subsidized "fuel-efficient" stove to be "responsible consumers" in the wake of air pollution disasters. Rather, many residents sold these household devices on the black market to gain immediate profit. Residents who purchased these stoves under the subsidized price – and understood both the monetary value and demand for these new, "modern" technologies – sold

these technologies to residents in the countryside at full price. Living "on the edge" many residents took advantage of their social networks both inside and outside of their communities to create alternative means for income.

My dissertation also contributes to anthropological work on post-Soviet public health in Mongolia by tracing connections between different post-Soviet infrastructures. Janes and Chuluundorj (2004) argue that the privatization of pastoral land catalyzed stark inequalities in the countryside, particularly affecting public health infrastructure for women's health. While during the Soviet period, pregnant women were encouraged to move into maternity homes in advance of their expected delivery to ensure a safe delivery, in the post-Soviet turn, these maternity waiting homes disappeared. My study shows similar patterns of eroding infrastructure, I move beyond medical patterns and incorporate broader patterns of change by examining the effects of air pollution. In Chapter 2, I focus on three infrastructures: land regulation, coal economy, and public health practice. The collapse of a collectivist system for pastoral economies triggered a large influx of nomadic herders to settle in the capital city for alternative forms of employment, which led to an expansion of *ger* district communities that burned coal. The dismantling of the state-run Nalaikh coal mine in 1989 drove an informal coal economy and the distribution of poor quality coal to *ger* district communities. Ger district households were also subject to state-enforced hygiene campaigns that divided the population based on levels of hygiene. In such ways, my study follows the connectivity between three infrastructures and how they come together to form a contemporary environmental health crisis.

Contributions to Policy

Beyond scholarly applications, my research also offers important policy recommendations for program managers tasked with developing and implementing air pollution

mitigation interventions. Due to the growing number of coal users in Ulaanbaatar, air pollution mitigation is a long-term project that will require more than singular "magic bullet" interventions each year. Previous stop-gap attempts such as the banning of coal in *ger* district communities, replacement with coal-burning stoves to more "efficient" alternatives, or prohibiting the migration of rural dwellers into the capital city illustrate a lack of understanding of the complexity of urban neighborhoods and urban migration. Long-term solutions require building infrastructures both inside and outside of the capital city. For instance, the government could invest in developing cities throughout the country to disperse education and employment opportunities in places other than Ulaanbaatar. Currently, all major universities, including medical sciences, engineering, social sciences, and natural sciences, are located in the heart of Ulaanbaatar. Creating other centers of economic productivity will reconfigure the migration patterns in the long-term.

Secondly, public outreach and educational curricula on air pollution-induced harms could be improved. At the time of my research, there were only a few shorter-term, small-scale educational outreach activities focused on educational outreach on the health effects of air pollution. As I showed in Chapter 3, while air quality data and administrative maps were available to internet-users, many expressed that this information was insufficient, as it did not provide guidance on how to protect one's health or how to access protective methods. Thus, I suggest that public outreach should include information about mask and air filter usage. Additionally, my research findings on the everyday experiences of air pollution could be incorporated into air quality metrics in order to make air quality information more accessible and effective in public outreach spheres. In Chapter 5, I demonstrated how medical doctors were not equipped with knowledge about air pollution-induced illnesses. I suggest that integrating air

pollution and public health into medical school curricula could provide future doctors with the training necessary to improve patient care around air pollution-induced illnesses.

Thirdly, my analysis of the stove-replacement program offers an alternative perspective on the air pollution mitigation intervention. While a market-based stove program may have potential, my research has shown how new stove models cannot be tested solely in the laboratory. Rather, stove emissions must be tested inside people's homes, so that they align with more realistic stove-use patterns. Further, while the program rendered all *ger* district households the same under the umbrella of "stove user", my research demonstrates how the composition of neighborhoods and households is highly diverse. As I showed in Chapter 4, some families live in *gers*, others live in single story or two-story homes. These variations in dwelling affect the amount of coal a household burns. Taking into account differences in income, type of residential dwelling, financial need, years of residence, and neighborhood dynamics could play an important role in the sustainability of the program.

Lastly, investments in air pollution mitigation work must be conducted collaboratively. My research methodology incorporated a multi-actor approach, where I worked with a wide-range of actors from medical doctors, government officials, scientists, urban planners, *ger* district residents, and NGO activists. This approach revealed that there is a remarkable disconnect among these groups. Since all groups are involved in air pollution mitigation work, it would be beneficial to conduct cross-sectoral working groups that would enable an interdisciplinary approach to project design and implementation. Anthropologists are well-suited to consult in these working groups, as they could mediate differences and provide important socio-cultural context to the air pollution problem.

The overarching message of the stories I narrate in this dissertation is that evidence-making of air pollution-induced harms is highly contested. This research focused on how the interactions among people, technologies, and the urban environment produced different kinds of knowledge about harm. While most studies in epidemiology focus on physical harm as a cause and effect relationship that occurs as a result of exposure, my study on air pollution reveals how harm can take various forms as body-environment interactions. Air pollution-induced harms were not limited to respiratory effects or long-term manifestations such as lung cancer. As I demonstrate in Chapter 1 and Chapter 2, *ger* district residents suffered from stress, anxiety, and stigma caused by air pollution odors and stains. Smog that attached to hair, skin, and clothes became "social indicators" of lower class and poverty in Mongolian society. This stigma had serious ramifications for residents like Amraa, who are constantly judged for their class and area of residence. My analysis demonstrates the *unevenness* of social harm. Some city residents had access to material resources – money, detergent, washing machines – that allowed them to wash out these pollution odors more effectively than others. Similarly, apartment dwellers did not have to face challenges of getting bit by stray dogs on their walk home because they did not live in neighborhood infrastructure where this is a frequent issue. My research also highlights the temporal aspects of harm. Ulaanbaatar residents engaged in seasonal pattern-making, to the point where people like Amraa could list the symptoms that they felt in the beginning of October through to March. There were "expected" symptoms such as coughs, and sore throats that were to come in the winter season. In order to mitigate these effects, some families wore masks, while others took nutritional supplements and took long vacations in the countryside where there was "fresh" and "clean" air. Thus, although air pollution had become a part of everyday life, this ethnographic account differs vastly from Swistun and Auyero's (2009) account where residents

felt that their exposure to pollution was out of their control. In contrast, Ulaanbaatar residents, actively sought ways to make sense of air pollution and mitigate their effects of their bodies, homes, and neighborhoods. For those living in the midst of air pollution, uncertainty was double edged – it caused despair but also made space for maneuver and negotiation.

APPENDIX 1A

In September 2015-February 2016, I surveyed 200 residents living in *ger* district communities in Songinokhairkhan, Bayanzurkh, and Bayangol districts, using the following questionnaire. The survey results are provisional and offer a glimpse into how urban residents understood air pollution patterns through different timescales (daily, monthly, yearly, decades), bodily symptoms, as well as who is responsible for mitigating air pollution.

Language: The survey was drafted and presented in the Mongolian language, the only language common to myself and the research participants. I consulted with Tsermaa Tomorbaatar on the survey questions, but I was responsible for the final draft and the dissemination of surveys.

Analysis: I conducted survey analysis using Microsoft Excel. I inputted data from these surveys on a weekly basis.

Улаанбаатарын агаарын бохирдолын талаарх судалгаа

Хүйс: □ эр □ эм

Нас: □ 18-25 □ 26-35 □36-45 □ 46-55 □ 56-65 □ 66+

Мэргэжил: _____

Та Улаанбаатарт төрсөн үү? □ тийм □ үгүй

Хэрэв үгүй бол, хэзээ Улаанбаатарт шилжиж ирсэн бэ? _____

Та ямар аймгаас/улсаас ирсэн бэ? _____
Та яагаад Улаанбаатарт шилжиж ирсэн бэ?
_____

Та Улаанбаатарт хэдэн жил амьдарсан бэ? □ 1-10 жил □ 11-20 жил □ 21-30 жил □ 30-с дээш жил

Та ямар дүүрэгт амьдардаг вэ?
□ Баянгол □ Сонгинохайрхан □ Чингэлтэй □ Баянзүрх □ Хан Уул □ Сүхбаатар □ Налайх □ Багануур

Орон сууцны төрөл: □ төвлөрсөн халааттай орон сууц □ зуухтай гэр □ пийшинтэй байшин

Та Улаанбаатарт хэзээ агаарын бохирдол асуудал болсон гэж бодож байна вэ? _____

Өнгөрсөн 10 жилд агаарын чанар муудсан: □ тийм □ үгүй

Таны бодлоор аль саруудад агаарын бохирдол хамгийн их байдаг вэ?
□ 11 сараас 3 сар хүртэл □ 4 сараас 7 сар хүртэл □ 8 сараас 10 сар хүртэл

Таны бодлоор агаарын бохирдолын хамгийн том шалтгаан юу вэ? (Зөвхөн нэгийг тэмдэглээрэй)
□ машины утаа □ гэр хорооллын нүүрс түлдэг зуух □ цахилгаан станц □ нам даралтын зуух

Таны бодлоор агаарын чанар хэдэн цагт хамгийн муу байдаг вэ? (Нэгээс олныг тэмдэглэж болно)
□ 6:00-11:00 □11:00-17:00 □17:00-22:00 □ 22:00-6:00

Би агаарын чанарын түвшинг шалгадаг: □ өдөрт нэг удаа □ долоо хоног бү р □ сарт нэг удаа □ хэзээ ч

Агаарын бохирдолын улмаас танд ямар зовиур илэрч байна вэ? (Нэгээс олныг тэмдэглэж болно)
□ нүд загатрах □ ханиалгах □ цээж хөндүүрлэх (Амьсгаадах) □ хоолой өвдөх
□ хамар битүүрэх □ найтаалгах □ толгой өвдөх □ байхгүй
□ бусад _____

Та агаарын бохирдолоос хамгаалахын тулд маск зүүдэг үү? □ тийм □ үгүй
Хэрэв үгүй бол яагаад? (Нэгээс олныг тэмдэглэж болно)
□ хэтэрхий үнэтэй □ надад хэрэггүй/агаарын бохирдол надад нөлөөлөхгүй
□ харагдах байдалд нь дургүй □ үр дүнтэй гэж боддоггүй
□ амьсгалахад хэцүү □ бусад
_____

Та хүүхдүүдээ агаарын бохирдолоос хамгаалахын тулд маск зүүлгэдэг үү? □ тийм □ үгүй
Хэрэв үгүй бол яагаад? (Нэгээс олныг тэмдэглэж болно)
□ хэтэрхий үнэтэй □ надад хэрэггүй/агаарын бохирдол надад нөлөөлөхгүй □ харагдах байдалд нь дургүй □ үр дүнтэй гэж боддоггүй
□ амьсгалахад хэцүү □ бусад _____

Танай гэрт агаар шүүгч байгаа юу? □ тийм □ үгүй

Хэрэв үгүй бол яагаад? (Нэгээс олныг тэмдэглэж болно)
□ хэтэрхий үнэтэй □ надад хэрэггүй/агаарын бохирдол надад нөлөөлөхгүй
□ ямарыг нь авах хэрэгтэйг мэдэхгүй □ үр дүнтэй гэж боддоггүй
□ бусад _____

Харгалзах дугаарыг дугуйл: (1= огт санал нийлэхгүй байна, 5= бүрэн санал нийлж байна)
Улаанбаатарын агаарын чанарын ирээдүй тодорхойгүй байна.
1 2 3 4 5
Өнгөрсөн 5 жилд агаарын чанар сайжирсан. 1 2 3 4 5
Монгол улсын засгийн газар агаарын бохирдолыг бууруулах арга хэмжээг үр дүнтэй хэрэгжүүлсэн.
1 2 3 4 5
Олон нийтэд мэдээлдэг агаарын чанарын мэдээлэлд би итгэдэг.
1 2 3 4 5
Агаарын бохирдол миний эрүүл мэндэд ямар аюултай гэдгийг би мэднэ.
1 2 3 4 5
Агаарын бохирдолтой холбоотой эрүүл мэндийн эрсдэлийн талаарх мэдээлэл хангалтай байна.
1 2 3 4 5

Агаарын бохирдолоос хамгаалах заавар зөвлөмжийг хэн өгөх үүрэгтэй вэ?
□ Монгол улсын засгийн газар □ олон улсын байгууллага □ эрүүл мэндийн төв
□ төрийн бус байгууллага
□ бусад: _____

Таны бодлоор хамгийн богино хугацааны шийдэл юу вэ?

_____
_____

Таны бодлоор хамгийн урт хугацааны шийдэл юу вэ?

_____
_____

Таны бодлоор агаарын бохирдолын асуудлыг шийдэхэд ямар хугацаа шаардлагатай вэ?
□ 5-10 жил □ 10-20 жил □ 20-30 жил □ 30-40 жил □ 40-с дээш жил
□ хэзээ ч шийдэгдэхгүй

APPENDIX 1B
Ulaanbaatar Air Pollution Survey

Gender: □ M □ F
Age range: □ 18-25 □ 26-35 □36-45 □ 46-55 □ 56-65 □ 66+
Occupation: _____
Were you born in Ulaanbaatar? □ Yes □ No
If no, what year did you move to Ulaanbaatar? _____ **From what province?** _____
Why did you move to Ulaanbaatar? -
_____
Number of years residing in UB: □ 1-10 years □ 11-20 years □ 21-30 years □ over 30 years
District of current residence:
□ Bayangol □ Songinkharan □ Chingeltei □ Bayanzurkh □ Khaan Uul □ Sukhbaatar □ Nalaikh □ Baganuur
Type of residence: □ apartment with central heating □ *ger* with household stove □ house with stove
In your opinion, when did air pollution become a problem in Ulaanbaatar?
_____
Over past 10 years the air quality has worsened. □ Yes □ No
Based on your experience, which month span has the most polluted air? □ Nov- March □ April-July □ Aug-October
In your opinion, what is the *biggest* cause of air pollution? (check ONLY ONE)
□ vehicle emissions □ coal-fueled stoves in *ger* districts □ coal-fired power plants □ heat-only boilers

What time of day has the worst air quality? (check all that apply)
□ 6:00-11:00 □11:00-17:00 □17:00-22:00 □ 22:00-6:00

I check air quality levels: □ once a day □ every week □ once a month □ never

What kind of symptoms do you experience as a result of air pollution? (check all that apply)
□Eye irritation□Coughing □Wheezing □Sore throat □Congestion □Sneezing□Headache □ No symptoms □ Other_____

Do you wear a mask during the winter? □ Yes □ No
Does your child/children wear a mask during the winter? □ Yes □ No
If your answer is no to either, it is because (check all that apply):
□ They are too expensive □ There is no need for me to wear one/I am not affected by air pollution □ I don't like how they look □ I don't think they are effective
□ It is difficult to breathe with it on □ Other _____

Do you have an air filter at home? □ Yes □ No
If your answer is no, it is because (check all that apply):
□ They are too expensive □ There is no need for me to purchase one/I am not affected by air pollution □ I don't know which one to buy □ I don't think they are effective
□ Other _____

Please circle the number (1= I strongly DISAGREE, 5= I strongly AGREE)

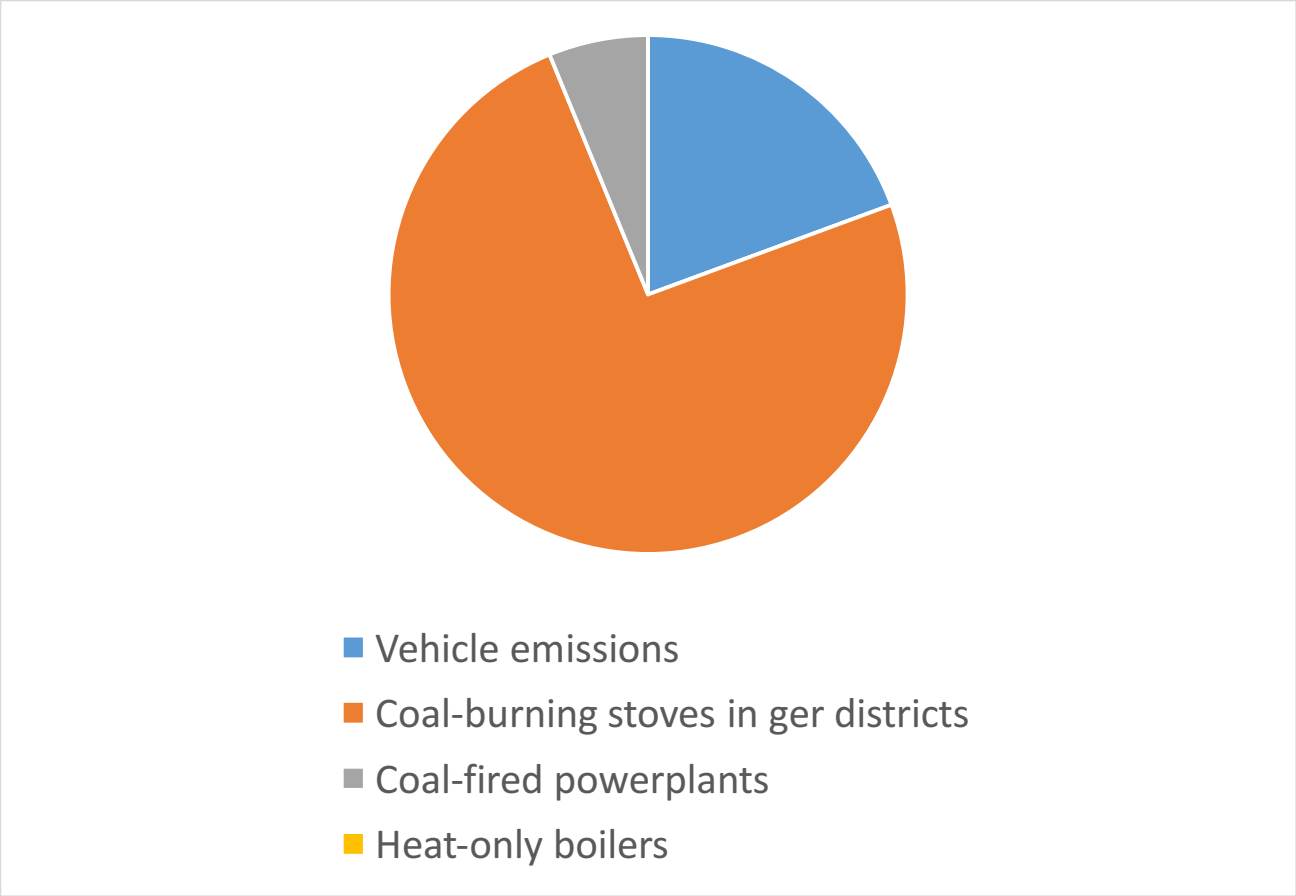
The air quality has improved over the past five years	1	2	3	4	5
The government has been tackling air pollution effectively	1	2	3	4	5
I trust the air quality data available to the public	1	2	3	4	5
I am aware of how dangerous air pollution is to my health	1	2	3	4	5
There is plenty of information on air pollution-related health risks	1	2	3	4	5

Who is responsible for providing guidelines to protect against air pollution?
□ Mongolian government □ international organizations □ health centers □ NGOs □ Other _____

In your opinion, what is the best short-term solution to Ulaanbaatar's air pollution?
_____
__
In your opinion, what is the best long-term solution to Ulaanbaatar's air pollution?
_____

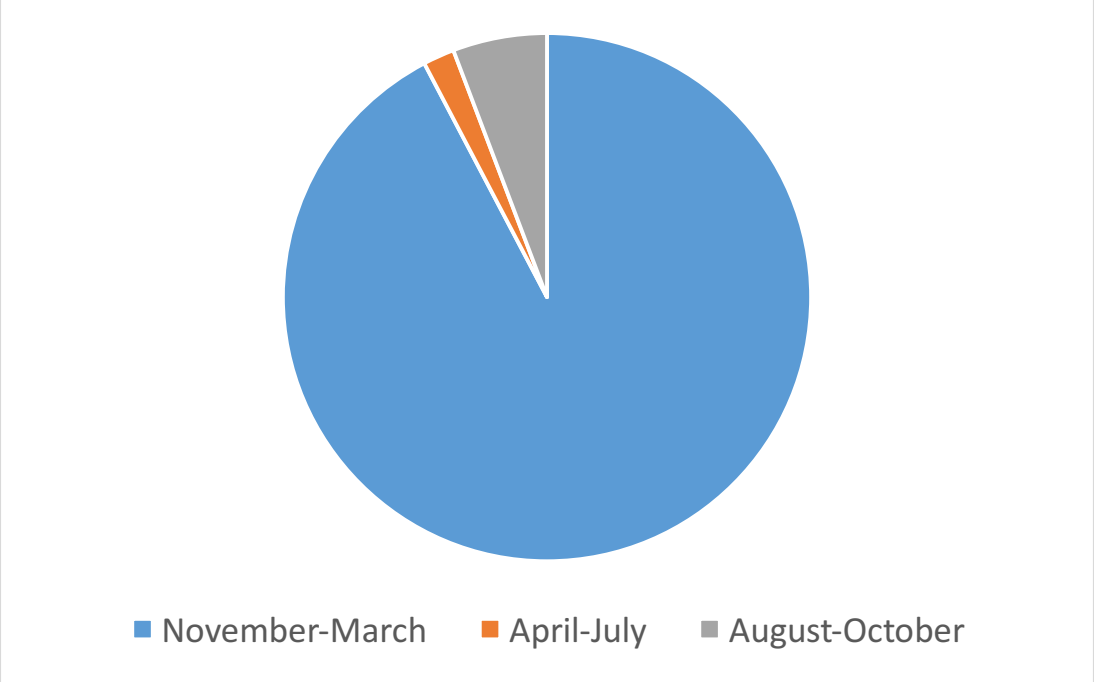
How long do you think it will take to solve the air pollution problem?
□ 5-10 years □ 10-20 years □ 20-30 years □ 30-40 years □ More than 40 years □ It will never be solved

APPENDIX 2



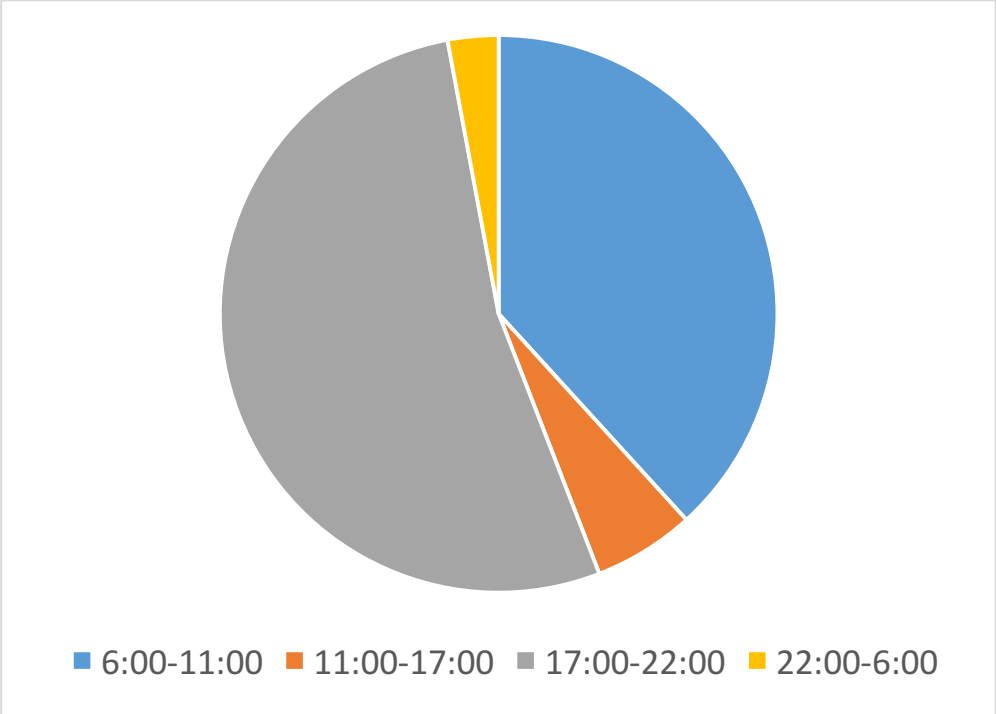
Survey Question: What is the biggest cause of air pollution? The vast majority of those who responded saw coal-burning stoves in the ger districts as the main cause of air pollution in Ulaanbaatar.

APPENDIX 3



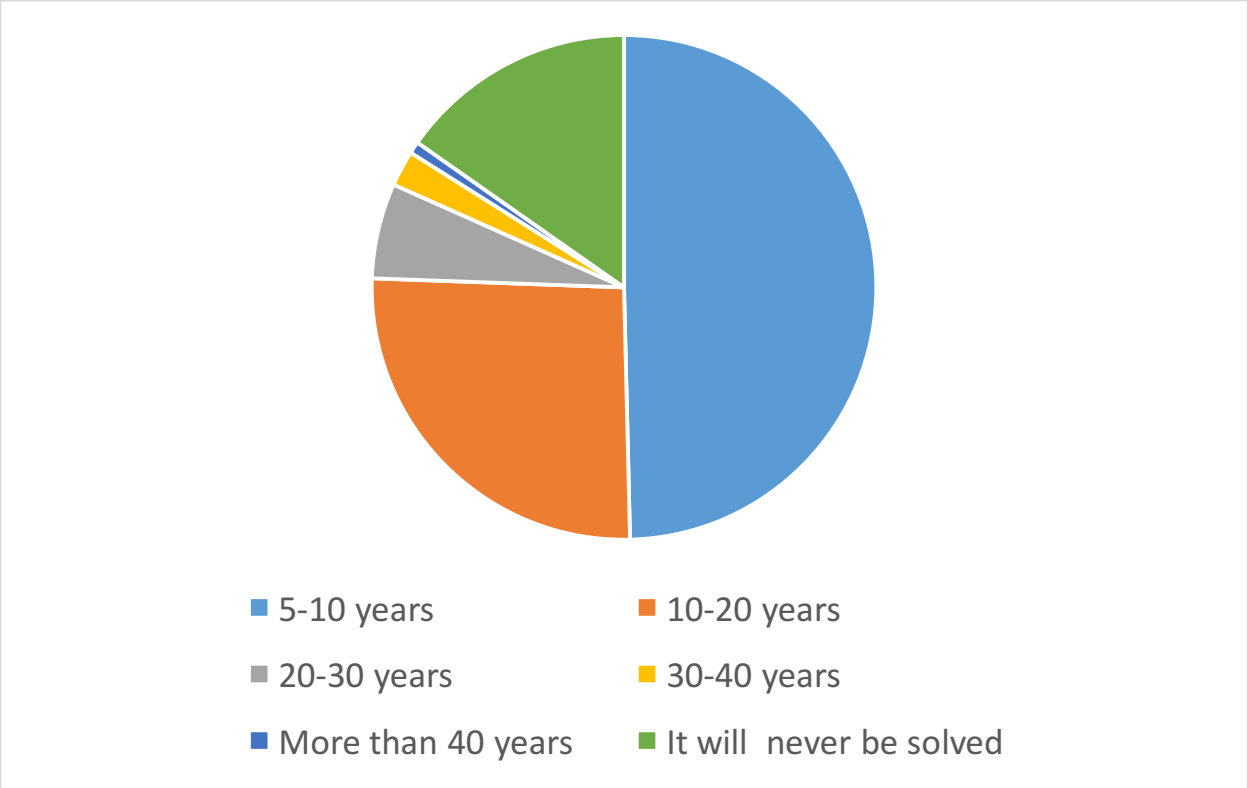
Survey question: In your experience, which month span has the most polluted air? The vast majority of survey respondents claimed that air pollution was highest from November to March.

APPENDIX 4



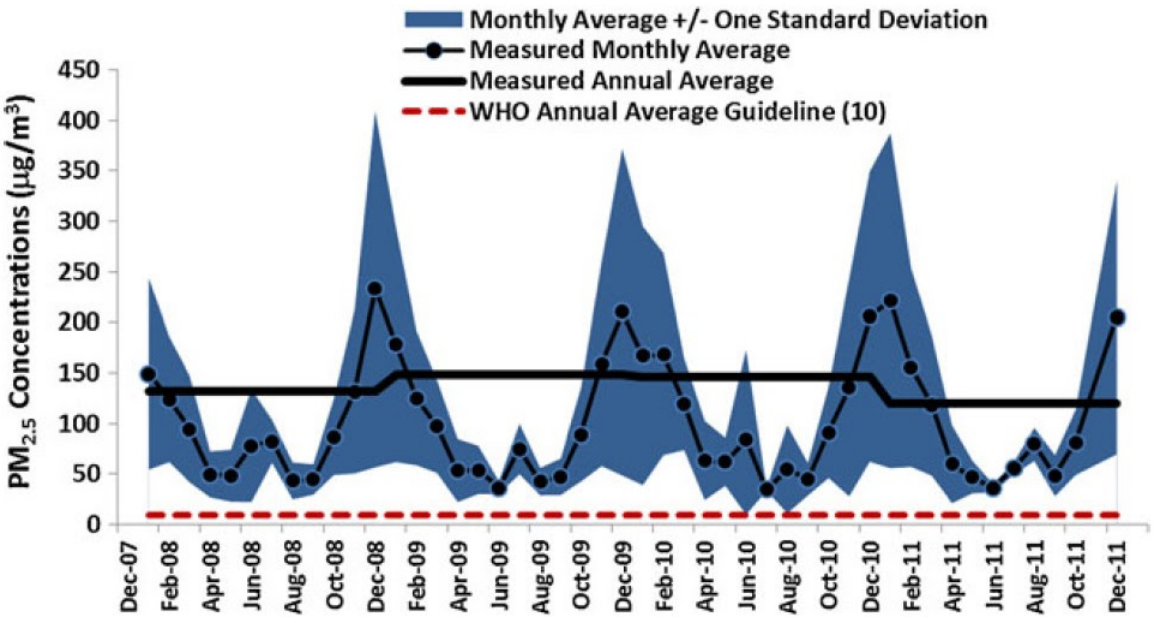
Survey question: What time of day has the worst air quality? More than 50% of survey respodents said that 17:00-22:00 had the worst air quality and approximately 30% of respondents claimed that morning hours, 6:00-11:00 had the worst air quality.

APPENDIX 5



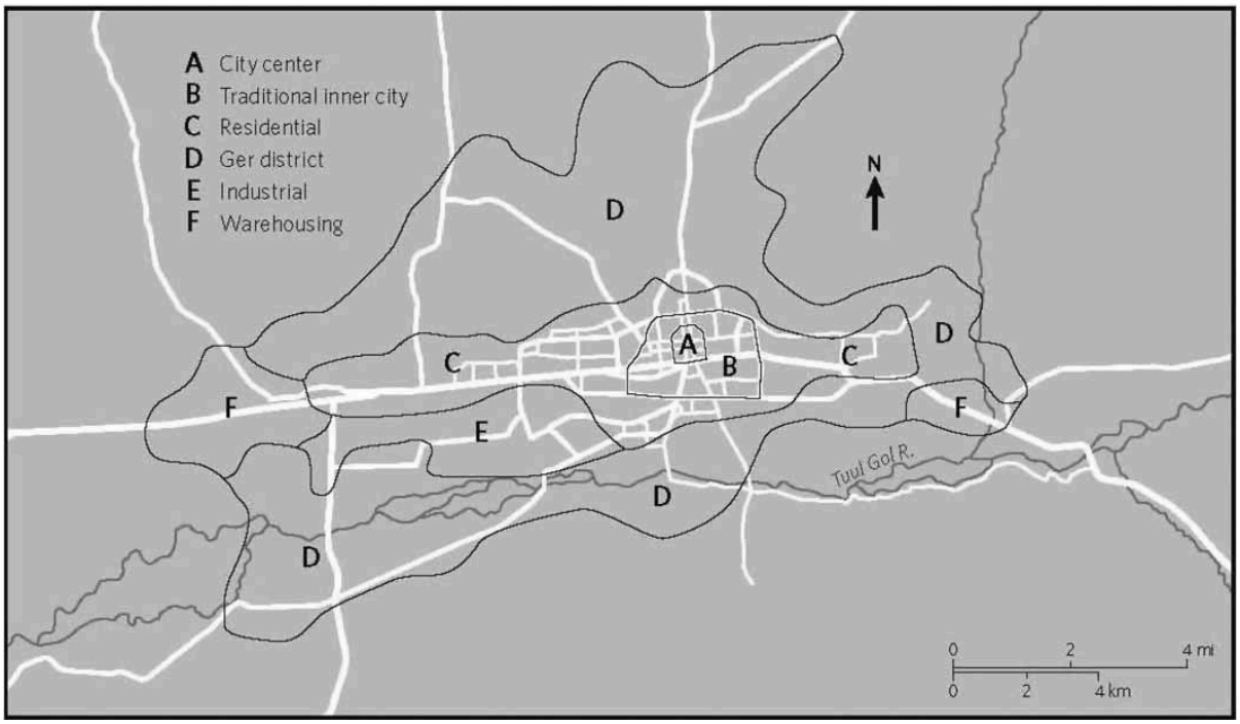
Survey question: How long do you think it will take to solve the air pollution problem? 50% of those who responded believed that the air pollution problem will be solved in 5-10 years. 25% of respondents believed that the air pollution problem will be solved in 10-20 years. Approximately 15% claimed responded that the air pollution problem will never be solved.

APPENDIX 6



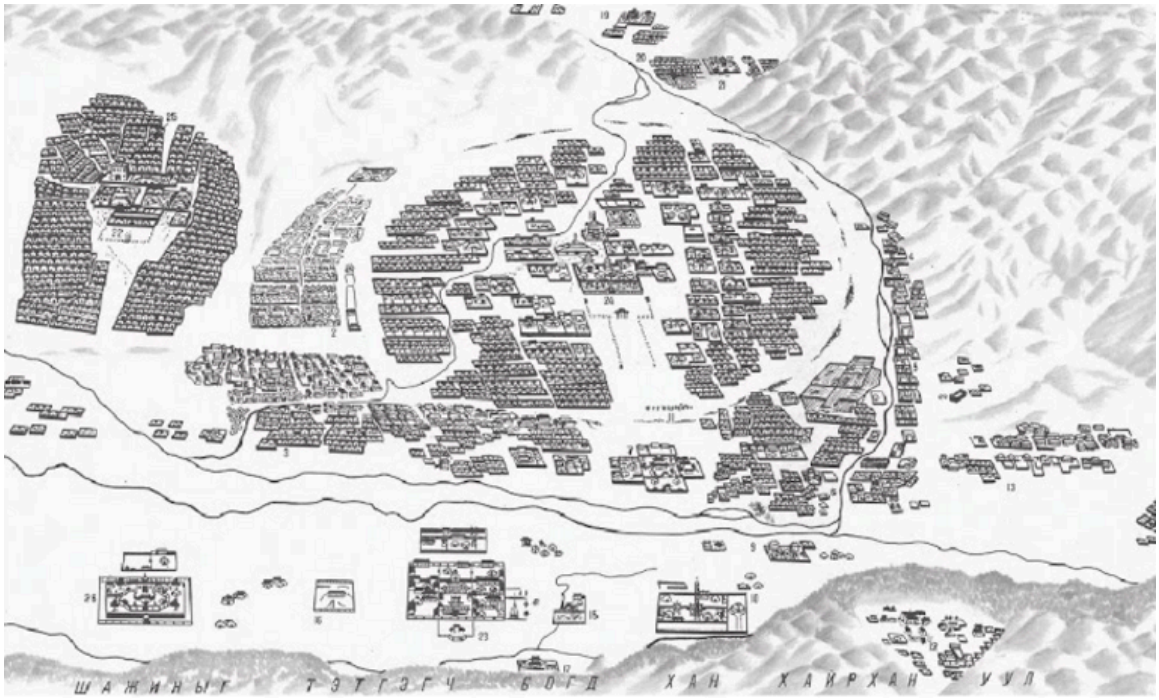
Seasonal patterns of PM2.5 concentrations from 2007-2011

APPENDIX 7



Spatial layout of Ulaanbaatar (Diener and Hagen 2013: 624)

APPENDIX 8



Ulaanbaatar (*Urga*) in early 20th century. State Geodesy and Cartography Office. 1990.

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